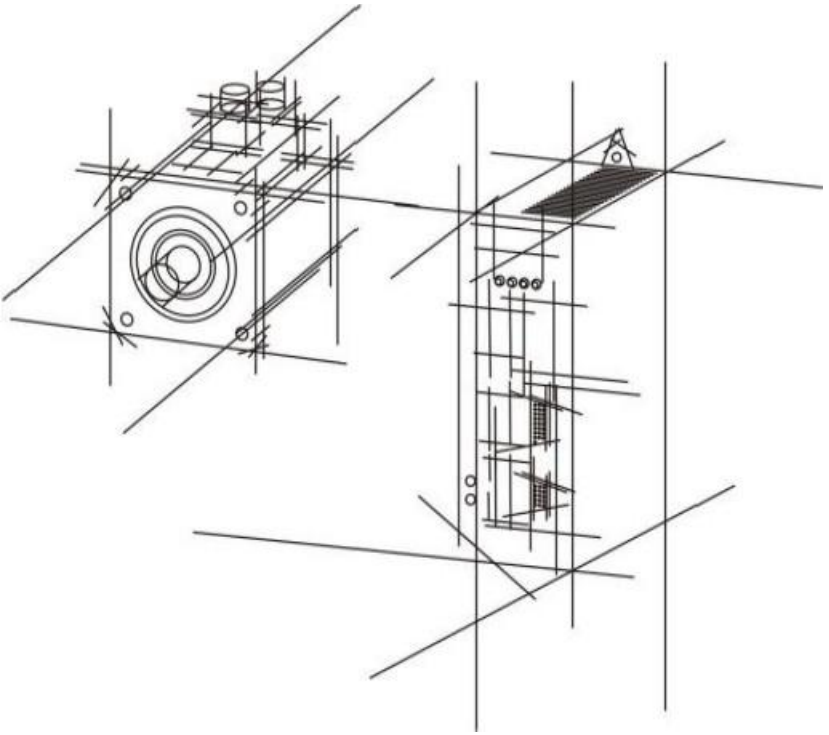
Qma
酷 马 机 电

Q500AC Servo
User manual

QMA ELECTRIC (ZHEJIANG) CO., LTD

AC Servo Manual



Security Considerations

Before storing, installing, wiring, operating, inspecting or repairing the product, the user must familiarize himself with and observe the following important matters to ensure safety using of this product.

Danger

Incorrect operation can cause danger and result in personal injury or death.

Attention

Incorrect operation can be dangerous, result in personal injury or death, and can damage equipment.

Prohibited

Conduct is strictly prohibited as it may result in damage or unusability of the device.

1. **Occassions**

Danger
1.It is forbidden to expose the product to moisture, corrosive gases, and flammable gases. Otherwise it will result in electric shock or fire. 2. It is forbidden to use the product in direct sunlight, dust, salt and metal powder places. 3. It is forbidden to use the product in places where water, oil and medicine are dripping.

2.Wire

Danger
1. Please ground the grounding terminal firmly. Poor grounding may cause electric shock or fire. 2. Do not connect the 220V driver power supply to the 380V power supply, as it may cause equipment damage, electric shock, or fire. 3. The output terminals of the U, V, and W motors and the motor wiring terminals U, V, and W must be connected one by one, otherwise the motor may overspeed and cause equipment damage and personal injury.

4. Please tighten the power supply and motor output terminals, otherwise it may cause a fire.

3.Operation


Attention

1.Before starting the operation of mechanical equipment, it is necessary to cooperate with appropriate parameter settings. If not adjusted to the appropriate setting value, it may cause mechanical equipment to lose control or malfunction.

2.Before starting operation, please confirm if the emergency switch can be activated at any time to stop.

3. Please test the servo motor for normal operation without load, and then connect the load to avoid unnecessary losses.

4. Do not frequently turn on or off the power supply, as it may cause internal overheating of the drive.

4.Running


Prohibited

1. When the motor is running, do not touch any rotating parts, otherwise it may cause personal injury or death.

2. When the device is running, it is prohibited to touch the driver and motor, otherwise it may cause electric shock or burns.

3. When the equipment is running, it is prohibited to move the connecting cables, otherwise it may cause personal injury or equipment damage.

5. Maintenance and Inspection


Prohibited

1. It is prohibited to touch the inside of the driver and its motor, otherwise it may cause electric shock.

2. When the power is turned on, it is prohibited to remove the drive panel, otherwise it may cause electric shock.

3.Within 5 minutes of turning off the power, do not touch the wiring terminals, otherwise residual high voltage may cause electric shock.

4. It is prohibited to change the wiring or disassemble the servo motor when the power is turned on, otherwise it may cause electric shock.

6.Application


Attention

The products in this manual are for general industrial application and should not be used on devices that may directly endanger personal safety.

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Chapter 1 Product Inspection and Installation

1.1 Product inspection: This product has been made a complete functional test before leaving the factory. To prevent any abnormalities caused by negligence during product transportation, please carefully inspect the following items after unpacking:

- Check if the servo driver and servo motor models are the same as the ones you ordered.
- Check whether the servo driver and servo motor are damaged or scratched during transportation. When damage is caused during transportation, do not connect wire or power on.
- Check if there are any loose components between the servo driver and servo motor. If there are any loose screws, or the screws not locked or falling off.
- Check if the servo motor rotor shaft can rotate smoothly by hand. Motors with brakes cannot rotate directly.
- Check if the servo operation manual is included.
- Check if the drive accessories are included in the packaging box.

If there are any discrepancies in the product content, please contact the agent.

1.2 Product front panel

This panel introduces the models：Q500

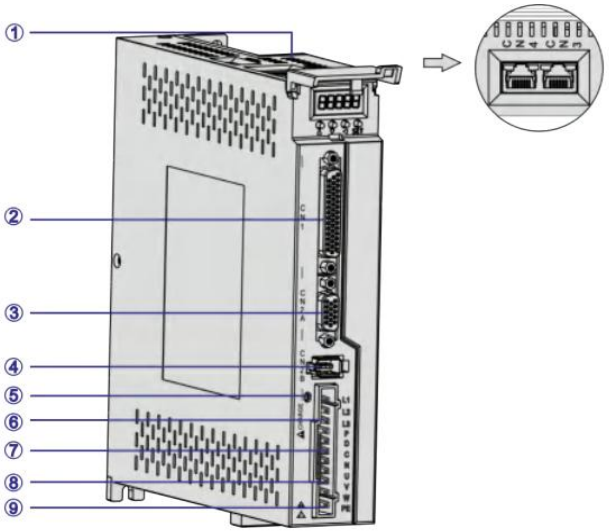


Figure 1.1 Introduction to the Front Panel of Q500 Servo Driver

Seq	Terminal	Function
①	CN3、CN4	Communication terminal
②	CN1	Input and output control signal terminals
③	CN2A	Encoder signal terminal, connected to incremental motor
④	CN2B	Encoder signal terminal, connected to absolute value motor
⑤	L1,L2	Main power input terminal.
⑥	CHARGE	Bus voltage indicator light. Used to indicate that the bus capacitor is in a charged state. When the indicator light is on, even if the main circuit power is turned off, the internal capacitor of the servo unit may still have charge. Therefore, do not touch the power terminal when the light is on to avoid electric shock.
⑦	P,D,C,N	Brake resistor connection terminal.
⑧	U,V,W	Servo motor connection terminal. Connect servo motors U, V, and W phases.

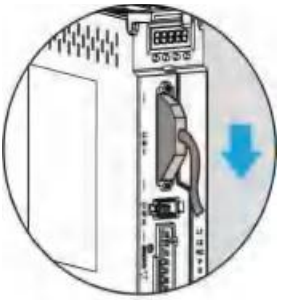
⑨	PE	Grounding terminal. Connect to the power supply and motor grounding terminals for grounding treatment.

1.3 Servo installation method

1.3.1

Driver installation

●Installation direction: Normal Servo driver installation direction is vertical and upright.
●Installation and fixation During installation, tighten the two M4 fixing screws at the rear of the servo driver.
●Be sure to ground the driver grounding terminal , otherwise there may be a risk of electric shock or interference causing incorrect operation.
●Connect wiring on the requirements When wiring the driver, please route the cable downwards (refer to the figure below) to avoid liquid adhering to the cable on site and causing the cable to flow into the driver.



Please wire the connected cables in a downward direction

Figure 1.2 Schematic diagram of servo driver cable routing requirements

● Installation interval Please refer to Figure 1.3 for the installation spacing distance between drivers and other devices. Please note that the minimum dimensions are indicated on the figure. To ensure the performance and lifespan of the drivers, please leave sufficient installation spacing as much as possible.
● Cooling servo driver, adopts Free cooling mode and forced cooling mode.
●Installation precautions: When installing the electrical control cabinet, prevent dust or iron filings from entering the interior of the servo drive.

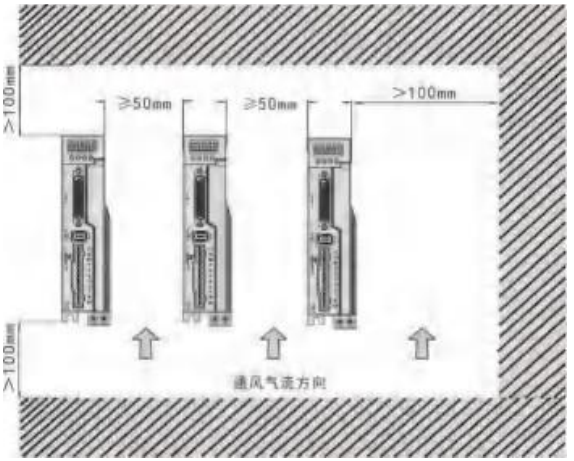


Figure 1.3 Installation Interval

1.3.2 Installing environmental conditions

●Working environment temperature: 0-40 ℃; Working environment humidity; Below 80% (without condensation).
●Storage environment temperature: -40~50 ℃; Storage environment humidity: below 80% (without condensation).
● Vibration: below 0.5G.
●A well ventilated place with minimal moisture and dust.
●No corrosive or igniting gases, oil and gas, cutting fluid, cutting powder, iron powder, etc.
● Places without water vapor and direct sunlight.

1.3.3 Motor installation method

●Horizontal installation: To prevent liquids such as water and oil from flowing into the motor from the outlet, please place the cable outlet below.
● Vertical installation: If the motor shaft is installed upwards and a gearbox is attached, attention should be paid to and prevent oil stains inside the gearbox from seeping into the motor through the motor shaft.
The extension of the motor shaft needs to be sufficient, as insufficient extension will easily cause vibration during motor movement.
When installing and disassembling the motor, do not use a hammer to strike the motor, otherwise it may damage the motor shaft and encoder.

1.3.4 Definition of motor rotation direction

The definition of the motor rotation direction in this manual: facing the motor shaft, the counterclockwise rotation (CCW) of the rotating shaft represents forward rotation, and the clockwise rotation (CW) of the rotating shaft represents reverse rotation.

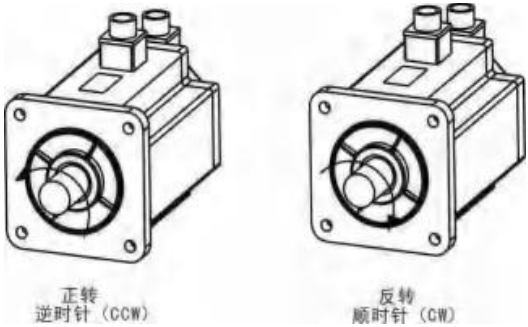


Figure 1.4 Definition of Motor Rotation Direction

Chapter 2 Servo Specifications

2.1 Introduction of servo driver specifications

Model	Q500	
Output power	1KW~3KW	
Main circuit input power supply	Single phase AC220V-15%~+10% 50/60Hz	
Control mode	0: Position control method; 1: Speed control mode; 2: Torque control method; 3: Hybrid control method for position and speed; 4: Position torque hybrid control method; 5: Speed torque hybrid control method	
Protect Function	Overspeed/main power supply overvoltage/undervoltage/overcurrent/overload/encoder abnormality/control power supply abnormality/position deviation	
Monitor Function	Speed/current position/command pulse accumulation/position deviation/motor torque/motor	
Control input	1: Servo Enable 2: Alarm Clear 3: CCW Drive Inhibit 4: CW Drive Inhibit 5: Deviation counter reset 6: Command pulse inhibit 7: CCW torque limit 8: CW torque limit	
Control output	Servo ready/servo alarm/positioning	
dynamic braking	Supports both built-in and external	
Applicable load	Less than 3 times the motor inertia	
Display	5-digit LED Nixie tube display, 4 operation keys	
Communication	RS485	
Position control	Input way	0：Pulse+direction
		1：CCW/CW Pulse
		2：A/B Two-phase orthogonal pulse
		3：Internal position control
	Input electronic gear ratio	Gear ratio molecule：1-32767
		Gear ratio denominator：1-32767

2.2 Naming rules for servo drives

Q	500	S	-	-	-	□□□
①	②	③		④		⑤

Seq	Means
①	Qma Q Series servo Driver
②	Power，100：0.05KW~1KW；200:1KW~2KW；300:2KW~4.5KW；
③	S: Simple servo, suitable for absolute encoders or incremental encoders.
④	Specific power of servo below 1KW，40:50W~400W；75:400W~750W；
⑤	Special specifications: customized by customers

2.3 Name Rules for motors

DN	130	-	040	25	A6 -	MH	B
①	②		③	④	⑤	⑥	⑦

Seq	Means
①	Motor type, DN: DN series 4 poles.
②	FRAME：40(mm)；60(mm)；80(mm)；110（mm); 130(mm)
③	rated torque（×0.1Nm）：040 means rated torque 4.0Nm.
④	maximum speed（×100rpm）：30 Means rated speed 3000rpm.
⑤	Encoder resolution：A1: Multi-turn absolute value 17 bits; A6: 17 bits in absolute lap; I2: Incremental 2500 line.
⑥	Connector type: MH: aviation plug; MA/TJA: Amp Head
⑦	B: With brakes; Blank: Without brakes

1. For example, the performance parameter code 04025 indicates that the rated torque is 4.0Nm and the rated speed is 2500rpm.
2. Rated power calculation formula: P=0.1047×N×T=0.1047×4.0×2500=1047W≈1.0KW, T is the rated torque, N is the rated speed.

2.4 Servo motor and servo driver adaptation table

Base (mm)	Model	Power (W)	Speed (rpm)	Adapted Driver	Encoder
80	DN80-04025A6-MH(B)	1000	2500	Q500	17 bit absolute /2500 Line increm ental encoder
90	DN90-04025A6-MH(B)	1000	2500		
100	DN100-03230A6-MH(B)	1000	3000		
	DN100-06430A6-MH(B)	1800	3000		
110	DN110-02030A6-MH(B)	600	3000		
	DN110-04020A6-MH(B)	800	2000		
	DN110-04030A6-MH(B)	1200	3000		
	DN110-05030A6-MH(B)	1500	3000		
	DN110-06020A6-MH(B)	1200	2000		
	DN110-06030A6-MH(B)	1800	3000		
130	DN130-04025A6-MH(B)	1000	2500		
	DN130-05025A6-MH(B)	1300	2500		
	DN130-06025A6-MH(B)	1500	2500		
	DN130-07725A6-MH(B)	2000	2500		
	DN130-10010A6-MH(B)	1000	1000		
	DN130-10015A6-MH(B)	1500	1500		
	DN130-10020A6-MH(B)	1500	2000		
	DN130-10025A6-MH(B)	2600	2500		
	DN130-15015A6-MH(B)	2300	1500		
	DN130-15025A6-MH(B)	3800	2500		

Chapter 3 Driver and Motor Dimensions

3.1 Driver Dimension

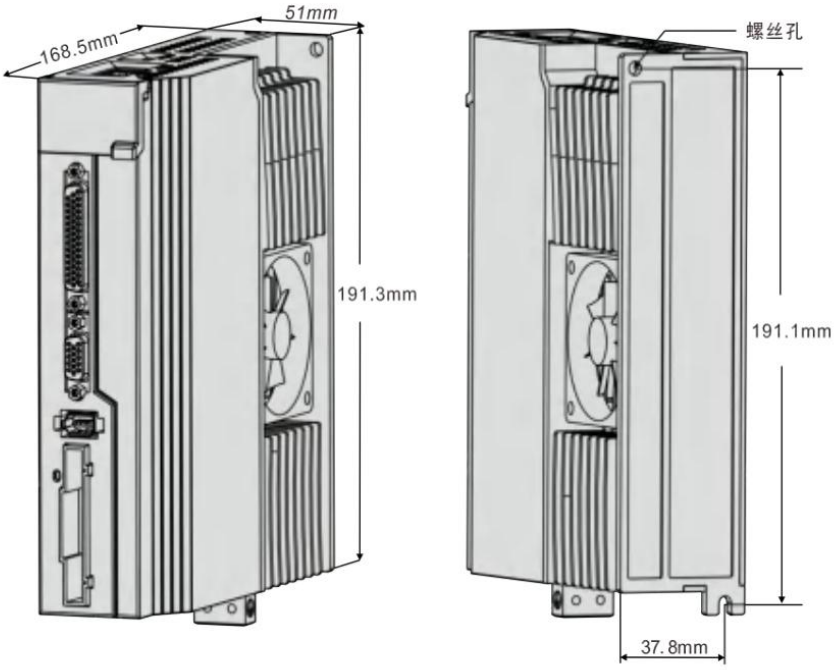


Figure 3.1 Outline Dimensional Drawing of Q500 Series

3.2 Motor dimension

- 80、90 Base (Unit：MM)

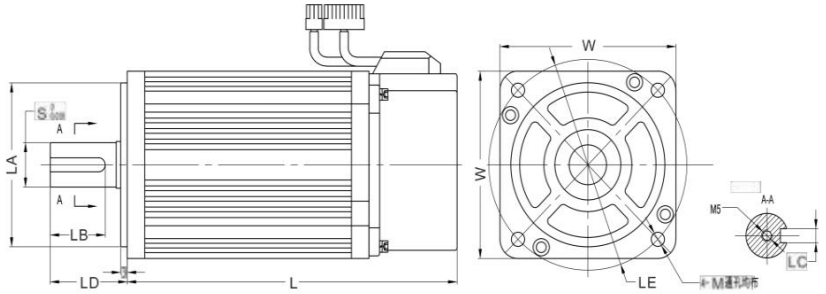


Figure 3.2 80,90 Motor base and Table 3-1

Model	W	L	LE	S	LA	LB	LC	LD	M
DN80-04025A6-MA	80	191	90	19	70	25	6	35	6
DN90-04025A6-MA	90	182	100	16	80	25	5	35	6.5

- 130 base(Unit：mm)

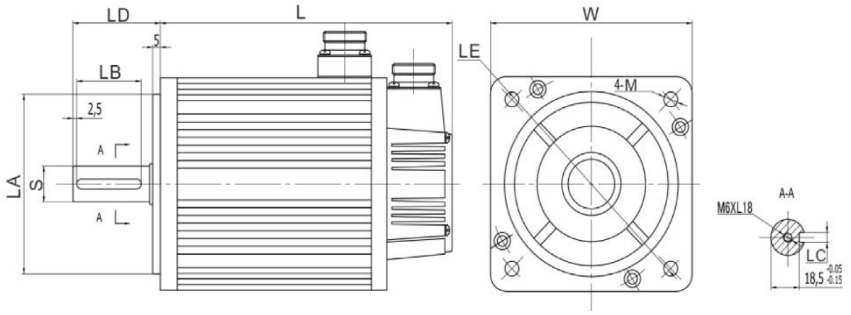


Figure 3.3 130 Motor base and Table 3-2

Model	W	L	LE	S	LA	LB	LC	LD	M
DN130-04025A6-MH	130	166	145	22	110	42	6	57	6
DN130-05025A6-MH	130	171	145	22	110	42	6	57	6
DN130-06025A6-MH	130	179	145	22	110	42	6	57	6
DN130-07725A6-MH	130	192	145	22	110	42	6	57	6
DN130-10010A6-MH	130	213	145	22	110	42	6	57	6
DN130-10015A6-MH	130	213	145	22	110	42	6	57	6
DN130-10025A6-MH	130	209	145	22	110	42	6	57	6
DN130-15015A6-MH	130	241	145	22	110	42	6	57	6
DN130-15025A6-MH	130	231	145	22	110	42	6	57	6

Chapter 4 Driver System Wiring and Composition

4.1 Servo system wiring

4.1.1 Servo driver wiring diagram

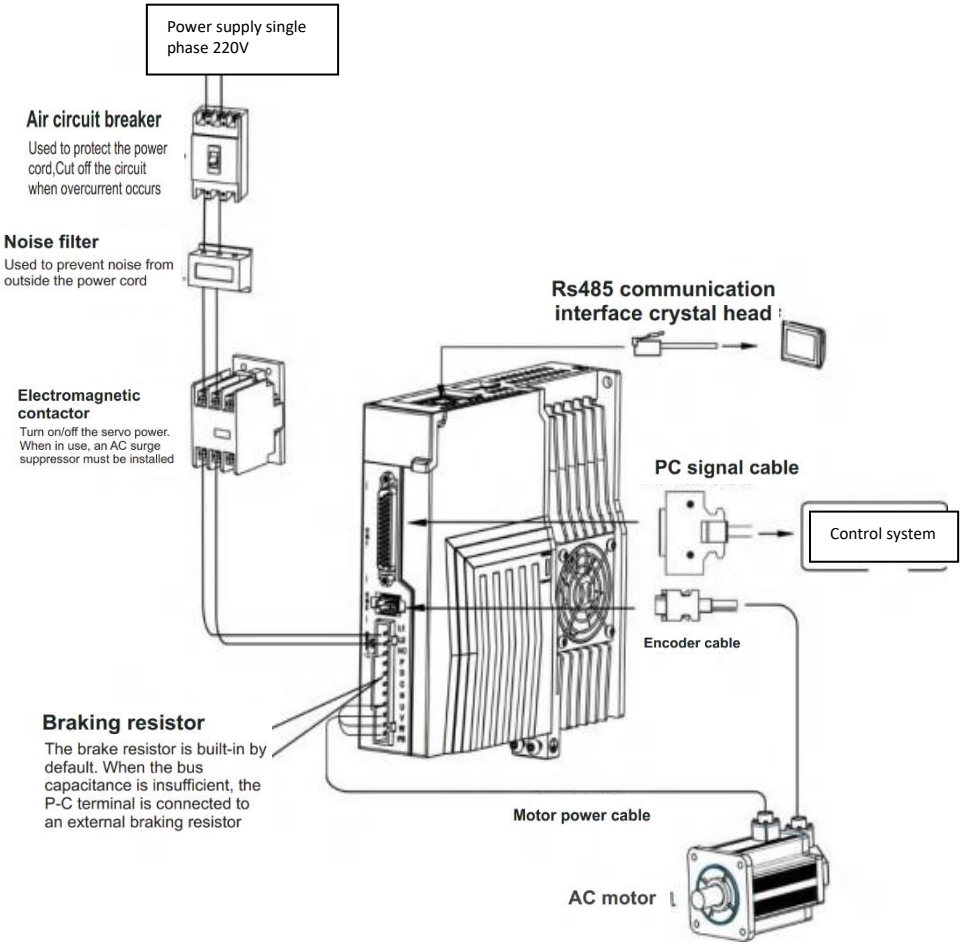


Figure 4.1 Servo System Wiring Diagram

4.1.2 Wiring Instructions

Wiring precautions:

The cable length is within 3m of the instruction cable, and the encoder length is within 20m.

