XINJE

DS5F series servo driver

User manual

WUXI Xinje ELECTRIC CO., LTD.

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XINJE

DS5F Series Servo Driver User Manual

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Basic explanation

- Thank you for purchasing the Xinje DS5C2 series servo drive products.
- This manual primarily provides product information on the DS5C2 series servo drives and the MS6 series servo motors.
- Before using the product, read this manual carefully and connect the wires only after fully understanding its contents.
- Please deliver this manual to the end user.

This manual is suitable for the following users

- Servo system designer
- Installation and wiring worker
- Commissioning and servo debugging workers
- Maintenance and Inspection Worker

How to obtain the manual

- Download the Xinje official website
  Website: www.Xinje.com
  Path: Services and Support--Download Center
- Scan the QR code below to view

Declaration of liability

- Although the content of the manual has been carefully verified, errors are inevitable, and we cannot guarantee complete consistency.
- We regularly review the content of the manual and make corrections in subsequent versions. Your valuable feedback is welcome.
- Any changes to the information provided in this manual will not be notified separately; please understand this.

Contact way

If you have any questions about using this product, please contact the agent or office that purchased it, or directly contact Xinje Company.

- Website: https://en.Xinje.com/web/ index
- Email: tech@Xinje.com
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Safety Precautions

Be sure to review this section carefully before use this product. In precondition of security, wire the product correctly.

Before using this product, please read this part carefully and operate after fully understanding the use, safety and precautions of the product. Please connect the product correctly on the premise of paying great attention to safety.

The problems that may arise during the use of the product are basically listed in the safety precautions, and all are indicated by the two levels of attention and danger. For other unmentioned matters, please follow the basic electrical operation rules.

Caution	When used incorrectly, there may be danger, moderate injury or minor injury, and property loss.
Danger	When used incorrectly, it may cause danger, personal casualties or serious injuries, as well as serious property losses.

Attention to Product Confirmation

1．Do not install damaged drives, drives that lack spare parts, or drives whose models do not meet the requirements.

Installation Notes

1. Before installing wiring, be sure to disconnect the power supply to prevent electric shock.
2. It is forbidden to expose the product to water, corrosive gases, flammable gases and other substances, causing electric shock and fire hazards.
3. Do not touch the conductive part of the product directly, which may cause misoperation and malfunction.

Cautions for wiring

1. Please connect AC power to LN or L1/L2/L3 or R/S/T on the dedicated power terminal of the driver. Do not connect the output terminals U, V, W of the driver to the three-phase power supply.
2. Please connect the ground wire correctly. Poor grounding may cause electric shock. Please use 2mm^2 wire to ground the ground terminal of the driver.

3. Please lock the fixed screw of the terminal, otherwise it may cause fire.

4. Be sure to disconnect all external power supply before wiring the driver.

5. Wiring, please ensure that the encode line, power line is loose, do not tighten, lest cable damage.



Operation Cautions

1. Do not touch the rotating part of the motor after the driver is running. There is a danger of injury.

2. Please Attention the test run of the motor once, do not connect the motor with the machine, there is the possibility of injury.

3. After connecting the machine, please set the appropriate parameters before running, otherwise it may cause the machine out of control or failure.

4. In operation, do not touch the radiator, there is a risk of scald.

5. Under power-on condition, do not change the wiring, there is a risk of injury.

6. Do not switch power frequently. If you need to switch power many times, please control it once in 2 minutes.



Maintenance and inspectio

1. Do not touch the inside of servo driver and servo motor, otherwise it may cause electric shock.

2. When the power is started, it is forbidden to remove the driver panel, otherwise it may cause electric shock.

3. Within 10 minutes of power off, the terminal should not be contacted. Otherwise, the residual voltage may cause electric shock.



Wiring attention

1. Do not cross the power line and the control signal line from the same pipeline, nor tie them together. The power line and the control signal line are separated by more than 30 centimeters.

2. For signal line and encoder (PG) feedback line, please use multi-stranded wire and multi-core stranded integral shielding line. For wiring length, the longest signal input line is 3 meters and the longest PG feedback line is 20 meters.

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► Confirmation upon product delivery

After the product arrives, please verify its integrity in the following aspects.

Confirm Project	Remarks
Does the delivered product match the ordered model?	Please verify this information Framed on the nameplates of the servo motor and servo unit.
Is the rotating shaft of the servo motor operating smoothly?	It is normal for the device to rotate gently when operated manually. Motors equipped with a brake will not rotate.
Are there any damaged areas?	Conduct a comprehensive visual inspection to check for any damage caused by transportation or other factors.
Are there any screws that are loose?	Use a screwdriver to check for any loose areas.
Are the motor codes consistent?	Check whether the motor codes on drive U3-70 and the motor label match.

If any of the above items are inappropriate, please promptly contact the product's authorized agent, office, or the sales department of Xinje Company

1. Selection of Servo Systems

1.1 Selection of Servo Drive

1.1.1 Model Naming

DS 5□-2 □P□ - PTA

Display	Product name
DS	Servo driver

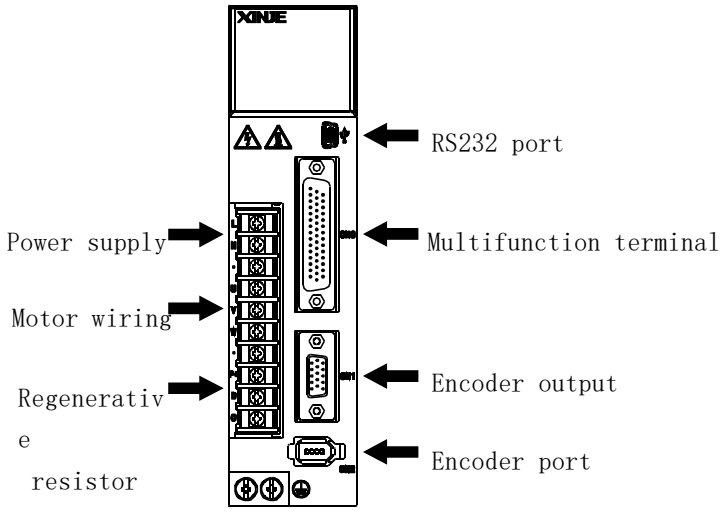
Display	Product series
5F	Full function

Display	Rated input voltage
2	AC220V
4	AC380V

Display	Encoder type
T	Communication encoder

Display	Rated output power	Display	Rated output power
0P1	100W	2P3	2.3KW
0P2	200W	2P6	2.6KW
0P4	400W	3P0	3KW
0P7	750W	5P5	5.5KW
1P5	1.5KW	7P5	7.5KW

1.1.2 Description of Each Section



1.1.3 Performance Specifications

Service Unit		DS5F Series Servo Drivers
Apply Encoder		Standard: 17-bit/23-bit communication encoder
Power Input		DS5□-2□P□-PTA: Single/three-phase AC 200–240 V, 50/60 Hz Below 1.5 kW (excl. 1.5 kW): Single-phase AC 200–240 V, 50/60 Hz; For devices rated at 1.5 kW or higher, a three-phase AC supply of 200–240 V (50/60 Hz) is recommended. (For single-phase power supply, connect to R and T; otherwise, parameter memory may be affected during power loss.)
		DS5□-4□P□-PTA: Three-phase AC 380–440 V, 50/60 Hz
Control method		Three-phase full-wave rectification IPM PWM control using sine wave current drive method
Function condition	Operating Temperature	-10°C to +55°C (No performance reduction required for temperatures between-10°C and 45°C; performance reduction is required when temperatures exceed 45°C, with a 2% decrease per 1°C increase)
	Storage Temperature	-20 ~ +60℃
	Ambient Humidity	Below 90% RH (non-condensing)
	Vibration Resistance	4.9m/s2
	Altitude	Maximum altitude: 2000 m. Derating is required above 1000 m at a rate of 1% per 100 m.

1.1.4 Electrical Specifications

Drive Model	Drive Power (Kw)	Continuous Output Current (A)	Maximum Output Current (A)	Power Supply Input Current (A)	Power Supply Voltage	Cooling Way
DS5F-20P1-PTA	0.1	0.9	3.15	1.3	uniphase AC200 ~ 240V, 50/60Hz	Self-cooling
DS5F-20P2-PTA	0.2	1.9	6.65	2.7		Self-cooling
DS5F-20P4-PTA	0.4	2.8	9.8	4		Self-cooling
DS5F-20P7-PTA	0.75	4	12	5		forced air cooling
DS5F-21P0-PTA	1.0	6	15	9	Single-phase/triple-phase AC 200–240 V, 50/60 Hz	forced air cooling
DS5F-21P5-PTA	1.5	6	15	9		forced air cooling
DS5F-22P3-PTA	2.3	9.5	19	8		forced air cooling

Drive Model	Drive Power (Kw)	Continuous Output Current (A)	Maximum Output Current (A)	Power Supply Input Current (A)	Power Supply Voltage	Cooling Way
DS5F-22P6-PTA	2.6	13	32.5	10		forced air cooling
DS5F-41P0-PTA	1.0	4	12	3	three-phase AC380～440V, 50/60Hz	forced air cooling
DS5F-41P5-PTA	1.5	7.4	22.2	6		forced air cooling
DS5F-43P0-PTA	3.0	9	24.3	8		forced air cooling
DS5F-43P0-PTA-H	3.0	12	30	10		forced air cooling
DS5F-45P5-PTA	5.5	16	32	10		forced air cooling
DS5F-45P5-PTA-H	7.5	20	50	20		forced air cooling
DS5F-47P5-PTA	7.5	16	32	10		forced air cooling
DS5F-47P5-PTA-H	7.5	25	62.5	20		forced air cooling

1.2 Servo Motor Selection

1.2.1 Model Naming

■ MS5 Motor

MS5S – 80 ST E – C S 02430 B Z - 2 0P7 – S01

Display	Inertia
MS5S	Low inertia
MS5G	Middle inertia
MS5H	High inertia

Display	Seat number
60	Frame 60
80	Frame 80

Display	Product name
ST	Sine-Wave Driven Motor

Display	Product name
empty	Without oil seal
E	With oil seal

Display	Encoder type
C	Magnetic encoder
T	Photoelectric encoder

Display	Encoder accuracy
S	Single circle 17-bit
M	Multi-circle 17-bit
U	Single circle 23-bit
L	Multi-circle 23-bit

Display	Rated torque (N·m)	Rated speed (rpm)
00630	0.637	3000
01330	1.27	3000
02430	2.39	3000

Display	Design number
S01	standard
S02	Small Aviation Plug Type

Display	Rated power (KW)
0P2	0.2
0P4	0.4
0P7	0.75

Display	Voltage level
2	220V
4	380V

Display	Power-off brake
Empty	without
Z	with

Display	Shaft
A	Without key
B	With key

■ MS6 Motor

MS6S - 60 C S 30 B Z 1 - 2 0P4 -□

display	inertia
MS6S	Low-inertia motor
MS6G	High-inertia motor
MS6H	High inertia motor

display	Frame
40	40 Frame
60	60 Frame
80	80 Frame
100	100 Frame
130	130 Frame
180	180 Frame

display	Encoder specifications
C	magnetic encoder
T	optical encoder

display	Encoder accuracy
S	17-bit Single-Turn
M	17-bit Multi-Turn
U	23-bit Single-Turn
L	23-bit Multi-Turn

display	Rated rotational speed (rpm)
15	1500
20	2000
25	2500
30	3000

display	Type
S	Short Body
H	Short Body

display	rated power	display	rated power
0P1	100W	1P8	1.8kW
0P2	200W	2P3	2.3kW
0P4	400W	3P0	3.0kW
0P7	750W	4P4	4.4kW
0P8	850W	5P5	5.5kW
1P5	1.5kW	7P5	7.5kW

display	voltage classes
2	220V
4	380V

display	Motor connector type
1	Amper plug
2	Connector for aviation plug
3	waterproof connector

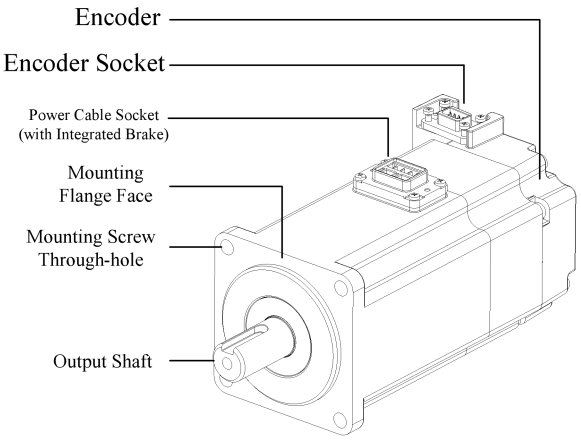
display	Brake
Empty	Without
Z	With

display	Motor shaft specification
A	With keys, without oil seals, with threaded holes
B	With keys, with oil seals, and with threaded holes
C	Keyless, without oil seal, with threaded holes
D	Without keys, with oil seals, and with threaded holes
E	Special shaft specifications (length, shaft diameter, etc.)

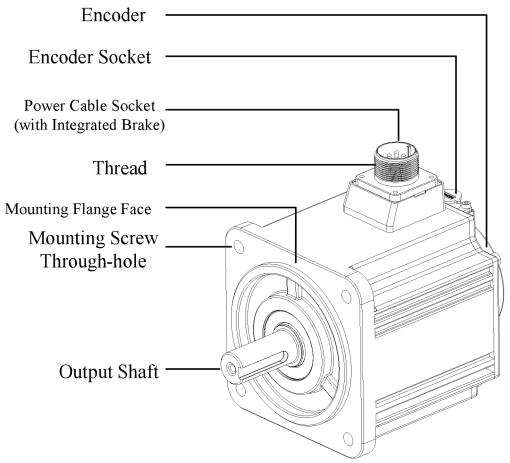
- Currently, the available encoder type options for selection are limited to combinations of CS, CM, TL, and T.
- Snap-In Type 1 refers to the Ampere connector, applicable to frame 80 and below.
- Snap-In Type 2 refers to the mini aviation connector, applicable to frame 80 and below.

1.2.2 Description of Each Section

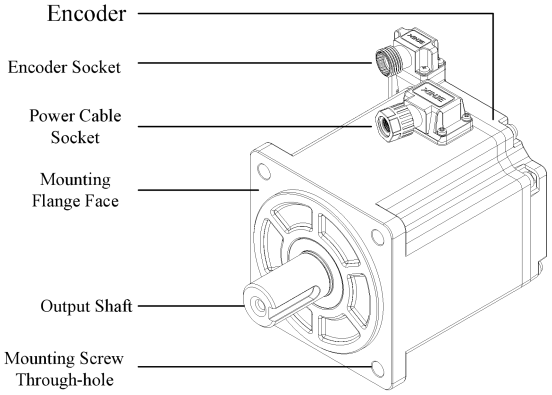
- Motor with B3 Connector Type



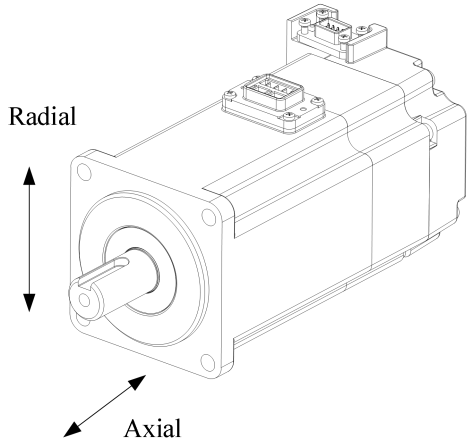
- Motor with B2 Connector Type



- Motor with B4 Connector Type



1.2.3 Axial Load & Radial Load



Frame NO.	40	60	80	100	110	130	180
axial force	54N	74N	147N	196N	147N	196N	400N
radial force	78N	245N	392N	500N	392N	686N	800N

1.3 Cable Selection

1.3.1 Model Naming

■ Encoder Cable Model

CP – SC T – M - 02

Display	Cable type
CP	Standard Encoder Cable
CPT	High-Flexible Encoder Cable

Display	Connector Type
SP	AMP Connector
SL	15-pin Aviation Connector
SC	10-pin Mini Aviation Connector
SE	B3 Connector, Motor Side (Standard Orientation)
SF	B3 Connector, Motor Side (Reverse Orientation)
ZDL	Straight DB Connector (Drive Side)
SW	Waterproof Aviation Connector - S02 Motor

Display	Length（M）	Display	Length（M）
02	2	12	12
03	3	16	16
05	5	20	20
08	8	25	25
10	10	30	30

Display	Battery Case Option
M	Without Battery Case
B	With Battery Case (Frame Size ≥100)
BM	With Battery Case (Frame Size ≤80)

Display	Coupling Type
T	Threaded Push-Pull Type (for Frame 130/180 only)
Empty	Standard Type

■ Power cable model

■ Brake Line Cable Specifications

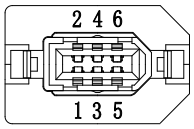
- For motors with a suffix of S01 and chassis numbers up to 80, the recommended brake cable model is: CB-P03 (standard material) or CBT-P03 (high-flexibility material).
- From motors with suffix S02 and power ratings up to 750 W: CMBT-W07-M-length specification required.
- For the 130-type chassis compatible with MS5G, the inertia brake motor requires cables that integrate power and brake lines into a single unit.
- Xinje Standard wiring lengths are available in 2m,3m,5m,8m,10m,12m,16m, and 20m. Specifically, the 25m and 30m specifications are designed for encoder cables and power lines with motor suffixes ending in S01 (up to 80 units).

1.3.2 Explanation of Cable Pin Definitions

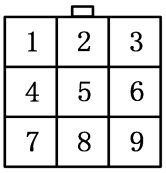
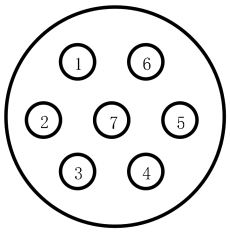
■ Encoder Cable

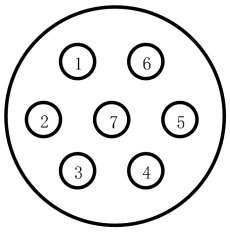
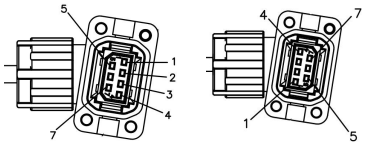
(1) Definition of soldering pin positions for encoder cables on the servo driver side

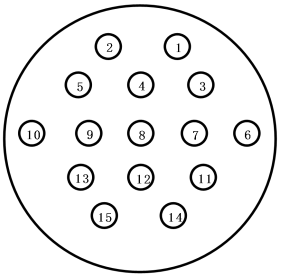
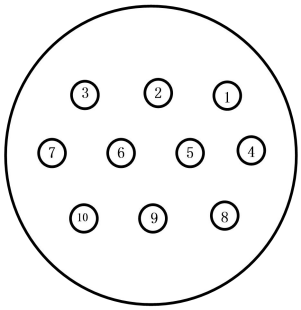
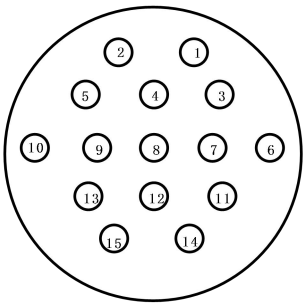
Connector Appearance	Interface Pin Definitions

	NO.	definition	NO.	definition
	1	5V	4	/
	2	GND	5	485-A
	3	/	6	485-B
	-	-	-	-

(2) Definition of soldering pin positions for encoder cables on the servo motor side

Motor Model	Connector Pin	Interface Pin Definitions	
		NO.	definition
MS6 Frame Size 40, 60, 80 Motors (B1/B4 Type) MS5 Frame Size 40, 60, 80 Motors (S01 Type)		1	B+
		2	B-
		3	Shielded Cable
		4	485-A
		5	485-B
		6	/
		7	5V
		8	GND
		9	/
MS5 Frame Size 40, 60, 80 Motors (S02 Type)		NO.	definition
		1	Shielded Cable
		2	B+
		3	B-
		4	485-A
		5	485-B
		6	5V
		7	GND

Motor Model	Connector Pin	Interface Pin Definitions	
		NO.	definition
MS6 Frame Size 60, 80 Motors (B2 Type)		1	GND
		2	B+
		3	B-
		4	485-A
		5	485-B
		6	5V
		7	Shielded Cable
MS6 Frame Size 40, 60, 80 Motors (B3 Type)	 Forward Outlet; Rearward Outlet (View)	NO.	definition
		1	5V
		2	GND
		3	B+
		4	B-
		5	485-A
		6	485-B
		7	Shielded Cable
MS6 Frame Size 180 Motor (B2 Type)		NO.	definition
		1	Shielded

MS5 Frame Size 110, 180 Motors (S01 Type) MS Frame Size 110, 130 Motors (Absolute Encoder Type)			Cable
		2	/
		3	485-B
		4	485-A
		5	/
		6	GND
		7	B-
		8	5V
		9	B+
		10-15	/
MS6 Frame Size 100, 130 Motors MS5 Frame Size 130 Motor		NO.	definition
		1	/
		2	5V
		3	GND
		4	485-A
		5	485-B
		6	B+
		7	B-
		8	/
		9	/
		10	Shielded Cable
Frame Size 220, 265 Motors		NO.	definition
		1	Shielded Cable
		2	/
		3	485-B
		4	485-A
		5	/
		6	GND
		7	B-
		8	5V
		9	B+
		14	temperature -
		15	temperature +

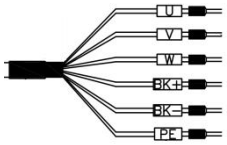
Battery Case Specifications:

1) The cable with pin definitions for Battery+ and Battery– in the aforementioned encoder is designed for absolute motors; non-absolutely controlled motors do not require these pins.
2) Only absolute value motors require an externally mounted battery box with a built-in 3.6 V/2.7 Ah high-capacity battery and battery replacement capability while powered on; the service life shall be ≥2 years, with battery replacement procedures following Section 5.6.2.

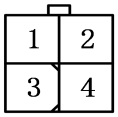
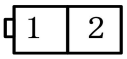
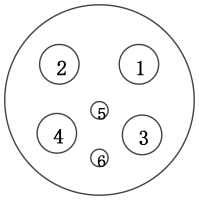
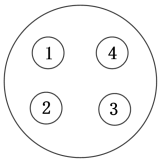
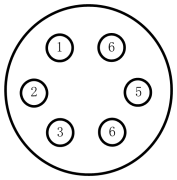
■ Power cable

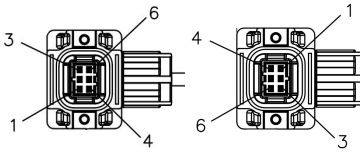
(1) Power line pin definitions on the servo driver side

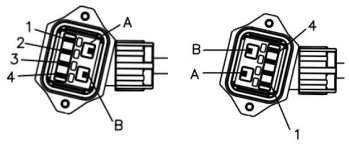
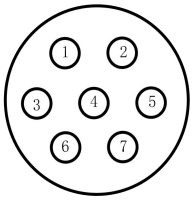
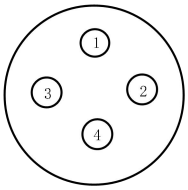
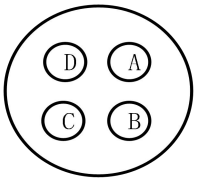
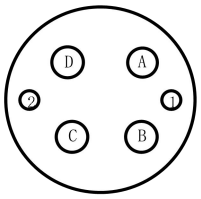
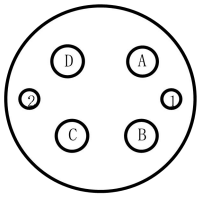
Motor Model	Connector Appearance	Interface Pin Definitions	
		Color	definition
MS5 – Full Series MS6-B1 and MS6-B2 motors		Brown	U
		black	V
		Blue	W
		Greenish-yellow	PE

Motor Model	Connector Pin	Interface Pin Definitions	
MS6-B3 Motor		red	U
		white	V
		black	W
		Greenish-yellow	PE
		Blue	BK+
		Brown	BK-

(2) Definition of welding pins for power cables on the motor side

Motor Model	Connector Pin	Interface Pin Definitions	
		NO.	definition
MS6 Frame Size 40, 60, 80 Motors (B1/B4 Type) MS5 Frame Size 40, 60, 80 Motors (S01 Type)		1	U
		2	W
		3	V
		4	PE
MS6 Frame Size 40, 60, 80 Motors with Brake (B1/B4 Type) MS5-40,60,80 machine Frames; S01 brake motorr		NO.	definition
		1	BK+
		2	BK-
MS5 Frame Size 40, 60, 80 Motors (S02 Type)		NO.	definition
		1	PE
		2	U
		3	V
		4	W
		5	BK+
		6	BK-
MS6 Frame Size 40, 60, 80 Motors (B2 Type)		NO.	definition
		1	U
		2	W
		3	V
		4	PE
MS6 Frame Size 40, 60, 80 Motors with Brake (B2 Type)		NO.	definition
		1	U
		2	W
		3	V
		4	PE
		5	BK+
		6	BK-

Motor Model	Connector Pin	Interface Pin Definitions	
		NO.	definition
MS6 Frame Size 40 Motor (B3 Type)	 Forward Outlet; Rearward Outlet (View)	1	W
		2	V
		3	U
		4	PE
		5	BK+
		6	BK-
		NO.	definition
		1	U

<table>
<tr><th rowspan="2">Motor Model</th><th rowspan="2">Connector Pin</th><th colspan="2">Interface Pin Definitions</th></tr>
<tr><th>NO.</th><th>definition</th></tr>
<tr><td rowspan="4">MS6 Frame Size 60, 80 Motor (B3 Type)</td><td rowspan="4">
Forward Outlet; Rearward Outlet (View)</td><td>2</td><td>V</td></tr>
<tr><td>3</td><td>W</td></tr>
<tr><td>4</td><td>PE</td></tr>
<tr><td>A</td><td>BK+</td></tr>
<tr><td rowspan="8">MS6 Frame Size 100, 130 Motors with Brake (Non-Medium-Inertia)
MS5G Frame Size 130 Medium-Inertia Motor with Brake</td><td rowspan="8"></td><td>B</td><td>BK-</td></tr>
<tr><td>NO.</td><td>definition</td></tr>
<tr><td>1</td><td>PE</td></tr>
<tr><td>2</td><td>U</td></tr>
<tr><td>3</td><td>V</td></tr>
<tr><td>4</td><td>W</td></tr>
<tr><td>5</td><td>BK+</td></tr>
<tr><td>6</td><td>BK-</td></tr>
<tr><td rowspan="5">MS6 Frame Size 100, 130, 180 Motors (Non-Medium-Inertia, Without Brake)
MS5 Frame Size 110, 130, 180 Motors (Without Brake)s
MS Frame Size 110, 130 Motors with Absolute Encoder (Without Brake)</td><td rowspan="5"></td><td>7</td><td>/</td></tr>
<tr><td>NO.</td><td>definition</td></tr>
<tr><td>1</td><td>PE</td></tr>
<tr><td>2</td><td>U</td></tr>
<tr><td>3</td><td>V</td></tr>
<tr><td rowspan="5">MS6G Frame Size 110, 130 Medium-Inertia Motors (Without Brake)</td><td rowspan="5"></td><td>4</td><td>W</td></tr>
<tr><td>NO.</td><td>definition</td></tr>
<tr><td>A</td><td>W</td></tr>
<tr><td>B</td><td>V</td></tr>
<tr><td>C</td><td>U</td></tr>
<tr><td rowspan="6">MS6G Frame Size 110, 130 Medium-Inertia Motors with Brake</td><td rowspan="6"></td><td>D</td><td>PE</td></tr>
<tr><td>NO.</td><td>definition</td></tr>
<tr><td>A</td><td>W</td></tr>
<tr><td>B</td><td>V</td></tr>
<tr><td>C</td><td>U</td></tr>
<tr><td>D</td><td>PE</td></tr>
<tr><td rowspan="6">MS6, MS5 Frame Size 180 Motors with Brake</td><td rowspan="6"></td><td>1</td><td>BK+</td></tr>
<tr><td>2</td><td>BK-</td></tr>
<tr><td>NO.</td><td>definition</td></tr>
<tr><td>A</td><td>U</td></tr>
<tr><td>B</td><td>V</td></tr>
<tr><td>C</td><td>W</td></tr>
<tr><td>D</td><td>PE</td></tr>
<tr><td>1</td><td>BK+</td></tr>
<tr><td>2</td><td>BK-</td></tr>
</table>

Brake engagement pin description:

The cable with pin definitions including BK+ and BK-is designed for brake-equipped motors; non-brake-equipped motors use a cable without these pins, featuring empty terminals instead.

1.4 Selection of Brake Resistance

1.4.1 Selection of Brake Resistance

When the servo motor operates in generator mode, power is returned to the servo amplifier side—a process known as regenerative power. This regenerative power is absorbed by charging the smoothing capacitor within the servo amplifier. Any excess energy beyond what can be stored is then dissipated through the braking resistor.

The regeneration power generated by a servo motor is as follows:

- During deceleration operation or during the period of deceleration stop;
- When the vertical axis runs downward;
- When an external load drives the motor to rotate.

Servo Driver Model	Braking resistor connection terminal
DSS□-□□P□-PTA	1) Use the built-in braking resistor by shorting terminals P+ and D, and disconnecting P+ from terminal C; 2) For applications below 5.5 kW, use an external braking resistor connected to terminals P+ and C; disconnect the shorting wires between P+ and D. P0-25 = power value; P0-26 = resistance value. For applications ranging from 5.5 kW to 11 kW, use an external braking resistor connected to terminals P+ and PB; P0-25 = power value; P0-26 = resistance value.



For software versions U2-07 <3700, set parameter P0-24: a value of 0 enables the built-in resistor, while a value of 1 enables the external resistor. For firmware versions U2-07 ≥ 3700, leave P0-24 unchanged and use the default value.

The table below lists the recommended specifications for external braking resistors for each motor model.

Servo Driver Model	Built-in braking unit	Minimum Resistance Value (Not less than this value)	External braking resistor (Recommended Resistance Value)	External braking resistor (Recommended Power Value)
DS5F-20P1-PTA	built-in	50Ω	50Ω-100Ω	Above 200W
DS5F-20P2-PTA				
DS5F-20P4-PTA		40Ω	40Ω-100Ω	Above 500W
DS5F-20P7-PTA		40Ω	40Ω-100Ω	Above 600W
DS5F-21P0-PTA		25Ω	25Ω-50Ω	Above 1000W
DS5F-21P5-PTA				
DS5F-22P3-PTA				
DS5F-22P6-PTA				
DS5F-43P0-PTA		55Ω	55Ω-75Ω	Above 1000W
DS5F-43P0-PTA-H		55Ω	55Ω-75Ω	Above 1200W
DS5F-45P5-PTA		25Ω	30Ω-65Ω	Above 2000W
DS5F-45P5-PTA-H		25Ω	25Ω-65Ω	Above 2000W

DS5F-47P5-PTA		22Ω	30Ω-65Ω	Above 2500W
DS5F-47P5-PTA-H		22Ω	22Ω-50Ω	Above 2500W

- The smaller the resistance value, the faster the discharge rate; however, values that are too small may cause the resistor to break down. Therefore, during selection, aim for a value as close as possible to the lower limit rather than below it.
- When wiring, use high-temperature resistant flame-retardant cables and ensure the surface of the braking resistor does not come into contact with the cable.

2. Installation of the Servo System

2.1 Installation of the Servo Driver

2.1.1 Installation Site

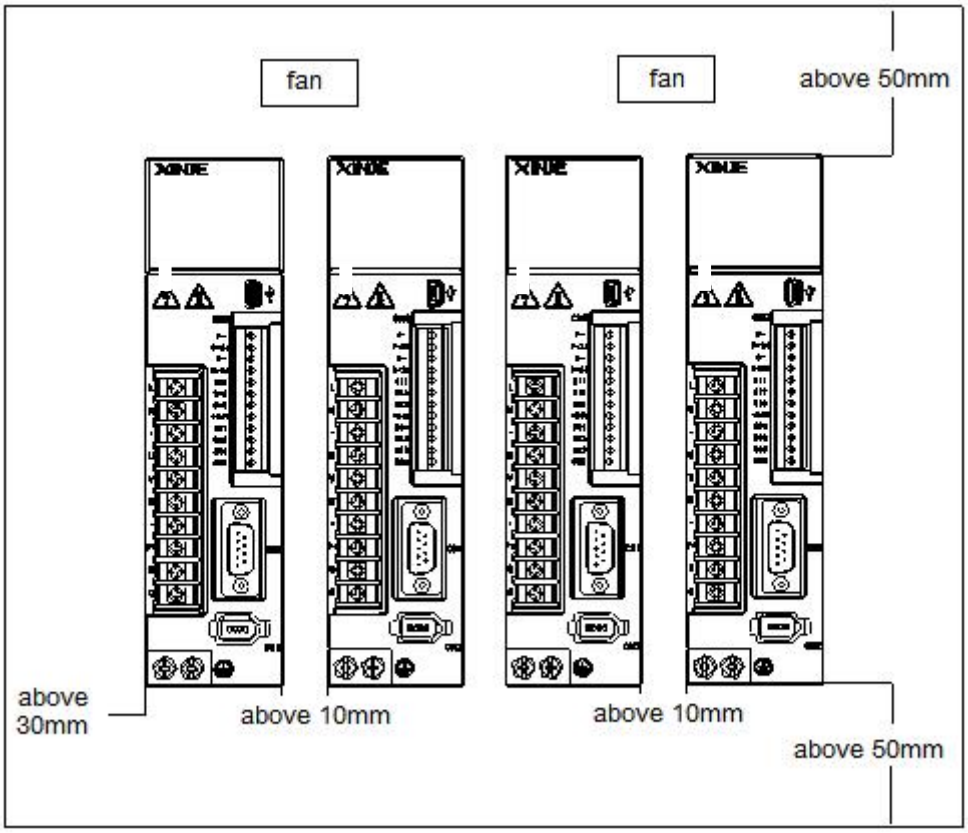
- Install in a cabinet protected from sunlight and rain.
- Do not use this product in environments containing corrosive or flammable gases such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gases, acids, alkalis, or salts, or near combustible materials.
- Do not install in environments with high temperatures, humidity, dust, or metal particles.
- No vibration required.

2.1.2 Environmental Conditions

project	description
Operating Ambient Temperature	-10°C to +55°C (No performance reduction required for temperatures between-10°C and 45°C; performance reduction is required when temperatures exceed 45°C, with a 2% decrease per 1°C increase)
Operating Ambient Humidity	20–90% RH (non-condensing)
storage temperature	-20~60℃
Storage Humidity	20–90% RH (non-condensing)
Vibration Resistance	No more than 4.9 m/s²
Altitude	Maximum altitude: 2000 m. Derating is required above 1000 m at a rate of 1% per 100 m.

2.1.3 Installation Standards

Please strictly adhere to the installation standards shown in the figure below for the control cabinet, which apply when installing multiple servo drives side by side within the cabinet (hereinafter referred to as "side-by-side installation").



■ Orientation of the servo driver

During installation, orient the front of the servo driver (the actual mounting surface for the operator) toward the operator and keep it perpendicular to the wall. For drivers with a braking resistor at the bottom, ensure proper heat dissipation on the mounting surface to prevent overheating and fire hazards.

■ cooling

To ensure proper cooling via fans and natural convection, leave sufficient space around the servo driver as shown in the figure above.

■ When installed side by side

As shown in the figure above, leave a space of at least 10 mm on each side horizontally and at least 50 mm on each side vertically. Additionally, install a cooling fan at the top of the servo driver. To prevent localized overheating of the servo driver's environment, ensure uniform temperature distribution within the control cabinet.

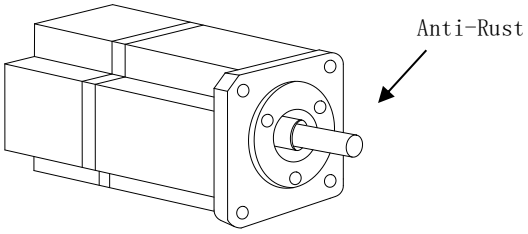
■ Environmental conditions inside the control cabinet

- Operating temperature range for servo drivers: -10°C to +55°C (no derating required at-10°C to 45°C; derating is required when temperatures exceed 45°C, with a 2% reduction per degree Celsius increase).
- Humidity: below 90% RH (relative humidity).
- Vibration: 4.9 m/s².
- Avoid freezing, condensation, or similar phenomena.

- To ensure long-term reliability, use the device in environments with temperatures below 50°C.

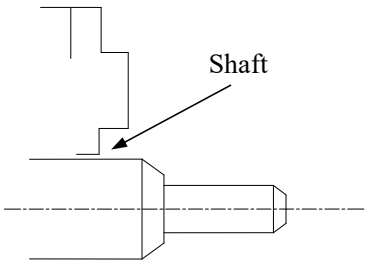
2.2 Installation of Servo Motors

MS series servo motors can be installed either horizontally or vertically. However, incorrect installation or placement in inappropriate locations may shorten the motor's lifespan or cause unexpected accidents. Follow the instructions below for proper installation.

Attention
1. A rust inhibitor has been applied to the shaft end. Before installing the motor, wipe off the inhibitor using a cloth soaked in the diluent. 2. When applying the rust inhibitor, avoid letting the diluent come into contact with other parts of the servo motor. 

2.2.1 Environmental Conditions

When used in areas with water or oil droplets, the motor can be protected by appropriate treatment. However, when sealing the shaft penetration section, use a motor equipped with an oil seal. Install the connector facing downward.



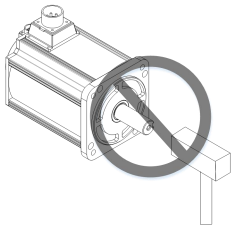
The MS6 series servo motors are designed for indoor use. Please operate them in environments that meet the following installation requirements:

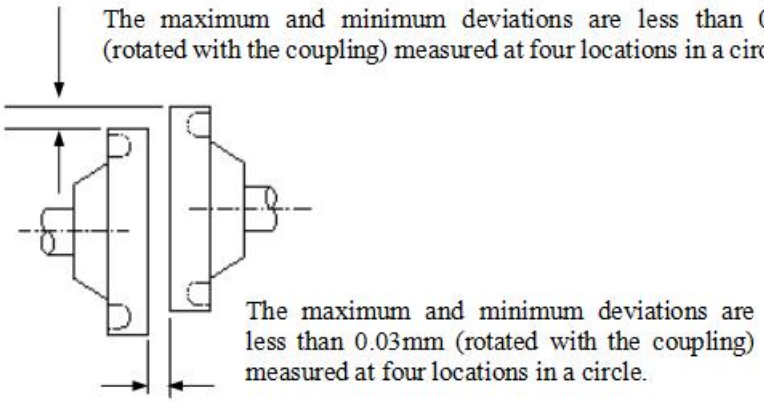
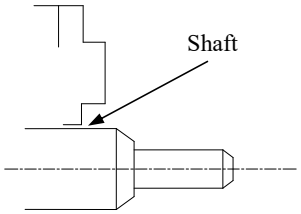
project	description
Operating Ambient Temperature	-10°C to 40°C (no freezing)
Operating Ambient Humidity	20%–90% RH (non-condensing)
storage temperature	-20°C~60°C
Storage Humidity	20%–90% RH (non-condensing)
Vibration-resistant	Radial: 49 m/s²

(vibration acceleration)	Axial: 24.5 m/s²
Altitude	Maximum height: 2000 m. Use at a reduced rate above 1000 m (reduction of 1% for every additional 100 m).
cooling-down method	Air cooling/Liquid cooling/Natural cooling
levels of protection	IP67 (for MS6 series B3 motors and MS6G series B2 motors) IP65 (MS6H series B2 motor) IP54 (for motors with a mounting Frame size of 200 mm or larger)

To achieve the required protection level, ensure the motor is correctly connected to the appropriate cable and securely locked.

2.2.2 Installation Notes

project	description
rust prevention	◆ Before installation, wipe off the rust preventive agent from the extended end of the servo motor shaft and apply appropriate anti-rust treatment.
Encoder Notes	◆ During installation, avoid impacting the shaft extension end; otherwise, the internal encoder may become damaged. 
	◆ When installing a pulley on a servo motor shaft with keyways, use a threaded hole at the shaft end. To mount the pulley, first insert a double-ended pin into the shaft's threaded hole, place a washer on the coupling surface, and gradually tighten the nut to secure the pulley. ◆ For servo motor shafts with keyways, install using the screw holes at the shaft ends. For shafts without keyways, use friction coupling or similar methods. ◆ When removing the pulley, use a pulley remAbove to prevent severe impact on the bearing. ◆ To ensure safety, install a protective cAbove or similar device in the rotating area, such as a pulley mounted on the shaft.

project	description
Centering	◆ When installing the servo motor, ensure it meets the centering accuracy requirements shown in the figure. Insufficient centering may cause vibration and potentially damage components such as bearings and encoders. During coupling installation, avoid direct impact on the motor shaft to prevent damage to the encoder mounted on the opposite side of the load shaft. 
Installation Direction	◆ The servo motor can be installed either horizontally or vertically.
Oil and Water Management Strategy	If the installation environment poses a water droplet risk (excluding the motor shaft end), verify that the motor's protection rating meets operational requirements; when the motor shaft may come into contact with oil splashes, use a servo motor equipped with an oil seal; the oil seal comes with factory-applied lubricating grease and should be replaced after 5,000 hours of normal operation.  Operating conditions for servo motors with oil seals: ◆ When in use, ensure the oil level is below the lip of the oil seal. ◆ Use when the oil seal maintains optimal oil mist retention. ◆ When installing the servo motor vertically upward, ensure no oil accumulates on the oil seal lip.
The stress state of the cable	◆ Avoid bending or applying excessive tension to electrical wires, especially signal lines with core diameters of 0.2 mm or 0.3 mm—these are extremely thin. During installation, do not pull them too tightly.
Processing of the Connector Section	For the connector section, please note the following: ◆ When connecting the connector, ensure there are no debris or metal fragments inside. ◆ When connecting the connector to the servo motor, always connect it from the main circuit cable side first, and ensure the ground wire of the main cable is securely connected. Connecting from the encoder cable side may cause the encoder to malfunction due to a potential difference between PE lines. ◆ When wiring, ensure the pin arrangement is correct. The connector is made of resin. Do not apply impact to prevent damage. When handling the cable while it remains connected, always grip the servo motor body. Handling only the cable may damage the connector or sever the cable.

project	description
	◆ When using a curved cable, exercise caution during wiring operations and avoid applying stress to the connector. Applying stress to the connector may cause damage.

2.2.3 Installation Site

- Do not use this product in environments containing corrosive or flammable gases such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gases, acids, alkalis, or salts, or near combustible materials.
- In environments containing grinding fluids, oil mist, iron dust, or cutting materials, select models equipped with oil seals.
- Keep away from heat sources such as stoves;
- Do not use the motor in enclosed environments. This can cause the motor to Aboveheat and shorten its lifespan.

2.3 Installation of Servo Cables

DS5 series servo motors utilize communication-type encoders, which may experience unpredictable performance issues due to improper operation or environmental factors. When installing optional power cables and encoder cables, please adhere to the following guidelines.

2.3.1 Optional Xinje Cable

Our company's standard cable materials include conventional cables and high-flexibility cables. For motors with 80-type Frames or smaller, the compatible cable connectors are available in aviation-type and AMP-type; for motors above 80-type Frames, only the aviation-type connector is applicable.

When customers select cables independently, they must description the actual operating conditions at the site.

For standard applications, select cables from other manufacturers strictly in accordance with Xinje's specifications (see 2.3.2 Xinje Cable Specifications). For non-standard applications, choose cables that exceed Xinje's current specifications Framed on actual operating conditions.

1. In routine settings, the following points should be noted:

- Ensure that the cable for pulse command signal lines has a length of no more than 3 meters.
- Encoder cables should be limited to 20 meters; for lengths exceeding this, specialized cables are recommended. The cable diameter depends on the actual usage length—longer cables exhibit higher resistance, greater voltage attenuation, and more severe signal distortion, potentially leading to pulse loss or signal failure. Therefore, custom-made specialized cables are typically required for distances beyond 20 meters.
- The wire diameter depends on the motor's current rating; typically, it should be set at 1/10 of the motor's maximum current. For example, if the motor's maximum current is 60 A, a 6 mm² wire diameter is recommended.
- If interference issues occur, ensure separation between high-voltage and low-voltage circuits; it is recommended to isolate power lines from encoder and signal lines.
- Ensure proper grounding for servo drives and servo motors. The grounding resistance must not exceed 4 Ω, and the grounding depth should be greater than 2 meters. It is recommended to use 4×40 mm galvanized angle steel or 40 mm diameter galvanized steel pipes.
- When customers install cables themselves, they must select appropriate cable specifications (refer to Section 2.3.2 for Xinje cable specifications). During installation, ensure reliable welding by avoiding poor connections, bridging, miswelding, or missed welds; conduct a continuity test at both cable ends after welding is complete.

2. In unconventional settings, the following precautions should be observed:

1) Applications for pulling and bending cables

- Do not bend or subject the cable to tension. Since the core wire diameter of signal cables is only 0.2 mm or 0.3 mm, they are prone to breaking; exercise caution during use.
- Use flexible cables when moving cables, as standard cables are prone to damage from prolonged bending.

Built-in cables for low-power motors (below 80-watt models) should not be used for cable relocation.

- When using a cable protection chain, ensure:

① The bending radius of the cable shall be at least 10 times its outer diameter;

② Do not secure or bundle the wiring within the cable protection chain; it may only be routed along the two fixed ends of the cable protection chain.

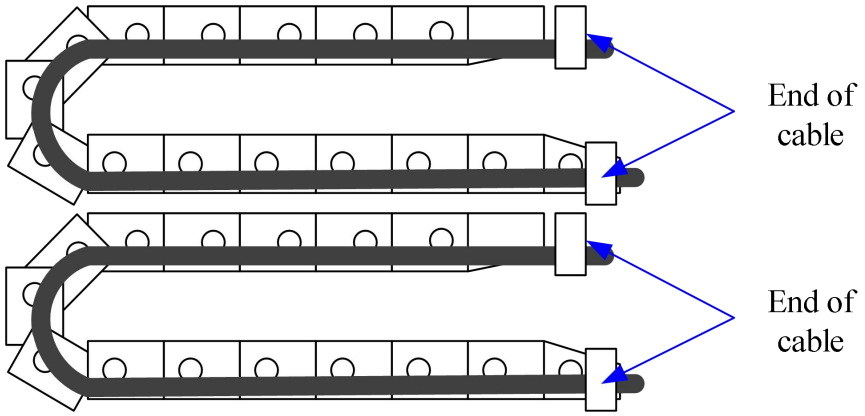
The end of the cable is secured by bundling.

③ Avoid winding or twisting the cable;

④ The duty cycle within the cable protection chain shall be maintained below 60%.

⑤ Do not mix cables with significant physical differences for wiring to prevent the thick wire from breaking the thin one; if mixing is absolutely necessary, take appropriate precautions.

A partition device is installed between the cables.



2) Oil-contaminated environments and humid environments

- It is recommended to use cables with aviation plugs as connectors; Amp interface cables are not advised.
- Existing Ampere interface cables at the site require appropriate protection measures (such as applying silicone sealant or wrapping with insulating fabric).
- Use special cables.

3) Interference-prone environments or high-current/high-power applications (e.g., welding equipment)

- The motor is properly grounded.
- High-current equipment should be grounded separately.
- Rational wiring, such as separating power and non-power cables.
- Protect the encoder cable with a metal shielding layer or add a magnetic ring for interference suppression.

4) Low-temperature/high-temperature environments

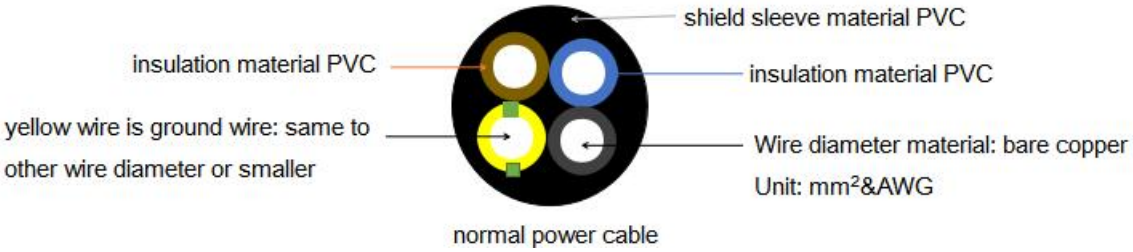
- Select cables that meet the usage requirements (special cables).

2.3.2 Specifications of Xinje Cable

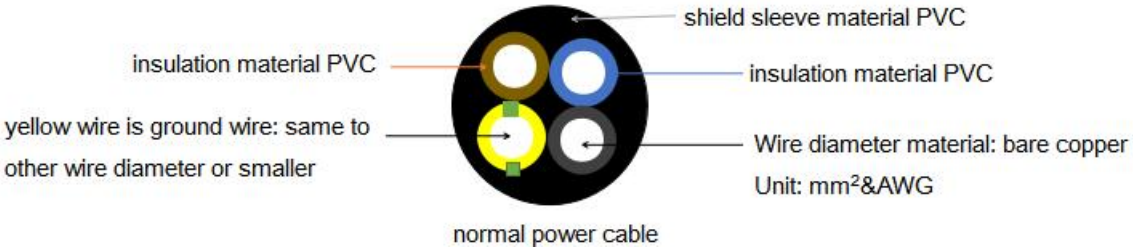
1. Material Composition of Xinje Cable

Cross-sectional diagram of cables (encoder cables, power cables), with detailed specifications for the insulation material, wire diameter, core material, and shielding layer material in the internal cross-section

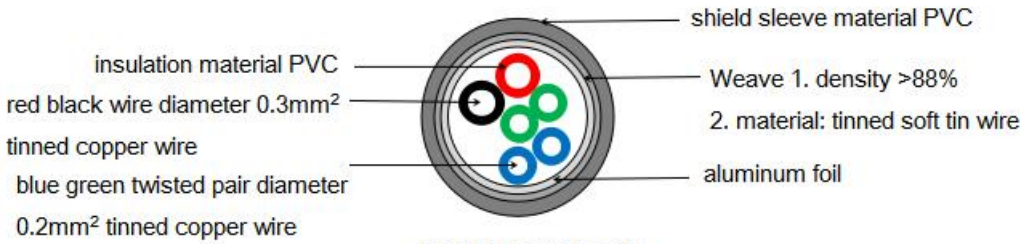
view.



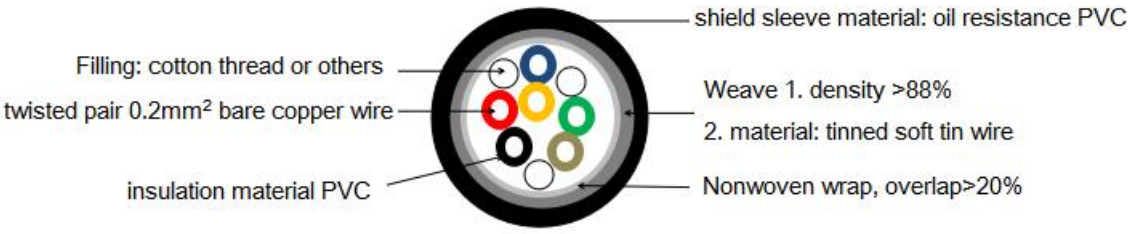
normal power cable



normal power cable



normal encoder cable



high flexible encoder cable

2. Wire Diameter Specifications

length	Frame	Encoder Wire Diameter			Power cable diameter		
		type	Aboveall Cable Diameter (mm)	Individual Cable Gauge Classification (mm²)	type	Aboveall Cable Diameter (mm)	Single Cable Cross-Sectional Area Classification (mm²)
15 meters or less	Model 80 and below	Standard version (without/bewith battery case)	5.8/6.4	3P*0.2 mm²	Standard/Flexible	7.2/7.0	4*0.75 mm²
	100 Machine Frames		6.2		Standard/Flexible	9.4/9.6	4*1.5 mm²
	110,130 Machine				Standard/Flexible		4*1 mm²

length	Frame	Encoder Wire Diameter			Power cable diameter		
		type	Aboveall Cable Diameter (mm)	Individual Cable Gauge Classification (mm^2)	type	Aboveall Cable Diameter (mm)	Single Cable Cross-Sectional Area Classification (mm^2)
	Frames						
	180-unit Frame, 2.9 kW, 3 kW	High Flexibility cable	6.2		Standard/Flexible	11.4/11.9	4*2mm^2
	180-unit Frame, capacity above 3 kW				Standard/Flexible	14.5/15.6	4*6mm^2
	220 Machine Frame	High Flexibility	6.7	4P*0.2 mm^2	common	19.8	4*10mm^2
25 meters, 30 meters	Model 180 and below	Standard/Flexible	7.8/6.8	2P*0.2 mm^2+1P*0.34 mm^2	/	/	/
	220-meter Frame (for structures 20 meters or taller)	High Flexibility cable	7.9	1P*0.4 mm^2+3P*0.2 mm^2	/	/	/

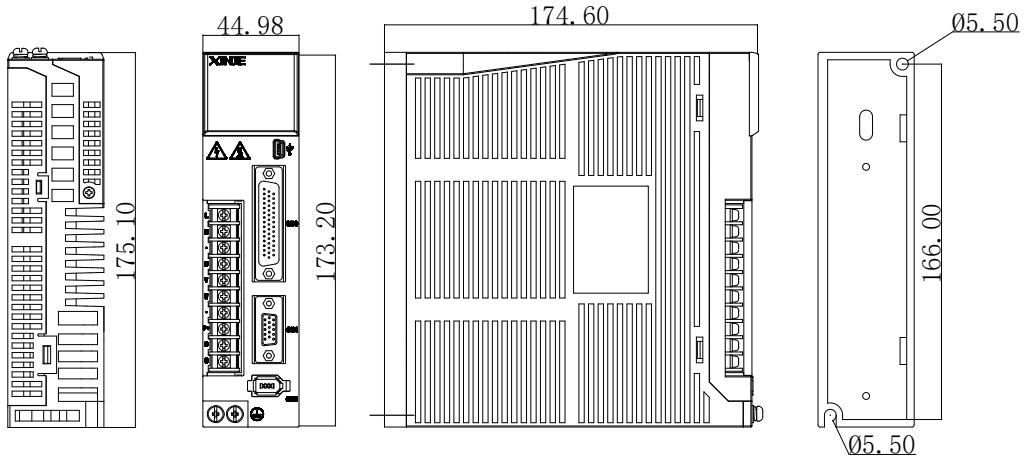
3. Cable Technical Specifications

Cable Type	Cable Performance Specifications		Cable Installation Specifications	
	temperature resistance	withstand voltage	Fixed Installation	Mobile Installation
Standard Cable	-20℃~80℃	2000V/min	≥5*D	/
High Flexibility cable	-20℃~80℃	2000V/min		If the travel distance is ≤2 m and R ≥ 7.5 × D, then N ≥ 3 million trips. If the travel distance is ≤2 m and R ≥ 10 × D, then N ≥ 5 million times.

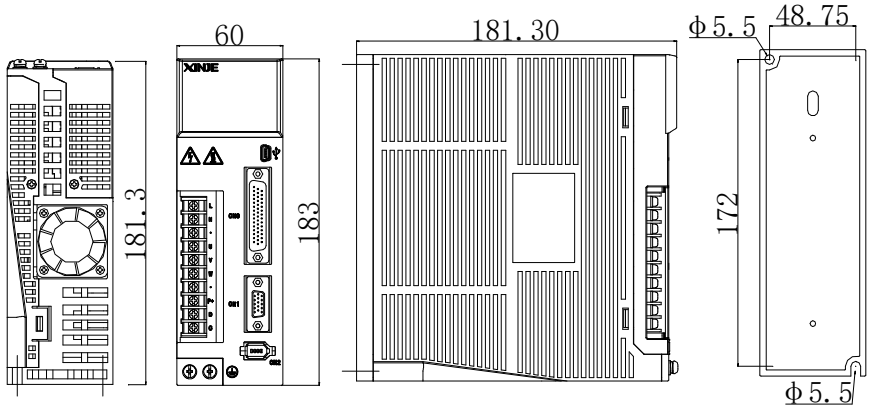
D represents the finished wire diameter, R represents the bending radius, and N represents the number of bending cycles.

2.4 Physical Dimensions of the Servo Driver

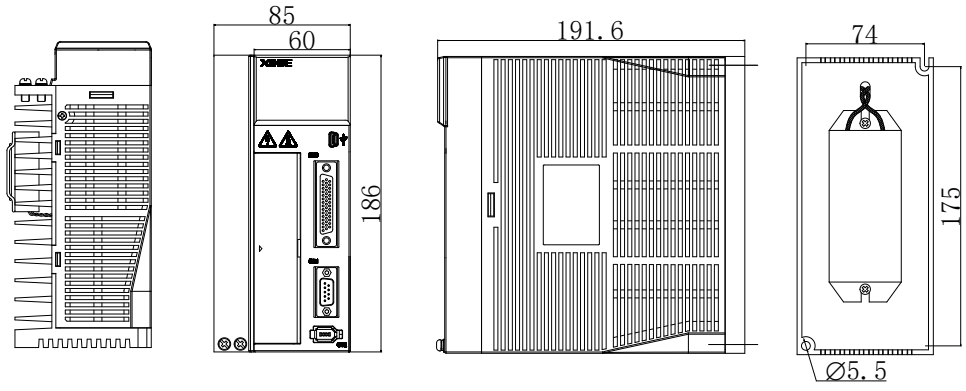
■ DS5F-20P1-PTA, DS5F-20P2-PTA, DS5F-20P4-PTA Unit: mm



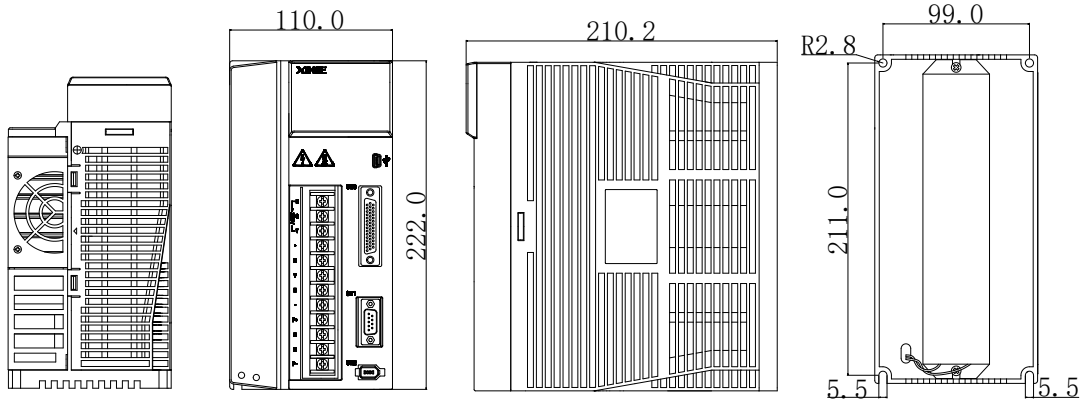
■ DS5F-20P7-PTA Unit: mm



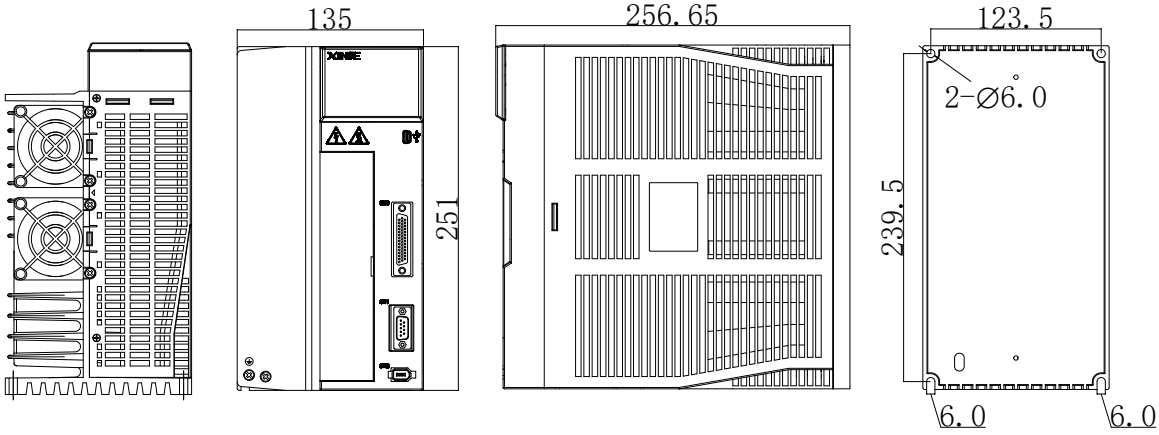
■ DS5F-21P0-PTA、DS5F-21P5-PTA、DS5F-22P3-PTA、DS5F-22P6-PTA、DS5F-41P0-PTA Unit: mm



DS5F-43P0-PTA, DS5F-43P0-PTA-H Unit: mm



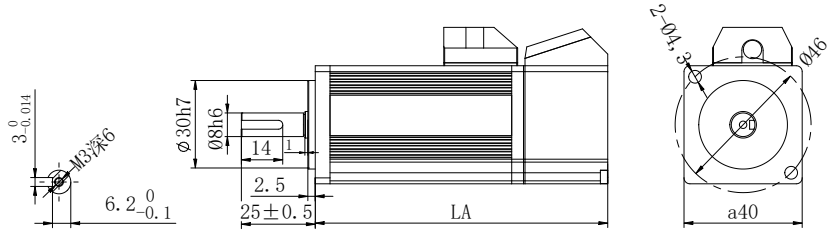
■ DS5F-45P5/47P5-PTA, DS5F-45P5/47P5-PTA-H Unit: mm



2.5 External Dimensions of the Servo Motor

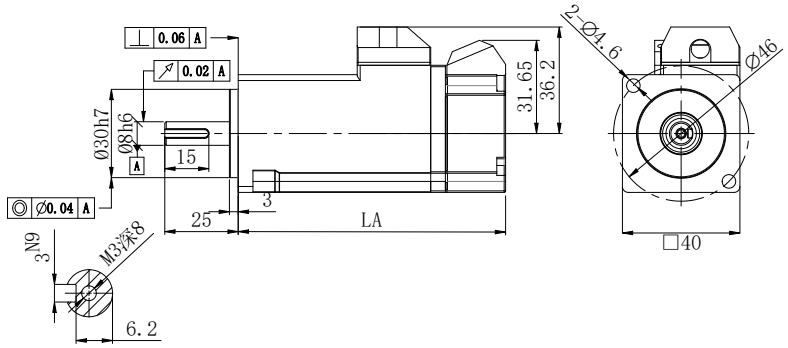
■ Installation dimensions for Series 40 motors Unit: mm

◆ MS5 Motor

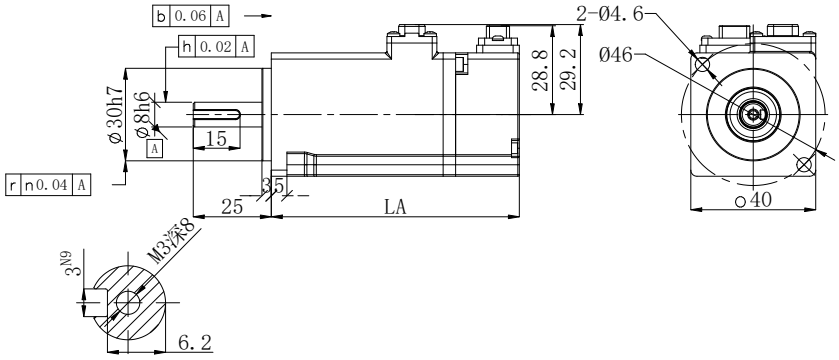


Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS5S-40STE-C□0030□□-20P1-S01/S02	89.5	119	Low inertia

◆ MS6 Motor



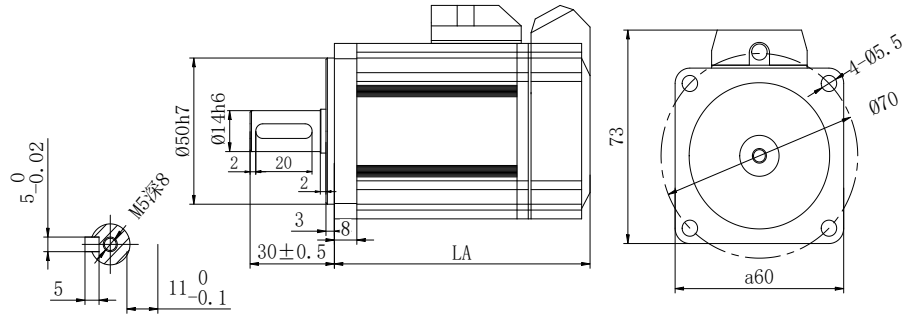
Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6H-40C□30B□1-20P1	91	122.9	High Inertia



Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6H-40C□30B□3-20P1	79.4	112	High Inertia

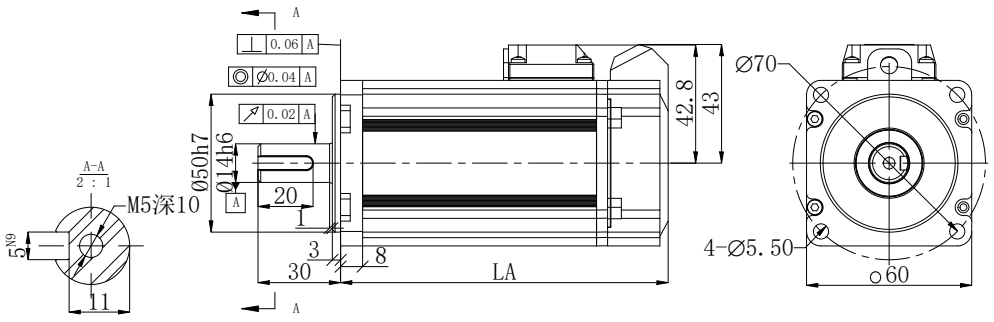
■ Installation dimensions for 60 series motors Unit: mm

◆ MS5/MS Motor

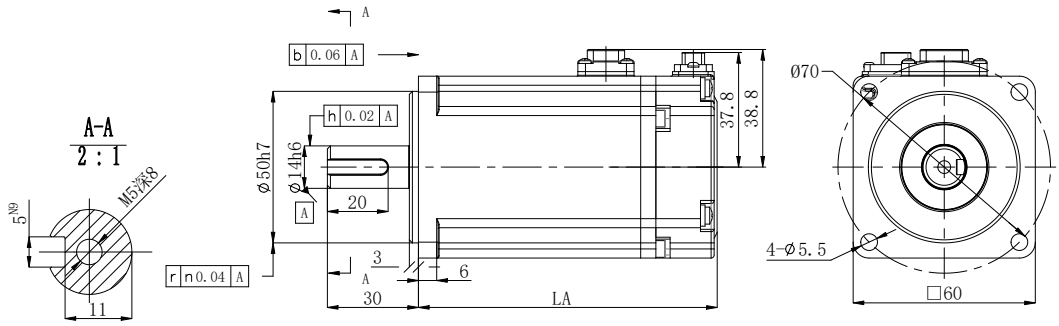


Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS5S-60STE-C□00630B□-20P2-S01/S02	79	114	Low inertia
MS5S-60STE-C□01330B□-20P4-S01/S02	99	134	
MS5H-60STE-C□00630B□-20P2-S01/S02	91	126	High Inertia
MS5H-60STE-C□01330B□-20P4-S01/S02	111	146	
MS-60STE-T01330-20P4-D01	145	189	-

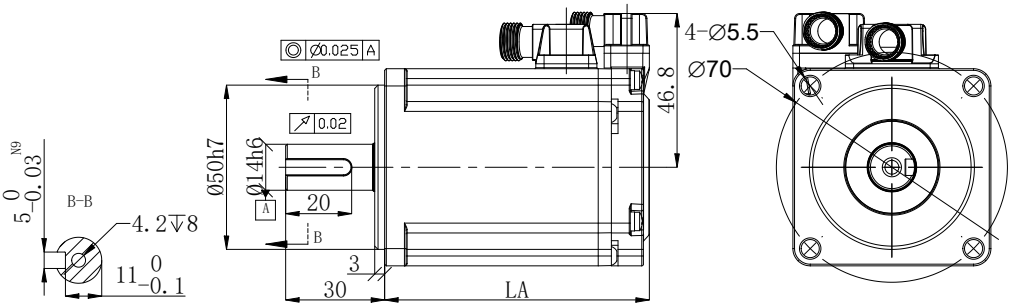
◆ MS6 Motor



Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6H-60C□30B□□-20P4	119	151	High Inertia
MS6S-60C□30B□□-20P4	107	139	Low inertia
MS6H-60C□30B□□-20P2	90	121	High Inertia



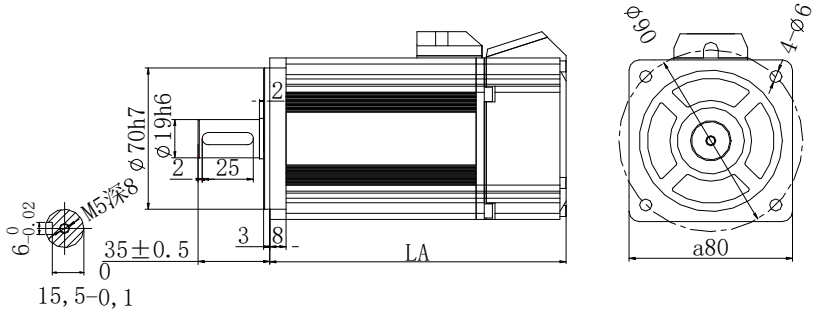
Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6H-60□□30B□3-20P2	76.4	99.2	High Inertia
MS6S-60□□30B□3-20P4	98.4	121.15	
MS6H-60□□30B□3-20P4	98.4	121.15	-



Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6H-60CM30B□4-20P4	80.2	106.95	High Inertia

■ Installation dimensions for Series 80 motors Unit: mm

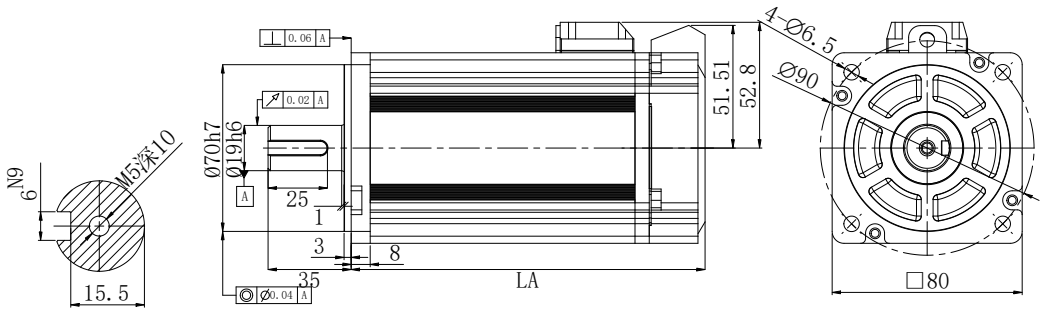
◆ MS5/MS Motor



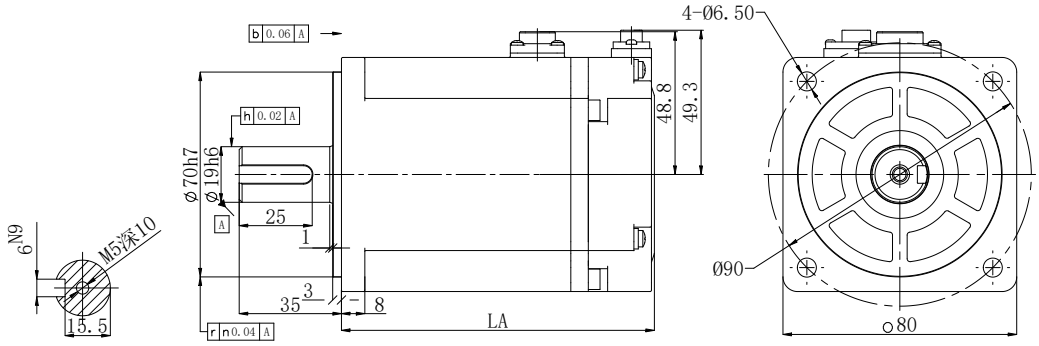
Motor Model	LA±1		Inertia Level
	Regular	With	

		brake engaged	
MS5S-80STE-C□02430B□-20P7-S01/S02	107	144	Low inertia
MS5S-80STE-C□03230B□-21P0-S01/S02	128	165	
MS5H-80STE-C□02430B□-20P7-S01/S02	119	156	High Inertia
MS5H-80STE-C□03230B□-21P0-S01/S02	140	177	
MS-80ST-T02430B□-20P7	151	199	-
MS-80ST-T03520B□-20P7	179	219	

◆ MS6 Motor

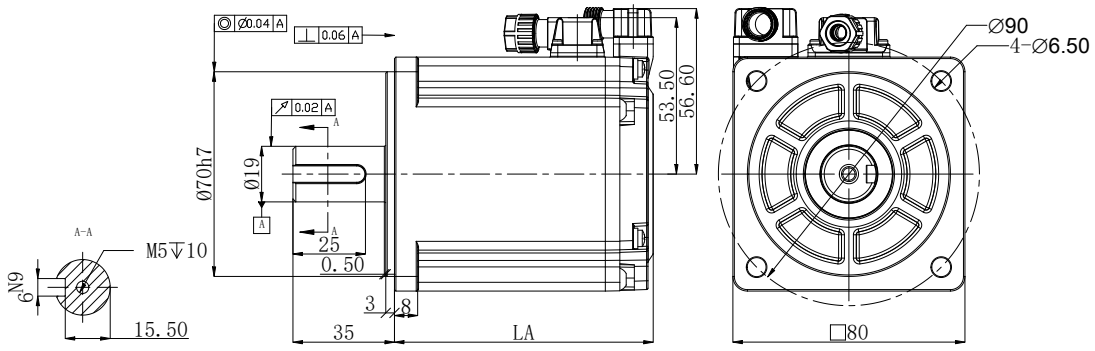


Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6S-80C□30B□□1/2-20P7	117	150	Low inertia
MS6S-80C□20B□□1/2-20P7	127	160	
MS6H-80C□30B□□1/2-20P7	124	157	High Inertia
MS6H-80C□20B□□1/2-20P7	149	182	
MS6S-80TL30B1-20P7	117	-	Low inertia



Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6S-80C□30B□3-20P7	107.1	132.1	Low inertia
MS6H-80C□30B□3-20P7	107.1	132.1	High Inertia
MS6S-80C□30B□3-21P0	117.6	142.6	Low inertia

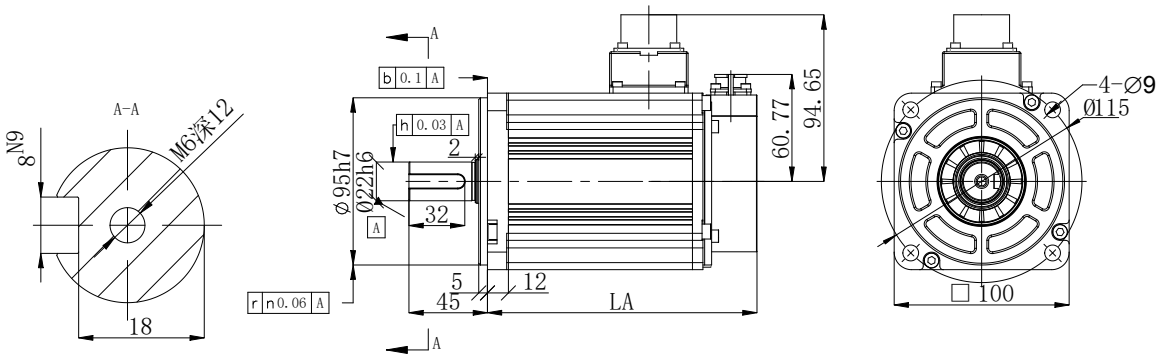
MS6H-80C□30B□3-21P0	134	159	High Inertia



Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6H-80CM30B□4-20P7	89.2	121.1	High Inertia

■ Installation dimensions for 100 series motors Unit: mm

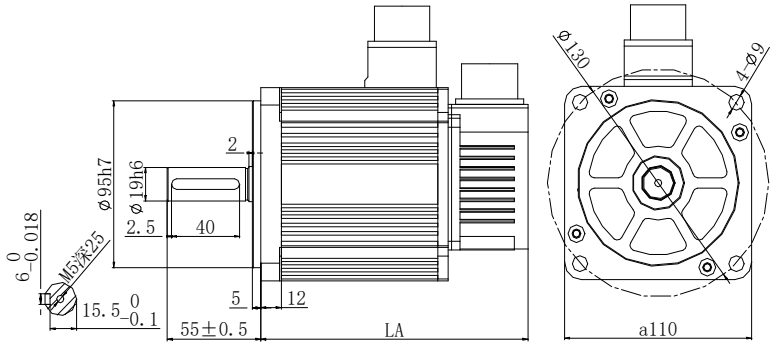
◆ MS6 Motor



Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6S-100C□30B2-21P5	154.2	183	Low inertia
MS6S-100C□30B□2-21P0	138.5	164	
MS6S-100TL30B□2-21P0	144.2	169.7	

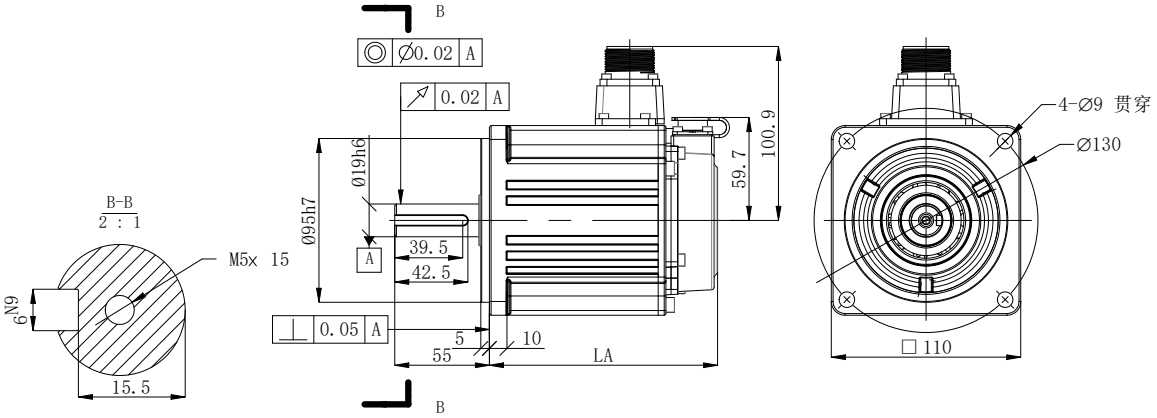
■ Installation dimensions for 110 series motors Unit: mm

◆ MS5/MS Motor



Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS5S-110ST-C□03230B□-21P0-S01	157	205	Low inertia
MS5S-110ST-TL03230B□-21P0-S01	157	205	
MS5S-110ST-C□04830B□-21P5-S01	166	214	
MS5S-110ST-TL04830B□-21P5-S01	166	214	
MS5S-110ST-C□06030B□-21P8-S01	181	229	
MS-110ST-TL06030B□-21P8-S01	181	229	-
MS-110ST-T04030B-21P2	157	205	
MS-110ST-T05030B-21P5	166	214	

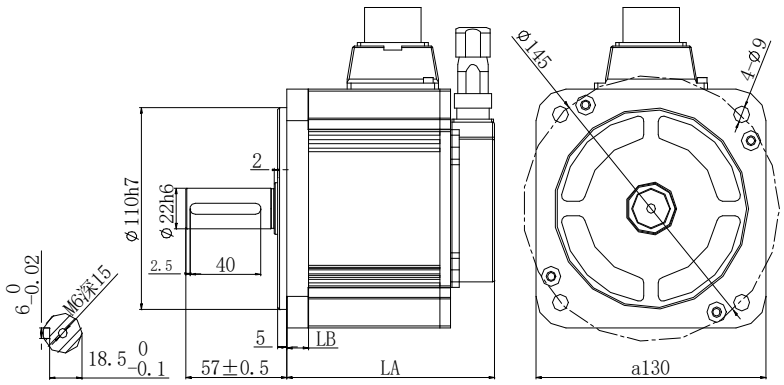
◆ MS6 Motor



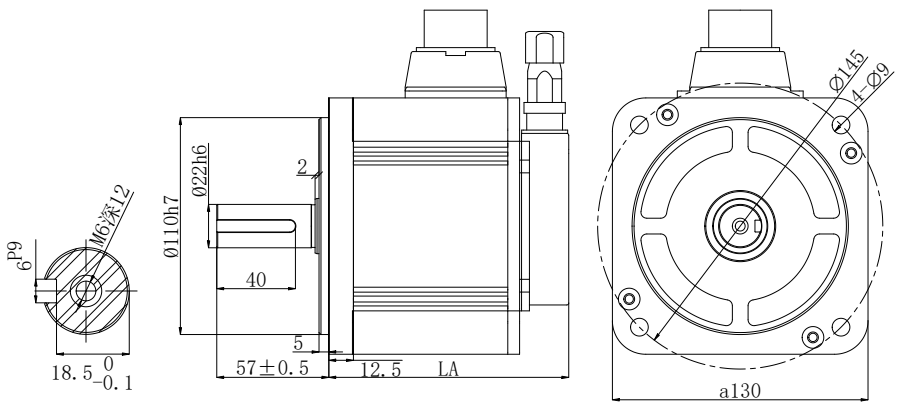
Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6G-110CS□30B□2-21P5	132.5	-	Medium-Inertia
MS6G-110TL30B2-□1P5	149	-	

■ Installation dimensions for 130 series motors Unit: mm

◆ MS5/MS Motor



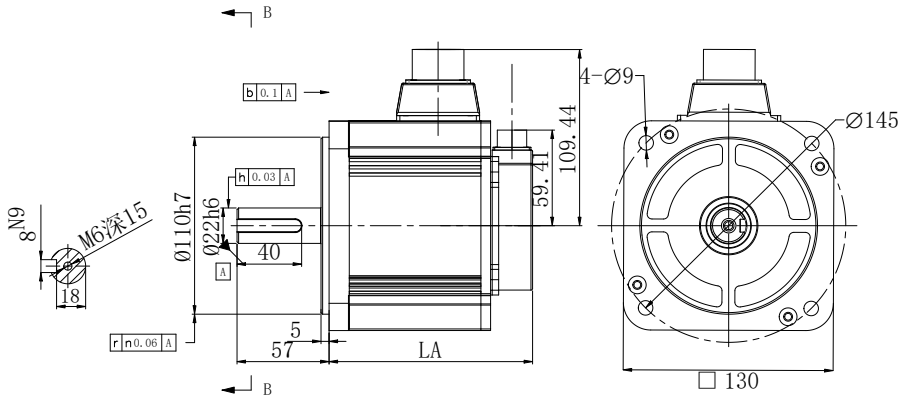
Motor Model	LA±1		LB	Inertia Level
	Regular	With brake engaged		
MS5G-130STE-C□05415B□-20P8-S01	117.5	147	12.5	Medium-Inertia
MS5G-130STE-TL05415B□-20P8-S01	134.5	164.5		
MS5G-130STE-C□07220B□-21P5-S01	133.5	162.5		
MS5G-130STE-C□07220B□-41P5-S01	133.5	162.5		
MS5G-130STE-TL07220B□-21P5-S01	149.5	179.5		
MS5G-130STE-TL07220B□-41P5-S01	149.5	179.5		
MS5G-130STE-C□11515B□-21P8-S01	159.5	189.5		
MS5G-130STE-C□11515B□-41P8-S01	159.5	189.5		
MS5G-130STE-TL11515B□-21P8-S01	176.5	206.5		
MS5G-130STE-TL11515B□-41P8-S01	176.5	206.5		
MS5G-130STE-C□14615B□-22P3-S01	180.5	210.5		
MS5G-130STE-C□14615B□-42P3-S01	180.5	210.5		
MS5G-130STE-TL14615B□-22P3-S01	197.5	227.5		
MS5G-130STE-TL14615B□-42P3-S01	197.5	227.5		
MS5G-130STE-C□07330B□-22P4-S01	133.5	163.5		
MS5G-130STE-TL07330B□-22P4-S01	149.5	179.5		
MS5G-130STE-C□10025B□-22P6-S01	159.5	189.5		
MS-130ST-T06025B□-21P5	179	238	14	-
MS-130ST-T10015B□-21P5	205	264		
MS-130STE-T15015G□-22P3	235	294		
MS-130STE-T07730B□-22P4	205	264		
MS-130ST-T10025B□-22P6	209	290		
MS-130ST-TL10030□□-43P0	225	284	15	



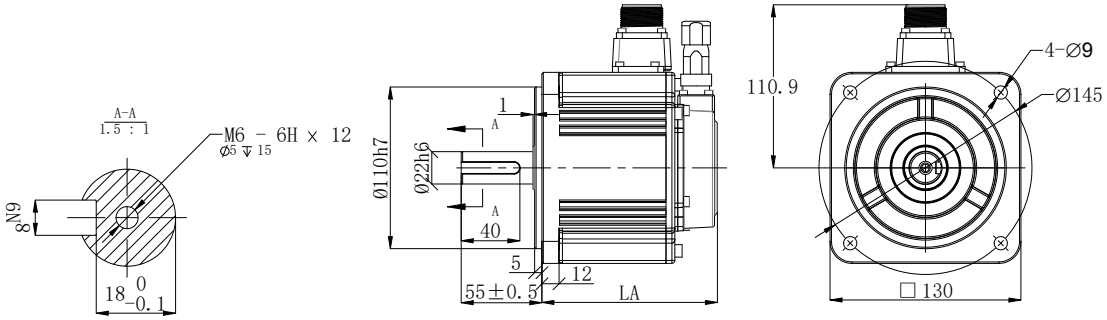
Motor Model	LA±1	Inertia Level

	Regular	With brake engaged	
MS5G-130STE-C□06025B□-21P5-S01	123.5	153.5	Medium-Inertia
MS5G-130STE-C□10015B□-21P5-S01	146.5	176.5	

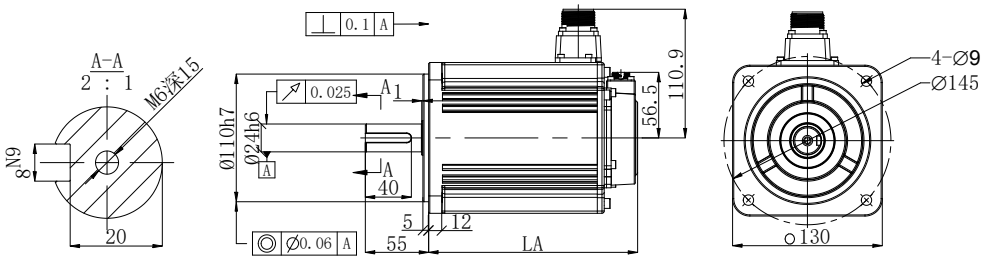
◆ MS6 Motor



Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6H-130C□15B□2-20P8	126	156	High Inertia
MS6H-130C□15B□2-40P8	126	156	
MS6H-130TL15B□2-20P8	142	172	
MS6H-130TL15B□2-40P8	142	172	
MS6H-130C□15B□2-41P3	148	178	
MS6H-130TL15B□2-41P3	164	194	
MS6H-130C□20B□2-21P5	148	178	
MS6H-130TL20B□2-21P5	164	194	
MS6H-130C□15B□2-21P8	175	205	
MS6H-130C□15B□2-41P8	175	205	
MS6H-130TL15B□2-21P8	191	221	
MS6H-130TL15B□2-41P8	191	221	
MS6H-130C□15B□2-22P3	195.6	225.6	
MS6H-130C□15B□2-42P3	195.6	225.6	
MS6H-130TL15B□2-22P3	211.6	241.6	
MS6H-130TL15B□2-42P3	211.6	241.6	



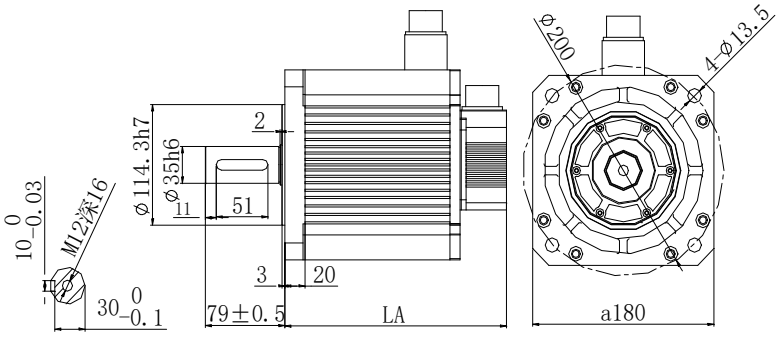
Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6G-130C□25B□2-□1P0	119.5	148.5	Medium-Inertia
MS6G-130TL25B□2-□1P0	136	165	
MS6G-130C□20B□2-□1P5	133.5	162.5	
MS6G-130TL20B□2-□1P5	150	179	
MS6G-130C□15B□2-□1P5	151.5	180.5	
MS6G-130TL15B□2-□1P5	168	197	
MS6G-130C□15E□2-□2P3	181.5	210.5	
MS6G-130TL15E□2-□2P3	198	227	



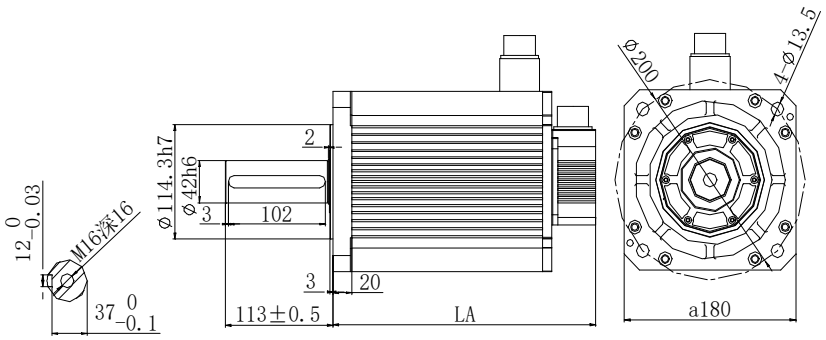
Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6G-130C□15B□2-□2P3	181.5	210.5	Medium-Inertia
MS6G-130TL15B□2-□2P3	198	227	

■ Installation dimensions for 180 series motors Unit: mm

◆ MS5 Motor

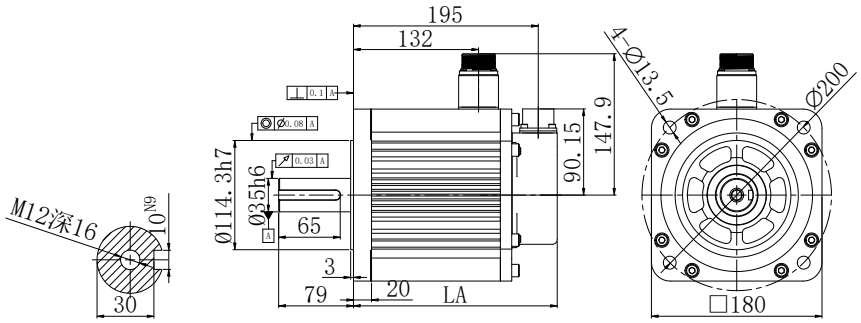


Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS5G-180ST-TL19015□□-42P9-S01	221	303	Medium-Inertia
MS5G-180ST-TL28015□□-44P4-S01	247	329	

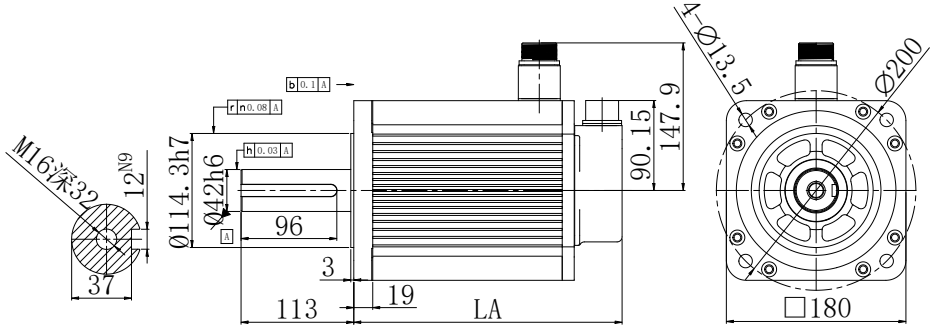


Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS5G-180ST-TL35015□□-45P5-S01	277	359	Medium-Inertia
MS5G-180ST-TL48015□□-47P5-S01	308	390	

◆ MS6 Motor

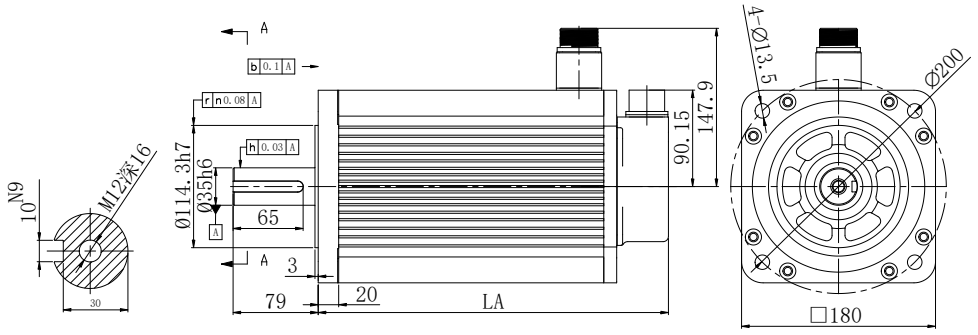


Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6H-180C□15B□2-43P0	215	255	High Inertia
MS6H-180TL15B□2-43P0	215	255	
MS6H-180C□15B□2-44P4	247	287	
MS6H-180TL15B□2-44P4	247	287	



Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6H-180C□15B□2-45P5	269	309	High Inertia
MS6H-180TL15B□2-45P5	269	309	

MS6H-180C□15B□2-47P5	325	365	
MS6H-180TL15B□2-47P5	325	365	



Motor Model	LA±1		Inertia Level
	Regular	With brake engaged	
MS6H-180CS/CM15E□2-45P5	269	309	High Inertia
MS6H-180CS/CM15E□2-47P5	325	365	

3. Cabling of the servo system

The recommended wiring materials for each interface of the servo driver are listed in the table below:

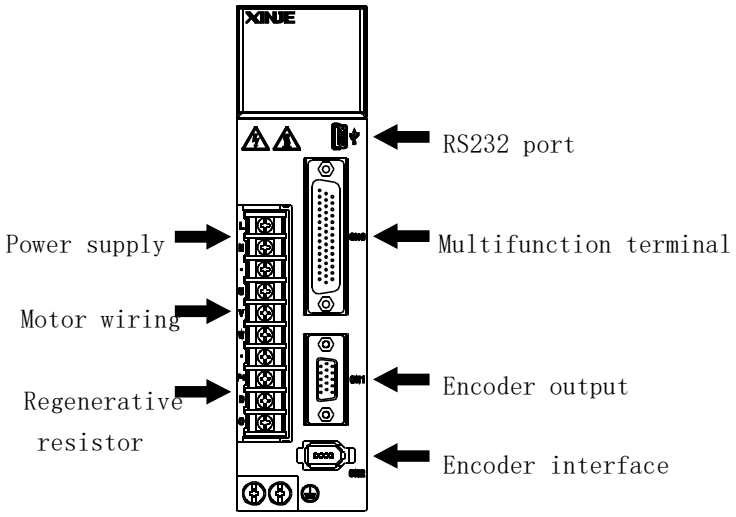
Drive Model	Power Cable – Cross-sectional Area (mm²)	UVW Power Cable – Cross-sectional Area (mm²)	Encoder wire – Wire diameter (mm²)	Ground ⏚ Wire – Diameter (mm²)
DS5F-20P1-PTA	2.0	0.75	0.2 (7 cores)	2.0
DS5F-20P2-PTA	2.0	0.75	0.2 (7 cores)	2.0
DS5F-20P4-PTA	2.0	0.75	0.2 (7 cores)	2.0
DS5F-20P7-PTA	2.0	0.75	0.2 (7 cores)	2.0
DS5F-21P5-PTA	2.0	1.5	0.2 (7 cores)	2.0
DS5F-22P3-PTA	2.0	1.5	0.2 (7 cores)	2.0
DS5F-22P6-PTA	2.0	1.5	0.2 (7 cores)	2.0
DS5F-43P0-PTA	2.0	2.5	0.2 (7 cores)	2.0
DS5F-45P5-PTA	6.0	6.0	0.2 (7 cores)	6.0
DS5F-47P5-PTA	6.0	6.0	0.2 (7 cores)	6.0



- Do not run power and signal cables through the same conduit or bundle them together. During wiring, maintain a distance of at least 30 cm between power and signal cables.
- For signal lines and encoder (PG) feedback lines, use multi-strand twisted pairs and multi-core twisted-pair shielded cables.
- Regarding wiring length, the maximum length for command input lines is 3 m, while that for PG feedback lines is 20 m.
- Even when the power is off, high voltage may still remain inside the servo unit. Avoid touching the power terminals for 10 minutes.
- Avoid frequent power cycling (turning the device on/off). When repeated on/off cycles are required, limit them to no more than once every 2 minutes. Due to the capacitor in the servo driver's power supply section, significant charging current flows during operation (charging time: 0.2 seconds). Frequent power cycling may degrade the performance of the main circuit components inside the servo driver.

