杰美康机电
JUST MOTION CONTROL

JAWD
Series AC Servo Driver user manual

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Preface

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Catalog

Chapter 1 Safety Precautions

In order to prevent harm to personal and property safety, please be sure to observe the following precautions, and the following marks are specially marked for distinction:

 Danger	Indicates a high risk of death or serious injury
 Notice	Indicates that there is a high possibility of minor injury or property damage
	Indicates prohibited items

1.1 Precautions for receiving and installing

 Danger：1、Please use it with the driver and motor according to the specified method, otherwise it will cause equipment damage or fire.

2、It is forbidden to use it in places with severe water vapor, flammable gas, corrosive gas, etc., otherwise it will cause electric shock, fire, equipment damage, etc.

1.2 Wiring Precautions

 Danger：1、Do not connect the driver power supply to the U, V, W motor output terminals, otherwise the driver will be damaged, which may cause personal injury or fire.

2、Please confirm that the connecting wires of the power supply and motor output terminals are locked tightly, otherwise sparks may be caused and fire may result.

3、Please choose the power cord and motor power extension cord correctly to avoid fire caused by insufficient current capacity of the wire.

4、Please confirm that the driver shell and the motor are grounded. Poor grounding may cause electric shock.


Notice ： 1. Please do not bind the motor power line and signal line together or pass through the same pipeline to prevent interference to the signal.

2. Please use multi-strand twisted and shielded wires for signal wires and encoder feedback extension wires to enhance anti-interference ability.

3. After the driver is powered off, there is still high voltage inside, please do not touch the power terminal within 5 minutes, and confirm that the discharge indicator light is off before operating.

4. Before powering on, please confirm whether the wiring is connected correctly.

1.3 Precautions for operation and operation


Danger ： 1. Before installing the equipment, please run it without load to avoid accidents.

2. Do not allow untrained personnel to operate to prevent equipment damage and personnel injury caused by misoperation.

3. During normal operation, please do not touch the radiator and its interior of the driver with your hands to prevent high temperature burns or electric shock.


Notice：1. Please adjust the driver parameters first, and then test for a long time to prevent bad use of the driver and equipment.

2. Please confirm that the switches such as equipment startup, emergency stop, and shutdown are valid before operating the equipment.

3. Please do not switch the power on and off frequently.

1.4 Precautions for maintenance and inspection


： 1. During operation, it is forbidden to touch the inside of the driver and motor to prevent electric shock.

2. Within 5 minutes after the power is turned off, do not touch the power supply and power terminals to prevent electric shock.

3.Do not change the connecting wire while the power is on, in case of electric shock or personal injury

4. It must be operated and maintained by trained professionals.

5. Do not disassemble and repair except for our company personnel.

Chapter 2 Product Introduction

2.1 Servo Driver

2.1.1 overview

JAWD series general-purpose servo driver is a high-performance AC servo unit developed by JMC. This series of servo driver adopts advanced MCU chip for motor control, large-scale programmable gate array (FPGA) and IPM power module. It has small size, high integration, stable performance and reliable protection. It has abundant digital and analog I/O interfaces, can be used with various host computer devices, and supports MODBUS communication protocol to facilitate networking. Through the optimized PID control algorithm, the full digital control of position, speed and torque accuracy is realized, which has the advantages of high precision and fast response. Supports 17-bit and 23-bit high-precision absolute encoder motors to meet different requirements for customer performance. Widely used in automation fields such as CNC machine tools, printing and packaging machinery, textile machinery, robots, and automated production lines.

2.1.2 Main feature

1. Using MCU+FPGA dual-chip platform and optimized current loop design, the driver has the characteristics of high dynamic response, extremely short settling time, stable operation, and small vibration when stopped.
2. Equipped with an automatic gain adjustment module, users can choose the rigidity level according to their needs.
3. Built-in FIR filter and multiple sets of notch filters can automatically identify and suppress mechanical vibration.
4. The built-in disturbance torque observer makes the drive have a strong ability to resist external disturbances.
5. There are multiple control modes for selection, position control, speed control, torque control, and various control modes can be switched.
6. The position pulse input frequency is up to 1MHz, and supports multiple position command methods such as pulse + direction, orthogonal pulse, and double pulse.
7. It has RS485 interface, supports MODBUS communication, cooperates with multi-turn absolute value encoder with memory function, and can be flexibly applied to industries such as manipulators.

8. There are programmable 6-way INPUT and 4-way OUTPUT ports, users can customize the input and output through parameter settings, and the application is flexible.
9. Support 17-bit and 23-bit high-precision absolute encoders.
10. It has perfect protection functions such as overvoltage, undervoltage, overspeed, overload, excessive position deviation, encoder error, etc., and can memorize 8 groups of historical fault information.
11. It has a wealth of monitoring items, and the user can choose the desired monitoring items to monitor the operating status during use.
12. The driver can communicate with the PC through the MINIUSB interface to realize simple and fast debugging of the servo drive system.

2.1.3 Driver Specifications

1、Electrical Specifications

Three-phase 220V grade servo driver

2、Basic Specifications

Model : JAWD***2	750	1500	2000
Three-phase continuous input current (Arms)	7	16	16
Continuous output current per axis (Arms)	5.5	10	10
Maximum output current per axis (Arms)	16.9	28	28
Main current supply	Three-phase AC180-240V，50/60Hz		
Control current supply	Single phase AC180-240V，50/60Hz		
Regen handling function	Built-in regen resistor		

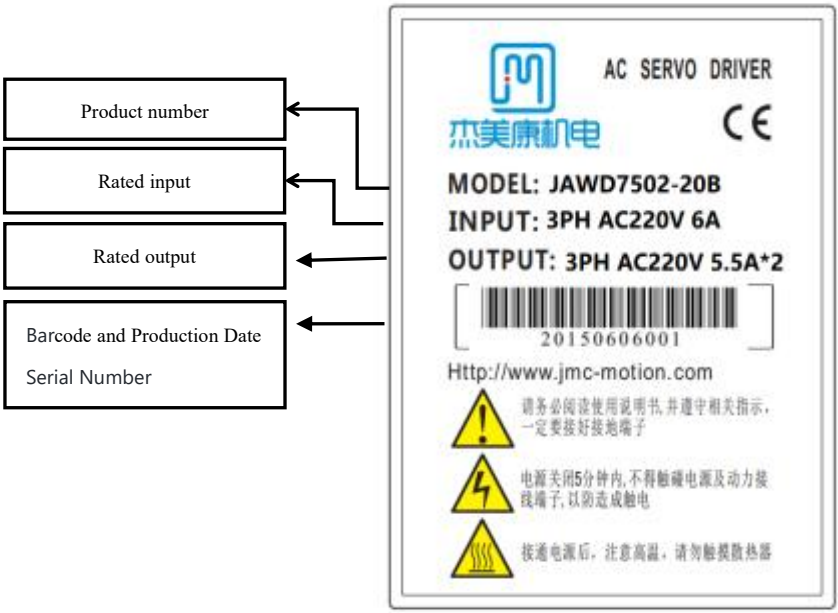
Project	Describe
Control method	Single-phase/three-phase full-wave rectification IGBT PWM Control Sine wave current drive method
Feedback	Absolute encoder

Conditions of use	Temperature	work：0～55℃ storage：-25～85℃
	humidity Temperature	work：10%～90%
	Altitude	<1000m, when it is higher than 1000m, it should be derated according to GB/T 3859.2-93
	protection level	Protection class: IP10, cleanliness: 2 No corrosive gas, flammable gas No oil, water splash Environment with less dust, salt and metal powder
performance	Speed adjustment range	1:6000
	Steady Speed Accuracy	±0.01%: External load changes 0 to 100% ±0.01%: power input variation ±10% (220V) ±0.1%: Ambient temperature ±25° C (25° C)
	Speed response frequency	2000Hz
	Torque Control Accuracy	±2%
Input and output signals	Encoder frequency division pulse output	A phase, B phase, C phase: linear drive output Frequency division pulse number: can be set arbitrarily
	Input signals	Points: 6 Functions: Servo ON, alarm clear, forward overtravel signal input, reverse overtravel signal input, control mode switching, P action command input, forward side external torque limit, reverse side external torque limit, gain switching input , zero fixed input, command pulse prohibition input, encoder absolute value data request input, internal setting speed switching input 1, internal setting speed switching input 2, internal setting speed

		switching input 3, position command clear input, magnetic pole Detection input, command pulse input multiplier switching input
	output signal	Points: 4 Functions: alarm output, brake release output, servo ready output, positioning complete output, positioning approach output, speed consistent output, motor zero speed output, torque limit detection output, speed limit detection output, warning output, command pulse Input magnification switching output.
display function		High-voltage power indicator light, 6-digit 8-segment LED
communication function	RS485	Support MODBUS protocol. Axis address: set by parameter
	MINIUSB	Connect to PC for debugging
Regen function		Built-in regen resistor or external regen resistor
Protective function		overvoltage, undervoltage, overcurrent, overload, etc.

2.1.4 Servo drive nameplate and model description

1、Description of nameplate content



2、Model Description：

JAWD 750 2

JMC JAWD series AC servo

Power	
symbol	output power
750	750W
1500	1500W
2000	2000W

Power supply	
symbol	specification
2	220VAC

2.2 Servo motor

2.2.1 overview

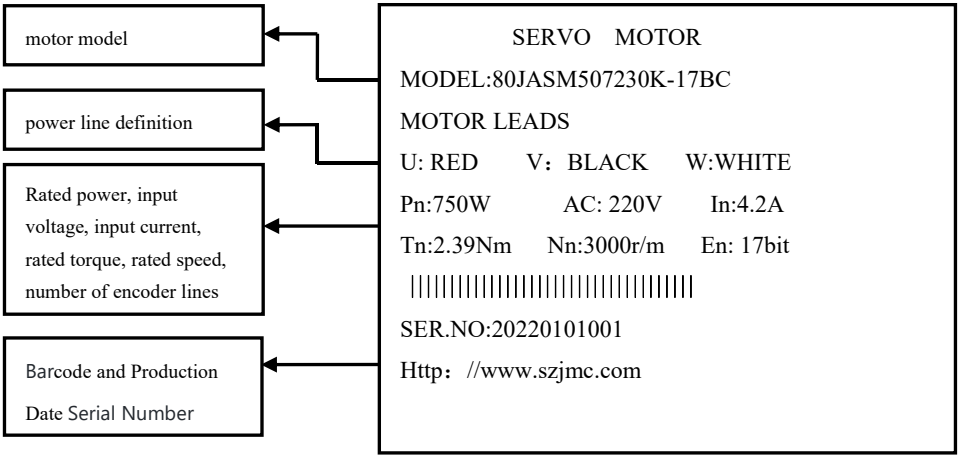
JASM series servo motors are high-speed, high-precision servo motors developed by JMC to meet the requirements of modern automatic control; this series of servo motors can control speed and position accuracy very accurately, and can convert voltage signals into torque and Speed to drive the control object. The rotor speed of this series of servo motors is controlled by the input signal and can respond quickly. In the automatic control system, it is used as an actuator, and has the characteristics of small electrical and mechanical time constants, high linearity, and starting voltage. The received electrical signal is converted into angular displacement or angular velocity output on the motor shaft, and the real-time feedback signal can be sent to the servo drive for adjustment to achieve high-precision control.

2.2.2 main feature

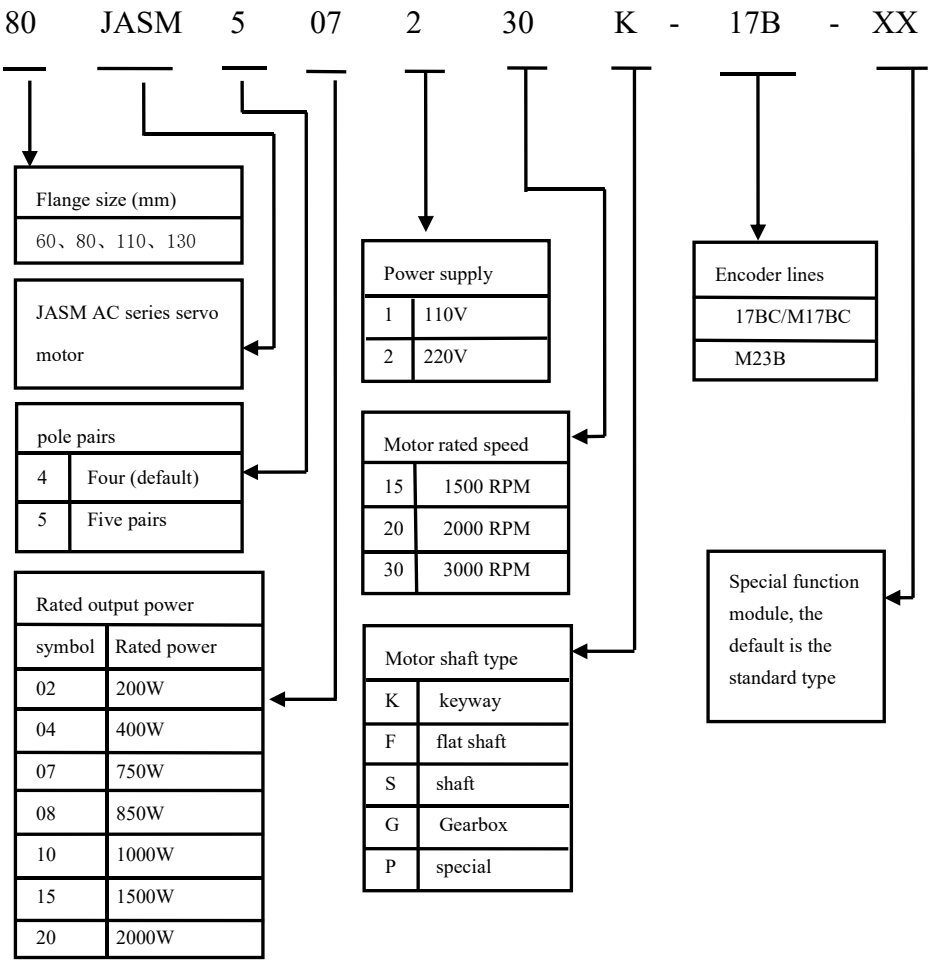
1. High energy magnetic force
2. Short time 300% overload capacity
3. Flange size (mm)：40、60、80、110、130, Power: 0.1-2KW optional
4. Low noise, low heat generation, high precision, high speed, etc.

2.2.3 Servo motor nameplate and model description

1、Description of nameplate content

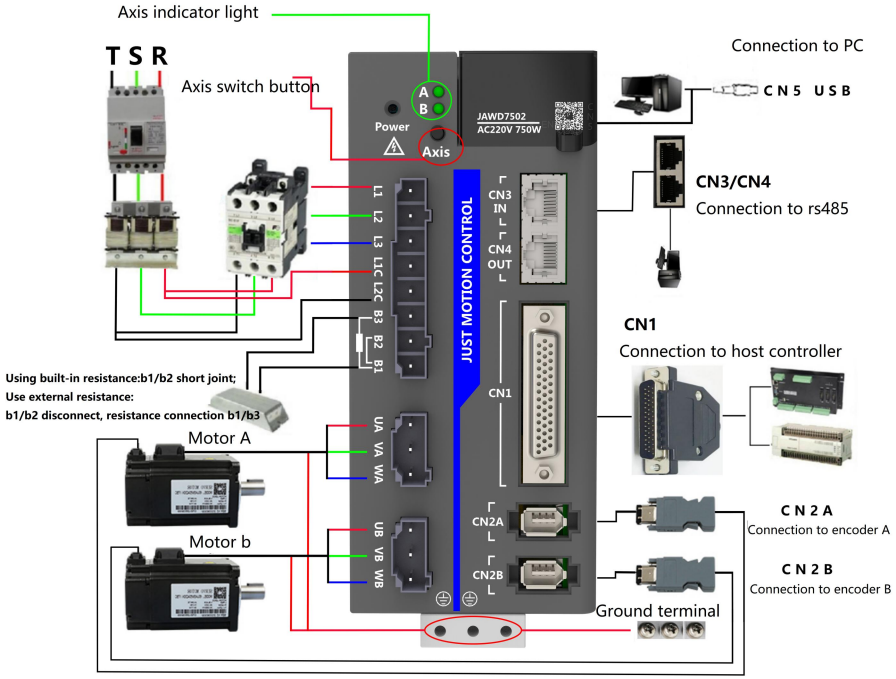


2、Model Description：



2.3 Main circuit wiring of the servo control system

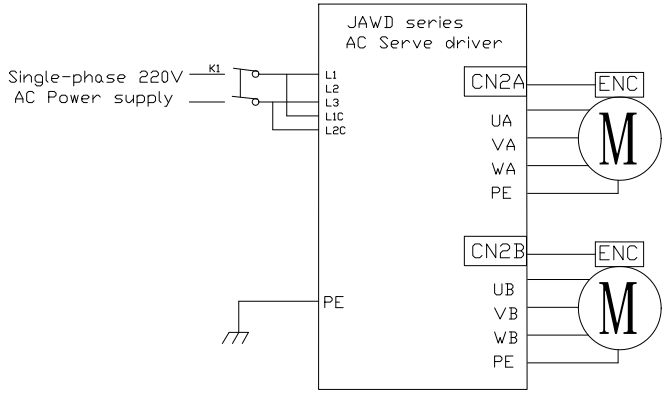
2.3.1 Servo control system wiring diagram



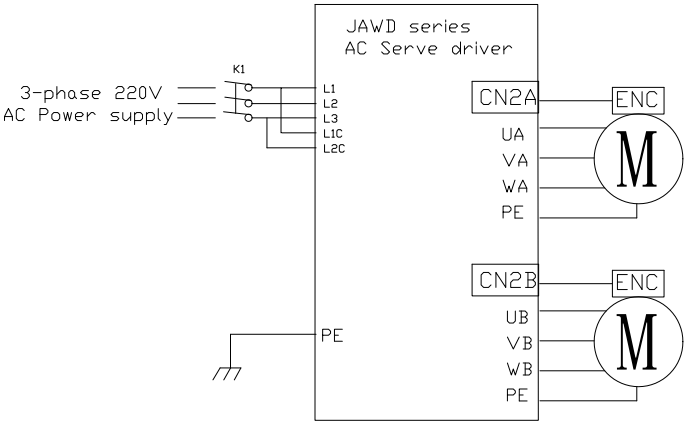
The servo driver is directly connected to the industrial power supply without isolation from power supplies such as transformers. In order to prevent cross-shock accidents in the servo system, please use a fuse or a circuit breaker for wiring on the input power supply. Since the servo drive does not have a built-in grounding protection circuit, in order to form a more secure system, please use a leakage circuit breaker for both overload and short circuit protection or a special leakage circuit breaker for supporting ground wire protection.

2.3.2 Main power circuit connection

1、Single-phase power wiring method

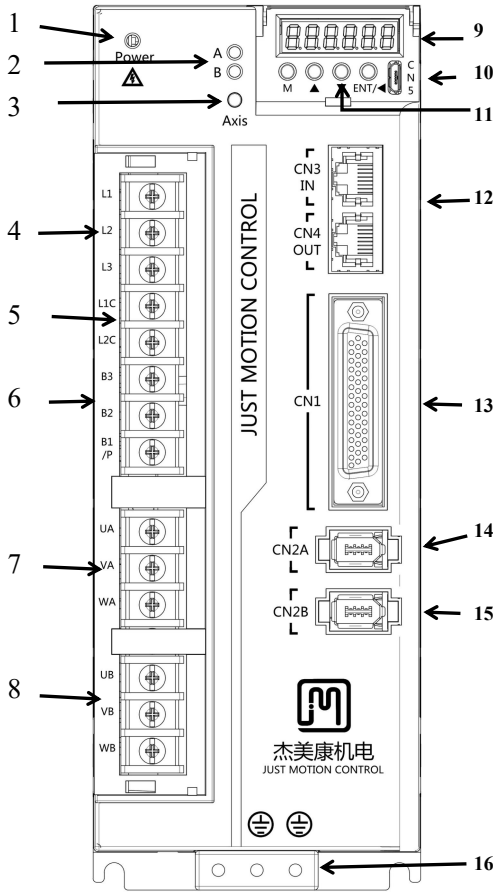


2、Three-phase power wiring method



Chapter 3 Port Description and Wiring

3.1 Port distribution of the servo driver



1. Power Indicator

2. Current axis indicator light

The axis with the green light always on represents the current operation axis

The green light flashes to indicate that the corresponding axis has an alarm

3. Axis switching button

4. Driver power input

5. Driver control power input

6. Regen resistance port

When using the built-in regeneration resistor, B1/P and B2 are shorted (default). When using an external resistor, disconnect B1/P and B2 and connect the external resistor to B1/P and B3.

7. A-Axis power line port.

8. B-Axis power line port.

9. LED display

Display drive current status, parameters, alarm information, etc

10. USB Debug Interface

11. Panel operation keys

12. 485 Communication port

13. Control port

14. Axis A encoder line port

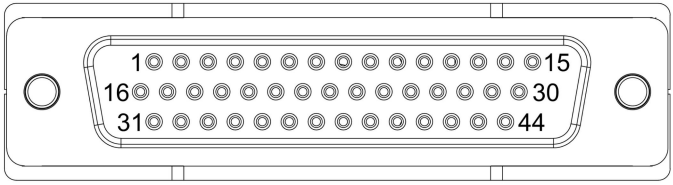
15. Axis B encoder line port

16. Eeath port

3.2 Description of servo driver CN1 control port

3.2.1 CN1 Control port definition

Host control and drive connection interface, used for host computer control drive and drive feedback output



Definition of each pin of the terminal:

pin number	label	Definition	Standard Voltage
1	A VREF	A-axis speed analog control positive	±10VDC input
2	B VREF	B-axis speed analog control positive	±10VDC input
3	A pulse+	A-axis pulse input positive	5V Signal
4	A direction+	A-axis direction input positive	5V Signal
5	B pulse+	B-axis pulse input positive	5V Signal
6	B direction +	B-axis direction input positive	5V Signal
7	DO4-	Digital output port 4 negative	DO4- low level terminal
8	DI2	digital input 2	24VGND

9	DI3	digital input 3	24VGND
10	A OA+	A-axis encoder A-phase positive output	5V differential output
11	A OB+	A-axis encoder B-phase positive output	5V differential output
12	A OZ+	A-axis encoder Z-phase positive output	5V differential output
13	B OZ+	B-axis encoder Z-phase positive output	5V differential output
14	SEN	none	none
15	SEN	none	none
16	A TREF	A-axis torque analog control positive	±10VDC input
17	B TREF	B-axis torque analog control positive	±10VDC input
18	A pulse-	A-axis pulse input negative	5V Signal
19	A direction-	A-axis direction input negative	5V Signal
20	B pulse-	B-axis pulse input negative	5V Signal
21	B direction-	B-axis direction input negative	5V Signal
22	DO4+	Digital output port 4 positive	DO4+ high level terminal
23	DI1	digital input 1	24VGND
24	DICOM	input common	24V+
25	DI6	Digital input 6	24VGND
26	A OA-	A-axis encoder A-phase negative output	5V differential output
27	A OB-	A-axis encoder B-phase negative output	5V differential output
28	A OZ-	A-axis encoder Z-phase negative output	5V differential output
29	B OZ-	B-axis encoder Z-phase negative output	5V differential output
30	GND	Digital Ground/Analog Ground	Digital Ground/Analog Ground

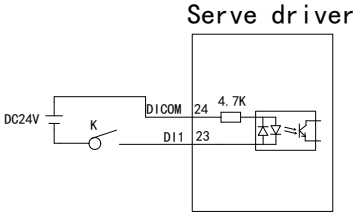
31	GND	Digital Ground/Analog Ground	Digital Ground/Analog Ground
32	DO1+	Digital output port 1 positive	DO1+ high level terminal
33	DO1-	Digital output port 1 negative	DO1-Low level terminal
34	DO2+	Digital output port 2 positive	DO2+ high level terminal
35	DO2-	Digital output port 2 negative	DO2-Low level terminal
36	DO3+	Digital output port 3 positive	DO3+ high level terminal
37	DO3-	Digital output port 3 negative	DO3-Low level terminal
38	DI4	digital input 4	24VGND
39	DI5	digital input 5	24VGND
40	B OA+	B-axis encoder A phase positive output	5V differential output
41	B OA-	B-axis encoder A phase negative output	5V differential output
42	B OB+	B-axis encoder B-phase positive output	5V differential output
43	B OB-	B-axis encoder B-phase negative output	5V differential output
44	None	None	None

Note:

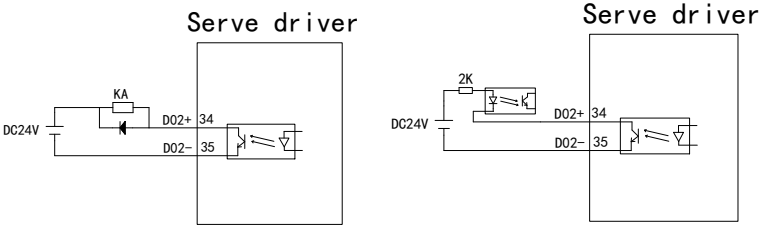
1. For digital input (DI) and output (DO) port custom function settings, please refer to Chapter 8 Parameter Description for setting.

