

HSD6-DS Series Big Power (90A and above) AC Servo User's Manual V2.0

Preface

First of all, thank you for purchasing HSD6-DS series servo drivers!

HSD6-DS series servo driver products are high-performance and medium-power AC servo drivers developed by the HNC. This series of products support MODBUS communication protocol, and with the corresponding communication interface and the upper machine, multiple servo drivers can be networked. It provides the functions of rigid table setting, inertia identification and vibration suppression, which makes the servo driver simple and easy to use. With a high-response servo motor with small inertia and medium inertia (motor with 17/23-bit incremental encoder or multi-turn absolute encoder or resolver encoder), the operation is quiet and stable, and the positioning control is more accurate. It is suitable for automatic equipment such as semiconductor manufacturing equipment, mounter, printed circuit board punching machine, handling machinery, food processing machinery, machine tools, conveying machinery, etc., and realizes fast and accurate position control, speed control and torque control.

This manual is a simple user manual for HSD6-DS series servo drivers, which provide product safety information, mechanical and electrical installation instructions, basic debugging and maintenance instructions. For first-time users, please read this manual carefully. If you are in doubt about some functions and performance, please consult our technical support staff for help. As we are committed to the continuous improvement of servo drives, the information provided by our company is subject to change without prior notice. Customers shall send this manual to the end users along with the equipment for supporting the equipment.

Unpacking inspection:

When unpacking, please carefully confirm:

Confirming items	Description
Does the arrival product match the product model you ordered?	The box contains the machine you ordered and the simple user manual of HSD6-DS servo drive. Please confirm by the nameplate model of servo motor and servo driver.
Is there any damage to the product?	Please check the appearance of the whole machine and see if the product is damaged during transportation. If you find any omission or damage, please contact our company or your supplier immediately to solve it.
Does the rotating shaft of servo motor run smoothly?	Being able to rotate gently by hand is normal, except for servo motor with brake.

Please pay attention when using

- ◆ This product is a general industrial product, not for the purpose of using machines and systems that are related to human life.
- ◆ Please ask people with professional knowledge for wiring, operation, maintenance and inspection.
- ◆ Please consider the strength of the screw and the material of the installation part when installing this product and select it correctly within the range of no looseness and no damage.
- ◆ If it is applied to devices that may cause major accidents or losses due to the failure of this product, please equip with safety devices.
- ◆ If it is used in special environments such as atomic energy control, aerospace equipment, transportation equipment, medical equipment, various safety devices and equipment requiring high cleanliness, please contact the Company.
- ◆ Although the quality management of this product is complete, due to unexpected external noise, static electricity, input power supply, wiring, parts and other factors,
in case of failure, it may cause unexpected actions. Please fully consider the mechanical safety measures to ensure the safety within the possible action range in the workplace.
- ◆ When the motor shaft is running without grounding, according to the actual machinery and installation environment, the motor bearing may be corroded and the bearing sound may become louder. Please confirm and verify it yourself.
- ◆ According to the fault phenomenon of this product, it may produce smoke burning about one cigarette. If it is used in purification workshop and other environments, please pay attention to it.
- ◆ If it is used in an environment with high concentration of sulfur or sulfurous gas, please note that the chip resistance may be broken or poor contact may occur due to sulfuration.
- ◆ If the input voltage far exceeds the rated range of the power supply of this product, smoke and fire may occur due to the damage of internal components. Please pay full attention to the input voltage.
- ◆ The matching with the structure, size, service life, characteristics, laws and regulations of the installation machine and parts, and the matching with the specification change of the installation machine are finally decided by the user.
- ◆ Please note that this product cannot be used beyond the product specifications.
- ◆ The Company is committed to the continuous improvement of products, and some parts may be changed.

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Chapter 1 Selection of Servo System

Items	Specifications
Digital tube display	5-bit 7-segment LED digital tube is used to display the running status and parameter setting of servo.
Key operator	<p>←: Press this button to display the settings and set values of each parameter, that is, enter the parameter setting state (long press the parameter to confirm);</p> <p>◀: The current blinking bit is shifted to the left;</p> <p>▲: The setting value can be increased to act as a forward start key when the auxiliary function mode JOG is running;</p> <p>▼: It can reduce the function of the set value as the reverse start key when the auxiliary function mode JOG is running;</p> <p>M: Switch the basic modes in turn.</p>
CHARGE Bus voltage indicator lamp	It shall be used to indicate that the bus capacitor is in a charged state. Even if the main loop power supply is OFF, the internal capacitor of the servo unit may still have charge when the indicator light is on. Therefore, do not touch the power supply terminal when the light is on to avoid electric shock.
L1, L2 and L3 main power supply terminals	Three-phase AC200V-240V,-15% ~ 10%, 50/60Hz Or three-phase AC380V-440V,-15% ~ 10%, 50/60Hz.
L1C and L2C control power supply terminals	Single-phase AC200V-240V,-15% ~ 10%, 50/60Hz Or single-phase AC380V-440V,-15% ~ 10%, 50/60Hz.
B1/⊕, B2, B3 Brake Resistance Terminals	Connect the braking resistor between B1/⊕ and B2 when using an external braking resistor; When using the internal braking resistor, short circuit B2 and B3 (B2 and B3 have been short-circuited at the factory).
⊖	Bus N.
U, V, W, ⊕ Motor power terminal and grounding terminal	Must correspond to the motor UVW terminals one by one.
CN1 motor encoder terminal	Pay attention to the terminal definition.
CN2 input and output terminal	Pay attention to the terminal definition.
CN3 and CN4 communication terminals	Internal parallel connection, connected with RS-232, RS-485 and Canopen communication instruction devices.

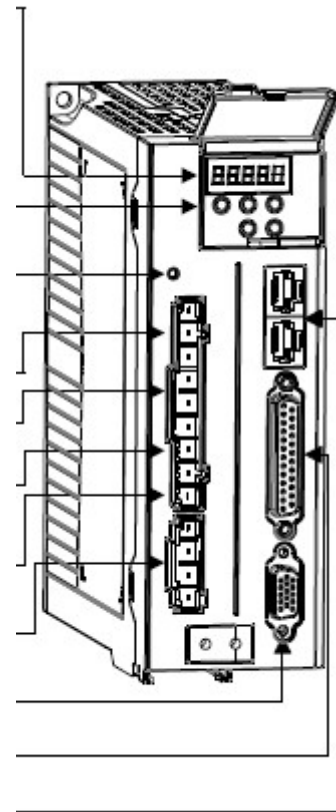


Figure 1-1 Servo Driver Composition

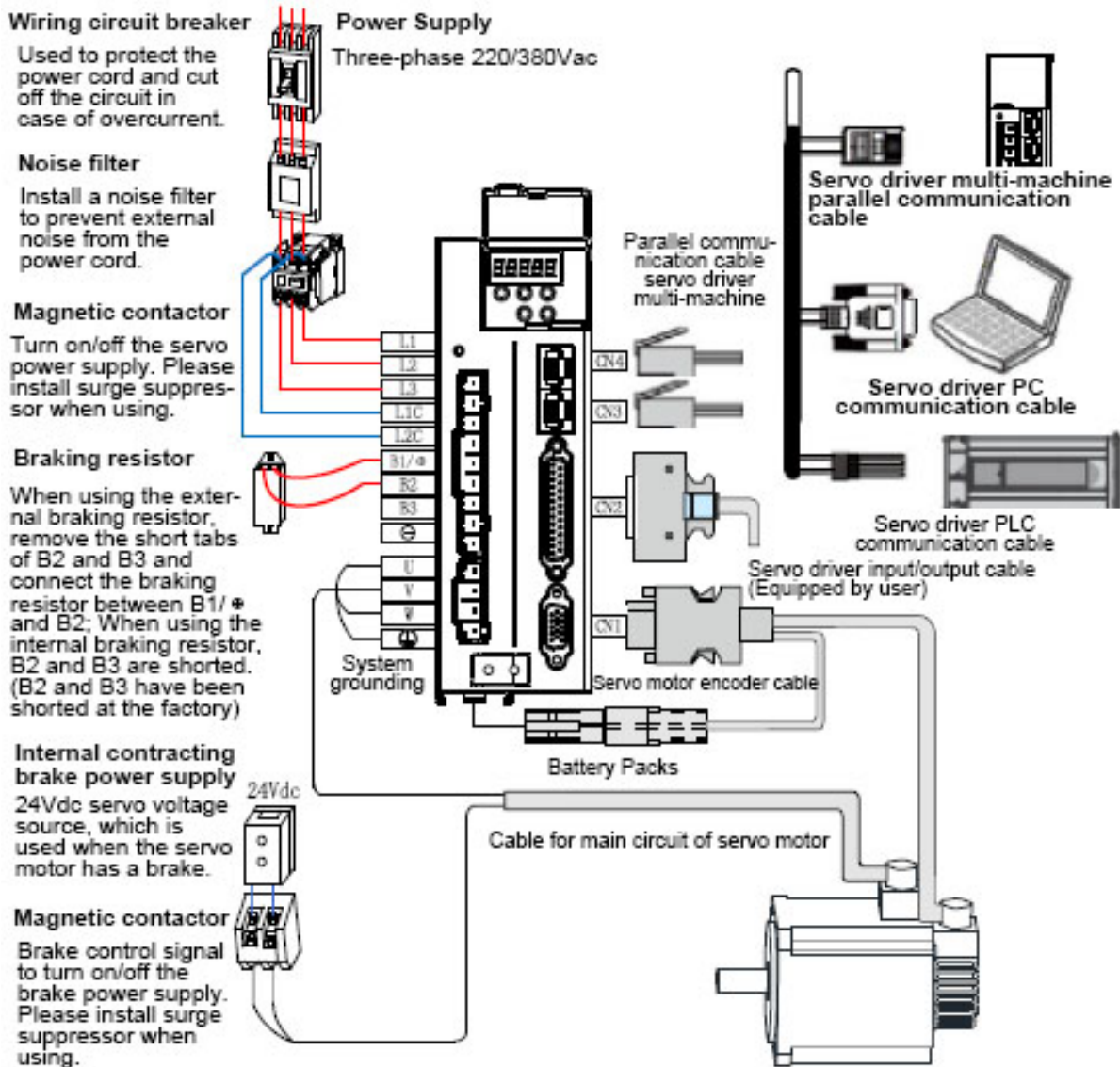


Figure 1-2 Example of System Wiring Diagram

The servo driver is directly connected to the industrial power supply, without power supply isolation such as transformer. In order to prevent cross electric shock accidents in the servo system, please use fuses or wiring circuit breakers on the input power supply. Since the servo driver has no built-in grounding protection circuit, in order to form a safer system, please use a leakage circuit breaker with overload and short circuit protection or a special leakage circuit breaker supporting grounding protection.

It is forbidden to use electromagnetic contactor for motor operation and stop operation. As the motor is a large inductance element, the instantaneous high voltage may break through the contactor.

Please pay attention to the power supply capacity when connecting external control power supply or 24Vdc power supply, especially when supplying power to several drivers or multi-channel brake, insufficient power supply capacity will lead to insufficient power supply current and failure of drivers or brake devices. The braking power supply is 24V DC voltage source, and the power should refer to the motor model and meet the requirements of braking power.

Precautions for system wiring:

1. Please remove the short circuit between terminals B2 and B3 of servo driver before connecting when external braking resistor is connected. Pay attention to modify the internal parameters.
2. CN3 and CN4 define identical communication interfaces for the two pins, and you can choose between them at will.

1.1 Servo driver model description

HSD6		-	DS	-	02	-	A	-	00
HSD6 Series Servopack			Axis Number		Continuous Output Current		Power Supply Voltage		Interface Type
Axis Number		Continuous Output Current			Power Supply Voltage		Interface Type		
S	Single Axis	02	1.6A		A	220VAC	00	Pulse/Analog	
		03	2.8A				01	CANopen	
		04	3.5A						
		06	5.5A						
		08	7.6A						
		09	8.4A						
		12	12A						
		15	15A						
		17	17A						
		18	18A						
		21	21A						
		25	25A						
		26	26A						
		32	32A						
		37	37A						
		45	45A						
		60	60A						
		75	75A						

Figure 1-4 Description of Servo Driver Model

1.2 Braking resistance related specifications

Servo driver model		Specification of built-in braking resistor		Minimum allowable resistance value (Ω)	Recommended external resistance power (kW)	Capacitor can absorb the maximum braking energy (J)
		Resistance value (Ω)	Capacity (W)			
Three-phase 220V	25	40	200	12	2.0	200
	32			12	3.5	250
	45	-	-	8	5.5	500
	60	-	-	6	5.5	900
	75	-	-	6	6.5	1200
Three-phase 380V	04	100	80	80	0.2	28
	06			60	0.5	34
	09	60	100	45	1.0	60
	12			45	2.0	90
	17			35	2.0	90
	21	40	200	35	3.0	122
	26			25	3.0	200
	32			25	4.5	200
	37	-	-	20	4.5	250
	45	-	-	16	5.5	300
	60	-	-	12	5.5	450
	75	-	-	12	6.5	600
	90	-	-	10	7.5	800
	112	-	-	10	8.5	800
	140	-	-	9	9.5	-
	170	-	-	9	10.5	-
	210	-	-	9	11.5	-

Note: ■ 02A, 03A, 45A, 60A, 75A and 37D-210D have no built-in braking resistors. If you need to use them, please configure the external braking resistors by yourself. Please consult our technical support for the power selection of the external braking resistors.

Chapter 2 Installation and Dimension Drawing of Servo Motor and Driver

2.1 Installation of servo motor

2.1.1 Installation site

- Please do not use this product in the environment with corrosive and flammable gases such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gas, acid, alkali, salt, and combustible materials.
- Please choose the machine with oil seal in places with grinding fluid, oil mist, iron powder and cutting.
- Places far away from heat sources such as stoves;
- Do not use the motor in a closed environment. Closed environment will lead to high temperature of motor and shorten its service life.

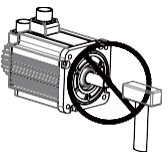
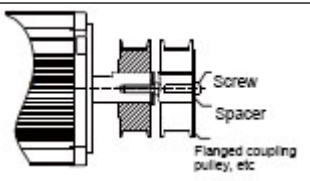
2.1.2 Environmental conditions

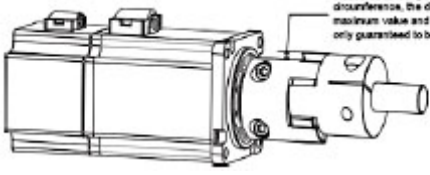
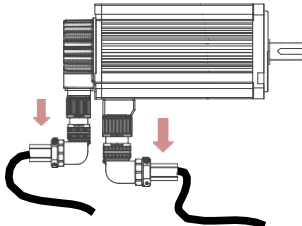
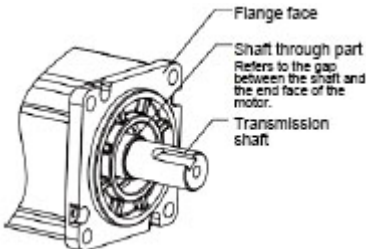
Table 2-1 Installation Environment

Items	Description
Operating ambient temperature	0~55℃
Using ambient humidity	Below 20~85% RH (no condensation)
Storage temperature	-20~65℃
Storage humidity	Below 20~85% RH (no condensation)
Vibration	10~60hz below 5.8m/s (0.6g) (it cannot be used continuously at resonance frequency).
Impact	Below 490m/s ²
The protection grades	IP65 (shaft penetration part, except the connecting terminal part of motor connector)
Altitude	Below 1000m

2.1.3 Precautions for installation

Table 2-2 Installation Precautions

Items	Description
Anti-corrosive treatment	Before installation, please clean the "rust inhibitor" at the extension ends of the servo motor shaft, and then does the related rust prevention treatment.
Encoder notes	<p>◆ It is forbidden to hit the shaft extension end during installation, otherwise the internal encoder will be broken.</p> 
	<p>◆ When installing a pulley on a servo motor shaft with a keyway, use a screw hole at the shaft end. In order to install the pulley, first insert the stud into the screw hole of the shaft, use a washer on the surface of the coupling end, and gradually lock the pulley with a nut.</p> 
	◆ For the servo motor shaft with keyway, use the screw hole at the shaft end for installation. For shafts without keyways, friction coupling or similar methods are adopted.
	◆ When removing the pulley, the pulley remover is used to prevent the bearing from being strongly impacted by the load.
	◆ To ensure safety, install a protective cover or similar device in the rotating area, such as a pulley installed on the shaft.

Items	Description
Centering	<p>◆ When connecting with the machine, please use the coupling, and keep the axis of the servo motor in a straight line with the axis of the machine. When installing the servo motor, please make it meet the alignment accuracy requirements as shown in the left figure. If the alignment is insufficient, vibration will occur, and sometimes bearings and encoder may be damaged.</p>  <p>Measured at four positions of the whole circumference, the difference between the maximum value and the minimum value is only guaranteed to be below 0.03 mm.</p>
Installation direction	<p>◆ The servo motor can be installed in the horizontal or vertical direction.</p>
Oil-water	<p>◆ Do not immerse the motor and cable in oil or water for use; ◆ When using in the place where water drops, please use it on the basis of confirming the protection level of servo motor. (Except for shaft penetration) ◆ In the application of liquid, please install the motor connection port downward (as shown in the following figure) to prevent the liquid from flowing to the motor body along the cable;</p>  <p>◆ Please specify the servo motor with oil seal when using in the place where oil drops will drip into the shaft penetration. ◆ Service conditions of servo motor with oil seal: 1) Please ensure that the oil level is lower than the lip of the oil seal when using; 2) When installing the servo motor vertically upward, do not accumulate oil on the lip of the oil seal.</p> 
Stress state of cable	<p>◆ Don't "bend" or apply "tension" to the wire, especially the core wire of the signal wire is 0.2mm or 0.3mm, which is very thin, so please don't stretch it too tightly when wiring (using).</p>
Treatment of connector part	<p>Regarding the connector section, please note the following:</p> <p>◆ Please make sure that there are no foreign objects such as garbage or metal sheets in the connector when the connector is connected.</p> <p>◆ When connecting the connector to the servo motor, please first connect it from the main circuit cable side of the servo motor, and the grounding wire of the main cable must be reliably connected. If one side of the encoder cable is connected first, the encoder may fail due to the potential difference between PE.</p> <p>◆ When wiring, please make sure that the pins are arranged correctly.</p> <p>◆ The connector is made of resin. Do not apply impact to avoid damaging the connector.</p> <p>◆ Be sure to hold the main body of the servo motor when carrying with the cable connected. If you only grasp the cable for handling, you may damage the connector or break the cable.</p> <p>◆ If a bent cable is used, you should pay full attention to the wiring operation, and do not apply stress to the connector part. If stress is applied to the connector part, the connector may be damaged.</p>

2.2 Servo System Wiring Diagram

2.2.1 Installation site

- Install it in an installation cabinet free from sun and rain;
- Please do not use this product in the environment with corrosive and flammable gases such as hydrogen sulfide, chlorine, ammonia, sulfur, chlorinated gas, acid, alkali, salt, and combustible materials.
- Please do not install in high temperature, humidity, dust and metal dust environment;
- No vibration place.

2.2.2 Precautions for installation

1) Method

Please ensure that the installation direction is perpendicular to the wall. Use natural convection or fan to cool the servo driver. The servo driver is firmly fixed on the mounting surface through 2 ~ 4 mounting holes (the number of mounting holes varies according to the capacity).

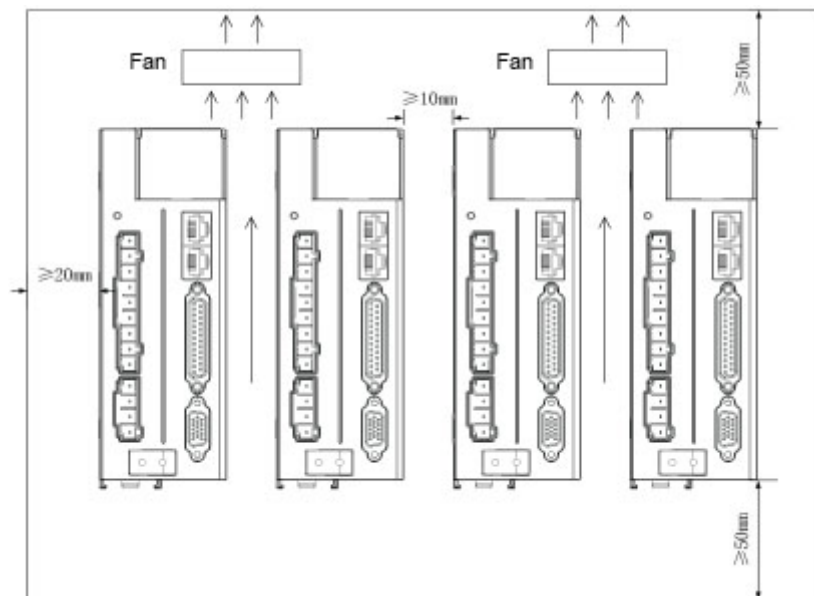


Figure 2-1 Schematic diagram of servo driver installation

Please face the front of the servo driver (the actual installation surface of the operator) to the operator and make it perpendicular to the wall when installing.

2) Cool down

To ensure cooling by fans and natural convection, please refer to the above figure and leave enough space around the servo driver.

Please install a cooling fan on the upper part of the servo driver. In order not to make the ambient temperature of the servo driver too high locally, it is necessary to keep the temperature in the electric cabinet uniform.

3) Side by side installation

When installing side by side, it is recommended to leave a spacing of more than 10mm on each lateral side (if the installation space is limited, you can choose not to leave a spacing), and a spacing of more than 50mm on each longitudinal side.

4) Grounding

Please be sure to ground the grounding terminal, otherwise there may be the danger of electric shock or interference and disoperation.

5) Routing requirements

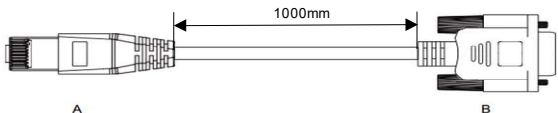
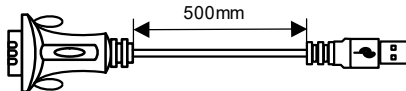
When wiring the driver, please run the cable down to avoid liquid adhering to the cable and flowing into the driver along the line.

2.3 Servo driver specification

Items			Specifications														
Model name			HSD6-DS-xxAxx					HSD6-DS-xxDxx									
			25	32	45	60	75	04	06	09	12	17	21	26	32		
External dimension	A(mm)		88		130		190		49		70		88				
	B(mm)		248		352		447		162		193		248				
	W(mm)		215		215		215		177		204		215				
	H(mm)		258		368		463		174		203		258				
	D(mm)		110		206		224		60		92		110				
	R(mm)		2.8		3.5		3.5		2.5		2.8		2.8				
	Weight (kg)		5.1		8.3		12		1.3		2.7		5.1				
	Input power		Three phase AC200V-240V, -15%~10%, 50/60Hz					Three phase AC380V-440V, -15%~10%, 50/60Hz									
Model name			HSD6-DS-xxDxx														
			37	45	60	75	90	112	140	170	210						
External dimension	A(mm)		130			190			272			200					
	B(mm)		352			447			465			614					
	W(mm)		215			215			249			309					
	H(mm)		368			463			480			630					
	D(mm)		206			224			304			278					
	R(mm)		3.5			3.5			9			9					
	Weight (kg)		8.3			12			22.9			39					
	Input power		Three phase AC380V-440V, -15%~10%, 50/60Hz														
Basic specifications	Environmental specification	Temperature	Operating ambient temperature	0 ~+55℃ (the ambient temperature is 45 ~ 55℃, and the average load rate should not exceed 80%) (not frozen)													
			Preserve ambient temperature	-20~65℃													
		Humidity	Using ambient humidity	Below 20 ~ 85% RH (no condensation)													
			Preserve ambient humidity	Below 20 ~ 85% RH (no condensation)													
		Use preserved ambient air		Indoor (no direct sunlight), no corrosive gas, flammable gas, oil mist and dust.													
		Altitude		The altitude is below 1000m m													
		Vibration		10 ~ 60hz below 5.8m/s² (0.6G) (it cannot be used continuously at resonance frequency).													
	Insulation and voltage resistance		Primary -FG between AC1500V 1 min														
	Control mode		Sine wave drive of three-phase PWM converter														
	Encoder feedback		1: 17/23 bits (used as a multi-turn absolute encoder after adding a battery) 2: resolver encoder														
	Control signal	Input	8 inputs (DC24V optocoupler isolation) are switched according to the control mode function.														
		Output	5 outputs (DC24V optocoupler isolation, open collector output) are switched according to the control mode function.														
	Pulse signal	Input	2 inputs (optocoupler isolation, RS-422 differential, open collector output)														
		Output	4 outputs (A/B/Z phase RS-422 differential; Z-phase open collector output)														
	Communicat ion function	RS232	For PC communication (for "Servostudio" connection)														
		RS-485	Upper remote control communication (1: n)														
		CAN	CANOPEN bus communication														
	Regenerative function			Optional regenerative resistor, which can be externally connected. Pay attention to modifying internal parameters.													
	Control model			6 control modes: speed control, position control, torque control, torque/speed control, speed/position control, torque/position control, and mixed torque/speed/position control.													
Function	Control input		Alarm reset, proportional action switching, zero-position fixed function enabling, prohibition of forward driving, prohibition of reverse driving, forward external torque limiting, reverse external torque limiting, forward inching, reverse inching, forward reset switch, reverse reset switch, origin switch, emergency stop, servo enabling and gain switching.														

Items			Specifications
Position control	Control output		Servo Ready, Motor Rotating, Zero Speed Signal, Speed Arrival, Position Arrival, Positioning Proximity Signal, Torque Limiting, Speed Limiting, Brake Output, Warning, Servo Failure, Alarm Code (3-digit output)
	Pulse input	Maximum command Impulse frequency	Differential input: 4Mpps at high speed, and the pulse width should not be less than 0.125 μs. The maximum low speed is 500Kpps, and the pulse width cannot be less than 1 μs. Open collector: the maximum is 200Kpps, and the pulse width cannot be less than 2.5μs.
		Input pulse Signal form	Differential input; open collector
		Input pulse Signal mode	Pulse+direction, right-angle phase difference (phase A+phase B), CW+CCW pulse
		Command pulse frequency division and multiplication (electronic gear ratio setting)	$0.1048576 < B/A < 419430.4$
		Command filter	Smoothing filter, FIR filter
	Pulse output	Output pulse shape	Phase A, phase B: differential output; phase Z : differential output or open collector output.
		Frequency division ratio	Arbitrary frequency division
		Output pulse function	Encoder position pulse and position pulse command (settable)
Speed control	Control input		Servo ON, alarm reset, speed command reversal, zero speed clamping, internal command selection input 1, internal command selection input 2, internal command selection input 3, internal command selection input 4, forward external torque limit input, reverse external torque limit input, and emergency stop.
	Control output		Alarm status, servo preparation, brake release, output in torque limit, output in speed limit, speed reaching, speed consistent, motor rotating output, zero speed signal output.
Torque control	Control input		Servo ON, alarm reset, torque command reversal, zero speed clamping
	Control output		Alarm status, servo preparation, brake release, torque limit, speed limit output, emergency stop.
	Torque command input		(Factory default setting, range can be set by function code)
	Speed limiting function		Positive and negative internal speed limits P03.27 and P03.28
Universal	Speed observer function		There is
	Damping control function		There is
	Adaptive notch filter		There is
	Automatic adjustment function		There is
	Encoder output frequency division		There is
	Internal location planning function		There is
	Adjustment/function setting		Use the upper machine setting software "Servostudio" for adjustment
	Defensive function		Overvoltage, abnormal power supply, overcurrent, overload, abnormal encoder, overspeed, excessive position deviation, abnormal parameters, etc.

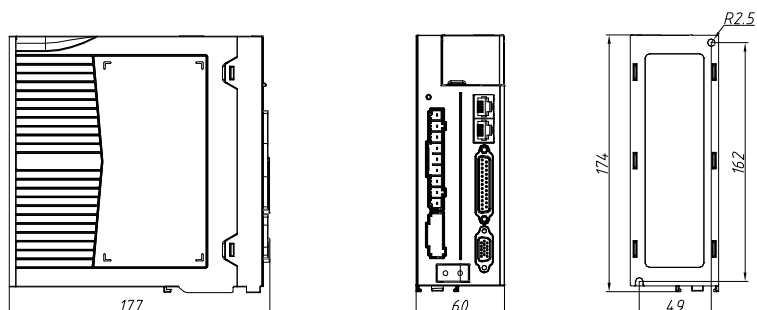
2.4 Communication cable options

Cable model	L length (mm)	Cable appearance diagram
HSD6-DS-RJ45 to 232 line	1000	
Connection line USB to 232	500	

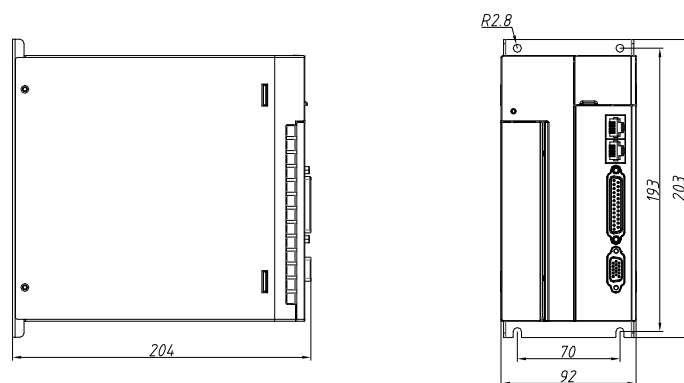
2.5 Outline dimensional drawing of Servo driver

HSD6-DS-xxAxx (220V), HSD6-DST (380V) (unit: mm)

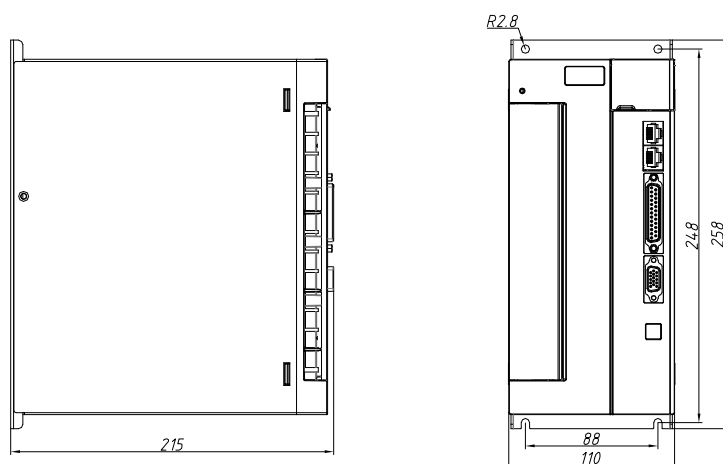
(1) HSD6-DS-04Dxx, HSD6-DSS-06Dxx



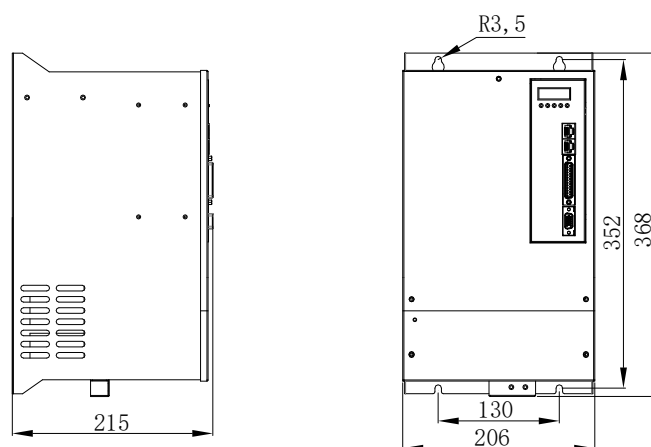
(2) HSD6-DS-09Dxx, HSD6-DS-12Dxx, HSD6-DS-17Dxx



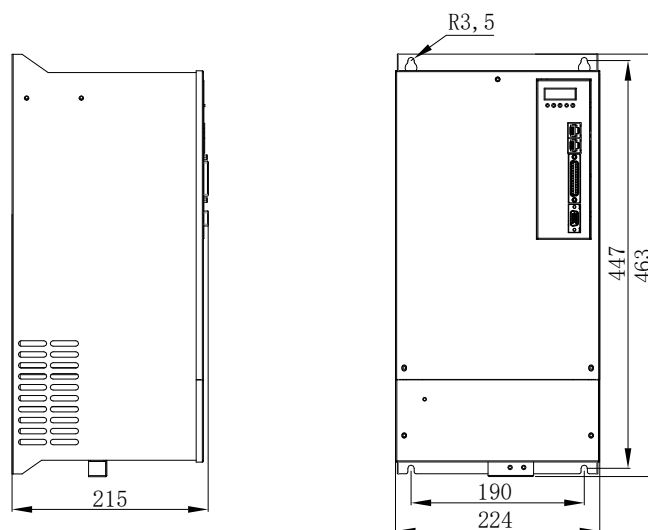
(3) HSD6-DS-25Axx, HSD6-DS-32Axx, HSD6-DS-21Dxx, HSD6-DS-26Dxx, HSD6-DS-32Dxx



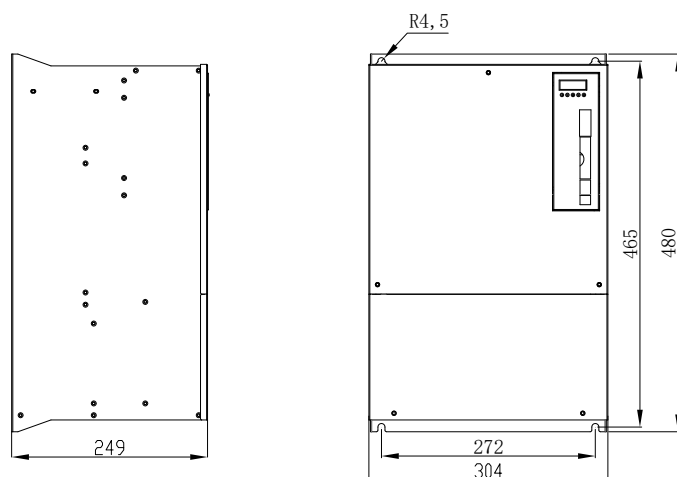
(4) HSD6-DS-45Axx, HSD6-DS-37Dxx, HSD6-DS-45Dxx



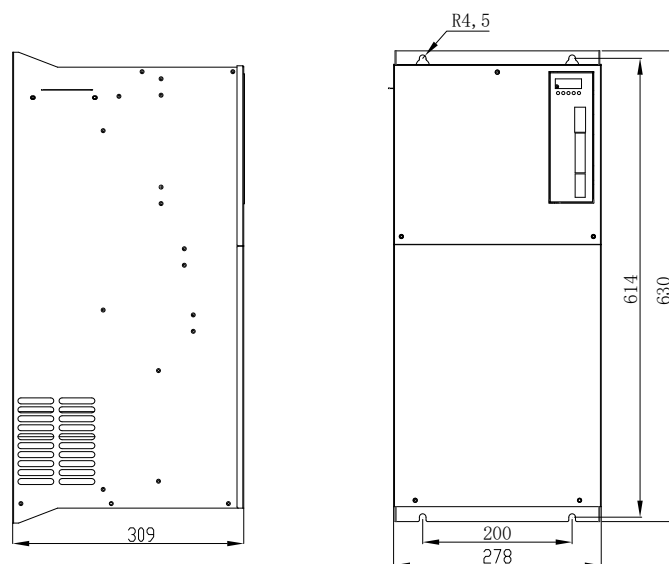
(5) HSD6-DS-60Axx, HSD6-DS-75Axx, HSD6-DS-60Dxx, HSD6-DS-75Dxx,



(6) HSD6-DS-90Dxx, HSD6-DS-112Dxx



(7) HSD6-DS-140Dxx, HSD6-DS-170Dxx, HSD6-DS-210Dxx



Chapter 3 Description of Connection between Servo Driver and Motor

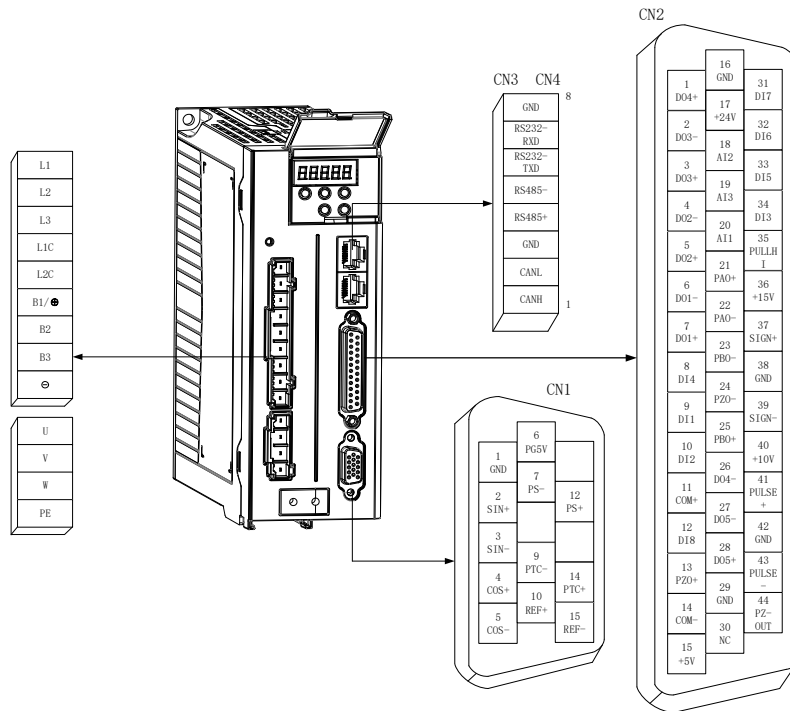


Figure 3-1 Distribution of terminal pins of servo drive

The above figure shows the pin arrangement of the driver body with its own terminals.

3.1 Servo driver main circuit loop connection

3.1.1 Introduction of main circuit terminal

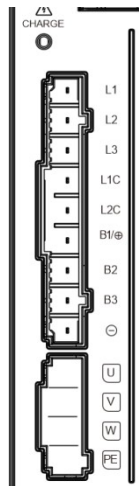
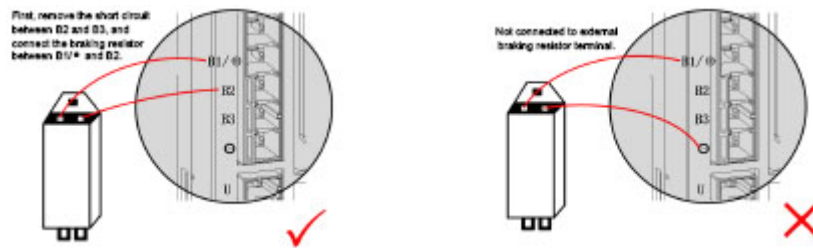


Figure 3-2 Terminal Block Arrangement of Servo Driver

Items	Specifications
L1,L2,L3 Main power terminal	Three phase AC200V-240V, -15% ~ 10%, 50/60Hz or three phase AC380V-440V, -15%~10%, 50/60Hz
L1C,L2C Control power terminal	Single phase AC200V-240V, -15% ~ 10%, 50/60Hz or single phase AC380V-440V, -15%~10%, 50/60Hz
B1/⊕,B2,B3 Brake resistor terminal	When using an external braking resistor, connect the braking resistor between B1/⊕ and B2; When using the internal braking resistor, short circuit B2 and B3 (B2 and B3 have been short-circuited at the factory).
⊖	Bus N
U,V,W,PE Motor power terminal and grounding terminal	Must correspond to the motor UVW terminals one by one.

Examples of wiring and selection errors of braking resistors:



Precautions for braking resistor wiring:

1. Please do not connect the external braking resistor directly to B1/⊕, ⊖, otherwise it will cause explosion and fire.
2. When using the external brake resistor, please remove the short circuit between B2 and B3, otherwise the brake pipe will be damaged by overcurrent.
3. Please refer to section 1.4 for the selection of external braking resistor resistance, and do not be less than the minimum allowable resistance, otherwise it will cause 201 alarm or damage the driver;
4. Before using the servo, please make sure that the brake resistance parameters P02-25, P02-26, P02-27 are correctly set;
5. Install the external brake resistor on a non-combustible material such as metal.

Table 3-Current Specifications of 3-3 HSD6-DS Series Drivers

Drive model HSD6-DS	Rated input current (A)	Rated output current (A)	Maximum output current (A)
02A	2	1.6	5.8
03A	4 (single phase) / 2 (three phase)	2.8	10.1
06A	7.9 (single phase) / 3.7 (three phase)	5.5	16.9
08A	11 (single phase) / 5.5 (three phase)	7.6	17
12A	8.0	12.0	28
15A	10.0	15.0	28
18A	12.0	18.0	45
25A	33.0	25.0	50
32A	40.0	32.0	64
45A	47.0	45.0	90
60A	62.0	60.0	120
75A	76.0	75.0	150
04D	4.5	3.5	8.5
06D	6.5	5.4	14
09D	10.0	8.4	20
12D	14.0	12.0	23.8
17D	21.0	17.0	42
21D	24.0	21.0	55
26D	28.0	26.0	65
32D	35.0	32.0	65
37D	39.0	37.0	75
45D	47.0	45.0	90
60D	62.0	60.0	120
75D	76.0	75.0	150
90D	92.0	90.0	180
112D	113.0	112.0	180
140D	157.0	140.0	225
170D	180.0	170.0	264
210D	214.0	210.0	315

Table 3-4 Recommended Cables and Models for Main Circuit of HSD6-DS Series Drivers

Drive model HSD6-DS	L1C、L2C	L1、L2、L3	B1/⊕、B2	U、V、W	PE
02A	18AWG (0.82 mm ²)	16AWG (1.31 mm ²)	16AWG (1.31 mm ²)	16AWG (1.31 mm ²)	14AWG (2.09 mm ²)
03A	18AWG (0.82 mm ²)	16AWG (1.31mm ²)	16AWG (1.31mm ²)	16AWG (1.31mm ²)	14AWG (2.09mm ²)
06A	18AWG (0.82mm ²)	16AWG (1.31mm ²)	16AWG (1.31mm ²)	16AWG (1.31mm ²)	14AWG (2.09mm ²)
08A	18AWG (0.82mm ²)	16AWG (1.31mm ²)	16AWG (1.31mm ²)	16AWG (1.31mm ²)	14AWG (2.09mm ²)
12A	18AWG (0.82mm ²)	14AWG (2.09mm ²)	14AWG (2.09mm ²)	14AWG (2.09mm ²)	14AWG (2.09mm ²)
15A	18AWG (0.82mm ²)	18AWG (0.82mm ²)	18AWG (0.82mm ²)	18AWG (0.82mm ²)	18AWG (0.82mm ²)
18A	18AWG (0.82mm ²)	14AWG (2.09mm ²)	14AWG (2.09mm ²)	14AWG (2.09mm ²)	14AWG (2.09mm ²)
25A	18AWG (0.82mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)
32A	18AWG (0.82mm ²)	9AWG (6.63mm ²)	9AWG (6.63mm ²)	9AWG (6.63mm ²)	9AWG (6.63mm ²)
45A	-	7AWG (10.55mm ²)	7AWG (10.55mm ²)	7AWG (10.55mm ²)	7AWG (10.55mm ²)
60A	-	6AWG (13.30mm ²)	6AWG (13.30mm ²)	6AWG (13.30mm ²)	6AWG (13.30mm ²)
75A	-	6AWG (13.30mm ²)	6AWG (13.30mm ²)	6AWG (13.30mm ²)	6AWG (13.30mm ²)
04D	18AWG (0.82mm ²)	18AWG (0.82 mm ²)	18AWG (0.82 mm ²)	18AWG (0.82 mm ²)	18AWG (0.82 mm ²)
06D	18AWG (0.82mm ²)	18AWG (0.82 mm ²)	18AWG (0.82 mm ²)	18AWG (0.82 mm ²)	18AWG (0.82 mm ²)
09D	18AWG (0.82mm ²)	16AWG (1.31mm ²)	16AWG (1.31mm ²)	16AWG (1.31mm ²)	14AWG (2.09mm ²)
12D	18AWG (0.82mm ²)	14AWG (2.09mm ²)	14AWG (2.09mm ²)	14AWG (2.09mm ²)	14AWG (2.09mm ²)
17D	18AWG (0.82mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)
21D	18AWG (0.82mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)
26D	18AWG (0.82mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)	10AWG (5.27mm ²)
32D	18AWG (0.82mm ²)	9AWG (6.63mm ²)	9AWG (6.63mm ²)	9AWG (6.63mm ²)	9AWG (6.63mm ²)
37D	-	8AWG (8.37mm ²)	8AWG (8.37mm ²)	8AWG (8.37mm ²)	8AWG (8.37mm ²)

Drive model HSD6-DS	L1C、L2C	L1、L2、L3	B1/⊕、B2	U、V、W	PE
45D	-	7AWG (10.55mm ²)	7AWG (10.55mm ²)	7AWG (10.55mm ²)	7AWG (10.55mm ²)
60D	-	6AWG (13.30mm ²)	6AWG (13.30mm ²)	6AWG (13.30mm ²)	6AWG (13.30mm ²)
75D	-	6AWG (13.30mm ²)	6AWG (13.30mm ²)	6AWG (13.30mm ²)	6AWG (13.30mm ²)
90D	-	50mm ²	50mm ²	50mm ²	25mm ²
112D	-	50mm ²	50mm ²	50mm ²	25mm ²
140D	-	70mm ²	70mm ²	70mm ²	35mm ²
170D	-	95mm ²	95mm ²	95mm ²	50mm ²
210D	-	120mm ²	120mm ²	120mm ²	70mm ²

3.1.2 Example of power supply wiring

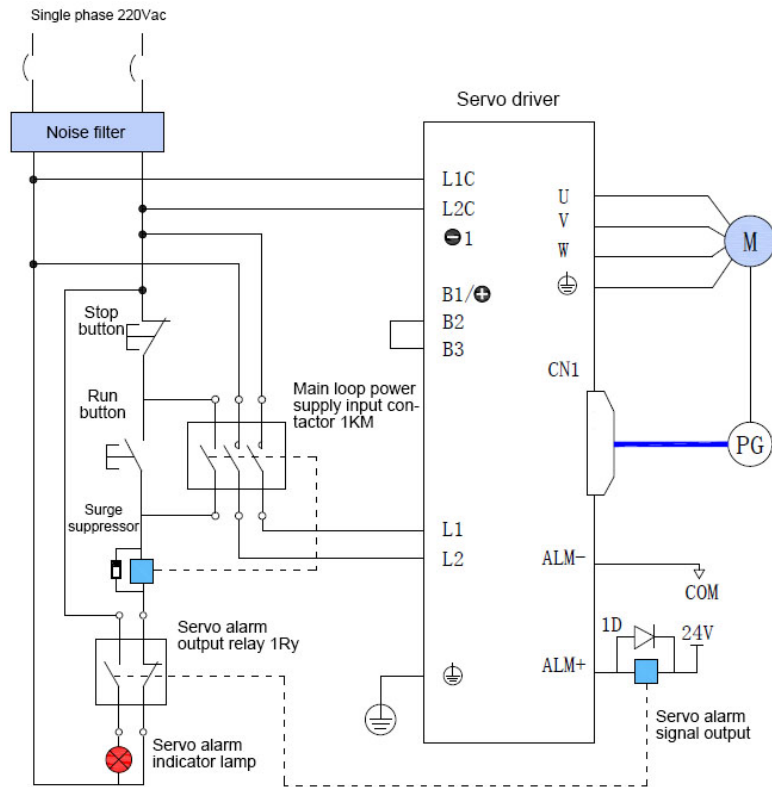


Figure 3-5 Single-phase 220V Main Circuit Wiring

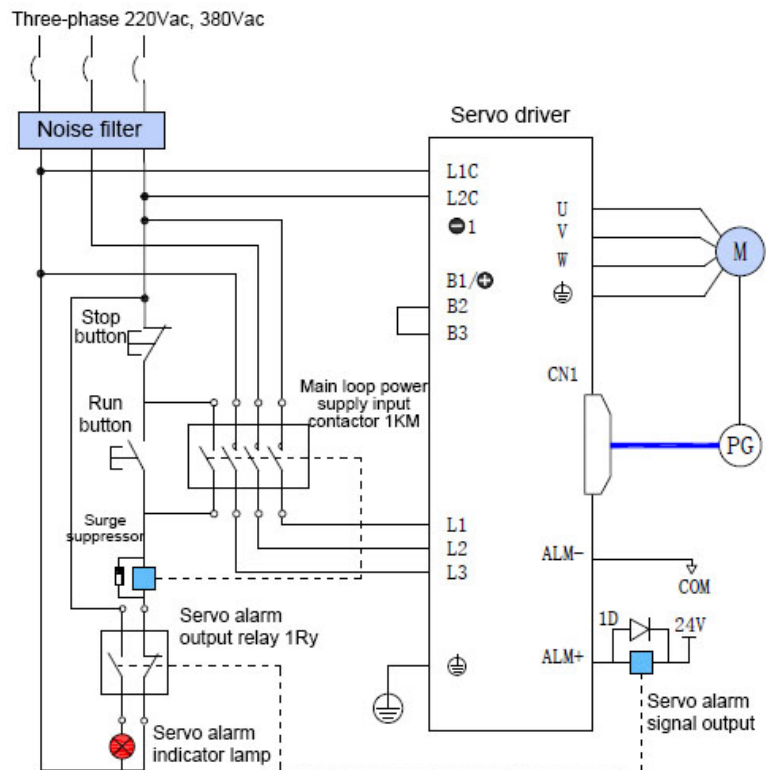


Figure 3-6 Wiring of Three-phase 220V and 380V Main Circuit

Note: ■1KM: electromagnetic contactor; 1Ry: relay; 1D: Flywheel diode.

Please refer to Figure 3-5 and Figure 3-6 to connect the power supply of the main circuit. DO is set to alarm output function (ALM+/-). When the servo driver gives an alarm, the power supply can be automatically cut off, and the alarm light is on at the same time.