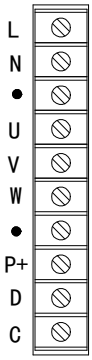
3.1 Main Circuit Wiring

3.1.1 Terminal Layout of the Servo Driver



3.1.2 Main Circuit Terminals and Description

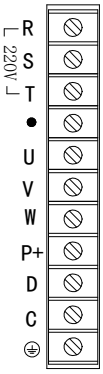
■ DS5F-20P1-PTA、DS5F-20P2-PTA、DS5F-20P4-PTA、DS5F-20P7-PTA



In top-down order, the functions of the main circuit terminals are as follows:

terminal	function	description
L、N	Main circuit power input terminal	Single-phase AC 200–240 V, 50/60 Hz
●	Air Pin	-
U、V、W	Motor Connection Terminal	Connected to the motor **Note: The ground wire is on the heat sink. Check it before powering on.**
P+、D、C	Use the built-in braking resistor	Short-circuit the P+ and D terminals; open the connection between P+ and C.
	Use an external braking resistor	Connect the braking resistor to terminals P+ and C, then disconnect the shorting wire between P+ and D. P0-25 = Power value; P0-26 = Resistance value

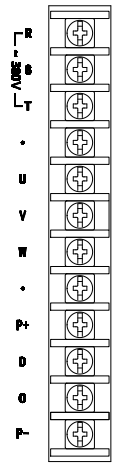
■ DS5F-21P0-PTA、DS5F-21P5-PTA、DS5F-22P3-PTA、DS5F-22P6-PTA



In top-down order, the functions of the main circuit terminals are as follows:

terminal	function	description
R、S、T	Main circuit power input terminal	Three-phase (R·S·T) AC, 200–240 V, 50/60 Hz Single-phase AC (R·T): 200–240 V, 50/60 Hz
●	Air Pin	-
U、V、W	Motor Connection Terminal	Connected to the motor **Note: The ground wire is on the heat sink. Check it before powering on.**
P+、D、C	Use the built-in braking resistor	Short-circuit the P+ and D terminals; open the connection between P+ and C.
	Use an external braking resistor	Connect the braking resistor to terminals P+ and C, then disconnect the shorting wire between P+ and D. Set P0-25 = power value, P0-26 = resistance value
⏚	earth terminal	Connect to the motor's grounding terminal for grounding.

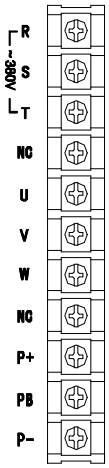
■ DS5F-43P0-PTA



In top-down order, the functions of the main circuit terminals are as follows:

terminal	function	description
R、S、T	Main circuit power input terminal	Three-phase AC, 380–440 V, 50/60 Hz
●	Air Pin	-
U、V、W	Motor Connection Terminal	Connected to the motor **Note: The ground wire is on the heat sink. Check it before powering on.**
P+、D、C	Use the built-in braking resistor	Short-circuit the P+ and D terminals; open the connection between P+ and C.
	Use an external braking resistor	Connect the braking resistor to terminals P+ and C, then disconnect the shorting wire between P+ and D. Set P0-25 = power value, P0-26 = resistance value
P+、P-	Bus Terminals	The real-time bus voltage can be measured. Please be aware of the hazard.

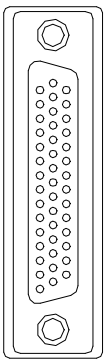
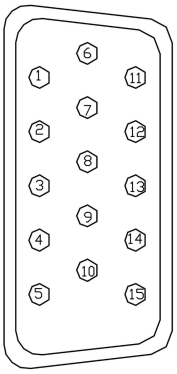
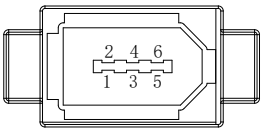
■ DS5F-45P5/47P5-PTA



In top-down order, the functions of the main circuit terminals are as follows:

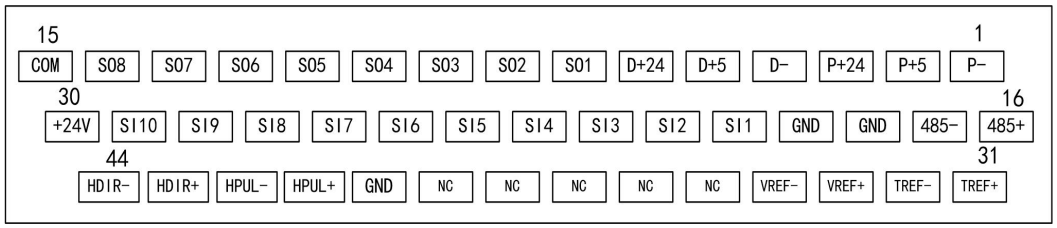
terminal	function	description
R、S、T	Main circuit power input terminal	Three-phase AC, 380–440 V, 50/60 Hz
●	Air Pin	-
U、V、W	Motor Connection Terminal	Connected to the motor **Note: The ground wire is on the heat sink. Check it before powering on.**
P+、PB	Use an external braking resistor	Connect the braking resistor to P+ and PB; Set P0-25 = power value, P0-26 = resistance value
P+、P-	Bus Terminals	The real-time bus voltage can be measured. Please be aware of the hazard.

3.1.3 Description of CN0, CN1, and CN2 terminals

CN0	CN1	CN2
		

3.1.3.1 Description of CN0 Terminal

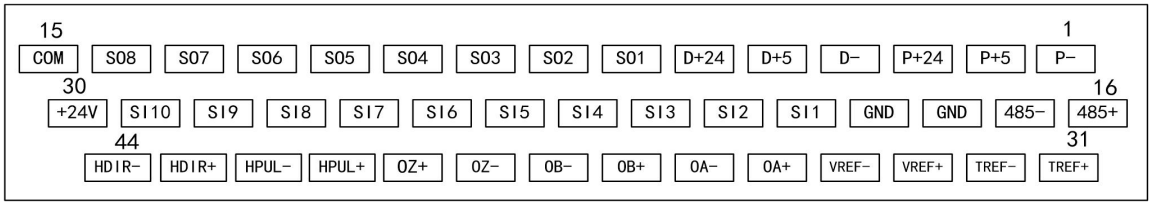
■ CN0 Terminal Description (Hardware Version V3.1.31 and Earlier Versions)



number	name	description	number	name	description
1	P-	impulse -	23	SI4	input terminal
2	P+5	Pulse +5V	24	SI5	input terminal
3	P+24	Pulse + 24V	25	SI6	input terminal
4	D-	direction -	26	SI7	input terminal
5	D+5	Direction +5V	27	SI8	input terminal
6	D+24	Direction +24V	28	SI9	input terminal
7	SO1	Output Terminals	29	SI10	High-speed Input Terminal
8	SO2	Output Terminals	30	+24V	Input Port Common Terminal
9	SO3	Output Terminals	31	TREF+	External torque analog signal with differential input +
10	SO4	Output Terminals	32	TREF-	External torque analog differential input-
11	SO5	Output Terminals	33	VREF+	External rotational speed analog differential input +
12	SO6	Output Terminals	34	VREF-	External rotational speed analog differential input-
13	SO7	Output Terminals	35	NC	Air Pin
14	SO8	Output Terminals	36	NC	Air Pin
15	COM	Output Common Port	37	NC	Air Pin
16	485+	Communication Terminal +	38	NC	Air Pin
17	485-	Communication Terminal-	39	NC	Air Pin

18	GND	Communication Terminal Ground	40	GND	Long-line drive signal ground
19	GND	Analog Input Ground	41	HPUL+	Long-range drive with high-speed pulses +
20	SI1	input terminal	42	HPUL-	Long-range drive high-speed pulse –
21	SI2	input terminal	43	HDIR+	Long-line drive in high-speed direction +
22	SI3	input terminal	44	HDIR-	Long-line drive high-speed direction-

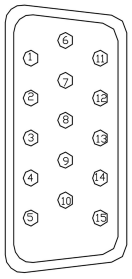
■ CN0 Terminal Description (Hardware Version V3.1.32 and later)



number	name	description	number	name	description
1	P-	impulse -	23	SI4	input terminal
2	P+5	Pulse +5V	24	SI5	input terminal
3	P+24	Pulse + 24V	25	SI6	input terminal
4	D-	direction -	26	SI7	input terminal
5	D+5	Direction +5V	27	SI8	input terminal
6	D+24	Direction +24V	28	SI9	input terminal
7	SO1	Output Terminals	29	SI10	High-speed Input Terminal
8	SO2	Output Terminals	30	+24V	Input Port Common Terminal
9	SO3	Output Terminals	31	TREF+	External torque analog signal with differential input +
10	SO4	Output Terminals	32	TREF-	External torque analog differential input-
11	SO5	Output Terminals	33	VREF+	External rotational speed analog differential input +
12	SO6	Output Terminals	34	VREF-	External rotational speed analog differential input-
13	SO7	Output Terminals	35	OA+	Encoder Divided Output OA+
14	SO8	Output Terminals	36	OA-	Encoder Divided Output OA-
15	COM	Output Common Port	37	OB+	Encoder Divided Output OB+
16	485+	Communication Terminal +	38	OB-	Encoder Divided Output OB-
17	485-	Communication Terminal-	39	OZ+	Encoder Divided Output OZ+
18	GND	Communication Terminal Ground	40	OZ-	Encoder Divided Output OZ-
19	GND	Analog Input Ground	41	HPUL+	Long-range drive with high-speed pulses +
20	SI1	input terminal	42	HPUL-	Long-range drive high-speed pulse –
21	SI2	input terminal	43	HDIR+	Long-line drive in high-speed direction +
22	SI3	input terminal	44	HDIR-	Long-line drive high-speed direction-

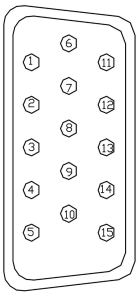
3.1.3.2 Description of CN1 Terminal

■ Terminal Description for CN1 (Hardware Version V3.1.31 and Earlier)



number	name	description	number	name	description
1	OA+	Encoder Divided Output A+	9	OZ-	Encoder Divided Output Z-
2	OA-	Encoder Divided Output A-	10	-	Air Pin
3	OB+	Encoder Divided Output B+	11	-	Air Pin
4	OB-	Encoder Divided Output B-	12	-	Air Pin
5	OZ+	Encoder Divided Output Z+	13	-	Air Pin
6	-	Air Pin	14	-	Air Pin
7	-	Air Pin	15	-	Air Pin
8	-	Air Pin			

■ Terminal Specifications for CN1 (Hardware Version V3.1.32 and later)

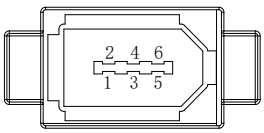


number	name	description	number	name	description
1	Z-	Full-Closed Loop Input Z-	9	Z+	Full-Closed Loop Input Z+
2	B-	Full-Closed Loop Input B-	10	-	Air Pin
3	B+	Full-Closed Loop Input B+	11	-	Air Pin
4	A+	Full-Closed Loop Input A+	12	-	Air Pin
5	A-	Full-Closed Loop Input A-	13	-	Air Pin
6	GND	Linear Scale GND	14	-	Air Pin
7	GND	Linear Scale GND	15	-	Air Pin
8	5V	Linear Scale Power Supply 5V			

3.1.3.3 Description of CN2 Terminal

The terminal arrangement on the Encoder Connector side of the CN2 driver body is as follows:

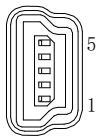
NO.	definition
1	5V



2	GND
3	/
4	/
5	485-A
6	485-B

3.1.4 Description of Communication Ports

■ RS-232 Communication



On the driver body side: 5-pin trapezoidal interface

Pin Number	name	description
1	TXD	RS232 Sender
2	RXD	RS232 Receiver
3	GND	RS232 Signal Ground

Note: Use the dedicated cable communication provided by Xinje Company.

RS232 communication operates in full-duplex mode: the TXD pin (pin number 1) on driver 232's communication port must be connected to the RX pin of the USB-to-Serial converter, while the RXD pin (pin number 2) should connect to the TX pin.

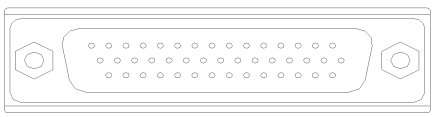
Default RS232 communication parameters: baud rate 19200 bps; 8-bit data bits; 1 stop bit; parity check.

Use a communication rate of 115200; internal hardware supports MAX up to 250 kHz and does not support hot swapping.

The Modbus station number is set as follows:

Parameter Number	function	Factory Settings	Set Range	revise	Take effect
P7-10	Modbus Station Number Setting	1	1 ~ 255	servo OFF	immediately

■ RS-485 Communication



Drive Body Side-CN0 Port

Pin Number	name
16	A
17	B

Default communication parameters for RS485 port: baud rate 19200 bps, 8-bit data width, 1-stopbit, parity check.

The Modbus station number can be freely specified and is set by P7-00:

Parameter Number	function	Factory Settings	Set Range	revise	Take effect

P7-00	Modbus Station Number Setting	1	0～255	servo OFF	immediately



- Supports the standard Modbus RTU protocol and functions as a Modbus RTU slave device.
- The RS232 and RS485 communication ports can be used simultaneously.

3.2 Classification and Functions of Signal Terminals

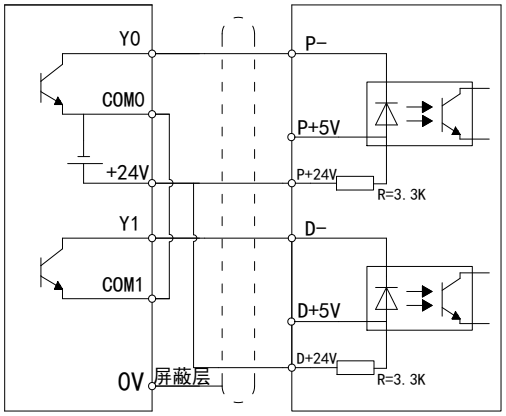
3.2.1 Pulse Signal

Command Structure	selectable	meaning	P- incoming signal	D- incoming signal	Refer to the chapter
P0-10 xxx□	0	CW/CCW dual-pulse sequence mode	CW	CCW	5.3.2.2
	1	AB Phase Mode (not supported in External Pulse Speed Mode)	A phase	B phase	
	2	Pulse + Direction Mode	impulse	direction	
For the open-circuit collector type (24 V voltage), the positive input signal is P+ (pin 3)/D+ (pin 6). The differential input signal (5 V voltage) is positive at P+ (pin 2)/D+ (pin 5).					

The interface circuits for P+D, CW, CCW, and AB phases are shown in the wiring diagram below:

Open-Collector Type (24 V voltage)

PLC, CNC, microcontroller-Framed servo drivers

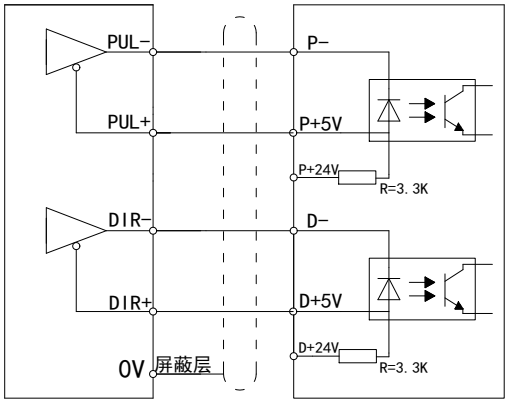


When the upper device uses a collector-open-output configuration, use this connection method and ensure that P+5V and D+5V are left open.

- The supply voltage ranges from 18 V to 25 V for P-/P+24V and D-/D+24V configurations. Voltages below 18 V may result in pulse or directional abnormalities.
- To prevent interference, use a twisted-pair shielded cable.

Differential mode (5V voltage)

PLC, CNC, microcontroller-Framed servo drivers PLC, CNC, microcontroller-Framed servo drivers

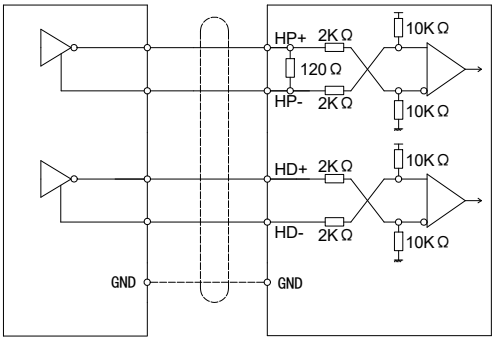


When the upper device outputs a 5V differential signal, use the diagrammed connection method and ensure that P+24V and D+24V are left open.

To prevent interference, use a twisted-pair shielded cable.

Line driver pulse wiring method

PLC, CNC, microcontroller-Framed servo drivers



Note:

(1) It is suggested to add the differential isolation board of Xinje;

(2) CW/CCW pulse input frequency is 2M at most, and AB phase pulse frequency is 2M at most.

- To prevent interference, use a twisted-pair shielded cable.
- The power supply voltage ranges from 18 V to 25 V for P-/P+24V and D-/D+24V configurations, and from 3.3 V to 5 V for P-/P+5V and D-/D+5V configurations; voltages below 18 V/3.3 V may result in pulse or directional anomalies.
- The servo pulse input port is turned on at 10 mA.
- If the controller is a Xinje PLC, its pulse output port has a rated current of 50 mA. Framed on this specification, theoretically one pulse channel can support up to five servos; however, it is recommended not to exceed three.

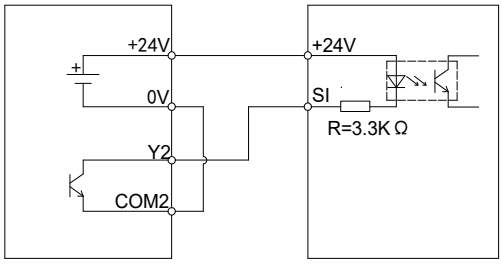
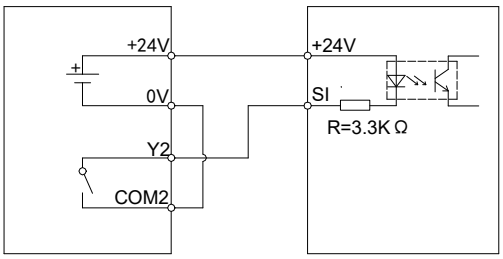
3.2.2 SI Input Signals

Connect using a relay or a transistor circuit with an open collector. When using a relay, select one designed for low current. Failure to use a low-current relay may result in poor contact.

classify	input terminal	function
on-off input	SI1 ~ SI10	Multi-functional Input Signal Terminal

Factory allocation of input terminals

terminal	SI1	SI2	SI3	SI4	SI5~SI10
function	S-ON/ enable	ALM-RST/Alarm Reset	P-OT/Prohibited forward rotation	N-OT/Reverse Rotation Prohibited	Not Assigned

Open-Collector Type (24V power supply)	Relay Type (24V Power Supply)
Upper Device: Servo Driver	Upper Device: Servo Driver
	

- SI10 is a high-speed input port, while SI1 to SI9 are low-speed input ports.
- All SIs only support NPN.
- Standard voltage: DC 24 V; maximum allowable voltage not exceeding DC 28 V, minimum not below DC 18 V; maximum allowable current: DC 50 mA.

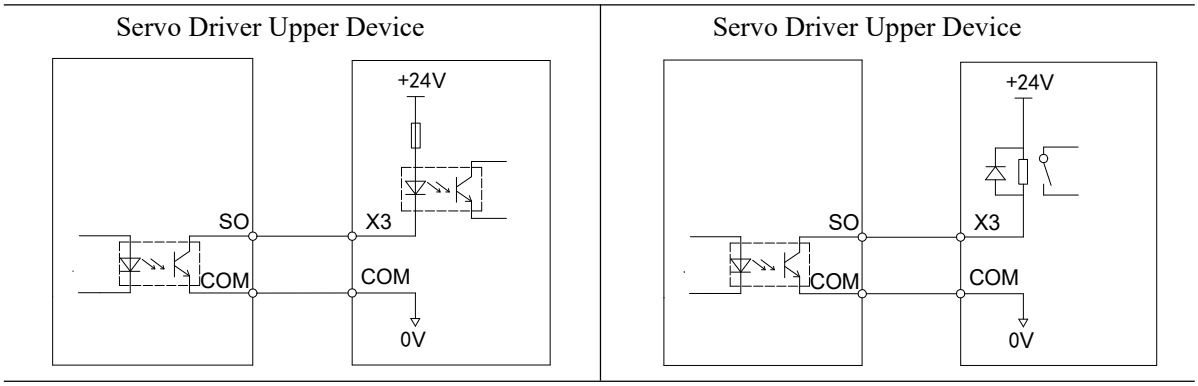
3.2.3 SO Output Signal

classify	Output Terminals	function
Optocoupler Output	SO1 ~ SO8	Multi-functional output terminal

Factory allocation of output terminals

terminal	SO1	SO2	SO3~SO8
function	COIN/Positioning Complete	ALM/ Alarm	Not Assigned

Photocoupler Type	relay-type



The maximum allowable voltage and current capacity for the collector open-circuit output circuit are as follows:

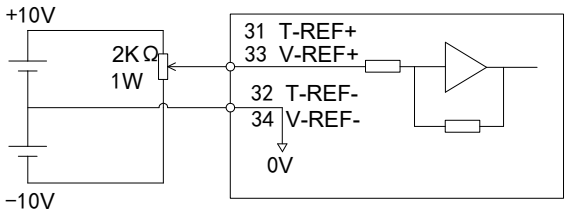
- Voltage: DC 30V (maximum);
- Maximum Load Current:

400 W or less:	SO1–SO2: up to 500 mA; SO3–SO8: up to 50 mA. Due to the high current required for brake engagement, when controlling the brake motor via SO, use terminals SO1 or SO2 and set the brake parameter P5-44 to n.0001 or n.0002.
750 W and above:	For power ratings from 750 W to below 3 kW: SO1–SO8, maximum current 50 mA; Due to the high current required for brake engagement, use an intermediate relay when controlling the brake motor via SO.
3 kW and above:	SO1–SO2: up to 500 mA; SO3–SO8: up to 50 mA. Due to the high current required for brake engagement, use an intermediate relay when controlling the brake motor via SO.

3.2.4 Analog Input Circuit

read analogue input

Upper Device: Servo Driver



Analog pins 31 (external torque analog differential input +), 32 (external torque analog differential input-), 33 (external speed analog differential input +), and 34 (external speed analog differential input-) are soldered onto port CN0; see Section 3.1.3.1 for details.

The analog signal is a speed command or torque command signal. The input impedance is as follows:

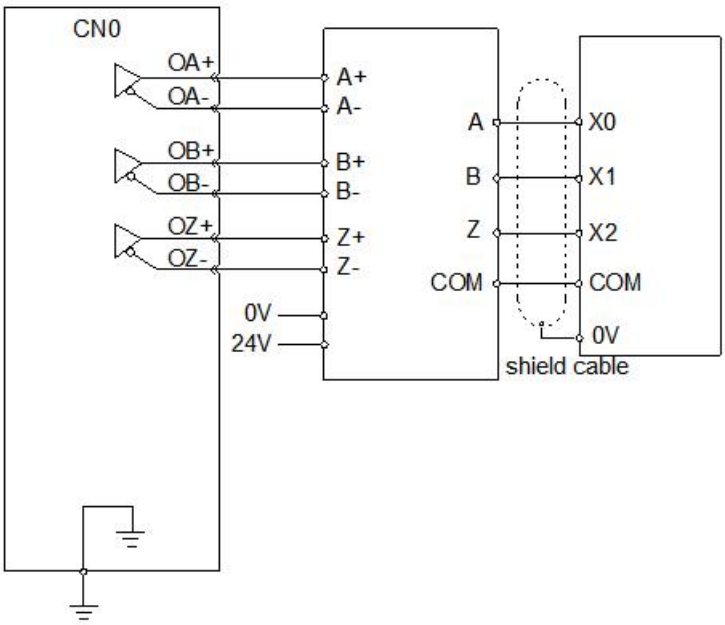
• Speed command input: approximately 72 kΩ

• Torque command input: approximately 72 kΩ

• The maximum allowable voltage for the input signal is ±10 V; do not apply voltages exceeding this range.

- For analog signals, always use twisted-pair shielded cables and connect them to a clean external ground terminal to minimize noise interference.
- When using analog voltage signals, the analog signal ground (pin 32 T-REF/ and pin 34 V-REF-) must be shorted to both the external and internal analog reference ground (pin 19 GND); this should not be done for differential analog signals.

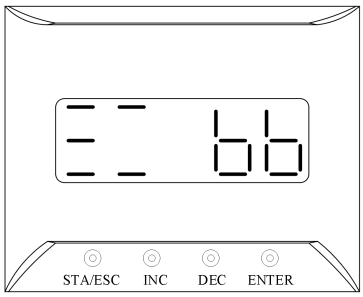
3.2.5 Encoder Feedback Output Signal



4. Using the Operation Panel

4.1 Basic Operations

4.1.1 Instructions for the Operation Panel



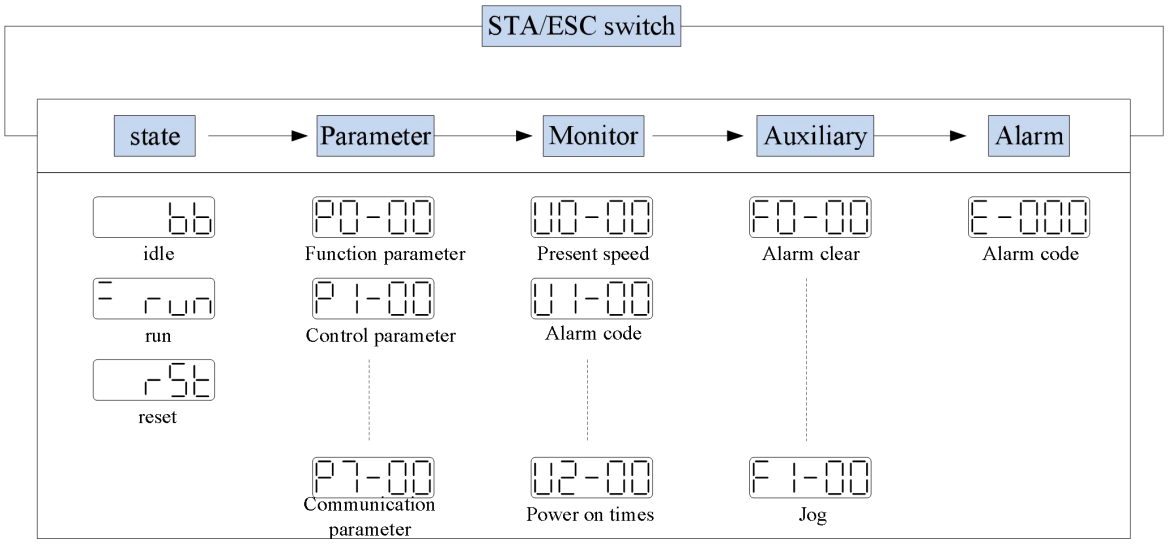
Button Name	operation declaration
STA/ESC	Short press: Switch states or return to the previous state.
INC	Short press: Display data in ascending order; Long press: Shows data in ascending order.
DEC	Short press: Show data in descending order; Long press: Show data decreasing sequentially.
ENTER	Short press: Shift; Long press: Set and view parameters.

After power-on, the rear panel will perform a self-check: all display digits and five decimal points will light up simultaneously for 1 second.

4.1.2 Key Operations

By switching the basic modes of the panel controller, you can display operating status, set parameters, activate auxiliary functions, and check alarm status. Pressing the STA/ESC keys will sequentially change between modes in the order shown below.

State: bb represents the servo system is idle; run represents the servo system is operating; rst represents the servo requires a power cycle.



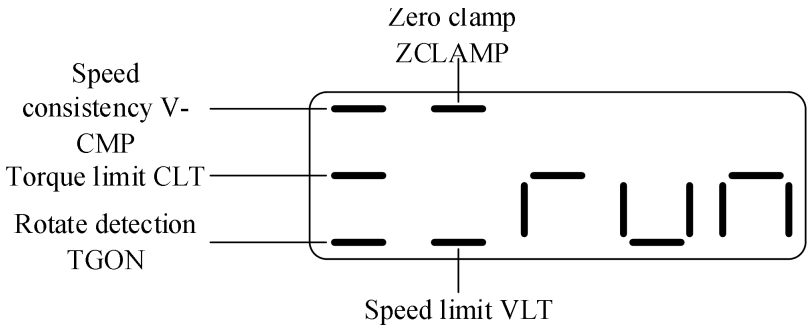
- Parameter setting Px-xx: The first x represents the group number, while the subsequent two x's indicate the parameter sequence number within that group.
- Monitoring status Ux-xx: The first x represents the group number, while the subsequent two x's indicate the parameter sequence numbers within that group.
- Auxiliary Function Fx-xx: The first 'x' represents the group number, while the subsequent two 'x's indicate the parameter sequence number within that group.
- Alarm Status E-xxx: The first two x characters represent the major alarm category, while the last x character represents the specific subtype within that category.

4.2 Description of the Operation Display Status

When powered on, the panel displays information Framed on P8-25 parameter settings (supported in version 3770 and later).

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P8-25	Panel Display Settings	0	All	0: Displays normally; upon power-on, shows 'bb' or 'run'. 1: When powered on, the panel displays the value of U0-00 as speed feedback in rpm. 2: The panel displays the value of U0-07 upon power-on, showing torque feedback in%	at any time	Power off and then power on again

■ When operating in speed or torque control mode



Number of digits displayed

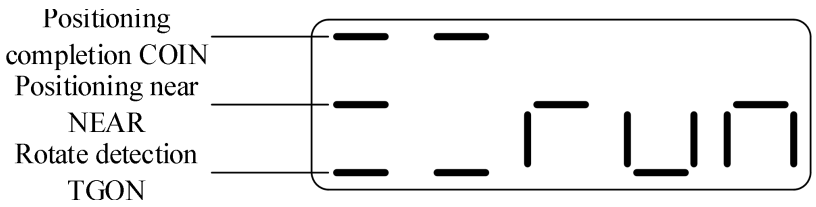
Bit Data	Display Content
P5-39 Speed coincidence detection (/V-CMP)	The light turns on when the motor's actual speed matches the commanded speed. Same-speed signal detection width: P5-04 (unit: rpm)
P5-42 Torque Limitation (/CLT)	The light turns on when the torque exceeds the set value. Internal forward torque limit: P3-28 Internal reverse torque limit: P3-29
P5-40 Rotation Detection (/TGON)	The light turns on when the motor speed exceeds the rotation detection speed. Rotation Detection Speed: P5-03 (Unit: rpm)
P5-31 Zero Clamping (/ZCLAMP)	The light turns on when the zero-clamping signal activates.
P5-43 Speed Limit (/VLT)	When torque control is enabled, the light turns on when the speed exceeds the set value. Forward speed limit during torque control: P3-16; Reverse speed limit: P3-17.

Short Code Display Content

Short Code Display Content	Display Content

Short Code Display Content	Display Content
bb	In standby mode Servo OFF state (motor is not powered)
run	in service Servo-enabled state. (The motor is powered on)
rst	needs to be reset The Servo needs to be powered on again
Pot	Prohibited forward drive state P-OT ON state. Refer to Section 5.2.4.
not	Prohibit Inverse Drive State N-OT ON state. Refer to Section 5.2.4.
idle	Control Mode 2 is empty

■ When in position control mode

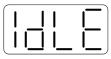


Number of digits displayed

Bit Data	Display Content
P5-38 Location End (/COIN)	During position control, the light turns on when the set position matches the actual position. Positioning completion width: P5-00 (unit: command pulse)
P5-36 Near (/NEAR)	During position control, the light turns on when the set position matches the actual position. Near Signal Width: P5-06
P5-40 Rotation Detection (/TGON)	The light turns on when the motor speed exceeds the rotation detection speed. Rotation Detection Speed: P5-03 (Unit: rpm)

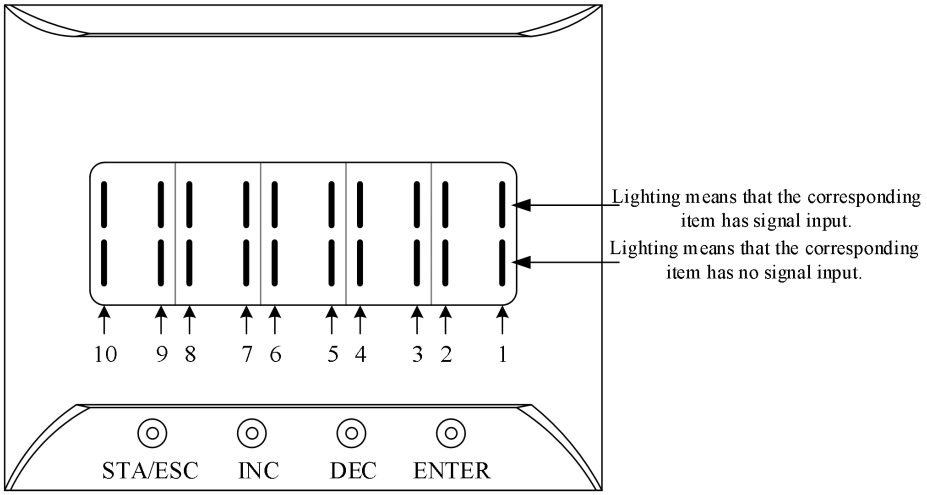
Short Code Display Content

Short Code Display Content	Display Content
bb	In standby mode Servo OFF state (motor is not powered)
run	in service Servo-enabled state. (The motor is powered on)
rst	needs to be reset The Servo needs to be powered on again.
Pot	Prohibited forward drive state P-OT ON state. Refer to Section 5.2.4.

	Prohibit Inverse Drive State N-OT ON state. Refer to Section 5.2.4.
	Control Mode 2 is empty

4.3 Monitoring Parameters for Group U

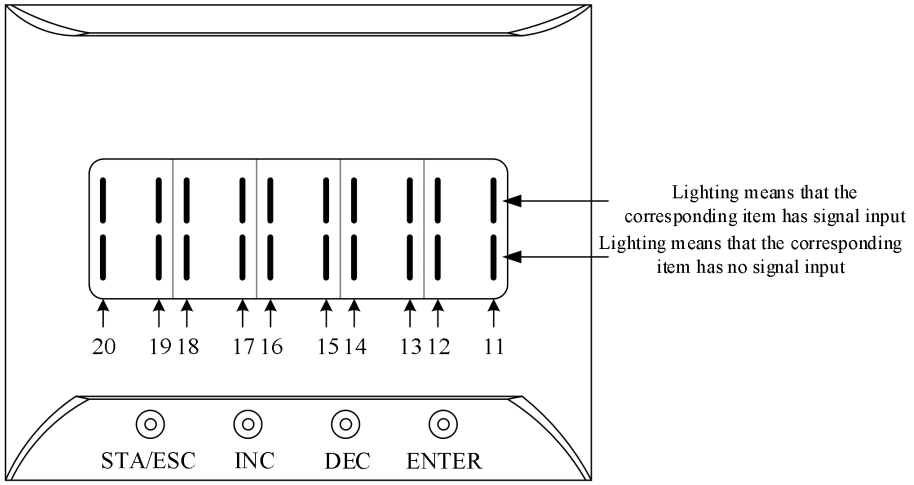
■ State of the U0-21 input signal



■ U0-21 Input Signal 1 Allocation

block code	description	block code	description
1	/S-ON Servo Enable Signal	2	/P/ – Proportional action command for the P/CON ratio
3	/P-OT prohibits forward drive	4	-N/OT: Reverse drive is prohibited
5	/ALM-RST Alert Clear	6	/P/ – External torque limit on the positive-side of the P/CL rotation
7	-N/CL Reverse Rotation Side External Torque Limit	8	/SPD-D Internal Speed Selection Settings
9	/SPD-A Internal Speed Selection Settings	10	/SPD-B Internal Speed Selection Settings
Note: When reading the status via communication, the binary values read from right to left correspond to the /S-ON and /P-CON positions: 0 represents no input at that position, while 1 represents input. For example, 0x0001 represents input at /S-ON, and 0x0201 represents inputs at both /S-ON and /SPD-B.			

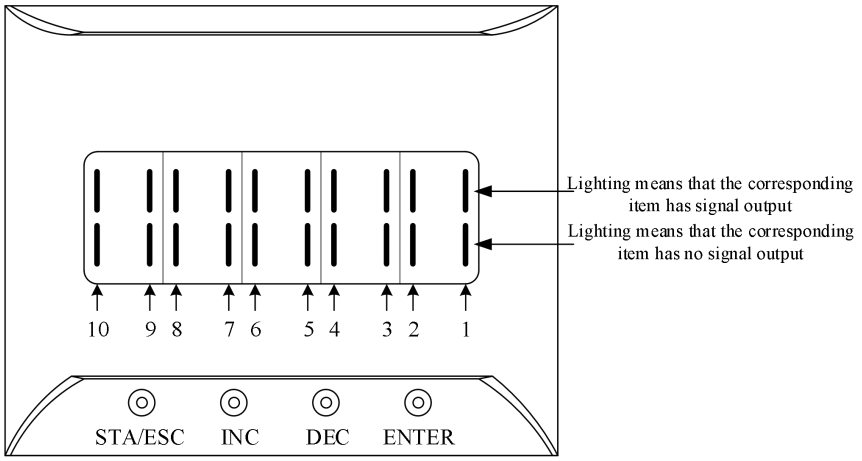
■ State of the U0-22 input signal



■ U0-22 Input Signal 2 Allocation

block code	description	block code	description
11	/C-SEL Control Method Selection	12	/ZCLAMP Zero Clamping
13	/INHIBIT: Pulse inhibition command	14	/G-SEL Gain Switching
15	/CLR Pulse Clear	16	/CHGSTP Step Change
17	Keep	18	Keep
19	Keep	20	Keep
Note: When reading the status via communication, the binary values read from right to left correspond to the /C-SEL and /ZCLAMP positions: 0 represents no input at that position, while 1 represents input. For example, 0x0001 represents input at /C-SEL, and 0x0009 represents input at both /C-SEL and /G-SEL.			

■ State of the U0-23 output signal

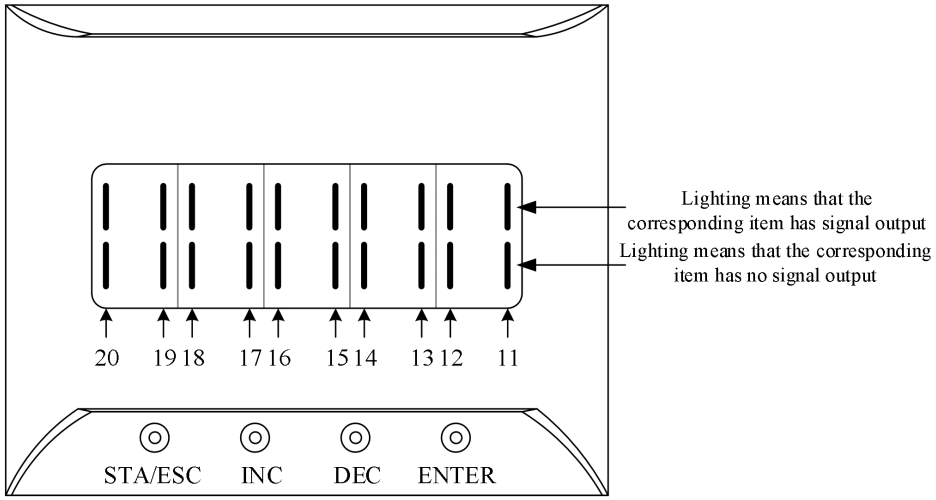


■ U0-23 Output Signal 1 Allocation

block code	description	block code	description

block code	description	block code	description
1	Keep Positioning Complete (/COIN_HD)	2	Location End (/COIN)
3	Speed coincidence detection (/V-CMP)	4	Rotation Detection (/TGON)
5	Ready (/S-RDY)	6	Torque Limitation (/CLT)
7	Speed Limit Detection (/VLT)	8	Brake Interlock (/BK)
9	Warning (/ WARN)	10	Output Near (/NEAR)
Note: When reading the status via communication, the binary values read from right to left correspond to /COIN_HD and /COIN positions respectively: 0 represents no output at that position, while 1 represents output. For example, 0x0001 represents output from /COIN_HD, and 0x0201 represents outputs from both /COIN_HD and /NEAR.			

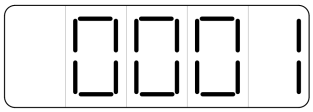
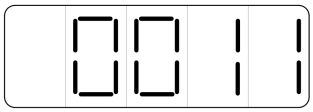
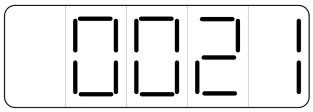
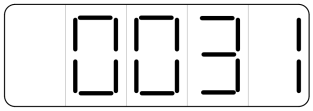
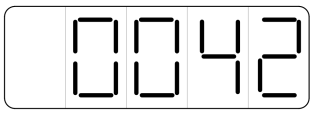
■ State of the U0-24 output signal



■ U0-24 Output Signal 2 Allocation

block code	description	block code	description
11	Alarm (/ALM)	12	Speed reached (/V-RDY)
13	Custom Output 1	14	Custom Output 2
15	/Z Xiang	16	/MRUN
17	XNet Bus Error	18	Keep
19	Keep	20	Keep
Note: When reading the status via communication, the binary values read from right to left correspond to /ALM and position respectively: 0 represents no input at that position, while 1 represents input. Example: 0x0001 represents output at /ALM; 0x0011 represents outputs at both /ALM and /Z phases.			

■ U0-88 Motor Code Reading Status

U0-88 Display Status	meaning
	0001 – Encoder motor parameters read successfully, but P0-33 = 0; use the motor parameters stored in the encoder.
	0011 – Encoder motor parameters read successfully; P0-33 = 0. Use the motor parameters from the driver.
	0021 – Encoder motor parameters read successfully, but the value is 0; set P0-53 before use.
	0031 – Encoder motor parameters read successfully but damaged (CRC verification error); use after setting P0-53.
	0042 – Failed to read encoder motor parameters; set P0-53 before use.

■ U4-18 Input Signal Status (-supported in versions 3790 and later)

SI1	SI2	SI3	U4-18 Display
1	0	0	0x0001
0	1	0	0x0002
1	1	0	0x0003
0	0	1	0x0004
...	...	...	...
Note: U4-18 displays the software-enabled status of SI terminals. The terminal will only be shown on U4-18 when its function is configured. For example, SI1 has no assigned function; even if hardware sets SI1 to a high level, the 0th bit of U4-18 will not display a 1.			

■ U4-19 Output Signal Status (-supported in versions 3790 and later)

SO1	SO2	SO3	U4-19 shows
1	0	0	0x0001
0	1	0	0x0002
1	1	0	0x0003
0	0	1	0x0004
...	...	...	...
Note: U4-19 displays the software activation status of the SO terminal, shown by bit position.			

4.4 Auxiliary Function Parameters for Group F

4.4.1 Operation for Group F0

Function Code	description	Function Code	description
F0-00	Clear Alert	F0-08	Panel External Instructions After Calibration
F0-01	Reset Parameters to Factory Settings	F0-09	Internal instructions within the panel are automatically configured during setup.
F0-02	Clear Position Deviation	F0-10	Panel Vibration Suppression 1
F0-04	Clear historical alarm records	F0-11	Panel Vibration Suppression 2
F0-07	Panel Inertia Identification	F0-12	Panel vibration suppression (fast FFT)

- Clear Alarm (F0-00)

Set F0-00=1 to reset the alarm status. When an alarm occurs, first eliminate the cause before clearing it.

- Parameter restoration to factory settings (F0-01)

Under enable-off conditions, set F0-01 to 1 and press ENTER to confirm. The parameters will be restored to factory settings automatically—no power cycle required.

- Clear Position Deviation (F0-02)

Set F0-02 to 1 to clear the deviation.

- Clear historical alarm records (F0-04)

Set F0-04 to 1 to clear historical alarm records U1-14 through U1-53.

- Panel Inertia Identification (F0-07)

Reference panel inertia identification: Follow procedure 6.2.4.

- Panel External Instructions from Setpoint (F0-08)

Refer to Section 6.4.5 for automatic adjustment Framed on external commands.

- Internal Panel Instructions Auto-setting (F0-09)

Refer to the internal instructions for self-calibration procedure 6.4.4.

- Panel vibration suppression (F0-10, F0-11)

Refer to Operation Step 6.7.3 for vibration suppression.

- Panel vibration suppression (F0-12)

Refer to Operation Step 6.7.6 for vibration suppression.

4.4.2 Operation for Group F1

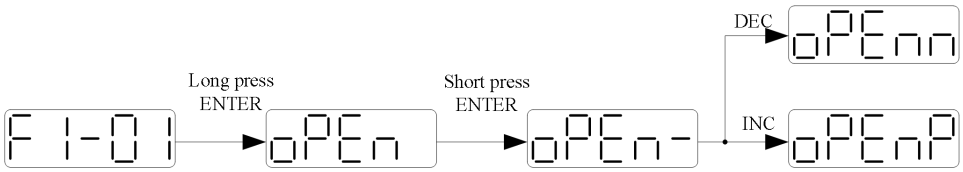
Function Code	description	Function Code	description
F1-00	Click	F1-04	Tref (Torque Analog Signal) Zero Adjustment
F1-01	pilot run	F1-05	Software Enablement
F1-02	Current Sampling Zeroing	F1-06	Absolute encoder position reset
F1-03	Vref (Speed Analog Signal) Zero Adjustment	-	-

1. Trial Operation (F1-01)

Before entering trial operation mode, confirm that the motor shaft is not connected to the machinery!

When connecting the servo driver to a non-original encoder cable or power cable, first enter test-run mode to verify proper connection of the encoder terminals or power terminals.

The trial run primarily checks the power lines and encoder feedback circuits to ensure proper connections. Follow these steps to operate the motor normally in both forward and reverse directions: If the motor shaft vibrates or an alarm occurs, immediately disconnect the power supply and recheck the wiring.

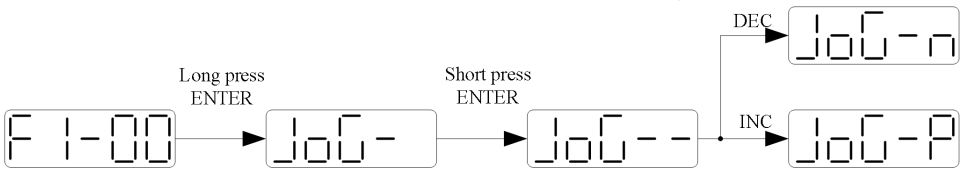


2. On-off operation (F1-00)

Before entering Jog Operation mode, verify that the trial run under motor idle conditions is functioning properly to confirm correct servo wiring.

The tap mode requires the driver to be in an idle state!

The tap function has been switched from location mode to speed mode starting with firmware version 3700; models P3-09 and P3-10 control acceleration/deceleration timing.

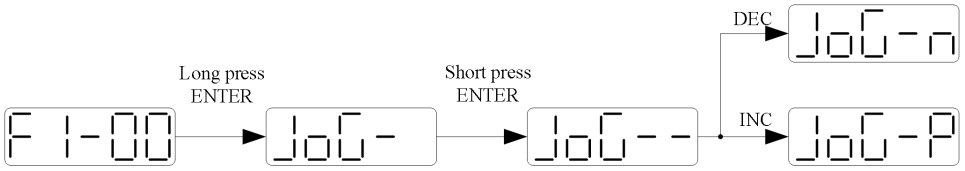


parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect

P3-18	JOG Point Movement Speed	100	1rpm	0 ~ 1000	servo OFF	immediately

3. Current Sampling Zeroing (F1-02)

After the servo driver completes self-update, or if the motor operates unstably after an extended period, users are advised to perform automatic current detection offset adjustment.



Press Status/ESC to exit this feature.

4. Zero calibration of Vref (rotational speed analog signal) (F1-03)

Refer to Chapter 5.4.4.5.

5. Tref (Torque Analog Signal) Zero Calibration (F1-04)

Refer to Chapter 5.5.3.4.

6. Force Enable (F1-05)

parameter	Signal Name	setting	meaning	revise	Take effect
P0-03	Enable Mode	0	Do not disable	servo OFF	immediately
		1 (Default)	I/O Enable/S-0N		
		2	Software Enablement (F1-05 or Communication)		
		3	Bus Enable (for models supporting the motion bus)		
Set P0-03 to 2. F1-05 = 0: Disables the enable function and restores to the BB idle state. F1-05 = 1: Forced enable; the servo is in RUN operating state.					

- After power restoration, the forced enable setting configured via F1-05 becomes invalid.
- To ensure the function remains active upon power-on and continues to work after power-off, set P0-03 to 1 and P5-20 to n.0010.

7. Absolute encoder position reset (F1-06)

Refer to Section 5.7.5 for clearing the absolute encoder value position.

4.5 Fault Alarm Handling

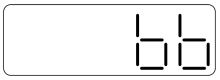
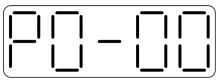
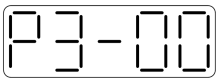
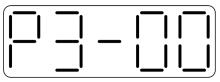
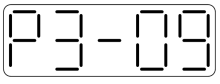
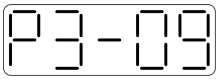
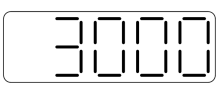
When a fault occurs, the system automatically enters an alarm state and displays the alarm number; in normal operation, the alarm state is not visible. During an alarm state, writing 1 to F0-00 via the panel allows you to reset the fault.

If a servo alarm occurs due to the servo power being turned off, there is no need to clear the alarm.

When an alarm occurs, the cause should first be eliminated before the alarm is cleared.

4.6 Parameter Settings for Group P

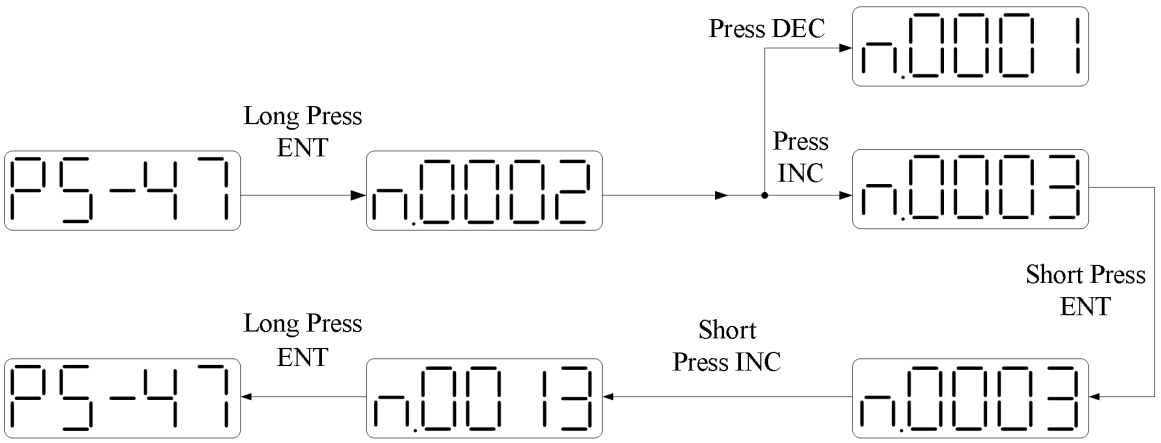
For example, describe the operational steps when changing the value of parameter P3-09 from 2000 to 3000.

step	panel display	Buttons Used	concrete operations
1		STA/ESC INC DEC ENTER	No action required
2		STA/ESC INC DEC ENTER	Press the STA/ESC key to access parameter settings
3		STA/ESC INC DEC ENTER	Press the INC key once to increment by 1; set the parameter to 3 and display P3-00
4		STA/ESC INC DEC ENTER	Shortly press the ENTER key to make the last zero on the panel flash
5		STA/ESC INC DEC ENTER	Press INC to add to 9
6		STA/ESC INC DEC ENTER	Long-press the ENTER key to access P3-09 and modify values.
7		STA/ESC INC DEC ENTER	Use the INC, DEC, and ENTER keys to add, subtract, or shift. Press ENTER long-term to confirm changes.
8	Operation completed		

When a parameter setting exceeds the allowed range, the driver will not accept it and display error E-021 (Parameter out of range). This typically occurs when the host computer writes parameters to the driver via communication.

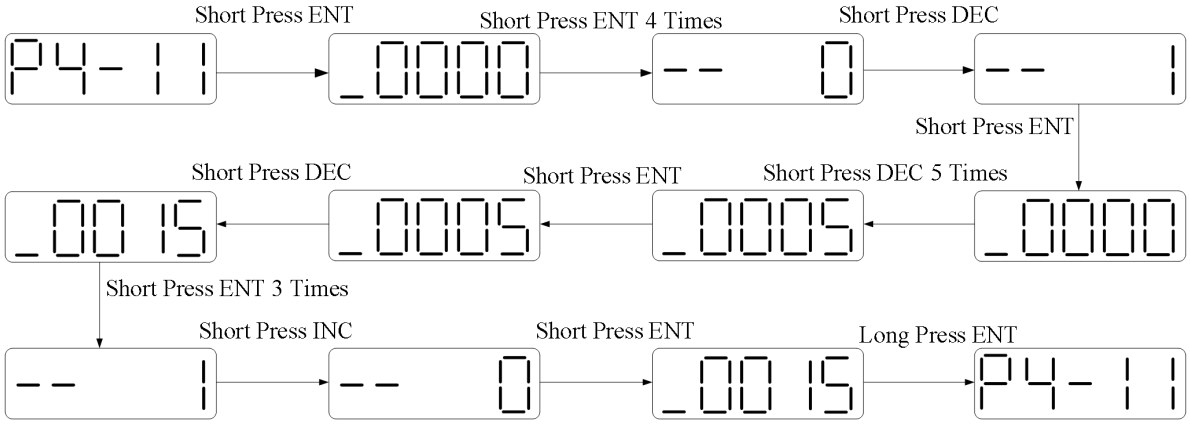
4.6.1 Example of setting parameters for the P-group related to input/output SI and SO

For example, the procedure involves changing the terminal of parameter P5-47 (alarm output terminal setting) from SO2 to SO3 control and modifying the normally open contact to a normally closed contact.



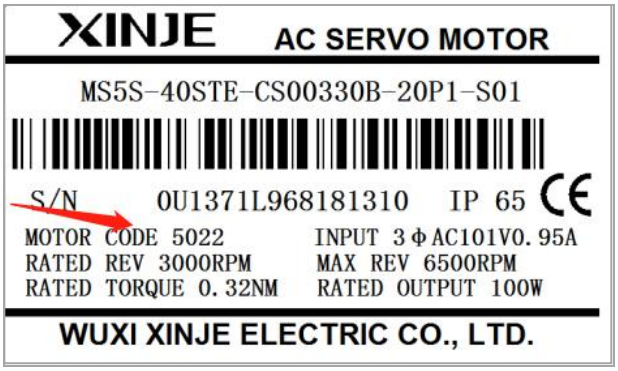
4.6.2 Example of Parameter Setting for Negative Value Group P

For example, set parameter P4-11 (high bit of internal position mode pulse count) to-15, specifying the operation procedure when the first pulse count is-150,000.



4.7 View Motor Code

A servo driver can be paired with motors of similar power ratings, with different models identified by the motor code on the nameplate. Before debugging the servo system, ensure that the motor code U3-70 matches the one indicated on the nameplate.



5. Operation of the Servo System

5.1 Selection and Switching of Control Modes

5.1.1 Selection of Control Mode

The servo unit can combine and switch between two control modes. The /C-SEL signal allows free switching between Mode 1 and Mode 2 to meet more complex control requirements.

User Parameters		control model	refer to
P0-01 Sub-pattern 1	1	Torque Control (Internal Setting)	5.5.1
	2	Torque Control (External Analog Signal)	5.5.4
	3	Speed Control (Internal Set Speed)	5.4.2
	4	Speed Control (External Analog Signal)	5.4.4
	5	Position Control (Internal Position Command)	5.3.3
	6 (Default)	Position Control (External Pulse Sequence Command)	5.3.2
	7	Speed Control (Pulse Sequence Frequency Command)	5.4.3
	8	Bus Torque Mode	5.6.4
	9	Bus Speed Mode	5.6.5
	10	Bus Position Mode	5.6.3
P0-02 Sub-pattern 1	1	Torque Control (Internal Setting)	5.5.1
	2	Torque Control (External Analog Signal)	5.5.4
	3	Speed Control (Internal Set Speed)	5.4.2
	4	Speed Control (External Analog Signal)	5.4.4
	5	Position Control (Internal Position Command)	5.3.3
	6 (Default)	Position Control (External Pulse Sequence Command)	5.3.2
	7	Speed Control (Pulse Sequence Frequency Command)	5.4.3
	8	Bus Torque Mode	5.6.4
	9	Bus Speed Mode	5.6.5
	10	Bus Position Mode	5.6.3

Position control involves sending a pulse sequence command to the servo unit to move it to a specified location. The position command can be set by combining external pulse inputs, internal preset position commands, and speed limits. Position is controlled by the number of input pulses, while speed is controlled by the pulse frequency. This method is primarily used in applications requiring precise positioning control, such as robotic arms, grinding machines, engraving machines, and CNC machine tools.

Speed control refers to regulating the mechanical speed via speed commands. By receiving speed

commands through digital signals, analog voltages, or communication links, the servo driver enables rapid and precise control of the mechanical speed.

Torque control refers to regulating a motor's output torque via a torque command, which can be provided using digital signals, analog voltages, or communication protocols. Since there is a linear relationship between servo motor current and torque, controlling the current directly enables torque regulation. This control method is primarily employed in applications requiring precise material tension control, such as winding/unwinding systems where the torque setpoint must maintain consistent material tension regardless of changes in winding radius.

5.1.2 Control Mode Switching

Mode switching refers to the ability of the servo system to transition between Mode 1 and Mode 2 via an external input signal (C-CEL), when the servo is enabled in ON mode (as indicated by the "Run" status on the servo panel).

- relevant parameter

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-30	/C-SEL	n.0000	All	Control Mode Switching Signal	at any time	immediately
Parameter range: n.0000–001A, assigned to other input terminals via parameter P5-30. To switch the control mode from SI2 input signals, set P5-30 to n.0002/0012. For hardware wiring details, refer to Chapter 3.2.2.						

Parameter Setting Status	Signal/C-SEL Terminal Input Status	Signal/C-SEL Terminal Logic	control method
P5-30=n.0000	No external terminal input required	invalid	The control mode set for P0-01
P5-30=n.000□	The SI□ terminal has no signal input.		
P5-30=n.001□	The SI□ terminal has a signal input.		
P5-30=n.0010	No external input terminals required	valid	The control mode set for P0-02
P5-30=n.000□	The SI□ terminal has a signal input.		
P5-30=n.001□	The SI□ terminal has no signal input.		

5.2 Configuration of Basic Functions

5.2.1 Jog Operation

The spot-run test must be completed after power-on but before online debugging, to ensure the servo system operates normally without abnormal vibrations or unusual noises. This test can be performed either via parameters in Panel F or using our company's upper-level software Xinje Servo Tuner.

Point operation consists of two modes: point operation and trial operation. Point operation employs closed-loop control, while trial operation uses open-loop control. The standard debugging sequence is to first perform trial operation before proceeding to point operation. Both modes require the servo to be disabled (i.e., the panel set to bb) for proper functioning.

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-18	JOG Point Movement Speed	100	1rpm	0 ~ 1000	servo bb	immediately

P3-18 is the speed setting for closed-loop point-start operation, effective only in point-start mode and invalid in other normal control modes.

1. Panel Click

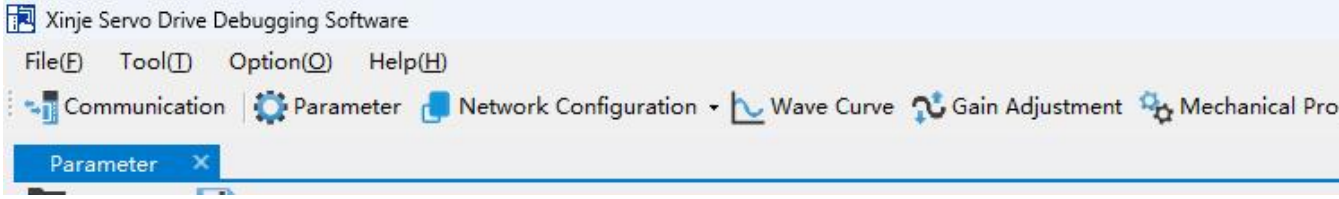
- relevant parameter

Function Code	meaning	description
F1-00	Click	Closed-loop pulse operation
F1-01	pilot run	Open-loop point movement operation

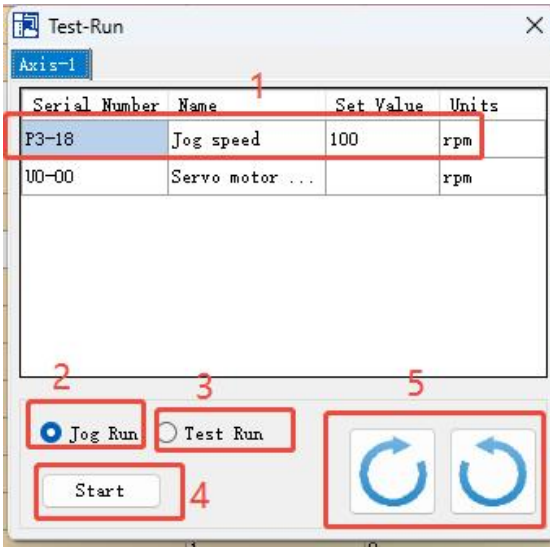
Panel Jog Operation Steps:

To operate the panel via manual selection, first run in open-loop mode (F1-01) without issues, then proceed to closed-loop operation (F1-00). Detailed operating procedures are outlined in Chapter 4.4.2.

2. Jog Operation via XinjeServo Tuner



Click [Trial Run] in the menu bar to view the following screen:



The interface is primarily divided into five configuration modules:

① Point-speed P3-18: Sets the motor's operating speed in the [Point-speed] mode;

② Point-start mode: Closed-loop point-start operation;

③ Test operation mode: open-loop point-start operation;

④ Enable: Activation in push-button mode;

⑤ Forward/reverse: Causes the motor to rotate forward or backward.

Steps for operating the upper-level computer in manual mode:

Open the Xinje Servo Tuner software on the servo host computer, set the P3-18 point-speed value, select the [Test Run]/[Point Motion] button, click [Enable], and use the forward/reverse buttons on the interface to control the device's directional movement.

5.2.2 Servo Enable Settings

The servo enable signal represents whether the servo motor is powered and operational; when invalid, the motor remains non-functional. Enablement can be controlled via external terminal signals or computer communication.

- relevant parameter

parameter	meaning	setting	meaning	revise	Take effect
P0-03	Enable Mode	0	Do not disable	servo bb	immediately
		1 (Default)	I/O Enable/S-ON		
		2	Software enablement (F1-05 or via host computer operation)		
		3	Bus Enable		

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-20	/S-ON	n.0001	All	Servo Enable Signal	at any time	immediately

1. Force Enable

When P0-03=2, the forced enable of F1-05 becomes effective; it becomes ineffective upon power restoration.

The F1-05 can be set to value 1 via the panel or written a single word at hexadecimal address 0x2105

using Modbus RTU protocol communication.

2. Enable upon power-on

Parameter settings: P0-03 = 1 (default), P5-20 = n.0010

This configuration ensures the servo system remains enabled immediately upon power-up, without requiring external terminal control, and maintains this enabled state even after a fresh power cycle.

3. Enable external SI terminal control

When P0-03 is set to 1, the external terminal enable control becomes effective.

Parameter settings: P0-03 = 1 (default); P5-20 = n.000 □ / n.001 □.

□ Represents the SI terminal number; for example, P5-20 corresponds to n.0001 (default), enabling control at SI1 terminal.

prerequisite	Parameter Setting Status	Signal/S-ON terminal input status	Signal/S-ON Terminal Logic	Servo Status
P0-03=1	P5-20=n.000□	The SI□ terminal has no signal input.	invalid	panel display bb, Servo not enabled
	P5-20=n.001□	The SI□ terminal has a signal input.		
	P5-20=n.000□	The SI□ terminal has a signal input.	valid	Panel shows "Run", servo enabled
	P5-20=n.001□	The SI□ terminal has no signal input.		

4. Bus Enable

When P0-03 equals 3, this setting enables the host computer on the XNet bus (applicable to DS5E series). The XNet bus is a proprietary bus developed by Xinje; servos must communicate via this bus using PLCs supported by Xinje. For detailed instructions, refer to the X-NET Bus User Manual on Xinje's official website.

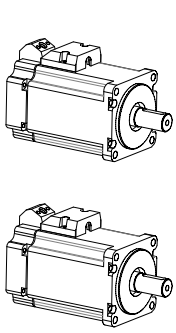
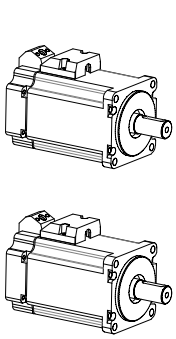
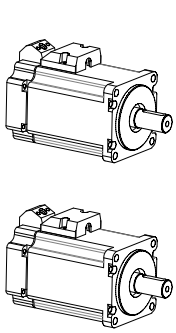
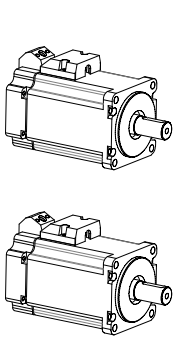
5.2.3 Switching Rotation Direction

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-05	Rotation Direction Definition 0: Normal Mode 1: Anti-pattern	0	-	0~1	servo bb	Power On Again

Users can change the rotation direction of the servo motor using parameter P0-05. The motor's "forward rotation" is descriptiond as rotating counterclockwise, and "reverse rotation" as rotating clockwise (both

measurements are taken from the perspective of the motor shaft).

pattern	Forward Rotation	Reverse Rotation	P0-05 Settings
Standard Setting CCW is forward rotation			P0-05=0
Reverse Mode CW means forward rotation			P0-05=1

5.2.4 Setting of Stop Method

Servo shutdown is categorized into two types Framed on the stopping method: free shutdown and deceleration shutdown. The following descriptions these methods in detail.

Stop Mode	Free Stop	Deceleration Stop
Stop Principle	The servo drive is disabled, and the servo motor remains unpowered; it freely decelerates to zero, with the deceleration time influenced by mechanical inertia and equipment friction.	The servo driver applies reverse braking torque, causing the motor to decelerate rapidly to zero.
Stop Characteristics	Advantages: Smooth deceleration with minimal mechanical impact Disadvantages: The deceleration process is relatively slow.	Advantages: Short deceleration time Disadvantages: Subject to mechanical impact

Framed on the specific scenarios, servo shutdowns are categorized into three types: servo OFF shutdown, alarm-induced shutdown, and out-of-range shutdown.

1. Servo OFF and Alarm Stop

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-30	Stop timeout time	20000	1ms	0～65535	servo bb	immediately
P0-27	Servo Service enables stop mode	0	-	0/2	servo bb	immediately
P0-29	Alarm Stop Method	2	-	0/2	servo bb	immediately

parameter	value	meaning
P0-27	0	Free run stops; it resumes free operation after stopping.
	2	The deceleration brake stops; after stopping, it remains in free-running mode.
P0-29	Enable Property Alarm for the Envoy	
	0/2	Free run stops; it resumes free operation after stopping.
	Do not enable attribute alerts	
	0	Free run stops; it resumes free operation after stopping.
	2	The deceleration brake stops; after stopping, it remains in free-running mode.

Attention ：

1）Servo Service Enable stop mode (P0-27)

① When P0-27 = 0, if the servo mode is turned off, the motor will initiate free-stop operation without any alarm.

② When P0-27 = 2, if the servo is turned off, the motor will begin decelerating to stop until its speed drops below 50 rpm, after which it will stop freely; simultaneously, the servo system will time the deceleration stop phase. If the elapsed time exceeds P0-30 during this process while the motor speed has not yet fallen below 50 rpm, alarm E-262 will be triggered.

2）Servo Alarm Stop Method (P0-29)

① Enable Property Alarm

- When P0-29 = 0/2, the motor initiates free-stop operation upon triggering a servo alarm.

② Do not enable the attribute alarm

- When P0-29 = 0, if a servo alarm occurs, the motor will initiate free-stop operation.
- When P0-29 = 2, if a servo alarm occurs, the motor will initiate deceleration-Framed stopping until its speed falls below 50 rpm, after which it transitions to free stopping; simultaneously, the servo system records the duration of the deceleration phase. If the recorded time exceeds P0-30 during deceleration, the servo will proceed directly to free stopping. Since the servo remains in an alarm state at this point, the E-262 alarm will not be triggered regardless of P0-29's value. After stopping, the motor continues operating freely.

3) The SO terminal of the servo drive is equipped with a brake engagement function; regardless of whether P0-27/P0-29 equals 0 or 2, the system will stop in reduced-speed mode.

4) Models P0-27/29/1/3/4/5 without dynamic braking functionality are meaningless, as they all operate in free-stop mode.

2. Stop Mode on Overtravel

The Abovetravel prevention function of a servo unit is a safety feature that forcibly stops the servo motor by triggering a limit switch signal when the mechanical moving part exceeds the designed safe movement range.

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-28	Servo Aboveload Stop Mode	2	-	0 ~ 3	servo bb	immediately
P0-30	Stop timeout time	20000	1ms	0 ~ 65535	servo bb	immediately
P3-32	brake torque	100	1%	0 ~ 1000	at any time	immediately
P5-22	Prohibited forward rotation /P-OT	n.0003	-	0~0xffff	at any time	immediately
P5-23	Reverse is prohibited /N-OT	n.0004	-	0~0xffff	at any time	immediately

Be sure to press the connection limit switch as shown in the figure below.

For rotational applications such as conical tables and conveyors, an Abovetravel prevention function is not required; therefore, no wiring for the Abovetravel prevention input signal is necessary.

Parameter Setting Status	Signal/POT, Terminal Input Status	Abovelimit Signal (/POT, /NOT) Terminal Logic
P5-22/P5-23=n.0000	No external terminal input	invalid

	required	
P5-22/P5-23=n.000□	The SI□ terminal has no signal input.	
P5-22/P5-23=n.001□	The SI□ terminal has a signal input.	
P5-22/P5-23=n.0010	No external input terminals required	valid
P5-22/P5-23=n.000□	The SI□ terminal has a signal input.	
P5-22/P5-23=n.001□	The SI□ terminal has no signal input.	

The internal parameter settings for forward limit signal/POT and reverse limit signal/NOT cannot be configured on the same terminal input simultaneously.

Operation Direction	Meet a limit	running state
Forward Rotation	Normal limit is valid	Set POT to the servo Abovetravel stop mode according to P0-28.
	Anti-limit effective	Alarm E-261
Reverse Rotation	Normal limit is valid	Alarm E-261
	Anti-limit effective	Note: Set the servo Abovetravel stop mode for parking according to P0-28.

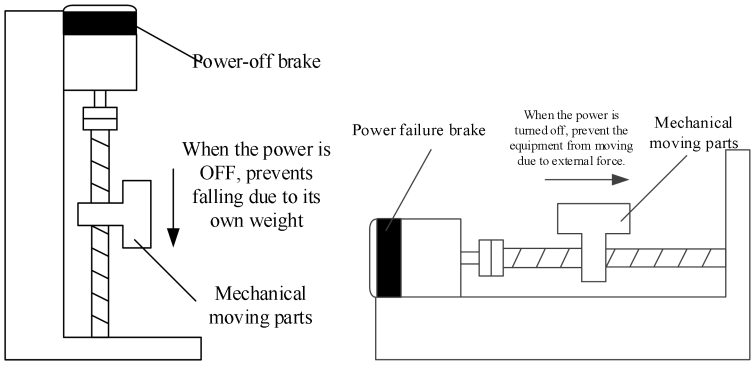
parameter	value	meaning
P0-28 n.xxx□	0	Stop the deceleration at position 1. After stopping, the torque in the Abovetravel direction is zero; receive the command.
	1	The system stops automatically; after stopping, the torque in the Abovetravel direction is zero, and the command is accepted.
	2	The stop mechanism 2 has ceased operation; no commands are received in the Abovetravel direction after stopping.
	3	Report an Incident (E-260)
P0-28 n.xx□x	0	Do not disable the Above-run alarm E-261
	1	Aboveload Alarm Shielding E-261

- When P0-28 = 0/2, the motor receives an Abovetravel stop signal and begins decelerating until it stops; the braking torque during this deceleration phase is also equal to P3-32. Additionally, the timeout duration during the Abovetravel processing also plays a role.
- During position control, using an out-of-range signal to stop the motor may generate position deviation pulses. To eliminate these pulses, a clear signal (CLR) must be input. If the servo unit continues to receive these pulses, they will accumulate until the servo unit triggers an alarm.
- During torque control, the SO terminal of the servo drive is assigned for brake engagement and cannot be activated via the Abovetravel signal terminals P5-22 or P5-23.

- The servo drive's SO terminal is equipped with a brake engagement function, and P0-28 is automatically set to 2.

5.2.5 Power-off Brake

When a servo motor controls a vertical load, the purpose of using a "servo motor with power-off brake" is to prevent the movable parts from shifting under their own weight or external forces when the system's power supply is turned off.



The brake integrated into the servo motor is a fixed, dedicated type without excitation operation. It cannot be used for dynamic braking and should only be employed when keeping the servo motor stationary.

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P5-44	Brake Interlock /BK	n.0000	-	0~ffff	servo bb	immediately
P5-07	Servo-off delay time	500	1ms	0 ~ 65535 -500~9999 (After version 3760)	servo bb	immediately
P5-08	Brake Command Output Speed	30	rpm	20 ~ 10000	servo bb	immediately
P5-09	Brake Command Wait Time	500	ms	0 ~ 65535	servo bb	immediately

1. Hardware Connection

The sequential output signals "/BK" and "Brake Power Supply" from the servo unit form the ON/OFF circuit for the brake. A typical connection configuration is illustrated below.