3.2.2 CN1 Control Port Connection Instructions

The digital inputs DI (DI1-DI6) can be connected using switches, relays, open-collector transistor circuits. (Input I/O port function settings refer to chapter 8.2.7 P06-xx I/O parameter description)

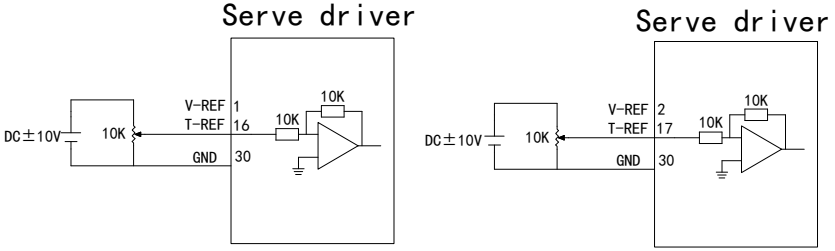


Digital output DO (DO1-DO4) output can be connected with relays, optocouplers, etc. (the output port is equivalent to a passive, polarized switch). Power supply voltage range 5-24V. (For the function setting of the output I/O port, please refer to the description of P06-xx I/O parameters in Chapter 8.2.7)



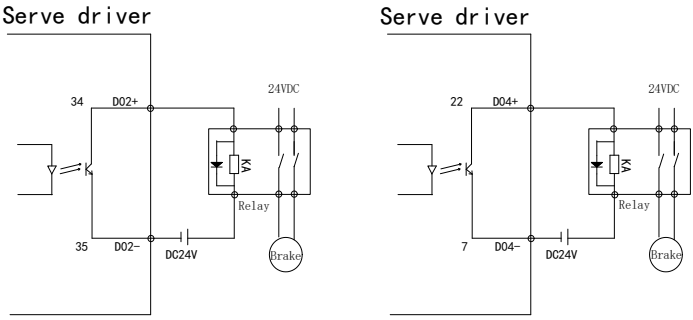
Control relay control optocoupler

Speed and torque control analog control input effective voltage range (-10V~10V), the command value corresponding to this voltage range can be set by the following parameters: P06-40 speed analog command input gain, P06-43 torque analog command input gain. Please read the detailed description of the parameters for the specific setting method.



A-axis B-axis

3.2.3 Brake Control Connection Diagram

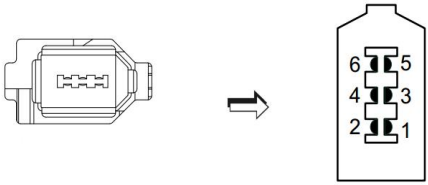


A-axis B-axis

Note: 1. The brake function of the drive is controlled by DO2 (pin 34, 35)/D04 (pin 22, 7) in CN1 to control the relay coil, and the relay switch controls the brake coil.

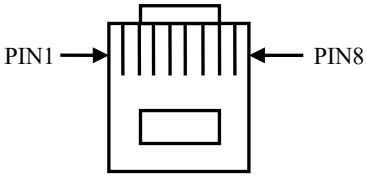
2. It is recommended to use a separate power supply for the brake coil

3.3 Driver CN2 encoder port description



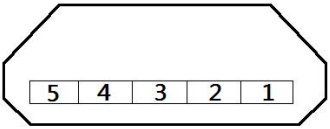
pin#	mark	definition	remark
1	+5V	5v power supply	
2	GND	power ground	
3	NC	No connect	
4	NC	No connect	
5	T+	encoder T+	
6	T-	encoder T-	

3.4 Driver CN3/CN4 port description



pin#	mark	Definition
PIN1	CANH	CNAH for bus servo only
PIN2	CANL	CNAL for bus servo only
PIN3	CGND	CGND for bus servo only
PIN4	reserve	reserve
PIN5	reserve	reserve
PIN6	GND	ground
PIN7	485-	485-
PIN8	485+	485+

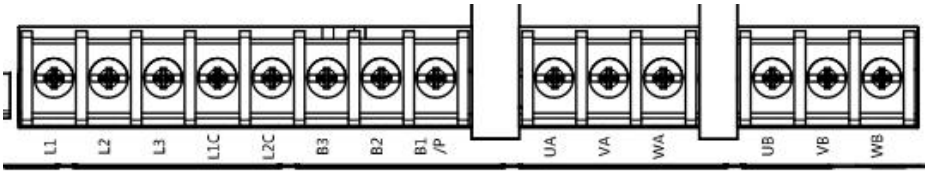
3.5 Driver CN5 port description



Front facing CN5 port

pin#	mark	Definition
1	V Bus	power 5V
2	D-	Data-
3	D+	Data+
4	ID	Empty
5	GND	Ground

3.6 Power supply and motor power cable port description



mark	Definition	Description
L1、L2、L3	Main circuit power input terminal	Connect to single-phase/three-phase 220V AC, it is recommended to use three-phase power supply for 2KW, single/ three-phase power supply for 750W
L1C、L2C	Control power input	Connect to single-phase 220V AC
UA、VA、WA UB、VB、WB	Motor power cable connection port	Connect motor power cable
B1/P、B2、B3	Regen resistor connection terminal	When using the built-in regenerative resistor, short-circuit B1/P and B2 (for 750W and above drivers, there is built-in regenerative resistors) When using an external resistor, disconnect B1/P, B2, and connect both ends of the resistor to B1/P, B3

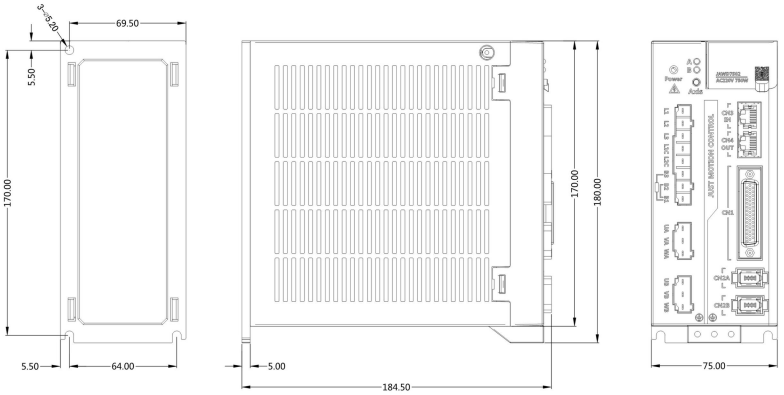
Notice:

1. Please be sure to connect an electromagnetic contactor between the power supply and the main circuit power supply of the servo drive, so that the power supply can be cut off when the servo drive fails, preventing fire caused by excessive current.

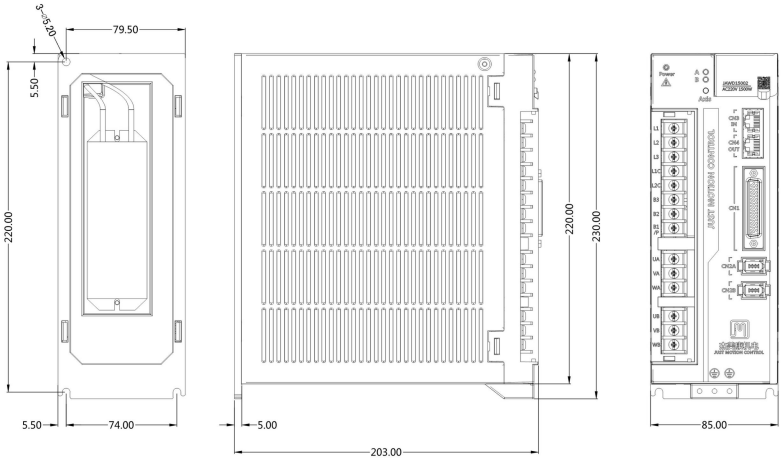
2. When the feedback energy exceeds the absorption capacity of the capacitor, an E.402 overvoltage alarm will appear. At this time, an external regenerative resistor is required, and P00-30~P00-35 are set to corresponding values. See 8.2 parameter analysis for details.

Chapter 4 Installation Instructions

4.1 Installation Dimension



750-1000W AC servo driver （unit：mm）



1500W/2000W AC servo driver （unit：mm）

Notice:

1. The normal installation direction of the servo driver must be vertical and upright, with the top facing up for heat dissipation.

2. When the driver is installed, ensure that the equipment is well ventilated. When multiple drivers are used side by side in the cabinet, the distance between them should not be less than 5CM.

3. In order to ensure the safety of use, please be sure to connect the grounding protection terminal of the driver with the equipment protection ground !

4.2 Installation environment

The installation and use environment has a direct impact on the normal operation and service life of the product, so the following conditions must be met:

1. Working environment temperature: 0~55℃; working environment humidity: below 10%~90% (no condensation).

2. Storage environment: -20℃～+85℃; storage environment humidity: below 90% (no condensation).

3. Vibration: below 0.5G.

4. Protect from rain dripping or humid environment.

5. Avoid exposure to sunlight.

6. Prevent oil mist and salt erosion.

7. Protect against corrosive liquids, gases, etc.

8. Prevent the intrusion of dust, cotton wool and metal fines.

9. Keep away from radioactive materials and combustible materials.

10. Space should be reserved around the placement of the driver in the cabinet to facilitate loading, unloading, and maintenance.

11. Pay attention to the air flow in the cabinet. If necessary, install an external fan to enhance the air flow and reduce the ambient temperature of the driver to facilitate heat dissipation; the long-term working temperature is below 55°C.

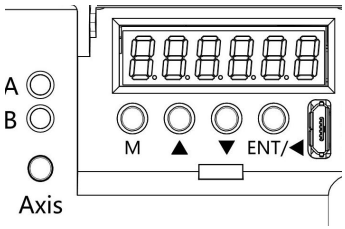
12. Try to avoid vibration sources nearby, and install shock-absorbing devices such as vibration absorbers or anti-vibration rubber pads.

13. If there is an electromagnetic interference source nearby, the power supply and control circuit of the driver are easily disturbed and cause malfunction. You can add a noise filter or take various effective anti-interference

measures to ensure the normal operation of the driver (the noise filter will increase the leakage current, it is necessary to install an isolation transformer at the input end of the drive power supply).

Chapter 5 Panel Display and Settings

5.1 Function introduction of the panel



The JAWD series AC servo panel uses six LED digital tubes to display the status; 5-digit keys to input commands, and the specific key functions are as follows:

Panel Key mark	Definition	Description
M	M button	Function switch and exit
▲	UP button	Display change, value increase function
▼	DOWN button	Display change, value decrease function
ENT/◀	ENT/LEFT button	Long press the button to confirm or save the function Short press the button for shifting to switch the high and low bits of the data
○ Axis	Axis switching button	A-axis, B-axis interface switch button
A ◎ B ◎	Current operating axis indicator light	The A or B axis indicator is always on to represent the current operation axis A flashing light indicates an alarm on another axis

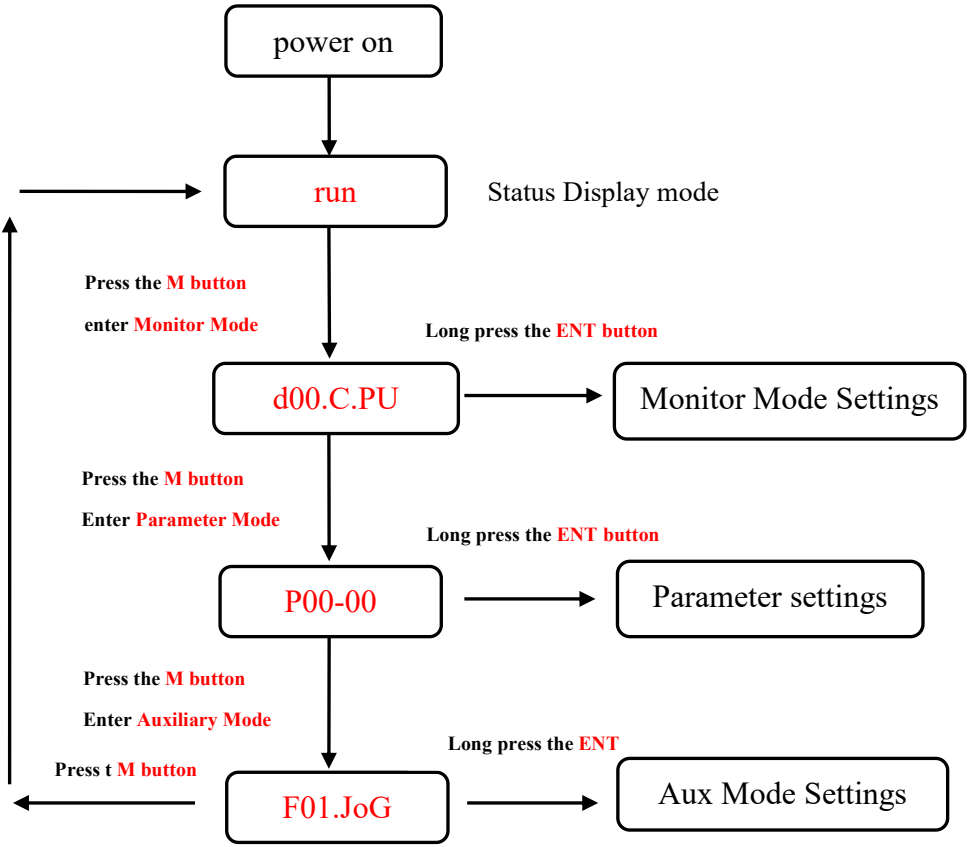
Remark:

Press and hold the ENT button for 3 seconds to confirm or save the function.

In the monitoring and parameter interface, press and hold ▲ ▼ to scroll quickly.

5.2 Switching process of operation mode

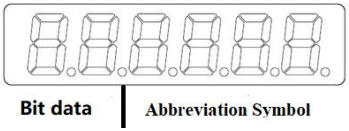
JAWD series AC servo has four functional modes, which are status display mode, monitoring mode, parameter setting mode, and auxiliary mode. The switching process between them is as follows:



Note: After pressing the ENT button to enter the mode setting, you can press the M button to exit the mode selection

5.3 Status Display

The display discrimination is as follows:



Status Display bit data meaning:

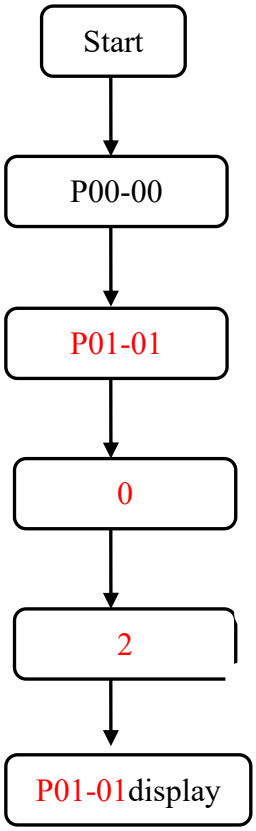
Display	Meaning	Display	Meaning
	Control circuit power on		Main circuit power supply ready
	Speed and torque control: Speed coincidence output Position control: positioning complete output		Rotate checkout display
	Base block display The light is ON at servo OFF state and OFF at ON state		Speed and torque control: speed command in input During position control: command pulse in input

Status display abbreviation meaning：

Display	Meaning
	Servo not ready (power supply not on)
	Servo ready (servo motor is not energized)
	servo enable state (servo motor energized state)
	Indicates that the forward overtravel signal input port is valid, and the motor forward rotation command is invalid
	Indicates that the reverse overtravel signal input port is valid, and the motor reverse command is invalid

FinSh	Related operation completed correctly
SY_on	The servo is in the enabled state and cannot be operated. The enable must be turned off before it can be operated.
no_oP	Invalid value entered, the servo does not perform the current operation
LocPd	The relevant parameters of the servo are locked, which shall be unlocked before operation
AL-501	Servo fault display. Please refer to chapter 9 for fault definition

5.4 Parameter setting and save method



Double click M button

Press ENT/LEFT to switch the high and low bits, UP or DOWN to select the parameter number to be set

Long press ENT to enter this parameter setting

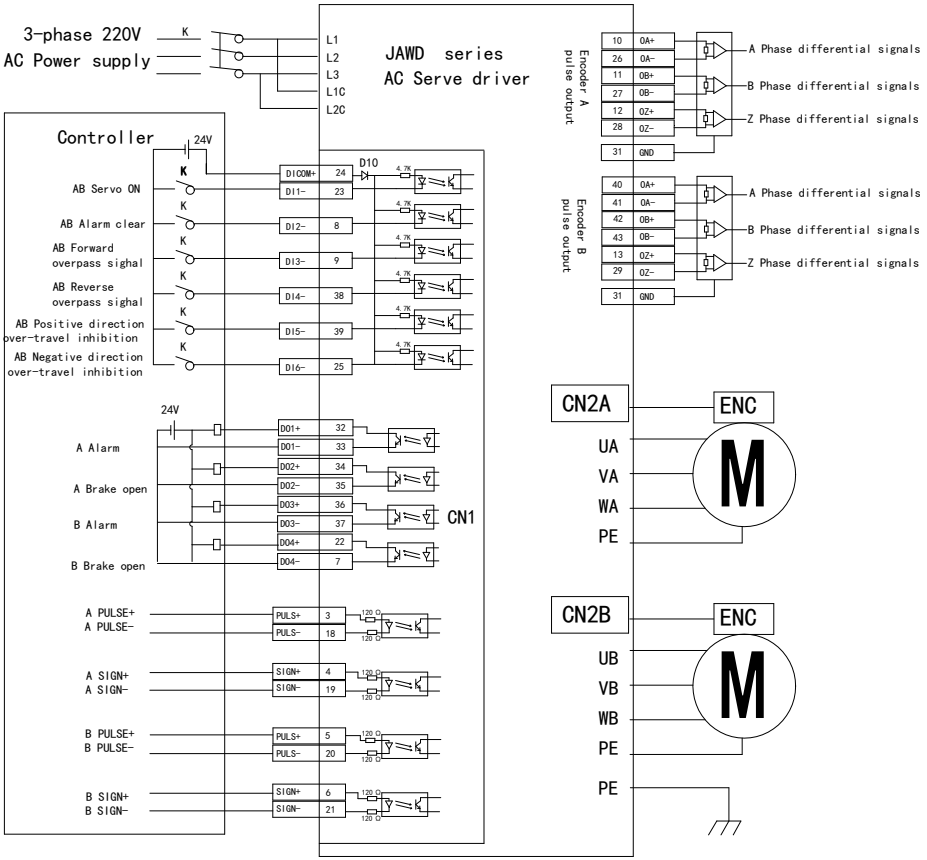
Parameter values can be changed by pressing the UP or DOWN buttons

Long press ENT to save the parameters

Chapter 6 Control Mode and Setting

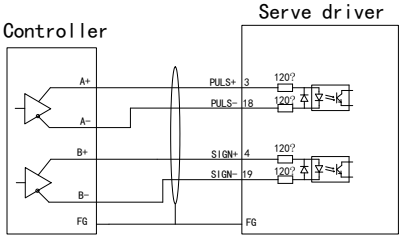
6.1 Position Control

6.1.1 Position Control Wiring Diagram

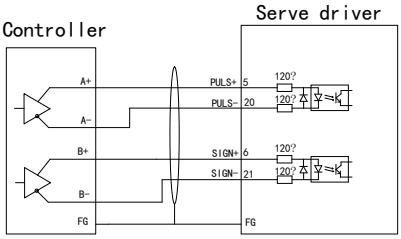


6.1.2 **Position control wiring diagram**

Position control commands are commonly used as differential signals and open-collector signals. It is recommended to use twisted-pair shielded wire for position signal connection wire, which can improve the anti-interference ability. Generally, single-chip controller systems use this kind of position control wiring method. The maximum input pulse frequency of this type of control is 500KHz

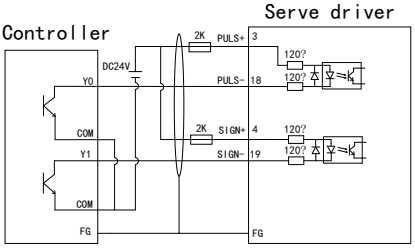


A-axis differential signal input

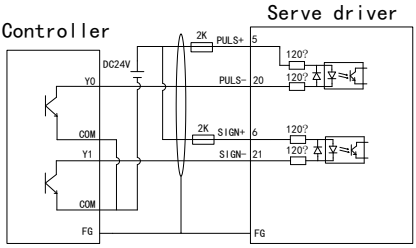


B-axis differential signal input

Description of open-collector input mode at the controller end: the single-end input mode can use the internal power supply provided by the driver, or an external power supply. But do not use dual power input to avoid damaging the drive. In general, PLC controller systems often use this position control wiring method



A-axis open collector input



B-axis open collector input

Note:

When using 24V signal, a **2K resistor** must be connected

Pulse command input can receive differential signal input and open collector input. The maximum receiving frequency of differential signal input is 500K, and the maximum receiving frequency of open collector input is 200K.

6.1.3 Description of position control mode parameters

1、Motor and driver control parameters

Para code		Name	range	Default	Description
P01-01		Control mode	0-5	0	0：position mode 1：speed mode 2：torque mode 3：speed, torque 4：position, torque 5：position, torque
P03-00		Position command setting	0-3	0	0：pulse command 1：reserve 2：bus command 3：Built-in multi-segment positions(reserve)
P03-01	0	Command pulse pattern	0-3	1	0：Quadrature pulse command 1：Direction/Pulse command 2/3：double pulse command
	1	Position command receiver port selection	0-1	0	0：Current axis pulse port input 1：Another axis pulse port input
P03-03	0	Command pulse inverse	0-1	0	command pulse inversion
P03-09		Pulses for one motor revolution	0-1073741822	10000	Set according to user needs, See 8.2

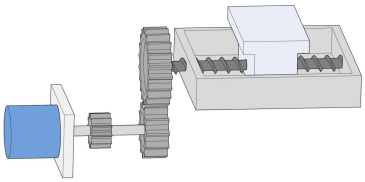
				parameter description for details
P03-40	1st Electronic Gear Molecule	1-1073741822	64	Set according to user needs, See 8.2 parameter description for details
P03-42	1st Electronic Gear Denominator	1-1073741822	1	
P03-15	Threshold of position deviation fault	0-1073741822	90000	Set according to user needs
P03-25	Frequency division output pulse number	1-65535	2500	Set according to user needs

2、Gain parameter

Please refer to the parameter adjustment in Chapter 7

6.1.4 Example of electronic gear ratio calculation

1、Ball screw drive



Eg:

(1) Mechanical parameters: deceleration ratio R is 2/1, lead of the lead screw is 10mm

(2) Resolution of each turn of position ring of absolute value encoder: 8388608

(3) Required load displacement corresponding to 1 position command (command unit) : 0.001mm

Then:

According to (1) and (3), the position instruction (instruction unit) value required for the screw to rotate 1 turn (table movement 10mm) :

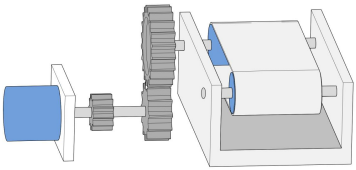
$$\frac{10}{0.001}=10000$$

The electronic gear ratio is :(B is the numerator, A is the denominator)

$$\frac{B}{A}=\frac{8388608}{10000}\times\frac{2}{1}=\frac{1048576}{625}$$

Finally, the parameter p03-40 is set to 1048576, and P03-42 is set to 625

2、Belt pulley drive



Assumptions:

（1）Mechanical parameters: deceleration ratio R: 5/1, pulley diameter: 0.2m(pulley circumference:0.628m)

（2）Resolution of each turn of position ring of absolute value encoder: 8388608

（3）Required load displacement corresponding to 1 position command (command unit) : 0.000005mm

Then:

From (1) and (3), the value of the position command (command unit) required for the pulley (load) to rotate one revolution is:

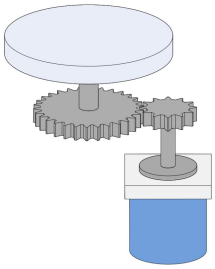
$$\frac{0.628}{0.000005}=125600$$

The electronic gear ratio is :(B is the numerator, A is the denominator)

$$\frac{B}{A}=\frac{8388608}{125600}\times\frac{5}{1}=\frac{262144}{785}$$

Finally, P03-40 is set to 262144 and P03-42 is set to 785

3、Rotating load



Assumptions:

（1）Mechanical parameters: the deceleration ratio R is 10/1, and the rotation Angle of the load axis for one turn is 360°

（2）Resolution of each turn of position ring of absolute value encoder: 8388608

（3）Load displacement corresponding to 1 position instruction (instruction unit) : 0.01°

Then:

It can be obtained that the value of the position command (command unit) required for the load to rotate one revolution:

$$\frac{360}{0.01}=36000$$

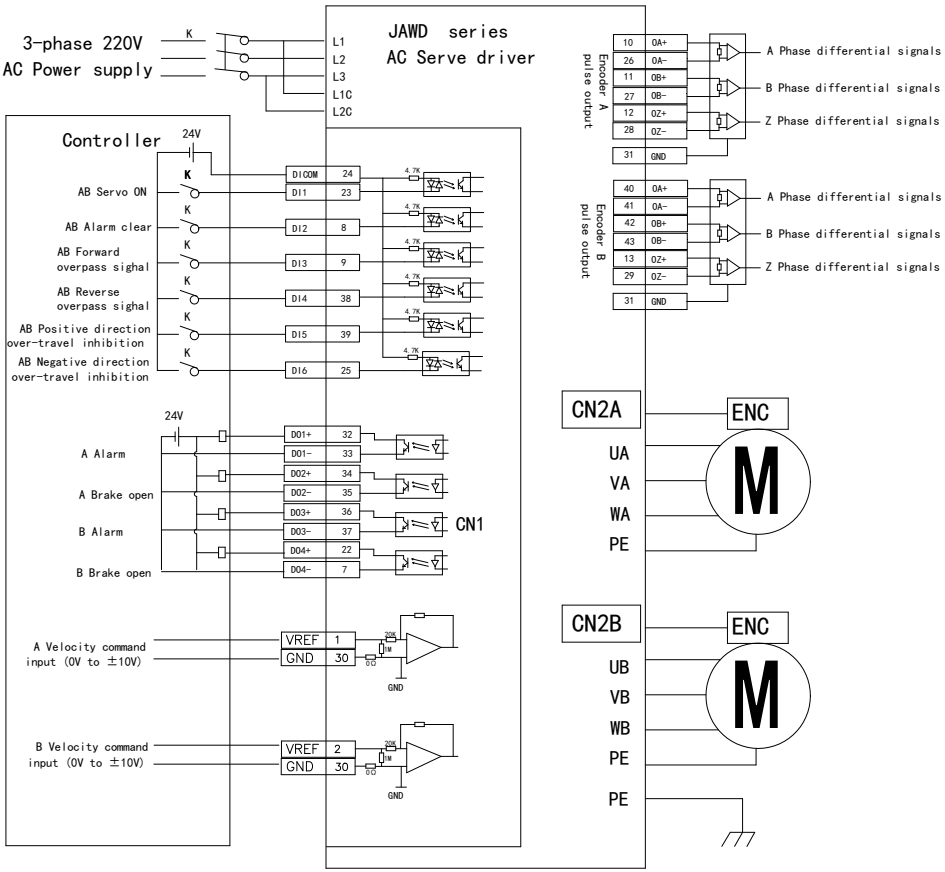
The electronic gear ratio is :(B is the numerator, A is the denominator)

$$\frac{B}{A}=\frac{8388608}{36000}\times\frac{10}{1}=\frac{524288}{225}$$

Finally, the parameter P03-40 is set to 524288 and P03-42 is set to 225

6.2 Speed control

6.2.1 Speed control wiring diagram



6.2.2 Description of speed control mode parameters

1、**Motor and driver control parameters**

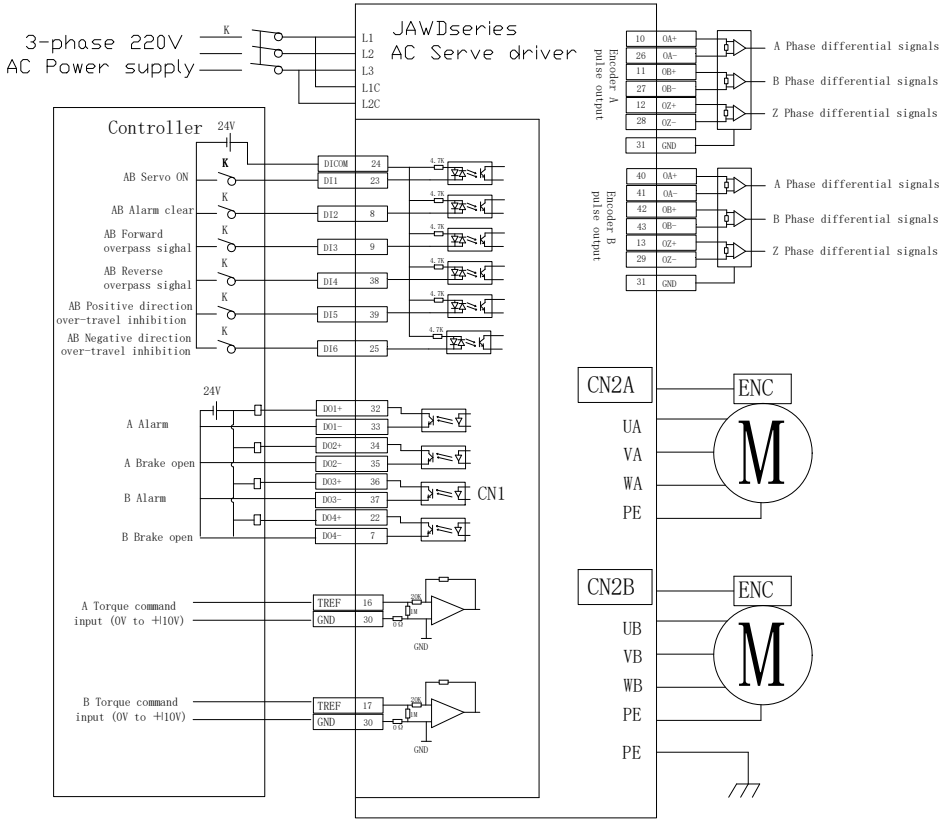
Para code	Name	Range	Default	Description
P01-01	Control mode	0-5	1	0: position mode 1: speed mode 2: torque mode 3: speed, torque 4: position, speed 5: position, torque
P04-00	Speed command source	0-3	0	0: External analog command 1: Set value of P04-02 2: BUS command 3: Built-in multi-speed
P04-02	Speed command digital setting value	-6000－6000	0	When P04-00 is set to 1, P04-02 is the speed setting value
P04-06	Forward speed limit	0-6300	6000	Limits forward speed
P04-07	Reverse speed limit	-6300-0	-6000	Limits reverse speed
P06-40	The analog 1V corresponds to the speed value	10-2000	300	**Set according to user needs See 8.2 parameter description for details**

2、Gain parameter

Please refer to the parameter adjustment in Chapter 7 for adjustment

6.3 Torque Control

6.3.1 Torque control wiring diagram



6.3.2 Description of torque control mode parameters

1、Motor and driver control parameters

Para code	Name	Range	Default	Description
P01-01	Control Mode	0-5	2	0：position mode 1：speed mode 2：torque mode 3：speed, torque 4：position, speed 5：position, torque
P05-00	Torque command selection setting	0-3	0	0：Analog command 1：Setting value of P05-03 2：Bus command 3：Built-in multi-stage torque
P05-01	Torque control speed limit source setting	0-3	0	0：Speed analog command 1：Setting value of P05-02 2：Bus command 3：Built-in multi-speed
P05-02	Torque control speed limit value	0-6000	1000	Set the maximum speed of the motor in torque mode. Valid when P05-01 is 1
P05-10	Positive internal torque limit	0-300	200	Limits positive torque value
P05-11	Negative internal torque limit	-300-0	-200	Limits reverse torque value
P06-43	The analog 1V corresponds to the torque value	0-100	10	Set according to user needs See 8.2 parameter description for details

2、Torque control command related gain parameters

Please refer to the parameter adjustment in Chapter 7 for adjustment

Chapter 7 Trial Operation and Parameter Adjustment

7.1 Running test

7.1.1 Pre-run testing

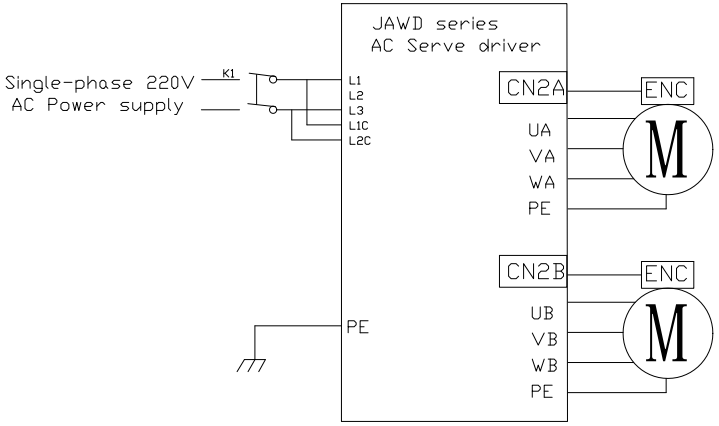
In order to avoid damage to the servo driver or mechanism, please remove all loads of the servo motor before operation, and carefully check whether the following precautions are normal, and then power on for a no-load test; after the no-load test is normal, the servo motor load can be connected for the next test.

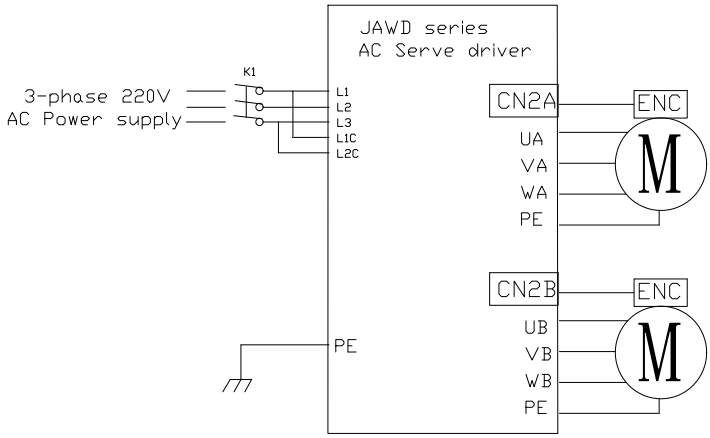
Precautions:

Detection before power-on	1、 Check whether the servo drive has obvious appearance damage 2、 Please insulate the connecting part of the wiring terminal 3、 Check whether there are foreign objects inside the driver 4、 Servo drives, motors and external regenerative resistors cannot be placed on combustible objects 5、 In order to avoid the failure of the electromagnetic brake, please check whether the immediate stop and cut off power circuit can work normally 6、 Confirm whether the external power supply voltage of the servo drive meets the requirements 7、 Confirm whether the motor U, V, W power lines, encoder lines and signal lines are connected correctly (confirm the labels and instructions)
Detection at power-up	1、 When the servo drive is power on, try to hear the sound of the relay action 2、 Whether the power indicator light and LED display of the servo driver are normal 3、 Confirm whether the parameter settings are correct, and there may be unpredictable actions depending on the mechanical characteristics Do not adjust parameters to extremes 4、 Is the servo motor self-locking 5、 If the servo motor vibrates and sounds too loud during operation, please contact the manufacturer

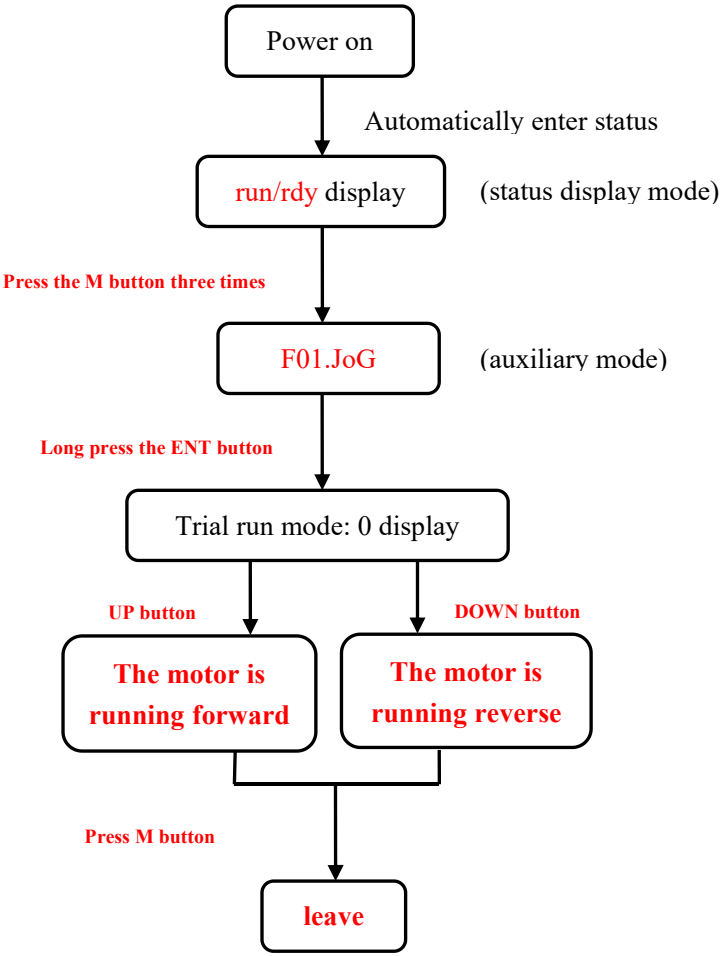
7.1.2 No-load trial run test

1、Jog mode no-load trial run test, the user does not need to connect additional wiring, for the sake of safety, before Jog no-load speed test, please fix the motor base to prevent the reaction force caused by the change of motor speed from causing danger. The following is a simple wiring diagram in Jog mode:





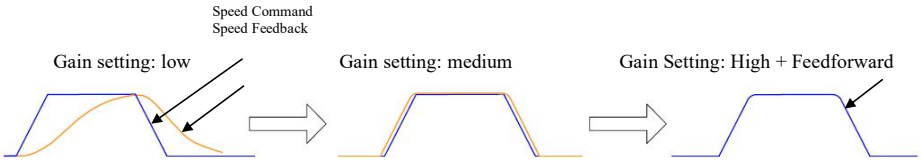
2、Select the Jog mode for trial operation according to the flow chart below



Note: F01.JOG running speed is set by parameter P04-01

7.2 Parameter adjustment

According to the equipment requirements, after selecting the appropriate control mode, the servo gain parameters need to be adjusted reasonably. Make the servo drive can drive the motor quickly and accurately, maximize the mechanical performance.

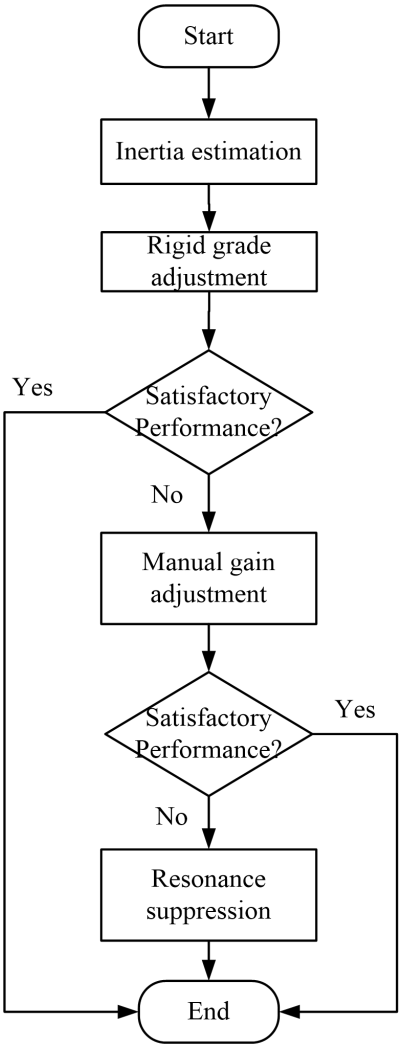


Position loop gain：	800	1600	1600
Speed loop gain：	400	600	600
Speed loop integral time constant：	100	100	100
Velocity Feedforward Gain：	0	0	50
Load inertia ratio：	100	100	100

The servo gain is adjusted by multiple loop parameters (position loop, speed loop, filter, etc.), which interact with each other. Therefore, the setting of gain needs to be balanced according to certain rules.

Choose according to the requirements of the equipment. After selecting the appropriate control mode, you need to adjust the servo gain parameters reasonably. This enables the servo drive to drive the motor quickly and accurately, maximizing its mechanical performance.

The process of gain adjustment can be carried out according to the following figure:



Calculate the device inertia ratio for input to P01-04
Or perform auxiiary function F19_JL measurements

Setting P01-02 to 1 or 2
According to the requirements,increase the p01-03 parameter value step , and when the operation noise occurs, reduce the parameter value of 2 levels

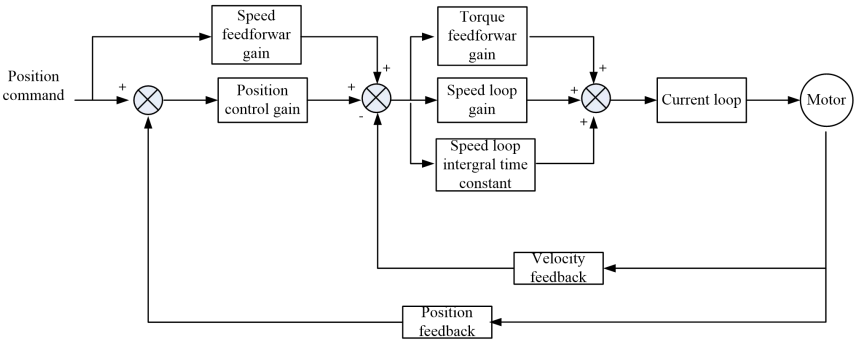
Setting P01-02 to 0, enter manual gain Adjustment mode

7.3 Manual Gain Adjustment

7.3.1 Basic parameters

If the automatic gain adjustment fails to achieve the expected effect, you can manually fine-tune the gain to optimize the effect.

The servo system consists of three control loops, the basic control block diagram is as follows:



Gain adjustment needs to follow the order of the inner loop first and then the outer loop. First, set the load moment of inertia ratio P01-04, then adjust the speed loop gain, and finally adjust the position loop gain.

Speed loop gain: Increase the setting value as much as possible without vibration and noise, which can improve the speed following performance and speed up the positioning time.

Speed loop integral time constant: The smaller the setting value, the faster the integral speed and the stronger the integral effect. If it is too small, vibration and noise will easily occur.

para code	ame	Range	set up	illustrate
P01-02.0	Adjustment mode	0-3	1	0：Manually adjusting。 1：Standard mode. In this mode, the parameterP02-00，P02-01，P02-10，P02-11，P02-13，P02-14，P08-20，P08-21 It will be automatically set according to the rigidity level set by P01-03, manual adjustment of these parameters will not work. The following parameters are set by the user:P02-03 (speed feedforward gain), P02-04 (speed

				feedforward smoothing constant). 2：Positioning mode. In this mode, parameters P02-00, P02-01, P02-10, P02-11, P02-13, P02-14, P08-20, P08-21 will be set according to the rigidity level of P01-03 Automatically set, manually adjusting these parameters will have no effect. The following parameters will be fixed values and cannot be changed: P02-03 (speed feedforward gain): 30% P02-04 (speed feed-forward smoothing constant): 50 3：Standard mode 2. In this mode, parameters P02-00, P02-01, P02-10, P02-11, and P02-13 will be automatically set according to the stiffness level set by P01-03.The following parameters are set by the user: P02-03 (speed feedforward gain), P02-14 (speed integral constant 2), P08-20 (torque command filter constant 1), P08-21 (torque command filter constant 2) 4：TurnLess mode,depends on parameters P01-05, P01-06
P01-03	Rigidity level	0-31	13	There are 32 built-in gain parameters, which work when P01-02 is set to 1, 2, or 3. It can be called directly according to the actual situation, the larger the set value, the stronger the rigidity.
P02-00	Position control gain 1	0-20000	800	。 ▸ The larger the setting value, the higher the gain, the greater the rigidity, and the smaller the position lag, but if the value is too large, the system will oscillate and overshoot. ▸ Make the value as large as possible without oscillating. ▸ Targeted gain at rest.
P02-01	2nd position loop gain	0-20000	800	▸ The larger the setting value, the higher the gain, the greater the rigidity, and the smaller the position lag, but if the value is too large, the system will oscillate and overshoot. ▸ Make the value as large as possible without oscillating. ▸ Gain for exercise.

P02-03	Speed Feedforward Gain	0-100	30	The feedforward gain of the speed loop, the larger the parameter value, the smaller the system position tracking error and the faster the response. However, if the feed-forward gain is too large, the position loop of the system will be unstable, and overshoot and oscillation will easily occur.
P02-04	Speed feedforward filter time	0-6400	50	This parameter is used to set the time constant of the speed loop feed-forward filter. The larger the value, the greater the filtering effect, but at the same time the phase lag increases.
P02-10	Speed loop gain	1-20000	400	▸ The larger the setting value, the greater the gain and rigidity, and the parameter value and load condition setting. ▸ Make the value as large as possible without oscillating. ▸ Targeted gain at rest.
P02-11	Speed loop integral time constant	10-51200	2000	▸ The integral time constant of the speed regulator, the smaller the setting value, the faster the integral speed and the greater the stiffness, if it is too small, vibration and noise will easily occur. ▸ When the system does not oscillate, try to reduce the value of this parameter. ▸ This parameter is for steady state response.
P02-13	2nd speed loop gain	1-20000	400	▸ The larger the setting value, the greater the gain and rigidity, and the parameter value and load condition setting. ▸ Make the value as large as possible without oscillating. ▸ Gain for exercise.
P02-14	2nd Speed loop integral time constant	10-51200	2000	▸The integral time constant of the speed regulator, the smaller the setting value, the faster the integral speed and the greater the stiffness, if it is too small, vibration and noise will easily occur. ▸ When the system does not oscillate, try to reduce the value of this parameter.

				▸ This parameter is for steady state response.

7.3.2 gain switching

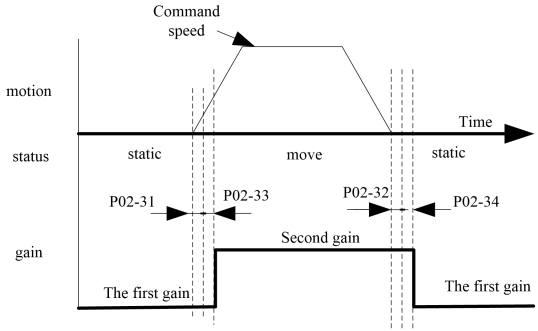
The gain switching function can be triggered by the internal state of the servo or the external DI port, and it is only valid in the position control and speed control modes. Using gain switching, it can play the following roles:

Switch to a lower gain when the motor is stationary (servo enabled) to suppress vibration;

Switch to a higher gain when the motor is running (servo enabled) to shorten the positioning time;

Switch to a higher gain when the motor is running to obtain better command following performance;

Depending on usage, switch between different gain settings with an external signal.



Related parameters

para code	name	Range	factory setting	unit	effect time
P02-30	Gain switching setting	0-9	0	---	Effective immediately
P02-31	1st gain switching time	0-60000	100	ms	Effective immediately
P02-32	2nd gain switching time 2	0-60000	800	ms	Effective immediately
P02-33	1st gain Switch Waiting Time	0-60000	1000	ms	Effective immediately
P02-34	2nd gain Switch Waiting Time	0-60000	100	ms	Effective immediately

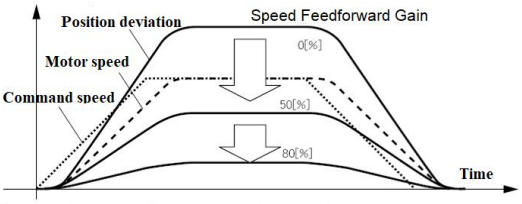
7.3.3 feedforward function

Speed feedforward: During position control, the required speed control command is calculated from the position command and added to the output of the position regulator, which can reduce the position deviation and improve the response of position control.

Torque feedforward: Calculate the required torque command from the speed control command and add it to the output of the speed regulator to improve the response of the speed control.

A. Speed feed-forward operation

Under the condition that the speed feed-forward smoothing constant is set to 50 (0.5ms), gradually increase the speed feed-forward gain to meet the system requirements. But too large speed feedforward gain will cause position overshoot, which will prolong the settling time.



B. Torque feedforward operation

In the state where the torque feedforward smoothing constant is set to 50, the torque feedforward gain is gradually increased to meet the system requirements.

Related parameters

para code	name	Range	factory setting	unit	effect time
P02-03	Speed Feedforward Gain	0-100	30	1%	Effective immediately
P02-04	Speed feedforward filter time	0-6400	50	0.01ms	Effective immediately
P02-19	Torque Feedforward Gain	0-200	0	1%	Effective immediately
P02-20	Torque feedforward filter time	0-6400	80	0.01ms	Effective immediately

7.3.5 Suppression of Machine Resonance

If the servo system is too rigid and responds too quickly, it may cause resonance in the mechanical system. This situation can be improved by reducing the gain of the control loop. Resonance suppression can also be performed by using low-pass filters and notch filters without reducing the gain.

1、Resonance frequency detection

The resonance frequency of the mechanical system can be observed through monitoring items d26.1.Fr and d28.2.Fr

2、Torque command low-pass filter (P08-20, P08-21)

The low-pass filter is used when the vibration frequency will shift, and it can have a better effect when used for high-frequency vibration. By setting the filter time constant, it dampens the resonance near the resonant frequency. However, the low-pass filter will cause the phase lag of the system, the bandwidth will be reduced, and the reduction of the phase margin will easily cause loop oscillation. Therefore, it can only be used in high-frequency vibration occasions.

Filter cutoff frequency (Hz) = 1/(2*pi*P08-20(ms)*0.001)

para code	name	Range	factory setting	unit	ffect time
P08-20	1st segment 1st torque command filter time constant	0-2500	100	0.01ms	Effective immediately
P08-21	1st segment 2nd torque command filter time constant	0-2500	100	0.01ms	Effective immediately

3、Notch filter

The notch filter is used when the system resonance frequency is fixed. A notch filter suppresses mechanical resonance by reducing the gain at a specific frequency. After the notch filter is set correctly, the vibration can be effectively suppressed, and you can try to continue to increase the servo gain. There are multiple sets of notch filters built into the servo, the first and second notch filters can be set automatically internally, or manually input parameters. Other notch filters can only be parameterized manually.