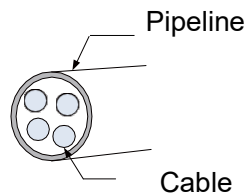
Precautions for wiring of main circuit:

1. Do not connect the input power cord to the output terminals U, V and W, otherwise the servo driver will be damaged;
2. When the cable is bundled and used in pipelines and other places, please consider the allowable current reduction rate because of the poor heat dissipation conditions;
3. Please use high-temperature cables in the surrounding high-temperature environment. Generally, cables will age quickly and cannot be used in a short time. Please pay attention to the insulation measures of cables in the surrounding low temperature environment. Generally, the surface of cables is easy to harden and crack in the low temperature environment.
4. Please ensure that the bending radius of the cable is more than 10 times of the outer diameter of the cable itself to prevent the internal core of the cable from breaking due to long-term bending;
5. Please use cables with withstand voltage above AC600V and rated temperature above 75°C. The allowable current density of wires using cables is around 30°C and under normal heat dissipation conditions. Generally, the total current should not exceed 8 A/mm below 50A and 5 A/mm above 50 A. In view of the high ambient temperature and bundled cables, it is necessary to properly adjust the allowable current value. The applicable allowable current density can be calculated by the following formula: (A/mm²)

Applicable allowable current density=8×reduction coefficient of current-carrying density of conductor×current correction coefficient

$$\text{Current correction coefficient} = \sqrt{(\text{Nominal maximum allowable temperature of cable} - \text{ambient temperature}) \div 30}$$

Table 3-7 Coefficient of reduction of current-carrying density of conductor



Number of cables in the same pipe	Current reduction coefficient
Less than 3 pieces	0.7
4 pieces	0.63
5~6 pieces	0.56
7~15 pieces	0.49

6. It is forbidden to connect the braking resistor between terminals B1/⊕ and ⊖ 1 of DC bus, otherwise it may cause a fire!
7. Do not pass or bind the power cord and signal cord through the same pipe, and the distance between them should be more than 30cm to avoid interference.
8. Even if the power supply is turned off, high voltage may remain in the servo driver. Do not touch the power terminal within 5 minutes;
9. Please confirm that the CHARGE indicator light is off before checking;
10. Do not turn ON/OFF the power frequently. When it is necessary to repeatedly turn ON/OFF the power continuously, please control it below 1 times at 1 minute. Because there is a capacitor in the power supply part of the servo driver, when the power supply is turned ON, a large charging current will flow (charging time is 0.2 seconds). Frequently turning ON/OFF the power supply will cause the performance degradation of the main circuit components inside the servo driver.
11. Please use the ground wire with the same cross-sectional area as the main circuit wire. If the cross-sectional area of the main circuit wire is less than 1.6mm², please use 2.0mm² earth wire;
12. Please connect the servo driver to the earth reliably;
13. Please don't turn on the power when the terminal screws are loose or the cable is loose, which may cause a fire.

3.1.3 Connection method of servo drive output and motor cable

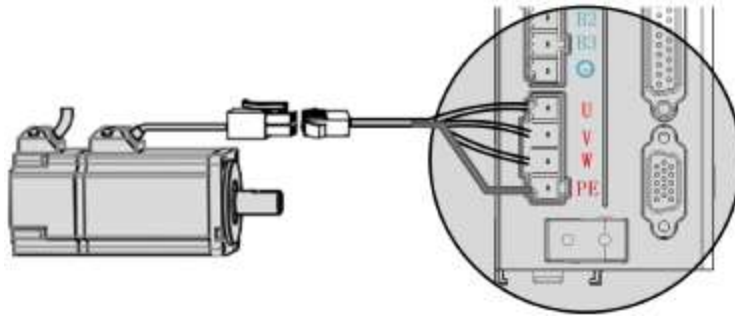


Figure 3-7 Example of Connection between Servo Driver Output and Servo Motor

3.2 Servo motor encoder signal connection method

3.2.1 Bus incremental encoder connection

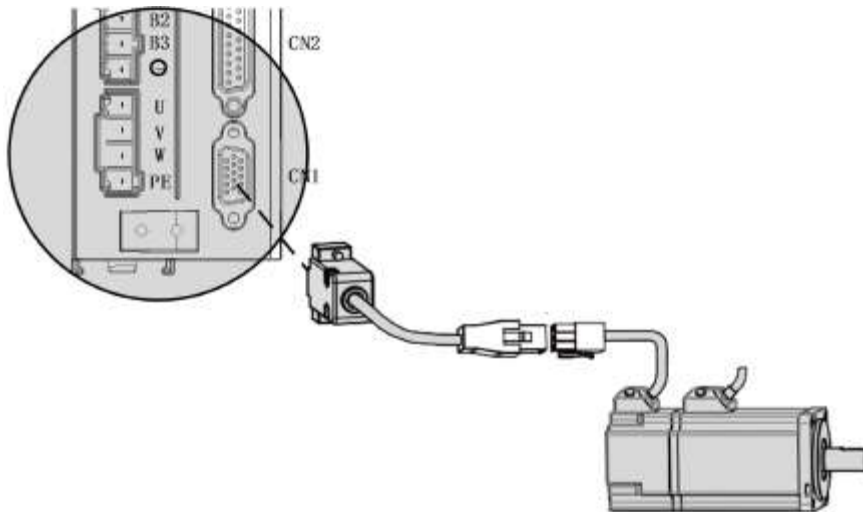


Figure 3-8 Example Diagram of Encoder Signal Wiring

Precautions for encoder signal wiring:

1. Please be sure to ground the shielding mesh layer on the driver side and motor side reliably, otherwise it will cause the driver to give a false alarm.
2. It is recommended to use 26 AWG ~ 16 AWG twisted-pair shielded cable with wiring length less than 20m.
3. Do not connect the wire to the "reserved" terminal.
4. The encoder cable length needs to fully consider the voltage drop caused by cable resistance and the signal attenuation caused by distributed capacitance. It is recommended to

use the twisted-pair shielded cable with specifications above 26AWG of UL2464 standard within the cable length of 10m, and the cable diameter needs to be appropriately increased for the demand of longer cables, as shown in the following table:

Table 3-13 Recommended Cable Information

Line diameter size	Ω/km	Allowable cable length (m)
26AWG(0.13mm ²)	143	10.0
25AWG(0.15mm ²)	89.4	16.0
24AWG(0.21mm ²)	79.6	18.0
23AWG(0.26mm ²)	68.5	20.9
22AWG(0.32mm ²)	54.3	26.4
21AWG(0.41mm ²)	42.7	33.5

5. Encoder cable shielding layer should be reliably grounded; Connect the differential signals to the two twisted cores in the twisted pair.
6. The length of signal cable also needs to fully consider the voltage drop caused by cable resistance, and pay attention to the capacity of power supply when distributing power to ensure that the signal and power supply reach the input side of the driver with sufficient strength. It is recommended to use twisted-pair shielded cables with specifications above 26AWG.
7. Encoder cable and power cable must be routed separately, with an interval of at least 30cm.
8. When the encoder cable is not long enough to connect the cable, it is necessary to connect the shielding layer reliably to ensure reliable shielding and grounding.

3.3 Control signal terminal connection method

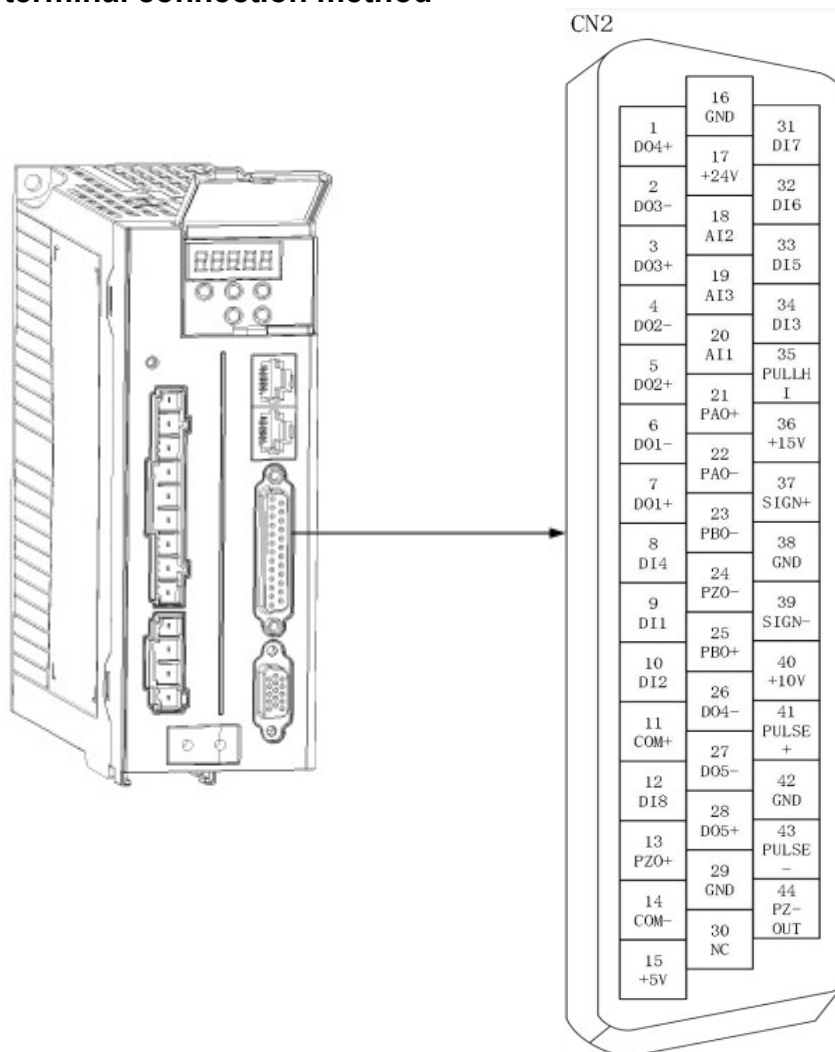


Figure 3-13 Pin Distribution Diagram of Terminal Connector of Driver Control Loop

Note: See "4.1.1 Position Mode Wiring, 4.2.1 Speed Mode Wiring and 4.3.1 Torque Mode Wiring" for wiring diagrams corresponding to three control modes: position mode wiring, speed mode wiring and torque mode wiring.

3.3.1 Position command input signal

The general command pulse input, command symbol input signal and command symbol input signal terminal of the user interface connector will be described below.

Table 3-18 Description of Position Command Input Signals

Signal name		Pin number	Function	
Position command	PULSE+	41	Low-speed pulse	Input pulse form:
	PULSE-	43	command input mode:	direction+pulse
	SIGN+	37	Differential drive input	A and B phase orthogonal pulse
	SIGN-	39	Open collector	CW/CCW pulse
	PULLHI	35	Input interface of external power supply for command pulse	

The command pulse and symbol output circuit on the upper device side can be selected from differential driver output or open collector output. The maximum input frequency and minimum pulse width are shown in the following table:

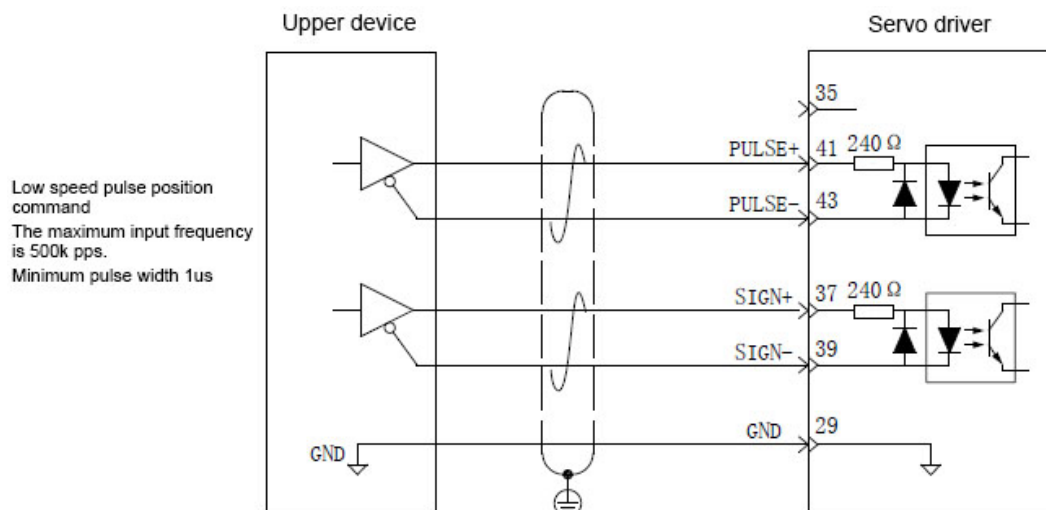
Table 3-19 Correspondence between Pulse Input Frequency and Pulse Width

Pulse mode		Maximum frequency (pps)	Minimum pulse width (us)
Normal	Difference	500k	1
	Open collector	200k	2.5
High speed difference		4M	0.125

Note: ■ If the output pulse width of the superior device is less than the minimum pulse width, the driver will receive the pulse incorrectly.

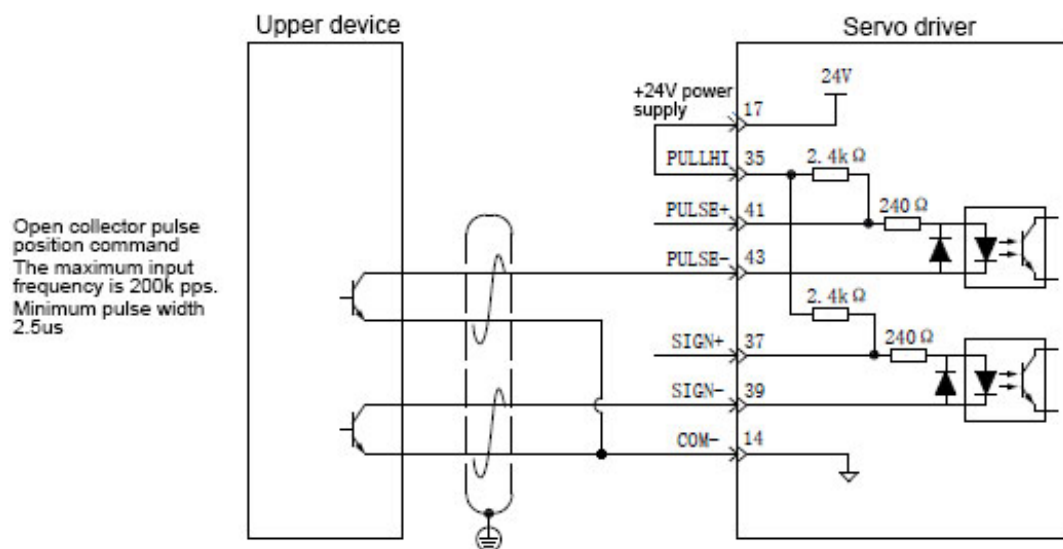
1) Low speed pulse command input

a) When it is a differential mode

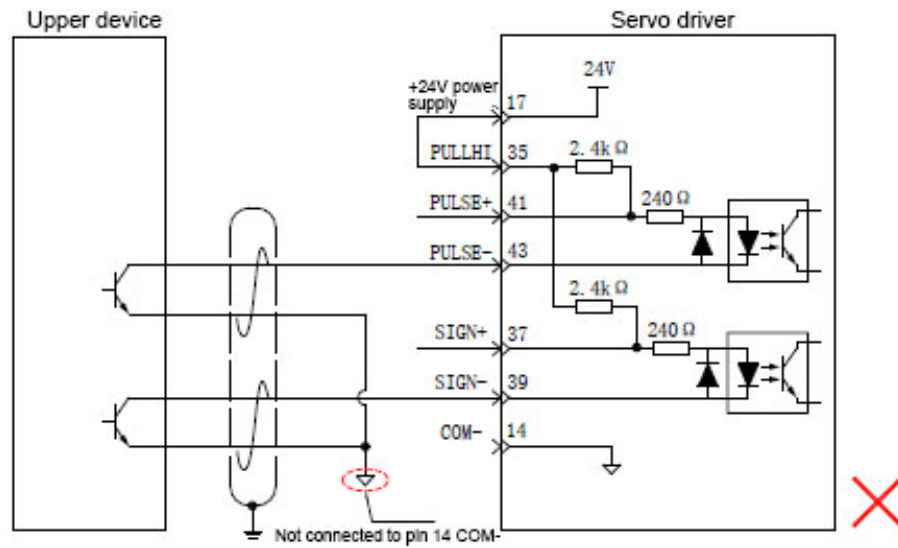


b) When it is open collector mode.

① When using the internal 24V power supply of servo driver:

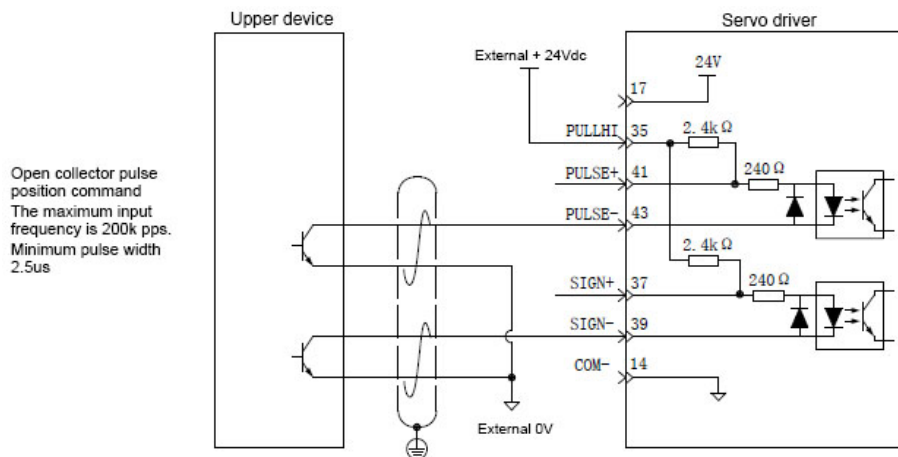


- Error: 14-pin COM- is not connected, so a closed loop cannot be formed.

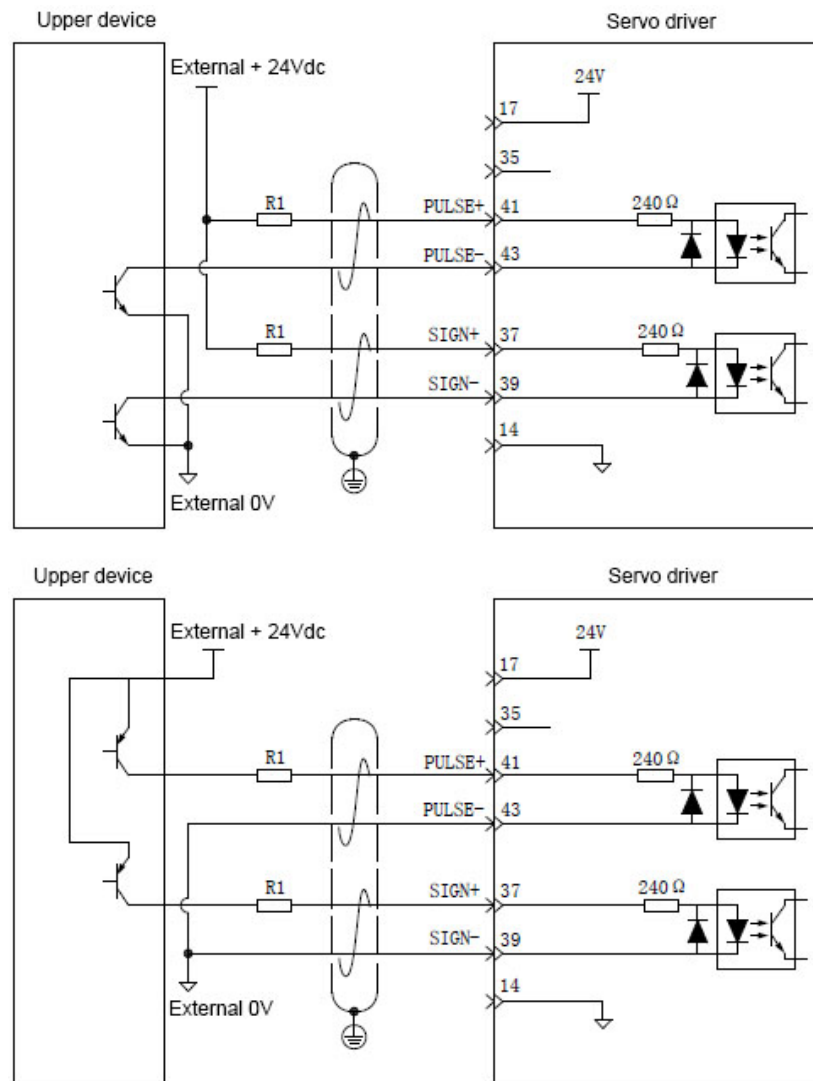


- ② When using external power supply:

Option 1: Use the internal resistance of the driver (recommended scheme)



Option 2: Use external resistor.



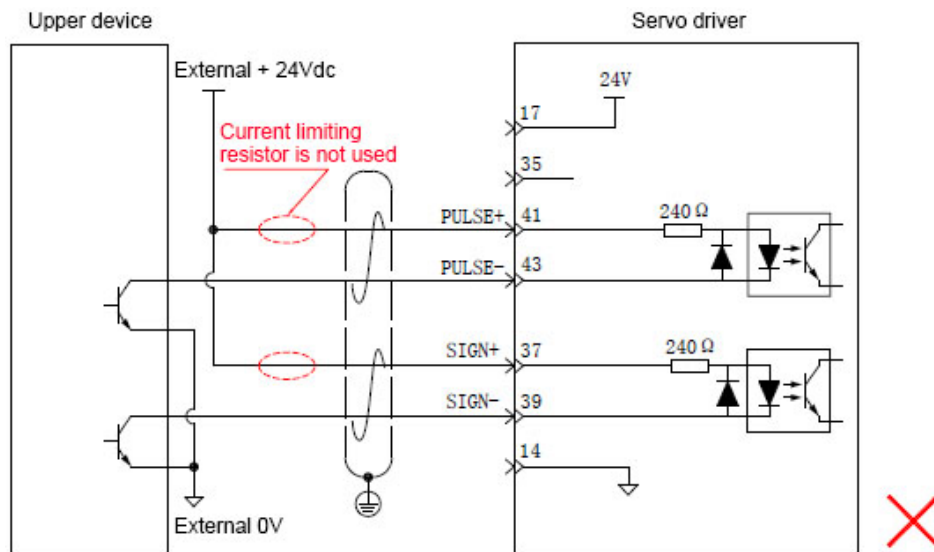
Please satisfy the formula for the selection of resistor R1: $\frac{V_{cc}-1.5}{R1+200}=10\text{mA}$

Table 3-20 Recommended R1 Resistance

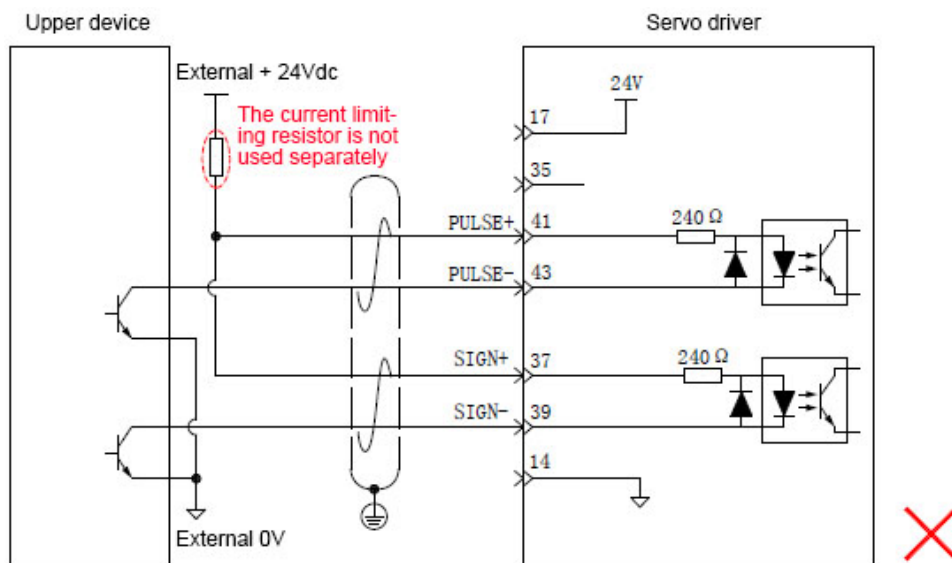
VCC voltage	R1 resistance	R1 power
24V	2.4kΩ	0.5W
12V	1.5kΩ	0.5W

Examples of wiring errors:

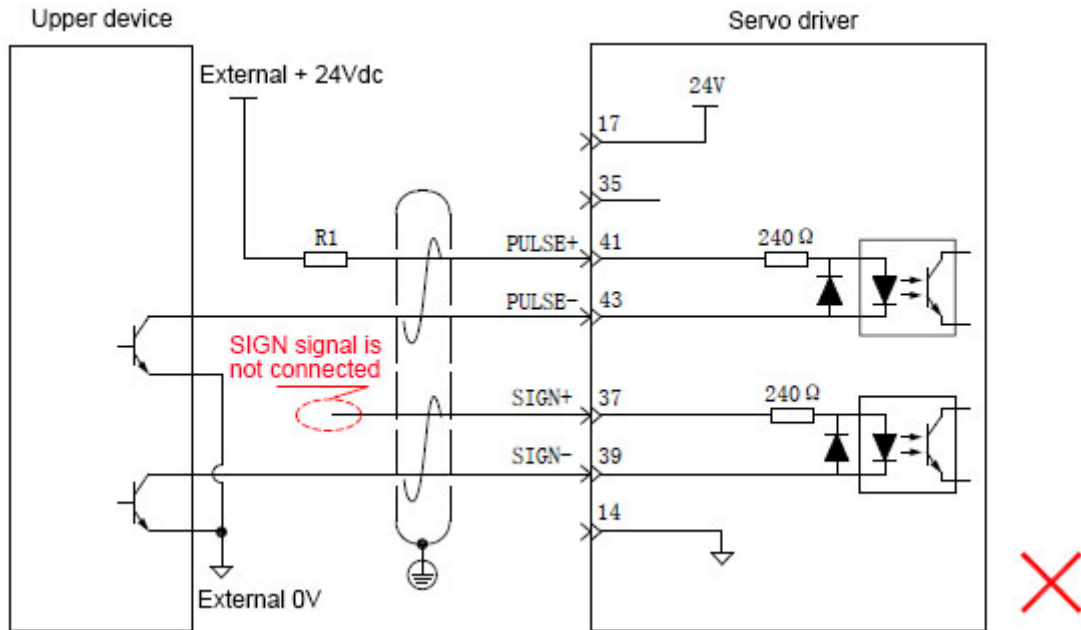
- Error 1: The current limiting resistor is not connected, resulting in port burning.



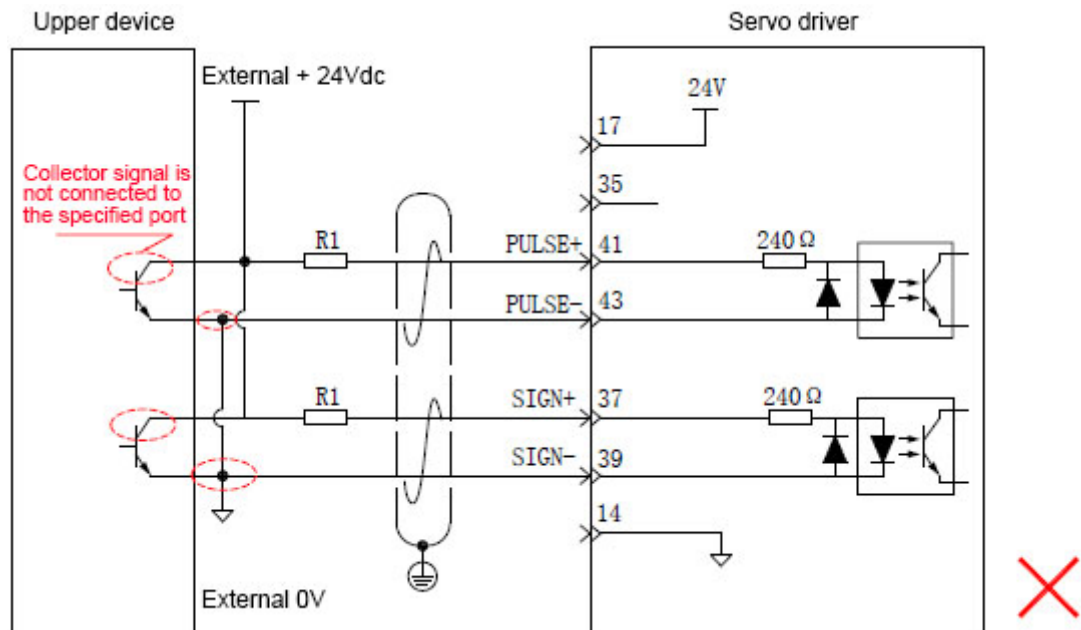
- Error 2: Multiple ports share the current limiting resistor, which leads to pulse reception error.



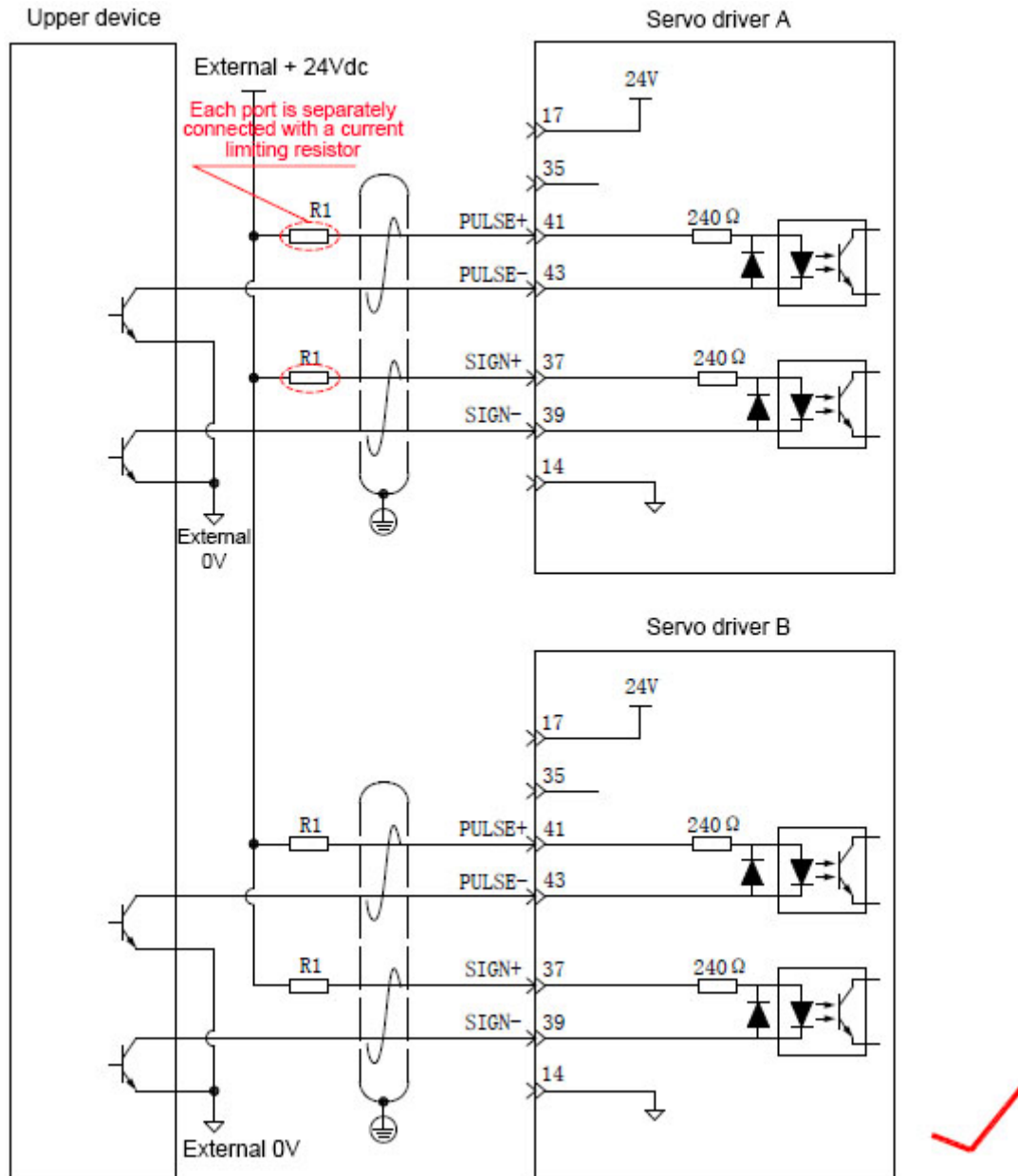
- Error 3: The 3: SIGN port is not connected, so these two ports can't receive the pulse.

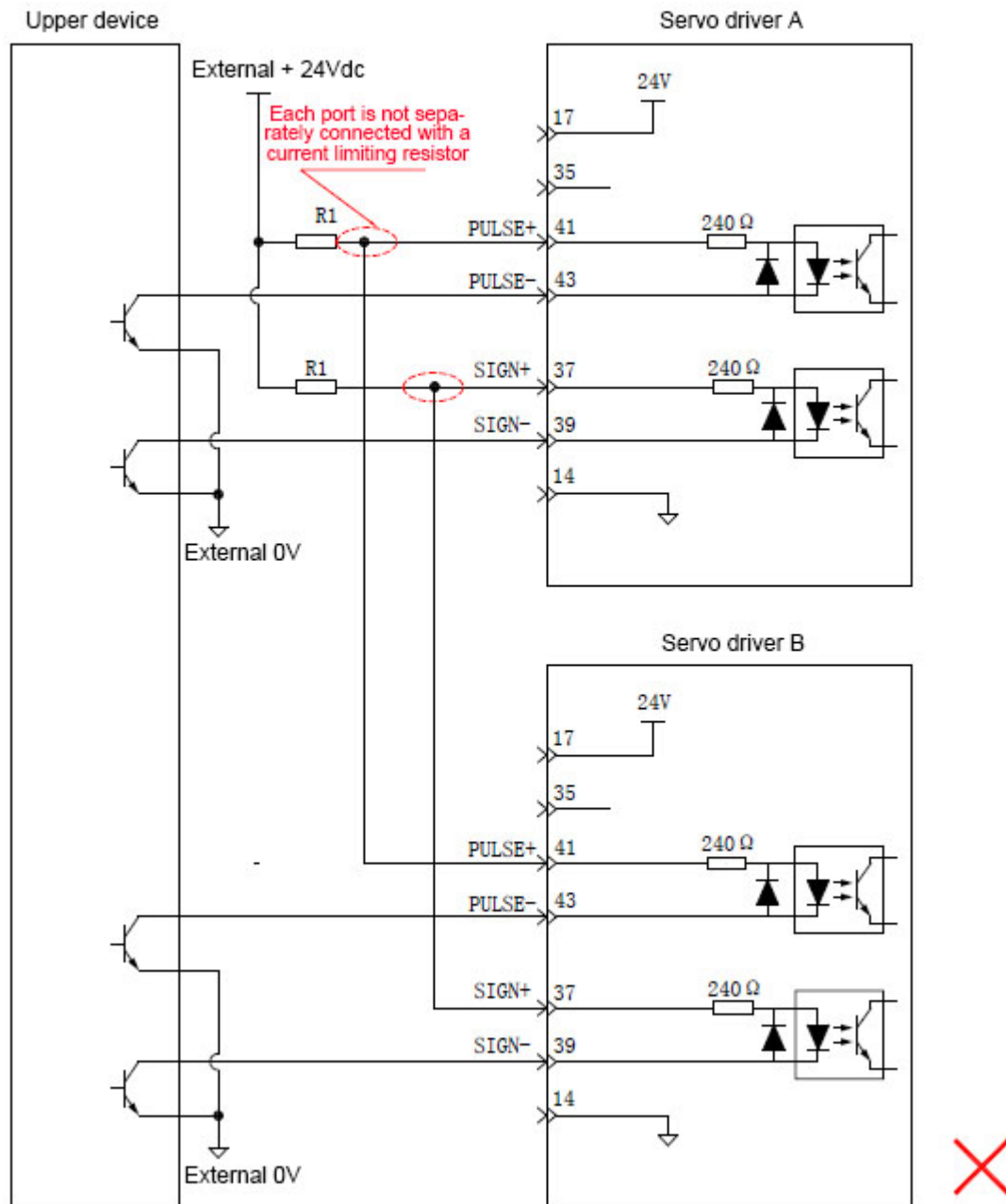


- Error 4: The port is wrongly connected, resulting in port burning.



- Error 5: Multiple ports share the current-limiting resistor, resulting in an error in pulse reception.





3.3.2 Analog input signal

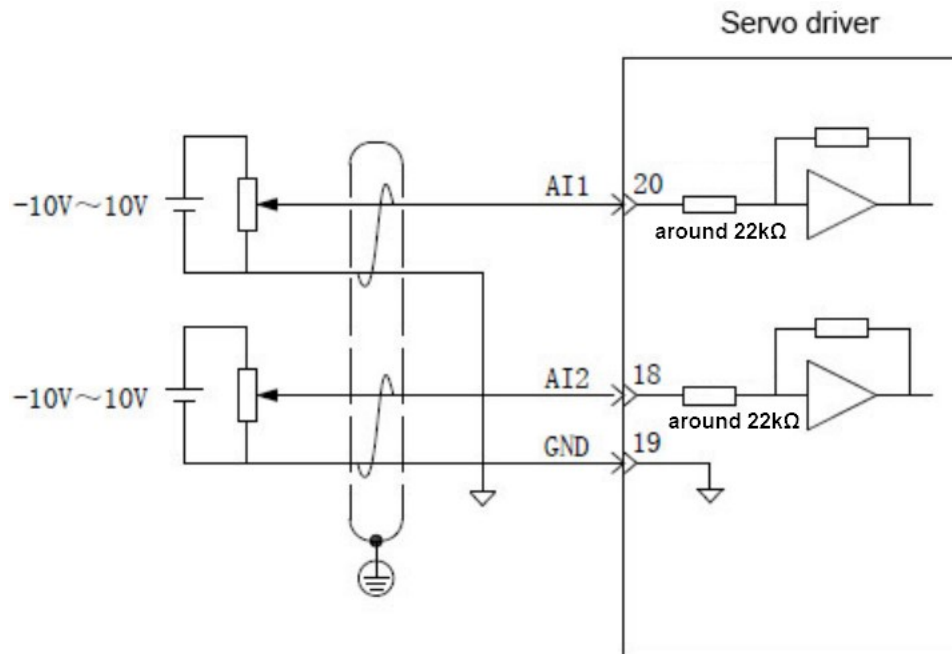
Table 3-21 Description of Analog Input Signals

Signal name	Default function	Pin number	Function
Analog quantity	AI2	18	Ordinary analog input signal, resolution of 12 bits, input voltage: $\pm 12\text{V}$ max.
	AI1	20	
	GND	19	Analog input signal grounding.

The input ports of speed and torque analog signals are AI1 and AI2, and the resolution is 12 bits. The command corresponding to the voltage value is set by P03 group. Voltage input range: $-10\text{V} \sim +10\text{V}$;

Maximum allowable voltage: $\pm 12\text{V}$;

The input impedance is about $22\text{k}\Omega$.



3.3.3 Digital input and output signal

Table 3-22 DI/DO Signal Description

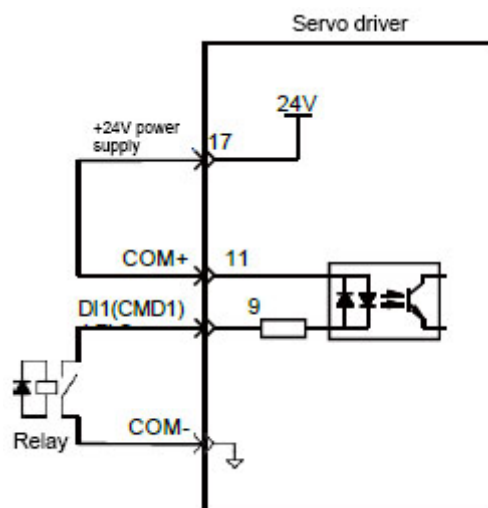
Signal name		Default function	Pin number	Function
Be in common use	DI1	P-OT	9	Forward overtravel switch.
	DI2	N-OT	10	Reverse overtravel switch.
	DI3	INHIBIT	34	Pulse disable.
	DI4	ALM-RST	8	Alarm reset (along the effective function).
	DI5	S-ON	33	The servo function is enabled.
	DI6	ZCLAMP	32	Zero fixed.
	DI7	GAIN-SEL	31	Gain switching.
	DI8	HomeSwitch	12	Origin switch.
	NC	-	30	-
	+24V		17	Internal 24V power supply, voltage range +20~28V, maximum output current 100mA.
	COM-		14	
	COM+		11	Power input (12V~24V).
	DO1+	S-RDY+	7	Servo ready.
	DO1-	S-RDY-	6	
	DO2+	COIN+	5	Position complete.
	DO2-	COIN-	4	
	DO3+	ZERO+	3	Zero speed.
	DO3-	ZERO-	2	
	DO4+	ALM+	1	Fault output.
	DO4-	ALM-	26	
	DO5+	HomeAttain+	28	The origin returns to zero.
	DO5-	HomeAttain-	27	

1) Digital input circuit

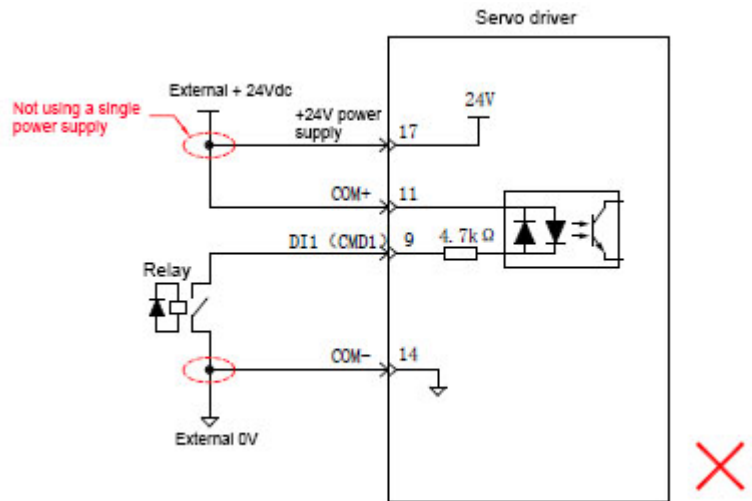
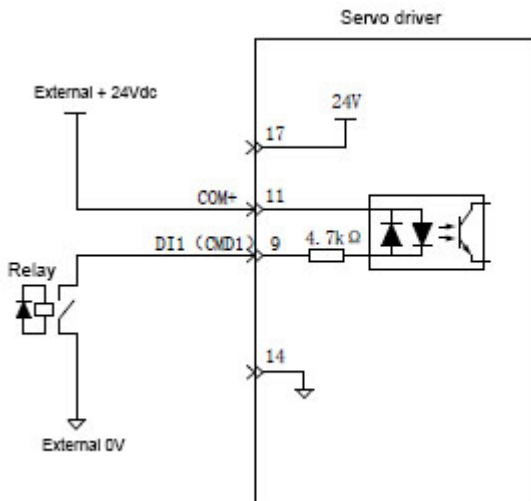
Taking DI1 as an example, the interface circuits of DI1~DI8 are the same.

a) When the upper device is the relay output:

① When using the internal 24V power supply of servo driver:

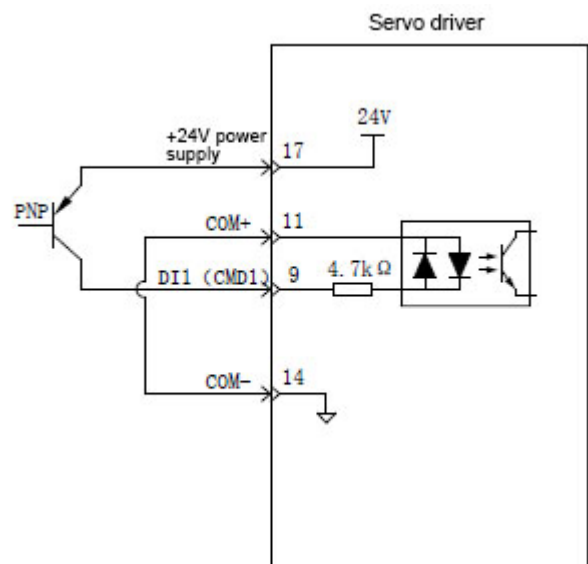
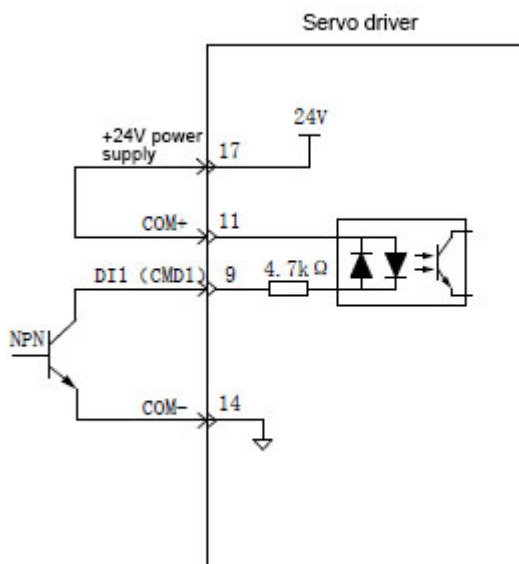


② When using external power supply:

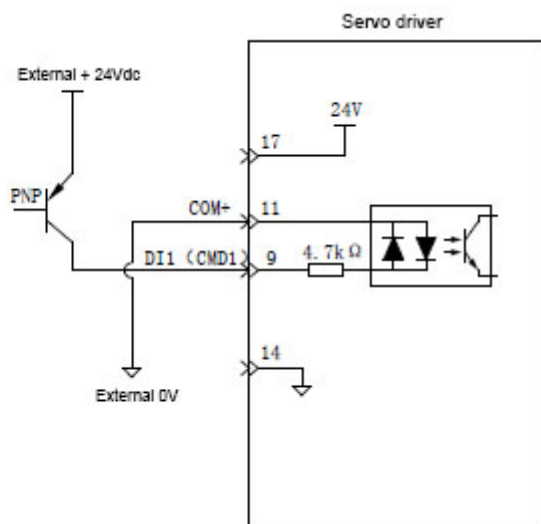
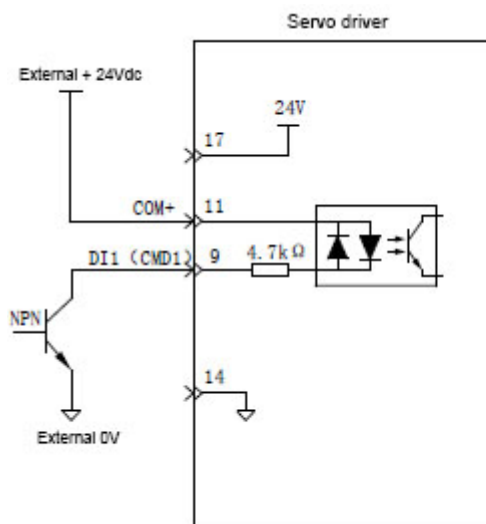


b) If the upper device is open collector output:

① When using the internal 24V power supply of servo driver:



② When using external power supply:

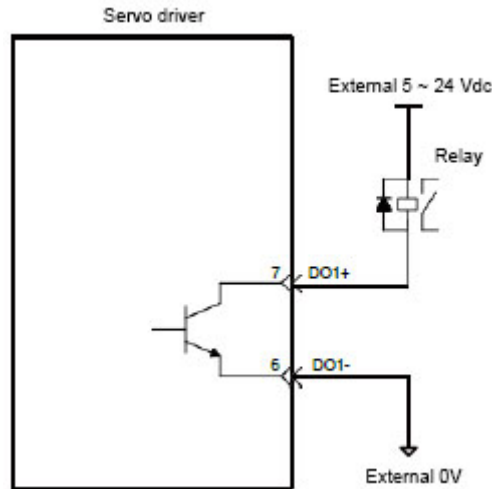


Note: ■ Mixing PNP and NPN inputs is not supported.

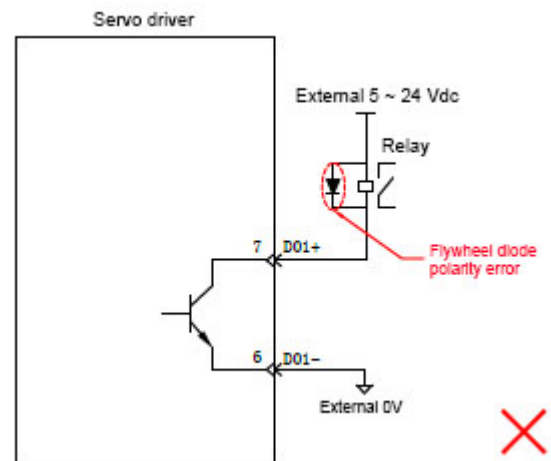
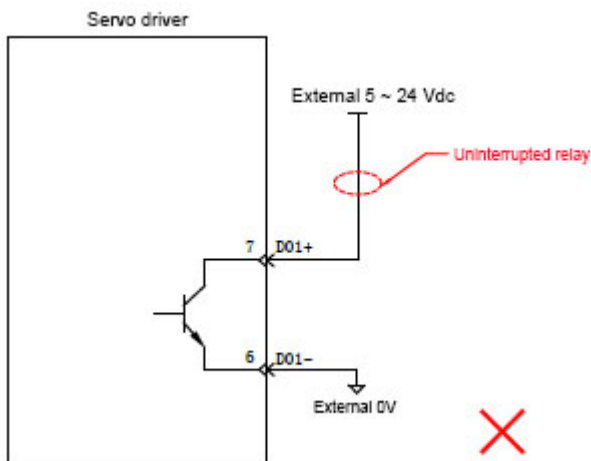
2) Digital output circuit

Taking DO1 as an example, the interface circuits of DO1~DO5 are the same.