- The excitation voltage of the power-off brake is 24 V.
- If the braking current exceeds 400 mA, use a relay adapter to prevent terminal burnout due to excessive current.

2. Software Parameter Settings

For servo motors with brake functionality, configure one SO terminal of the servo driver as the brake output/BK function and specify its valid logic by setting parameter P5-44.

Parameter Setting Status	Servo Drive Status	Signal/BK Terminal Output Logic	Servo Motor Status
P5-44=n.000□	servo bb	invalid	The brake power supply has been disconnected, and the motor is in a locked position.
	servo run	valid	The brake power supply is activated, and the motor is in a rotatable position.
P5-44=n.001□	servo run	invalid	The brake power supply has been disconnected, and the motor is in a locked position.
	servo bb	valid	The brake power supply is activated, and the motor is in a rotatable position.

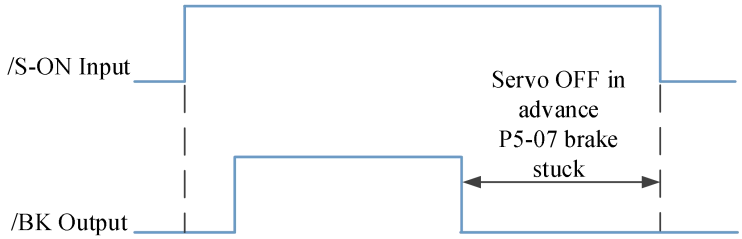
- When the SO terminal is used to control the brake, and the servo enable function is activated, the brake power supply is turned on, allowing the motor to rotate.
- If the motor fails to rotate during new device debugging, verify whether the brake is released.

3. Timing of servo-driven brake engagement control

(1) Normal braking sequence under normal conditions

Due to the delay in brake activation, the mechanism may experience slight movement under gravitational forces. Adjust the time setting using parameter P5-07 to ensure the brake lever opens delayed or closes prematurely.

When using a servo motor with a brake, the control parameters for the brake output signal "/BK" and the ON/OFF operation timing of the servo SON signal are specified as shown below: the servo motor enters the powered-on enabled state before the output/BK signal activates the brake release; it only exits the powered-on state after the output/BK signal engages the brake lock.



This parameter specifies the duration during which rotation detection TGON is invalid when the motor is stationary.

(2) Time sequence for applying the brake in abnormal conditions

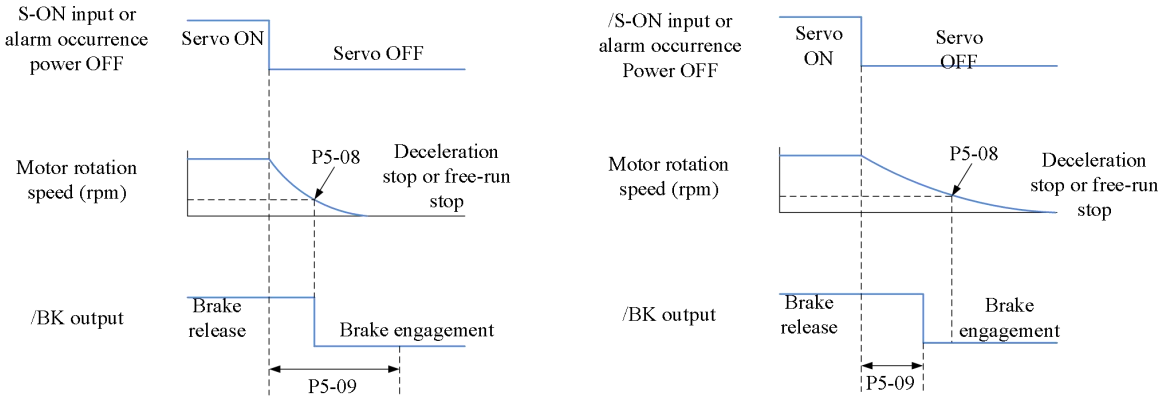
Upon occurrence of an alarm or power outage, the motor rapidly transitions to an unpowered state. During the period when the brake activates due to gravity or inertia, the mechanism may shift position. To prevent this,

The BK signal for motor rotation transitions from ON to OFF under the following conditions (either condition applies):

① After the servo is turned off, when the motor speed falls below the set value of P5-08;

② After the servo is turned off, if the duration exceeds the setting time specified in P5-09.

The timeline diagram is as follows:



Since the servo motor's brake is designed for position holding, it must be activated at the appropriate moment when the motor stops. Adjust these user parameters while monitoring the mechanical operation.

5.3 Position Control

5.3.1 General Position Modes

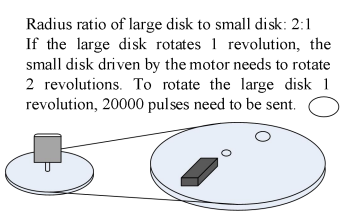
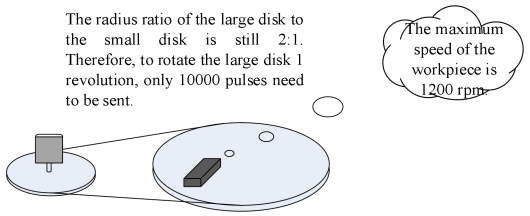
5.3.1.1 Electronic Gear Ratio

1. Above view

The so-called "electronic gear" function has two primary applications:

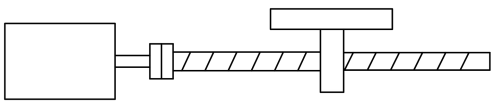
(1) Determine the number of command pulses required for the motor to complete one full rotation, ensuring it reaches the desired speed.

The following example uses a 17-bit encoder motor, with the PLC host sending pulses at a frequency of 200 kHz:

Set the number of pulses per revolution to 10000 The electronic gear ratio is set to 131072:10000	Set the number of pulses per revolution to 5000 The electronic gear ratio is set to 131072:5000
	

(2) During precise positioning, specify the physical unit length corresponding to each command pulse for ease of calculation.

As shown in the figure below, if a specified unit pulse corresponds to a workpiece movement of 1 μm, then the number of command pulses required for one full rotation of the load axis is 6 mm / 1 μm = 6000. For a reduction ratio of 1:1, you can directly set P0-11 = 6000 and P0-12 = 0; the upper computer will then issue 6000 pulses to move the workpiece by 6 mm (refer to steps 1–6 for the detailed calculation method).



Encoder: 131072 (17 bits); Screw pitch: 6 mm

Do not change the electronic gear ratio.	Change the electronic gear ratio
Without modification, the electronic gear ratio motor rotates one full cycle generating 131,072 pulses (when P0-11 = 0 and P0-12 = 0). To rotate the motor one full revolution causing the workpiece to move 6 mm, 131,072 pulses are required; for a 10-mm movement, this	By adjusting the electronic gear ratio, the motor requires 6,000 pulses to complete one full rotation. To rotate the motor one full revolution and move the workpiece by 6 mm, 6000 pulses are required; to move it by 10 mm, 10/6 × 6000 =

amounts to 10/6 × 131,072 = 218,453.333 pulses. Round-off during pulse delivery introduces errors due to fractional values being truncated.	10000 pulses are needed. Since no decimal values are generated during pulse delivery, no errors occur.

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-11	Number of pulses per revolution * 1	0	pul	0 ~ 9999	servo OFF	immediately
P0-12	Number of pulses per revolution × 10,000	1	pul	0 ~ 9999	servo OFF	immediately
P0-13	Electronic Gear Ratio (Molecular)	1	-	0 ~ 65535	○ (Before 3770) √ (For versions 3770 and later, only applicable in Mode 6)	immediately
P0-14	Electronic Gear Ratio (Denominator)	1	-	0 ~ 65535	servo OFF	immediately
P0-92	Second group of electronic gear ratios (molecules): low position *1	1	-	1 ~ 9999	○ (Before 3770) √ (For versions 3770 and later, only applicable in Mode 6)	immediately
P0-93	Second group of electronic gear ratios (molecules): high position * 10,000	0	-	0 ~ 65535	○ (Before 3770) √ (For versions 3770 and later, only applicable in Mode 6)	immediately
P0-94	Second group of electronic gear ratios (denominator) lower position *1	1	-	1 ~ 9999	servo OFF	immediately
P0-95	Second group of electronic gear ratios (denominator): high value × 10,000	0	-	0 ~ 65535	servo OFF	immediately

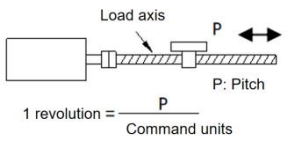
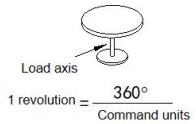
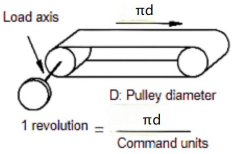
- The parameters P0-11 to P0-14 all pertain to the electronic gear ratio. P0-11 and P0-12 form one pair, while P0-13 and P0-14 form another pair; however, the priority of the per-turn pulse count values for P0-11 and P0-12 takes precedence Above that of the electronic gear ratios P0-13 and P0-14. The electronic gear ratios P0-13 and P0-14 will only be activated when both P0-11 and P0-12 are set to 0.
- When P0-11, P0-12, P0-13, and P0-14 are all set to 0, P0-92, P0-93, P0-94, and P0-95 will take effect.
- In BB mode, both the numerator and denominator of the electronic gear ratio can be modified arbitrarily; in Run mode, only the numerator may be changed, and modifications are permitted only in pulse-position mode with real-time updates—other control modes prohibit modification when enabled. (Version 3770 and later)

2. Calculation of pulse count per revolution and electronic gear ratio

step	content	description
1	Confirm Mechanical Specifications	Verify the reduction ratio n:m (where the load shaft rotates n revolutions for every m revolutions of the servo motor), ball screw pitch, pulley diameter, etc.
2	Confirm encoder pulse count	Confirm the encoder resolution of the servo motor used.
3	Decision Instruction Unit	Each pulse sent to the command decision controller corresponds to the actual distance or angle traveled during operation.
4	Number of instructions required to rotate the load shaft one full revolution	Framed on the instruction unit of the decision, calculate the number of instructions N required for the load axis to complete one full rotation.
5	Calculate the number of pulses M required for one full rotation of the motor shaft.	The number of command pulses required for the motor shaft to rotate one full revolution is M = N/(m/n).
6	Set the number of pulses per revolution (P0-11/P0-12) or the electronic gear ratio (P0-13/P0-14)/(P0-92~95)	P0-11=M%10000 P0-12=M/10000 $\frac{P0-13}{P0-14}=\frac{Encoderresolution}{M}=\frac{Encoderresolution\times m}{N\times n}$

- In Step 6, the activation priority of pulse count per revolution depends on whether it exceeds the electronic gear ratio: only when all pulses P0-11 to P0-12 are zero do pulses P0-13 to P0-14 become active. In special cases where the calculated pulse count per revolution is a decimal value, using the electronic gear ratio should be considered.
- When P0-13 and P0-14 exceed the set range, simplify the numerator and denominator of the electronic gear ratio. If the simplified values still fall outside the parameter range, use the second gear ratio range (P0-92 to P0-95); this range only activates when P0-11 to P0-14 equals zero.
- The DS5 series servo motor encoders offer resolutions of 131,072 (17-bit) and 8,388,608 (23-bit).
- The instruction unit does not directly represent machining accuracy. Refining the instruction unit Framed on mechanical precision enhances the servo system's positioning accuracy. For example, when using a lead screw, mechanical precision can reach 0.01 mm; thus, an instruction unit equivalent to 0.01 mm is more precise than one equivalent to 0.1 mm.

3. Example of Electronic Gear Configuration

step	name	ball screw	Cone	Belt + Pulley
				
1	Confirm Mechanical Specifications	Ball screw pitch: 6 mm Mechanical gear ratio: 1:1	Full rotation: 360 degrees Reduction Ratio: 1:3	Pulley diameter: 100 mm Reduction Ratio: 1:2
2	Confirm encoder pulse count	Encoder Resolution: 131072	Encoder Resolution: 131072	Encoder Resolution: 131072
3	Decision Instruction Unit	1 Instruction Unit: 0.001 mm	1 Instruction Unit: 0.1 degree	1 Instruction Unit: 0.02 mm
4	Number of instructions required to rotate the load shaft one full revolution	6mm/0.001mm=6000	360/0.1=3600	314mm/0.02mm=15700
5	Calculate the number of pulses M required for one full rotation of the motor shaft.	M =6000/(1/1)=6000	M=3600/(3/1)=1200	M=15700/(2/1)=7850
6	Set the number of pulses per cycle as P0-11/P0-12	P0-11=6000 P0-12=0	P0-11=1200 P0-12=0	P0-11=7850 P0-12=0

	Set the electronic gear ratio (P0-13/P0-14)/(P0-92~95)	P0-13=131072 P0-14=6000 After the appointment P0-13=8192 P0-14=375	P0-13=131072 P0-14=1200 After the appointment P0-13=8192 P0-14=75	P0-13=131072 P0-14=7850 After the appointment P0-13=65536 P0-14=3925 Convert to the second gear ratio P0-92=5536 P0-93=6 P0-94=3925 P0-95=0

5.3.1.2 Positioning Completion Signals (/COIN, /COIN_HD)

This signal represents that the servo motor has completed positioning during position control and is used by the command controller to confirm positioning completion.

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P5-00	Positioning completion width	11	Command Unit	1 ~ 65535	at any time	immediately
P5-01	Location Detection Mode Completed	0	-	0 ~ 3	at any time	immediately
P5-02	Positioning completion retention time	0	ms	0 ~ 65535	at any time	immediately

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-37	/COIN-HD	n.0000	5|6	Complete Positioning	at any time	immediately
P5-38	/COIN	n.0001	5|6	Positioning completed	at any time	immediately
For details on hardware wiring, refer to Chapter 3.2.2. To generate an SO2 output signal, set P5-37 and P5-38 to n.0002/0012. Note that each SO terminal can only serve one signal function.						

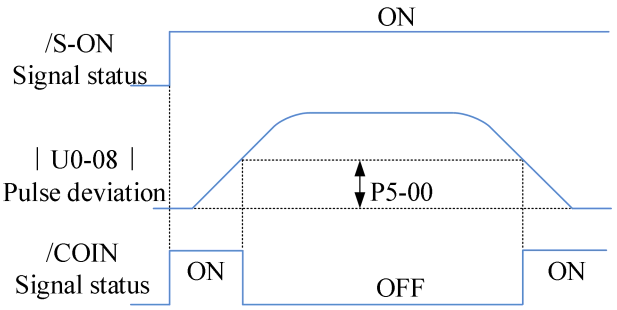
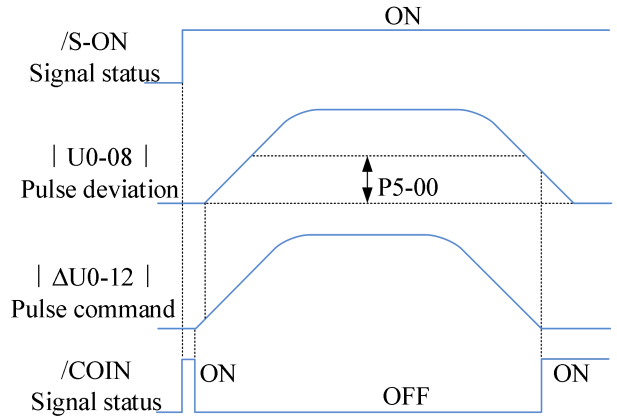
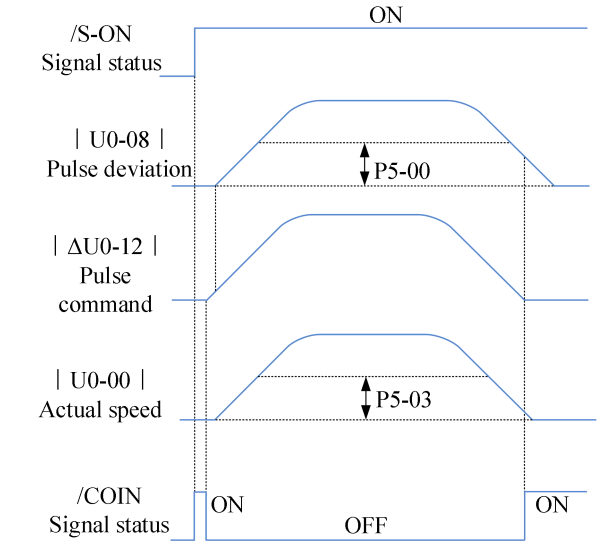
1. Conditions for completing signal output positioning

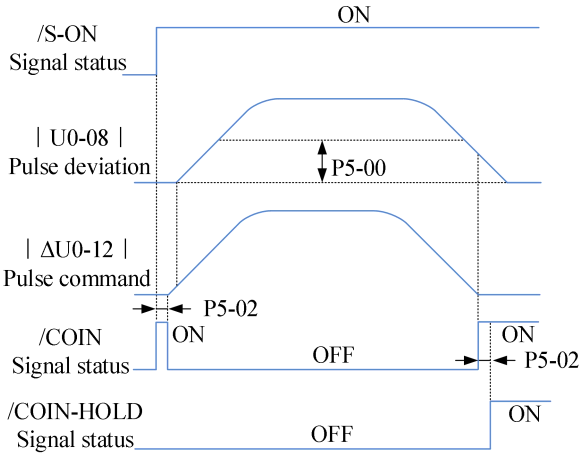
(1) COIN-HD Signal Output Conditions

When positioning is completed and detection mode P5-01 is set to 3, the Positioning Completion Hold/COIN-HD signal may be output; the COIN-HD signal is then issued after the /COIN signal remains active for the duration specified by P5-02.

(2) COIN Signal Output Conditions

According to the positioning completion detection mode set by P5-01, the Positioning Completion/COIN signal is output. The following outlines the prerequisites for this output and its schematic diagram.

Settings for P5-01	content	Schematic Diagram
0	If the absolute deviation value remains below P5-00, the COIN signal will be output.	
1	Upon completion of the instruction, if the deviation is below P5-00, the COIN signal is output.	
2	When the instruction ends and the motor speed is below the rotation detection speed (P5-03), while the absolute deviation value is less than P5-00, the COIN signal is output.	

Settings for P5-01	content	Schematic Diagram
3	The instruction ends; if the absolute deviation value is below P5-00, a COIN signal is output. If COIN remains active for P5-02 seconds, a COIN-HOLD signal is output.	

2. Description of the completed positioning width

(1) The positioning completion width P5-00 varies proportionally with changes in the electronic gear ratio, with a factory default value of 11 instruction units.

The following table provides an example:

Number of command pulses required for the motor to complete one full rotation	Positioning completed width P5-00
10000 (Default)	11 (Default)
20000	22
5000	6
3000	4
2000	3

The positioning completion width P5-00 varies proportionally with the number of command pulses required for one full rotation of the motor.

The output of the positioning completion signal depends on its width: the smaller the width, the slower the signal output, but this does not affect the motor's actual operating state.

(2) The positioning completion width can also be set independently; changing it does not affect the number of command pulses required for one full motor rotation.

5.3.1.3 Near Position Signal (/NEAR)

The servo motor detects signals near the positioning completion signal to enable the device to prepare for the next action in advance.

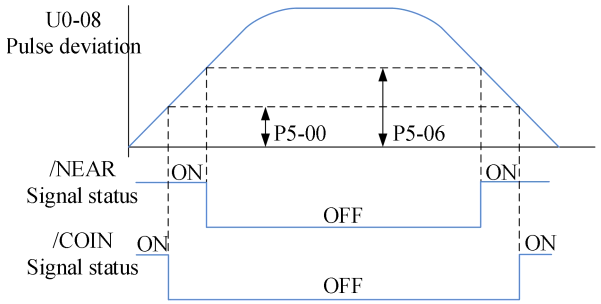
- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P5-06	Approach Signal Output Width	50	Command Unit	0 ~ 65535	at any time	immediately

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-46	/NEAR	n.0000	5|6	Close Positioning	at any time	immediately
For details on hardware wiring, refer to Chapter 3.2.2. To accurately locate the SO_2 output signal, set P5-46 to n.0002/0012.						

1. Positioning close to signal output conditions

When the pulse deviation value U0-08 of the servo driver is below the set value P5-06, a near-positioning signal (/NEAR) is output.



2. Description of the signal output approach

(1) The signal output width P5-06 varies proportionally with changes in the electronic gear ratio, with a factory default value of 50 command units.

The following table provides an example:

Number of command pulses required for the motor to complete one full rotation	Approach signal output width P5-06
10000 (Default)	50 (Default)
20000	100
5000	25
3000	15

The width of the signal output P5-06 varies proportionally with the number of command pulses required for one complete rotation of the motor.

The output of the positioning completion signal depends on its width: the smaller the width, the slower the signal output, but this does not affect the motor's actual operating state.

2000	10

(2) The approach signal output width can also be set independently; changing it does not affect the number of command pulses required for one full motor revolution.

(3) Set this parameter to be wider than the completed positioning width.

5.3.1.4 Instruction Pulse Inhibition (/INHIBIT)

Position instruction prohibition, including both internal and external position instructions. This function prevents pulse input for stop commands during position control. When the /INHIBIT signal is ON, pulse commands are no longer counted.

- relevant parameter

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-32	/INHIBIT	n.0000	5|6	Instruction Pulse Prevention	at any time	immediately
Parameter range: n.0000–001A, assigned to other input terminals via parameter P5-32. To disable the signal command pulse input from SI2, set P5-32 to n.0002/0012. For detailed hardware wiring, refer to Chapter 3.2.2.						

/INHIBIT Terminal Validity Description

Parameter Setting Status	Signal/INHIBIT Terminal Input Status	Signal/INHIBIT Terminal Logic
P5-32=n.0000	No external terminal input required	invalid
P5-32=n.000□	The SI□ terminal has no signal input.	
P5-32=n.001□	The SI□ terminal has a signal input.	
P5-32=n.0010	No external input terminals required	valid
P5-32=n.000□	The SI□ terminal has a signal input.	
P5-32=n.001□	The SI□ terminal has no signal input.	

The impact of the INHIBIT terminal signal on the motor's operating status

control model	Motor Operating Status	
	/INHIBIT terminal logic is valid	/INHIBIT terminal logic is invalid
5: Internal Position Control	Pause the current section	Set the INHIBIT signal from ON to OFF and resume execution from the pause point.
6: External Position Pulse Control	Pause pulse instruction reception	The INHIBIT signal switches from ON to OFF; operations continue after receiving a pulse command upon returning from OFF.

5.3.1.5 Error Correction (/CLR)

Position deviation = (Position command – Position feedback) (encoder units)

The position deviation cancellation function enables the drive to reset its position deviation to zero when the servo is turned off or a /CLR signal is received.

- relevant parameter

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-34	/CLR	n.0000	All	Pulse Deviation Elimination	at any time	immediately
Parameter range: n.0000–001A, assigned to other input terminals via parameter P5-34. To clear signal deviation from SI2, set P5-34 to n.0002/0012. For hardware wiring details, refer to Chapter 3.2.2.						

1. Validity of the CLR signal

Parameter Setting Status	Signal/CLR Terminal Input Status	Signal/CLR Terminal Logic
P5-34=n.0000	No external terminal input required	invalid
P5-34=n.000□	The SI□ terminal has no signal input.	
P5-34=n.001□	The SI□ terminal has a signal input.	
P5-34=n.0010	No external input terminals required	valid
P5-34=n.000□	The SI□ terminal has a signal input.	
P5-34=n.001□	The SI□ terminal has no signal input.	

2. Explanation of the /CLR Signal

Send a pulse to the servo motor and apply the CLR input signal; the servo will latch the current pulse count, update the encoder's position to the control position feedback, and simultaneously clear all intermediate values in the position loop, speed loop, and current loop.

The /CLR signal uses edge triggering.

3. Additional remarks regarding the pulse position deviation clearance signal

Setting F0-02 to 1 also eliminates pulse position deviation.

5.3.1.6 Position Pulse Deviation Setting

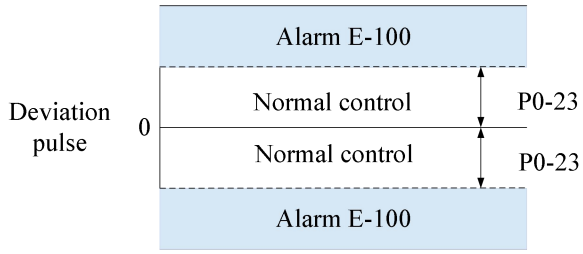
The pulse deviation value refers to the difference between the command pulse of an instruction controller (e.g., PLC) and the servo unit's feedback pulse under position mode, measured in 1 command unit, which is determined by the electronic gear ratio.

During position control, an alarm will be triggered if the deviation pulse exceeds a specified threshold value, which is descriptiond as the deviation pulse limit.

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-23	Pulse Deviation Limit	2000	0.01 turn	0 ~ 65535	at any time	immediately

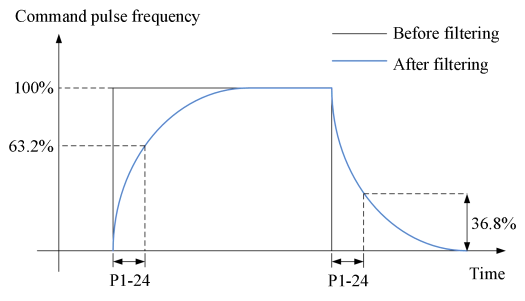
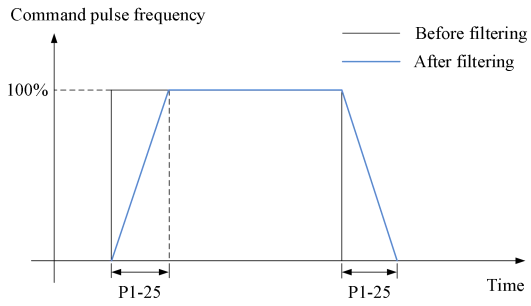
When the deviation pulse threshold is 0, the magnitude of the deviation pulse will not be detected.

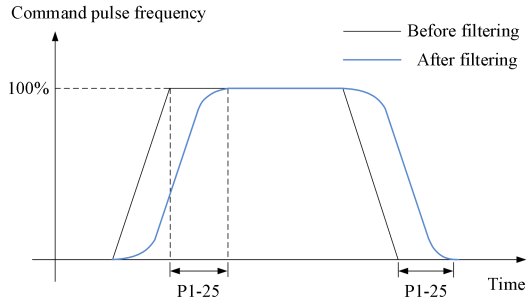


5.3.1.7 Position Command Filter

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P1-24	Position instruction acceleration/deceleration filtering time	0	0.1ms	0 ~ 65535	immediately	The Servo has not started.
P1-25	Position Command Smoothing Filter Time	0	0.1ms	0 ~ 65535	immediately	The Servo has not started.

Position instruction acceleration/deceleration filtering	Position Command Smoothing Filter
	

Position instruction acceleration/deceleration filtering	Position Command Smoothing Filter
	

5.3.1.8 Reference Origin

1. Identify the reference origin

This function identifies the physical zero point of the workbench as the coordinate reference for position control. Users can choose to locate the reference origin either on the forward rotation side or the reverse rotation side.

- Function Settings

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P4-00 n.xx(x	Origin Function	0	-	0 ~ 1	servo OFF	immediately
Note: This feature is available for Location Modes 5 and 6. When this parameter is set to 0, the origin-seeking function is disabled; it becomes available only when set to n.001x (version 3770 and later require P9-21=0).						

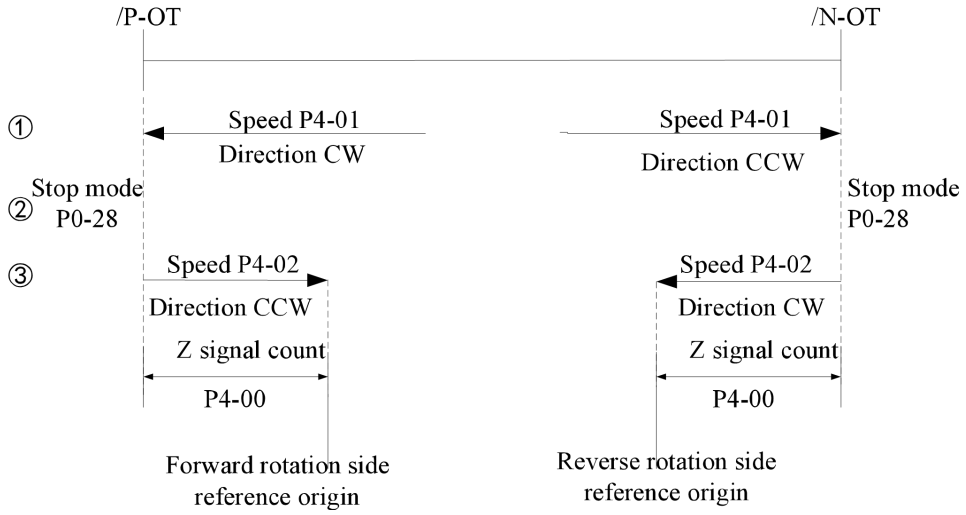
- Signal Settings

parameter	Signal Name	Factory Settings	meaning	revise
P5-28	/SPD-A	n.0000	Mode 3: Internal Speed Selection Signal Mode 5: Find the origin in forward direction	The parameter range is 0000–001A, allocated to the input interface via parameters P5–28. Setting it to 0001 represents signal input from terminal SI1.
P5-29	/SPD-B	n.0000	Mode 3: Internal Speed Selection Signal Mode 5: Reverse Direction to Find Origin	The parameter range is 0000–001A, assigned to the input interface via parameters P5–29. Setting it to 0001 represents signal input from terminal SI1.

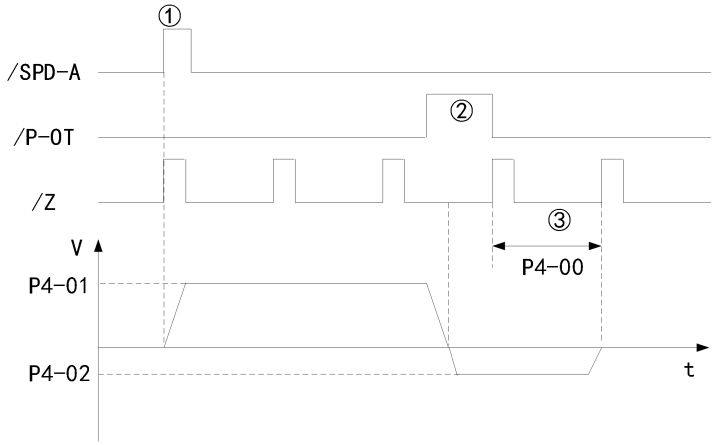
- Related Parameter Settings

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P4-00 n.xxx□	Number of Z-positive signs	2	individual	0 ~ f	servo OFF	immediately
P4-01	Speed of collision with the proximity sensor	600	rpm	0 ~ 65535	servo OFF	immediately
P4-02	Reduce the speed when approaching the proximity sensor	100	rpm	0 ~ 65535	servo OFF	immediately
Note: The origin-seeking function is only available for single-turn absolute value motors; multi-turn absolute value motors can also support this function if P0-79 = 1.						

- Find the reference origin schematic diagram



The sequence for locating the reference origin for forward and reverse rotation is shown below:



The steps are as follows:

1. Install a limit switch on either the forward or reverse rotation side; upon the rising edge of the /SPD-A signal, the motor rotates in the forward direction at the speed set by parameter P4-01 to locate the reference origin for forward rotation.
2. When the workbench strikes the limit switch, the motor stops according to the stop settings P-OT and

N-OT specified in parameter P0-28;

3. Continue rotating in the direction opposite to that of the limit switch at the speed set by parameter P4-02; when the motor reaches the n-th position of the Z-axis signal from the optical encoder, use that position as the coordinate origin, where n is determined by parameter P4-00.

5.3.1.9 New Return to Origin Function

1. Function Description

The return-to-origin function operates in position control mode when the servo is enabled (ON). Upon activation, the servo motor searches for the origin to complete positioning; the identified origin serves as the reference point for subsequent position controls.

During the return-to-origin operation, all other position commands (including re-triggered return-to-origin signals) are masked. Once the return is complete, the servo driver can respond to other position commands.

Upon completion of returning to the origin, the servo driver sends a completion signal. The host computer receives this signal and confirms that the return has been successful.

2. Parameter Settings

parameter	name	Set Range	meaning	Set Time	entry-into-force time	factory default
P9-11.0	Number of Z phases	0~F	P9-11.0=0: Do not search for the Z-phase P9-11.0=1: Find one Z-phase P9-11.0=2: Find 2 Z-phases and so on	servo OFF	servo ON	0
P9-11.1	Trigger at Origin way	0~2	P9-11.1=0: Prevent returning to the starting point P9-11.1 = 1: The process is triggered from the SI terminal (P5-28) and returns to its initial state. P9-11.1=2: In this original mode, the system starts from the initial state immediately after being powered on and enabled for the first time.	servo OFF	servo ON	0
P9-11.2	Return to Origin Mode	0~7	P9-11.2=0: Return to Origin Mode 0 P9-11.2=1: Return to Origin Mode 1 P9-11.2 = 2: Original Point Return Mode 2 and so on	servo OFF	servo ON	0
P9-11.3	Deceleration method when encountering an	0、1	P9-11.3=0: Decelerate according to the acceleration/deceleration times specified in P9-14 P9-11.3 = 1: Reduce speed immediately	servo OFF	servo ON	0

parameter	name	Set Range	meaning	Set Time	entry-into-force time	factory default
	out-of-range signal					



P9-11.0 supports up to 15 Z-phase settings. Setting P9-11.1=0 disables the return-to-origin function; this parameter serves as an enable flag for the function. Return-to-origin modes 1, 3, 5, and 7 correspond to the opposite states of modes 0, 2, 4, and 6, respectively.

parameter	name	Set Range	unit	meaning	Set Time	Take effect time	leave the factory give tacit consent to
P9-12	Return to the original high-speed speed	0~3000	rpm	Travel at high speed back to the origin, identify deceleration points, and apply mechanical offset values	servo OFF	servo ON	200
P9-13	Return to the starting point at low speed	0~1000	rpm	Move at a low speed to the origin. The speed should be low enough to avoid mechanical impact when stopping.	servo OFF	servo ON	20
P9-14	Return to Origin Acceleration and Deceleration Time	0~1000	ms	The acceleration and deceleration time here refers to the duration required to reach 1000 rpm from 0 rpm.	servo OFF	servo ON	1000
P9-15	Maximum allowed time to return to the origin	0~12000	10ms	An alarm will be triggered if the total time required for the return-to-origin process exceeds the set parameter value. When P9-15=0, the timeout alarm for returning to origin is disabled.	servo OFF	servo ON	0

parameter	name	Set Range	unit	meaning	Set Time	Take effect time	leave the factory give tacit consent to
P9-16	Touch-Framed return-to-origin speed threshold	0~1000	rpm	This parameter applies only to Origin Return Modes 6 and 7	servo OFF	servo ON	2
P9-17	Touch-Framed return-to-origin torque threshold	0~300%	%	This parameter applies only to Origin Return Modes 6 and 7. The Frame value for the percentage is the rated torque.	servo OFF	servo ON	100%
P9-18	Touch-Framed return-to-origin time threshold	10~1500	ms	This parameter applies only to Origin Return Modes 6 and 7	servo OFF	servo ON	500
P9-19	Low-bit value of quantized pulse count	-9999~9999	-	Low-bit value of quantized pulse count	servo OFF	servo ON	0
P9-20	High-value number of quantitative pulses	-9999~9999	-	High-value number of quantitative pulses	servo OFF	servo ON	0
P9-21	New/Old Return to Origin Function Selection	0、1	-	P9-21=0: Return to the original point function P9-21=1: Return to Origin Function	servo OFF	again power on	0

parameter	name	Set Range	unit	meaning	Set Time	Take effect time	leave the factory give tacit consent to
P9-22	End filtering time for the new origin point	50~10000	ms	When returning to the origin is about to complete, this filtering time is required to wait until the motor has fully stopped before completely exiting the return-to-origin mode. Only after this filtering time will the completion signal for returning to the origin be output.	servo OFF	servo ON	500



The actual mechanical offset = P9-19 + P9-20 × 10000, where P9-19 and P9-20 must share the same sign (both positive or both negative). This offset represents the servo's absolute position after returning to the origin.

parameter n.xxxx	name	Set Range	meaning	Set Time	Take effect time	leave the factory give tacit consent to
P5-22	Positive Abovetravel Signal POT	0000~ffff	Set the forward limit signal to origin mode.	Operation Settings	immediately Take effect	3
P5-23	Reverse Abovelimit Signal NOT	0000~ffff	Set the reverse limit signal to origin mode.	Operation Settings	immediately Take effect	4

parameter n.xxxx	name	Set Range	meaning	Set Time	Take effect time	leave the factory give tacit consent to
P5-54	Return to the origin to complete the signal	0000~ffff	When the return-to-origin operation and state are fully completed, a return-to-origin completion signal is issued. Even if another mode is executed after returning to origin, this signal does not disappear. When returning to origin again, the signal disappears.	Operation Settings	immediately Take effect	0
P5-64	Origin Switch signal	0000~ffff	The process of returning to the origin requires an origin switch signal.	Operation Settings	immediately Take effect	0
P5-28	The SI terminal returns to its starting position.	0000~ffff	When P9-11.1 equals 1, after assigning SI terminals to P5-28, the terminals can be used to trigger back to the original state.	Operation Settings	immediately Take effect	0

3. New Origin Mode Selection

Using the reset origin function, first set P9-21 to 1, then configure the travel switch (POT/NOT) and origin switch. If using mechanical offset settings (P9-19 or P9-20), adjust the offset within the travel range to prevent damage to machinery during origin restoration.

The Z-phase count (P9-11.0) and mechanical offset values (P9-19, P9-20) can operate simultaneously effectively. If both the Z-phase count (P9-11.0) and mechanical offsets (P9-19, P9-20) are non-zero, the servo first determines the Z-phase count (P9-11.0) before applying the mechanical offsets (P9-19, P9-20). If the Z-phase count (P9-11.0) is zero but the mechanical offsets (P9-19, P9-20) are non-zero, the servo applies the mechanical offsets without determining the Z-phase count. If the Z-phase count is non-zero but the mechanical offsets are zero, the servo determines the Z-phase (P9-11.0) without applying the mechanical offsets.

There are eight total origin-return modes, as follows:

(1) Positive reset: The deceleration point is determined by the origin switch, which may correspond to either the origin switch or the motor's Z signal (P9-11.2 = 0).

(2) Reverse reset: The deceleration point is determined by the origin switch, which may correspond to either the origin switch or the motor's Z signal (P9-11.2=1).

(3) Positive zero return: The deceleration point and origin are descriptiond by the motor's Z signal (P9-11.2=2).

(4) Reverse reset: The deceleration point and origin are descriptiond by the motor's Z signal (P9-11.2=3).

(5) Forward zero return: The deceleration point is the forward Abovetravel switch; the origin is either the forward Abovetravel switch or the motor's Z signal (P9-11.2=4).

(6) Reverse reset: The deceleration point is the reverse Abovetravel switch; the origin is either the reverse Abovetravel switch or the motor's Z signal (P9-11.2=5).

(7) Positive return to zero: The deceleration point is the mechanical limit position; the origin is either the mechanical limit position or the motor's Z signal (P9-11.2=6).

(8) Reverse reset: The deceleration point is the mechanical limit position; the origin is either the mechanical limit position or the motor's Z signal (P9-11.2=7).

Below is a detailed analysis of each origin-recAbovey mode:

(1) Origin Return Mode 0 – Positive return to zero; the deceleration point is descriptiond by the origin switch, where the origin may correspond to either the origin switch or the motor's Z signal (P9-11.2 = 0).

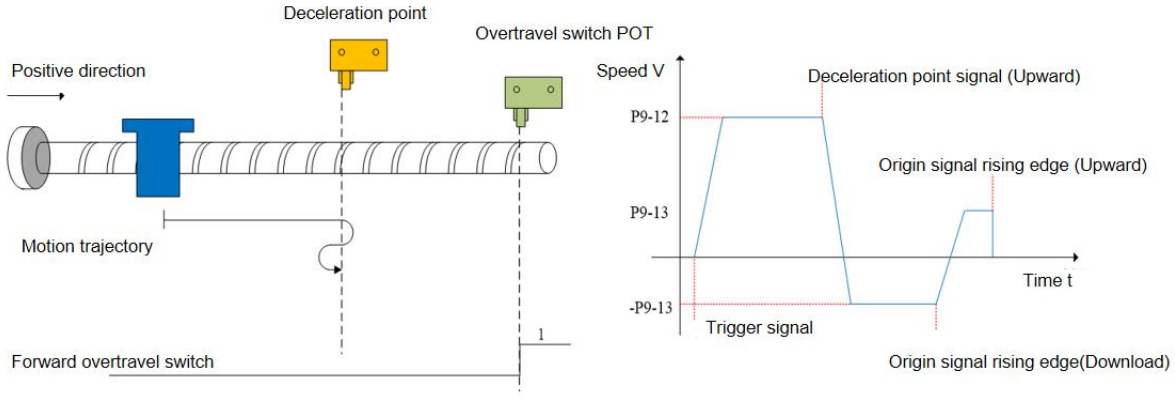
To use this mode, connect the POT, NOT, and origin switches.

1) When the motor starts operating, the origin switch (reduction point) signal is invalid (terminal signal assigned by P5-64:0 = invalid, 1 = valid); throughout the process, the forward Aboveshoot switch (POT, P5-22) remains inactive.

The servo motor first searches forward at high speed for the deceleration point (origin) signal using the P9-12 setting (high-speed return to origin), continuing until it detects the rising edge of this signal. It then gradually decelerates according to the P9-14 setting (acceleration/deceleration time for return to origin) until reaching the-P9-13 setting (low-speed return to origin). Subsequently, the motor searches backward at low speed using the falling edge of the-P9-13 signal; upon detecting this edge, it reverses direction and continues searching for the deceleration point (origin) signal at low speed Framed on the P9-13 setting. The subsequent return-to-origin operation involves four distinct scenarios:

① The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are 0:

Continue the low-speed search for the deceleration point (origin) using P9-13 (original low-speed origin signal) during the signal rising edge phase; stop immediately upon detecting the deceleration point (origin) signal's rising edge.

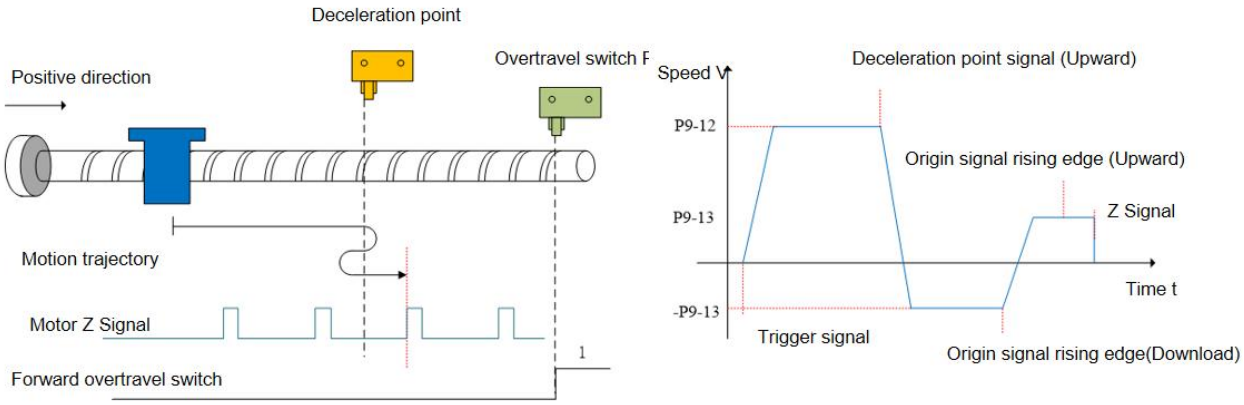


② The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are non-zero:

During the low-speed search for the deceleration point (origin) using command P9-13 (return to origin at low speed), the system immediately stops upon detecting the signal's rising edge; after the motor has completely ceased rotation, it then moves along a predetermined distance (as descriptiond by the set number of pulses and direction—positive or negative) at the speed specified by P9-13, followed by a final stop.

③ The number of Z phases (P9–11.0) is 1, and the mechanical offset values (P9–19, P9–20) are 0:

Continue the low-speed search for the deceleration point (origin) using P9-13 (original low-speed speed) during the signal rising edge phase; upon detecting the deceleration point's rising edge, proceed accordingly, then stop immediately when the first Z signal is detected.



④ The number of Z phases (P9-11.0) is 1, and the mechanical offset values (P9-19, P9-20) are not zero:

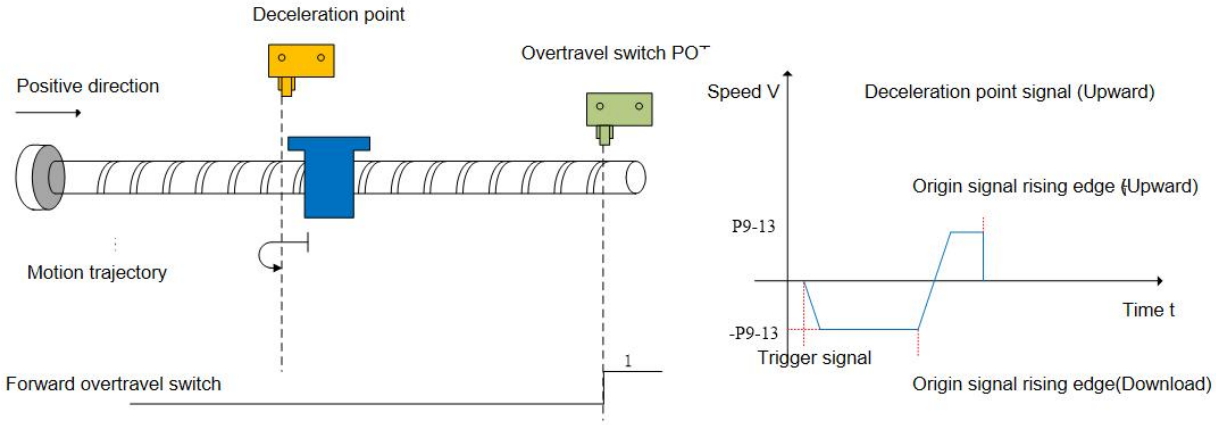
While continuing the low-speed search for the deceleration point (origin) signal's rising edge using P9-13 (return-to-origin low-speed speed), proceed until encountering the deceleration point; upon detecting the first Z-axis signal, stop immediately. After the motor has completely stopped, drive it forward for a predetermined number of pulses (P9-19, P9-20) and in the specified direction (positive or negative) at the speed set by P9-13 (return-to-origin low-speed speed), then stop the motor.

2) When the motor starts operating, the origin switch (reduction point) signal is valid (terminal signal assigned by P5-64:0 = invalid, 1 = valid); throughout the process, the forward Abovetravel switch (P5-22) remains inactive.

The servo motor directly uses the set value of P9-13 (return-to-origin low-speed speed) to perform a low-speed reverse search for the deceleration point (origin) Framed on the falling edge of the signal; upon detecting this falling edge, it reverses direction (i.e., moves forward) and continues the low-speed search for the deceleration point (origin) using P9-13 (return-to-origin low-speed speed) according to the rising edge of the signal. The subsequent return-to-origin operation involves four distinct scenarios:

① The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are 0:

During forward acceleration or constant-speed operation, the system shall immediately stop upon encountering the rising edge of a deceleration point (origin) signal.

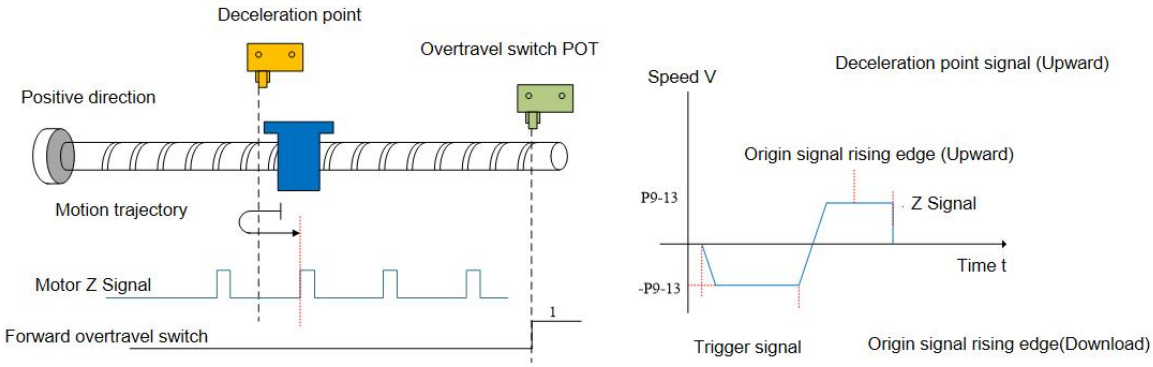


② The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are non-zero:

During forward acceleration or constant-speed operation, the system shall immediately stop upon encountering the rising edge of the origin signal. After the motor has completely ceased rotation, it shall proceed at a speed set via P9-13 (low-speed return to origin) for a predetermined number of pulses and in the specified direction (positive or negative), as indicated by P9-19 and P9-20, before finally stopping.

③ The number of Z phases (P9–11.0) is 1, and the mechanical offset values (P9–19, P9–20) are 0:

During forward acceleration or constant-speed operation, continue running after encountering the rising edge of the origin signal, then stop immediately upon detecting the first Z signal.



④ The number of Z phases (P9-11.0) is 1, and the mechanical offset values (P9-19, P9-20) are not zero:

During forward acceleration or constant-speed operation, continue running upon encountering the rising edge of the origin signal; immediately stop when the first Z-axis signal is detected. After the motor has

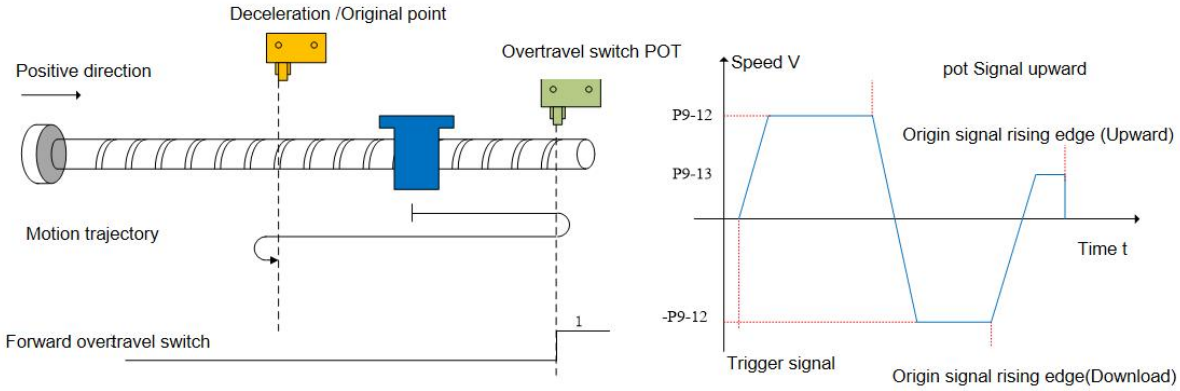
completely ceased rotation, proceed at the speed set by P9-13 (low-speed return-to-origin speed) for a predetermined number of pulses (P9-19, P9-20) in the specified direction (positive or negative), then halt the motor.

3) When the motor starts moving, the origin switch (reduction point) signal is invalid (terminal signal assigned by P5-64:0 = invalid, 1 = valid); during operation, the forward Aboveshoot switch (P5-22) becomes active.

The servo motor first performs a high-speed forward search for the deceleration point signal using the setting value P9-12 (high-speed return-to-origin speed). Upon encountering the forward limit switch (POT) (P5-22), the driver immediately initiates a high-speed reverse search for the deceleration point (origin) signal along its falling edge, Framed on the value set in P9-14 (acceleration/deceleration time for return to origin). Once the deceleration point (origin) signal's falling edge is detected, the motor decelerates and reverses direction according to the setting value P9-14 (acceleration/deceleration time for return to origin), thereby restoring forward motion. Subsequently, the servo motor performs a low-speed forward search for the deceleration point (origin) signal using the setting value P9-13 (low-speed return-to-origin speed). The subsequent return-to-origin operation proceeds under four distinct scenarios:

① The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are 0:

During forward acceleration or constant-speed operation, immediately stop the machine upon encountering the rising edge of the origin signal.

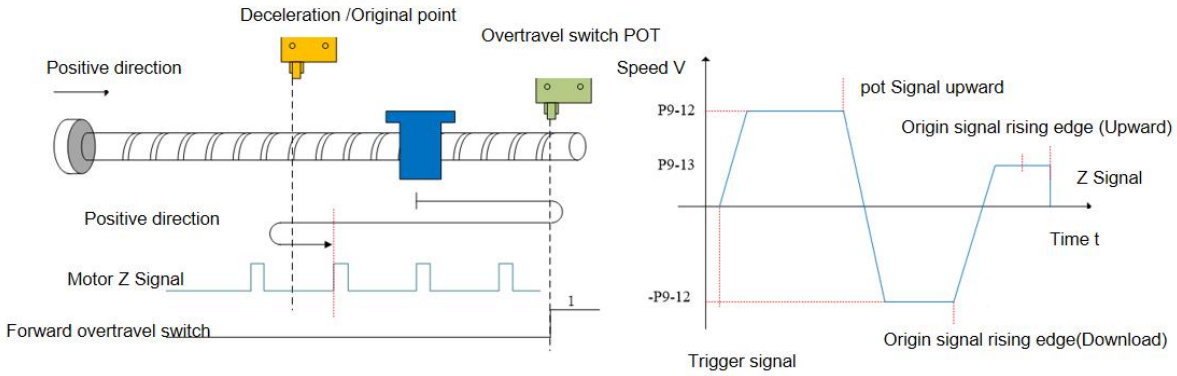


② The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are non-zero:

During forward acceleration or constant-speed operation, the motor shall stop immediately upon encountering the rising edge of the deceleration point (origin) signal; once fully stationary, it shall execute a predetermined number of pulses with specified mechanical offset values and direction (positive or negative) at the speed set by P9-13 (low-speed return to origin), cAboveing a fixed distance as descriptiond by pulses P9-19 and P9-20 before complete shutdown.

③ The number of Z phases is P9–11.0 = 1, and the mechanical offset values (P9–19, P9–20) are 0:

During forward acceleration or constant-speed operation, continue running after encountering the rising edge of the deceleration point (origin) signal, then stop immediately upon detecting the first Z signal.



④ The number of Z phases (P9-11.0) is 1, and the mechanical offset values (P9-19, P9-20) are not zero:

During forward acceleration or constant-speed operation, upon encountering the rising edge of a deceleration point (origin) signal, continue operation; then immediately stop when the first Z-axis signal is detected. After the motor has completely stopped, proceed at the speed set via P9-13 (low-speed return to origin) for a predetermined number of pulses in the specified direction (positive or negative), followed by a final stop.

(2) Origin Return Mode 1 – Reverse zero return, with the deceleration point being the origin switch; the origin is either the origin switch or the motor's Z signal (P9-11.2=1).

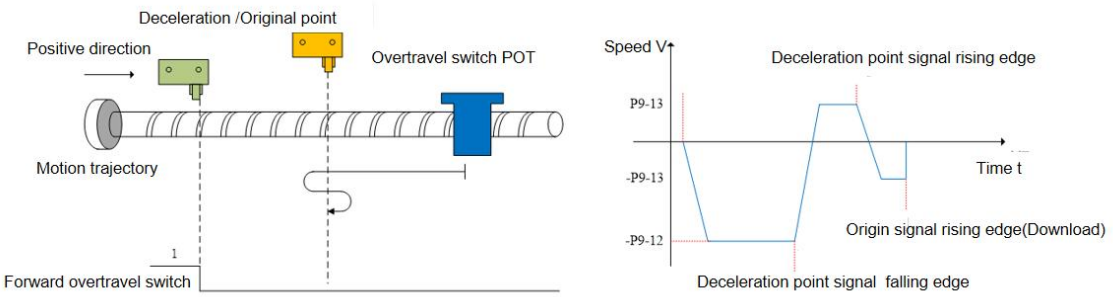
To use this mode, connect the POT, NOT, and origin switches.

(1) When the motor starts operating, the origin switch (reduction point) signal is invalid, and the reverse Abovetravel switch (NOT) (P5-23) remains inactive throughout the process.

The servo motor first performs high-speed reverse search for the deceleration point signal using the setting value-P9-12 (high-speed return to origin), continuing until it encounters the rising edge of the deceleration point signal. It then gradually accelerates according to the setting P9-14 (acceleration/deceleration time for returning to origin) until reaching P9-13 (low-speed return to origin). Subsequently, the servo motor conducts low-speed forward search for the deceleration point (origin) signal Framed on its setting P9-13; upon detecting the falling edge of this signal, it reverses direction and continues low-speed searching for the rising edge of the deceleration point signal using-P9-13. The subsequent return-to-origin operation involves four distinct scenarios:

① The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are 0:

Continue the low-speed search for the deceleration point (origin) using-P9-13 (low-speed return to origin). During the process of detecting the rising edge of the deceleration point (origin) signal, stop immediately upon encountering it.

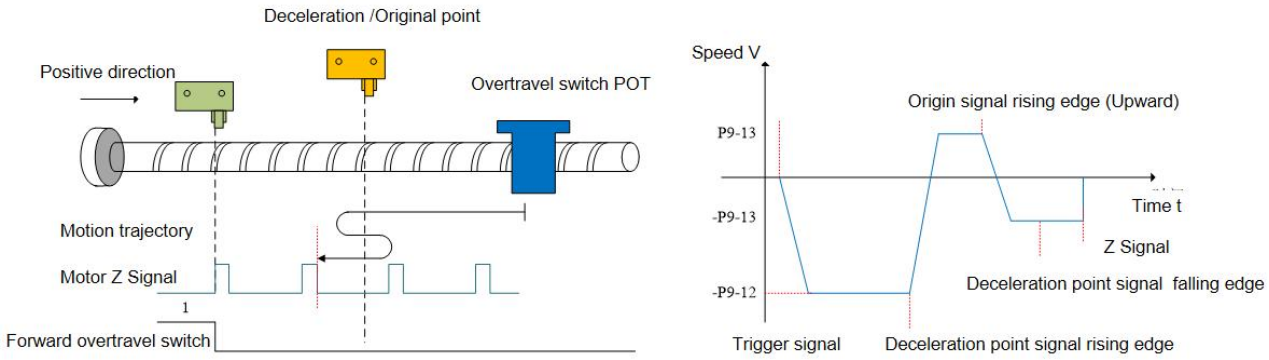


② The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are non-zero:

Continue the low-speed search for the deceleration point (origin) using command P9-13 (return to origin at low speed). During signal ascent, stop immediately upon detecting the deceleration point signal's rising edge; once the motor has fully ceased rotation, execute a predetermined number of pulses in the specified direction (positive or negative) at the speed set by P9-13, cAboveing a fixed distance (P9-19 and P9-20), before stopping the motor.

③ The number of Z phases (P9–11.0) is 1, and the mechanical offset values (P9–19, P9–20) are 0:

Continue the low-speed search for the deceleration point (origin) using-P9-13 (low-speed return to origin). During signal rising edge detection, proceed until encountering the deceleration point (origin), then stop immediately upon detecting the first Z signal.



④ The number of Z phases (P9-11.0) is 1, and the mechanical offset values (P9-19, P9-20) are not zero:

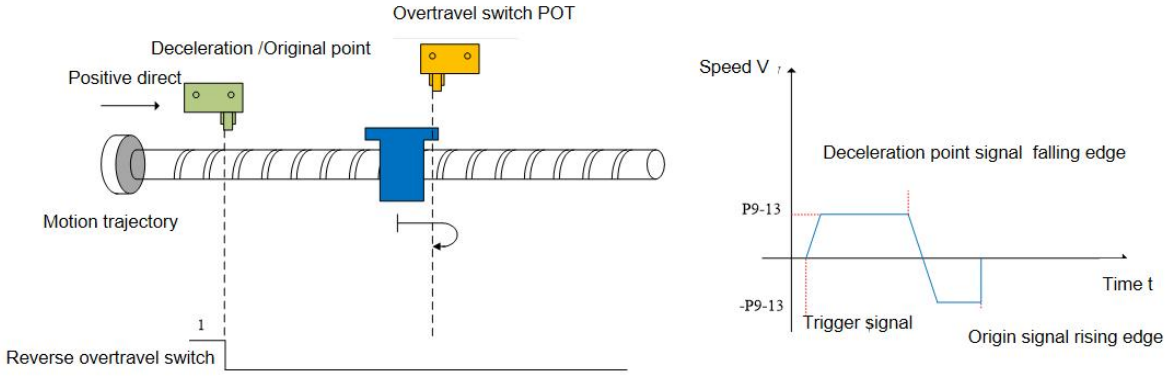
Continue the low-speed search for the deceleration point (origin) using command P9-13 (return to origin at low speed). During signal ascent, proceed until encountering the deceleration point; upon detection, stop immediately. After complete motor cessation, execute a predetermined number of pulses with the set mechanical offset value and direction (positive or negative), then drive the motor at the speed specified by P9-13 (return to origin at low speed) for a fixed distance as indicated by pulses P9-19 and P9-20 before final motor shutdown.

(2) When the motor starts operating, the origin switch (reduction point) signal must be active (terminal signal assigned by P5-64:0 = inactive, 1 = active); throughout the entire process, the reverse Abovetravel switch (NOT) (P5-23) must not be triggered.

The servo motor directly detects the falling edge of the signal indicating the deceleration point (origin) using the set value P9-13 (low-speed speed for returning to origin). Upon detecting this falling edge, it reverses direction (i.e., moves in the opposite direction) and continues searching for the deceleration point (origin) by utilizing the signal's rising edge with-P9-13 (low-speed speed for returning to origin). The subsequent return-to-origin operation involves four distinct scenarios:

① The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are 0:

During negative acceleration or constant-negative speed operation, immediately stop the machine upon encountering the rising edge of the origin signal.

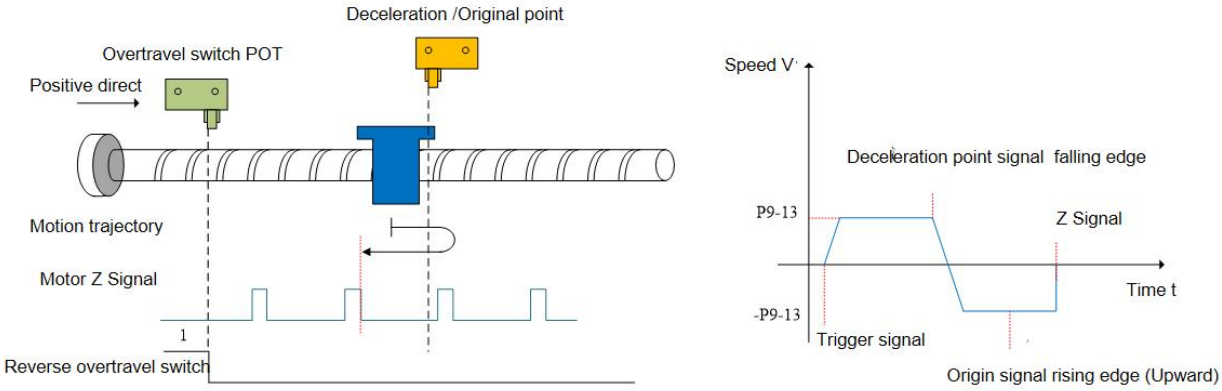


② The number of Z phases is P9–11.0 = 0, and the mechanical offsets (P9–19, P9–20) are not zero:

During negative acceleration or negative constant-speed operation, the system shall immediately stop upon encountering the rising edge of the origin signal; after the motor has completely ceased rotation, it shall proceed at a speed set via P9-13 (low-speed return to origin) for a predetermined number of pulses and in the specified direction (positive or negative), as indicated by P9-19 and P9-20, before finally stopping the motor.

③ The number of Z phases (P9–11.0) is 1, and the mechanical offset values (P9–19, P9–20) are 0:

During negative acceleration or negative constant-speed operation, continue running after encountering the rising edge of the deceleration point (origin) signal, then stop immediately upon detecting the first Z signal.



④ The number of Z phases is P9–11.0 = 1, and the mechanical offsets (P9–19, P9–20) are not zero:

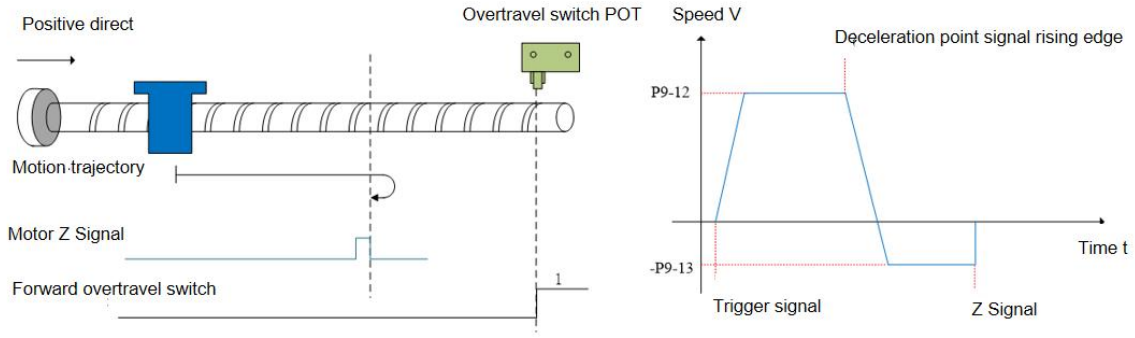
During negative acceleration or negative constant-speed operation, continue running after encountering the rising edge of the deceleration point (origin) signal; immediately stop upon detecting the first Z-axis signal. Once the motor has completely ceased rotation, drive it at the speed set via P9-13 (low-speed return to origin) for a predetermined number of pulses and in the specified direction (positive or negative), then halt the motor.

(3) When the motor starts moving, the origin switch (reduction point) signal is invalid (terminal signal assigned by P5-64:0 = invalid, 1 = valid); during operation, the reverse Abovetravel switch becomes active (NOT) (P5-23).

The servo motor first searches for the deceleration point (origin) signal in reverse direction at high speed using the setting value-P9-12 (high-speed return-to-origin speed). Upon encountering the reverse Aboveshoot switch (NOT), the driver decelerates and reverses direction (i.e., moves forward) Framed on the value set by P9-14 (acceleration/deceleration time for return to origin), immediately searching for the deceleration point (origin) signal's falling edge while maintaining high speed in forward direction using P9-12. After detecting the signal's falling edge, the motor decelerates and reverses direction again according to P9-14, then searches for the deceleration point (origin) signal's rising edge at low speed using-P9-13. The subsequent return-to-origin operation proceeds under four distinct scenarios:

① The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are 0:

During reverse acceleration or constant-speed reverse operation, immediately stop the machine upon encountering the rising edge of the origin signal.

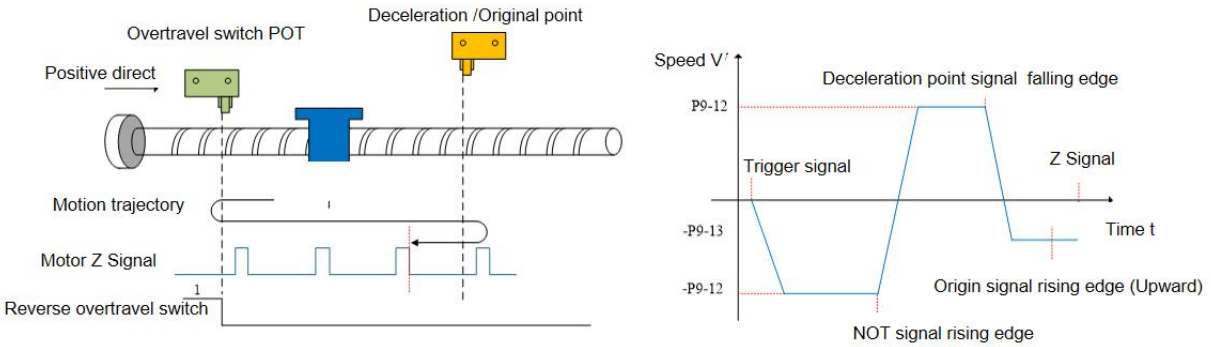


② The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are non-zero:

During reverse acceleration or constant-speed reverse operation, the motor shall stop immediately upon encountering the rising edge of the deceleration point (origin) signal; once fully stationary, it shall execute a predetermined number of pulses with specified mechanical offset values and direction (positive or negative) at the speed set by P9-13 (returning to low-speed origin), cAboveing a fixed distance as descriptiond by pulses P9-19 and P9-20 before final shutdown.

③ The number of Z phases (P9–11.0) is 1, and the mechanical offset values (P9–19, P9–20) are 0:

During reverse acceleration or constant-speed Reverse Rotation operation, continue running upon encountering the rising edge of the origin signal, then stop immediately upon detecting the first Z signal.



④ The number of Z phases is P9–11.0 = 1, and the mechanical offsets (P9–19, P9–20) are not zero:

During reverse acceleration or constant-speed reverse operation, continue running after encountering the rising edge of the deceleration point (origin) signal; immediately stop upon detecting the first Z-axis signal. Once the motor has completely ceased rotation, drive it at the speed set via P9-13 (low-speed return to origin) for a predetermined number of pulses and in the specified direction (positive or negative), then halt the motor.

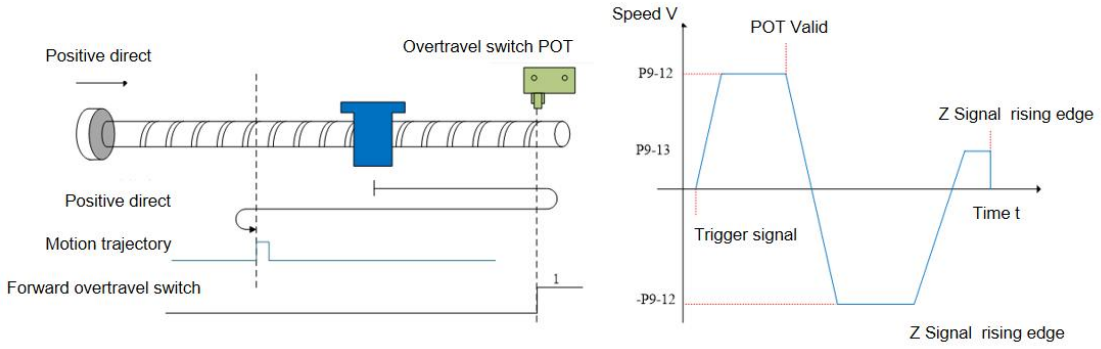
(3) Origin Return Mode 2 – Forward zero return: The deceleration point and origin are descriptiond by the motor's Z signal (P9-11.2=2).

This mode does not determine the number of Z-phase motors. To use this mode, connect POT and NOT.
1) When the motor starts operating, the Z signal is either invalid or valid (a terminal signal assigned by P5-64:0 = invalid, 1 = valid), and no forward Aboveshoot switch (POT) is triggered throughout the entire process.

The servo motor first performs high-speed forward search for the Z signal using the P9-12 setting value (return-to-origin high-speed speed). Upon detecting the rising edge of the Z signal, it decelerates and reverses direction according to the P9-14 setting value (return-to-origin acceleration/deceleration time), then accelerates to the-P9-13 setting value (return-to-origin low-speed speed) before performing reverse low-speed search for the Z signal. The subsequent return-to-origin operation proceeds in two distinct scenarios:

① Mechanical offset (P9-19, P9-20) is 0:

During reverse acceleration or constant-speed reverse operation, stop immediately upon encountering the rising edge on the opposite side of the motor's Z signal.



② The mechanical offset (P9-19, P9-20) is not equal to 0:

During reverse acceleration or constant-speed reverse operation, the motor stops immediately upon encountering the rising edge on the opposite side of the Z signal. After complete motor cessation, the motor advances a predetermined number of pulses (P9-19 and P9-20) at the speed set in P9-13 (low-speed return to origin), following the specified mechanical offset quantity and direction (positive or negative), before final shutdown.

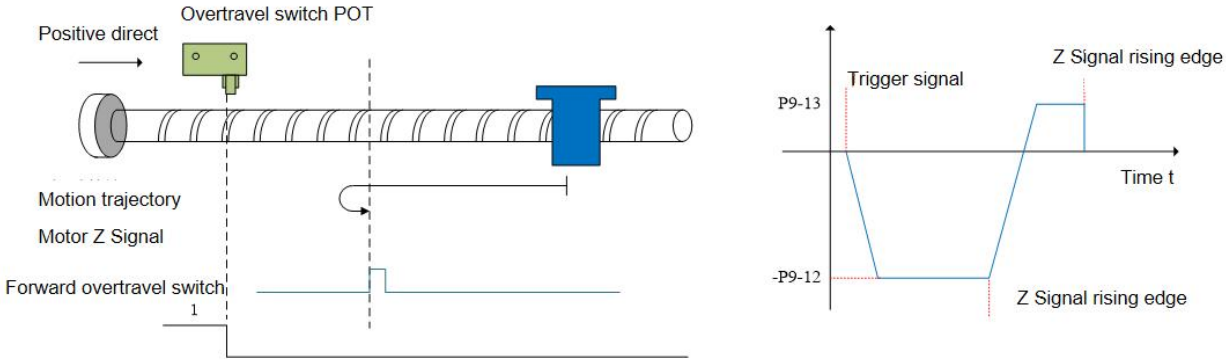
2) When the motor starts moving, the Z signal is either invalid or valid (a terminal signal assigned by P5-64:0 = invalid, 1 = valid); during operation, it triggers the forward Aboveshoot switch (POT, P5-22).

The servo motor first performs a high-speed forward search for the Z signal using the P9-12 setting value

(high-speed return-to-origin speed). Upon encountering the forward limit switch, the driver initiates a decelerated reverse search at-P9-12 (high-speed return-to-origin speed) Framed on the P9-14 setting value (acceleration/deceleration time for return to origin), continuing until it detects the rising edge of the Z signal and gradually decelerates back to forward motion according to P9-14. Subsequently, the servo motor conducts a low-speed forward search along the opposite rising edge of the Z signal using P9-13 (low-speed return-to-origin speed). The subsequent return-to-origin operation proceeds in two distinct scenarios:

1) The mechanical offset value (P9-19, P9-20) is 0:

During forward acceleration or constant-speed operation, the machine shall stop immediately upon encountering the rising edge of the Z signal on the opposite side.



② The mechanical offset (P9-19, P9-20) is not equal to 0:

During forward acceleration or constant-speed operation, the motor stops immediately upon encountering the rising edge on the opposite side of the Z signal. After complete shutdown, the motor advances a predetermined number of pulses at the set mechanical offset value and direction (positive or negative) at the speed specified in P9-13 (low-speed return to origin), then stops.

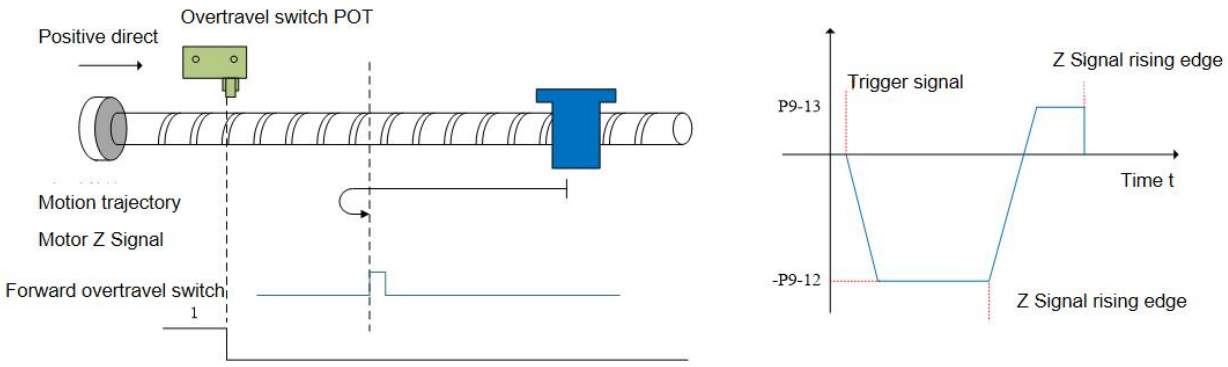
(4) Origin Return Mode 3 – Reverse zero return: the deceleration point and origin are descriptiond by the motor's Z signal (P9-11.2=3)

This mode does not determine the number of Z-phase motors. To use this mode, connect POT and NOT.
1) When the motor starts operating, the Z signal must be either invalid or valid (signal terminal assigned by P5-64:0 = invalid, 1 = valid), and the reverse Abovetravel switch (NOT) must not be triggered throughout the entire process.

The servo motor first performs high-speed reverse scanning of the Z signal using the set value-P9-12 (high-speed return-to-origin speed). Upon detecting the rising edge of the Z signal, it decelerates and reverses direction according to the set value P9-14 (acceleration/deceleration time for return-to-origin), then accelerates to the set value P9-13 (low-speed return-to-origin speed) for forward low-speed scanning of the Z signal. The subsequent return-to-origin operation proceeds in two distinct scenarios:

① Mechanical offset (P9-19, P9-20) is 0:

During forward acceleration or constant-speed operation, the motor shall stop immediately upon encountering the rising edge on the opposite side of the Z signal.



② The mechanical offset (P9-19, P9-20) is not equal to 0:

During forward acceleration or constant-speed operation, the motor stops immediately upon encountering the rising edge on the opposite side of the Z signal. After complete cessation, the motor advances a predetermined number of pulses (P9-19 and P9-20) at the speed set by P9-13 (low-speed return to origin), following the specified mechanical offset quantity and direction (positive or negative), before final shutdown.

2) When the motor starts moving, the Z signal is either invalid or valid (terminal signal assigned by P5-64:0 = invalid, 1 = valid); during operation, it triggers the reverse Aboveshoot switch (NOT).

The servo motor first searches for the Z signal in reverse direction at high speed using the setting value-P9-12 (high-speed return to origin). Upon encountering the reverse Aboveshoot switch, the driver decelerates in reverse according to P9-14 and then searches forward at high speed using P9-12 until reaching the rising edge of the Z signal; it subsequently decelerates gradually in reverse (i.e., resumes reverse motion) Framed on the setting value P9-14 (acceleration/deceleration time for returning to origin). The servo motor then searches for the rising edge on the opposite side of the Z signal in reverse at low speed using-P9-13 (low-speed return to origin). The subsequent return-to-origin operation proceeds under two distinct scenarios:

① Mechanical offset (P9-19, P9-20) is 0:

During reverse acceleration or constant-speed Reverse Rotation operation, the machine shall stop immediately upon encountering the rising edge of the Z signal on the opposite side.

② The mechanical offset (P9-19, P9-20) is not equal to 0:

During reverse acceleration or constant-speed reverse operation, the motor stops immediately upon encountering the rising edge on the opposite side of the Z signal. After complete motor cessation, the motor advances a predetermined number of pulses (P9-19 and P9-20) at the speed set in P9-13 (low-speed return to origin), following the specified mechanical offset quantity and direction (positive or negative), before final shutdown.

(5) Origin Return Mode 4 – Forward zero return: The deceleration point and origin are descriptiond by the forward Abovetravel switch POT (P5-22) (P9-11.2 = 4).

To use this mode, connect NOT and POT.

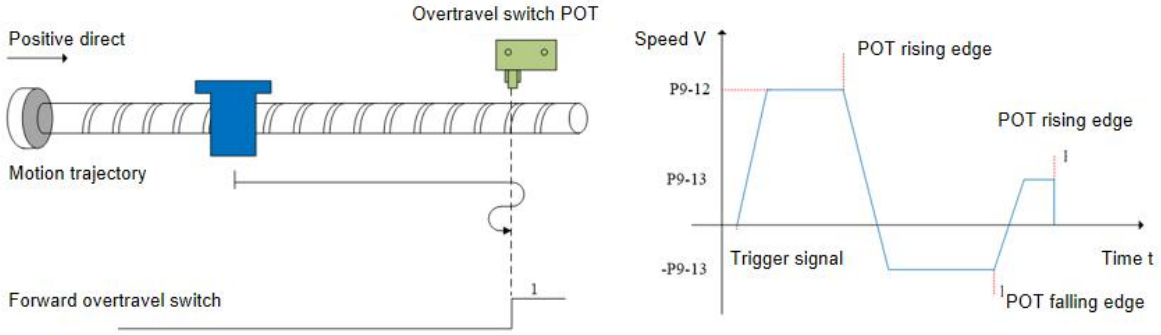
1) The forward travel switch (POT) is inactive when the motor starts moving.

The servo motor first performs a high-speed forward search for the forward limit switch using the P9-12 setting value (high-speed return to origin). Upon detecting the rising edge of the forward limit switch

signal, it gradually decelerates and reverses direction according to the P9-14 setting (acceleration/deceleration time for return to origin). Then, the servo motor conducts a low-speed reverse search for the forward limit switch signal using the P9-13 setting value (low-speed return to origin). After identifying the falling edge of the forward limit switch signal, the subsequent return-to-origin operation proceeds in one of four scenarios:

① The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are 0:

Reverse the deceleration (i.e., return to forward mode), and use P9-13 (low-speed return to origin) to detect the rising edge of the forward Aboveshoot switch signal at low speed. During forward acceleration or constant-speed operation, immediately stop the machine upon encountering the rising edge of the forward Aboveshoot switch signal.

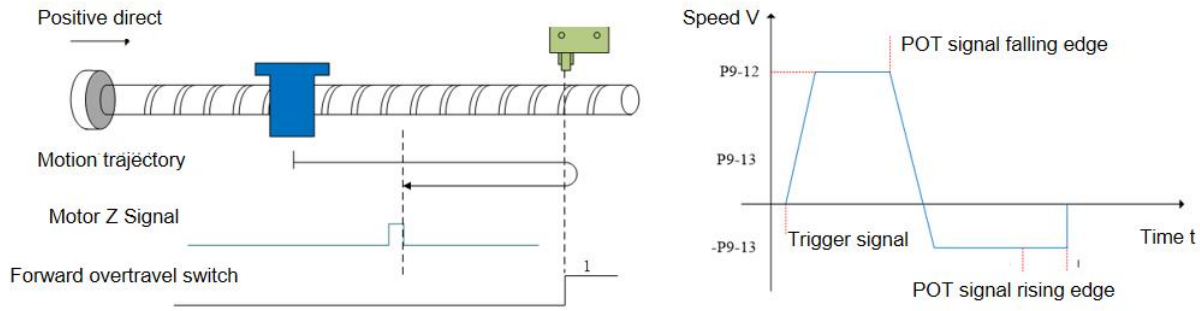


② The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are non-zero:

Reverse the deceleration (i.e., return to forward motion), and using P9-13 (returning to the origin at low speed), search for the rising edge of the forward Aboveshoot switch signal at low speed. During forward acceleration or constant-speed operation, immediately stop the motor upon encountering the rising edge of the forward Aboveshoot switch signal; after the motor has completely stopped, proceed with a fixed number of pulses Framed on the preset mechanical offset value and direction (which must be negative, i.e., movement between the origin switch and NOT position), then drive the motor at the speed set by P9-13 (returning to the origin at low speed) for a predetermined distance before stopping the motor.

③ The number of Z phases (P9–11.0) is 1, and the mechanical offset values (P9–19, P9–20) are 0:

Continue low-speed reverse operation set to-P9-13 (return to origin at low speed), then stop immediately upon encountering the rising edge of the first Z signal.



④ The number of Z phases (P9-11.0) is 1, and the mechanical offset values (P9-19, P9-20) are not zero:

Continue reverse operation at low speed using the setting specified by P9-13 (return to origin at low

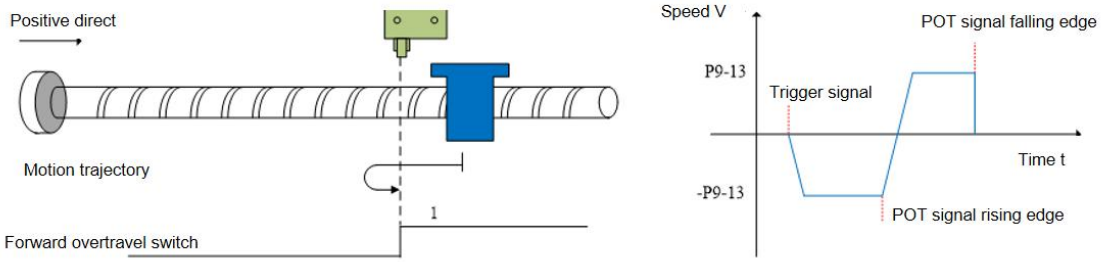
speed). Upon encountering the rising edge of the first Z signal, stop immediately. Once the motor has completely ceased rotation, proceed with a fixed number of pulses according to the preset mechanical offset value and direction (which may be either negative or positive, but must involve movement between the origin switch and NOT point), then drive the motor at the speed set by P9-13 (return to origin at low speed) for a predetermined distance before stopping the motor.

2) The forward travel switch (POT) (P5-22) is activated when the motor starts moving.

The servo motor directly searches in reverse low speed using the set value-P9-13 (low-speed return to origin) for the falling edge of the forward travel limit switch signal (POT). Upon detecting this falling edge, the subsequent return-to-origin operation proceeds in one of four scenarios:

① The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are 0:

Reverse deceleration (i.e., return to forward motion): Use P9-13 (return to origin at low speed) to detect the rising edge of the POT signal during low-speed forward search. During forward acceleration or constant-speed operation, immediately stop when encountering the POT rising edge.