A. Adaptive notch filter mode

When using the self-tuning function, and set P08-25.0, P08-25.1 to 1, through the adaptive notch filter function module, the servo system will automatically identify the current resonance frequency and automatically configure the notch filter parameters.

B. Manually perform frequency identification and set notch filter parameters

You can use the auxiliary function of the drive to identify the vibration frequency and set the notch filter parameters at the same time. Note: This function is only to scan the maximum point of each frequency amplitude of the machine. Even if there is no mechanical resonance point in the machine itself, this function will scan out the frequency. Steps for usage:

a) Confirm whether the first notch filter and the second notch filter are allowed to be set. It can be judged by checking parameter P08-24. If both the first notch filter and the second notch filter are enabled. It is necessary to set the parameters of the first or second notch filter to the third notch filter, and set the corresponding P08-24.0/1 to 0. That means the first/second notch filter can be reset.

b) Turn off the servo enable, so that the servo is in the off enable state. Then execute the auxiliary function F21

c) After executing the F21 auxiliary function, the drive will give the motor a certain excitation to trigger mechanical resonance. The identified vibration frequency will then be displayed on the driver LED.

d) If the frequency identification is correct, long press the confirmation key, the drive will automatically set the current frequency parameters to the first/second notch filter, and set the corresponding P08-24.0/1 to 1 to start the notch filter.

Related parameters

para code	name	illustrate
P08-51	Frequency Sweep Torque Amplitude	Setting range: 1-300 Frequency Sweep Torque Amplitude

C. Use the auxiliary function to identify the resonance frequency and set the notch filter parameters during mechanical operation

You can use the auxiliary function of the drive to identify the vibration frequency and set the notch filter parameters at the same time. The difference from the function of the previous point is that in item B, when the mechanical off is enabled, the drive itself gives excitation to identify resonance. Item C is when the machine is in normal operation, resonance occurs, and the frequency is identified. Steps for usage:

a) Confirm whether the first notch filter and the second notch filter are allowed to be set. It can be judged by checking parameter P08-24. If both the first notch filter and the second notch filter are enabled. It is necessary to set the parameters of the first or second notch filter to the third notch filter, and set the corresponding P08-24.0/1 to 0. That means the first/second notch filter can be reset.

b) Then execute the auxiliary function F22

After executing the F22 auxiliary function, the drive enters the frequency identification state and lasts for 10s. Run the device here, when there is a resonance point, the driver will recognize it and display it on the LED. The sensitivity of frequency recognition depends on parameters P01-11 and P01-12.

d) If the frequency identification is correct, long press the confirmation key, the drive will automatically set the current frequency parameters to the first/second notch filter, and set the corresponding P08-24.0/1 to 1 to start the notch filter.

Related parameters

para code	name	llustrate
P01-11	Vibration detection sensitivity	Setting range: 50-500
P01-12	Vibration detection level	Setting range: 0-5000 This parameter sets the vibration detection sensitivity of the adaptive notch filter. The smaller the parameter value is, the more sensitive the detection sensitivity is.

D. Manually set notch filter parameters

a) The resonance frequency of the mechanical system can be observed through monitoring items d26.1.Fr and d28.2.Fr.

b) Input the resonance frequency observed in the previous step into the notch filter parameters, and input the width level and depth level of the group of notch filters at the same time.

c) If the vibration is suppressed, the notch filter is working. You can continue to increase the gain, and repeat the previous 2 steps after new vibrations appear.

d) If the vibration cannot be eliminated for a long time, please turn off the servo enable in time.

E. Notch Filter Width Class

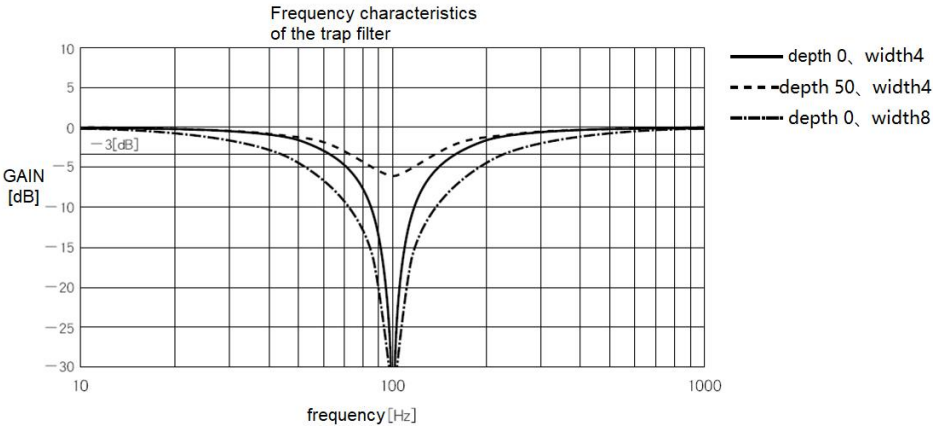
$$\text{Notch width level} = \frac{\text{Notch width}}{\text{Notch center}}$$

The width of the notch filter indicates the frequency bandwidth of the amplitude attenuation rate of -3dB relative to the center frequency of the notch filter

F. Notch filter depth rating

Strap depth level=output value/input value

When the notch depth level is 0, the input is completely rejected at the center frequency; when the depth level is 100, the input is completely passed at the center frequency.



Related parameters

para code	name	illustrate
P08-30	1st Notch filter frequency	Setting range: 300-5000, unit: Hz Center frequency of notch filter 1 When set to 5000, the notch filter is invalid

P08-31	1st Notch filter width	Setting range: 50-1000 Notch Width Class for Notch Filter 1 is the ratio of the width to the center frequency
P08-32	1st Notch filter depth	Setting range: 0-1000 Notch Depth Class for Notch Filter 1 The ratio relationship between the input and output for the center frequency of the notch filter The larger this parameter, the smaller the notch depth and the weaker the effect

Related parameters

para code	name	Range	factory setting	unit	Effective time
P08-24.0	1st notch filter selection	0-1	0	---	Real time
P08-24.1	2nd notch filter selection	0-1	0	---	Real time
P08-30	1st notch filter frequency	50-5000	5000	HZ	Real time
P08-31	1st notch filter width	50-1000	70	0.01	Real time
P08-32	1st notch filter depth	0-1000	0	0.001	Real time
P08-33	2nd notch filter frequency	50-5000	5000	HZ	Real time
P08-34	2nd notch filter width	50-1000	70	0.01	Real time
P08-35	2nd notch filter depth	0-1000	0	0.001	Real time
P08-36	3rd notch filter frequency	50-5000	5000	HZ	Real time
P08-37	3rd notch filter width	50-1000	70	0.01	Real time
P08-38	3rd notch filter depth	0-1000	0	0.001	Real time

Note: The 1st and 2nd notch filters need to be enabled by P08-24 to work. The third notch filter only needs to set the frequency parameters to work.

Chapter 8 Parameter & Function

8.1 Parameter list

P00-xx Motor and drive parameters

P01-xx Main control parameter

P02-xx Gain parameters

P03-xx Position parameters

P04-xx Velocity parameters

P05-xx Torque parameters

P06-xx I/O parameters

P08-xx Advanced Function Parameters

The bit number identification (0, 1, 2, 3) represents the serial number of current parameter code value, which sorted as 3210. Blank means the entire parameter value.

Para code	bit	Name	Unit	Range	Default	Effective Time
P00-00		Motor number		0-2000	2000	Restart
P00-01		Motor rated speed	rpm	1-12000		Restart
P00-02		Motor rated torque	0.01Nm	1-65535		Restart
P00-03		Motor rated current	0.01A	1-65535		Restart
P00-04		Motor inertia	0.01kg cm2	1-65535		Restart
P00-05		Motor pole pairs	pole-pairs	1-50		Restart
P00-06		Current Motor No.		0-0		Restart
P00-07	0	Encoder (Type)		0-1	1	Restart
	1	Encoder (Disable overheat alarm)		0-1	1	Restart

	2	Encoder (Disable multi-turn alarm)		0-1	1	Restart
	3	Encoder (Disable battery alarm)		0-1	1	Restart
P00-08		Encoder zero offset		0-360	0	Restart
P00-09		Rated voltage	V	1-600		Restart
P00-10		Rated power	0.01kW	1-65535		Restart
P00-11		Max torque	0.01Nm	1-65535		Restart
P00-12		Max speed	rpm	1-12000		Restart
P00-13		Stator resistor	1mΩ	1-65535		Restart
P00-14		Stator inductance (Lq)	0.01mH	1-65535		Restart
P00-15		Stator inductance (Ld)	0.01mH	1-65535		Restart
P00-16		Line Back EMF Coefficient	0.01mV /krpm	1-65535		Restart
P00-17		Electrical constant	0.01ms	1-65535		Restart
P00-18		Mechanical constant	0.01ms	1-65535		Restart
P00-19		Current gain percentage	%	10-500		Restart
P00-20		Monitor display at power-on		0-100	100	Restart
P00-23		Slave station ID		1-255	1/2	Real time
P00-24	0	485 communication baud rate selection		0-7	2	Real time
	1	485 communication parity check mode		0-3	1	Real time
P00-26		Modbus response delay	0.1ms	0-100	1	Real time
P00-30		regen resistor setting		0-2	1	Real time
P00-31		Power of external regen resistor	1W	1-65535	40	Real time
P00-32		External regen resistor value	0.1Ω	1-65535	300	Real time
P00-33		Power of built-in regen resistor	1W	1-65535	40	Real time
P00-34		Built-in regen resistor value	0.1Ω	1-65535	400	Real time
P00-35		Regen resistor cooling coefficient	1%	1-100	20	Real time
P00-39	0	Three-phase power input selection		0-1	0	Restart

	1	RST power-on signal isolate		0-1	0	Restart
	2	Axis alarm association		0-1	0	Restart
P00-40		Temperature Compensation Settings	° C	-20-20	0	Real time
P00-41		Over Temperature Alarm Settings	° C	0-150	100	Real time
P00-42		Over Temperature Warning Setting	° C	0-150	100	Real time
P00-43		Fan Start Temperature Setting	° C	0-150	60	Real time
P00-44	0	Fan Fault Settings		0-1	0	Restart
	1	Abnormal communication with FPGA fault setting (E.052)		0-1	0	Restart
	2	Regeneration abnormal alarm (E.430)		0-1	0	Restart
	3	Soft start resistor overload fault setting (E.435)		0-1	0	Restart
P00-46	0	DB overload fault setting (E.436)		0-1	0	Restart
	1	Motor out of control detection fault setting (E.421)		0-1	0	Restart
	2	U-phase current feedback abnormal (E.071)		0-1	0	Restart
	3	W-phase current feedback abnormal (E.072)		0-1	0	Restart
P00-47	0	Power line off-line fault setting (E.305)		0-1	0	Restart
	1	FPGA Clock Abnormal Fault Settings (E.069)		0-1	0	Restart
P00-50		Motor stall protection time	ms	10-60000	500	Real time
P00-51		Overload warning value	%	0-100	100	Real time
P00-52		Undervoltage alarm voltage value	V	10-500	180	Restart
P00-55		Overload reference value	%	50-200	115	Restart
P00-56		Motor overload time percentage	%	10-100	100	Restart
P00-80		Carrier Wave Settings		0-2	0	Restart

P01-00	0	Rotation direction		0-1	0	Restart
P01-01	0	Control mode		0-6	0	Restart
P01-02	0	Adjustment mode		0-4	0	Restart
P01-03		Rigidity level		0-31	13	Restart
P01-04		Inertia ratio	%	0-20000	300	Real time
P01-05	0	mute adjustment		0-1	0	Restart
	1	Self-adjusting type		0-2	0	Restart
	2	Quiescent current basic gain		0-8	8	Restart
P01-06	0	Self-adjusting value		0-7	4	Real time
	1	Self-adjusting load value		0-2	1	Real time
P01-10		Vibration detection selection		0-2	0	Real time
P01-11		Vibration detection sensitivity	%	50-500	100	Real time
P01-12		Vibration detection level	rpm	0-5000	50	Real time
P01-13		Residual vibration detection amplitude	0.1%	1-3000	400	Real time
P01-20	0	Stop mode when servo OFF or Gr.1 error occurs		0-2	0	Restart
	1	Stop mode when Gr.2 error occurs		0-2	0	Restart
	2	Stop mode when overtravel		0-4	0	Restart
	3	Stop mode when forced to stop		0-2	0	Restart
P01-21		Deceleration stop torque when overtravel, emergency stop and fault	%	0-350	300	Real time
P01-22		Deceleration stop time when overtravel, emergency stop and fault	ms	0-60000	0	Real time
P01-29		Brake release to command reception delay	ms	0-500	100	Real time
P01-30		Static state, delay from brake OFF to motor power off	ms	0-500	100	Real time
P01-31		Rotation state, speed threshold when	rpm	0-6000	100	Real time

		the brake is OFF				
P01-32		Rotation state, delay from servo OFF to brake OFF	ms	0-1000	50	Real time
P01-35		Z signal width setting	0.1ms	1-1000	50	Real time
P02-00		Position loop gain	0.1/s	10-20000	400	Real time
P02-01		2nd position loop gain	0.1/s	10-20000	400	Real time
P02-03		Speed Feedforward Gain	%	0-100	30	Real time
P02-04		Speed feedforward filter time	0.01ms	-6400	50	Real time
P02-10		Speed loop gain	0.1Hz	10-20000	400	Real time
P02-11		Speed loop integral time constant	0.01ms	15-51200	2000	Real time
P02-13		2nd speed loop gain	0.1Hz	10-20000	400	Real time
P02-14		2nd Speed loop integral time constant	0.01ms	15-51200	51200	Real time
P02-19		Torque Feedforward Gain	%	-200	0	Real time
P02-20		Torque feedforward filter time	0.01ms	-6400	50	Real time
P02-21		Friction Compensation Gain	%	10-1000	100	Real time
P02-22		2nd friction compensation gain	%	10-1000	100	Real time
P02-23		Friction compensation coefficient	%	0-100	0	Real time
P02-24		Friction Compensation Frequency Compensation	0.1Hz	0-10000	0	Real time
P02-25		Friction Compensation Gain Compensation	%	1-1000	100	Real time
P02-30	0	Gain switching setting		0-1	0	Real time
	1	Gain switching selection		0-9	5	Real time
P02-31		1st gain switching time	ms	0-60000	100	Real time
P02-32		2nd gain switching time 2	ms	0-60000	800	Real time
P02-33		1st gain Switch Waiting Time	ms	0-60000	1000	Real time
P02-34		2nd gain Switch Waiting Time	ms	0-60000	100	Real time

P02-40	0	Mode switch function selection		0-4	0	Real time
P02-41		Mode switch torque command threshold	1%	0-350	200	Real time
P02-42		Mode switch speed command threshold	rpm	0-6000	0	Real time
P02-43		Mode Switch acceleration threshold	1rpm/s	0-30000	0	Real time
P02-44		Mode switch position deviation threshold	command unit	0-10000	0	Real time
P02-50		Added value of torque command	%	-100-100	0	Real time
P02-51		Positive direction torque compensation value	%	0-100	0	Real time
P02-52		Negative direction torque compensation value	%	0 - -100	0	Real time
P02-53		Viscous Friction Compensation Value	%	0-100	0	Real time
P02-57		Low Frequency Vibration Suppression Settings		0-1	0	Real time
P02-58		Low vibration frequency 1	0.1Hz	10-2000	800	Real time
P02-59		Low frequency resonance setting 1	%	10-1000	100	Real time
P02-60	0	Model Control Selection		0-1	0	Real time
	1	Vibration Suppression Options		0-1	0	Real time
P02-61		Model Tracking Control Gain	0.1/s	10-20000	500	Real time
P02-62		Model Tracking Control Gain Compensation	0.1%	500-2000	1000	Real time
P02-63		Model Control Bias (Forward Direction)	0.1%	0-10000	1000	Real time
P02-64		Model Control Bias (Reverse Direction)	0.1%	0-10000	1000	Real time
P02-65		Vibration suppression 1 Frequency A	0.1Hz	10-2500	500	Real time
P02-66		Vibration suppression 1 Frequency B	0.1Hz	10-2500	700	Real time
P02-67		Model Control speed Feedforward Compensation	0.1%	0-10000	1000	Real time
P02-68		2nd model control gain	0.1/s	10-20000	500	Real time

P02-69		2nd model control gain compensation	0.1%	500-2000	1000	Real time
P02-70		Speed vibration suppression settings		0-0x1121	0x0010	Real time
P02-71		Speed vibration suppression frequency	0.1Hz	10-20000	1000	Real time
P02-72		2nd Speed vibration suppression frequency	0.1Hz	10-20000	1000	Real time
P02-73		Speed vibration suppression gain compensation	%	1-1000	100	Real time
P02-74		Speed vibration suppression attenuation gain	%	0-300	100	Real time
P02-75		2nd Speed vibration suppression attenuation gain	%	0-300	100	Real time
P02-76		Speed vibration suppression filter time constant Compensation	0.01ms	0-1000	0	Real time
P02-77		2nd Speed vibration suppression filter time constant Compensation	0.01ms	0-1000	0	Real time
P02-88		Current loop gain value	%	20-500	100	Real time
P03-00	0	Position command setting		0-4	0	Restart
P03-01	0	Command pulse pattern		0-3	1	Restart
	1	Position command receiver port selection		0-1	0	Restart
P03-03	0	Command pulse inverse		0-1	0	Restart
	1	The active level of the command pulse		0-1	0	Restart
P03-04		Command pulse filter time	0.1us	0-2000	0	Real time
P03-05		Position complete output condition		0-2	0	Real time
P03-06		Position complete threshold	command unit	0-65535	7	Real time
P03-07		Position close to threshold	command unit	0-65535	60000	Real time

P03-09		Pulses for one motor revolution		0-1073741823	10000	Restart
P03-15		Threshold of position deviation fault	command unit	0-1073741823	90000	Real time
P03-17		Position command moving average time	0.1ms	0-10000	0	Real time
P03-18		Position command first-order low-pass filter time constant	0.1ms	0-65535	0	Real time
P03-25		Frequency division output pulse number		1-65535	2500	Restart
P03-26	0	Frequency division output pulse phase sequence inversion		0-1	0	Restart
P03-30		Position deviation excessive warning value	%	10-100	100	Real time
P03-31		Servo ON position deviation too large alarm value	指令单位	0-1073741823	90000	Real time
P03-33		Servo ON position deviation too large warning value	%	10-100	100	Real time
P03-34		Overshoot detection value	%	0-100	100	Real time
P03-40		1st Electronic Gear Molecule		1-1073741823	64	Restart
P03-42		1st Electronic Gear Denominator		1-1073741823	1	Restart
P03-44		2nd Electronic Gear Molecule		1-1073741823	64	Restart
P03-46		2nd Electronic Gear Denominator		1-1073741823	1	Restart
P03-50	0	Gantry function enable		0-n.xxx1	0	Real time
	1	Enable OFF, clear gantry deviation		0-n.xx1x	0	Real time
P03-53		Threshold of gantry function position		0-1073741823	10000	Real time

		deviation fault		23		
P03-55		Gantry function synchronous position proportional gain		0-500	10	Real time
P04-00	0	Speed command selection setting		0-5	0	Restart
P04-01		JOG speed command setting value	rpm	0-6000	0	Real time
P04-02		Speed command digital setting value	rpm	-6000-6000	0	Real time
P04-04		Zero speed clamp threshold	rpm	0-6000	30	Real time
P04-05		Overspeed threshold	rpm	0-6300	6300	Real time
P04-06		Forward speed limit	rpm	0-6300	6000	Real time
P04-07		Reverse speed limit	rpm	-6300-0	-6000	Real time
P04-10		Zero speed detection value	rpm	0-2000	30	Real time
P04-11		Motor rotation detection speed value	rpm	0-2000	20	Real time
P04-12		Speed reach signal threshold	rpm	0-2000	30	Real time
P04-14		Speed command acceleration time	ms	0-10000	0	Real time
P04-15		Speed command deceleration time	ms	0-10000	0	Real time
P04-30		Internal setting speed 1	rpm	-6000-6000	0	Real time
P04-31		Internal setting speed 2	rpm	-6000-6000	0	Real time
P04-32		Internal setting speed 3	rpm	-6000-6000	0	Real time
P04-33		Internal setting speed 4	rpm	-6000-6000	0	Real time
P04-34		Internal setting speed 5	rpm	-6000-6000	0	Real time
P04-35		Internal setting speed 6	rpm	-6000-6000	0	Real time
P04-36		Internal setting speed 7	rpm	-6000-6000	0	Real time
P04-37		Internal setting speed 8	rpm	-6000-6000	0	Real time
P05-00	0	Torque command selection setting		0-5	0	Restart
P05-01		Torque control speed limit source setting		0-3	1	Real time

P05-02		Torque control speed limit value	rpm	0-6000	1000	Real time
P05-03		Torque command digital setting value	%	-300-300	0	Real time
P05-05		Torque limiting source setting		0-3	0	Real time
P05-06		Torque limit detection signal output delay	ms	0-10000	0	Real time
P05-10		Positive internal torque limit	%	0-350	200	Real time
P05-11		Negative internal torque limit	%	-350-0	-200	Real time
P05-12		Positive external torque limit	%	0-350	200	Real time
P05-13		Negative external torque limit	%	-350-0	-200	Real time
P05-14		Internally setting torque 1	%	-300-300	0	Real time
P05-15		Internally setting torque 2	%	-300-300	0	Real time
P05-16		Internally setting torque 3	%	-300-300	0	Real time
P05-17		Internally setting torque 4	%	-300-300	0	Real time
P06-00		1st Effective DI function assignment after power-on		0-n.FFFF	0	Restart
P06-01		2nd Effective DI function assignment after power-on			0	Restart
P06-05	0	Speed analog command selection			0	Restart
	1	Torque analog command selection			0	Restart
P06-11	01	DI1 Terminal settings - Function selection			01	Restart
	2	DI1 Terminal settings - Logic selection			1	Restart
P06-12	01	DI2 Terminal settings - Function selection			02	Restart
	2	DI2 Terminal settings - Logic selection			2	Restart
P06-13	01	DI3Terminal settings - Function selection			03	Restart
	2	DI3Terminal settings - Logic selection			1	Restart
P06-14	01	DI4Terminal settings - Function selection			04	Restart
	2	DI4Terminal settings - Logic selection			1	Restart

P06-15	01	DI5 Terminal settings - Function selection		00-1E	07	Restart
	2	DI5 Terminal settings - Logic selection		0-4	1	Restart
P06-16	01	DI6 Terminal settings - Function selection		00-1E	08	Restart
	2	DI6 Terminal settings - Logic selection		0-4	1	Restart
P06-21	01	DO1 Terminal settings - Function selection		00-13	01/00	Restart
	2	DO1 Terminal settings - Logic selection		0-1	1	Restart
P06-22	01	DO2 Terminal settings - Function selection		00-13	02/00	Restart
	2	DO2 Terminal settings - Logic selection		0-1	1	Restart
P06-23	01	DO3 Terminal settings - Function selection		00-13	00/01	Restart
	2	DO3 Terminal settings - Logic selection		0-1	1	Restart
P06-24	01	DO4 Terminal settings - Function selection		00-13	00/02	Restart
	2	DO4 Terminal settings - Logic selection		0-1	1	Restart
P06-40		The analog 1V corresponds to the speed value	rpm	0-2000	300	Real time
P06-41		AI1 filter time constant	0.01ms	0-2500	10	Real time
P06-42		AI1 offset	mV	-9999-9999	0	Real time
P06-43		The analog 1V corresponds to the torque value	%	0-100	10	Real time
P06-44		AI2Filter time constant	0.01ms	0-2500	10	Real time
P06-45		AI21 Offset	mV	-9999-9999	0	Real time
P06-46		AI1 Dead zone	mV	0-9999	0	Real time
P06-47		AI2 Dead zone	mV	0-9999	0	Real time
P08-00	0	Offline inertia identification mode		0-n.xxx1	0	Real time
	1	Online inertia identification mode		-n.xx1x		Real time
P08-01		Inertia Identification Initial Value of Inertia	1%	0-20000	300	Real time
P08-02		Inertia identification running circles	0.1	5-1000	30	Real time

			turn			
P08-03		Inertia identification maximum speed	rpm	10-2000	800	Real time
P08-04		Inertia identification acceleration time	ms	20-800	100	Real time
P08-05		Waiting time after a inertia identification completed	ms	50-10000	1000	Real time
P08-06		Program JOG mode		0-5	0	Real time
P08-07		Program JOG movement distance	0.1 turn	1-2000	30	Real time
P08-09		Program JOG movement speed	rpm	1-10000	500	Real time
P08-10		Program JOG acceleration & deceleration time	ms	2-10000	100	Real time
P08-11		Program JOG waiting time	ms	0-10000	100	Real time
P08-12		Program JOG movement times	次	0-10000	1	Real time
P08-15	0	Auto adjust inertia settings		0-n.xxx1	1	Real time
	1	Auto adjust mode settings		0-n.xx3x	3	Real time
P08-16		Auto adjust maximum gain	0.1Hz	100-7000	3000	Real time
P08-17		Velocity observer gain	Hz	10-500	500	Real time
P08-18		Velocity observer coefficient	%	0-500	150	Real time
P08-20		1st segment 1st torque command filter time constant	0.01ms	0-2500	100	Real time
P08-21		1st segment 2nd torque command filter time constant	0.01ms	0-2500	100	Real time
P08-22		2nd segment 2nd torque command filter frequency	Hz	100-5000	5000	Real time
P08-23		2nd segment 2nd torque command filter Q value	0.01ms	50-100	50	Real time
P08-24	0	1st notch filter selection		0-1	1	Real time
	1	2nd notch filter selection		0-1	1	Real time

	3	Friction compensation function selection		0-1	1	Real time
P08-25	0	Adaptive1st notch filter mode setting		0-1	1	Real time
	1	Adaptive 2nd notch filter mode setting		0-1	1	Real time
P08-30		1st notch filter frequency	Hz	50-5000	5000	Real time
P08-31		1st notch filter width	0.01	50-1000	70	Real time
P08-32		1st notch filter depth	0.001	0-1000	0	Real time
P08-33		2nd notch filter frequency	Hz	50-5000	5000	Real time
P08-34		2nd notch filter width	0.01	50-1000	70	Real time
P08-35		2nd notch filter depth	0.001	0-1000	0	Real time
P08-36		3rd notch filter frequency	Hz	50-5000	5000	Real time
P08-37		3rd notch filter width	0.01	50-1000	70	Real time
P08-38		3rd notch filter depth	0.001	0-1000	0	Real time
P08-51		Frequency sweep torque amplitude	%	1-300	15	Real time

Notes:

1: The bit number identification (0, 1, 2, 3) represents the serial number of current parameter code value, which sorted as 3210. Blank means the entire parameter value.