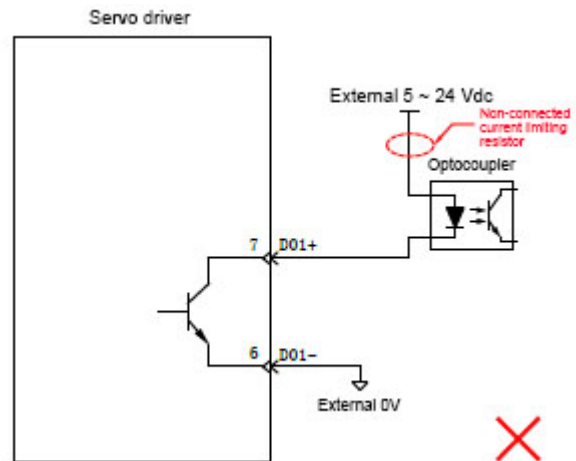
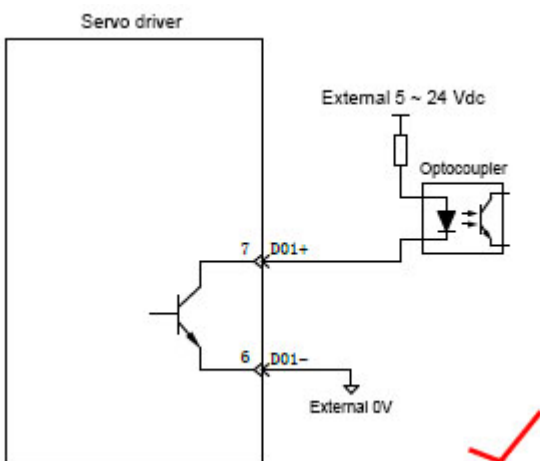
a) When the upper device is relay input:



Note: ■ Please be sure to connect the freewheeling diode when the upper device is the relay input, otherwise the DO port may be damaged.



b) When the upper device is an optocoupler input:



The maximum allowable voltage and current capacity of the internal optocoupler output circuit of the servo driver are as follows:

- Voltage: DC30V (maximum)

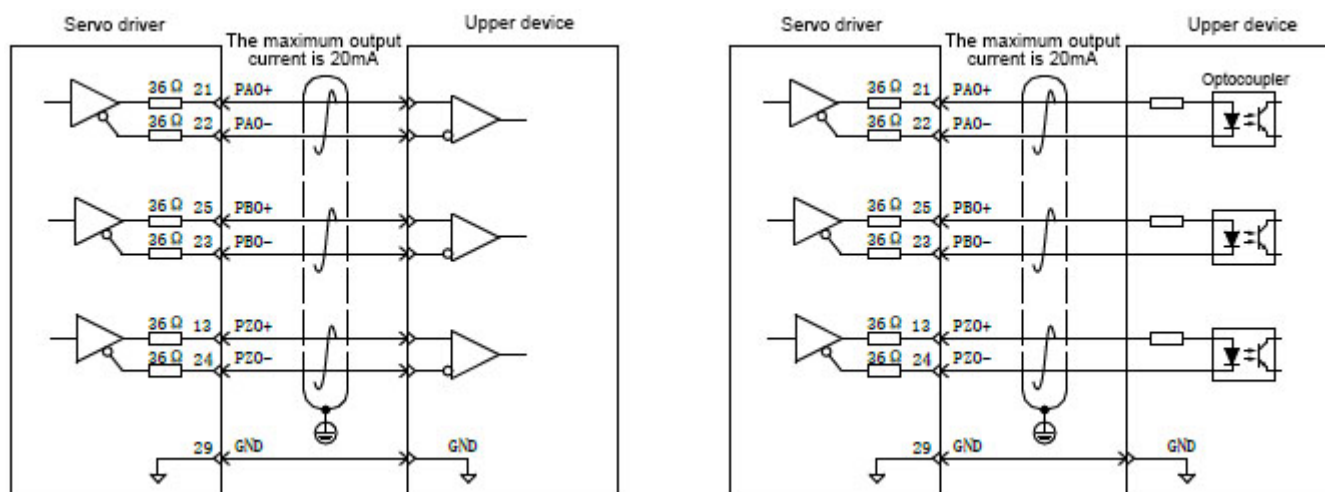
- Current: DC50mA (maximum)

3.3.4 Encoder frequency division output circuit

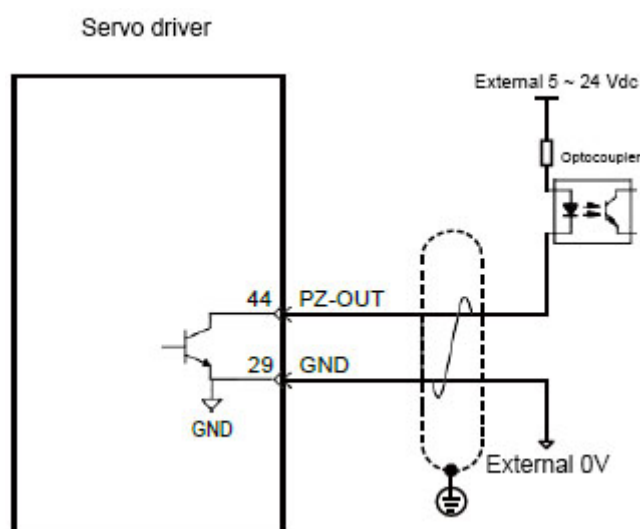
Table 3-23 Explanation of Frequency Division Output Signal of Encoder

Signal name	Default function	Pin number	Function	
Be in common use	PAO+	21	A phase frequency division output signal	Orthogonal frequency division pulse output signal of A and B
	PAO-	22		
	PBO+	25	B phase frequency division output signal	
	PBO-	23		
	PZO+	13	Z phase frequency division output signal	Origin pulse output signal
Be in common use	PZO-	24		
	PZ-OUT	44	Z phase frequency division output signal	Origin pulse open collector output signal
	GND	29	Origin pulse open collector output signal ground	
Be in common use	+5V	15	Internal 5V power supply, maximum output current of 200mA.	
	GND	29		
	PE	Case		

The encoder frequency division output circuit outputs a differential signal through a differential driver. Usually, when a position control system is constructed for an upper device, a feedback signal is provided. On the upper device side, please use differential or optocoupler receiving circuit to receive, and the maximum output current is 20mA.



The Z-phase frequency division output circuit of the encoder can pass the open collector signal. Usually, when a position control system is constructed for an upper device, a feedback signal is provided. On the upper device side, please use photoelectric coupler circuit, relay circuit or bus receiver circuit to receive.



Please be sure to connect the 5V ground of the upper device with the GND of the driver, and use twisted-pair shielded wire to reduce noise interference. The maximum allowable voltage and current capacity of the internal optocoupler output circuit of the servo driver are as follows:

- Voltage: DC30V (maximum)
- Current: DC50mA (maximum)

3.3.5 Internal contracting brake wiring

The internal contraction brake is a mechanism to prevent the servo motor shaft from moving when the servo driver is not running, which keeps the motor in a locked position, so that the moving part of the machine will not move due to their own weight or external force.

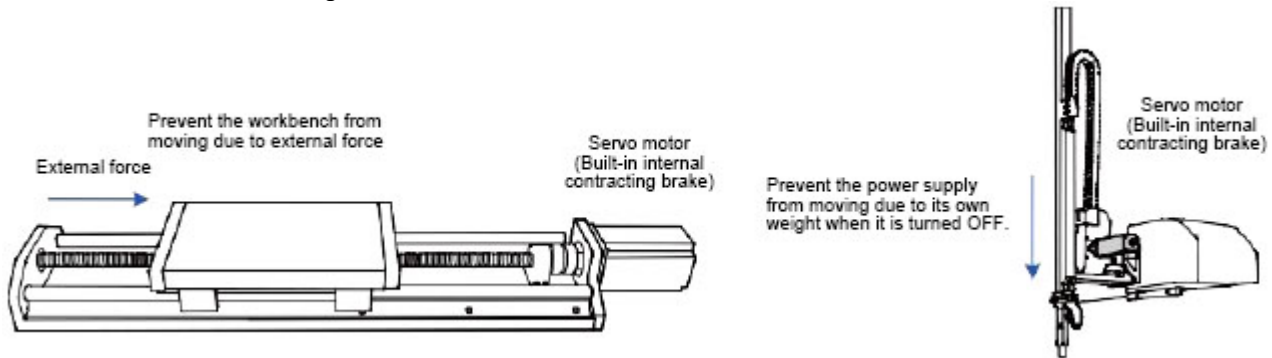


Figure 3-14 Schematic diagram of brake application

Note:

- The internal contracting brake mechanism built into the servo motor is a non-electrified fixed special mechanism, which cannot be used for braking, and is only used when the servo motor is kept in a stopped state.
- Non-polarity of internal contracting brake coil
- After the servo motor stops, turn off the servo enable (S-ON).
- When the motor with built-in internal contracting brake is running, the internal contracting brake may make a click sound, which has no functional impact.
- When the internal contracting brake coil is energized (the internal contracting brake is open), magnetic flux leakage may occur at the shaft end and other parts. Please pay attention when using instruments such as magnetic sensors near the motor.

a) Internal contracting brake connection

There is no polarity in the connection of the internal contracting brake input signal, so the user needs to prepare a 24V power supply. An example of the standard connection between the internal contracting braking signal BK and the internal contracting braking power supply is as follows:

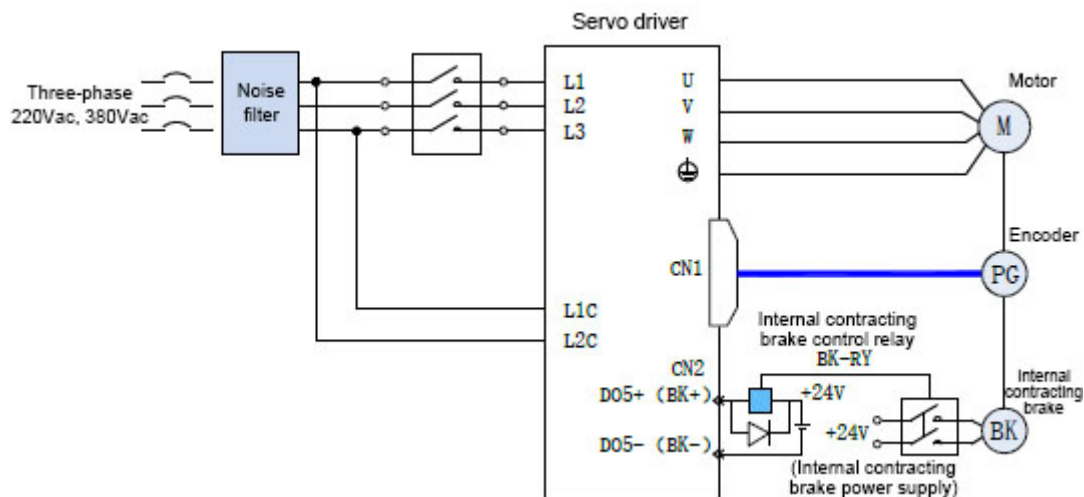


Figure 3-15 Internal Contracting Brake Wiring Diagram

Matters needing attention in internal contracting brake wiring:

- It is best not to share the power supply with other electrical appliances to prevent the voltage or current from decreasing due to the work of other electrical appliances, which will eventually lead to misoperation of the internal contracting brake.
- It is recommended to use cables above 0.5mm²

b) Internal contracting brake holding software settings

For the servo motor with internal contracting brake application, one DO terminal of the servo driver must be configured as function 9 (fun out.9: BK, brake application output), and the effective logic of the DO terminal must be determined.

☆ Associated function number:

Coding	Name	Name of function	Function
FunOUT.9	BK	Internal contracting brake output	Invalid, the internal contracting brake power supply is turned on, the internal contracting brake is actuated, and the motor is in a position locking state; Effective, the internal contracting brake power supply is disconnected, the internal contracting brake is released, and the motor can rotate;

According to the current state of the servo driver, the working time sequence of the locking mechanism of internal contracting brake can be divided into the normal state locking time sequence of the servo driver and the fault state locking time sequence of the servo driver.

c) Servo driver normal state internal contracting brake timing sequence

The internal contracting braking sequence in normal state can be divided into two situations: motor static and motor rotating:

- Static: the actual motor speed is lower than 20rpm;
- Rotation: the actual speed of the motor reaches 20rpm or above.

① When the servo motor is at rest, the internal contracting braking sequence.

When the servo enable is turned from ON to OFF, if the current motor speed is lower than 20rpm, the driver will act according to the static internal contracting braking sequence.

- Note:
- Do not input position/speed/torque command within P02-09 after the internal contracting brake output is turned from OFF to on, otherwise it will cause command loss or operation error.
 - When used for vertical axis, the self-weight or external force of the mechanical moving part may cause the machine to move slightly. When the servo motor is at rest, the servo enable is turned OFF, and the internal contracting braking output is turned OFF immediately. However, during P02-10, the motor is still energized to prevent the mechanical moving part from moving due to its own weight or external force.

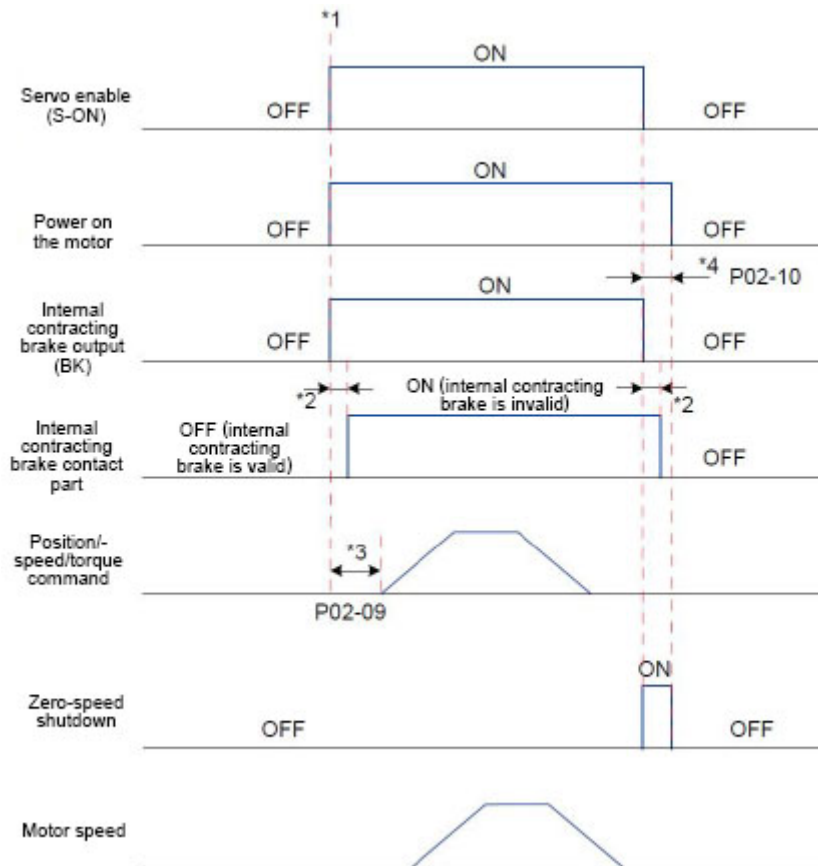


Figure 3-16 Timing diagram of braking when the motor is stationary

Notes:

- *1. When the servo is enabled ON, the internal contracting braking output is set to ON, and the motor enters the electrified state at the same time;
- *2. Please refer to the relevant specifications of the motor for the delay time of the internal contracting brake contact action. See Chapter 2 for details.
- *3. Please wait more than P02-09 from the time when the internal contracting brake output is set to ON to the time when the command is input;
- *4. When the servo motor is at rest (the motor speed is lower than 20rpm), when the servo is turned OFF, the internal contracting braking output is turned OFF at the same time. P02-10 can be used to set the delay of the motor entering the non-powered state after the internal contracting braking output is turned OFF.

☆ Associated function code:

Function code	Name	Setting range	Unit	Factory setting	Effective date	Setting mode	Correlation pattern
P02-09	Delay from internal contracting brake output ON to command reception	0~500	ms	250	Be effective immediately	Operation setting	PS
P02-10	Static state, internal contracting brake output OFF-to-motor power-off delay	1~1000	ms	150	Be effective immediately	Operation setting	PS

② Internal contracting brake timing sequence when servo motor rotates

When the servo enable is turned from ON to OFF, if the current motor speed is greater than or equal to 20rpm, the driver will act according to the rotation and internal contracting braking sequence.

Note:

- When the servo enable is turned from OFF to ON, do not input the position/speed/torque command during P02-09, otherwise the command will be lost or the operation will be wrong;
- When the servo motor rotates, the servo can be turned OFF, and the servo motor enters the zero-speed stop state, but the internal contracting brake output must meet any of the following conditions before it is

set to OFF:

P02-12 Time is not up, but the motor has slowed down to P02-11;

P02-12 Time is up, but the motor speed is still higher than P02-11.

- After the output of the internal contracting brake is changed from ON to OFF, the motor is still energized within 50ms to prevent the mechanical moving part from moving due to its own weight or external force.

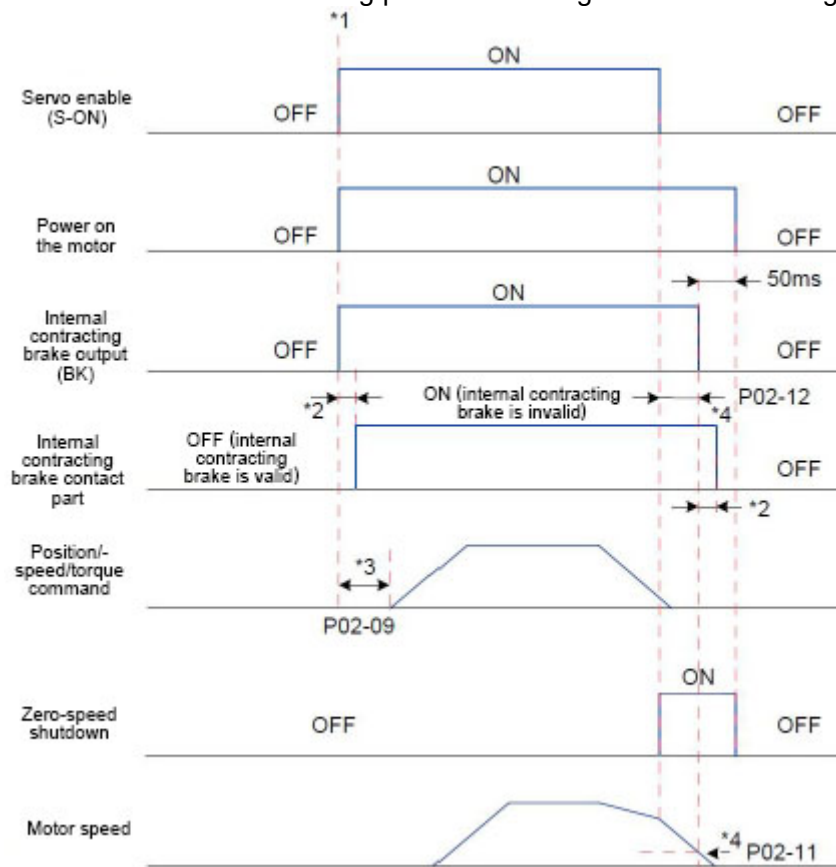


Figure 3-17 Timing diagram of braking when motor rotates

Notes:

- *1. When the servo is enabled ON, the internal contracting braking output is set to ON, and the motor enters the electrified state at the same time;
- *2. Please refer to the relevant specifications of the motor for the delay time of the internal contracting brake contact action. See Chapter 2 for details.
- *3. Please wait more than P02-09 from the time when the internal contracting brake output is set to ON to the time when the command is input;
- *4. When the servo motor rotates, when the servo is turned OFF, P02-11 and P02-12 can be used to set the delay of the internal contracting brake output after the servo is turned OFF. After the internal contracting brake output is turned OFF, it will be delayed for 50ms, and the motor will enter the non-powered state.

☆ Associated function code:

Function code	Name	Setting range	Unit	Factory setting	Setting mode	Effective date	Correlation pattern
P02-11	Rotating state, internal contracting brake output OFF speed threshold	0~3000	rpm	30	Operation setting	Be effective immediately	PS
P02-12	Rotating state, internal contracting brake output OFF delay	1~1000	ms	500	Operation setting	Be effective immediately	PS

c) Servo driver fault state internal contracting brake timing sequence

According to the different stop modes, servo faults can be divided into Class 1 faults (abbreviated as NO.1) and Class 2 faults (abbreviated as: NO.2), please see chapter 6. Servo driver fault state internal contracting brake timing sequence can be divided into the following two situations:

① Class 1 failure occurs:

The output condition of the internal contracting brake DO is the same as "the internal contracting brake timing sequence when the servo motor rotates under the normal state of the servo driver". Namely: The internal contracting brake output must meet any of the following conditions before it is set to OFF:

- P02-12 Time is not up, but the motor has slowed down to P02-11;
- P02-12 Time is up, but the motor speed is still higher than P02-11.

② Class 2 failure occurs:

When the Class 2 type of fault occurs and internal contracting braking is enabled, the stop mode of the second type of fault is forced to be "zero-speed stop, free running state".

At this time, the servo motor stops at zero speed first. When the actual speed of the motor is lower than 20rpm, the output condition of the internal contracting brake DO is the same as "the internal contracting brake time sequence of the servo motor at rest under the normal state of the servo driver", that is, the internal contracting brake output immediately turns OFF, but the motor is still in the power-on state within P02-10.

3.4 Communication signal wiring

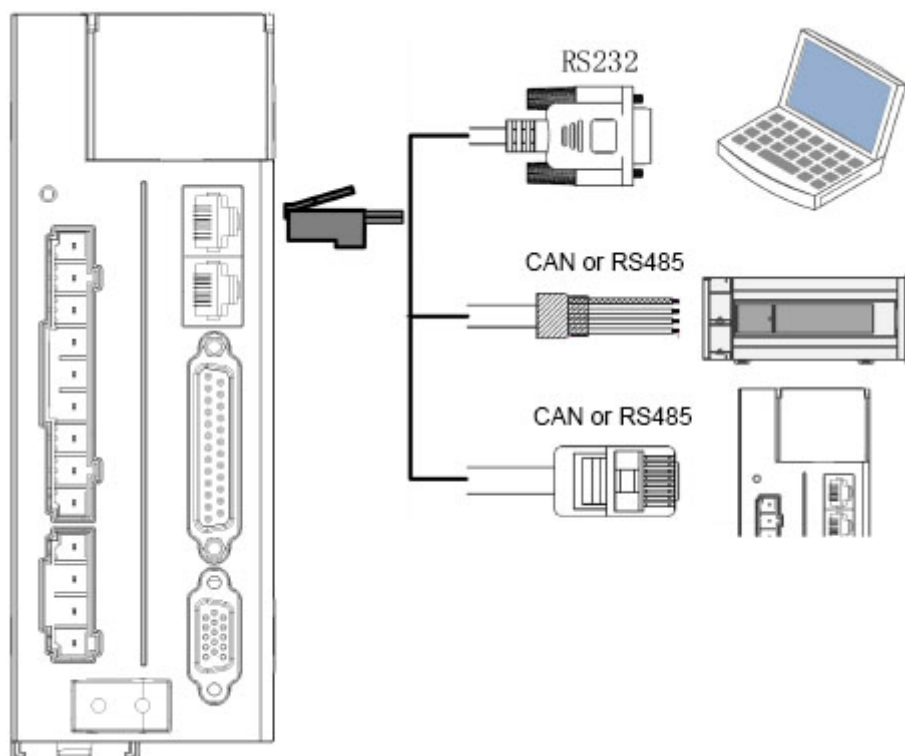
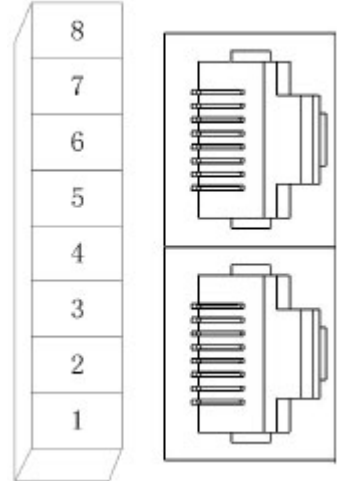


Figure 3-18 Schematic Diagram of Communication Wiring

Communication signal connectors (CN3, CN4) are two identical communication signal connectors connected in parallel. Do not connect the wire to the "reserved" terminal.

Table 3-25 Pin Definition of Communication Signal Connector

Pin number	Definition	Description	Terminal pin distribution
1	CANH	CAN communication port	
2	CANL		
3	GND		
4	RS485+	RS485 communication port	
5	RS485-		
6	RS232-TXD	The RS232 sending end is connected with the receiving end of the upper machine.	
7	RS232-RXD	The RS232 receiving end is connected with the sending end of the upper machine.	
8	GND	Land	
Housing	PE	Shielding	

3.4.1 CAN communication networking connection

1) CAN communication connection with PLC

When using CAN communication networking, the connecting cables between the driver and PLC are as follows:

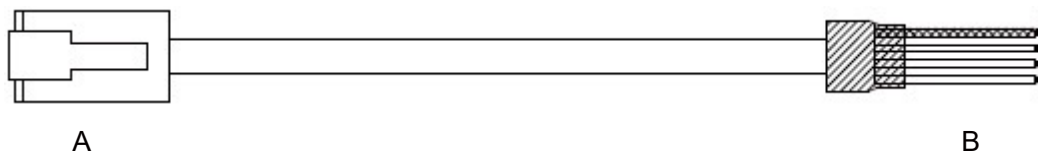


Figure 3-19 Examples of the appearance of PLC and servo communication cables

Table 3-26 Connection Relationship between PLC and Servo Communication Cable Pin

Drive side RJ45 (A end)			PLC side (B end)		
Communication type	Signal name	Pin number	Communication type	Signal name	Pin number
CAN	CANH	1	CAN	CANH	1
	CANL	2		CANL	2
	CGND	3		CGND	3
	PE (Shielding net layer)	Housing		PE (Shielding net layer)	Housing

2) CAN communication connection of multi-machine parallel connection

When the CAN communication network is adopted, the connecting cables of multiple parallel drivers are as follows:

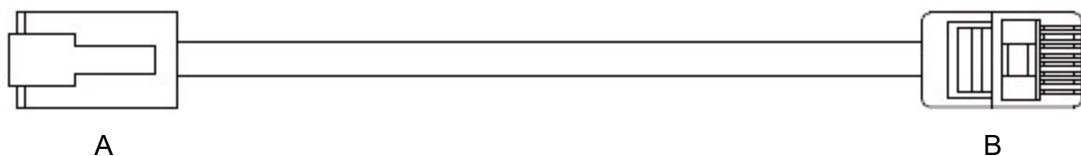


Figure 3-20 Example Appearance of Multi-machine Parallel Communication Cable

Table 3-27 Pin Connection Relationship of Multi-machine Parallel Communication Cable

Drive side RJ45 (A end)			Drive side RJ45 (B end)		
Communication type	Signal name	Pin number	Communication type	Signal name	Pin number
CAN	CANH	1	CAN	CANH	1
	CANL	2		CANL	2
	CGND	3		CGND	3
	PE (Shielding net layer)	Housing		PE (Shielding net layer)	Housing

3) Matters needing attention in grounding of CAN communication

When using CAN communication, pay attention to the connection between the CGND terminal of the upper device and the CGND terminal of the servo driver, as shown in the following figure:

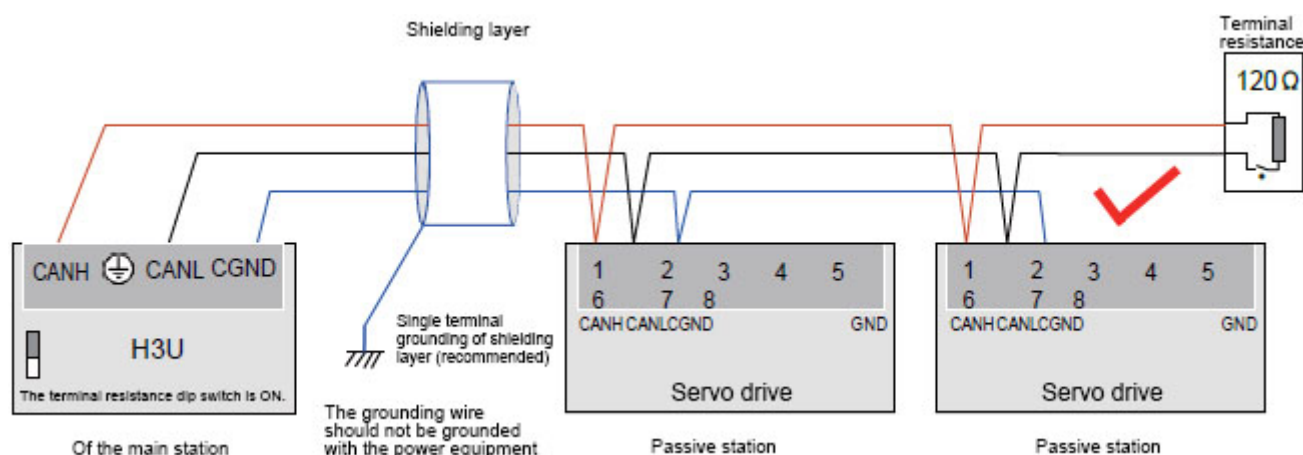


Figure 3-21 Correct CAN connection method



- PLC has built-in CAN communication terminal resistor, and the corresponding dip switch must be set to ON;
- It is recommended that the shielding layer be single-ended grounded;
- Never connect the CGND terminal of the upper device with the GND terminal of the servo driver, otherwise the machine will be damaged!

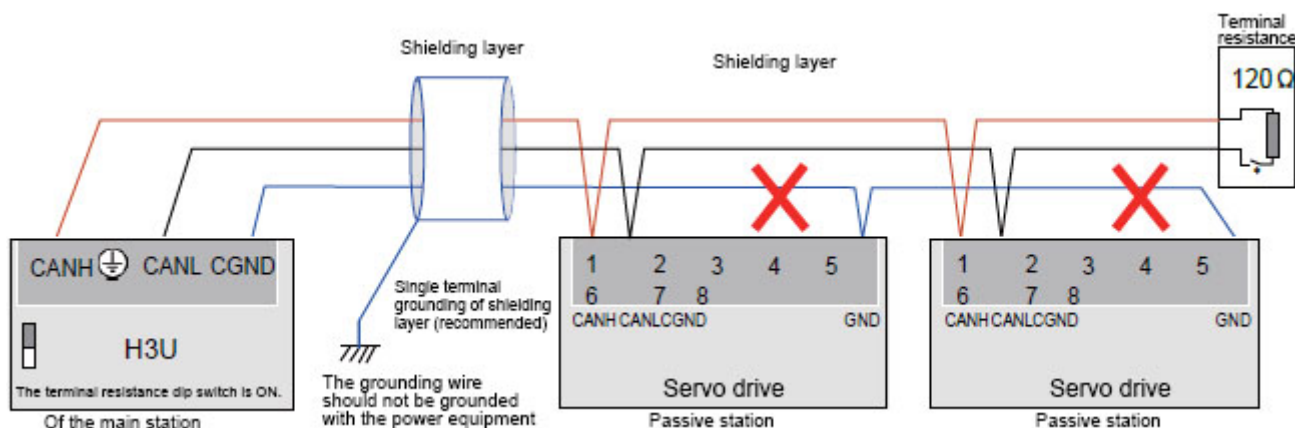


Figure 3-22 Error CAN connection method

3.4.2 485 communication networking connection

1) 485 communication connection with PLC

When using 485 communication network, the connecting cables between the driver and PLC are as follows:

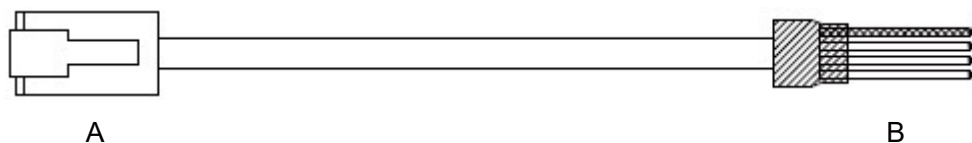


Figure 3-23 Example Diagram of PLC and Servo Communication Cable Appearance

Table 4-35 Connection Relationship between PLC and Servo Communication Cable Pin

Drive side RJ45 (A end)			PLC side (B end)		
Communication type	Signal name	Pin number	Communication type	Signal name	Pin number
RS485	RS485+	4	RS485	RS485+	4
	RS485-	5		RS485-	5
	GND	8		GND	8
	PE (Shielding net layer)	Housing		PE (Shielding net layer)	Housing

2) Multi-machine parallel 485 communication connection

When 485 communication network is adopted, the connecting cables for parallel connection of multiple drivers are as follows:

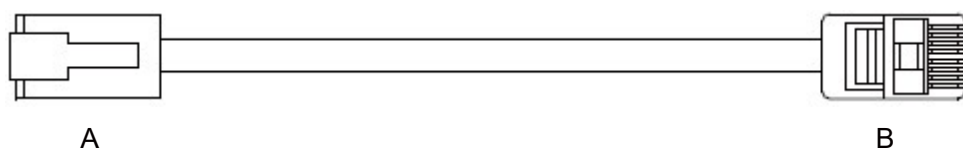


Figure 3-24 Example Appearance of Multi-machine Parallel Communication Cable

Table 3-28 Pin Connection Relationship of Multi-machine Parallel Communication Cable

Drive side RJ45 (A end)			Drive side RJ45 (B end)		
Communication type	Signal name	Pin number	Communication type	Signal name	Pin number
RS485	RS485+	4	RS485	RS485+	4
	RS485-	5		RS485-	5
	GND	8		GND	8
	PE (Shielding net layer)	Housing		PE (Shielding net layer)	Housing

3) Matters needing attention in grounding of 485 communication

When using RS485 communication, pay attention to the connection between the \oplus (GND) terminal of the upper device and the GND terminal of the servo driver, as shown in the following figure:

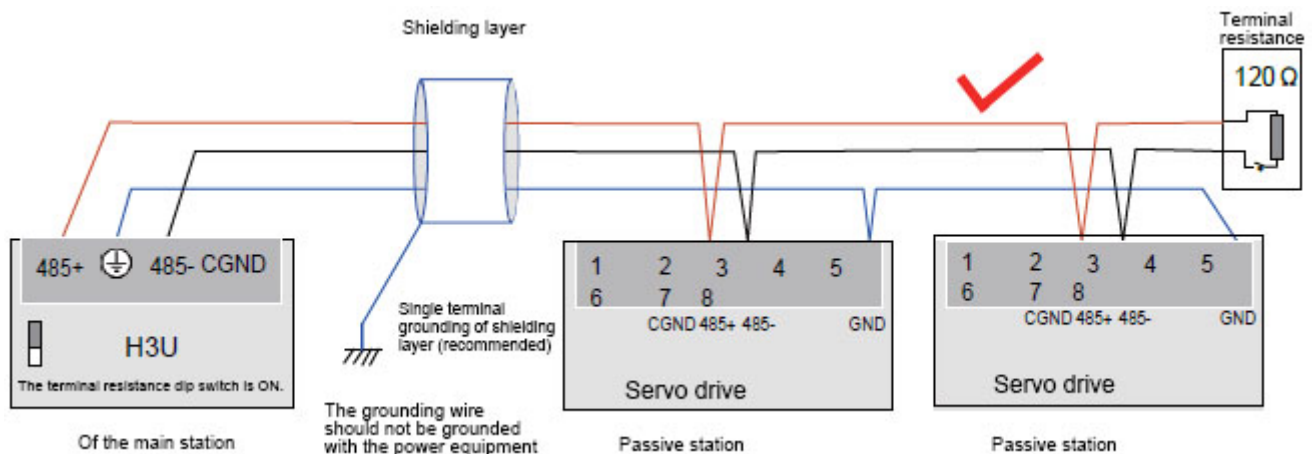


Figure 3-25 Correct 485 Connection Method



Note

- PLC has built-in 485 communication terminal resistor, and the corresponding dip switch must be set to ON;
- It is recommended that the shielding layer be single-ended grounded
- Never connect the \oplus GND terminal of the upper device with the CGND terminal of the servo driver, otherwise the machine will be damaged!

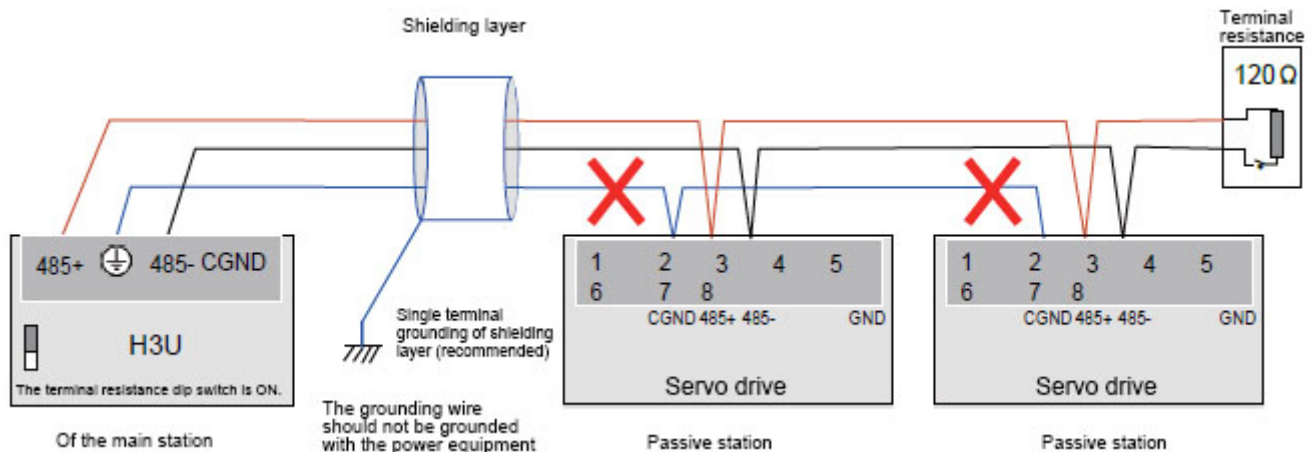


Figure 3-26 Error 485 connection method

3.4.3 Communication connection with PC (232 communication)

Users can connect the driver and PC through PC communication cable. It is recommended to use the commonly used communication interface RS-232. The cable schematic is as follows:

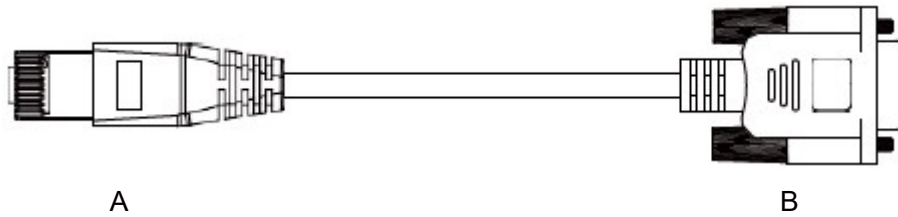


Figure 3-27 Example Diagram of PC Communication Cable Appearance

Table 3-29 Connection Relationship between Driver and PC Communication Cable Pin

Drive side RJ45 (A end)		PC DB9 (B end)	
Signal name	Pin number	Signal name	Pin number
RS232-TXD	6	PC-RXD	2
RS232-RXD	7	PC-TXD	3
GND	8	GND	5
PE (Shielding net layer)	Housing	PE (Shielding net layer)	Housing

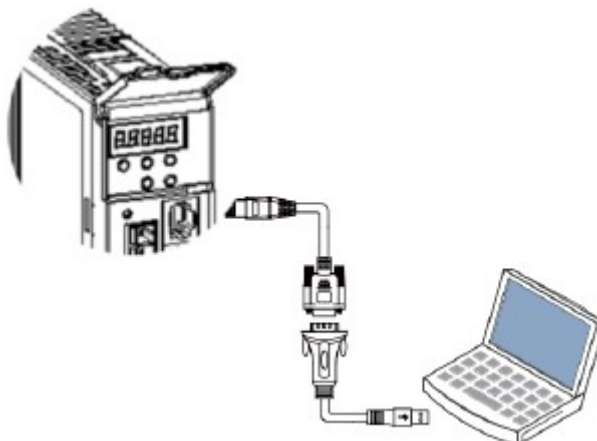
The corresponding PC terminal DB9 is defined as follows.

Table 3-30 Definition of terminal pin of DB9 at PC end of communication cable (terminal B in the above table)

Pin number	Definition	Description	Terminal pin distribution
2	PC-RXD	PC receiver terminal	
3	PC-TXD	PC sending end	
5	GND	Land	
Housing	PE	Shielding	

If the host computer is not configured with serial port and can only be connected with USB interface, it can be converted from serial port to USB cable.

Figure 3-28 Schematic Diagram of Communication Serial Port to USB



3.5 Anti-interference countermeasures of electrical wiring

To suppress interference, please take the following measures:

- 1) Connect cables with command input and encoder wiring with the shortest connection length.
- 2) Use thick lines for grounding wiring as much as possible. (above 2.0mm^2)
 - a) It is recommended to use more than D kinds of grounding (grounding resistance is below 100Ω).
 - b) It must be grounded at one point.
- 3) Please use noise filter to prevent RF interference. Please install a noise filter on the input side of the power cord when it is used in a civil environment or in an environment with strong power interference and noise.
- 4) In order to prevent misoperation caused by electromagnetic interference, the following treatment methods can be adopted:
 - a) Install the upper device and noise filter near the servo driver as much as possible.
 - b) Install surge suppressor on the coil of relay, screw tube and electromagnetic contactor.
 - c) When wiring, please separate the strong current lines from the weak current lines, and keep an interval of more than 30cm. Do not put them in the same pipe or bundle them together.
 - d) Do not share the power supply with electric welding machines, electrical discharge machining equipment, etc. When there is a high frequency generator nearby, please install a noise filter on the input side of the power cord.

3.5.1 Examples of anti-interference wiring and grounding treatment

The main circuit of this servo driver adopts "high-speed switching element". According to the difference of peripheral wiring and grounding treatment of servo driver, switching noise may affect the normal operation of the system. Therefore, the correct grounding method and wiring treatment must be adopted, and noise filters should be added when necessary.

1) Anti-jamming wiring example

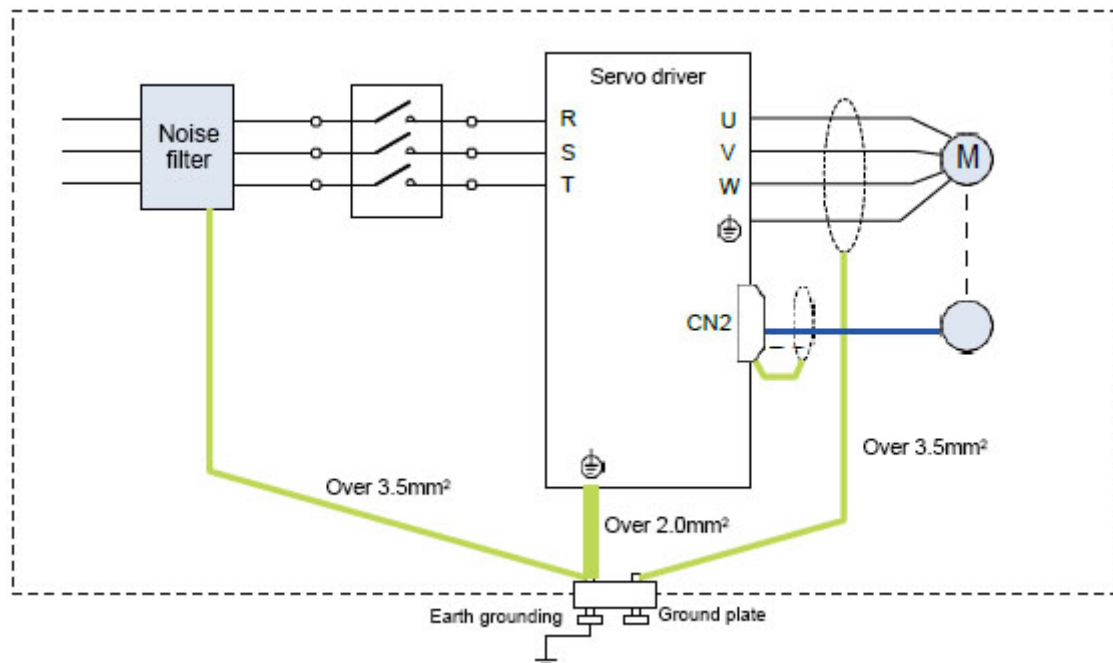


Figure 3-30 Anti-jamming Wiring Example

- Note:
- Please use thick wire of 3.5mm^2 or more as far as possible for connecting wires in the outer box for grounding. (Braided copper wire is recommended)
 - When using the noise filter, please observe the precautions described in the following "How to use the noise filter".

2) Grounding treatment

In order to avoid possible electromagnetic interference problems, please ground in the following ways.

a) Grounding of servo motor housing

Please connect the grounding terminal of the servo motor with the grounding terminal PE of the servo driver, and reliably ground the PE terminal to reduce the potential electromagnetic interference.

b) Power line shielding layer grounding

Please ground the shielding layer or metal conduit in the main circuit of the motor at both ends. It is suggested to adopt crimping method to ensure good lap joint.

c) Grounding of servo driver

The grounding terminal PE of the servo driver should be reliably grounded, and the fixing screws should be tightened to maintain good contact.

3.5.2 Method of using noise filter

In order to prevent the interference of the power line and weaken the influence of the servo driver on other sensitive devices, please select the corresponding noise filter at the power input according to the input current. In addition, please install a noise filter at the power cord of the peripheral device as needed. When installing and wiring the noise filter, please observe the following precautions to avoid weakening the actual use effect of the filter.

- 1) Please arrange the input and output wiring of noise filter separately, and do not put them into the same pipe or bundle them together.

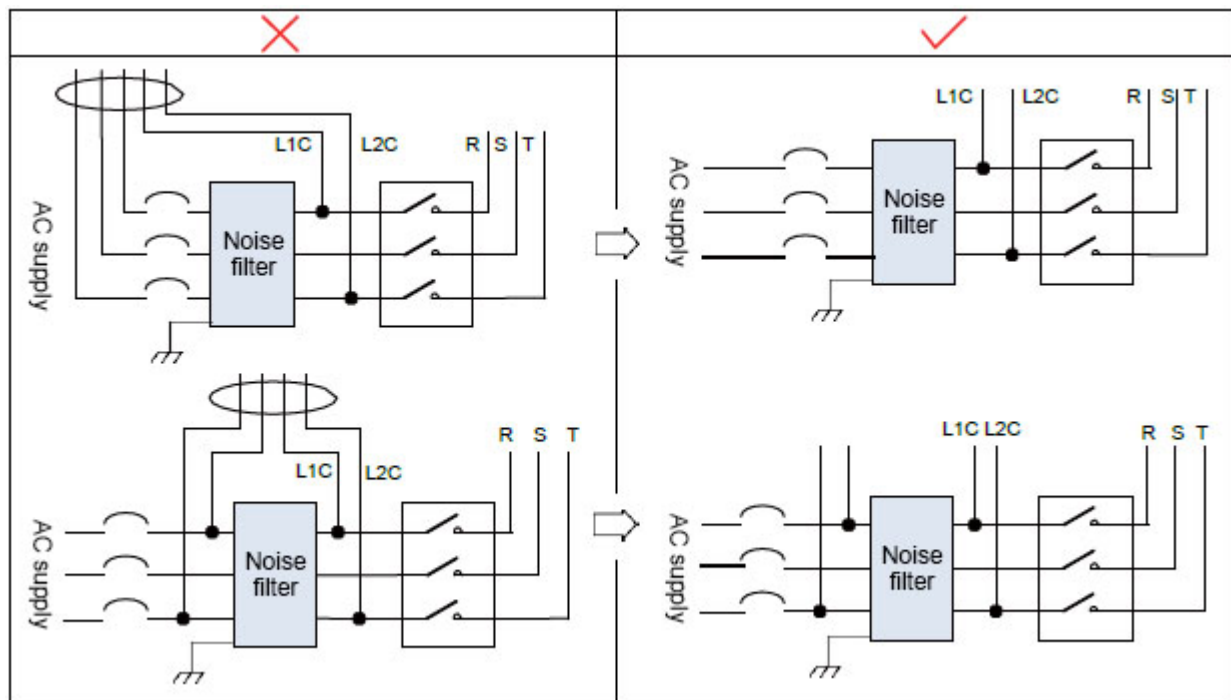


Figure 3-31 Schematic diagram of separation of input and output wiring of noise filter

- 2) Separate the ground wire of the noise filter from its output power wire.

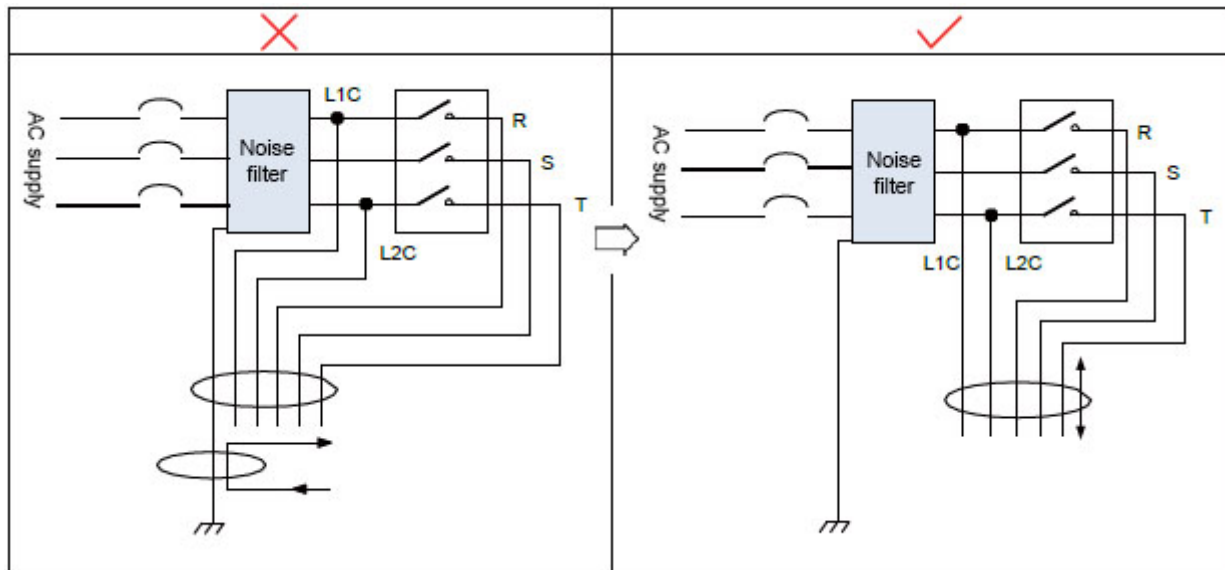


Figure 3-32 Schematic diagram of separation of ground wire and output wiring of noise filter

- 3) The noise filter needs to be grounded separately with the shortest thick wire as possible. Do not share a ground wire with other grounding equipment.

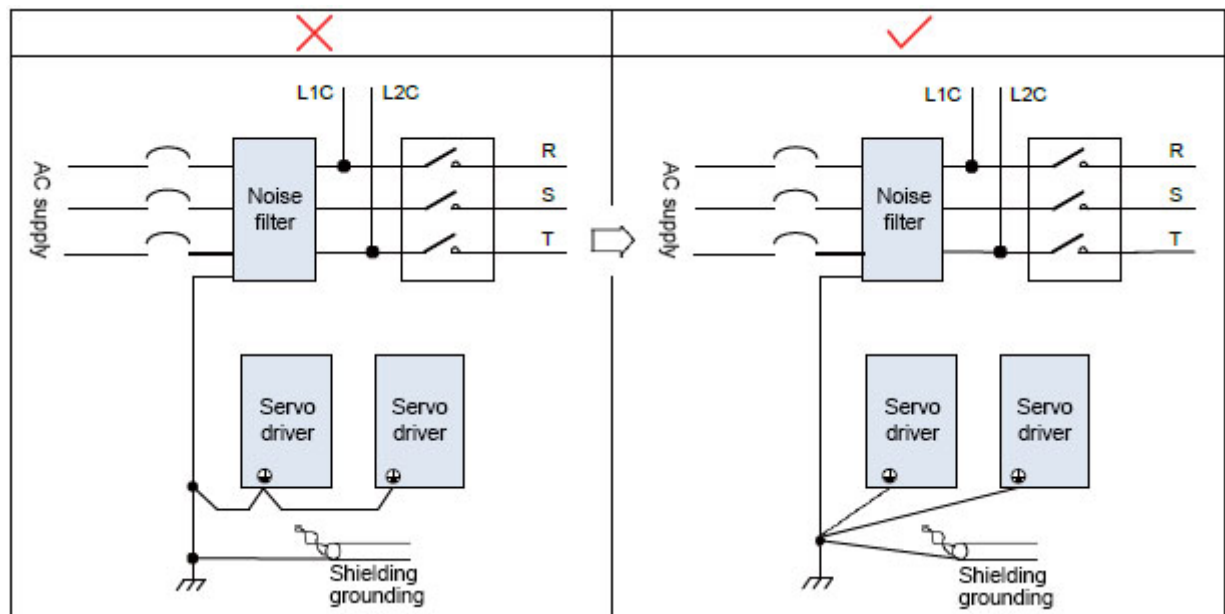


Figure 3-33 Schematic Diagram of Single Point Grounding

4) Ground wire treatment of noise filter installed in control cabinet

It is suggested to fix the filter and the servo driver on the same metal plate to ensure that the contact parts are conductive and well connected when the noise filter and the servo driver are installed in a control cabinet and the metal plate should be grounded. Or refer to Figure 3-28 for separate grounding.