Check if the power supply and wiring of L1 L2 and L3 are correct. If only single-phase 220VAC drives are supported, do not connect them to 380VAC power supply.

The phase sequence of the output U, V, and W terminals of the motor must connect to the corresponding terminals of the driver one by one. The motor may not rotate or spin due to incorrect connection. It is not possible to reverse the motor by swapping the three-phase terminals, which is different from asynchronous motors.

The motor grounding terminal must be connected to the servo driver grounding terminal PE and well grounded.

Pay attention to the correct direction of freewheel diode which is connected with the delay at the output terminal, other can cause the output circuit breakdown.

In order to protect the servo driver from noise interference that can cause malfunction, please use an insulation transformer and noise filter on the power lines.

Wiring the power cables(power supply , main circuit ,etc) at a distance over 30cm away from the control signal cables, do not lay them together.

Please install a non fusible circuit breaker to cut off external power in a timely manner when the driver malfunctions.

After the power supply is cut off, wait at least 5 minutes before touching the driver and motor.

4.1.3 Wire Spec

Connection terminal	Symbol	Wire Spec
Main Power Supply	L1、L2、L3	1.5~4mm2
Servo Motor	U、V、W	1.5~4mm2
Ground	⏚	1.5~4mm2
Control Signals	CN1	≧0.14mm2(AWG26), Shielded wire included
Encoder Signals	CN2	≧0.14mm2(AWG26), Shielded wire included
Regenerative Resistors Terminals	P、D/P、C	1.5~4mm2

- Must use a twisted pair wire cable for the encoder signal wiring. If the encoder signal cable is too long(＞20m), in which the encoder power supply can be insufficient, may use multi wires or thick wire for the power supply wiring.

4.2 Servo driver terminals Introduction

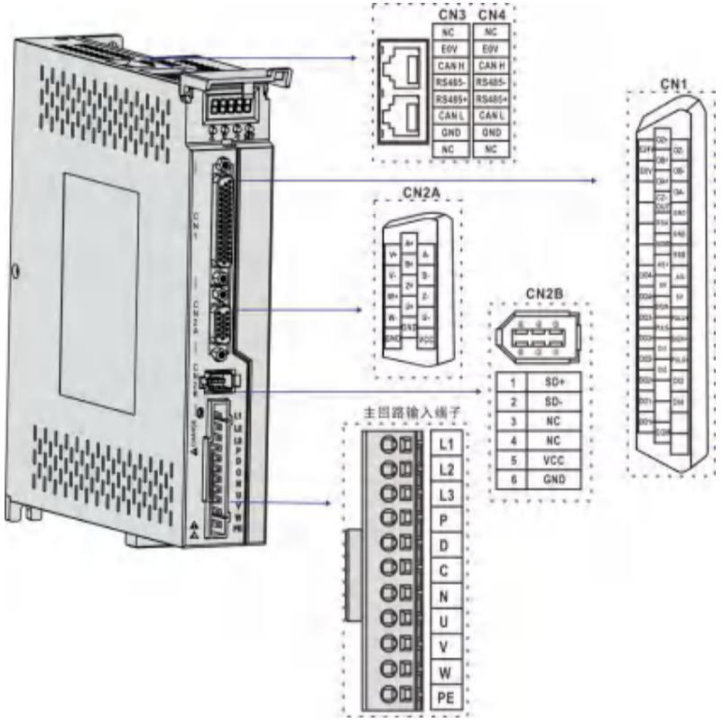


Figure 4.2 Schematic diagram of Q500 terminal

NOTE

◆ The above picture shows the pins arrangement of the drive

4.3 Main Circuit Terminal

4.3.1 Main Circuit Terminal Introduction Figure

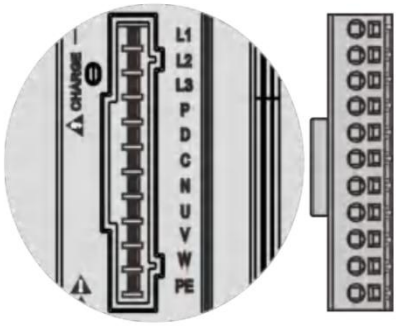


Figure 4.3 Main Circuit Terminal

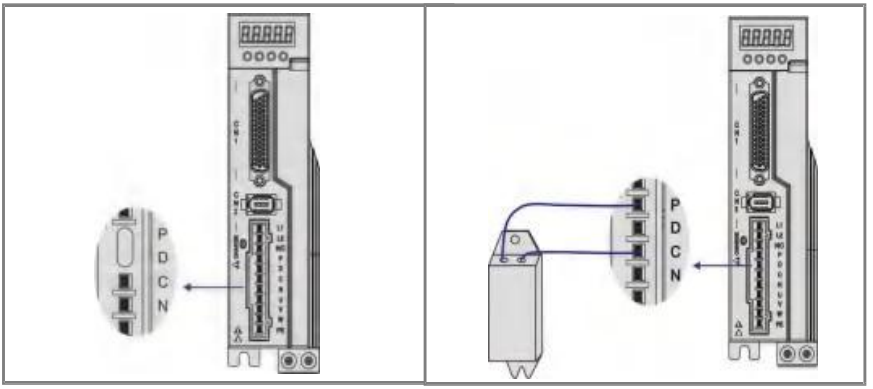
Name	Terminal Symboll	Detail description
Main Power Supply	L1、L2	Single phase 220VAC -15%~+10%，50/60Hz
	L1、L2、L3	Three phase 220VAC -15%~+10%，50/60Hz
Regenerative Resistance	P、D	When use the built-in resistor, please connect P and D.
	P、C	When using an external brake resistor, P is shorted to D, and then the external brake resistor wiring is connected between P and C, respectively. P and N prohibit connections.
Servo Motor	U、V、W	U、V W phase output to servo motor.
	⏚	Ground with servo motor and power supply

NOTE

◆ The built-in resistor has been set as default by factory: P and D connector are in short-cut condition.

4.3.2 Brake resistance wiring instructions

If the internal brake resistor is used, the driver is shorted to P and D, that is, it can be used normally according to the factory state, as shown in Figure A. If an external brake resistor is used, the short connection between P and D must be disassembled and then crossed to P and C, as shown in Figure B:



Precautions for braking resistor wiring:

- Do not connect the external brake resistance to the positive and negative poles of the bus P、N, otherwise it will cause explosion and fire.
- Must be over minimum resistance value at 25Ω. Otherwise it would cause drive alarm or damage.
- Please install external brake resistance on non-combustible materials such as metal.

4.4 CN1 Control signal terminals

4.4.1 CN1 Terminal Introduction

The CN1 connector DB44 plug provides the signals interfaced with the hostcontroller. The signal includes:

- 4 programmable input terminals
- 4 programmable output terminals;
- Analog command inputs;
- Pulse command inputs.

4.4.2 CN1 terminal pin distribution

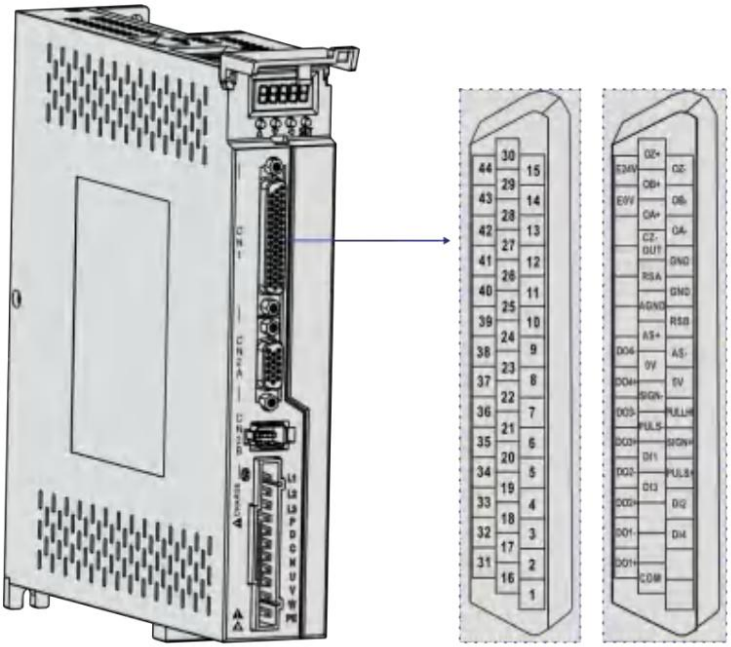
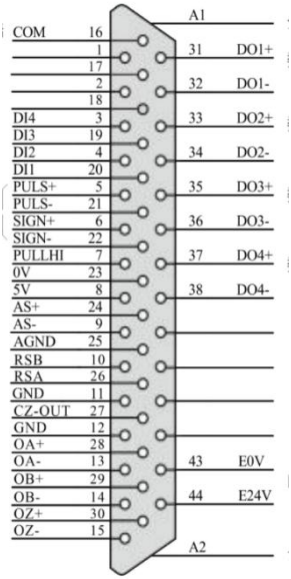


Figure 4.4 CN1 Terminal Pin Distribution

NOTE

◆ 24-26 AWG cable is recommended.



Pin	Name	Func
16	COM	Digital input signal common
3	DI4	Digital input 4
19	DI3	Digital input 3
4	DI2	Digital input 2
20	D |`]	Digital input 1
5	PULS+	5V command pulse input, disable 24V connection
21	PULS-	
6	SIGN+	
22	SIGN-	
7	PULLHI	Command pulse plus 24V power input interface
23	0V	
8	5V	Internal5V power output
24	AS+	Analog speed/torque command input
9	AS-	
25	AGND	Analog signal ground
10	RSB	RS485 communication Negative end
26	RSA	RS485 communication Positive end
11	GND	Internal digital signal ground
27	CZ-out	Z-phase collector open-circuit output
12	GND	Internal digital signal ground
28	OA+	A phase signal output only support incremental encoder
13	OA-	
29	OB+	B phase signal output only support incremental encoder
14	OB-	
30	OZ+	Z phase signal output only support incremental encoder
15	OZ-	
31	DO1+	Digital output 1
32	DO1-	
33	DO2+	Digital output 2
34	DO2-	
35	DO3+	Digital output 3
36	DO3-	
37	DO4+	Digital output 4
38	DO4-	
43	EOV	Internally isolated 24V power output
44	E24V	
A1	Metal shell grounding	
A2	Metal shell grounding	

Figure 4.5 Schematic diagram of the driver CN1 terminal pin

4.4.3 Position Instruction Input Signal

Signal name		Pin No#	Function
Position pulse instruction	PULS+	5	High-speed photoelectric isolation input, parameter PA14 setting working mode： ●Pulse + direction; ●CCW/CW pulse; ● A, B two-phase orthogonal pulse input; ●Internal position control input.
	PULS-	21	
	SIGN+	6	
	SIGN-	22	
	PULLHI	7	External 24V power input interface of the instruction pulse
	GND	11	Internal digital signal ground

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

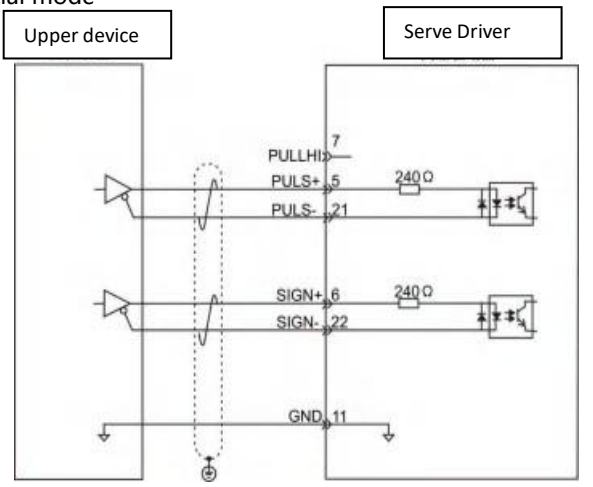
Pulse mode	Maximum frequency (pps)	Minimum pulse width
Difference output	500k	1
Open collector	200k	2.5

◆ If the output pulse width of the upper device is less than the minimum pulse width value, the driver will receive the pulse incorrectly.

◆ The ports between PULS plus and PULS-and between SIGN and SIGNAL only support signal level inputs below 5V, and more than 5V signals must be threaded with external resistors or the driver will be damaged.

Schematic diagram of the pulse command input circuit

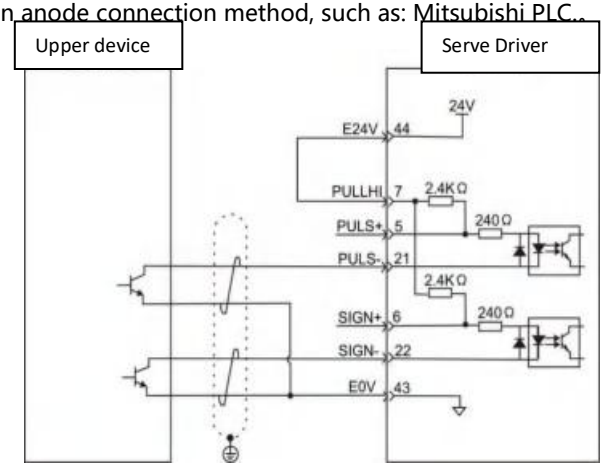
1) In differential mode



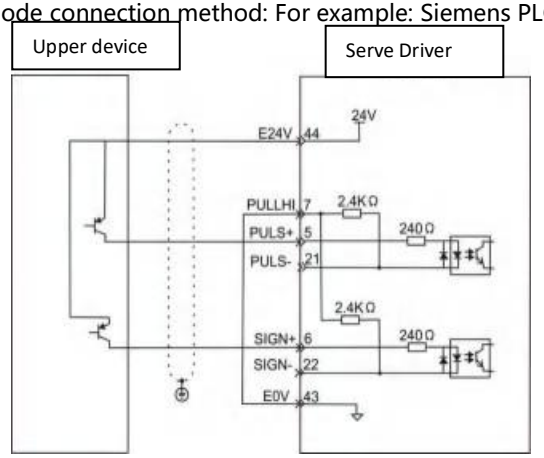
2) In collector open mode

A) When using the Servo drive's internal 24V power supply:

- Common anode connection method, such as: Mitsubishi PLC.



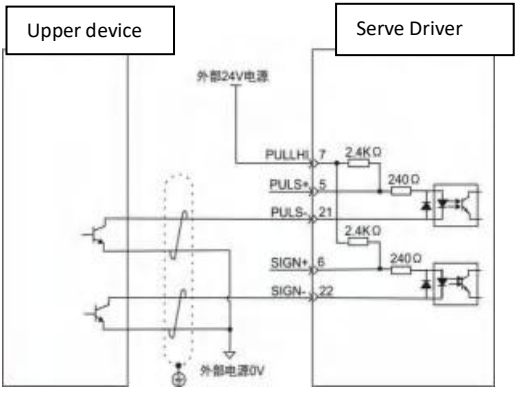
- Common cathode connection method: For example: Siemens PLC



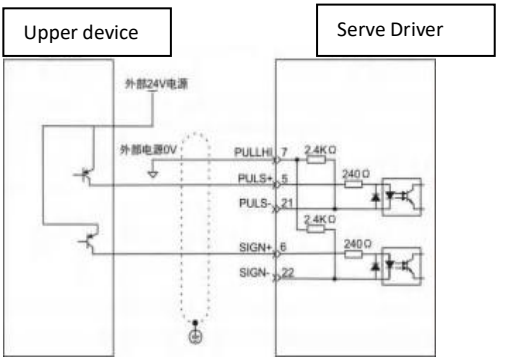
B) Use external power supply:

Case1: Use the drive internal resistance (recommended)

- Common anode connection

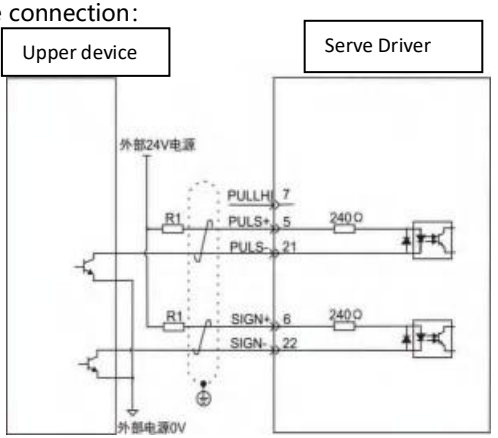


- Common cathode connection

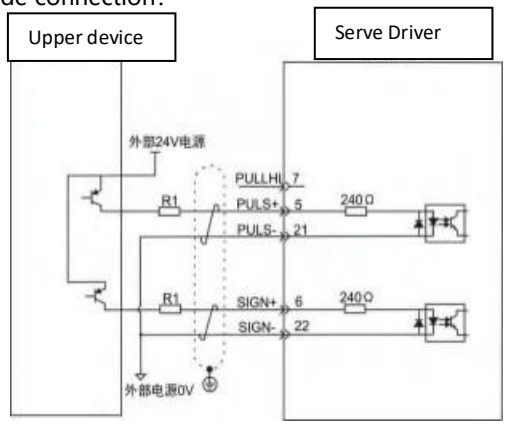


Case2.Use the driver's external resistance

- Common anode connection:



- Common cathode connection:



◆ Selection formula for resistance R1::

$$\frac{VCC-1.5}{R1+240}=10m$$

Sheet 4-1 recommend R1 value

VCC Voltage	R1 Value	R1 Power
24V	2.4KΩ	0.5W
12V	1.5KΩ	0.5W

4.4.4 Digital Quantity Input And Output Signal

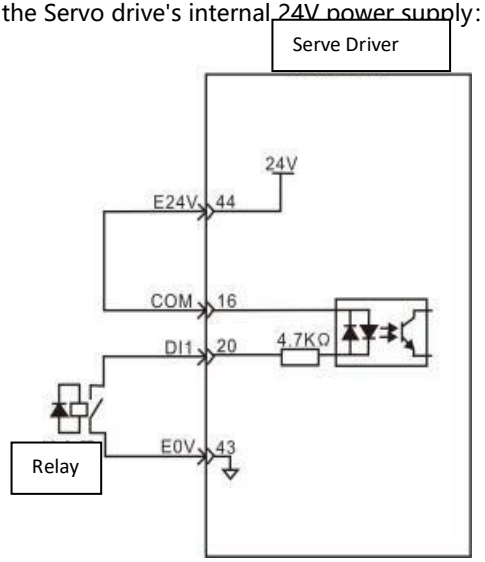
Signal		Pin	Def Function	Instruction
Digital input	DI1	20	**Servo enablement**	Optocoupler input and function can be programmable.Defined by parameter P3 group(P3-0~P3-17). The input voltage of COM is both of common positive and negative terminal. And input signal voltage is 12~24V. In position mode (internal position mode) and non-position mode ,please connect 24 V to pin 7, DI5 to pin21, DI6 to pin 22. Or to connect 0 V to pin7, DI5 to 5 pin ,DI6 to pin 6.
	DI2	4	**Alarm cleared**	
	DI3	19	**Forward drive prohibited**	
	DI4	3	**Reverse drive prohibited**	
	PULS-	21	**In position mode (internal position mode) and non-position mode**	
	SIGN-	22		
	PULS+	5		
	SIGN+	6		
	PULLHI	7		
	COM	16	**Common end of digital input signals**	
Digit output	DO1+	31	**Servo ready**	Photo isolation output. Function can be programmable. Defined by parameter P3 group (P3-20~P3-23). Remark: When PA104=1, the differential output can be programed by P3-24.
	DO1-	32		
	DO2+	33	**Alarm output**	
	DO2-	34		
	DO3+	35	**Position completed**	
	DO3-	36		
	DO4+	37	**Magnetic brake**	
	DO4-	38		
	DO5+/ RSA	26	**Z Signal differential output**	
	DO5-/ RSB	10		
Internal power output	0V	23	**Internal 0V**	Internal 5V supply output with 200mA maximum output current.
	5V	8	**Internal 5V**	
Internal isolation Power output	E0V	43	**Internal 0V**	Internal isolated 24V power output and the voltage range is 20V~28V and max output current 100mA.
	E24V	44	**Internal 24V**	