2: Most of factory values in the parameter table are the same, except some AB axes motors. Here we use A/B for distinguish, value before / means the factory value of A axis, and value after / means factory value of B axis.

8.2 Parameter Description

Parameter Code	Bit Number	Name	Unit	Parameter Range	Default Setting	Setting Method
P00-07	0	Encoder (Type)		0-1	1	Running & setting
	1	Encoder (Disable overheat alarm)		0-1	1	Running & setting
	2	Encoder (Disable multi-turn alarm)		0-1	1	Running & setting
	3	Encoder (Disable battery alarm)		0-1	1	Running & setting

注：如上图红框显示：代表该参数**位号**标识，其中 **0**、**1**、**2**、**3** 代表当前参数值的位号，位号排序为 **3210**

8.2.1 P00-xx Motor and drive parameters

Para Code		Name	Description
P00-00		Motor number	Factory set, no need to reset 0: P00-00 ~ P00-19 works 2000: Absolute encoder motor, automatically identified by the drive (P00-01 ~ P00-19)
P00-01		Motor rated speed	Setting range: 1-6000; Unit: rpm Factory set, no need to reset
P00-02		Motor rated torque	Setting range: 1-65535; Unit: 0.01N.M Factory set, according to the motor matched
P00-03		Motor rated current	Setting range: 1-65535; Unit: 0.01A Factory set, according to the motor matched
P00-04		Motor inertia moment	Setting range: 1-65535; Unit: 0.01kg.cm² Factory set, according to the motor matched
P00-05		Motor pole pairs	Setting range: 1-31; Unit: Pairs Factory set, according to the motor matched
P00-07	0	Encoder (Type)	Setting range: 0-1 0: Incremental encoder; 1: Absolute encoder.
	1	Encoder (Disable overheat alarm)	Setting range: 0-1 0: Turn on overheat alarm; 1: Turn off overheat alarm.
	2	Encoder (Disable multi-turn alarm)	Setting range: 0-1 0: Turn on Multi-turn alarm (Multi-turn absolute encoder) 1: Turn off Multi-turn alarm (Single-turn absolute encoder)
	3	Encoder (Disable battery alarm)	Setting range: 0-1 0: Turn on Battery alarm (Multi-turn absolute encoder) 1: Turn off Battery alarm (Single-turn absolute encoder)
P00-08		Encoder zero offset	Encoder zero offset
P00-09		Rated voltage	Rated voltage
P00-10		Rated power	Rated power
P00-11		Max torque	Max torque

P00-12		Max speed	Max speed
P00-13		Stator resistor	Stator resistor
P00-14		Stator inductance (Lq)	Stator inductance (Lq)
P00-15		Stator inductance (Ld)	Stator inductance (Ld)
P00-16		Line Back EMF Coefficient	Line Back EMF Coefficient
P00-17		Electrical constant	Electrical constant
P00-18		Mechanical constant	Mechanical constant
P00-19		Current gain percentage	Current gain percentage
P00-20		Monitor display at power-on	Monitor display at power-on
P00-23		Slave station ID	Slave station ID setting
P00-24	0	Modbus Communication baud rate	Setting range: 0-7; Default: 2 0:2400 1:4800 2:9600 3:19200 4:38400 5:57600 6:115200 7:256000
P00-24	1	485 communication parity check mode	Setting range: 0-3; Default: 0 0: No parity, 2 stop bits 1: Even parity, 1 stop bit 2: Odd parity, 1 stop bit 3: No parity, 1 stop bits

P00-26		Modbus response delay	Setting range: 0-100, unit: 01mS. Default 0 When the parameter is set to 0, it responds according to standard communication. When the parameter is set to a value, the Modbus communication response time responds according to the set time
P00-30		regen resistor setting	Setting range: 0-2 0: No regenerated resistor is used 1: Use built-in regenerative resistor 2: Use external regenerative resistance
P00-31		Power of external regen resistor	The value ranges from 1 to 65535, unit: 1W Set the brake resistance power correctly according to the external brake resistance power. For example, if the value is 40, the resistance power is 40W
P00-32		External regen resistor value	The value ranges from 1 to 65535, unit: 0.1 ohm Set correctly according to the value of the external brake resistance
P00-33		Power of built-in regen resistor	The value ranges from 1 to 65535, unit: 1W According to the built-in brake resistance power set correctly, such as: set value 40, then the resistance power is 40W
P00-34		Built-in regen resistor value	The value ranges from 1 to 65535, unit: 0.1 ohm Set correctly according to the built-in brake resistance value
P00-35		Regen resistor cooling coefficient	Setting range: 1-100, unit: % According to the resistance heat dissipation conditions reasonable setting, heat dissipation conditions can be properly set large. When the setting value is large, the allowable energy of resistance regeneration increases and it is not easy to report regeneration overload.
P00-39	0	Three-phase power input selection	Setting range: 0-1 0: Single-phase power input 1: Three-phase power input (Alarm AL400 while phase loss)
	1	RST Power-on signal shield	Setting range: 0-1 0: Normal use power-on judgment signal 1: Shield power-on signal
	2	Axis alarm association	Setting range: 0-1 0: 1, 2 axis alarm independent; 1: 1, 2 axis alarm association, one axis alarms, the other stops.
P00-40		Temperature	Setting range: -20-20

		Compensation Settings	Temperature Compensation Settings
P00-41		Over Temperature Alarm Settings	Setting range: 0-150 Over Temperature Alarm Settings
P00-42		Over Temperature Warning Setting	Setting range: 0-150 Over Temperature Warning Setting
P00-43		Fan Start Temperature Setting	Setting range: 0-150 Fan Start Temperature Setting
P00-44	0	Fan Fault Settings	Setting range: 0-1 0: Close fault 1: Allow fault
	1	Abnormal communication with FPGA fault setting (E.052)	Setting range: 0-1 0: Close fault 1: Allow fault
	2	Regeneration abnormal alarm (E.430)	Setting range: 0-1 0: Close fault 1: Allow fault
	3	Soft start resistor overload fault setting (E.435)	Setting range: 0-1 0: Close fault 1: Allow fault
P00-46	0	DB overload fault setting (E.436)	Setting range: 0-1 0: Close fault 1: Allow fault
	1	Motor out of control detection fault setting (E.421)	Setting range: 0-1 0: Close fault 1: Allow fault
	2	U-phase current feedback abnormal (E.071)	Setting range: 0-1 0: Close fault 1: Allow fault

	3	W-phase current feedback abnormal (E.072)	Setting range: 0-1 0: Close fault 1: Allow fault
P00-47	0	Power line off-line fault setting (E.305)	Setting range: 0-1 0: Close fault 1: Allow fault
P00-47	1	FPGA Clock Abnormal Fault Settings (E.069)	Setting range: 0-1 0: Close fault 1: Allow fault
P00-50		Motor stall protection time	Motor stall protection time
P00-51		Overload warning value	Overload warning value
P00-52		Undervoltage alarm voltage value	Undervoltage alarm voltage value
P00-55		Overload reference value	Overload reference value
P00-56		Motor overload time percentage	Motor overload time percentage

8.2.2 Main control parameter

Para Code	Name	Description
P01-00	Rotation direction	Setting range: 0-1 0: Counterclockwise is the positive direction 1: Clockwise is the positive direction
P01-01	Control mode	Setting range: 0-5 0: Position control mode 1: Speed control mode 2: Torque control mode 3: Speed & Torque control mode. Use an external input port in CN1

<table>
<tr><td></td><td></td><td>for switch, and set the function selection of the selected DI port input port to 5 (Control mode switching). The control mode can be switched by controlling the logic state of this port.
<table>
<tr><td>Terminal logic</td><td>Control mode</td></tr>
<tr><td>Effective</td><td>Speed mode</td></tr>
<tr><td>Ineffective</td><td>Torque mode</td></tr>
</table>
4: Position & Speed control mode. Use an external input port in CN1 for switch, and set the function selection of the selected DI port input port to 5 (Control mode switching). The control mode can be switched by controlling the logic state of this port.
<table>
<tr><td>Terminal logic</td><td>Control mode</td></tr>
<tr><td>Effective</td><td>Position mode</td></tr>
<tr><td>Ineffective</td><td>Speed mode</td></tr>
</table>
5: Position & Torque control mode. Use an external input port in CN1 for switch, and set the function selection of the selected DI port input port to 5 (Control mode switching). The control mode can be switched by controlling the logic state of this port.
<table>
<tr><td>Terminal logic</td><td>Control mode</td></tr>
<tr><td>Effective</td><td>Position mode</td></tr>
<tr><td>Ineffective</td><td>Torque mode</td></tr>
</table></td></tr>
<tr><td>P01-02</td><td>adjustment mode</td><td>Setting range: 0-4
0: Manually adjust rigidity.
1: Standard mode automatically adjusts rigidity. In this mode, parameters P02-00, P02-01, P02-10, P02-11, P02-13, P02-14, P08-20 will be set automatically according to the rigidity level set by P01-03, manual adjustment of these parameters will not work. The following parameters are set by the user:
P02-03 (velocity feed-forward gain), P02-04 (velocity feed-forward smoothing constant).
2: Positioning mode automatically adjusts rigidity. In this mode, in this mode, the parameters P02-00, P02-01, P02-10, P02-11, P02-13, P02-14,</td></tr>
</table>

			P08-20 will be set automatically according to the rigidity level set by P01-03, manual adjustment of these parameters will not work. The following parameters are fixed values and cannot be changed: P02-03 (speed feed-forward gain): 30.0% P02-04 (velocity feed-forward smoothing constant): 0.50 3: Automatically adjust rigidity 2, in this mode, parameters P02-00, P02-01, P02-10, P02-11, P02-13, will be automatically set according to the rigidity level set by P01-03. The following parameters are set by the user: P02-03 (speed feed-forward gain), P02-14 (speed integration constant 2), P08-20 (torque command filter constant 1), P08-21 (torque command filter constant 2) 4: Automatic adjustment, dependent parameters P01-05, P01-06
P01-03		Rigidity level	Setting range: 0-31 Built-in 32 kinds of gain class parameters, when P01-02 is set to 1, 2, 3. It can be called directly according to the actual situation, and the larger the setting value, the stronger the rigidity.
P01-04		Inertia ratio	Setting range: 0-20000, unit: 1% Set the load inertia ratio of the corresponding motor as follows: P01-04 = load inertia / motor moment of inertia This inertia ratio can be identified using the F19.J-L auto-inertia recognition value, and the identified value is written to the parameter
P01-05	0	mute adjustment	Setting range: 0-1 0: Turn off mute adjustment 1: Turn on mute adjustment
	2	Quiescent current basic gain	Setting range: 0-8 The smaller the value, the smaller the current gain at low loads. 0: corresponds to 20%, 8 corresponds to 100%.
P01-06	0	Self-adjusting value	Setting range: 0-7 When P01-02 is set to 4, it works, the larger the value, the stronger the rigidity.
P01-06	1	Self-adjusting load	Setting range: 0-2 Useful when P01-02 is set to 4

		value	The higher the value, the greater the model load
P01-10		Vibration detection selection	Setting range: 0-2 Useful when P01-02 is set to 4 The higher the value, the greater the model load Setting range: 0-2 0: No vibration detection (turn off E.520 alarm) 1: Warning after vibration detection (off A.911 warning) 2: Alarm after vibration detection
P01-11		Vibration detection sensitivity	Setting range: 50-500, unit: % Percentage based on P02-52
P01-12		Vibration detection level	Setting range: 0-5000 units: rpm Vibration detection level base
P01-13		Residual vibration detection amplitude	Setting range: 1-3000 units: 0.1% Based on the positioning completion threshold
P01-20	0	Stop mode when servo OFF or Gr.1 error occurs	Setting range: 0-2. You need to check whether the driver has DB hardware circuitry. 0: Stop the motor via DB, then keep DB. 1: Stop the motor through the DB, then disarm the DB. 2: Do not use DB, stop freely
	1	Stop mode when Gr.2 error occurs	0: Use the setting in P120.nnnX. 1: Set the torque deceleration stop according to P01-21, and follow the setting in P01-20.nnnX after shutdown. 2: Decelerate and stop according to P01-22 deceleration time, and follow the settings in P01-20.nnnX after shutdown
P01-20	2	Stop method when overtravel	0: Use the settings in P01-20.nnnX. 1: Set the torque deceleration and stop according to P01-21, and the servo is locked after shutdown. 2: Set the torque deceleration and stop according to P01-21, and enter the free running state after the shutdown. 3: Decelerate and stop according to P01-22 deceleration time, and the servo locks after shutdown. 4: Decelerate and stop according to P01-22 deceleration time, and enter the

			free running state after shutdown
	3	Stop method when forced to stop	0: Use the settings in P01-20.nnnX. 1: Set the torque deceleration stop according to P01-21, and use the settings in P01-20.nnnX after shutdown. 2: Decelerate and stop according to P01-22 deceleration time, and use the settings in P01-20.nnnX after shutdown.
P01-21		Deceleration stop torque when overtravel, emergency stop and fault	Setting range: 0-350 units: % Set the deceleration and stop torque in case of emergency stop, failure, overtravel
P01-22		Deceleration stop time when overtravel, emergency stop and fault	Setting range: 0-60000 units: ms Emergency stops, breakdowns, deceleration downtime in case of overtravel
P01-29		Brake release to command reception delay	Setting range: 0-500 units: ms The delay time when the brake is turned on until the command is received
P01-30		Static state, delay from brake OFF to motor power off	Setting range: 0-500 units: ms When enabling is on: After executing the enable command, the driver will not receive the position command until the time has elapsed from P01-30. Off enable: When the motor is in a stationary state, after the off enable command is executed, the time between the shutdown brake closing and the motor becoming non-energized.
P01-31		Rotation state, speed threshold when the brake is OFF	Setting range: 0-6000, unit: rpm When the motor is in rotation, the motor speed threshold when the brake output is active. Below this threshold, the holding brake output command is valid, otherwise it will wait for time P01-32 before the holding brake output command is valid.
P01-32		Rotation state,	Setting range: 0-1000, unit: ms

	delay from servo OFF to brake OFF	The maximum waiting time of the holding brake output when the enable time is turned off and the motor is in rotation.
P01-35	Z signal width setting	Setting range: 0-1000, unit: 0.1ms If set to 0, the default width is set When there is a value, the Z signal width is measured in set time

8.2.3 P02-xx Gain parameter

Para code	Name	Description
P02-00	Position loop gain	Setting range: 0-20000, unit: 0.1/s The proportional gain of the position ring regulator, the larger the parameter value, the higher the gain ratio, the greater the stiffness, the smaller the position tracking error, and the faster the response. However, too large parameters can easily cause vibration and overshoot. This parameter is for steady-state response.
P02-01	2nd Position loop gain	Setting range: 0-20000, unit: 0.1/s The proportional gain of the position ring regulator, the larger the parameter value, the higher the gain ratio, the greater the stiffness, the smaller the position tracking error, and the faster the response. However, too large parameters can easily cause vibration and overshoot. This parameter is for dynamic response.
P02-03	Speed feedforward gain	Setting range: 0-100, unit: 1% The feed-forward gain of the velocity loop, the larger the parameter value, the smaller the system position tracking error and the faster the response. However, excessive feedforward gain will make the position loop of the system unstable, which is easy to produce overshoot and oscillation.
P02-04	Speed feedforward filter time	Setting range: 0-64.00, unit: 0.01ms This parameter is used to set the velocity ring feed-forward filter time constant. The higher the value, the filtering effect increases, but at the same time the phase lag increases.

P02-10	Speed loop gain	Setting range: 10-20000, unit: 0.1Hz The greater the speed proportional gain, the greater the servo stiffness, and the faster the speed response, but excessive vibration and noise are easily generated. Under the condition that the system does not oscillate, increase the value of this parameter as much as possible. This parameter is for a static response.
P02-11	Speed loop integral constant	Setting range: 15-51200, unit: 0.01ms The speed regulator integrates the time constant, the smaller the setting value, the faster the integration speed, the greater the stiffness, too small is easy to generate vibration and noise. In the absence of oscillation in the system, reduce the value of this parameter as much as possible. This parameter is for steady-state response.
P02-13	2nd Speed loop gain	Setting range: 10-20000, unit: 0.1Hz The greater the speed proportional gain, the greater the servo stiffness, and the faster the speed response, but excessive vibration and noise are easily generated. Under the condition that the system does not oscillate, increase the value of this parameter as much as possible. This parameter is for dynamic response.
P02-14	2nd Speed loop integral time constant	Setting range: 15-51200, unit: 0.01ms The speed regulator integrates the time constant, the smaller the setting value, the faster the integration speed, the greater the stiffness, too small is easy to generate vibration and noise. In the absence of oscillation in the system, reduce the value of this parameter as much as possible. This parameter is for dynamic response.
P02-19	Torque feedforward gain	Setting range: 0-200, unit: 1% Set the current loop feed-forward weight. This parameter weights the differentiation of the speed command and adds the current loop.

P02-20		Torque feedforward filter time	Setting range: 0-6400, unit: 0.01ms This parameter is used to set the torque feed-forward filter time constant
P02-21		Friction compensation gain	Setting range: 10-1000, unit: 0.1% Set parameters for responsiveness to external interference. The higher the setpoint, the better the response to external interference, and if the effect is insufficient, increase the setpoint of friction compensation gain in units of 10% without vibration, but vibration may be generated when the setpoint is too high when the device has a resonance frequency.
P02-22		2nd Friction compensation gain	Setting range: 10-1000, unit: 0.1% Set parameters for responsiveness to external interference. The higher the setpoint, the better the response to external interference, and if the effect is insufficient, increase the setpoint of friction compensation gain in units of 10% without vibration, but vibration may be generated when the setpoint is too high when the device has a resonance frequency.
P02-23		Friction compensation coefficient	Setting range: 0-100, unit: 1% Set the parameters of the friction compensation effect. The higher the setpoint, the better the effect, but if the setpoint is too high, the more likely the response is to vibrate. Generally, set the setting value below 95%.
P02-24		Friction compensation frequency compensation	Setting range: 0-10000, unit: 0.1Hz This parameter is used for friction compensation frequency compensation
P02-25		Friction compensation gain compensation	Setting range: 1-1000, unit: % This parameter is used for friction compensation gain compensation
P02-30	0	Gain switching settings	0: No gain switching. 1: Automatically switch the gain according to the conditions
	1	Gain switching selection	Setting range: 0-9 Set the conditions for switching between the first gain (P02-00, P02-10, P02-11, P08-20) and the second gain (P02-01, P02-13, P02-14, P08-21).

<table>
<tr><td>P02-30</td><td></td><td></td><td>0: Positioning completes the output signal ON
1: Positioning the output signal OFF
2: Locate close to the output signal ON
3: Locate close to the output signal OFF
4: Position command filter output = 0 and command pulse input OFF
5: Position command pulse input ON
6: Gain switching IO input is active
7: Zero speed status is valid
8: Motor rotation state
9: Speed consistent state</td></tr>
<tr><td>P02-31</td><td colspan="2">1st gain switching time</td><td>Setting range: 0-60000 Unit: 1ms
Set the time from the first set of gains to the second set of gains</td></tr>
<tr><td>P02-32</td><td colspan="2">2nd gain switching time 2</td><td>Setting range: 0-60000 Unit: 1ms
Set the first set of gain switching time from the second set of gains</td></tr>
<tr><td>P02-33</td><td colspan="2">1st gain Switch Waiting Time</td><td>Setting range: 0-1000.0, unit: ms
Set the first set of gain switching wait times when the switching condition is reached</td></tr>
<tr><td>P02-34</td><td colspan="2">2nd gain Switch Waiting Time</td><td>Setting range: 0-1000.0, unit: ms
Set the second set of gain switching wait times when the switching condition is reached</td></tr>
<tr><td>P02-40</td><td>0</td><td>Mode switch function selection</td><td>Setting range: 0-4
Set the conditions for speed loop PI control and P control
<table>
<tr><td>value</td><td>Judgment conditions</td><td>remark</td></tr>
<tr><td>0</td><td>Torque command</td><td>When the torque command is less than P02-41, it is PI control, and if it is greater, it is P control</td></tr>
<tr><td>1</td><td>Speed command</td><td>When the speed command is less than P02-42, it is PI control, and if it is greater than it, it is P control</td></tr>
</table></td></tr>
</table>

<table>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>2</td><td>acceleration</td><td>When the acceleration is less than P02-43, it is PI control, and if it is greater than it, it is P control</td></tr>
<tr><td>3</td><td>position deviation</td><td>The position deviation is less than P02-45 when the threshold is set for PI control, and greater than P control</td></tr>
<tr><td>4</td><td>Modeless switch</td><td>The position deviation is less than P02-45 when the threshold is set for PI control, and greater than P control</td></tr>
</table>
</td></tr>
<tr><td>P02-41</td><td>Mode switch torque command threshold</td><td>Setting range: 0-350, unit: 1%
When P02-40.0=0, when the torque command is less than the set value driver PI control, greater than P control</td></tr>
<tr><td>P02-42</td><td>Mode switch speed command threshold</td><td>Setting range: 0-6000, unit: rps
P02-40.0=1, when the speed command is less than the setpoint driver PI control, greater than P control</td></tr>
<tr><td>P02-43</td><td>Mode switch acceleration threshold</td><td>Setting range: 0-30000, unit: 1rps/s
When P02-40.0=2, when the acceleration is less than the setpoint driver PI control, greater than P control</td></tr>
<tr><td>P02-44</td><td>Mode switch position deviation threshold</td><td>Setting range: 0-10000, unit: 1 command unit
When P02-40.0=3, when the position deviation is less than the setpoint driver PI control, it is greater than P control</td></tr>
<tr><td>P02-50</td><td>Added value of torque command</td><td>Setting range: -100-100, unit: 1%
Valid when in position control mode. This value is superimposed on the given torque value and is used for static moment compensation on the vertical axis.</td></tr>
<tr><td>P02-51</td><td>Positive torque compensation value</td><td>Setting range: -100-100, unit: 1%
Valid when in position control mode. Used to compensate for positive static friction</td></tr>
<tr><td>P02-52</td><td>Negative direction torque compensation value</td><td>Setting range: -100-100, unit: 1%
Valid when in position control mode. Used to compensate for reverse static friction</td></tr>
</table>

P02-53		Viscous friction compensation value	Setting range: 0-100, unit: 1%
P02-57		Low frequency vibration suppression setting	Setting range: 0-1 0: P02-58, P02-59 is invalid 1: Effective In position mode, it is used to suppress machine shaking caused by positioning.
P02-58		Low frequency vibration frequency 1	Setting range: 10-2000 units: 0.1Hz
P02-59		Low frequency resonance setting 1	Setting range: 10-1000 units: %
P02-60	0	Model Control Selection	Setting range: 0-1 0: Disable 1: Enable
	1	Vibration Suppression Options	Setting range: 0-1 0: Disable 1: Enable
P02-61		Model controls gain	Model tracking control bias (forward direction)
P02-62		Model controls gain compensation	Model Control Bias (Inverting Direction)
P02-63		Model control bias (forward direction)	Setting range: 10-1000 units: 0.1% If the forward and reverse responses are different, fine-tune them with the following parameters. If you decrease the setpoint, the responsiveness is slower, but overshoot is not likely to occur.
P02-64		Model Control Bias (reverse Direction)	Setting range: 10-10000 Units: 0.1% If the forward and reverse responses are different, fine-tune them with the following parameters. If you decrease the setpoint, the responsiveness is slower, but overshoot is not likely to occur.