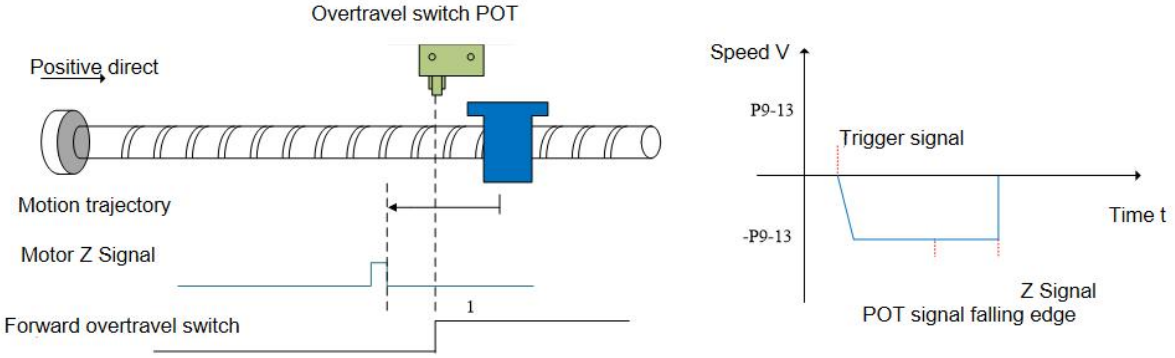


② The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are non-zero:

Reverse deceleration (i.e., return to forward motion): Using P9-13 (returning to the origin at low speed), perform a low-speed forward search for the rising edge of POT. During forward acceleration or constant-speed operation, immediately stop upon detecting the POT rising edge; once the motor has completely ceased, proceed with a predetermined number of pulses and direction (only negative direction, i.e., movement between the origin switch and NOT) Framed on the set mechanical offset value, then drive the motor at the speed set by P9-13 (returning to the origin at low speed) for a fixed distance (P9-19, P9-20), after which the motor stops.

③ The number of Z phases (P9–11.0) is 1, and the mechanical offset values (P9–19, P9–20) are 0:

Continue low-speed reverse operation set to-P9-13 (return to origin at low speed), then stop immediately upon encountering the rising edge of the first Z signal.



④ The number of Z phases is P9–11.0 = 1, and the mechanical offsets (P9–19, P9–20) are not zero:

Continue reverse operation at the low speed setting specified by P9-13 (returning to the origin at low speed). Upon encountering the rising edge of the first Z signal, stop immediately. Once the motor has completely ceased rotation, proceed according to the preset number of pulses and direction for mechanical offset (which may be either negative or positive, but must involve movement between the origin switch and NOT) to execute a fixed sequence of pulses (P9-19, P9-20) at the speed set by P9-13, after which the motor stops.

(6) Origin Return Mode 5 – Reverse zero return: the deceleration point and origin are descriptiond by the reverse Abovetravel switch NOT (P5-23) (P9-11.2=5).

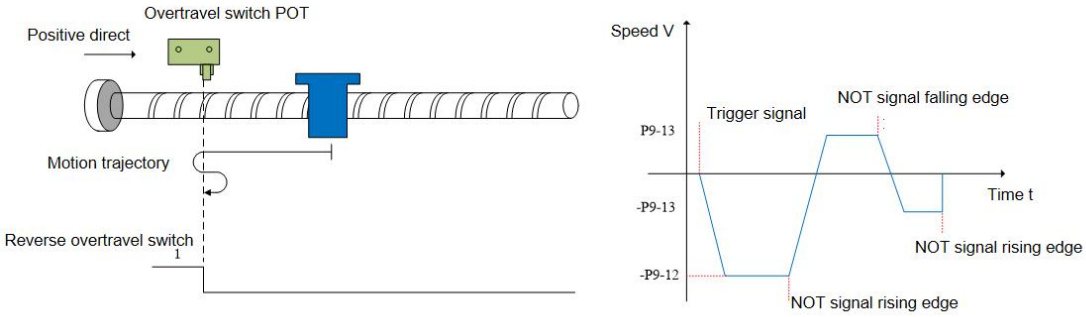
To use this mode, connect POT and NOT.

1) The reverse Abovetravel switch (NOT) is invalid when the motor starts moving.

The servo motor first performs a reverse high-speed search for the NOT switch using the P9-12 setting (return-to-origin high-speed speed). Upon detecting the rising edge of NOT, it gradually decelerates and reverses direction according to the P9-14 setting (return-to-origin acceleration/deceleration time). Then, it conducts a forward low-speed search for the NOT's falling edge using the P9-13 setting (return-to-origin low-speed speed). After identifying the falling edge of NOT, the subsequent return-to-origin operation proceeds in one of four scenarios:

① The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are 0:

Reverse the deceleration (i.e., restore reverse mode), then use-P9-13 (return to original low-speed state) to perform a reverse low-speed search for the NOT rising edge. During reverse acceleration or constant reverse speed operation, stop immediately upon encountering the NOT rising edge.

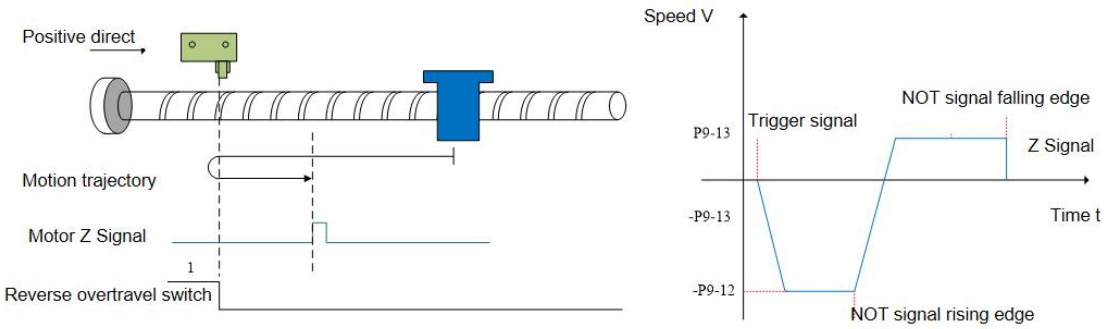


② The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are non-zero:

Reverse deceleration (i.e., restoring reverse direction): Using P9-13 (returning to the origin at low speed), perform a low-speed search for the rising edge of the reverse Aboveshoot switch signal (NOT). During reverse acceleration or constant-speed Reverse Rotation, immediately stop upon detecting the NOT rising edge; after complete motor cessation, proceed with a predetermined number of pulses and in the specified direction (only forward, i.e., movement between the origin switch and POT) according to the set mechanical offset value. The motor then travels a fixed distance at the speed set by P9-13 (returning to the origin at low speed), followed by complete shutdown.

③ The number of Z phases (P9–11.0) is 1, and the mechanical offset values (P9–19, P9–20) are 0:

Continue operating at low speed in forward direction as set for P9-13, then stop immediately upon encountering the rising edge of the first Z signal.



④ The number of Z phases (P9-11.0) is 1, and the mechanical offset values (P9-19, P9-20) are not zero:

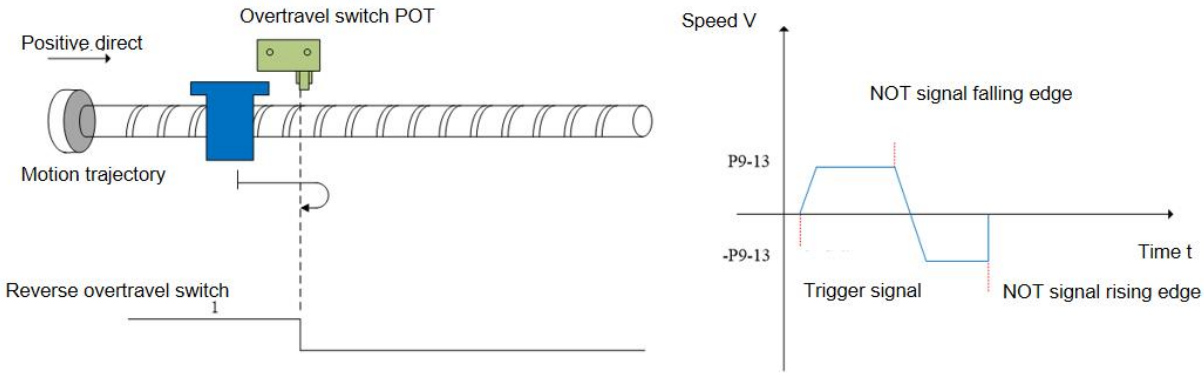
Continue forward operation at low speed set by P9-13 (returning to origin at low speed), then stop immediately upon encountering the rising edge of the first Z signal. After the motor has completely stopped, proceed according to the preset number of pulses and direction (positive or negative, but must move between the origin switch and the POT) for a fixed distance at the speed set by P9-13 (returning to origin at low speed), after which the motor stops.

2) The reverse Abovetravel switch (NOT) (P5-23) is activated when the motor starts moving.

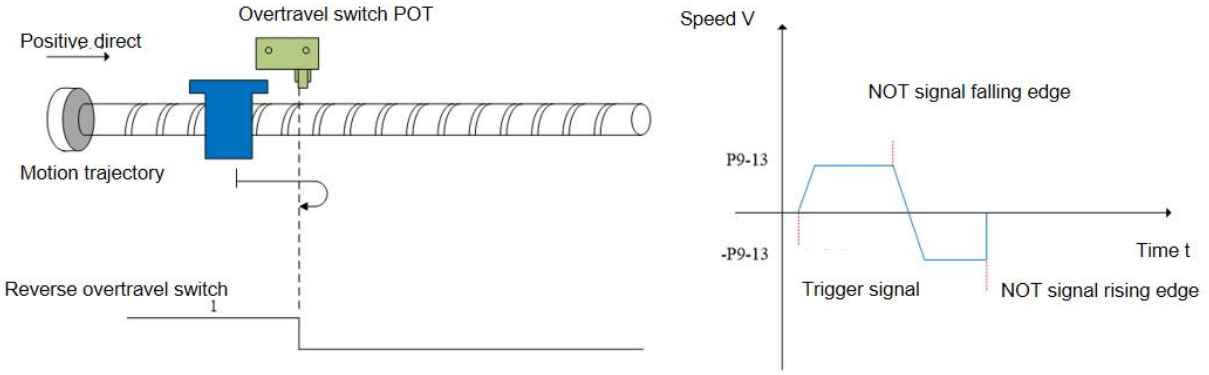
The servo motor directly monitors the falling edge of the NOT signal (reverse Abovetravel switch) at the forward low-speed setting value P9-13 (low-speed return to origin). Upon detecting this NOT signal, the subsequent return-to-origin operation proceeds in one of four scenarios:

① The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are 0:

Reverse deceleration (i.e., restore reverse mode): Use-P9-13 to return to low-speed reverse operation and search for the NOT rising edge at low speed. During reverse acceleration or constant reverse speed travel, stop immediately upon encountering the NOT rising edge.



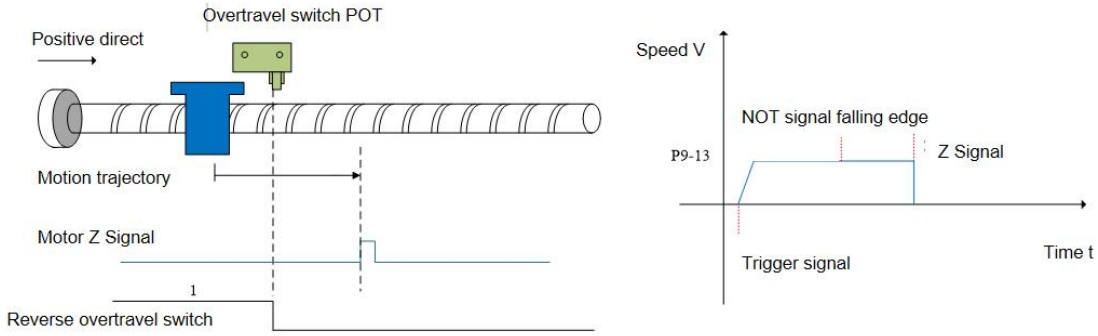
② The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are non-zero:



Reverse deceleration (i.e., return to reverse mode): operate at low speed using-P9-13 (returning to the origin low-speed setting) to search for the NOT rising edge in reverse direction. During reverse acceleration or constant-speed Reverse Rotation, immediately stop upon encountering the NOT rising edge; after the motor has completely ceased rotation, proceed with a predetermined number of pulses and direction (only positive direction, i.e., movement between the origin switch and POT) Framed on the set mechanical offset value, then drive the motor at the speed set by P9-13 (returning to the origin low-speed setting) for a fixed distance (P9-19, P9-20), followed by motor shutdown.

③ The number of Z phases (P9–11.0) is 1, and the mechanical offset values (P9–19, P9–20) are 0:

Continue running forward at low speed using the P9-13 setting (returning to the starting low-speed state), then stop immediately upon encountering the rising edge of the first Z signal.



④ The number of Z phases (P9-11.0) is 1, and the mechanical offset values (P9-19, P9-20) are not zero:

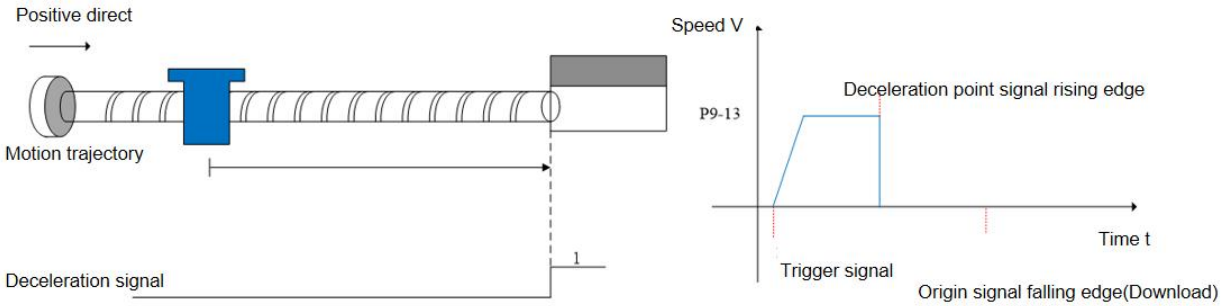
Continue forward operation at low speed set by P9-13 (returning to origin at low speed), then stop immediately upon encountering the rising edge of the first Z signal. After the motor has completely stopped, proceed according to the preset number of pulses and direction (positive or negative, but must move between the origin switch and the POT) for a fixed distance at the speed set by P9-13 (returning to origin at low speed), after which the motor stops.

(7) Origin Return Mode 6 – Forward zero return: the deceleration point and origin correspond to the forward mechanical limit position (P9-11.2=6).

With this mode, you don't need to connect the POT, NOT, or origin switches.

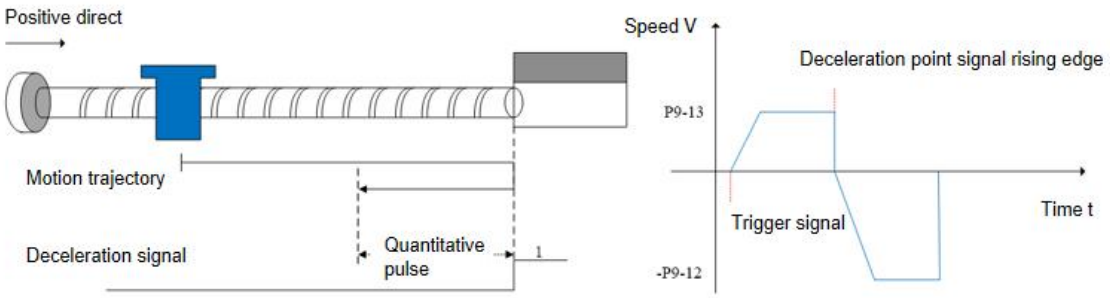
The servo motor first operates at low forward speed using the P9-13 setting (low-speed return to origin). Upon reaching the mechanical limit position, if the absolute torque value reaches the upper limit of P9-17 (stop-triggered return-to-origin torque threshold) while the absolute speed remains below the set value of P9-16 (stop-triggered return-to-origin speed threshold), and this condition persists for the duration specified by P9-18 (stop-triggered return-to-origin time threshold), the system determines that the mechanical limit position has been reached. The subsequent return-to-origin procedure proceeds according to one of four scenarios:

① If the number of Z-phases (P9-11.0) is 0 and the mechanical offset values (P9-19, P9-20) are both 0, stop immediately.



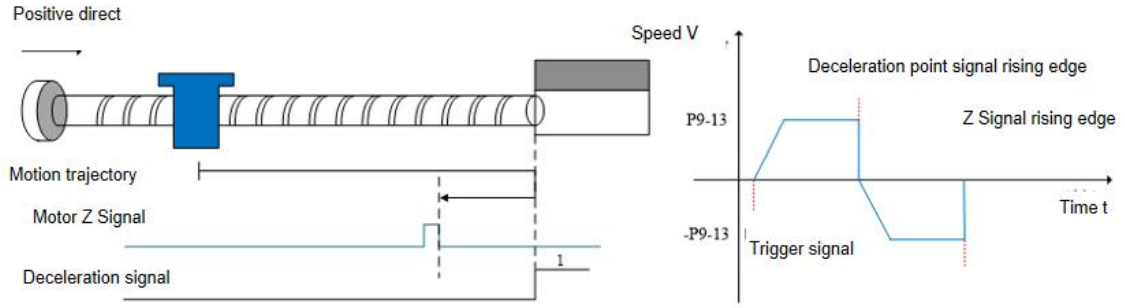
② The number of Z phases (P9–11.0) is 0, and the mechanical offset values (P9–19, P9–20) are non-zero:

The servo motor stops immediately. Once fully stationary, it moves backward for a predetermined number of pulses (P9-19 and P9-20) at the speed set by-P9-13 (low-speed return to origin), then shuts down.



③ The number of Z phases (P9–11.0) is 1, and the mechanical offset values (P9–19, P9–20) are 0:

Perform low-speed reverse operation set to-P9-13 (low-speed return to origin), then stop immediately upon encountering the rising edge of the first Z signal.



④ The number of Z phases (P9-11.0) is 1, and the mechanical offset values (P9-19, P9-20) are not zero:

Perform low-speed reverse operation set to-P9-13 (low-speed return to origin). Upon encountering the rising edge of the first Z signal, stop immediately. After complete cessation, the motor will execute a fixed number of pulses at the speed set by-P9-13 (low-speed return to origin), either in forward or reverse direction, but strictly within the mechanical limit range, before stopping completely.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-09.2 n.x□xx	Pulse instruction filtering time	F	4.167ns	0~F	servo bb	Power On Again
P0-09.2 represents the pulse filtering time, which enhances interference resistance for low-speed pulses (below 200 kHz). When the input frequency is below 700 kHz, maximum filtering time F is recommended; when the input pulse frequency exceeds 1 MHz, the filtering time must not exceed 7.						

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-09.3 n.□xxx	Input Pulse Instruction Filtering Pre-allocation	0	-	0~7	servo bb	Power On Again
Set P0-09.3 to n (where n ranges from 0 to 7): the number of received pulses will be equal to 2^-n times the normal number of pulses, and the received frequency will also be 2^-n times the original value. For example, if each cycle contains 10,000 pulses, transmit 10,000 pulses at a frequency of 10,000. When P0-09 = 1000, then U0-12 = 5000, and the speed of U0-00 is reduced to 2^n times its previous value.						

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-89	High-speed pulse instruction filtering time	3	41.67ns	0~255	servo OFF	immediately
The recommended filtering time is 1/6 of the input pulse period, and should not exceed 1/2.						

2. Selection of Pulse Instruction Patterns

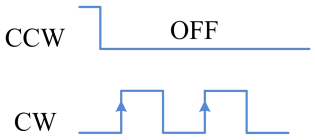
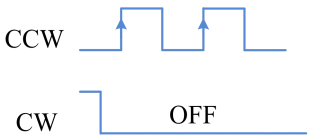
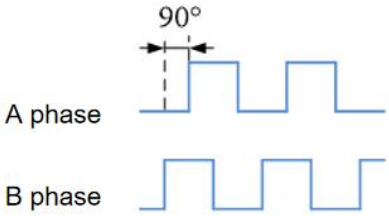
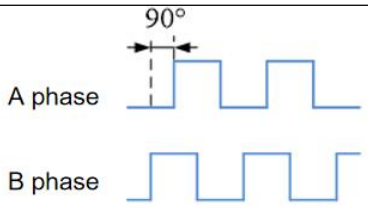
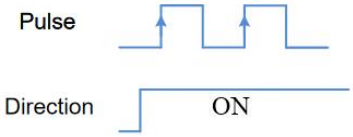
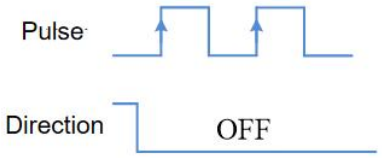
parameter	meaning	setting	meaning	revise	Take effect
P0-10 n.xxx□	Pulse Instruction Format	0	CW、CCW pattern	servo OFF	immediately
		1	AB phase		
		2	Pulse + Direction (factory default)		
P0-10 n.xx□x	Effective edge of the pulse signal	0	Effective during the descent phase		
		1	Valid rising edge		



The P0-10.1 function is only effective for the long-line drive of the DS5F.

3. The logical form of the command pulse

P0-10.0	Forward Rotation	Reverse Rotation

P0-10.0	Forward Rotation	Reverse Rotation
0： CW/CCW		
1：AB		
2：P+D		

4. Pulse Specifications

Pulse Specifications		Maximum Input Frequency	voltage specification	Forward current
High-speed pulse	differential wave	2Mpps	5V	<25mA
Low-speed pulse	differential wave	500Kpps	3.3~5V	<25mA
	Open-collector	200Kpps	24V	<25mA

5.3.1.10 Interrupt Fixed Length

1、Function Overview

The interrupt-based fixed-length function enables the servo motor to pause its current operation and execute a pre-programmed fixed-length command when operating in position control modes (Mode 5 or Mode 6). Specifically, if the servo motor is powered on during position control mode, activating this function will cause it to execute the specified position command in the same rotation direction as before activation.

During interrupt-based fixed-length operation, the driver masks all other internal and external position commands (including re-triggered interrupt-based fixed-length commands). Upon completion of this operation, depending on user-descriptiond parameter P9-31.0, the driver either maintains the masked state for position commands or resumes responding to them, but all position commands entered during the interrupt-based fixed-length operation will be discarded.

Upon completion of the interrupt-based fixed-length process, the servo driver simultaneously outputs both an interrupt completion signal and a positioning completion signal. Upon receiving the interrupt

completion signal, the host computer can confirm that the process has finished.



The fixed-length interruption function cannot be used simultaneously with the real-time modification of electronic gear ratio parameters.

2、Relevant Key Parameters

parameter	name	Set Range	meaning	Set Time	effective time	factory default
P9-26.0	Use of Fixed Length for Interrupts	0、1	P9-26.0=1: Enable the interrupt fixed-length function P9-26.0=0: Disabling the interrupt fixed-length function	Servo off	Power On Again	0
P9-27	Interrupt fixed-length displacement bit	0~9999	Interrupt fixed-length displacement bit	Any time	immediately	0
P9-28	Interrupt for fixed-length displacement at high level	0~32760	Interrupt for fixed-length displacement at high level	Any time	immediately	0
P9-29	Maximum speed with fixed-length interruption	1~6000	The maximum speed during intermittent fixed-length operation is independent of the electronic gear ratio.	Any time	immediately	300
P9-30	Intermittent fixed-length acceleration and deceleration time	1~1000	The time it takes for the motor to accelerate uniformly from 0 rpm to 1000 rpm	√	immediately	100
P9-32	Intermittent fixed-length delay time	10~3000	When a fixed-length interrupt ends, a delay is required for the process to complete fully. The longer this delay, the more extended the output signal will be delayed.	Servooff	immediately	1000
P9-31.0	Enable the interrupt fixed-length locking release signal	0-Disabling 1-Enabling	After completing the interrupt-based fixed-length measurement, if P9-31.0 = 1, the SI terminal set by P5-66 must be used to unlock the state. If P9-31.0 = 0, the interrupt-based fixed-length measurement function terminates immediately and responds to other commands.	Any time	immediately	1

parameter	name	Set Range	meaning	Set Time	effective time	factory default
P9-31.1	Intermittent Constant Length Speed Selection	0-P9-29 Speed 1 – Speed before the fixed-length section	Select the speed for fixed-length operation during interruption. When P9-31.1=1: if the pre-fixed-length speed (absolute value) is less than 0.1 rpm, the servo continues operating at the speed set by P9-29; if the pre-fixed-length speed (absolute value) is greater than or equal to 0.1 rpm, the servo runs at that pre-fixed-speed value; when P9-31.1=0, the servo operates at the speed specified in P9-29.	Any time	immediately	0

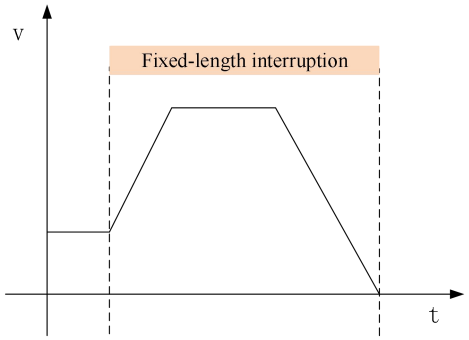
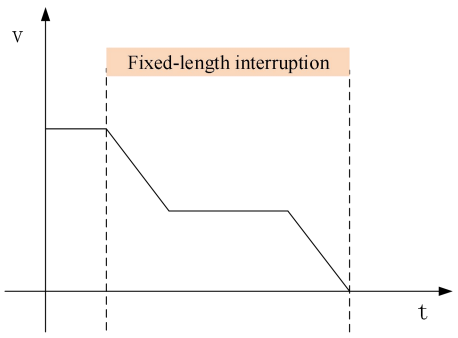
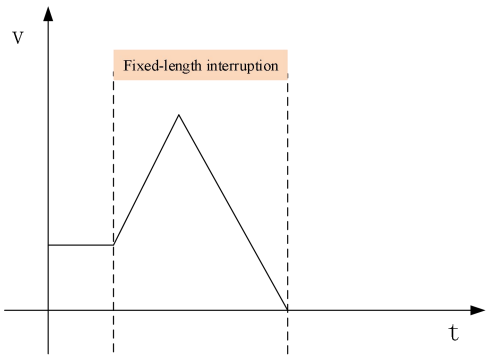
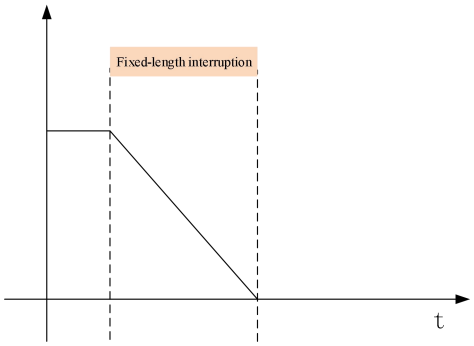
parameter	Name	meaning	effective time
P5-66	Unlock the fixed-length locking state after interruption	This terminal is activated only when P9-26.0 = 1, P9-31.0 = 1, and the fixed-length interrupt has been completed. Signal valid: Release the fixed-length lock state; the servo responds to other position commands. Signal invalid: Maintain a fixed-length locked state; the servo does not respond to other position commands.	Edge Valid
P5-67	Interrupt Fixed Length Prohibition	Signal valid: Prevents triggering the fixed-length interrupt function. Signal invalid: permite triggering the fixed-length interrupt function. The terminal becomes active only when the fixed-length interrupt function is enabled (P9-26.0=1).	Level valid
P5-32	Pulse instruction prohibition	Signal valid: Terminate the interrupt's fixed-length execution. Signal invalid: interrupts normal operation of fixed-length processing. This terminal is also suitable for the fixed-length interruption function.	Edge Valid
P5-55	Output of the completion signal for the interrupted fixed-length process	Signal valid: End of fixed-length interrupt operation (full displacement completed). Signal invalid: The fixed-length run has not ended (run incomplete or interrupted during execution).	Level valid

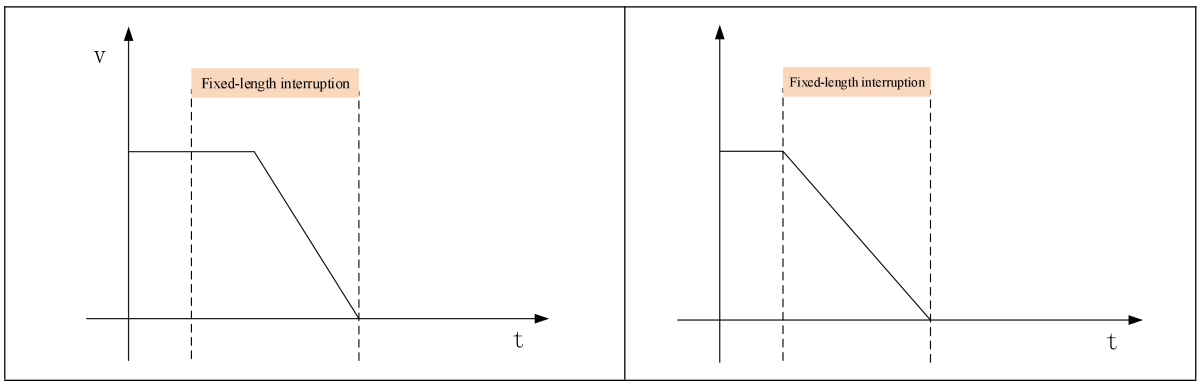
- The fixed displacement = P9-27 + P9-28 × 10,000 (instruction unit); the actual fixed displacement measured by the encoder must also be multiplied by the electronic gear ratio.
- After enabling the power supply, no interrupt-based fixed-length completion signal is output. Once the fixed-length movement concludes, this signal will be triggered regardless of whether the P9-31.0 fixed-length locking release signal is enabled. Even when returning to the pre-fixed-length position mode, the interrupt-based fixed-length completion signal remains active. Its status remains unaffected when encountering an out-of-range signal during operation. If the position command prohibiting P5-32 is triggered during fixed-length operation, the process terminates without generating the interrupt-based fixed-length completion signal.

3、Trigger for interrupt with fixed length

The interrupt fixed-length trigger terminal must be a high-speed SI terminal. The DS5F connects to SI10 and uses edge-triggering (P9-26 = 1).

The fixed-length segmentation is interrupted under the following four conditions:

<table>
<tr><td>There is a constant-speed section where the final speed is greater than the initial speed.</td><td>There is a constant-speed section with a fixed speed before reaching the fixed length.</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>No constant-speed section; the fixed-length speed is greater than the previous fixed-length speed.</td><td>No constant-speed section; fixed-length speed <previous fixed-length speed</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>There is a constant-speed section; the fixed-length velocity equals the previous fixed-length velocity.</td><td>No constant-speed section; fixed-length velocity = initial velocity at the fixed length.</td></tr>
</table>



5.3.2 Position Control (External Pulse Sequence Command)

parameter	essentials	Reference Chapter
P0-01 Control Method Selection	Set to 6: External Pulse Mode	5.3.2.1 External Pulse Position Mode
P0-10 Pulse Instruction Pattern	Set Pulse Shape 0：CW/CCW 1：AB 2：P+D	5.3.2.2 Positive Direction of Pulse Instructions and Pulse Shape
P0-11 Set number of motor pulses per revolution *1 P0-12 Set number of motor pulses per revolution *10000 P0-13 Electronic gear ratio (numerator) P0-14 Electronic gear ratio (denominator) P0-92–P0-93:32-bit electronic gear ratio numerator P0-94–P0-95:32-bit electronic gear ratio denominator	When the number of command pulses required for the motor to complete one revolution is set to zero for both P0-11 and P0-12, P0-13 and P0-14 become active; when all P0-11 through P0-14 are zero, P0-92 through P0-95 take effect. The 32-bit gear ratio numerator is calculated as P0-92 × 1 + P0-93 × 10000; the denominator is calculated as P0-94 × 1 + P0-95 × 10000.	5.3.1.1 Electronic Gear Ratio
P0-09 Pulse Instruction Settings	Each device can set the direction of low-speed pulse commands and the filtering time for low-speed pulses.	5.3.2.2 Positive Direction of Pulse Instructions and Pulse Shape
P9-00~P9-08	Full Closed-Loop Input Configuration	5.3.2.2 Positive Direction of Pulse Instructions and Pulse Shape
P0-88 High-Speed Pulse Mode Selection Switch	0: Normal Pulse Mode 1: High-Speed Pulse Mode	5.3.2.2 Positive Direction of Pulse Instructions and Pulse Shape
P0-89 High-speed Pulse Instruction Filtering Time	Unit：41.67ns	5.3.2.2 Positive Direction of Pulse Instructions and Pulse Shape

5.3.2.1 External Pulse Position Pattern

parameter	set value	meaning	revise	Take effect
P0-01	6	Use external pulse sequence commands for position	Servo	immediately

		control	OFF	

5.3.2.2 The positive direction of the pulse command and the pulse waveform

1、Selection of the positive direction for pulse commands

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-09.0 n.xxx□	Pulse instruction positive direction	0	-	0/1	Servo bb	Power On Again
The P0-09 parameter changes the counting direction of the servo's internal counter, which determines the motor's rotation direction. Therefore, in position mode, this parameter can be adjusted if the motor's actual rotation direction differs from the desired one.						

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-09.2 n.x□xx	Pulse instruction filtering time	F	4.167ns	0~F	Servo bb	Power On Again
P0-09.2 represents the pulse filtering time, which enhances interference resistance for low-speed pulses (below 200 kHz). When the input frequency is below 700 kHz, maximum filtering time F should be used; when the input pulse frequency exceeds 1 MHz, the filtering time must not exceed 7.						

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-09.3 n.□xxx	Input Pulse Instruction Filtering Pre-allocation	0	-	0~7	Servo bb	Power On Again
The set value of P0-09.3 is n (with n ranging from 0 to 7). The number of received pulses equals the normal value of 2^n-n, and the reception frequency remains unchanged at 2^n-n. For example, if the pulse count per revolution is 10,000 and 10,000 pulses are transmitted at a frequency of 10,000, then when P0-09 = 1000, U0-12 = 5000, meaning U0-00 represents 2^n-n times the previous speed.						

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-89	High-speed pulse instruction filtering time	3	41.67ns	0~255	Servo OFF	即时
The recommended filtering time is 1/6 of the input pulse period, and should not exceed 1/2.						

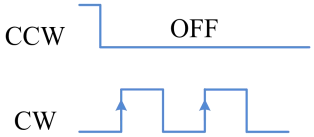
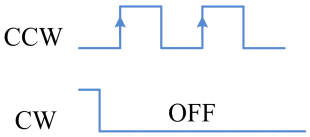
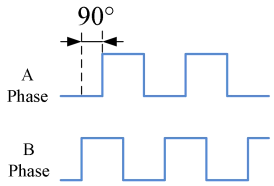
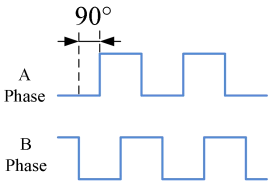
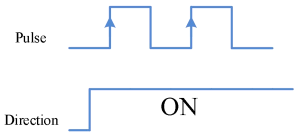
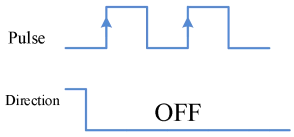
2、Selection of pulse instruction formats

parameter	meaning	Factory Settings	unit	Set Range	revise

P0-10 n.xxx□	Pulse Instruction Format	0	CW、CCW mode	Servo OFF	immediately
		1	AB phase		
		2	Pulse + Direction (factory default)		
P0-10 n.xx□x	Effective edge of the pulse signal	0	Effective during the descent phase		
		1	Valid rising edge		

The P0-10.1 function is only effective for the long-line drive of the DS5F.

3、The logical form of the instruction pulse

P0-10.0	Forward	Reversal
0：CW/CCW		
1：AB		
2：P+D		

4、Pulse Specifications

Pulse Specifications		Maximum Input Frequency	Voltage specification	Forward current
High-speed pulse	differential wave	2Mpps	5V	<25mA
Low-speed pulse	differential wave	500Kpps	3.3~5V	<25mA
	Open-collector	200Kpps	24V	<25mA

5.3.3 Position Control (Internal Position Instructions)

Parameter	Essentials	Reference Chapter
P4-03 Internal Position Given Mode P4-04 Number of Valid Segments P4-10~P4-254: Internal position	The control parameters for the internal positioning mode are specified, including step change method, positioning	5.3.3.2 Internal Position Mode Settings

Parameter	Essentials	Reference Chapter
parameter settings for paragraphs 1 to 35	method, and adjustment time. Configuration of pulse displacement, velocity, acceleration/deceleration time, etc., for each section	
P5-35 Step-change Signal/GHGSTP P5-32 Pause the current segment signal/INHIBIT P5-31 Skip current section number / Z-CLAMP	Common Terminal Function Assignments	5.3.3.4 Step-change Signal (/CHGSTP) 5.3.1.4 Instruction Pulse Inhibition (/INHIBIT) 5.3.3.5 Skip the current segment signal (/ZCLAMP)
The number of Z-phase signals after P4-00 passes the departure limit switch P4-01 Speed of Impact on the Proximity Sensor P4-02 Speed of Departure from the Proximity Sensor P5-28: In position mode, rotate forward to locate the reference origin/SPD-A P5-29: Find the reference origin on the Reverse Rotation side in position mode / SPD-B	Internal Position Return to Origin Settings Parameters	5.3.1.8 Reference Origin
Any setting for position F2-09 35	Number of Communication Settings Sections	5.3.3.6 Communication Setting Segment Number

5.3.3.1 Internal Position Pattern

parameter	set value	meaning	revise	Take effect
P0-01	5	Use preset values in the servo unit's internal registers for position control.	servo bb	immediately

5.3.3.2 Internal Position Mode Settings

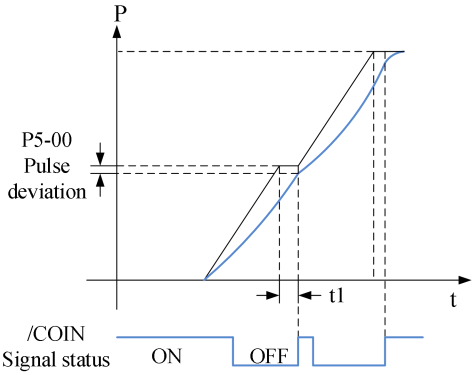
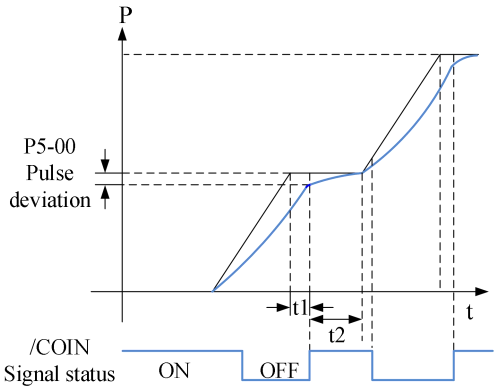
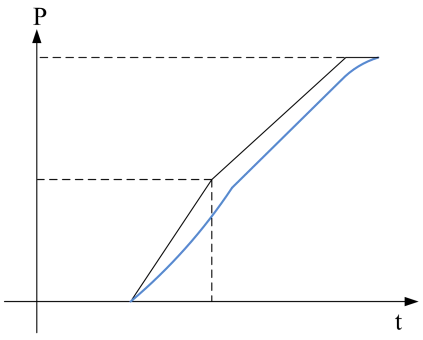
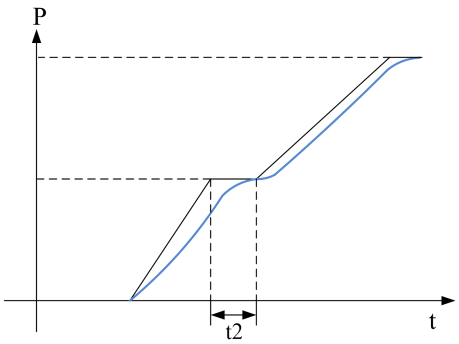
parameter	Parameter Functions	Set Unit	Factory Settings	Applicable Mode	revise	Take effect
P4-03	Internal Location Mode Settings	-	n.0000	5	servo bb	immediately
	parameter setting	Functionality Above view	Factory Settings	Set Range		

	n.□xxx	insignificance		
	n.x□xx	Waiting Mode	0	0 ~ 1
	n.xx□x	Step Change Mode	0	0 ~ 6
	n.xxx□	positioning mode	0	0 ~ 1

1. Wait Mode

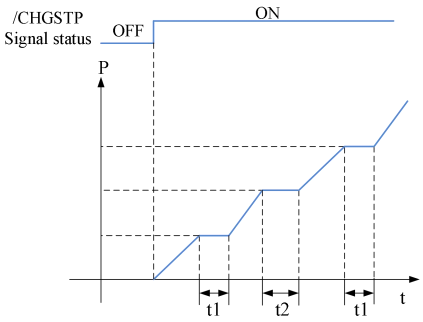
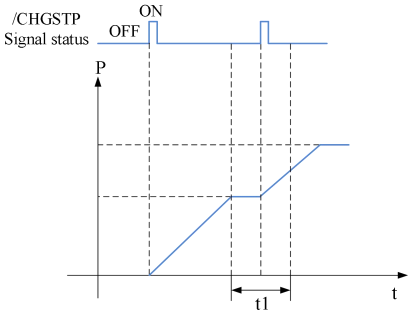
n.x□xx	meaning
0	Waiting for the process to complete
1	Do not wait for positioning to complete

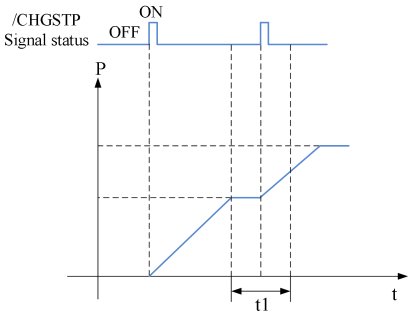
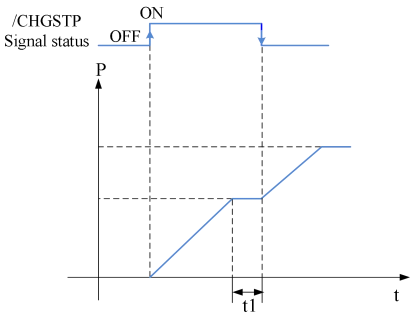
Note: Wait mode determines whether to wait for motor positioning completion after sending a position command to the drive when the internal position is set. This applies to all step change modes.

Waiting Mode = 0, Adjustment Time = 0 ms	Waiting Mode = 0, Adjustment Time> 0 ms
	
After sending a position command, the driver waits until the motor completes positioning before immediately initiating the next position command. In the diagram, t1 represents the positioning time—the interval between pulse transmission and the output of the positioning completion signal.	After issuing a position command, the driver waits for the motor to complete positioning before initiating the next command after the adjustment period. In the diagram, t1 represents the positioning time and t2 the adjustment time; in this example, these correspond to parameter P4-16.
Waiting Mode = 1, Adjustment Time = 0 ms	Waiting Mode = 1, Adjustment Time> 0 ms
	
After sending a position command, the driver immediately proceeds to the next position command without waiting for the motor to complete positioning.	After issuing a position command, the driver does not wait for the motor to complete positioning but only starts the next position command after the adjustment period. In the figure, t2 represents the

	adjustment time, which corresponds to parameter P4-16 in this example.

2. Step Change Mode

n.xx□x	description	
0 Step when Signal ON, repeatable;		In the figure, t1 = P4–16 and t2 = P4–23. 1. If the CHGSTP signal remains ON, the servo unit will continuously cycle through the preset position segments. 2. If the CHGSTP signal is set to OFF during a specific segment, the servo will continue executing that segment without proceeding to the next one. 3. In this mode, the step-change signal/CHGSTP is triggered by a high level. 4. During operation, if servo enable is turned off, the motor will shut down according to the servo OFF shutdown procedure; after shutdown completion, positioning is invalid. 5. After each segment is completed, both the positioning completion and positioning proximity signals remain valid. 6. In this mode, the adjustment time for each section is valid.
1 Signal rising edge step-change , executed in single steps;		Taking the two-stage setup as an example, t1 = P4-16 in the figure. 1. As shown in the figure, under this step-change mode, the preset adjustment time is ineffective; once the previous sequence of position commands has been executed, the system immediately proceeds to the next command upon receiving a new step-change signal. 2. In this mode, the step-change signal/CHGSTP is triggered by its rising edge. 3. After each segment runs, both the positioning completion and positioning proximity signals remain valid. 4. During operation, if servo enable is turned off, the motor will shut down according to the servo OFF shutdown procedure; after shutdown completion, positioning is invalid. 5. Adjustments made in this mode are invalid.

<table>
<tr><th>n.xx□x</th><th colspan="2">description</th></tr>
<tr><td>2
The signal rising edge initiates execution of all steps sequentially without looping.</td><td>
</td><td>Set two bit positions; in the diagram, t1 = P4-16.
1. The /CHGSTP signal before a complete cycle is not counted, as shown in the second /CHGSTP signal in the figure.
2. In this mode, the step-change signal/CHGSTP is triggered by its rising edge.
3. After each segment runs, both the positioning completion and positioning proximity signals remain valid.
4. During operation, if servo enable is turned off, the motor will shut down according to the servo OFF shutdown procedure; after shutdown completion, positioning is invalid.
5. Time adjustments are effective in this mode.</td></tr>
<tr><td>3
Communication Setting Number</td><td colspan="2">When the drive is in RUN mode, set F2-09 to 0 and specify the operating section number for the motor to execute. Refer to Chapter 5.3.3.6.</td></tr>
<tr><td>4
/CHGSTP Bilateral Trigger Edge</td><td>
</td><td>In the figure, t1 = P4-16.
1. The rising edge of /CHGSTP triggers the first segment, while the falling edge triggers the second segment. To ensure full operation of the first segment, the /CHGSTP signal remains ON until the end of that segment.
2. Only in this mode, the valid segment count for P4-04 is disabled (but cannot be set to 0).
3. After each segment runs, both the positioning completion and positioning proximity signals remain valid.
4. During operation, if servo enable is turned off, the motor will shut down according to the servo OFF shutdown procedure; after shutdown completion, positioning is invalid.
5. Adjustments made in this mode are invalid.
6. Before using this step-change mode, the P5-35 terminals must be properly assigned; step-change terminals cannot be assigned during operation of this mode.</td></tr>
</table>

<table>
<tr><th>n.xx□x</th><th>description</th></tr>
<tr><td>5
/PREFA
(P5-57)、
/PREFB
(P5-58) and
/PREFC
(P5-59) are
terminal
selection
section
numbers,
selectable
from
sections 1
to 3.</td><td>
<table>
<tr><th>/PREFC</th><th>/PREFB</th><th>/PREFA</th><th>segment number</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>not have</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1 (First paragraph position)</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>2 (second paragraph position)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>3 (third paragraph position)</td></tr>
</table>
1. After each run, all positioning completion and proximity signals remain valid.
2. During operation, if servo enable is turned off, the motor will shut down according to the servo OFF shutdown procedure; after shutdown completion, the positioning command becomes invalid.
3. Time adjustments are effective in this mode.
4. The CHGSTP step-change signal is invalid only in this mode.
5. The section number selection terminal can either trigger step switching upon edge detection or remain ON. This mode supports continuous repetition of a specific section. If the terminal remains ON, the motor will stop upon receiving an Abovetravel signal; in this case, it must be switched to OFF. Otherwise, the motor will execute the target section even after the Abovetravel signal is cleared.
</td></tr>
<tr><td>6
/PREFA
(P5-57)、
/PREFB
(P5-58)、
/PREFC
(P5-59)、
/P PREFD
(P5-60):
Select a
terminal
section
number
from 1 to
16
pour ：
firmware
version
3730 and
later
supports</td><td>
<table>
<tr><th>/PREFD</th><th>/PREFC</th><th>/PREFB</th><th>/PREFA</th><th>segment number</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td><td>1 (First paragraph position)</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td><td>2 (second paragraph position)</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td><td>3 (third paragraph position)</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1</td><td>4 (position in the fourth paragraph)</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>0</td><td>5 (at the fifth paragraph)</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td><td>6 (at the sixth paragraph)</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td><td>7 (Position in Paragraph 7)</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>1</td><td>8 (Position of the eighth paragraph)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>0</td><td>9 (position in the ninth paragraph)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td><td>10 (Position in Paragraph 10)</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>0</td><td>11 (at paragraph 11)</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>1</td><td>12 (at paragraph 12)</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td><td>13 (at paragraph 13)</td></tr>
</table>
</td></tr>
</table>

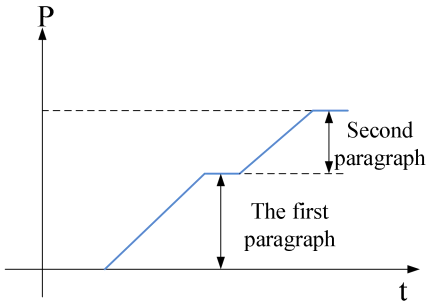
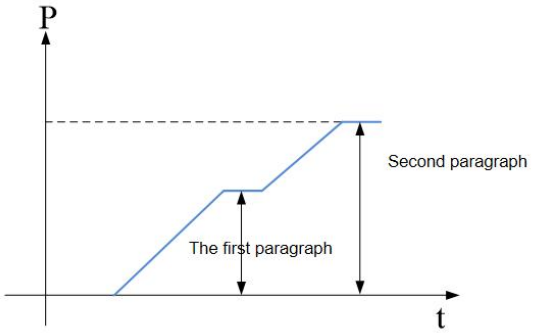
<table>
<tr><th>n.xx□x</th><th>description</th></tr>
<tr><td>segments 1–8 of Step Mode 6
②
Firmware versions 3740 and later support segments 1–16 of Step Change Mode 6</td><td>
<table>
<tr><td>1</td><td>1</td><td>0</td><td>1</td><td>14 (at paragraph 14)</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>0</td><td>15 (at paragraph 15)</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>1</td><td>16 (at paragraph 16)</td></tr>
</table>
Note: The rising edge of the P5-35 step-change signal triggers each segment position (the rising edge is invalid during operation).
1. During operation, if servo enable is turned off, the motor will shut down according to the servo-off shutdown procedure; after shutdown completion, the positioning status becomes invalid.
2. Adjustments made in this mode are invalid.
3. After each segment runs, both the positioning completion and positioning proximity signals remain valid.
4. After selecting the section number, the position section can only be activated when triggered by the rising edge of the P5-35/CHGSTP step-change signal; triggering during section operation is invalid.
5. The terminal logic for section number selection is level-sensitive: high input levels are valid, while low input levels are invalid.
</td></tr>
</table>

Use the following input signals to switch between internal positions 1–3 and 1–16.

parameter	Signal Name	leave the factory setting	suit pattern	Set Range	revise	Take effect
P5-57	Internal Location – First Section Selection/PREFA	n.0000	5	Parameter range 0000–0014, allocated to other input interfaces via parameters P5–57.	at any time	immediately
P5-58	Internal Position – Second Section Selection/PREFB	n.0000	5	Parameter range 0000–0014, assigned to other input interfaces via parameters P5–58.		
P5-59	Internal Position – Third Section Selection/PREFC	n.0000	5	Parameter range 0000–0014, assigned to other input interfaces via parameters P5–59.		
P5-60	Internal Position – Fourth Section Selection/PREFC	n.0000	5	Parameter range: 0000–0014, configured via parameters P5–60 on other input interfaces.		

3. Positioning Mode

n.xxx□	meaning
0	relative positioning
1	Absolute Positioning
2	Interruptible absolute positioning

0: Relative Positioning	1: Absolute positioning (using the reference origin as the zero point)
	

5.3.3.3 Parameter settings for paragraphs 1 to 35

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P4-10+（n-1）*7	Pulse Count (Low Bit)	0	1 Pulse	-9999 ~ 9999	at any time	immediately
P4-11+（n-1）*7	Pulse Count (High Bit)	0	10,000 pulses	-32767 ~ 32767	at any time	immediately
P4-12+（n-1）*7	speed	0	0.1rpm	0 ~ 65535	at any time	immediately
P4-13+（n-1）*7	Trapezoidal acceleration time	0	ms	0 ~ 65535	at any time	immediately
P4-14+（n-1）*7	Trapezoidal deceleration time	0	ms	0 ~ 65535	at any time	immediately
P4-15+（n-1）*7	retention parameter	-				

P4-16+（n-1）*7	adjust the time	0	ms	0～65535	at any time	immediately

description ：

① Set pulse count = (high-order bit value × 10,000) + (low-order bit value); the number of pulses per revolution is determined by the electronic gear ratio or per-turn pulse count parameter.

② In the formula P4-10+ (n–1) * 7, n represents the segment number of the internal location, ranging from 1 to 35; parameters for segments 1–12 can be set via the panel, while those for segments 13–35 require parameter writing via communication (RS232 or RS485).

③ If the speed of any section is set to zero, it will be skipped during execution and the next section will be processed.

④ In relative positioning mode, if the speed setting for a segment is non-zero but the pulse count is set to zero, the motor in that segment will not operate during execution; however, its designated waiting mode remains active, meaning it must wait until the adjustment period ends before proceeding to the next segment.

⑤ In absolute positioning mode, if the speed setting for a specific section is non-zero but the pulse count is set to zero, the motor will return to the reference origin at that section's preset speed when executing it.

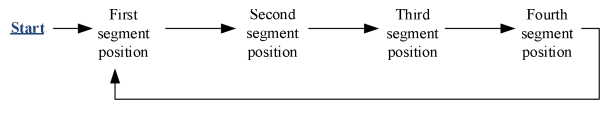
⑥ In absolute positioning mode, if the speed settings for two consecutive segments are both non-zero and the pulse count settings are identical, the motor in the latter segment will not operate, but the designated waiting mode for that segment remains active.

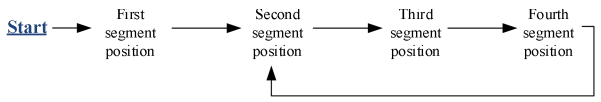
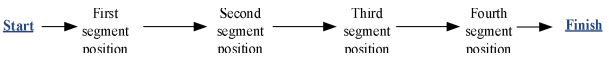
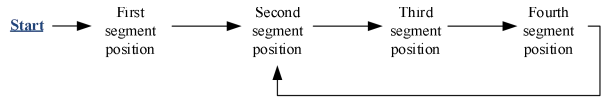
parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P4-04	Number of valid segments	0	-	0～35	servo bb	immediately

There are 35 internal positions in total. If you need to switch between operating 10 or 5 positions Framed on process requirements, you can configure the valid position count. For example, if all positions 1–10 have parameters set, set P4–04's valid position count to 5 (i.e., positions 1–5 are valid); set it to 10 to make positions 1–10 valid.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P4-08	Internal Location Pattern Starting Segment Number	1	-	0～35	servo bb	immediately

P4-08 sets the starting run segment number after the first round; only Step Change Mode P4-03.1 has valid settings of 0 or 1. The following descriptions the configuration: valid values are set for segments No.1 through No.8.

Step Change Mode	set up	parameter setting	Specific Phenomenon
P4-03.1=0	P4-08=0 or P4-08>P4-04	P4-08=8 P4-04=4	

Step Change Mode	set up	parameter setting	Specific Phenomenon
	1≤P4-08≤P4-04	P4-08=2 P4-04=4	
P4-03.1=1	P4-08=0 or P4-08>P4-04	P4-08=8 P4-04=4	
	1≤P4-08≤P4-04	P4-08=2 P4-04=4	

5.3.3.4 Step-change Signal (/CHGSTP)

parameter	Signal Name	setting	meaning	Modification Scope
P5-35	Step Change Signal/CHGSTP	n.0000	Default unallocated terminal input. Refer to 5.4.2 for the application of step-change signals in the step-change mode table.	The parameter range is 0000–001A, assigned to the input interface via parameters P5–35. Setting it to 0001 represents signal input from terminal SI1.

5.3.3.5 Skip the current segment signal (/ZCLAMP)

parameter	Signal Name	setting	meaning	Modification Scope
P5-31	Skip current section / Z-CLAMP	n.0000	Default Unassigned Terminal Input	The parameter range is 0000–0014, assigned to the input interface via parameters P5–31. Setting it to 0001 represents signal input from terminal SI1.

Under different step-switching modes, skipping the current segment produces different effects, as shown below:

Step Change Mode P4-03 n.xx□x	Skip the current section	Execution Action
0	/Z-CLAMP	Cancel the current section and proceed to the next one immediately
1		Cancel the current section and proceed to the next section when starting the transition signal
2		Cancel the current section and proceed to the next one immediately
3		Current section canceled; F2-09 redescriptiond

Step Change Mode P4-03 n.xx□x	Skip the current section	Execution Action
4		Current segment canceled; the falling edge of the /CHGSTP transition signal triggers the next segment.
5		Cancel the current section. Select another section and apply the corresponding section settings.
6		Current segment canceled; the selected position segment is executed during the rising edge of the /CHGSTP step change signal.

When using the skip current segment function, the SI terminal assigned to P5-31 requires a rising edge for triggering.

5.3.3.6 Communication Setting Segment Number

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
F2-09	Communication Setting Number	0	-	0 ~ 35	at any time	immediately
Setting this parameter to a specific paragraph number executes that paragraph without requiring a step change signal. The parameter must be modified via communication. Recommendation: After modifying F2-09, the value will reset automatically; assign it directly. To ensure data integrity and prevent conflicts between the cache and the current segment, use the rising edge for communication to avoid repeated cache writes.						

5.3.3.7 Movement Start Signal (/MRUN)

parameter	Signal Name	Factory Settings	meaning	revise
P5-50	Exercise Start/MRUN	n.0000	Default unallocated terminal output. Valid only in internal position mode, similar to the positioning completion signal in external pulse mode; generates output when the motor is running and no output when the motor stops	The parameter range is 0000–0014, allocated to the output interface via parameters P5–50. Setting it to 0001 represents signal output from terminal SO1.

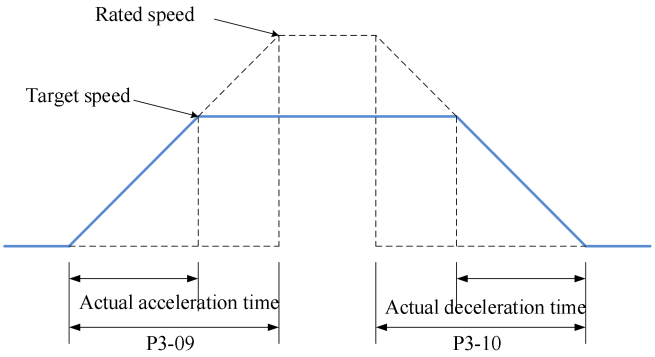
5.4 Speed Control

5.4.1 General Control for Speed Modes

5.4.1.1 Soft Start

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-09	Soft start acceleration time	200	ms	0 ~ 65535	servo bb	immediately
P3-10	Soft-start deceleration time	200	ms	0 ~ 65535	servo bb	immediately

Soft start acceleration/deceleration times apply to modes 3, 4, and 7; smooth speed control is available when a step-speed command is entered or an internal set speed is selected.
P3-09: Time required to reach the rated speed from the idle state;
P3-10: Time from operating at rated speed to stopping.



5.4.1.2 Zero Clamp Function (/ZCLAMP)

1. Functional Above view

This advanced function uses a "speed command" input and is applicable in systems without a "position loop" configuration. It must stop the motor when the speed command is non-zero and is intended for use with the servo locked.
When the "Zero Clamping" function is set to "ON", it temporarily configures a position loop internally, causing the motor to clamp within ±1 pulse at that location. Even when rotated under external force, the motor will return to the zero-clamped position.
When using zero clamping, the current speed must be below the zero-clamping threshold for the function to activate, securing the motor shaft in place. Upon enabling zero clamping, the motor switches from speed mode to position mode; rotating the shaft and releasing it will restore it to its original position, whereas in speed mode, rotation does not return the shaft to its initial position due to the absence of position feedback.

2. Input Signal Settings

parameter	Signal Name	setting	meaning	Modification Scope
P5-31	Zero Clamping / ZCLAMP	n.0000 (Default)	Default: No output terminals assigned	Parameter range: 0001–0014 Can be assigned to other input terminals via parameter P5-31
		n.0002	Enter the signal using the SI2 terminal	

3. Setting of Relevant Parameters

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-13	Zero clamping speed	10	rpm	0 ~ 300	servo bb	immediately
P3-12	Zero Clamping Mode	0	-	0 ~ 3	servo bb	immediately

Settings for P3-12	content
0	When the ZCLAMP input signal is ON, the forced speed command is set to 0. Once the actual speed drops below P3-13, the system switches to position mode control and locks the position servo.
1	When the ZCLAMP input signal is ON, the speed command is forcibly set to 0.
2	When the ZCLAMP input signal is set to ON and the feedback speed falls below P3-13, the system switches to position mode control and locks the position via servo mechanism. Note: Once zero-clamping mode is activated, the motor will not operate even at speeds exceeding those specified for the P3-13 motor. The mode can only be exited and operation resumed when the ZCLAMP input signal is set to OFF.
3	When the ZCLAMP input signal is ON and the set speed falls below P3-13, the system switches to position mode control and locks the motor at that position. If the set speed exceeds P3-13, the motor resumes operation.

5.4.1.3 Speed arrival signal (/V-RDY)

- relevant parameter

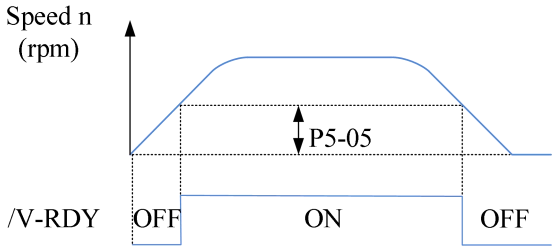
parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect

P5-51	Speed Limit / V-RDY	n.0000	3、4、7	Speed Arrival Signal	at any time	immediately

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P5-05	Detection speed reached	1000	rpm	0 ~ 10000	at any time	immediately

1. Speed reaches the signal output condition

When the actual motor speed exceeds the detection threshold specified in P5-05, the output speed reaches the signal (/V-RDY).



5.4.1.4 Speed Command Filter

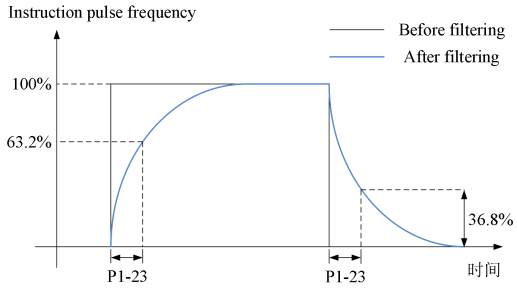
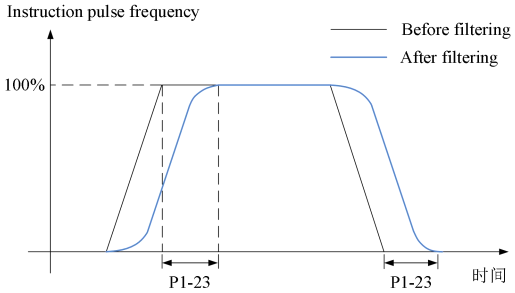
Before version 3770

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P1-22	Speed Command Filter Selection	0	-	0 ~ 1	servo bb	immediately
P1-23	Speed Command Filter Time Constant	0	0.1ms	0 ~ 65535	servo bb	immediately

Settings for P1-22	content
0	First-order inertial filtering
1	smoothing filtering

Speed Command with Acceleration/Deceleration Filtering	Speed Command Smoothing Filter

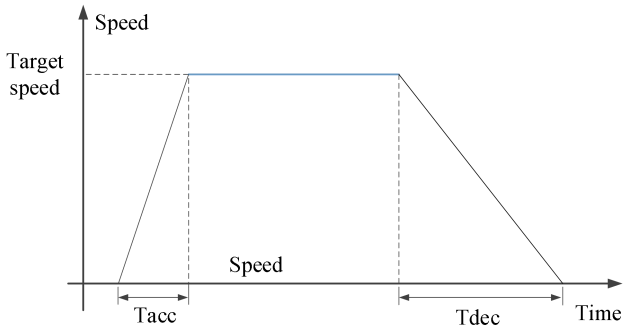
Speed Command with Acceleration/Deceleration Filtering	Speed Command Smoothing Filter
	

2. Version 3770 and later

- relevant parameter

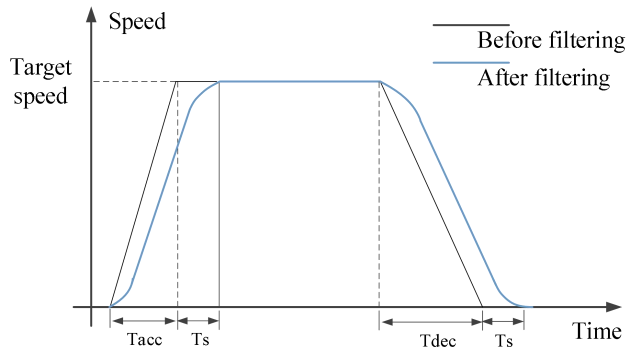
parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P1-23	Speed Command Filter Time Constant	0	0.1ms	0 ~ 65535	servo bb	immediately
P3-09	acceleration time	200	1ms	0 ~ 65535	servo bb	immediately
P3-10	deceleration time	200	1ms	0 ~ 65535	servo bb	immediately
P3-11	Sliding average filter time constant	0	0.1ms	0 ~ 65535	servo bb	immediately

First, set P3-09 and P3-10. Then plan the acceleration and deceleration times for the speed command.



Where Tacc is the acceleration time calculated as (target speed / rated speed) × P3-09 [ms], and Tdec is the deceleration time calculated as (target speed / rated speed) × P3-10 [ms].

Set the appropriate moving average filter time constant P3-11 (S-type acceleration/deacceleration time constant): Ts = P3-11 × 0.1 [ms].



The sliding average filter time constant must meet the requirements: Ts <0.5*Tacc and Ts <0.5*Tdec. Otherwise, an excessively large filtering time will result in excessive deceleration periods, violating the specifications in P3-09 and P3-10.

When P3-09 and P3-10 are set to 0, setting the moving average filtering time converts the speed command into a trapezoidal acceleration/deceleration command. Setting P1-23 (speed command filtering time constant) and P1-24 (first-order low-pass filter time constant) produces the following effects:

When acceleration/deceleration is applied, a first-order low-pass filter increases the delay of the speed command.

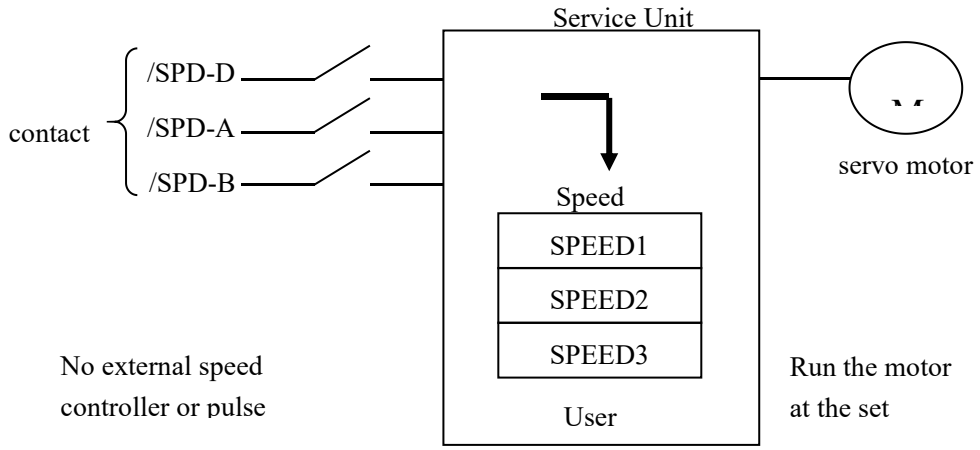
5.4.2 Speed Control (Internal Set Speed)

parameter	essentials	Reference Chapter
P0-01 Control Method Selection	Set to 3: Internal Speed Control Mode	5.4.2.1 Internal Speed Mode
P3-05 Internal Set Speed 1 P3-06 Internal Set Speed 2 P3-07 Internal Set Speed 3	Speed value setting for the internal 3-speed stage, in rpm	5.4.2.1 Internal Speed Mode
P5-28 Internal Speed Selection/SPD-A P5-29 Internal Speed Selection/SPD-B	The combination of terminals determines the corresponding section speed.	5.4.2.1 Internal Speed Mode
P5-27 Internal Speed Direction Selection/SPD-D	Switch direction; default is n.0000. By applying a commutation signal via terminal SI2, P5-27 can be set to n.0002.	5.4.2.1 Internal Speed Mode
P3-09 Soft-start acceleration time P3-10 Soft-start deceleration time	Set acceleration and deceleration time in ms	5.4.1.1 Soft Start

5.4.2.1 Internal Speed Mode

parameter	set value	meaning	revise	Take effect
P0-01	3	Speed Control: Internal Speed Selection	servo bb	immediately

Function Above view: The internal speed selection feature allows users to pre-set three motor speeds via user parameters within the servo unit and select the desired speed using external input signals for precise speed control operation, eliminating the need for external speed generators or pulse generators.



- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-05	Internal Set Speed 1	0	rpm	-9999 ~ +9999	at any time	immediately
P3-06	Internal Set Speed 2	0	rpm	-9999 ~ +9999	at any time	immediately
P3-07	Internal Set Speed 3	0	rpm	-9999 ~ +9999	at any time	immediately

parameter	Signal Name	Factory Settings	Set Range	revise	Take effect
P5-27	Internal Direction Selection/SPD-D	n.0000	Parameter range 0000–0014, allocated to other input interfaces via parameters P5–27.	at any time	immediately
P5-28	Internal Speed Selection/SPD-A	n.0000	Parameter range 0000–0014, allocated to other input interfaces via parameters P5–28.		
P5-29	Internal Speed Selection/SPD-B	n.0000	Parameter range 0000–0014, assigned to other input interfaces via parameters P5–29.		

1. The relationship between operating speed and terminal signals

incoming signal			running speed
/SPD-D（P5-27）	/SPD-A（P5-28）	/SPD-B（P5-29）	
0 <Forward>	0	0	Internal Instruction: 0 Speed
	0	1	P3-05：SPEED1
	1	1	P3-06：SPEED2
	1	0	P3-07：SPEED3
1 <Reverse Rotation>	0	0	Internal Instruction: 0 Speed
	0	1	P3-05：SPEED1
	1	1	P3-06：SPEED2
	1	0	P3-07：SPEED3

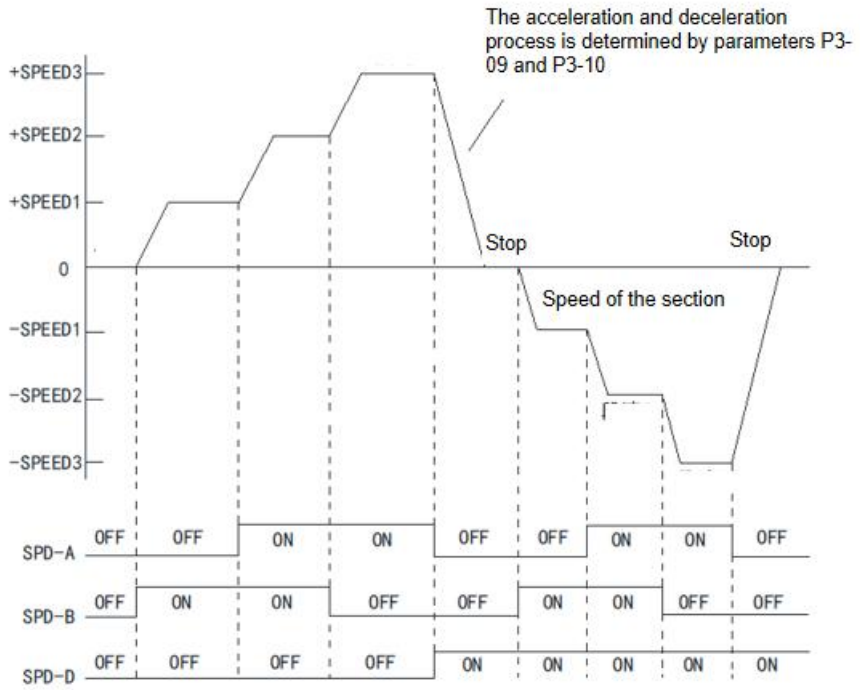
- The SPD-D signal controls direction; the input SI terminal can be changed according to P5-27. The validity of the terminal signal determines the motor direction.
- The combination of the validity status of the SPD-A and SPD-B input terminals determines the multi-stage speed setting.
- In the table above, both 0 and 1 indicate the validity of the signal. 0 means the terminal input is invalid; 1 means it is valid.

2. Description of Terminal Validity

The table below uses /SPD-D as an example; the same applies to /SPD-A and /SPD-B signals.

Parameter Setting Status	Signal/SPD-D Terminal Input Status	Signal/SPD-D Terminal Logic
P5-27=n.0000	No external terminal input required	invalid
P5-27=n.000□	The SI□ terminal has no signal input.	
P5-27=n.001□	The SI□ terminal has a signal input.	
P5-27=n.0010	No external input terminals required	valid
P5-27=n.000□	The SI□ terminal has a signal input.	
P5-27=n.001□	The SI□ terminal has no signal input.	

3. Operation Example



5.4.3 Speed Control (Pulse Frequency Command)

parameter	essentials	Reference Chapter
P0-01 Control Method Selection	Set to 7: External Pulse Speed Mode	5.4.3.1 External Pulse Speed Mode
P0-10 Pulse Instruction Pattern	Set Pulse Shape 0：CW/CCW 2：P+D	5.3.2.2 Positive Direction of Pulse Instructions and Pulse Shape
P0-15 Instruction pulse frequency at rated speed	Determine the linear relationship between the pulse frequency and rotational speed.	5.4.3.3 Instruction pulse frequency at rated speed
P0-16 Speed Command Pulse Filtering Time	When the instruction pulse frequency is relatively low, appropriately setting this parameter can reduce speed fluctuations.	5.4.3.4 Filtering Time for Speed Command Pulses
P5-71 Pulse Speed Mode Direction Terminal Function Selection	Change Pulse Direction	5.4.3.5 Direction Selection for Speed Command Pulses

5.4.3.1 External Pulse Speed Mode

parameter	set value	meaning	revise	Take effect
P0-01	7	Speed Control: Pulse Frequency Speed Command	servo bb	immediately
Function Above view: The speed command is determined by the frequency of external pulses and independent of the total number of pulses. The circuit connection and positioning instructions remain identical, allowing selection of CW/CCW modes, AB phases, or a "direction + pulse" pulse configuration.				

5.4.3.2 Pulse Frequency Instruction

The pulse frequency instruction is the same as when using position control (external pulse sequence instruction); refer to Section 5.3.2 Pulse Instructions.

5.4.3.3 Instruction pulse frequency at rated speed

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-15	The rated speed corresponds to the pulse frequency.	1000	100Hz	0 ~ 10000	servo bb	immediately
Note: The unit here is 100 Hz. For example, when the P0-15 parameter is set to 300, the command pulse frequency at the corresponding rated speed is 30 kHz. When the P0-15 parameter is set to 1000, the command pulse frequency at the corresponding rated speed is 100 kHz.						

5.4.3.4 Filtering Time for Speed Command Pulses

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-16	Speed Command Pulse Filtering Time	100	0.01ms	0 ~ 10000	servo bb	immediately
When the instruction pulse frequency is low, appropriately setting this parameter can reduce speed fluctuations.						

5.4.3.5 Direction Selection for Speed Command Pulses

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect

P5-71	Pulse Velocity Mode Direction Terminal Function Selection	0	-	0 ~ 1	servo bb	immediately

5.4.4 Speed Control (External Analog Signal)

parameter	essentials	Reference Chapter
P0-01 Control Method Selection	Set to 4: External Analog Speed Mode	5.4.4.1 External Analog Speed Mode
P3-01: The rated rotational speed corresponds to the analog voltage value.	Set the speed command voltage required for the servo motor to operate at its rated speed, in units of 0.001 V	5.4.4.3 Main Parameters of Analog Speed Measurement
P3-09 Soft-start acceleration time P3-10 Soft-start deceleration time	Set acceleration and deceleration time in ms	5.4.1.1 Soft Start
P3-02 Analog Voltage and Speed Filtering	Unit: 0.01 ms	5.4.4.4 Analog Voltage and Speed Filtering
P3-03: Speed Command Input Dead Zone Voltage	Unit: 0.001 V	5.4.4.6 Speed Command Input Dead Zone Voltage
P3-04 Simulation Method for Switching the Direction of Rotational Speed	Switch the input direction selection for analog speed control commands	5.4.4.5 Analog speed direction switching

5.4.4.1 External Analog Speed Mode

parameter	set value	meaning	revise	Take effect
P0-01	4	Speed Control: External Analog Signal	servo bb	immediately
Function Above view: The speed command is specified by an external analog signal. The analog voltage command input from the V-REF terminal serves as the speed control signal for regulating rotational speed.				

- Direction switching: Both positive/negative voltage and SPD-D (P5-27) can control the direction.
- For hardware wiring details, refer to Chapter 3.2.4 on Analog Input Circuits.

5.4.4.2 Analog Speed Mode Switching Framed on Digital Control (Supported in Version 3770 and later)

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P5-65	Analog Speed Mode Switch	n.0000	-	0000~00ff	immediately	immediately

P5-65 defaults to 0000, indicating that the analog speed mode switch is inactive and Mode 4 can be used normally; setting it to 0010 prevents Mode 4 from being activated. When assigning SI terminals, use their validity status to control the activation or deactivation of the analog speed mode. For example, if the analog speed function switch is controlled via SI1, set P5-65 to 0001: Mode 4 remains functional when no signal is present on SI1, but becomes unavailable when a signal is detected on SI1.

5.4.4.3 Main Parameters of Analog Speed

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-00	V-REF Function Allocation	0	-	0~2	servo bb	immediately
P3-01	The rated speed corresponds to the analog voltage value.	10000	0.001V	1500~30000	servo bb	immediately

(1) P3-00: Function allocation of the V-REF speed analog signal

0: V-REF as a speed command input

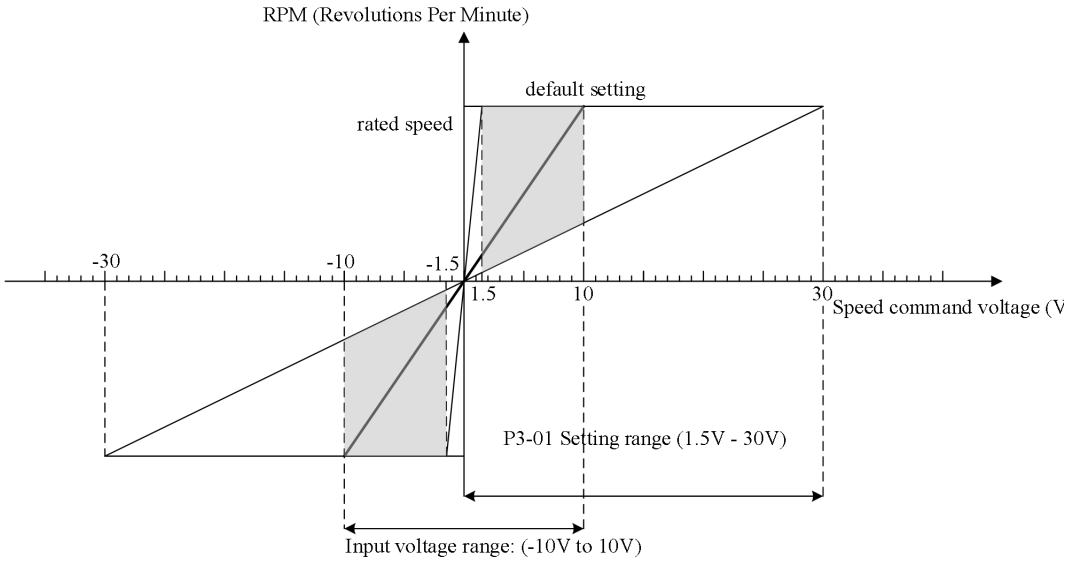
1: V-REF serves as the external speed limit reference value; the actual speed limit depends on the external analog speed limit (this value is invalid in analog speed mode).

2: Speed Feedforward

(2) P3-01 Function Description: Sets the speed command voltage (V-REF) required for the servo motor to operate at its rated speed.

For example: P3-01=5000 represents that the motor operates at its rated speed when the analog input voltage is 5.00 V.

P3-01=8000 represents that the motor operates at its rated speed when the analog input voltage is 8.00 V.



- The input for analog voltage commands used for speed limiting has no polarity. The absolute value is taken regardless of whether the voltage is positive or negative, and the resulting speed limit applies to both forward and reverse directions.
- The maximum allowable voltage for analog input signals is ±10 V; do not apply voltages exceeding ±10 V.

5.4.4.4 Analog Voltage and Speed Filtering

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-02	Analog voltage speed filter	200	0.01ms	0~10000	at any time	immediately

5.4.4.5 Analog speed direction switching

There are three methods for analog speed control to achieve direction switching:

① Change control parameters (P3-04); ② Positive/negative voltage; ③ External signal from SPD-D (P5-27).

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-04	Analog speed direction switching	0	-	0~1	at any time	immediately

5.4.4.6 Automatic speed command offset adjustment (F1-03)

When using the analog voltage speed mode, the motor may rotate at a slight speed even when the commanded voltage is 0 V. This minor rotation occurs when there is a slight deviation (in mV) in the commanded voltage from that of the higher-level control device or external circuit. In such cases, the panel operator can automatically adjust the commanded voltage offset.

When servo enable is turned off (i.e., in BB state), disconnect the analog signal from driver port CN0 and perform the following steps:

Press Status/ESC to exit this feature.

- The current analog voltage is 0 V. According to the calibration procedure shown in Figure F1-03,0 V corresponds to 0 rpm: a voltage below 0 V represents the motor running in reverse, while above 0 V represents forward rotation. Similarly, if the current analog voltage is 5 V, 5 V corresponds to 0 rpm: a voltage below 5 V represents reverse rotation, and above 5 V represents forward rotation.
- If slight movement persists after automatic offset adjustment, apply zero clamping or increase parameter P3-03 appropriately (e.g., to 5) to set the dead zone voltage at

0.005 V.

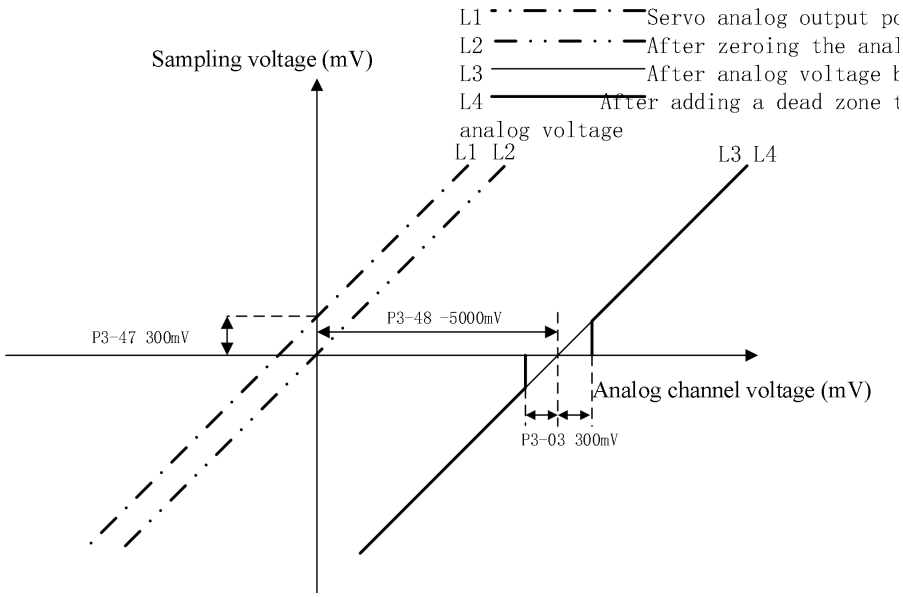
5.4.4.7 Speed Command Input Dead Zone Voltage

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-03	Speed Command Input Dead Zone Voltage	0	0.001V	0~500	at any time	immediately
P3-47	V-REF Analog Signal Zero Drift Correction	0	-	-1000~1000	at any time	immediately
P3-48	V-REF Analog Voltage Offeset	0	mV	-9999~9999	at any time	immediately

description ：

(1) When the input speed command voltage falls within the specified range, the input command is considered zero.

(2) If minor adjustments remain after automatic offset adjustment, simply increase the dead zone voltage accordingly.



Example ：

Assuming the motor's rated speed is 3000 rpm, the system should reverse the motor when the analog voltage is set to 0–5 V and rotate it forward when set to 5–10 V, with a dead zone voltage of 4.7–5.3 V.

The parameters are configured as follows: P3-01 = 5000, P3-48 = –5000, P3-03 = 300. To reverse the motor when the analog voltage is set to 0–5 V and rotate it forward when set to 5–10 V, adjust P0-05 to 1.

5.5 Torque Control

5.5.1 General Torque Mode

5.5.1.1 Internal Speed Limitation During Torque Control

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-16	Internal forward speed limit during torque control	Motor Rating	rpm	5 ~ 65535	at any time	immediately
P3-17	Internal reverse speed limit during torque control	Motor Rating	rpm	5 ~ 65535	at any time	immediately
Note: Even if the set speed for this parameter exceeds the P3-14 speed limit, only the lower speed limit applies. (The maximum speed is the smaller value between P3-14/P3-15 and P3-16/P3-17)						

5.5.1.2 Speed Limit Detection (/VLT)

In torque mode, if the absolute value of the servo motor's actual speed exceeds the speed limit, the system recognizes that the speed is restricted and the servo driver may output a VLT signal; otherwise, the speed restriction signal is invalid.

