JASD-EC Field-Bus high voltage servo driver series

Introduction

The JASD series universal servo driver is a high-performance AC servo unit developed by JMC. The servo driver of this series uses advanced motor control dedicated DSP chip, FPGA and IPM power module. High integration, stable performance and reliable protection. It has rich digital and analog I/O interfaces, can be used with a variety of host devices, and supports the EtherCAT communication protocol to facilitate networking. Through the optimized PID control algorithm, it realizes full digital control of position, speed and torque accuracy, with the advantages of high precision and fast response. At the same time, it supports 2500 line incremental encoders and 17-bit and 20-bit high-precision absolute encoder motors to meet different requirements for customer performance. Widely used in CNC machine tools, printing and packaging machinery, textile machinery, robots, automated production lines and other automation fields.

Technical characteristics

- ✧ The use of DSP+FPGA dual-chip platform and optimized current loop design make the driver have the characteristics of high dynamic response, extremely short settling time, smooth operation, and small vibration when stopped.
- ✧ Support standard 100M full-duplex EtherCAT bus network interface and CoE communication protocol.
- ✧ Support standard CIA402 motion control protocol.
- ✧ With automatic gain adjustment module, users can choose the rigidity level according to their needs.
- ✧ Built-in FIR filter and multiple sets of notch filters can automatically identify and suppress mechanical vibration.
- ✧ Built-in disturbance torque observer makes the drive have a strong ability to resist external disturbance.
- ✧ A variety of control modes are available for selection, position control, speed control, torque control, can switch various control modes.
- ✧ Position pulse input frequency up to 4MHz, support pulse + direction, orthogonal pulse, double pulse and other position command modes.
- ✧ Support EtherCAT communication, with multi-turn absolute encoder with memory function, can be flexibly applied to industries such as manipulators.

- ✧ There are programmable 8-channel INPUT and 5-channel OUTPUT ports, users can customize input and output through parameter settings, flexible application.
- ✧ Support incremental encoder and 17-bit, 20-bit, 23-bit high-precision absolute value encoder.
- ✧ It has perfect protection functions such as over-voltage, under-voltage, over-speed, overload, excessive position deviation, encoder error, etc., and can remember 8 groups of historical fault information.
- ✧ With rich monitoring items, users can select the desired monitoring items to monitor the running status during use
- ✧ The driver can communicate with the PC through the RS232 interface to achieve simple and quick debugging of the servo drive system

➢ 1 Safety Precautions

In order to prevent harm to personal and property safety, please be sure to observe the following precautions and make the following marks to distinguish:

⚠ Danger	It indicates that it may cause death or serious injury
⚠ Caution	It indicates that it may cause minor injuries or endanger property safety
🚫	It indicates that implementation is prohibited

1.1 Reception and installation precautions

⚠Danger:

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

2、It is forbidden to use 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 power supply of the drive to the U, V, W motor output terminals, otherwise the drive will be damaged, which may cause personal injury or fire.

2、Please make sure that the connection wires of the power supply and motor output terminals are locked, otherwise it may cause sparking and fire.

3、Please correctly select the power cord and motor power extension cord to avoid the current capacity of the cord not enough to cause fire.

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

⚠Caution:

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

2、For signal cables and encoder feedback extension cables, use multi-stranded shielded cables to enhance anti-interference ability.

3、After the drive is turned off, there is still a high voltage inside, please do not touch the power terminal within 5 minutes, and confirm that the discharge indicator is off before proceeding with the operation.

4、Before powering on, please make sure the wiring is connected correctly.

1.3 Notes on operation and operation

⚠Danger:

1、Before installing the equipment, please test run with no load to avoid accidents.

2、Do not allow untrained personnel to operate to prevent equipment damage and personal injury caused by misuse

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

⚠Caution:

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 device start, emergency stop, shutdown and other switches are effective before running the device.

3、Please do not switch the power frequently.

1.4 Precautions for maintenance and inspection

1. During operation, it is forbidden to touch the driver and the inside of the motor to prevent electric shock.
2. Within 5 minutes after the power is turned off, do not touch the power and power terminals to prevent electric shock.
3. Do not change the connection line when power is on to prevent electric shock or personal injury.
4. The operation and daily maintenance must be carried out by trained professionals.
5. Except the personnel of our company, please do not disassemble and repair.