- Schematic diagram of digital input circuit

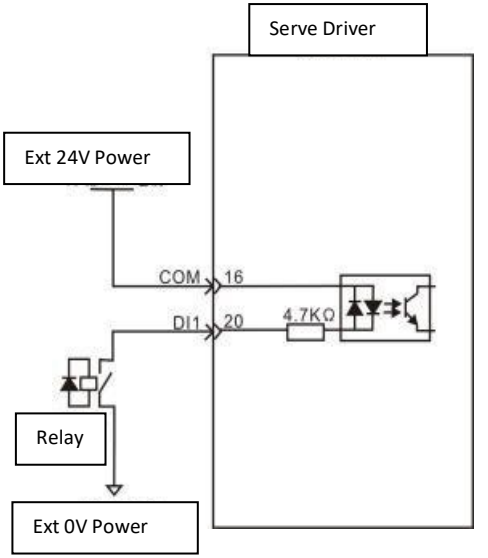
For DI1 as an example(the DI1~DI4 interface circuit is the same):

1）When the upper device is relay output:

A) When using the Servo drive's internal 24V power supply:

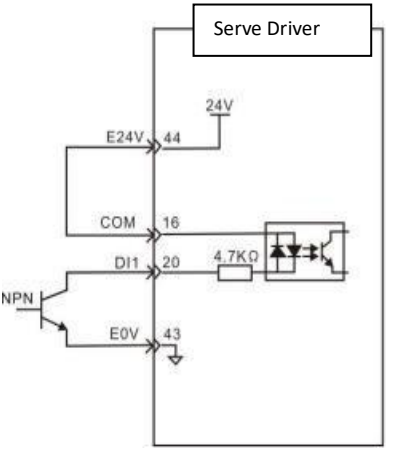


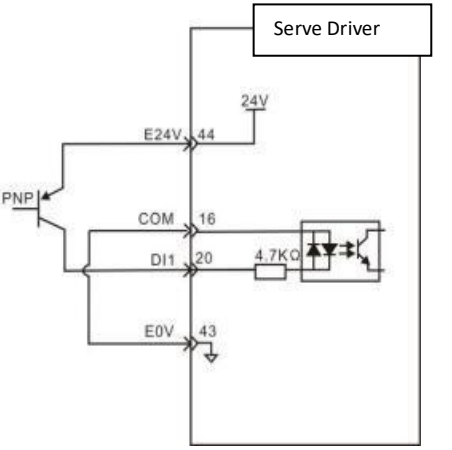
B) When using external 24V power supply:



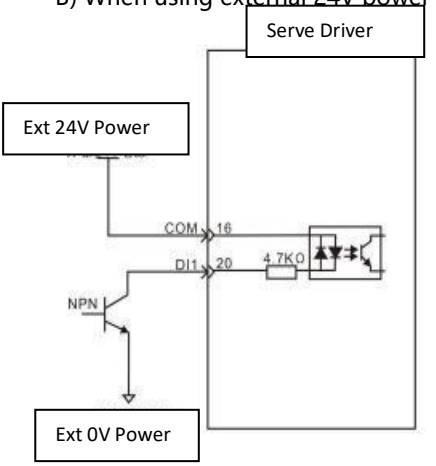
2) When the upper unit is an open output of the collector

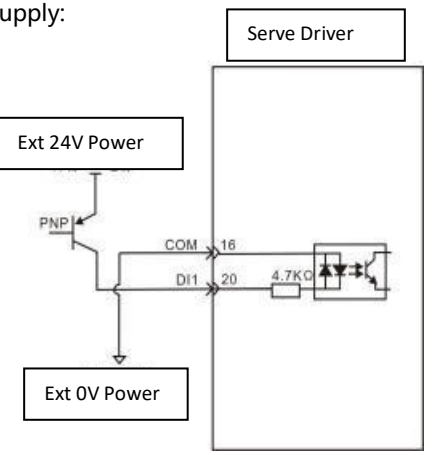
A) When using the internal 24V power supply of the servo drive:





B) When using external 24V power supply:



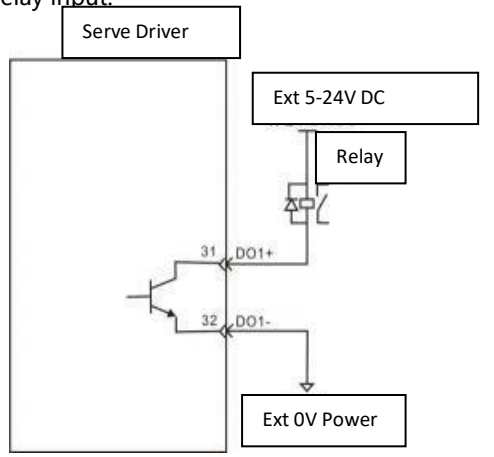


◆ Mixing PNP with NPN input is not supported.

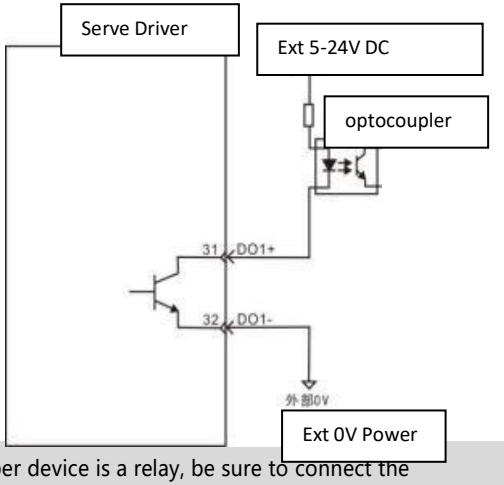
- **Digital output circuit diagram**

Take DO1 as an example, the DO1-DO4 interface circuit is the same.

1) When the upper unit is a relay input:



2) When the upper device is an optocoupler input:



NOTE

- ◆ When the upper device is a relay, be sure to connect the freewheeling diode, otherwise it may damage the DO port or cause strong signal interference. The maximum allowable voltage and current capacity of the optocoupler output circuit inside the servo drive are as follows:
- ■ Voltage: DC30V

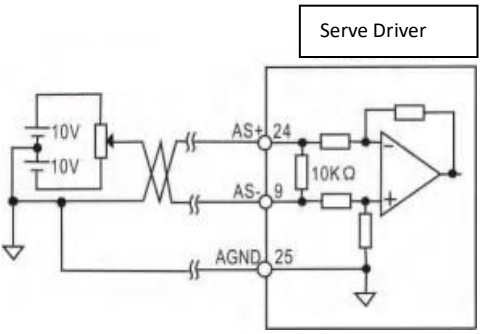
4.4.5 Analog instruction signal

Signal name		Pin	Function
Analog Instruction	AS+、AT+	24	Analog input of speed/speed input, range: -10V~+10V
	AS-、AT-	9	
	AGND	25	

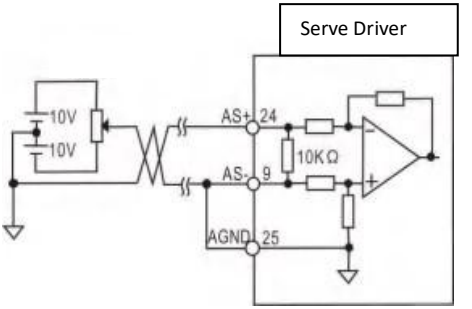
Pulse Instruction Input Interface Diagram

There are two kinds of connections, differential input and single-ended input, and differential input join is recommended. Speed and torque share an analog input, input range: -10V to 10V, input impedance of about 10K. It is normal for analog inputs to have zero bias and can be compensated by parameters.

1) When it is analog differential input:



2) When it is analog single-end input:

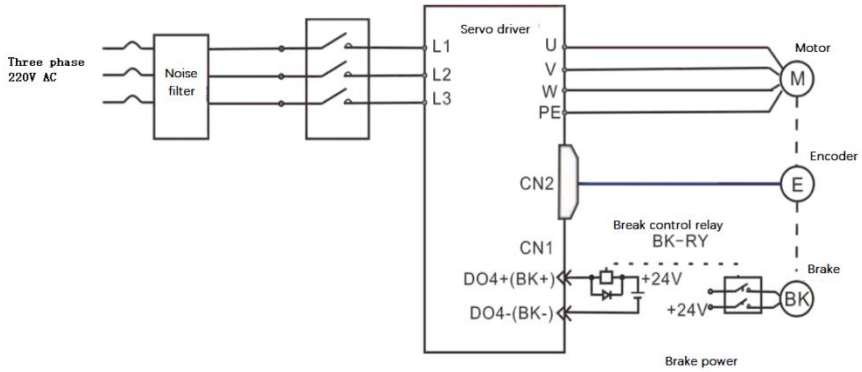


4.4.6 Motor Brake Connection

The lock is an mechanism that prevents the servo motor shaft from moving while the servo drive is not running, keeping the motor locked in position so that the moving part of the machine does not move due to self-weight or external forces.

Brake Signal Circuit Diagram

The connection of the lock terminal input signal is not polar and requires the user to prepare a 24V power supply. The standard wire examples of the lock signal BK and the lock power supply are as follows:



NOTE:

- lock mechanism built into the servo motor is a fixed special mechanism of non energized action type and is not used for braking purposes and only when the servo motor is kept stopped.
- The lock coil is non-polar
- After the servo motor is stopped, the servo on signal (Servo On) should be cut off.
- When the motor with the built-in lock is running, the lock may click without functional effect.
- Flux leakage may occur at the shaft end and other areas when the lock coil is energized (the lock is open). Be aware when using instruments such as magnetic sensors in motor accessories.
- The lock is prohibited from sharing power supply with other electrical appliances to prevent voltage or current reduction due to the work of other electrical appliances, which ultimately causes the wrong action of the lock.
- Cables above 0.5mm are recommended.

4.5 CN2 Encoder Signal Terminal CN2

4.5.1 CN2A Terminal Introduction

CN2A encoder signal terminal and incremental motor encoder connection diagram.

The terminals connected to the encoder use a 15PIN socket, and the shape and pin distribution are:

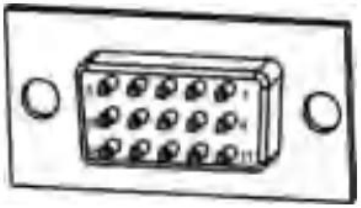


Figure 4.7 CN2 Encoder Signal Terminal

4.5.2 CN2 Signal Introduction

Signal name		Pin No#	Function
Encoder signal power supply	5V	5	Encoder with a 5V power supply (provided by the driver), cables above 20m, in order to prevent the encoder voltage reduction, the power supply and ground wire can be multiwire connection or use thick wires.
	GND	10	
		15	
Encoder A phase input	A+	6	connected to the output of encoder A
	A-	1	
Encoder B phase input	B+	7	connected to the output of encoder B
	B-	2	
Encoder Z phase input	Z+	8	connected to the output of encoder Z
	Z-	3	
Encoder U phase input	U+	9	connected to the output of encoder U
	U-	4	
Encoder V phase input	V+	11	connected to the output of encoder V
	V-	12	
Encoder W phase input	W+	13	connected to the output of encoder W
	W-	14	
Shielded layer	Metal cover		Connect to the shielded layer of the encoder cable

4.5.3 CN2B Signal Introduction

Connection diagram of CN2B encoder signal terminal and absolute motor encoder.

The terminals connected to the encoder use a 6PIN socket, and the shape and pin distribution are:

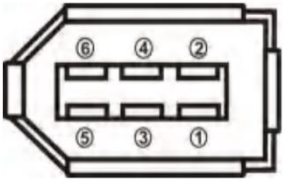


Figure 4.8 CN2B encoder signal

4.5.3 CN2B encoder terminal Signal Introduction

Signal name		Pin No#	Function
Encoder signal power supply	5V	5	Encoder with a 5V power supply (provided by the driver), cables above 20m, in order to prevent the encoder voltage reduction, the power supply and ground wire can be multiwire connection or use thick wires
	0V	6	
Absolute encoder communication positive terminal	SD+	1	Absolute encoder communication positive terminal
Absolute encoder communication negative terminal	SD-	2	Absolute encoder communication negative terminal
Empty end	NC	3	Not used
Empty end	NC	4	Not used
Shielded layer	Metal cover		Connect to the shielded layer of the encoder cable

4.6 CN3 And CN4 Terminal Definition

4.6.1 Communication Terminal Wiring Diagram

CN2 encoder signal terminal and motor encoder connection diagram. The terminals of the encoder use a 6PIN socket with a pin distribution of:

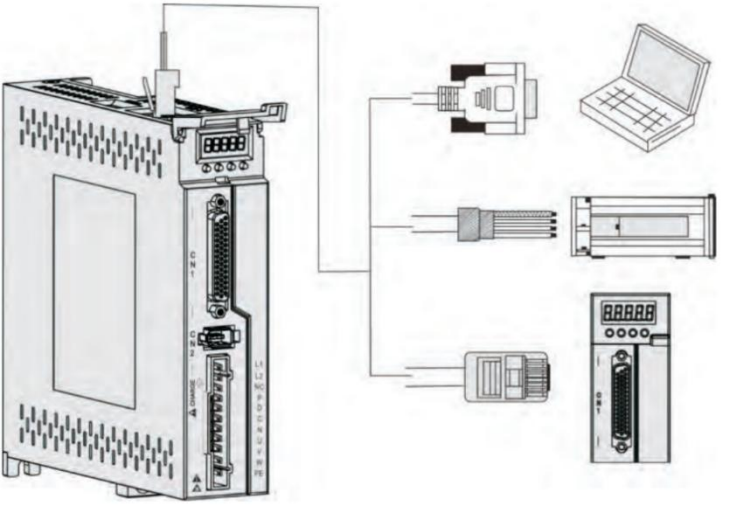
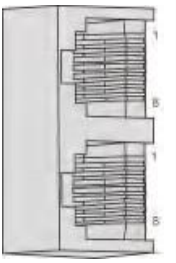


Figure 4.8 Communication Terminal Wiring

4.6.2 Communication port definition

The CN3 and CN4 ports on the drive allow the drive to communicate with the PC, PLC, and drive, where the port pins for CN3 and CN4 are defined as follows:

Pin No.	CN3	name	CN4	name	pic
1	NC	Empty end	NC	Empty end	
2	E0V	CAN signal ground	E0V	CAN signal ground	
3	CAN H	CAN bus interface	CAN H	CAN bus interface	
4	RS485 -	RS485 Communications interface	RS485 -	RS485 Communications	
5	RS485+		RS485+		
6	CAN L	CAN bus interface	CAN L	CAN bus	
7	GND	485 signal ground	GND	485 signal ground	
8	NC	Empty end	NC	Empty end	

NOTE:

◆ The PC or upper computer controls can be connected via a dedicated serial cable, which is not plugged in and out.

◆ Twisted pair or shielded wire is recommended, the length of the wire is less than 2 meters.

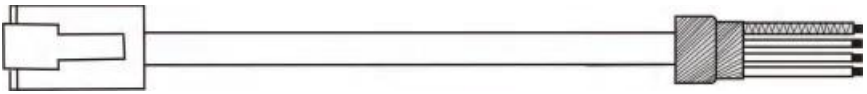
◆ When multi-machine series, the CN3 is connected to the first-stage drive CN4 and the CN4 is connected to the first-stage driveN3.

◆ When using RS485 bus communication, when the upper machine's 485 signal is connected to the earth (PE), connect the upper machine PE terminal to the driver terminal by reasonable grounding, in which case the upper machine 485 signal ground is not allowed to be connected to the driver 485 signal ground (GND), otherwise the driver may be damaged.

4.6.3 RS485 Communication Connection Introduction

1. Connection With RS485 of A PLC

A connection cable between the driver and the PLC is as follows:



A B

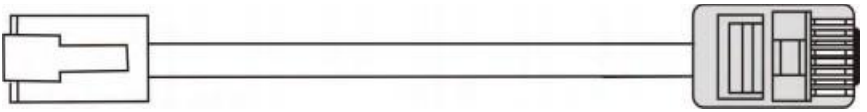
Figure 4.9 The Communication Cable Of Servo Drive With PLC

Table 4-2 Servo drive and PLC communication cable pin connection relationship

Drive side RJ45 (A-side)		PLC side (B-side)	
Signal name	Pin No#	Signal name	Pin name
RS485+	5	RS485+	5
RS485-	4	RS485-	4
GND	7	GND	7
PE（Shielding layer）	Cover	PE（Shielding layer）	cover

2. RS485 Communication Parallel Connection Of Multi Drives

When using 485 communication network, the parallel connection of multi drives is as follows:



A B

Figure 4.10 Parallel Cable Diagram Of Multi Drives

Table 4-3 Connection Between Multi Drives

Drive side RJ45 (A-side)		PLC side (B-side)	
Signal name	Pin No#	Signal name	Pin name
RS485+	5	RS485+	5
RS485-	4	RS485-	4
GND	7	GND	7
PE（Shielding layer）	Cover	PE（Shielding layer）	cover

3. RS485 Communication Grounding Precaution

When using RS485 communication, the GND terminal of the upper device is connected with the GND terminal of the servo drive as shown in the following picture:

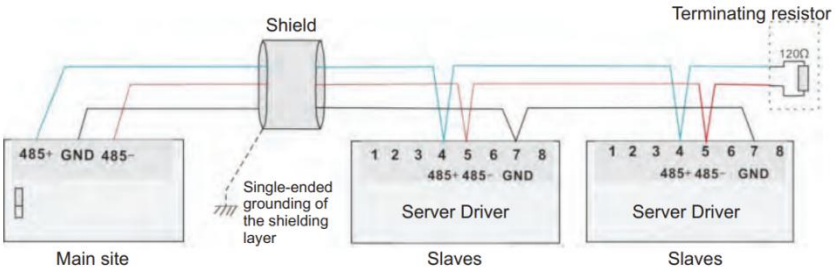


Figure 4.11 485 Communication Connection Diagram

When using RS485 communication, the signal ground of the upper device is connected to the ground as shown in the figure below:

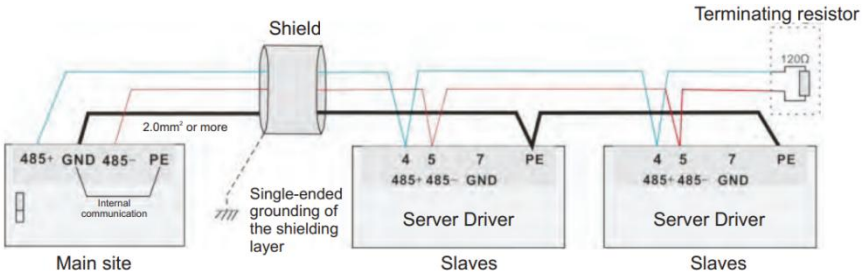


Figure 4.12 485 host computer communication connection diagram

NOTE:

- The PLC has a built-in 485 communication terminal resistor.
- It is recommended that the shield be single-ended grounding.
- Do not connect the GND terminal of the upper unit to the Servo driver E0V terminal, as this will damage the machine

4.7 Anti-jamming countermeasures for power wiring

To suppress interference, please take the following measures:

- The instruction input cable length should be below 3m and the encoder cable should be below 20m
- Use thick wiring whenever possible for ground wiring. (2.0mm2 or more)
- Use a noise filter to prevent RF interference. When used in civilian environments or in environments with high power interference, install a noise filter on the input side of the power cord.
- To prevent incorrect actions caused by electromagnetic interference, the following methods can be used:

1. Install the upper unit and the noise filter near the servo drive whenever possible.
2. Install the surge suppressor on the coils of relays, solenoids, and electromagnetic contactors.
3. Separate the strong line from the weak line when wiring and maintain a distance of more than 30cm. Do not put in the same pipe or tie them together.
4. Do not share power supplies with welding machines, discharge processing devices, etc. When a high frequency generator is nearby, install a noise filter on the input side of the power cord.

4.7.1 Wiring Examples Of Anti-Jamming And Ground Handling

4.7.1.1 Examples of anti-jamming wiring

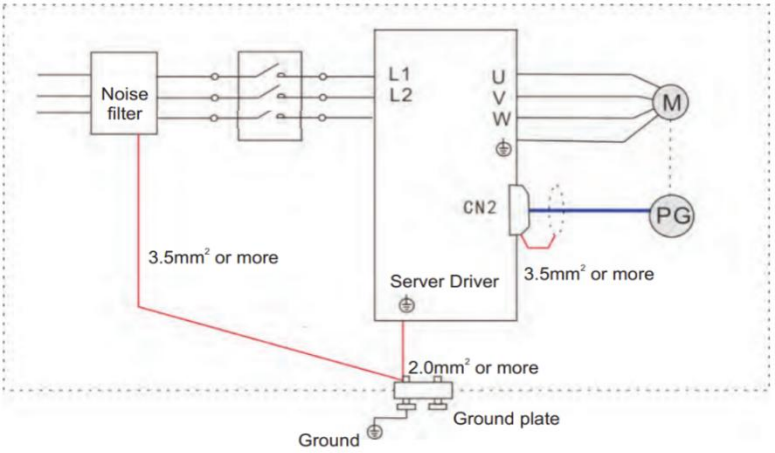


Figure 4.12 Example Of Anti-Jamming Wiring

◆ The outer box cable for grounding uses more than 3.5mm2 thick wire whenever possible, and braided copper wire is recommended.