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-43	/VLT	n.0000	1、2	Speed Limit Detection	at any time	immediately
By default, no terminals are assigned; the parameter range is 0000–0018 and is assigned to the output interface via parameter P5-43. Setting it to 0002 represents signal output from the SO2 terminal. The VLT signal is only active in torque mode.						

5.5.2 Torque Control (Internal Setting)

parameter	essentials	Reference Chapter
P0-01 Control Method Selection	Set to 1: Internal Torque Mode	5.5.2.1 Internal Torque Mode
P3-33 Internal Torque Instruction Given	Given a percentage value of the rated torque	5.5.2.2 Internal Torque Command Setting
P3-16 Internal forward speed limit during torque control P3-17 Internal reverse speed limit during torque control	Speed Limitation under Torque Mode	5.5.1.1 Internal Speed Limitation During Torque Control

P3-14 Forward Maximum Speed Limit (MAX Speed) P3-15 Reverse Maximum Speed Limit (MAX Speed)		
P5-27 Speed Direction Switching/SPD-D	Switch direction; default is n.0000. By applying a commutation signal via terminal SI2, P5-27 can be set to n.0002.	

5.5.2.1 Internal Torque Mode

parameter	set value	meaning	revise	Take effect
P0-01	1	Torque Control: Internal Setting	servo bb	immediately
Function Above view: Uses the internally set torque as a torque command for torque control.				

5.5.2.2 Internal Torque Command Setting

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-33	Internal Torque Instruction Given	0	1% rated torque	-1000 ~ +1000	at any time	immediately
This parameter is set in terms of 1% of the rated torque, with positive or negative values indicating forward or reverse motor rotation. For example: setting P3-33 to 50 represents the motor operates in forward direction at 50% of its rated torque. Set P3-33 to-20, indicating the motor operates in reverse mode with 20% of its rated torque. In addition to controlling the servo direction using torque values, you can also use the /SPD-D command to set the direction.						

5.5.3 Torque Control (External Analog Signal)

parameter	essentials	Reference Chapter
P0-01 Control Method Selection	Set to 2: External Analog Torque Mode	5.5.3.1 Analog torque mode
P3-24: The rated torque corresponds to the analog voltage value.	Set the torque command voltage required for the servo motor to operate at rated torque, in units of 0.001 V	5.5.3.2 The rated torque corresponds to an analog value
P3-25 Analog Voltage to Torque Command Filter Simulation	Unit: 0.01 ms	5.5.3.3 Analog voltage torque filter
P3-26 Torque Command Input Dead Zone Voltage	Unit: 0.001 V	5.5.3.5 Dead Zone Voltage for Torque Command Input

5.5.3.1 Analog torque mode

parameter	set value	function	revise	Take effect
P0-01	2	Torque Control: Analog Voltage Command	servo OFF	immediately
Function Above view: Uses the analog voltage input from the T-REF terminal as the command signal for torque control.				

- Direction switching: Both positive/negative voltage and SPD-D (P5-27) can control the direction.
- The hardware wiring section follows Chapter 3.2.4.

5.5.3.2 Main Parameters of Analog Torque

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-23	T-REF Function Allocation	0	-	0~2	servo bb	immediately
P3-24	The rated torque corresponds to an analog value.	10000	0.001V	1500~30000	servo bb	immediately

1) P3-23: T-REF Analog Torque Function Allocation

0: As torque command input;

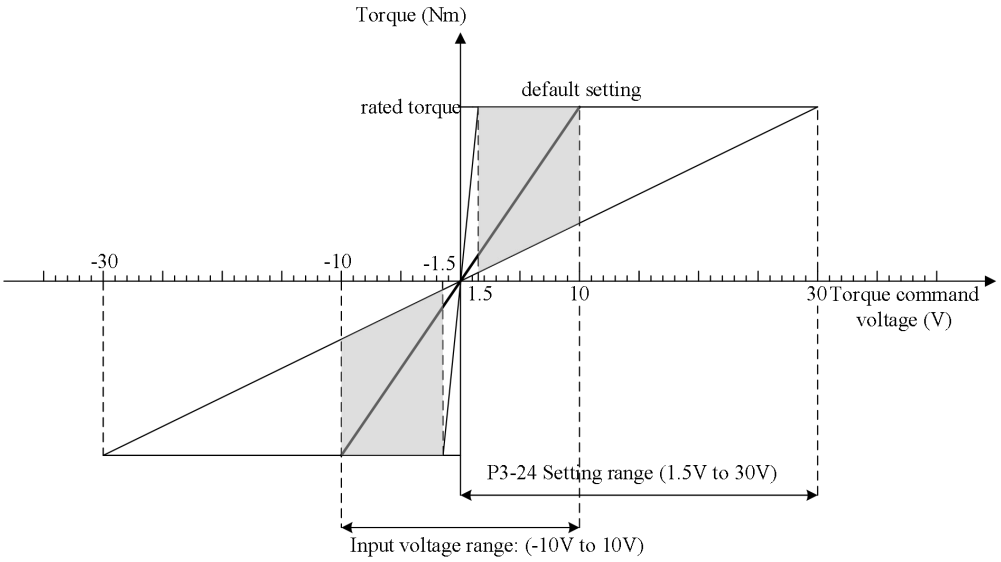
1: As a mandatory condition for external torque limit input, the minimum value applies when compared to P3-28/P3-29 (this value is invalid in analog torque mode);

2: Torque feedforward.

2) P3-24: Sets the torque command voltage (T-REF) required for the servo motor to operate at rated torque.

For example: P3-24=5000 represents that the motor operates at rated torque when the analog input voltage is 5.00 V.

P3-24=8000 represents that the motor operates at its rated torque when the analog input voltage is 8.00 V.



- The input for analog voltage commands used in torque limitation has no polarity. The absolute value is applied regardless of whether the voltage is positive or negative, and the resulting torque limit applies to both forward and reverse rotation directions.

- The maximum allowable voltage for analog input signals is ±10 V; do not apply voltages exceeding ±10 V to the motor.

5.5.3.3 Analog voltage torque filter

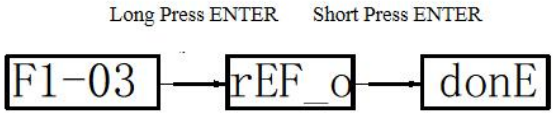
parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-25	Analog Voltage-Torque Command Filter	0	0.01ms	0~10000	at any time	immediately

Pass the torque command through a single delay filter to smooth it. Setting this value too high will reduce responsiveness.

5.5.3.4 Automatic torque command offset adjustment (F1-04)

When using the analog voltage-torque mode, the motor may rotate at a slight speed even when the command voltage is 0 V. This slight rotation occurs when there is a minor deviation (in mV) in the command voltage from the upper control device or external circuit. In such cases, the panel operator can automatically adjust the command offset.

When servo enable is turned off (i.e., in BB state), disconnect the analog signal from driver port CN0 and perform the following steps:



Press Status/ESC to exit this feature.

- When the analog current voltage is 0 V, calibration according to Figure F1-04 represents that 0 V corresponds to 0% output torque—lower than the motor's reverse output torque but higher than its forward output torque. Similarly, when the analog current voltage is 5 V, calibration per Figure F1-04 shows that 5 V corresponds to 0% output torque—lower than the motor's reverse output torque but higher than its forward output torque.
- If slight movement persists after automatic offset adjustment, increase parameter P3-26 appropriately to 5, setting the dead zone voltage to 0.005 V.

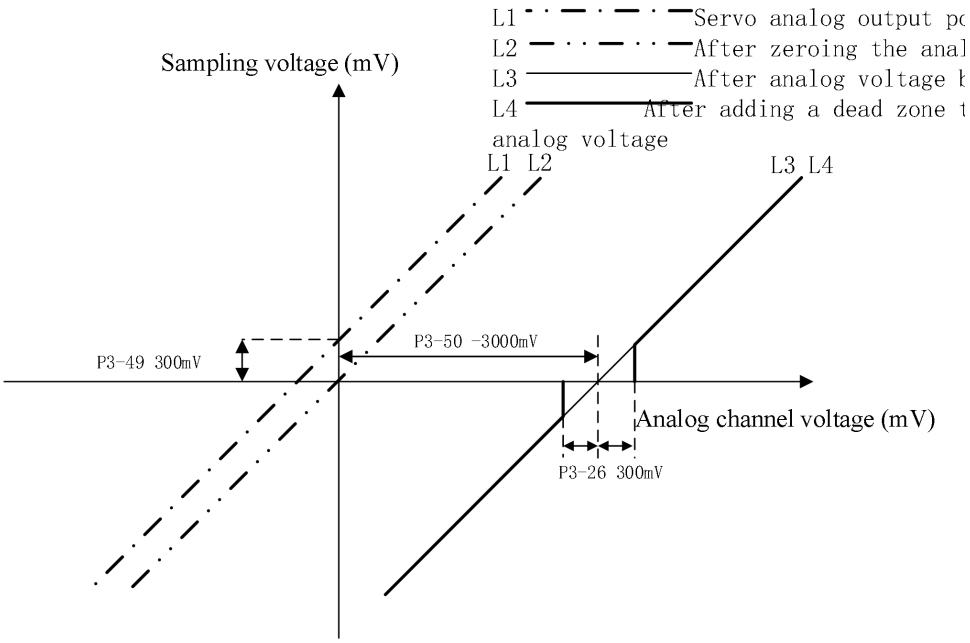
5.5.3.5 Dead Zone Voltage for Torque Command Input

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-26	Torque command input dead zone voltage	0	0.001V	0~500	at any time	immediately
P3-49	T-REF Analog Signal Zero Drift Correction	0	-	-1000~1000	at any time	immediately
P3-50	T-REF Analog Voltage Bias	0	mV	-9999~9999	at any time	immediately

P3-26 Torque Command Input Dead Zone Voltage Description:

(1) When the input torque command voltage is lower than the set value of P3-26, the input torque command is considered zero.

(2) If minor adjustments remain after automatic offset adjustment, simply increase the dead zone voltage accordingly.



5.6 Absolute Value System

5.6.1 Configuration of the Absolute Value System

To store the position data of the absolute encoder, a battery unit must be installed.

Install the battery on the battery cell equipped with an encoder cable containing the battery unit (internal).

When not using an encoder cable with a battery unit, set P0-79 to 1 to treat the multi-turn absolute encoder as an incremental encoder.

parameter	Signal Name	setting	meaning	setting scope
P0-79	Absolute encoder single/multi-turn position switch	0	Use an absolute encoder normally and store the position using batteries.	0~2
		1 (Default)	When used as an incremental encoder, it no longer remembers positions beyond multiple turns.	
		2	-used as an absolute encoder, but ignores multi-turn Aboveflow alarms	

After replacing the multi-turn motor, an E-222 alarm will be triggered, automatically resetting the count of Aboveflowed turns; otherwise, severe positional deviation may occur, posing a hazard.

5.6.2 Replace the Battery

When replacing the battery, ensure the driver is properly connected to the motor and the control power supply is turned on. Replacing the battery with the control power supply off will result in loss of data stored in the encoder.

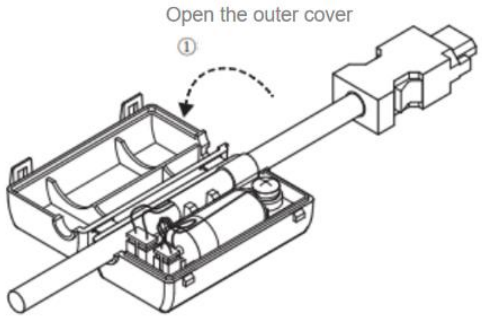
Absolute encoder battery case model (This battery cannot be charged)

- Battery case for standard cables: CP-B-BATT
- Specialized battery case for tank line: CPT-B-BATT

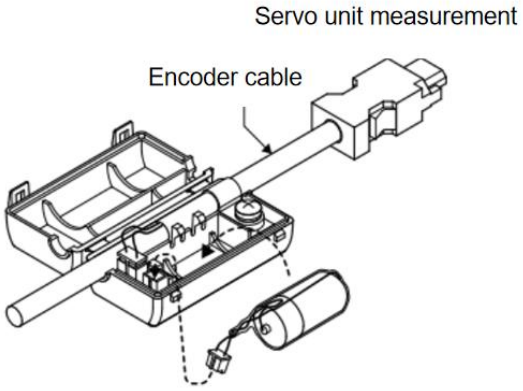
Steps for replacing the battery

When using encoder cables with battery units

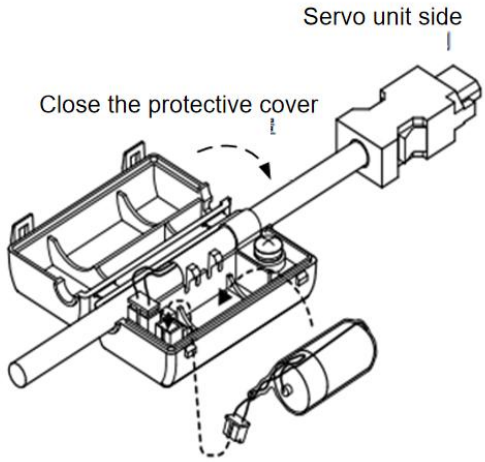
1. Connect only the control power supply to the servo unit;
2. Open the cAbove of the battery unit;



3. Remove the old battery and install a new one;



4. Close the box cAbove of the battery unit;

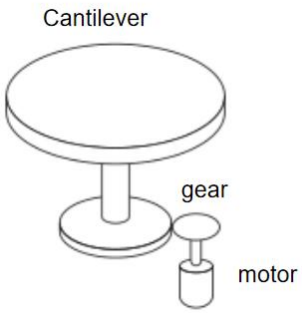


5. After replacing the battery, clear the alarm (F0-00=1) twice to eliminate the "Encoder Battery Alert (E-222)" display (only once required for version 3770 and later).
6. Re-power the servo unit;
7. Confirm that error messages have disappeared and the servo unit is functioning properly.

5.6.3 Maximum Number of Rotations Setting Value

The maximum number of rotation cycles can be used for position control of rotating bodies such as turntables.

For example, consider a machine whose rotating platform moves only in one direction, as shown below.



Since it can only rotate in one direction, after a certain period of time, the total number of rotations will inevitably exceed the maximum count limit of the absolute encoder.

Servo Motor Series	resolution ratio (Single-round data)	Serial Data with Rotation Count Output Range	Operation beyond time limit
CS/M	17	-32768~32767	When exceeding the upper limit value of the forward direction (+32767*217): Rotation sequence serial data = 32767 * 217 When it falls below the lower limit of the Reverse Rotation direction (-32768*217): Rotation serial data = -32767 * 217
TL	23		When exceeding the upper limit value of the forward direction (+32767*223): Rotation sequence serial data = 32767 * 223 When it falls below the lower limit of the Reverse Rotation direction (-32768*223): Rotation serial data = -32767 * 223

5.6.4 Absolute Value Position Read via Communication

essential parameter		
User Parameters	name	Function
U0-10	Encoder Feedback Value	The absolute position per revolution is determined by reading the hexadecimal addresses 0x100A and 0x100B using the Modbus RTU single-word command; U0-10 + U0-11 × 10,000 represents the current encoder position per revolution.
U0-11		
U0-91	Absolute value of multiple loops: Current loop count	Read the hexadecimal address 0x105B using the Modbus RTU single-word read function to determine the current encoder revolution count.
U0-57	Absolute encoder current position feedback: 32-bit low	Read the hexadecimal address 0x1039 using the Modbus RTU dual-word read function to obtain the current encoder position, which includes positive and negative pulses.
U0-58		

U0-59	Absolute encoder current position feedback: 32-bit high	Read the hexadecimal address 0x103B using the Modbus RTU dual-word read function; this represents the high-bit value of the current encoder position, with the low-bit data to be added.
U0-60 (Direction Signs)		

The servo driver transmits encoder position data via the RS485 interface using the Modbus RTU protocol.

- A 17-bit absolute encoder with a pulse count of 131,072 per revolution.
- A 23-bit absolute encoder with a pulse count of 8,388,608 per revolution.

First, read the value of U0-60 (0x103C):
① 0 represents the positive direction of the encoder's zero position. The current encoder value is: U0-57*1 + U0-58*216 + U0-59*232 + U0-60*248.
② –1 represents the opposite direction of the encoder's zero position. The current encoder value is calculated as: [U0-57 + U0-58 × 216 + U0-59 × 232 + (65536 + U0-60) × 248] – 264.

Communication Parameter Description

Default communication parameters for RS485 port: baud rate 19200 bps; 8-bit data width; 1 stop bit; parity check; Modbus station ID 1.



For details of communication parameters, refer to Appendix 1 (P7–XX).

5.6.5 Absolute encoder multi-turn clear

User Parameters	name	description
F1-06	Absolute encoder position reset	
U0-94	Zeroable relative encoder feedback value	
U0-95		
U0-96		
U0-97 (Direction Signs)		0: Positive direction of encoder zero position -1: Encoder zero position in reverse direction

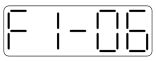
The encoder's reset count must be completed in servo BB mode; it can be cleared via the servo panel or Modbus RTU communication. Writing 1 to F1-06 will set the multi-turn absolute current count (U0-91) to zero, and the multi-turn counts in the absolute encoder position feedback signals U0-57–U0-60 and U0-94–U0-97 will also be cleared, retaining positions up to one turn.

1. Clear Servo Drive Panel

When the servo is in BB mode, parameter F1-06 displays:



Press the [INC] key to set to 1 and hold the [ENT] key to confirm exit:



Using F1-06, you can clear the number of rotations for the absolute encoder position via the panel.

2. Modbus RTU Communication Clear

To clear the number of circles, write 1 to the hexadecimal address 0x2106 using a Modbus RTU.
The servo BB status takes effect; after clearing, set 0x2106 to 0.

5.6.6 Absolute encoder zero calibration

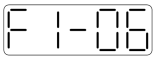
Absolute encoder zero calibration must be performed in servo BB mode and can be conducted via either servo panel calibration or Modbus RTU communication calibration. Set F1-06 to 3; the encoder position indicated on U0-94–97 will be calibrated to zero.

1. Servo Drive Panel Calibration

When the servo is in BB mode, parameter F1-06 displays:



Press the [INC] key to set to 3 and hold the [ENT] key to confirm exit:



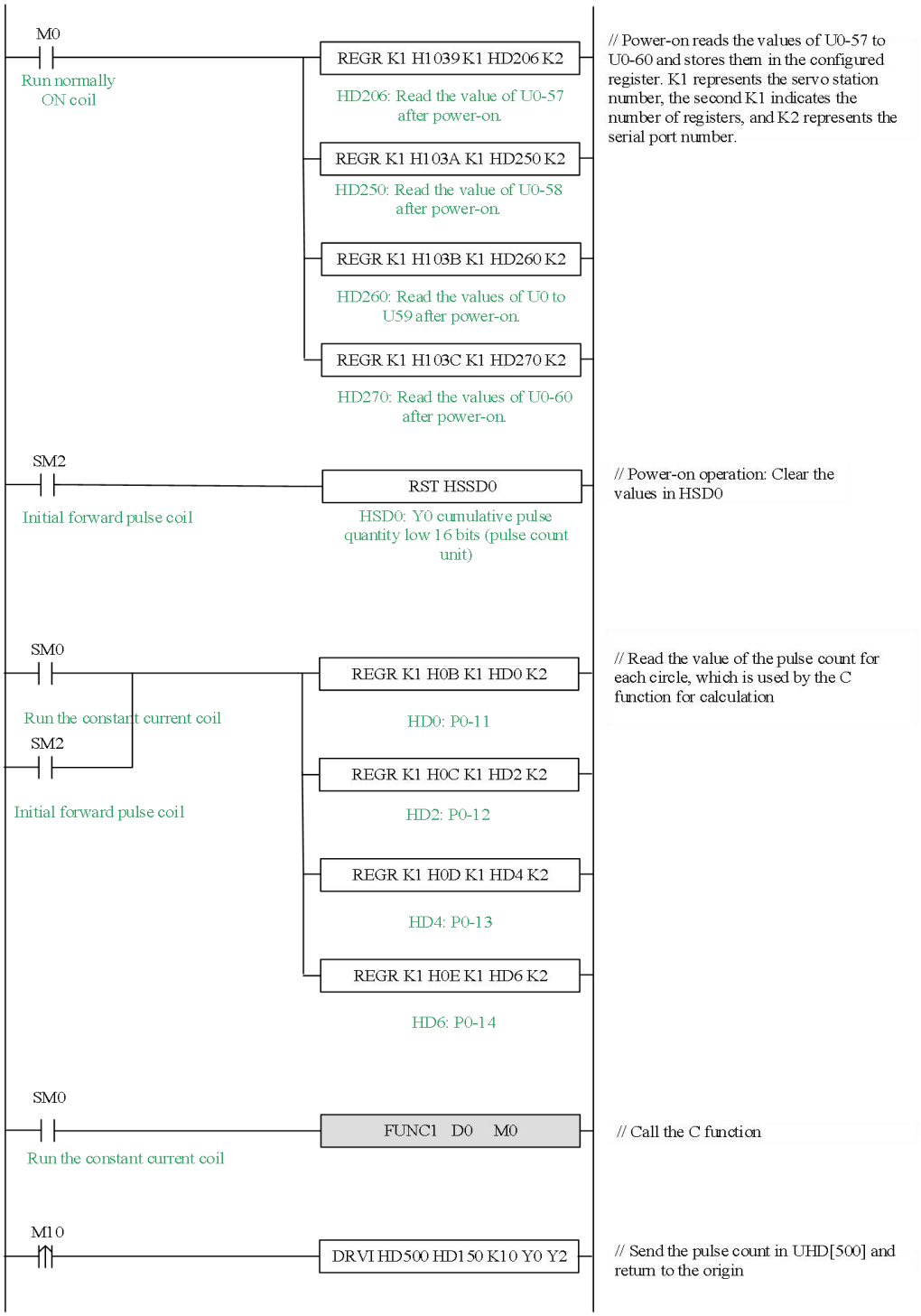
Using F1-06, the panel can set the encoder's current position to zero; U0-94~97 displays the calibrated encoder position.

2. Modbus RTU Communication Clear

The decimal value 3 can be written to F1-06 (Modbus address 0X2106) via Modbus RTU communication, while U0-94 to U0-97 display the calibrated absolute position of the motor.

5.6.7 Returning to the original case Framed on absolute values

Use the Xinje PLC to read multi-turn absolute position values using four-digit encoding. The following example demonstrates returning to the origin via encoder feedback: M1 stores the origin position, SM12 records the current position; by calling a function, the encoder feedback difference for the traveled distance is retrieved, and the DRVI instruction is used to return to the origin.


M0
Run normally ON coil
REGR K1 H1039 K1 HD206 K2
// Power-on reads the values of U0-57 to U0-60 and stores them in the configured register. K1 represents the servo station number, the second K1 indicates the number of registers, and K2 represents the serial port number.
HD206: Read the value of U0-57 after power-on.
REGR K1 H103A K1 HD250 K2
HD250: Read the value of U0-58 after power-on.
REGR K1 H103B K1 HD260 K2
HD260: Read the values of U0 to U59 after power-on.
REGR K1 H103C K1 HD270 K2
HD270: Read the values of U0-60 after power-on.
SM2
Initial forward pulse coil
RST HSSD0
// Power-on operation: Clear the values in HSD0
HSD0: Y0 cumulative pulse quantity low 16 bits (pulse count unit)
SM0
Run the constant current coil
REGR K1 H0B K1 HD0 K2
// Read the value of the pulse count for each circle, which is used by the C function for calculation
HD0: P0-11
SM2
Initial forward pulse coil
REGR K1 H0C K1 HD2 K2
HD2: P0-12
REGR K1 H0D K1 HD4 K2
HD4: P0-13
REGR K1 H0E K1 HD6 K2
HD6: P0-14
SM0
Run the constant current coil
FUNC1 D0 M0
// Call the C function
M10
DRVI HD500 HD150 K10 Y0 Y2
// Send the pulse count in UHD[500] and return to the origin

5.7 Auxiliary Functions

5.7.1 Anti-stall protection

When the motor operating speed falls below P0-75 (unit: 1 rpm) and remains below P0-74 (unit: ms) for the specified duration, if the current motor output torque U0-02 exceeds both the internal forward torque limit P3-38 and the internal reverse torque limit P3-39, alarm E-165 (Stalled Operation timeout) is triggered (supported in versions 3760 and above).

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-74	Turn-off alarm time	By Device Model	1ms	0 ~ 65535	at any time	immediately
P0-75	Turn-off alarm speed	50	rpm	5 ~ 9999	at any time	immediately
P3-28	Internal forward rotation torque limit	By Device Model	%	0 – Motor Aboveload factor	at any time	immediately
P3-29	Internal reverse rotation torque limit	By Device Model	%	0 – Motor Aboveload factor	at any time	immediately
P3-38	Prevention of reverse rotation alarms; internal limit on forward rotation torque	By Device Model	%	0 – Motor Aboveload factor	at any time	immediately
P3-39	Prevention of reverse rotation alarms; internal limit on reverse rotation torque	By Device Model	%	0 – Motor Aboveload factor	at any time	immediately

description ：

1) This alarm is not detected when P0-74 or P0-75 is set to 0;

2) If this alarm occurs during normal servo operation, confirm the following:

a) Monitor the torque of motor U0-02 and verify whether the torque limit settings for P3-28, P3-29 (P3-38/P3-39) are appropriate;

b) Inspect the external mechanical structure and installation;

3) The default alarm time for P0-74 stall condition is as follows by model:

Power Drive Model	P0-74 (/ms) Default Parameter
DS5□-20P1-PTA	2000
DS5□-20P2-PTA	3000
DS5□-20P4-PTA	3000
DS5□-20P7-PTA	5000

DS5□-415P0-PTA	20000
Other Models	0

P0-74 is set to 0, indicating the anti-clogging alarm is not enabled by default; users can configure it as needed.

4) For firmware versions prior to version 3760 in U2-07, the comparison value for anti-clogging rotation alarm torque is P3-28/P3-29; for firmware versions 3760 and later in U2-07, the comparison value is P3-38/P3-39.

5) P3-38/P3-39 are solely used as reference values for blockage prevention rotation alarms (added after version 3760), while P3-28/P3-29 serve as internal torque limits during actual motor operation.

5.7.2 Torque Limit

1. Internal Torque Limit

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-28	Internal forward rotation torque limit	By Device Model	%	0 – Motor Aboveload factor	at any time	immediately
P3-29	Internal reverse rotation torque limit	By Device Model	%	0 – Motor Aboveload factor	at any time	immediately
(1) If this set value is lower than the external torque limit, the final limit will be determined by this parameter's set value. (2) The setting value is expressed as a percentage of the motor's rated torque; for example, if the motor operates at three times its rated load, the factory default is set at 300% of the rated torque, with the actual maximum output torque also limited by the motor's Aboveload factor.						

2. External torque limitation (activated via input signal)

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-30	Forward rotation and external torque limitation	By Device Model	%	0 – Motor Aboveload factor	at any time	immediately
P3-31	Reverse Side External Torque Limit	By Device Model	%	0 – Motor Aboveload factor	at any time	immediately
The setting unit is expressed as% of the motor's rated torque; for example, a 3x Aboveload condition corresponds to a factory-set value of 300% of the rated torque.						

parameter	Signal Name	Factory Settings	meaning	Set Range	revise	Take effect
P5-25	/P-CL	n.0000	Necessary conditions for using forward rotation with external torque limitation	Parameter range 0000–0014, allocated to other input interfaces via parameters P5–25.	at any time	immediately
P5-26	/N-CL	n.0000	Necessary conditions for applying reverse-side external torque limitations	Parameter range 0000–0014, allocated to other input interfaces via parameters P5–26.	at any time	immediately

3. Functional Relationship

Below is the functional relationship among internal torque limits, external torque limits, /P-CL, /N-CL, and T-REF.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-23	T-REF Function Allocation	0	-	0~2	servo bb	immediately

T-REF distribution	P-CL/N-CL state	Final value of forward rotation torque	Final Reverse Rotation torque value
0	0	P3-28 Decision	P3-29 Decision
	1	The smaller of the internal forward rotation torque limit and the external side forward rotation torque limit	The smaller of the internal reverse torque limit and the external reverse-side torque limit
1	Not working	The smaller value between the internal forward rotation torque limit and the external analog torque	The smaller value between the internal reverse rotation torque limit and the external analog torque

4. Output torque reaches the limit value

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-42	torque limitation /CLT	n.0000	All	The motor output torque reaches the limit values specified in P3-28/P3-29/P3-30/P3-31/P3-38/P3-39 for the output signal.	at any time	immediately
Default value: no assigned terminals. Parameter range: 0000–0018, assigned to the output interface via parameter P5-42. Setting to 0002 enables signal output from SO2 terminals.						

5.7.3 Speed Limitations

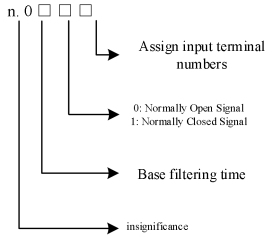
parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-14	Positive maximum speed command limit	4000	rpm	0 ~ 10000	servo bb	immediately
P3-15	Reverse Maximum Speed Command Limit	4000	rpm	0 ~ 10000	servo bb	immediately

Note: The parameters set for P3-14 and P3-15 are valid in all modes.

5.7.4 Input/Output Terminal Allocation

5.7.4.1 Input Terminal Allocation

1. Allocation of Input Signals

parameter	Parameter Meaning	set value	meaning
P5-20 ~ P5-36		n.0000	Not assigned to terminal input
		n.000x	Enter a normally open signal from the SIx terminal
		n.0010	Set the signal to always active
		n.001x	Enter a normally closed signal from the SIx terminal.

The basic filtering time refers to the filtering time of the input terminal.

2. Factory settings for input terminals

terminal	SI1	SI2	SI3	SI4
function	/S-ON	/ALM-RST	/P-OT	/N-OT

3. Filter Time for Input Terminal

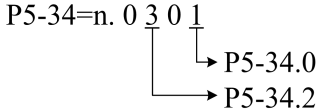
- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P5-18	IO Filtering Time Factor	1	Times	0 ~ 10000	at any time	immediately

The SI input filtering time is determined jointly by the IO parameter value and P5-18, as illustrated below:

Set the pulse deviation clearance configuration to terminal SI1 with a filtering time of 30 ms.

The parameters are set as follows:



P5-34.0=1: Set the input terminal to SI1

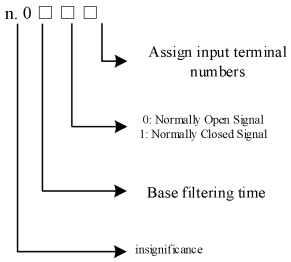
P5-34.2=3: The basic filtering time is set to 3 ms

P5-18=10: Set the filtering time factor to 10 times

The total filtering time is P5-34.2 × P5-18 = 3 ms × 10 = 30 ms.

5.7.4.2 Output Terminal Allocation

1. Terminal Allocation for Output Signals

parameter	Parameter Meaning	set value	meaning
P5-37 ~ P5-53		n.0000	Not assigned to terminal output
		n.000x	The SOx terminal outputs a normally open signal.
		n.0010	Set the signal to always active
		n.001x	The SOx terminal outputs a normally closed signal.

2. Factory settings for output terminals

terminal	SO1	SO2	SO3
function	COIN/Positioning Complete	ALM/ Alarm	Not Assigned

5.7.5 Description of Output Terminal Functions

5.7.5.1 Servo Ready Output (/S-RDY)

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P5-70	/S-RDY: Output Condition Selection	0	-	0~1	at any time	immediately

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-41	/S-RDY	n.0000	All	Servo Ready Output	at any time	immediately
For details on hardware wiring, refer to Chapter 3.2.2. Parameter range P5-41: The parameter setting range is n.0000–0014, which is assigned to other input terminals via parameters. To obtain an SO_2 output signal, set P5-41 to n.0002/0012.						

1. Output Conditions for Servo Ready Signal

When P5-70 is set to 0: The drive has completed initialization and the servo has no alarm status/S-RDY is

active;

When P5-70 is set to 1: enabled when the servo has no alarm status and S-RDY is active.

5.7.5.2 Rotation Detection Output (/TGON)

1. Signal Settings

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-40	/TGON	n.0000	All	Rotation Detection Output	at any time	immediately
It is an output signal indicating that the servo motor is rotating at a speed higher than the set value. 1. Default value: no output signal assigned to terminals. Parameter range: 0000–0014, which can be assigned to other output terminals via parameter P5–40. 2. represents that when the servo motor's rotational speed exceeds the set value of P5-03, it signifies the servo is rotating.						

2. Relevant Parameters

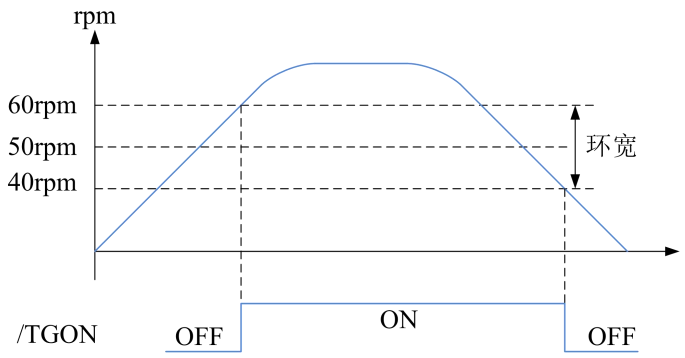
parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P5-03	Rotation Detection Speed/TGON	50	rpm	0 ~ 10000	at any time	immediately
Set the condition range for rotation detection output: if the servo motor's speed exceeds the P5-03 set value, it is determined that "the servo motor is rotating," and the rotation detection signal (/TGON) is triggered.						



The rotation detection exhibits a hysteresis loop at 10 rpm.

3. The Concept of Hysteresis Loop

The hysteresis loop is designed to prevent system oscillations caused by parameter fluctuations around a specific value. Once the hysteresis threshold is set, a fixed loop width is established: the system only activates when parameters exceed a certain value and deactivates when they fall below another threshold; this width determines the action interval. A narrow loop results in rapid and frequent responses, while a wide loop causes delayed responses. Note that rotation detection speed (P5-03), synchronous detection speed (P5-04), and arrival detection speed (P5-05) all incorporate a 10 rpm hysteresis range. For example, setting rotation detection speed P5-03 to 50 with the rotation detection/TGON output port at SO3.



5.7.5.3 Speed coincidence detection (/V-CMP)

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-39	Speed coincidence detection/V-CMP	n.0000	3、4、7	Detection signal at the same speed	at any time	immediately
Default value: no assigned terminals. Parameter range: 0000–0014, assigned to the output interface via parameter P5-39. Setting to 0002 enables signal output from SO2 terminals.						

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P5-04	Signal width detected at the same speed	50	rpm	0 ~ 10000	at any time	immediately

By default, there is a hysteresis of 10 rpm; refer to Section 5.12.3 for the definition of hysteresis.

5.7.5.4 Warning Output (/ WARN)

Set an alarm output threshold; when the current speed exceeds the warning speed, output WARN.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-19	Positive Warning Speed	Motor-related	rpm	0 ~ 65535	servo bb	immediately
P3-20	Reverse Warning Speed	Motor-related	rpm	0 ~ 65535	servo bb	immediately

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-45	/WARN	n.0000	All	Warning Output	at any time	immediately
1. Default value for unallocated terminal output signals. Parameter range: 0000–0014, assigned to other						

output terminals via parameters P5–45.

2. When a warning occurs, the servo unit only outputs a warning signal and will not be forcibly turned off.

5.7.5.5 Servo Alarm Output (/ALM)

1. Servo Alarm Output/ALM

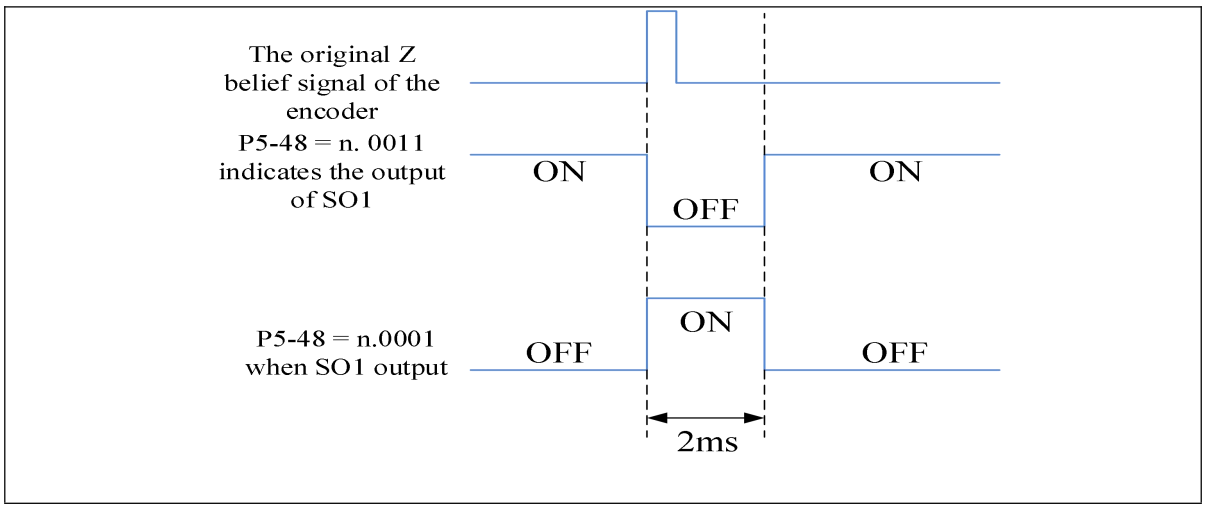
parameter	Signal Name	setting	meaning	Modification Scope
P5-47	Alarm Output /ALM	n.0002 (give tacit consent to)	When a servo alarm occurs, conduction is established between SO2 and COM, generating an alarm signal.	The parameter range is 0000–0018, assigned to the output interface via parameters P5–47. Setting it to 0001 enables signal output from terminal SO1.
		n.0012	When the servo alarm occurs, the connection between SO2 and COM is disconnected.	

- When an alarm occurs, the servo unit is forcibly turned off, and the motor will move under external force (including gravity). To maintain motor position, use a motor equipped with a power failure brake (also called a lock-up brake) and apply the /BK signal. Refer to Section 5.2.5.
- No output terminals may be duplicated for the assigned functional parameters.

5.7.5.6 Encoder Z-phase output (/Z)

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P5-48	Z-phase Output/Z	n.0000	-	0000 ~ 0018	at any time	immediately
P5-19	Z-phase output hold time	2	ms	1 ~ 65535	at any time	immediately

1. The /Z signal can be assigned to other output terminals via parameter P5-48.
2. The Z-axis signal outputs as a single pulse with a default pulse width of approximately 2 ms, which can be configured via parameter P5-19 and is independent of motor rotation speed. (Before version 3770, only incremental motors were supported; versions 3770 and later support multi-turn motors.)


The original Z belief signal of the encoder
P5-48 = n. 0011 indicates the output of SO1
ON
OFF
ON
P5-48 = n.0001 when SO1 output
OFF
ON
OFF
2ms

5.7.5.7 Custom Output Signals

Users can customize two output paths as needed, descriptiond as SOx outputs when A> B or SOx outputs when A <B. A represents nine system-provided trigger conditions, while B is a user-descriptiond comparison value selected from these conditions.

Custom Output 1

<table>
<tr><td rowspan="3">P5-10</td><td colspan="6">Custom Output 1 Trigger Condition</td></tr>
<tr><td>Default Trigger Condition</td><td>Trigger Condition Settings</td><td>unit</td><td>Applicable Mode</td><td>revise</td><td>Take effect</td></tr>
<tr><td>0</td><td>See table: Optional trigger conditions</td><td>With the selected trigger The conditions are related.</td><td>All Modes</td><td>at any time</td><td>immediately</td></tr>
<tr><td rowspan="3">P5-11</td><td colspan="6">Value to compare with the trigger condition for Custom Output 1</td></tr>
<tr><td colspan="2">Set Unit</td><td>Factory Settings</td><td>Set Range</td><td>Applicable Mode</td><td>revise</td><td>Take effect</td></tr>
<tr><td colspan="2">Related to the selected trigger condition</td><td>0</td><td>-32768~32767</td><td>All Modes</td><td>at any time</td><td>immediately</td></tr>
<tr><td rowspan="6">P5-12</td><td colspan="6">Output when P5-10 ≥ P5-11; or SOx output when P5-10 <P5-11.</td></tr>
<tr><td>set value</td><td colspan="2">function</td><td>Factory Value</td><td>Applicable Mode</td><td>revise</td><td>Take effect</td></tr>
<tr><td>0</td><td colspan="2">When P5-10 ≥ P5-11, the SOx output is determined.</td><td rowspan="4">0</td><td rowspan="4">All Modes</td><td rowspan="4">at any time</td><td rowspan="4">immediately</td></tr>
<tr><td>1</td><td colspan="2">SOx output from P5-10 to P5-11</td></tr>
<tr><td>2</td><td colspan="2">When the absolute value of P5-10 is ≥ P5-11, SOx output occurs.</td></tr>
<tr><td>3</td><td colspan="2">When the absolute value of P5-10 is ≤ P5-11, the SOx output is determined.</td></tr>
<tr><td rowspan="3">P5-13</td><td colspan="6">Set Custom Output 1 Hysteresis Loop</td></tr>
<tr><td colspan="2">Set Unit</td><td>Factory Settings</td><td>Set Range</td><td>Applicable Mode</td><td>revise</td><td>Take effect</td></tr>
<tr><td colspan="2">Related to the selected trigger condition</td><td>0</td><td>0~65535</td><td>All Modes</td><td>at any time</td><td>immediately</td></tr>
<tr><td rowspan="3">P5-52</td><td colspan="6">Custom Output 1 Port Settings</td></tr>
<tr><td colspan="2">Signal Name</td><td>Factory Settings</td><td>meaning</td><td colspan="3">revise</td></tr>
<tr><td colspan="2">Custom Output 1</td><td>n.0000</td><td>Default unallocated terminal output</td><td colspan="3">Parameter range 0000–0018 is assigned to other output terminals via parameters P5–52.</td></tr>
</table>

			signal.	

Custom Output 2

P5-14	Custom Output 2 Trigger Condition					
	Default Trigger Condition	Trigger Condition Settings	unit	Applicable Mode	revise	Take effect
	0	See table: Optional trigger conditions	Related to the selected trigger condition	All Modes	at any time	immediately
P5-15	Value to compare with the trigger condition for Custom Output 2					
	Set Unit	Factory Settings	Set Range	Applicable Mode	revise	Take effect
	Related to the selected trigger condition	0	-9999~9999	All Modes	at any time	immediately
P5-16	Output when P5-14 ≥ P5-15; SOx output when P5-14 <P5-15.					
	set value	function	Factory Value	Applicable Mode	revise	Take effect
	0	When P5-14 ≥ P5-15, SOx output is generated.	0	All Modes	at any time	immediately
	1	When P5-14 <P5-15, SOx output is generated.				
	2	When the absolute value of P5-14 is ≥ P5-15, SOx output occurs.				
	3	When the absolute value of P5-14 is ≤ P5-15, SOx output is generated.				
P5-17	Set Custom Output 2 Hysteresis Loop					
	Set Unit	Factory Settings	Set Range	Applicable Mode	revise	Take effect
	Related to the selected trigger condition	0	-32768~32767	All Modes	at any time	immediately
P5-53	Custom Output 2: Output Port Configuration					
	Signal Name	Factory Settings	meaning	revise		
	Custom Output 2	n.0000	Default unallocated terminal output signal.	Parameter range: 0000–001A, assigned to other output terminals via parameter P5-53.		

The concept of hysteresis loop is referenced in 5.12.3.

Optional Trigger Conditions

Trigger Condition Code	meaning	unit
0	not have	-
203	Current Command	rated current %
205	Current Feedback	rated current %
301	Speed Instruction	rpm
302	rate feedback	rpm
308	jitter	rpm
4402	Position Instruction	1 Instruction
4404	position feedback	1 Instruction
1405	position deviation	1 Instruction
502	busbar voltage	V
503	Internal temperature of the drive	℃
506	Average Output Power	W
508	Average Thermal Power	W

5.7.5.8 Other SO Terminal Function Links

Terminal Name	description	Quick Link
/COIN-HD	Complete Positioning	5.3.1.2
/COIN	Location Determination Completed	5.3.1.2
/CLT	Torque Limit Detection	5.8.2
/VLT	Speed Limit Detection	5.5.1.3
/MRUN	Internal Location Mode Movement Has Begun	5.3.2.7
/V-RDY	Speed Arrival Signal	5.4.1.3

5.7.6 Input Terminal Functions

5.7.6.1 Proportional Motion Command (/P-CON)

parameter	Signal Name	type	Factory Settings	state	meaning	revise	Take effect
P5-21	Proportional Action/P-CON	import	n.0000	valid	Run in P-control mode	at any time	immediately
				invalid	Operate in PI control mode		
1. For the P-CON signal, select either PI (proportional-integral) or P (proportional) control as the speed							

control method.
2. Setting it to P control reduces motor rotation and minor vibrations caused by speed command drift, but simultaneously decreases servo rigidity during stop.
3. The /P-CON signal can be assigned to the input terminals via parameter P5-21.

5.7.6.2 Alarm Reset (/ALM-RST)

Alarm Reset/ALM-RST

parameter	Signal Name	Factory Settings	Applicable Mode	meaning	revise	Take effect
P5-24	/ALM-RST	n.0002	All	Enter a normally open signal at terminal SI2	at any time	immediately

1. Parameter range: 0000–001A, allocated to other input terminals via parameters P5–24.
2. When an alarm occurs, determine the cause and resolve it, then clear the alarm by setting this signal to valid.
3. The /ALM-RST signal can be routed to other terminal inputs via this parameter. Since the alarm signal is critical for the safe operation of the servo system, the /ALM-RST signal should not be set to always active (n.0010).

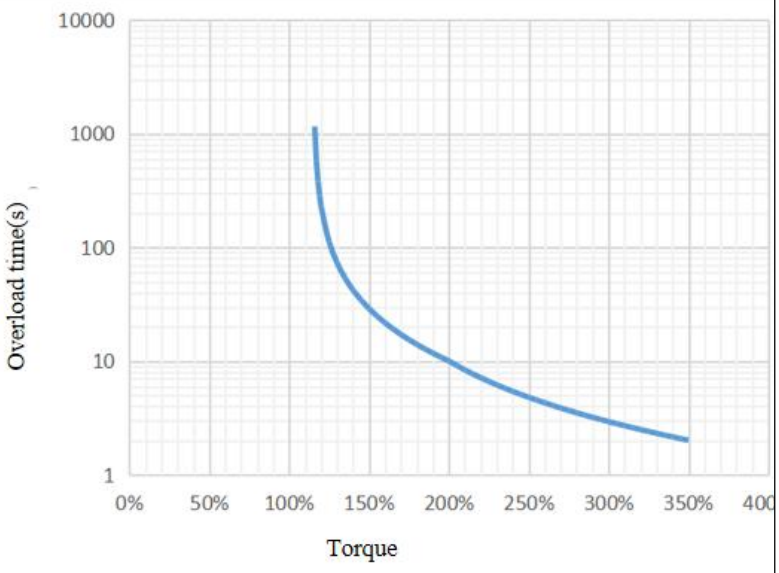
5.7.6.3 Other SI Terminal Function Links

Terminal Name	description	Quick Link
/S-ON	Servo Enablement	5.2.2
/P-OT	Forward drive is prohibited	5.2.4
/N-OT	Reverse Drive Prohibited	5.2.4
/P-CL	Forward rotation and external torque limitation	5.8.2
/N-CL	Reverse Side External Torque Limit	5.8.2
/SPD-D	Internal Speed Direction	5.4.2
/SPD-A	Internal Set Speed	5.4.2
	Position Mode Reference Origin Trigger	5.3.1.8
/SPD-B	Internal Set Speed	5.4.2
	Position Mode Reference Origin Trigger	5.3.1.8
/C-SEL	Control Method Selection	5.1.2
/ZCLAMP	Zero Clamping	5.4.1.2
/INHIBIT	Instruction Pulse Prevention	5.3.3.4
/PREFA	Internal Location Selection Signal	5.3.2.1
/PREFB	Internal Location Selection Signal	5.3.2.1
/PREFC	Internal Location Selection Signal	5.3.2.1
/PREFD	Internal Location Selection Signal	5.3.2.1

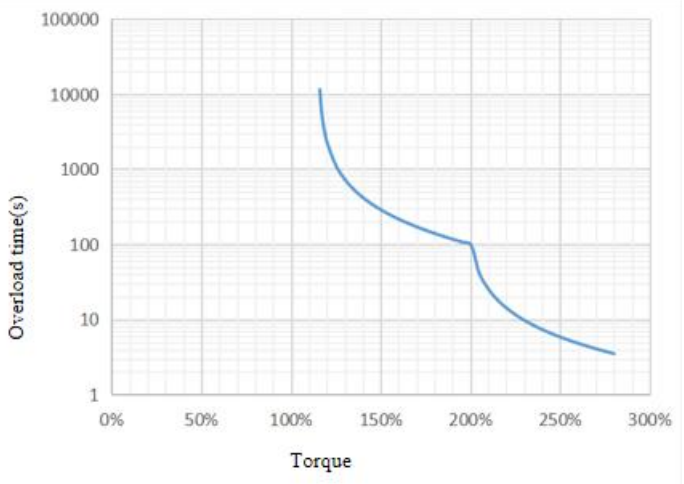
5.7.7 Aboveload Protection Time-Limit Curve

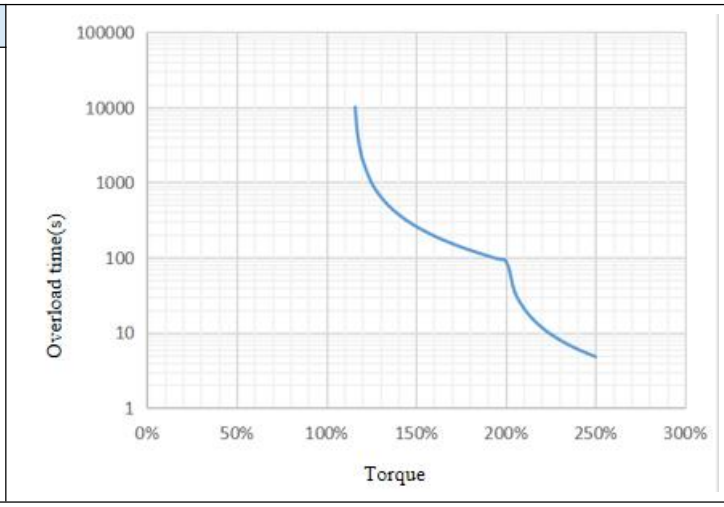
The Aboveload protection time-limit curve is intended solely for alarm output determination and protection against Aboveload operation. It is recommended to use it only during the continuous operating phase of the torque-speed curve, as specified in Appendix 9.

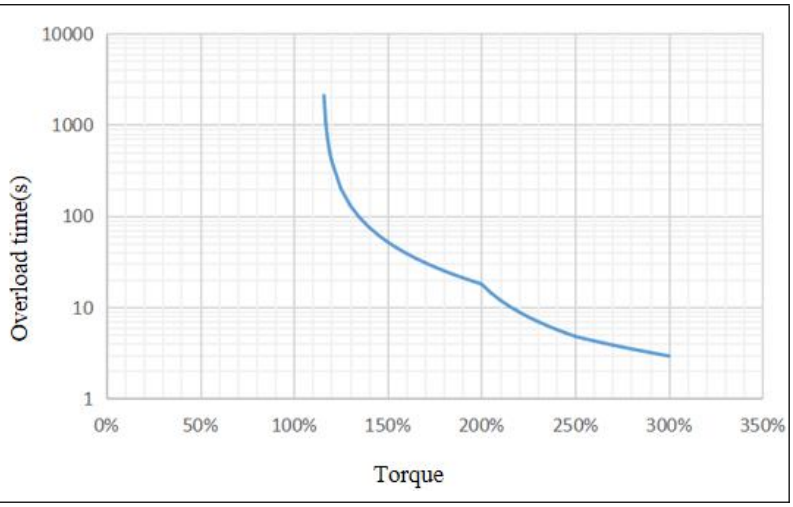
Applicable Model (Motor Code)			
5022	5822	5003	5803
50C3	58C3	5004	5804
50C4	58C4	4004	50C5
58C5	5011	5811	50D1
58D1	4011	4012	50D7
58D7	50D3	58D3	9025
5012	50D2	50B3	58B3
5005	5805	5007	5807
5013	5813	50D7	58D7
5013	5813		

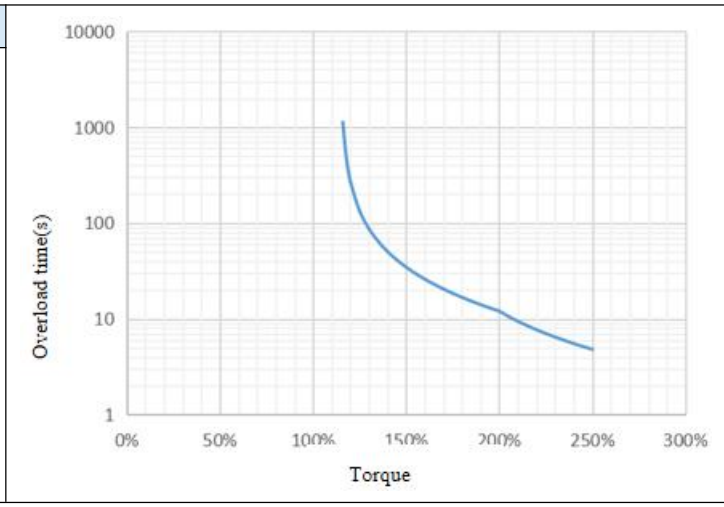


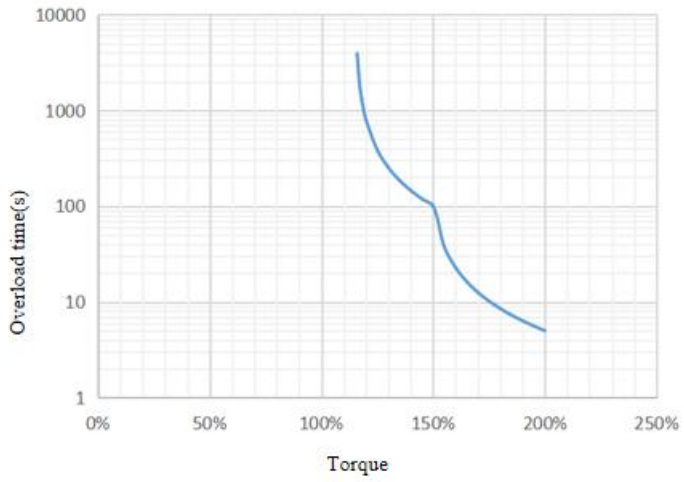
Applicable Model (Motor Code)			
5072	5872	9072	9872
5082	5882	9082	9882
5177	5977	9177	9977

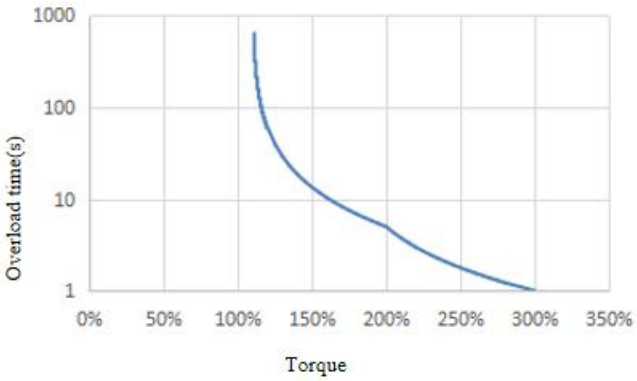


Applicable Model (Motor Code)	
5033 9033 4031 4032 4042 4044 5078 5878 5079 5879 5077 5877 9077 9877 5079 5879 5087 5887 9087 9887 5083	

Applicable Model (Motor Code)	
5174 9174 5974 9974 9148 9045 5196 5996 9196 9996 5182 5982 9182 9982	

Applicable Model (Motor Code)	
5175 9175 5975 9975 9166 916A 916B 5186 5986 9186 9986 5185 9185 5985 9985 5192 5992 5192 9192 9992 5193 5993 9193 9993	

Applicable Model (Motor Code)	
5034 9034 5074 5874 9074 9874 9037 5037 916C 516C 5075 5875 9075 9875 404B 9161 9162 9163 5071 5871 9071 9871	

Applicable Model (Motor Code)	
50B2 58B2	

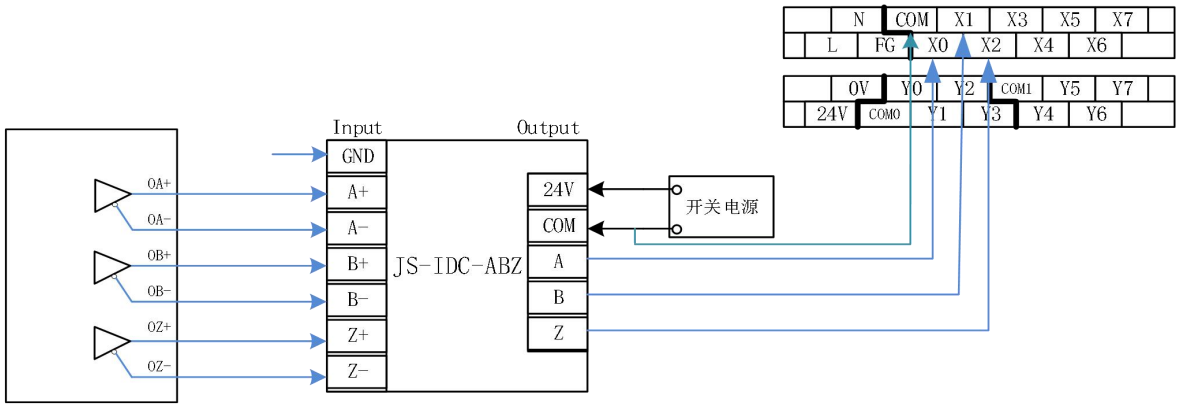
5.8 Encoder ABZ Phase Division Output

The servo drive generates a differential signal via a frequency-dividing output circuit and a differential driver, providing position signals for the host computer or pulse signals for the driven servo motor to achieve precise synchronization control between master and slave axes.

1. Encoder Frequency Division Output Specifications

Terminal Name	Terminal Pin Number		Terminal Functions
	Hardware version 3131 and earlier [Port CN1]	Hardware Version 3131 and later [CN0 port]	
OA+	1	35	A-phase frequency-divided signal output
OA-	2	36	
OB+	3	37	B-phase frequency-divided signal output
OB-	4	38	
OZ+	5	39	Z-phase frequency-divided signal output
OZ-	9	40	

2. Wiring diagram



3. Number of feedback pulses per encoder revolution setting

P0-18	Number of feedback pulses per encoder revolution (low bit)					
	Set Unit	Factory Settings	Set Range	Applicable Mode	revise	Take effect
	1	0	0~9999	All	servo OFF	immediately
P0-19	Number of feedback pulses per encoder revolution (high bit)					
	Set Unit	Factory Settings	Set Range	Applicable Mode	revise	Take effect
	10000	1	0~9999	All	servo OFF	immediately
P0-20	Encoder feedback pulse output frequency division (numerator)					

	Set Unit	Factory Settings	Set Range	Applicable Mode	revise	Take effect
	-	1	0~65535	All	servo OFF	immediately
P0-21	Encoder feedback pulse output frequency division (denominator)					
	Set Unit	Factory Settings	Set Range	Applicable Mode	revise	Take effect
	-	1	0~65535	All	servo OFF	immediately

description ：

1) Number of feedback pulses per revolution: P0-19 × 10,000 + P0-18. The values P0-18 to P0-21 represent encoder feedback parameters; P0-18 and P0-19 form one pair, while P0-20 and P0-21 form another. However, the priority of the feedback pulse count for P0-18 and P0-19 exceeds that of the feedback pulse output division (P0-20 and P0-21). Division settings for P0-20 and P0-21 only activate when both P0-18 and P0-19 are set to 0.

For example, a magnetic multi-turn absolute encoder motor (CM) requires 2,500 pulses per revolution for feedback; this can be configured as P0-18 = 2,500 and P0-19 = 0, or alternatively as P0-18 = P0-19 = 0 with P0-20/P0-21 set to the required ratio of motor feedback pulses per revolution divided by encoder resolution: 2,500 / 131,072 = 625 / 32,768.

2) Encoder feedback is output via port CN0 (for hardware versions 3131 and earlier, it is output via port CN1). With single-phase counting, the count per motor revolution equals the set value; with AB-phase counting, the count per revolution is four times the set value. It is recommended that the lower-level device use AB-phase counting for pulse reception.

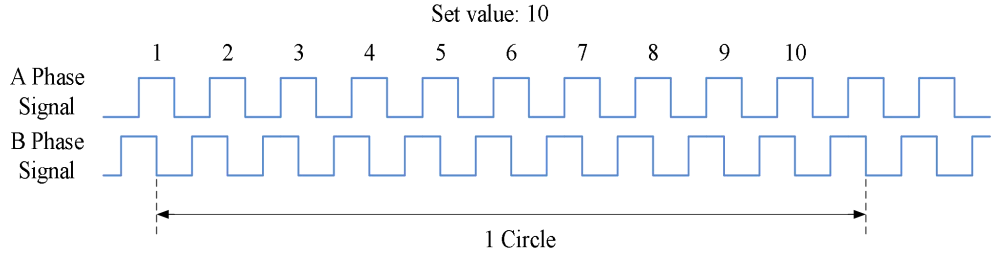
3) The pulse output frequency per phase shall not exceed 1 MHz; the number of feedback pulses per cycle can be determined using the Z-phase pulse estimation formula.

Example: Assume the motor's actual speed is 3000 rpm.

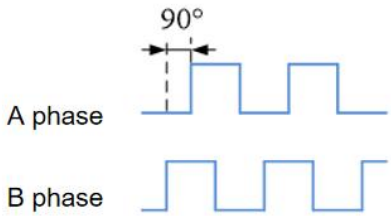
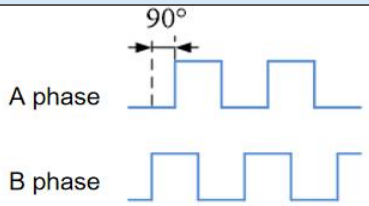
$\frac{28.08}{3000\times ppr}\times 2 \geqslant \frac{1}{10^6} \Rightarrow ppr \leqslant 18720$ $\frac{28.08}{3000\times ppr}\times 2 \geqslant \frac{1}{10^6} \Rightarrow ppr \leqslant 18720$ The pulse count feedback per cycle should not exceed 18,720 (at frequencies above 50 kHz).

$\frac{1}{\frac{n}{60}\times ppr} \geqslant \frac{1}{10^6} \Rightarrow ppr \leqslant 20000$ $\frac{1}{\frac{n}{60}\times ppr} \geqslant \frac{1}{10^6} \Rightarrow ppr \leqslant 20000$ The pulse count feedback per cycle should not exceed 20,000 (below 50 kHz).

4) Assuming a feedback pulse count of 10 per cycle, the encoder's frequency division pulse outputs A-phase (PAO) and B-phase (PBO) signals as follows:



P0-87.0	Encoder feedback output direction selection					
	set	function	Factory	Applicable	revise	Take effect

<table>
<tr><td rowspan="4"></td><td>value</td><td></td><td>Value</td><td>Mode</td><td></td><td></td></tr>
<tr><td>0</td><td>Phase A precedes Phase B, and both rotate in the same direction (positive rotation).</td><td rowspan="2">0</td><td rowspan="2">All</td><td rowspan="2">servo OFF</td><td rowspan="2">immediately</td></tr>
<tr><td>1</td><td>Phase B precedes Phase A and rotates in the forward direction.</td></tr>
<tr><td colspan="3">Phase A precedes Phase B, and both rotate in the same direction (positive rotation).</td><td colspan="3">Phase A lags behind Phase B, and Phase B rotates in the forward direction.</td></tr>
<tr><td colspan="3">
</td><td colspan="3">
</td></tr>
<tr><td rowspan="4">P0-87.1</td><td colspan="6">Differential feedback output in Z-phase mode</td></tr>
<tr><td>set value</td><td>function</td><td>Factory Value</td><td>Applicable Mode</td><td>revise</td><td>Take effect</td></tr>
<tr><td>0</td><td>Only the forward-output encoder's frequency-divided Z-phase pulse</td><td rowspan="2">1</td><td rowspan="2">All</td><td rowspan="2">servo OFF</td><td rowspan="2">immediately</td></tr>
<tr><td>1</td><td>Both positive and negative directions output encoder-frequency-divided Z-phase pulses.</td></tr>
<tr><td rowspan="2">Z-phase pulse width</td><td colspan="3">Pulse output frequency below 50 kHz (unit: s)</td><td colspan="3">Pulse output frequency above 50 kHz (unit: s)</td></tr>
<tr><td colspan="3">$\frac{1}{\frac{n}{60}\times ppr}\div 2$</td><td colspan="3">$\frac{28.08}{n\times ppr}$</td></tr>
</table>

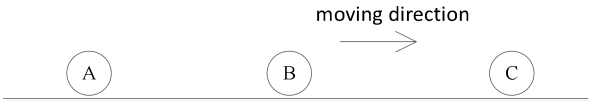
n: Rotational speed, unit: rpm; ppr: P0-19*10000 + P0-18, unit: pulses n: Rotational speed, unit: rpm; ppr: P0-19*10000 + P0-18, unit: pulses

The above formula is only an estimate.

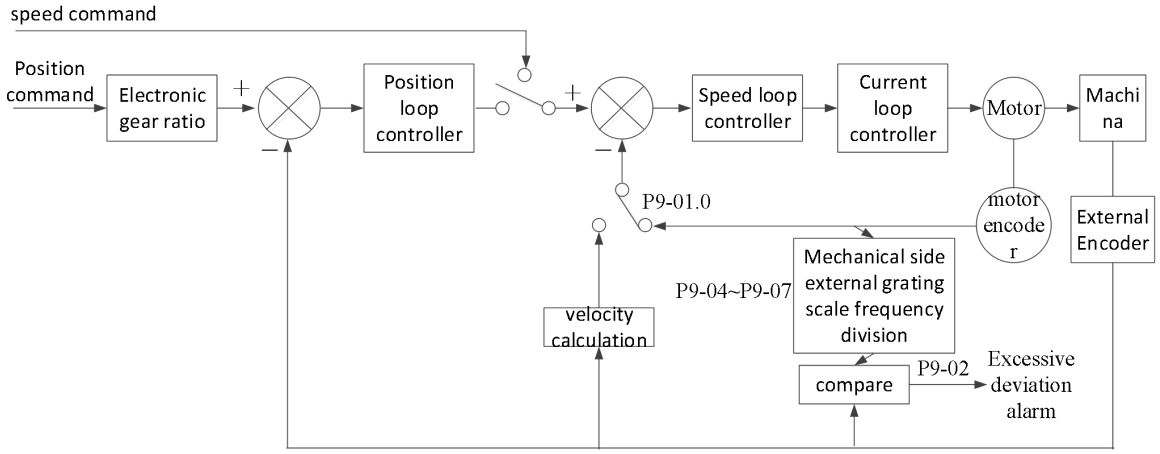
5.9 Full-Closed Loop Input

5.9.1 Above view of the Fully Closed-Loop System

A fully closed-loop system is one in which external position sensing devices (such as encoders or optical grating scales) are installed on moving machinery to detect the position of the controlled component and provide real-time position feedback to the servo unit.



At point A, a pulse command is sent from the host computer. Assuming the target position is the grating scale's feedback position C, the motor must rotate n full turns to reach it. If during operation the motor has already rotated n turns to reach point B due to mechanical deviations or other reasons, operation will continue until the grating scale feedback represents that the target position C has been reached.
The full closed-loop method ensures that control is unaffected by external mechanical deviations, improving control accuracy. Currently, the full closed-loop function supports all control modes.

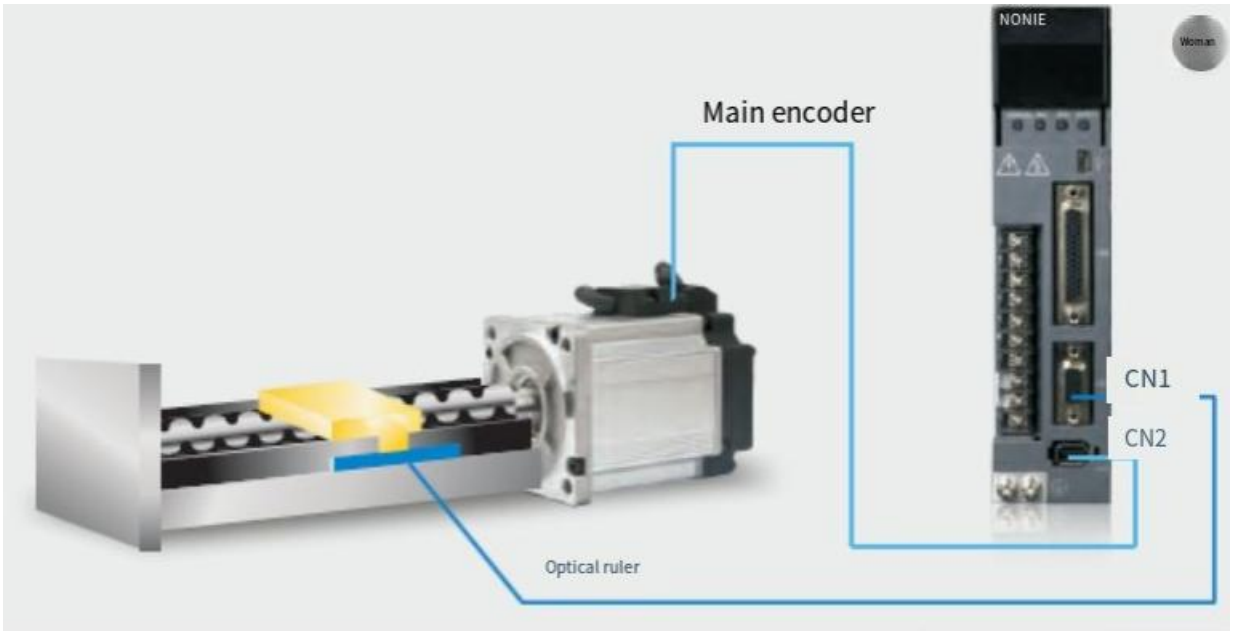


When full closed-loop mode is enabled, external grating scale position feedback is used; when full closed-loop speed feedback is enabled, external grating scale speed feedback is used. (Note: If the grating scale precision is too low or the mechanical structure has poor rigidity, enabling full closed-loop speed feedback may result in poor control performance—use this feature with caution.)
When the fully closed-loop mode is enabled, you can switch control modes (P0-01 and P0-02).

5.9.2 Input wiring for full closed-loop control

The DS5F series servo hardware versions starting from 3132 support full closed-loop input functionality. The position feedback signal from the external encoder (grating scale) is transmitted to the servo driver via port CN1.

Terminal Name	Terminal Pin Number	Terminal Functions
A+	4	Full-Closed Loop Input for Phase A
A-	5	
B+	3	Full-Closed Loop Input for Phase B
B-	2	
Z+	9	Full-Closed Loop Input for Z-phase
Z-	1	
GND	6/7	Grating scale signal ground
5V	8	Linear Scale Power Supply 5V



5.9.3 Operating Procedures for the Fully Closed-Loop Mode

5.9.3.1 Debugging before fully activating the closed-loop system

1. For the new motor in idle state, perform a stop-and-go test run after power-off to verify its operation under the semi-closed-loop system.

Under no-load conditions, perform a trial run and intermittent operation on the servo motor according to Section 4.4.2, Group F1; once confirmed correct, set the initial control parameters.

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-01	Control Method Selection	6	-	1~10	servo bb	immediately
P0-09.0	Pulse instruction positive	0	-	0/1	servo bb	again

n.xxx□	direction					power on
P0-11	Number of pulses per revolution * 1	0	pul	0 ~ 9999	servo bb	immediately
P0-12	Number of pulses per revolution × 10,000	1	pul	0 ~ 9999	servo bb	immediately
P0-13	Electronic Gear Ratio (Molecular)	1	-	0 ~ 65535	○ (Before 3770) √(3770 and later)	immediately
P0-14	Electronic Gear Ratio (Denominator)	1	-	0 ~ 65535	servo bb	immediately
P0-92	Second group of electronic gear ratios (molecules): low position *1	1	-	1 ~ 9999	servo bb	immediately
P0-93	Second group of electronic gear ratios (molecules): high position * 10,000	0	-	0 ~ 65535	servo bb	immediately
P0-94	Second group of electronic gear ratios (denominator) lower position *1	1	-	1 ~ 9999	servo bb	immediately
P0-95	Second group of electronic gear ratios (denominator): high value × 10,000	0	-	0 ~ 65535	servo bb	immediately

2. Under the condition of connected servo motor and mechanical components, verify the operation of the half-closed-loop control system.

After connecting to the relevant mechanical structure, first determine the load inertia ratio (refer to Section 6.2.4 Operating Procedures). Then use the host computer to send commands to the servo unit and verify that the mechanism is correctly connected and operating normally.

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-07	First Inertia Ratio	200	%	0 ~ 50000	at any time	immediately

5.9.3.2 Full Closed-Loop Parameter Settings

1. Linear scale counting direction confirmation

When the motor is not activated, operate the machinery manually and monitor the raw data from the

optical grating scale (U4-11/12) and the motor encoder (U0-10/11) to ensure proper installation of the grating scale or adjust its counting direction via P9-00.1.

If U4-11/12 and U0-10/11 increase or decrease in the same direction, use the grating scale reading directly. Otherwise, adjust the grating scale installation orientation or set P9-00.1 to 1.

parameter	parameter setting	Functionality Above view	Factory Settings	Set Range	revise	Take effect
P9-00	n.xx□x	Grating scale counting direction	0	The grating scale reading is positive	servo bb	again power on
			1	The grating scale reading is reversed.		

If the direction setting is incorrect and P9-02 is not set to 0, alarm E-236 (excessive deviation between motor and load positions) may be triggered during operation; in this case, disable the setting and restart the device. If P9-02 is set to 0, alarm E-237 (counting direction reversed) will occur, requiring a restart and adjustment of the value.

2. Linear scale type selection

parameter	parameter setting	Functionality Above view	Factory Settings	Set Range	revise	Take effect
P9-00	n.x(xx	Grating Scale Type	0	AB Counter	servo bb	again power on
			1	Incremental Serial Communication (Not supported)		
			2	Absolute serial communication (not supported)		

3. Linear scale feedback pulses per revolution confirmation

Method 1: Determine the resolution of the grating scale according to its manual. Send a pulse from the host computer to rotate the motor one full revolution, then count the number of feedback pulses generated during this rotation and record it as the number of feedback pulses per revolution.

Method 2: Send pulses from the host computer to rotate the motor one full revolution, monitor the change in raw data of the U4-11/12 optical grating scale, and record this as the number of feedback pulses per revolution of the grating scale (to be used after compensation for mechanical errors; not applicable directly).

4. Mechanical-side linear scale frequency division setting

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P9-05	Number of feedback pulses per revolution of the motor encoder / Low	0	PULSE	0 ~ 9999	servo bb	Power On Again

P9-06	Number of feedback pulses per revolution of the motor encoder / High	0	PULSE	0 ~ 9999	servo bb	Power On Again
P9-07	Number of feedback pulses per circle of the grating scale /Low	0	PULSE	0 ~ 9999	servo bb	Power On Again
P9-08	Number of feedback pulses per circle of the grating scale / High	1	PULSE	0 ~ 9999	servo bb	Power On Again

(1) Mechanical side grating scale frequency division

The number of feedback pulses per revolution for a motor encoder is calculated as P9-06 × 10,000 + P9-05. When the set value is 0, the encoder resolution will be automatically read and used as the numerator in the frequency division formula.

The number of feedback pulses per circle of the grating scale is calculated as P9-08*10000 + P9-07, P9-08*10000 + P9-07. The factory default resolution for the grating scale (external encoder) is 10000. Set it according to the actual grating scale resolution.



Enter the complete external grating scale division ratio; it must be irreducible.

Recommended operating range for mechanical side grating scale frequency division: 1/64 to 100× (for 17-bit encoder motors) and 1/2 to 3200× (for 23-bit encoder motors).

(2) In full closed-loop mode, it is recommended to set P0-11 and P0-12 to 0 and use the electronic gear ratios P0-13 and P0-14. Note that when using the electronic gear ratio (P0-13/P0-14), P0-13 represents the grating scale resolution rather than motor resolution, while P0-14 represents the number of pulses per revolution. P0-11 and P0-12 may also be used provided the external grating scale frequency division is correct; otherwise, alarm E-236 will be triggered.

5. Alarm Detection Parameter Settings

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P9-02	Alarming threshold for excessive deviation between motor and load positions	100	PULSE	0 ~ 65535	servo bb	immediately

(1) P9-02: Setting the alarm threshold for excessive deviations between motor encoder feedback (position) and full closed-loop grating scale feedback (load position).

If the value exceeds the set limit, Alarm E-236 will be triggered; power cycling will clear the alarm. If significant mechanical errors are confirmed to cause frequent E-236 alarms, the P9-02 value may be appropriately increased under equipment constraints. When P9-02 is set to 0, no alarm occurs; however, if the motor encoder signal and the optical encoder signal count in opposite directions, Alarm E-237 will be triggered, which can be resolved by power cycling and adjusting P9-00.1.

(2) To prevent motor Abovespeeding or damage caused by external grating scale damage or loose wiring, set P9-02 to the appropriate value.

(3) The P9-02 configuration is determined Framed on the user position command resolution.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P9-03	Setting for eliminating deviations between the motor position and the load position	0	Circle	0 ~ 65535	servo bb	immediately

(1) After completing n cumulative rotations in one direction, the P9-03 motor will reset the recorded difference between the encoder feedback (position) and the full closed-loop grating scale feedback (load position) to zero and restart counting from zero.
(2) Setting to 0 represents that the motor-load position deviation will not be eliminated; setting a non-zero value enables the deviation to be cleared after the motor has rotated n revolutions.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P9-04	Motor-load speed deviation alarm threshold value (excessive deviation allowed):	100	RPM	0 ~ 65535	servo OFF	immediately

No alarm is triggered when this parameter is set to 0.
The P9-04 motor encoder's speed feedback and full closed-loop optical grating speed feedback may exhibit deviations; if the actual deviation exceeds the set value, alarm E-238 is triggered, but this function only activates when full closed-loop speed feedback P9-01.0 is enabled.

6. Full closed-loop function enabled

parameter	parameter setting	Functionality Above view	Factory Settings	Set Range	revise	Take effect
P9-00	n.xxx□	Full closed-loop control mode switch	0	0 ~ 1	servo bb	Power On Again

When the parameter is set to 0, the full closed-loop function is disabled; when set to 1, it is enabled and controlled using an external encoder position signal.
Other related functions of P9-00 and P9-01 will only work when the P9-00.0 full closed-loop function is enabled; otherwise, even if configured, they will be ineffective. Enabling the full closed-loop function requires re-powering the servo unit.

(1) Perform a point operation at F1-00 under full closed-loop control mode (P9-00.0=1) to verify normal system operation.

Perform intermittent operation on the servo motor (via panel F1-00 or a host computer), gradually increasing speed while monitoring for any abnormalities during operation.

- relevant parameter

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P3-18	JOG Point Movement Speed	100	1rpm	0 ~ 1000	servo bb	immediately

P3-18 is the speed setting for closed-loop point-start operation, effective only in two point-start modes; it is invalid in other normal control modes.

(2) Run the servo system to verify that the entire closed-loop system operates normally.

Send commands via upper-level devices such as PLCs to monitor the servo unit's operating status. Gradually increase the speed from low to the target speed for step-by-step verification.



Enter the complete external grating scale division ratio; it must be irreducible.

5.9.4 Fully Closed-Loop Functional Correlation Parameters

5.9.4.1 Selection of Speed Feedback and Servo Pulse Output Method under Full Closed-Loop Control

parameter	Parameter Functions	Set Unit	Factory Settings	Applicable Mode	revise	Take effect
P9-01		-	n.0000	whole	servo bb	Power On Again
	parameter setting	Functionality Above view	Factory Settings	Set Range		
	n.□xxx	insignificance				
	n.x□xx	Servo Pulse Output	0	0 ~ 1		
	n.xx□x	Z Confidence Sign Source	0	0 ~ 1		
	n.xxx□	Selection of speed feedback during fully closed-loop control	0	0 ~ 1		

1. Selection of speed feedback under full closed-loop control

n.xxx□	meaning
0	Use motor encoder speed (recommended)
1	Measure speed using a grating scale

In fully closed-loop control, set to "Use motor encoder speed (P9-01.0 = 0)". When connecting only a directly driven servo motor and a high-resolution linear encoder, set to "Use linear encoder speed (P9-01.0 = 1)".

2. Source of the Z Signal

n.xx□x	meaning
0	Motor Encoder Z-phase
1	Grating scale Z-phase

P9-01.1 specifies the source of Z-phase for the zero-return process; in the new return-to-original-mode configuration, using a grating-scale Z-phase as the source is not supported.

3. Servo Pulse Output

n.x□xx	meaning
0	Motor Encoder ABZ Output
1	Grating scale ABZ output awaiting completion of positioning

P9-01.2 specifies the signal source for servo pulse output.

5.9.4.2 Monitoring Parameters in Full Closed-Loop Mode

In the fully closed-loop mode, all motor encoder data in the original control loop are replaced by position data from the optical encoder (except for data related to current loop and mechanical angle feedback).

parameter	meaning	data
U4-11	Grating scale raw data	U4-12*10000+ U4-11
U4-12		
U4-13	Number of Z-axis grating scales	-

5.9.4.3 Sampling Channel with Fully Closed-Loop Control

When the grating scale function is enabled, the position control information in position control mode comes from grating-scale feedback position data. When grating-scale speed feedback is enabled, the motor encoder's speed feedback is replaced by grating-scale speed data. In other words, the same channel samples provide grating-scale feedback information.

Sampling Channel	Sampling Function
1950	Original position information of the grating scale;
0955	The error between the position feedback from the motor encoder and that from the optical grating scale, measured at the resolution of the optical grating scale;
1957	The cumulative error between the motor encoder feedback and the grating scale position feedback differential values at user-descriptiond resolution levels.
4959	Original feedback from the motor encoder at grating scale resolution;

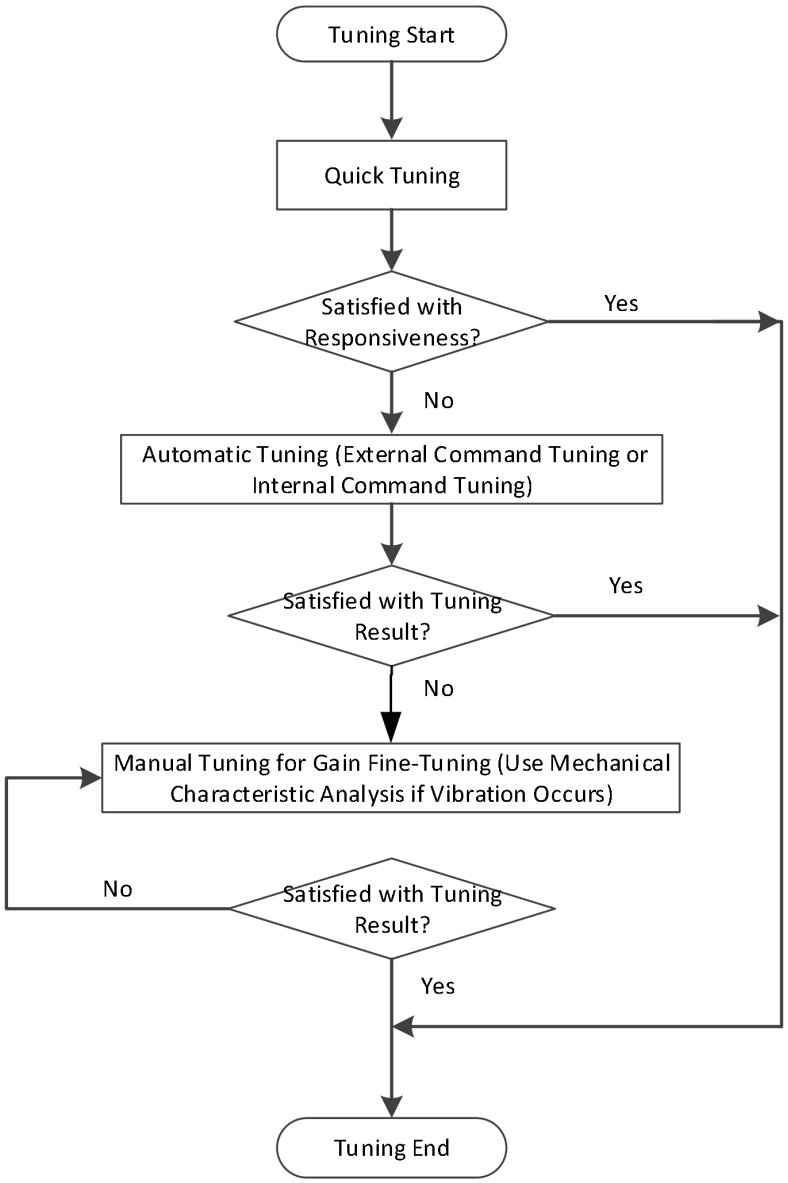
6. Adjustment of Servo Gain

6.1 Above view of Servo Gain Adjustment

6.1.1 Above view and Process

A servo driver requires a motor that operates as quickly and accurately as possible to follow commands from the host computer or internal settings. To meet this requirement, the servo gain must be properly adjusted.