2 Product Introduction

2.1 Servo Drive

2.1.1 Names of each part of servo drive

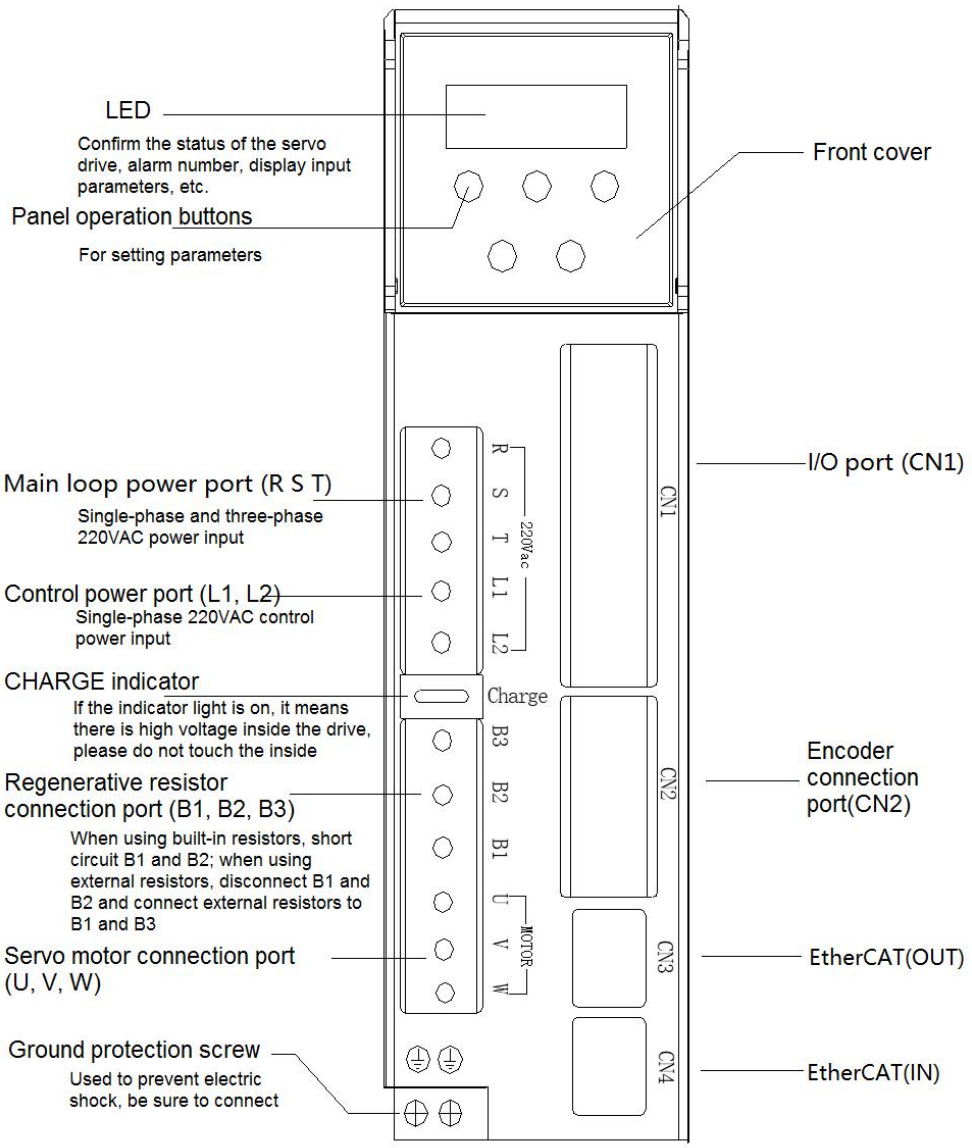


Figure 101 Names of parts of servo driver

2.1.2 Specification of driver

Fig.75 Single phase 220V servo drive

Model JASD***2-20B	200	400	750	1500
Single Phase Continuous Input Current (Arms)	1.9	3.2	6.7	8.8
Continuous Output Current (Arms)	2.1	2.8	5.5	8
Max Output Current (Arms)	5.8	9.6	16.9	19
Main Circuit Power Supply	Single phase AC180-240V, 50/60Hz			

Control Circuit Power Supply	Single phase AC180-240V, 50/60Hz	
Brake Handling Function	External brake resistance	Built in brake resistance

Fig.76 3-phase 220V servo drive

Model JASD***2-20B	750	1500	2000	3000
3-Phase Continuous Input Current (Arms)	3.6	6	8.7	11
Continuous Output Current	5.5	8	14	20
Max Output Current (Arms)	16.9	19	33	50
Main Circuit Power Supply	3-phase AC180-240V, 50/60Hz			
Control Circuit Power Supply	Single phase AC180-240V, 50/60Hz			
Brake Handling Function	Built in brake resistance			