◆ When using the noise filter, observe the precautions described in the Noise Filter Usage Methods below.

2. Ground handling

To avoid possible electromagnetic interference problems, please ground it as follows.

1) Grounding of the servo motor housing

Please connect the grounding terminal of the servo motor and the grounding terminal PE of the servo drive together, and connect the PE terminal to the ground reliably to reduce potential electromagnetic interference problems.

2)The shielding layer of the encoder cable is grounded Please ground both ends of the shielding layer of the motor encoder cable.

4.7.2 How To Use A Noise Filter

To prevent interference from the power cord and to reduce the impact of servo drivers on other sensitive devices, select the appropriate noise filter at the power input, depending on the size of the input current. Also, install the noise filter at the power cord of the peripheral unit as needed. When installing and wiring noise filters, observe the following precautions so as not to impair the actual use of the filter.

- Please separate the noise filter input and output wiring, do not put the two in the same pipe or bundle them together.

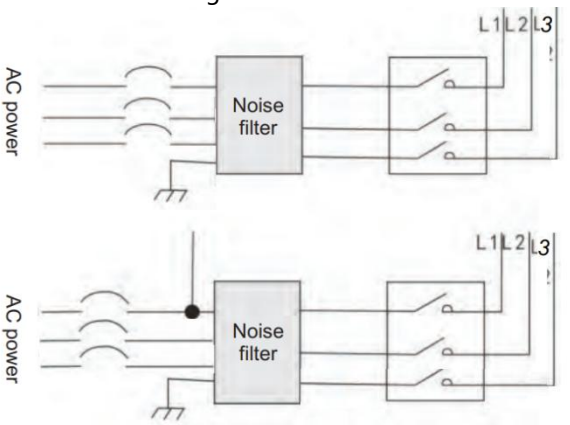


Figure 4.13 Example diagram of separate wiring of noise filter input and output wiring

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

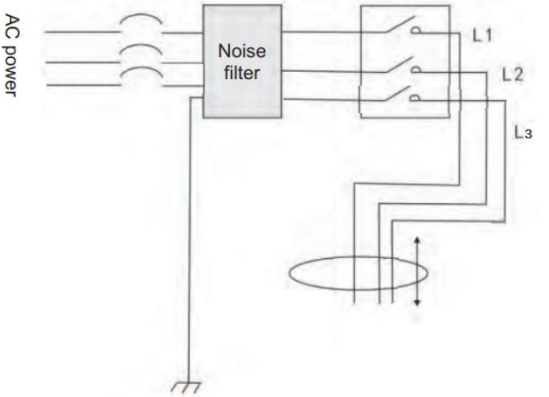


Figure 4.14 Schematic diagram of separate wiring of noise filter ground wire and output wiring

- Noise filters should be grounded separately using as short a thick wire as possible, and do not share a ground wire with other grounding equipment.

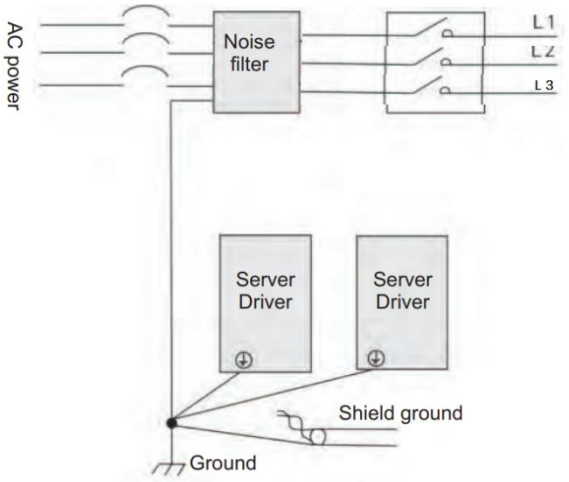
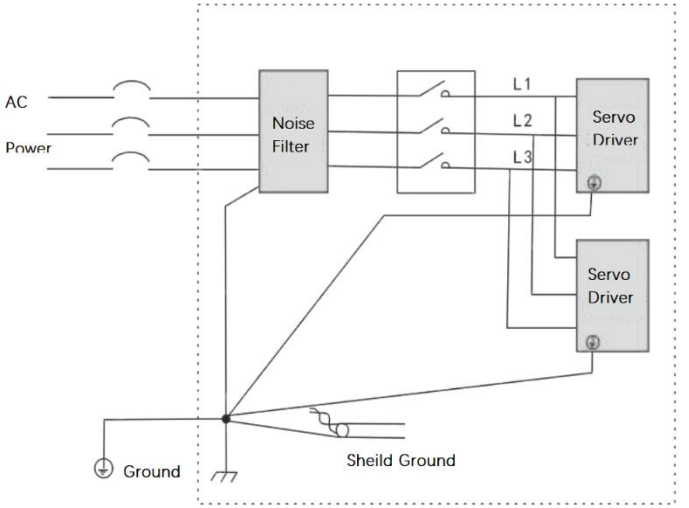


Figure 4.15 Schematic diagram of single point grounding

- Ground wire treatment of the noise filter installed in the control cabinet. When the noise filter is installed in the same control cabinet as the servo driver, it is recommended that the filter be secured to the servo drive on the same metal plate to ensure that the contact part is conductive and well connected, and that the metal plate is grounded.



Chapter 5 Running Mode and Control Wiring Chart

According to the command mode and operation characteristics of servo drive, there are three modes of operation: position control operation mode, speed control operation mode and torque control operation mode.

- Position control mode generally determines the displacement of movement by the number of pulses, and the pulse frequency of the external input determines the size of the rotation speed. Because the position mode can be strictly controlled for position and speed, it is generally used in positioning devices. Servo is the most widely used control mode, mainly used in robots, patch machines, milling engraving, CNC machine tools.

- Speed control mode is used in some constant speed situations by simulating a given amount, a digital quantity given, and communicating a given control rotation speed. For example, the milling machine application, the upper machine uses the position control mode, the servo driver adopts the speed control mode.

- The torque control mode is given by analog quantity, given by digital quantity, and by communication given by controlling torque size. Mainly used in the material force has strict requirements for winding and rolling devices, such as winding devices or pull fiber optic equipment and other tension control situations, torque settings should be changed at any time according to the radius of winding, to ensure that the material's force does not change with the winding radius.

5.1 Position control mode

5.1.1 Position Mode Introduction

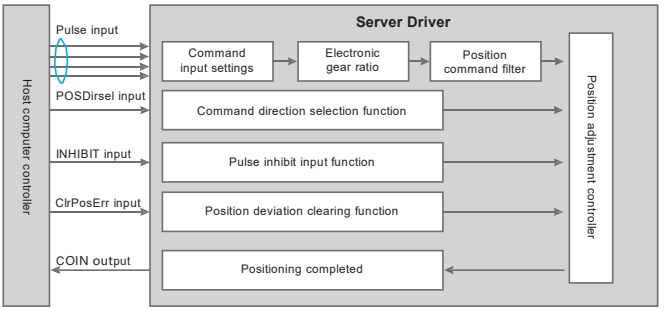


Figure 5.1 Position control mode block diagram

Location mode is a common operating mode for servo drives, and its main use steps are as follows:

1) Correctly connect the power supply of the servo main circuit and control circuit,

as well as the motor power line and encoder line. After power-on, the servo panel displays "r 0", which means that the servo power supply and encoder wiring are correct.

2) Carry out servo JOG test run by pressing the key to confirm whether the motor can run normally.

3) Refer to Figure 5.2 for wiring instructions to connect the pulse direction input and pulse command input in the CN1 terminal, as well as the required DI/DO signals, such as servo enable, alarm clear, positioning completion signal, etc.

4) Carry out position mode related settings. Set the DI/DO used according to the actual situation.

5) Serve enable, control the rotation of the servo motor through the position command issued by the upper computer. First, make the motor rotate at a low speed, and confirm whether the direction of rotation and the electronic gear ratio are normal, and then adjust the gain.

5.1.2Position mode wiring

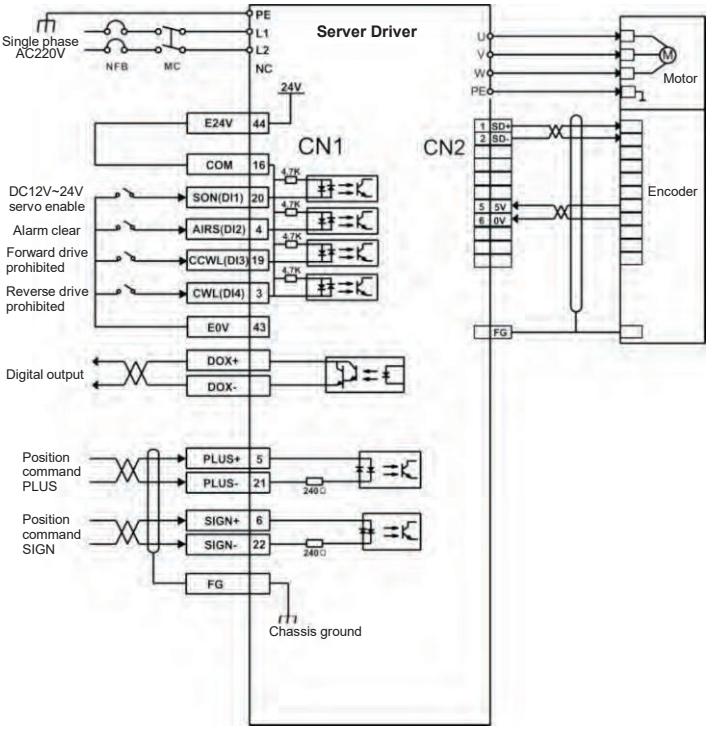


Figure 5.2 Position mode wiring diagram

NOTE

◆ The internal supply voltage range is 20V to 28V, with a maximum operating current of 100mA. If you are using an external 24V power supply, connect the external power supply to pin 16 (COM) and the external power supply 0V to pin 43 (E0V).。

◆ DO output power users need to bring their own, power range 5V to 24V. The DO port has a maximum allowable voltage dc30V and a maximum allowable current of 50mA.

5.1.3 Parameter Settings In Position Mode

5.1.3.1Gain And Smooth Filter

Necessary parameters	Parameter Description	Parameter value	Factory default
PA4	Control method selection	0	0
PA9	Position proportional gain	1-1000	80
PA19	Position command smoothing filter	0-1000×0.1ms	100
PA100	Command filter selection	0-1	0

5.1.3.2 Digital Input

Necessary parameters	Parameter Description	Parameter value	Factory default
PA11	Command pulses for each rotation	0-30000	10000
PA12	1st numerator of electronic gear for position command pulse	1-32767	0
PA13	Denominator of electronic gear for position command pulse	1-32767	10000
PA14	Input mode of position command pulse	0-3	0
PA15	reverse direction of position command pulse	0-1	0
PA59	The effective edge of command pulse	0-1	0
PA77	2nd numerator of electronic gear for position pulse	1-32767	0
PA78	3rd numerator of electronic gear for position pulse	1-32767	0
PA79	4th numerator of electronic gear for position pulse	1-32767	0
PA80	Effective level of command direction signal	0-1	0
PA81	Command pulse(PULS)signal filter	0-15	4
PA82	Command pulse(SIGN)signal filter	0-15	4

5.1.3.3 Digital Output (DO)

Necessary parameters	Parameter Description	Parameter value	Factory default
PA16	Range of positioning completion	0-3000 pulses	10000
PA17	Position deviation limit	0-30000×100 pulses	0
PA18	Position deviation error	0-1	10000
PA83	CWL,CCWL prohibited mode	0-1	0
PA84	Hysteresis for position completion	0-32767	0
PA85	Range for approach positioning	0-32767	0
PA86	Hysteresis for approach positioning	0-32767	0

5.1.3.4 Input And Output Terminals

Necessary parameters	Parameter Description	Parameter value	Factory default
PA55	Input terminal effective level control word	0000-1111	0000
PA57	Output terminal effective level control word	0000-1111	0000
PA58	IO input terminal debounce time constant	1-20ms	2
P3-0	Digital input DI1 function	0-99	1
P3-1	Digital input DI2 function	0-99	2
P3-2	Digital input DI3 function	0-99	3
P3-3	Digital input DI4 function	0-99	4
P3-15	Digital input DI forced effective 1	00000000-11111111	00000000
P3-16	Digital input DI forced effective 2	00000000-11111111	00000000
P3-17	Digital input DI forced effective 3	00000000-11111111	00000000
P3-20	Digital output DO1 function	0-99	2
P3-21	Digital output DO2 function	0-99	3
P3-22	Digital output DO3 function	0-99	5
P3-23	Digital output DO4 function	0-99	8

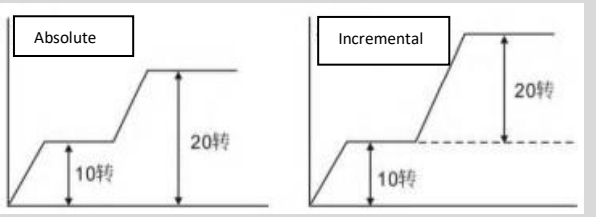
● **Position Command Introduction Of Internal Position Pr Mode**

The Pr position command source is a set of 8 built-in location command registers using parameters (P4-2, P4-3) - (P4-23, P4-24), with external I/O (CN1, POS0- POS 2, and CTRG) that can select one of eight groups as location commands:

Name	POS2	POS1	POS0	CTRG	Parameter	Induction	Moving Speed Register
P1	0	0	0	↑	P4-2	Circle(+/-30000)	P4-4（V1）
					P4-3	Pulse(+/-max cnt)	
P2	0	0	1	↑	P4-5	Circle(+/-30000)	P4-7（V2）
					P4-6	Pulse(+/-max cnt)	
P3	0	1	0	↑	P4-8	Circle(+/-30000)	P4-10（V3）
					P4-9	Pulse(+/-max cnt)	
P4	0	1	1	↑	P4-11	Circle(+/-30000)	P4-13（V4）
					P4-12	Pulse(+/-max cnt)	
P5	1	0	0	↑	P4-14	Circle(+/-30000)	P4-16（V5）
					P4-15	Pulse(+/-max cnt)	
P6	1	0	1	↑	P4-17	Circle(+/-30000)	P4-19（V6）
					P4-18	Pulse(+/-max cnt)	
P7	1	1	0	↑	P4-20	Circle(+/-30000)	P4-22（V7）
					P4-21	Pulse(+/-max cnt)	
P8	1	1	1	↑	P4-23	Circle(+/-30000)	P4-25（V8）
					P4-24	Pulse(+/-max cnt)	

◆ The status of POS0-2:0 means contact is open (open), 1 means contact is closed (close). CTRG↑ represents the moment when the connection changes from open circuit (0) to circuit (1). max represents the command pulse of one revolution of the motor

◆ The absolute position register has a wide range of applications, which is equivalent to a simple program control. Users only need to use the above table to easily complete periodic operations. For example, if the position command P1=10 revolutions and P2=20 revolutions, the position command P1 is issued first, and then the position command P2 is issued. Differences between P1 and P2 as below:



5.2 Speed Control Mode Wiring

5.2.1 Introduction

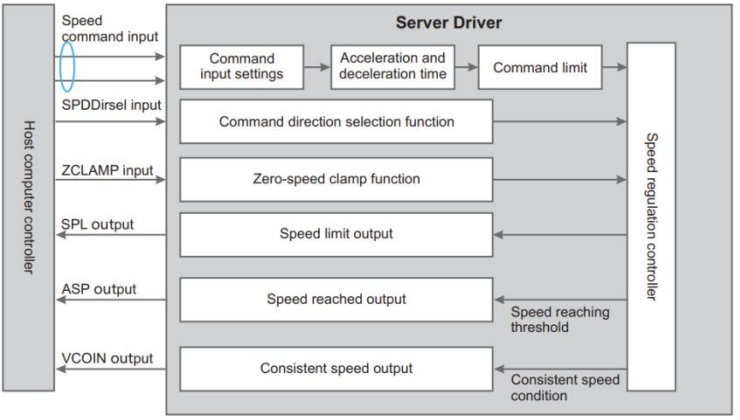


Figure 5.3 Speed Control Mode

The main steps for using speed mode are as follows:

1) Properly connect the power supply of the servo main circuit and the control circuit, as well as the motor power cord and encoder line, the servo panel displays"r 0"after powering on, which means that the servo power supply and encoder wiring is correct.
2) The servo JOG test run is carried out by pressing the button to confirm the normal operation of the motor.
3) Refer to Figure 5.4 wiring to explain the required DI/DO signals in the connection CN1 terminal, such as servo enablement, alarm clearing, positioning completion signal, etc.
4) Set the speed mode. Set the DI/DO used based on the actual situation.
5) Servo enable, through the upper machine issued position command to control the rotation of the servo motor. First rotate the motor at low speed and confirm that the rotation direction and electronic gear ratio are correct, and then make a gain adjustment.

5.2.2 Speed Mode Wiring

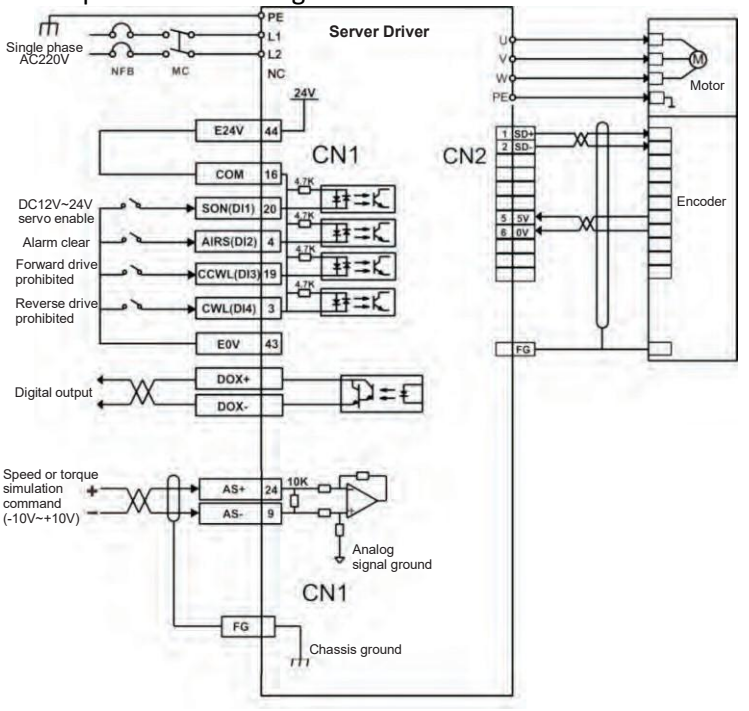


Figure 5.4 Speed mode wiring diagram

5.2.3 Parameter Settings In Speed Mode

- **Related parameters to be adjusted for speed control mode**

Necessary Para	Description	value	Default
PA4	Control method selection	1	0
PA5	Speed proportional gain	5-2000Hz	150
PA6	Speed integral constant	1-1000ms	75
PA22	Internal and external speed command selection	0-5	0
PA24	Internal speed 1	-6000-6000r/min	100
PA25	Internal speed 2	-6000-6000r/min	500
PA26	Internal speed 3	-6000-6000r/min	1000
PA27	Internal speed 4	-6000-6000r/min	2000
PA28	Arrival speed	0-3000r/min	3000
PA40	Acceleration time constant	1-10000ms	100
PA41	Deceleration time constant	1-10000ms	100
PA42	S type acceleration and deceleration time constant	0-1000ms	0
PA43	Analog speed command input gain	10-3000r/min/v	300
PA44	The direction of the analog speed command is reversed	0-1	0
PA45	Analog speed command zero offset compensation	-5000-5000	0
PA46	Analog speed command filter	1-300Hz	300
PA75	Zero speed detection point	0-1000r/min	10
PA76	Speed consistent setting value	0-1000r/min	10
PA87	Arrival speed difference	0-5000r/min	30
PA88	Polarity of arrival speed	0-1	0
PA92	Zero speed detection hysteresis	0-1000r/min	5

5.3Torque control mode

5.3.1Introduction

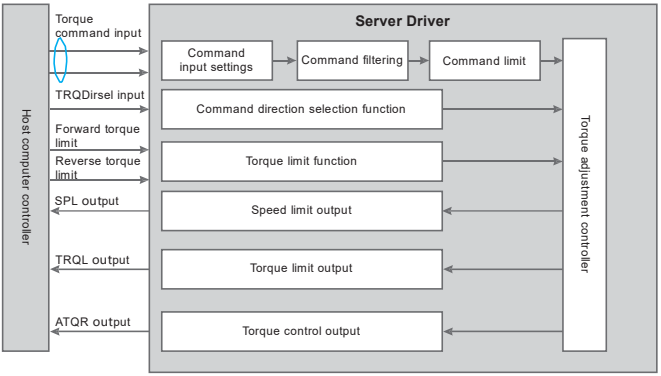


Figure 5.5 Torque Control Mode Block diagram

The main steps of using torque mode are as follows:

Correctly connect the power supply of the servo main circuit and control circuit, as well as the motor power line and encoder line. After power-on, the servo panel displays "r 0", which means that the servo power supply and encoder wiring are correct.