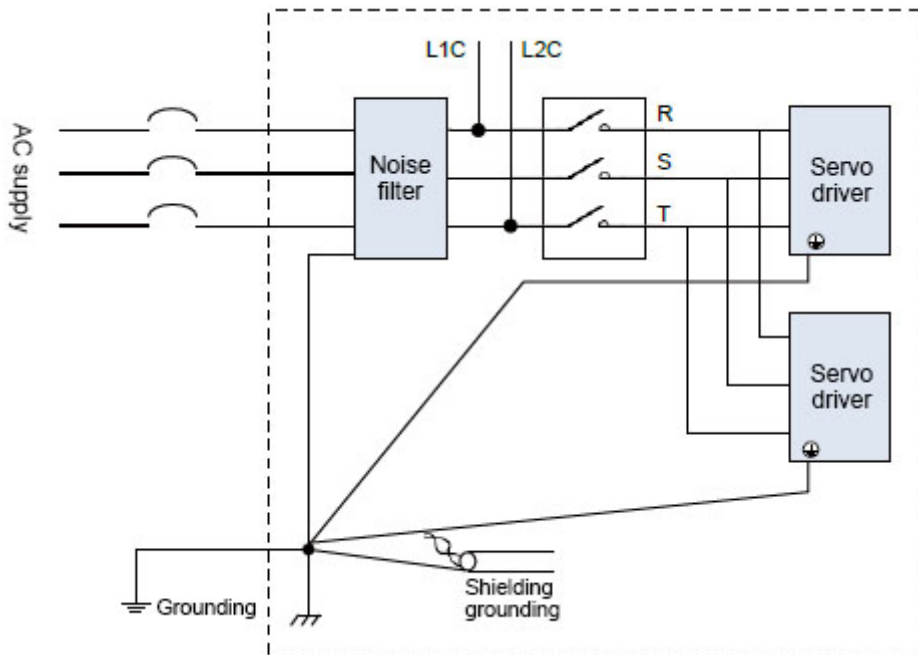
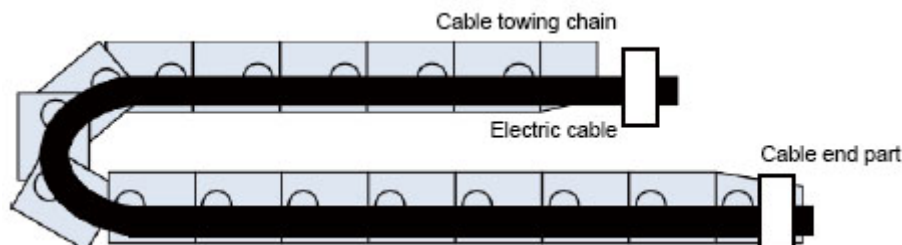


Figure 3-34 Schematic Diagram of Ground Wire Processing of Noise Filter

3.6 Matters needing attention in cable use

1. Do not bend the cable or put it under tension. Since the diameter of the core wire of the signal cable is only 0.2 mm or 0.3 mm, it is easy to break, so please pay attention to it when using.
2. Please use flexible cables when moving cables. Ordinary cables are easy to be damaged after long-term bending. Low-power motor's own cable can't be used in cable moving occasions.
3. When using the cable protection chain, please ensure that:
 - The bending radius of the cable is more than 10 times of the outer diameter of the cable;
 - Do not fix or bind the wiring in the cable protection chain, and only bind and fix it at the two immobile ends of the cable protection chain;
 - Do not twist or twist the cable;
 - The duty factor in the cable protection chain is ensured to be below 60%;
 - Do not mix wiring for cables with too different shapes, to prevent thick wires from breaking thin wires. If it is necessary to mix wiring, please set a partition device in the middle of cables.



Chapter 4 Operation Mode and Debugging Method

According to the command mode and operating characteristics, the servo driver can be divided into three operating modes, namely position control operating mode, speed control operating mode and torque control operating mode.

The position control mode generally determines the moving displacement through the number of pulses, and the external input pulse frequency determines the rotation speed. It is usually used in positioning equipment as the position mode can strictly control the speed and position. It is the most widely used control mode of servo, mainly used in manipulator, mounter, engraving, milling and engraving, CNC machine tools and so on.

Speed mode is to control the rotation speed through analog input or digital input and communication, which is mainly used in some constant speed occasions. For example, in the application of analog engraving and milling machine, the upper machine adopts position control and the servo driver adopts speed control mode.

Torque control mode is to change the set torque by changing the setting of analog quantity immediately or changing the corresponding address value by communication. It is mainly used in winding and unwinding devices that have strict requirements on the stress of materials, such as winding devices or optical fiber drawing equipment, and the setting of torque should be changed at any time according to the change of winding radius to ensure that the stress of materials will not change with the change of winding radius.

4.1 Position mode operation command

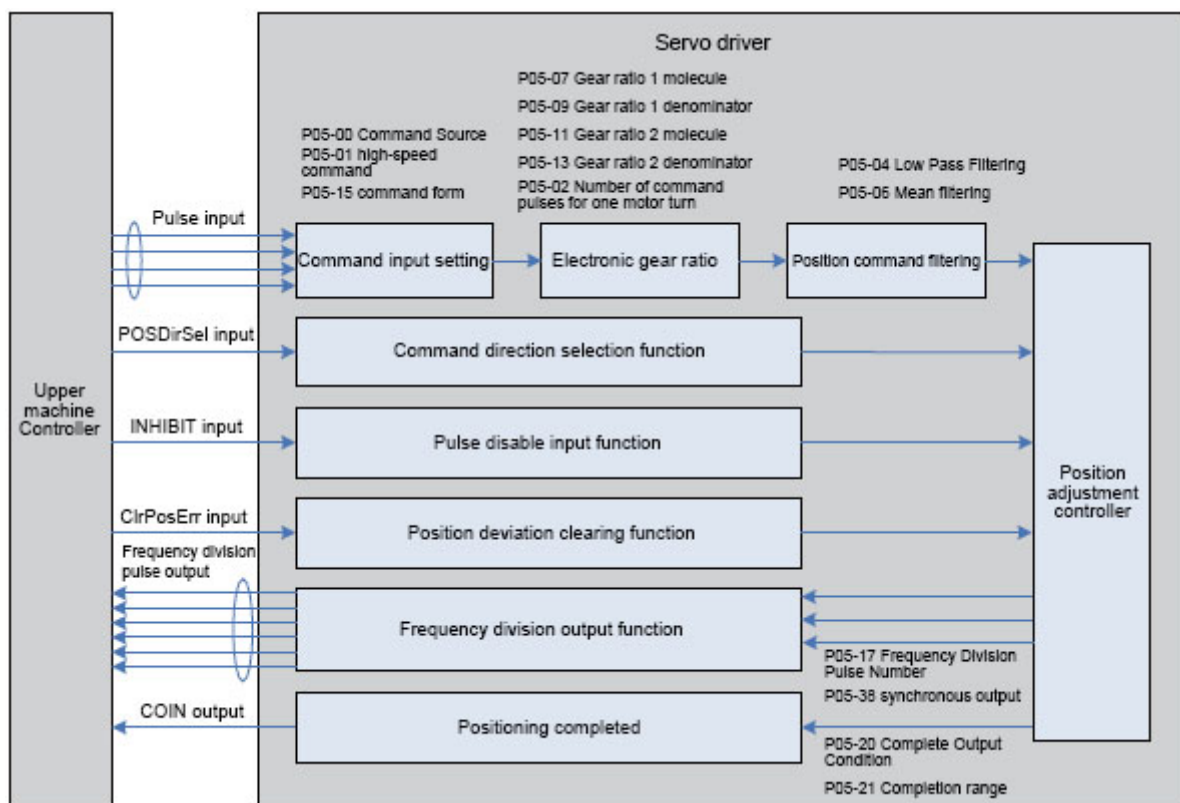


Figure 4-1 Block diagram of position control mode

Position mode is a common working mode of servo driver, and its main usage steps are as follows:

1. Connect the power supply of the servo main circuit and control circuit correctly, as well as the motor power line and encoder line. After power-on, the servo panel displays "rdy", which means that the servo power supply and motor encoder are connected correctly.
2. Run the servo JOG test run by pressing the key to confirm whether the motor can run normally.
3. Refer to Figure 4-2 wiring to explain the pulse direction input, pulse command input and necessary DI/DO signals, such as servo enable, positioning completion signal, etc.
4. Make relevant settings for the position mode. Set the DI/DO used according to the actual situation. Refer to P03/P04 for the function code. In addition, functions such as reset of origin, frequency division output, etc. are sometimes set according to needs. See the product comprehensive manual for details.
5. Enable servo, and control the servo motor to rotate through the position command sent by the upper machine. First, make the motor rotate at a low speed, and confirm whether the rotation direction and electronic gear ratio are normal, and then adjust the gain. Please refer to the general debugging steps in Section 4.7.

4.1.1 Position mode wiring

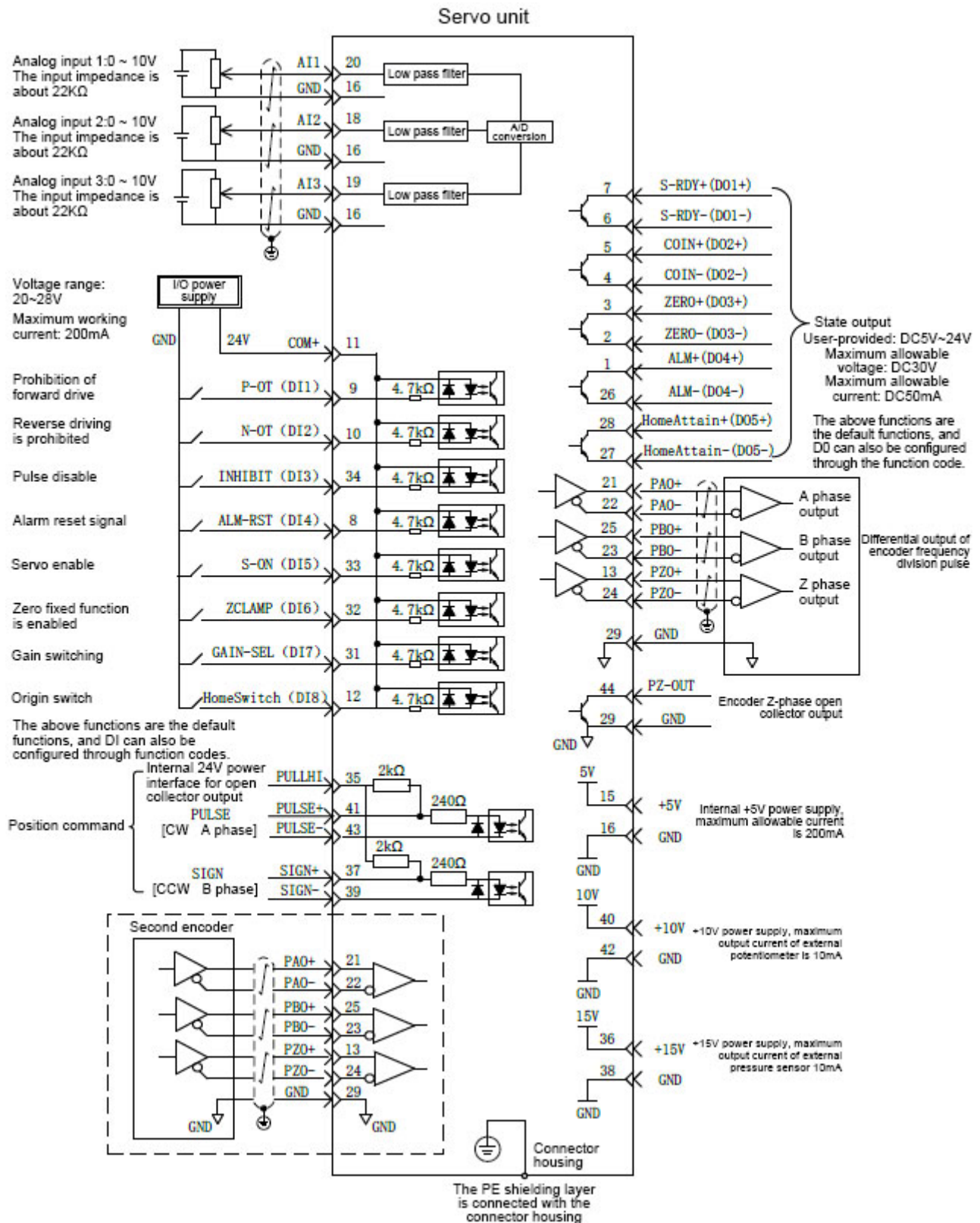


Figure 4-2 Position Mode Wiring Diagram

↗ Represents a twisted pair.

Note: ■ Signal cables and power cables must be routed separately, with an interval of at least 30cm;

- The shielding layer must be connected reliably to ensure reliable shielding and grounding when the signal cable is not long enough to connect the cable;
- +5V is referenced to GND and +24V is referenced to COM-. Do not exceed the maximum allowable current, otherwise the driver will not work normally.

4.1.2 Position control mode related function code setting

Parameter setting in position control mode, including mode selection, command pulse form, electronic gear ratio, DI/DO, etc.

1) Position command input setting

a) Position command source

Set the function code P05-00=0. The position command comes from the pulse command, and it can also be set to other values according to the actual situation.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05-00	Position command source	0- Pulse command 1- Stepping size 2- Multistage position command	-	0	Be effective immediately	Stop setting	P

b) Pulse command source

Set the function code P05-01 specify that the pulse command comes from the low-speed pulse port or the high-speed pulse port.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05-01	Pulse command input terminal selection	0- Low speed 1- High-speed	-	0	Power on again	Stop setting	P

c) Position command direction switching

By setting the DI function FunIN.27, you can use DI to control the direction switching of position commands, so as to meet the needs of direction switching.

Coding	Name	Name of function	Description	Remarks
FunIN.27	POSDirSel	Position command direction Settings	Invalid-positive direction; Valid-opposite direction.	The logical selection of the corresponding terminal is suggested to be set to: Level Effective.














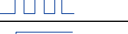

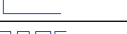




d) Pulse command form selection

Set function code P05-15, and select the form of external pulse command, including "direction+pulse (positive and negative logic)", "orthogonal pulse" and "CW+CCW".

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05-15	Pulse command form	0- Pulse+direction, positive logic 1- Pulse+direction, negative logic 2- A phase +B phase quadrature pulse, 4 times frequency. 3- CW+CCW	-	0	Power on again	Stop setting	P

The principles of the three pulse command forms are shown in the following table.

Table 4-1 Principle of Pulse command Form

Pulse command form	Positive logic		Negative logic	
	Positive rotation	Reverse	Positive rotation	Reverse
Direction+pulse	PULS  SIGN 	PULS  SIGN 	PULS  SIGN 	PULS  SIGN 
Orthogonal pulse (phase A+phase B)	PULS  SIGN 	PULS  SIGN 		
CW+CCW	PULS  SIGN 	PULS  SIGN 		
	PULS  SIGN 	PULS  SIGN 		

e) Pulse inhibit input

By setting the DI function FunIN.13, the pulse command input is prohibited.

Coding	Name	Name of function	Description	Remarks
FunIN.13	INHIBIT	Position command prohibition	Valid-disable command pulse input-allow command pulse input	It turned out to be a pulse prohibition function. Now it is upgraded to position command prohibition, including internal and external position commands. The logical selection of the corresponding terminal, must be set to: Level Effective.

2) Electronic gear ratio setting

Set the electronic gear ratio according to the actual situation of machinery and upper machine.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05-07	Electronic gear ratio 1 (molecule)	1~1073741824	1	1048576	Be effective immediately	Operation setting	P
P05-09	Electronic gear ratio 1 (denominator)	1~1073741824	1	10000	Be effective immediately	Operation setting	P
P05-11	Electronic gear ratio 2 (molecule)	1~1073741824	1	1048576	Be effective immediately	Operation setting	P
P05-13	Electronic gear ratio 2 (denominator)	1~1073741824	1	10000	Be effective immediately	Operation setting	P

The working principle of electronic gear ratio is shown in the following figure:

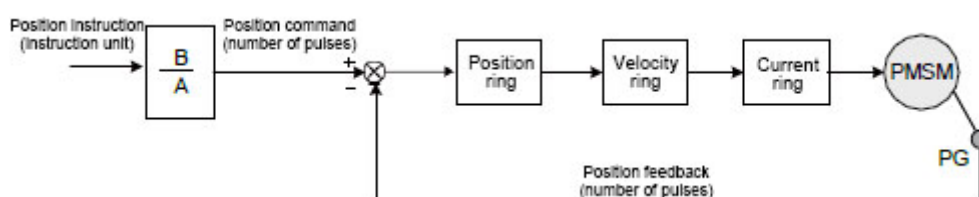


Figure 4-3 schematic diagram of electronic gear ratio function

When P05-02=0, the motor and the load are connected through a reduction gear. Assuming that the reduction ratio of the motor shaft and the mechanical side of the load is n/m (the motor shaft rotates m times and the load shaft rotates n times), the calculation formula of the electronic gear ratio is as follows:

$$\text{Electronic gear ratio} \frac{B}{A} = \frac{P05-07}{P05-09} = \frac{\text{Encoder resolution}}{\text{Displacement of load shaft for one revolution (command unit)}} \times \frac{m}{n}$$

HSD6-DS supports up to 2 sets of electronic gear ratios, and gear ratio selection can be completed by using the gear ratio switching function (FunIN.24).

When P05-02 ≠ 0:

$$\text{Electronic gear ratio} \frac{B}{A} = \frac{\text{Encoder resolution}}{P05-02}$$

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05-02	Number of position commands for each rotation of the motor	0~1048576	P/r	0	Power on again	Stop setting	P

At this time, the gear ratio has nothing to do with P05-07, P05-09, P05-11 and P05-13, and the gear ratio switching function is invalid.

3) Position command filter setting

The smoothing function of position command refers to filtering the input position command to make the rotation of servo motor smoother. This function is valid in the following occasions:

- The pulse command output by the upper device has not been accelerated/decelerated, and the acceleration/deceleration speed is very high;
- Command pulse frequency is too low;
- The electronic gear ratio is more than 10 times.

Note: ■ This function has no influence on the displacement (total number of position commands).

The parameters related to the position command smoothing function are set as follows.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05-04	Time constant of first-order low-pass filtering	0.0~6553.5	ms	0.0	Be effective immediately	Stop setting	P

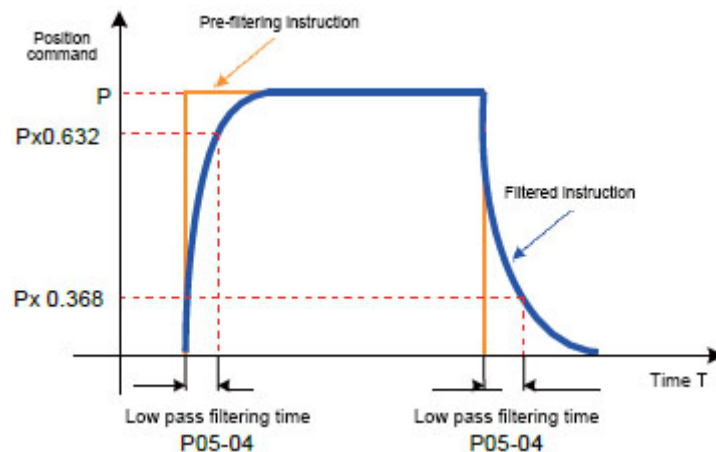
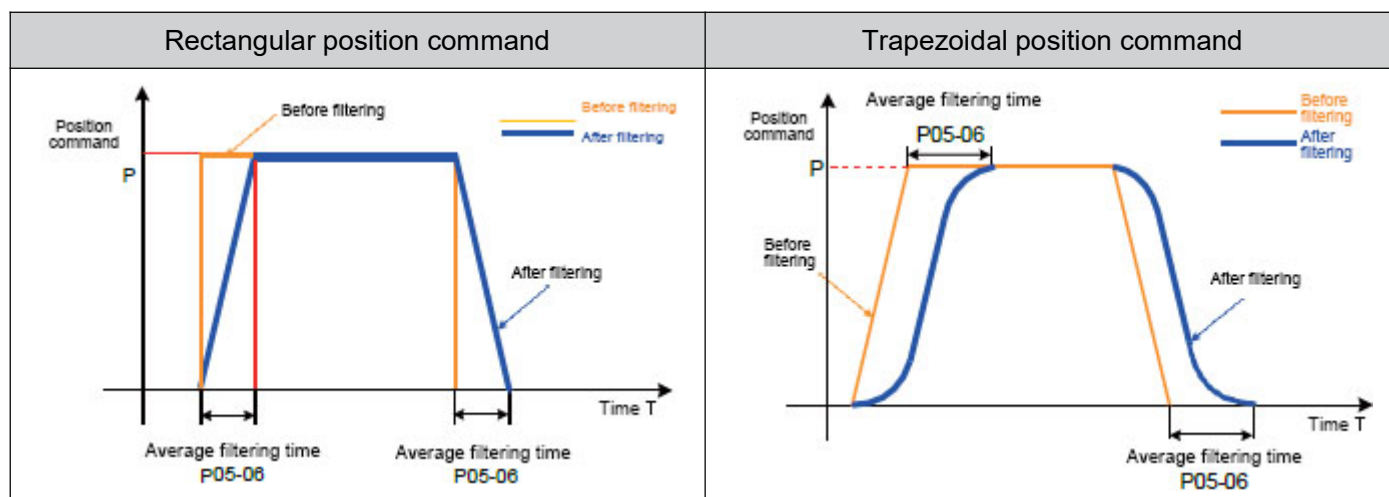


Figure 4-4 Example Diagram of First-order Filtering

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05-06	Average filtering time constant	0.0~128.0	ms	0.0	Be effective immediately	Stop setting	P

Note: ■ When P05-06 = 0, the average filter is invalid.

Table 4-2 Comparison of filtering effects of average filter on two different position commands



4) Position deviation clearing function

By setting the DI function FunIN.35, it is possible to use DI to control whether the position deviation is cleared.

Coding	Name	Name of function	Description	Remarks
FunIN.35	ClrPosErr	Clear position deviation (along the effective function)	Valid-position deviation is cleared; Invalid-position deviation is not cleared.	The logical selection of the corresponding terminal is suggested to be: edge valid. This DI function is recommended to be configured on the DI8 terminal.

5) Frequency division output function

The source of servo pulse output is selected by P05-38, and the synchronous output function of pulse instruction is generally used in synchronous control occasions.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05-38	Selection of servo pulse output source	0- Encoder frequency division output 1- Pulse instruction synchronous output 2- Frequency division and synchronous output prohibition	-	0	Power on again	Stop setting	P

By setting P05-17, the servo driver divides the number of pulses fed back by the encoder in accordance with the set value and outputs it through the divided output port. The set value of P05-17 corresponds to the number of pulses output by PAO/PBO per turn (before 4 times frequency multiplication).

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05-17	Encoder frequency division pulse number	35~32767	P/r	2500	Power on again	Stop setting	-

Table 4-3 Output Phase Morphology

Forward rotation (phase A leads phase B by 90°)	When it is reversed (phase B leads phase A by 90°)
PAO PBO	PAO PBO

The feedback phase of output pulse can be adjusted by P02-03.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P02-03	Output pulse phase	0- Take CCW direction as the forward direction (A ahead of B) 1- Take CW direction as the forward rotation direction 2- (Reverse mode, A lags behind B)	-	0	Power on again	Stop setting	PST

4.2 Speed mode instruction

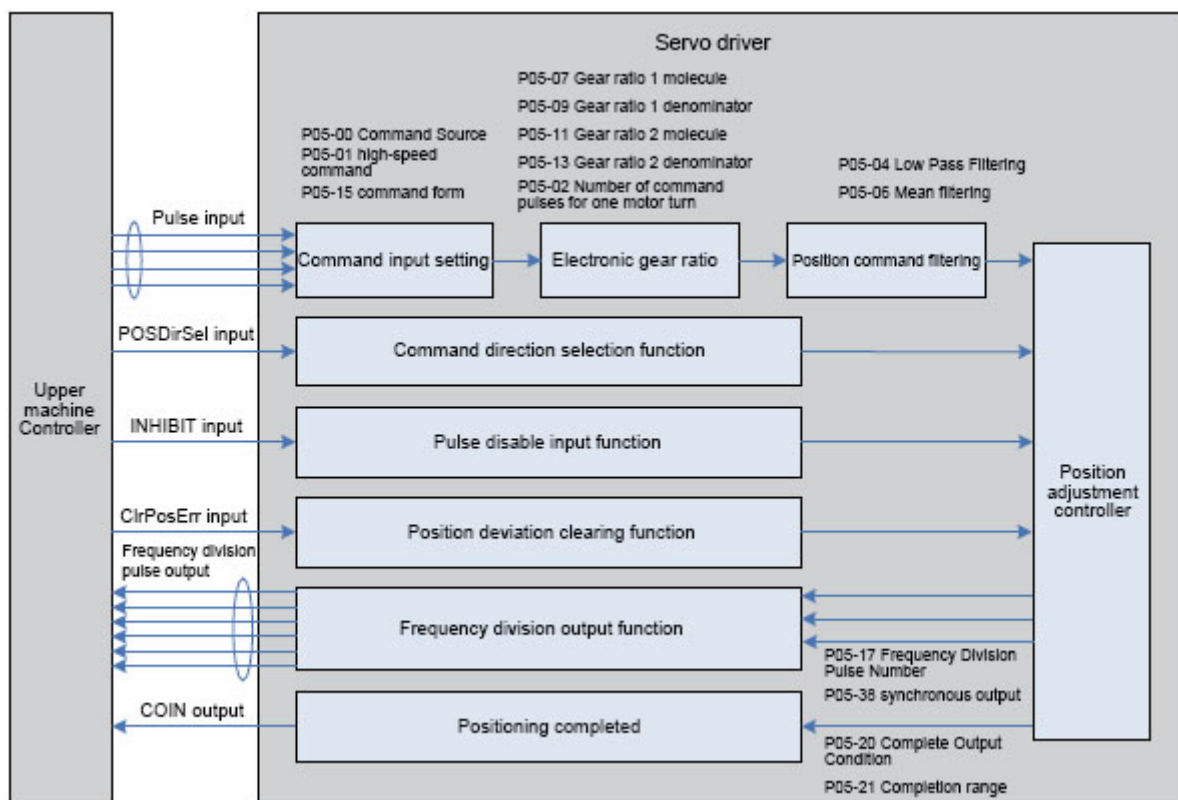


Figure 4-5 Block diagram of speed control mode

The main steps of speed control mode are as follows:

1. Connect the power supply of the servo main circuit and control circuit correctly, as well as the motor power line and encoder line. After power-on, the servo panel displays "rdy", which means that the servo power supply and motor encoder are connected correctly.
2. Run the servo JOG test run by pressing the key to confirm whether the motor can run normally.
3. Refer to Figure 4-6 for wiring to explain the necessary DI/DO signals and analog speed commands for connecting CN2 terminals.
4. Set the speed mode.
5. To enable the servo, first make the motor rotate at a low speed, judge whether the rotation direction of the motor is normal, and then adjust the gain. Please refer to the general debugging steps in Section 4.7.

4.2.1 Speed mode wiring

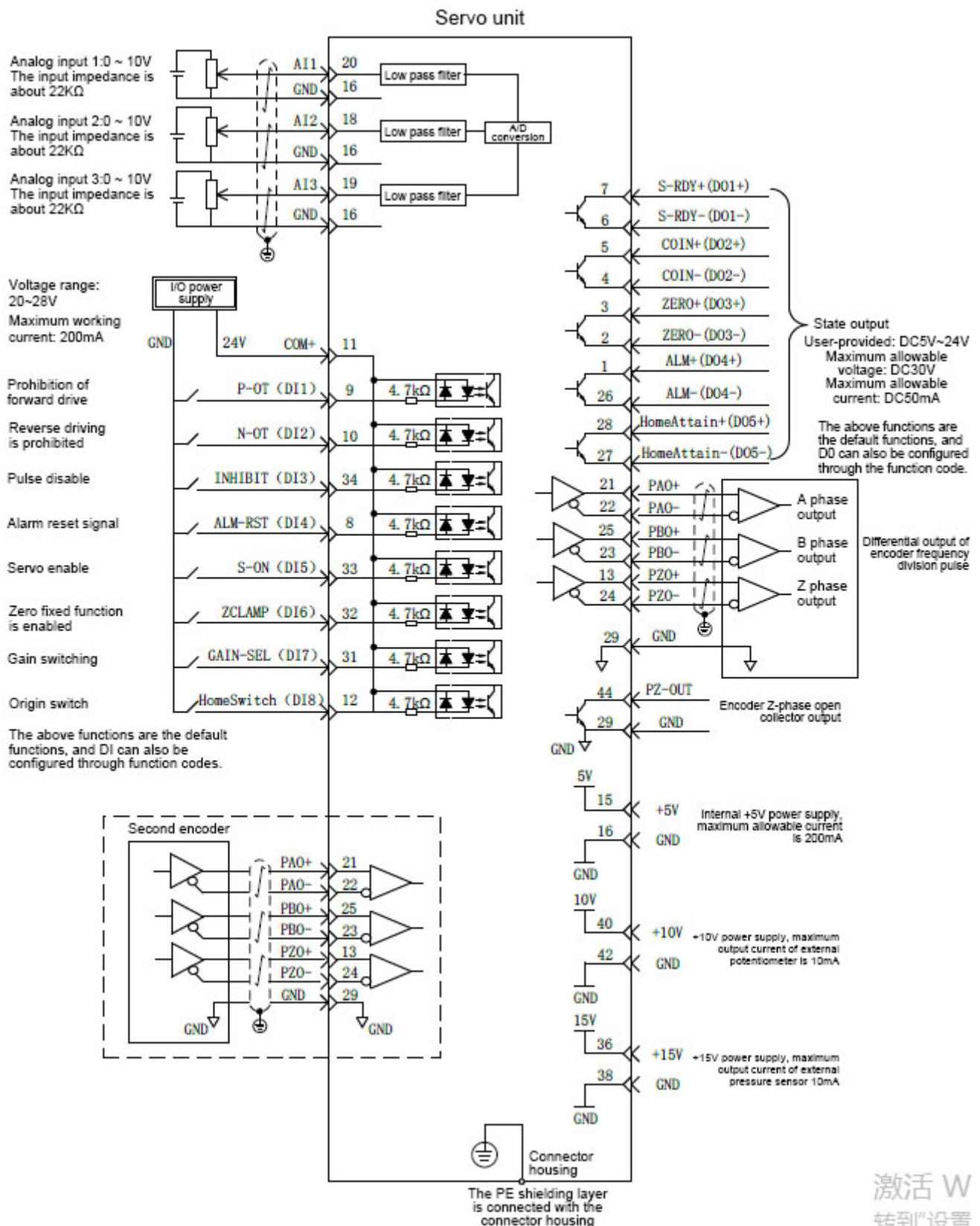


Figure 4-6 Speed Mode Wiring Diagram

Represents a twisted pair.

Note: ■ Signal cables and power cables must be routed separately, with an interval of at least 30cm;

- The shielding layer must be connected reliably to ensure reliable shielding and grounding when the signal cable is not long enough to connect the cable;

■ **+5V is referenced to GND and +24V is referenced to COM-. Do not exceed the maximum allowable current, otherwise the driver will not work normally.**

4.2.2 Speed mode related function code setting

1) Speed command input setting

a) Source of speed command

In speed control mode, there are two sources of speed command: source A and source B.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P06-00	Master speed command A source	0- number given (P06-03) 1-AI1 2-AI2	-	0	Be effective immediately	Stop setting	S
P06-01	Auxiliary speed command B source	0- number given (P06-03) 1-AI1 2-AI2 3-0 (no effect) 4-0 (no effect) 5- Multistage Speed Command	-	1	Be effective immediately	Stop setting	S
P06-03	Speed command keyboard setting value	-6000~6000	rpm	200	Be effective immediately	Operation setting	S
P06-04	Set point of inching speed	0~6000	rpm	100	Be effective immediately	Operation setting	S

Among them:

- Digital setting, that is, keyboard setting, refers to storing the set speed value through the function code P06-03 as a speed command.
- The source of analog speed command refers to the conversion of externally input analog voltage signals into command signals for controlling motor speed. Taking AI2 as an example, the method of setting speed command by analog is explained.

Table 4-4 Examples of Analog Set Speed Command Operation

Step	Operation content	Remarks
1	Set the command source as the AI2 source in the main speed command A. P06-00 = 2, P06-02 = 0	Set the speed command source under speed control
2	Adjust AI2 related parameters: 1. Zero drift correction (P03-59 setting or P0D-10 selecting automatic correction) 2. Offset setting (set by P03-55) 3. Dead zone setting (set by P03-58)	The sampling of AI2 is adjusted by setting zero drift, offset and dead zone.
3	P03-80 sets the maximum/minimum value of speed command corresponding to $\pm 10V$, P03-80 = 3000rpm	Specify the maximum speed value corresponding to +10V (P03-80) Specify the minimum speed value corresponding to -10V (-P03-80)

When there is interference in the AI2 input signal, the AI2 low-pass filtering parameters (P03-56) can be set for filtering.

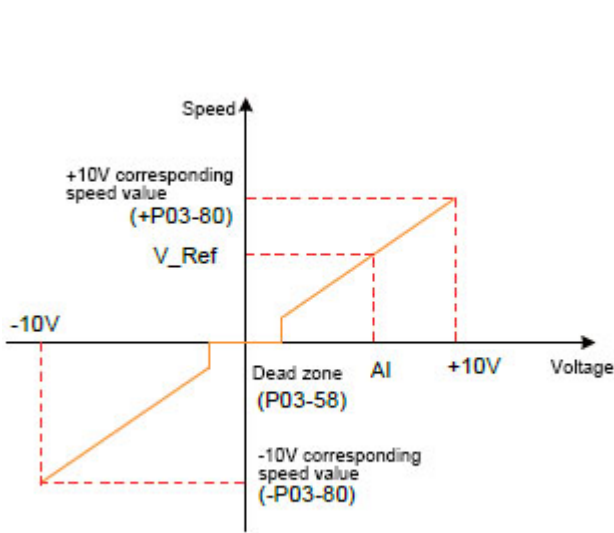


Figure 4-7 Schematic diagram of unbiased AI2

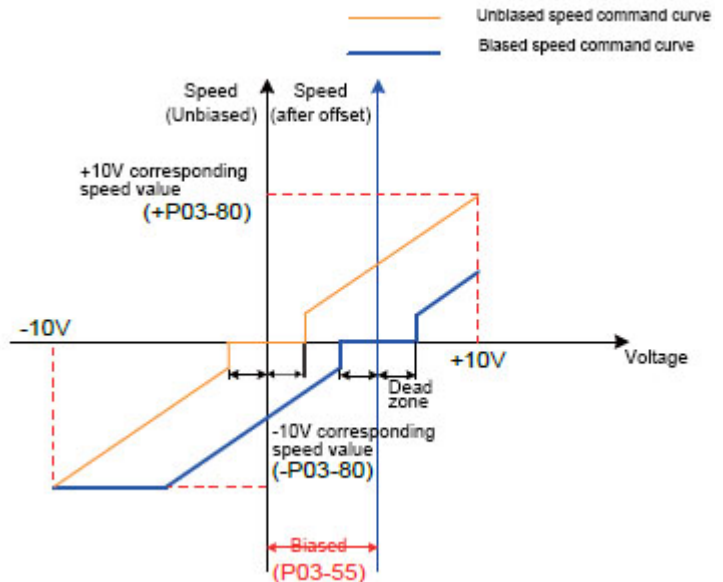


Figure 4-8 schematic diagram of AI2 after biased

The given speed command value can be viewed through P0B-01.

- Multi-segment speed commands refer to 16 groups of speed commands and related control parameters stored in internal registers selected by users through external DI or internal designation.
- The inching speed command means that the user sets the inching operation function by configuring two external DI or upper machine control software. (FunIN.18, FunIN.19), the speed value stored according to the function code P06-04 is used as the inching speed, and the DI status. Select the direction of speed command.

b) Speed command direction switching

DI can be used to control the direction switching of speed command by setting the function code FunIN.26, so as to meet the need of direction switching.

Coding	Name	Name of function	Description	Remarks
FunIN.26	SPDDirSel	Speed command direction Settings	Invalid-positive direction; Valid-opposite direction.	The logical selection of the corresponding terminal is suggested to be set to: Level Effective.

c) Speed command selection

The speed control mode has the following five speed command acquisition modes, which are set by the function code P06-02.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P06-02	Speed command selection	0- Master speed command A source 1- Auxiliary speed command B source 2- A+B 3- A/B switching 4- Communication given	-	0	Be effective immediately	Stop setting	S

When the speed command selects "A/B switching", that is, the function code P06-02=3, it is necessary to separately assign a function definition to the DI terminal, and determine whether the A command input is valid or the B command input is valid at present through this input terminal.

Coding	Name	Name of function	Description	Remarks
FunIN.4	CMD-SEL	Main and auxiliary operation command switching	Invalid-the current running instruction is A; Valid-the current running instruction is B.	The logical selection of the corresponding terminal is suggested to be set to: Level Effective.

2) Instruction ramp function setting

The ramp function control function refers to converting the speed command with great change into a smooth constant acceleration and deceleration command, that is, by setting the acceleration and deceleration time, the acceleration and deceleration can be controlled. In the speed control mode, if the given speed command changes too much, the motor will jump or vibrate violently. If the acceleration and deceleration time of soft start are increased, the motor can be started smoothly, and the above situation can be avoided, resulting in the damage of mechanical parts.

☆ Related function codes:

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P06-05	Speed command acceleration ramp time constant	0~65535	ms	0	Be effective immediately	Operation setting	S
P06-06	Speed command deceleration ramp time constant	0~65535	ms	0	Be effective immediately	Operation setting	S

The ramp function control function converts the step speed command into a relatively smooth constant acceleration and deceleration speed command to realize smooth speed control (including internal set speed control).

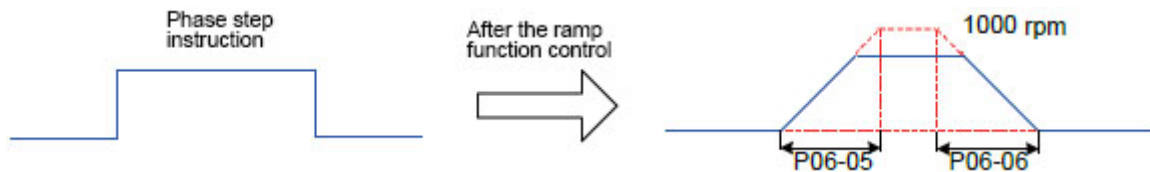


Figure 4-9 Schematic Diagram of Slope Function Definition

P06-05: Time required for the speed command to accelerate from zero speed to 1000rpm.

P06-06: Time required for the speed command to decelerate from 1000rpm to zero speed.

The actual acceleration and deceleration time calculation formula is as follows:

Actual acceleration time = (speed command / 1000) × speed command acceleration ramp time

Actual deceleration time = (speed command / 1000) × speed command deceleration ramp time

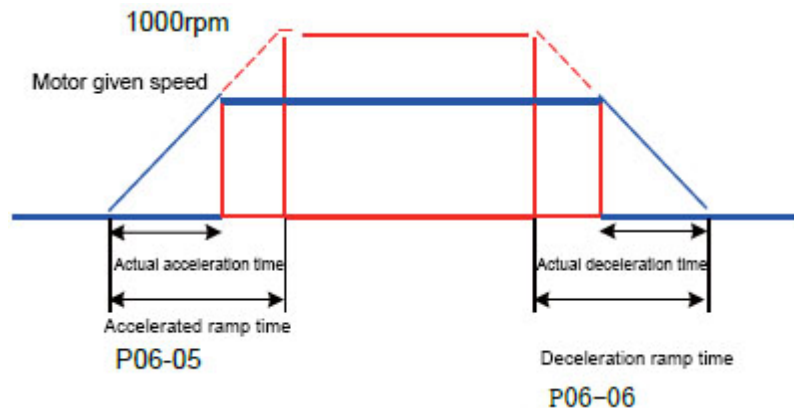


Figure 4-10 Schematic diagram of acceleration and deceleration time

3) Speed command clipping limit setting

In the speed control mode, the servo driver can limit the size of the speed command. Speed command limits include:

- P06-07 Set the amplitude limit of speed command, and the speed command in both positive and negative directions cannot exceed this value, otherwise it will be limited to output at this value.
- P06-08 sets the forward speed limit. If the forward speed command exceeds the set value, it will be limited to be output at this value.
- P06-09 sets the negative speed limit. If the negative speed command exceeds the set value, it will be limited to be output at this value.
- The maximum speed of the motor is the default limit point. When different motors are matched, this parameter will change with the motor parameters.

Note: ■ The function codes P06-07, P06-08 and P06-09 take the minimum limit point as the limit condition, as shown in the following figure, because the set value of P06-09 is greater than P06-07, the actual forward rotation speed is limited to P06-08 and the reverse rotation speed is limited to P06-07.

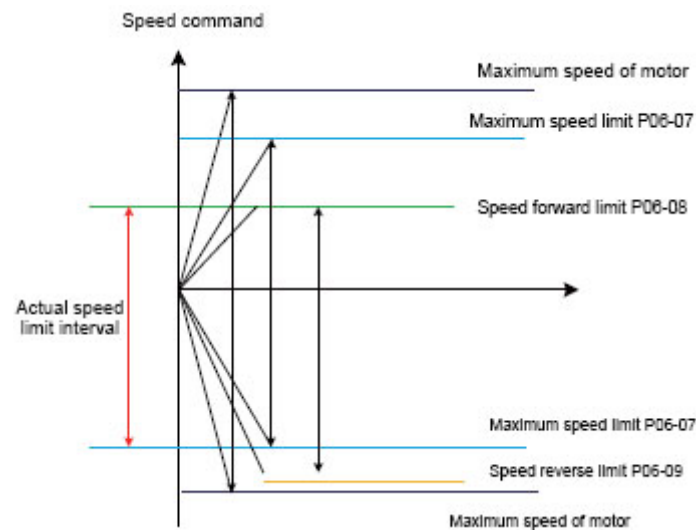


Figure 4-11 Schematic diagram of speed command limit

Note: ■ The maximum speed of the motor is the default limit maximum point.

The actual motor speed limit interval satisfies:

| Range of forward speed command | $\leq \min\{\text{Maximum speed of motor, P06-07, P06-08}\}$

| Amplitude of negative speed command | $\leq \min\{\text{Maximum speed of motor, P06-07, P06-09}\}$

☆ Related function codes:

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P06-07	Threshold of maximum speed	0~6000	rpm	6000	Be effective immediately	Operation setting	S
P06-08	Forward threshold velocity	0~6000	rpm	6000	Be effective immediately	Operation setting	S
P06-09	Reverse threshold velocity	0~6000	rpm	6000	Be effective immediately	Operation setting	S

4) Zero fixed function

In the speed control mode, if ZCLAMP is valid and the amplitude of speed command is less than or equal to the speed value set in P06-15, the servo motor will enter the control of zero fixed state. If oscillation occurs at this time, the position loop gain can be adjusted. When the amplitude of the speed command is greater than the speed value set in P06-15, the servo motor exits the control of zero fixed state.

DI function selection:

Coding	Name	Name of function	Description	Remarks
FunIN.12	ZCLAMP	Zero fixed enable	Valid-enables the zero position fixing function; Invalid-Zero Fixed function is disabled.	The logical selection of the corresponding terminal is suggested to be set to: Level Effective.

☆ Related function codes:

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P06-15	Zero fixed speed threshold	0rpm~6000rpm	rpm	60	Be effective immediately	Operation setting	S

4.3 Torque mode instruction

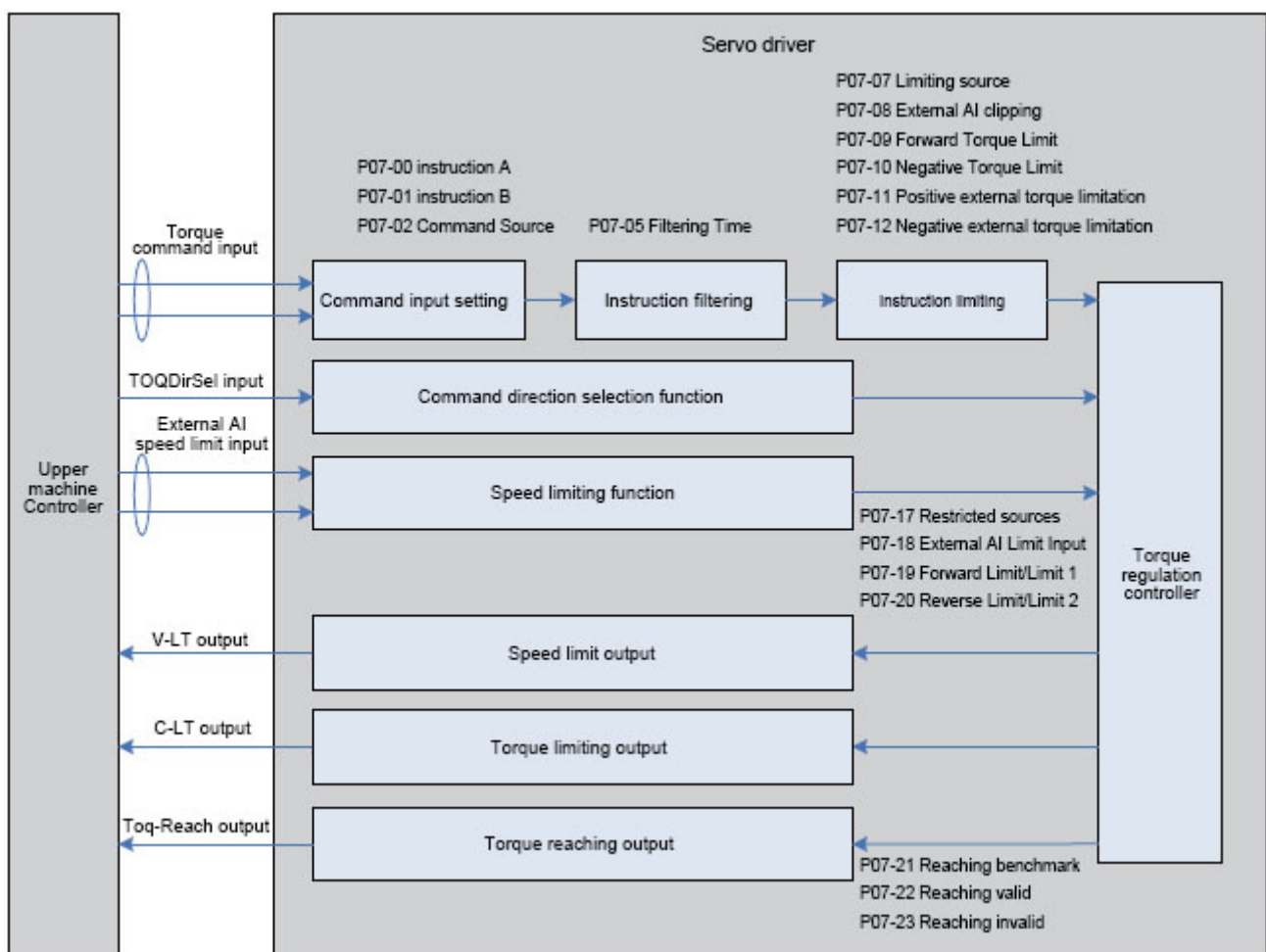


Figure 4-12 Block diagram of torque control mode

The main use steps of torque control mode are as follows:

1. Connect the power supply of the servo main circuit and control circuit correctly, as well as the motor power line and encoder line. After power-on, the servo panel displays "rdy", which means that the servo power supply and motor encoder are connected correctly.
2. Run the servo JOG test run by pressing the key to confirm whether the motor can run normally.
3. Refer to Figure 4-13 for wiring to explain the necessary DI/DO, torque command source, speed limit and other signals in connecting CN1 terminals.
4. Set the relevant torque mode.
5. Enable the servo, set a lower speed limit value, and apply a forward or reverse torque command to the servo to confirm the motor rotation. Whether the direction is correct, whether the speed is properly limited, and if it is normal, it can be used.