P02-65		Vibration suppression 1 frequency A	Vibration suppression 1 frequency A
P02-66		Vibration suppression 1 frequency B	Vibration suppression 1 frequency B
P02-67		Model controls speed feedforward compensation	Setting range: 10-10000 Units: 0.1% Even if you adjust the model control gain, model control bias (forward direction), and model tracking control offset (reverse direction), when overshoot still occurs, you can improve this parameter by adjusting this parameter. If you decrease the setpoint, the responsiveness is slower, but overshoot is not likely to occur.
P02-68		2nd model control gain	Setting range: 10-20000 Unit: 0.1/s When P02-60.0=1, increase the second model control gain, the responsiveness becomes higher and the positioning time becomes shorter. The responsiveness of the servo system depends on this parameter
P02-69		2nd model control gain compensation	Setting range: 500-2000 Unit: 0.1% By increasing the model control gain compensation, the responsiveness becomes higher and the positioning time becomes shorter.
P02-70	0	Speed vibration suppression settings	Setting range: 0-1 0: No speed vibration suppression 1: Perform speed vibration suppression
P02-71		Speed vibration suppression frequency	Setting range: 10-20000 Unit: 0.1Hz Set the speed damping frequency
P02-72		2nd Speed vibration suppression frequency	Setting range: 10-20000 Unit: 0.1Hz Set the speed damping frequency2

P02-73	Speed vibration suppression gain compensation	Setting range: 0-1000 Units: 1%
P02-74	Speed vibration suppression attenuation gain	Setting range: 0-300 units: 1% The higher the value, the stronger the vibration suppression effect
P02-75	2nd Speed vibration suppression attenuation gain	Setting range: 0-300 units: 1% The higher the value, the stronger the vibration suppression effect
P02-76	Speed vibration suppression filter time constant Compensation	Setting range: 0-1000 Unit: 0.01ms
P02-77	2nd Speed vibration suppression filter time constant Compensation	Setting range: 0-1000 Unit: 0.01ms
P02-88	Current loop gain value	Setting range: 0-1000 Unit: 0.01ms

8.2.4 P03-xx Position parameter

para code	Name	Description
P03-00	Position command source	0: Pulse command 1: Reserved

			2: Bus instructions 3: Built-in multi-segment position
P03-01	0	Command pulse pattern	0: Quadrature pulse command (90° phase difference two-phase pulse) 1: Direction + pulse command 2 or 3: Double pulse command (CW+CCW)
	1	Position command receiver port selection	0: Pulse port input of this axis 1: Another shaft pulse port input Used to adjust the pulse command counting direction
P03-03	0	Command pulse inverse	Used to adjust the pulse command counting direction 0: Normal. 1: Reverse direction 0: Rising edge count
	1	The active level of the command pulse	0: Rising edge count 1: Falling edge count
P03-04		Command pulse filter time	Setting range: 0-2000 Unit: 0.1us Command pulse filter width setting, filter width = set value * 0.1 (us)
P03-05		Position complete output condition	0: The position deviation is less than the P03-06 setpoint 1: The position deviation is less than the P03-06 set value, and the command after position command filtering is 0 2: The position deviation is less than the P03-06 set value, and the command after the position command is 0
P03-06		Position complete threshold	Setting range: 0-65535 Unit: Instruction unit Used to set the threshold value of the position-completed output to the command unit (refer to parameters P03-09, P03-40, P03-42) The positioning completion range is used as the basis for determining the position gain tuning in the one-key autotuning function.
P03-07		Position close to	Setting range: 0-65535 Unit: Instruction unit

		threshold	Used to set the threshold value of the position-completed output to the command unit (refer to parameters P03-09, P03-40, P03-42) The positioning completion range is used as the basis for determining the position gain tuning in the one-key autotuning function.
P03-09		Pulses for one motor revolution	Setting range: 0-1073741823 Used to set the number of command pulses for one revolution of motor rotation. When this parameter is set to 0, the P03-40 and P03-42 parameters are valid.
P03-15		Threshold of position deviation fault	Setting range: 0-1073741823 Unit: Command unit Set the number of pulses that can be deviated, and if the set value is exceeded, an alarm E.501 will be alarmed. Do not check out when set to 0
P03-17		Position command moving average time	Setting range: 0-10000 Unit: 0.1ms Set the time constant of the position command smoothing filter, the moving average filter.
P03-18		Position command first-order low-pass filter time constant	Setting range: 0-65535 Unit: 0.1ms Set the time constant of the position command smoothing filter, a first-order low-pass filter.
P03-25		Frequency division output pulse number	Setting range: 0-65535 Set the absolute value of the motor rotation one turn, the number of A and B frequency pulses each output. Example: The setting value is 2500, and for each revolution of the motor, the A and B signals output 2500 pulses each
P03-26	0	Frequency division output pulse phase sequence inversion	Used to adjust the phase sequence of the crossover output pulse 0: Normal. 1: Reverse direction
P03-30		Position deviation excessive warning	Setting range: 0-100 units:% Excessive position deviation warning value = P03-30 set

		value	value * P03-15
P03-31		Servo ON position deviation is too large alarm value	Unit: Command unit Setting range: 0-1073741823 The number of pulses allowed to deviate when setting the servo ON, if it exceeds the set value, it will alarm E.503, and it will not be detected when it is set to 0
P03-33		Servo ON position deviation too large warning value	Setting range: 0-100 units:% Servo ON position deviation is too large warning value = set value * P03-31
P03-34		Overshoot detection value	Setting range: 0-100 units:% Overshoot detection threshold = P03-34* P03-06. The overshoot detection value will be used as the basis for position gain tuning in the one-key autotuning function.
P03-40		1st Electronic Gear Molecule	See 6.1.3 Examples of electronic gear ratio calculations for instructions Note: The encoder molecule is 8388608
P03-42		1st Electronic Gear Denominator	
P03-44		2nd Electronic Gear Molecule	
P03-46		2nd Electronic Gear Denominator	
P03-50	0	Gantry function enable	0: Turn off the gantry function. 1: Parameter setting enable, and input IO gantry enable at the same time to start the gantry function
	1	Enable OFF, clear gantry deviation	0: Turn off the gantry function. 1: Parameter setting enable, and input IO gantry enable at the same time to start the gantry function
P03-53		Threshold of gantry function position deviation fault	Setting range: 0-1073741823 Unit: Command unit Set the number of pulses allowed to deviate, exceed the set value will alarm E.510, set 0 when not detected

P03-55	Gantry function synchronous position proportional gain	Setting range: 0-500 Increasing the parameter value can improve the position synchronization of the two axes and help reduce the synchronization error, but it is easy to generate vibration and noise when the setting is too large.

8.2.5 P04-xx Speed parameter

Para code	Name	Description
P04-00	Speed command selection settings	0: Analog instructions 1: Setpoint of P04-02 2: Bus instructions 3: Built-in multi-segment speed
P04-01	JOG speed command set point	Setting range: 0-6000, unit: rpm Set the JOG running speed
P04-02	Speed command digital setpoint	Setting range: -6000-6000, unit: rpm When P04-00 is set to 1, P04-02 is the speed setpoint
P04-04	Zero speed clamp threshold	Setting range: 0-6000, unit: rpm Sets the speed command threshold that triggers the zero-speed position clamp function
P04-05	Overspeed threshold	Setting range: 0-6300, unit: rpm Set the maximum allowable speed value, exceeding the set value will be E.420 overspeed alarm
P04-06	Forward speed limit	Setting range: 0-6300, unit: rpm Limit the positive speed value of the motor
P04-07	Reverse speed limit	Setting range: -6300-0, unit: rpm Limit the motor reverse speed value
P04-10	Zero-speed	Setting range: 0-2000, unit: rpm

<table>
<tr><td></td><td>detection value</td><td>Set a zero-speed detection threshold below which a "zero-speed detection" signal can be output through the output port</td></tr>
<tr><td>P04-11</td><td>Motor rotation detection speed value</td><td>Setting range: 0-2000, unit: rpm
Set the motor rotation detection threshold, above which the motor speed can be displayed via an LED panel</td></tr>
<tr><td>P04-12</td><td>Speed reach signal threshold</td><td>Setting range: 0-2000, unit: rpm
Set the threshold value of the speed consistent signal, and when the difference between the motor speed and the command speed is within this threshold, the "speed reached detected" signal can be output through the output port</td></tr>
<tr><td>P04-14</td><td>Speed command acceleration time</td><td>Setting range: 0-10000, unit: 1ms/1000rpm
Set the acceleration when controlling the speed</td></tr>
<tr><td>P04-15</td><td>Speed command deceleration time</td><td>Setting range: 0-10000, unit: 1ms/1000rpm
Deceleration when setting the speed control</td></tr>
<tr><td>P04-30

P04-37</td><td>Internal speed settings 1-8</td><td>Setting range: -6000—6000, unit: rpm
Parameters P04-30 to P04-37 set the internal speed 1 to internal speed 8, respectively
The internal speed switching is implemented as follows:
When the speed ring is controlled, P04-00 set 3,
The corresponding input port functions are defined as 0D, 0E, 0F
Example: Use the input signal ports DI3, DI4, DI5, and define the I/O port functions as 0D, 0E, and 0F respectively (see P06-11 parameter description for function definition), and realize the speed switching operation of the corresponding parameter setting through the combination of I/O levels.
<table>
<tr><th>DI3</th><th>DI4</th><th>DI5</th><th>action parameter</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>P04-30</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>P04-31</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>P04-32</td></tr>
</table>
</td></tr>
</table>

		1	1	0	P04-33
		0	0	1	P04-34
		1	0	1	P04-35
		0	1	1	P04-36
		1	1	1	P04-37

8.2.6 P05-xx Torque parameter

Para code	Name	Description
P05-00	Torque command selection settings	0: Analog instructions 1: The setpoint of P05-03 2: Bus instructions 3: Built-in multi-stage torque
P05-01	Torque control speed limit source setting	0: Speed analog command 1: Setpoint of P05-02 2: Bus instructions 3: Built-in multi-segment speed
P05-02	Torque control speed limit value	Setting range: 0-6000 units: rpm The maximum motor speed value when the torque mode is set to prevent mechanical damage caused by the motor speed being too high under no load The torque control mode is active
P05-03	Torque command digital set value	Setting range: -300-300, unit: % When P05-00 is set to 1, P05-03 is given a value for digital torque 0: Built-in/external torque setting P05-10,5-11 or P05-12,05-13
P05-05	Torque limiting source setting	1: Torque simulation command limiting, superimposed P05-10,05-11 or P05-12,05-13 2: Torque simulation command limiting, which only works when PCL and NCL are effective. Superimpose P05-10,05-11 or

<table>
<tr><td></td><td></td><td>P05-12,05-13 at the same time</td></tr>
<tr><td>P05-06</td><td>Torque limit detection signal output delay</td><td>Setting range: 0-10000, unit: ms
Set the signal delay time in the DO port output torque limit</td></tr>
<tr><td>P05-10</td><td>Positive internal torque limit</td><td>Setting range: 0-350 Units: 1%
Limit the forward output of the motor, 100 means 1 times the torque, 300 means 3 times the torque
When the torque output reaches the limit value, the torque limit signal can be output through the DO port</td></tr>
<tr><td>P05-11</td><td>Negative internal torque limit</td><td>Setting range: -350-0 Unit: 1%
Limit the reverse output of the motor, 100 means 1 times the torque, 300 means 3 times the torque
When the torque output reaches the limit value, the torque limit signal can be output through the DO port</td></tr>
<tr><td>P05-12</td><td>Positive external torque limit</td><td>Setting range: 0-350 Units: 1%
To switch this function, you need to use an external input port in CN1 to switch, and set the selected DI port input port function selection to 7 (forward external torque limit value). Control the logical state of the port to switch control modes.
<table><tr><td>Terminal logic</td><td>Torque limit</td></tr><tr><td>effective</td><td>External limit P05-12</td></tr><tr><td>invalid</td><td>Internal limit P05-10</td></tr></table>If this DI function is not assigned, the default torque limit of the system is P05-10
When the torque output reaches the limit value, the torque limit signal can be output through the DO port</td></tr>
<tr><td>P05-13</td><td>Negative external torque limit</td><td>Setting range: 0-350 Units: 1%
To switch this function, you need to use an external input port in CN1 to switch, and set the selected DI port input port function selection to 8 (reverse external torque limit</td></tr>
</table>

<table>
<tr><td></td><td></td><td>value). Control the logical state of the port to switch control modes.
<table>
<tr><td>Terminal logic</td><td>Torque limit</td></tr>
<tr><td>effective</td><td>External limit P05-13</td></tr>
<tr><td>invalid</td><td>Internal limit P05-11</td></tr>
</table>
If this DI function is not assigned, the default torque limit of the system is P05-11
When the torque output reaches the limit value, the torque limit signal can be output through the DO port</td></tr>
<tr><td>P05-14
~
P05-17</td><td>Internal setting torque 1~ 4</td><td>Setting range: -300—300, unit: %
Parameters P05-14 to P05-17 set the internal torque 1 to the internal torque 4, respectively
The internal speed switching is implemented as follows:
When the torque loop is controlled, P05-00 sets 3,
The corresponding input port functions are defined as 11, 12
Example: Use input signal ports DI3 and DI4. And the I/O port functions are defined as 11 and 12 respectively (see P06-11 parameter description for function definition), and the torque switching operation of the corresponding parameter setting is realized through the combination of I/O levels.
<table>
<tr><th>DI3</th><th>DI4</th><th>action parameter</th></tr>
<tr><td>0</td><td>0</td><td>P05-14</td></tr>
<tr><td>1</td><td>0</td><td>P05-15</td></tr>
<tr><td>0</td><td>1</td><td>P04-16</td></tr>
<tr><td>1</td><td>1</td><td>P04-17</td></tr>
</table></td></tr>
</table>

8.2.7 P06-xx I/O parameter

Para	Name	Description

code			
P06-00		1st Effective DI function assignment after power-on	Setting range: 00-ffff Factory setting: 0 Set the IO function to take effect at power-on
P06-01		2nd Effective DI function assignment after power-on	Setting range: 00-ffff Factory setting: 0 Set the IO function to take effect at power-on
P06-05	0	Speed analog command selection	0: Use Ain_1 (Speed Simulation Command Interface) 1: Use Ain_2 (torque simulation command interface)
	1	Torque analog command selection	0: Use Ain_2 (torque simulation command interface) 1: Use Ain_1 (speed simulation command interface)
P06-11 P06-11	0 1	DI1 Terminal - Function Selection	Setting range: 00-1E Factory setting: 0x00: None 0x01: Servo enable 0x02: Alarm clearance 0x03: Forward overtravel 0x04: Reverse overtravel 0x05: Control mode switching 0x06: P control command input 0x07: Forward external torque limit value switching 0x08: Reverse external torque limit value switching 0x09: Gain switching 0x0A: Zero lock 0x0B: Pulse command input is prohibited 0x0D: Speed multi-segment selection 1 0x0E: Speed multi-segment selection 2 0x0F: Speed multi-segment selection 3 0X10: Position residue command removal 0X11: Torque multi-stage selection 1

			0X12: Torque multi-stage selection 2 0x13: Gantry synchronization enable 0x14: Gantry alignment zero signal 0x15: Origin switch signal 0x16: Origin regression initiation signal 0X17: Speed simulation command negation 0X18: Torque simulation command inverse 0X19: External alarm signal 0X1A: Emergency stop input signal 0X1B: Probe 1 input signal 0X1C: Probe 2 input signal 0X1D: Pole detection request signal 0X1E: The position command takes the negative signal Note: For low-speed terminals, the active level can only be confirmed if the active level exceeds 3.2ms
	2	DI1 terminal - logic selection	0: Active low (optocoupler off) 1: Active high level (optocoupler on) 2: The falling edge is effective 3: The rising edge is effective 4: The rising and falling edges are effective
P06-12 P06-12	0 1	DI2 terminal - function selection	SeeP06-11.01
	2	DI2 terminal - logic selection	See P06-11.2
P06-13	0 1	DI3 terminal - function selection	See P06-11.01
	2	DI3 terminal - logic selection	See P06-11.2
P06-14	0	DI4 terminal -	See P06-11.01

	1	function selection	
	2	DI4 terminal - logic selection	See P06-11.01
P06-15	0 1	DI5 terminal - function selection	See P06-11.01
	2	DI5 Terminal - Logic Selection	See P06-11.2
P06-16	0 1	DI6 terminal - function selection	See P06-11.2
	2	DI6 Terminal - Logic Selection	See P06-11.2
P06-21	0 1	DO1 terminal - function selection	Setting range: 0-13, factory setting: 0x03 servo ready output 0x00: None 0x01: Servo alarm 0x02: Holding brake 0x03: Servo ready 0x04: Positioning complete 0x05: Positioning approach 0x06: Speed consistent checkout 0x07: Zero speed detection 0x08: torque limiting 0x09: Speed limit 0x0A: Servo warning 0x0B: Reserved 0x0C: Reserved 0x0D: Reserved 0x0E: Forward overtravel 0x0F: In reverse overtravel 0x10: Enabled state 0x11: Dynamic braking 0x12: Motor rotation detection 0x13:1st gain is active
	2	DO1 terminal - logic	0: When the state is valid, DO shuts down

		selection	1: When the state is valid, DO is on
P06-22	0 1	DO2 terminal - function selection	See P06-21.01
P06-22	2	DO2 terminal - logic selection	See P06-21.2
P06-23	0 1	DO3 terminal - function selection	See P06-21.01
	2	DO3 terminal - logic selection	See P06-21.2
P06-24	0 1	DO4 terminal - function selection	See P06-21.01
	2	DO4 terminal - logic selection	See P06-21.2
P06-40		The analog 1V corresponds to the speed value	Setting range: 10-2000, unit 1rpm/V Sets the coefficient between the analog command input to CN1 and the speed control command Example: 500 means that every V corresponds to 500 revolutions per minute
P06-41		AI1 filter time constant	Setting range: 0-2500, unit: 0.01ms Set the analog command filtering time factor for AI1 input
P06-42		AI1 offset	Setting range: -9999-9999, unit V Sets the zero offset of the analog instruction input by AI1
P06-43		The analog 1V corresponds to the torque value	Setting range: 0-100, unit 1% Sets the coefficient between the analog command input by AI1 and the speed control command For example, 30 represents 30% of the rated torque per V
P06-44		AI2 filter time constant	Setting range: 0-6400, unit: ms Set the analog command filtering time coefficient input by AI2
P06-45		AI2 bias	Setting range: -9999-9999, unit V

		Sets the zero offset of the analog instruction input by AI2
P06-46	AI1 analog dead band	Setting range: 0-9999 Unit: mv Set the dead voltage value of the analog instruction, and when the analog quantity is given within this positive and negative value range, the system defaults to zero
P06-47	AI1 analog dead band	Setting range: 0-9999 Unit: mv Set the dead voltage value of the analog instruction, and when the analog quantity is given within this positive and negative value range, the system defaults to zero

8.2.8 P08-xx Advanced Feature Parameters

Para code		Name	Description
P08-00	0	Offline inertia identification mode	Setting range: 0-1 0: Default mode (set according to P08-03, P08-04 parameters) 1: Internal setting mode (P08-03, P08-04 automatic setting)
P08-00	1	Online inertia identification mode	设定范围：0-1
P08-01		Inertia Identification Initial Value of Inertia	Setting range: 0-20000, unit: 1%. Set the initial value of inertia identification inertia.
P08-02		Inertia identification running circles	Setting range: 5-1000, unit: 0.1 circle. Set the motor rotation circle value for inertia identification.
P08-03		Inertia identification maximum speed	Setting range: 10-2000, unit: rpm. Set the maximum running speed for inertia identification.

P08-04	Inertia identification acceleration time	Setting range: 20-800, unit: ms. When setting the inertia identification, the acceleration and deceleration time of the motor.
P08-05	Waiting time after a inertia identification completed	Setting range: 50-10000, unit: ms. Waiting time after a single inertia identification is completed.
P08-06	Program JOG mode	Setting range: 0-5 0: (waiting time P08-11->forward rotation movement P08-07) * movement times P08-12. 1: (waiting time P08-11 -> reverse movement P08-07) * movement times P08-12. 2: (waiting time P08-11->forward movement P08-07)*moving times P08-12->(waiting time P08-11->reverse moving P08-07)*moving times P08-12. 3: (waiting time P08-11->reverse movement P08-07)*moving times P08-12->(waiting time P08-11->forward moving P08-07)*moving times P08-12. 4: (waiting time P08-11->forward rotation movement P08-07->waiting time P08-11->reverse rotation movement P08-07)*movement times P08-12. 5: (waiting time P08-11->reverse movement P08-07->waiting time P08-11->forward movement P08-07)*moving times P08-12.
P08-07	Program JOG movement distance	Setting range: 1-2000, unit: 0.1 circle. The number of circles per step when setting the program JOG.
P08-09	Program JOG movement speed	Setting range: 1-10000, unit: rpm. Set the maximum speed of movement when the program JOG is running.
P08-10	Program JOG acceleration and deceleration time	Setting range: 2-10000, unit: ms. Set the acceleration and deceleration time during JOG operation of the program.

P08-11		Program JOG waiting time	Setting range: 0-10000, unit: ms. Set the program JOG operation waiting time.
P08-12		Program JOG movement times	Setting range: 0-10000, unit: times. Set the number of times of program JOG movement.
P08-15	0	Auto adjust inertia settings	Setting range: 0-1. 0: Inertia identification during auto-tuning. 1: During auto-tuning, inertia identification is not performed.
P08-15	1	Auto adjust mode settings	Setting range: 0-3 0, 1: standard mode, close model tracking. 2: Positioning mode: Turn on end vibration suppression, turn on model tracking, model tracking speed compensation 100%. 3: Positioning mode, pay attention to overshoot: open end vibration suppression, open model tracking, model tracking speed compensation 90%.
P08-16		Auto adjust maximum gain	Setting range: 100-7000, unit: 0.1Hz. During auto-tuning, search for the maximum value of the gain.
P08-17		Velocity Observer Gain	Setting range: 10-500, unit: Hz. The larger the setting value, the larger the bandwidth of the speed observer. When it is set to 500, the observer is invalid.
P08-18		Velocity Observer Coefficient	Setting range: 0-500, unit: %. The larger the setting value, the greater the torque effect of the speed observer.
P08-20		1st segment 1st torque command filter time constant	Setting range: 0-2500, unit: 0.01ms. The torque command filter time constant is 1. When the motor whistling occurs during operation, the value can be appropriately set larger.

P08-21		1st segment 2nd torque command filter time constant	Setting range: 0-2500, unit: 0.01ms. The torque command filter time constant is 2. When the motor whistling occurs during operation, the value can be appropriately set larger.
P08-22		2nd segment 2nd torque command filter frequency	Setting range: 100-5000, unit: Hz. Second order torque command filter frequency.
P08-23		2nd segment 2nd torque command filter Q value	Setting range: 50-100, unit: 0.01. Q value of the second order torque command filter.
P08-24	0	1st notch filter selection	Setting range: 0-1 0: the first notch filter is invalid, 1: The first notch filter is valid
	1	2nd notch filter selection	Setting range: 0-1 0: The second notch filter is invalid 1: The second notch filter is valid
	2	Reserve	
	3	Friction compensation function selection	Setting range: 0-1 0: invalid 1: Valid
P08-25	0	Adaptivelst notch filter mode setting	Setting range: 0-1 0: invalid 1: Allow the driver to automatically set the first notch filter
	1	Adaptive 2nd notch filter mode setting	Setting range: 0-1 0: invalid 1: Allow the driver to automatically set the second notch filter

P08-30	1st notch filter frequency	Setting range: 300-5000, unit: Hz. Center frequency of notch filter 1. P08-24-0 needs to be set to enable to be valid. When set to 5000, the notch filter is invalid.
P08-31	1st notch filter width	Setting range: 50-1000 Unit: 0.01 Notch Width Class for Notch Filter 1 is the ratio of the width to the center frequency
P08-32	1st notch filter depth	Setting range: 0-99. Notch depth level for notch filter 1. It is the ratio relationship between the input and the output for the center frequency of the notch filter. The larger the parameter, the smaller the notch depth and the weaker the effect.
P08-33	2nd notch filter frequency	Same as P08-30. P08-24-1 needs to be set to enable to be valid
P08-34	2nd notch filter width	Same as P08-31
P08-35	2nd notch filter depth	Same as P08-32
P08-36	3rd notch filter frequency	Same as P08-30
P08-37	3rd notch filter width	Same as P08-31
P08-38	3rd notch filter depth	Same as P08-32
P08-51	Frequency sweep torque amplitude	Setting range: 1-300 When the auxiliary function F22 is executed, this set value is used as the maximum value of the frequency sweep torque.