Fig.77 Basic Specifications

Project		Description
Control method		Single/3-phase full-wave rectifier IGBT PWM sinusoidal wave current drive
Feedback		Incremental encoder Absolute encoder
Environment	temperature	Work: 0～55℃ Storage: -25～85℃
	humidity	Work: 10%～90%
	altitude	<1000m. When it is higher than 1000m, it shall be derated according to GB/T 3859.2-93

	Protection level	Protection level: IP10, cleanliness: 2 Non-corrosive and non-combustible gas No oil and water splash Environment with less dust, salt and metal powder
Function	speed regulate area	1:5000
	Steady speed accuracy	±0.01%: External load fluctuation 0～100% ±0.01%: power input change ±10% (220V) ±0.1%: ambient temperature ±25℃ (25℃)
	velocity response frequency	1200Hz
	Torque control accuracy	±2%
Input/Output signal	frequency-dividing pulse output of encoder	A phase, B phase and C phase: linear driving output. frequency-dividing pulse output number: can be set at will.
	input signal	point: 8 Function: Servo ON、Erase warning the warning、Forward overpass signal input、Reverse overpass signal input、Control mode switching、P action instruction input、Positive side external torque limit、Reverse side external torque limit 、Gain switching input 、Zero position fixed input、Instruction pulse inhibit input 、Encoder absolute value data required input 1.Internal set speed switching input 2. Internal set speed switching input 3、Position instruction clear input、Check out input of magnetic pole、Switch input of instruction pulse input multiplier
		point: 5 Function: Alarm output、Band-type brake open output、Servo ready for output、Position complete

	output signal	output、Position close output、Uniform speed output、Motor zero speed output、Torque limit detection output、Speed limit detection output、Warning output、instruction pulse input multiplier switching output

Display function		High voltage power indicator lamp, 6-digit 8-segment LED.
Communication function	EtherCAT	Support CoE protocol, distributed clock
	RS232	Connect to PC for debugging
Regeneration treatment		Built-in regenerative resistor or external regenerative resistor.
Protection function		Overvoltage, undervoltage, overcurrent, overload, etc.