4.3.1 Torque mode wiring

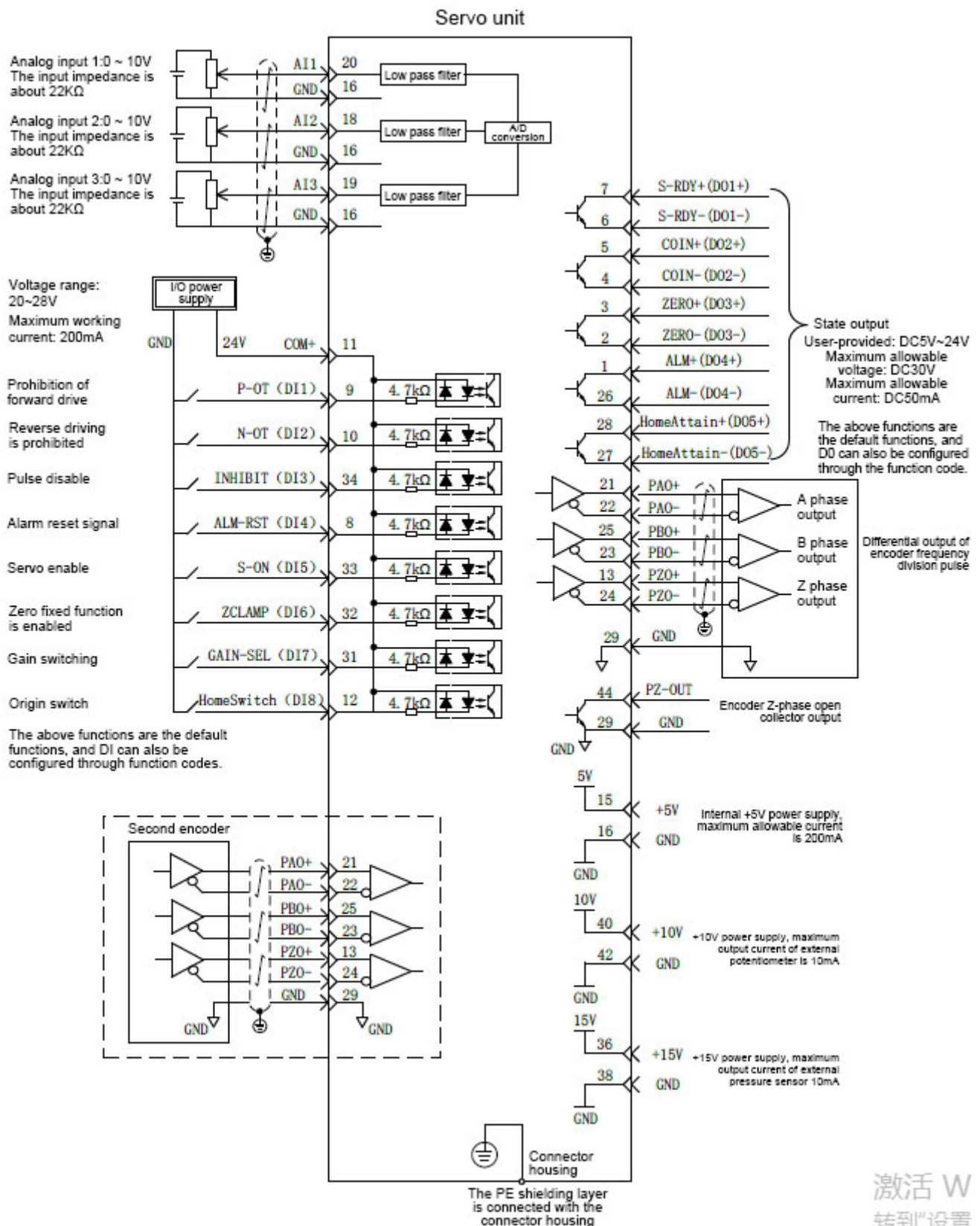


Figure 4-13 Wiring Diagram of Torque Mode



Represents a twisted pair.

Note: ■ Signal cables and power cables must be routed separately, with an interval of at least 30cm;

■ The shielding layer must be connected reliably to ensure reliable shielding and grounding when the signal cable is not long enough to connect the cable;

■ +5V is referenced to GND and +24V is referenced to COM-. Do not exceed the maximum allowable current, otherwise the driver will not work normally.

4.3.2 Torque mode related function code setting

1) Torque command input setting

a) Torque command source

In torque control mode, there are two sources of torque command: source A and source B. It can be set in the following two ways:

- Digital setting, that is, keyboard setting. Refers to the percentage of torque value and rated torque stored in function code P07-03 as torque command.
- The source of analog command refers to the conversion of externally input analog voltage signals into torque command signals for controlling motors. The corresponding relationship between analog quantity and torque command can be specified at will at this time.

☆ Related function parameter:

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P07-00	Main torque command source A	0- number given (P07-03) 1-AI1 2-AI2	-	0	Be effective immediately	Stop setting	T
P07-01	Auxiliary torque command source B	0- number given (P07-03) 1-AI1 2-AI2	-	1	Be effective immediately	Stop setting	T
P07-03	Torque command keyboard setting value	-300.0~300.0	%	0	Be effective immediately	Operation setting	T

b) Torque command selection

The torque control mode has the following five ways to obtain torque commands, which are set by function code P07-02.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P07-02	Torque command selection	0- Main torque command A source 1- Auxiliary torque command B source 2- A+B source 3- A/B switching 4- Communication given	-	0	Power on again	Stop setting	T

c) Torque command direction switching

DI can be used to control the direction switching of torque command by setting the function code FunIN.25, so as to meet the need of direction switching.

Coding	Name	Name of function	Description	Remarks
FunIN.25	TOQDirSel	Torque command direction setting	Invalid-positive direction; Valid-opposite direction.	The logical selection of the corresponding terminal is suggested to be set to: Level Effective.

When the torque command selects "A/B switching", that is, the function code P07-02=3, it is necessary to assign a function definition to the DI terminal separately. You can choose whether the current A instruction input is valid or the B instruction input is valid through this input terminal.

Coding	Name	Name of function	Description	Remarks
FunIN.4	CMD-SEL	Main and auxiliary operation command switching	Invalid-the current running instruction is A; Valid-the current running instruction is B.	The logical selection of the corresponding terminal is suggested to be set to: Level Effective.

Taking AI1 as an example, the method of analog setting torque command is explained.

Table 4-5 Examples of Analog Set torque command Operation

Step	Operation content	Remarks
1	Set the command source as the AI1 source in the auxiliary torque command B. P07-02=1, P07-01=1	Set the torque command source under torque control.
2	Adjust AI1 related parameters: 1. Zero drift correction (P03-54 setting or P0D-10 selecting automatic correction) 2. Offset setting (set by P03-50) 3. Dead zone setting (set by P03-53)	The sampling of AI1 is adjusted by setting zero drift, offset and dead zone.
3	P03-81 Set the maximum/minimum torque corresponding to $\pm 10V$. P03-81 = 3.00 times rated torque	Specify the maximum torque value corresponding to +10V (P03-81) Specify the minimum torque value corresponding to -10V (-P03-81)

When there is interference in the AI1 input signal, the AI1 low-pass filtering parameters (P03-51) can be set for filtering.

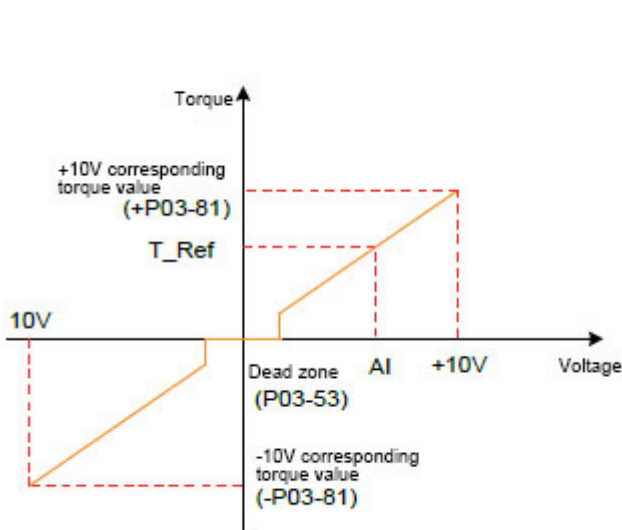


Figure 4-14 Schematic diagram of unbiased AI1

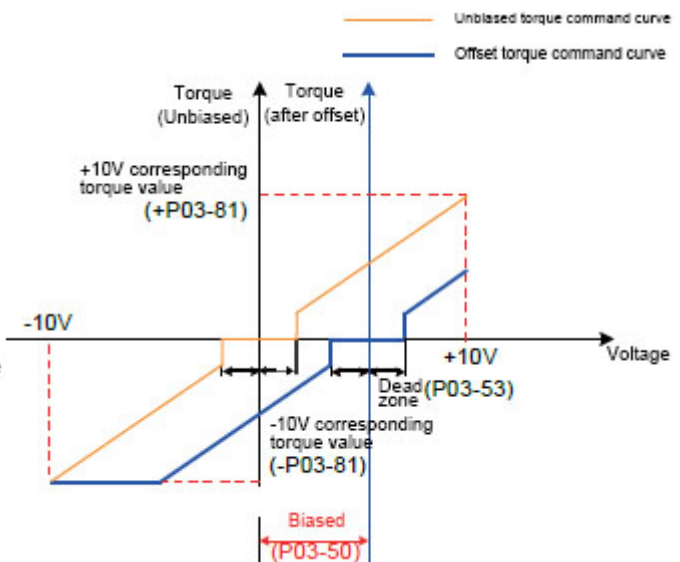


Figure 4-15 schematic diagram of AI1 after biased

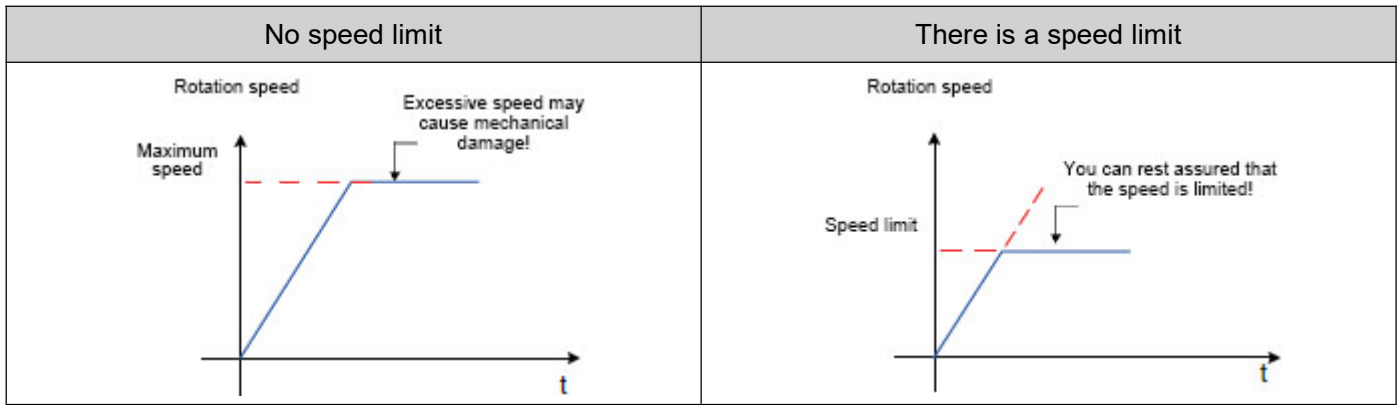
The given torque command (percentage relative to the rated torque of the motor) can be viewed through P0B-02.

2) Torque mode speed limit function

In the torque control mode, it is necessary to limit the speed of the servo motor in order to protect the machine. During torque control, the servo motor is only controlled by the output torque command and does not control the speed. Therefore, if the set torque command is too large and higher than the load torque on the mechanical side, the motor will accelerate all the time, and overspeed may occur. At this time, it is necessary to set the speed limit value of the motor.

When the speed exceeds the limit speed range, the speed difference between overspeed and limit speed is converted into a certain proportion of torque, and the speed returns to the limit speed range through negative clearance. Therefore, the actual motor speed limit value will fluctuate due to different load conditions. The speed limit value can be given by internal reference or analog sampling reference. (Same as speed command in speed control)

Table 4-6 Schematic Diagram of Speed Limit



DO function selection: the output signal of motor speed after speed limit is as follows:

Coding	Name	Name of function	Description	Remarks
FunOUT.8	V-LT	Speed limit signal	Confirmation signal of speed limitation in torque control: Valid-motor speed is limited; Invalid-motor speed is not limited.	-

Note: ■ V-LT needs to distribute signals.

Speed limit sources include internal speed limit sources and external speed limit sources. When selecting the internal speed limit source (P07-17=0), directly set P07-19 to limit the forward speed P07-20 to limit the negative speed. If P07-17=2, P07-19 or P07-20 is selected as the speed limit through DI in the case of FunIN.36 distribution. When P07-17=1 selects the external speed limit source, first specify the analog channel through P07-18, and then set the corresponding relationship of analog quantity as required. At this time, the external limit value should be smaller than the internal speed limit value source to prevent danger caused by improper setting of the external speed limit source.

The speed limit mode is set by the following function codes.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P07-17	Speed limit source selection	0- Internal speed limit (Speed limit in torque control) 1- Use V-LMT as external speed limit input. 2- Select by FunIN.36(V-SEL) 1st or 2nd speed limit input	-	0	Be effective immediately	Operation setting	T
P07-18	V-LMT selection	1-AI1 2-AI2	-	1	Be effective immediately	Operation setting	T
P07-19	Torque control forward speed limit/ Torque control speed limit value 1	0~6000	rpm	3000	Be effective immediately	Operation setting	T
P07-20	Torque control reverse speed limit/ Torque control speed limit value 2	0~6000	rpm	3000	Be effective immediately	Operation setting	T

3) Torque command limiting setting

In order to protect the mechanical device, the output torque can be limited by setting the function code P07-07. There are four ways to limit the torque:

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P07-07	Torque limiting source	0- Positive and negative internal torque limits (default) 1- Positive and negative external torque limit (using P-CL, N-CL selection) 2-T-LMT is used as external torque limit input. 3- The torque limit is the minimum value of positive and negative external torque and external T-LMT (selected by P-CL and N-CL). 4- Positive and negative internal torque limits and T-LMT Switching between torque limits (using P-CL, N-CL selection)	-	0	Be effective immediately	Stop setting	PST

DI function selection: input positive/negative external torque limit selection signal P-CL/N-CL.

Coding	Name	Name of function	Description	Remarks
FunIN.16	P-CL	Positive external torque limit	According to the selection of P07-07, switch the torque limiting source. P07-07=1: Valid-forward external torque limit is valid; Invalid-Forward internal torque limit is valid. P07-07=3 and the AI limit value is greater than the logical selection of the positive corresponding terminal, When turning to external limit value: Valid-Forward external torque limit is valid. Invalid -AI torque limit is valid. P07-07=4: Effective -AI torque limit is valid; Invalid-Forward internal torque limit is valid.	The logical selection of the corresponding terminal is suggested to be set to: Level Effective.
FunIN.17	N-CL	Anti-external torque limitation	According to the selection of P07-07, switch the torque limiting source. P07-07=1: Valid-Reverse external torque limit is valid; Invalid-Reverse internal torque limit is valid. P07-07=3 and the AI limit value is less than When the external limit value is reversed: Valid-Reverse external torque limit is valid; Invalid -AI torque limit is valid. P07-07 = 4: Valid-AI torque limit is valid; Invalid-Reverse internal torque limit is valid.	The logical selection of the corresponding terminal is suggested to be set to: Level Effective.

DO function selection: output torque limit confirmation signal c-lt.

Coding	Name	Name of function	Description	Remarks
FunOUT.7	C-LT	Torque limiting signal	Confirmation signal of torque limit: Valid-motor torque is limited; Invalid-motor torque is not limited.	-

DI/DO related function codes need to be set for function and logic allocation.

For example, when setting analog input AI, first specify T_LMT variable through function code P07-08, and then set the corresponding relationship between torque and analog voltage.

When P07-07=1, the forward and reverse external torque limit is triggered by external DI given (P-CL, N-CL), and the torque is limited according to the values set by P07-11 and P07-12. When the external limit, T_LMT and their combination limit exceed the internal limit, the internal limit is adopted, that is, all the limiting conditions are controlled according to the minimum limit value, so that the torque is limited within the maximum torque range of the motor. T_LMT is symmetrical, and it is limited by the value of |T_LMT| in forward rotation and by the value of -|T_LMT| in reverse rotation.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P07-07	Torque limiting source	0- Positive and negative internal torque limit 1- Positive and negative external torque limit (using P-CL, N-CL selection) 2-T-LMT is used as external torque limit input. 3- The torque limit is the minimum value of positive and negative external torque and external T-LMT (selected by P-CL and N-CL). 4- Positive and negative internal torque limits and T-LMT Switching between torque limits (using P-CL, N-CL selection)	-	0	Be effective immediately	Stop setting	PST
P07-08	T-LMT selection	1-AI1 2-AI2	-	2	Be effective immediately	Stop setting	PST
P07-09	Positive internal torque limit	0.0~300.0 (100% corresponds to one time rated torque)	%	300.0	Be effective immediately	Operation setting	PST
P07-10	Negative internal torque limit	0.0~300.0 (100% corresponds to one time rated torque)	%	300.0	Be effective immediately	Operation setting	PST
P07-11	Positive external torque limit	0.0~300.0 (100% corresponds to one time rated torque)	%	300.0	Be effective immediately	Operation setting	PST
P07-12	Negative external torque limit	0.0~300.0 (100% corresponds to one time rated torque)	%	300.0	Be effective immediately	Operation setting	PST

4.4 Absolute value system instruction

4.4.1 Summary

The absolute encoder not only detects the position of the motor within one revolution, but also counts the number of revolutions of the motor. The resolution of a single revolution is 8388608(223), and it can remember 16-bit multi-revolution data. The absolute value system composed of absolute value encoder can be divided into absolute position linear mode and absolute position rotation mode, which can be used in position, speed and torque control modes. When the driver is powered off, the encoder backs up data through the battery, and when the driver is powered on, the absolute position of the machine is calculated by the absolute position of the encoder, so it is not necessary to repeat the operation of resetting the mechanical origin.

It is necessary to set the motor number P00-00=14130 (our company's 17-bit absolute encoder) and P02-01 (absolute value system selection) according to the actual application when the HSD6-DS series servo driver is matched with the absolute encoder. FU.731 (encoder battery failure) will occur when the battery is connected for the first time. It is necessary to set P0D-20=1 to reset the encoder failure, and then reset the original point.

Note: When P02-02 (rotation direction selection) or P0D-20 (absolute encoder reset enable) is modified, the absolute position of the encoder will suddenly change, resulting in the change of the mechanical absolute position reference, so it is necessary to reset the mechanical origin. The deviation between the absolute position of the machine and the absolute position of the encoder will be automatically calculated and stored in the EEPROM of the drive when the function of resetting the internal origin of the drive is used.

4.4.2 Related function code setting

1) Absolute value system setting

Set P00-00=14130 to select the company's 17-bit absolute encoder motor, and select the absolute position mode through P02-01.

Function code	Name	Setting range	Unit	Out of factory Settings	Effective Time	Category	Relevance Model
P00-00	Motor No.	14130- 17 bit incremental encoder motor	-	14130	Power on again	Stop setting	ALL
P02-01	Absolute value system selection	0-Incremental position mode 1-Absolute position linear mode 2-Absolute position rotation mode		0	Power on again	Stop setting	ALL

Note: The system automatically detects whether the motor number is an absolute encoder motor in absolute position mode,. If the setting error occurs, FU.122 (Absolute position mode product matching failure).

2) Encoder feedback data

The feedback data of absolute encoder can be divided into encoder rotation number data and encoder position in one circle, while the incremental position mode has no encoder rotation number data feedback.

Function code	Name	Setting range	Unit	Out of factory Settings	Effective Time	Category	Relevance Model
P0B-70	Number of revolutions of absolute encoder Data	-	r	0	-	Display	ALL
P0B-71	Within 1 revolution of absolute value encoder Position	-	Encoder unit	0	-	Display	ALL
P0B-77	Absolute encoder absolute position (low 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B-79	Absolute encoder absolute position (upper 32 bits)	-	Encoder unit	0	-	Display	ALL

The number of revolutions of the absolute encoder P0B-70 is an unsigned number, ranging from 0 to 65535. Assuming the encoder resolution RE(RE=223), the position P0B-71 within 1 revolution of the absolute encoder ranges from 0 to re.

The absolute position $P0B-79 \times 2^{32} + P0B-77$ of that absolute value encode is R_E calculated by the feedback data $P0B-70$ and $P0B-71$ of the absolute value encode and the resolution of the encoder, When $P0B-70 < 32768$ ($P0B-79 \times 2^{32} + P0B-77$) = $P0B-70 \times R_E + P0B-71$, when $P0B-70 \geq 32768$, ($P0B-79 \times 2^{32} + P0B-77$) = $(P0B-70 - 65536) \times R_E + P0B-71$.

3) Absolute value position linear mode

Function code	Name	Setting range	Unit	Out of factory Settings	Effective Time	Category	Relevance Model
P05-46	Absolute Position Linear Mode Position Offset (Low 32 bits)	-2147483648 ~ 2147483647	Encoder unit	0	Be effective immediately	Stop setting	ALL
P05-48	Absolute Position Linear Mode Position Offset (high 32 bits)	-2147483648 ~ 2147483647	Encoder unit	0	Be effective immediately	Stop setting	ALL
P0B-07	Absolute position counter	-	Command unit	0	-	Display	PST
P0B-58	Mechanical absolute position (low 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B-60	Mechanical absolute position (High 32 bits)	-	Encoder unit	-	-	Display	ALL

This mode is mainly used when the load stroke range of the equipment is fixed and the encoder multi-turn data will not overflow, as shown in the following figure: the ball screw transmission mechanism.

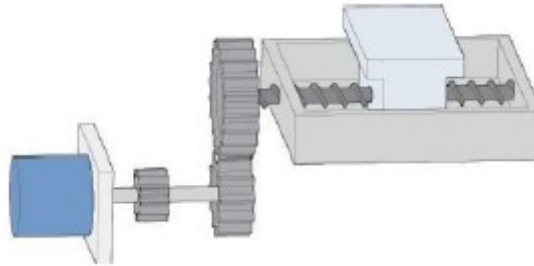


Figure 4-16 Schematic diagram of ball screw transmission mechanism

Assume that the mechanical absolute position ($P0B-58$ and $P0B-60$) is P_M , ($P_M = P0B-60 \times 2^{32} + P0B-58$), and the encoder absolute position is

R_E [R_E The range is $-2^{38} \sim (2^{38}-1)$], and the absolute position linear mode position offsets ($P05-46$ and $P05-48$) are P_0 , then the relationship among them is $P_M = P_E - P_0$.

Assume that the electronic gear ratio is $\frac{B}{A}$, absolute position counter ($P0B-07$) indicates the current absolute position of the machine (instruction unit), $P0B-07 = P_M / (\frac{B}{A})$.

The absolute position linear mode position offsets $P05-46$ and $P05-48$ are 0 by default, and the driver's origin reset function is enabled. After the origin reset, the driver automatically calculates the deviation between the encoder's absolute position and the mechanical absolute position, assigns values to $P05-46$ and $P05-48$ and saves them in EEPROM.

The multi-turn data range of absolute position linear mode encoder is $-32768 \sim 32767$. If the number of forward turns is greater than 32767 or the number of reverse turns is less than -32768, FU. 735 (encoder multi-turn counting overflow fault) will occur, and this fault can be shielded by setting $P0A-36$.

4) Absolute value position rotation mode

Function code	Name	Setting range	Unit	Out of factory Settings	Effective Time	Category	Relevance Model
P05-50	Absolute position rotation mode mechanical gear ratio (molecular)	1-65535	-	65535	Be effective immediately	Stop setting	ALL
P05-51	Absolute position rotation mode mechanical gear ratio (denominator)	1-65535	-	1	Be effective immediately	Stop setting	ALL
P05-52	Number of pulses for one revolution of load in absolute position rotation mode (encoder unit low 32 bits)	0~4294967295	Encoder unit	0	Be effective immediately	Stop setting	ALL
P05-54	Number of pulses for one revolution of load in absolute position rotation mode (encoder unit High 32 bits)	0~127	Encoder unit	0	Be effective immediately	Stop setting	ALL
P0B-07	Absolute position counter	-	Command unit	0	-	Display	ALL
P0B-58	Mechanical absolute position (low 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B-60	Mechanical absolute position (High 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B-81	Rotating load single revolution position (low 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B-83	Rotating load single revolution position (High 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B-85	Rotating load single revolution position	-	Command unit	0	-	Display	ALL

This mode is mainly used for equipment with unlimited load travel range. When the power fails, the number of single-direction rotations of the motor is less than 32,767, as shown in the figure below.

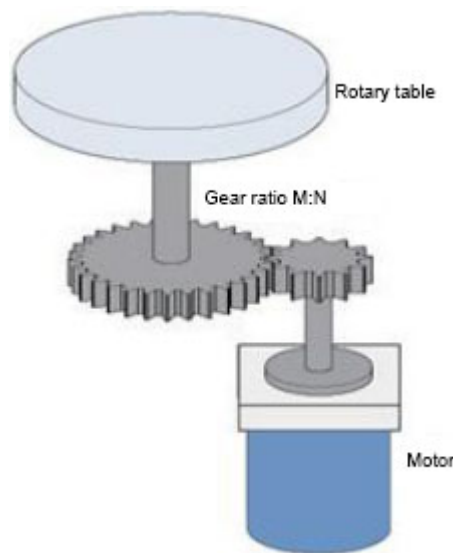


Figure 4-17 Schematic Diagram of Rotating Load

P05-52 and P05-54 are preferred for calculating the upper limit value of the mechanical absolute position inside the driver, and P05-50 and P05-51 are used for calculation when P05-52 and P05-54 are all 0. Assuming the encoder resolution R_E ($R_E = 2^{23}$) and the assuming the number of encoder pulses corresponding to one revolution rotation of the load is R_M , when P05-52 or P05-54 is not equal to 0, $R_M = P05-54 \times 2^{32} + P05-52$; P05-52, P05-54 are 0, $R_M = R_E \times \frac{P_{0550}}{P_{0551}}$

Assuming that the electronic gear ratio is $\frac{B}{A}$, the rotating load single revolution position (encoder unit, P0B-83×2³²+ P0B-81) ranges from 0~R_M, the position (instruction unit, P0B-85) of the rotating load is in the range of 0 ~ R_M/ ($\frac{B}{A}$);

$$P0B-85 = (P0B-83 \times 2^{32} + P0B-81) / \left(\frac{B}{A}\right).$$

Assume that the absolute mechanical positions (P0B-58 and P0B-60) are P_M (P_M=P0B-60×2³²+ P0B-58):

$$P_M = \text{Turntable turns} \times R_M + (P0B-83 \times 2^{32} + P0B-81)$$

Assume that the electronic gear ratio is $\frac{B}{A}$, absolute position counter (P0B-07) indicates the current absolute position of the machine (instruction unit):

$$P0B-07 = P_M / \left(\frac{B}{A}\right) = \text{number of turns of the turntable} \times R_M / \left(\frac{B}{A}\right) + P0B-85$$

The corresponding relationship between the position of a single revolution of the rotating load and the position of the turntable is shown in the following figure:

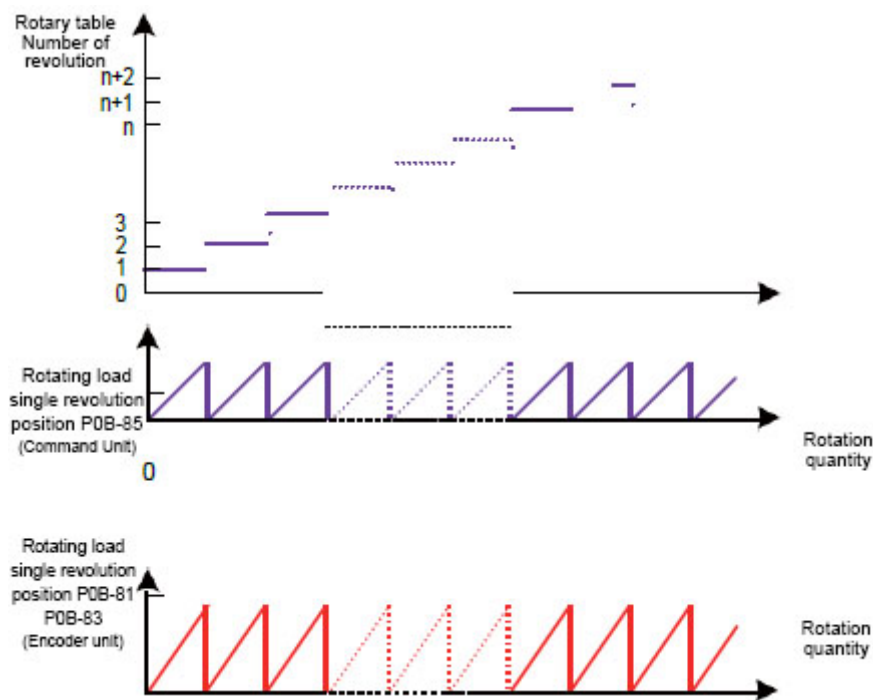


Fig. 4-18 Schematic diagram of the corresponding relationship between the position of a rotating load single revolution and the position of the turntable

Absolute position rotation mode has unlimited multi revolutions data range, shielding FU. 735 (encoder multi revolutions counting overflow fault).

5) Multi revolutions overflow fault selection of encoder

In absolute position linear mode, P0A-36 is set to shield the encoder from multi revolutions overflow fault.

Function code	Name	Setting range	Unit	Out of factory Settings	Effective Time	Category	Relevance Model
P0A-36	Multi revolutions overflow fault selection of encoder	0: No shielding 1:Shielding	-	0	Be effective immediately	Stop setting	ALL

6) Absolute encoder reset operation

Set P0D-20 to reset the internal fault of the encoder or reset the encoder to feed back multiple revolutions of data.

Function code	Name	Setting range	Unit	Out of factory Settings	Effective Time	Category	Relevance Model
P0D-20	Absolute encoder reset enable	0- No operation 1- Reset fault 2- Reset fault and multi-cycle data	-	0	Be effective immediately	Stop setting	ALL

Note: The absolute position of the encoder suddenly changes after resetting the encoder to feed back multi-turn data, so it is necessary to reset the mechanical origin.

4.4.3 Matters needing attention in the use of absolute value system battery box

FU.731 (encoder battery failure) will occur when the battery is connected for the first time. It is necessary to set P0D-20=1 to reset the encoder failure, and then operate the absolute position system.

When the battery voltage is less than 3.0V, FU.730 (encoder battery warning) will occur. Please replace the battery as follows:

- Step 1: the driver is powered on and is in a non-running state;
- Step 2: replace the battery;
- Step 3: After the driver automatically cancels FU.730 (encoder battery warning), there is no other abnormal warning and it can run normally.

Note:

- In the case of servo power failure, FU.731 (encoder battery failure) will occur when the battery is replaced and powered on again, and multi-turn data will suddenly change. Please set P0D-20=1 to reset the encoder failure and re-operate the original point reset function.
- When the driver is powered off, please ensure that the maximum speed of the motor does not exceed 6000rpm to ensure that the encoder position information is accurately recorded;
- Please store at the specified ambient temperature during storage, and ensure reliable battery contact and sufficient power, otherwise the encoder position information may be lost.

4.5 Soft limit function

Traditional hardware limit function: In the traditional way, the limit position can only be given by external signals, and the external sensor signals are connected to the CN2 interface of the servo driver.

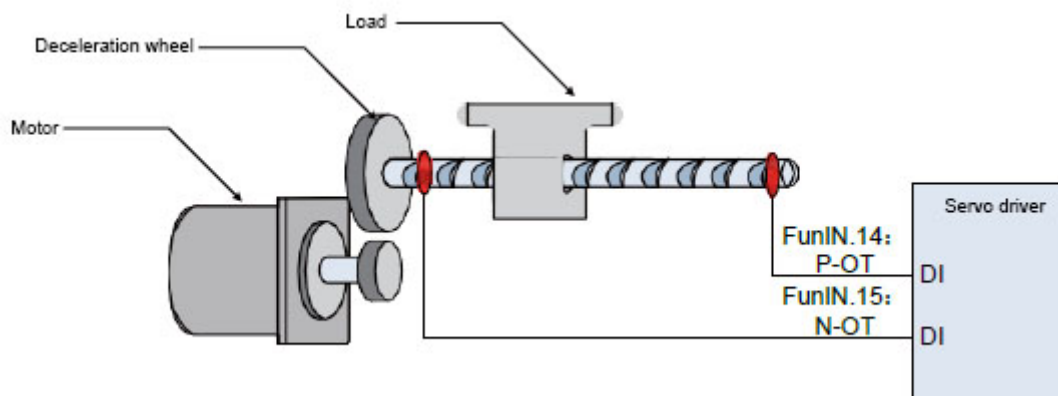


Figure 4-19 Installation Diagram of Limit Switch

Soft limit function: it refers to comparing the internal position feedback of the driver with the set limit value, and immediately giving an alarm and performing shutdown operation when the limit value is exceeded. This function can be used in both the absolute position mode and the incremental position mode. In the incremental position mode, P0A-40=2 needs to be set. After the drive is powered on, the origin is reset to find the machine origin, and then the soft limit function is enabled.

Comparison of advantages and disadvantages between traditional hardware limit function and soft limit function;

Traditional hardware limit function		Soft limit function	
1	It can only be limited to linear motion and single rotation motion	1	It can be used not only in linear motion, but also in rotation mode.
2	Requires external mechanical limit switch installation	2	Hardware wiring is not needed to prevent misoperation caused by poor line contact.
3	It is impossible to judge the abnormal mechanical slip.	3	Internal position comparison, to prevent abnormal action caused by mechanical slippage.
4	When the power is cut off, the machine moves out of the limit, so it is impossible to judge and give an alarm.		

Soft limit related function code:

Function code	Name	Setting range	Unit	Out of factory Settings	Effective Time	Category	Relevance Model
P0A-40	Soft limit Setting	0-The soft limit is disabled 1-Enable soft limit immediately after power-on. 2-Enable soft limit after the origin returns to zero.	1	0	Be effective immediately	Stop setting	PST
P0A-41	Maximum value of soft limit	-2147483648~2147483647	Command Unit	2147483647	Be effective immediately	Stop setting	PST
P0A-43	Minimum value of soft limit	-2147483648~2147483647	Command Unit	-2147483648	Be effective immediately	Stop setting	PST

- P0A-40=0, the soft limit function is disabled.
- P0A-40=1, the soft limit function is enabled immediately after the driver is powered on. When the absolute position counter (P0B-07) is greater than P0A-41, FU.950 will give an alarm, and forward overtravel shutdown will be executed; When the absolute position counter (P0B-07) is less than P0A-43, FU.952 will give an alarm and perform negative overtravel shutdown;
- When P0A-40=2, the soft limit will not be enabled before the return of the original point after the driver is powered on. When the absolute position counter (P0B-07) is greater than P0A-41 after the return of the original point, a warning of FU.950 will be given, and forward overtravel shutdown will be performed. When the absolute position counter (P0B-07) is less than P0A-43 after the origin is reset, an alarm of FU.952 will be given and forward overtravel shutdown will be executed.

4.6 Pre-operation inspection

Please first disconnect the load connected to the servo motor, the coupling connected to the servo motor shaft and its related accessories. Ensure that the servo motor can work normally without load, and then connect the load to avoid unnecessary danger.

Before running, please check and ensure that:

1. The servo driver has no obvious damage in appearance;
2. The wiring terminal has been insulated;
3. There are no conductive objects or combustible objects such as screws or metal sheets in the driver, and there are no conductive foreign objects at the wiring port;
4. Servo driver or external braking resistor is not placed on combustible objects;
5. Wiring is complete and correct:
 - The driver power supply, auxiliary power supply and grounding terminal are connected correctly; All control signal cables are connected correctly and reliably; All limit switches and protection signals have been connected correctly.
6. The enable switch has been turned OFF;
7. Cut off the power supply circuit and the emergency stop alarm circuit to keep the path;
8. The external voltage reference of servo driver is correct.

Power on the servo driver when the controller does not send the operation command signal. Check and ensure that:

- The servo motor can rotate normally without vibration or excessive running sound;
- All parameters are set correctly. Unexpected actions may occur according to different mechanical characteristics. Please do not set excessively extreme parameters.
- Bus voltage indicator and digital tube display are normal.

4.7 Load inertia identification and gain adjustment

First of all, please install and wire correctly. After setting the relevant functional parameters, refer to Figure 4-20 for the use process, and debug the inertia identification, rigidity table and vibration suppression.

Inertia identification (see 4.7.1 for details). After obtaining the correct load inertia ratio, it is recommended to adjust the gain automatically (see 4.7.2 for details) first, and then adjust the gain manually if the effect is not good (see 4.6.3 for details). Mechanical resonance can be suppressed by notch filter, and two resonance frequencies can be set (see 4.7.4 for details). The general debugging process is shown in the following flowchart.

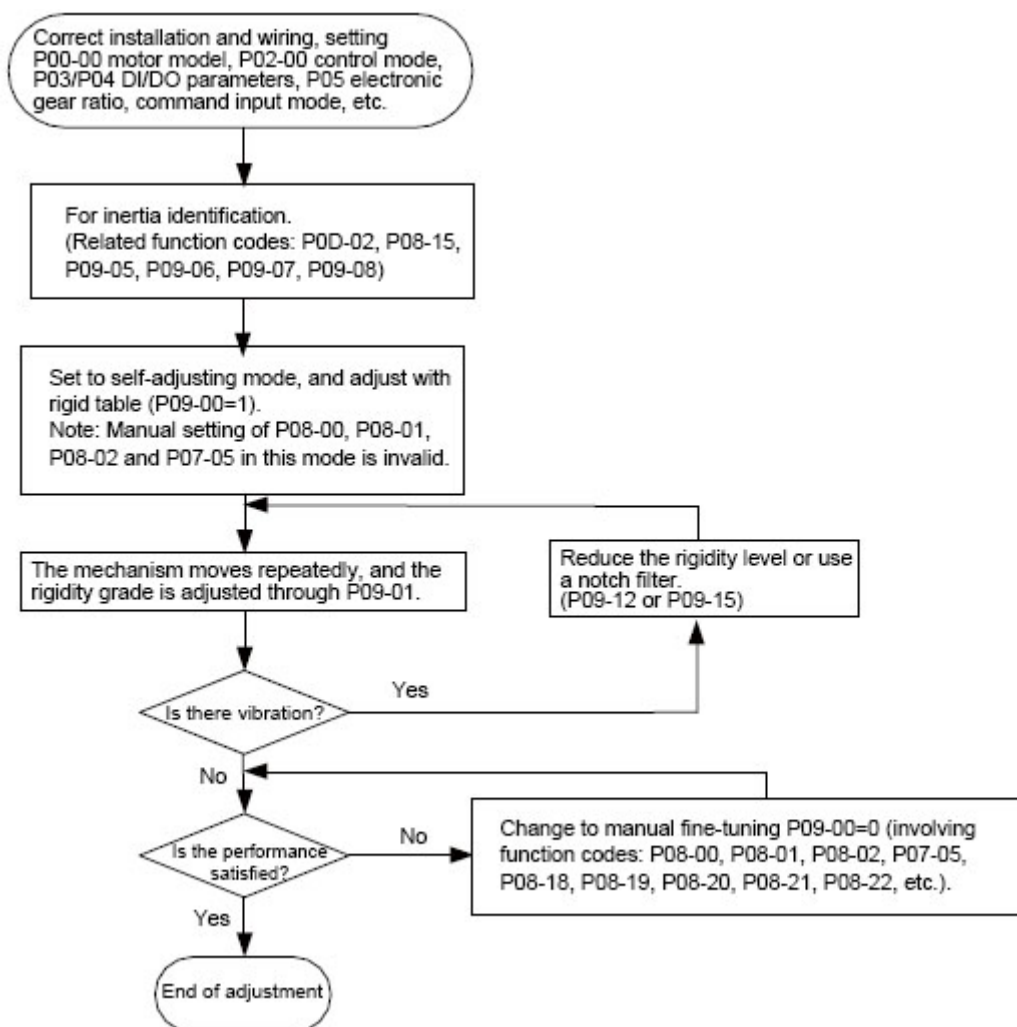


Figure 4-20 General Debugging Flowchart

4.7.1 Inertia identification

Inertia identification is needed before automatic gain adjustment or manual gain adjustment to get the real load inertia ratio. The flow chart of inertia identification is as follows:

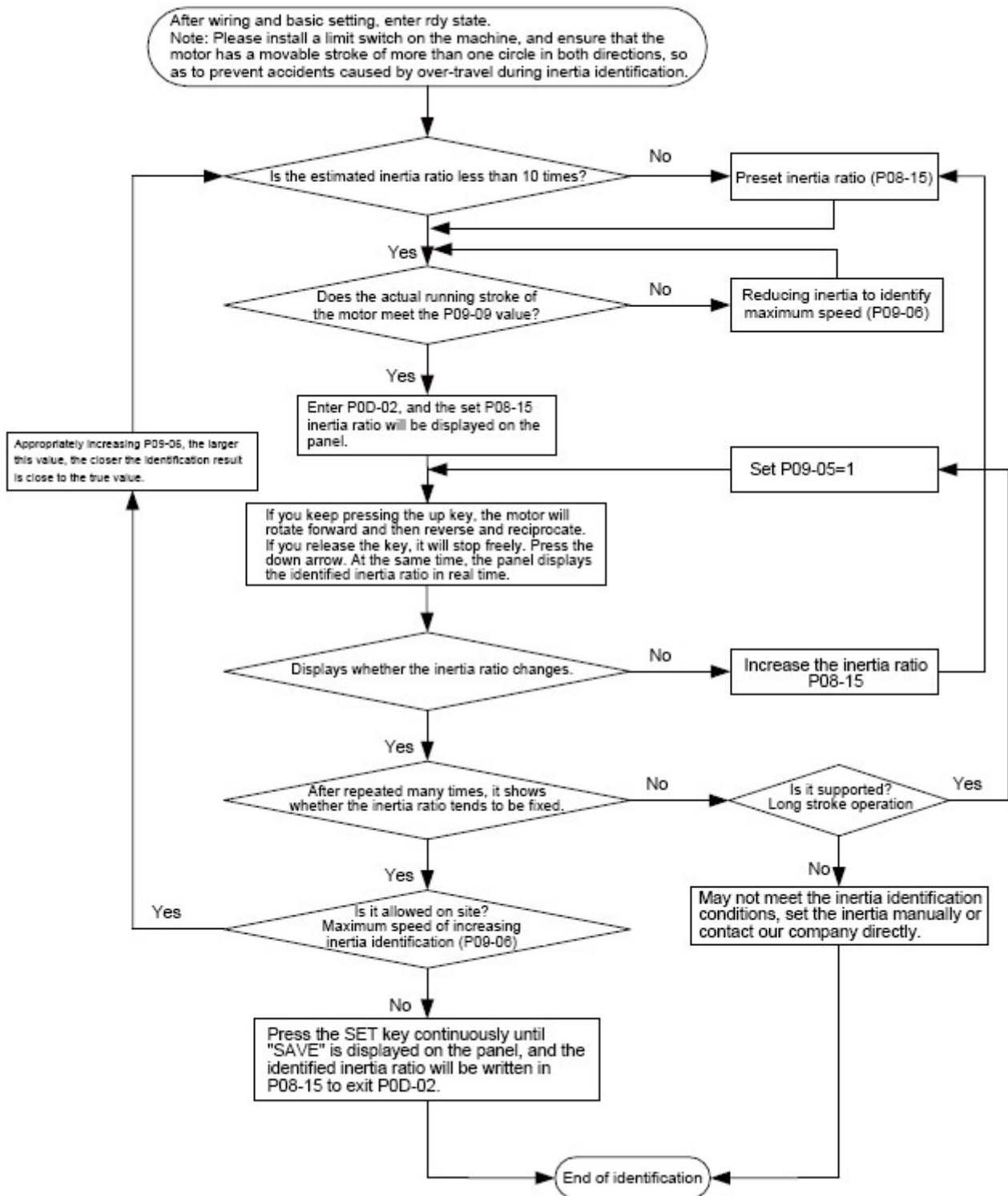


Figure 4-21 Inertia Identification and Debugging Flowchart

- Note:
- If the actual speed can't keep up with the instruction because the inertia ratio is too small under the default value of P08-15=1, and the identification fails, it is necessary to preset the "Last Output Average of Inertia Identification" (P08-15). The preset value is suggested to be 5 times as the initial value and gradually increase until it can be identified normally.
 - Off-line inertia identification mode, it is generally recommended to use triangular wave mode, and if there is an occasion with poor identification effect, try using step rectangular wave mode.

- **Pay attention to the mechanical stroke when P09-05=1, so as to prevent the off-line inertia identification from exceeding the distance and causing accidents.**

☆ Related function codes are as follows:

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P09-05	Mode selection of off-line inertia identification	0: positive and negative triangular wave mode 1: Jog inching mode	-	0	Be effective immediately	Stop setting	PST
P09-06	Maximum speed of inertia identification	100~1000	rpm	500	Be effective immediately	Stop setting	PST
P09-07	Time constant of acceleration to maximum speed in inertia identification	20~800	ms	125	Be effective immediately	Stop setting	PST
P09-08	Waiting time after single inertia identification is completed	50~10000	ms	800	Be effective immediately	Stop setting	
P09-09	Complete single inertia identification motor rotation number	0.00~2.00	r	-	-	Display	

Conditions for inertia identification to be effective:

- The actual maximum motor speed is higher than 150rpm;
- The acceleration during actual acceleration and deceleration is above 3000rpm/s;
- The load torque is relatively stable and cannot change drastically;
- 120 times of inertia can be identified at most;
- Failure may be identified when the mechanical rigidity is extremely low or the backlash of the transmission mechanism is large.

4.7.2 Automatic gain control

The general method of automatic gain adjustment is to set P09-00 to 1 first, and then apply instructions to make the servo motor move. At this time, the value of P09-01 rigidity grade is adjusted while observing the effect until satisfactory results are achieved. If you are not satisfied all the time, switch to manual gain adjustment mode.

- Note:
- When the rigidity table is valid, the four parameters P08-00, P08-01, P08-02 and P07-05 will be automatically set according to the setting of P09-01 rigidity grade, and manual setting is invalid.
 - Vibration may occur after the rigidity is raised, so it is recommended to use notch filter to suppress it. See 4.7.4 for details.
 - In order to avoid vibration caused by sudden increase of rigidity grade, please gradually increase rigidity grade.
 - Please check whether there is a gain margin to avoid the servo system being in a critical stable state.

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P09-00	Self-adjusting mode selection	0- Parameter self-adjustment is invalid. Adjust the gain parameter manually. 1- Parameter self-adjusting mode, using rigid table to automatically adjust gain parameters. 2- Positioning mode, automatic adjustment of gain parameters with rigid table.	-	0	Be effective immediately	Operation setting	PST
P09-01	Selection of rigidity grade	0~31	-	12	Be effective immediately	Operation setting	PST

Recommended rigidity grade	Load mechanism type
Grade 4 ~ 8	Some large machinery
Grade 8 ~ 15	Low rigidity applications such as belts.
Grade 15 ~ 20	Ball screw, direct connection and other applications with high rigidity.

4.7.3 Manual gain adjustment

When manually adjusting the gain, it is necessary to set P09-00 to 0, and then adjust several gain-related parameters separately.

Increasing the position loop gain and velocity ring gain will make the response of the system faster, but too much gain will cause the system instability. In addition, on the premise that the load inertia ratio is basically accurate, the velocity ring gain and the position loop gain should satisfy a certain relationship, as shown below, otherwise the system will be unstable.

$$\frac{1}{3} \leq \frac{P_{08-00} [HZ]}{P_{08-02} [HZ]} \leq 1$$

Increasing the filtering time of torque command P07-05 is helpful to suppress mechanical resonance, but it will reduce the response of the system. Relative velocity ring gain, the filtering time cannot be arbitrarily increased, and the following conditions should be met:

$$P08-00 \leq \frac{1000}{2\pi \times P07-05 \times 4}$$

☆ Related function codes are as follows:

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P08-00	Velocity ring gain	0.1~2000.0	Hz	25.0	Be effective immediately	Operation setting	PS
P08-01	Velocity ring integration time constant	0.15~512.00	ms	31.83	Be effective immediately	Operation setting	PS
P08-02	Position ring gain	0.0~2000.0	Hz	40.0	Be effective immediately	Operation setting	P
P07-05	Torque command filtering time constant	0.00~30.00	ms	0.79	Be effective immediately	Operation setting	PST

4.7.4 Wave trap

The mechanical system has a certain resonance frequency. It may produce resonance near the mechanical resonance frequency if the servo gain is set too high. Meanwhile, notch filter can be considered. The notch filter can suppress mechanical resonance by reducing the gain of a specific frequency, so the gain can be set higher.

There are 4 groups of notch filters, and each group of notch filters has 3 parameters, namely frequency, width grade and attenuation grade. When the frequency is the default value of 4000Hz, the notch filter is actually invalid. Among them, the 1st and 2nd groups of traps are manual traps, and the parameters are set manually by the user. The 3rd and 4th groups of traps are adaptive traps, which are set by the driver when the adaptive filter mode is turned on, or can be set manually if the adaptive filter mode is not turned on.

The mode of adaptive notch filter is controlled by P09-02 function code. When P09-02 is set to 1, the third group trap is valid. When the servo is enabled and resonance is detected, the parameters will be automatically set to suppress vibration. When P09-02 is set to 2, the 3rd and 4th groups of notch filters are effective together, and both groups of notch filters can be set automatically.

If a notch filter is used to suppress resonance, an adaptive notch filter is preferred. If the adaptive notch filter is ineffective or ineffective, a manual notch filter can be used. When using the manual notch filter, set the frequency parameter to the actual resonance frequency. This frequency can be obtained by the mechanical characteristic analysis tool of the background software. It is recommended to keep the default value of 2 for the width level. The depth level is adjusted according to the situation. The smaller this parameter is, the stronger the suppression effect on resonance is. The larger it is, the weaker the suppression effect is. If it is set to 99, it will hardly work. Although lowering the depth level will enhance the suppression effect, it will also lead to phase lag, which may make the system unstable, so it should not be lowered at will.

Note:

- The notch filter can only be used in modes other than torque mode;
- If P09-02 is always set to 1 or 2, the parameters updated by the adaptive notch filter are automatically written into EEPROM every 30 minutes, and the updates within 30 minutes will not be stored in EEPROM;
- When P09-02 is set to 0, the adaptive filter will keep the current parameters unchanged. After using adaptive filter to suppress vibration correctly and stabilize for a period of time. You can use this function to fix the parameters of the adaptive notch filter;
- Although there are 4 groups of notch filters in total, it is recommended that at most 2 groups of notch filters work at the same time, otherwise the vibration may be aggravated;
- When the resonance frequency is below 300Hz, the effect of adaptive notch filter will be reduced;
- When using the adaptive notch filter, please turn off the driver in time if the vibration cannot be eliminated for a long time.