Carry out servo JOG test run by pressing the key to confirm whether the motor can run normally.

Refer to Figure 5.6 for wiring instructions to connect the required DI/DO signals in the CN1 terminal, such as servo enable, alarm clear, positioning completion signal, etc.

Make relevant settings for torque mode. Set the DI/DO used according to the actual situation.

Servo enable, control the rotation of the servo motor through the position command issued by the upper computer. First, make the motor rotate at a low speed, and confirm whether the direction of rotation and the electronic gear ratio are normal, and then adjust the gain.

5.3.2Torque mode wiring

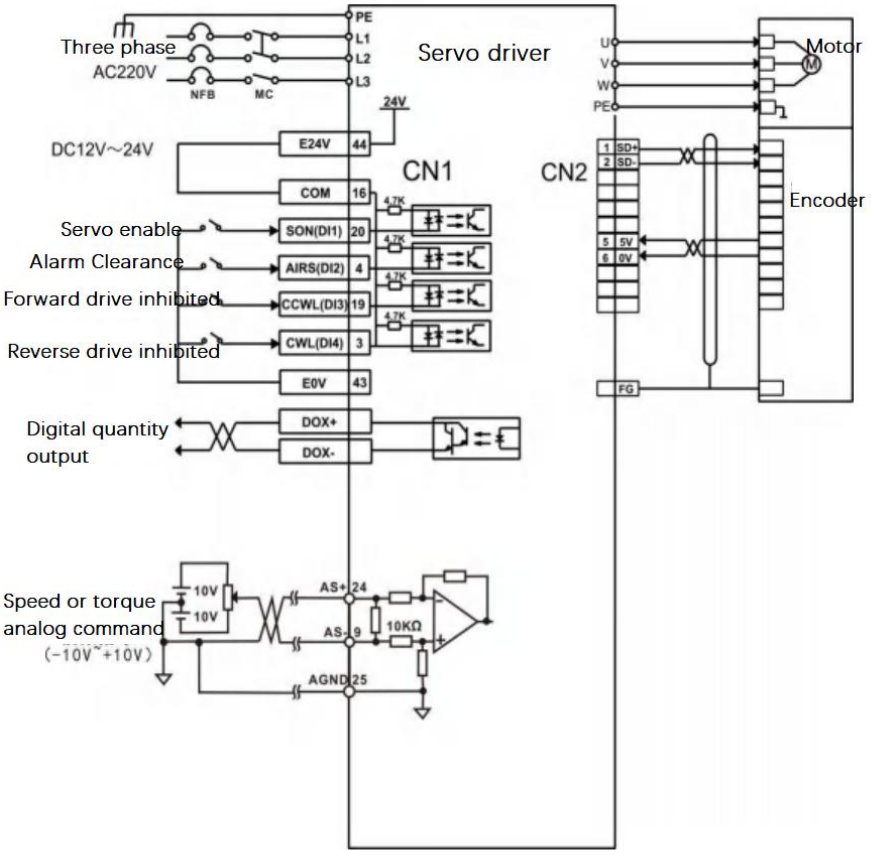


Figure 5.6 Torque mode wiring diagram

5.3.3Parameter Settings In Torque Mode

5.3.3.1 Torque control mode needs to adjust parameters

Nece. Para	Description	Value	Default
PA4	Control method selection	2	0
PA29	Analog torque command input gain	Set as needed	30
PA32	Internal and external torque command selection	0-2	0
PA33	Analog torque command input direction is reversed	0	0
PA39	Analog torque command zero offset compensation	0	0
PA50	Speed limit during torque control	Set as needed	Rated speed
PA64	Internal torque 1	-300-300	0
PA65	Internal torque 2	-300-300	0
PA66	Internal torque 3	-300-300	0
PA67	Internal torque 4	-300-300	0
PA83	Prohibition method	0-1	0
PA89	Reach torque	-300%-300%	100
PA90	Reached torque difference	0%-300%	5
PA91	Reached torque polarity	0-1	0

5.4 Origin Regression function and description of relevant parameters

5.4.1 Relevant Parameter Settings

Nece Par.	Description	Value	Default
P4-32	Origin detector type and search direction setting	0-5	0
P4-33	Short-distance movement method setting to reach the origin	0-2	0
P4-34	Origin trigger start mode	0-2	0
P4-35	Origin stop mode setting	0-1	0
P4-36	The first stage of high-speed home return speed setting	1-2000 r/min	1000
P4-37	The second stage of low-speed home return speed setting	1-500r/min	50
P4-38	Origin return offset circle number	+/-30000	0
P4-39	Origin return offset pulse number	+/-max cnt	0

5.4.2 Origin Regression Mode Introduction(Must be in internal position mode)

5.4.2.1 Origin trigger start mode (P4-34)

The origin trigger start mode is divided into two categories: the automatic execution origin regression function and the contact trigger origin regression function:

P4-34=0: Turn off origin regression. When P4-34 is set to 0, the origin regression function does not start regardless of the other set points.

P4-34=1: The origin regression function is automatically performed when the power is on. This function is only valid once when power supply and servo start up inputs are made, i.e. under operating conditions where servo operation does not require repeated regression. Use this feature to omit an input contact to perform regression origin.

P4-34=2: The origin regression function is triggered by the SOM input contact. When setting this function, any register in the input pin function planning register (P3-0 to P3-3) must be set to the SOM trigger origin input function. THE Servo connection can be triggered at any time during servo operation and the origin regression function can be performed.

B. Origin detector type and direction setting (P4-32)

The origin detector can use the left or right limit switch as the origin reference point, or additional detectors, such as proximity or light gate switches, can be used as the origin reference point. The Z pulse can also be set as the origin reference point when the servo motor is only moving within one turn.

P4-32=0: Look for the origin in the forward direction and use the CCWL limit input point as a rough reference point for the origin. When origin positioning is complete, CCWL moves to the limit input function. Subsequent re-triggering will generate a limit warning, and when using the limit input point as a rough reference point for the origin, it is recommended to set the return to look for the Z pulse(P4-33=0) as the exact mechanical origin.

P4-32=1: The reverse direction looks for the origin and takes the CWL limit input point as a rough reference point for the origin. When origin positioning is complete, the CWL moves to the limit input function. Subsequent re-triggering will produce an extreme warning, and when using the limit input point as a rough reference point for the origin, it is recommended to set the return look for the Z

pulse(P4-33s0) as the exact mechanical origin.

P4-32=2: Forward direction to find the origin, and or GP (external detector input point) as the reference point of the origin, at this time the precise mechanical origin can be set to return to look for(P4-33s 0) or not return to look for (P4-33s1) Z-phase pulse. When the Z-phase pulse is not used as the mechanical origin, the positive edge of or GP can also be set to the mechanical origin(P4-33s2).

P4-32=3: The reverse direction looks for the origin and uses ORGP (external detector input point) as the reference point for the origin. The precise mechanical origin can then be set to return a search(P4-33s0) or not a Z-phase pulse to look for(P4-33s1). When the Z-phase pulse is not used as the mechanical origin, the positive edge of or GP can also be set to the mechanical origin(P4-33s2).

P4-32=4: Forward direction directly looking for the absolute position zero of the single turn, this function is typically used for servo motors only in a range of motion control, at this time can not be external to any detection switch.

P4-32=5: Invert direction directly looking for the absolute position zero of the single turn, this function is typically used for servo motors only in a range of motion control, at this time can not be attached to any detection switch.

C. Movement mode setting of short distance to the origin (P4-33)

P4-33=0: After finding the reference origin, the motor folds back to find the nearest absolute position zero point at the second speed as the mechanical origin.

P4-33=1: After finding the reference origin, the motor turns to the second stage speed and continues to look forward for the nearest single-lap absolute position zero as the mechanical origin.

P4-33=2: Find the rising edge of the detector ORGP as the mechanical origin and slow down to stop, suitable for P4-32 values of 2 and 3 settings, or find the absolute position of the single lap zero point and slow stop, suitable for P4-32 value of 4 and 5 settings.

D. The mode setting of origin point stops (P4-35)

P4-35=0: After the origin detection is complete, the motor decelerates and pulls back to the origin. After the origin heartbeat is obtained during the second speed operation, the motor deceleration stops. Stop and then move to the mechanical origin position at a two-stage speed.

P4-35=1: After the origin detection is complete, the motor slows down in the forward direction and stops. After the origin heartbeat is obtained during the second speed operation, the motor deceleration stops. The positional override after the stop is no longer corrected, at which point the position of the mechanical origin does not change depending on the amount of position override.

5.5 Pre-operational Inspection

First remove the load connected to the servo motor, the coupling connected to the servo motor shaft, and its associated accessories. Ensure that the servo motor works properly without load before connecting the load to avoid unnecessary hazards.

- Before you run, check and make sure that:

1) There is no obvious damage to the appearance of the servo drive;
2) The wiring terminals have been insulated;
3) here are no conductive objects or flammable objects such as screws or metal pieces inside the driver, and there are no conductive foreign objects at the wiring ports
4) e servo drive or external braking resistor is not placed on combustible objects;
5) The wiring is completed and the wiring is correct

- The drive power supply, auxiliary power supply, ground terminal and so on are wired correctly, each control signal cable is wired correctly, and the limit switch and protection signal are all properly wired.

1) The enable switch has been placed in the OFF state;
2) t off the power circuit and the emergency stop alarm circuit to maintain the access;
3) The applied voltage reference of the servo drive is correct.

- Power up the servo drive without the controller sending a run command signal. Check and guarantee:

1) The servo motor can rotate normally without vibration or excessive running sound;
2) The parameters are set correctly. Unexpected actions may occur depending on the mechanical characteristics. Please do not over-set extreme parameters;
3)There is no abnormality in bus voltage indicator and digital tube display.

Character 6 Operation and Display

6.1 Drive Panel Introduction

6.1.1 Front Panel

The panel consists of 5 LED digital tube displays and 4 buttons ▲、▼、◀、**SET**， It is used to display various system statuses, set parameters, etc. Actions are hierarchical actions that are expanded layer by layer by the main menu.

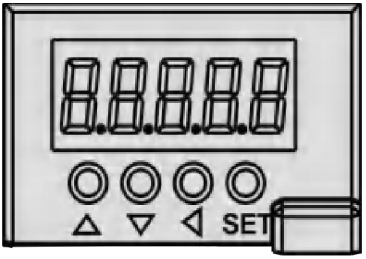


Figure 6.1 Drive panel display interface

6.1.2Key introduction

Symbol	Name	Function
▲	Increasing	Increase sequence number or value;Press and hold to keep increasing
▼	Decreasing	Decrease sequence number or value;Press and hold to keep decreasing
◀	Exit	Menu exit or cancel the operation
SET	Confirm	Menu entered or confirm the operation

6.2 Main menu

The first layer is the main menu, there are 8 ways to operate, ▲、▼ Keys to change the mode， press the **SET** key to enter the second layer, perform specific operations, and press the key to return to the main menu from the second layer.

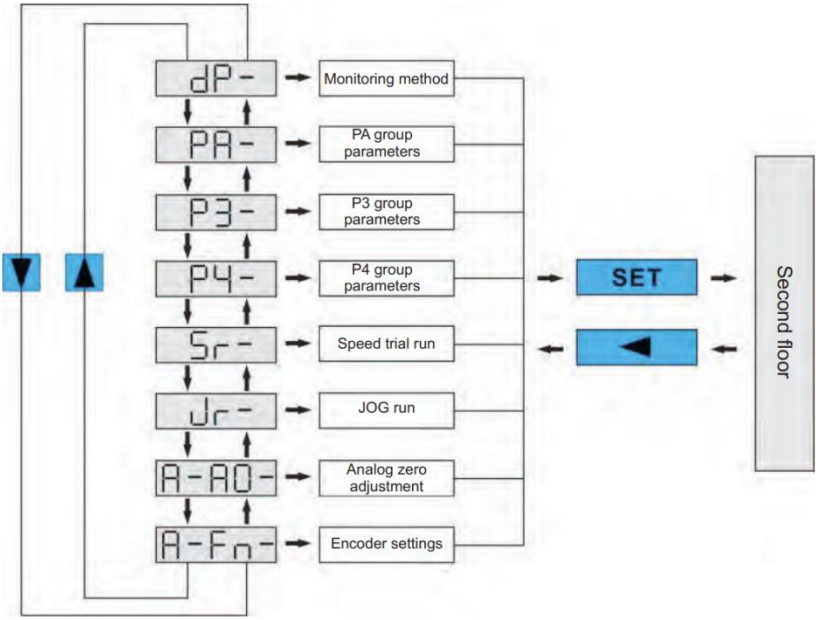


Figure 6.2 Block diagram of the main menu operation

6.3 Steps To Set Parameters

Parameters are represented by parameter segment + parameter number, the hundreds digit is the segment number, and the tens and ones digits are the parameter numbers. For example, for parameter PA53, the segment number is "PA", the parameter number is "53", and the display shows "PA-53".

Select the parameter setting "P-" in the main menu, and press the SET key to enter the parameter setting mode. First use the ▲、▼ keys to select the parameter section, after selecting, press the SET key to enter the parameter

number selection of this section. Secondly, use the▲、▼ keys to select the parameter number, after selecting, press the SET key to display the parameter value.

Use ▲、▼ keys to modify the parameter value. Press ▲ or ▼ key once to increase or decrease the parameter by 1, press and hold ▲ or ▼, to continuously increase or decrease the parameter. When the parameter value is modified, press the SET key, the decimal point of the rightmost LED digital tube lights up and flashes twice, that is, the modification is completed, and the modified value will be immediately reflected in the control (some parameters need to be saved and then powered on again to take effect).

6.4 Monitoring Status

The first layer is used to choose how to operate, there are 8 ways, Use▲、▼ keys to change the mode, press the **SET** key to enter the second layer of the selected mode, and press the ◄ key to return to the first layer from the second layer.

Select "dp--" in the first layer, and press the **SET** key to enter the monitoring mode. There are a total of 23 display states, The user selects the desired display mode with the ▲、▼ keys, and then presses the **SET** key to enter the specific display state.

Monitoring method	Operate	Monitoring example	Illustrate
P-SPd		r 1000	Motor speed 1000r/min
P-PoS		04580	Current position 124580
P-PoS.		P. 12	
P-CPo		C4581	Position command 124581
P-CPo.		C. 12	
P-EPo		E 4	Position deviation 4 pulses
P-EPo.		E. 0	
P-tr9		t 0.70	Motor torque 70%
P- I	SET	I 2.3	Motor current 2.3A
P-Cnt		Cnt 0	Current control mode 0: Position control mode
P- CS		r. 500	The speed corresponding to the analog input in speed mode is 500 r/min.
P- Ct		t 0.50	The torque corresponding to the analog input in torque mode is 50%。
P-APo		A3265	The absolute position of the rotor is 3265.
P-APo.		A. 0	
P- In		n ııı	Input terminal

P-oUt		oUt.111	Output terminal
P-UdC		UC336	us voltage 336V
P-Err		Err 4	Alarm No. 4

P- rL		rL-on	Relay open state
		rL.-oF	Relay off state
		rL-Er	Relay alarm status
P- rn		rn - on	The main circuit is operating normally
		rn.-oF	The main circuit is not charged
		rn-CH	The main circuit is charged but the servo is not enabled
		rn-Er	Main circuit alarm
P- US		U-on	Bus voltage is normal
		U-.LoU	Bus voltage is too low
		U-Err	There is an alarm
P- AS		43210	Motor absolute position 876543210
P- AS.		A.8765	

6.5 Analog Quantity Zeroing Adjustment

With this operation, the drive automatically detects the analog zero bias and writes the zero bias value to parameter PA39 (or Pa45). This operation has saved the zero-bias parameter to EEPROM, so no more parameter writes are required.

First select the analog zero "A-A0" and press **SET** to enter. Then select speed analog zero adjustment "A-SPd" or torque analog zero adjustment "A-Trq" through ▲、▼, and after selecting the operation, press and hold the **SET** key for more than 3 seconds, and activate the operation after "donE" is displayed. After finishing, you can press ◄again to return to the menu selection state.

6.6 Encoder Selection

Select "F-res" to reset the encoder operation, the encoder multi-circle information zero, through the P3-36 parameter value setting, the single-circle information can be zeroed to achieve the purpose of the origin; Press and hold the SET key for more than 3 seconds after selecting the operation, and after "donE" is displayed, activate the action. When you're done, press ◄ to return to the menu selection state.

6.7 How To Reset Default Parameters

Use the Restore Default (Factory Parameters) function if::

• The parameters are scrambled and the system does not work properly。

The steps to restore the default parameters are as follows:

1. The motor needs to be connected to the drive, and after power-on, the drive will automatically read the motor parameters and automatically match the motor model.

2. Change the password (PA0) to 385.

3. Enter parameter management and perform the following operations:

All parameters are restored as the default, and user-modified parameters are restored to factory defaults. Press ◄ to return to the main menu, use ▲、▼select "PA-" mode, press set key to enter the second layer of the interface, and then press ▲, ▼ so that PA-0, then press **SET** into the third layer of interface, PA0 set to the value 385, press **SET** to save. Next press◄ o return to the "PA-" interface, and set PA1 to DEF-, press **SET** for 5 seconds, wait for the LED to flash a few times, complete the default parameter saving. Finally, power on again is valid.

Chapter 7
Parameters Function
Instruction

7.1 PA Group Para

Seq	name	function	Par Range	Default
0	password	1. The user password is 315. 2. The model code is 385.	0-9999	315
1	Model code	This parameter is read-only and cannot be modified. The driver automatically recognizes the motor model without selecting it	40-80	Sheet 7-1
2	Software version	You can view the software version number, but you cannot modify it.		

Sheet 7-1

Driver	Q500	
Motor	80-04025	130-04025
	90-04025	130-05025
	100-03230	130-06025
	100-06430	130-07725
	110-02030	130-10010
	110-04020	130-10015
	110-04030	130-10020
	110-05030	130-10025
	110-06020	130-15015
	110-06030	130-15025

Seq	name	Function	Para.range	default
3	Initial display state Initial display state	1: Display the lower 5 digits of the current position; 2: Display the upper 5 digits of the current position; 3: Display the lower 5 digits of position command (accumulated amount of command pulse); 4: Display position command (accumulated amount of command pulse) high 5 digits; 5: Display the lower 5 digits of the position deviation; 6: Display position deviation high 5 digits; 7: Display motor torque; 8: Display motor current; 9: Current control mode; 10: Display the current temperature; 11: Display speed command; 12: Display torque command; 13: Display the lower 5 positions of the absolute position of the rotor in one revolution; 14: Display the upper 5 digits of the absolute position of the rotor in one revolution; 15: Display the status of the input terminal;; 16: Display the status of the output terminal;; 17: Display the encoder input signal;; 18: Display the bus voltage value of the main circuit; 19: Display the alarm code; 20: Display the version number of the logic chip 21: Display the pull-in state of the relay; 22: Display running status; 23: Display the external voltage status; 24: Display the lower 5 digits of the absolute value position; 25: Display the upper 5 digits of the absolute value position;	0-25	0

		This parameter allows you to set the way the drive is controlled:		
Seq	name	Function	Para.range	default
4	Control method selection	0: Position control mode; 1: speed control mode; 2: torque control mode; 3: Position speed mixed control mode; 4: Position torque mixing control mode; 5: Speed torque mixing control mode; 6: Encoder zero mode.	0-6	0
5	Speed proportional gain	1. Set the proportional gain of the speed ring regulator. 2. The higher the set value, the higher the gain and the greater the stiffness. The parameter values are determined according to the specific servo drive system model and load conditions. In general, the greater the load inertia, the larger the setting. 3. Set as large as possible without oscillating the system.	5-2000HZ	150
6	Speed integral constant	1. . Set the integral time constant of the speed loop regulator. 2. The smaller the setting value, the faster the integration speed, and the stronger the system resists deviation, that is, the greater the stiffness, but too small an overshoot is likely to occur.	1-1000 ms	75
7	Torque filter	1. Set the torque command filter characteristics. 2. Used to suppress the resonance generated by the torque. 3. The smaller the value, the lower the cut-off frequency, and the less vibration and noise the motor produces. If the load inertia is large, the set value can be reduced appropriately. The value is too small, causing the response to slow down and may cause oscillations. 4. The higher the value, the higher the cutoff frequency and the faster the response. If a high torque response is required, the setting can be increased appropriately.	20-500%	100

Seq	name	Function	Para.ran	default
8	Speed detection filter	1. Set the speed detection filter characteristics. 2. The smaller the value, the lower the cut-off frequency, and the less noise the motor produces. If the load inertia is large, the set value can be reduced appropriately. The value is too small, causing the response to slow down and may cause oscillations. 3. The higher the value, the higher the cutoff frequency, and the faster the feedback response. If a high speed response is required, the setting can be increased appropriately.	20-500%	100
9	Position proportion al l gain	1. Set the proportional gain of the position ring regulator. 2. The higher the set value, the higher the gain, the greater the stiffness, the smaller the position lag under the same frequency command pulse conditions. However, a value that is too large may cause oscillations. 3. The parameter values are determined according to the specific servo drive system model and load conditions.	1-1000	80
10	Number of pulses output by the motor per 1 revolution	Set the number of pulses output by the encoder phase AB for every 1 revolution of the motor.	100-300 00	1000 0
11	Number of command pulses per motor revolution	1. Set the number of command pulses equivalent to 1 revolution per rotation of the motor. 2. When the setting value is 0, PA-12 (position command pulse divider molecule) and PA-13 (position command pulse divider) are valid.	0-30000	1000 0