2.1.3 Servo driver model description and nameplate content

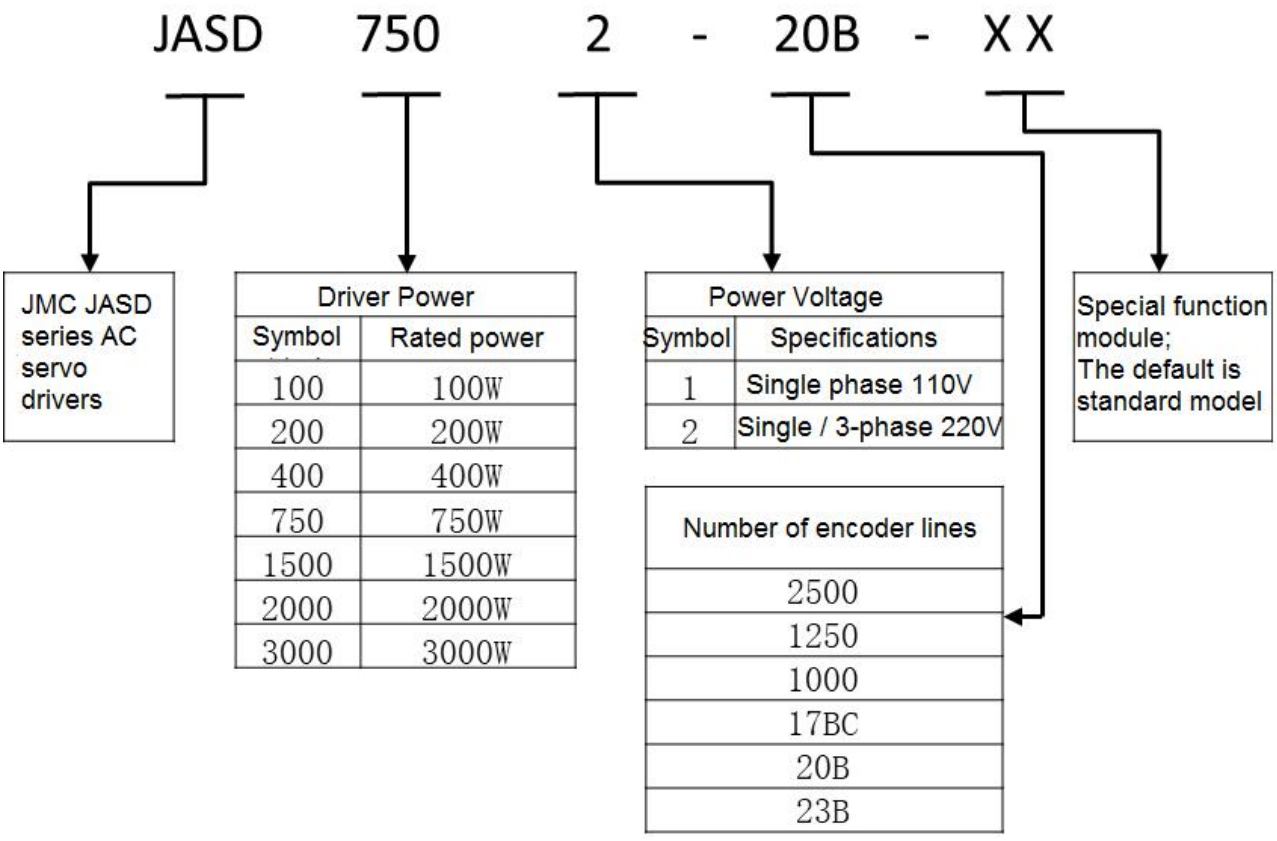


Fig.102 Servo Drive Model

2.1.4 Nameplate of driver

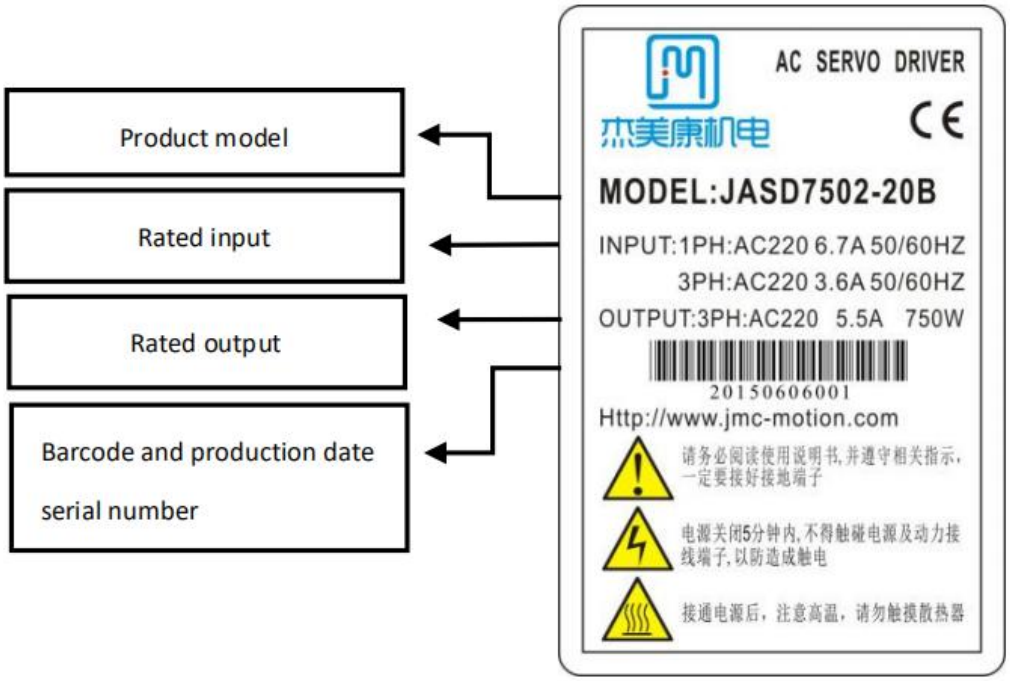


Fig. 103 Nameplate content description

2.2 Servo Motor

2.2.1 Introduction

JASM servo motors are high rotational speed, high precision servo motors developed by JMC to meet the requirements of modern automatic control. This series of servo motors can make the control speed and position accuracy very accurate, and can convert the voltage signal into torque and speed to drive the control object. This series of servo motor rotor speed is controlled by the input signal and can respond quickly. It in the automatic control system, is used as actuators, and the advantages of small electrical and mechanical time constant, high linearity, initiating character such as voltage, can convert the received electrical signal to the motor shaft angular displacement or angular velocity on output, and can be adjusted real time feedback signal to the servo drive, realize high precision control.