Chapter 5 Summary Table of Parameters

Functional code group	Parameter group summary	Functional code group	Parameter group summary
P00 group	Servo motor parameters	P0A group	Fault and protection parameters
P01 group	Driver parameters	P0B group	Monitoring parameters
P02 group	Basic control parameters	P0C group	Communication parameters
P03 group	Terminal input parameters	P0D group	Auxiliary function parameter
P04 group	Terminal output parameters	P0F group	Full closed-loop functional parameters
P05 group	Position control parameter	P11 group	Multi-segment position function parameter
P06 group	Speed control parameter	P12 group	Multistage velocity parameter
P07 group	Torque control parameters	P17 group	Virtual DIDO parameter
P08 group	Gain class parameter	P30 group	Communication reading servo related variables
P09 group	Self-adjusting parameter	P31 group	Communicating given servo-related variables

P00 group servo motor parameters

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P00 00	Motor No.	14130: Tamagawa absolute value encoder motor 22 □□□□: 220v class incremental encoder motor. 38 □□□□: 380 V incremental encoder motor	-	14130	Power on again	Stop setting	ALL
P00 02	Unlabeled	-	-	-	-	Display	-
P00 09	Rated voltage	0-220 1-380	V	-	Power on again	Stop setting	-
P00 10	Rated power	0.01~655.35	kW	-	Power on again	Stop setting	-
P00 11	Rated current	0.01~655.35	A	-	Power on again	Stop setting	-
P00 12	Torque torque	0.01~655.35	Nm	-	Power on again	Stop setting	-
P00 13	Maximum torque	0.10~655.35	Nm	-	Power on again	Stop setting	-
P00 14	Rated rotating speed	100~6000	rpm	-	Power on again	Stop setting	-
P00 15	Maximum rotating speed	100~6000	rpm	-	Power on again	Stop setting	-
P00 16	Moment of inertia Jm	0.01~655.35	kgcm ²	-	Power on again	Stop setting	-
P00 17	Pole logarithm of permanent magnet synchronous motor	2~360	Antipolar	-	Power on again	Stop setting	-
P00 18	Stator resistance	0.001~65.535	Ω	-	Power on again	Stop setting	-
P00 19	Stator inductance Lq	0.01~655.35	mH	-	Power on again	Stop setting	-
P00 20	Stator inductance Ld	0.01~655.35	mH	-	Power on again	Stop setting	-
P00 21	Linear back emf coefficient	0.01~655.35	mV/rpm	-	Power on again	Stop setting	-

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P00	22	Torque coefficient Kt	0.01~655.35	Nm/Arms	-	Power on again	Stop setting	-
P00	23	Electrical constant Te	0.01~655.35	ms	-	Power on again	Stop setting	-
P00	24	Mechanical constant Tm	0.01~655.35	ms	-	Power on again	Stop setting	-
P00	28	Absolute code wheel position offset	0~1073741824	P/r	-	Power on again	Stop setting	-
P00	30	Encoder selection (HEX)	0x000- Ordinary Incremental Encoder (UVW-ABZ) 0x010-17bit domochuan bus encoder	1	0x010	Power on again	Stop setting	-
P00	31	Number of encoder lines	0~1073741824	P/r	1048576	Power on again	Stop setting	-
P00	33	Z signal corresponding angle	0.0~360	°	180	Power on again	Stop setting	-
P00	34	Angle corresponding to rising edge of U phase	0.0~360	°	180	Power on again	Stop setting	-

P01 group driver parameters

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P01	00	MCU software version number	0~65535	-	-	-	Display	-
P01	01	FPGA software version number	0~65535	-	-	-	Display	-
P01	02	Servo driver No.	0~65535	-	-	Power on again	Stop setting	-

P02 group basic control parameters

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P02	00	Control mode selection	0: Speed mode 1: Position mode 2: Torque mode 3: Torque Mode <input type="checkbox"/> Speed Mode 4: Speed Mode <input type="checkbox"/> Position Mode 5: Torque Mode <input type="checkbox"/> Position Mode 6: Torque Mode <input type="checkbox"/> Speed <input type="checkbox"/> Position Mixed Mode	-	1	Be effective immediately	Stop setting	-
P02	01	Absolute value system selection	0: Incremental position mode 1: Absolute position linear mode 2: Absolute position rotation mode	-	0	Power on again	Stop setting	ALL
P02	02	Rotation direction selection	0: CCW direction is the forward direction (A is ahead of B) 1: CW direction is the forward direction (Reverse mode, A lags behind B)	-	0	Power on again	Stop setting	PST
P02	03	Output pulse phase	0: CCW direction is the forward direction (A is ahead of B) 1: CW direction is the forward direction (Reverse mode, A lags behind B)	-	0	Power on again	Stop setting	PST
P02	05	Servo-enabled OFF stop mode selection	0: Stop freely and keep it running freely. 1: Stop at zero speed and keep it running freely.	-	0	Be effective immediately	Stop setting	PST

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P02	06	Fault No.2 Stop Mode Selection	0: Stop freely and keep it running freely. 1: Stop at zero speed and keep it running freely.	-	0	Be effective immediately	Stop setting	PST
P02	07	Selection of overtravel stop mode	0: Stop freely and keep it running freely. 1: zero-speed shutdown, and the position remains locked. 2: Stop at zero speed and keep it running freely.	-	1	Be effective immediately	Stop setting	PST
P02	08	Fault No.2 Stop Mode Selection	0- Stop freely and keep it running freely.	-	0	Be effective immediately	Stop setting	PST
P02	09	Delay from internal contracting brake output ON to command reception	0~500	ms	250	Be effective immediately	Operation setting	PS
P02	10	At rest state, the internal contracting braking output is OFF and the motor is not energized.	1~1000	ms	150	Be effective immediately	Operation setting	PS
P02	11	Rotating state, speed threshold when the internal contracting brake output is OFF.	0~3000	rpm	30	Be effective immediately	Operation setting	PS
P02	12	In the rotating state, the motor is not energized until the internal contracting brake output is OFF.	1~1000	ms	500	Be effective immediately	Operation setting	PS
P02	15	LED warning display selection	0: output warning information immediately. 1: No warning message is output.	-	0	Be effective immediately	Stop setting	PST
P02	18	Servo enable (S-ON) Filtering time constant	0~64	ms	0	Be effective immediately	Stop setting	PST
P02	21	Minimum allowable braking resistance of driver	-	Ω	-	-	Display	PST
P02	22	Built-in braking resistor power	-	W	-	-	Display	PST
P02	23	Built-in braking resistor resistance	-	Ω	-	-	Display	PST
P02	24	Resistance heat dissipation coefficient	10~100	%	30	Be effective immediately	Stop setting	PST
P02	25	Brake resistance setting	0: Use the built-in braking resistor 1: Use external braking resistor to cool naturally 2: Use external braking resistor to force air cooling 3: No braking resistor, totally absorbed by capacitor.	-	0	Be effective immediately	Stop setting	PST
P02	26	External brake resistance power	1~65535	W	-	Be effective immediately	Stop setting	PST
P02	27	Resistance value of the external brake resistance	1~1000	Ω	-	Be effective immediately	Stop setting	PST
P02	30	User password	0~65535	-	0	Power on again	Stop setting	PST
P02	31	System parameter initialization	0: No operation 1: Restore the factory set value. (Except P00/P01 group parameters) 2: Clear the fault record	-	0	Be effective immediately	Stop setting	PST
P02	32	Panel default display function	0~99	-	50	Be effective immediately	Operation setting	-
P02	38	Fault short circuit braking time	0~30000	ms	5000	Be effective immediately	Operation setting	PST
P02	39	Fault short-circuit braking threshold	0~3000	0.1%	1000	Be effective immediately	Operation setting	PST

P03 group Terminal input parameters

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P03	00	Power-on effective DI function allocation 1	0~0xFFFF Bit0: corresponding to FunIN.1 Bit1: Corresponding to FunIN.2 Bit15: corresponding to FunIN.16	-	0	Power on again	Operation setting	-
P03	01	Power-on effective DI function allocation 2	0~ 0xFFFF Bit0: corresponding to FunIN.17 Bit1: corresponding to FunIN.18 Bit15: corresponding to FunIN.32	-	0	Power on again	Operation setting	-
P03	02	DI1 terminal function selection	0~37	-	14	Stops working	Operation setting	-
P03	03	DI1 terminal logic selection	Input polarity: 0 ~ 4 0: indicates active low 1: indicates active high level 2: indicates that the rising edge is valid 3: indicates that the falling edge is valid 4: indicates that both rising and falling edges are valid.	-	0	Stops working	Operation setting	-
P03	04	DI2 terminal function selection	0~37	-	15	Stops working	Operation setting	-
P03	05	DI2 terminal logic selection	Input polarity: 0 ~ 4 0: indicates active low 1: indicates active high level 2: indicates that the rising edge is valid 3: indicates that the falling edge is valid 4: indicates that both rising and falling edges are valid.	-	0	Stops working	Operation setting	-
P03	06	DI3 terminal function selection	0~37	-	13	Stops working	Operation setting	-
P03	07	DI3 terminal logic selection	Input polarity: 0 ~ 4 0: indicates active low 1: indicates active high level 2: indicates that the rising edge is valid 3: indicates that the falling edge is valid 4: indicates that both rising and falling edges are valid.	-	0	Stops working	Operation setting	-
P03	08	DI4 terminal function selection	0~37	-	2	Stops working	Operation setting	-
P03	09	DI4 terminal logic selection	Input polarity: 0 ~ 4 0: indicates active low 1: indicates active high level 2: indicates that the rising edge is valid 3: indicates that the falling edge is valid 4: indicates that both rising and falling edges are valid.	-	0	Stops working	Operation setting	-
P03	10	DI5 terminal function selection	0~37	-	1	Stops working	Operation setting	-

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P03	11	DI5 terminal logic selection	Input polarity: 0 ~ 4 0: indicates active low 1: indicates active high level 2: indicates that the rising edge is valid 3: indicates that the falling edge is valid 4: indicates that both rising and falling edges are valid.	-	0	Stops working	Operation setting	-
P03	12	DI6 terminal function selection	0~37	-	12	Stops working	Operation setting	-
P03	13	DI6 terminal logic selection	Input polarity: 0 ~ 4 0: indicates active low 1: indicates active high level 2: indicates that the rising edge is valid 3: indicates that the falling edge is valid 4: indicates that both rising and falling edges are valid.	-	0	Stops working	Operation setting	-
P03	14	DI7 terminal function selection	0~37	-	3	Stops working	Operation setting	-
P03	15	DI7 terminal logic selection	Input polarity: 0 ~ 4 0: indicates active low 1: indicates active high level 2: indicates that the rising edge is valid 3: indicates that the falling edge is valid 4: indicates that both rising and falling edges are valid.	-	0	Stops working	Operation setting	-
P03	16	DI8 terminal function selection	0~37	-	31	Stops working	Operation setting	-
P03	17	DI8 terminal logic selection	Input polarity: 0 ~ 4 0: indicates active low 1: indicates active high level 2: indicates that the rising edge is valid 3: indicates that the falling edge is valid 4: indicates that both rising and falling edges are valid.	-	0	Stops working	Operation setting	-
P03	34	Power-on effective DI function allocation 3	0~0xFFFF Bit0: corresponding to FunIN.33 Bit1: corresponding to FunIN.34 Bit15: corresponding to FunIN.48	-	0	Power on again	Operation setting	-
P03	35	Power-on effective DI function allocation 4	0~0xFFFF Bit0: corresponding to FunIN.49 Bit1: corresponding to FunIN.50 Bit15: corresponding to FunIN.64	-	0	Power on again	Operation setting	-
P03	50	A11 bias	-5000~5000	mV	0	Be effective immediately	Operation setting	-
P03	51	A11 Input filtering time constant	0~655.35	ms	2.00	Be effective immediately	Operation setting	-
P03	53	A11 Dead zone	0~1000.0	mV	10.0	Be effective immediately	Operation setting	-
P03	54	A11 null shift	-500.0~500.0	mV	0.0	Be effective immediately	Operation setting	-

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P03	55	AI2 bias	-5000~5000	mV	0	Be effective immediately	Operation setting	-
P03	56	AI2 Input filtering time constant	0~655.35	ms	2.00	Be effective immediately	Operation setting	-
P03	58	AI2 Dead zone	0~1000.0	mV	10.0	Be effective immediately	Operation setting	-
P03	59	AI2 null shift	-500.0~500.0	mV	0.0	Be effective immediately	Operation setting	-
P03	80	Analog quantity 10V Corresponding speed value	0rpm~9000rpm	1rpm	3000rpm	Be effective immediately	Stop setting	-
P03	81	Analog quantity 10V corresponding torque value	1.00 Times~ 8.00 times rated torque	1.00 times rated torque	1.00 times rated torque	Be effective immediately	Stop setting	-

P04 group Terminal output parameters

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P04	00	DO1 terminal function selection	0~22	-	1	Stops working	Operation setting	-
P04	01	DO1 terminal logic selection	Output polarity reversal setting: 0 ~ 1 0: output L low level when it is active. (Optocoupler on) 1: indicates that H high level is output when it is active. (Optocoupler off)	-	0	Stops working	Operation setting	-
P04	02	DO2 terminal function selection	0~22	-	5	Stops working	Operation setting	-
P04	03	DO2 terminal logic selection	Output polarity reversal setting: 0 ~ 1 0: output L low level when it is active. (Optocoupler on) 1: indicates that H high level is output when it is active. (Optocoupler off)	-	0	Stops working	Operation setting	-
P04	04	DO3 terminal function selection	0~22	-	3	Stops working	Operation setting	-
P04	05	DO3 terminal logic selection	Output polarity reversal setting: 0 ~ 1 0: output L low level when it is active. (Optocoupler on) 1: indicates that H high level is output when it is active. (Optocoupler off)	-	0	Stops working	Operation setting	-
P04	06	DO4 terminal function selection	0~22	-	11	Stops working	Operation setting	-
P04	07	DO4 terminal logic selection	Output polarity reversal setting: 0 ~ 1 0: output L low level when it is active. (Optocoupler on) 1: indicates that H high level is output when it is active. (Optocoupler off)	-	0	Stops working	Operation setting	-
P04	08	DO5 terminal function selection	0~22	-	16	Stops working	Operation setting	-

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P04	09	DO5 terminal logic selection	Output polarity reversal setting: 0 ~ 1 0: output L low level when it is active. (Optocoupler on) 1: indicates that H high level is output when it is active. (Optocoupler off)	-	0	Stops working	Operation setting	-
P04	22	DO source selection	0~31	-	0	Be effective immediately	Stop setting	-
P04	50	AO1 signal selection	00: Motor speed (1V/1000rpm) 01: speed command (1V/1000rpm) 02: Torque command (1V/100%) 03: position deviation (0.05V/ instruction unit) 04: position deviation (0.05V/ encoder unit) 05: position command speed (1V/1000 rpm) 06: Positioning Complete Instruction (Positioning completed: 5V; positioning not completed: 0V) 07: Speed Feedforward (1V/1000rpm)	-	0	Be effective immediately	Operation setting	-
P04	51	AO1 bias voltage	-10000~10000	mV	5000	Be effective immediately	Operation setting	-
P04	52	AO1 multiplying power	-99.99~99.99	Times	1.00	Be effective immediately	Operation setting	-
P04	53	AO2 signal selection	00: motor speed (1V/1000rpm) 01: speed command (1V/1000rpm) 02: Torque command (1V/100%) 03: position deviation (0.05V/ instruction unit) 04: position deviation (0.05V/ encoder unit) 05: position command speed (1V/1000 rpm) 06: Positioning Complete Instruction (Positioning completed: 5V; positioning not completed: 0V) 07: Speed Feedforward (1V/1000rpm)	-	0	Be effective immediately	Operation setting	-
P04	54	AO2 bias voltage	-10000~10000	mV	5000	Be effective immediately	Operation setting	-
P04	55	AO2 multiplying power	-99.99~99.99	Times	1.00	Be effective immediately	Operation setting	-

P05 group Position control parameter

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05	00	Position command source	0: Pulse command 1: Step amount given 2: Multi-segment position command given	-	0	Be effective immediately	Stop setting	P
P05	01	Pulse command input terminal selection	0: Low speed 1: High-speed	-	0	Be effective immediately	Stop setting	P
P05	02	Number of position commands for each rotation of the motor.	0~1048576	P/r	0	Power on again	Stop setting	P
P05	04	Time constant of first-order low-pass filtering	0~6553.5	ms	0.0	Be effective immediately	Stop setting	P
P05	05	Stepping size	-9999~9999	Command unit	50	Be effective immediately	Stop setting	P
P05	06	Average filtering time constant	0.0~128.0	ms	0.0	Be effective immediately	Stop setting	P
P05	07	Electronic gear ratio 1 (molecule)	1~1073741824	-	131072	Be effective immediately	Operation setting	P
P05	09	Electronic gear ratio 1 (denominator)	1~1073741824	-	10000	Be effective immediately	Operation setting	P
P05	11	Electronic gear ratio 2 (molecule)	1~1073741824	-	131072	Be effective immediately	Operation setting	P
P05	13	Electronic gear ratio 2 (denominator)	1~1073741824	-	10000	Be effective immediately	Operation setting	P
P05	15	Pulse command form	0: pulse+direction, positive logic 1: pulse+direction, negative logic 2: phase A+phase B quadrature pulse, 4 times frequency. 3: CW+CCW	-	0	Power on again	Stop setting	P
P05	16	Clear action selection	0: the servo is enabled to be OFF and the position deviation is cleared when a fault occurs. 1: Clear the position deviation pulse in case of enabling OFF and failure. 2: Enable OFF and ClrPosErr signal input through DI clears the position deviation.	-	0	Be effective immediately	Stop setting	P
P05	17	Encoder frequency division pulse number	35~32767	P/r	2500	Power on again	Stop setting	-
P05	19	Speed feed forward control selection	0: No Speed Feedforward 1: Internal Speed Feedforward	-	1	Be effective immediately	Stop setting	P
P05	20	Positioning completion output condition	0: output when the absolute value of position deviation is less than P05-21. 1: Output when the absolute value of position deviation is less than P05-21 and the filtered position command is 0. 2: Output when the absolute value of position deviation is less than P05-21 and the position command before filtering is 0. 3: When the absolute value of position deviation is less than the positioning completion/approaching threshold, and the position command filter is 0, it will be output, and at least the time set in P05-60 will be kept valid.	-	0	Be effective immediately	Operation setting	P

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05	21	Positioning completed threshold	1~65535	Encoder /connabd unit	734	Be effective immediately	Operation setting	P
P05	22	The positioning is close to the threshold	1~65535	Encoder /connabd unit	65535	Be effective immediately	Operation setting	P
P05	23	Interrupt positioning function enable	0: Forbidden of interrupt positioning function 1: Use the Interrupt positioning function	-	0	Power on again	Stop setting	P
P05	24	Displacement of interrupt positioning function	0~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P05	26	Constant velocity running speed of interrupt positioning function	0~6000	rpm	200	Be effective immediately	Operation setting	P
P05	27	Acceleration and deceleration time of interrupt positioning function	0~1000	ms	10	Be effective immediately	Operation setting	P
P05	29	Fixed-length lock and release signal enabled	0: Not enabled 1: Enable	-	1	Be effective immediately	Operation setting	P
P05	30	Origin reset enable control	0: Turn off the origin reset 1: input the HomingStart signal through DI to enable the origin reset function. 2: Input HomingStart signal through DI, and enable the electrical return to zero function. 3: Start the origin reset immediately after power-on. 4: Conduct the origin reset immediately. 5: Start the electrical return to zero command 6: Take the current position as the origin.	-	0	Be effective immediately	Operation setting	P
P05	31	Origin reset mode	0: Forward return to zero, and the deceleration point and origin are the origin switches. 1: Reverse to zero, with deceleration point and origin as the origin switch. 2: Return to zero in the forward direction, and the deceleration point and origin are the Z signal of the motor. 3: Reverse to zero, deceleration point and origin are motor Z signal. 4: Forward return to zero, the deceleration point is the origin switch, and the origin is the motor Z signal. 5: Reverse to zero, the deceleration point is the origin switch, and the origin is the Z signal of the motor. 6: Forward return to zero, deceleration point and origin are forward overtravel switches. 7: Reverse return to zero, and the deceleration point and origin are reverse overtravel switches. 8: Forward return to zero, deceleration point is forward overtravel switch, and origin is motor Z signal. 9: Reverse return to zero, the deceleration point is the reverse overtravel switch, and the origin is the motor Z signal. 10: Positive return to zero, deceleration point and origin are mechanical limit positions.	-	0	Be effective immediately	Stop setting	P

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
		11: Reverse to zero, deceleration point and origin are mechanical limit positions. 12: Forward return to zero, deceleration point is mechanical limit position, and origin is motor Z signal. 13: Reverse to zero, the deceleration point is the mechanical limit position, and the origin is the Z signal of the motor.					
P05	32	The speed of high-speed search origin switch signal	rpm	100	Be effective immediately	Operation setting	P
P05	33	The speed of the low-speed search origin switch signal	rpm	10	Be effective immediately	Operation setting	P
P05	34	The acceleration and deceleration time when searching the origin.	ms	1000	Be effective immediately	Stop setting	P
P05	35	Limited time to find the origin	ms	10000	Be effective immediately	Stop setting	P
P05	36	Mechanical origin offset	Command unit	0	Be effective immediately	Stop setting	P
P05	38	Selection of servo pulse output source	-	0	Power on again	Stop setting	P
P05	39	Electronic gear ratio switching condition	-	0	Be effective immediately	Stop setting	P
P05	40	Offset of mechanical origin and treatment method of limit	-	0	Be effective immediately	Stop setting	P
P05	41	Z-pulse output polarity selection	-	1	Power on again	Stop setting	P
P05	43	Position pulse edge selection	-	0	Power on again	Operation setting	PST
P05	46	Absolute Position Linear Mode Position Offset (Low 32 bits)	Encoder unit	0	Be effective immediately	Stop setting	ALL
P05	48	Absolute Position Linear Mode Position Offset (high 32 bits)	Encoder unit	0	Be effective immediately	Stop setting	ALL
P05	50	Absolute position rotation mode mechanical gear ratio (molecular)	-	65535	Be effective immediately	Stop setting	ALL
P05	51	Absolute position rotation mode mechanical gear ratio (denominator)	-	1	Be effective immediately	Stop setting	ALL
P05	52	Number of pulses for one revolution of load in absolute position rotation mode (low 32 bits)	Encoder unit	0	Be effective immediately	Stop setting	ALL

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P05	54	Number of pulses for one revolution of load in absolute position rotation mode (high 32 bits)	0~127	Encoder unit	0	Be effective immediately	Stop setting	ALL
P05	56	Threshold for judging the speed of touching and stopping back to zero	0~1000	rpm	2	Be effective immediately	Operation setting	P
P05	58	Touch stop back to zero torque limit	0~300.0	%	100.0%	Be effective immediately	Operation setting	P
P05	59	Positioning completion window time	0~30000	ms	0	Be effective immediately	Operation setting	P
P05	60	Positioning completion holding time	0~30000	ms	0	Be effective immediately	Operation setting	P
P05	61	Encoder frequency division pulse number (32 bits)	0~262143	P/r	0	Power on again	Stop setting	-
P05	63	Width of collector Z signal	-	°	0.15	Power on again	Stop setting	P

P06 group Speed control parameter

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P06	00	Master speed command A source	0: number given (P06-03) 1:A11 2:A12	-	0	Be effective immediately	Stop setting	S
P06	01	Auxiliary speed command B source	0: number given (P06-03) 1:A11 2:A12 3: 0 (no effect) 4: 0 (no effect) 5: Multistage Speed Command	-	1	Be effective immediately	Stop setting	S
P06	02	Speed command selection	0: Master speed command A source 1: Auxiliary speed command B source 2:A+B 3:A/B switching 4:Communication given	-	0	Be effective immediately	Stop setting	S
P06	03	Speed command keyboard setting value	-6000~6000	rpm	200	Be effective immediately	Operation setting	S
P06	04	Set point of inching speed	0~6000	rpm	100	Be effective immediately	Operation setting	S
P06	05	Speed command acceleration ramp time constant	0~65535	ms	0	Be effective immediately	Operation setting	S
P06	06	Speed command deceleration ramp time constant	0~65535	ms	0	Be effective immediately	Operation setting	S
P06	07	Threshold of maximum speed	0~6000	rpm	6000	Be effective immediately	Operation setting	S
P06	08	Forward velocity threshold	0~6000	rpm	6000	Be effective immediately	Operation setting	S
P06	09	Reverse velocity threshold	0~6000	rpm	6000	Be effective immediately	Operation setting	S
P06	11	Torque feedforward control selection	0: No torque feedforward 1. Internal torque feedforward	-	1	Be effective immediately	Operation setting	PS

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P06	15	Zero fixed speed threshold	0~6000	rpm	10	Be effective immediately	Operation setting	S
P06	16	Motor rotation speed threshold	0~1000	rpm	20	Be effective immediately	Operation setting	S
P06	17	Speed consistent signal threshold	0~100	rpm	10	Be effective immediately	Operation setting	S
P06	18	Speed reaches signal threshold	10~6000	rpm	1000	Be effective immediately	Operation setting	S
P06	19	Zero speed output signal threshold	1~6000	rpm	10	Be effective immediately	Operation setting	S

P07 group torque control parameters

Torque command 100% corresponds to the rated torque of the motor.

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P07	00	Main torque command A source	0: number given (P07-03) 1:A11 2:A12	-	0	Be effective immediately	Stop setting	T
P07	01	Auxiliary torque command B source	0: number given (P07-03) 1:A11 2:A12	-	1	Be effective immediately	Stop setting	T
P07	02	Torque command selection	0: Main torque command A source 1: auxiliary torque command B source 2: main instruction A source+auxiliary instruction B source 3: Switch between the source of main instruction A and the source of auxiliary instruction B. 4:Communication given	-	0	Be effective immediately	Stop setting	T
P07	03	Torque command keyboard setting value	-300.0~300.0	%	0	Be effective immediately	Operation setting	T
P07	05	Torque command filtering time constant	0~30.00	ms	0.79	Be effective immediately	Operation setting	PST
P07	06	The second torque command filtering time constant	0~30.00	ms	0.79	Be effective immediately	Operation setting	PST
P07	07	Torque limiting source	0: positive and negative internal torque limit 1: Positive and negative external torque limit (using P-CL, N-CL selection) 2: T-LMT is used as external torque limit input. 3: Take the minimum value of positive and negative external torque and external T-LMT as the torque limit (selected by P-CL and N-CL). 4: Switch between positive and negative internal torque limit and T-LMT torque limit (using P-CL,N-CL to select)	-	0	Be effective immediately	Stop setting	PST
P07	08	T-LMT selection	1: A11 2: A12	-	2	Be effective immediately	Stop setting	PST
P07	09	Positive internal torque limit	0.0~300.0	%	300.0	Be effective immediately	Operation setting	PST
P07	10	Negative internal torque limit	0.0~300.0	%	300.0	Be effective immediately	Operation setting	PST
P07	11	Positive external torque limit	0.0~300.0	%	300.0	Be effective immediately	Operation setting	PST

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P07	12	Negative external torque limit	0.0~300.0	%	300.0	Be effective immediately	Operation setting	PST
P07	17	Speed limit source selection	0: Speed limit Internal speed limit (Speed limit in torque control) 1: Use V-LMT as external speed limit input. 2: Select P07-19/P07-20 as the internal speed limit through FunIN.36 (V-SEL).	-	0	Be effective immediately	Operation setting	T
P07	18	V-LMT selection	1: AI1 2: AI2	-	1	Be effective immediately	Operation setting	T
P07	19	Torque control forward speed limit/torque control speed limit 1	0~6000	rpm	3000	Be effective immediately	Operation setting	T
P07	20	Negative speed limit value in torque control/speed limit value in torque control 2	0~6000	rpm	3000	Be effective immediately	Operation setting	T
P07	21	Torque reaches reference value	0.0~300.0	%	0.0	Be effective immediately	Operation setting	PST
P07	22	Torque reaches effective value	0.0~300.0	%	20.0	Be effective immediately	Operation setting	PST
P07	23	Torque reaches invalid value	0.0~300.0	%	10.0	Be effective immediately	Operation setting	PST
P07	40	Speed limited window in torque mode	0.5~30.0	ms	1.0	Be effective immediately	Operation setting	T

P08 group Gain class parameter

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P08	00	Velocity ring gain	0.1~2000.0	Hz	25.0	Be effective immediately	Operation setting	PS
P08	01	Velocity ring integration time constant	0.15~512.00	ms	31.83	Be effective immediately	Operation setting	PS
P08	02	Position ring gain	0.0~2000.0	Hz	40.0	Be effective immediately	Operation setting	P
P08	03	2nd Velocity ring gain	0.1~2000.0	Hz	40.0	Be effective immediately	Operation setting	PS
P08	04	2nd Velocity ring integration time constant	0.15~512.00	ms	40.00	Be effective immediately	Operation setting	PS
P08	05	2nd Position ring gain	0.0~2000.0	Hz	64.0	Be effective immediately	Operation setting	P
P08	08	Second gain mode setting	0: the first gain is fixed, and external DI is used for P/PI switching; 1: Use gain switching according to P08-09 condition setting.	-	1	Be effective immediately	Operation setting	PST
P08	09	Selection of gain switching conditions	0: the first gain is fixed (PS) 1: using external DI switching (PS) 2: Torque command is large (PS) 3: Speed command is large (PS) 4: Speed command change rate is large (PS) 5: Speed command high and low speed threshold (PS) 6: Large position deviation (P) 7: Position command (P) 8: Positioning completed (P)	-	0	Be effective immediately	Operation setting	PST

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
		9: Actual speed is high (P) 10: Position command+actual speed (P)					
P08	10	Gain switching delay time	ms	5.0	Be effective immediately	Operation setting	PST
P08	11	Gain switching level	According to the switching condition	50	Be effective immediately	Operation setting	PST
P08	12	Time delay of gain switching	According to the switching condition	30	Be effective immediately	Operation setting	PST
P08	13	Position gain switching time	ms	3.0	Be effective immediately	Operation setting	P
P08	15	Load moment of inertia ratio	Times	1.00	Be effective immediately	Operation setting	PST
P08	18	Velocity feedforward filtering time constant	ms	0.50	Be effective immediately	Operation setting	P
P08	19	Velocity Feedforward gain	%	0.0	Be effective immediately	Operation setting	P
P08	20	Torque feedforward filtering time constant	ms	0.50	Be effective immediately	Stop setting	PS
P08	21	Torque feedforward gain	%	0.0	Be effective immediately	Operation setting	PS
P08	22	Speed feedback filtering option 0: Speed feedback average filtering is prohibited 1: Speed feedback quadratic average filtering 2: Speed feedback 4th average filtering 3: Speed feedback 8 times average filtering 4: Speed feedback 16 times average filtering	-	0	Be effective immediately	Stop setting	PS
P08	23	Speed feedback low-pass filtering cutoff frequency	Hz	4000	Be effective immediately	Operation setting	PS
P08	24	Pseudo-differential feedforward control coefficient	-	100.0	Be effective immediately	Operation setting	PS
P08	27	Friction force gain	%	0.0	Be effective immediately	Operation setting	P
P08	28	Static friction force	%	0.0	Be effective immediately	Operation setting	P

P09 group Self-adjusting parameter

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P09	00	Self-adjusting mode selection	0: parameter self-adjustment is invalid, and parameters are adjusted manually. 1: parameter self-adjustment mode, with a rigid table to automatically adjust the gain parameters 2: Positioning mode, with a rigid table to automatically adjust the gain parameters.	-	0	Be effective immediately	Operation setting	PST
P09	01	Selection of rigidity grade	0~31	-	12	Be effective immediately	Operation setting	PST
P09	02	Adaptive wave trap mode selection	0: The adaptive wave trap is not updated any more. 1: Adaptive wave traps are effective (group 3 notch filters) 2: Adaptive wave traps are effective. (Group 3 and Group 4 wave traps) 3: Only the resonance point is tested, which is displayed in P09-24. 4: Restore the values of the 3rd and 4th groups of wave traps to the factory state.	-	0	Be effective immediately	Operation setting	PST
P09	03	On-line inertia identification mode	0: Turn off online identification 1: Turn on online identification and change slowly. 2: Open online identification, general change. 3: Open online identification, rapid change.	-	0	Be effective immediately	Operation setting	RST
P09	04	Mode selection of low frequency resonance suppression	0: Set vibration frequency manually. 1: Automatic identification of vibration frequency	-	0	Be effective immediately	Operation setting	P
P09	05	Mode selection of off-line inertia identification	0: positive and negative triangular wave mode 1: Jog inching mode	-	0	Be effective immediately	Stop setting	PST
P09	06	Maximum speed of inertia identification	100~1000	rpm	500	Be effective immediately	Stop setting	PST
P09	07	Time constant of acceleration to maximum speed in inertia identification	20~800	ms	125	Be effective immediately	Stop setting	PST
P09	08	Waiting time after single inertia identification is completed	50~10000	ms	800	Be effective immediately	Stop setting	PST
P09	09	Complete single inertia identification motor rotation number.	0.00~2.00	r	-	-	Display	PST
P09	12	Group 1 wave traps frequency	50~4000	Hz	4000	Be effective immediately	Operation setting	PS
P09	13	Group 1 wave traps width class	0~20	-	2	Be effective immediately	Operation setting	PS
P09	14	Group 1 wave traps depth class	0~99	-	0	Be effective immediately	Operation setting	PS
P09	15	Group 2 wave traps frequency	50~4000	Hz	4000	Be effective immediately	Operation setting	PS
P09	16	Group 2 wave traps width class	0~20	-	2	Be effective immediately	Operation setting	PS
P09	17	Group 2 wave traps depth class	0~99	-	0	Be effective immediately	Operation setting	PS
P09	18	Group 3 wave traps frequency	50~4000	Hz	4000	Be effective immediately	Operation setting	PS
P09	19	Group 3 wave traps width class	0~20	-	2	Be effective immediately	Operation setting	PS

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P09	20	Group 3 wave traps depth class	0~99	-	0	Be effective immediately	Operation setting	PS
P09	21	Group 4 wave traps frequency	50~4000	Hz	4000	Be effective immediately	Operation setting	PS
P09	22	Group 4 wave traps width class	0~20	-	2	Be effective immediately	Operation setting	PS
P09	23	Group 4 wave traps depth class	0~99	-	0	Be effective immediately	Operation setting	PS
P09	24	Resonant frequency identification result	0~2	Hz	0	-	Display	PS
P09	30	Compensation gain of torque disturbance	0.0~100.0	%	0.0	Be effective immediately	Operation setting	PS
P09	31	Filter time constant of torque disturbance observer	0.00~25.00	ms	0.50	Be effective immediately	Operation setting	PS
P09	38	Low frequency resonance frequency	1.0~100.0	Hz	100.0	Be effective immediately	Operation setting	P
P09	39	Low frequency resonance frequency settings	0~10	-	2	Be effective immediately	Operation setting	P

P0A group Fault and protection parameters

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P0A	00	Selection of power input open-phase protection	0: Enable fault inhibit warning 1: Enable faults and warnings 2: No faults and warnings	-	0	Be effective immediately	Operation setting	-
P0A	03	Power-off save function enables selection	0: Do not perform power-off saving 1: Perform power-off saving	-	0	Be effective immediately	Operation setting	-
P0A	04	Motor overload protection gain	50~300	%	100	Be effective immediately	Stop setting	-
P0A	08	Overspeed fault threshold	0~10000	rpm	0	Be effective immediately	Operation setting	PST
P0A	09	Maximum position pulse frequency	100~4000	kHz	4000	Be effective immediately	Stop setting	P
P0A	10	Excessive position deviation fault threshold	1~60000	°	1440	Be effective immediately	Operation setting	P
P0A	12	Protection of flywheel trip function is enabled.	0: No protection of flywheel trip 1: Turn on the protection of flywheel trip	-	1	Be effective immediately	Operation setting	PST
P0A	16	Low frequency resonance position deviation judgment threshold	1 -1000	Encoder unit	5	Be effective immediately	Operation setting	P
P0A	17	Position setting unit selection	0: encoder unit 1: Instruction unit	-	0	Be effective immediately	Stop setting	P
P0A	19	DI8 Filtering time constant	0~255	11ns	80	Power on again	Stop setting	-
P0A	24	Low-speed pulse input pin filtering time constant	0~255	11ns	30	Power on again	Stop setting	P
P0A	25	Velocity feedback display value filtering time constant	0~5000	ms	50	Be effective immediately	Stop setting	-
P0A	26	Motor overload shielding enabled	0: Open motor overload detection 1: Shielding motor overload warning and fault detection	-	0	Be effective immediately	Stop setting	-
P0A	27	Velocity DO filtering	0~5000	ms	10	Be effective	Stop	-

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
		time constant				immediately	setting	
P0A	28	Filter time constant of orthogonal encoder	0~255	11ns	30	Power on again	Stop setting	-
P0A	30	High-speed pulse input pin filtering time constant	0~255	11ns	3	Power on again	Stop setting	P
P0A	32	Block the over-temperature protection time window	10~65535	ms	200	Be effective immediately	Operation setting	-
P0A	33	Block over-temperature protection is enabled	0: Detection of block over-temperature protection of shield motor 1: Enable the detection of motor block over-temperature protection.	-	1	Be effective immediately	Operation setting	-
P0A	36	Multi-turn overflow fault selection of encoder	0: No mask 1: Shielding	-	0	Be effective immediately	Stop setting	ALL
P0A	40	Soft limit Setting	0: The soft limit is disabled 1: Enable soft limit immediately after power-on. 2: Enable soft limit after the origin returns to zero.	1	0	Be effective immediately	Stop setting	PST
P0A	41	Maximum value of soft limit	-2147483648~2147483647	Com mand unit	214748 3647	Be effective immediately	Stop setting	PST
P0A	43	Minimum value of soft limit	-2147483648~2147483647	Com mand unit	-214748 3648	Be effective immediately	Stop setting	PST
P0A	47	Internal contracting brake protection detection enable	0: Not enabled 1: Enable	-	1	Be effective immediately	Operation setting	ALL

P0B group Monitoring parameters

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P0B	00	Actual motor speed	-	rpm	-	-	Display	PST
P0B	01	Speed command	-	rpm	-	-	Display	PS
P0B	02	Internal torque command (relative to rated torque)	-	%	-	-	Display	PST
P0B	03	Input signal (DI signal) monitoring	-	-	-	-	Display	PST
P0B	05	Output signal (DO signal) monitoring	-	-	-	-	Display	PST
P0B	07	Absolute position counter (32 bits decimal display)	-	Command unit	-	-	Display	PST
P0B	09	Mechanical angle (number of pulses from origin)	-	Encoder unit	-	-	Display	PST
P0B	10	Electrical angle	-	°	-	-	Display	PST
P0B	11	Input that speed information corresponding to the position command	-	rpm	-	-	Display	P
P0B	12	Average load rate	-	%	-	-	Display	PST
P0B	13	Input command pulse counter (32 bits decimal display)	-	Command unit	-	-	Display	P
P0B	15	Encoder position deviation counter(32 bits decimal display)	-	Encoder unit	-	-	Display	P
P0B	17	Feedback pulse counter (32 bits decimal display)	-	Encoder unit	-	-	Display	PST
P0B	19	Total power-on time (32 bits decimal display)	-	s	-	-	Display	PST
P0B	21	AI1 Sampling voltage value	-	V	-	-	Display	PST
P0B	22	AI2 Sampling voltage value	-	V	-	-	Display	PST

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P0B	24	Effective value of phase current	-	A	-	-	Display	PST
P0B	26	Bus voltage value	-	V	-	-	Display	PST
P0B	27	Module temperature value	-	°C	-	-	Display	PST
P0B	33	Fault record	0: Current fault 1: Last failure 2: Last 2 failures 9: Last 9 failures	-	0	Be effective immediately	Operation setting	PST
P0B	34	Selected number of fault codes	-	-	-	-	Display	PST
P0B	35	Selected fault time stamp	-	s	-	-	Display	PST
P0B	37	Speed of motor at selected fault	-	rpm	-	-	Display	PST
P0B	38	U-phase current of motor at selected fault	-	A	-	-	Display	PST
P0B	39	V-phase current of motor at selected fault	-	A	-	-	Display	PST
P0B	40	Bus voltage at selected fault	-	V	-	-	Display	PST
P0B	41	Input terminal status at selected fault.	-	-	-	-	Display	PST
P0B	42	Output terminal status at selected fault.	-	-	-	-	Display	PST
P0B	53	Position deviation counter	-	Command unit	-	-	Display	P
P0B	55	Actual motor speed (0.1rpm)	-	rpm	-	-	Display	PST
P0B	58	Mechanical absolute position (low 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B	60	Mechanical absolute position (High 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B	64	Real-time input position instruction counter	-	Command unit	-	-	Display	PST
P0B	70	Number of revolutions of absolute encoder data	-	r	0	-	Display	ALL
P0B	71	Within 1 revolution of absolute value encoder position	-	Encoder unit	0	-	Display	ALL
P0B	77	Absolute encoder absolute position (low 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B	79	Absolute encoder absolute position (High 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B	81	Rotating load single revolution position (low 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B	83	Rotating load single revolution position (High 32 bits)	-	Encoder unit	0	-	Display	ALL
P0B	85	Rotating load single revolution position	-	Command unit	0	-	Display	ALL

P0C group Communication parameters

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P0C	00	Servo shaft address	1 ~ 247, 0 is the broadcast address.	-	1	Be effective immediately	Operation setting	PST
P0C	02	Serial baud rate setting	0: 2400Kbp/s 3: 19200Kbp/s 1: 4800Kbp/s 4: 38400Kbp/s 2: 9600Kbp/s 5: 57600Kbp/s	-	2	Be effective immediately	Operation setting	PST
P0C	03	MODBUS data format	0: No check, 2 end bits 1: even parity, 1 end bit 2: odd parity, 1 end bit 3: No check, 1 end bits	-	3	Be effective immediately	Operation setting	PST
P0C	08	CAN Communication rate setting	0: 20K 3: 125K 6: 1M 1: 50K 4: 250K 7: 1M 2: 100K 5: 500K	-	5	Be effective immediately	Operation setting	PST
P0C	09	Communication VDI	0: Forbidden 1: Enable	-	0	Be effective immediately	Stop setting	PST
P0C	10	VDI default value after power-on.	Bit0-VDI1 default value Bit15-VDI16 default value	-	0	Power on again	Operation setting	PST
P0C	11	Communication VDO	0: Forbidden 1: Enable	-	0	Be effective immediately	Stop setting	PST
P0C	12	Default level when VDO function is selected as 0.	Bit0-VDO1 default value Bit15-VDO16 default value	-	0	Be effective immediately	Stop setting	PST
P0C	13	If MODBUS communication writing function code updated to EEPROM?	0: EEPROM is not updated 1: Update EEPROM except P0B group and P0D group.	-	1	Be effective immediately	Operation setting	PST
P0C	14	MODBUS error code	New protocol: 0x0001: Illegal function (command code) 0x0002: Illegal data address 0x0003: Illegal data. 0x0004: Slave equipment failure Old protocol: 0x0002: Command code is not 0x03/0x06/0x10 0x0004: The CRC check code of the received data frame is not equal to the intra-frame check code 0x0008: The accessed function code does not exist 0x0010: The value written in the function code exceeds the upper and lower limits of the function code 0x0080: The written function code can only be modified when the servo is stopped, while the servo is currently running.	1	-	-	Display	-
P0C	16	If CAN communication writing function code updated to EEPROM?	0: EEPROM is not updated 1: Update EEPROM except P0B group and P0D group.	-	0	Be effective immediately	Operation setting	PST
P0C	25	MODBUS command response delay	0~5000	ms	1	Be effective immediately	Operation setting	PST
P0C	26	High and low bit order of MODBUS communication data	0: the upper 16 bits are in front and the lower 16 bits are in the back 1: The lower 16 bits are in front and the upper 16 bits are in the back.	1	1	Be effective immediately	Operation setting	PST
P0C	30	MODBUS error frame format selection	0: Old protocol 1. New protocol (standard protocol)	1	1	Be effective immediately	Operation setting	PST

P0D group Auxiliary function parameter

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P0D	00	Software reset	0: No operation 1: Enable	-	0	Be effective immediately	Stop setting	-
P0D	01	Fault reset	0: No operation 1: Enable	-	0	Be effective immediately	Stop setting	-
P0D	02	Offline inertia identification function	-	-	-	Be effective immediately	Operation setting	-
P0D	03	Reserved parameter	-	-	-	-	-	-
P0D	05	Emergency shut down	0: No operation 1: Enable emergency shut down	-	0	Be effective immediately	Operation setting	-
P0D	10	Analog channel automatic adjustment	0: No operation 1: Ai1 adjustment 2: Ai2 adjustment	-	0	Be effective immediately	Stop setting	-
P0D	11	JOG Trial operation function	(self-filtering)	-	-	-	-	-
P0D	17	DIDO forced input and output enable	0: No operation 1: forced DI enabled, forced DO not enabled. 2: DO is forced to be enabled and DI is forced not to be enabled 3: Force DIDO to be enabled	-	0	Be effective immediately	Operation setting	-
P0D	18	DI forced input given	0~0x01FF	-	0x01FF	Be effective immediately	Operation setting	-
P0D	19	DO forced output given	0~ 0x001F	-	0	Be effective immediately	Operation setting	-
P0D	20	Absolute encoder reset enable	0: No operation 1: Reset fault 2: Reset fault and multi-cycle data	-	0	Be effective immediately	Stop setting	ALL
P0D	24	Gravity load identification	0: Not recognized 1: Turn on identification	-	0	Be effective immediately	Operation setting	-

P0F group Full closed-loop functional parameters

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P0F	00	Encoder feedback mode	0~2	-	0	Be effective immediately	Stop setting	P
P0F	01	Use mode of external encoder	0: Use in standard running direction. 1: Use in reverse running direction.	-	0	Be effective immediately	Stop setting	P
P0F	04	Number of external encoder pulses for one revolution of motor	0~1073741824	External encoder unit	10000	Power on again	Stop setting	P
P0F	08	Full closed-loop position deviation is too large threshold.	0~1073741824	External encoder unit	10000	Be effective immediately	Operation setting	P
P0F	10	Full closed-loop position deviation clearing setting	0~100	r	0	Be effective immediately	Operation setting	P
P0F	13	Hybrid vibration suppression filtering time constant	0~6553.5	ms	0	Be effective immediately	Operation setting	P
P0F	16	Full closed-loop position deviation counter	-1073741824~1073741824	External encoder unit	0	-	Display	P
P0F	18	Internal encoder feedback pulse counter	-1073741824~1073741824	Internal encoder unit	0	-	Display	P
P0F	20	External encoder feedback pulse counter	-1073741824~1073741824	External encoder unit	0	-	Display	P

P11 group multi-segment position function parameters

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P11	00	Multi-position operation mode	0: Shut down at the end of single operation (P11-01 Select the number of segments) 1: Cycle operation (P11-01 selects the number of segments) 2: DI switching operation (selected by DI) 3: Sequential operation (P11-01 selects the number of segments)	-	1	Be effective immediately	Stop setting	P
P11	01	Number of end segments of displacement instruction	1~16	-	1	Be effective immediately	Stop setting	P
P11	02	Residual treatment mode	Effective in other three modes except DI mode 0: Continue running the unfinished segment 1: Restart the operation from 1st segment.	-	0	Be effective immediately	Stop setting	P
P11	03	Unit of time	0: ms 1: s	-	0	Be effective immediately	Stop setting	P
P11	04	Selection of displacement instruction type	0: Relative displacement instruction 1: Absolute displacement instruction	-	0	Be effective immediately	Stop setting	P
P11	05	Sequential operation start segment selection	0~16	-	0	Be effective immediately	Stop setting	P
P11	12	1st segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	14	1st segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	15	1st segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	16	The waiting time after 1st segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	17	2nd segment moving displacement	-1073741824 ~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	19	2nd segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	20	2nd segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	21	The waiting time after 2nd segment displacement is completed	0~0000	ms(s)	10	Be effective immediately	Operation setting	P
P11	22	3rd segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	24	3rd segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	25	3rd segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	26	The waiting time after 3rd segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	27	4th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	29	4th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	30	4th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	31	The waiting time after 4th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P11	32	5th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	34	5th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	35	5th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	36	The waiting time after 5th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	37	6th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	39	6th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	40	6th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	41	The waiting time after 6th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	42	7th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	44	7th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	45	7th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	46	The waiting time after 7th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	47	8th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	49	8th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	50	8th segment displacement acceleration and deceleration time	0~5535	ms(s)	10	Be effective immediately	Operation setting	P
P11	51	The waiting time after the 8th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	52	9th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	54	9th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	55	9th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	56	The waiting time after the 9th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	57	10th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	59	10th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	60	10th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	61	The waiting time after the 10th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	62	11th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P11	64	11th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	65	11th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	66	The waiting time after the 11th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	67	12th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	69	12th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	70	12th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	71	The waiting time after the 12th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	72	13th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	74	13th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	75	13th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	76	The waiting time after the 13th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	77	14th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	79	14th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	80	14th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	81	The waiting time after the 14th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	82	15th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	84	15th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	85	15th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	86	The waiting time after the 15th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P
P11	87	16th segment moving displacement	-1073741824~1073741824	Command unit	10000	Be effective immediately	Operation setting	P
P11	89	16th segment displacement maximum operating speed	1~6000	rpm	200	Be effective immediately	Operation setting	P
P11	90	16th segment displacement acceleration and deceleration time	0~65535	ms(s)	10	Be effective immediately	Operation setting	P
P11	91	The waiting time after the 16th segment displacement is completed	0~10000	ms(s)	10	Be effective immediately	Operation setting	P

P12 group Multistage velocity parameter

Function code	Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P12	00	Multistage speed command operation mode 0: Shut down at the end of single operation (P12-01 Select the number of segments) 1: Cyclic operation (P12-01 Select the number of segments) 2: Switching through external DI	-	1	Be effective immediately	Stop setting	S
P12	01	Selection of the number of end segments of speed command	-	16	Be effective immediately	Stop setting	S
P12	02	Selection of operating time unit	-	0	Be effective immediately	Stop setting	S
P12	03	Accelerating time 1	ms	10	Be effective immediately	Stop setting	S
P12	04	Decelerating time 1	ms	10	Be effective immediately	Stop setting	S
P12	05	Accelerating time 2	ms	50	Be effective immediately	Stop setting	S
P12	06	Decelerating time 2	ms	50	Be effective immediately	Stop setting	S
P12	07	Accelerating time 3	ms	100	Be effective immediately	Stop setting	S
P12	08	Decelerating time 3	ms	100	Be effective immediately	Stop setting	S
P12	09	Accelerating time 4	ms	150	Be effective immediately	Stop setting	S
P12	10	Decelerating time 4	ms	150	Be effective immediately	Stop setting	S
P12	20	1st segment segments Speed Command	rpm	0	Be effective immediately	Stop setting	S
P12	21	1st segment command operating time	S (min)	5.0	Be effective immediately	Stop setting	S
P12	22	1st segment acceleration and deceleration time 0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	23	2nd segment speed command	rpm	100	Be effective immediately	Stop setting	S
P12	24	2nd segment command operating time	S (min)	5.0	Be effective immediately	Stop setting	S
P12	25	2nd segment acceleration and deceleration time 0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	26	3rd segment speed command	rpm	300	Be effective immediately	Stop setting	S
P12	27	3rd segment command operating time	S (min)	5.0	Be effective immediately	Stop setting	S

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P12	28	3rd segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	29	4th segment speed command	-6000~6000	rpm	500	Be effective immediately	Stop setting	S
P12	30	4th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	31	4th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	32	5th segment speed command	-6000~6000	rpm	700	Be effective immediately	Stop setting	S
P12	33	5th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	34	5th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	35	6th segment speed command	-6000~6000	rpm	900	Be effective immediately	Stop setting	S
P12	36	6th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	37	6th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	38	7th segment speed command	-6000~6000	rpm	600	Be effective immediately	Stop setting	S
P12	39	7th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	40	7th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	41	8th segment speed command	-6000~6000	rpm	300	Be effective immediately	Stop setting	S
P12	42	8th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	43	8th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	44	9th segment speed command	-6000~6000	rpm	100	Be effective immediately	Stop setting	S

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P12	45	9th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	46	9th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	47	10th segment speed command	-6000~6000	rpm	-100	Be effective immediately	Stop setting	S
P12	48	10th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	49	10th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	50	11th segment speed command	-6000~6000	rpm	-300	Be effective immediately	Stop setting	S
P12	51	11th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	52	11th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	53	12th segment speed command	-6000~6000	rpm	-500	Be effective immediately	Stop setting	S
P12	54	12th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	55	12th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	56	13th segment speed command	-6000~6000	rpm	-700	Be effective immediately	Stop setting	S
P12	57	13th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	58	13th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	59	14th segment speed command	-6000~6000	rpm	-900	Be effective immediately	Stop setting	S
P12	60	14th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	61	14th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P12	62	15th segment speed command	-6000~6000	rpm	-600	Be effective immediately	Stop setting	S
P12	63	15th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	64	15th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S
P12	65	16th segment speed command	-6000~000	rpm	-300	Be effective immediately	Stop setting	S
P12	66	16th segment command operating time	0~6553.5	S (min)	5.0	Be effective immediately	Stop setting	S
P12	67	16th segment acceleration and deceleration time	0: zero acceleration and deceleration time 1: Acceleration and deceleration time 1 2: Acceleration and deceleration time 2 3: Acceleration and deceleration time 3 4: Acceleration and deceleration time 4	-	0	Be effective immediately	Stop setting	S

P17 group Virtual DIDO parameter

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P17	00	VDI1 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	01	VDI1 terminal logic selection	0: indicates that VDI1 write 1 is valid. 1: indicates that it is valid when the written value of VDI1 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	02	VDI2 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	03	VDI2 terminal logic selection	0: indicates that VDI2 write 1 is valid. 1: indicates that it is valid when the written value of VDI2 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	04	VDI3 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	05	VDI3 terminal logic selection	0: indicates that VDI3 write 1 is valid. 1: indicates that it is valid when the written value of VDI3 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	06	VDI4 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	07	VDI4 terminal logic selection	0: indicates that VDI4 write 1 is valid. 1: indicates that it is valid when the written value of VDI4 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	08	VDI5 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	09	VDI5 terminal logic selection	0: indicates that VDI5 write 1 is valid. 1: indicates that it is valid when the written value of VDI5 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	10	VDI6 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	11	VDI6 terminal logic selection	0: indicates that VDI6 write 1 is valid. 1: indicates that it is valid when the written value of VDI6 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	12	VDI7 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	13	VDI7 terminal logic selection	0: indicates that VDI7 write 1 is valid. 1: indicates that it is valid when the written value of VDI7 changes from 0 to 1.	-	0	Stops working	Operation setting	-

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P17	14	VDI8 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	15	VDI8 terminal logic selection	0: indicates that VDI8 write 1 is valid. 1: indicates that it is valid when the written value of VDI8 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	16	VDI9 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	17	VDI9 terminal logic selection	0: indicates that VDI9 write 1 is valid. 1: indicates that it is valid when the written value of VDI9 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	18	VDI10 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	19	VDI10 terminal logic selection	0: indicates that VDI10 write 1 is valid. 1: indicates that it is valid when the written value of VDI10 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	20	VDI11 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	21	VDI11 terminal logic selection	0: indicates that VDI11 write 1 is valid. 1: indicates that it is valid when the written value of VDI11 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	22	VDI12 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	23	VDI12 terminal logic selection	0: indicates that VDI12 write 1 is valid. 1: indicates that it is valid when the written value of VDI12 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	24	VDI13 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	25	VDI13 terminal logic selection	0: indicates that VDI13 write 1 is valid. 1: indicates that it is valid when the written value of VDI13 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	26	VDI14 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	27	VDI14 terminal logic selection	0: indicates that VDI14 write 1 is valid. 1: indicates that it is valid when the written value of VDI14 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	28	VDI15 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	29	VDI15 terminal logic selection	0: indicates that VDI15 write 1 is valid. 1: indicates that it is valid when the written value of VDI15 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	30	VDI16 terminal function selection	0~37	-	0	Stops working	Operation setting	-
P17	31	VDI16 terminal logic selection	0: indicates that VDI16 write 1 is valid. 1: indicates that it is valid when the written value of VDI16 changes from 0 to 1.	-	0	Stops working	Operation setting	-
P17	32	VDO Virtual electrical level	-	-	-	-	Display	-
P17	33	VDO1 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	34	VDO1 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	35	VDO2 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	36	VDO2 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	37	VDO3 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	38	VDO3 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P17	39	VDO4 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	40	VDO4 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	41	VDO5 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	42	VDO5 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	43	VDO6 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	44	VDO6 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	45	VDO7 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	46	VDO7 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	47	VDO8 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	48	VDO8 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	49	VDO9 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	50	VDO9 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	51	VDO10 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	52	VDO10 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	53	VDO11 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	54	VDO11 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	55	VDO12 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	56	VDO12 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	57	VDO13 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	58	VDO13 terminal logic selection	0: output 1 when it is valid. 1; output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	59	VDO14 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	60	VDO14 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	61	VDO15 terminal function selection	0~22	-	0	Stops working	Operation setting	-
P17	62	VDO15 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-
P17	63	VDO16 terminal function selection	0~22	-	0	Stops working	Operation setting	-

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P17	64	VDO16 terminal logic selection	0: output 1 when it is valid. 1: output 0 when it is valid.	-	0	Stops working	Operation setting	-

P30 group Communication reading servo related variables

The panel is invisible.