The factory default servo gain is set to adaptive mode, but different machines have varying requirements for servo responsiveness. The following diagram shows the basic gain adjustment process; adjust it according to your machine's current status and operating conditions.



Marked as version 3730; earlier versions come with adaptive mode by default. Before version 3770, models up to 3 kW use auto-adjustment, while those above 3 kW use adaptive mode.

6.1.2 Differences Between Various Adjustment Methods

Adjustment methods include adaptive and self-adjusting modes, each with independent control algorithms and parameters. The self-adjusting mode comprises three functions: rapid adjustment, automatic adjustment, and manual adjustment—these share the same underlying principle but differ in implementation; refer to the corresponding sections for details.

Adjustment Method	classify	controlling parameter	rigidity	reactive mode	Key Relevant Control Parameters
self-adaption	autoadaptation	P2-01.0=1	Middle	150 ms level	P2-05 Adaptive Speed Loop Gain P2-10 Adaptive Speed Loop

					Integral P2-11 Adaptive Position Loop Gain P2-07 Adaptive Inertia Ratio P2-08 Adaptive Speed ObServo Gain P2-12 Adaptive Stability Maximum Inertia Ratio
Self-calibration	rapid adjustment	P2-01.0=0	High	10–50 ms range	P0-07 First Inertial Ratio P1-00 Speed Loop Gain P1-01 Speed Loop Integral P1-02 Position Ring Gain P2-35 Torque command filtering time constant 1 P2-49 Model Ring Gain
	self-correcting		High	10 ms level	
	Manual Adjustment		High	Determines by parameters	

6.2 Estimation of Rotational Inertia

6.2.1 Above view

Rotational inertia estimation is a function that automatically calculates the load's rotational inertia within the driver during operation (via forward and reverse rotation).
The moment of inertia ratio (the ratio of the load's moment of inertia to the motor rotor's moment of inertia) serves as the reference parameter for gain adjustment and should be set to the correct value whenever possible.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P0-07	First Inertia Ratio	500	%	0 ~ 50000	at any time	immediately

6.2.2 Precautions

When inertia cannot be determined

- Mechanical systems can only operate in one direction.

Scenarios where inertia estimation is prone to failure

- The load's rotational inertia is too large.
- The operating range is narrow, with a stroke of up to 0.5 revolutions.
- The rotational inertia varies significantly during operation.
- The mechanical rigidity is low, resulting in vibration during the estimation of inertia.

Key considerations for inertia estimation

- Since rotation is allowed in both directions within the specified movement range, confirm the movement range or direction, and ensure the load operates within a safe travel distance.
- If jitter occurs when calculating inertia using default parameters, it represents excessive load inertia. Switch to high-inertia mode (P2-03.3=1) and try again. Under heavy loads, set the initial inertia to approximately twice the current value and repeat.
- The maximum identification limit for the drive inertia ratio is 500 times (parameter upper limit: 50,000). If the estimated inertia ratio equals 50,000, it represents the limit has been reached and the ratio cannot be used. Replace with a motor featuring a larger rotor inertia.

Other Notes

- Inertia switching is not supported; the second inertia ratio is invalid.
- Starting with version 3700, the driver firmware has increased the maximum inertia ratio to 500 times (with a parameter upper limit of 50,000).

6.2.3 Operating Tools

The tools for estimating load moment of inertia are the driver panel and the XinjeServo host software.

Operation Tools	Restriction Item
Drive Panel	The driver firmware requires version 3700 or higher
XinjeServo Master Computer Software	All versions of the host software support it.

The driver firmware version can be viewed via U2-07.

6.2.4 Operating Steps

1. Steps for Estimating Inertia of the Drive Panel

1. Parameter Configuration

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P2-15	Inertia Configuration Stroke	100	0.01 turn	1 ~ 300	at any time	immediately
P2-17	Inertia identification and the maximum speed determined through internal command-Framed self-adjustment	/	rpm	0 ~ 65535	at any time	immediately
P2-18	Initial inertia ratio for inertia identification	500	%	1 ~ 20000	at any time	immediately

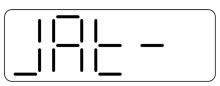
The recommended operating speed for P2-17 is 500 rpm or higher; an excessively low set speed may result in inaccurate inertia ratio identification.

2. Inertia identification implementation

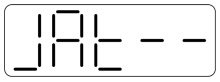
Before performing inertia identification, use the F1-00 point movement function to confirm the servo rotation direction. The initial operating direction is determined by INC or DEC at the start of inertia identification.

If servo jitter occurs under adaptive default parameters, first switch to the Adaptive High-Inertia Mode (P2-03.3=1) to ensure stable servo operation before performing inertia identification!

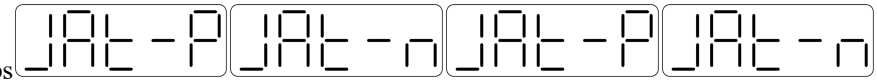
The servo enters the BB state and displays parameter F0-07:



Press and hold the ENTER key to enable the servo; the panel displays:



Press and hold the INC key for forward operation or the DEC key for reverse operation (choose one). The display will show:

perhaps 

The operation begins under the condition P0-05=0 (initial forward direction): a short press on INC initiates first forward rotation followed by reverse rotation; a short press on DEC initiates first reverse rotation followed by forward rotation. If inertia identification succeeds, the system displays the load-inertia ratio after several cycles of forward/reverse operation and writes it automatically to P0-07; if identification fails, an error code is displayed. A short press on the STA/ESC key terminates the panel's inertia identification process.

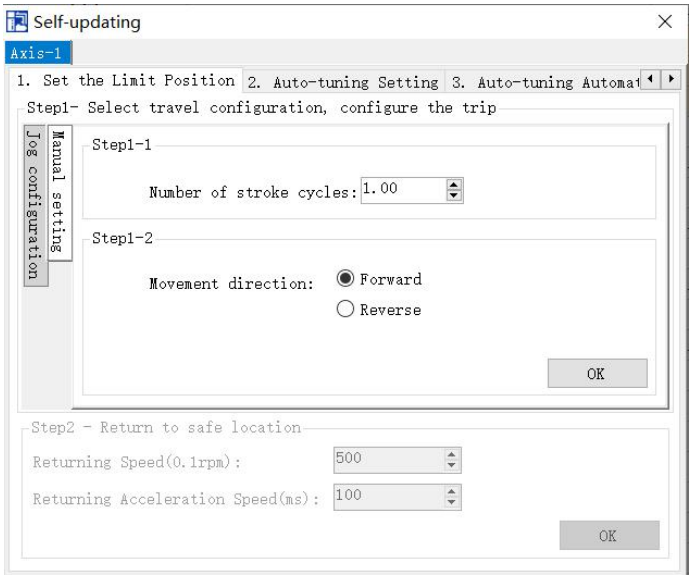
- Panel Inertia Identification Error Alarm

error code	meaning	Possible Causes and Solutions	Possible Reasons
Err-1	Motor torque saturation	① Initial inertia is too low; in adaptive mode, switch to high-inertia mode (P2-03.3=1); in self-set mode, the initial inertia value for inertia identification (P2-18) is adjusted to twice the current value. ② The maximum speed is too high (P2-17), but it should not fall below 500 rpm; an instruction speed that is too low may result in inaccurate inertia ratio identification. ③ The torque limit is too low (P3-28/29).	Insufficient initial inertia; excessive maximum speed; inadequate torque limit
Err-2	The calculated inertia value has an excessively large numerical error.	① The maximum speed limit is set too low (P2-17), but it should not fall below 500 rpm; an excessively low target speed may lead to inaccurate inertia ratio identification. ② The estimated inertia stroke is too small. It is recommended that the minimum inertia stroke for P2-15 configuration be no less than 50 units (0.5 revolution); an insufficient stroke will result in inaccurate determination of the actuated inertia. ③ Excessive institutional friction; ④ Out-of-range occurrence	The maximum speed limit is too low; the travel distance is too short; there is excessive friction in the mechanism; Abovetravel has occurred.
Err-3	Error in calculating the drive's internal stroke	① The estimated inertia travel is too small. It is recommended that the minimum inertia travel for P2-15 configuration be no less than 50 units (0.5 revolution); an insufficient travel will result in inaccurate determination of the actuated inertia.	Contact the manufacturer
Err-5	Uncontrollable vibrations occur during the inertia identification	An unhandleable vibration occurred	An unhandleable vibration occurred

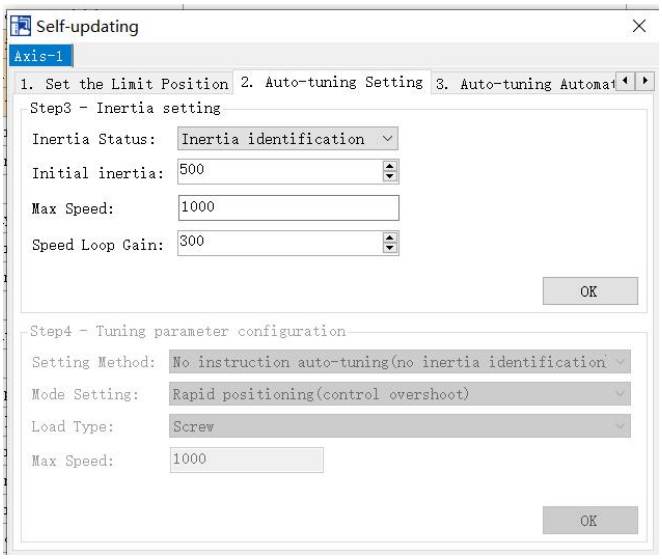
error code	meaning	Possible Causes and Solutions	Possible Reasons
	process.		
Err-6	The drive is not in BB mode currently	① The enable option is already turned on. Set P5-20 to 0 first; ② The driver alarm will appear. Press ESC to exit the configuration interface and check for any alarms.	This occurs when enabling is already enabled or when a drive alarm occurs.
Err-7	An alarm was triggered in the driver during the inertia identification process.	The drive has an alarm function. Press the ESC key to exit the calibration interface and view the alarm code. Address the alarm first before proceeding with inertia estimation.	The drive has an alarm.

II. XinjeServo Inertial Estimation Steps

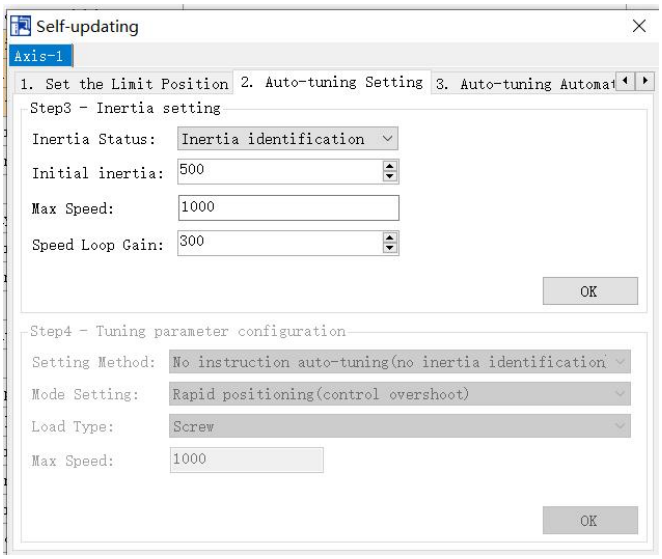
1. On the XinjeServo main menu screen, click [Self-Calibration];



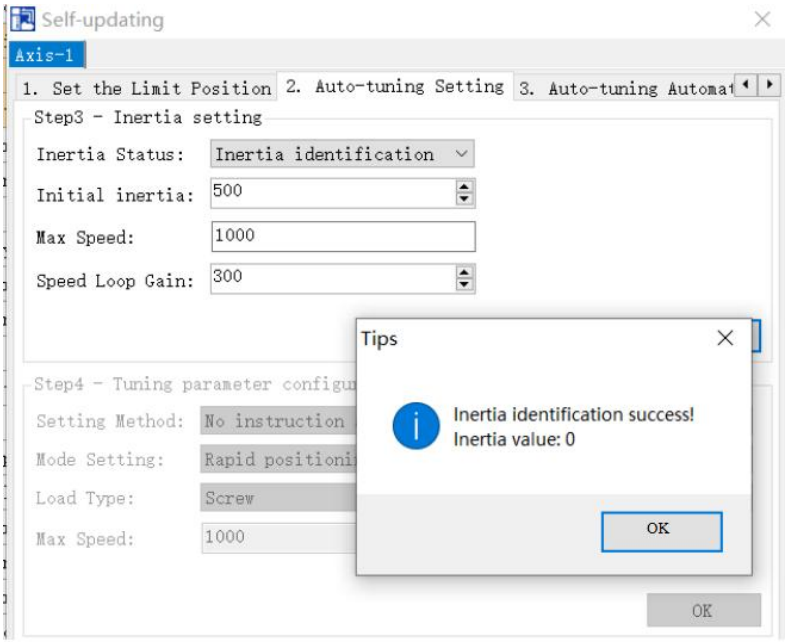
2. Select [Dynamic Configuration] or [Manual Setting] to configure the inertia estimation travel distance;



3. Configure the settings interface;



4. Click [Confirm] to start calculating the inertia.



- If you close the self-calibration interface directly at this point, the driver will only configure the inertia ratio parameters.
- For detailed instructions on using XinjeServo's estimated inertia, refer to the XinjeServo help documentation.

6.3 Quick Adjustment

6.3.1 Above view

To use Quick Adjustment, first set the load moment of inertia and then disable the adaptive function. Mismatched moments of inertia may trigger an oscillation alarm. This feature is supported in Servo firmware version 3640 and later; versions can be checked via U2-07. The gain parameters for Quick Adjustment operate in self-tuning mode.

6.3.2 Quick Adjustment Steps

;

6.2 Estimation of rotational inertia;

2. Disengage adaptive mode and set P2-01.0 to 0;



P2-01.0 is the rightmost digit of the P2-01 parameters, as shown below:

P2-01=n. 0 0 1 0

P2-01.0

6.3.3 Rigid Grade Corresponding to Gain Parameters

Rigidness Level P0-04	Rigidity Level P1-00	Speed Loop Gain P1-01	Speed loop integral P1-02	Torque command filtering P2-35	Model loop gain P2-49
1	100	6600	100	100	100
2	200	3300	200	100	300
3	300	2200	300	100	400
4	400	1650	400	100	500
5	450	1467	400	90	600
6	500	1320	450	80	700
7	550	1200	450	70	800
8	600	1100	500	60	900
9	650	1015	550	50	1000
10	700	943	600	40	1100
11	750	880	650	30	1200
12	800	825	700	20	1300
13	850	776	750	10	1400
14	900	733	800	10	1500
15	1000	660	900	10	1600

Rigidness Level P0-04	Rigidity Level P1-00	Speed Loop Gain P1-01	Speed loop integral P1-02	Torque command filtering P2-35	Model loop gain P2-49
16	1050	629	950	10	1800
17	1100	600	1000	10	2000
18	1150	574	1050	10	2200
19	1200	550	1100	10	2400
20	1300	508	1100	10	2600
21	1400	471	1200	10	2800
22	1500	440	1300	10	3000
23	1600	413	1400	10	3500
24	1700	388	1500	10	4000
25	1800	367	1600	10	4500
26	1900	347	1700	10	5000
27	2000	330	1800	10	5500
28	2100	314	1900	10	6000
29	2200	300	2000	10	6500
30	2300	287	2100	10	7000
31	2400	275	2200	10	7500

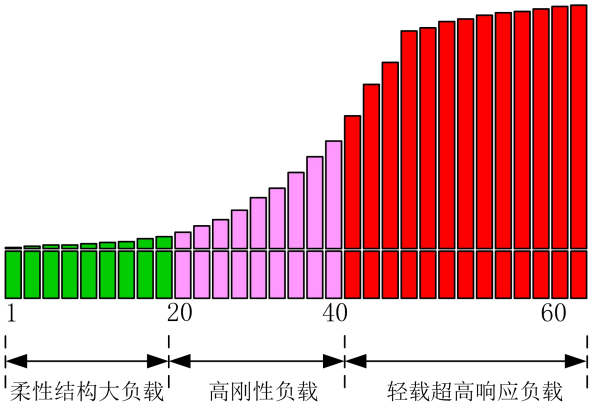
■ Firmware rigidity level for versions 3700 and later

P0-04 Rigidity Level	P1-00 Speed Loop Gain	P1-01 Speed loop integral	P1-02 Position Loop Gain	P2-35 Torque Command Filtering	P2-49 Model Ring Gain	P2-49 Model Ring Gain
1	20	31831	20	100	50	50
2	50	12732	50	100	80	80
3	70	9094	70	100	90	90
4	80	7957	80	100	100	100
5	100	6366	100	100	100	120
6	120	5305	120	100	150	150
7	140	4547	140	100	150	200
8	160	3978	160	100	200	250
9	180	3536	180	100	250	310
10	200	3183	200	100	300	350
11	220	2893	220	100	300	380
12	240	2652	240	100	350	410
13	260	2448	260	100	350	440
14	280	2273	280	100	350	470
15	300	2122	300	100	400	500
16	320	1989	320	100	400	540
17	340	1872	340	100	400	580
18	360	1768	360	100	450	620

P0-04 Rigidity Level	P1-00 Speed Loop Gain	P1-01 Speed loop integral	P1-02 Position Loop Gain	P2-35 Torque Command Filtering	P2-49 Model Ring Gain	P2-49 Model Ring Gain
19	380	1675	380	100	450	660
20	400	1591	400	100	500	700
21	450	1414	400	90	600	800
22	500	1273	450	80	700	950
23	550	1157	450	70	800	1100
24	600	1061	500	60	900	1300
25	650	979	550	50	1000	1500
26	700	909	600	40	1100	1800
27	750	848	650	30	1200	2100
28	800	795	700	20	1300	2400
29	850	748	750	10	1400	2700
30	900	707	800	10	1500	3000
31	950	670	900	10	1500	3100
32	1000	636	900	10	1600	3200
33	1050	606	950	10	1800	3300
34	1100	578	1000	10	2000	3400
35	1150	553	1050	10	2200	3500
36	1200	530	1100	10	2400	3600
37	1250	509	1100	10	2500	3700
38	1300	489	1100	10	2600	3800
39	1350	471	1200	10	2700	3900
40	1400	454	1200	10	2800	4000
41	1450	439	1250	10	2900	4100
42	1500	424	1300	10	3000	4200
43	1550	410	1350	10	3200	4300
44	1600	397	1400	10	3500	4400
45	1650	385	1450	10	3800	4500
46	1700	374	1500	10	4000	4600
47	1750	363	1750	10	4500	4800
48	1800	353	1800	10	5000	5000
49	1850	344	1850	10	5000	5000
50	1900	335	1900	10	5000	5000
51	1950	326	1950	10	5000	5000
52	2000	318	2000	10	5000	5000
53	2050	310	2050	10	6000	6000
54	2100	303	2100	10	6000	6000
55	2150	296	2150	10	6000	6000
56	2200	289	2200	10	6000	6000
57	2250	282	2250	10	6000	6000
58	2300	276	2300	10	6000	6000
59	2350	270	2350	10	6000	6000

P0-04 Rigidity Level	P1-00 Speed Loop Gain	P1-01 Speed loop integral	P1-02 Position Loop Gain	P2-35 Torque Command Filtering	P2-49 Model Ring Gain	P2-49 Model Ring Gain
60	2400	265	2400	10	6000	6000
61	2450	259	2450	10	6000	6000
62	2500	254	2500	10	6000	6000
63	2600	244	2600	10	6000	6000

The stiffness level should be set Framed on actual load conditions; the higher the P0-04 value, the greater the servo gain. If vibration occurs during stiffness level increase, further increases should be avoided; however, if vibration is eliminated through vibration suppression, additional increases may be attempted. The following are recommended stiffness levels for different loads for reference only.



High-load flexible structures: refer to equipment with synchronous belt configurations and significant load inertia.

High-rigidity load: refers to mechanisms such as lead screws or direct-connected systems, i.e., equipment with strong mechanical rigidity.

Light-load ultra-high-response load: refers to equipment with very low load inertia, sufficiently high mechanical stiffness, and requiring rapid response.

Drive Power	Default Parameters	Corresponds to firmware version 3640 Rigidity Level	Firmware versions 3700 and above correspond to the rigid level.
1.5 kW and above	P1-00=200 P1-01=3300 P1-02=200 P2-35=100 P2-49=300	2	10
200w ~ 750w	P1-00=300 P1-01=2200 P1-02=300 P2-35=100 P2-49=400	3	15
100w	P1-00=400 P1-01=1650 P1-02=400 P2-35=100 P2-49=500	4	20

6.3.4 Precautions

- In Quick Adjustment Mode, all gain parameters corresponding to the rigidity level can be independently fine-tuned.
- To ensure stability, the model ring gain is kept low at low stiffness levels; this parameter can be increased separately when high response is required.
- When rapid adjustment causes vibration, modify the torque command filter P2-35; if ineffective, perform mechanical characteristic analysis and set the relevant notch parameters (refer to Section 6.7 Vibration Suppression).
- The Quick Adjustment Mode defaults to a rigid level. If the gain doesn't meet mechanical requirements, adjust it gradually upward or downward.
- The gain switching feature is not supported; therefore, second gain parameters such as P1-05, P1-06, and P1-07 are invalid.

6.4 Automatic Adjustment

6.4.1 Above view

Automatic adjustment is divided into internal command-Framed self-adjustment and external command-Framed self-adjustment.

Automatic adjustment (internal command self-setting) refers to a function where the servo unit operates automatically (performing reciprocating movements in both forward and reverse directions) without commands from the higher-level device, adjusting its operation Framed on mechanical characteristics during runtime.

Automatic adjustment (external command self-setting) is a function that automatically optimizes parameters Framed on operational commands from the upper-level device.

The automatic adjustment items are as follows:

- Load rotational inertia
- Gain Parameters (Speed Ring, Position Ring, Model Ring Gain)
- Filter (Notch filter, torque command filter)

6.4.2 Precautions

When unable to configure

- Mechanical systems can only operate in one direction.

Scenarios where calibration is prone to failure

- The load's rotational inertia is too large;
- The rotational inertia varies significantly during operation.
- Low mechanical rigidity causes vibration during operation, resulting in failed detection and positioning.
- The operating range is small, within 0.5 revolutions.

Preparations before calibration

- Use Position Mode;
- The drive is in BB mode;
- The drive has no alarm;
- The number of pulses per revolution of the servo motor must be properly matched to the required positioning width.

6.4.3 Operating Tools

Both internal command self-setting and external command self-setting can be performed via the driver panel and the XinjeServo host software.

Calibration Mode	Operation Tools	Restriction Item
Internal commands are set after calibration.	XinjeServo Master Computer Software	All versions of the host software support it.
External commands are set after the initial configuration.	Drive Panel	The driver firmware requires version 3700 or higher

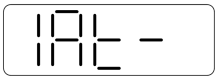
The driver firmware version can be viewed via U2-07.

6.4.4 Internal Instructions for Self-Setting Operation Steps

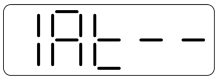
1. Self-Calibration Steps for the Drive Panel

1. Perform inertia identification by following Step 6.2.4 of the driver panel inertia estimation procedure for rotational inertia calculation.

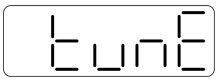
2. Enter parameter F0-09 and display "iat-";



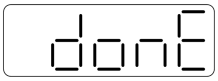
3. Press and hold the ENTER key; the panel will display "iat--", indicating that the servo is enabled.



4. Shortly press INC or DEC; the panel will display "tune" and flash, entering the calibration state.



5. The driver automatically sends pulse commands internally to operate; upon successful calibration, it displays "done" and flashes.



6. Press the STA/ESC key to exit internal instruction auto-setting mode.

During the calibration process, pressing STA/ESC briefly at any time will terminate the operation and apply the gain parameters at that moment; if calibration fails, always initialize the driver before attempting it again.

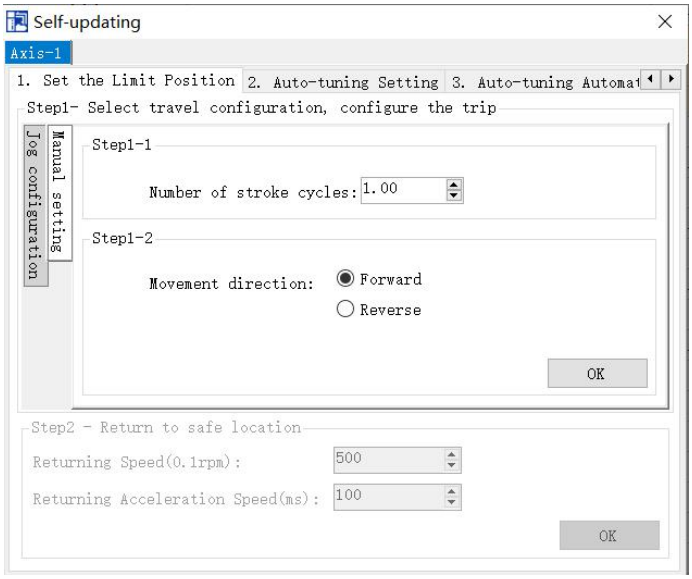
Error alarm on the Self-Calibration Process Panel

error code	meaning	Possible Reasons
Err-1	Search for optimal gain failed	The inertia ratio is too high; the mechanism's rigidity is too low
Err-2	Above-range/alarm occurred during the self-calibration process	Ensure the journey does not exceed limits or trigger alarms before auto-resetting
Err-6	The drive is not in the "bb" state when performing the operation.	Confirm the current status of the drive
Err-7	An alarm occurred in the driver during the	The drive has an alarm.

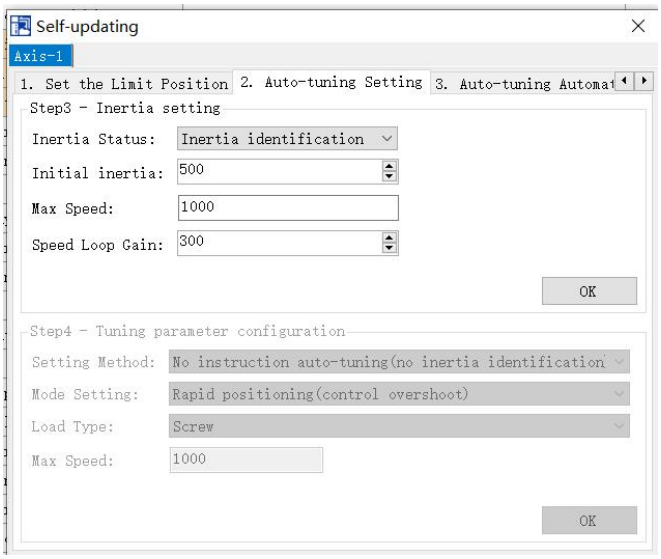
	calibration process.	

II. XinjeServo Self-Calibration Steps

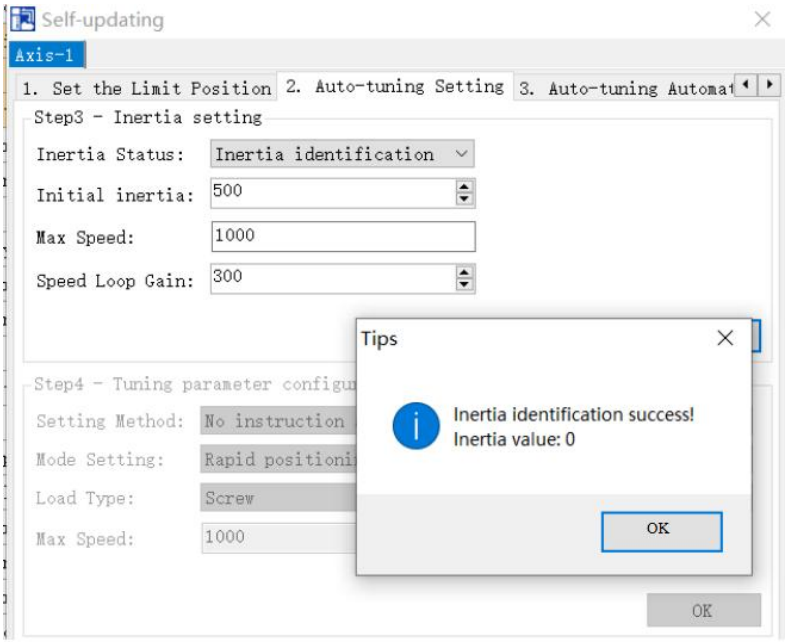
1. On the XinjeServo main menu screen, click [Self-Calibration];
2. Select [Dynamic Configuration] or [Manual Setting] to configure the inertia estimation travel distance;



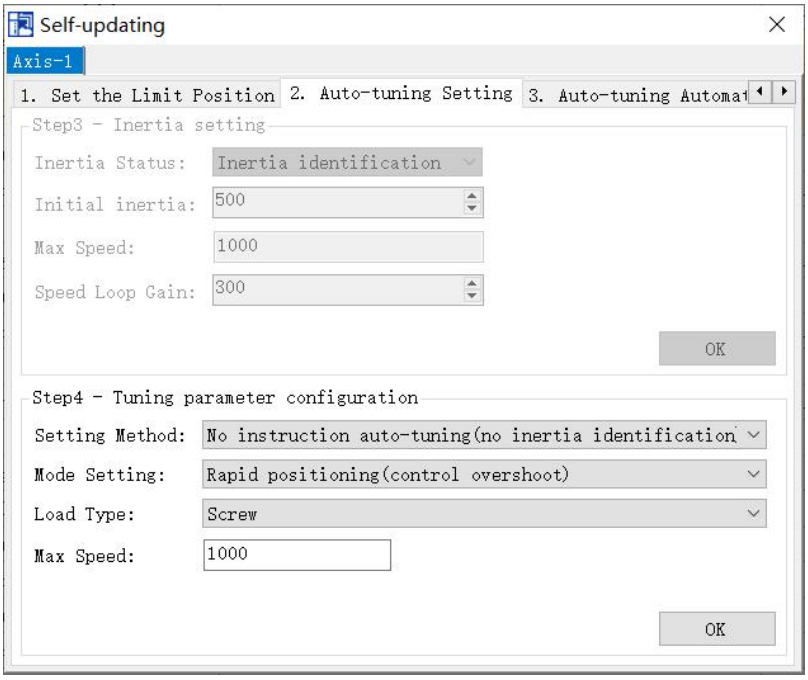
3. Configure the settings interface;



4. Click [Confirm] to start calculating the inertia;



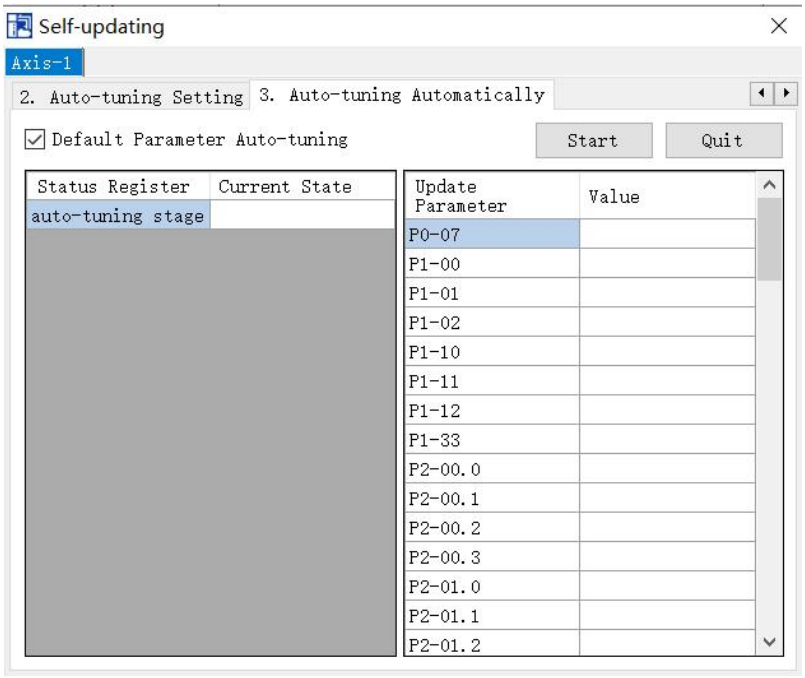
5. Adjust parameter settings;



Calibration Method	description
soft	Make gentle gain adjustments. In addition to gain adjustment, the notch filter is automatically adjusted.
quick positioning	For dedicated positioning adjustments. In addition to gain adjustment, it automatically adjusts the model loop gain and notch filter.
quick positioning (Control Aboveshoot)	During positioning application, adjustments are made to ensure no Aboveshoot. In addition to gain adjustment, the model loop gain and notch filter are automatically adjusted.

Rigidity Level	description
Synchronous belt	Perform adjustments suitable for mechanisms with low rigidity, such as synchronous belt systems.
lead screw	Perform adjustments suitable for highly rigid mechanisms such as ball screw systems. If no corresponding mechanism is available, select this type.
fixed joint	Perform adjustments suitable for rigid systems and other mechanisms with high rigidity.

6. Begin calibration;



7. Wait for the calibration to complete.

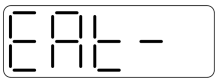
6.4.5 External Command-Framed Self-Setting Operation Steps

1. Self-Calibration Steps for the Drive Panel

1. Perform inertia identification by following Step 6.2.4 of the driver panel inertia estimation procedure for rotational inertia calculation.

2. Disengage the adaptive function (set P2-01.0 to 0) and power on again;

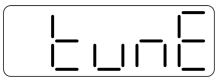
3. When entering parameter F0-08, the display shows Eat-(External Reference Auto-tuning);



4. Press and hold the ENTER key: if enabling is not enabled, the panel will display "Son" and flash; wait for enabling to activate; if enabling is already enabled, skip this step.

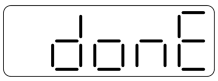


5. Enable the servo function; the panel displays "Tune" and flashes, entering the calibration state.



6. The upper-level device initiates pulse command transmission for operation; if calibration succeeds, the

screen displays "Done" with a flashing indicator.



7. Press and hold the STA/ESC key to exit external command-Framed self-setting.

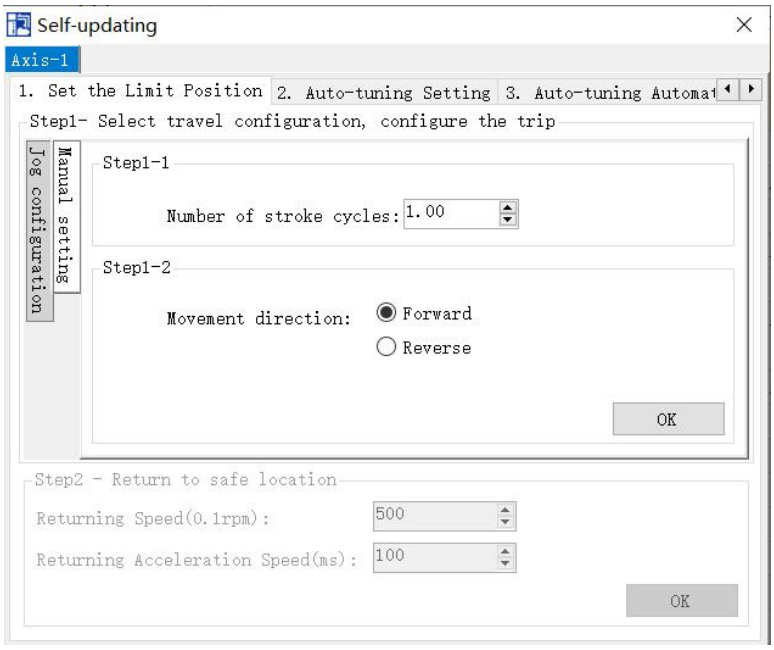
During the calibration process, a short press of STA/ESC at any time will terminate the operation and apply the gain parameters at that moment.

Error alarm on the Self-Calibration Process Panel

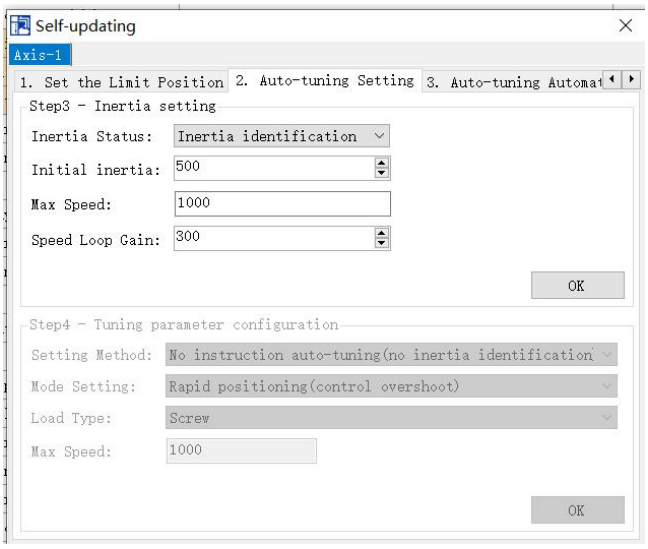
error code	meaning	Possible Reasons
Err-1	Search for optimal gain failed	The inertia ratio is too high; the mechanism's rigidity is too low
Err-2	① Above-range/alarm occurred during the calibration process ② External command setting/vibration suppression mode: Servo function is enabled during the setting process	Ensure the journey does not exceed limits or trigger alarms before auto-resetting Confirm that enabling is not disabled during the calibration process
Err-3	Current Non-Position Control Mode	Self-adjust in location mode
Err-4	Adaptive feature is not turned off	Change P2-01.0 to 0 before performing self-calibration
Err-7	An alarm occurred in the driver during the calibration process.	The drive has triggered an alarm
Err-8	The positioning completion signal is unstable.	The instruction interval is too short

II. XinjeServo Self-Calibration Steps

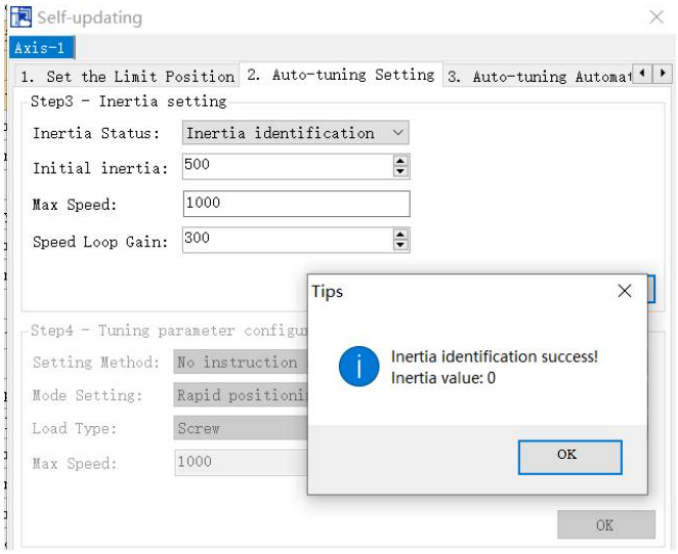
1. On the XinjeServo main menu screen, click [Self-Calibration];



2. Select [Dynamic Configuration] or [Manual Setting] to configure the inertia estimation travel distance;



3. Configure the settings interface;
4. Click [Confirm] to start calculating the inertia;

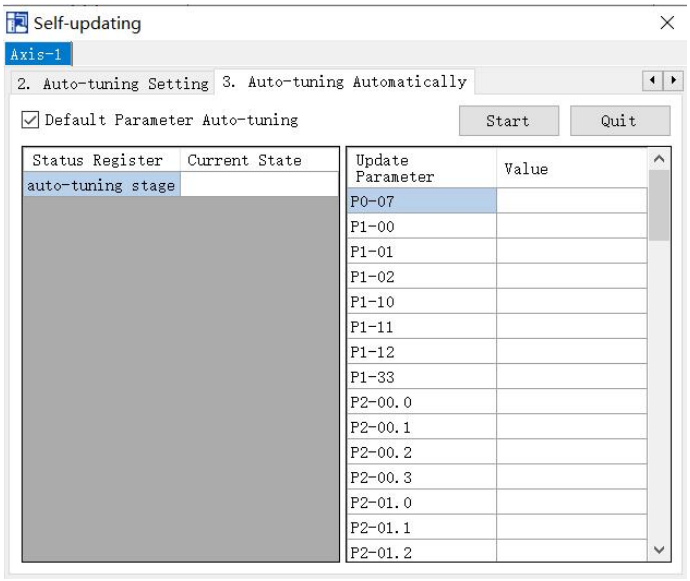


5. Adjust parameter settings;

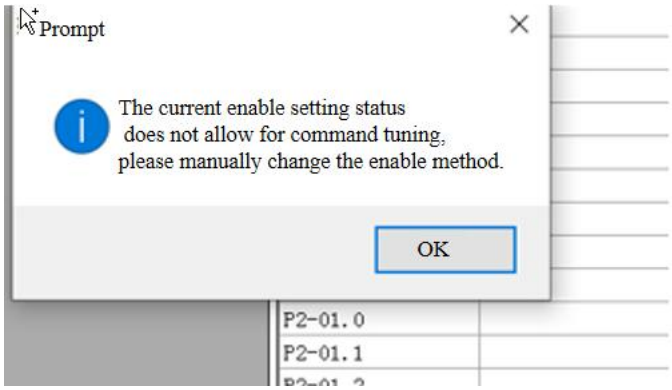
Calibration Method	description
soft	Make gentle gain adjustments. In addition to gain adjustment, the notch filter is automatically adjusted.
quick positioning	For dedicated positioning adjustments. In addition to gain adjustment, it automatically adjusts the model loop gain and notch filter.
quick positioning (Control Aboveshoot)	During positioning application, adjustments are made to ensure no Aboveshoot. In addition to gain adjustment, the model loop gain and notch filter are automatically adjusted.

Rigidity Level	description
Synchronous belt	Perform adjustments suitable for mechanisms with low rigidity, such as synchronous belt systems.
lead screw	Perform adjustments suitable for highly rigid mechanisms such as ball screw systems. If no corresponding mechanism is available, select this type.
fixed joint	Perform adjustments suitable for rigid systems and other mechanisms with high rigidity.

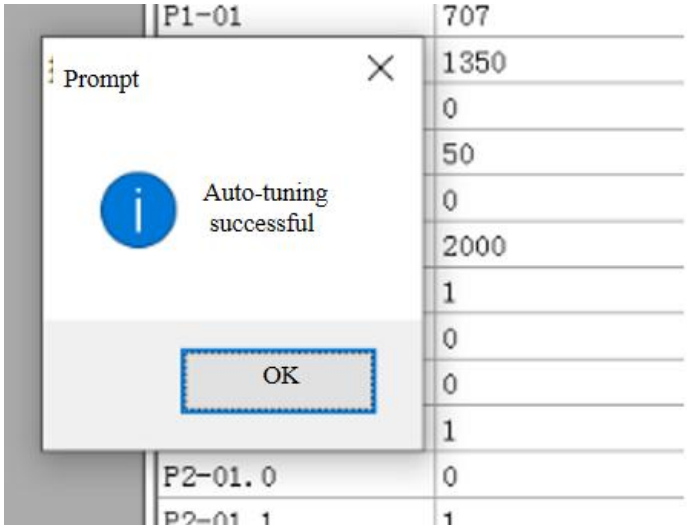
6. Begin calibration;



7. After enabling the servo, click OK;



8. The upper-level device initiates pulse command transmission and waits for calibration completion;



9. After setup is complete, click OK.

6.4.6 Relevant Parameters

The following parameters may be modified during automatic adjustment. Do not change them manually.

parameter	name	parameter attribute	After the calibration is completed, the resulting values affect the gain.
P0-07	First Inertia Ratio	Gain Performance parameter	have
P1-00	First Speed Loop Gain		
P1-01	First-speed loop integral time constant		
P1-02	First-position ring gain		
P2-00.0	Disturbance ObServo Switch		
P2-01.0	Adaptive Mode Switch		
P2-35	Torque command filtering time constant 1		
P2-41	Disturbance obServo gain		
P2-47.0	Model Loop Switch		
P2-49	Model Ring Gain		
P2-55	Model Speed Feedforward Gain		
P2-60.0	Active Vibration Suppression Switch		
P2-61	Active vibration suppression frequency		
P2-62	Active vibration suppression gain		
P2-63	Active vibration suppression damping		
P2-64	Active vibration suppression filtering time 1		
P2-65	Active vibration suppression filtering time 2		
P2-66	The second group uses active vibration suppression damping techniques.		
P2-67	Second group of active vibration suppression		

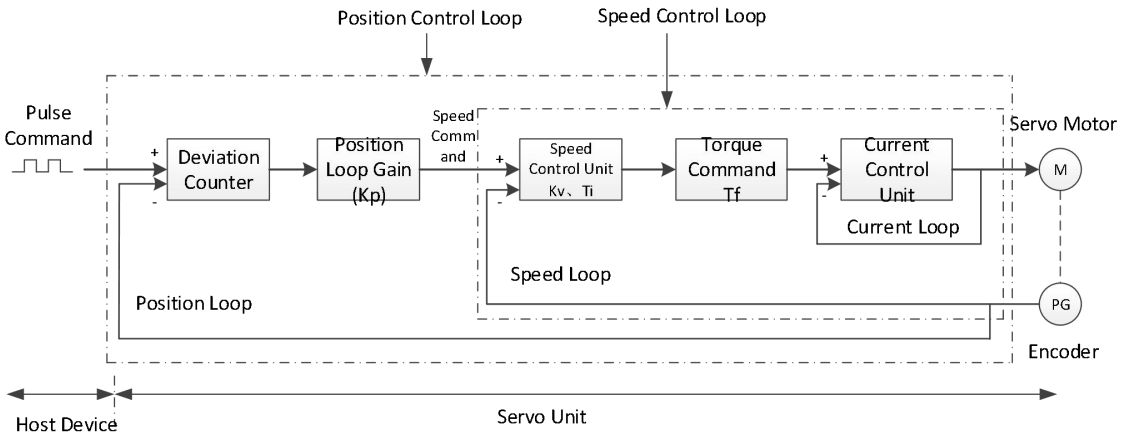
parameter	name	parameter attribute	After the calibration is completed, the resulting values affect the gain.
	frequencies		
P2-69.0	First notch switch		
P2-69.1	Second suppression switch		
P2-71	First notch frequency		
P2-72	First notch attenuation		
P2-73	First notch bandwidth		
P2-74	Second absorption frequency		
P2-75	Second absorption attenuation		
P2-76	Second absorption band width		
P2-17	Inertia identification and the maximum speed determined through internal command-Framed self-adjustment	Calibration Configuration parameter	not have
P2-86	Set the Jog Operation mode		
P2-87	Minimum limit for the adjustment movement		
P2-88	Maximum limit for the adjustment movement		
P2-89	Maximum speed during the adjustment movement		
P2-90	Set-up acceleration and deceleration time		



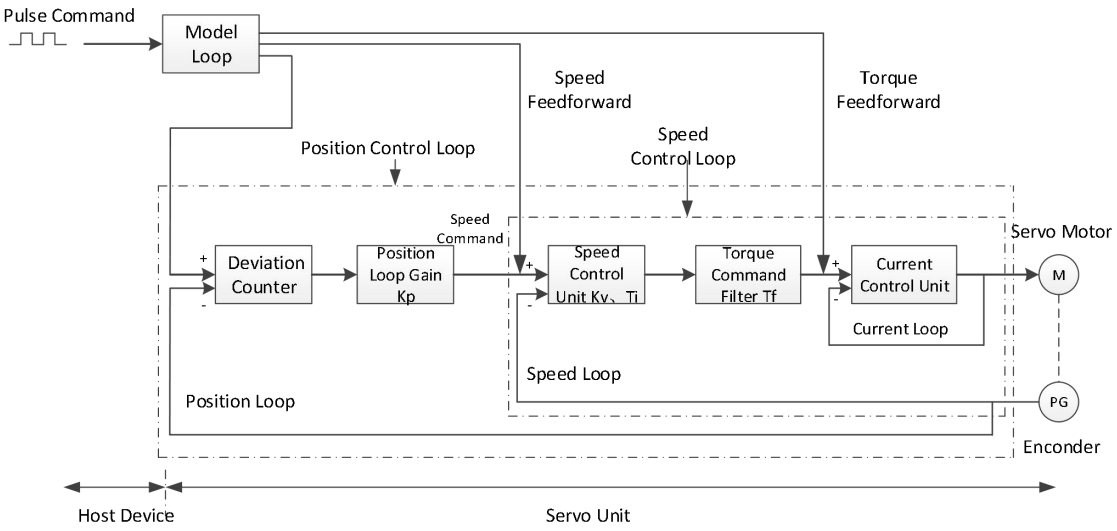
Values P2-60 to P2-67 are automatically adjusted during the self-calibration process and cannot be modified manually by users; doing so may risk system instability.

6.5 Manual Adjustment

6.5.1 Above view



Control block diagram for position control (turn off the model loop)



Control Block Diagram for Position Control (Model Loop Activated)

The servo unit consists of three feedback loops (from inner to outer: current loop, speed loop, and position loop). The innermost loop requires the highest responsiveness. Failure to adhere to this principle may result in reduced responsiveness or vibration. The current loop parameters are fixed values that ensure adequate responsiveness, eliminating the need for user adjustment.

Use manual adjustment in the following situations:

- When rapid gain adjustment fails to achieve the desired effect;
- When automatic gain adjustment fails to achieve the desired effect.

6.5.2 Example of Adjustment Steps

In position mode, if the soft mode (P2-02.0=1) is selected during self-adjustment, the model loop function is disabled; in speed mode, the position loop gain becomes ineffective.

Improve response time

1. Reduce the torque command filtering time constant (P2-35)
2. Increase the speed loop gain (P1-00)
3. Reduce the velocity loop integration time parameter (P1-01)
4. Increase the position loop gain (P1-02)
5. Increase the model loop gain (P2-49)

Reduce response, prevent vibration and Aboveshoot

1. Reduce the speed loop gain (P1-00)
2. Increase the integration time constant of the velocity loop (P1-01)
3. Reduce position loop gain (P1-02)
4. Increase the torque command filtering time constant (P2-35)
5. Reduce model loop gain (P2-49)

6.5.3 Adjusted Gain Parameters

The gain parameters that need adjustment are generally:
P1-00 Speed Loop Gain
P1-01 Integration Time Constant for the Speed Loop
P1-02 Position Ring Gain
P2-35 Torque Command Filter Time Constant
P2-49 Model Ring Gain

- Speed Loop Gain

When the speed loop exhibits low responsiveness, it becomes a delay factor for the lateral position loop, leading to Aboveshoot or vibration in the speed command. Therefore, within the range where no vibration occurs in the mechanical system, the higher the set value, the more stable and responsive the servo system becomes.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P1-00	Speed Loop Gain	200	0.1Hz	10 ~ 20000	at any time	immediately

- Speed loop integral time constant

To ensure responsiveness even to minimal inputs, the speed loop incorporates an integral element. Since this integral element acts as a delay component in servo systems, setting the time constant too large may cause Aboveshoot or prolong positioning time, thereby reducing responsiveness.

The speed-loop gain and the speed-loop integration time constant approximately satisfy the following relationship: P1-00 × P1-01 = 636620

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P1-01	Speed loop integral time constant	3300	0.01ms	15 ~ 51200	at any time	immediately

- Position Loop Gain

When the model loop is inactive (P2-47.0 = 0), the responsiveness of the servo unit's position loop is determined by its gain. A higher position loop gain results in greater responsiveness and shorter positioning time. Generally, the gain should not be set beyond the range of the mechanical system's natural frequencies. Therefore, achieving a high position loop gain requires increasing the machine's rigidity and raising its natural frequencies.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P1-02	Position Loop Gain	200	0.1/s	10 ~ 20000	at any time	immediately

- Torque command filtering time constant

Vibrations caused by servo drive can be eliminated by adjusting the filtering time parameter for torque commands. A smaller value enables better responsive control, though subject to machine constraints. When vibrations occur, reduce this parameter; the recommended range is 10–150.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P2-35	Torque command filtering time constant 1	100	0.01ms	0 ~ 65535	at any time	immediately

- Model Ring Gain

When the model loop is active (P2-47.0 = 1), the servosystem's responsiveness is determined by its model loop gain. Increasing this gain enhances responsiveness and shortens positioning time; in this case, the system's responsiveness depends solely on this parameter rather than P1-02 (position loop gain). The model loop gain applies only to position mode.

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P2-49	Model Ring Gain	500	0.1Hz	10 ~ 20000	at any time	immediately

6.6 Adaptive

6.6.1 Above view

The adaptive function enables stable response through automatic adjustment regardless of machine type or load fluctuations. Servo ON automatically initiates the adjustment process.

6.6.2 Precautions

- After the servo unit is installed on the machine, it may produce a brief sound when first powered on. This is due to the automatic notch filter being configured and does not indicate a fault. No sound will be heard during subsequent power-ups.
- When operating beyond the motor's allowable load moment of inertia, the motor may vibrate. In this case, adjust the relevant adaptive parameters to match the current load moment of inertia.
- During adaptive operation, to ensure safety, enable the adaptive function in a state where it can be stopped or disabled urgently at any time.

6.6.3 Operating Procedures

The factory setting is in the calibration mode, so no other parameters need to be modified. Whether adaptive mode is enabled is controlled by the following parameters.

Parameter		Meaning	Factory Settings	Revise	Take Effect
P2-01	n.□□□0	Adaptive Close	n.□□□0	servo bb	Power On Again
	n.□□□1	Adaptive Open			

6.6.4 Momentum Mode and Related Parameters

The adaptive default parameter is set to the low-inertia mode. If the load inertia significantly exceeds the motor's allowable rotational inertia (e.g., 60 times the inertia of a 60-watt motor), you can activate the adaptive high-inertia mode.

Parameter		Meaning	Factory Settings	Revise	Take Effect
P2-03	n.0□□□	Adaptive Low-Inertia Mode	n.0□□□	servo bb	Power On Again
	n.1□□□	Adaptive High-Inertia Mode			

Parameter	Meaning	Factory Settings	Revise	Take Effect
P2-05	Adaptive Speed Loop Gain	400 Notes 1	servo bb	immediately
P2-10	Adaptive Speed Loop Integration	500	servo bb	immediately

Parameter	Meaning	Factory Settings	Revise	Take Effect
P2-11	Adaptive Position Loop Gain	100	servo bb	immediately
P2-07	Adaptive Inertia Ratio	0	servo bb	immediately
P2-08	Adaptive Speed ObServo Gain	60	servo bb	immediately
P2-12	Adaptive Stable Maximum Inertia Ratio	30	servo bb	immediately
P2-16	Adaptive control of the motor rotor inertia coefficient	100	servo bb	immediately
P2-19	Adaptive Control Bandwidth	50 Notes 2	servo bb	immediately
P6-05	Adaptive large-inertia mode velocity-loop gain	200	servo bb	immediately
P6-07	Adaptive Large Inertia Mode Inertia Ratio	50	servo bb	immediately
P6-08	Gain of the adaptive large-inertia mode velocity obServo	40	servo bb	immediately
P6-12	Adaptive large-inertia mode stabilizes the maximum inertia ratio.	50	servo bb	immediately

- Note 1: For DS5 series servos with 750 W or lower power, the default value is 400; for other power ranges, the default value is 200.
- Note 2: For DS5 series servos with 400 W or lower power, the default value is 70; for other power ranges, the default value is 50.

6.6.5 Recommended Inertia Ratio Parameters

Under adaptive default parameters, the system only ensures stable operation of the load at a specific moment of inertia. If the load has a large moment of inertia, some parameters still need to be adjusted. The recommended parameters are as follows (all modified parameters were set under the default parameters).

Motor Housing	Inertia	Parameter
40～90 Frame	Within 20 times the inertia value	Adaptive Low-Inertia Mode (Default Parameter)
	Inertia of 20 to 30 times	Change P2-08 to 50 and P2-12 to 40
	Inertia of 30 to 40 times	Change P2-08 to 50, P2-12 to 40, and P2-07 to 10
	Inertia of 40 to 50 times	Change P2-08 to 50, P2-12 to 40, and P2-07 to 30
	Inertia of 50 to 80 times	Switch to Adaptive High-Inertia Mode or modify P2-08=40, P2-12=50, P2-07=50
110/130 Frame	Within 10 times the inertia	Adaptive Low-Inertia Mode (Default Parameter)
	Inertia of 10 to 15 times	Change P2-08 to 50 and P2-12 to 40

Motor Housing	Inertia	Parameter
	Inertia of 15 to 20 times	Switch to Adaptive High-Inertia Mode or modify P2-08=40, P2-12=50, P2-07=50
Frame with a height of 180 cm or more	Within 5 times the inertia	Adaptive Low-Inertia Mode (Default Parameter)
	Inertia of 5 to 10 times	Change P2-08 to 50 and P2-12 to 40
	Inertia of 10 to 20 times	Switch to Adaptive High-Inertia Mode or modify P2-08=40, P2-12=50, P2-07=50



Parameters with high inertia can still handle loads with lower inertia; for example, a parameter with 50 times the inertia can be used in a mechanism requiring 20 times the load inertia, though its responsiveness will decrease.

6.6.6 Effects of Adaptive Correlation Parameters

Parameter Small Inertia / Large Inertia	Name	Windows Default	Reference Angle Section Range	Effect
P2-05/P6-05	Speed loop gain in adaptive mode	400/200	200 ~ 400	Reduction improves inertia capacity but decreases responsiveness, significantly impacting it.
P2-07/P6-07	Load Inertia Ratio in Adaptive Mode	0/50	0 ~ 200	An increase in this parameter can significantly enhance the system's inertia capacity without compromising responsiveness; however, excessive increases may readily induce oscillations.
P2-08/P6-08	Speed Observer Gain	60/40	30 ~ 60	Reducing P2-08 while increasing P2-12 can significantly enhance the system's inertia capacity, but it will compromise responsiveness, with a substantial impact on response performance.
P2-12/P6-12	Adaptive Mode Stabilization with Maximum Inertia Ratio	30/50	30 ~ 60	
P2-10	Adaptive Mode Speed Loop Integration Time Coefficient	500	200 or more	Adjust as needed; generally increase
P2-11	Adaptive Mode Position Loop Gain Coefficient	100	50 ~ 200	Adjust as needed to increase response speed and magnitude, or decrease response magnitude and speed
P2-16	Adaptive Mode Motor Rotor Inertia Coefficient	100	100 ~ 200	Enhances servo rigidity and improves resistance to

				disturbances, effectively addressing operational jitter.
P2-19	Adaptive Control Bandwidth	50 ~ 70	40 ~ 80	Increasing the magnitude slightly enhances the inertia capacity with minimal impact on responsiveness, serving as an auxiliary parameter.

6.6.7 Parameters whose adaptive validity becomes invalid

When the adaptive function is active (P2-01.0=1), the parameters that become inactive are listed in the table below:

Project	Parameter	Parameter Name
Gain Class	P1-00 P1-05	First Speed Loop Gain Second Speed Loop Gain
	P1-01 P1-06	First-speed loop integration time constant Second speed loop integration time constant
	P1-02 P1-07	First-position ring gain Second Position Ring Gain
	P2-49	Model Ring Gain
	P0-07 P0-08	First Inertia Ratio Second Inertia Ratio
	P5-36	-I-SEL Inertia Ratio Switching

6.7 Vibration Suppression

6.7.1 Above view

Mechanical systems possess a specific resonant frequency; when the servo gain is increased, sustained vibrations may occur near this frequency (typically between 400 Hz and 1000 Hz), preventing further gain improvement. Vibrations can be eliminated either through automatic detection or manual adjustment of the vibration frequency. Once vibrations are eliminated, the gain may be further increased to enhance responsiveness.



- After performing vibration suppression, the servo responsiveness will change compared to before.
- Before performing vibration suppression, correctly set the moment of inertia ratio and gain parameters; otherwise, control will not function properly.

6.7.2 Operating Tools

Adjustment Method	Operation Tools	control model	Refer to the operational steps for guidance.	Restriction Item
Adaptive Mode	XinjeServo Mechanical Property Analysis	In Position Mode	6.7.4 Vibration Suppression (Host Computer Software)	All versions of the host software support it.
Self-Calibration Mode	Panel Vibration Reduction Operation		6.7.3 Vibration Suppression (Panel)	The driver firmware requires version 3700 or higher
	XinjeServo Mechanical Property Analysis		6.7.4 Vibration Suppression (Host Computer Software)	All versions of the host software support it.
Self-Tuning/Adaptive Mode	Panel Vibration Reduction Operation		6.7.7 Vibration Suppression (Fast FFT)	The driver firmware requires version 3730 or higher



The driver firmware version can be viewed via U2-07.

6.7.3 Vibration Suppression (Panel)

The panel vibration inhibition system has two operating modes: Mode 1 (vib-1) and Mode 2 (vib-2).

- Two Differences in Vibration Suppression Mechanisms

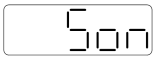
Vibration Suppression Mode	Show	Changed Parameters
pattern 1	vib-1	Only changes vibration suppression-related parameters
pattern 2	Vib-2	Changes vibration suppression parameters and speed loop gain

The following describes the steps:

1. In self-calibration mode, select parameter F0-10 to display vib-1 on the panel, or select F0-11 to display vib-2.



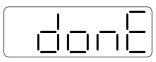
2. Press and hold the ENTER key; the panel will display "Son" and flash. At this point, manually enable it.



3. After enabling the servo, the panel displays "Tune" and flashes, indicating that the system has entered the calibration state.



4. The upper-level device initiates pulse command transmission until the "done" indicator flashes, indicating successful vibration suppression.



5. Press and hold the STA/ESC key to exit;
6. Vibration suppression parameters are automatically written to both the first and second notch filters (the second filter is prioritized when there is only one vibration point). For detailed parameters, see Section 6.7.7 Notch Filters.

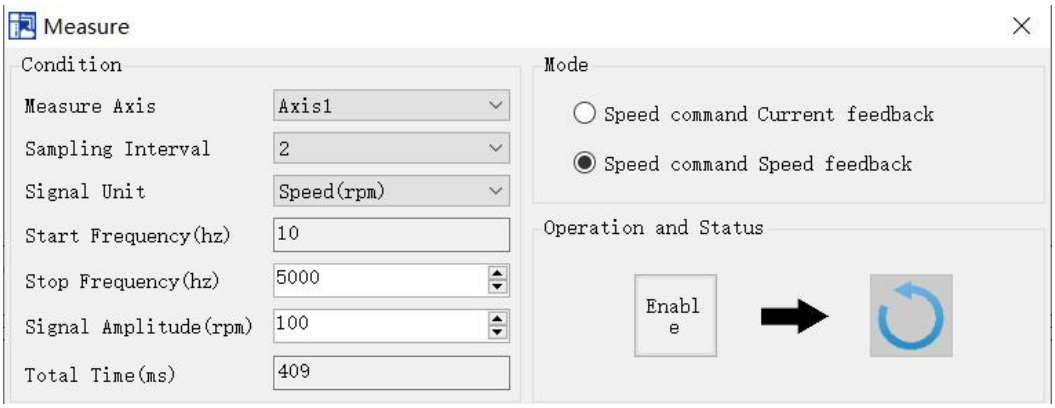
- Panel error alarm for vibration suppression process

Error Code	Meaning	Possible Reasons
Err-1	Search for optimal gain failed	The moment of inertia ratio is too high; the mechanism rigidity is too low
Err-2	① Above-range/alarm occurred during the calibration process ② External command setting/vibration suppression mode: Servo function is enabled during the setting process	Ensure the journey does not exceed limits or trigger alarms before resetting Confirm that enabling is not disabled during the calibration process
Err-3	Current Non-Position Control Mode	Self-adjust in location mode
Err-4	Adaptive feature is not turned off	Change P2-01.0 to 0 before performing

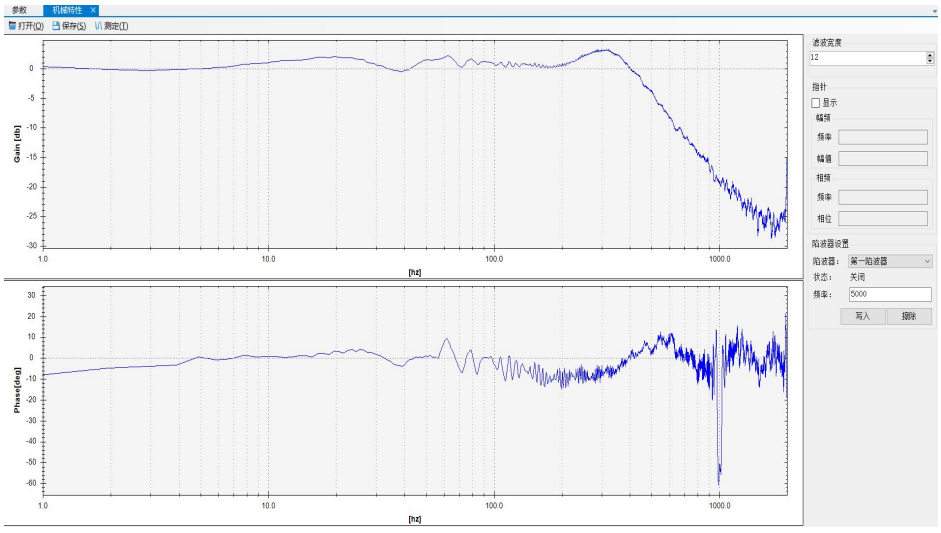
		self-calibration
Err-7	An alarm occurred in the driver during the calibration process.	The drive has triggered an alarm
Err-8	The positioning completion signal is unstable.	The instruction interval is too short

6.7.4 Vibration Suppression (Host Computer Software)

1. Open the XinjeServo host software and select Mechanical Properties;
2. Click [Measure];



3. Configure the test conditions, then click [Run];
4. Select [Amplitude and Phase];



5. Set the filter width (to clearly view the resonance frequency) and identify the resonance frequency;
6. The notch filter parameters need to be set manually; refer to Section 6.7.7 for details.

Taking the above figure as an example, mechanical analysis reveals a resonance frequency of 328 Hz. The third notch filter can be employed with the following parameter settings:
P2-69=n.1000 P2-77=328

Whether in adaptive or self-tuning mode, using mechanical characteristic analysis constitutes manual notch setting. If multiple resonance points exist, configure the third to fifth notch filters sequentially.

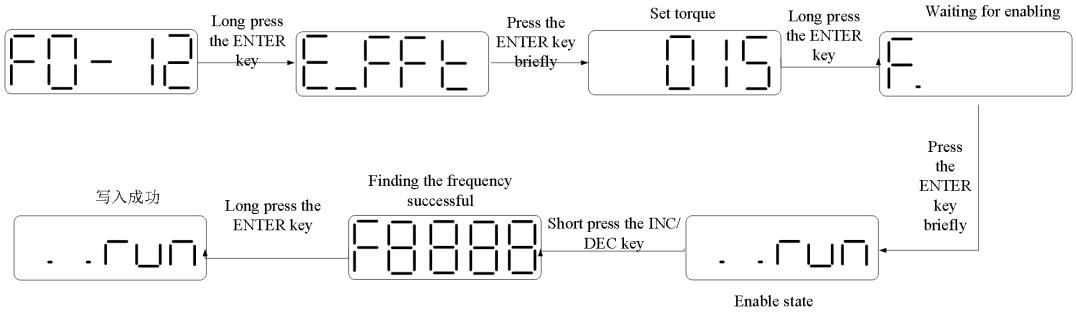
6.7.5 Vibration Suppression (Manual Setting)

When the resonant frequency of the mechanical system is known, you can eliminate vibrations by manually setting the vibration frequency. Configure the third to fifth notch filters. For detailed parameters, see Section 6.7.7 Notch Filters.

6.7.6 Vibration Suppression (Fast FFT)

This function enables mechanical characteristic analysis via parameters F0–12 on the servo control panel, identifying mechanical resonance frequencies to achieve vibration suppression.

The complete procedure is shown below:



The following describes the steps:

1. For F0–12, press and hold [ENTER] to activate the EasyFFT function, displaying "E_FFt";



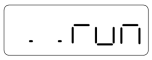
2. Press [ENTER] to enter the torque setting interface, where the currently set torque value (i.e., the value of P6-89) will be displayed. Use [INC] or [DEC] to adjust the torque command; when increasing the torque value, increment it gradually to avoid severe equipment vibration.



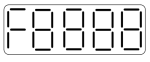
3. After setting the torque command, press and hold [ENTER] to enter the "Prepare for Activation" phase; the interface will display "F.".



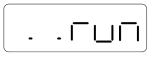
4. Press [ENTER] to enable and display "...run";



5. Press [INC] and [DEC] to switch directions and identify the resonant frequency. During operation, the interface will flash "E_FFt"; if the resonant frequency is found, it will display "Fxxxx", where "xxxx" represents the resonant frequency. If the search fails, the interface will show "F----".



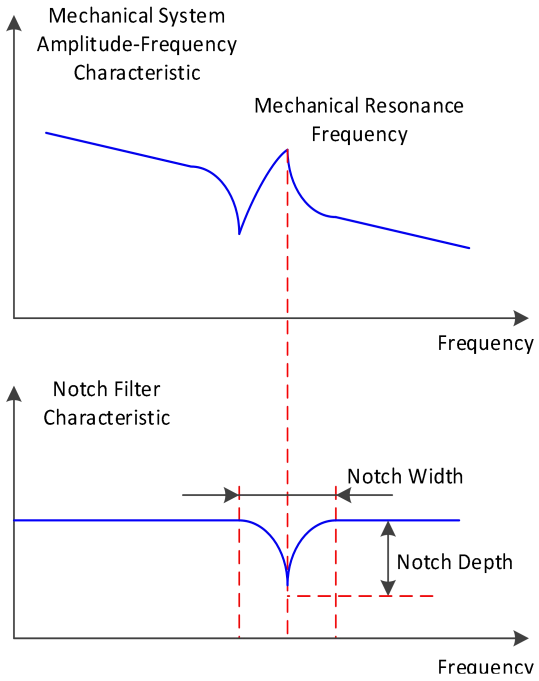
6. Whether the display shows "Fxxxx" or "F----", continue pressing [INC] and [DEC] to locate the resonant frequency again. Once identified, hold [ENTER] to set the displayed resonant frequency in the driver's notch filter.



Press and hold the STA/ESC key to return to the previous step; tap [STA] to exit.

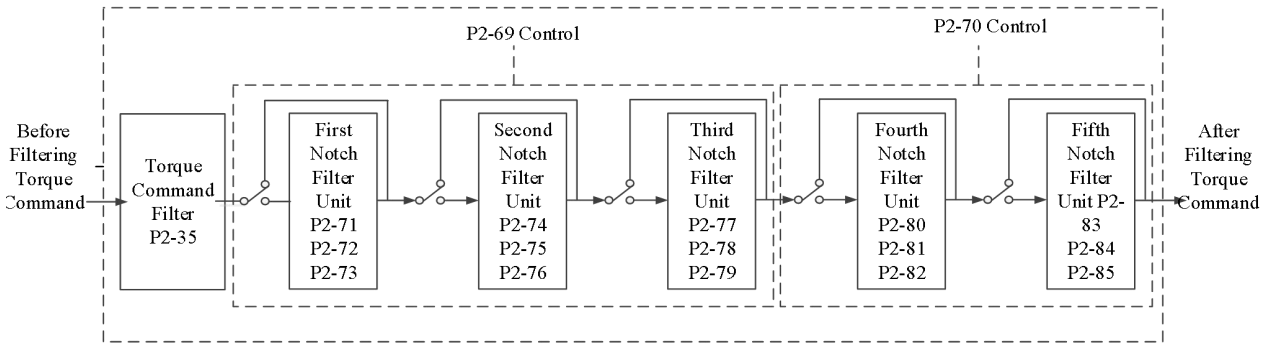
6.7.7 Notch filter

A notch filter suppresses mechanical resonance by reducing gain at specific frequencies. Once properly configured, the filter effectively attenuates vibrations; you may then increase the servo gain further.
The schematic diagram of the notch filter is shown below:



Slokker Wiring diagram

The servo driver features five groups of notch filters, each with three parameters: notch frequency, notch attenuation, and notch bandwidth. The first and second notch filters are automatically set, while the third, fourth, and fifth are manually adjustable.
The torque command filter and notch filter are connected in series within the system, as shown in the figure below, with their switching controlled by P2-69 and P2-70.



parameter		meaning	Factory Settings	revise	Take effect
P2-69	n.□□□0	The first notch is closed	n.□□□0	at any time	immediately
	n.□□□1	First notch is open			
	n.□□0□	The second bandpass filter is off	n.□□0□	at any time	immediately
	n.□□1□	Second bandpass filter is turned on			
	n.0□□□	The third filter is turned off.	n.0□□□	at any time	immediately
	n.1□□□	The third choke is open			
P2-70	n.□□□0	The fourth absorber is turned off.	n.□□□0	at any time	immediately
	n.□□□1	The fourth absorber is open			
	n.□□0□	The fifth filter is turned off.	n.□□0□	at any time	immediately
	n.□□1□	The fifth filter is turned on			

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P2-71	First notch frequency	5000	Hz	50 ~ 5000	at any time	immediately
P2-72	First notch attenuation	70	0.1dB	50 ~ 1000	at any time	immediately
P2-73	First notch bandwidth	0	Hz	0 ~ 1000	at any time	immediately
P2-74	Second absorption frequency	5000	Hz	50 ~ 5000	at any time	immediately
P2-75	Second absorption attenuation	70	0.1dB	50 ~ 1000	at any time	immediately
P2-76	Second absorption band width	0	Hz	0 ~ 1000	at any time	immediately
P2-77	Third absorption frequency	5000	Hz	50 ~ 5000	at any time	immediately
P2-78	Third waveguide attenuation	70	0.1dB	50 ~ 1000	at any time	immediately

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P2-79	Third absorption band width	0	Hz	0 ~ 1000	at any time	immediately
P2-80	Fourth absorption frequency	5000	Hz	50 ~ 5000	at any time	immediately
P2-81	Fourth absorption wave attenuation	70	0.1dB	50 ~ 1000	at any time	immediately
P2-82	Fourth absorption band bandwidth	0	Hz	0 ~ 1000	at any time	immediately
P2-83	Fifth absorption frequency	5000	Hz	50 ~ 5000	at any time	immediately
P2-84	Fifth: Waveform attenuation	70	0.1dB	50 ~ 1000	at any time	immediately
P2-85	Fifth absorption band bandwidth	0	Hz	0 ~ 1000	at any time	immediately

- In adaptive mode, the second notch filter is automatically configured when vibration is detected.
- In automatic adjustment mode, the second and first notch filters are automatically configured when vibration is detected (the second filter takes priority when there is only one vibration point).
- Whether in adaptive or self-adjusting mode, using mechanical characteristic analysis requires manual setup of notch filters; configure the third to fifth notch filters.

6.8 Benefit Adjustment Application Features

6.8.1 Model Ring Control

In self-tuning mode, in addition to the gain of the speed loop and position loop, there is also a model-loop gain, which significantly influences servo responsiveness. When the model loop is disabled, servo responsiveness is determined by the position-loop gain; when enabled, it is determined by the model-loop gain. The model loop serves as a feedforward function within the driver's control circuit, with its specific role detailed in Section 6.5 on manual adjustment.

The model loop function automatically turns off when the auto-adjust mode is set to Soft; it turns on automatically when the auto-adjust mode is set to Fast Positioning or Fast Positioning (Control Abovelap).

Self-Calibration Mode

parameter		meaning	Factory Settings	revise	Take effect
P2-02	n.□□□1	soft	n.□□□3	at any time	immediately
	n.□□□2	quick positioning			
	n.□□□3	Quick Localization (Control Abovelap)			

Selection of Self-Tuning Mode:

① Soft (P2-02.0 = 1):

This method does not enable model loop gain, operates smoothly, and is suitable for applications with insufficient mechanical rigidity and low response requirements.

② Rapid positioning (P2-02.0 = 2):

This method offers the fastest response in parameter tuning, but provides no significant suppression of Aboveshoot.

③ Rapid positioning (control Aboveshoot) (P2-02.0=3):

This method features rapid parameter response and effectively suppresses Aboveshoot.

loadtype	description
Synchronous belt	Perform adjustments suitable for mechanisms with low rigidity, such as synchronous belt systems.
lead screw	Perform adjustments suitable for highly rigid mechanisms such as ball screw systems. If no corresponding mechanism is available, select this type.
fixed joint	Perform adjustments suitable for rigid systems and other mechanisms with high rigidity.

Self-Calibration Mode	description
soft	Make gentle gain adjustments. In addition to gain adjustment, the notch filter is automatically adjusted.

quick positioning	For dedicated positioning adjustments. In addition to gain adjustment, it automatically adjusts the model loop gain and notch filter.
quick positioning (Correct Aboveshoot)	During application-specific configuration, adjust parameters to avoid Aboveshoot. In addition to gain adjustment, the system automatically adjusts model loop gain and notch filter settings.

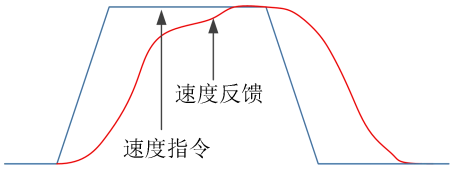
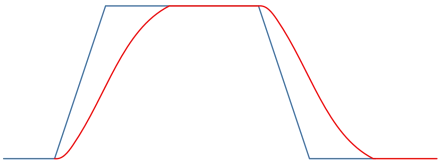
parameter		meaning	Factory Settings	revise	Take effect
P2-02	n.□□□1	soft	n.□□□3	at any time	immediately
	n.□□□2	quick positioning			
	n.□□□3	Quick Localization (Control Abovelap)			

Model Ring Function Switch

parameter		meaning	Factory Settings	revise	Take effect
P2-47	n.□□□0	Model loop closed	n.□□□0	at any time	immediately
	n.□□□1	Model loop enabled			

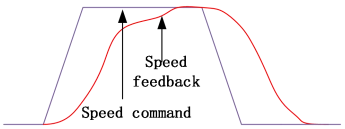
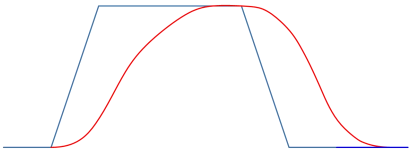
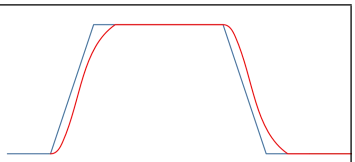
Using the DS5 series servo self-tuning mode as an example with a 750 W servo motor operating at five times its rated load inertia:

- Model Ring Function Off (Soft Mode)

Low rigidity, low response	High rigidity, moderate response
	
Load Inertia Ratio P0-07:500%	
Speed Loop Gain P1-00:200	Speed Loop Gain P1-00:800
Speed loop integral P1-01:3300	Speed loop integral P1-01:825
Position Loop Gain P1-02:200	Position Loop Gain P1-02:700
Phenomenon: Operation jitter and slow response	Phenomenon: Stable operation and fast response

- Model loop function enabled (Quick Positioning or Quick Positioning with Control Abovelap)

Low rigidity, low response	High rigidity, low response	High rigidity, high responsiveness

		
Load Inertia Ratio P0-07:500%		
Speed Loop Gain P1-00:200	Speed Loop Gain P1-00:800	Speed Loop Gain P1-00:800
Speed loop integral P1-01:3300	Speed loop integral P1-01:825	Speed loop integral P1-01:825
Position Loop Gain P1-02:200	Position Loop Gain P1-02:700	Position Loop Gain P1-02:700
Model Ring Gain P2-49:300	Model Ring Gain P2-49:300	Model Ring Gain P2-49:4000
Phenomenon: Operation jitter and slow response	Phenomenon: Stable operation, slow response	Phenomenon: Smooth operation and fast response

The above curve diagram only illustrates the parameter effects and does not represent the actual operational curve.

6.8.2 Torque Perturbation Observation

The disturbance obServo detects and estimates the external disturbance torque acting on the system, compensates for it in the torque command, thereby reducing the impact of external disturbances on the servo system and enhancing its disturbance resistance.

Selecting the Soft Mode in Self-Regulation Mode automatically turns off the disturbance obServo without changing its gain. Selecting Fast Positioning or Fast Positioning (Control Abovelap) activates the disturbance obServo and sets its gain to 85. These parameters require no manual adjustment.

parameter		meaning	Factory Settings	revise	Take effect
P2-00	n.□□□0	Disruptive obServo turned off	n.□□□1	servo bb	immediately
	n.□□□1	Enable the disturbance obServo			

parameter	meaning	Factory Settings	unit	Set Range	revise	Take effect
P2-41	Disturbance obServo gain	85	%	0 ~ 100	at any time	immediately

6.8.3 Gain Switching



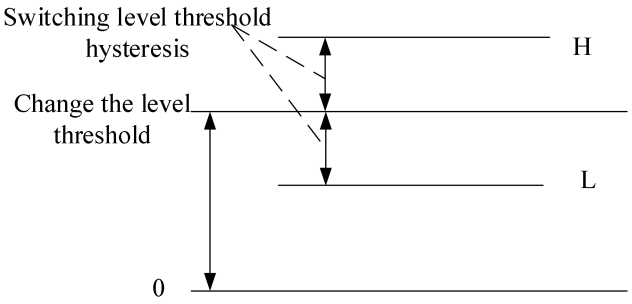
Version 3770 and later support gain switching functionality.

parameter		meaning	Factory Settings	unit	revise	Take effect
P1-14.0	n.□□□X	n.□□□X: Gain switching function switch 0: SI terminal gain switching is effective (gain switching parameters are not applied) 1: Perform gain switching according to the gain switching conditions 2: Reserve	0	-	at any time	immediately
P1-14.1	n.□□X□	n.□□X□: Selection of gain switching conditions 0: First gain fixed 1: Switch using the external SI terminal 2: High Torque Command 3: Large Speed Instruction 4: Significant variations in speed commands 5: [retained] 6: Significant positional deviation 7: Position Command 8: Localization completed 9: Actual speed is high A: Position command + actual speed				
P1-15		Gain switching wait time	5	ms	servo bb	immediately
P1-16		Gain Switching Level Threshold	50	-	servo bb	immediately
P1-17		Hysteresis loop of the gain switching level threshold	30	-	servo bb	immediately
P1-18		Position loop gain switching time	3	ms	servo bb	immediately

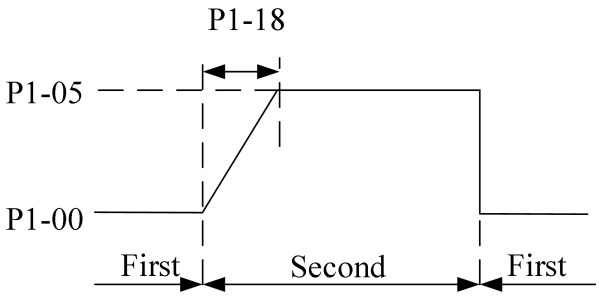
description ：

1) Gain switching wait time applies only during the transition from the second gain to the first gain

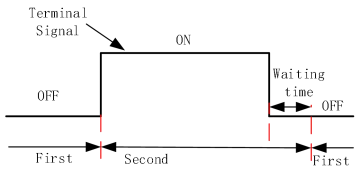
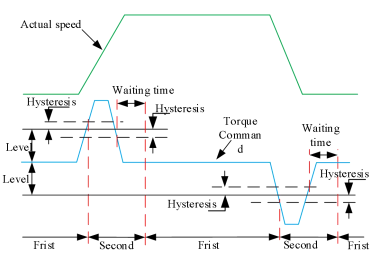
2) The definition of "gain switching level threshold hysteresis" is shown in the figure below:

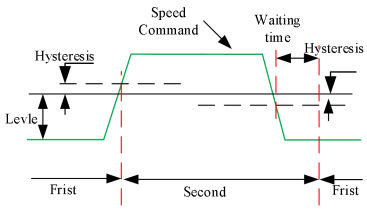


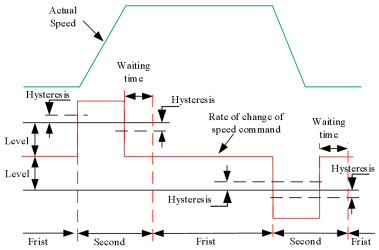
3) Explanation of "Position Gain Switching Time":

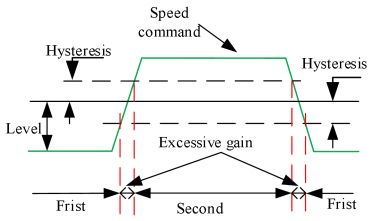


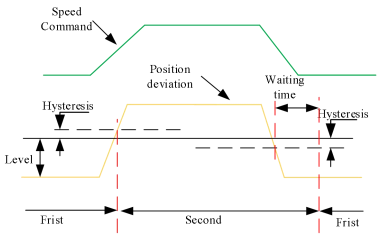
4) Explanation of Gain Switching Conditions

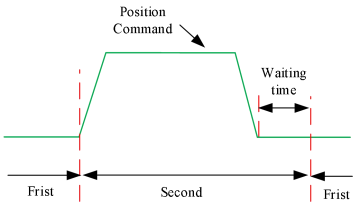
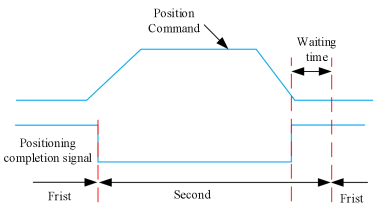
Gain Switching Condition Settings				relevant parameter		
P1-14.1	condition	Schematic Diagram	remarks	P1-15 wait time	P1-16 grade threshold	P1-17 threshold hysteresis
0	First gain fixed	-	-	invalid	invalid	invalid
1	terminal changing-Above		Use the G-SEL signal for gain switching: The G-SEL signal is invalid; Group 1 gain The G-SEL signal is active; Group 2 gain	valid	invalid	invalid
2	torque instruct		When the absolute value of the torque command exceeds (level + hysteresis) [%] during the previous first gain setting,	valid	valid (%)	valid (%)

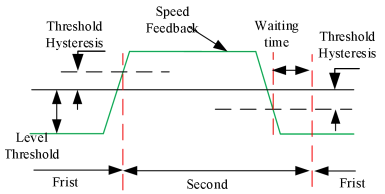
Gain Switching Condition Settings				relevant parameter		
P1-14.1	condition	Schematic Diagram	remarks	P1-15 wait time	P1-16 grade threshold	P1-17 threshold hysteresis
			switch to the second gain. During the previous second gain application, when the absolute value of the torque command remained below [level-hysteresis] [%] and this condition persisted for P1-15 seconds, return to the first gain setting.			
3	velocity instruct		When the absolute value of the speed command exceeds (level + hysteresis) [rpm] during the previous first gain setting, switch to the second gain. During the previous second gain application, when the absolute value of the speed command was below (level minus hysteresis) [rpm] and P1-15	valid	valid	valid

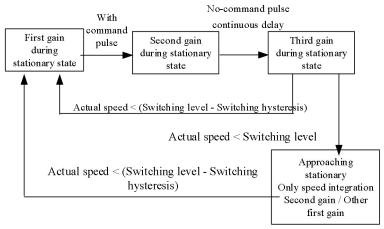
Gain Switching Condition Settings				relevant parameter		
P1-14.1	condition	Schematic Diagram	remarks	P1-15 wait time	P1-16 grade threshold	P1-17 threshold hysteresis
			remained in this state throughout the entire duration, revert to the first gain setting.			
4	Speed Command Change Rate		When the absolute value of the speed command change rate exceeds (level + hysteresis) [10 rpm/s] during the previous first gain setting, switch to the second gain. During the previous second gain application, when the absolute value of the speed command change rate remained below (level minus hysteresis) [10 rpm/s] for the duration specified by P1-15, the system returns to the first gain setting.	valid	valid (10rpm/s)	valid (10rpm/s)

Gain Switching Condition Settings				relevant parameter		
P1-14.1	condition	Schematic Diagram	remarks	P1-15 wait time	P1-16 grade threshold	P1-17 threshold hysteresis
5	Speed command high/low threshold [Not supported]		During the previous application of Gain 1, when the absolute value of the speed command exceeds (Level – Hysteresis) [rpm], the system switches to Gain 2. The gain gradually adjusts until the absolute value reaches (Level + Hysteresis) [rpm], at which point the gain fully transitions to Gain 2. During the previous second gain phase, when the absolute value of the speed command fell below (level + hysteresis) [rpm], it began returning to the first gain level. The gain gradually adjusted until the absolute value reached (level – hysteresis)	invalid	valid (rpm)	valid (rpm)

Gain Switching Condition Settings				relevant parameter		
P1-14.1	condition	Schematic Diagram	remarks	P1-15 wait time	P1-16 grade threshold	P1-17 threshold hysteresis
			[rpm], at which point the gain fully returned to the initial setting.			
6	position bias in statistics		Only active in Position Mode (other modes fixed at Gain 1) When the absolute value of position deviation exceeds (level + hysteresis) [encoder units] during the previous first gain setting, switch to the second gain. When the absolute value of position deviation is less than (level-hysteresis) [encoder units] during the previous second gain application, and P1-15 remains in this state throughout the entire duration, return to the first gain setting.	valid	valid (Encoder Unit)	valid (Encoder Unit)

Gain Switching Condition Settings				relevant parameter		
P1-14.1	condition	Schematic Diagram	remarks	P1-15 wait time	P1-16 grade threshold	P1-17 threshold hysteresis
7	position instruct		Only active in Position Mode (other modes fixed at Gain 1) During the previous first gain setting, switch to the second gain if the position command is not 0. During the previous second gain application, if the position instruction remains at state 0 throughout the waiting period P1–15, the system returns to the first gain setting.	valid	invalid	invalid
8	fixed position accomplish		Only active in Position Mode (other modes fixed at Gain 1) When the first gain is applied and positioning is not complete, switch to the second gain. During the previous second gain application, if the positioning completion	valid	invalid	invalid

Gain Switching Condition Settings				relevant parameter		
P1-14.1	condition	Schematic Diagram	remarks	P1-15 wait time	P1-16 grade threshold	P1-17 threshold hysteresis
			status remains unchanged throughout the waiting period P1–15, proceed to the first gain step. [Note] The detection mode must be configured according to P5-01 to complete positioning.			
9	reality velocity		Only valid in Position mode (other modes are set to gain 1): During the previous first gain application, if the absolute value of the actual speed exceeded (level + hysteresis) [rpm], switch to the second gain. During the previous second gain application, when the absolute value of the relative speed remained below (level-hysteresis) [rpm] and P1-15 continued	valid	valid (rpm)	valid (rpm)

Gain Switching Condition Settings				relevant parameter		
P1-14.1	condition	Schematic Diagram	remarks	P1-15 wait time	P1-16 grade threshold	P1-17 threshold hysteresis
			to maintain this condition, switch back to the first gain setting.			
A	Position Command + Actual Speed		Only valid in Position mode (other modes are set to gain 1): When switching to the first gain level, if the position command is not 0, switch to the second gain level. During the previous second gain application, when the position command was set to 0, the system maintained the second gain throughout the waiting period P1–15. When the position command is 0 and the waiting time P1-15 has elapsed, if the absolute value of the actual speed is less than	valid	valid (rpm)	valid (rpm)

Gain Switching Condition Settings				relevant parameter		
P1-14.1	condition	Schematic Diagram	remarks	P1-15 wait time	P1-16 grade threshold	P1-17 threshold hysteresis
			(level)[rpm], the speed integration time constant is set to the second speed-loop integration time constant (P1-06); otherwise, it returns to the first gain. If the absolute value of the actual speed is less than (level-hysteresis loop)[rpm], the speed integration also returns to the first speed-loop integration time constant (P1-02).			