<table>
<tr><th>Seq</th><th>name</th><th>Function</th><th>Para.ran</th><th>default</th></tr>
<tr><td>12</td><td>Position command pulse electronic gear first numerator</td><td>1. Set the division/multiplication frequency of the position command pulse (electronic gear).
2. In the position control mode, by setting the parameters of PA12 and PA13, it can be easily matched with various pulse sources to achieve the user's ideal control resolution (ie angle/pulse).
3. P×G=N×131072。
P： Number of pulses for input instructions；G：electronic gear ratio； G= frequency division numerator/frequency division denominator N: motor rotation number 131072： The default number of pulses for one revolution of the motor is 131072.
4. For example, when the input command pulse is 6400, the servo motor rotates one revolution G=(N×131072)/P=(1×131072)/6400=512/25,
Then the parameter PA12 is set to 512， and PA13 set as 25.
5. The numerator of the command pulse electronic gear is determined by Gear1 and Gear2. The denominator is set by parameter PA13. The combination is as follows：
<table>
<tr><th colspan="2">DI signal{Note}</th><th rowspan="2">Command pulse electronic gear denominator</th></tr>
<tr><th>Gear2</th><th>Gear1</th></tr>
<tr><td>0</td><td>0</td><td>First molecule (parameter PA12)</td></tr>
<tr><td>0</td><td>1</td><td>Second molecule (parameter PA 77)</td></tr>
<tr><td>1</td><td>0</td><td>Third molecule (parameter PA 78)</td></tr>
<tr><td>1</td><td>1</td><td>Fourth molecule (parameter PA 79)</td></tr>
<tr><td colspan="3">Note: 0 means OFF, 1 means ON</td></tr>
</table>
</td><td>0-32767</td><td>0</td></tr>
<tr><td>13</td><td>Position command pulse electronic gear denominator</td><td>See Parameters PA12</td><td>1-32767</td><td>10000</td></tr>
</table>

Seq	name	Function	Para.ran	default
14	Position command pulse input method	1. Set the input form of the position command pulse. 2. Set the parameters to one of the three input modes: 0: Pulse-plus direction; 1: CCW pulse/CW pulse; 2: A, B two-phase orthogonal pulse input; 3: Internal location input. Note: CCW is axial observation from the servo motor, rotating in an anticlockwise direction, defined as forward, and CW is observed from the axial direction of the servo motor, rotating clockwise, defined as reverse.	0-3	0
15	Inverted command pulse direction	Set to: 0: Normal; 1: Position command pulse direction is reversed.	0-1	0
16	Positioning completion range	1. Position the complete pulse range under position control. 2. This parameter provides the basis for the drive to determine whether to complete the positioning under position control. When the remaining pulses in the position deviation counter are less than or equal to the set value of this parameter, the digital output DO's COIN (positioning complete) ON, otherwise OFF. 3. Comparator has a return function. Set by parameter Pa84.	0-30000 Pulse	130
17	Position tolerance range detection	1. Set the position difference alarm detection range. 2. Under position control mode, the driver gives a position alarm when the value of the position deviation counter exceeds the value of this parameter.	0-30000 ×100 Pulse	6000
18	Invalid position error	Set to: 0: Positional difference alarm detection is effective; 1: Position difference alarm detection is not valid, stop detection location error.	0-1	0

<table>
<tr><th>Seq</th><th>name</th><th>Function</th><th>Para.rang</th><th>default</th></tr>
<tr><td>19</td><td>Position command smoothing filter</td><td>1. Smooth filtering of the command pulse, with exponential acceleration and deceleration, the value represents the time constant.
2. The filter does not lose input pulses, but instruction delays occur.
3. This filter is used to:
1The upper controller has no deceleration function;
2Electronic gears are multiplied in larger frequencies (>10);
3The instruction frequency is low.
4. Step jumps and unevenness occur when the motor is running.
5. When set to 0, the filter does not work.</td><td>0-1000× 0.1ms</td><td>100</td></tr>
<tr><td>20</td><td>Drive prohibitio n input is invalid</td><td>Set as: 0: CCW, CW input prohibition is valid. When the CCW drive prohibition switch (FSTP) is ON, the CCW drive is allowed; when the CCW drive prohibition switch (FSTP) is OFF, the CCW direction torque remains at 0; the same is true for CW. If both CCW and CW drive prohibitions are OFF, a drive prohibition input error alarm will be generated; 1: Cancel CCW and CW input prohibition. Regardless of the status of the CCW and CW drive prohibition switches, both CCW and CW drive are allowed. At the same time, if both CCW and CW drive prohibition are OFF, no drive prohibition input error alarm will be generated.</td><td>0-1</td><td>1</td></tr>
<tr><td>21</td><td>JOG running speed</td><td>Set the speed at which the JOG operation will run.</td><td>0-6000 r/min</td><td>100</td></tr>
<tr><td>22</td><td>Speed command source</td><td>During speed control, set the source of the speed command, the meaning of the parameter: 0: Analog speed command is input by analog port AS+, AS-; 1: Internal speed command, determined by SP1 and SP2 input by DI:
<table>
<tr><th colspan="2">DI Signals</th><th rowspan="2">Command pulsed electronic gear denominator</th></tr>
<tr><th>SP2</th><th>SP1</th></tr>
<tr><td>0</td><td>0</td><td>Internal speed 1 (para PA24)</td></tr>
<tr><td>0</td><td>1</td><td>Internal speed 2 (para PA25)</td></tr>
<tr><td>1</td><td>0</td><td>Internal speed 3 (paraPA26)</td></tr>
<tr><td>1</td><td>1</td><td>Internal speed 4 (paraPA27)</td></tr>
</table></td><td>0-5</td><td>0</td></tr>
</table>

<table>
<tr>
<td></td>
<td></td>
<td>2: Analog speed command + internal speed command:
<table>
<tr><th colspan="2">DI Signals</th><th rowspan="2">Command pulsed electronic gear denominator</th></tr>
<tr><th>SP2</th><th>SP1</th></tr>
<tr><td>0</td><td>0</td><td>Analog volume speed</td></tr>
<tr><td>0</td><td>1</td><td>Internal speed 2 (para PA25)</td></tr>
<tr><td>1</td><td>0</td><td>Internal speed 3 (para PA26)</td></tr>
<tr><td>1</td><td>1</td><td>Internal speed 4 (para PA27)</td></tr>
</table>
Note: 0 means OFF, 1 means ON.
3: JOG speed command, when inching (JOG) operation, Need to be set.
4: Keyboard speed command, when performing keyboard speed regulation (Sr) operation, Need to be set.
5: IO terminal controls jog operation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Maximum speed limit</td>
<td>Set the maximum speed limit for the servo motor.
1.No related to the direction of rotation.
2. If the setting exceeds the rated speed, the actual maximum speed limit is the rated speed.</td>
<td>0-6000r/ min</td>
<td>5000</td>
</tr>
<tr>
<td>24</td>
<td>Internal speed 1</td>
<td>1. Set the internal speed1.
2. Speed control mode (PA22=0), when SP1 OFF, When SP2 OFF, select internal speed 1 as the speed instruction.</td>
<td>-6000-6000 r/min</td>
<td>100</td>
</tr>
<tr>
<td>25</td>
<td>Internal speed2</td>
<td>1. Set internal speed 2.
2. In speed control mode (PA22=0), when SP1 is ON and SP2 is OFF, select internal speed 2 as the speed indicator.</td>
<td>-6000-6000 r/min</td>
<td>500</td>
</tr>
<tr>
<td>26</td>
<td>Internal speed 3</td>
<td>1. Set the internal speed 3.
2. Under speed control (PA22-0), when SP1 OFF, SP2 ON, select the internal speed 3 as the speed command.</td>
<td>-6000-6000 r/min</td>
<td>1000</td>
</tr>
<tr>
<td>27</td>
<td>Internal speed 4</td>
<td>1. Set the internal speed4.
2. Under speed control (PA22-0), when SC1 ON, SC2 ON, select the internal speed 4 as the speed command.</td>
<td>-6000-6000 r/min</td>
<td>2000</td>
</tr>
</table>

<table>
<tr><th>Seq</th><th>name</th><th>Function</th><th>Para.range</th><th>default</th></tr>
<tr><td>28</td><td>Arrival speed</td><td>1. When the motor speed exceeds this parameter, the ASP of the digital output DO (Speed reached) ON, otherwise OFF.
2. The comparator has a hysteresis function, which is set by parameter Pa87.
3. With polarity setting function:
<table><tr><th>PA88</th><th>PA28</th><th>Comparator</th></tr><tr><td>0</td><td>>0</td><td>Speed regardless of direction</td></tr><tr><td rowspan="2">1</td><td>>0</td><td>Only positive speed is detected</td></tr><tr><td><0</td><td>Only the reversal speed is detected</td></tr></table></td><td>0-3000 r/min</td><td>3000</td></tr>
<tr><td>29</td><td>Analog torque command input gain</td><td>1. Set the proportional relationship between the analog torque input voltage and the actual running torque of the motor.
2. The unit of the set value is 0.1v/100%.
3. The default value is 30, corresponding to 3v/100%, that is, inputting 3v voltage produces 100% rated torque.</td><td>10-100 (0.1v/100%)</td><td>30</td></tr>
<tr><td>30</td><td>User torque overload alarm value</td><td>1. Set the user torque overload value, which is a percentage of the rated torque, the torque limit value regardless of direction, both positive and negative directions are protected.
2. In the case of PA31>9, when the motor torque > PA30, the duration > PA31 case, the driver alarm, alarm number is Err-29, the motor stop. After the alarm is generated, the drive must be re-powered up to clear the alarm.</td><td>1-300</td><td>300</td></tr>
<tr><td>31</td><td>User torque overload alarm detection time</td><td>1. User torque overload detection time, in milliseconds.
2. When set to zero, the user torque overload alarm does not work.</td><td>0-32767</td><td>0</td></tr>
</table>

<table>
<tr><th>Seq</th><th>name</th><th>Function</th><th>Para.range</th><th>default</th></tr>
<tr><td>32</td><td>Torque command source</td><td>During torque control, set the source of torque command:
0: Analog torque command, input by analog ports AS+ and AS-.
1: Internal torque command, determined by TRQ1 and TRQ2 input by DI:
<table><tr><th colspan="2">DI Signals (Notes)</th><th rowspan="2">Torque command</th></tr><tr><th>TRQ2</th><th>TRQ1</th></tr><tr><td>0</td><td>0</td><td>Internal torque 1 (parameter PA64)</td></tr><tr><td>0</td><td>1</td><td>Internal torque 2 (parameter PA65)</td></tr><tr><td>1</td><td>0</td><td>Internal torque 3 (parameter PA66)</td></tr><tr><td>1</td><td>1</td><td>Internal torque 4 (parameter PA67)</td></tr></table>2: Analog torque command + internal torque command:
<table><tr><th colspan="2">DI Signals (Notes)</th><th rowspan="2">Torque command</th></tr><tr><th>TRQ2</th><th>TRQ1</th></tr><tr><td>0</td><td>0</td><td>Analog torque command</td></tr><tr><td>0</td><td>1</td><td>Internal torque 2 (parameter PA65)</td></tr><tr><td>1</td><td>0</td><td>Internal torque 3 (parameter PA66)</td></tr><tr><td>1</td><td>1</td><td>Internal torque 4 (parameter Pa67)</td></tr></table>Note: 0 means OFF, 1 means ON.</td><td></td><td></td></tr>
<tr><td>33</td><td>Analog torque command input direction Take the opposite</td><td>Polarity reverse for analog torque input.</td><td>0-1</td><td>0</td></tr>
<tr><td>34</td><td>Internal CCW torque limit</td><td>1. The setting value is a percentage of the rated torque, for example, 200 if it is set to 2 times the rated torque.
2. This restriction is in effect at all times.
3. If the set value exceeds the maximum overload capacity allowed by the system, the actual torque is limited to the maximum overload capacity allowed by the system.</td><td>0-300%</td><td>300</td></tr>
</table>

Seq	name	Function	Para.ran	default
35	Internal CW torque limit	1. The setting value is a percentage of the rated torque, e.g. 2 times the rated torque, then the setting value is -200. 2. This restriction is in effect at all times. 3. If the set value exceeds the maximum overload capacity allowed by the system, the actual torque is limited to the maximum overload capacity allowed by the system.	-300-0%	-300
36	External CCW torque limit	1. The setting value is a percentage of the rated torque, for example, 100 if it is set to 1 times the rated torque. 2. This limit is valid only when CCW torque limit input terminal (CCWL)ON is used. 3. When the limit is in effect, the actual torque limit is the minimum of the maximum overload capacity allowed by the system, the internal CCW torque limit, and the external CCW torque limit.	0-300%	100
37	External CW moment limit	Set the external torque limit in the CW direction of the servo motor. 1. The setting value is a percentage of the rated torque, for example, 1 times the rated torque, the setting value is -100. 2. This limit is valid only when the CW torque limit input terminal (CWL)ON is used. 3. When the limit is in effect, the actual torque limit is the minimum absolute value of the maximum overload capacity allowed by the system, the internal CW torque limit, and the external CW torque limit.	-300-0%	-100
38	Temperature alarm value	Set the drive temperature to the upper alarm value.	200- 1350	
39	Zero-bias compensation for analog torque	Zero-bias compensation for the analog torque input.	-2000-2000	0
40	Acceleration time constant	The setting value is the acceleration time of the motor from 0-1000r/min. 1. The acceleration and deceleration characteristics are linear. 2. Only for speed control and internal position control, other control methods are not valid.	1-10000 ms	100
41	Deceleration time constant	The setting value is to indicate the deceleration time of the motor from 1000-0r/min. 1. The acceleration and deceleration characteristics are linear. 2. Only for speed control and internal position control, other control methods are not valid.	1-10000 ms	100

Seq	name	Function	Para.ran	default
42	S type acceleration &deceleration time constant	To smooth the start and stop of the motor, set the S-type plus-deceleration curve part of the time.	0-1000ms	0
43	Analog speed command input gain	Sets the proportional relationship between the analog speed input voltage and the actual running speed of the motor	10-3000	300
44	The direction of the analog speed command is reversed	Polarity reverses to the analog speed input. 1. When set to 0, the analog speed command is positive and the speed direction is CCW. 2. When set to 1, the analog speed command is positive and the speed direction is CW.	0-1	0
45	Analog speed command zero offset compensation	Zero-bias compensation for analog speed input.	-5000-5000	0
46	Analog speed command filter	1. Low-pass filter for analog speed input. The larger the setting, the faster the response speed to the speed input analog volume, the greater the signal noise impact, the smaller the setting, the slower the response speed, the smaller the signal noise impact.	1-1000 Hz	300
47	Mechanical brake action setting when the motor stops	1. Define the delay time from the mechanical brake action (output BRK from ON to OFF) to the motor current cut-off during motor stop. This parameter should not be less than the delay time (Tb) of the mechanical brake to avoid minor displacements or operating drops of the motor.	0-2000ms	0
48 48	Mechanical brake action setting when	1. Define the delay time from the motor current cut off to the mechanical braking action (output BRK from ON to OFF) during motor stop. 2. This parameter is designed to allow the motor to slow down from the telling rotation to a low speed, and then to make the mechanical brake action to avoid damage to the brake.	0-2000ms	500

	the motor is running	The actual action time is the time required for the PA48 or motor to decelerate to the PA49 value, taking both minimum values.		
49	Operating speed of the mechanical brake when the motor is running	1. Define the speed value from the motor current cut off to the mechanical brake action (output terminal BRK changed from ON to OFF) during motor operation. The actual action time is the time required for the PA48 or motor to decelerate to the PA49 value, taking the minimum of both.	0-3000 r/min	100
50	Speed limit during torque control	1. When torque control is in place, the motor operating speed is limited to this parameter. Speeding on light loads can be prevented.	0-5000 r/min	3000
53	Servo forced enable	Set to 0: The enable signal is controlled by the SON input of DI; 1: Software force enablement	0-1	0
54	Servo enable delay close time	Defines the time when the motor current is delayed when the servo enable signal is switched off.	0-30000 ms	0
55	Input terminal effective level control word	Set the input terminal to reverse. Terminals that do not take reverses are valid when the switch is open and closed, and terminals that are not valid when the switch is open and closed, and terminals that are not valid when the switch is switched off. 2. In the form of a 4-bit binary number, the bit of 0 indicates that the output terminal represents no reversal, and 1 represents the counter-measure of the output terminal.	0000-1111	0000

<table>
<tr><th>Seq</th><th>name</th><th>Function</th><th>Para.ran</th><th>default</th></tr>
<tr><td>55</td><td>Input terminal effective level control word</td><td>The input terminals represented by binary numbers are as follows:
<table><tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>DI8</td><td>DI7</td><td>DI6</td><td>DI5</td><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr></table>0: High level is effective;
1: Low level is effective.</td><td>0000- 1111</td><td>0000</td></tr>
<tr><td>57</td><td>Output terminal effective level control word</td><td>1. Set the output terminal to reverse. The definition of reverse terminals, on and cut-off is the opposite of the standard definition.
2. In the form of a 4-bit binary number, the output terminal represented by 0 is not reversed, and the output terminal represented by 1 is reversed. The input terminals represented by binary numbers are as follows:
<table><tr><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>DO4</td><td>DO3</td><td>DO2</td><td>DO 1</td></tr></table>0: High level is effective;
1: Low level is effective.</td><td>0000- 1111</td><td>0000</td></tr>
<tr><td>58</td><td>IO input terminal debounce time constant</td><td>1. De-jitter filter time for the input terminals.
2. The smaller the value, the faster the terminal input response.
3. The higher the value, the better the anti-jamming performance of the terminal input, but the slower the response.</td><td>1-20ms</td><td>2</td></tr>
<tr><td>59</td><td>Command pulse valid edge</td><td>Set to:
0: Pulse rising edge is effective;
1: The pulse drop edge is valid.</td><td>0-1</td><td>0</td></tr>
<tr><td>60</td><td>Soft reset</td><td>0: Soft reset is not valid;
1: The soft reset is valid and the system will restart.</td><td>0-1</td><td>0</td></tr>
</table>

Seq	name	Function	Para.ran	default
61	System alarm cleared	Set as: 0: System alarm clearing is invalid; 1: The system alarm clearing is effective.	0-1	0
62	Encoder selection	0: incremental encoder; 1: ABZ encoder; 4: Single turn absolute value encoder; 5: Multiturn absolute encoder. Note: Switch from absolute encoder to (ABZ) incremental encoder, set PA61 to 1, and power cycle. And vice versa.	0，1，4，5	4
63	Load inertia ratio	1. Set the load inertia ratio of the corresponding motor rotation inertia. 2. The setting is: ((load inertia plus rotational inertia) / rotational inertia) ×100.	1-500	100
64	Internal torque 1	In torque control mode (PA4=2), when TRQ1 is OFF, when TRQ2 is OFF, select internal torque 1 as torque command.	-300-300	0
65	Internal torque 2	In torque control mode (PA4=2), when TRQ1 is ON, when TRQ2 is OFF, select internal torque 2 as torque command.	-300-300	0
66	Internal torque 3	In torque control mode (PA4=2), when TRQ1 is OFF, when TRQ2 is ON, select internal torque 3 as torque command.	-300-300	0
67	Internal torque 4	In torque control mode (PA4=2), when TRQ1 is ON, when TRQ2 is ON, select internal torque 4 as torque command.	-300-300	0
71	MODBUS slave address	MODBUS communication from the machine address value.	1-254	1
72	MODBUS communication baud rate	MODBUS Communication Baud Rate.	48-1152 ×100	96
73	MODBUS communication protocol selection	Set to: 0：8，N，2（MODBUS, RTU)； 1：8，E，1（MODBUS, RTU)； 2：8，O，1（MODBUS, RTU)； 3：8，N，1（MODBUS, RTU)。		

Seq	name	Function	Para.ran	default
73	MODBUS communication protocol selection	This parameter determines the communication protocol, the number 8 indicates that the transmitted data bit is 8 bits, and the English letters N, E, O represent parity: N: indicates that this bit is not used; E: represents 1 even position; O: Represents 1 odd bit. The number 1 or 2 indicates that the communication bit is 1 or 2 bits.	0-3	0
74	Communication error handling	When the communication signal is wrong, select: 0: Continue to operate; 1: Alarm and stop operation.	0-1	1
75	Zero speed detection point	1. When the motor speed is lower than this parameter, the ZSP (zero speed) of the digital output DO is ON, otherwise it is OFF. 2. When the ZCLAMP of the digital input DI is ON and the speed command value is lower than this value, the speed command value is forced to zero.	0-1000 r/min	10
76	Speed consistent setting value	When the difference between the actual speed and the command speed is less than this setting, the UCO2N (speed consistent) of the digital output DO is ON, otherwise it is OFF	0-1000 r/min	10
77	Position command pulse electronic gear ratio second numerator	See parameter PA12 for details	0-32767	0
78	Position command pulse electronic gear ratio third numerator	See parameter PA12 for details.	0-32767	0