8.3 List of monitoring items

Display	Display item	Explanation	Unit

number			
d00.C.PU	Sum of position command pulses	This parameter can monitor the number of pulses sent by the user to the servo drive, so as to confirm whether there is any pulse loss.	Command unit
d01.F.PU	Sum of position feedback pulses	This parameter can monitor the number of pulses fed back by the servo motor. The unit is consistent with the user command unit	Command unit
d02.E.PU	Position deviation pulse number	This parameter can monitor the pulse number of position lag during the operation of the servo system. The unit is consistent with the user input command unit	Command unit
d03.C.PE	Sum of position given pulses/ Gantry motor feedback pulse	This parameter can monitor the number of pulses sent by the user to the servo drive. Unit: When using an absolute value motor, calculate as 8388608 per revolution.	Encoder unit
d04.F.PE	Sum of position feedback pulses/	This parameter can monitor the number of pulses fed back by the servo motor. Unit: When using an absolute value motor, calculate as 8388608 per revolution.	Encoder unit
d05.E.PE	Position deviation pulse number/ Gantry pulse deviation	This parameter can monitor the pulse number of position lag during the operation of the servo system. Unit: When using an absolute value motor, calculate by 8388608 per revolution.	Encoder unit
d06.C.Fr	Pulse command input frequency	This parameter can monitor the input frequency of external pulse command.	KHz
d07.C.SP	Speed control command	This parameter can monitor the servo reference speed when the servo motor is running.	rpm
d08.F.SP	Motor speed	This parameter can monitor the actual speed of the servo motor when it is running.	rpm
d09.C.tq	Torque command	This parameter can monitor the servo given torque when the servo motor is running.	%
d10.F.tq	Actual torque	This parameter can monitor the torque feedback when the servo motor is running.	%
d11.AG.L	Average torque	This parameter can monitor the average torque	%

		of the servo motor in the past 10 seconds	
d12.PE.L	Peak torque	This parameter can monitor the peak torque of the servo motor after power on.	%
d13.oL	Cumulative load rate	This parameter can monitor the load rate of the driver. When it exceeds 100, the driver will alarm for overload.	%
d14.rG	Regenerative load factor	This parameter can monitor the load rate of the regeneration resistor. When it exceeds 100, the drive will alarm for regeneration overload.	%
d15.PE.S	Actual speed peak	This parameter can monitor the peak speed of the servo motor after power-on.	rpm
d16.I.Io	Input IO status	This parameter can monitor the input port status of CN1. The upper vertical bar represents high level (optocoupler cut-off), the lower vertical bar represents low level optocoupler conduction). The corresponding relationship with the input port is that the 8 vertical bars from right to left on the operation panel correspond to DI1-DI6 respectively.	Binary system
d17.o.Io	Output IO status	This parameter can monitor the output port status of CN1. The upper vertical bar represents the conduction of the optocoupler, and the lower vertical bar represents the cut-off of the optocoupler. The corresponding relationship with the output port is that the 5 vertical bars from right to left on the operation panel correspond to DO1-DO4 respectively.	Binary system
d18.AnG	Motor Mechanical Angle	This parameter can monitor the mechanical angle of the motor, and one rotation is 360 degrees.	0.1 degree
d19.HAL	Electrical Angle	Electrical angle of an absolute encoder.	0.1 degree
d20.ASS	Absolute encoder single-turn value	This parameter can monitor the feedback value of the absolute encoder, and the value changes between 0-8388607 for one revolution	Decimalism

d21.ASH	Absolute encoder multi-turn value	This parameter can monitor the number of revolutions of the multi-turn absolute encoder motor.	Decimalism
d22.J-L	Inertia ratio	This parameter can monitor the real-time inertia of the load carried by the motor	%
d23.dcp	Main circuit voltage (DC value)	This parameter can monitor the voltage value of the main circuit	V
d24.Ath	Drive temperature	This parameter can monitor the drive temperature	1 degree
d25.tiE	Cumulative running time	This parameter can monitor the running time of the drive, unit: second	1 Second
d26.1.Fr	Resonant frequency 1	This parameter can monitor resonance frequency 1, high frequency resonance frequency	Hz
d28.2.Fr	vibrational frequency 2	This parameter can monitor vibrational frequency, low frequency resonance frequency	Hz
d29.cn	Current control mode	This parameter can monitor the current control mode	
d30.Ai1	Ai1 port input voltage	This parameter can monitor the Ai1 input voltage value.	0.001V
d31.Ai2	Ai2 port input voltage	This parameter can monitor the Ai2 input voltage value.	0.001V
d32.c.Er	Encoder communication abnormal times	This parameter can monitor the number of encoder communication abnormalities after power-on	
d33.H1	Hardware model (hardware information)	This parameter can monitor the driver model (hardware information)	
d34.H2	Hardware version	This parameter can monitor the hardware version number	
d35.S1	Software version	This parameter can monitor the software version. High 8 bits: FPGA version; Low bits: ARM	

		version	
d36.C.PU	Sum of position command pulses	This parameter can monitor the sum of position command pulses (accumulated after power on)	command unit
d37.F.PU	Sum of position feedback pulses	This parameter can monitor the sum of position feedback pulses (accumulated after power on)	command unit
d38.P.Er	Parameter number with unusual value	This parameter can query the abnormal parameter number when alarm 107	
d39.Adu	Advanced Function Exception Codes	This parameter can query the warning code when the advanced function is abnormal	

8.4 Auxiliary function

Display items	Function	Operate
F01.JoG	JOG run	1. Press the **M button** on the operation panel to switch to the auxiliary mode **F****, operate the **Up/Down** button to **F01.JoG**, and press the **ENT** button to enter the Jog working mode. The default Jog speed is 30rpm (P04-01 sets the JOG running speed). 2. Press the **Up** button, and the motor will rotate forward at a speed of 30r/min; press the **Down** button, and the motor will rotate reversely at a speed of 30r/min. 3. Press the **M** button to exit Jog mode.
F02.run	Forcibly enable the running speed mode	1. Press the **M button** on the operation panel to switch to the auxiliary mode **F****, operate the **Up/Down** button to **F02.run**, and press the **ENT** button to enter this working mode. 2. Press the **Up** button, the motor rotates forward, press the **Up** button for a long time, the motor speed will continue to increase; press the **Down** button, the motor will reverse, and press the **Down** button for a long time, the motor speed will continue to increase. 3. Press the **M** button to exit this mode.
F03.Ai1	Analog input 1	1. Press the **M** button on the operation panel to switch to the auxiliary

	automatic zero calibration (VCMD)	mode **F****, operate the **Up/Down** button to **F03.Ai1**, press the **ENT** button, and **of.Ai1** will be displayed. 2. Press and hold the **ENT** button until the **finsh** flashes, and the Ai1 zero automatic calibration is completed. 3. Press the **M** button to exit this mode.
F04.Ai2	Analog input 2 automatic calibration (TCMD)	1. Press the **M** button on the operation panel to switch to the auxiliary mode **F****, operate the **Up/Down** button to **F04.Ai2**, press the **ENT** button, and **of.Ai2** will be displayed. 2. Press and hold the **ENT** button until the **finsh** flashes, and the Ai2 zero automatic calibration is completed. 3. Press the **M** button to exit this mode
F05.Ai3	Current sensor automatic zero drift compensation	Same as F03.Ai1 Note: When performing this function, the servo must be turned off and enabled, otherwise the finsh flashing page will not appear, and the automatic calibration cannot be completed
F06.En0	Absolute encoder fault clearing	This auxiliary function must be operated in the disabled state, and the operation steps are as follows 1. Press the **M** button on the operation panel to switch to the auxiliary mode **F****, operate the **Up/Down** button to **F06.En0,** press the **ENT** button, and **clr.Ft** will be displayed. 2. Press and hold the **ENT** button until **finsh** flashes, and the absolute encoder fault is cleared. 3. Press the **M** button to exit this mode.
F07.En1	Absolute encoder multi-turn value reset	This auxiliary function must be operated in the disabled state, and the operation steps are as follows 1. Press the **M** button on the operation panel to switch to the auxiliary mode **F****, operate the **Up/Down** button to **F07.En1**, press the **ENT** button, and **clr.EH** will be displayed. 2. Press and hold the **ENT** button until the **finsh** flashes, and the multi-turn value of the absolute encoder is cleared. 3. Press the **M** button to exit this mode.
F10.ini	Restore factory setting	This auxiliary function must be operated in the disabled state, and the operation steps are as follows 1. Enter the factory reset interface: press the **M** button on the operation panel, switch to the auxiliary mode **F****, press the Up/Down button to **F10.ini**, press the **ENT** button to enter

<table>
<tr><td></td><td></td><td>2. Select the recovery parameter range: enter the corresponding code as shown in the table below, and select the parameter range to be recovered. Press and hold the ENT button, a progress bar will appear until finsh flashes, and the factory reset will be completed.
<table>
<tr><td>Code</td><td>Meaning</td></tr>
<tr><td>51</td><td>Restoring Level 1 Permission Parameters (Application Parameters)</td></tr>
<tr><td>52</td><td>Restore level 2 authority parameters (application parameters + motor parameters)</td></tr>
<tr><td>55</td><td>Restore all parameters (including hidden parameters)</td></tr>
</table></td></tr>
<tr><td>F11.Err</td><td>Fault record display</td><td>1. Press the M button on the operation panel to switch to the auxiliary mode F**, operate the Up/Down button to F11.Err, press the ENT button, and the past 8 historical fault information will be displayed. The number on the left is F0, which represents the latest fault
2. Press the Up button to display past faults one by one. Press and hold the ENT button to display the fault occurrence time, and the time coordinates refer to d25.tiE.
3. Press the M button to exit this mode.
Note: For faults that occur during power on and off multiple times within 30 minutes, the recording time may have a deviation of 30 minutes.</td></tr>
<tr><td>F12.clr</td><td>Alarm log clear</td><td>1. Press the M button on the operation panel to switch to the auxiliary mode F**, operate the Up/Down button to F12.clr, press the ENT button, the panel displays clr.Er, press the ENT button to clear F11.Err The alarm information recorded in the
2. Press the M button to exit this mode.</td></tr>
<tr><td>F13.unL</td><td>Operation authority setting</td><td>1. Press the M button on the operation panel to switch to the auxiliary mode F**, operate the Up/Down button to F13.unL, and press the ENT button to edit the operation authority.
0: All parameters are locked and cannot be changed;
1: P00-** parameters are locked and others can be changed;
2: Not locked and can be changed. Set 0,1 value, it can be saved after power off. When setting 2, it will not be saved when power off.

2. Press the M button to exit this mode.</td></tr>
<tr><td>F14. out</td><td>Force output port</td><td>1. Press the M button on the operation panel to switch to the auxiliary</td></tr>
</table>

	level	mode **F****, operate the **Up/Down** button to **F14. out**, and press the **ENT** button to force the output port level through the **Up/Down** button. The corresponding relationship with the output port is that the 4 vertical bars from right to left on the operation panel correspond to DO1-DO4 respectively 2. Press the **M** button to exit this mode.
F17.rES	Software reset	1. Press the **M** button on the operation panel to switch to the auxiliary mode **F****, operate the **Up/Down** button to **F17.rES**, press the **ENT** button, the panel displays **rESEt**, and press the **ENT** button to reset the software. 2. Press the **M** button to exit this mode.
F18.PJG	Program JOG	1. Press the **M** button on the operation panel to switch to the auxiliary mode **F****, operate the **Up/Down** button to **F18.PJG**, and press the **ENT** button to execute the program JOG function. 2. Press the **UP** button or **DOWN** button, the motor will run according to the operating conditions set by P08-06~P08-12. 3. Press the **M** button to exit this mode. Note: This mode can only be operated under rdy, otherwise the drive will alarm **A.905**
F19.J-L	Load inertia ratio measurement	1. Press the **M** button on the operation panel to switch to the auxiliary mode **F**,** operate the **Up/Down** button to **F19.J-L,** press the **ENT** button to enter the load inertia measurement function, the panel displays 1.00, long press the ENT button, the panel displays - 1.00 2. Press the **UP** button, the motor will run back and forth according to the number of turns set by P08-02, the maximum speed set by P08-03, the acceleration and deceleration time set by P08-04, and the waiting time of P08-05 until the load appears. Inertia ratio. 3. Record the value and write it into parameter P01-04 4. Press the **M** button to exit this mode

Chapter 9 Fault Analysis and Treatment

9.1 Fault alarm information table

Alarm type	Serial number	Alarm content
Hardware malfunction	E. 051	EEPROM parameter exception
	E. 052	FPGA communication error
	E. 053	Initial failure
	E. 054	Operation timeout
	E. 060	Hardware match exception
	E. 061	Combination of motor and drive is abnormal
	E. 063	Overcurrent detection
	E. 064	Motor overcurrent detection
	E. 068	Drive DC bus overcurrent detection
	E. 069	FPGA clock error
	E. 071	Abnormal detection of U-phase current
	E. 072	Abnormal detection of W-phase current
	E. 100	Abnormal parameter combination
	E. 102	DI port allocation exception
	E. 106	The frequency division output setting is abnormal
	E. 107	Parameter Error
	E. 108	Parameter setting out of range
	E. 120	Servo ON command invalid alarm
	E. 121	External input alarm signal
	E. 305	Motor cable disconnected
	E. 400	Power line phase loss
	E. 401	Undervoltage

Malfunction	E. 402	Overvoltage
	E. 410	Instantaneous overload
	E. 412	Continuous overload
	E. 420	Motor overspeed
	E. 421	Out of control detection
	E. 430	Abnormal regeneration
	E. 431	regeneration overload
	E. 435	Inrush current limiting resistor overload
	E. 436	DB overload
	E. 440	Abnormal drive temperature
	E. 500	Frequency divider output overspeed
	E. 501	Position deviation over threshold
	E. 503	Position deviation over threshold when the servo is ON
	E. 510	Gantry position deviation is too large
	E. 511	Gantry axis alarm
	E. 520	Vibration alert
Encoder failure	E. 620	Encoder disconnection
	E. 621	Encoder built-in data does not match
	E. 622	Encoder built-in data verification error
	E. 641	Encoder overheating (inside encoder)
	E. 643	Encoder battery voltage failure (encoder internal)
	E. 644	The multi-turn data of the encoder is abnormal (inside the encoder)
	E. 645	Encoder multi-turn count overflow (encoder internal)
	E. 646	Encoder communication failure
	E. 649	Encoder communication CRC failure
Warn	A.900	Position deviation over threshold
	A.901	The position deviation is over threshold while servo ON

Warn	A.905	Auxiliary (F**) function cannot be executed when servo is ON
	A.910	Overload
	A.911	Vibration
	A.912	The temperature of the control board is abnormal
	A.913	Abnormal drive temperature
	A.920	Regeneration overload
	A.921	DB overload
	A.923	The internal fan of the servo unit stops
	A.930	Encoder battery low voltage
	A.941	Parameter changes that require power cycle
	A.942	EEPROM write failed
	A.950	Overtravel
	A.960	Repeated definition of input terminal
	A.971	Undervoltage

9.2 Fault alarm causes and solutions

E.051：EEPROM parameter exception

Fault alarm reason	Fault alarm check	treatment measures
The EEPROM data of the servo unit is abnormal	Perform factory initialization (F10.INI)	If it persists, replace the drive

E.052：FPGA communication error

Fault alarm reason	Fault alarm check	treatment measures
The main control MCU is powered on and initialized abnormally	Power on again	Turn off the alarm by setting parameter Pn044 If it persists, replace the drive

E.053：Initialization failed

Fault alarm reason	Fault alarm check	treatment measures
The main control MCU failed to be powered on and initialized	Power on again	If it persists, replace the drive

E.054：Operation timeout

Fault alarm reason	Fault alarm check	treatment measures
Operation timeout	Power on again	If it persists, replace the drive

E.060：Hardware match error

Fault alarm reason	Fault alarm check	treatment measures
Hardware match error	Perform Factory Initialization (F10.INI)	If it persists, contact the manufacturer

E.061：Combination of motor and drive is abnormal

Fault alarm reason	Fault alarm check	treatment measures
The servo unit does not match the servo motor model	Check whether the servo unit supports the motor	Replace the servo unit that matches the motor

E.063：Overcurrent detection

Fault alarm reason	Fault alarm check	treatment measures
U, V, W interphase short circuit	Whether there is a short circuit in the U, V, W wiring. Whether there is a short circuit between B1 and B3	correct wiring If there is no alarm, check the power line and motor for short circuit
Ther drive is damaged.	Disconnect the U, V, W wires on the drive, and the drive is enabled	If the U, V, W wires is disconnected, and the starting driver still alarms, replace the driver

E.068：Drive DC bus overcurrent detection

Fault alarm reason	Fault alarm check	treatment measures
U, V, W short circuit to earth PE	Check if the wiring is correct Try to remove the motor U, V, W wires	Correct wiring, replace the motor wire and motor. If it persists, replace the drive

E.069：FPGA clock error

Fault alarm reason	Fault alarm check	treatment measures
FPGA clock is abnormal	FPGA clock is abnormal	Set P00-47.1 to 0 to turn off the alarm. If it persists, replace the drive

E.071： Abnormal detection of U-phase current

Fault alarm reason	Fault alarm check	treatment measures
The sampling data of the current sensing device is abnormal	Check whether the UVW wiring is correct and whether the connection is reliable	Correct wiring Set P00-46.2 to 0 to turn off the alarm If it persists, replace the drive

E.072：Abnormal detection of W-phase current

Fault alarm reason	Fault alarm check	treatment measures
The sampling data of the current sensing device is abnormal	Check whether the UVW wiring is correct and whether the connection is reliable	Correct wiring Set P00-46.3 to 0 to turn off the alarm If it persists, replace the drive

E.100：Abnormal parameter combination

Fault alarm reason	Fault alarm check	treatment measures
Parameter setting error	Check the set parameters	Set parameters correctly If it always appears, please initialize the parameters

E.102：DI port allocation exception

Fault alarm reason	Fault alarm check	treatment measures
At least 2 input ports have the same function selection	（P06-11、P06-12……） Check the input port function selection parameters (P06-11, P06-12...)	Set parameters correctly Execute parameter initialization and power on again

E.106：Frequency division pulse output setting is abnormal

Fault alarm reason	Fault alarm check	treatment measures
Frequency division pulse output parameter setting is out of range	Check the frequency division pulse output setting parameters. P03-25	Correctly set the frequency division pulse output parameters Bus encoder P03-25<65535 The drive is powered on again

E.107： Parameter error

Fault alarm reason	Fault alarm check	treatment measures

Parameter exception	Check whether the parameter range, etc. are reasonable	Set parameters correctly Perform parameter initialization

E.108： Parameter setting out of range

Fault alarm reason	Fault alarm check	treatment measures
Parameter setting out of range	Check whether the parameter range, etc. are reasonable	Set parameters correctly Perform parameter initialization

E.120： Servo ON command invalid alarm

Fault alarm reason	Fault alarm check	treatment measures
When the servo is ON, the power supply input ports L1, L2, and L3 are not powered	Check wiring and input voltage	Check wiring The drive is powered on again

E.121： External input alarm signal

Fault alarm reason	Fault alarm check	treatment measures
External input alarm signal	Check whether the relevant external input port has signal input and whether the relevant parameters of the I/O port are correct	Correct use of relevant parameters

E.305： Motor cable disconnected

Fault alarm reason	Fault alarm check	treatment measures
Motor U,V,W wires disconnected	Check whether the UVW wiring is correct and whether the connection is reliable	Make sure UVW wiring is correct and reliable Set P00-47.0 to 0 to turn off the alarm

E.400：Power line phase loss

Fault alarm reason	Fault alarm check	treatment measures
Main circuit input power line phase loss	Check whether the three phases of the main circuit input L1, L2, and L3 are connected	Make sure the wiring is correct, use the correct voltage source or series connection regulator. P00-39.0 can close the phase loss alarm

E.401： Undervoltage

Fault alarm reason	Fault alarm check	treatment measures
The input voltage of the main circuit is lower than the rated voltage value or there is no input voltage	Check whether the wiring of the main circuit input L1, L2, L3 is correct, and check the voltage value. The bus voltage can be monitored through d23.dcp	Make sure the wiring is correct, use the correct voltage source or series regulator. P00-52 can modify the alarm threshold.

E.402： Overvoltage

Fault alarm reason	Fault alarm check	treatment measures
Main circuit input voltage is too high	Use a voltmeter to test whether the input voltage of the main circuit is correct	Use the correct voltage source or series regulator
The regeneration resistor is not connected or the selection of the regeneration resistor is wrong	Check if a proper regenerative resistor is connected	Correctly connect and match the regenerative resistor
Incorrect parameter setting	Confirm that the parameter setting of P00-30~P00-34 is consistent with the resistance connection method	Correctly set parameters and connect external regenerative resistor
Drive hardware failure	When it is confirmed that the input voltage is correct, there is still an overvoltage alarm	Please send it back to the dealer or the original factory for inspection

E.410： Instantaneous overload

Fault alarm reason	Fault alarm check	treatment measures
The machine is stuck when the motor starts	Check whether the mechanical connection is stuck	Adjust the mechanical structure
P00-50 parameter setting is unreasonable	Check P00-50 parameter value	Correctly set the P00-50 parameters
Drive hardware failure	Confirm that the mechanical part is normal and still alarm	Please send it back to the dealer or the original factory for inspection

E.412： Continuous overload

Fault alarm reason	Fault alarm check	treatment measures
Continuous use exceeding the rated load of the drive	It can be monitored through d13.oL. in the monitoring mode	Change to a higher power motor or reduce the load

Improper setting of control system parameters	1. Is the mechanical system installed? 2. The acceleration setting is too large 3. Whether the gain parameters are set correctly	1. Adjust the control loop gain 2. Acceleration and deceleration setting time slows down
Motor wiring error	Check U, V, W wiring	Correct wiring

E.420： Over speed

Fault alarm reason	Fault alarm check	treatment measures
Input speed command is too large	Check if the input signal is normal	Adjust the frequency of the input signal
Overspeed judgment parameter setting is unreasonable	Check whether P04-05 (overspeed alarm value) is set properly	Correctly set P04-05 (overspeed alarm value)

E.421： Out of control detection

Fault alarm reason	Fault alarm check	treatment measures
Motor power line U, V, W wiring error	Check wiring	Correct wiring
Incorrect motor parameter setting	Check P00-05; and whether the encoder parameter setting is correct	Set parameters correctly Set P00-46.1 to 0 to close out-of-control detection

E.430： Abnormal regeneration

Fault alarm reason	Fault alarm check	treatment measures
Wrong selection of regenerative resistor or no external regenerative resistor	Check the connection of the regenerative resistor	If the connection is normal, please return the drive to the factory for inspection. The alarm can be turned off by setting P00-44.2 to 0
Parameter setting error	Please confirm the parameter settings of P00-30~P00-34	Correctly set parameter values

E.431： Regeneration overload

Fault alarm reason	Fault alarm check	treatment measures
Wrong selection of regenerative	Check the connection status of the	Selecting an Appropriate

resistor or no external regenerative resistor	regenerative resistor and whether the resistance and power of the regenerative resistor are appropriate	Regeneration Resistor
Incorrect parameter setting	Confirm whether the parameters P00-30~P00-35 are correct	Correctly set parameter values

E.435： Inrush current limiting resistor overload

Fault alarm reason	Fault alarm check	treatment measures
Frequent power-on of drive power		P00-44 can be set to close the alarm

E.440：Abnormal drive temperature

Fault alarm reason	Fault alarm check	treatment measures
The internal temperature of the drive is higher than the set value of P00-41	Check whether the heat dissipation condition of the drive is good	Improve the cooling conditions of the drive, if the alarm still occurs, please return the drive to the factory for inspection
Overheat alarm threshold setting is too small	Check parameter P00-41	Correctly set P00-41

E.501：Position deviation over threshold

Fault alarm reason	Fault alarm check	treatment measures
The position deviation is too large, the parameter setting is too small	Confirm the parameter setting of P03-15 (position deviation is too large setting)	Increase the setting value of P03-15 (position deviation is too large setting)
The gain value is set too small	Confirm whether the gain parameters are set properly	Re-adjust the gain parameters correctly
The internal torque limit value is set too small	Confirm the internal torque limit value	Re-adjust the internal torque limit value correctly
Excessive external load	Check external load	Reduce the load or change to a high-power motor

E.503：Position deviation over threshold when the servo is ON

Fault alarm reason	Fault alarm check	treatment measures
The position deviation is too large when the servo is ON	Confirm the parameter settings of P03-30, P03-31, and P03-33	Correctly set relevant parameters

The gain value is set too small	Confirm whether the gain parameters are set properly	Re-adjust the gain parameters correctly
The internal torque limit value is set too small	Confirm the internal torque limit value	Re-adjust the internal torque limit value correctly
Excessive external load	Check external load	Reduce the load or change to a high-power motor

E.510：Gantry position deviation is too large

Fault alarm reason	Fault alarm check	treatment measures
Gantry position deviation is too large	Confirm the parameter setting of P03-53	Correctly set parameter values
The gain value is set too small	Confirm whether the gain parameters are set properly	Re-adjust the gain parameters correctly
The internal torque limit value is set too small	Confirm the internal torque limit value	Re-adjust the internal torque limit value correctly
Excessive external load	Check external load	Reduce the load or change to a high-power motor

E.511： Gantry axis alarm

Fault alarm reason	Fault alarm check	treatment measures
For dual-axis drives, P00-39 sets the axis-related alarm, and there is an axis alarm at the same time.	Detect whether each axis is in alarm	Carry out alarm (other alarm) troubleshooting
Dual-axis drive, open gantry function, one of the axes will alarm	Detect whether each axis is in alarm	Carry out alarm (other alarm) troubleshooting

E.620：Encoder disconnection e

Fault alarm reason	Fault alarm check	treatment measures
Bus encoder communication failure	Check encoder wiring	Correct wiring