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P30	00	Communication reading servo state	-	-	-	-	Communication read-only	PST
P30	01	Communication reading DO function status 1	-	-	-	-	Communication read-only	PST
P30	02	Communication reading DO function status 2	-	-	-	-	Communication read-only	PST
P30	03	Communication reads the sampling value of input pulse instruction.	-	-	-	-	Display	PST

P31 group Communicating given servo-related variables

The panel is invisible.

Function code		Name	Setting range	Unit	Factory setting	Effective mode	Setting mode	Correlation pattern
P31	00	Communication given VDI Virtual electrical level	0~65535	-	0	Be effective immediately	Operation setting	PST
P31	04	Communication given DO output status	0~31	-	0	Be effective immediately	Operation setting	PST
P31	09	Communication given speed command	-6000.000~6000.000	rpm	0	Be effective immediately	Operation setting	S
P31	11	Communicate a given torque command	-100.000~100.000	%	0	Be effective immediately	Operation setting	T

DIDO function definition

Coding	Name	Name of function	Description	Remarks
Input signal function description				
FunIN.1	S-ON	Servo enable	Invalid-the servo motor is enabled and disabled; Valid-The servo motor is powered on.	The logical selection of the corresponding terminal must be set to: electrical level effective. When the DI or VDI terminal corresponding to this function changes, or when the logical selection of the corresponding terminal changes, the change will not take effect until it is powered on again.
FunIN.2	ALM-RST	Fault and warning reset (along valid function)	Invalid-forbidden; Valid-enabled.	The logical selection of the corresponding terminal must be set to: edge valid. If the selected electrical level is valid, the driver is forced to set the edge to be valid internally. According to the alarm type, the servo can continue to work after some alarms are reset.
FunIN.3	GAIN-SEL	Gain switching	P08-08=0: Invalid-the speed control loop is PI control; Valid-the speed control loop is P control. P08-08=1, according to the setting of P08-09.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.4	CMD-SEL	Main and auxiliary operation command switching	Invalid-the current running command is A; Valid-the current running command is B.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.5	DIR-SEL	Multistage speed DI switching operation direction setting	Invalid- default command direction; Valid- command opposite direction.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.6	CMD1	Multistage operation command switching 1	16-segment command selection.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.7	CMD2	Multistage operation command switching 2	16-segment command selection.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.8	CMD3	Multistage operation command switching 3	16-segment command selection.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.9	CMD4	Multistage operation command switching 4	16-segment command selection.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.10	M1-SEL	Mode switching 1	Switch between speed, position and torque according to the selected control mode (3, 4 and 5).	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.11	M2-SEL	Mode switching 2	Switch between speed, position and torque according to the selected control mode (6).	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.12	ZCLAMP	Zero fixed enable	Valid-enabled Zero fixed function; Invalid-Zero Fixed function is disabled.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.13	INHIBIT	Position command prohibition	Valid-command pulse input is prohibited; Invalid-command pulse input is allowed.	It turned out to be a pulse prohibition function. Now it is upgraded to position command prohibition, including internal and external position commands. The logical selection of the corresponding terminal must be set to: electrical level effective.
FunIN.14	P-OT	Forward overtravel switch	Valid-forward drive is prohibited; Invalid-forward drive is allowed.	When the mechanical movement exceeds the movable range, it enters the over-travel prevention function: the logical selection of the corresponding terminal, and it is recommended to set it to: electrical level effective.
FunIN.15	N-OT	Reverse overtravel switch	When the mechanical movement exceeds the movable range, it enters the over-travel prevention function: Valid-reverse driving is prohibited; Invalid-reverse driving is allowed.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.16	P-CL	Positive external torque limit	According to the selection of P07-07, switch the torque limiting source. P07-07=1: Valid-forward external torque limit is valid; Invalid-Forward internal torque limit is valid. Invalid-Forward internal torque limit is valid.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.

Coding	Name	Name of function	Description	Remarks
			P07-07=3 and the AI limit value is greater than the forward external limit value: Valid-forward external torque limit is valid; Invalid -AI torque limit is valid. P07-07=4: Valid -AI torque limit is valid; Invalid-Forward internal torque limit is valid.	
FunIN.17	N-CL	Negative external torque limit	According to the selection of P07-07, switch the torque limiting source. P07-07=1: Valid-Reverse external torque limit is valid; Invalid-Reverse internal torque limit is valid. P07-07=3 and the AI limit value is less than the inverted external limit value: Valid-Reverse external torque limit is valid; Invalid -AI torque limit is valid. P07-07=4: Valid -AI torque limit is valid; Invalid-Reverse internal torque limit is valid.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.18	JOGCMD+	Positive inching	Valid-input according to the given instruction; Invalid-Run instruction stops input.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.19	JOGCMD-	Negative inching	Valid-Reverse input according to the given instruction; Invalid-Run instruction stops input.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.20	POSSTEP	Stepping size enable	Valid-execute the instruction of stepping size Invalid-the instruction is zero, which is in the positioning state.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.21	HX1	Hand wheel magnification ratio signal 1	HX1 is valid and HX2 is invalid: X10 HX1 is invalid, HX2 is valid: X100 Other: X1	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.22	HX2	Hand wheel magnification ratio signal 2		
FunIN.23	HX_EN	Hand wheel enable signal	Invalid-carry out position control according to P05-00 function code selection; Valid-Receive hand wheel pulse signal for position control in position mode.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.24	GEAR_SEL	Selection of electronic gear	Invalid- Electronic gear ratio 1; Valid-Electronic gear ratio 2.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.25	TOQDirSel	Torque command direction setting	Invalid-positive direction; Valid-opposite direction.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.26	SPDDirSel	Speed command direction Settings	Invalid-positive direction; Valid-opposite direction.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.27	POSDirSel	Position command direction Settings	Invalid-positive direction; Valid-opposite direction.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.28	PosInSen	Multistage position command enable	Along the effective function is valid Invalid-Ignore internal multi-segment instruction; Valid-Start internal multi-segment.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.29	XintFree	Interrupt positioning function state released	Invalid-forbidden; Valid-enabled.	The logical selection of the corresponding terminal is suggested to be: edge valid.
FunIN.31	HomeSwitch	Origin switch.	Invalid-not triggered; Valid-triggered.	The logical selection of the corresponding terminal must be set to: electrical level effective. It is recommended to assign it to the fast DI terminal. If it is set to 2 (rising edge is valid), it will be forced to change to 1 (high level is valid) inside the driver; If it is set to 3 (the falling edge is valid), the driver will be forced to change to 0 (the low level is active);

Coding	Name	Name of function	Description	Remarks
				If it is set to 4 (both rising and falling edges are valid), the driver will be forced to change to 0 (low level is valid) internally.
FunIN.32	HomingStart	Origin reset enable	Invalid-forbidden; Valid-enabled.	The logical selection of the corresponding terminal is suggested to be: edge valid.
FunIN.33	XintInhibit	Prohibition of interrupt positioning function	Valid- Forbidden of interrupt positioning function Invalid- enable the interrupt positioning function	The logical selection of the corresponding terminal must be set to: electrical level effective. If it is set to 2 (rising edge is valid), it will be forced to change to 1 (high level is valid) inside the driver; If it is set to 3 (the falling edge is active), the driver will be forced to change to 0 (the low level is active); If it is set to 4 (both rising and falling edges are valid), the driver will be forced to change to 0 (low level is valid) internally.
FunIN.34	Emergency Stop	Emergency shut down	Valid-position locking after zero-speed shutdown; Invalid-has no effect on the current running state.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.35	ClrPosErr	Clear position deviation	Valid-position deviation is cleared; Invalid-position deviation is not cleared.	The logical selection of the corresponding terminal is suggested to be: edge valid. This DI function is recommended to be configured on the DI8 terminal.
FunIN.36	V_LmtSel	Internal speed limiting source	Valid -P07-19 as the internal positive and negative speed limit (P07-17 = 2); Invalid -P07-20 as internal positive and negative speed limit (P07-17=2).	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
FunIN.37	PulseInhibit	Pulse command prohibition	In position control mode, when the source of position command is pulse command (P05-00=0): Invalid-can respond to Pulse command; Valid-does not respond to pulse commands.	The logical selection of the corresponding terminal is suggested to be set to: electrical level effective.
Output signal function description				
FunOUT.1	S-RDY	Servo ready	The servo state is ready to receive the S-ON valid signal: Valid-Servo ready; Invalid-the servo is not ready.	-
FunOUT.2	TGON	Motor rotation output	When the speed of the servo motor is higher than the speed threshold P06-16: Valid-motor rotation signal is valid; Invalid-Motor rotation signal is invalid.	-
FunOUT.3	ZERO	Zero speed.	Signal output when the servo motor stops rotating: Valid motor speed is zero; Invalid motor speed is not zero.	-
FunOUT.4	V-CMP	Uniform speed	During speed control, it is valid when the absolute value of the difference between the speed of the servo motor and the Speed command is less than the set value of P06-17 speed deviation.	-
FunOUT.5	COIN	Positioning completed	In position control, the position deviation pulse is valid when it reaches the positioning completion range P05-21.	-
FunOUT.6	NEAR	During positioning proximity position control,	the position deviation pulse is valid when it reaches the set value of positioning proximity signal amplitude P05-22.	-
FunOUT.7	C-LT	Torque limit	Confirmation signal of torque limit: Valid-motor torque is limited; Invalid-motor torque is not limited.	-
FunOUT.8	V-LT	Speed limit	Confirmation signal of speed limitation in torque control:	-

Coding	Name	Name of function	Description	Remarks
			Valid-motor speed is limited; Invalid-motor speed is not limited.	
FunOUT.9	BK	Internal contracting brake output	Internal contracting brake signal output: Valid-close, release the internal contracting brake; Invalid-activate the internal contracting brake.	-
FunOUT.10	WARN	Warning output	Warning output signal is valid. (on)	-
FunOUT.11	ALM	Fault output	The status is valid when the fault is detected.	-
FunOUT.12	ALMO1	Output 3-digit alarm code	Output 3-digit alarm code	-
FunOUT.13	ALMO2	Output 3-digit alarm code	Output 3-digit alarm code	-
FunOUT.14	ALMO3	Output 3-digit alarm code	Output 3-digit alarm code	-
FunOUT.15	Xintcoin	Completion of interrupt positioning function	Valid-interrupt positioning function positioning is completed; Invalid-interrupt positioning function positioning is not completed.	-
FunOUT.16	HomeAttain	Origin return to zero output	Origin back to zero state: Valid-origin returns to zero; Invalid-the origin does not return to zero.	-
FunOUT.17	ElecHome Attain	Electrical return to zero output	Electrical return to zero state: Valid-electrical origin returns to zero; Invalid-the electrical origin does not return to zero.	-
FunOUT.18	ToqReach	Torque reaching output	Valid-the absolute value of torque reaches the set value; Invalid-the absolute value of torque is less than the set value.	-
FunOUT.19	V-Arr	Speed arrival output	Valid-speed feedback reaches the set value; Invalid-the speed feedback has not reached the set value.	-
FunOUT.20	AngIntRdy	Angle identification output	Valid-complete angle identification; Invalid-Angle recognition is not completed.	-
FunOUT.21	DB	DB brake output	Valid-dynamic braking relay is off; Invalid-dynamic brake relay is engaged.	
FunOUT.22	CmdOk	Internal instruction output	Valid-internal instruction completed; Invalid-internal instruction not completed.	

Chapter 6 Troubleshooting

6.1 Fault and warning handling at startup

6.1.1 Position control mode

➤ Fault check

Starting procedure	Fault phenomenon	Cause	Confirmation method
Turn on the control power supply (L1C L2C) Main power supply (L1 L2)(L1 L2 L3)	The digital tube is not lit or does not display "rdy"	1. Control power supply voltage failure	◆ After CN1, CN2, CN3 and CN4 are unplugged, the fault still exists. ◆ Measure the AC voltage between (L1C, L2C).
		2. Main power supply voltage fault	◆ Single-phase 220V power supply model measures the AC voltage between (L1, L2). The DC bus voltage amplitude of the main power supply (voltage between B1/⊕ and ⊖1) is lower than 200V, and the digital tube displays "nrd". ◆ Three-phase 220V/380V power supply models measure the AC voltage between (L1 L2 L3). The DC bus voltage amplitude of the main power supply (voltage between B1/⊕ and ⊖1) is lower than 460V, and the digital tube displays "nrd".
		3. The burning program terminal is shorted.	◆ Check the terminal of the burning program to confirm whether it is shorted.
		4. Servo driver failure	◆ -
	The panel shows "FU.xxx"	Refer to Section 7.2 to find out the reasons and troubleshoot.	
	■ After troubleshooting, the panel should display "rdy".		
The servo enable signal is asserted (S-ON is ON).	The panel shows "FU.xxx"	Refer to Section 7.2 to find out the reasons and troubleshoot.	
	The shaft of the servo motor is in a free running state.	1. The servo enable signal is invalid	◆ Switch the panel to the servo state display to see if the panel is displayed as "rdy" instead of "run". ◆ Check P03 and P17 to see if the servo enable signal is set (DI function 1: s-on). If it has been set, check whether the corresponding terminal logic is valid; If not, set it and make the terminal logic effective. Refer to the setting method in Chapter 6 "P03 Group: Terminal Input Parameters". ◆ If P03 group has set the servo enable signal, and the logic of the corresponding terminal is valid, but the panel still displays "rdy", check whether the wiring of the DI terminal is correct. Refer to Chapter 5.
		2. Wrong control mode selection	◆ Check whether P02-00 is 1. If it is set to 2 by mistake (torque mode), the motor shaft is also in a free running state because the default torque command is zero.
	■ After troubleshooting, the panel should display "run".		
Input position command	Servo motor does not rotate.	Input position command counter (P0B-13) is 0.	◆ High/low speed pulse port wiring error When P05-00=0 pulse command source, check whether the high/low speed pulse port wiring is correct. Please refer to Chapter 5 "Wiring" and check whether P05-01 settings match. ◆ No position command was entered. 1. whether to use DI function 13 (FunIN.13: prohibit, position instruction) or DI function 37(FunIN.37: PulseInhibit, pulse instruction prohibited) 2. When P05-00=0 pulse command source, the upper machine or other pulse output devices do not output pulses. You can check whether there is pulse input at the high/low speed pulse port with an oscilloscope. Please refer to Chapter 5 "Wiring"; 3. When P05-00=1 is the source of the stepping instruction, check

Starting procedure	Fault phenomenon	Cause	Confirmation method
			<p>whether P05-05 is 0; if not, check whether DI function 20 (FunIN.20: POSStep) has been set and whether the corresponding terminal logic is valid;</p> <p>4. When P05-00=2 is the source of multi-segment position command, check whether P11 group parameters are set correctly. If so, check whether DI function 28 (FunIN.28: Posinsen) has been set and whether the corresponding terminal logic is valid;</p> <p>5. If the long-judging function has been used, check whether P05-29 is 1 (whether it can directly respond to other position instructions after the long-judging operation is completed). If it is 1, confirm whether to use DI function 29 (FunIN.29: Xin Tfree) to release the locked state.</p>
	Servo motor inversion	Input position command counter (P0B-13) is negative.	<ul style="list-style-type: none"> ◆ When P05-00=0 is the source of the pulse command, check whether the parameter setting of P05-15 (pulse command form) corresponds to the actual input pulse; if not, P05-15 is set incorrectly or the terminal is connected incorrectly; ◆ P05-00=1 When the source of the step instruction, check the positive and negative values of P05-05; ◆ P05-00=2 When the multi-segment position command comes from, check the positive and negative displacement of each segment in P11 group; ◆ Check whether the DI function 27(FunIN.27: PosDirSel, position instruction direction setting) and whether the corresponding terminal logic is valid; <p>Check whether the P02-02 parameter is set incorrectly.</p>
	■ The servo motor can rotate after the above faults are eliminated.		
Low-speed rotation instability	The speed is unstable when rotating at low speed.	The gain setting is unreasonable.	◆ Perform automatic gain adjustment.
	Motor shaft vibrates left and right.	Load moment of inertia ratio (P08-15) too big	<ul style="list-style-type: none"> ◆ If it can run safely, identify the inertia again; ◆ Perform automatic gain adjustment.
	■ The servo motor can rotate normally after removing the above faults.		
Regular service	Inaccurate positioning	Produce a position that does not meet the requirements Deviation	◆ Determine the input position command counter (P0B-13), feedback pulse counter (P0B-17) and mechanical stop position. The confirmation steps are as follows.

➤ Steps to check the cause of failure when positioning is not correct.

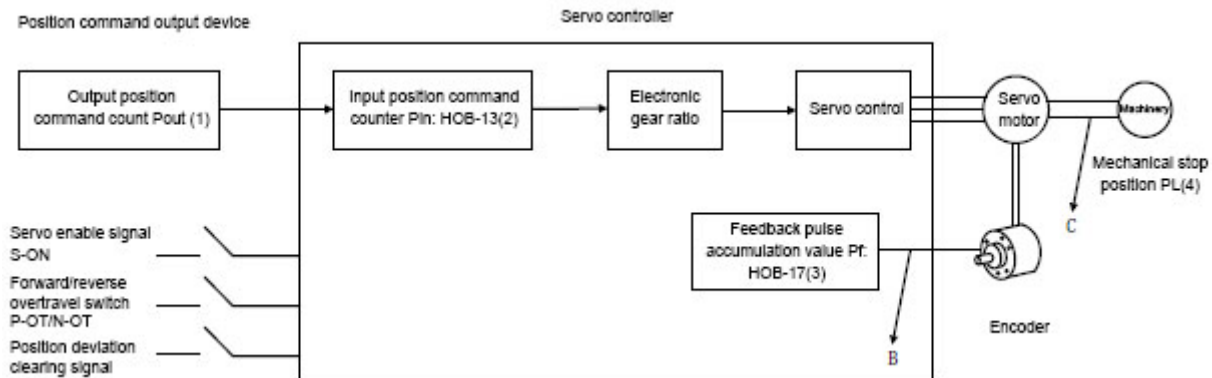


Figure 7-1 Block diagram of positioning control principle

When misalignment occurs, check the 4 signals in the above figure:

- 1) Output position command count value Pout; in position command output device (internal parameters of upper machine or driver);
- 2) The input position command counter Pin received by the servo controller corresponds to the parameter P0 b-13;
- 3) The feedback pulse accumulation value Pf of the servo motor with its own encoder corresponds to the parameter P0 b-17;
- 4) Position PL of mechanical stop.

There are 3 reasons for inaccurate positioning, corresponding to A, B and C in the figure, among which:
 A stands for: ① In the wiring between the position command output device (especially the upper machine) and the servo driver, the input position command is incorrectly counted due to the influence of noise;
 ② During the operation of the motor, the input position command is interrupted.

Reason: The servo enable signal is set to be invalid (S-ON is OFF), and the forward/reverse overtravel switch signal.

(P-OT or N-OT) is valid, and the position deviation clearing signal (ClrPosErr) is valid;

B means: encoder feedback position signal is wrong (signal is disturbed).

C indicates that there is a mechanical position sliding between the machine and the servo motor. Under the ideal condition of no positional deviation, the following relationship holds:

- $P_{out} = P_{in}$, output position command count value = input position command counter.
- $P_{in} \times \text{electronic gear ratio} = P_f$, input position command counter \times electronic gear ratio = feedback pulse accumulation value.
- $P_f \times \Delta L = PL$, cumulative value of feedback pulse \times load displacement corresponding to one position instruction = position of mechanical stop.

In case of inaccurate positioning, check method:

a) $P_{out} \neq P_{in}$

Cause of failure: A

Elimination methods and steps:

- ① Check whether the pulse input terminal (low-speed or high-speed pulse input terminal, please refer to Chapter 5 "Wiring") adopts twisted-pair shielded wire;
- ② If open collector input mode in low-speed pulse input terminal is selected, it should be changed to differential input mode;
- ③ The wiring of pulse input terminals must be separated from the main circuit (L1C, L2C, L12L3, U, V, W);
- ④ The low-speed pulse input terminal is selected to increase the filtering time constant of the low-speed pulse input pin (P0a-24);

On the contrary, the high-speed pulse input terminal is selected to increase the filtering time constant of the high-speed pulse input pin (P0A-30).

b) $P_{in} \times \text{electronic gear ratio} \neq P_f$

Cause of failure: B

Elimination methods and steps:

- ① Check whether there is a fault in the process of operation, resulting in the instruction is not fully executed and the servo has stopped;
- ② If the position deviation clearing signal (ClrPosErr) is valid, check whether the position deviation clearing method (P05-16) is reasonable.

c) $P_f \times \Delta L \neq PL$

Cause of failure: C

Troubleshooting methods and steps: check the connection of machinery step by step to find the position where relative sliding occurs.

6.1.2 Speed control mode

Starting procedure	Fault phenomenon	Cause	Confirmation method
Turn on the control power supply (L1C L2C) Main power supply (L1 L2)(L1 L2 L3)	The digital tube is not lit or does not display "rdy"	1. Control power supply voltage failure	◆ The fault still exists after CN1, CN2, CN3 and CN4 are unplugged. ◆ Measure the AC voltage between (L1C, L2C).
		2. Main power supply voltage fault	◆ Single-phase 220V power supply model measures the AC voltage between (L1, L2). The DC bus voltage amplitude of the main power supply (voltage between B1/⊕ and ⊖1) is lower than 200V, and the digital tube displays "nrd". ◆ Three-phase 220V/380V power supply models measure the AC voltage between (L1 L2 L3). The DC bus voltage amplitude of the main power supply (voltage between B1/⊕ and ⊖1) is lower than 460V, and the digital tube displays "nrd".
		3. The burning program terminal is shorted.	◆ Check the terminal of the burning program to confirm whether it is shorted.
		4. Servo driver failure	-
	The panel shows "FU.xxx"	Refer to Section 7.2 to find out the reasons and troubleshoot.	
■ After troubleshooting, the panel should display "rdy".			
The servo enable signal is asserted (S-ON is ON).	The panel shows "FU.xxx"	Refer to Section 7.2 to find out the reasons and troubleshoot.	
	The shaft of the servo motor is in a free running state.	1. The servo enable signal is invalid	◆ Switch the panel to the servo state display to see if the panel is displayed as "Rdy" instead of "run". ◆ Check P03 and P17 to see if the servo enable signal is set (DI function 1: s-on). If it has been set, check whether the corresponding terminal logic is valid; If not, set it and make the terminal logic effective. Refer to the setting method in Chapter 6 "P03 Group: Terminal Input Parameters". ◆ If P03 group has set the servo enable signal, and the logic of the corresponding terminal is valid, but the panel still displays "rdy", check whether the wiring of the DI terminal is correct. Refer to Chapter 5.
		2. Wrong control mode selection	◆ Check whether P02-00 is 0. If it is set to 2 by mistake (torque mode), the motor shaft is also in a free running state because the default torque command is zero.
■ After troubleshooting, the panel should display "run".			
Input speed command	Servo motor does not rotate or the speed is incorrect.	Speed command (P0B-01) is 0	◆ AI wiring error ◆ When selecting analog input command, first check whether the AI analog input channel is selected correctly, and then check whether the AI terminal wiring is correct. Please refer to Chapter 5. ◆ Speed command selection error ◆ Check whether P06-02 is set correctly. ◆ No Speed command is entered or the Speed command is abnormal. 1. First check whether P03 AI related parameters are set correctly when selecting analog input instructions; Then check whether the input voltage signal of external signal source is correct, which can be observed by oscilloscope or read by P0B-21 or P0B-22. 2. When the number is given, check whether P06-03 is correct; 3. Check whether the P12 group parameters are set correctly when the multi-stage Speed command is given; 4. When communication is given, check whether P31-09 is correct; 5. Check whether P06-04 is correct, whether DI functions 18 and 19 have been set, and whether the corresponding terminal logic is effective when the inching speed command is given; 6. Check whether the acceleration and deceleration times P06-05 and P06-06 are set correctly; 7. Whether the zero-fixed function is enabled by mistake, that is, check the DI function. 12. Whether it is misconfigured and whether the effective logic of the corresponding DI terminal is correct.
Input speed command	Servo motor inversion	Speed command (P0B-01) is negative.	◆ When selecting analog input instructions, check whether the positive and negative polarities of input signals are reversed; ◆ When the number is given, check whether P06-03 is less than 0; ◆ When multiple Speed commands are given, check the positive

Starting procedure	Fault phenomenon	Cause	Confirmation method
			and negative Speed commands of P12 groups; ◆ When communication is given, check whether P31-09 is less than 0; ◆ When the inching speed command is given, check whether the P06-04 value, the effective logic of DI functions 18 and 19 match the predicted steering; ◆ Check whether the DI function 26(FunIN.26: SpdDirSel (Speed command direction setting) and whether the corresponding terminal logic is valid; ◆ Check whether the P02-02 parameter is set incorrectly.
		■ The servo motor can rotate after the above faults are eliminated.	
Low-speed rotation instability	The speed is unstable when rotating at low speed.	The gain setting is unreasonable.	◆ Perform automatic gain adjustment.
	Motor shaft vibrates left and right.	Load moment of inertia ratio (P08-15) too big	◆ If it can run safely, identify the inertia again; ◆ Perform automatic gain adjustment.

6.1.3 Speed control mode

Starting procedure	Fault phenomenon	Cause	Confirmation method
Turn on the control power supply (L1C L2C) and the main power supply (L1 L2)(L1 L2 L3)	The digital tube is not lit or does not display "rdy"	1. Control power supply voltage failure	◆ The fault still exists after CN1, CN2, CN3 and CN4 are unplugged. ◆ Measure the AC voltage between (L1C, L2C).
		2. The main power supply voltage failure	◆ Single-phase 220V power supply model measures the AC voltage between (L1, L2). The DC bus voltage amplitude (B1/⊕, ⊖1 voltage) of the main power supply is lower than 200V, and the digital tube displays "nrd". ◆ Three-phase 220V/380V power supply models measure the AC voltage between (L1 L2 L3). The DC bus voltage amplitude (B1/⊕, ⊖1 voltage) of the main power supply is lower than 460V, and the digital tube displays "nrd".
		3. The programming terminal is shorted.	◆ Check the terminal of the burning program to confirm whether it is shorted.
		4. Servo driver failure	-
	The panel shows "FU.xxx"	Refer to Section 6.2 to find out the reasons and troubleshoot.	
	■ After troubleshooting, the panel should display "rdy".		
The servo enable signal is asserted (S-ON is ON).	The panel shows "FU.xxx"	Refer to Section 6.2 to find out the reasons and troubleshoot.	
	The shaft of the servo motor is in a free running state.	The servo enable signal is invalid	◆ Switch the panel to the servo state display to see if the panel is displayed as "Rdy" instead of "run". ◆ Check P03 and P17 to see if the servo enable signal is set (DI function 1: s-on). If it has been set, check whether the corresponding terminal logic is valid; If not, set it and make the terminal logic effective. Refer to Chapter 6 "P03 Group: Terminal Input Parameters" setting method. ◆ If P03 group has set the servo enable signal, and the logic of the corresponding terminal is valid, but the panel still displays "rdy", check whether the wiring of the DI terminal is correct. Refer to Chapter 5.
	■ After troubleshooting, the panel should display "run".		
Input torque command	Servo motor does not rotate.	Internal torque command(P0B-02) is 0	◆ When selecting analog input command for AI wiring error, check whether the AI terminal wiring is correct. Please refer to Chapter 4. ◆ Torque command selection error ◆ Check whether P07-02 is set correctly. ◆ No torque command is input. 1. When selecting analog input instructions, first check whether P03 AI related parameters are set correctly; Then check whether the input voltage signal of external signal source is correct, which can be observed by oscilloscope or read by P0B-21 or P0B-22. 2. When the number is given, check whether P07-03 is 0;

Starting procedure	Fault phenomenon	Cause	Confirmation method
			3. When communication is given, check whether P31-11 is 0.
Input torque command	Servo motor inversion	Internal torque command (P0B-02) is negative.	<ul style="list-style-type: none"> ◆ When analog input command is selected, whether the polarity of input voltage of external signal source is reversed can be checked by oscilloscope or through P0B-21 or P0B-22. ◆ When the number is given, check whether P07-03 is less than 0; ◆ When communication is given, check whether P31-11 is less than 0; ◆ Check whether the DI function 25(FunIN.25: ToqDirSel, rotational moment instruction direction setting) and whether the corresponding terminal logic is valid; ◆ Check whether the P02-02 parameter is set incorrectly.
	■ The servo motor can rotate after the above faults are eliminated.		
Low-speed rotation instability	The speed is unstable when rotating at low speed.	The gain setting is unreasonable.	◆ Perform automatic gain adjustment.
	Motor shaft vibrates left and right.	Load moment of inertia ratio (P08-15) too big	◆ If it can run safely, identify the inertia again; Perform automatic gain adjustment.

6.2 Fault and warning handling at runtime

6.2.1 Fault and Warning Code Table

1) Fault and warning classification

The faults and warnings of servo drivers are classified according to their severity, which can be divided into three levels, namely, category 1, category 2 and category 3. The severity level is category 1 > category 2 > category 3. The specific classification is as follows:

- Class 1 (NO.1 for short) non-resettable fault;
- Class 1 (referred to as NO.1) resettable fault;
- Class 2 (referred to as NO.2) resettable fault;
- Class 3 (NO.3 for short) resettable warning.

"Resettable" means that the panel stops the fault display state by giving a "reset signal".

Specific operation: setting parameter P0D-01=1 (fault reset) or using DI function 2 (FunIN.2: ALM-RST) and making it logically valid can make the panel stop displaying faults.

NO.1 and NO.2 reset methods for resettable faults: first turn OFF the servo enable signal (set S-ON to OFF), then set P0D-01=1 or use DI function 2.

NO.3 Reset method of resettable warning: set P0D-01=1 or use DI function 2.

Note: ■ It is necessary to change the settings to eliminate the causes before resetting for some faults or warnings, , but resetting does not mean that the changes take effect. For changes that need to be re-powered on (L1C, L2C) to take effect, the power must be re-powered on; For changes that require downtime to take effect, the servo enable must be turned off. The servo driver can run normally after the change takes effect.

☆ Associated function code:

Function code		Name	Setting range	Unit	Factory setting	Setting mode	Effective date	Correlation pattern
P0D	01	Fault reset	0: No operation 1: Fault and warning reset	-	0	Stop setting	Be effective immediately	-

☆ Associated function code:

Coding	Name	Name of function	Function
FunIN.2	ALM-RST	Fault and warning reset signal	<ul style="list-style-type: none"> ◆ The DI function is edge-valid, but it is invalid when the level continues to be high/low. ◆ According to the alarm type, the servo can continue to work after some alarms are reset. ◆ It will be forced to be effective along the change, and the effective level change must be kept for more than 3ms, otherwise the fault reset function will be invalid when assigned to low-speed DI, if the DI logic is set to level valid. Do not assign fault reset function to fast DI, otherwise the function will be invalid. Invalid, failure and warning will not be reset; valid, reset faults and warnings.

2) Fault and warning records

The servo driver has the function of fault recording, which can record the names of faults and warnings in the last 10 times and the servo when faults or warnings occur. State parameters of the drive. If repeated faults or warnings have occurred in the last 5 times, the fault or warning code, that is, the drive status, is recorded only once.

The fault record will still save the fault and warning after the fault or warning is reset; Use the System Parameter Initialization Function (P02-31=1 or 2) to clear the fault and warning records.

By monitoring the parameter P0B-33, you can select the number of times n between the fault or warning and the current fault, P0B-34 can view the name of the n+1st fault or warning, and P0 b-35 ~ P0 b-42 can view the state parameters of the servo driver when the corresponding n+1st fault or warning occurs. P0B-34 on the panel shows "FU.000" when there is no fault.

The panel displays "FU.xxx", and "xxx" is the fault or warning code when viewing P0B-34 (the name of the n+1 time fault or warning) through the panel; The decimal data of the code is read when reading P0B-34 by driving debugging platform software or communication, which needs to be converted into hexadecimal data to reflect the real fault or warning code, such as:

The panel displays the fault or warning "FU.xxx"	P0B-34 (decimal number system)	P0B-34 (hexadecimal number system)	Description
FU.101	257	0101	0: Class 1 non-resettable fault 101: fault code
FU.130	8496	2130	2: Class 1 resettable fault 130: fault code
FU.121	24865	6121	6: Class 2 resettable fault 121: fault code
FU.110	57616	E110	E: Class 3 resettable warning 110: warning code

3) Fault and warning coded output

The servo driver can output the current highest level of fault or warning code.

"Fault code output" refers to setting the three DO terminals of the servo driver to DO functions 12, 13 and 14, where FunOUT.12:

ALMO1 (alarm code 1, referred to as AL1), FunOUT.13:

ALMO2 (alarm code 2, referred to as AL2), FunOUT.14:

ALMO3 (3rd digit of alarm code, referred to as AL3 for short)

When different faults occur, the levels of the three DO terminals will change.

a) Class 1 (NO.1) non-resettable fault:

Display	Fault name	Fault type	Can it be reset	Coded output		
				AL3	AL2	AL1
FU.101	P02 and above groups have abnormal parameters.	NO.1	No	1	1	1
FU.102	Programmable logic configuration failure	NO.1	No	1	1	1
FU.104	Programmable logic interrupt fault	NO.1	No	1	1	1
FU.105	Abnormal internal program	NO.1	No	1	1	1
FU.108	Parameter storage fault	NO.1	No	1	1	1
FU.111	Internal fault	NO.1	No	1	1	1
FU.120	Product matching fault	NO.1	No	1	1	1
FU.122	Absolute position mode product matching failure	NO.1	No	1	1	1
FU.136	The data in the motor ROM is checked incorrectly or the parameters are not stored.	NO.1	No	1	1	1
FU.201	Overcurrent 2	NO.1	No	1	1	0

Display	Fault name	Fault type	Can it be reset	Coded output		
				AL3	AL2	AL1
FU.208	Sampling operation timeout of FPGA system	NO.1	No	1	1	0
FU.210	Output short circuit to ground	NO.1	No	1	1	0
FU.220	Phase sequence error	NO.1	No	1	1	0
FU.234	Flywheel trip	NO.1	No	1	1	0
FU.740	Encoder interference	NO.1	No	1	1	1
FU.A33	Encoder data abnormal	NO.1	No	0	1	0

Note: ■ "1" means valid, "0" means invalid, and does not represent the level of DO terminal.

b) Class 1 (NO.1) resettable fault:

Display	Fault name	Fault type	Can it be reset	Coded output		
				AL3	AL2	AL1
FU.130	DI function repeated allocation	NO.1	Yes	1	1	1
FU.131	DO function allocation exceeds the limit	NO.1	Yes	1	1	1
FU.207	D/Q axis current overflow fault	NO.1	Yes	1	1	0
FU.400	Electrical overvoltage of main circuit	NO.1	Yes	0	1	1
FU.410	Main circuit electrical undervoltage	NO.1	Yes	1	1	0
FU.602	Angle identification failed	NO.1	Yes	0	0	0

c) Class 2 (NO.2) resettable fault:

Display	Fault name	Fault type	Can it be reset	Coded output		
				AL3	AL2	AL1
FU.121	Servo ON command invalid fault	NO.2	Yes	1	1	1
FU.420	Main circuit electrical phase loss	NO.2	Yes	0	1	1
FU.430	Control voltage undervoltage	NO.2	Yes	0	1	1
FU.500	Overspeed	NO.2	Yes	0	1	0
FU.510	Pulse output overspeed	NO.2	Yes	0	1	0
FU.610	Drive overload	NO.2	Yes	0	0	0
FU.620	Motor overload	NO.2	Yes	0	0	0
FU.625	Abnormal closing of internal contracting brake	NO.2	Yes	0	0	0
FU.626	Abnormal opening of internal contracting brake	NO.2	Yes	0	0	0
FU.630	Motor stalling	NO.2	Yes	0	0	0
FU.650	Radiator excessive heating	NO.2	Yes	0	0	0
FU.731	Encoder battery failure	NO.2	Yes	1	1	1
FU.733	Encoder multi-turn counting error	NO.2	Yes	1	1	1
FU.735	Multi-turn counting overflow of encoder	NO.2	Yes	1	1	1
FU.834	AD sampling overvoltage	NO.2	No	1	1	1
FU.835	High precision AD sampling fault	NO.2	No	1	1	1
FU.B00	Excessive position deviation	NO.2	Yes	1	0	0
FU.B01	Abnormal pulse input	NO.2	Yes	1	0	0
FU.B02	Full closed-loop position deviation is too large	NO.2	Yes	1	0	0
FU.B03	Electronic gear ratio setting exceeds the limit.	NO.2	Yes	1	0	0
FU.B04	Full closed-loop function parameter setting error	NO.2	Yes	1	0	0
FU.D03	CAN communication connection is interrupted	NO.2	Yes	1	0	1

d) Warning, resettable:

Display	Fault name	Fault type	Can it be reset	Coded output		
				AL3	AL2	AL1
FU.110	Frequency division pulse output setting failure	NO.3	Yes	1	1	1
FU.601	Back to origin timeout fault	NO.3	Yes	0	0	0
FU.730	Encoder battery warning	NO.3	Yes	1	1	1
FU.831	AI zero drift is too large	NO.3	Yes	1	1	1
FU.900	DI emergency brake	NO.3	Yes	1	1	1
FU.909	Motor overload warning	NO.3	Yes	1	1	0
FU.920	Brake resistance overload	NO.3	Yes	1	0	1
FU.922	External braking resistance is too small	NO.3	Yes	1	0	1
FU.939	The motor power line is broken.	NO.3	Yes	1	0	0
FU.941	Change parameters need to be re-energized to take effect.	NO.3	Yes	0	1	1
FU.942	Frequent parameter storage	NO.3	Yes	0	1	1
FU.950	Forward overtravel warning	NO.3	Yes	0	0	0
FU.952	Reverse overtravel warning	NO.3	Yes	0	0	0
FU.980	Encoder internal fault	NO.3	Yes	0	0	1
FU.990	Input phase loss warning	NO.3	Yes	0	0	1
FU.994	CAN address conflict	NO.3	Yes	0	0	1
FU.A40	Internal fault	NO.3	Yes	0	1	0

6.2.2 Fault and Warning Code Table

1) FU.101: Abnormal internal parameters of servo.

Generation mechanism:

- The total number of function codes changes, which generally appears after updating the software;
- The parameter values of function codes of P02 and later groups exceed the upper and lower limits, and generally appear after updating the software.

Cause	Confirmation method	Treatment measures
1. Control the instantaneous drop of power supply voltage.	◆ Confirm whether it is in the process of cutting off the control electricity (L1C, L2C) or an instantaneous power failure occurs.	After the system parameters are initialized (P02-31=1), write the parameters again.
	◆ Measure whether the input voltage of the non-driver side of the control electric cable meets the following specifications during operation: 220V driver: Valid values: 220V-240V. Allowable deviation:-10% ~+10% (198 V ~ 264 V) 380V driver: Valid values: 380V-440V Allowable deviation:-10% ~+10% (342V ~ 484V)	Increase the power supply capacity or replace a large-capacity power supply. After the system parameters are initialized (P02-31=1), rewrite the parameters.
2. Instantaneous power failure during parameter storage.	◆ Confirm whether there is instantaneous power failure in the parameter value storage process.	Power on again, and after the system parameters are initialized (P02-31=1), re-write the parameters.
3. Write parameters within a certain period of time The number of times has exceeded the maximum.	◆ Confirm whether the upper device frequently changes parameters.	Change the parameter writing method and write again. Or the servo driver fails, replace the servo driver.

Cause	Confirmation method	Treatment measures
4. Updated the software	◆ Confirm whether the software has been updated	Reset the driver model and motor model, and the system parameters are initialized again (P02-31=1).
5. Servo driver failure	◆ When the power supply is turned on for many times and the factory parameters are restored, the servo driver fails.	Replace the servo drive

2) FU.102: Programmable Logic Configuration Failure

Generation mechanism:

- Software versions of FPGA and MCU do not match;
- The related hardware of FPGA or MCU is damaged, which makes it impossible to establish communication between MCU and FPGA.

Cause	Confirmation method	Treatment measures
1.FPGA and MCU are not matching	◆ Check the MCU software version number P01-00 and FPGA software version number P01-01 through the panel or drive debugging platform, and confirm whether the most significant non-zero values of the two software version numbers are consistent.	Consult our technical support and update the matching FPGA or MCU software.
2.FPGA failure	◆ After connecting the power supply for many times, the fault is still reported.	Replace the servo drive

3) FU.104: programmable logic interrupt fault

In order to distinguish the fault mechanism, the servo driver can display different internal fault codes under the same external fault code, which can be viewed through P0B-45.

Generation mechanism:

- MCU or FPGA access timeout.

Cause	Confirmation method	Treatment measures
1. FPGA failure (FU.104)	◆ After connecting the power supply for many times, the fault is still reported.	Replace the servo drive
2. Communication handshake between FPGA and MCU. Abnormal (FU.100)		
3. The internal operation of the driver timed out (FU.940)		

4) FU.105: Internal program exception

Generation mechanism:

- When EEPROM reads/writes function codes, the total number of function codes is abnormal;
- The range of function code setting value is abnormal (usually after the update procedure).

Cause	Confirmation method	Treatment measures
1. EEPROM failure	◆ Confirm according to the method of FU.101	After the system parameters are initialized (P02-31=1), power on again.
2. Servo driver failure	◆ After connecting the power supply for many times, the fault is still reported.	Replace the servo drive

5) FU.108: Parameter storage failure

Generation mechanism:

- Unable to write parameter values to EEPROM; Parameter values cannot be read from EEPROM.

Cause	Confirmation method	Treatment measures
1. Exception occurred in parameter writing.	◆ After changing a parameter, power it on again to see if the parameter value is saved.	Not saved, and the fault still occurs after multiple power-ups, and the drive needs to be replaced.
2. Abnormal parameter reading.		

6) FU.120: Product matching failure

Generation mechanism:

- The motor and driver do not match or the parameters are set incorrectly.

Cause	Confirmation method	Treatment measures
1. The product number (motor or driver) does not exist.	Internal fault code P0B45=0120 or 1120 ◆ Check whether the motor nameplate is our matching motor, and confirm whether the setting of P00-00 is correct according to the motor nameplate.	According to the motor nameplate, reset P00-00 (motor number) or replace the matching motor.

	Internal fault code P0B45=2120 ◆ Check the drive model (P01-02) to see if there is such a drive model.	The drive number does not exist. Set the correct drive model according to the nameplate of the drive.
2. The power level of motor and driver does not match.	Internal fault code P0B45=3120 ◆ Confirm whether the driver model (P01-02) matches the bus motor model (P00-05).	Replace mismatched products.

7) FU.121: Servo ON command is invalid.

Generation mechanism:

- When some auxiliary functions are used, redundant servo enable signals are given.

Cause	Confirmation method	Treatment measures
1. Under the condition of internal enabling, external Servo enable signal (S-ON) is valid.	◆ Confirm whether to use accessibility features: P0D-02, P0D-03, P0D-12, and DI function 1 (FunIN.1: S-ON, servo enable signal) is valid.	Deactivate the signal of DI function 1 (including hardware DI and virtual DI).

8) FU.122: Product matching failure in absolute position mode

Generation mechanism:

- Absolute position mode motor mismatch or motor number setting error.

Cause	Confirmation method	Treatment measures
Detecting motor in absolute position mode Mismatch or wrong motor number setting.	◆ Check whether the motor nameplate is a multi-turn absolute encoder motor. ◆ Check whether P00-00 (motor number) is correct.	According to the motor nameplate, reset P00-00 (motor number) or replace the matching motor.

9) Fu.130: Duplicate allocation of DI functions

Generation mechanism:

- The same DI function is repeatedly allocated, including hardware DI and virtual DI;
- DI function number exceeds the number of DI functions.

Cause	Confirmation method	Treatment measures
1. When assigning DI functions, the same function is repeatedly assigned to multiple DI terminals.	◆ Check whether P03-02/P03-04...P03-20, P17-00/P17-02...P17-30 have the same non-zero DI function number.	Re-assign the P03 group and P17 group parameters with the same non-zero function number to different function numbers, and then turn on the control power again to make the change effective, or turn off the servo enable signal first and give a "reset signal" to make the change effective.
2. DI function number exceeds the number of DI functions.	◆ Whether the MCU program has been updated.	After the system parameters are initialized (P02-31=1), power on again.

10) Fu.131: Do function allocation exceeds the limit.

Generation mechanism:

- DO function number exceeds the number of DO functions.

Cause	Confirmation method	Treatment measures
1. The number of DO functions exceeds the number of DO functions.	◆ Whether the MCU program has been updated.	After the system parameters are initialized (P02-31=1), power on again.

11) FU.136: The data in the ROM of the motor encoder is checked incorrectly or the parameters are not stored.

Generation mechanism:

- When the driver reads the parameters of the encoder ROM area, it is found that the parameters are not stored, or the parameters are inconsistent with the agreed values.

Cause	Confirmation method	Treatment measures
1. The driver and motor types do not match.	<ul style="list-style-type: none"> According to the nameplate of the driver and motor, confirm that P00-00 is set correctly. For this series of drivers and 17-bit servo motors (-U2***), check whether P00-00 (motor number) is 14130. 	Replace with matched drivers and motors, and power on again. <ul style="list-style-type: none"> When using our driver and 17-bit servo motor, ensure P00-00= 14130.
2. The parameters in the ROM of the bus incremental encoder are checked incorrectly or the parameters are not stored.	<ul style="list-style-type: none"> Check whether the encoder cable standard by the company is selected. The cable has no broken skin or broken wire, and the terminals on both sides have no bad contact, and are reliably connected. Measure the signals at both ends of the encoder cable: PS+, PS-, +5V, GND, and observe whether the signals on both sides are consistent. Signal definition refers to hardware wiring. 	Use our standard encoder cable, make sure that the terminals at the motor end are firmly connected, tighten the screws at the driver end, and replace the encoder cable with a new one if necessary. Encoder cables and power wires (L1, L2, L3, U, V, W) should not be bound, but should be routed separately.
3. Drive failure	<ul style="list-style-type: none"> Power on again and still report the fault. 	Replace the servo drive

12) FU.201: overcurrent 2

Generation mechanism:

- The hardware has detected an overcurrent.