7. Alarm analysis

7.1 Above view Table of Alarm Parameters

History record: The "√" represents that historical alarms are recorded; "○" means no recording.

Clearable column: "" √ "" represents an alarm that can be cleared; "○" represents one that cannot be cleared.

Alarm Code		confirm code	description	attribute			Servo status when an alarm occurs
Major Category	subcategory			history	Can be deleted	Does clearing the alarm require a power cycle to take effect?	
EEEE	1	EEEE1	Communication error between the panel and the CPU	○	○	deny	servo run
	2	EEEE2			○	deny	servo run
	3	EEEE3			○	deny	servo run
	4	EEEE4			○	deny	servo run
01	0	E-010	Firmware version does not match	○	○	yes	servo run
	3	E-013	FPGA loading error	○	○	yes	servo run
	5	E-015	Program execution error	○	○	yes	servo run
	6	E-016	hard error	○	○	deny	servo run
	7	E-017	Processor operation timed out	○	○	yes	servo run
	9	E-019	System Password Error	○	○	yes	servo run
02	0	E-020	Parameter loading error	○	○	yes	servo run
	1	E-021	Parameter range exceeded	√	√	deny	servo run

Alarm Code		confirm code	description	attribute			Servo status when an alarm occurs
Major Category	subcategory			history	Can be deleted	Does clearing the alarm require a power cycle to take effect?	
	2	E-022	Parameter Conflict	○	√	deny	servo run
	3	E-023	Incorrect sampling channel configuration	○	○	yes	servo run
	4	E-024	Parameter loss	√	√	deny	servo run
	5	E-025	Erasing FLASH Error	√	√	deny	servo run
	6	E-026	Initialization Flash error	√	√	deny	servo run
	8	E-028	EEPROM write error	√	√	deny	servo run
	9	E-029	Frequent EEPROM write operation alarm	√	√	deny	servo run
03	0	E-030	Busbar voltage overheatingtage	√	√	deny	servo off
04	0	E-040	Busbar voltage is too low; ① The grid voltage is insufficient.	√	√	deny	servo run
			Bus voltage is too low; ② Power loss in the driver causes the bus voltage to drop below the required level.	○	√	deny	servo off
	1	E-041	Drive power failure	○	√	deny	servo run
	3	E-043	Busbar voltage charging failed	√	√	yes	servo off
	4	E-044	Three-phase voltage input with one phase missing	√	√	deny	servo off
06	0	E-060	The module temperature is too high.	√	√	deny	servo run
	1	E-061	Motor overheating	√	√	deny	servo run
	3	E-063	Thermistor wire break alarm	√	√	deny	servo run
08	0	E-080	Excessive Speed Alarm	√	√	deny	servo off
	2	E-082	Encoder Zero Position Deviation Protection 1	√	√	deny	servo off
	3	E-083	Speed command exceeded limits	√	√	deny	servo

Alarm Code		confirm code	description	attribute			Servo status when an alarm occurs
Major Category	subcategory			history	Can be deleted	Does clearing the alarm require a power cycle to take effect?	
							off
09	2	E-092	The analog signal Tref's zero calibration value exceeds the allowed limit.	√	√	deny	servo run
	3	E-093	The analog signal Vref's zero calibration value exceeds the allowed limit.	√	√	deny	servo run
10	0	E-100	Excessive positional deviation	√	√	deny	servo run
11	0	E-110	During self-check, a short circuit was detected in the external UVW component.	√	√	deny	servo off
	1	E-111	P+ Current Abovecurrent Protection	√	√	deny	servo off
	2	E-112	U-phase current Abovecurrent protection	√	√	deny	servo off
	3	E-113	V-phase current Abovecurrent protection	√	√	deny	servo off
13	0	E-150	Power line has been disconnected	√	√	deny	servo off
16	1	E-161	Drive thermal power Aboveload	√	√	deny	servo run
	5	E-165	Blockage Prevention and Turnaround Alarm	√	√	deny	servo run
20	0	E-200	Braking resistor Aboveload	√	√	deny	servo run
22	0	E-220	Absolute value servo encoder communication error	√	√	deny	servo run
	1	E-221	Too many CRC error occurrences in encoder communication	√	√	deny	servo off
	2	E-222	Absolute value servo encoder battery low-voltage alarm	√	√	deny	servo off
	3	E-223	Absolute value servo encoder data access alarm	√	√	deny	servo off
	7	E-227	Error in the multi-turn signal data of the Shanghai Electric encoder	√	√	deny	servo off
	8	E-228	Absolute value servo encoder value Aboveflow	√	√	deny	servo off
	9	E-229	Encoder Electric Angle Deviation Protection	√	√	deny	servo off

Alarm Code		confirm code	description	attribute			Servo status when an alarm occurs
Major Category	subcategory			history	Can be deleted	Does clearing the alarm require a power cycle to take effect?	
24	0	E-240	Time sequence error in encoding position data	√	√	deny	servo off
	1	E-241	The encoder returned corrupted data.	√	√	deny	servo off
25	0	E-250	Return to Origin Error Alarm	√	√	deny	servo off
26	0	E-260	Excess Travel Alarm	√	√	deny	servo run
	1	E-261	Out-of-range signal connection error	√	√	deny	servo run
	2	E-262	Control Stop Timed Out	√	√	deny	servo off
	4	E-264	Excessive vibration	√	√	deny	servo run
	5	E-265	The motor is vibrating excessively.	√	√	deny	servo run
28	0	E-280	Failed to access motor parameters	√	√	deny	servo off
	1	E-281	An error occurred while writing data to the encoder EEPROM.	√	○	deny	servo off
31	0	E-310	Motor power mismatch	√	○	deny	servo off
	1	E-311	Motor code lost	√	○	yes	servo off
	2	E-312	The motor parameters have been corrupted during reading.	√	○	deny	servo off
	3	E-313	Encoder software version does not match	√	○	deny	servo off
	4	E-314	The encoder software version is not supported	√	○	deny	servo off
	5	E-315	Cannot read motor parameters	√	○	yes	servo off
	6	E-316	The motor code read does not match the set code.	√	○	yes	servo off

7.2 Analysis of Alarm Types

The DS5 alarm code follows the format E-XX□, where "XX" represents the major category of the alarm and "□" specifies the exact sub-category.

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
EEEE	1	EEEE1	Communication error between the panel and the CPU	① Significant fluctuations in power supply voltage; insufficient voltage causes panel refresh failure. ② The panel program is damaged	① Ensure stable power supply with consistent voltage; ② After power outage and restart, if the alarm persists, contact your agent or manufacturer. ① Ensure stable power supply with consistent voltage; ② After power outage and restart, if the alarm persists, contact your agent or manufacturer.
	2	EEEE2			
	3	EEEE3			
	4	EEEE4			
01	0	E-010	Firmware version does not match	The downloaded firmware version is incorrect	Contact the agent or manufacturer
	3	E-013	FPGA loading error	①The program is damaged; ② Device damage	Contact the agent or manufacturer
	4	E-014	FPGA access error	①The program is damaged; ② Hardware damage; ③ The intensity of external interference is too high	Contact the agent or manufacturer
	5	E-015	Program execution error	Program malfunction	Contact the agent or manufacturer
	6	E-016	hard error	①The program is damaged; ② Hardware damage; ③ The intensity of external interference is too high	① Check the input voltage for phase loss or insufficient supply voltage; ②Contact the agent or manufacturer
	7	E-017	Processor operation timed out	Program malfunction	Contact the agent or manufacturer
	9	E-019	System Password Error	Program malfunction	Contact the agent or manufacturer
02	0	E-020	Parameter	Parameter self-check	Repowering will restore

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
			loading error	failed	parameters to their default values. If the issue persists, contact your dealer or manufacturer.
	1	E-021	Parameter range exceeded	The value is outside the specified range	Check parameters and reset
	2	E-022	Parameter Conflict	TREF or VREF function settings conflict	For example, in the P0-01=4 mode, setting P3-00 to 1 will trigger an alarm.
	3	E-023	Incorrect sampling channel configuration	Incorrect settings for custom output trigger channel or data monitoring channel	Check if the settings are correct
	4	E-024	Parameter loss	The grid voltage is too low.	① For a single-phase 220V power supply, connect R and T; ② Turning the power back on immediately after a power outage will trigger an E-024 alarm; ③ Reset Parameters
	5	E-025	Erasing FLASH Error	Parameter saving failed during power outage	Contact the agent or manufacturer
	6	E-026	Initialization Flash error	The FLASH chip's power supply is unstable.	Contact the agent or manufacturer
	8	E-028	EEPROM write error	Unstable voltage or chip malfunction	Contact the agent or manufacturer
	9	E-029	Frequent EEPROM write operation alarm	Parameter write frequency is too high	Reduce the frequency of parameter changes, or contact the agent or manufacturer
03	0	E-030	The bus voltage U0-05 exceeds the preset threshold value. Machine powered by 220 V (U0–05 ≥ 402 V) Machines powered by 380V electricity (U0–05 ≥ 780V)	The grid voltage is too high.	Check the power supply voltage fluctuations: the normal voltage range for a 220V driver is 200V–240V, and for a 380V driver it is 380V–440V. If significant voltage fluctuations are observed, use a proper voltage source and regulator.
				Excessive load rotational inertia (insufficient regenerative capacity)	① Connect an external braking resistor; specify the resistance values as detailed in Section 1.4.1: (For 220 V: discharge begins at U0-05 = 392 V and ends at U0-05 = 377 V; for 380 V: discharge begins at U0-05 =

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
					750 V and ends at U0-05 = 720 V.) ② Increase acceleration and deceleration times; ③ Reduce load inertia; ④ Reduce the start-stop frequency; ⑤ Replace with a higher-power driver and motor
03	0	E-030	The bus voltage U0-05 exceeds the preset threshold value. Machine powered by 220 V (U0–05 ≥ 402 V) Machines powered by 380V electricity (U0–05 ≥ 780V)	The braking resistor is damaged or has an excessively high resistance value.	Check the braking resistor and replace it with an external resistor of appropriate resistance value; refer to Section 1.4.1 for selection guidelines.
				The acceleration and deceleration times are too short.	Extend acceleration and deceleration times
				Hardware failure in the sampling circuit inside the drive unit	Use the AC range of a multimeter to measure the input voltage of the servo LN (R/S/T); normal value is 220 V ± 10% (or 380 V ± 10%). If the reading exceeds 220 V ± 10% (or 380 V ± 10%), check the supply voltage; if normal, the servo is in operational status—monitor U0-05. If the measured voltage on the multimeter × 1.414 <U0-05 (within an error margin of 10 V), the servo driver is faulty and requires replacement.
04	0	E-040	The bus voltage U0-05 is below the preset threshold. Machines powered by 220 V (U0–05 ≤ 150 V) Machine powered by 380V electricity	An alarm is triggered during normal power-on when the grid voltage is too low.	① Check the power grid voltage fluctuations: 220V drivers operate within a normal voltage range of 200V–240V, while 380V drivers require 380V–440V. Significant voltage fluctuations may necessitate using a voltage stabilizer. ② Replace with a transformer of larger capacity
				Occurred during a sudden	Power on again after the voltage

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
			(U0–05 ≤ 300V)	power outage	stabilizes
				Hardware failure in the sampling circuit inside the drive unit	Use the AC range of a multimeter to measure the input voltage of the servo LN (R/S/T). Normal value: 220 V ± 10% (or 380 V ± 10%). If <220 V ± 10% (or 380 V ± 10%), check the supply voltage; if normal, the servo is operational. Monitor U0-05: if the measured voltage on the multimeter × 1.414> U0-05 (within ±10 V error), the servo driver is faulty and requires replacement.
	1	E-041	Drive power failure	The drive power supply has been disconnected	Check the power supply
	3	E-043	Busbar voltage charging failed	An alarm is triggered during normal power-on when the grid voltage is too low.	An alarm is triggered during normal power-on when the grid voltage is too low.
				Hardware damage	When powering on the drive, check for any relay engagement sound.
	4	E-044	Three-phase voltage input with one phase missing	Three-phase input power supply lacks one phase	Check the power supply
06	0	E-060	The module temperature is too high. (Module temperature U0-06 ≥ 90°C alarm) U0-06: Temperature ≥ 70°C (Warning)	Running under heavy load for an extended period	Re evaluate the motor capacity and monitor the U0-02 torque during operation to determine if it remains above 100 for extended periods. If so, consider using a higher-capacity motor or reducing the load.
				The ambient temperature is too high.	①Enhance ventilation measures to reduce ambient temperature; ② Check whether the fan rotates during servo enable; module temperature U0-06 ≥ 45°C, and the fan is activated
				Fan damage	Change the fan
	1	E-061	Motor	An alarm is triggered	① Check whether the motor fan

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
			overheating	when the motor temperature exceeds 140°C.	is abnormal; ② Contact the manufacturer's technical support
	3	E-063	Thermistor wire break alarm	① The thermistor in a motor with a power rating of 11 kW or higher has broken; ② Alarm triggered when a motor below 11 kW is mistakenly turned on due to a broken wire.	Check the connection of the external thermistor; Shielded thermistor wire break alarm: P0-69.1=1
08	0	E-080	Above-speed (actual speed ≥ P3-21/P3-22) The maximum forward speed is P3-21, and the maximum reverse speed is P3-22.	Motor code does not match	Check whether the motor code (the number following MOTOR CODE) on drive U3-70 matches that on the motor label. If they do not match, adjust them to match and power on again.
				UVW wiring error	Check the UVW wiring of the motor; connect it according to the phase sequence.
				The motor speed is too high.	① The maximum speed limit values P3-21/P3-22 have been reduced; ② Verify whether any external force is causing the motor to rotate at excessive speed, whether the pulse input frequency is too high, or whether the electronic gear ratio is excessively large.
				Encoder malfunction	① Check the encoder cable or replace it; ② Set the servo driver to BB mode and adjust it to U0-10. Slowly rotate the motor shaft manually to verify normal value changes: one direction shows increasing values while the other shows decreasing values (with cyclic display from 0 to 9999).

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
	2	E-082	Encoder Zero Position Deviation Protection 1	① Phase sequence mismatch in the UVW phase; ② Motor encoder zero position deviation	① Check whether the three-phase power lines are connected in the UVW sequence. ② Check the encoder zero position; contact the manufacturer's technical support.
	3	E-083	Speed command exceeded limits	In position mode, the speed command exceeds the set value of 1.3×P3−21/P3−22.	① Check the set values for P3-21/P3-22; ②Abnormal position command;
09	2	E-092	The analog signal Tref's zero calibration value exceeds the allowed limit.	Error in analog signal zeroing operation	Zero the measurement when no analog voltage is applied
	3	E-093	The analog signal Vref's zero calibration value exceeds the allowed limit.	Error in analog signal zeroing operation	Zero the measurement when no analog voltage is applied
10	0	E-100	Excessive positional deviation	During position control, the difference between the set position and the actual position exceeds the limit value.	① Check whether the motor is running under locked rotor conditions; ② Reduce the position-given speed; ③ Increase the deviation pulse limit value P0-23
11	0	E-110	During self-check, a short circuit was detected in the external UVW component.	No matching motor code found	Check whether the motor code (the number following MOTOR CODE) on the U3-70 drive motor label matches. If not, adjust it to match and power the device again.
				incorrect wiring for U, V, and W	Check the UVW wiring of the motor; ensure proper phase connection (brown U, black V, blue W).
				The UVW output driver	① Check whether the UVW

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
				is short-circuited or the motor is faulty.	phase resistance of the motor is balanced; if the phase resistance values are unbalanced, replace the motor. ② Check for a short circuit between the UVW and PE terminals of the motor; if present, replace the motor. ③ Measure the UVW output on the driver side using a multimeter (in diode mode): connect the black probe to P+ and the red probe to measure UVW; connect the red probe to P-and the black probe to measure UVW. If any of the six voltage drop values is 0, replace the driver.
				The load section is experiencing a blockage.	Run the motor with an empty shaft to resolve load issues
				Instant alarm during rapid start/stop operation	Increase acceleration and deceleration time
				Encoder Problem	① Check the encoder cable or replace it; ② Set the servo driver to BB mode and adjust it to U0-10. Slowly rotate the motor shaft manually to verify normal value changes: one direction shows increasing values while the other shows decreasing values (with cyclic display from 0 to 9999).
11	2	E-112	U-phase current Abovecurrent protection	incorrect wiring for U, V, and W	Check the UVW wiring of the motor; ensure proper phase connection (brown U, black V, blue W).
				The UVW output driver is short-circuited or the motor is faulty.	① Check whether the UVW phase resistance of the motor is balanced; if the phase resistance values are unbalanced, replace the motor.

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
					② Check for a short circuit between the UVW and PE terminals of the motor; if present, replace the motor. ③ Measure the UVW output on the driver side using a multimeter (in diode mode): connect the black probe to P+ and the red probe to measure UVW; connect the red probe to P-and the black probe to measure UVW. If any of the six voltage drop values is 0, replace the driver.
				The load section is experiencing a blockage.	Run the motor with an empty shaft to resolve load issues
				Instant alarm during rapid start/stop operation	Increase acceleration and deceleration time
				Encoder Problem	① Check the encoder cable or replace it; ② Set the servo driver to BB mode and adjust it to U0-10. Slowly rotate the motor shaft manually to verify normal value changes: one direction shows increasing values while the other shows decreasing values (with cyclic display from 0 to 9999).
	3	E-113	V-phase current Abovecurrent protection	incorrect wiring for U, V, and W	Check the UVW wiring of the motor; ensure proper phase connection (brown U, black V, blue W).
				The UVW output driver is short-circuited or the motor is faulty.	① Check whether the UVW phase resistance of the motor is balanced; if the phase resistance values are unbalanced, replace the motor. ② Check for a short circuit between the UVW and PE terminals of the motor; if present, replace the motor.

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
					③ Measure the UVW output on the driver side using a multimeter (in diode mode): connect the black probe to P+ and the red probe to measure UVW; connect the red probe to P-and the black probe to measure UVW. If any of the six voltage drop values is 0, replace the driver.
				The load section is experiencing a blockage.	Run the motor with an empty shaft to resolve load issues
				Instant alarm during rapid start/stop operation	Increase acceleration and deceleration time
				Encoder Problem	① Check the encoder cable or replace it; ② Set the servo driver to BB mode and adjust it to U0-10. Slowly rotate the motor shaft manually to verify normal value changes: one direction shows increasing values while the other shows decreasing values (with cyclic display from 0 to 9999).
15	0	E-150	Power line has been disconnected	The drive unit/cable/motor experiences a break in any one of the U/V/W three-phase power lines.	Disconnect the drive power supply and check the power line connections. Use a multimeter to test for continuity. After resolving the issue, power on the device again.
16	1	E-161	Drive thermal power Aboveload	Motor code does not match	Check whether the motor code (the number following MOTOR CODE) on drive U3-70 matches that on the motor label. If they do not match, adjust them to match and power on again.
				Aboveload condition: the actual operating torque exceeds the rated torque and persists during prolonged continuous	Increase the capacity of the drive and motor. Extend acceleration and deceleration times and reduce load. Monitor U0-00 for Abovespeed

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
				operation. (Check the actual operating torque on monitor U0-02; if the motor operates normally without seizing or vibration, a value consistently above 100 on U0-02 represents improper motor selection.)	operation.
				The mechanism experiences impact, sudden weight increase, or distortion.	Eliminate mechanical distortion factors and reduce the load.
				The motor operates when the brake is not released.	① Measure the voltage at the brake lever terminal to confirm that the brake is released; ② Determine the brake engagement control method; it is recommended to use a servo BK brake signal for control. If servo control is not employed, careful attention must be paid to the timing relationship between brake release and motor operation.
				There are wiring errors in the encoder and power lines, or there may be broken wires or loose connectors with reduced pins.	① Check the wiring of the U, V, and W power lines for any phase sequence errors; ② Use a multimeter to check whether all encoder wires are properly connected and if any are broken. ③ Check for any looseness at the connector, monitor machine vibration, and verify that the connectors do not exhibit pin shrinkage, poor soldering, or damage.
				In multi-machine wiring, the motor wire was mistakenly connected to	Check the servo wiring by correctly connecting the motor wires and encoder wires to their

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
				another shaft, resulting in incorrect wiring.	respective shafts.
				Improper gain adjustment causes the motor to vibrate, oscillate back and forth, and produce abnormal noises.	Re-adjust the gain parameters
				Hardware failure of the drive or motor;	① On-site servo cross-test represents either motor shaft misalignment or motor failure: F1-01 fails during trial run, and F1-00 cannot rotate at constant speed during spot operation. ② Replace with a new drive or motor; return the faulty unit to the manufacturer for repair.
16	5	E-165	Blockage Prevention and Turnaround Alarm If the current motor output torque exceeds both forward and reverse torque limits, and the duration reaches P0-74 (in ms) while the speed remains below P0-75 (1 rpm), an alarm will be triggered.	① The machinery experiences impact, sudden weight increase, or distortion; ② The motor operates when the brake is not released; ③ Improper parameter settings	① Eliminate mechanical distortion factors; reduce the load. ② Measure the voltage at the brake lever terminal to confirm that the brake is released; Determine the brake control method; it is recommended to use a servo BK brake signal for control. If servo control is not used, careful attention must be paid to the timing between brake release and motor operation. ③ Monitor the actual output torque range of U0-02 and verify whether the torque limit settings for P3-28/29 are appropriate. (For versions after 3760, the torque limit parameters for anti-clogging alarm output are set to P3-38 and P3-39.)
20	0	E-200	Braking resistor Aboveload	The grid voltage exhibits significant fluctuations, resulting in excessively	Improve input voltage

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
				high voltage levels.	
				The braking resistor is selected to be too small.	Replace with a higher-power brake discharge resistor (refer to resistance value in 1.4.1)
				The acceleration and deceleration times are too short.	Extend acceleration and deceleration times
				Hardware damage	Use the AC range of a multimeter to measure the input voltage of the servo LN (R/S/T); normal value is 220 V ± 10% (or 380 V ± 10%). If the reading exceeds 220 V ± 10% (or 380 V ± 10%), check the supply voltage; if normal, the servo is in operational status—monitor U0-05. If the measured voltage on the multimeter × 1.414 <U0-05 (within an error margin of 10 V), the servo driver is faulty and requires replacement.
22	0	E-220	Absolute value servo encoder communication error	Motor mismatch error	Check if the motor matches correctly
				The encoder cable is not connected or has poor contact.	Check if the value of U0-54 increases rapidly; if so, determine that the encoder circuit is disconnected. Disconnect the driver power supply and check the encoder cable connections for loose wires. Use a multimeter to test for continuity. After resolving the issue, power on the device again. ① Hot swapping is strictly prohibited. ② For applications requiring tank chains, use dedicated cables.
				The received encoder data contains errors, and the number of errors exceeds the value set in	① Check whether the value of U0-54 has increased and whether the value of U0-79 is also increasing; if so, conclude

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
				the encoder error retry count register P0-56 (for versions 3770 and later, set error counts to P0-68.0–P0-68.1).	that the encoder is experiencing interference. ② Do not route encoder wires through the same conduit as high-voltage cables; install a filter on the power input side of the servo driver; equip encoder wires with magnetic ferrules; avoid using welding machines or other equipment that generates significant interference.
	1	E-221	Too many CRC error occurrences in encoder communication	The received encoder data contains errors, and the number of errors exceeds the value set in the encoder error retry count register P0-56 (for versions 3770 and later, set error counts to P0-68.0–P0-68.1).	The encoder is subjected to interference; isolate the source of interference.
	2	E-222	Absolute servo encoder low battery voltage alarm (this alarm can be disabled)	The battery voltage in the encoder line battery box is below 3 V.	Replace the battery while keeping the servo driver powered on to avoid encoder position errors. Battery specifications: AA battery, 3.6 V (model CP-B-BATT or CPT-B-BATT).
				Power-on alarm for the new device	① The motor's absolute position memory during power failure relies on the battery connected to the encoder cable. If the encoder cable disconnects from the motor and power is lost, the current position will be lost, triggering Alarm E-222. Clearing this alarm by setting F0-00=1 restores normal operation. ② Using P0-79 can disable this alarm. When P0-79 is set to 1, the motor will operate as an

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
					incremental motor without performing multi-turn counting, and power loss will not retain the current position.
	3	E-223	Absolute value servo encoder data access alarm	The multi-turn absolute-value motor does not use the encoder cable that comes with the battery box.	① Use the encoder cable that comes with the battery case; ② Power off and then power on again (ensure the driver panel is completely powered down). If the alarm persists, contact your dealer or manufacturer.
				This is usually due to issues with the encoder itself or unstable power supply to the encoder.	
				Abnormal power-on behavior of the main control chip for multi-turn absolute value servo encoders	
				ADC sampling exceeds the range; certain resistive components are faulty or the magnetic sensor signals exhibit poor consistency.	
	7	E-227	Error in the multi-turn signal data of the Shanghai Electric encoder	This is usually due to issues with the encoder itself or unstable power supply to the encoder.	When the battery is depleted, unplugging the encoder cable may trigger this alarm.
	8	E-228	Absolute value servo encoder value Aboveflow	The motor runs in one direction continuously, and the encoder data value exceeds the limit (Aboveflows).	① Set F1-06 to 1 and clear the absolute encoder's revolution count; ② Setting P0-79 to 2 will disable this alarm.
	9	E-229	Encoder Electric Angle Deviation Protection	When the encoder exhibits zero-degree offset or the motor's power line phase sequence is incorrect, the motor experiences excessive deviation in its	① Check whether the three-phase power lines are connected in the UVW sequence. ② Check the encoder zero position; contact the manufacturer's technical

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
				control angle. This results in erroneous data during control calculations, potentially causing the motor to spin out of control and malfunction, triggering a zero-degree offset alarm.	support.
23	6	E-236	The error between the feedback from the motor encoder and that from the displacement sensor (user command resolution) exceeds the set value specified in P9-02.	① The external linear scale is installed incorrectly and not parallel; ② When P9-02 is not zero and the counting direction of the P9-00.1 grating scale is incorrect; ③ Incorrect frequency division setting for the grating scale	① Mechanical error. The position of the motor's direct output shaft is transmitted to the motion platform via mechanical components; the feedback from the optical encoder directly originates from the motion platform, introducing errors due to intermediate elements such as synchronous belts or lead screws. ② reinstall the grating scale; ③ Reset P9-00.1 and power on again (to confirm: with the motor enabled, manually operate the machinery and verify that the direction changes in the same direction via U4-11/12 and U0-10/11). ④ Set the correct grating scale division frequency and power on again; ⑤ Appropriately increase P9-02
	7	E-237	The fully closed-loop motor encoder has its counting direction reversed compared to that of the external optical grating scale.	When P9-02 is set to 0 ① The grating scale line has broken; ② The counting direction of the P9-00.1 grating scale is incorrect.	① Check the linear scale and power it on again; ② Reset P9-00.1 and power on again
	8	E-238	The speed of the fully closed-loop external optical grating scale	The error between the motor encoder's feedback speed and the optical grating's feedback speed exceeds the value set in P9-04.	① Check the relevant section and select the correct items from P9-05 to P9-08; ② When the grating scale accuracy is low, it is recommended to disable full closed-loop speed feedback

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
			exceeds the allowed limit.		(P9-01.0=0).
24	0	E-240	Time sequence error in encoding position data	① The number of consecutive errors during encoder data update timing exceeds the value specified in P0-68 (set to P0-68.0–P0-68.1 for versions 3770 and later); ②Fluctuations occur in the CPU timer	①Restart the drive; ② Check the wiring arrangement of transmission cables to ensure separate routing for high-voltage and low-voltage circuits; ③ Equipment requiring high current should be supplied with separate power sources; ④ Good grounding
	1	E-241	The encoder returned corrupted data.	The received encoder data is incorrect, and the number of errors exceeds the value stored in the encoder error retry count register P0-56.	① Check the wiring arrangement of transmission cables to ensure separate routing for high-voltage and low-voltage circuits; ② Equipment requiring high current should be supplied with separate power sources; ③ Good grounding
25	0	E-250	Return to Origin Error Alarm (-supported in Version 3770 and later)	①The total time required for P9-15 to return to the origin when its value is not zero exceeds the time set in P9-15; ② Incorrect settings for the original function parameters of the new version	① Increase P9-15; ② Ensure that the direction of the mechanical displacement (P9-19, P9-20) is opposite to that of returning to the origin; ③ Check whether there are any issues with the origin signal; ④ Check the original function parameter settings for the new device.
26	0	E-260	Excess Travel Alarm	An out-of-range signal was detected, and the out-of-range handling mode is set to alarm.	To avoid immediate alarm when exceeding the limit, you can change the signal processing method for Above-limit conditions.
	1	E-261	Out-of-range signal connection error	① The motor encounters a reverse Aboveshoot signal during forward rotation; ② When the motor reverses, it encounters a	Check the connection of Above-limit signals and the allocation of Above-limit terminals.

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
				forward Abovetravel signal.	
	2	E-262	Control Stop Timed Out	① Excessive inertia; ② The stop timeout duration is too short; ③ The brake torque setting is too low	① Reduce inertia or use a brake motor; ② Increase the stop timeout time P0 to 30; ③ Increase braking torque P3-32
	4	E-264	Excessive vibration	① Oscillation caused by external forces; ② High load inertia, incorrect load inertia ratio settings, or insufficient gain cause oscillation during positioning.	① Identify the source of external forces and check for any issues with mechanical installation; ② Increase the servo gain to enhance disturbance resistance; ③ Analysis of the data acquisition speed curve; When the first three peaks and troughs of the pulse signal converge (i.e., 0.8 × |first peak| ≤ |second peak| ≤ 0.8 × |third peak|) after the pulse command ends, no alarm should be triggered; in such cases, the relevant thresholds can be adjusted. When the three first peak speed values after the completion of the pulse command consecutively reach or exceed 300 rpm for three times, a drive alarm is triggered. This issue should be resolved using Method ① or Method ② as described above. ④ Contact the manufacturer's technical support
	5	E-265	The motor is vibrating excessively.	The machine is vibrating.	① Set P2-03.0 to 0; ② Check the motor installation.
28	0	E-280	Failed to read motor	Request to read EEPROM failed	① After professional verification, the drive unit and motor are compatible and can be

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
			parameters		used together. ② Check the connection status of the encoder wires; measure their continuity or replace them for verification. ③ Check whether the driver and motor are functioning properly by replacing them with new components. If issues are identified with either the driver or the motor itself, return the unit to the manufacturer for inspection.
	1	E-281	An error occurred while writing data to the encoder EEPROM.	EEPROM write request failed	Once professionals have confirmed that the drive and motor are compatible and can be used together, you may proceed by setting P0-53 to 1 (to disable the automatic motor parameter reading alarm) and correctly configuring the P0-33 motor code.
31	0	E-310	The drive and motor power are mismatched	For example, a 750 W drive unit with a 200 W motor.	Match the correct motor and driver, set the P0-33 motor code properly, then use it.
	1	E-311	When reading the motor code automatically, the recorded motor parameters are 0, and driver P0-33 = 0.	Motor code not set	Once professionals have confirmed that the drive and motor are compatible and can be used together, you may proceed by setting P0-53 to 1 (to disable the automatic motor parameter reading alarm) and correctly configuring the P0-33 motor code.
	2	E-312	Reading motor parameters has caused damage.	Parameter CRC check failed	Once professionals have confirmed that the drive and motor are compatible and can be used together, you may proceed by setting P0-53 to 1 (to disable the automatic motor parameter reading alarm) and correctly configuring the P0-33 motor code.

Major Category	Small Class	Confirm Code	Description	Possible Reasons	Solution
	3	E-313	Encoder software version does not match	Encoder software version does not match	① Update the driver firmware to achieve optimal performance Framed on the current motor parameters; ② Set P0-53 to 1 (to disable the automatic motor parameter reading alarm) and correctly configure the P0-33 motor code. In this configuration, the motor parameters are stored in the driver and the motor will operate normally, although some performance may be affected.
	4	E-314	Motor code does not match the software version	The encoder hardware version is higher than the driver firmware version.	Contact technical support to update the driver firmware
	5	E-315	When reading the motor code automatically, the recorded motor parameters are 0, and driver P0-33 = 0.	The motor code read is 0	Once professionals have confirmed that the drive and motor are compatible and can be used together, you may proceed by setting P0-53 to 1 (to disable the automatic motor parameter reading alarm) and correctly configuring the P0-33 motor code.
	6	E-316	Automatic code reading error	The automatically read motor code does not match the one set in P0-33.	Check the motor code on the U3-70 and the motor housing plaque. If the values differ, contact the manufacturer's technical support.

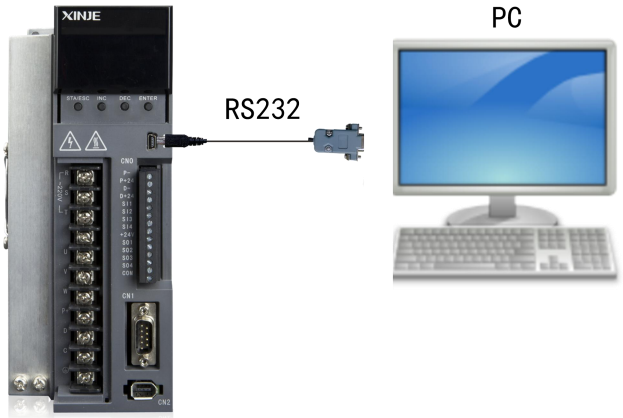
8. Modbus-RTU Communication

Our company provides users with the RS485 communication interface, a standard solution widely used in industrial control systems. The interface employs the MODBUS protocol, enabling servos to communicate as slaves with host devices (such as PLC controllers or PCs) that share the same communication interface and protocol. It also supports connection to human-machine interfaces, facilitating remote operation of servos by users.

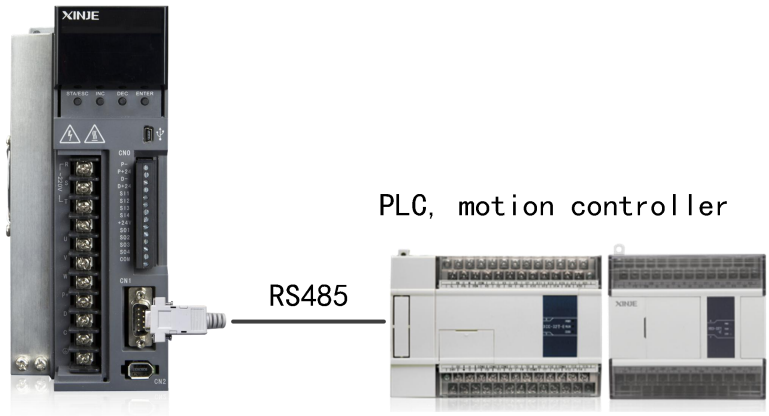
This series of servos supports the RTU mode via the MODBUS communication protocol. The following provides a detailed description of the protocol.

8.1 Communication Wiring

1. RS-232 Communication Wiring

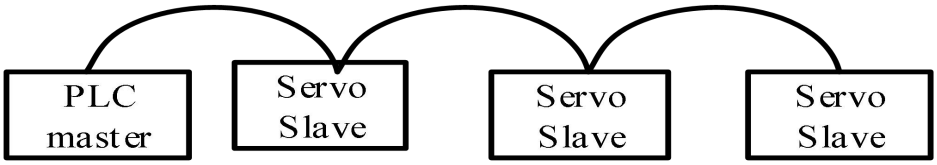


2. RS-485 Communication Wiring

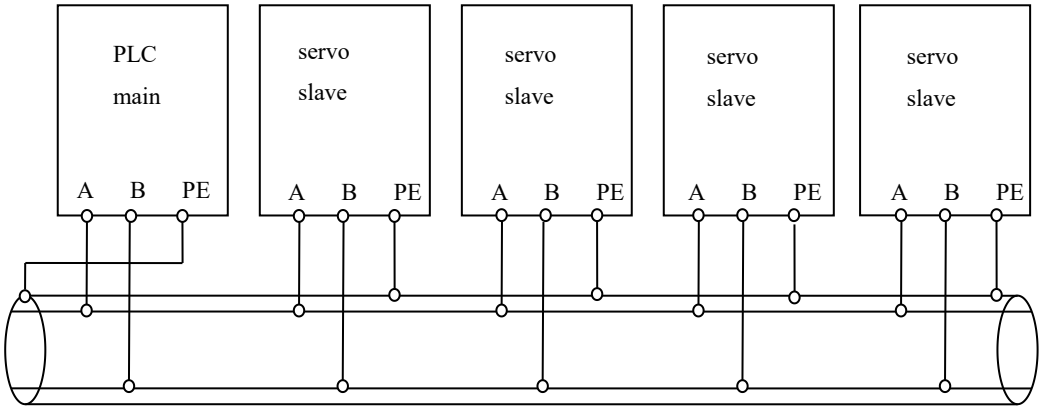


3. Communication between PLC and multiple servo motors (all servo drives and motors are properly grounded)

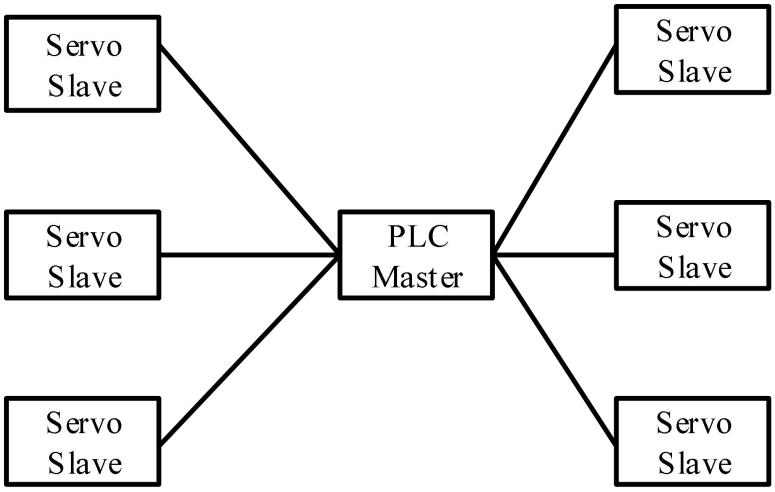
(1) Recommended approach: Hand-in-hand strategy



(2) Generally recommended: Branch structure



(3) Not recommended: Star-shaped connection structure



8.2 Communication Parameter Settings

1. RS485 Communication Parameter Settings

parameter	meaning	Factory Settings	Set Range	revise	Take effect
P7-00	RS485 Station Number	1	0~100	servo bb	immediately

parameter	Parameter Functions	Set Unit	Factory Settings	Applicable Mode	revise	Take effect
P7-01	Communication Configuration	-	n.2206	whole	servo bb	immediately
	parameter setting	Functionality Above view	Factory Settings	Set Range		
	n.□xxx	check bit	2	0: No validation 1: Odd Check 2: Parity Check		
	n.x□xx	stop bit	2	2:1st position		
	n.xx□□	Baud rate	06	00：300 01：600 02：1200 03：2400 04：4800 05：9600 06：19200 07：38400 08：57600 09：115200 0A：192000 0B：256000 0C：288000		

				0D：384000 0E：512000 0F：576000 10：768000 11：1M 12：2M 13：3M 14：4M 15：5M 16：6M

parameter	meaning	Factory Settings	Set Range	revise	Take effect
P7-02	RS485 Communication Protocol	1	1: Modbus RTU Protocol 2: XNet Bus Protocol 3: Read the Xnet bus torque	servo bb	immediately

2. RS232 Communication Parameter Settings

parameter	meaning	Factory Settings	Set Range	revise	Take effect
P7-10	RS232 Station Number	1	0~100	servo bb	immediately

parameter	Parameter Functions	Set Unit	Factory Settings	Applicable Mode	revise	Take effect
P7-11	Communication Configuration	-	n.2206	whole	at any time	immediately
	parameter setting	Functionality Above view	Factory Settings	Set Range		
	n.□xxx	check bit	0	0: No validation 1: Odd Check 2: Parity Check		
	n.x□xx	stop bit	0	0: 2 digits 2:1st position		

	n.xx□□	Baud rate	06	00：300 01：600 02：1200 03：2400 04：4800 05：9600 06：19200 07：38400 08：57600 09：115200 0A：192000 0B：256000 0C：288000 0D：384000 0E：512000 0F：576000 10：768000 11：1M 12：2M 13：3M 14：4M 15：5M 16：6M

8.3 Communication Protocols

When communicating Above a Modbus network, this protocol requires each controller to know its device address, identify messages received at that address, and determine the appropriate action to take. If a response is needed, the controller generates feedback and transmits it via the Modbus protocol. On other networks, messages containing Modbus protocol data are converted into frame or packet structures suitable for that network; this conversion also adapts methods for addressing, routing, and error detection according to specific network requirements.

8.3.1 Character Structure

(Format 1-8-2, no validation)

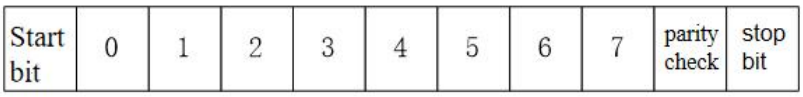


(Format 1-8-1, odd parity)

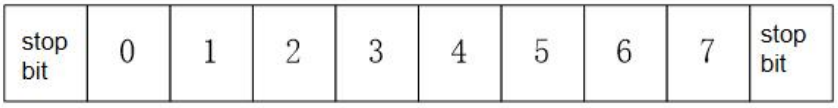


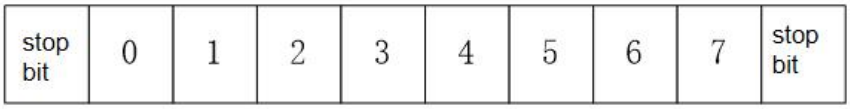
(Format 1-8-1, parity check)





(Format 1-8-1, no validation)





The default data format for a servo driver is: 1 start bit, 8 data bits, and 1 stop bit.

8.3.2 Structure of Communication Information

1、RTU pattern

project	description
START	Keep the no-input signal duration greater than or equal to 10 ms
Address	Address: 8-bit binary address
Function	Function Code: 8-bit binary address
DATA（n - 1）	Data content: N × 8-bit data, where N ≤ 8, with a maximum of 8 bytes
……	
DATA 0	
CRC CHK Low	CRC check code
CRC CHK High	The 16-bit CRC check code consists of two 8-bit binary combinations.
END	Maintain the input/output signal duration to be greater than or equal to 10 ms

2. Communication address

The manual provides Modbus addresses; refer to Appendix 4 for the correspondence table.

3. Function Code (Function) and Data Content (DATA)

FC	description
03H	Read the contents of registers. You can read multiple register contents, but no more than 31 at a time; each read operation can only target data within the same group.
06H	Write one piece of data to the register

Function Code 03H: Read register contents

For example: Read the content of register address H1005 (bus voltage) in U0-05.

RTU pattern ：

Request Information Format		Response Message Format	
address	01H	address	01H
FC	03H	FC	03H
Register Address	10H	Byte Count	02H
	05H		
Number of Registers	00H	Data Content	01H
	01H		34H
CRC CHECK Low	90H	CRC CHECK Low	B8H
CRC CHECK High	CBH	CRC CHECK High	03H

Function Code 06H: Write a piece of data to the register

For example: Set the rotational speed of 300 revolutions to the address of the P3-18 register for point-speed control.

RTU pattern ：

Request Information Format		Response Message Format	
address	01H	address	01H
FC	06H	FC	06H
Register Address	03H	Register Address	03H
	12H		12H
Data Content	01H	Data Content	01H
	2CH		2CH
CRC CHECK Low	29H	CRC CHECK Low	29H
CRC CHECK High	C6H	CRC CHECK High	C6H

4. Verification Code

RTU Mode: Two-byte hexadecimal number.

The CRC field is a two-byte field containing a 16-bit binary value. It is computed by the sender and appended to the message; the low byte is added first, followed by the high byte, making the high byte of the CRC the final byte of the transmitted message. The receiver recalculates the CRC of the received message and compares it with the value in the CRC field. If the values differ, an error is detected, the message frame is discarded without any response, and reception proceeds to the next frame. For detailed CRC calculation methods, refer to the MODBUS protocol specifications.

8.4 Communication Examples

8.4.1 Communication Example with Xinje PLC

The Xinje PLC communicates with two Xinje drivers via 485 interface to read the motor's rotational speed and set its torque limits.

1. Hardware wiring

When using the AB terminals of the Xinje PLC for 485 communication, connect the driver's CN4 port via an Ethernet cable, and route pins 485-A and 485-B to the corresponding AB terminals on the PLC.

2. Parameter Settings

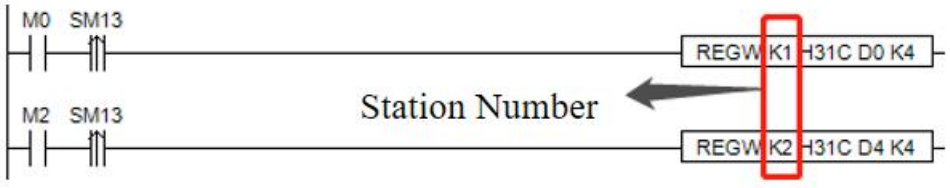
Align the communication parameters of both the drive and PLC, including baud rate, parity, data bits, and slave configuration. Both the Xinje PLC and servo units utilize the standard MOBUS-RTU communication protocol (19200 bps, 1-8-1 parity).
Set the parameters as follows:
P7-00 Station Numbers 1, 2
P7-01.0~1 Port Rate: 06
P7-01.2 Stop Level 2
P7-01.3 Check Bit 2

If the communication parameters between the upper computer and the lower computer are inconsistent, communication will fail.

3. Software Programs

In the program, write instructions must specify the station number, communication address, and the register containing the data to be written.

(1) Station number: Value set for servo driver P7-00. K1 represents P7-00 set to 1; K2 represents P7-00 set to 2.



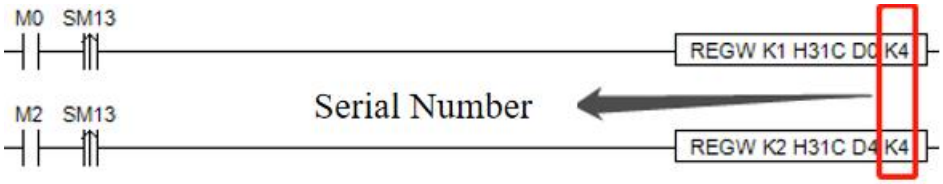
(2) Communication Address: The address of the slave station; for specific register addresses, refer to Appendix 4, the Modbus Address Correspondence Table.



(3) Register: Used to store the parameter value of the write address.



(4) Serial port number: The serial port number of the PLC's RS485 interface.



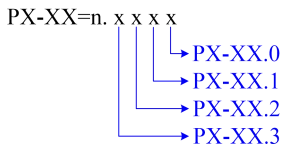
Appendix

Appendix 1. Above view Table of Functional Parameters for Group P

Modification and Effective Date:
"○" represents modifications made during Servo configuration, effective immediately;
"√" values can be changed at any time and take effect immediately.
"●" represents modifications made during servo BB operation; requires a power cycle to take effect.
"△" represents that it can be changed at any time and takes effect when the motor is not rotating;
"▲" represents it can be modified at any time and requires a power cycle to take effect.

For hexadecimal parameters, prefix "n." before the value represents that it is a hexadecimal number.

Parameter Composition:



P0-XX：

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P0-01	Control Mode 1: Internal Torque Mode 2: External Analog Torque Mode 3: Internal Speed Mode 4: External Analog Speed Mode 5: Internal Position Mode 6: External Pulse Position Mode 7: External Pulse Speed Mode	-	6	1~10	○	1|2|3|4|5|6|7	5.1.1
P0-02	**Control Mode 2 (same as above)**	-	6	1~10	○	1|2|3|4|5|6|7	5.1.1
P0-03	**Enabling Mode: 0: Disabled;** 1: IO-enabled;	-	1	0~3	○	1|2|3|4|5|6|7	5.2.2

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
	2: Software-enabled; 3: XNET Bus-enabled						
P0-04	Rigidity Level	-	≤20P7：15 ≥21P0：10	0~63	△	1|2|3|4|5|6|7	6.3.3
P0-05	Rotation Direction Definition: 0: Normal Mode; 1: Reversed Mode	-	0	0~1	●	1|2|3|4|5|6|7	5.2.3
P0-07	First Inertia Ratio	1%	500	0~50000	√	1|2|3|4|5|6|7	6.2.1
P0-09.0	**Enter the pulse instruction in positive direction** 0: Forward pulse count 1: Reverse pulse count	-	0	0~1	●	6|7	5.3.2
P0-09.2	**Input Pulse Instruction Filtering Time**	-	F	0~F	●	6|7	5.3.2
P0-09.3	Input Pulse Instruction Filtering Pre-allocation	-	0	0~7	●	6|7	5.3.2
P0-10.0	0: CW/CCW 1: AB (not supported in external pulse speed mode) 2: P+D	-	2	0~2	○	6|7	5.3.2
P0-11～P0-12	**Number of instruction pulses per cycle** 0: Uses electronic gear ratio Non-0: Number of command pulses required per motor revolution	1 pul	10000	0~99999999	○	5|6	5.3.1.1
P0-13	Electronic Gear Molecule	-	1	0~65535	○（Before 3770 ） √（3770 and after	5|6	5.3.1.1
P0-14	Electronic Gear Denominator	-	1	0~65535	○	5|6	5.3.1.1
P0-15	The rated speed corresponds to the pulse frequency.	100Hz	1000	1~10000	○	7	5.4.3.2
P0-16	Speed Command Pulse Filtering Time	0.01ms	100	0~10000	○	7	5.4.3.3
P0-18	Number of feedback pulses per encoder revolution (low bit)	0	0	0~9999	○	1|2|3|4|5|6|7	5.8
P0-19	Number of feedback pulses per encoder revolution (high bit)	10000	1	0~9999	○	1|2|3|4|5|6|7	5.8

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P0-20	Encoder feedback pulse output frequency division (numerator)	-	1	0~65535	○	1|2|3|4|5|6|7	5.8
P0-21	Encoder feedback pulse output frequency division (denominator)	-	1	0~65535	○	1|2|3|4|5|6|7	5.8
P0-23	Pulse Deviation Limit	0.01 Circle	2000	0~65535	√	5|6|10	5.3.1.6
P0-24	**Discharge resistor type selection (Version 3640 and earlier)** 0: Built-in | 1: External **Discharge resistor power protection method (Version 3700 and later)** 0: Cumulative discharge time 1: Average power mode 12: Average power mode 2 (imperfect, not recommended)	-	0	0~2	○	1|2|3|4|5|6|7	5.2.6
P0-25	Discharge resistance power value	W	By Device Model Settings	1~65535	○	1|2|3|4|5|6|7	5.2.6
P0-26	Discharge resistance value	Ω	By Device Model Settings	1~500	○	1|2|3|4|5|6|7	5.2.6
P0-27	**Server Gateway enables shutdown mode** 0: Free run stopped 2: Decelerated run stopped	-	0	0~5	○	1|2|3|4|5|6|7	5.2.4
P0-28	**Servo Overload Stop Mode (P0-28.0)** 0: Slow down and stop 1: Stop freely 2: Slow down and stop 3: Alarm and stop **Overload Alarm Shielding Switch (P0-28.1)** 0: Do not block out-of-range alarms 1: Block out-of-range alarms	-	2 0	0~3 0~1	○	1|2|3|4|5|6|7	5.2.4
P0-29	**Servo Alarm Stop Mode**	-	2	0~2	○	1|2|3|4|5|6|7	5.2.4

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
	0: Free run stopped 2: Decelerated run stopped						
P0-30	Stop timeout time	1ms	20000	0~65535	○	1|2|3|4|5|6|7	5.2.3
P0-31	Stop Time of Reduction	1ms	25	0~5000	○	1|2|3|4|5|6|7	5.2.3
P0-33	Motor Code Setting	-	0	0~ffff	●	1|2|3|4|5|6|7	-
P0-53	**Automatic Reading Motor Parameters Alarm Shielding Switch** 0: Do not block alarms 1: Block alarms for unread valid motor parameter values	-	0	0~1	●	1|2|3|4|5|6|7	7.2
P0-55	Open-loop rotation speed	-	0	-6000~6000	●	1|2|3|4|5|6|7	-
P0-56	Number of encoder communication attempts	-	10	1~65535	●	1|2|3|4|5|6|7	7.2
P0-68 xx□□	Number of alarms for sequential errors during encoding data update	-	0x05	0x01~0xFF	●	1|2|3|4|5|6|7	-
P0-68 □□xx	E-241 Alarm Filtering Count	-	0	0~0xFF	●	1|2|3|4|5|6|7	-
P0-69	Fan switch (P0-69.0): 0 – Turns fan on when temperature exceeds 45°C; turns off when temperature drops below 42°C (with a hysteresis of 3°C); 1 – Activates fan when enabled; deactivates fan when disabled. Large motor thermocouple wire break alarm shielding switch (P0-69.1): 0 – Does not shield the thermocouple wire break alarm; 1 – Shields the thermocouple wire break alarm.	-	1 0	0~1 0~1	√	1|2|3|4|5|6|7	-
P0-74	Turn-off alarm time	ms	By Device Model	0~5000	√	1|2|3|4|5|6|7	5.7.1

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P0-75	Turn-off alarm speed	rpm	50	5~9999	√	1|2|3|4|5|6|7	5.7.1
P0-79	Absolute encoder single/multiple-turn position switch: 0 – Used as an absolute encoder; 1 – Used as an incremental encoder; 2 – Used as an absolute encoder with ignored multiple-turn overflow alarm.	-	1	0~2	●	1|2|3|4|5|6|7	5.6.1
P0-80	Motor Thermal Power Protection Methods: 0: Current Protection 1: Average Thermal Power Protection 2: Analog Thermal Power Protection	-	2	0~2	●	1|2|3|4|5|6|7	-
P0-88.0	High/Low Speed Pulse Command (Long Line Drive) Input Mode Switch	-	0	0~1	●	6|7	5.3.2.2
P0-92～P0-93	The 32-bit electronic gear ratio formula is valid when values P0-11 to P0-14 are all equal to 0. P0-92*1 + P0-93 *10000	-	1	1~9999 0~65535	○Before 3770 √(3770 and later versions, effective only in Mode 6 in real time)	5|6	5.3.1.1
P0-94～P0-95	The 32-bit electronic gear ratio is valid when the denominators P0-11 to P0-14 are all equal to 0. P0-94*1 + P0-95 *10000	-	1	1~9999 0~65535	○	5|6	5.3.1.1

P1-XX：

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P1-00	First Speed Loop Gain	0.1Hz	<=20P7：300 >=21P0：200	10~20000	√	1|2|3|4|5|6|7	6.5.3
P1-01	First-speed loop integration time constant	0.01ms	<=20P7：2122 >=21P0：3183	15~51200	√	1|2|3|4|5|6|7	6.5.3
P1-02	First-position ring gain	0.1/s	<=20P7：300 >=21P0：200	10~20000	√	1|2|3|4|5|6|7	6.5.3
P1-05	Second Speed Loop Gain	0.1Hz	200	10~20000	√	1|3|5|6|7|	6.8.3
P1-06	Second speed loop integration time constant	0.01ms	3300	15~51200	√	1|3|5|6|7|	6.8.3
P1-07	Second Position Ring Gain	0.1/s	200	10~20000	√	1|3|5|6|7|	6.8.3
P1-10	Speed Feedforward Gain	1%	0	0~300	√	5|6|7	-
P1-11	Speed feedforward filtering time	0.01ms	50	0~10000	√	5|6|7	-
P1-14	Gain Switching Mode Settings	-	0	0~0x00A2	√	1|2|3|4|5|6|7	6.8.3
P1-15	Gain switching wait time	-	5	0~1000	√	1|2|3|4|5|6|7	6.8.3
P1-16	Gain Switching Level Threshold	-	50	0~20000	√	1|2|3|4|5|6|7	6.8.3
P1-17	Gain switching level hysteresis	-	30	0~20000	√	1|2|3|4|5|6|7	6.8.3
P1-18	Position loop gain switching time	-	3	0~1000	√	1|2|3|4|5|6|7	6.8.3
P1-22	Speed command filter selection: 0: First-order low-pass filter 1: Sliding average filter	-	0	0~1	○	3|4|7	5.4.1.4

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P1-23	Speed Command Filter Time Parameter	0.1ms	0	0~65535	○	3|4|7	5.4.1.4
P1-24	Position instruction acceleration/deceleration filtering time	0.1ms	0	0~65535	△	5|6	5.3.1.7
P1-25	Position Command Smoothing Filter Time Parameter	0.1ms	0	0~65535	△	5|6	5.3.1.7
P1-74	Encoder Zero Bit Offset Detection Cycle	-	1000	0~65535	√	1|2|3|4|5|6|7	-
P1-75.0~1	Encoder Zero-bit Offset Detection Threshold	-	0A	0~500	√	1|2|3|4|5|6|7	-
P1-75.2~3	Number of filtering steps for electrical angle deviation detection (supported in versions 3770 and later)	-	06	0~500	√	1|2|3|4|5|6|7	-

P2-XX：

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P2-00.0	Disturbance observer switch: 0: Off; 1: On	-	1	0~1	○	1|2|3|4|5|6|7	6.1.4
P2-01.0	Adaptive Mode Switch 0: Off 1: On	-	3KW 及以下：0 Others：1	0~1	●	1|2|3|4|5|6|7	6.6.3
P2-01.1	Adaptive Level: 0 – High Response; 1 – Low Noise	-	By Device Model	0~1	●	1|2|3|4|5|6|7	-
P2-02.0	Self-tuning modes: 1: Soft; 2: Fast positioning; 3: Fast positioning with overshoot control	-	3	1~3	√	1|2|3|4|5|6|7|	6.1.3

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P2-02.2	Load Type (valid only during self-tuning): 1: Synchronous Belt 2: Screw Drive 3: Rigid Connection	-	2	1~3	√	1|2|3|4|5|6|7	6.1.3
P2-03.3	Adaptive Load Type: 0 – Low Inertia Mode; 1 – High Inertia Mode	-	0	0~1	●	1|2|3|4|5|6|7	6.6.4
P2-05	Adaptive Mode Speed Loop Gain (Standard)	0.1Hz	20P1/20P2/20P4/20P7：400 >=21P5：200	1~65535	○	1|2|3|4|5|6|7	6.6.4
P2-07	Adaptive Mode Inertia Ratio (Standard)	%	0	0~10000	○	1|2|3|4|5|6|7	6.6.4
P2-08	Adaptive Mode Speed Observer Gain (Standard)	Hz	20P1/20P2/20P4/20P7：60 >=21P5：40	10~1000	○	1|2|3|4|5|6|7	6.6.4
P2-12	Adaptive Mode Maximum Inertia Ratio (Standard)	-	30	1~10000	○	1|2|3|4|5|6|7	6.6.4
P2-15	Internal command: Set to maximum travel distance Maximum travel distance for inertia recognition	0.01r	100	1~3000 1~300	√	1|2|3|4|5|6|7	6.2.4
P2-17	Maximum speed achievable through inertia identification and internal command-based self-tuning	rpm	0	0~65535	√	1|2|3|4|5|6|7	6.2.4
P2-16	Adaptive Mode Motor Rotor Inertia Coefficient	-	100	10~1000	○	1|2|3|4|5|6|7	6.2.4
P2-18	Initial inertia ratio for inertia identification	%	500	1~20000	√	1|2|3|4|5|6|7	6.2.4

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P2-19	Adaptive Mode Bandwidth	%	20P1：100 20P2，20P4：70 >=20P7：50	1~100	○	1|2|3|4|5|6|7	6.2.4
P2-35	Torque command filtering time constant 1	0.01ms	100	0~65535	√	1|2|3|4|5|6|7	6.5.3
P2-41	Disturbance torque compensation coefficient (effective in non-adaptive mode)	%	85	0~100	√	1|2|3|4|5|6|7	6.1.4
P2-47.0	Model Loop Switch 0: Off 1: On	-	1	0~f	√	1|2|3|4|5|6|7	6.1.3
P2-49	Model Ring Gain	0.1Hz	500	10~20000	√	3|4|5|6|7	6.5.3
P2-60.0	Active Vibration Suppression Switch 0: Off 1: On	-	0	0~1	√	3|4|5|6|7	6.4.6
P2-60.1	Active vibration suppression during self-adjustment: 0 – No active vibration suppression configured; 1 – Active vibration suppression configured	-	1	0~1	√	3|4|5|6|7	6.4.6
P2-61	Active vibration suppression frequency	0.1Hz	1000	10~20000	√	1|2|3|4|5|6|7	6.5
P2-62	Active vibration suppression gain	%	100	1~1000	√	1|2|3|4|5|6|7	6.4.6
P2-63	Active vibration suppression damping	%	100	0~300	√	1|2|3|4|5|6|7	6.4.6
P2-64	Active vibration suppression filtering time 1	-	0	-5000~5000	√	1|2|3|4|5|6|7	6.4.6
P2-65	Active vibration suppression filtering time 2	-	0	-5000~5000	√	1|2|3|4|5|6|7	6.4.6
P2-66	The second group uses active vibration suppression damping	-	0	0~1000	√	1|2|3|4|5|6|7	6.4.6

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
	techniques.						
P2-67	Second group of active vibration suppression frequencies	Hz	20000	10~50000	√	1|2|3|4|5|6|7	6.4.6
P2-69.0	Sloshing Filter 1 Switch	-	0	0~1	√	1|2|3|4|5|6|7	6.4.6
P2-69.1	Sloshing Filter 2 Switch	-	0	0~1	√	1|2|3|4|5|6|7	6.4.6
P2-69.3	Sloshing Filter 3 Switch	-	0	0~1	√	1|2|3|4|5|6|7	-
P2-70.0	Sloshing Filter 4 Switch	-	0	0~1	√	1|2|3|4|5|6|7	-
P2-70.1	Sloshing Filter 5 Switch	-	0	0~1	√	1|2|3|4|5|6|7	-
P2-71	First notch frequency	Hz	5000	50~5000	√	1|2|3|4|5|6|7	6.7.7
P2-72	First notch attenuation	0.1dB	70	50~1000	√	1|2|3|4|5|6|7	6.7.7
P2-73	First notch bandwidth	Hz	0	0~1000	√	1|2|3|4|5|6|7	6.7.7
P2-74	Second absorption frequency	Hz	5000	50~5000	√	1|2|3|4|5|6|7	6.7.7
P2-75	Second absorption attenuation	0.1dB	70	50~1000	√	1|2|3|4|5|6|7	6.7.7
P2-76	Second absorption band width	Hz	0	0~1000	√	1|2|3|4|5|6|7	6.7.7
P2-77	Third absorption frequency	Hz	5000	50~5000	√	1|2|3|4|5|6|7	6.7.7
P2-78	Third waveguide attenuation	0.1dB	70	50~1000	√	1|2|3|4|5|6|7	6.7.7
P2-79	Third absorption band width	Hz	0	0~1000	√	1|2|3|4|5|6|7	6.7.7
P2-80	Fourth absorption frequency	Hz	5000	50~5000	√	1|2|3|4|5|6|7	6.7.7
P2-81	Fourth absorption wave attenuation	0.1dB	70	50~1000	√	1|2|3|4|5|6|7	6.7.7
P2-82	Fourth absorption band bandwidth	Hz	0	0~1000	√	1|2|3|4|5|6|7	6.7.7
P2-83	Fifth absorption frequency	Hz	5000	50~5000	√	1|2|3|4|5|6|7	6.7.7
P2-84	Fifth: Waveform attenuation	0.1dB	70	50~1000	√	1|2|3|4|5|6|7	6.7.7

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P2-85	Fifth absorption band bandwidth	Hz	0	0~1000	√	1|2|3|4|5|6|7	6.7.7

P3-XX：

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P3-00	**V-REF Function Allocation** 0: V-REF serves as the speed command input 1: V-REF acts as the reference value for external speed limit; actual speed limit depends on the external analog speed limit 2: Speed feedforward	-	0	0~2	○	1|2|4	5.5
P3-01	The rated speed corresponds to the analog voltage value.	0.001V	10000	1500~30000	○	1|2|4	5.4.4
P3-02	Analog voltage velocity filtering	0.01ms	200	0~10000	√	1|2|4	5.4.4
P3-03	Speed Command Input Dead Zone Voltage	0.001v	0	0~500	√	1|2|4	5.4.4
P3-04	V-REF Analog Signal Speed Direction Switching Method	-	0	0~1	√	1|2|4	5.4.4
P3-05	Default Speed 1	rpm	0	-9999~9999	√	3	5.4.2
P3-06	Default Speed 2	rpm	0	-9999~9999	√	3	5.4.2
P3-07	Default Speed 3	rpm	0	-9999~9999	√	3	5.4.2
P3-09	[计] acceleration	ms	Version	0~65535	○	3|4|7	5.4.1.1

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
	time		3720 and earlier: Version 03730:200				
P3-10	[计] deceleration time	ms	Version 3720 and earlier: Version 03730:200	0~65535	○	3|4|7	5.4.1.1
P3-11	Speed command sliding average filter time (supported in version 3770 and later)	ms	0	0~65535	○	3|4|7	5.4.1.4
P3-12	Zero-speed Clamping Mode	-	0	0~3	○	3|4|7	5.4.1.2
P3-13	Zero-speed clamping speed	rpm	10	0~300	○	3|4|7	5.4.1.2
P3-14	Positive maximum speed command limit	rpm	4000	0~10000	○	1|2|3|4|5|6|7	5.7.3
P3-15	Reverse Maximum Speed Command Limit	rpm	4000	0~10000	○	1|2|3|4|5|6|7	5.7.3
P3-16	Internal forward speed limit during torque control	rpm	2000	5~10000	√	1|2	5.5.1.2
P3-17	Internal reverse speed limit during torque control	rpm	2000	5~10000	√	1|2	5.5.1.2
P3-18	Jog Speed	rpm	100	0~1000	○	1|2|3|4|5|6|7	4.4.2
P3-19	Positive Warning Speed	rpm	3000	0~10000	○	1|2|3|4|5|6|7	5.7.5.4
P3-20	Reverse Warning Speed	rpm	3000	0~10000	○	1|2|3|4|5|6|7	5.7.5.4
P3-21	Positive alarm speed	rpm	4000	0~10000	○	1|2|3|4|5|6|7	-
P3-22	Reverse Alarm Speed	rpm	4000	0~10000	○	1|2|3|4|5|6|7	-
P3-23	T-**REF Function**	-	0	0~2	○	2|3|4|5|6|7	5.7.2

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
	Allocation 0: As torque command input 1: Required condition for external torque limit input; compare with P3-28/P3-29 – minimum value is valid 2: Torque feedforward						
P3-24	The numerical value of the analog quantity corresponding to the rated torque	0.001V	10000	1500~30000	○	2|3|4|5|6|7	5.5.3
P3-25	Analog voltage-to-torque filtering time	0.01ms	200	0~10000	√	2|3|4|5|6|7	5.5.3
P3-26	Torque command input dead zone voltage	0.001V	0	0~500	√	2|3|4|5|6|7	5.5.3
P3-27	**Analog torque in positive direction** 0: Forward 1: Reverse	-	0	0~1	○	2|3|4|5|6|7	-
P3-28	Internal forward rotation torque limit	%	By Device Model	0 - Motor overload factor	√	1|2|3|4|5|6|7	5.7.2
P3-29	Internal reverse rotation torque limit	%	By Device Model	0 - Motor overload factor	√	1|2|3|4|5|6|7	5.7.2
P3-30	External forward rotation torque limit	%	By Device Model	0 - Motor overload factor	√	1|2|3|4|5|6|7	5.7.2
P3-31	External Reverse Torque Limit	%	By Device Model	0 - Motor overload factor	√	1|2|3|4|5|6|7	5.7.2
P3-32	brake torque	1%	100	0~1000	√	1|2|3|4|5|6|7	5.2.4
P3-33	Prescribed Torque	%	0	-1000~1000	√	1	5.5.1.1

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P3-38	Prevention of reversal and establishment of positive rotation torque limits	%	By Device Model	0 - Motor overload factor	√	1|2|3|4|5|6|7	5.7.1
P3-39	Prevention of reverse rotation; Limitation of reverse rotation torque	%	By Device Model	0 - Motor overload factor	√	1|2|3|4|5|6|7	5.7.1
P3-45	Torque mode switching delay	ms	40	0~9999	√	1|2	-
P3-47	V-REF Analog Signal Zero Drift Correction	-	0	-1000~1000	√	2|4	5.4.4.7
P3-48	V-REF Analog Voltage Bias	mV	0	-9999~9999	√	2|4	5.4.4.7
P3-49	T-REF Analog Signal Zero Drift Correction	-	0	-1000~1000	√	2|4	5.5.3.5
P3-50	T-REF Analog Voltage Bias	mV	0	-9999~9999	√	2|4	5.5.3.5

P4-XX：

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P4-00.0	**Z believes the number of signs** Number of Z signals after passing the limit switch (Note: Stop when the n+1th Z signal arrives).	-	2	0~f	○	5|6	5.3.1.8
P4-00.1	**Is the Origin Search feature enabled?** 0: Disabled 1: Enabled	-	0	0~1	○	5|6	5.3.1.8
P4-00.2	**Prohibition of exceeding the return-to-zero range** 0: Not prohibited 1-Prohibited	-	0	0~1	○	5|6	5.3.1.8
P4-01	Speed of collision with the proximity sensor	rpm	600	0~65535	○	5|6	5.3.1.8
P4-02	Speed when approaching the proximity sensor	rpm	100	0~65535	○	5|6	5.3.1.8
P4-03.0	Set the positioning mode based on the	-	0	0~1	○	5	5.3.3.1

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
	given internal location pattern 0: Relative Positioning 1: Absolute Positioning						
P4-03.1	Internal location-based step switching mode settings: 0 – Switch steps when the signal is ON, with cyclic operation; 1 – Switch steps at the signal's rising edge, executed sequentially; 2 – Initiate step switching at the signal's rising edge, execute all steps sequentially without cycling; 3 – Communication-based segment number setting; 4 – /CHSTP triggered by both edges; 5 – Select segment numbers using terminals/PREFA (P5 – 57), /PREFB (P5 – 58), or /PREFC (P5 – 59); available segments 1 – 3; 6 – Select segment numbers using terminals/PREFA (P5 – 57), /PREFB (P5 – 58), /PREFC (P5 – 59), or /PREFD (P5 – 60); available segments 1 – 16 (Note: Firmware versions 3730 and later support segments 1 – 8 of Step Switching Mode 6; firmware versions 3740 and later support segments 1 – 16).	-	0	0~6	○	6	5.3.3.1
P4-03.2	Internal location setting: 0 – Wait for positioning to complete; 1 – Do not wait for positioning to complete	-	0	0~1	○	5	5.3.3.1
P4-04	Number of valid segments	-	0	0~35	○	5	5.3.3.2
P4-08	Internal Location Pattern Starting Segment Number	-	1	0~35	○	5	5.3.3.3
P4-10 ～ P4-11	First pulse segment	1pul	0	-2276899999~32767999999	√	5	5.3.3.3
P4-12	First Paragraph Speed	0.1rpm	0	0~65535	√	5	5.3.3.3
P4-13	First acceleration time	1ms	0	0~65535	√	5	5.3.3.3
P4-14	First deceleration period	1ms	0	0~65535	√	5	5.3.3.3

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P4-16	adjust the time	1ms	0	0~65535	√	5	5.3.3.3
P4-10+（n-1）*7~P4-16+（n-1）*7	Pulse parameters for paragraphs 1 through 35 (where n indicates the position number)	-	-	-	√	5	5.3.3.3

P5-XX：

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P5-00	Positioning completion width/COIN	Command Unit	11	1~65535	√	5|6	5.3.1.2
P5-01	Location Detection Mode Completed	-	0	0~3	√	5|6	5.3.1.2
P5-02	Positioning completion retention time	ms	0	0~65535	√	5|6	5.3.1.2
P5-03	Rotation Detection Speed	rpm	50	0~10000	√	1|2|3|4|5|6|7	5.7.5.2
P5-04	Detection speed at the same speed	rpm	50	0~10000	√	1|2|3|4|5|6|7	5.7.5.3
P5-05	Detection speed reached	rpm	1000	0~10000	√	1|2|3|4|5|6|7	5.4.1.3
P5-06	Position close to the output width	Command Unit	50	1~65535	√	5|6	5.3.1.3
P5-07	Servo-off delay time	ms	500	0~65535 (Before 3760) -500~9999（3760 and beyond）	○	1|2|3|4|5|6|7	5.2.5
P5-08	Brake Command Output Speed	rpm	30	20~10000	○	1|2|3|4|5|6|7	5.2.5
P5-09	Brake Command Wait Time	ms	500	0~65535	○	1|2|3|4|5|6|7	5.2.5
P5-10	Custom Output 1 Trigger Condition	-	0	0~ffff	√	1|2|3|4|5|6|7	5.7.5.7
P5-11	Value to compare with the trigger condition for Custom Output 1	Related to trigger conditions	0	-9999~9999	√	1|2|3|4|5|6|7	5.7.5.7
P5-12	Select Custom Output 1 Method	-	0	0~3	√	1|2|3|4|5|6|7	5.7.5.7
P5-13	Set Custom Output 1 Hysteresis Loop	Related to trigger conditi	0	0~65535	√	1|2|3|4|5|6|7	5.7.5.7

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
		ons					
P5-14	Custom Output 2 Trigger Condition	-	0	0~ffff	√	1|2|3|4|5|6|7	5.7.5.7
P5-15	Value to compare with the trigger condition for Custom Output 2	Related to trigger conditions	0	-9999~9999	√	1|2|3|4|5|6|7	5.7.5.7
P5-16	Select Custom Output 2 Method	-	0	0~3	√	1|2|3|4|5|6|7	5.7.5.7
P5-17	Set Custom Output 2 Hysteresis Loop	Related to trigger conditions	0	0~65535	√	1|2|3|4|5|6|7	5.7.5.7
P5-18	SI Filtering Time Factor	-	1	0~10000	√	1|2|3|4|5|6|7	5.7.4.1
P5-19	Z-phase output hold time	ms	2	1~65535	√	1|2|3|4|5|6|7	5.7.5.6
P5-20.0~1	/S-ON: Servo signal 00 – Set the signal to always "off"; 01 – Apply a positive signal to SI1; 02 – Apply a positive signal to SI2; 03 – Apply a positive signal to SI3; 04 – Apply a positive signal to SI4; 10 – Set the signal to always "on"; 11 – Apply an inverted signal to SI1; 12 – Apply an inverted signal to SI2; 13 – Apply an inverted signal to SI3; 14 – Apply an inverted signal to SI4	-	01	0~ff	√	1|2|3|4|5|6|7	5.2.2
P5-20.2	SI Terminal Filtering Time	ms	0	0~f	√	1|2|3|4|5|6|7	5.7.4.1
P5-21.0~1	/P/ – Proportional action command for the P/CON ratio	-	00	0~ff	√	1|2|3|4|5|6|7	5.7.6.1
P5-21.2	SI Terminal Filtering Time	ms	0	0~f	√	1|2|3|4|5|6|7	5.7.4.1
P5-22.0~1	/P-OT: Forward drive is prohibited	-	03	0~ff	√	1|2|3|4|5|6|7	5.2.4
P5-22.2	SI Terminal Filtering Time	ms	0	0~f	√	1|2|3|4|5|6|7	5.7.4.1
P5-23.0~1	-N/OT: Reverse drive is prohibited	-	04	0~ff	√	1|2|3|4|5|6|7	5.2.4
P5-23.2	SI Terminal Filtering Time	ms	0	0~f	√	1|2|3|4|5|6|7	5.7.4.1
P5-24.0~1	/ALM-RST: Alert cleared	-	02	0~ff	√	1|2|3|4|5|6|7	5.7.6.2
P5-24.2	SI Terminal Filtering Time	ms	0	0~f	√	1|2|3|4|5|6|7	5.7.4.1

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P5-25.0~1	/P-CL: External torque limit for forward rotation	-	00	0~ff	√	1|2|3|4|5|6|7	5.7.2
P5-25.2	SI Terminal Filtering Time	ms	0	0~f	√	1|2|3|4|5|6|7	5.7.4.1
P5-26.0~1	-N/CL: External torque limit on the reverse side	-	00	0~ff	√	1|2|3|4|5|6|7	5.7.2
P5-26.2	SI Terminal Filtering Time	ms	0	0~f	√	1|2|3|4|5|6|7	5.7.4.1
P5-27.0~1	/SPD-D: Internal Speed Direction Selection	-	00	0~ff	√	1|2|3|4|7	5.4.2
P5-27.2	SI Terminal Filtering Time	ms	0	0~f	√	1|2|3|4|7	5.7.4.1
P5-28.0~1	Speed Mode: /SPD-A – Internal speed setting; Select new original mode: /SPD-A – Trigger original action; Old original mode: /SPD-A – Forward rotation direction; Find origin	-	00	0~ff	√	3|5	5.4.2
P5-28.2	SI Terminal Filtering Time	ms	0	0~f	√	3|5	5.7.4.1
P5-29.0~1	Speed Mode: /SPD-B – Internal speed setting; Select original mode: /SPD-B – Reverse direction to return to origin	-	00	0~ff	√	3|5	5.4.2
P5-29.2	SI Terminal Filtering Time	ms	0	0~f	√	3|5	5.7.4.1
P5-30.0~1	/C-SEL: Control Mode Selection	-	00	0~ff	√	1|2|3|4|5|6|7	5.1.2
P5-30.2	SI Terminal Filtering Time	ms	0	0~f	√	1|2|3|4|5|6|7	5.7.4.1
P5-31.0~1	Internal speed mode / External pulse speed mode / External analog speed measurement: /ZCLAMP: Zero clamp; Internal position mode: /Z-CLAMP: Skip current segment	-	00	0~ff	√	Zero clipping: 3|4|7 Skip current segment: 5	5.4.1.2
P5-31.2	SI Terminal Filtering Time	ms	0	0~f	√	3|4|7	5.7.4.1
P5-32.0~1	/INHIBIT: Command pulse prohibition	-	00	0~ff	√	5	5.3.1.4
P5-32.2	SI Terminal Filtering Time	ms	0	0~f	√	5	5.7.4.1
P5-33.0~1	/G-SEL：Gain Switching	-	00	0~ff	√	1|3|5|6|7	6.8.3
P5-33.2	SI Terminal Filtering Time	ms	0	0~f	√	1|3|5|6|7	6.8.3
P5-34.0~1	/CLR：Pulse offset elimination	-	00	0~ff	√	5|6	5.3.1.5
P5-34.2	SI Terminal Filtering Time	ms	0	0~f	√	5|6	5.7.4.1
P5-35.0~1	/CHGSTP：Internal Location Mode Step Change Signal	-	00	0~ff	√	5	5.3.3
P5-35.2	SI Terminal Filtering Time	ms	0	0~f	√	5	5.7.4.1
P5-36.0~1	/I-SEL：Inertia Ratio Switching	-	00	0~ff	√	1|2|3|4|5|6|7	6.6.7
P5-36.2	SI Terminal Filtering Time	ms	0	0~f	√	1|2|3|4|5|6|7	5.7.4.1
P5-37	/COIN_HD：Positioning completed, status 00: Not	-	0000	0~ffff	√	5|6	5.3.1.2