E.621： Encoder built-in data does not match

Fault alarm reason	Fault alarm check	treatment measures
Encoder read and write exception	Check encoder wiring	Correct wiring
Abnormal motor parameter setting	Correctly set the motor parameters	Set parameters correctly

	of P00-00~P00-19	

E.622： Encoder built-in data verification error

Fault alarm reason	Fault alarm check	treatment measures
Encoder built-in data verification error	Check encoder wiring Confirm that the encoder shielding wire is connected correctly	If the connection is normal, please return the driver to the factory for repair

E.641：Encoder overheating (inside encoder)

Fault alarm reason	Fault alarm check	treatment measures
Encoder overheating (inside encoder)	Check encoder temperature	If the temperature is normal, the alarm can be turned off by modifying the parameter P00-07.2

E.643： Battery failure of bus encoder

Fault alarm reason	Fault alarm check	treatment measures
When the bus encoder is set to multi-turn absolute value, the voltage of the external battery is low	Check the voltage of the external battery of the encoder and confirm that it is higher than 3.0V	When the battery voltage is lower than 3.0V, replace the battery, Above 3V, use the auxiliary function F16.EN0 to clear the alarm The alarm can be turned off by parameter P00-07

E.644： Bus encoder multi-turn abnormal

Fault alarm reason	Fault alarm check	treatment measures
The number of revolutions of the bus encoder is out of range	The number of turns can be monitored through the monitoring mode d21.ASH, and the multi-turn absolute motor cannot rotate in one direction for a long time.	Use instruction F06.En1 to clear the multi-turn value

E.645： Bus encoder multi-turn overflow fault

Fault alarm reason	Fault alarm check	treatment measures
The number of revolutions of the bus encoder is out of range	The number of turns can be monitored through the monitoring mode d21.ASH, and the multi-turn	Use command F06.En1 to clear the multi-turn value. The alarm can be turned off by

	absolute motor cannot rotate in one direction for a long time.	parameter P00-07

E.646： Encoder communication failure

Fault alarm reason	Fault alarm check	treatment measures
Encoder communication failure	Check encoder	Correctly install the encoder

E.649： Encoder communication CRC failure

Fault alarm reason	Fault alarm check	treatment measures
Encoder communication CRC failure	Check encoder	Correctly install the encoder

A.900： Position deviation over threshold

Fault alarm reason	Fault alarm check	treatment measures
Excessive position deviation warning	Confirm the parameter setting of P03-15/P03-30 (position deviation is too large setting)	Increase the setting value of P03-15/P03-30 (position deviation is too large setting)
The gain value is set too small	Confirm whether the gain parameters are set properly	Re-adjust the gain parameters correctly
The internal torque limit value is set too small	Confirm the internal torque limit value	Re-adjust the internal torque limit value correctly
Excessive external load	Check external load	Reduce the load or change to a high-power motor

A.901：Position deviation over threshold when the servo is ON

Fault alarm reason	Fault alarm check	treatment measures
The position deviation is too large when the servo is ON	Confirm P03-31/P03-33 parameter setting	Increase the set value of P03-31/P03-33
Pulse command frequency is too high when servo is ON	Pulse command frequency is too high when servo is ON	Reduce the pulse command frequency when the servo is ON

A.905： The FN function cannot be executed when the servo is ON

Fault alarm reason	Fault alarm check	treatment measures
The FN function cannot be executed when the servo is ON	The FN function cannot be executed when the servo is ON	Under SV-OFF, execute FN function

A.910： Overload warning

Fault alarm reason	Fault alarm check	treatment measures
overload warning	It can be monitored through d13.oL. in the monitoring mode	Properly increase P00-51 (overload warning value)
Improper setting of control system parameters	1. Is the mechanical system installed? 2. The acceleration setting constant is too fast 3. Whether the gain parameters are set correctly	1. Adjust the control loop gain 2. Acceleration and deceleration setting time slows down
Motor wiring error	Check U, V, W wiring	Correct wiring

A.911： Vibration warning

Fault alarm reason	Fault alarm check	treatment measures
Vibration warning	It can be monitored by d26.1.Fr in the monitoring mode	When the equipment is normal, set the value of P02-51 correctly, or set P02-50 to 0 to close the warning

A.912： The temperature of the control board is abnormal

Fault alarm reason	Fault alarm check	treatment measures
The temperature of the control board is abnormal		Restart the device and still alarm replace drive

A.913： Abnormal drive temperature

Fault alarm reason	Fault alarm check	treatment measures
Abnormal drive temperature	Driver temperature monitoring can be performed through d24.Ath in monitor mode	When the equipment is normal, you can set P02-50 to 0 to close the warning

A.920： Regeneration Overload Warning

Fault alarm reason	Fault alarm check	treatment measures
Wrong selection of regenerative resistor or no external regenerative resistor	Check the connection status of the regenerative resistor and whether the resistance and power of the	Selecting an Appropriate Regeneration Resistor

	regenerative resistor are appropriate	

A.930： Absolute encoder battery failure

Fault alarm reason	Fault alarm check	treatment measures
Absolute encoder battery failure	Check the voltage of the external battery of the encoder and confirm that it is higher than 3.0V	The battery voltage is lower than 3.0V, replace the battery Use command F06.En0 to clear when it is higher than 3.0V

A.941：Parameter changes need to be powered off and restarted to take effect

Fault alarm reason	Fault alarm check	treatment measures
After modifying the parameters, the parameters will take effect after re-powering		Power off and restart

A.960： Repeated definition of input terminal

Fault alarm reason	Fault alarm check	treatment measures
Repeated definition of input terminal	Check whether the relevant external input port has signal input and whether the relevant parameters of the I/O port are correct	Correctly set relevant parameters

A.971： Undervoltage warning

Fault alarm reason	Fault alarm check	treatment measures
The input voltage of the main circuit is lower than the rated voltage value or there is no input voltage	Check whether the wiring of the main circuit input L1, L2, L3 is correct, and check the voltage value . The bus voltage can be monitored through d23.dcp	Make sure the wiring is correct and use the correct voltage source or series regulator. P00-52 can modify the alarm threshold or close the alarm

Chapter 10 Communication

10.1 Modbus communication parameter setting

Para code	Name	Explanation
P00-23	slave address	The setting range：0-255， default 1 Set according to equipment requirements
P00-24.0	485 communication baud rate selection	The setting range：0-7， default 2 0：2400 1：4800 2：9600 3：19200 4：38400 5：57600 6：115200 7：25600
P00-24.1	485 communication parity check mode	The setting range：0-3， default 0 0：no parity，2 stop bit 1：even parity，1 stop bit 2：Odd parity，1 stop bit 3：No parity,，1 stop bit
P00-26	Modbus response delay	The setting range：0-100， default 0 When the parameter is set to 0, it will respond according to the standard communication. When the parameter setting has a value, the Modbus communication response time will respond according to the set time

10.2 Modbus communication supports reading and writing parameter settings

Support reading the address list of monitored items

monitoring items	definition	unit	Decimal communication address (double address, high order first)
d00.C.PU	Sum of position command pulses	command unit	2100-2101
d01.F.PU	Sum of position feedback pulses	command unit	2102-2103
d02.E.PU	Position deviation pulse number	command unit	2104-2105
d03.C.PE	Sum of position given pulses/ Gantry motor feedback pulse	encoder unit	2106-2107
d04.F.PE	Sum of position feedback pulses/	encoder unit	2108-2109
d05.E.PE	Position deviation pulse number/Gantry pulse deviation	encoder unit	2110-2111
d06.C.Fr	Pulse command input frequency	Kpps	2112
d07.C.SP	Speed control command	rpm	2113
d08.F.SP	Motor speed	rpm	2114
d09.C.tq	Torque command	%	2115
d10.F.tq	Actual torque	%	2116
d11.AG.L	Average torque		2117
d12.PE.L	Peak torque	%	2118
d13.oL	Cumulative load rate	%	2119
d14.rG	Regenerative load factor	%	2120
d15.PE.S	Actual speed peak	rpm	2121
d16.I.Io	Input IO status	binary	2122
d17.o.Io	Output IO status	binary	2123
d18.AnG	Motor Mechanical Angle	0.1 degree	2124
d19.HAL	Electrical Angle	0.1degree	2125

d20.ASS	Absolute encoder single-turn value		2126-2127
d21.ASH	Absolute encoder multi-turn value		2128
d22.J-L	Inertia ratio	1%	2129
d23.dcp	Main circuit voltage (DC value)	1Vdc	2130
d24.Ath	Drive temperature	1 Celsius	2131
d25.tiE	Cumulative running time	1 Second	2132-2133
d26.1.Fr	Resonant frequency 1	Hz	2134
d28.2.Fr	vibrational frequency 2	Hz	2136
d29.cn	Current control mode		2137
d30.Ai1	Ai1 port input voltage	0.001V	2138
d31.Ai2	Ai2 port input voltage	0.001V	2139
d32.c.Er	Encoder communication abnormal times		2140
d33.H1	Hardware model (hardware information)		2141
d34.H2	Hardware version		2142
d35.S1	Software version		2143
d36.C.PU	Sum of position command pulses	command unit	2144-2145
d37.F.PU	Sum of position feedback pulses	command unit	2146-2147
current fault number			2180

Note: 1. All parameters support 485 read, parameter read and write addresses refer to parameter codes: such as P03-09, read and write addresses are decimal 309

3. Parameter writing refers to the drive permission setting. For example, if the current permission level of the drive is 1, the parameters higher than permission 1 cannot be written. Parameter writing will not be saved when the power is off.

10.3 Overview of Modbus communication protocol

10.3.1 introduction

Nexus monitors can communicate with other devices using the RTU transfer mode of the AEG Modicon Modbus protocol. This communication works with both RS-232 and RS-485 standards.

- RS-232 communication requires a single connection between a Nexus monitor and one other device, and only channel 1 of the Nexus monitor is used.
- RS-485 supports multiple Nexus monitors connected to a network, is a two-wire connection up to 115200 baud, ports 1-4 are available.

10.3.2 communication packet

Communication occurs between a Modbus master and one or more Nexus slaves. The master initiates all communication by sending a "request packet" to the designated slave, and the slave replies with a "reply packet". The communication packet is arranged in a string of 8-bit bytes, as follows:

- slave address, one byte
- function code, one byte
- Data, N bytes, high byte first, low byte after
- CRC (RTC error detection code), 2 bytes
- Dead time, 3.5 byte transfer time.

A maximum of 127 registers can be sent in a single communication packet.

10.3.3 Slave address and send request

Each slave device on the communication bus has its own dedicated address and only responds to the address addressed by the master. Packets returned to the master have the same address in the slave address field as the request packet. These addresses are programmable and range from 0 to 255.

Slave address 0 is a broadcast command, allowing the master to send the same packet to all

devices at once. All slaves follow the instructions of this packet, but do not respond. Transfer requests are only available for functions up to 6 and 10, which represent presetting a single register and presetting multiple registers, respectively. See Tables 1.3 and 1.4.

10.4 function number

The function number of a packet tells the addressed slave what action to perform. Nexus supports the following Modus function numbers.

Table 1.1 Function number

Function number		description
Hexadecimal	Decimalism	
03H	3	Read holding register
06H	6	Preset a single register
10H	16	Preset multiple registers

10.4.1 Function number 03: read holding register

This function allows the master to read one or more parameter values (data registers) from a Nexus slave. This data register is a 16-bit value transferred in "Big Endian" format. The high byte is read first, and the low byte is read last.

BIG-ENDIAN means that the low-order bytes are discharged at the low end of the memory, and the high-order bytes are discharged at the high end of the memory

The master sends a packet to define a starting register and the number of registers to be read for the slave. The slave responds with a packet containing the requested parameter value within the range specified in the original request.

In the following example, the master device requests a slave at 01 to send the values in two registers, the initial register is 00001, and the slave replies with the values 3031H and 3037H from registers 00001 and 00002.

Host sending format:

Slave address Function number Data start address Number of read data CRC

Slave sending format:

Slave address Function number of bytes Value of each data CRC

Table 1.2 Example of function number 03

host package definition	Hexadecimal address	Slave package definition	Hexadecimal address
slave address	01H	slave address	01H
function number	03H	function number	03H
Data start address high byte	00H	Number of bytes	04H
Data start address low byte	01H	1st Data high byte	30H
register number high byte	00H	1st Data low byte	31H
register number low byte	02H	2nd Data high byte	30H
CRC low byte	95H	2nd Data low byte	37H
CRC high byte	CBH	CRC low byte	F1H
		CRC high byte	2AH

10.4.2 Function No. 06: Adjust a single register

This function allows the master to modify a single register on the Nexus slave. The data register is a 16-bit value, the high byte is transmitted first, and the low byte is transmitted last. In the following example, the master device saves the value 0001H of register 57346 (E002) in the Nexus slave at address 01H.

Host sending format:

Slave address Function number Data start address Data value CRC

Slave sending format:

Slave address Function number Data start address Data value CRC

Table 1.3 Function number 6 sample questions

host package definition	Hexadecimal address	Slave package definition	Hexadecimal address
slave address	01H	slave address	01H
function number	06H	function number	06H

Data start address high byte	E0H	Data start address high byte	E0H
Data start address low byte	01H	Data start address low byte	01H
data high byte	00H	data high byte	00H
data low byte	01H	data low byte	01H
CRC low byte	2EH	CRC low byte	2EH
CRC high byte	0AH	CRC high byte	0AH

10.4.3 Function number 10: Adjust register

This function allows the host to modify a set of consecutive registers on the Nexus slave. The data register is a 16-bit value, the high byte is transmitted first, and the low byte is transmitted last.

In the following example, the master device saves the value 0001H of the register 57345, the value 0001H of 57346, and the value 0001H of 57347 of the Nexus slave with address 01H.

Host sending format:

Slave address Function number Data start address Number of modified data The first data... CRC

Slave sending format:

Slave address Function number Data start address Modify data number CRC

10.4.4 Data start address

Hex range: 0001H-FFFFH

decimal range: 0001－65535

For example, for some Scada software, in order to read the value in the holding register, the address format should be 4 (XXXXX), where XXXXX is the decimal address.

Table 1.4 Function number 10 sample questions

host package definition	Hexadecimal address	Slave package definition	Hexadecimal address
slave address	01H	slave address	01H
function number	10H	function number	10H

Data start address high byte	E0H	Data start address high byte	E0H
Data start address low byte	01H	Data start address low byte	01H
Set point number high byte	00H	Set point number high byte	00H
Set point number low byte	03H	Set point number low byte	03H
Bytes	06H	CRC low byte	E6H
1st Data high byte	00H	CRC high byte	08H
1st Data low byte	01H		
2nd Data high byte	00H		
2nd Data low byte	01H		
3rd Data high byte	00H		
3rd Data low byte	01H		
CRC low byte	4DH		
CRC high byte	46H		

10.5 dead time

If the Nexus slave does not receive the data from the master within the sending time of 3.5 bytes (about 7ms at the baud rate of 4800; about 300us at the baud rate of 115200), it considers that the data reception is over. If the delay between two bytes in the transmission process of the master is greater than this time, the slave considers it as dead time. So the conclusion drawn from the dead time is that all unaddressed slaves should pay attention to new packets from the master.

10.6 Exception procedure response

When executing the master command, if the slave encounters an illegal command or other problems, it will send an exception program response packet to the master. The exception program response packet contains an error code to indicate the type of error.

The following table is the error codes and corresponding error types.

Table 1-5 Error codes and types

error	error type	explain

code		
01	illegal function number	The slave does not support the function number in the request packet
02	illegal address	The slave does not recognize the address of the data area in the transmitted request packet
03	illegal data	The data mentioned in the transfer request packet is not supported by the registers in the Nexus slave
06	Busy, refuse package	The slave is busy executing long operations and cannot receive request packets

In the following example, the master device requests the value in the send register 00256 of the slave device with address 01H, and the slave device sends an error response message, implying that it is busy.

Table 1.6 Examples of exception procedure responses

host includes	Hexadecimal address	Slave contains meaning	Hexadecimal address
address	01H	address	01H
function number	03H	function number	03H
Data start address high byte	01H	Error code	06H
Data start address low byte	00H	CRC low byte	C1H
Register Number High Byte	00H	CRC high byte	32H
Register Number Low Byte	01H		
CRC low byte	85H		
CRC high byte	F6H		

Chapter 11 Instructions for using special functions

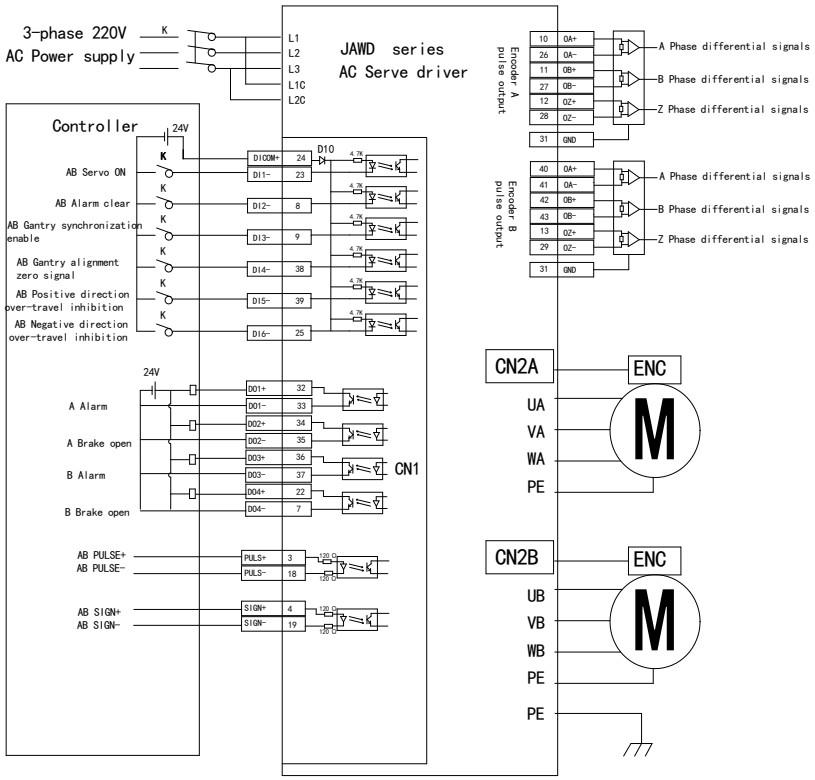
11.1 Use method of gantry function

11.1.1 Functional description

The large-span machinery now basically adopts the connection mode of the gantry beam, and is driven by two motors. In order to improve the synchronization of the two axes during operation, it is necessary to use in synchronous mode, the early synchronization is realized by the upper computer, and the servo is only used as the actuator. Now the gantry synchronous control is completely completed by the servo driver.

The upper computer only does simple open-loop position control and logic control

11.1.2 Gantry function realization connection diagram



11.1.3 Servo basic settings and instructions

parameter code	name	Explanation
P01-00	Rotation direction	Setting range: 0-1 (for the current axis to change the direction of rotation independently) 0： Counterclockwise is the positive direction 1： Clockwise is the positive direction
P03-01.1	Position command receiver	0： This axis pulse port input

		port selection	1： Another axis pulse port input
P03-03	0	command pulse inversion	It is used to adjust the counting direction of the pulse command (set the A axis, and it is used to reverse the direction of the AB axis at the same time) 0： normal. 1： reverse direction
P03-50	0	Gantry function enabled	0： Disable the gantry function. 1： The parameter setting is enabled, and the gantry function can be started only by inputting the IO gantry enable at the same time
	1	Enable OFF, clear gantry deviation	0： The gantry deviation is not cleared when the enable is turned off 1： Clear the gantry deviation when the enable is turned off
P03-53		Threshold of gantry function position deviation fault	Setting range: 0-1073741823 Unit: command unit Set the number of pulses for the allowable deviation. If it exceeds the set value, it will alarm E.510. When it is set to 0, it will not be detected
P03-55		Gantry function synchronous position proportional gain	Setting range: 0-500 Increasing the parameter value can improve the position synchronization of the two axes and help reduce the synchronization error, but if the setting is too large, vibration and noise will easily occur.
P06-11	01	DI1 terminal - function selection	AB axis set 1, servo ON
P06-13	01	DI3 terminal - function selection	AB axis is set to 13, and the gantry synchronous function is enabled
P06-14	01	DI4 terminal - function selection	AB axis is set to 14, and the gantry synchronization command is cleared
P06-15	01	DI5 terminal - function selection	A axis is set to 3/4, forward/reverse overtravel; B axis is set to 0

P06-16	01	DI6 terminal - function selection	A axis is set to 0; B axis is set to 3/4, forward/reverse overtravel

Note: The parameters are set according to the actual situation of the A and B axes

11.1.4 Synchronization setting open method and steps

1、The pulse command is input from the A-axis interface. The first bit of B-axis P3-01 is set to 1, and it is configured as the B-axis shares the A-axis pulse signal.

2、 Confirm that A-axis complies with orientation requirements. If the single axis does not match, it can be reversed by setting P01-00 of the current axis; if the two axes are not matched, it can be reversed by modifying the A axis P03-03.0

3、 Set P3-50.0 to enable the gantry function; set parameter 3-50.1 to select whether to clear the gantry deviation when the function is turned off. Gantry deviation can also be cleared by setting the gantry deviation clear input DI port. Set the "gantry synchronization enable" function input DI port. Only when this port is valid, the gantry function is valid. The gantry function is turned on, and the port input is valid at the same time. The gantry function is activated, and the deviation count value starts counting

4、 If it is necessary to adjust the machine, one axis needs to be moved, and the other axis should not be moved. It is necessary to close the "gantry synchronization enable", and use the pulse prohibition function to forcibly close the pulse input of the axis.

5、 Monitoring: The following options are all encoder units, according to 8388608 per circle

d03 The position difference between the two axes, regardless of whether it is enabled or not, starts counting from power-on.

d04 Accumulated value of position difference between two axes. The gantry function is turned on and the gantry enable port input is valid to count.

d05 Position difference. The position difference that is finally applied to the position loop

11.2 Absolute encoder use

11.2.1 Functional description

By using a servo motor with an absolute encoder, an absolute value detection system can be constructed from a host device. With the absolute value detection system, it is no longer necessary to perform a return-to-origin operation every time the power is turned on. This function is based on MODBUS communication to read the number of turns and position data of the absolute encoder, and the upper device performs processing and control to realize the related functions of the absolute encoder.

11.2.2 Basic setting and description of servo based on MODBUS communication

When the system using the absolute encoder is put into use, it is necessary to initialize the number of rotation data (F07.En1 absolute encoder multi-turn value is cleared). Therefore, when initialization is required, such as when the power is turned on for the first time, an alarm related to the absolute encoder will occur. By setting (initializing) the absolute encoder, the alarm related to the absolute encoder will be cleared after the initialization of the number of revolutions data is executed.

Para code	name	Description
P00-23	Slave station ID	Setting range: 0-255, default 1 Set according to equipment requirements
P00-24.0	Modbus Communication baud rate	Setting range: 0-7, default 2 0: 2400 1: 4800 2: 9600 3: 19200 4: 38400 5: 57600 6: 115200 7: 25600
P00-24.1	485 communication	Setting range: 0-3, default 0

	parity check mode	0: no parity, 2 stop bits 1: even parity, 1 stop bit 2: Odd parity, 1 stop bit 3: No parity, 1 stop bit

11.2.3 Absolute data address based on MODBUS communication

The servo provides 2 kinds of length encoder data options, you can choose one according to your needs, and the corresponding addresses are as follows:

Single-turn 23-bit address table

content	Address: Decimalism	Remark
Absolute encoder position within one turn	2126-2127	Single-turn value range: 0-8388608
Absolute encoder revolutions	2128	Multi-turn value range: 0-65535

Single-turn 16-bit address table

content	Address: Decimalism	Remark
Absolute encoder revolutions	2160	Multi-turn value range: 0-65535
Absolute encoder position within one turn	2161	Single-turn value range:0-65535

11.2.4 Absolute encoder related alarm processing

alarm code	Fault alarm reason	Fault alarm check	Disposal measures
E.643	When the bus encoder is set to multi-turn absolute value, the voltage of the external	Check the voltage of the external battery of the encoder and confirm that it	Replace the battery, and clear the alarm through F06.EN0 (see Chapter 8.4 for details)

	battery is low	is higher than 3.0V	
E.644 E.645	Reading multi-turn data is abnormal, or multi-turn data is greater than 32767	Check the multi-turn value of d21.ASH (see Chapter 8.3 for details)	If the multi-turn value is greater than 32767, clear the multi-turn data through F07.EN1 (see Chapter 8.4 for details)
A.930	Absolute encoder battery failure	Check the encoder external battery voltage	Replace the battery, and clear the alarm through F06.EN0 (see Chapter 8.4 for details)

11.2.5 Absolute Encoder Battery Replacement

If any of the following conditions occurs to the driver, please replace the battery to avoid loss of absolute position data.

1. When the driver displays A.930, it means low battery voltage warning. The battery must be replaced in time to avoid loss of motor absolute position data. After replacing the battery, use the auxiliary function AF-EN0 to clear the alarm

2. When the driver displays E.643, it means that the battery voltage is low and the alarm occurs. When this alarm occurs, the data of the number of motor turns cannot be recorded normally, and the battery must be replaced immediately. After replacing the battery, use the auxiliary function AF-EN0 to clear the alarm, and at the same time verify the origin of the device. At the same time, use the auxiliary function to clear the multi-turn data of the motor

Note: When replacing the battery, it is recommended to do it when the drive is powered on to avoid loss of absolute position data