Seq	name	Function	Para.ran	default
79	Position command pulse electronic gear ratio fourth numerator	See parameter PA12 for details	0-32767	0
80	Command direction signal effective level	Set as: 0: High level positive direction; 1: Low level positive direction.	0-1	0
81	Command pulse PULS signal filtering	1. For the pulse input PULSE signal digital filtering, the larger the value, the greater the filter time constant. 2. By default, the maximum pulse input frequency is 500kHz (kpps), and the larger the value, the lower the maximum pulse input frequency. 3. Used to filter out noise on the signal line to avoid counting errors. If there is a phenomenon of not being allowed to go due to the count, the parameter value can be increased appropriately. After the parameters have been modified, they must be saved and powered on again before they are valid.	0-15	4
82	Hardware filtering selection	1. 0: Select hardware filter; 2. 1: Bypass hardware filtering.	0-1	1

<table>
<tr><th>Seq</th><th>name</th><th>Function</th><th>Para.ran</th><th>default</th></tr>
<tr><td>83</td><td>CWL, CCWL direction prohibition method</td><td>1. This parameter is used to select the prohibited method when the machine touches the mechanical limit switch and triggers the CWL, CCWL limit.
Parameter meaning:
0: Limit the torque in this direction to 0; 1: Pulse input in this direction is prohibited.</td><td>0-1</td><td>0</td></tr>
<tr><td>84</td><td>Positioning complete return difference</td><td>1. Position the complete pulse range under position control.
2. When the remaining pulses in the position deviation counter are less than or equal to the set value of this parameter, the digital output DO's COIN (positioning complete) ON, otherwise OFF.
The comparator has a return function, set by parameter Pa85.</td><td>0-32767 pulse</td><td>65</td></tr>
<tr><td>85</td><td>Positioning proximity</td><td>1. Position close to pulse range under position control.
2. When the remaining pulses in the position deviation counter are less than or equal to the set value of this parameter, the DIGITAL output DO's NEAR (nearby positioning) ON, otherwise OFF.
3. The comparator has a return function, set by parameter Pa86.
Used to prepare for the next step by accepting the NEAR signal when the positioning is about to be completed. The general parameter value is greater than the positioning completion range.</td><td>0-32767 pulse</td><td>6500</td></tr>
<tr><td>86</td><td>Positioning approach difference</td><td>See the description of parameter Pa85.</td><td>0-32767 pulse</td><td>65</td></tr>
<tr><td>87</td><td>Arrival speed difference</td><td>1. When the motor speed exceeds this parameter, the ASP (speed arrival) of the digital output DO is ON, otherwise it is OFF.
2. The comparator has a hysteresis function.
3. With polarity setting function:
<table>
<tr><th>PA88</th><th>PA28</th><th>Comparator</th></tr>
<tr><td>0</td><td>>0</td><td>Speed regardless of direction</td></tr>
<tr><td>1</td><td>>0</td><td>Only positive speed is detected</td></tr>
<tr><td></td><td><0</td><td>Only the reversal speed is detected</td></tr>
</table></td><td>0-5000 r/min</td><td>30</td></tr>
</table>

<table>
<tr><th>Seq</th><th>name</th><th>Function</th><th>Para.ran</th><th>default</th></tr>
<tr><td>88</td><td>Reach speed polarity</td><td>Refer to the description of parameter Pa87</td><td>0-1</td><td>0</td></tr>
<tr><td>89</td><td>Reach torque</td><td>1. When the motor torque exceeds this parameter, the ATRQ (torque arrival) of the digital output DO is ON, otherwise it is OFF.
2. The comparator has a hysteresis function, which is set by the parameter Pa90.
3. With polarity setting function:
<table><tr><td>PA88</td><td>PA28</td><td>Comparator</td></tr><tr><td>0</td><td>>0</td><td>Speed regardless of direction</td></tr><tr><td>1</td><td>>0</td><td>Only positive torque is detected</td></tr><tr><td></td><td><0</td><td>Only the reversal speed is detected</td></tr></table></td><td>-300%-300%</td><td>100</td></tr>
<tr><td>90</td><td>Reached torque difference</td><td>1.When the motor torque exceeds this parameter, the ATRQ (torque arrival) of the digital output DO is ON, otherwise it is OFF.
2.The comparator has a hysteresis function, which is set by parameter PA90.
3.With polarity setting function:
<table><tr><td>PA88</td><td>PA28</td><td>Comparator</td></tr><tr><td>0</td><td>>0</td><td>Speed regardless of direction</td></tr><tr><td>1</td><td>>0</td><td>Only positive torque is detected</td></tr><tr><td></td><td><0</td><td>Only the reversal speed is detected</td></tr></table></td><td>0-300%</td><td>5</td></tr>
<tr><td>91</td><td>Reached torque polarity</td><td>1.When the motor torque exceeds this parameter, the ATRQ (torque arrival) of the digital output DO is ON, otherwise it is OFF.
2.The comparator has a hysteresis function, which is set by parameter PA90.
3.With polarity setting function:
<table><tr><td>PA88</td><td>PA28</td><td>Comparator</td></tr><tr><td>0</td><td>>0</td><td>Speed regardless of direction</td></tr><tr><td>1</td><td>>0</td><td>Only positive torque is detected</td></tr><tr><td></td><td><0</td><td>Only reverse torque is detected</td></tr></table></td><td>0-1</td><td>0</td></tr>
</table>

Seq	name	Function	Para.ran	default
92	Zero speed detection hysteresis	1.When the motor speed is lower than this parameter, the digital output DO's ZSP (zero speed) ON, otherwise OFF. 2.The comparator has a return function.	0-1000 r/min	5
94	Delay time of electromagnetic brake opening	1. Set the delay time for the electromagnetic brake to open	0-200× 10ms	0
94	Command direction signal effective level	Set as: 0: High level positive direction; 1: Low level positive direction.	0-1	0
95	Motor encoder resolution	Encoder resolution, default to 2 of the 17 times square - 131072, set the value of 17, please modify carefully, otherwise the wrong setting will lead to flying cars.	10-32	17
96	Number of motor pole pairs	This parameter represents the motor pole pair. Please modify it carefully, otherwise the wrong setting will cause the flying car.	1-360	5
97	Motor zero offset angle	The zero-bit bias angle of the encoder and the motor is determined by the motor.	0-3600	216
99	Maximum duty cycle position ring when braking	Maximum duty ratio setting when braking.	5-90	50
100	Filter selection position loop	Set to: 0: Digital moving average filter; 1: Exponential smoothing filter.	0-1	0

Seq	name	Function	Para.ran	default
101	Feedforward gain	Feed forward reduces the position tracking error when position control is set to 100, and the position tracking error is always 0 under the command pulse at any frequency.	0-100	0
102	Position loop feedforward filter time constant	Position ring feed filtering to increase the stability of the feed-forward control.	20-500	100
103	Z Signal Output Pulse Width	Z Signal Output Pulse Width	1-200	50
104	RS Output Function Selection	To set: 0: It can use RS485 communication function. 1: No RS485 communication function, but it can add a programmable output port which can outputdifferential signal(Z signal as default).	0-1	0
107	ABZ encoder zero offset angle	When PA62=1, when using an ABZ type motor, this parameter determines the zero offset angle of the encoder.	0-3600	1800

7.2 P3 Group Parameters For Multifunctional Terminals

7.2.1 Parameter Table

P series servo drives have 4 input terminals and 4 output terminals. The definition values can be set by P3 group parameters.(Low level is effective as default for input terminals).

Parameter	Name	Range	Factory value
P3-0	Digital input DI1 function	0-99	1
P3-1	Digital input DI2 function	0-99	2
P3-2	Digital input DI3 function	0-99	3
P3-3	Digital input DI4 function	0-99	4
P3-15	Digital input DI forced effective 1	00000000-11111111	00000000
P3-16	Digital input DI forced effective 2	00000000-11111111	00000000
P3-17	Digital input DI forced effective 3	00000000-11111111	00000000
P3-18	Digital input DI forced effective 4	00000000-11111111	00000000
P3-19	Digital input DI forced effective 5	00000000-11111111	00000000
P3-20	Digital output DO1 function	0-99	2
P3-21	Digital output DO1 function	0-99	3
P3-22	Digital output DO1 function	0-99	5
P3-23	Digital output DO1 function	0-99	8
P3-30	Virtual input terminal control	0-2	0
P3-31	Virtual input terminal status value	00000000-11111111	00000000
P3-32	Virtual output terminal control	0-1	0
P3-33	Virtual output terminal status value	0000-1111	0000
P3-23	Virtual IO input DI1 function	0-99	5
P3-38	Virtual IO input DI2 function	0-99	6
P3-39	Virtual IO input DI3 function	0-99	7
P3-40	Virtual IO input DI4 function	0-99	8
P3-41	Virtual IO input DI5 function	0-99	9
P3-42	Virtual IO input DI6 function	0-99	10
P3-43	Virtual IO input DI6 function	0-99	11
P3-44	Virtual IO input DI7 function	0-99	11
P3-45	Virtual IO input DI8 function	0-99	12

NOTE:

1：When P3-30 is 0, the IO input is determined by DI1 to DI4 to enter the number of IOs for 4, corresponding to the parameter p3-0 to P3-3;

2：P3-30 s 1, IO input by the virtual IOP3-31 corresponding bits to determine the number of input IOs for 8, corresponding parameters P3-38 to P3-45;

3：P3-30-2, the IO input is determined by DI1 to DI4 and P3-31, the number of IOs is 12, corresponding to parameters P3-0 to P3-3 and P3-38 to P3-45.

7.2.2 DI Function Explanation

The input terminals (four terminals correspond to P3 group parameters are P3-0, P3-1, P3-2, P3-3) define the values.

Define the value	Symbol	Function	Functional resolution
0	NULL	No function	The input status has no effect on the system.
1	SON	Servo enablement	The servo enables the input terminals. OFF: Servo driver can not be used, the motor does not current; ON: Servo driver enables the motor to switch on current.
2	ARST	Alarm cleared	Alarm clear input terminal: When there is an alarm, if the alarm allows to clear, enter the rising edge (OFF changes ON moments) to clear the alarm. Note: Only some alarms are allowed to clear.
3	CCWL	Forward drive prohibited	1. CCW drive prohibited input terminal: OFF: Prohibit forward rotation (CCW) rotation; ON: Allow forward rotation (CCW) rotation. 2. Used for mechanical limit travel protection, the function is controlled by parameter PA-20. Note that the default value of PA-20 ignores

Define the value	Symbol	Function	Functional resolution
3	CCWL	Forward drive prohibited	this function. If you need to enable this function, you need to modify PA-20: 1. When PA-20 is 0, the function of input prohibition is valid, and whether CCW is prohibited is controlled by PA-83; 2.When PA-20 is 1, the input prohibition function is invalid, and whether CCW prohibition is not controlled by PA-83. 3. When the prohibition function is valid (PA- 20 is 0): 1.When PA-83 is 0, the forward torque is limited to 0, and the forward pulse input is not limited; 2. When PA-83 is 1, the input of forward pulse is prohibited.
4	CWL	Reverse drive prohibition	1. CW drive prohibited input terminal: OFF: Prohibit forward rotation (CW) rotation; ON: Allow forward rotation (CW) rotation. 2. Used for mechanical limit travel protection, the function is controlled by parameter PA-20. Note that the default value of PA-20 is to ignore this function, if you need to enable this function, you need to modify PA-20: A: When PA-20 is 0, the function of input prohibition is valid, and whether CW is prohibited is controlled by PA-83; B: When PA-20 is 1 , the function of input prohibition is invalid, and whether CW is prohibited is not controlled by PA-83. 3.When the prohibition function is valid (PA- 20 is 0): A: When PA-83 is 0, the reverse torque is limited to 0, and the reverse pulse input is not limited; B:when PA-83 is 1, the input of reverse pulse is prohibited.
5	TCCW	Forward torque limit	OFF: CCW direction torque is not limited by PA-36 parameter; ON: The torque in the CCW direction is limited by the PA-36 parameter. Note: Regardless of whether TCCW is valid or invalid, the torque in the CCW direction is still limited by parameter PA-34.

Define the value	Symbol	Function	Functional resolution
6	TCW	Reverse torque limit	OFF: CW direction torque is not limited by PA- 37 parameter; ON: CW direction torque is limited by PA-37 parameter. Note: No matter whether TCW is valid or invalid, the torque in CW direction is still limited by parameter PA-35.
7	ZCLAMP	Zero speed clamp	When the following conditions are met, the zero-speed clamp function is turned on (the speed is forced to zero): Condition 1: Speed control mode (PA4=1), when external speed is selected (PA22=0); Condition 2: ZCLAMP ON; Condition 3: The speed command is lower than the parameter PA-75. When any of the above conditions are not met, normal speed control is executed.
8	CZERO	Zero instruction	Under speed or torque control, the speed or torque commands are respectively: OFF: normal command; ON: Zero command.
9	CINV	Inverted instruction	Under speed or torque control, the speed or torque commands are respectively: OFF: normal command; ON: The command is reversed.
10	SP1	Speed selection 1	Under speed control (PA4-1), when selecting the internal speed (PA22=1), SP1 and SP2 are combined to select different internal speeds: SP2-OFF SP1-OF: Internal Speed 1 (parameter PA-24) SP2-OFF SP1-ON: Internal Speed 2 (parameter PA-25) SP2-ON SP1-OFF: Internal Speed 3 (parameter PA-26) SP2-ON SP1-ON: Internal Speed 4 (parameter PA-27)
11	SP2	Speed selection 2	

Define the value	Symbol	Function	Functional resolution
13	TRQ1	Torque selection 1	Under torque control mode (PA4-2), when selecting the internal torque (PA32-1), the TRQ1, TRQ2 combination selects different internal torques: TRQ2-OFF TRQ1-OFF: Internal Torque 1 (parameter PA-64) TRQ2-OFF TRQ1-ON: Internal Torque 2 (parameter PA-65) TRQ2-ON TRQ1-OFF: Internal Torque 3 (parameter PA-66) TRQ2-ON TRQ1-ON: Internal Torque 4 (parameter PA-67)
14	TRQ2	Torque selection 2	
16	CMODE	Multi-mode control mode setting	When the PA-4 is set to 3,4,5, it is in mixed control mode, which allows you to switch control modes through this input terminal: (1) When PA-4 is 3, CMODE OFF is position mode, and CMODE ON is speed mode; (2) When PA-4 is 4, CMODE OFF is position mode and CMODE ON is torque mode; (3) When the PA-4 is 5, CMODE OFF is speed mode and CMODE ON is torque mode.
18	GEAR1	Electronic gear selection 1	When PA-11 is 0, the combination of GEAR1 and GEAR2 is used to select the numerator of different electronic gear ratios: GEAR2=OFF GEAR1=OFF: numerator 1 (parameter PA-12) GEAR2=OFF GEAR1=ON: numerator 2 (parameter PA-77) GEAR2=ON GEAR1= OFF: numerator 3 (parameter PA-78) GEAR2=ON GEAR1=ON: numerator 4 (parameter PA-79)
19	GEAR2	Electronic gear selection 2	
20	CLR	Position deviation clear	In position control mode, the position deviation counter zeros the input terminals.
21	INH	Pulse input prohibited	In position control mode, the position command pulse prohibits terminals: OFF: the command pulse input is valid; ON: The command pulse input is prohibited.

<table>
<tr><th>Define the value</th><th>Symbol</th><th>Function</th><th>Functional resolution</th></tr>
<tr><td>22</td><td>JOGP</td><td>Positiveinching</td><td>In speed mode, when PA22 is 5, the signal is switched on, the motor is moving in the positive direction, and the speed is set by Pa21.
Note: This signal is switched on at the same time as the reverse inch motion, and the inch action function is not valid.</td></tr>
<tr><td>23</td><td>JOGN</td><td>Reverse Inching</td><td>In speed mode, and PA22 is 5, this signal is switched on, the motor is moving in the opposite direction, and the speed is set by Pa21.
Note: This signal is switched on at the same time as the forward inch movement, and the inch movement function is not valid.</td></tr>
<tr><td>27</td><td>HOLD</td><td>Internal position control command stop</td><td>When the internal position register mode is on, the signal is switched on and the motor will stop running (only in the internal position mode PA-14-3).</td></tr>
<tr><td>28</td><td>CTRG</td><td>Internal position command trigger</td><td>In the internal position register mode, when the internal position register control command (POS0-2) is selected, the signal is triggered and the motor operates according
to the internal position register command. The next trigger internal position command is accepted when the digital output of a zero speed signal (ZSPD=1).</td></tr>
<tr><td>29</td><td>POS0</td><td>Internal position command selection 0</td><td rowspan="3">Corresponding relationship of internal location selection:
<table><tr><th>location command</th><th>POS2</th><th>POS1</th><th>POS0</th><th>CTRG</th><th>corresponding parameter</th></tr><tr><td>P1</td><td>0</td><td>0</td><td>0</td><td>↑</td><td>P4-2
P4-3</td></tr><tr><td>P2</td><td>0</td><td>0</td><td>1</td><td>↑</td><td>P4-5
P4-6</td></tr><tr><td>P3</td><td>0</td><td>1</td><td>0</td><td>↑</td><td>P4-8
P4-9</td></tr><tr><td>P4</td><td>0</td><td>1</td><td>1</td><td>↑</td><td>P4-11
P4-12</td></tr><tr><td>P5</td><td>1</td><td>0</td><td>0</td><td>↑</td><td>P4-14
P4-15</td></tr><tr><td>P6</td><td>1</td><td>0</td><td>1</td><td>↑</td><td>P4-17
P4-18</td></tr><tr><td>P7</td><td>1</td><td>1</td><td>0</td><td>↑</td><td>P4-20
P4-21</td></tr><tr><td>P8</td><td>1</td><td>1</td><td>1</td><td>↑</td><td>P4-23
P4-24</td></tr></table></td></tr>
<tr><td>30</td><td>POS1</td><td>Internal position command selection 1</td></tr>
<tr><td>31</td><td>POS2</td><td>Internal position command selection 2</td></tr>
<tr><td>33</td><td>SHOM</td><td>Start home return</td><td>In internal position register mode, the origin needs to be searched and the search origin function is activated when this signal is switched on (refer to the settings of P4-34).</td></tr>
<tr><td>34</td><td>ORGP</td><td>Return to the origin</td><td>In internal position register mode, when searching for the origin, the servo takes the location of this point as the origin when the signal is switched on (refer to the setting of parameter P4-32).</td></tr>
</table>

7.2.3DO Function Explanation

Definition values of output terminals (4 terminals corresponding to P3 group parameters are P3-20, P3-21, P3-22, P3-23):

Define the value	Symbol	Function	Functional resolution
1	ON	Always effective	Force output ON.
2	RDY	Servo ready	OFF: Servo main power supply is not closed or has an alarm; ON: Servo main power supply is OK, no alarm.
3	ALM	Call the police	OFF: Alarms; ON: No alarm.
4	ZSP	Zero speed	Speed and torque control, OFF: Motor speed is higher than parameter PA-75 (regardless of direction); ON: The motor speed is lower than the parameter PA-75 (regardless of direction).
5	COIN	Positioning completed	When position control is in place, OFF: The position deviation is greater than the parameter PA-16; ON: The position deviation is less than the parameter PA-16.
6	ASP	Speed reached	Speed and torque control, OFF: Motor speed is lower than parameter PA- 28; ON: The motor speed is higher than the parameter PA-28. With polarity setting function, refer to the description of parameter PA-28.
7	ATRQ	Torque reached	OFF: The motor torque is lower than the parameter PA-89; ON: The motor torque is higher than the parameter PA-89. With polarity settings, refer to the description of parameter PA-89.
8	BRK	Electromagnetic brake	OFF: electromagnetic brake; ON: Electromagnetic brake release.

Define the value	Symbol	Function	Functional resolution
9	RUN	Servo running	OFF: Servo motor is not powered on; ON: The servo motor is powered on.
10	NEAR	Positioning close	When position control is in place, OFF: The position deviation is greater than the parameter PA-85; ON: Position deviation small residual parameter PA-85.
11	TRQL	Torque limit	OFF: the motor torque does not reach the limit value; ON: The motor torque reaches the limit. The torque limit method is passed by parameters PA-34, PA-35, PA-36, PA-37.
12	SPL	Speed limit	When torque is controlled, OFF: the motor speed does not reach the limit value; ON: Motor speed reaches the limit. The speed limit method is set by parameter PA-50.
13	VCOIN	Consistent speed	OFF: The absolute value of the difference between the actual speed and the command speed is greater than Pa76; ON: The absolute difference between the actual speed and the command speed is less than Pa76.
15	HOME	Return to origin completed	OFF: No signal is output when origin regression is not completed; ON: Signal output when origin regression is complete.
16	CMDOK	Internal position command completed	OFF: Do not output a signal when the internal position command is not completed or the internal location command is not stopped; ON: When the internal position command is complete or the internal position command is stopped, the signal is output after P4-1 set time.
18	ZOUT	Z signal output	OFF: When the Z signal is invalid, no signal is output; ON : When the Z signal is valid, the signal is output.

DI 7.2.4 DI Forced Valid

(1) There are five parameters in the P3 group (P3-15, P3-16, P3-17, P3-18, P3-19) that can be set to be digital input DI forced valid. There are five parameters in the P3 group (P3-15, P3-16, P3-17, P3-18, P3-19) that can be set to be digital input DI forced valid.