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
	output to terminal 01: Positive signal output from SO1 terminal 02: Positive signal output from SO2 terminal 03: Positive signal output from SO3 terminal 11: Reverse signal output from SO1 terminal 12: Reverse signal output from SO2 terminal 13: Reverse signal output from SO3 terminal						
P5-38	/COIN: Location Determination Completed	-	0001	0~ffff	√	5|6	5.3.1.2
P5-39	/V-CMP：Detection at the same speed	-	0000	0~ffff	√	3|4|7	5.7.5.3
P5-40	/TGON：Rotation Detection	-	0000	0~ffff	√	1|2|3|4|5|6|7	5.7.5.2
P5-41	/S-RDY：be all set, in train	-	0000	0~ffff	√	1|2|3|4|5|6|7	5.7.5.1
P5-42	/CLT：torque limitation	-	0000	0~ffff	√	1|2|3|4|5|6|7	5.7.2
P5-43	/VLT：Speed Limit DetectionSpeed Limit Detection	-	0000	0~ffff	√	1|2	5.5.1.3
P5-44	/BK：Brake Interlock	-	0000	0~ffff	○	1|2|3|4|5|6|7	5.2.5
P5-45	/WARN：Warn	-	0000	0~ffff	√	1|2|3|4|5|6|7	5.7.5.4
P5-46	/NEAR：near	-	0000	0~ffff	√	5|6	5.3.7
P5-47	/ALM：Alarm	-	0002	0~ffff	√	1|2|3|4|5|6|7	5.2.6
P5-48	/Z：Encoder Z's binary signal output	-	0000	0~ffff	√	1|2|3|4|5|6|7	5.7.5.6
P5-50	/MRUN：Internal Location Mode Movement Start Signal	-	0000	0~ffff	√	5	5.3.3.6
P5-51	/V-RDY：Speed to Reach	-	0000	0~ffff	√	3|4|7	5.4.1.3
P5-52	/USER1：Custom Output 1	-	0000	0~ffff	√	1|2|3|4|5|6|7	5.7.5.7
P5-53	/USER2：Custom Output 2	-	0000	0~ffff	√	1|2|3|4|5|6|7	5.7.5.7
P5-54	Return to the origin to complete the signal	-	0000	0~ffff	√	1|2|3|4|5|6|7|8|9|10	6.6.1.9
P5-57.0~1	/PREFA：Internal Location Selection Signal A	-	00	0~ff	√	5	5.3.3.1
P5-57.2	SI Terminal Filtering Time	ms	0	0~f	√	5	5.7.4.1
P5-58.0~1	/PREFB：Internal Location Selection Signal B	-	00	0~ff	√	5	5.3.3.1
P5-58.2	SI Terminal Filtering Time	ms	0	0~f	√	5	5.7.4.1
P5-59.0~1	/PREFC：Internal Location Selection Signal C	-	00	0~ff	√	5	5.3.3.1
P5-59.2	SI Terminal Filtering Time	ms	0	0~f	√	5	5.7.4.1
P5-60.0~1	/PREFD：Internal Location Selection Signal D	-	00	0~ff	√	5	5.3.3.1
P5-60.2	SI Terminal Filtering Time	ms	0	0~f	√	5	5.7.4.1

Parameter	Functional Description	Unit	Factory Default Value	Span	Effectiveness Time	Rnge	Reference Chapter
P5-61.0~1	/TRAJ-START：The exercise starts triggering the signal.	-	00	0~ff	√	5	
P5-61.2	SI Terminal Filtering Time	ms	0	0~f	√	5	
P5-65.0~1	Analog Speed Mode Switch	-	0	0~ff	√	4	5.4.4.2
P5-70	/SRDY：Output condition selection: 0: This terminal conducts after driver initialization is complete; 1: This terminal conducts only when enabled.	-	0	0~1	√	1|2|3|4|5|6|7	5.7.5.1
P5-71	Pulse Velocity Mode Direction Terminal Function Selection	-	0	0~1	○	7	5.4.3.4

P6-XX：

Parameter	Functional Description	Unit	Factory Default Value	Range	Effective Timing	Suit Scope	Reference Chapter
P6-05	Adaptive mode speed loop gain (high inertia)	0.1Hz	200	1~65535	○	1|2|3|4|5|6|7	6.2.4
P6-07	Adaptive mode inertia ratio (high inertia)	%	50	0~10000	○	1|2|3|4|5|6|7	6.2.4
P6-08	Adaptive mode speed observer gain (high inertia)	Hz	40	10~1000	○	1|2|3|4|5|6|7	6.2.4
P6-12	Adaptive mode maximum inertia ratio (high inertia)	-	50	1~10000	○	1|2|3|4|5|6|7	6.2.4

P7-XX：

Parameter	Functional Description	Unit	Factory Default Value	Range	Effective Timing	Suit Scope	Reference Chapter
P7-00	RS485 node address	-	1	0~100	○	1|2|3|4|5|6|7	8.2

Parameter	Functional Description	Unit	Factory Default Value	Range	Effective Timing	Suit Scope	Reference Chapter
P7-01.0~1	RS485 Baud Rate 00：300 01：600 02：1200 03：2400 04：4800 05：9600 06：19200 07：38400 08：57600 09：115200 0A：192000 0B：256000 0C：288000 0D：384000 0E：512000 0F：576000 10：768000 11：1M 12：2M 13：3M 14：4M 15：5M 16：6M	Baud Rate	06	0~16	○	1|2|3|4|5|6|7	8.2
P7-01.2	RS485 Stop Bit 2：1 Bit	Stop Bit	2	0~2	○	1|2|3|4|5|6|7	8.2
P7-01.3	RS485 Parity bit 0：No parity 1：Odd parity 2：Even parity	Parity bit	2	0~2	○	1|2|3|4|5|6|7	8.2
P7-02	**RS485 Communication Protocol** 1：Modbus Rtu protocol 2：-Xnet Bus Protocol 3：Read Xnet Bus torque	-	1	1~255	○	1|2|3|4|5|6|7	8.2
P7-10	RS232 Stop Bit	-	1	0~100	√	1|2|3|4|5|6|7	8.2

Parameter	Functional Description	Unit	Factory Default Value	Range	Effective Timing	Suit Scope	Reference Chapter
P7-11.0~1	**RS232** Baud Rate 00：300 01：600 02：1200 03：2400 04：4800 05：9600 06：19200 07：38400 08：57600 09：115200 0A：192000 0B：256000 0C：288000 0D：384000 0E：512000 0F：576000 10：768000 11：1M 12：2M 13：3M 14：4M 15：5M 16：6M	Baud Rate	06	0~16	√	1|2|3|4|5|6|7	8.2
P7-11.2	**RS232 Stop Bit** 0：2 bit 2：1 bit	Stop Bit	2	0~2	√	1|2|3|4|5|6|7	8.2
P7-11.3	**RS232 Parity Bit** 0：No parity 1：Odd parity 2：Even parity	Parity Bit	2	0~2	√	1|2|3|4|5|6|7	8.2

P8-XX：

Parameter	Functional Description	Unit	Factory Default Value	Range	Effective Timing	Suit Scope	Reference Chapter
P8-25	Setting of content displayed on panel at power-on	-	0	0~2	▲	1|2|3|4|5|6|7	4.2

P9-XX：

parameter	functional description	unit	Factory Default Value	Range	Effective Timing	suit scope	consult chapters and sections
P9-00.0	Full closed-loop control mode switch 0: Close the full closed-loop mode 1: Enable full closed-loop mode	-	0	0~1	●	5|6	5.9.3.2
P9-00.1	Grating scale counting direction 0: Use the grating scale reading directly 1: Use the grating scale reading after inversion	-	0	0~1	●	5|6	5.9.3.2
P9-00.2	Grating Scale Type 0: AB phase count 1: Incremental serial communication (not supported) 2: Absolute serial communication (not supported yet)	-	0	0~2	●	5|6	5.9.3.2
P9-01.0	Full closed-loop control of speed and feedback selection 0: Motor encoder speed 1: Speed using a grating scale	-	0	0~1	●	5|6	5.9.4.1
P9-01.1	Source of the Z-phase model: 0: Encoder Z-phase 1: Grating scale Z-axis (not supported in new original mode)	-	0	0~1	●	5|6	5.9.4.1
P9-01.2	Servo Pulse Output 0: Motor encoder ABZ output 1: Grating scale ABZ output	-	0	0~1	●	5|6	5.9.4.2
P9-02	Alarming threshold for excessive deviation between motor and load positions	-	100	0~65535	●	5|6	5.9.3.2
P9-03	Setting for eliminating deviations between the motor position and the load position 0: Does not remove errors n: When the motor has completed a cumulative rotation of n revolutions, the position deviation between the motor and the load is eliminated.	-	0	0~65535	●	5|6	5.9.3.2

parameter	functional description	unit	Factory Default Value	Range	Effective Timing	suit scope	consult chapters and sections
P9-04	Alarming threshold for excessive speed deviation between motor and load	-	100	0~65535	●	5|6	5.9.3.2
P9-05	Number of feedback pulses per revolution for a motor encoder	pulse	0	0~9999	●	5|6	5.9.3.2
P9-06	Number of feedback pulses per revolution for a motor encoder	pulse	0	0~9999	●	5|6	5.9.3.2
P9-07	Number of feedback pulses per circle on the grating scale	pulse	0	0~9999	●	5|6	5.9.3.2
P9-08	Number of feedback pulses per circle on the grating scale	pulse	0	0~9999	●	5|6	5.9.3.2
P9-11.0	Return to the origin and find the number of Z-phase points	-	0	0~f	○	5|6	5.3.1.9
P9-11.1	New Origin Trigger Method 0: Prohibit returning to the origin 1: Trigger the return to origin via the SI terminal 2: In this original mode, upon initial power-on activation, it immediately returns to the starting state.	-	0	0~2	○	5|6	5.3.1.9
P9-11.2	New Origin Point Mode 0: Return to Origin Mode 0 1: Return to Origin Mode 1 2: Return to Origin Mode 2 3: Return to Origin Mode 3 4: Return to Origin Mode 4 5: Return to Origin Mode 5 6: Return to Origin Mode 6 7: Return to Origin Mode 7	-	0	0~7	○	5|6	5.3.1.9
P9-11.3	Deceleration method when encountering an out-of-range signal	-	0	0~1	○	5|6	5.3.1.9
P9-12	Return to the original high-speed speed	-	200	0~3000	○	5|6	5.3.1.9
P9-13	Return to the low-speed state at the origin	-	20	0~1000	○	5|6	5.3.1.9
P9-14	Return to Origin Acceleration and Deceleration Time	-	1000	0~5000	○	5|6	5.3.1.9
P9-15	Return to Origin Timeout Time	-	0	0~12000	○	5|6	5.3.1.9
P9-16	Touch-to-Return-to-Origin Speed Threshold	-	2	0~1000	○	5|6	5.3.1.9
P9-17	Touch-to-revert-to-origin torque	-	100	0~300	○	5|6	5.3.1.9

parameter	functional description	unit	Factory Default Value	Range	Effective Timing	suit scope	consult chapters and sections
	threshold						
P9-18	Touch-to-Return-to-Origin Time Threshold	-	500	10~1500	○	5|6	5.3.1.9
P9-19	Low-bit value of quantized pulse count	1 Instruction Pulse	0	-9999~9999	○	5|6	5.3.1.9
P9-20	High-value number of quantitative pulses	1 Instruction Pulse	0	-9999~9999	○	5|6	5.3.1.9
P9-21	Return to Origin Selection	-	0	0~1	●	5|6	5.3.1.9
P9-22	Return to origin and end filtering time	-	500	50~10000	○	5|6	5.3.1.9
P9-26	Enable interrupt fixed length	-	0	0~0x1111	●	5|6	5.3.1.10
P9-27	Interrupt fixed-length displacement bit	1 Instruction Pulse	0	0~9999	√	5|6	5.3.1.10
P9-28	Interrupt for fixed-length displacement at high level	1 Instruction Pulse	0	0~32760	√	5|6	5.3.1.10
P9-29	Maximum speed with fixed-length interruption	rpm	300	1~6000	√	5|6	5.3.1.10
P9-30	Intermittent fixed-length acceleration and deceleration time	ms	100	1~1000	√	5|6	5.3.1.10
P9-31	Interrupt Fixed Length Function Configuration	-	0x0001	0~0x1111	√	5|6	5.3.1.10
P9-32	Intermittent fixed-length delay time	-	1000	10~3000	○	5|6	5.3.1.10

Appendix 2. Content of the UX-XX Monitoring Status

U0-XX：

Monitoring Number	content		unit
U0-00	Servo motor speed		Rpm
U0-01	Input Speed Command		Rpm
U0-02	Torque Command		％ specified
U0-03	Mechanical Angle		1°
U0-04	electric degress		1°
U0-05	busbar voltage		V
U0-06	IPM temperature		0.1℃
U0-07	Torque Feedback		% specified
U0-08	Pulse Deviation Value	（-9999～9999）*1	command pulse
U0-09		（-32768～32767）*10000	
U0-10	Encoder Feedback Value	（0000～9999）*1	Encoder Pulse
U0-11		（0000～65535）*10000	
U0-12	Enter the number of command pulses	（-9999～9999）*1	command pulse
U0-13		（-32768～32767）*10000	
U0-14	position feedback	（-9999～9999）*1	command pulse
U0-15		（-32768～32767）*10000	
U0-18	torque current		0.01A
U0-19	Analog input V-REF value		0.001V
U0-20	Analog input T-REF value		0.001V
U0-21	Input Signal State 1		-
U0-22	Input Signal State 2		-
U0-23	Output Signal State 1		-
U0-24	Output Signal Status 2		-
U0-25	Input Pulse Frequency	（0～9999）*1	1Hz
U0-26		（0～9999）*10000	
U0-37	VREF AD Original Value		-

Monitoring Number	content		unit
U0-38	TREF AD Original Value		-
U0-41	Instantaneous output power		1W
U0-42	Average Output Power		1W
U0-43	Instantaneous thermal power		1W
U0-44	Average Thermal Power		1W
U0-49	Position Feedforward		1 Instruction Unit
U0-50	Speed Feedforward		rpm
U0-51	Torque Feedforward		% specified
U0-52	Instantaneous bus capacitor power		1W
U0-53	Average busbar capacitive power		1W
U0-55	Discharge power during instantaneous regenerative braking		1W
U0-56	Average regenerative braking discharge power		1W
U0-57	Absolute encoder current position feedback: 32-bit low	(0～65535) *1	Encoder Pulse
U0-58		(0～65535) *216	
U0-59	Absolute encoder current position feedback: 32-bit high	(0～65535) *232	Encoder Pulse
U0-60 (Direction Signs)		(-32768～32767) *248	
U0-61	Total number of Xnet communication errors		-
U0-62	Xnet Communications is awaiting synchronization of frame status information due to interference.		-
U0-63	Xnet Communications is waiting for the synchronization frame status to receive the data frame.		-
U0-64	The Xnet communication system is experiencing interference due to the status of waiting data frames.		-
U0-65	The Xnet communication is awaiting the data frame status and has received the synchronization frame.		-
U0-66	Xnet Communication CRC Verification Error		-
U0-67	Xnet Communication UART Error		-
U0-68	Xnet Communication Timeout Count		-
U0-69	Communication Encoder Timeout Count		-
U0-88	Motor Code Reading Status		-
U0-89	Real-time speed feedback (display range: -99.99 to 99.99 rpm)		0.01rpm
U0-91	Number of turns in the absolute value motor circuit		-
U0-94	Total value of encoder position feedback after calibration	(0～65535) *1	Encoder Pulse
U0-95		(0～65535) *216	

Monitoring Number	content		unit
U0-96		(0～65535) *232	
U0-97 (Direction Signs)		(-32768～32767) *248	
U0-98	Temperature of high-power motors		0.1℃

U1-XX：

Monitoring Number	content	unit
U1-00	Current Alarm Code	-
U1-01	Current Warning Code	-
U1-02	The U-phase current at the time of the alarm occurrence	0.01A
U1-03	The V-phase current at the time of the alarm occurrence	0.01A
U1-04	Bus voltage at the time of the alarm occurrence	V
U1-05	IGBT temperature at the time of the alarm occurrence	℃
U1-06	Torque current at the time of alarm occurrence	0.01A
U1-07	The excitation current at the time of the alarm occurrence	A
U1-08	Position deviation at the time of the alarm occurrence	command pulse
U1-09	Speed value at the time of the alarm occurrence	rpm
U1-10	Number of seconds since the alarm was triggered (low 16 bits), accumulated from the first power-on	s
U1-11	Number of seconds since the alarm was triggered (16-bit integer), accumulated from the first power-on	s
U1-12	The number of runtime errors is calculated from after this power-on	-
U1-13	The number of operation warnings is calculated from after this power-on	-
U1-14	Total Number of Historical Alarms	-
U1-15	Total Number of Historical Warnings	-
U1-16	Recent Second Alarm Code	-
U1-17	The latest third alarm code	-
U1-18	Recent 4th alarm code	-
U1-19	The latest alarm code (for the 5th time)	-
U1-20	The latest alarm code is the 6th one.	-
U1-21	The latest alarm code (for the 7th time)	-
U1-22	The latest alarm code is the 8th one.	-
U1-23	The latest alarm code is the 9th one.	-
U1-24	The latest alarm code (10th occurrence)	-
U1-25	The latest alarm code is the 11th one.	-
U1-26	The latest alarm code for the 12th occurrence	-
U1-27	The latest alarm code is the 13th one.	-

Monitoring Number	content	unit
U1-28	The latest alarm code is the 14th one.	-
U1-29	The latest alarm code (15th occurrence)	-
U1-30	The latest 16th alarm code	-
U1-31	The latest alarm code for the 17th occurrence	-
U1-32	Second warning code recently	-
U1-33	Recent third warning code	-
U1-34	Fourth warning code recently	-
U1-35	Recent 5th warning code	-
U1-36	Recent Sixth Warning Code	-
U1-37	Recent 7th warning code	-
U1-38	Recent 8th warning code	-
U1-39	Recent 9th warning code	-
U1-40	Latest Warning Code (10th Time)	-
U1-41	Latest warning code (11th occurrence)	-
U1-42	Latest 12th warning code	-
U1-43	Latest 13th warning code	-
U1-44	Latest 14th warning code	-
U1-45	Latest 15th warning code	-
U1-46	Latest 16th warning code	-
U1-47	Latest 17th warning code	-

U2-XX：

Monitoring Number	content	unit
U2-00	Power On Times	-
U2-01	series	-
U2-02	Model (Low 16-bit)	-
U2-03	Model (16-bit height)	-
U2-04	Production Date: Year	-
U2-05	Production Date: Month	-
U2-06	Production Date: Day	-
U2-07	Firmware Version	-
U2-08	Hardware Version	-
U2-09	Total runtime (from the first power-on)	hour
U2-10	Total runtime (from the first power-on)	minute
U2-11	Total runtime (from the first power-on)	second
U2-12	Running time (from the last power-on)	hour
U2-13	Running time (from the last power-on)	minute
U2-14	Running time (from the last power-on)	second
U2-15	Average output power (average power during the enabling process from the first enable)	1W

Monitoring Number	content	unit
U2-16	Average heating power (average power during the activation process from the first activation)	1W
U2-17	Average bus capacitor filtering power (average power during the power-on period starting from the first power-up)	1W
U2-20	Device serial number: 16-bit (not supported)	-
U2-21	Device serial number: 16-digit (not supported)	-
U2-22	Firmware generation date: Year	-
U2-23	Firmware generation date: Month/Day	-
U2-24	Firmware generation time: hours/minutes	-

U3-XX：

Monitoring Number	content	unit
U3-00	Motor code for automatic reading (including thermal power parameters)	-
U3-01	Motor Version	-
U3-02	Encoder Version	-
U3-70	Automatically reads the motor code from the encoder in motor parameters (relates only to the motor code)	-

U4-XX：

Monitoring Number	content	unit
U4-10	Resonance frequencies detected by Fast FFT	Hz
U4-11	Grating scale raw data	1 Grating scale feedback pulse
U4-12	Grating scale raw data	1 Grating scale feedback pulse
U4-13	Number of Z-axis gratings on the scale	-
U4-14	Motor encoder feedback under a fully closed-loop system	1 Encoder feedback pulse
U4-15	Motor encoder feedback under a fully closed-loop system	1 Encoder feedback pulse
U4-16	Cumulative value of continuous Aboveload operation for thermal power protection (supported in version 3770 and later)	-
U4-17	Cumulative instantaneous Aboveload operation value for thermal power protection (supported in version 3770 and later)	-
U4-18	SI Terminal Status (-supported in versions 3790 and later)	-
U4-19	SO Terminal Status (-supported in versions 3790 and later)	-

Appendix 3. Content of the FX-XX Auxiliary Functions

Function Code	description	Effectiveness Time	Refer to the chapter
F0-00	Clear Alert	servo OFF	4.4.1
F0-01	Restore Factory Settings	servo OFF	4.4.1
F0-02	Clear Position Deviation	servo OFF	4.4.1
F0-07	Panel Inertia Identification	servo OFF	6.2.4
F0-08	Panel External Instructions from Calibration Process	servo OFF	6.4.5
F0-09	Internal instructions within the panel are automatically configured during setup.	servo OFF	6.4.4
F0-10	Panel Vibration Suppression 1	servo OFF	6.7.3
F0-11	Panel Vibration Suppression 2	servo OFF	6.7.3
F0-12	Panel vibration suppression (fast FFT)	servo OFF	6.7.6
F1-00	Click	servo OFF	4.4.2
F1-01	pilot run	servo OFF	4.4.2
F1-02	Current Sampling Zeroing	servo OFF	4.4.2
F1-03	Vref (Speed Analog Signal) Zero Adjustment	servo OFF	4.4.2
F1-04	Tref (Torque Analog Signal) Zero Adjustment	servo OFF	4.4.2
F1-05	Software Enablement	servo OFF	4.4.2
F1-06	Absolute encoder position reset	servo OFF	5.6.5

Appendix 4. Modbus Address Correspondence Table

parameter group	Modbus Full Address	description
P0-00~P0-xx	0x0000~0x0063	The Modbus addresses start from 0x0000 and increase sequentially; for example, the Modbus address corresponding to P0-23 is 0x0017.
P1-00~P1-xx	0x0100~0x0163	The Modbus addresses start at 0x0100 and increase sequentially by 1; for example, the Modbus address corresponding to P1–10 is 0x010A.
P2-15~P2-xx	0x020F~0x0263	The Modbus addresses start at 0x020F and increase sequentially by one; for example, the Modbus address corresponding to P2-16 is 0x0210.
P3-00~P3-xx	0x0300~0x0363	The Modbus addresses start at 0x0300 and increase sequentially by one; for example, the Modbus address corresponding to P3-13 is 0x030D.
P4-00~P4-xx	0x0400~0x0463	The Modbus addresses start at 0x0400 and increase sequentially; for example, the Modbus address corresponding to P4-25 is 0x0419.
P5-00~P5-xx	0x0500~0x0563	The Modbus addresses start at 0x0500 and increase sequentially; for example, the Modbus address corresponding to P5-20 is 0x0514.
P6-00~P6-xx	0x0600~0x0663	The Modbus addresses start at 0x0600 and increase sequentially by 1; for example, the Modbus address corresponding to P6-05 is 0x0605.
P7-00~P7-xx	0x0700~0x0763	The Modbus addresses start at 0x0700 and increase sequentially by one; for example, the Modbus address corresponding to P7–11 is 0x070B.
P8-00~P8-xx	0x0800~0x0863	The Modbus addresses start at 0x0800 and increase sequentially by one; for example, the Modbus address corresponding to P8-25 is 0x019.
P9-00~P9-xx	0x0900~0x0963	The Modbus addresses start at 0x0900 and increase sequentially; for example, the Modbus address corresponding to P9–12 is 0x090C.
U0-00~U0-xx	0x1000~0x1063	The Modbus addresses start at 0x1000 and increase sequentially by 1; for example, the Modbus address corresponding to U0-05 is 0x1005.
U1-00~U1-xx	0x1100~0x1163	The Modbus addresses start at 0x1100 and increase sequentially; for example, the Modbus address corresponding to U1-14 is 0x110E.
U2-00~U2-xx	0x1200~0x1263	The Modbus addresses start at 0x1200 and increase sequentially; for example, the Modbus address corresponding to U2-08 is 0x1208.
U4-00~U4-xx	0x1400~0x1463	The Modbus addresses start at 0x1400 and increase sequentially by one; for example, the Modbus address corresponding to U4-11 is 0x140B.
F0-00~F0-xx	0x2000~0x2063	The Modbus addresses start at 0x2000 and increase sequentially; for example, the Modbus address corresponding to F0-01 is 0x2001.
F1-00~F1-xx	0x2100~0x2163	The Modbus addresses start at 0x2100 and increase sequentially; for example, the Modbus address corresponding to F1-03 is 0x2103.



Parameters not listed in the following Modbus address table shall follow the address rules specified in the aforementioned table.

- Group P Parameter Address

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
P0-00	0x0000	0	P0-17	0x0011	17
P0-01	0x0001	1	P0-18	0x0012	18
P0-02	0x0002	2	P0-19	0x0013	19
P0-03	0x0003	3	P0-20	0x0014	20
P0-04	0x0004	4	P0-21	0x0015	21
P0-05	0x0005	5	P0-22	0x0016	22
P0-06	0x0006	6	P0-23	0x0017	23
P0-07	0x0007	7	P0-24	0x0018	24
P0-08	0x0008	8	P0-25	0x0019	25
P0-09	0x0009	9	P0-26	0x001A	26
P0-10	0x000A	10	P0-27	0x001B	27
P0-11	0x000B	11	P0-28	0x001C	28
P0-12	0x000C	12	P0-29	0x001D	29
P0-13	0x000D	13	P0-30	0x001E	30
P0-14	0x000E	14	P0-31	0x001F	31
P0-15	0x000F	15	P0-32	0x0020	32
P0-16	0x0010	16	P0-33	0x0021	33

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
P1-00	0x0100	256	P1-15	0x010F	271
P1-01	0x0101	257	P1-16	0x0110	272
P1-02	0x0102	258	P1-17	0x0111	273
P1-03	0x0103	259	P1-18	0x0112	274
P1-04	0x0104	260	P1-19	0x0113	275
P1-05	0x0105	261	P1-20	0x0114	276
P1-06	0x0106	262	P1-21	0x0115	277
P1-07	0x0107	263	P1-22	0x0116	278
P1-08	0x0108	264	P1-23	0x0117	279
P1-09	0x0109	265	P1-24	0x0118	280
P1-10	0x010A	266	P1-25	0x0119	281
P1-11	0x010B	267	P1-26	0x011A	282
P1-12	0x010C	268	P1-27	0x011B	283

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
P1-13	0x010D	269	P1-28	0x011C	284
P1-14	0x010E	270			

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
P2-00	0x0200	512	P2-15	0x20F	527
P2-01	0x0201	513	P2-16	0x210	528

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
P3-00	0x0300	768	P3-19	0x0313	787
P3-01	0x0301	769	P3-20	0x0314	788
P3-02	0x0302	770	P3-21	0x0315	789
P3-03	0x0303	771	P3-22	0x0316	790
P3-04	0x0304	772	P3-23	0x0317	791
P3-05	0x0305	773	P3-24	0x0318	792
P3-06	0x0306	774	P3-25	0x0319	793
P3-07	0x0307	775	P3-26	0x031A	794
P3-08	0x0308	776	P3-27	0x031B	795
P3-09	0x0309	777	P3-28	0x031C	796
P3-10	0x030A	778	P3-29	0x031D	797
P3-11	0x030B	779	P3-30	0x031E	798
P3-12	0x030C	780	P3-31	0x031F	799
P3-13	0x030D	781	P3-32	0x0320	800
P3-14	0x030E	782	P3-33	0x0321	801
P3-15	0x030F	783	P3-34	0x0322	802
P3-16	0x0310	784	P3-35	0x0323	803
P3-17	0x0311	785	P3-36	0x0324	804
P3-18	0x0312	786			

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
P4-00	0x0400	1024	P4-15	0x040F	1039

P4-01	0x0401	1025	P4-16	0x0410	1040

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
P5-00	0x0500	1280	P5-27	0x051B	1307
P5-01	0x0501	1281	P5-28	0x051C	1308
P5-02	0x0502	1282	P5-29	0x051D	1309
P5-03	0x0503	1283	P5-30	0x051E	1310
P5-04	0x0504	1284	P5-31	0x051F	1311
P5-05	0x0505	1285	P5-32	0x0520	1312
P5-06	0x0506	1286	P5-33	0x0521	1313
P5-07	0x0507	1287	P5-34	0x0522	1314
P5-08	0x0508	1288	P5-35	0x0523	1315
P5-09	0x0509	1289	P5-36	0x0524	1316
P5-10	0x050A	1290	P5-37	0x0525	1317
P5-11	0x050B	1291	P5-38	0x0526	1318
P5-12	0x050C	1292	P5-39	0x0527	1319
P5-13	0x050D	1293	P5-40	0x0528	1320
P5-14	0x050E	1294	P5-41	0x0529	1321
P5-15	0x050F	1295	P5-42	0x052A	1322
P5-16	0x0510	1296	P5-43	0x052B	1323
P5-17	0x0511	1297	P5-44	0x052C	1324
P5-18	0x0512	1298	P5-45	0x052D	1325
P5-19	0x0513	1299	P5-46	0x052E	1326
P5-20	0x0514	1300	P5-47	0x052F	1327
P5-21	0x0515	1301	P5-48	0x0530	1328
P5-22	0x0516	1302	P5-49	0x0531	1329
P5-23	0x0517	1303	P5-50	0x0532	1330
P5-24	0x0518	1304	P5-51	0x0533	1331
P5-25	0x0519	1305	P5-52	0x0534	1332
P5-26	0x051A	1306	P5-53	0x0535	1333

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
P6-00	0x0600	1536	P6-10	0x060A	1546
P6-01	0x0601	1537	P6-11	0x060B	1547

Parameter	Modbus address	Parameter	Modbus address

Number	hexadecimal	decimal system	Number	hexadecimal	decimal system
P7-00	0x0700	1792	P7-10	0x070A	1802
P7-01	0x0701	1793			

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
P8-25	0x0819	2073			

- Monitoring Status Address Group U

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
U0-00	0x1000	4096	U0-32	0x1020	4128
U0-01	0x1001	4097	U0-33	0x1021	4129
U0-02	0x1002	4098	U0-34	0x1022	4130
U0-03	0x1003	4099	U0-35	0x1023	4131
U0-04	0x1004	4100	U0-36	0x1024	4132
U0-05	0x1005	4101	U0-37	0x1025	4133
U0-06	0x1006	4102	U0-38	0x1026	4134
U0-07	0x1007	4103	U0-39	0x1027	4135
U0-08	0x1008	4104	U0-40	0x1028	4136
U0-09	0x1009	4105	U0-41	0x1029	4137
U0-10	0x100A	4106	U0-42	0x102A	4138
U0-11	0x100B	4107	U0-43	0x102B	4139
U0-12	0x100C	4108	U0-44	0x102C	4140
U0-13	0x100D	4109	U0-45	0x102D	4141
U0-14	0x100E	4110	U0-46	0x102E	4142
U0-15	0x100F	4111	U0-47	0x102F	4143
U0-16	0x1010	4112	U0-48	0x1030	4144
U0-17	0x1011	4113	U0-49	0x1031	4145
U0-18	0x1012	4114	U0-50	0x1032	4146
U0-19	0x1013	4115	U0-51	0x1033	4147
U0-20	0x1014	4116	U0-52	0x1034	4148
U0-21	0x1015	4117	U0-53	0x1035	4149
U0-22	0x1016	4118	U0-57	0x1039	4153
U0-23	0x1017	4119	U0-58	0x103A	4154
U0-24	0x1018	4120	U0-59	0x103B	4155

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
U0-25	0x1019	4121	U0-60	0x103C	4156
U0-26	0x101A	4122	U0-91	0x105B	4187
U0-27	0x101B	4123	U0-94	0x105E	4190
U0-28	0x101C	4124	U0-95	0x105F	4191
U0-29	0x101D	4125	U0-96	0x1060	4192
U0-30	0x101E	4126	U0-97	0x1061	4193
U0-31	0x101F	4127			

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
U1-00	0x1100	4352	U2-00	0x1200	4608
U1-01	0x1101	4353	U2-01	0x1201	4609
U1-02	0x1102	4354	U2-02	0x1202	4610
U1-03	0x1103	4355	U2-03	0x1203	4611
U1-04	0x1104	4356	U2-04	0x1204	4612
U1-05	0x1105	4357	U2-05	0x1205	4613
U1-06	0x1106	4358	U2-06	0x1206	4614
U1-07	0x1107	4359	U2-07	0x1207	4615
U1-08	0x1108	4360	U2-08	0x1208	4616
U1-09	0x1109	4361	U2-09	0x1209	4617
U1-10	0x110A	4362	U2-10	0x120A	4618
U1-11	0x110B	4363	U2-11	0x120B	4619
U1-12	0x110C	4364	U2-12	0x120C	4620
U1-13	0x110D	4365	U2-13	0x120D	4621
U1-14	0x110E	4366	U2-14	0x120E	4622
U1-15	0x110F	4367	U2-15	0x120F	4623
U1-16	0x1110	4368	U2-16	0x1210	4624
U1-17	0x1111	4369	U2-17	0x1211	4625
U1-18	0x1112	4370	U2-20	0x1214	4628
U1-19	0x1113	4371	U4-11	0x140B	5131
U1-20	0x1114	4372	U4-12	0x140C	5132
U1-21	0x1115	4373	U4-13	0x140D	5133
U1-22	0x1116	4374	U4-14	0x140E	5134

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
U1-23	0x1117	4375	U4-15	0x140F	5135
U1-24	0x1118	4376			
U1-25	0x1119	4377			

Parameter Number	Modbus address		Parameter Number	Modbus address	
	hexadecimal	decimal system		hexadecimal	decimal system
F0-00	0x2000	8192	F1-00	0x2100	8448
F0-01	0x2001	8193	F1-01	0x2101	8449
F0-02	0x2002	8194	F1-02	0x2102	8450
F2-09	0x2209	8713	F1-03	0x2103	8451
			F1-04	0x2104	8452
			F1-05	0x2105	8453
			F1-06	0x2106	8454

Appendix 5. Analysis of Common Usage Issues

Q1: What does the panel indicate regarding bb and run?

1. When the BB is in standby mode, the enable function is not activated, and the motor remains powered off.
2. Run status: When enabled, the motor is powered on.

Q2: How do I view/configure parameters?

Refer to 4.6.

Q3: How to change the enable status parameter?

1、For P5-20, setting it to 0000 disables enable functionality; setting it to 0010 enables enable upon power-on without requiring a restart and takes effect immediately. The default value is 0001, requiring an external high-level signal on SI1 (with SI1 connected to low level and +24 to high level; refer to 3.2.2).

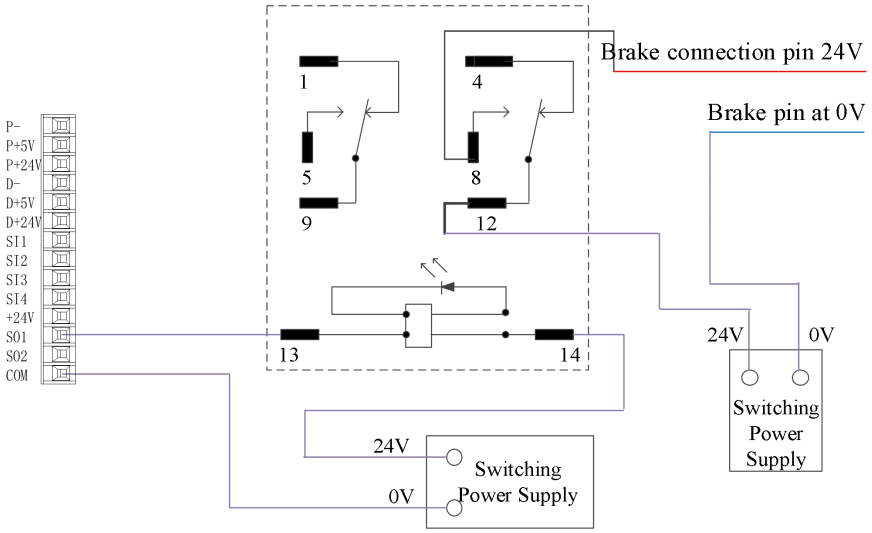
Q4: How to restore initialization?

1. For P5-20, setting it to 0000 will disable the enable function; F0-01 = 1.

Q5: Which drivers currently support the bus mode?

1. The DS5E series supports XNet communication, with maximum support for 20 axes.
2. The DS5C supports EterCAT communication, supporting up to 32 axes.

Q6: How should the brake motor be wired? If slight slippage occurs after power disconnection, how should the parameters be adjusted?



1. P5-44 descriptions the terminal for the brake engagement output signal; as shown in the figure above, it uses SO1 to control the brake engagement, i.e., P5-44 = n.0001.
2. Extend the servo OFF delay time P5-07 (default: 500 ms) as needed; set the brake engagement

command wait time P5-09 to 0 for immediate response.

Q7: The initial orientation isn't what I want; how can I change it using the servo driver?

Change the initial direction by modifying P0-05, set it to 0 or 1, and the change will take effect after power-on. (only to modes 2, 4, 6, and 7.) For the internal speed mode (mode 3), you can adjust the positive or negative value of the speed setting.

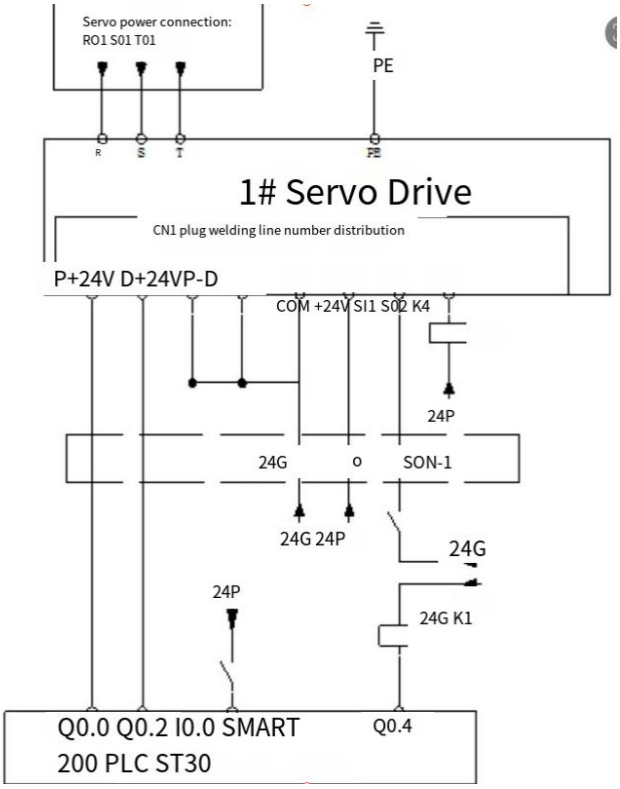
Q8: How do the two operating modes switch between each other?

Both the main mode P0-01 and sub-mode P0-02 are configured with the required settings. P5-30 is descriptiond as 0002, and SI2 serves as the mode switching terminal: when no signal is received at SI2, operation follows the preset mode in P0-01; when a signal is present at SI2, operation follows the preset mode in P0-02.

The SI2 terminal signal must be set to the ON state for switching to occur.

Q9: What is the connection method between a PLC and a servo motor?

1. NPN low-level output PLC: Connect the Y0 pulse to P-, Y1 terminal to D-, and +24 V to P+24 and D+24 (using a Xinje PLC as example).
2. PNP high-level output PLC: Pulse pin Q0.0 connects to P+24, direction pin Q0.2 connects to D+24, and 0 V connects to P-and D-. (Using a Siemens PLC as an example) As shown in the figure below:



Q10: What are the external connection methods and parameter settings for the braking resistor?

1. The servo interface features P+, D, and C terminals, with a shorting strip connecting P+ and C (using an internal resistor). If the internal resistor specification is insufficient, replace it with an external resistor; refer to Section 1.4.1 for the required specifications.

① P+, D, C interfaces: Remove the shorting strip between P+ and D, then connect the external braking resistor to P+ and C.

② Models with P+ and PB interfaces: Connect the external braking resistor to P+ or PB.

2. For version number parameter U2-07 <3700, set P0-24 = 1, P0-25 = power value, and P0-26 = resistance value.

3. Version number parameter: U2-07 ≥ 3700; P0-24 requires no setting; P0-25 = power value; P0-26 = resistance value.

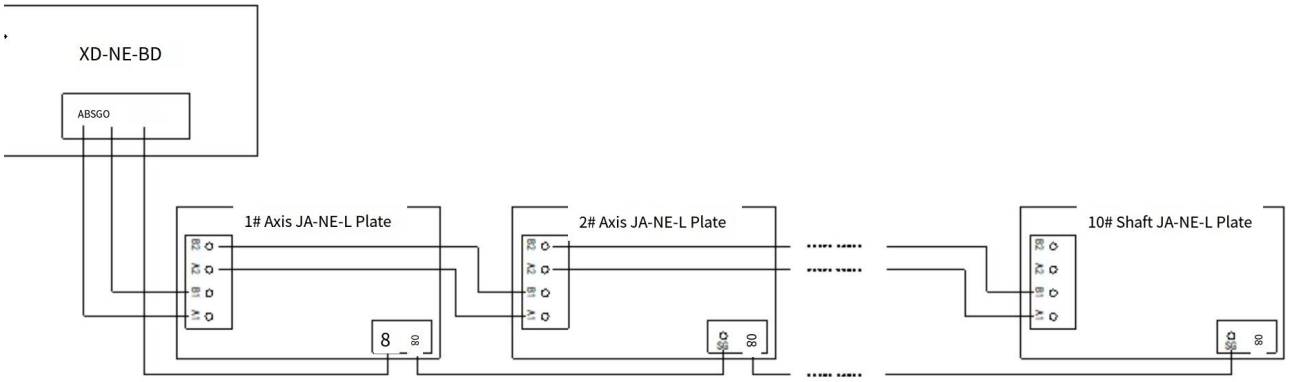
For versions prior to 3700, set P0-24:0 enables the built-in resistor, while 1 enables the external resistor.

Q11: What is the service life of the tank chain line?

The number of bending cycles is 5 million, with a roundness radius of 50 mm.

Q12: How are the bus control BD board and the JA-NE-L connection lines connected?

During single-axis operation, set the terminal resistors on boards A-A1, B-B1, and SG-SG to ON; for multi-axis operation, set the terminal resistors on the PLC's BD board and the final JA-NE-L board in the electrical circuit to OFF, while setting those on the intermediate JA-NE-L board to OFF.

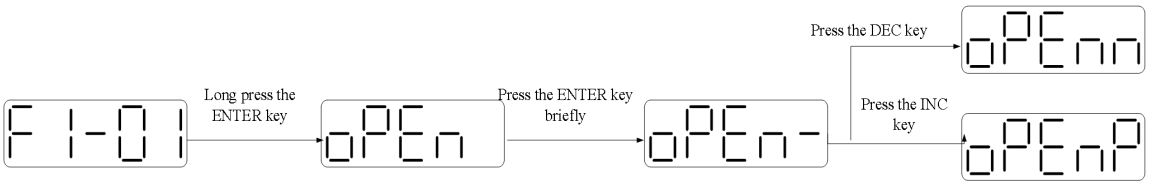


Appendix 6. General Debugging Steps

1. Motor shaft is empty; perform preliminary debugging

A. Connect the cables correctly, ensuring that each U, V, W, and PE terminal is paired individually without crossing phase sequences.

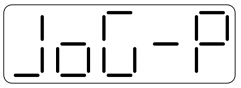
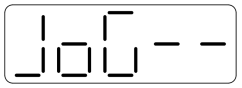
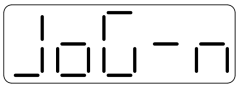
B. Open-loop trial run: This phase primarily checks the power lines and encoder feedback circuits to verify proper connectivity. Following these steps, the motor should operate normally in both forward and reverse directions. If shaft vibration occurs or an alarm is triggered, immediately disconnect the power supply and recheck the wiring connections.



C. Spot-run test: Select parameter F1-00.

Press and hold the ENTER key to enable the motor. When enabled, press INC for forward jogging or DEC for reverse jogging. Press STATUS/ESC to disable enable mode, exit jogging mode, and enter sequence switching mode.

The four states during a tap operation are displayed as follows:

state	panel display	state	panel display
Idle Status Display		Forward Display	
Enable Display		Reverse Display	

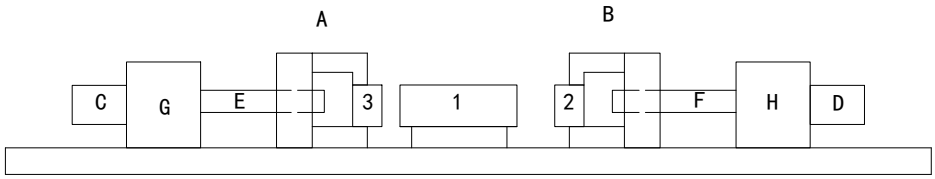
2. Integrate the motor with the mechanical components and perform debugging

A. Check the aircraft's heading direction; if it differs from required, turn off the servo unit, set parameter P0-05 to 1, then power on again to apply the changes.

B. During operation, monitor the system's stability and responsiveness, and adjust the servo control parameters as needed.

Appendix 7. Application Cases

Mode 6: Pulse Sequence Instruction Position Mode



Device Above view:

This is a schematic diagram of a welding machine. In the diagram, components 1, 2, and 3 represent the workpieces: Workpiece 2 and Workpiece 3 are mounted on Head B and Head A respectively, while Heads A and B are movable as a unit, driven by ball screws E and F with a pitch of 5 mm. Components C and D are 17-bit resolution servo motors, and components G and H are reducers with a reduction ratio of 10.

Before using the equipment, calibrate it with standard-sized workpieces to determine the origin points of Head A and Head B.

Workpiece 1 is placed flat on the workbench and can be slid horizontally left or right. Its dimensions conform to positive tolerances and must not be shorter than those of the standard workpiece. While the placement process may be arbitrary, it must ensure that when welding begins, both workpieces are positioned symmetrically relative to each other. Once placed, motors A and B drive Workpieces 3 and 2 toward Workpiece 1 at identical speeds. Regardless of their initial positions, one workpiece will always strike Workpiece 1 first, then push it to the opposite side until both Workpieces 2 and 3 have contacted Workpiece 1. This mutual pushing action increases the motor's output torque, ultimately ensuring Workpiece 1 is in a symmetrical position.

After one welding operation is completed, Head A and Head B return to their original positions.

I. Analysis

1. Determine the working mode: 6

2. When identifying symmetrical points for the first time, verify whether all points have been contacted; this is indicated by an increase in the servo's output torque, which requires the use of torque limits (P3-28, P3-29) and the torque upper limit output signal (CLT).

3. Since the dimensions of workpiece 1 are greater than or equal to the standard dimensions, for workpieces exceeding this standard size, residual deviation pulses will inevitably remain in the servo system when identifying symmetrical points; these pulses must be eliminated using the /CLR signal. Additionally, the pulse amplitude transmitted by the PLC differs from the actual travel distance of the servo motor. To determine the precise travel distance, encoder feedback signals (A+, A-, B+, B-) should be utilized for high-speed counting of the AB phases.

4. Operating directions of Head A and Head B.

II. Determining Signals and Terminals

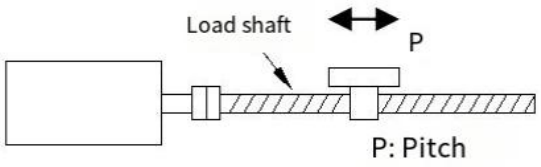
/COIN positioning completes output signal: SO1

/When CLT torque reaches the upper limit, output signal: SO2

/CLR Pulse Bias Clear Input Signal: SI1

Encoder feedback signals: /A+, /A-, /B+, /B-

III. Calculation of Electronic Gear Ratios

step	description	ball screw
		
1	Confirm Mechanical Specifications	Ball screw pitch: 5 mm Reduction Ratio: 10/1
2	Confirm encoder pulse count	131072
3	Decision Instruction Unit	1 Instruction Unit: 0.001 mm
4	Number of instructions required to rotate the load shaft one full revolution	5mm/0.001mm=5000
5	Calculate the number of pulses for one rotation of the motor shaft	5000/10=500
6	Computational Gear Ratio	$\frac{B}{A}=\frac{2^{17}}{500}=\frac{32768}{125}$
7	Set User Parameters	P0-13=32768 P0-14=125

IV. Parameter Settings

running mode ： P0-01=6

Pulse Instruction Format: P0-10=2

Electronic Gear Ratio: P0-11=0 P0-12=0 P0-13=32768 P0-14=125

Forward rotation torque limit: P3-28=150

Reverse Torque P3-29=150

Limit:	
Positioning completion width:	P5-00=7
/S-ON Signal Settings:	P5-20=0010
/CLR Signal Settings:	P5-34=0001
/COIN Signal Settings:	P5-38=0001
/CLT Signal Settings:	P5-42=0002

Appendix 8. Common Servo Mode Parameters

Appendix 8.1 Basic General Parameters

Basic General Parameters	
parameter	essentials
P0-03 Enable Mode P5-20 Servo ON Signal/S-ON	Enable method selection: typically P0-03 is the default; set P5-20 to n.0010 for immediate enablement upon power-on.
P0-04 Rigidness Grade	Adjust the servo gain in the fast adjustment mode after calibration
P0-05 Rotation Direction Definition	Determine the motor direction, usually set to 0/1 by default
P0-25 Discharge resistance power value P0-26 Discharge Resistance Value	Set the external brake resistor specifications to match the actual values.
P3-28 Internal forward rotation torque limit P3-29 Internal Reverse Rotation torque limit P3-30 External forward torque limit P3-31 External Reverse Torque Limit	Set the source and value of the servo torque limit. The default value is expressed as a percentage of servo torque.
P5-44 Power Failure Brake/BK P5-07 Servo OFF Delay Time P5-08 Brake Command Output Speed P5-09 Brake Command Wait Time	The brake-equipped motor uses servo SO terminals to control the brake setting parameters.
P5-47 Alarm Output/ALM	When configuring the alarm function for the SO terminal output, the SO2 terminal defaults to output a normally closed signal.
P7-00 RS485 Station Number P7-01 Communication Configuration P7-02 RS485 Communication Protocol	Set Communication Parameters

Appendix 8.2 Common Parameters for External Pulse Position Patterns

Common Parameters for External Pulse Position Modes	
parameter	essentials
P0-01 Control Method Selection	Set to 6: External Pulse Mode
P0-10 Pulse Instruction Pattern	Set Pulse Shape 0：CW/CCW 1：AB

	2：P+D
P0-11 Set the number of pulses per motor revolution *1 P0-12 Sets the number of pulses per motor revolution * 10,000 P0-13 Electronic Gear Ratio (Molecular) P0-14 Electronic gear ratio (denominator) P0-92 ~ P0-93: A 32-bit electronic gear ratio module P0-94 ~ P0-95: A 32-bit electronic gear ratio with a denominator	Number of command pulses required for the motor to complete one full rotation Both P0-11 and P0-12 are valid at midnight; P0-13 and P0-14 take effect thereafter. The values for P0-11 to P0-14 are all zero, while those for P0-92 to P0-95 are valid. 32-bit gear ratio numerator: P0-92*1 + P0-93*10000 32-bit gear ratio denominator: P0-94*1 + P0-95*10000
P0-09 Pulse Instruction Settings	Each device can set the direction of low-speed pulse commands and the filtering time for low-speed pulses.

Appendix 8.3 Common Parameters for Internal Position Patterns

Common Parameters for Internal Location Mode	
parameter	essentials
P0-01 Control Method Selection	Set to 5: Internal Position Mode
P4-03 Internal Position Given Mode P4-04 Number of valid segments P4-10~P4-254: Internal parameter settings for positions 1 to 35	The control parameters for the internal positioning mode are specified, including step change method, positioning method, and adjustment time. Configuration of pulse displacement, velocity, acceleration/deceleration time, etc., for each section position
P5-35 Step-change Signal/GHGSTP P5-32 Pause the current segment signal/INHIBIT P5-31 Skip current section number / Z-CLAMP	Common Terminal Function Allocation
The number of Z-phase signals after P4-00 passes the departure limit switch P4-01 Speed of Impact on the Proximity Sensor P4-02 Speed of Departure from the Proximity Sensor P5-28: In position mode, rotate forward to locate the reference origin/SPD-A P5-29: Find the reference origin on the Reverse Rotation side in position mode / SPD-B	Internal Position Return to Origin Settings Parameters
Any setting for position F2-09 35	Number of Communication Settings Sections

Appendix 8.4 Common Parameters for Internal Torque Control

Internal Torque Control	
parameter	essentials
P0-01 Control Method Selection	Set to 1: Internal Torque Mode
P3-33 Internal Torque Command Given	Given a percentage value of the rated torque
P3-16 Internal forward speed limit during torque control P3-17 Internal reverse speed limit during torque control P3-14 Forward Maximum Speed Limit (MAX Speed) P3-15 Reverse Maximum Speed Limit (MAX Speed)	Speed Limitation under Torque Mode
P5-27 Speed Direction Switching/SPD-D	Switch direction; defaults to n.0000. By applying a commutation signal through terminal SI2, P5-27 can be set to n.0002.

Appendix 8.5 Common Parameters for External Analog Torque Control

External Analog Torque Control	
parameter	essentials
P0-01 Control Method Selection	Set to 2: External Analog Torque Mode
P3-24: The rated torque corresponds to the analog voltage value.	Set the speed command voltage required for the servo motor to operate at rated torque, in units of 0.001 V
P3-25 Analog Voltage to Torque Command Filter Simulation	Unit: 0.01 ms
P3-26 Torque Command Input Dead Zone Voltage	Unit: 0.001 V

Appendix 8.6 Common Parameters for Internal Speed Control

Internal Speed Control	
parameter	essentials
P0-01 Control Method Selection	Set to 3: Internal Speed Control Mode
P3-05 Internal Set Speed 1 P3-06 Internal Set Speed 2 P3-07 Internal Set Speed 3	Speed value setting for the internal 3-speed stage, in rpm
P5-28 Internal Speed Selection/SPD-A P5-29 Internal Speed Selection/SPD-B	The combination of terminals determines the corresponding section speed.
P5-27 Internal Speed Direction Selection/SPD-D	Switch direction; defaults to n.0000. By applying a commutation signal through terminal SI2, P5-27 can be set to n.0002.

P3-09 Soft-start acceleration time P3-10 Soft-start deceleration time	Set acceleration and deceleration times in ms

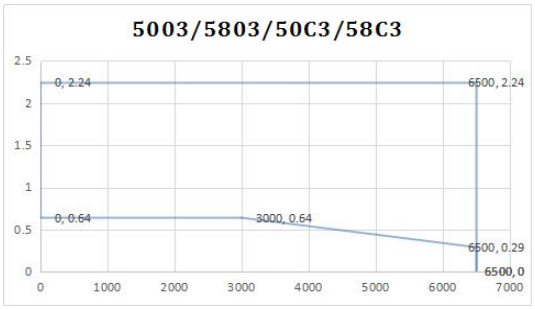
Appendix 8.7 Common Parameters for External Pulse Speed Control

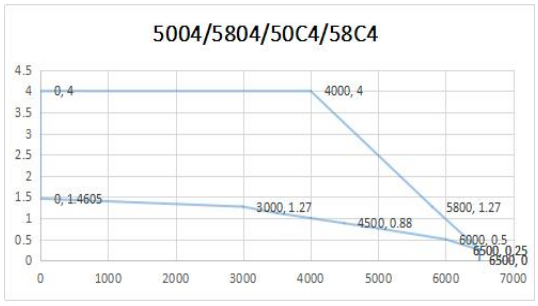
External Pulse Speed Control	
parameter	essentials
P0-01 Control Method Selection	Set to 7: External Pulse Speed Mode
P0-10 Pulse Instruction Pattern	Set Pulse Shape 0：CW/CCW 2：P+D
P0-15 Instruction pulse frequency at rated speed	Determine the linear relationship between the pulse frequency and rotational speed.
P0-16 Speed Command Pulse Filtering Time	When the instruction pulse frequency is relatively low, appropriately setting this parameter can reduce speed fluctuations.

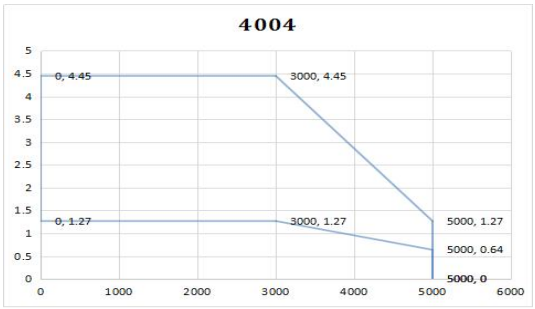
Appendix 8.8 Common Parameters for External Analog Speed Control

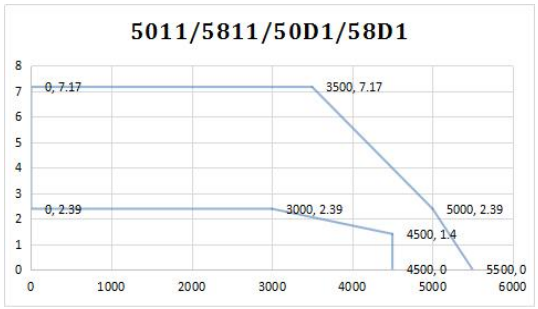
External Analog Speed Control	
parameter	essentials
P0-01 Control Method Selection	Set to 4: External Analog Speed Mode
P3-01: The rated rotational speed corresponds to the analog voltage value.	Set the speed command voltage required for the servo motor to operate at its rated speed, in units of 0.001 V
P3-09 Soft-start acceleration time P3-10 Soft-start deceleration time	Set acceleration and deceleration times in ms
P3-02 Analog Voltage and Speed Filtering	Unit: 0.01 ms
P3-03: Speed Command Input Dead Zone Voltage	Unit: 0.001 V
P3-04: Method for switching the direction of rotational speed in analog signals	Switch the input direction selection for analog speed control commands

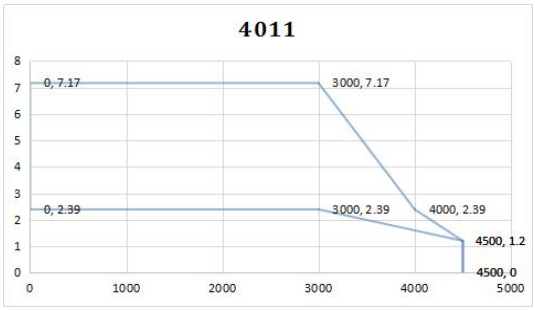
Appendix 9. Torque-speed characteristic curve

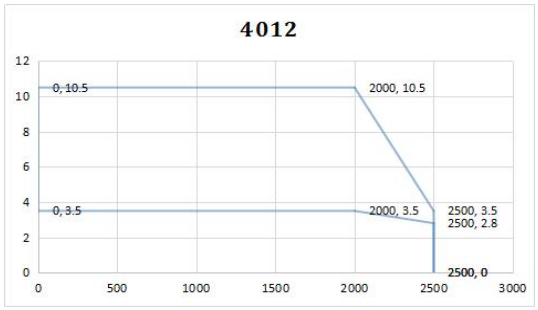


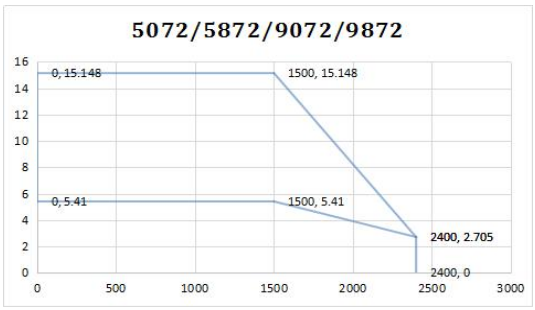


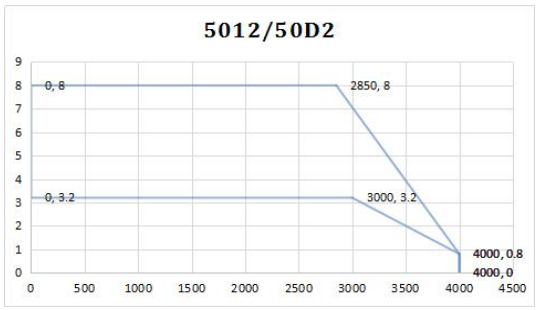


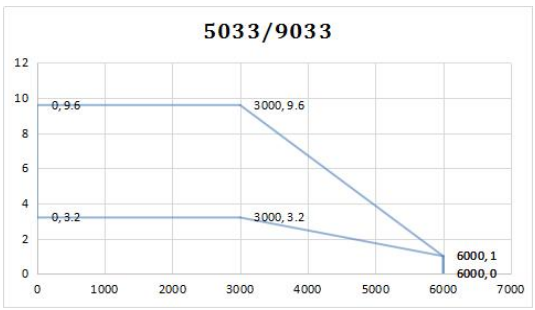


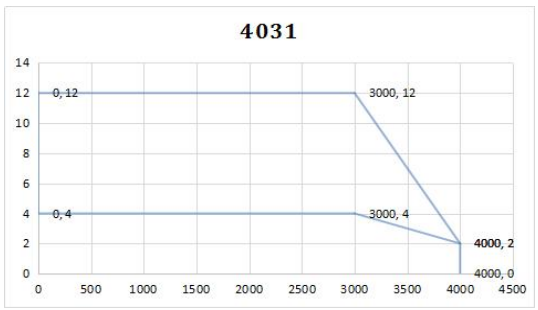


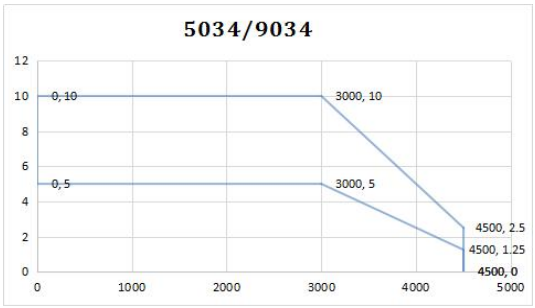


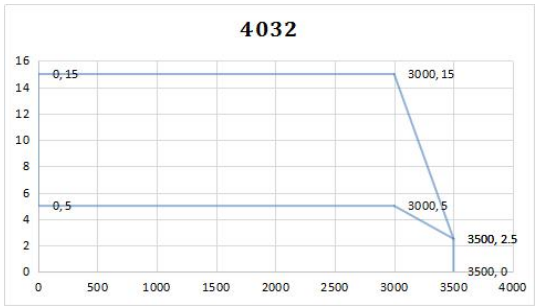


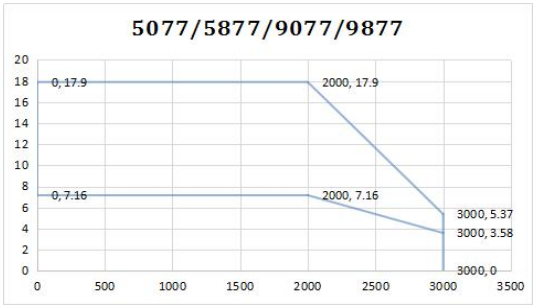


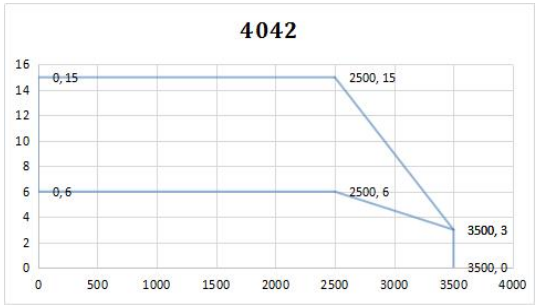


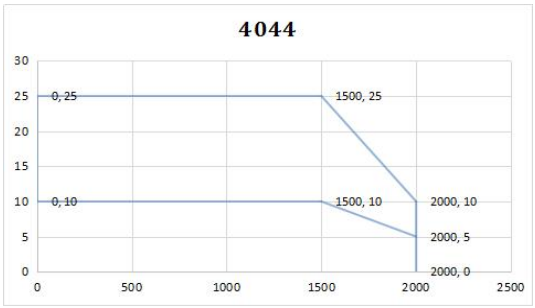


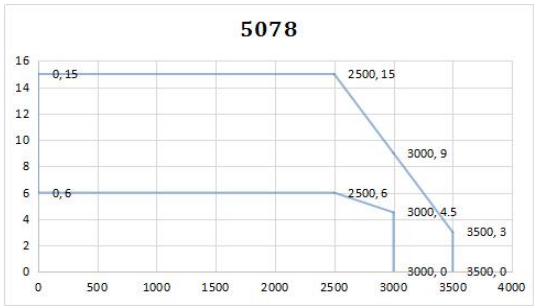

5034/9034
0, 10
3000, 10
0, 5
3000, 5
4500, 2.5
4500, 1.25
4500, 0

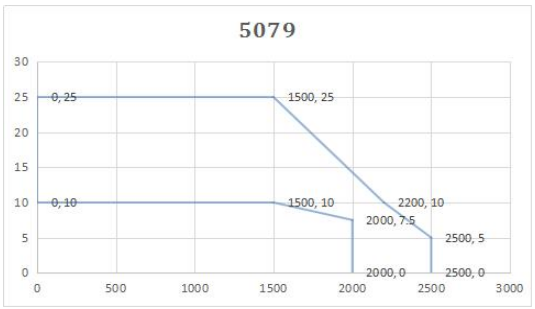

4032
0, 15
3000, 15
0, 5
3000, 5
3500, 2.5
3500, 0

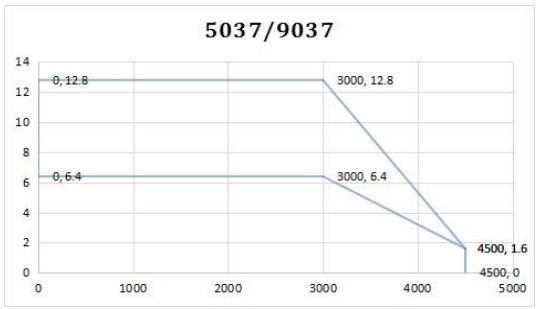

5077/5877/9077/9877
0, 17.9
2000, 17.9
0, 7.16
2000, 7.16
3000, 5.37
3000, 3.58
3000, 0

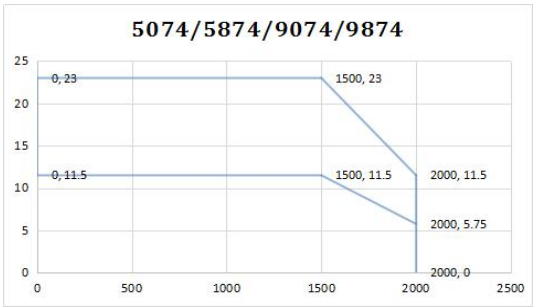

4042
0, 15
2500, 15
0, 6
2500, 6
3500, 3
3500, 0

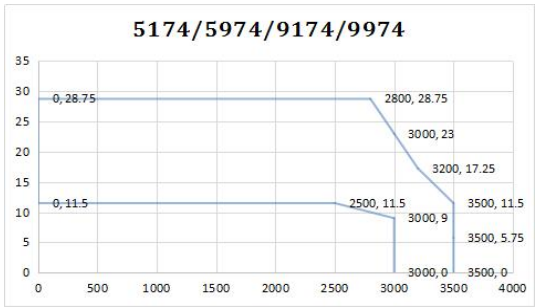

4044
0, 25
1500, 25
0, 10
1500, 10
2000, 10
2000, 5
2000, 0

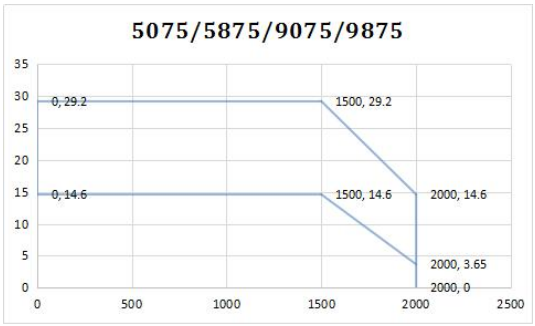

5078
0, 15
2500, 15
3000, 9
0, 6
2500, 6
3000, 4.5
3500, 3
3000, 0
3500, 0

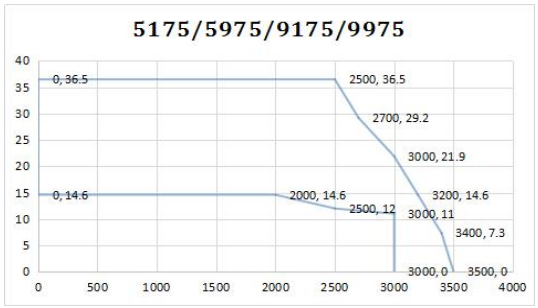

5079
0, 25
1500, 25
0, 10
1500, 10
2200, 10
2000, 7.5
2500, 5
2000, 0
2500, 0

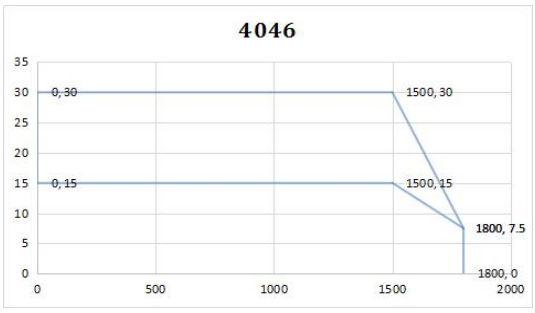

5037/9037
0, 12.8
3000, 12.8
0, 6.4
3000, 6.4
4500, 1.6
4500, 0

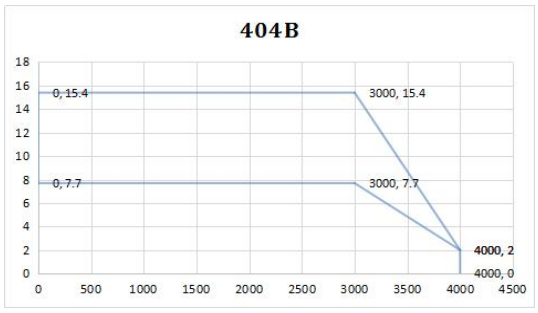

5074/5874/9074/9874
0, 23
1500, 23
0, 11.5
1500, 11.5
2000, 11.5
2000, 5.75
2000, 0

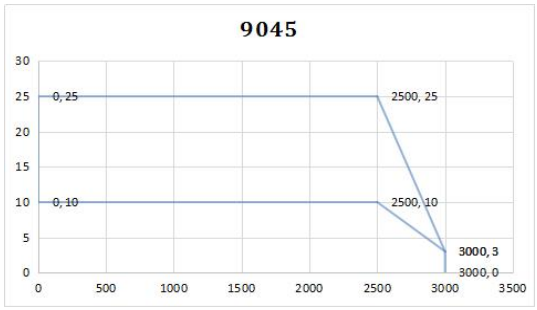

5174/5974/9174/9974
0, 28.75
2800, 28.75
3000, 23
3200, 17.25
0, 11.5
2500, 11.5
3500, 11.5
3000, 9
3500, 5.75
3000, 0
3500, 0

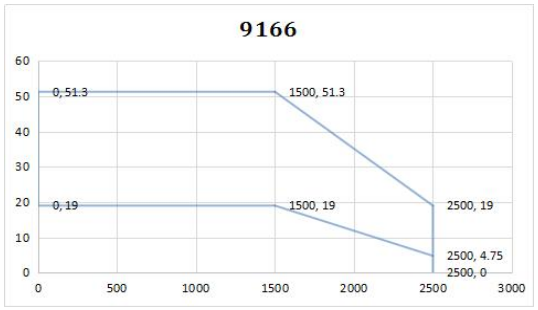

5075/5875/9075/9875
0, 29.2
1500, 29.2
2000, 14.6
0, 14.6
1500, 14.6
2000, 3.65
2000, 0

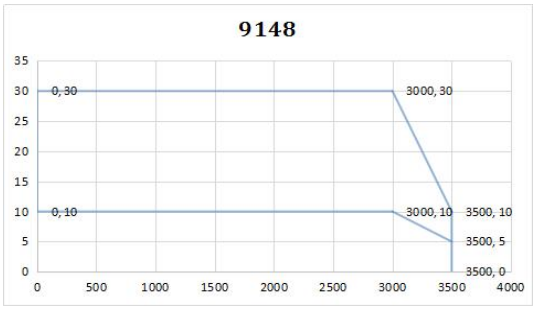

5175/5975/9175/9975
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2500, 36.5
2700, 29.2
3000, 21.9
0, 14.6
2000, 14.6
3200, 14.6
2500, 12
3000, 11
3400, 7.3
3000, 0
3500, 0

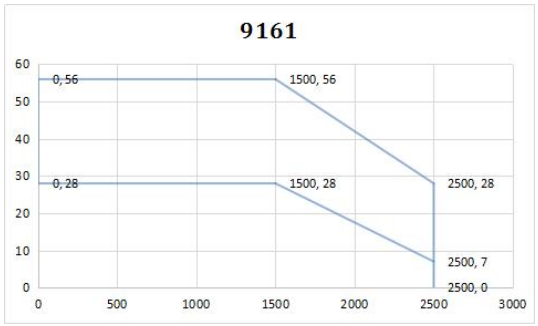

4046
0, 30
1500, 30
0, 15
1500, 15
1800, 7.5
1800, 0

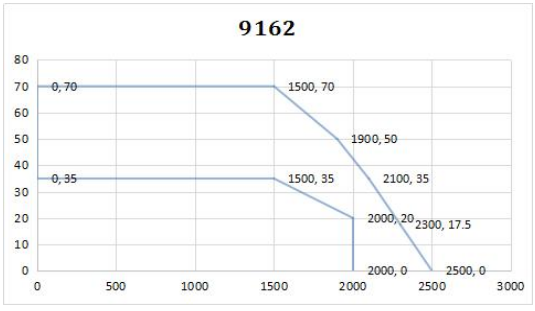

404B
0, 15.4
3000, 15.4
0, 7.7
3000, 7.7
4000, 2
4000, 0

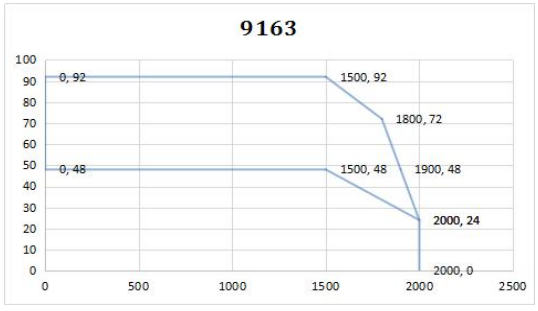

9045
0, 25
2500, 25
0, 10
2500, 10
3000, 3
3000, 0

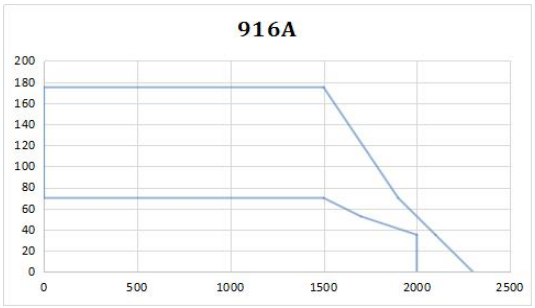

9166
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1500, 51.3
0, 19
1500, 19
2500, 19
2500, 4.75
2500, 0

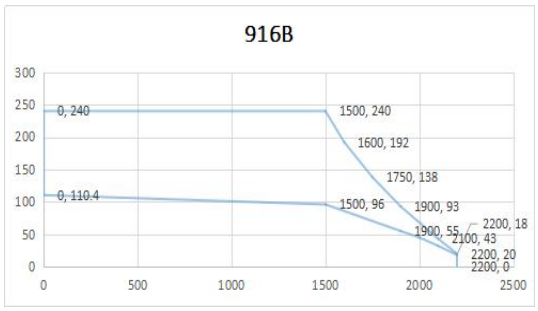

9148
0, 30
3000, 30
0, 10
3000, 10
3500, 10
3500, 5
3500, 0

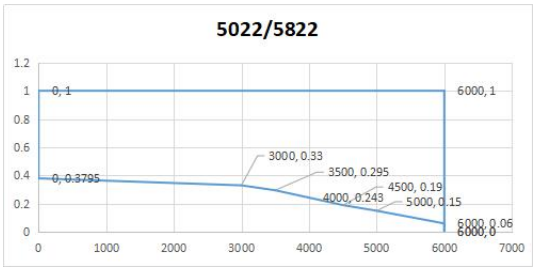

9161
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1500, 56
0, 28
1500, 28
2500, 28
2500, 7
2500, 0

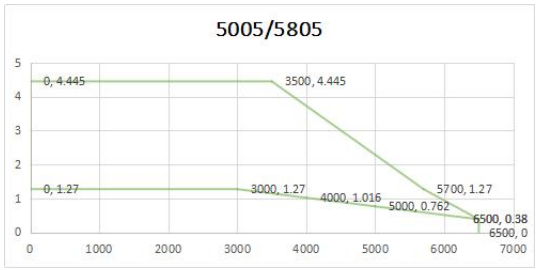

9162
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1500, 70
1900, 50
0, 35
1500, 35
2100, 35
2000, 20
2300, 17.5
2000, 0
2500, 0

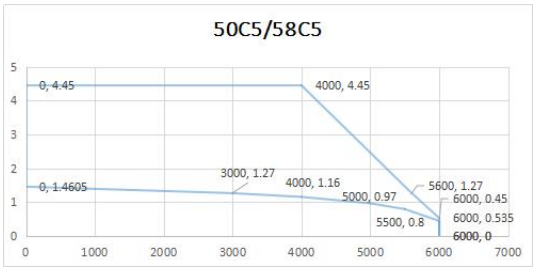

9163
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1500, 92
1800, 72
0, 48
1500, 48
1900, 48
2000, 24
2000, 0


916A

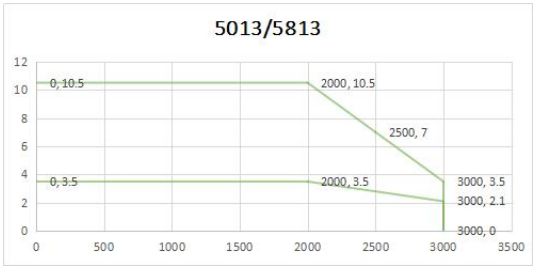

916B
0, 240
1500, 240
1600, 192
1750, 138
1900, 93
2200, 18
2100, 43
2200, 20
2200, 0
0, 110.4
1500, 96
1900, 55

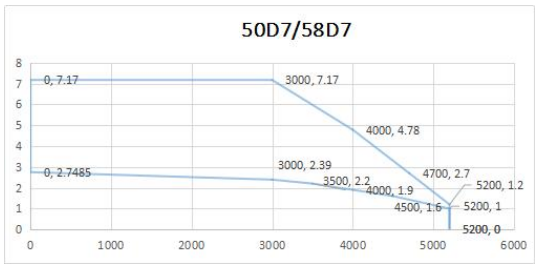

5022/5822
0, 1
6000, 1
3000, 0.33
3500, 0.295
4500, 0.19
4000, 0.243
5000, 0.15
6000, 0.06
6000, 0
0, 0.3795

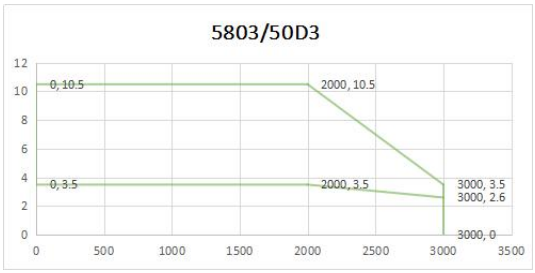

5005/5805
0, 4.445
3500, 4.445
0, 1.27
3000, 1.27
4000, 1.016
5000, 0.762
5700, 1.27
6500, 0.38
6500, 0

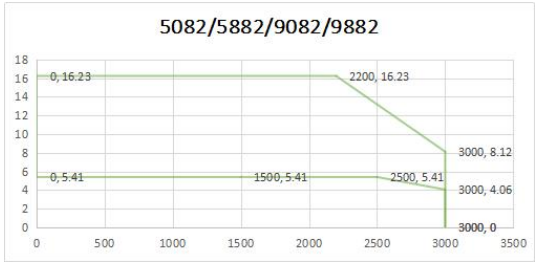

50C5/58C5
0, 4.45
4000, 4.45
0, 1.4605
3000, 1.27
4000, 1.16
5000, 0.97
5500, 0.8
5600, 1.27
6000, 0.45
6000, 0.535
6000, 0

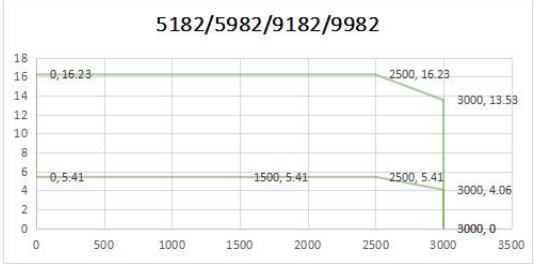

5007/5807
0, 7.17
3000, 7.17
3800, 4.78
0, 2.39
3000, 2.39
4200, 1.2
4700, 2.39
5200, 1.2
5200, 0.6
5200, 0

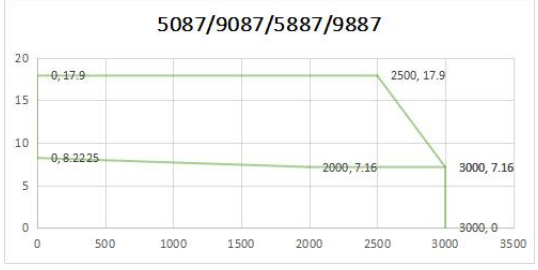

5013/5813
0, 10.5
2000, 10.5
2500, 7
0, 3.5
2000, 3.5
3000, 3.5
3000, 2.1
3000, 0


50D7/58D7
0, 7.17
3000, 7.17
4000, 4.78
0, 2.7485
3000, 2.39
3500, 2.2
4000, 1.9
4500, 1.6
4700, 2.7
5200, 1.2
5200, 1
5200, 0

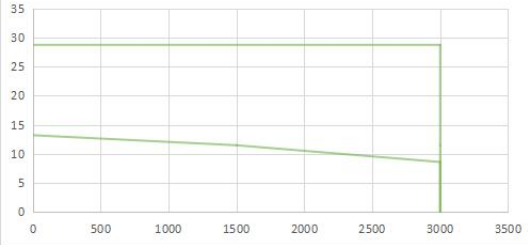

5803/50D3
0, 10.5
2000, 10.5
0, 3.5
2000, 3.5
3000, 3.5
3000, 2.6
3000, 0


5082/5882/9082/9882
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2200, 16.23
3000, 8.12
0, 5.41
1500, 5.41
2500, 5.41
3000, 4.06
3000, 0

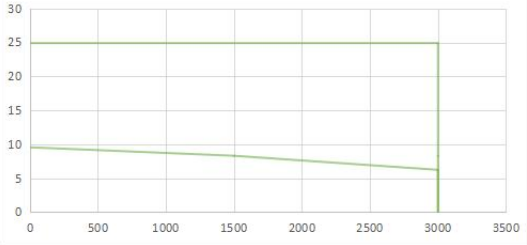

5182/5982/9182/9982
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2500, 16.23
3000, 13.53
0, 5.41
1500, 5.41
2500, 5.41
3000, 4.06
3000, 0


5087/9087/5887/9887
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2500, 17.9
0, 8.2225
2000, 7.16
3000, 7.16
3000, 0

5186/5986/9186/9986



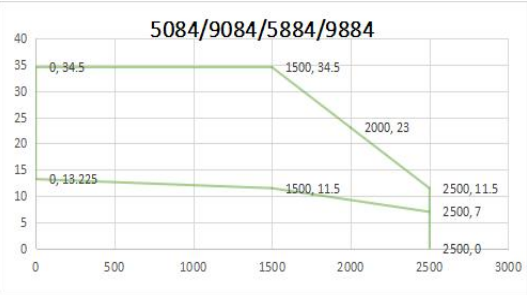
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5083



5084/9084/5884/9884



5085/9085/5885/9885



5185/5985/9185/9985



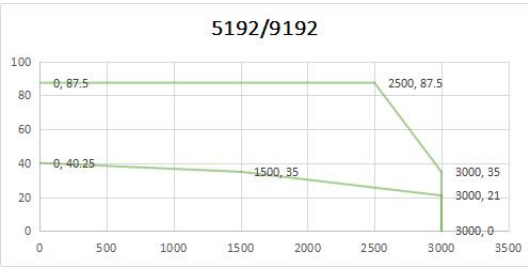
5196/9196



5191/9191



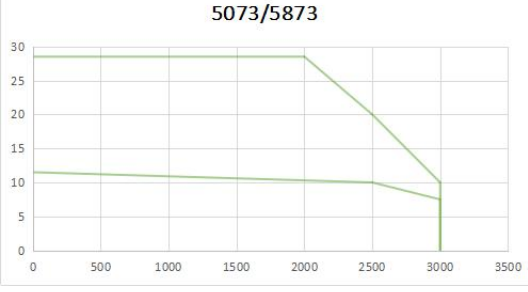
5192/9192



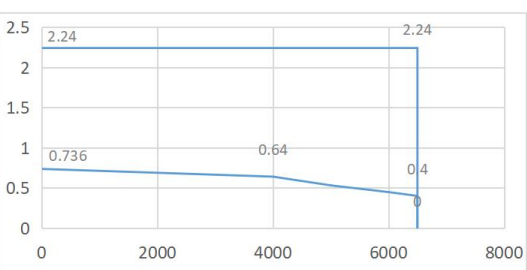
5193/9193



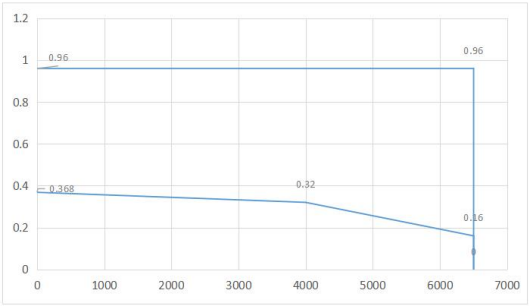
5073/5873



50B3/58B3



50B2/58B2


1.2
1
0.8
0.6
0.4
0.2
0
0.96
0.96
0.368
0.32
0.16
0
0
1000
2000
3000
4000
5000
6000
7000

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