Cause	Confirmation method	Treatment measures
1. The input command is synchronized with the on servo or the input command is too fast.	<ul style="list-style-type: none"> Check whether the command has been entered before the servo panel displays "Rdy". 	Command sequence: After the servo panel displays "Rdy", turn on the servo enable signal (S-ON) first, and then input the command. If possible, add the instruction filtering time constant or increase the acceleration and deceleration time.
2. The braking resistance is too small or short circuit.	<ul style="list-style-type: none"> If the built-in braking resistor (P02-25=0) is used, confirm whether B2 and B3 are reliably connected by wires; if so, measure the resistance between B1/⊕ and B3; If an external braking resistor (P02-25=1/2) is used, measure the resistance of the external braking resistor between B1/⊕ and B2. Refer to Chapter 1 for brake resistor specifications. 	If the built-in braking resistor is used with a resistance value of "0", it is adjusted to use an external braking resistor (P02-25=1/2), and the wire between B2 and B3 is removed. The resistance value and power of the resistor can be selected to be consistent with the specifications of the built-in braking resistor; If an external braking resistor is used and its resistance is less than P02- 21, refer to Chapter 1 "Braking Resistance Specifications", replace it with a new resistor and reconnect it between B1/⊕ and B2. Make sure to set P02-26 (external braking resistor power) P02-27 (external braking resistor resistance value) to be consistent with the actual external braking resistor parameters.
3. Poor contact of motor cable	<ul style="list-style-type: none"> Check whether the connection between both ends of the driver power cable and the driver U V W side in the motor cable is loose. 	Refer to Chapter 1 for brake resistor specifications.
4. Motor cable grounding	<ul style="list-style-type: none"> Ensure that the power cable and motor cable of the driver are securely connected, and measure whether the insulation resistance between the UVW end of the driver and the ground wire (PE) is megaohm (MΩ) level. 	Replace the motor if the insulation is poor.
5. Short circuit of motor U V W cable.	<ul style="list-style-type: none"> Unplug the motor cable, and check whether there is a short circuit between the motor cables, whether there is burr in the wiring, etc. 	Connect the motor cable correctly.
6. The motor is burnt out	<ul style="list-style-type: none"> Unplug the motor cable and measure whether the resistance between the motor cables is balanced. 	Replace the motor if it is unbalanced.

Cause	Confirmation method	Treatment measures
7. The gain setting is unreasonable and the motor oscillates.	<ul style="list-style-type: none"> Check whether the motor vibrates or has sharp sound during starting and running. You can also use the drive debugging platform to check the "current feedback". 	Make gain adjustment.
8. Incorrect wiring of encoder, aging and corrosion, and loose encoder plug.	<ul style="list-style-type: none"> Check whether our standard encoder cable is selected, and whether the cable has aging corrosion and loose connector. Turn off the servo enable signal, and turn the motor shaft by hand to see whether P0B-10 changes with the rotation of the motor shaft. 	Reweld, plug in or replace the encoder cable.
9. Drive failure	<ul style="list-style-type: none"> Unplug the motor cable, and report the fault when it is powered on again. 	Replace the servo drive

13) Fu.207: D/Q axis current overflow fault

Generation mechanism:

- Abnormal current feedback leads to the overflow of the internal register of the driver;
- Abnormal encoder feedback leads to internal register failure of the driver.

Cause	Confirmation method	Treatment measures
1.DQ axis current overflow	<ul style="list-style-type: none"> When the power supply is turned on for many times and the fault is still reported, the servo driver fails. 	Replace the servo drive

14) FU.208: FPGA system sampling operation timed out.

Generation mechanism:

- When FU.208 occurs, please check the cause of the failure through the internal fault code (P0B-45).

Cause	Confirmation method	Treatment measures
1.MCU communication timeout	<ul style="list-style-type: none"> Internal fault code P0B-45=1208: Internal chip is damaged. 	Replace servo driver.
2. Encoder communication timeout	Internal fault code P0B-45=2208: <ul style="list-style-type: none"> Encoder wiring error Loose encoder cable Encoder cable is too long. Encoder communication is disturbed. Encoder failure 	<ul style="list-style-type: none"> For cables, our standard cables are preferred. If they are not standard cables, it is necessary to check whether the cables meet the specification requirements and whether twisted-pair shielded wires are used. Check whether the plugs at both ends of the encoder are in good contact and whether the needles are retracted; Please contact the manufacturer; Separate the strong and weak current as far as possible for wiring, and do not bind the motor cable and encoder cable. The grounding of the motor and driver should be well lifted. Replace the servo motor.
3. Current sampling timeout	Internal fault code P0B-45=3208: <ul style="list-style-type: none"> Check whether there is interference from large equipment on site, or whether there are various interference sources such as various power frequency conversion equipment in the cabinet; The internal current sampling chip is damaged. 	<ul style="list-style-type: none"> On-site wiring shall be separated from strong current and weak current as far as possible and shall not be bundled; Replace the servo drive
4. High-precision AD conversion timeout	Internal fault code P0B-45=4208: <ul style="list-style-type: none"> There is interference in the wiring of high-precision AI channel. Check the wiring of AI channel with reference to the correct wiring diagram. 	Re-wiring with twisted-pair shielded wire can shorten the line length.
5.FPGA operation timed out	Internal fault code P0B-45=0208: <ul style="list-style-type: none"> Investigate the reason according to the reason 1/2/3/4. 	Handle it according to reason 1/2/3/4.

15) FU.210: Output short circuit to ground

Generation mechanism:

- During the drive power-on self-test, abnormal motor phase current or bus voltage was detected.

Cause	Confirmation method	Treatment measures
1. The driver power cable (U V W) is short-circuited to the ground.	<ul style="list-style-type: none"> Unplug the motor cable and measure the power cable of the driver respectively. Whether U V W is short-circuited to ground (PE). 	Reconnect or replace the drive power cable.
2. The motor is short-circuited to the ground	<ul style="list-style-type: none"> Ensure that the power cable and motor cable of the driver are securely connected, and measure whether the insulation resistance between the U V W terminal of the driver and the ground wire (PE) is megaohm (mw) level. 	Replace the motor.

Cause	Confirmation method	Treatment measures
3. Drive failure	◆ Remove the power cable of the driver from the servo driver and report the fault after turning on the power for many times.	Replace the servo drive

16) FU.220: Phase sequence error

Generation mechanism:

- The angle of the driver is identified, and it is identified that the phase sequence of the driver UVW and the motor UVW does not match.

Cause	Confirmation method	Treatment measures
The driver U V W and the motor UVW have different phase sequences.	◆ After many times of power-on, the angle identification still reported the fault of FU.220	Reconnect and then identify the angle again.

17) FU.234: flywheel trip

Generation mechanism:

- In torque control mode, the direction of torque command is opposite to the direction of speed feedback;
- In position or speed control mode, the speed feedback is opposite to the speed command.

Cause	Confirmation method	Treatment measures
1. U V W phase sequence wiring error.	◆ Check whether the connections between the two ends of the driver power cable, the U V W end of the motor cable and the U V W end of the driver are in one-to-one correspondence.	Connect the wires according to the correct U V W phase sequence.
2. When the motor is powered on, the interference signal causes the initial phase detection error of the motor rotor.	◆ The phase sequence of U V W is correct, but if the servo driver is enabled, it will be reported to FU.234.	Power it on again.
3. Wrong encoder model or wiring.	◆ According to the nameplate of the driver and motor, confirm that P00-00 (motor number) is set correctly.	Replace with matched drivers and motors. Reconfirm P00-00 (motor number) and connect the encoder.
4. Incorrect wiring of encoder, aging and corrosion, and loose encoder plug.	◆ Check whether our standard encoder cable is selected, and whether the cable has aging corrosion and loose connector. ◆ Turn off the servo enable signal, and turn the motor shaft by hand to see whether P0B-10 changes with the rotation of the motor shaft.	Reweld, plug in or replace the encoder cable.
5. Under the condition of vertical axis, the gravity load is too large.	◆ Check whether the vertical shaft load is too large, and adjust the parameters of P02-09 ~ P02-12 to eliminate the fault.	Reduce the vertical axis load, or improve the rigidity, or shield it without affecting the safety and use. Fault.

Note: ■ Please set P0A-12=0 to shield the flywheel trip fault under the condition of being towed and vertical axis.

18) FU.400: Mechanism of Electrical Overvoltage in Main Circuit;

- The DC bus voltage between B1/⊕ and ⊖1 exceeds the fault value:

220V driver: normal value: 310V, fault value: 420V;

380V driver: normal value: 540V, fault value: 760V.

Cause	Confirmation method	Treatment measures
1. The main circuit input voltage is too high.	◆ Check the specifications of the driver input power supply, and measure whether the input voltage of the main loop cable driver side (L1 L2 L3) meets the following specifications: 220V driver: Valid values: 220V-240V. Allowable deviation:-10% ~+10% (198 V ~ 264 V) 380V driver: Valid values: 380V-440V Allowable deviation:-10% ~+10% (342V ~ 484V)	Replace or adjust the power supply according to the specifications on the left.
2. The power supply is in an unstable state or is affected by lightning strike.	◆ Monitor whether the input power supply of the driver is affected by lightning strike, and measure whether the input power supply is stable and meets the above specifications.	After the surge suppressor is connected, turn on the control power and the main loop power. If the fault still occurs, replace the servo driver.
3. Failure of braking resistor	◆ If the built-in braking resistor (P02-25=0) is used, confirm whether B2 and B3 are reliably connected by wires, and if so, measure the resistance between B1/⊕ and B3; ◆ If an external braking resistor (P02-25=1/2) is used, measure the resistance of the external braking resistor between B1/⊕ and B2. ◆ Refer to Chapter 1 for brake resistor specifications.	If the resistance value is "∞" (infinite), the braking resistor is disconnected internally: If the built-in braking resistor is used, it is adjusted to use the external braking resistor (P02-25=1/2), and the wire between B2 and B3 is removed. The resistance value and power of the resistor can be selected to be consistent with the built-in braking resistor; If an external braking resistor is used, replace it with a new

		resistor and reconnect it between B1/⊕ and B2. Make sure to set P02-26 (external braking resistor power) P02-27 (external braking resistor resistance value) to be consistent with the actual external braking resistor parameters.
4. The resistance of external braking resistor is too large, and the maximum braking energy cannot be completely absorbed.	◆ Measure the resistance of external braking resistor between B1/⊕ and B2, and compare with the recommended value.	Replace the resistance of the external braking resistor with the recommended value and reconnect it between B1/⊕ and B2. Make sure to set P02-26 (external braking resistor power) P02-27 (external braking resistor resistance value) to be consistent with the actual external braking resistor parameters.
5. When the motor is running in sudden acceleration and deceleration, the maximum braking energy exceeds the absorbable value.	◆ Confirm the acceleration and deceleration time in operation, measure the DC bus voltage between B1/⊕ and ⊖1, and confirm whether the voltage exceeds the fault value during deceleration.	Firstly, ensure that the input voltage of the main circuit is within the specification range, and secondly, increase the acceleration and deceleration time if allowed.
6. The sampling value of bus voltage has great deviation.	◆ Observe whether the parameter P0B-26 (bus voltage value) is in the following range: 220V driver: P0B-26 > 420V 380V driver: P0B-26 > 760V Measure whether the DC bus voltage between B1/⊕ and ⊖1 is normal and less than P0B-26.	Consult our technical support.
7. Servo driver failure	◆ After being powered off for many times, the main circuit is reconnected, and the fault is still reported.	Replace the servo drive

19) FU.410: Electrical Undervoltage of Main Circuit

Generation mechanism:

- The DC bus voltage between B1/⊕ and ⊖1 is lower than the fault value:
220V driver: normal value: 310V, fault value: 200V;
380V driver: normal value: 540V, fault value: 380V V.

Cause	Confirmation method	Treatment measures
1. The main loop power instability or power failure.	◆ Check the specifications of the driver input power supply, and measure whether the input voltages of the non-driver side and the driver side (L1 L2 L3) of the main loop cable meet the following specifications: 220V driver: Valid values: 220V-240V. Allowable deviation:-10% ~+10% (198 V ~ 264 V) 380V driver: Valid values: 380V-440V Allowable deviation:-10% ~+10% (342V ~ 484V) All three phases need to be measured.	Improve power supply capacity.
2. Instantaneous power failure occurs		
3. The power supply voltage drops in operation		
4. In case of lack of phase, the driver running with 3-phase power supply actually runs with single-phase power supply.	◆ Check whether the wiring of the main circuit is correct and reliable, and check whether the parameter P0A-00 is shielded for open-phase fault detection.	Replace the cable and connect the main loop power cord correctly: Three phases: L1 L2 L3; ; Single phase: L1 L2
5. Servo driver failure	◆ Observe whether the parameter P0B-26 (bus voltage value) is in the following range: 220V driver: P0B-26 < 200V 380V driver: P0B-26 < 380V After several times of power-off, reconnecting the main circuit power (L1 L2 L3) still reports a fault.	Replace the servo drive

20) FU.420: Main circuit electrical phase loss

Generation mechanism:

- The three-phase driver is missing one or two phases.

Cause	Confirmation method	Treatment measures
1. The three-phase input line is poorly connected.	◆ Check whether the cable between the non-driver side and the input terminal (L1 L2 L3) of the driver's main loop is good and securely connected.	Replace the cable and connect the main loop power cord correctly:
2. The driver with three-phase specifications runs under single-phase power supply.	◆ Check the input power specification of the driver, check the actual input voltage specification, and measure whether the input voltage of the main loop meets the following specifications: 220V driver: Valid values: 220V-240V. Allowable deviation: -10% ~ +10% (198V ~ 264V) 380V driver: Valid values: 380V-440V Allowable deviation: -10% ~ +10% (342V ~ 484V) All three phases need to be measured.	For a 0.75kW three-phase driver (driver model P01-02=5), it is allowed to run under single-phase power supply. If the input voltage meets the left specification, P0A-00=2 can be set (failure and warning of power supply input phase-loss protection is prohibited); In other cases, if the input voltage does not meet the left specification, please replace or adjust the power supply according to the left specification.
3. The three-phase power supply is unbalanced or the three-phase voltage is too low.		
4. Servo driver failure	◆ After several times of power-off, reconnecting the main circuit power (L1 L2 L3) still reports a fault.	Replace the servo drive

21) FU.430: Controlling the undervoltage of electricity

Generation mechanism:

- 220V driver: normal value: 310V, fault value: 190V;
- 380V driver: normal value: 540V, fault value: 350V V.

Cause	Confirmation method	Treatment measures
1. Control the unstable power supply or power failure.	◆ Confirm whether it is in the process of cutting off the control power (L1C L2C) or an instantaneous power failure occurs.	Power on again. If it is abnormally powered off, make sure the power supply is stable.
	◆ Measure whether the input voltage of the control electric cable meets the following specifications: 220V driver: Valid values: 220V-240V. Allowable deviation: -10% ~ +10% (198V ~ 264V) 380V driver: Valid values: 380V-440V Allowable deviation: -10% ~ +10% (342V ~ 484V)	Improve power supply capacity.
2. Poor contact of control cable	◆ Check whether the cables are connected, and measure whether the voltage on the driver side (L1C, L2C) of the control electric cable meets the above requirements.	Reconnect or replace cables.

22) FU.500: overspeed

Generation mechanism:

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

Cause	Confirmation method	Treatment measures
1. The motor cable U V W phase sequence is wrong.	◆ Check whether the connections between the two ends of the driver power cable, the U V W end of the motor cable and the U V W end of the driver are in one-to-one correspondence.	Connect the wires according to the correct U V W phase sequence.
2. P0A-08 parameter setting error	◆ Check whether the overspeed fault threshold is less than the maximum motor speed required for actual operation: Over-speed fault threshold = 1.2 times the maximum motor speed (P0A-08 = 0); Over-speed fault threshold = P0A-08 (P0A-08 ≠ 0, and P0A-08 < 1.2 times the maximum motor speed).	Reset the overspeed fault threshold according to the mechanical requirements.
3. The input command exceeds the overspeed fault threshold.	◆ Confirm whether the motor speed corresponding to the input command exceeds the overspeed fault threshold. Position control mode, when the command source is pulse command: Motor speed (rpm) = $\frac{\text{Input pulse frequency (HZ)}}{\text{Encoder resolution}} \times \text{Electronic gear ratio} \times 60$ For this driver, the encoder resolution = 1048576(P/r).	Position control mode: When the source of position command is pulse command: on the premise of ensuring the final positioning accuracy, reduce the frequency of pulse command or reduce the electronic gear ratio when the running speed allows; Speed control mode: check the input speed command value or speed limit

Cause	Confirmation method	Treatment measures
		value (P06-06 ~ P06-09) and confirm that they are all within the overspeed fault threshold; Torque control mode: set the speed limit threshold within the overspeed fault threshold.
4. Motor speed overshoot	◆ Check whether the "speed feedback" exceeds the overspeed fault threshold with the drive debugging platform.	Adjust the gain or adjust the mechanical operating conditions.
5. Servo driver failure	◆ After power-on operation again, the fault still occurs.	Replace the servo drive

23) FU.510: Pulse output overspeed

Generation mechanism:

- When using the pulse output function (P05-38=0 or 1), the output pulse frequency exceeds the upper frequency limit (2MHz) allowed by the hardware.

Cause	Confirmation method	Treatment measures
The output pulse frequency exceeds the upper frequency limit (2MHz) allowed by the hardware.	◆ P05-38=0 (encoder frequency division output), calculate the output pulse frequency corresponding to the motor speed when the fault occurs, and confirm whether it exceeds the limit. Output pulse frequency (Hz)= $\frac{\text{Motor speed (rpm)}}{60} \times \text{P05-17}$	Reduce P05-17 (the number of encoder divided pulses), so that the output pulse frequency is less than the upper frequency limit allowed by hardware in the whole speed range required by machinery.
	◆ P05-38=1 (synchronous output of pulse instruction), the input pulse frequency exceeds 2MHz or the pulse input pin has interference. Low speed pulse input pin: Differential input terminals: PULSE+, PULSE-, SIGN+, SIGN-, and the maximum pulse frequency is 500kpps. Open collector input terminals: PULLHI, PULSE+, PULSE-, SIGN+, SIGN-, and the maximum pulse frequency is 200kpps.	Reduce the input pulse frequency to within the upper frequency limit allowed by hardware. Please be noted: At this time, if the electronic gear ratio is not modified, the motor speed will decrease. If the input pulse frequency itself is high, but it does not exceed the upper frequency limit allowed by hardware, anti-interference measures should be taken (twisted pair shielded wire is used for pulse input wiring, and pin filter parameter P0A-24 or P0A-30 is set) to prevent interference pulses from being superimposed on real pulse instructions, resulting in false alarm failure.

24) FU.602: Angle identification failed.

25) FU.610: Drive overload

Generation mechanism:

- The accumulated heat of the drive is too high and the fault threshold is reached.

26) FU.620: Motor overload

Generation mechanism:

- The accumulated heat of the motor is too high and reaches the fault threshold.

Cause	Confirmation method	Treatment measures
1. The motor wiring and encoder wiring are incorrect and defective.	◆ Compare the correct "wiring diagram" and check the wires between the motor, the driver and the encoder.	Connect cables according to the correct wiring diagram; Give priority to the use of our standard cables; When using homemade cables, please follow the instructions of hardware wiring to make and connect them.
2. The load is too heavy, the motor output effective torque exceeds the rated torque, and it runs continuously for a long time.	◆ Confirm the overload characteristics of the motor or driver; ◆ Check whether the average load rate (P0B-12) of the drive is greater than 100.0% for a long time.	Replace the large-capacity drive and the matching motor; Or reduce the load and increase the acceleration and deceleration time.
3. Too frequent acceleration and deceleration or large load inertia.	◆ Calculate the mechanical inertia ratio or identify the inertia, and check the inertia ratio P08-15; ◆ Confirm the single operation period when the servo motor runs circularly.	Increase the acceleration and deceleration time in a single operation.
4. The gain adjustment is inappropriate or too rigid.	◆ Observe whether the motor vibrates and the sound is abnormal during operation.	Readjust the gain.
5. Driver or motor model is set incorrectly.	◆ For this series of products: check the bus motor model P00-05 and the driver model P01-02.	Check the nameplate of the driver, and set the correct driver model (P01-02) and motor model to match the model.

6. The motor is stalled due to mechanical factors, resulting in excessive load during operation.	<ul style="list-style-type: none"> ◆ Displayed by the drive debugging platform or panel, confirm the operation instruction and motor speed (P0B-00): Operating instruction in position mode: P0B-13 (Input position command counter) Operating instruction in speed mode: P0B-01 (Speed command) Operating instruction in torque mode: P0B-02 (Internal torque command) Confirm whether the running instruction is not 0 and the motor speed is 0 in the corresponding mode. 	Eliminate mechanical factors.
7. Servo driver failure	<ul style="list-style-type: none"> ◆ After power off, power on again, and still report the fault. 	Replace the servo drive

Note: ■ Only after 30s of overload can the fault be cleared or the power supply be restarted.

27) FU.625: Abnormal closing of brake.

Generation mechanism:

- After the internal contracting braking protection is turned on, the internal contracting braking output signal is valid, and the first 100 input instructions are zero.
~ 500ms, the output torque is less than 70% of the detected value of gravity load.

Cause	Confirmation method	Treatment measures
The motor internal contracting brake is not open.	<ul style="list-style-type: none"> ◆ Confirm whether the signal at the motor internal contracting braking end is valid and whether the motor internal contracting braking switch is damaged. 	Reconnect according to the correct wiring, or replace the motor.

28) FU.626: Abnormal opening of internal contracting brake.

Generation mechanism:

- After the internal contracting braking protection is turned on, the internal contracting braking output signal is invalid, but at this time, it is detected that the motor has rotated more than two times.

Cause	Confirmation method	Treatment measures
Abnormal opening of motor internal contracting brake.	<ul style="list-style-type: none"> ◆ Make sure whether the signal at the motor internal contracting braking end is valid and whether the motor internal contracting braking switch is damaged. 	Reconnect according to the correct wiring, or replace the motor.

29) FU.630: Overheat protection for stall motor.

Generation mechanism:

- The actual motor speed is lower than 10rpm, but the torque command reaches the limited value and the duration reaches the set value of P0A-32.

Cause	Confirmation method	Treatment measures
1. The driver's U V W output is out of phase or the phase sequence is wrong.	<ul style="list-style-type: none"> ◆ Test run the motor without load, and check the wiring. 	Reconnect according to the correct wiring, or replace the cable.
2. The driver U V W output is disconnected or the encoder is disconnected.	<ul style="list-style-type: none"> ◆ Check the wiring. 	Reconnect according to the correct wiring, or replace the cable.
3. The motor is stalled due to mechanical factors.	<ul style="list-style-type: none"> ◆ Displayed by the drive debugging platform or panel, confirm the operation instruction and motor speed (P0B-00): Operating instruction in position mode: P0B-13 (Input position command counter) Operation instruction in speed mode: P0B-01 (Speed command) In torque mode Operation instruction: P0B-02 (Internal torque command) Confirm whether the running instruction is not 0 and the motor speed is 0 in the corresponding mode. 	Check mechanical factors.

30) FU.650: radiator overheating

Generation mechanism:

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

Cause	Confirmation method	Treatment measures
1. The ambient temperature is too high	<ul style="list-style-type: none"> ◆ Measuring ambient temperature 	Improve the cooling condition of servo driver and reduce the ambient temperature.
2. Reset the overload fault by turning off the power supply, and	<ul style="list-style-type: none"> ◆ Check the fault record (set P0B-33, check P0B-34), and see if there is any overload fault 	Change the fault reset method, and wait for 30s after overload before resetting.

Cause	Confirmation method	Treatment measures
repeat it many times after overload.	or warning (FU.610, FU.620, FU.630, FU.650, FU.909, FU.920, FU.922).	Improve the capacity of drivers and motors, increase the acceleration and deceleration time and reduce the load.
3. The fan is broken	◆ Whether the fan is running during operation.	Replace the servo drive
4. The installation direction of the servo driver and the interval with other servo drivers are unreasonable.	◆ Confirm whether the installation of servo driver is reasonable.	Install it according to the installation standard of servo driver.
5. Servo driver failure	◆ Restart after 5 minutes of power failure and still report failure.	Replace the servo drive

31) FU.731: Encoder battery failure

Generation mechanism:

- The encoder battery voltage of multi-turn absolute encoder is too low or not connected to the battery.

Cause	Confirmation method	Treatment measures
The battery was not connected during the power failure.	◆ Confirm whether to connect during power failure.	Set P0D-20=1 to clear fault.
Encoder battery voltage is too low.	◆ Measure the battery voltage	Replace the battery with a new one with a matching voltage.

Note: ■ This fault will only occur when the multi-turn absolute position function is enabled (P0201=1 or 2).

32) FU.733: Error in encoder multi-turn counting.

Generation mechanism:

- Encoder multi-turn counting error

Cause	Confirmation method	Treatment measures
Encoder failure	◆ Set P0D-20=1 to clear the fault, and FU.733 still occurs after power-on again.	Replace the motor

33) FU.735: encoder multi-turn counting overflow

Generation mechanism:

- Detect encoder multi-turn count overflow.

Cause	Confirmation method	Treatment measures
P0201=1 to detect encoder multi-turn count overflow.	-	Set P0D-20=1 to clear the fault and power on again.

34) FU.740: encoder interference

Generation mechanism:

- The encoder z signal is disturbed, which leads to the excessive change of the electrical angle corresponding to the z signal.

Cause	Confirmation method	Treatment measures
1. Encoder wiring error	◆ Check the encoder wiring.	Reconnect according to the correct wiring diagram.
2. The encoder cable is loose	◆ Check whether the vibration at the site is too large, which causes the encoder cable to be loose or even damages the encoder.	Reconnect the wiring and ensure that the encoder terminals are securely connected.
3. The encoder Z signal is disturbed	◆ Check the field wiring: Whether there is interference from large equipment around, or whether there are various interference sources such as power frequency conversion equipment in the cabinet. ◆ Let the servo be in the "Rdy" state, manually rotate the motor shaft counterclockwise, and monitor whether P0B-10 (electrical angle) increases or decreases smoothly, and one circle corresponds to 5 0-360° (refers to Z series motors, or 4 0-360° for X series motors). If P0B-10 has an abnormal mutation during the rotation, the encoder itself has a big problem. If no alarm is given during the rotation process, but an alarm is given during the servo operation, the possibility of interference is very high.	Cable priority is given to our standard cable; If the cable is not standard, it is necessary to check whether the cable meets the specification requirements and whether the twisted pair shielded wire is used. The wiring shall be separated from the weak current as far as possible, and the motor cable and the encoder cable shall not be bundled, and the motor and the driver shall be in good contact with the ground. Check whether the plugs at both ends of the encoder are in good contact and whether the needles are retracted.
4. Encoder failure	◆ Replace the encoder cable that can be used normally. If the fault does not occur after replacement, the original encoder cable is damaged. ◆ Put the motor in the same position, power it on for many times and check P0B-10. The deviation of electric angle should be $\pm 30^\circ$.	Replace the encoder cable that can be used normally. If not, the encoder itself has a big problem and the servo motor needs to be replaced.

35) Fu.834: AD sampling overvoltage fault

Generation mechanism:

- The value of AI sampling is greater than 11.5V

Cause	Confirmation method	Treatment measures
1. The input voltage of AI channel is too high.	◆ Measure the input voltage of AI channel, and check whether the actual sampled voltage (P0B-21 or P0B-22) is greater than 11.5V V.	Check the sampled voltage while adjusting the input voltage until the sampled voltage does not exceed 11.5V.
2. AI channel wiring is wrong or there is interference.	◆ Check AI channel wiring with reference to the correct wiring diagram.	Re-wiring with twisted-pair shielded wire can shorten the line length. Increase the filtering time constant of AI channel; AI1 filtering time constant: P03-51 AI2 filtering time constant: P03-56

36) FU.835: High-precision AD sampling failure

Generation mechanism:

- The high-precision AD circuit is disturbed.

Cause	Confirmation method	Treatment measures
1. Interference exists in high-precision AI channel wiring.	◆ Check AI channel wiring with reference to the correct wiring diagram.	Re-wiring with twisted-pair shielded wire can shorten the line length.

37) FU.A33: The encoder data is abnormal.

Generation mechanism:

- The internal parameters of encoder are abnormal.

Cause	Confirmation method	Treatment measures
1. The bus-type incremental encoder cable is broken or loose.	◆ Check the wiring.	Confirm whether the encoder cable is connected incorrectly, or it is disconnected with poor contact, etc. If the motor cable and encoder cable are bundled together, please wire them separately.
2. Abnormal parameter reading and writing of bus incremental encoder.	◆ When the power supply is turned on for many times and the fault is still reported, the encoder fails.	Replace the servo motor.

38) FU.B00: The position deviation is too large.

Generation mechanism:

- In the position control mode, the position deviation is greater than the set value of P0A-10.

Cause	Confirmation method	Treatment measures
1. The driver's U V W output is out of phase or the phase sequence is wrong.	◆ Test run the motor without load, and check the wiring.	Reconnect according to the correct wiring, or replace the cable.
2. The driver U V W output is disconnected or the encoder is disconnected.	◆ Check the wiring.	Reconnect, the servo motor power cable and the driver power cable UVW must correspond to each other. If necessary, replace the new cable and ensure its reliable connection.
3. The motor is stalled due to mechanical factors.	◆ Displayed by the drive debugging platform or panel, confirm the operation instruction and motor speed (P0B-00): Operating instruction in position mode: P0B-13 (Input position command counter) Operating instruction in speed mode: P0B-01 (Speed command) Operating instruction in torque mode: P0B-02 (internal torque command) Confirm whether the running instruction is not 0 and the motor speed is 0 in the corresponding mode.	Check mechanical factors.
4. The servo driver has low gain.	◆ Check the servo driver position loop gain and speed loop gain: First gain: P08-00 ~ P08-02 Second gain: P08-03 ~ P08-05	Perform manual gain adjustment or automatic gain adjustment.
5. The input pulse frequency is high.	◆ When the source of position command is pulse command, is the input pulse frequency too high?	Reduce the frequency of position command or reduce the electronic gear ratio. When the position pulse is output by the upper machine,

	<ul style="list-style-type: none"> Acceleration and deceleration time is 0 or too small. 	a certain acceleration time can be set in the upper machine; If the upper machine cannot set the acceleration and deceleration time, the smoothing parameters P05-04 and P05-06 of the position command can be increased.
6. Compared with the operating conditions, the fault value (P0A-10) is too small	<ul style="list-style-type: none"> Confirm whether the position deviation fault value (P0A-10) is set too small. 	Increase P0A-10 set value.
7. Servo driver/motor failure	<ul style="list-style-type: none"> Monitor the running waveform by driving the oscilloscope function of the debugging platform; Position command, position feedback, speed command and torque command. 	If the position command is not zero and the position feedback is always zero, please replace the servo driver/motor.

39) FU.B01: Abnormal pulse input.

Generation mechanism:

- The input pulse frequency is greater than the maximum position pulse frequency (P0A-09).

Cause	Confirmation method	Treatment measures
1. The input pulse frequency is greater than the set maximum position pulse frequency (P0A-09)	<ul style="list-style-type: none"> Check whether P0A-09 (maximum position pulse frequency) is less than the maximum input pulse frequency required for normal operation of the machine. 	Reset P0A-09 according to the maximum position pulse frequency required for normal operation of the machine. If the output pulse frequency of the upper machine is greater than 4MHz, the output pulse frequency of the upper machine must be reduced.
2. Input pulse interference	<ul style="list-style-type: none"> First, by driving the oscilloscope function of the debugging platform software, we can see whether the position command suddenly increases or whether the position command counter (P0B-13) input by the servo driver is greater than the number of pulses output by the upper machine. Then, check the grounding of the line. 	First of all, the pulse input cable must be twisted-pair shielded wire and wired separately from the driver power line. Secondly, when the low-speed pulse input port (P05-01=0) is used and the differential input is selected, the "ground" of the upper machine must be reliably connected with the "GND" of the driver; When open collector input is selected, the "ground" of the upper machine must be reliably connected with the "com" of the driver; Using high-speed pulse input port (P05-01=1), only differential input can be used, and the "ground" of the upper machine must be reliably connected with the "GND" of the driver. Finally, according to the selected hardware input terminal, increase the pin filtering time P0A-24 or P0A-30 of the pulse input terminal.

40) FU.B02: The full closed-loop position deviation is too large.

Generation mechanism:

- The absolute value of full closed-loop position deviation exceeds P0F-08 (full closed-loop position deviation is too large threshold).

Cause	Confirmation method	Treatment measures
1. The driver's U V W output is out of phase or the phase sequence is wrong.	<ul style="list-style-type: none"> Test run the motor without load, and check the wiring. 	Reconnect according to the correct wiring, or replace the cable.
2. The driver U V W output is disconnected or the internal/external encoder is disconnected.	<ul style="list-style-type: none"> Check the wiring. 	Reconnect, the servo motor power cable and the driver power cable UVW must correspond to each other. If necessary, replace the new cable and ensure its reliable connection.

3. The motor is stalled due to mechanical factors.	<ul style="list-style-type: none"> Displayed by the drive debugging platform or panel, confirm the operation instruction and motor speed (P0B-00): Operating instruction in position mode: P0B-13 (Input position command counter) Operation instruction in speed mode: P0B-01 (Speed command) Operating instruction in torque mode: P0B-02 (Internal torque command) Confirm whether the running instruction is not 0 and the motor speed is 0 in the corresponding mode. 	Check mechanical factors.
4. The servo driver has low gain.	<ul style="list-style-type: none"> Check the servo driver position loop gain and speed loop gain: First gain: P08-00 ~ P08-02 Second gain: P08-03 ~ P08-05 	Perform manual gain adjustment or automatic gain adjustment.
5. The input pulse frequency is high.	<ul style="list-style-type: none"> When the source of position command is pulse command, is the input pulse frequency too high? Acceleration and deceleration time is 0 or too small. 	Reduce the frequency of position command or reduce the electronic gear ratio. When the position pulse is output by the upper machine, a certain acceleration time can be set in the upper machine; If the upper machine cannot set the acceleration and deceleration time, the smoothing parameters P05-04 and P05-06 of the position command can be increased.
6. The fault value (P0F-08) is too small relative to the operating conditions.	<ul style="list-style-type: none"> Confirm that the full closed-loop position deviation is too large fault threshold (P0F-08) is set too small. 	Increase P0F-08 set value.
7. Servo driver/ Motor failure	<ul style="list-style-type: none"> Monitor the running waveform by driving the oscilloscope function of the debugging platform; Position command, position feedback, speed command and torque command. 	If the position command is not zero and the position feedback is always zero, please replace the servo driver/motor.

41) FU.B03: Electronic gear setting exceeds the limit.

Generation mechanism:

- The ratio of any group of electronic gears exceeds the limit value:
($0.001 \times \text{encoder resolution} / 10000$, $4000 \times \text{encoder resolution} / 10000$).

Cause	Confirmation method	Treatment measures
The set value of electronic gear ratio exceeds the above range.	<ul style="list-style-type: none"> If P05-02=0, determine the ratio of parameters P05-07/P05-09, P05-11/P05-13. If P05-02>0, determine the ratio of encoder resolution/P05-02, P05-07/P05-09, P05-11/P05-13. 	Will: Encoder resolutions /P05-02, P05-07/P05-09, P05-11/P05-13 The ratio is set within the above range.
Parameter change order problem	<ul style="list-style-type: none"> Change the electronic gear ratio related parameters: In P05-02, P05-07/P05-09 and P05-11/P05-13, the electronic gear ratio exceeded the limit during the transition process of calculating the electronic gear ratio. 	Just use the fault reset function or power on again.

42) FU.B04: Error in setting full closed-loop function parameters.

Generation mechanism:

- When the full closed-loop function is used and the position command comes from the internal position command, the inner and outer ring switching function is used.

Cause	Confirmation method	Treatment measures
In the fully closed-loop position mode, the position command comes from the internal position command, but the inner and outer ring switching mode is used.	<ul style="list-style-type: none"> Check whether P0F-00 is 2. Confirm whether the source of position command is internal position command: multi-segment position command, medium-length function. 	When the full closed-loop function is used, and the source of the position command is the internal position command, only the external encoder feedback mode can be used, that is, P0F-00 can only be 1.

43) FU.D03: CAN communication connection is interrupted.

Generation mechanism:

- CAN communication timeout.

Cause	Confirmation method	Treatment measures
CAN communication connection is interrupted: the slave station is dropped off	<ul style="list-style-type: none"> ◆ Check the status of PLC CAN communication card lamp in the main station: The ERR light of the master station PLC flashes at a frequency of 1Hz, and the ERR light of some slave stations PLC stays on for a long time (when using PLC background software, D78xx can be monitored in the component monitoring table of the master station, where xx represents the station number in decimal, and D78xx corresponding to some configured stations is 5, indicating that the slave station is out of order). 	Check the communication cable connection between the slave station and the master station with the ERR light on; Check the slave communication baud rate P0C-08 with the ERR light on, and adjust it to be consistent with the master station.
CAN communication connection is interrupted: the main station dropped off.	<ul style="list-style-type: none"> ◆ Check the status of PLC CAN communication card lamp in the main station: ERR lights of all slave stations' PLC are on for a long time (when using PLC background software, D78xx can be monitored in the component monitoring table of the master station, where xx represents the station number in decimal, and all D78xx corresponding to all configured stations are 5, indicating that the master station is out of order). 	Check the cable connection of the main station.

6.2.3 Handling method of warning

1) FU.110: setting fault of frequency division pulse output.

Generation mechanism:

- When using the encoder frequency division output function (P05-38=0), the set number of encoder frequency division pulses does not meet the threshold determined by encoder specifications.

Cause	Confirmation method	Treatment measures
The encoder frequency division pulse number is out of range.	<ul style="list-style-type: none"> ◆ Incremental code wheel: the number of divided pulses of the encoder cannot exceed the resolution of the encoder; 17-bit bus incremental encoder with resolution of 1048576 (P/r); 2500-line incremental encoder with resolution of 10000(P/ r); ◆ Absolute code wheel: The number of divided pulses of the encoder cannot exceed 1/4 of the resolution of the encoder. 	Reset the encoder frequency division pulse number (P05-17) to meet the specified range.

2) FU.601: Back to origin timeout fault

Generation mechanism:

- When using the origin reset function (P05-30 = 1 ~ 5), the origin was not found within the time set by P05-35.

Cause	Confirmation method	Treatment measures
1. The origin switch is faulty	<ul style="list-style-type: none"> ◆ When the origin returns, it has been searching at a high speed without a low speed search process. ◆ It has been in the process of reverse low-speed search after the origin returned to high-speed search. 	If the hardware DI is used, please confirm that the DI function 31 has been set in P03 group, and then check the wiring of the DI terminal. When the logic of the DI terminal is changed manually, monitor whether the driver receives the corresponding DI level change through P0B-03. If not, it means that the DI switch is wired incorrectly. If yes, there is an error in the origin regression operation. Please refer to section 6.2.8 to operate this function correctly. If virtual DI is used, refer to 10.4 to check whether the VDI usage process is correct.
2. The time limit for finding the origin is too short.	<ul style="list-style-type: none"> ◆ Check whether the time set in P05-35 is too short. 	Increase P05-35
3. The speed of searching the origin switch signal at high speed is too small.	<ul style="list-style-type: none"> ◆ Look at the distance from the starting position of returning to zero to the origin switch to judge whether the speed value set in P05-32 is too small, resulting in too long time to find the origin switch. 	Increase P05-32

3) FU.730: Encoder battery warning

Generation mechanism:

- The encoder battery voltage of multi-turn absolute encoder is too low or not connected to the battery.

Cause	Confirmation method	Treatment measures
The battery was not connected during the power failure.	◆ Confirm whether to connect during power failure.	Replace the battery with a new one with a matching voltage.
Encoder battery voltage is too low.	◆ Measure the battery voltage	

Note: ■ This fault will only occur when the multi-turn absolute position function is enabled (P0201=1 or 2).

4) FU.831: AI zero drift is too large

Generation mechanism:

- When the input voltage of AI (including AI1 and AI2) terminal is 0V, the voltage sampled by the driver is greater than 500mV.

Cause	Confirmation method	Treatment measures
1. Wrong wiring or interference.	◆ Check the wiring with reference to the correct wiring diagram.	Re-wiring with twisted-pair shielded wire can shorten the line length. Increase the filtering time constant of AI channel; AI1 filtering time constant: P03-51 AI2 filtering time constant: P03-56
2. Servo driver failure	◆ Remove the external wiring of AI terminal (input is 0), and check whether the AI sampling value of P0B group exceeds 500mV.	If it exceeds, replace the drive.

5) FU.900: DI emergency braking

Generation mechanism:

- DI terminal logic corresponding to DI function 34 (FunIN.34: Emergency) is valid (including hardware DI and virtual DI).

Cause	Confirmation method	Treatment measures
DI function 34: Brake, triggered	◆ Check whether DI function 34: Emergency Stop Brake and its corresponding DI terminal logic are set to be valid.	Check the operation mode and release the effective signal of DI brake on the premise of safety.

6) FU.909: Motor overload warning

Generation mechanism:

- The accumulated heat of 60Z series 200W and 400W motors is too high and reaches the warning value.

Cause	Confirmation method	Treatment measures
1. Motor wiring and encoder wiring are wrong or bad.	◆ Compare the correct wiring diagram and check the indirect lines of motor, driver and encoder.	Connect cables according to the correct wiring diagram; Give priority to the use of our standard cables; When using homemade cables, please follow the instructions of hardware wiring to make and connect them.
2. The load is too heavy, the motor output effective torque exceeds the rated torque, and it runs continuously for a long time.	◆ Confirm the overload characteristics of the motor or driver; ◆ Check whether the average load rate (P0B-12) of the drive is greater than 100.0% for a long time.	Replace the large-capacity drive and the matching motor; Or reduce the load and increase the acceleration and deceleration time.
3. Acceleration and deceleration are too frequent or the load inertia is too large	◆ Check the mechanical inertia ratio or identify the inertia, and check the inertia ratio P08-15. ◆ Confirm the single operation period when the servo motor runs circularly.	Increase acceleration and deceleration time.
4. Improper gain adjustment or excessive rigidity.	◆ Observe whether the motor vibrates and the sound is abnormal during operation.	Readjust the gain.
5. Driver or motor model is set incorrectly.	◆ For this series of products: check the bus motor model P00-05 and the driver model P01-02.	Check the nameplate of the driver, and set the correct driver model (P01-02) and motor model to match the model.
6. The motor is stalled due to mechanical factors, resulting in excessive load during operation.	◆ Use the drive debugging platform or panel to check the operation instructions and motor speed (P0B-00): Operating instruction in position mode: P0B-13 (Input position command counter) Operating instruction in speed mode: P0B-01 (speed instruction) Operating instruction in torque mode: P0B-02 (internal torque instruction) Confirm whether the operation instruction is not	Eliminate mechanical factors.

	0 or very large and the motor speed is 0 in the corresponding mode.	
7. Servo driver failure	◆ After powering it off, power it on again.	If the fault is still reported after re-energizing, please replace the servo driver.

7) FU.920: Brake Resistance Overload Alarm

Generation mechanism:

- The accumulated heat of the braking resistor is greater than the set value.

Cause	Confirmation method	Treatment measures
1. The external braking resistor is poorly connected, falling off or broken.	<ul style="list-style-type: none"> ◆ Remove the external braking resistor and directly measure whether the resistance value of the resistor is "∞" (infinity); ◆ Measure whether the resistance between B1/⊕ and B2 is "∞" (infinity). 	<p>Replace a new external braking resistor, and connect it between B1/⊕ and B2 after the measured resistance is consistent with the nominal value.</p> <p>Choose a good cable and connect both ends of the external braking resistor between B1/⊕ and B2 respectively.</p>
2. When using the built-in braking resistor, the cable between the power terminals B2 and B3 is short or falls off.	<ul style="list-style-type: none"> ◆ Measure whether the resistance between B2 and B3 is "∞" (infinity). 	Connect B2 and B3 directly with a good cable.
3. When using external braking resistor, P02-25 (braking resistor setting) is selected incorrectly.	<ul style="list-style-type: none"> ◆ View P02-25 parameter values; ◆ Measure the resistance value of the external resistor between B1/⊕ and B2 actually selected, and compare it with the braking resistor specification table to see if it is too large; ◆ Check whether the P02-27 parameter value is greater than the resistance value of the external resistor between B1/⊕ and B2 actually selected. 	Set P02-25 correctly: P02-25 = 1 (use external resistor for natural cooling) P02-25=2 (use external resistor for forced air cooling).
4. When using an external braking resistor, the resistance value of the external braking resistor actually selected is too large.		Refer to the specification table of braking resistor, and correctly select the resistor with appropriate resistance.
5. P02-27 (external braking resistance) is greater than the actual external braking resistance.		Setting P02-27 is consistent with the resistance of the external resistor actually selected.
6. The input voltage of the main circuit exceeds the specification range.	<ul style="list-style-type: none"> ◆ Measure whether the input voltage of the main loop cable driver side meets the following specifications: 220V driver: Valid values: 220V~240V. Allowable deviation:-10% ~+10% (198V ~ 264V) 380V driver: Valid values: 380V~440 Allowable deviation:-10% ~+10% (342V ~ 484V) 	Adjust or replace the power supply according to the specifications on the left.
7. The load moment of inertia ratio is too large.	<ul style="list-style-type: none"> ◆ Identifying the moment of inertia; Or manually calculate the total inertia of the machine according to the mechanical parameters; ◆ Whether the international load inertia ratio exceeds 30. 	<p>Select a large-capacity external braking resistor, and set P02-26 to be consistent with the actual value; Choose a large-capacity servo driver;</p> <p>If possible, reduce the load;</p> <p>If possible, increase the acceleration and deceleration time; If possible, increase the motor running cycle.</p>
8. The motor speed is too high, the deceleration process is not completed within the set deceleration time, and it is in a continuous deceleration state during periodic movement.	<ul style="list-style-type: none"> ◆ Check the speed curve of the motor during periodic movement, and check whether the motor is in deceleration state for a long time. 	
9. The capacity of servo driver or braking resistor is insufficient.	<ul style="list-style-type: none"> ◆ Check the speed curve of the motor in a single cycle and calculate whether the maximum braking energy can be completely absorbed. 	
10. Servo driver failure	-	Replace the servo drive with a new one.

8) FU.922: External braking resistance is too small.

Generation mechanism:

- P02-27 (resistance value of external braking resistor) is less than P02-21 (minimum allowable external braking resistor of driver).

Cause	Confirmation method	Treatment measures
When an external braking resistor is used (P02-25=1 or 2), the resistance of the external braking resistor is less than the minimum value allowed by the driver.	◆ Measure the resistance of external braking resistor between B1/⊕ and B2, and confirm whether it is less than P02-21.	If yes, replace it with an external braking resistor matched with the driver. After setting P02-27 as the selected resistance value, connect both ends of the resistor between B1/⊕ and B2 respectively; If not, set P02-27 as the actual external braking resistance.

9) FU.939: The motor power line is broken.

Generation mechanism:

- The actual phase current of the motor is less than 10% of the rated current, and the actual speed is small, but the internal torque command is very large.

Cause	Confirmation method	Treatment measures
The motor power line is broken.	◆ Check whether the effective value of phase current (P0B-24) is more than 5 times different from the internal torque command (P0B-02), and the actual motor speed (P0B-00) is less than 1/4 of the rated motor speed.	Check the wiring of motor power cable, rewire it, and replace the cable if necessary.

10) FU.941: The changed parameters take effect after being powered on again

Generation mechanism:

- When the function code attribute "Effective Time" of the servo driver is "Power on again", the parameter value of the function code is changed, and the driver reminds the user that it needs to be powered on again.

Cause	Confirmation method	Treatment measures
Changed the function code that takes effect after being powered on again.	◆ Confirm whether the function code whose "effective time" is "power on again" has been changed.	Power it on again.

11) FU.942: Parameters are frequently stored.

Generation mechanism:

- The number of function codes modified at the same time exceeds 200.

Cause	Confirmation method	Treatment measures
Modify the function code parameters very frequently and a lot, and store them in EEPROM. (P0C-13=1)	◆ Check whether the upper machine system frequently and quickly modifies the function code.	Check the operation mode, and set P0C-13 to 0 for the parameters that do not need to be stored in EEPROM before the upper machine writes.

12) FU.950: Forward overtravel warning

Generation mechanism:

- The logic of DI terminal corresponding to DI function 14 (FunIN.14: P-OT) is valid.

Cause	Confirmation method	Treatment measures
DI function 14: forward drive is prohibited, and the terminal logic is valid.	◆ Check whether the P03 group DI terminal is set with DI function 14; ◆ Check whether the DI terminal logic of the corresponding bit of input signal monitoring (P0B-03) is valid.	Check the operation mode, and under the premise of ensuring safety, give negative instructions or rotate the motor to make the terminal logic of "forward overtravel switch" invalid.

13) FU.952: Reverse Overtravel Warning

Generation mechanism:

- The logic of DI terminal corresponding to DI function 15 (FunIN.15: N-OT, reverse overtravel switch) is valid.

Cause	Confirmation method	Treatment measures
DI function 15: reverse driving is prohibited, and the terminal logic is valid.	◆ Check whether the DI terminal of P03 group is set with DI function 15; ◆ Check whether the DI terminal logic of the corresponding bit of input signal monitoring (P0B-03) is valid.	Check the operation mode, and under the premise of ensuring safety, give negative instructions or rotate the motor to make the terminal logic of "reverse overtravel switch" invalid.

14) FU.980: Internal fault of encoder

Generation mechanism:

- Error in encoder algorithm.

Cause	Confirmation method	Treatment measures
Encoder internal fault	◆ When the power supply is turned on for many times and the fault is still reported, the encoder fails.	Replace the servo motor.

15) FU.990: Input phase-missing warning.

Generation mechanism:

- Single-phase operation is allowed for drivers below 1kW, but the power input phase failure and warning (P0A-00) is enabled.

Cause	Confirmation method	Treatment measures
P0A-00=1 (Power input phase loss protection option: enable fault and warning), for a 0.75kW three-phase driver (driver model P01-02=5), it is allowed to operate under single-phase power supply, and a warning will be given when the single-phase power supply is connected.	◆ Confirm whether it is a three-phase driver that allows single-phase operation.	If it is actually a three-phase driver, and the power cord of the main loop is connected to the three-phase power supply, and the warning is still given, it shall be handled according to FU.420; If it is actually a three-phase driver and allows single-phase operation, and the power cord of the main loop is connected to the single-phase power supply, and still gives a warning, set P0A-00 to 0.

16) FU.994: CAN address conflict.

Cause	Confirmation method	Treatment measures
CAN address conflict	◆ Confirm whether there is duplicate allocation between slave stations P0C-00.	Assign the addresses of the slave stations to ensure that P0C-00 is not duplicated.

6.2.4 Internal failure

Please contact our technicians when the following faults occur.

- FU.602: Angle identification failed;
- FU.220: phase sequence error;
- FU.A40: parameter identification failed;
- FU.111: Abnormal internal parameters of servo.

Version: V2.0

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