Digit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Func	CZERO	ZCLAMP	TCW	TCCW	CWL	CCWL	ARST	SON

(2) The corresponding function of P3-16 is represented by 8-bit binary::

Digit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Func	CMODE	NULL	TRQ2	TRQ1	NULL	SP2	SP1	CINV

(3) The corresponding function of P3-17 is represented by 8-bit binary:

Digit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Func	NULL	JOGN	JOGP	INH	CLR	GEAR2	GEAR1	NULL

(4) The corresponding function of P3-18 is represented by 8-bit binary::

Digit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Func	NULL	POS2	POS1	POS0	CTRG	HOLD	NULL	NULL

(5) The corresponding function of P3-19 is represented by 8-bit binary:

Digit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Func	NULL	NULL	NULL	NULL	NULL	NULL	ORGP	SHOM

Parameter meaning::

Any one of the 5 parameters	Corresponding function	Function Results
0	Not planned	OFF（invalid）
	Planned	Up to Signal
1	Not planned or Planned	ON（Enforcement works）

◆ Planned means that the parameter has been selected by the input terminal in P3-0~P3-3, and the opposite is true if it is not planned.

7.3 P4 Group Parameters For Internal Position Command

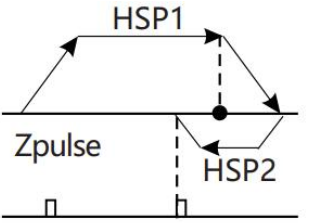
Serial number	Name	Function	Parameter range	Factory value
P4-0	Internal position command control mode	0: Absolute position command; 1: Incremental position command.	0-1	0
P4-1	Internal position command completion digital output delay	1. When the internal position command is completed or the internal position command is stopped, after the delay time set in P4-1, the internal position command complete (CMDOK) DO signal is output. 2. When the P4-1 delay time is set to 0, when the DO signal zero speed detection (ZSPD) is set to 1, the internal position command of the trigger signal is accepted again. 3. When the P4-1 delay time is not set to 0, it is set to 1 when the internal position command of the DO signal is completed (CMDOK), and then the internal position command triggered by the DI signal command trigger (CTRG) is accepted.	0-200ms	0
P4-2	Setting of position circle number of internal position command 1	Sets the number of positional laps for the internal position of paragraph 1.	-30000-30000	0
P4-3	Setting of the number of pulses in the position circle of the internal position command 1	1. Set the number of position pulses for the internal position of the first segment. 2. The internal position command 1 = the set value of the number of turns of the internal position of the first stage + the set value of the number of pulses of the internal position of the first stage. (Max is the set number of pulses per revolution of the motor, please refer to the setting of PA-11, PA-12, and PA-13).	+/-max.cnt/rev	0
P4-4	Movement speed setting of internal position command control 1	Set the internal position command to control the speed of movement of 1.	0-5000 r/min	1000
P4-5	Setting of position circle number of internal position command 2	Sets the number of positional laps in the internal position of paragraph 2.	-30000-30000	0
P4-6	Setting of the number of pulses in the position circle of the internal position command 2	1.Set the number of position pulses for the internal position of the second segment. The internal position command 2=the set value of the number of turns of the internal position of the second stage + the set value of the number of pulses of the internal position of the second stage.	+/-max.cnt/rev	0

Serial number	Name	Function	Parameter range	Factory value
P4-7	Movement speed setting of internal position command control 2	Set the internal position command to control the speed of movement of 2.	0-5000 r/min	1000
P4-8	Setting of position circle number of internal position command 3	Set the number of positional laps for the internal position of paragraph 3.	-30000-30000	0
P4-9	Setting of the number of pulses in the position circle of the internal position command 3	1. Set the number of position pulses for the internal position of the third segment.	+/- max.cnt/rev	0
P4-9	Setting of the number of pulses in the position circle of the internal position command 3	2. The internal position command 3 = the set value of the number of turns of the internal position of the third stage + the set value of the number of pulses of the internal position of the third stage.	+/- max.cnt/rev	0
P4-10	Movement speed setting of internal position command control 3	Set the internal position command to control the movement speed of 3.	0-5000 r/min	1000
P4-11	Setting of position circle number of internal position command 4	Sets the number of position laps in the internal position of paragraph 4.	-30000-30000	0
P4-12	Setting of the number of pulses in the position circle of the internal position command 4	1.Sets the number of position pulses at the internal position of segment 4. Internal position instruction 4 - The internal positional number of revolutions in paragraph 4 is set and the internal position pulse setting in paragraph 4 is set.	+/- max.cnt/rev	0
P4-13	Movement speed setting of internal position command control 4	Set the movement speed of the internal position command control 4.	0-5000 r/min	1000
P4-14	Setting of position circle number of internal position command 5	Set the number of positional laps for the internal position of paragraph 5.	-30000-30000	0
P4-15	Setting of the number of pulses in the position circle of the internal position command 5	1.Sets the number of position pulses at the internal position of segment 5. Internal position instruction 5 - The internal positional number of revolutions in the 5th paragraph is set.	+/- max.cnt/rev	0

P4-16	Internal position command control 5 movement speed setting	Set the internal position command to control the speed of movement of 5.	0-5000 r/min	1000
Serial number	**Name**	**Function**	**Parameter range**	**Factory value**
P4-17	Setting of position circle number of internal position command 6	Sets the number of positional laps for the internal position of paragraph 6.	-30000-30000	0
P4-18	Setting the number of pulses in the position circle of internal position command 6	1.Sets the number of position pulses at the internal position of segment 6. 2.Internal position instruction 6 - The internal positional number set value of paragraph 6 and the internal position pulse setting value of paragraph 6.	+/- max.cnt/ rev	0
P4-19	Internal position command control 6 movement speed setting	Set the internal position command to control the movement speed of 6.	0-5000 r/min	1000
P4-20	Setting of position circle number of internal position command 7	Sets the number of position laps for the internal position of paragraph 7.	-30000-30000	0
P4-21	The number of pulses in the position circle of the internal position command 7 is set	1.Sets the number of position pulses at the internal position of segment 7. 2.Internal position instruction 7 - The internal position number set value of paragraph 7 and the internal position pulse setting value of paragraph 7.	+/- max.cnt/ rev	0
P4-22	Internal position command control 7 movement speed setting	Set the internal position command to control the speed of movement of 7.	0-5000 r/min	1000
P4-23	Setting of position circle number of internal position command 8	Sets the number of positional laps for the internal position of paragraph 8.	-30000-30000	0
P4-24	Setting of pulse number in position circle of internal position command 8	1.Sets the number of position pulses at the internal position of paragraph 8. 2.Internal Position Directive 8 - The internal positional number of revolutions in paragraph 8 is set , and the internal position pulse setting in paragraph 8 is set.	+/- max.cnt/ rev	0

P4-25	Internal position command control 8 moving speed setting	3.Set the internal position command to control the speed of movement of 8.	0-5000 r/min	1000

Serial number	Name	Function	Parameter range	Factory value
P4-32	Origin detector type and search direction setting	0: forward direction origin regression, CCWL as regression origin; 1: Reverse direction origin regression, CWL as regression origin; 2: Forward direction origin regression, ORGP as regression origin; 3: Reverse direction origin regression, ORGP as regression origin; 4: turn directly to find the absolute position of the single circle zero point for the regression origin; 5: Reverse directly looking for the absolute position zero of the lap is the regression origin.	0-5	0
P4-33	Short-distance movement method setting to reach the origin	0: After finding the reference origin, return to find the single-turn absolute position zero point as the mechanical origin; 1: Do not return after finding the reference origin, look forward to the absolute position zero point of a single circle as the mechanical origin; 2: After finding the reference origin (ORGP rising edge or single-turn absolute position zero point) as the mechanical origin, decelerate to a stop.	0-2	0
P4-34	Origin trigger start mode	0: Turn off origin regression; 1: When the power is on, the origin regression function is automatically performed; 2: Trigger origin regression by the origin search function (SHOM) input contact.	0-2	0
P4-35	Origin stop mode setting	0: After the origin detection is completed, the motor slows down and pulls back to the origin; 1: After the origin detection is complete, the motor slows down in the forward direction and stops.	0-1	0

Serial number	Name	Function	Parameter range	Factory value
P4-36	The first stage of high-speed home return speed setting (HSPD1)	Set the first high-speed origin regression speed. 	1-2000 r/min	1000
P4-37	The second stage of low-speed home return speed setting (HSPD2)	Set the second low-speed origin regression speed.	1-500 r/min	50
P4-38	Home return offset circle number (HOF1)	Sets the number of origin regression offset circles.	-30000-30000	0
P4-39	Origin return offset pulse number (HOF2)	1.Sets the number of origin regression offset pulses. 2.When the parameter function HOF1, HOF2 is set to zero, the origin is defined as the absolute position zero or ORGP of the single circle according to the origin regression mode. If the set value is not zero, the origin will be based on the above-mentioned single circle absolute position zero or ORGP plus a pulse offset HOF1 x 10000 plus HOF2 as the new origin.	+/- max.cnt/ rev	0

Chapter 8 Error Code

Fault symbol	Fault name	Fault content
–	normal	
1	Over Speeding	Servo motor speed exceeds the set value
2	Main circuit overvoltage	The main circuit power supply voltage is too high
3	Main circuit undervoltage	The main circuit power supply voltage is too low
4	Location is out of tolerance	The value of the position deviation counter exceeds the set value
5	Drive overheating	Drive temperature is too high
6	Speed amplifier saturation failure	Speed regulation is saturated for a long time
7	Drive prohibited exception	CCW/CW drive prohibition inputs are all OFF
8	Position deviation counter overflow	The absolute value of the position deviation count exceeds 230
11	IPM module failure	IPM smart module failure
13	Drive overload	Servo drive and motor overload (instantaneous overheating)
14	Brake failure	Brake circuit failure
18	Relay switch failure	The actual state of the relay is inconsistent with the control state
19	Brake delay error	Pulse input when the brake is not open
20	EEPROM error	EEPROM error
21	FPGA module failure	Abnormal function of FPGA module
22	The parameter store does not match the encoder parameter store	The value of the PA62 parameter has been modified, and the encoder types supported by default have changed
23	Current acquisition circuit failure	Current acquisition circuit failure
29	User torque overload alarm	The motor load exceeds the value and duration set by the user
31	Encoder UVW signal is wrong	The encoder UVW signal is wrong or the encoder does not match
32	The encoder UVW signal is illegally encoded	The UVW signal has a full high level, full low level or encoder is not matched
33	UVW signal error	There are no high-impedance states or encoder mismatches in the power-up sequence
34	UVW signal is unstable and jumps	Poor UVW signal
36	When connecting an ABZ encoder, the illegal state is too long	When connecting an ABZ encoder, the encoder is in an illegal state that is too long

Fault symbol	Fault name	Fault content
39	Data CRC validation error	The motor encoder has not written data yet, both are 0
40	Models are not supported	This motor model is not supported by the drive
41	Motor model needs to be switched	The current motor is different from the model selected for the drive.
42	AC input voltage is too low	AC input voltage is too low
47	The main circuit voltage is too high when powering on	The main circuit voltage is too high when powering on
50	Encoder communication failure	The drive and the encoder have not established a communication connection
51	Encoder communication abnormal	After the encoder communication is established, the communication is interrupted and the connection is disconnected
52	Encoder battery voltage is low alarm	Encoder battery voltage is low and alarm, the information is not lost but needs to be replaced as soon as possible
53	Encoder battery voltage error alarm	Encoder battery voltage error alarm, the stored information has been wrong, the encoder needs to be reset
54	Encoder error alarm	Encoder is not battery alarm, but the encoder needs to be reset
55	CRC check error 3 times in a row	The CRC of the data received by the encoder communication has errors for 3 consecutive times
56	MODBUS frame too long error	The received MODBUS frame data is too long
57	MODBUS communication format is abnormal	Improper communication parameter setting or incorrect address or value
58	Wrong lap position value	The single-turn position offset value stored by the drive exceeds the encoder resolution
59	Encoder reports CF error	The encoder continuously reports errors in the CF domain, and the encoder needs to be reset

Chapter 9 Alarm handling method

alarm code	Name	Run State	Cause	Way to deal
1	Over speed	Appear when Power on	1. Control board failure. 2. Encoder failure.	1. Change the servo drive. 2. Change the servo motor.
		During Motor running	The input command pulse frequency is too high.	Set the input command pulse correctly.
			The acceleration/deceleration time constant is too small, making the speed overshoot too large.	Increase the acceleration/deceleration time constant.
			The input electronic gear ratio is too large.	Set it up correctly.
			Encoder failure.	Change the servo motor.
			Bad encoder cable.	Change the encoder cable.
			The servo system is unstable, causing overshoot.	1. Reset the gain value. 2. If the gain cannot be set to a suitable value, reduce the kinetic inertia ratio.
		When Motor start	Excessive load.	1. Reduce the amount of load. 2. Replace with a higher power drive and motor.
			1. Encoder zero point error. 2. The motor UVW leads are connected incorrectly. 3. The encoder cable leads are disconnected.	1. Change the servo motor. 2. Ask the manufacturer to readjust the encoder zero. 3. Correct wiring.

alarm code	Name	Run State	Cause	Way to deal
2	Main circuit Overvoltage	Appears when the control power is turned on	Circuit board malfunction.	Replace the servo driver.
		Appears when the main power is turned on	1. The power supply voltage is too high. 2. The power supply voltage waveform is abnormal.	Check the power supply.
		During motor operation	The brake resistor wiring is disconnected.	Reconnection
			1. The brake transistor is damaged. 2. The internal braking resistor is damaged.	Replace the servo driver.
			Insufficient capacity of the braking circuit.	1. Reduce the start stop frequency. 2. Increase the acceleration and deceleration time constant. 3. Reduce the torque limit value. 4. Reduce load inertia. 5. Replace with a higher power driver and motor.
3	Main circuit undervoltage	Appears when the main power is turned on	1. Circuit board malfunction. 2. The power fuse is damaged. 3. Soft start circuit malfunction. 4. The rectifier is damaged.	Replace the servo driver.
			1. The power supply voltage is low. 2. Temporary power outage for more than 20ms.	Check the power supply.
		During motor operation	1. Insufficient power capacity. 2. Instantaneous power failure.	Check the power supply.
			The radiator is overheating.	Check the load condition.

alarm code	Name	Run State	Cause	Way to deal
4	Position deviation	Appears when the control power is turned on	Circuit board failure。	Replace the servo driver.
		Connect the main power supply and control line & input pulse commands, but the motor does not rotate or reverse	1. Encoder zero point change. 2. Encoder malfunction.	1. Readjust the encoder zero point. 2. Replace the servo motor.
		During motor operation	The detection range for setting	Increase the detection range of position deviation.
			The position proportional gain is too small.	Increase the gain value.
			Insufficient torque.	1. Check the torque limit value. 2. Reduce load capacity. 3. Replace with a higher power driver and motor.
			The command pulse frequency is too high.	Reduce frequency.
			Encoder zero point change.	Readjust the zero point of the encoder.
5	Drive overheating	During the operation of the drive	1. Circuit board malfunction. 2. The driver temperature is too high.	1. Reduce the temperature of the drive. 2. Replace the servo driver.
6	Speed amplification saturation fault	During motor operation	1. Excessive load. 2. The motor is mechanically stuck.	1. Reduce load. 2. Replace with a higher power driver and motor. 3. Check the mechanical part of the load.
7	Drive inhibit abnormal		The CCW/CW drive inhibit input terminals are all disconnected.	Check the wiring.
8	Position deviation counter overflow		1. The motor is mechanically stuck. 2. Abnormal input command pulse.	1. Check the mechanical part of the load. 2. Check the command pulse. 3. Check whether the motor rotates in accordance with the command pulse.

alarm code	Name	Run State	Cause	Way to deal
11	IPM Module failure	Appear when the control power turns on	Circuit board failure。	Replace the servo driver.
		During motor operation	1. The power supply voltage is low. 2. Overheating.	1. Check the drive. 2. Power on again. 3. Replace the drive。
			Short circuit in driver UVW	Check grounding line
			Poor grounding.	Grounding correctly
			The motor insulation is damaged.	Change motor
			Been interference	1. Add line filters. 2. Stay away from interference sources.
13	Overload	Appears when the control power is turned on	Circuit board failure。	Replace the servo driver.
		During motor operation	Operating exceed rated torque.	1. Check the load. 2. Reduce the start stop frequency. 3. Reduce the torque limit value. 4. Replace the high-power driver and motor.
			Keep the brake not open.	Check and hold the brake.
			The motor oscillates, unstable.	1. Adjust the gain. 2. Increase acceleration/deceleration time. 3. Reduce load inertia.
			1. One phase of UVW is disconnected. 2. Encoder connection error.	Check wire connection
14	Braking fault		Brake circuit malfunction.	Replace drive

Alarm code	Name	Run State	Cause	Way to deal
18	Relay switch failure		Relay damaged	Return to factory for repair。
19	Holding brake delay not opened		The PA94 parameter value is set too high, the control pulse has arrived, and the brake has not yet been opened.	Reduce PA94 value。
20	EEPROM error		Chip or circuit board broken。	1. Replace the servo driver. 2. After repair, you must reset the drive model (refer to PA10), and then restore the Default argument.
21	FPGA Module		FPGA Module function abnormal	Replace the driver
22	The parameter store does not match the encoder parameter store	Modified PA62 parameter value, encoder type changed	Switching encoder types requires resetting the system.	Set PA61 to 1 and power on again
23	Current collection circuit fault		Current collection circuit fault.	Replace the driver
29	User torque overload alarm		1. The parameters of PA30 and PA31 are unreasonable.	1. Modify parameters. 2. Repair the machinery.
30	The encoder Z-pulse is lost		1. The Z pulse is not present and the encoder is broken. 2. Poor cable or shielding. 3. The shielded ground wire is not well connected. 4. Encoder interface circuit failure.	1. Change the encoder. 2. Check the encoder interface circuit
31	The encoder UVW signal is wrong		1. The encoder UVW signal is damaged. 2. The encoder Z signal is damaged. 3. Poor cable or shielding. 4. The shielding ground wire is not well connected. 5. Encoder interface circuit failure.	1. Change the encoder. 2. Check the encoder interface circuit

32	The encoder UVW signal is illegally encoded		1. The encoder UVW signal is damaged. 2. Poor cable. 3. Poor cable shielding. 4. The shielding ground wire is not properly connected. 5. Encoder interface circuit failure.	1. Change the encoder. 2. Check the encoder interface circuit
33	ABZ Encoder Alarm		The parameter settings do not match.	Set the PA62 parameters correctly
34	UVW signal is unstable and jumps		Poor UVW signal	Check the wire connection
39	Data CRC verification ERROR		The motor encoder has not yet written data, all are 0.	Write the motor parameters of the corresponding model into the encoder.
40	Model not supported		The drive does not support this motor model.	Use a matching motor.
41	Need to switch motor model		The current motor does not match the selected model of the drive.	Manually switch the model to the current model.
42	AC input voltage too low	When power off During Run	1. Normal. 2. The external AC voltage input is too low.	Check AC220V input
47	The main circuit voltage is too high when powered on		1. The external AC voltage input is too high. 2. Main circuit failure.	1. Check the AC220V input. 2. Replace the drive.
50	Encoder communication failure		The drive and encoder have not established a communication connection.	Connect the encoder cable and power it on again
51	Encoder communication error		After establishing communication with the encoder, there was an interruption and the connection was disconnected.	Connect the encoder cable and power it on again
52	Encoder battery low voltage alarm		Encoder battery voltage insufficient alarm, Information is not lost but needs to be replaced as soon as possible	Replace the encoder battery
53	Encoder battery voltage error alarm		Encoder battery voltage error alarm, An error has occurred with the stored information and the encoder needs to be reset.	The encoder battery is dead and must be replaced
54	Encoder error alarm		The encoder is not a battery type alarm, but the encoder needs to be reset again	Resets the encoder.

55	The CRC check has been faulted 3 times in a row		The data received by MODBUS Communication CRC validation has been wrong 3 times in a row.	Replace the drive.
56	MODBUS frame too long error		1. The communication protocol does not match. 2. Disturbed	1. Confirm the frame length. 2. Add line filters to stay away from interference.
57	The MODBUS communication format is abnormal		1. Improper setting of communication parameters. 2. The mailing address or value is incorrect.	Replace the drive.
58	The lap position value is wrong		The drive stores a single turn position offset value that exceeds the encoder resolution.	Power on again.
59	The encoder reports a CF error		The encoder continuously reports CF domain errors, The encoder needs to be reset.	Resets the encoder

Alarm code	Name	Run State	Cause	Way to deal
52	Encoder battery low voltage alarm		Encoder battery low voltage alarm, message not lost but needs to be replaced as soon as possible.	Replace the encoder battery.
53	Encoder battery voltage error alarm		Encoder battery voltage error alarm, stored information has been incorrect, encoder needs to be reset.	The encoder battery has been depleted and must be replaced.
54	Encoder error alarm		Encoder non battery alarm, but encoder needs to be reset.	Reset the encoder again.
55	CRC verification error 3 consecutive times		Data received through MODBUS communication	Replace the driver
56	MODBUS Frame too long error		1. Communication protocol mismatch. 2. Affected by interference.	1. Confirm the frame length. 2. Add line filters to stay away from interference.
57	MODBUS Abnormal communication format		1. Improper setting of communication parameters. 2. The communication address or value is incorrect.	Replace the driver
58	Single lap position value error		The single turn position offset value stored by the driver exceeds the encoder resolution.	Power on and start again
59	Encoder reported CF error		The encoder continuously reports CF domain errors and needs to be reset.	Reset the encoder again.

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公司电话：00886-222029000 0573-84882226 18968074627

技术支持：0573-84882226 13817827870

公司传真：00886-222039000