2.2.2 Main features

- ✧ High-energy magnetic
- ✧ 300% overload capacity for short time
- ✧ Flange dimensions (mm): 60、80、110、130 (mm):
- ✧ Power: 0.1-3KW optional
- ✧ Low noise, low heat, high precision, high rotation speed, etc.

2.2.3 Model explanation

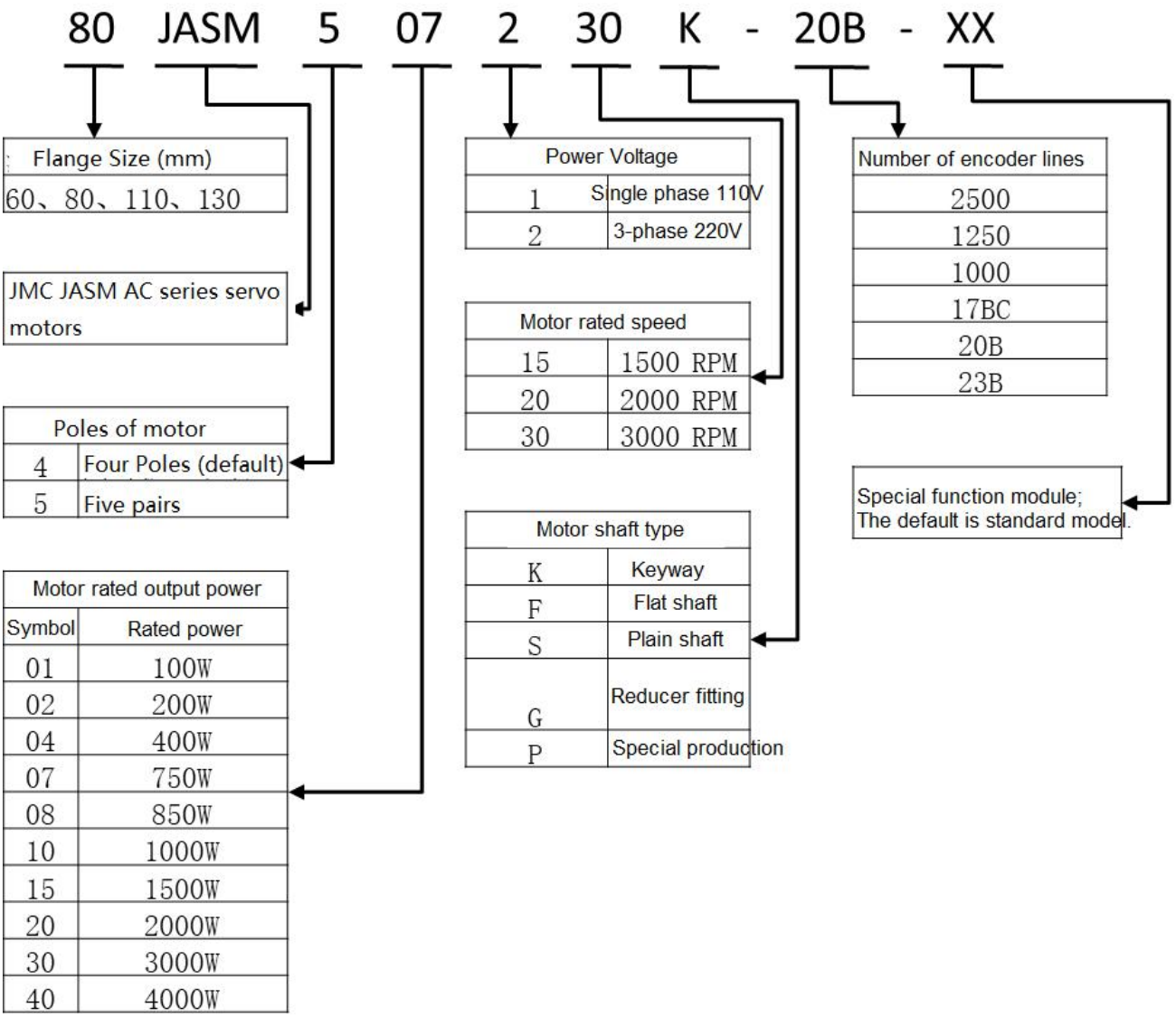


Fig. 104 Servo Motor Model

2.2.4 Nameplate of motor

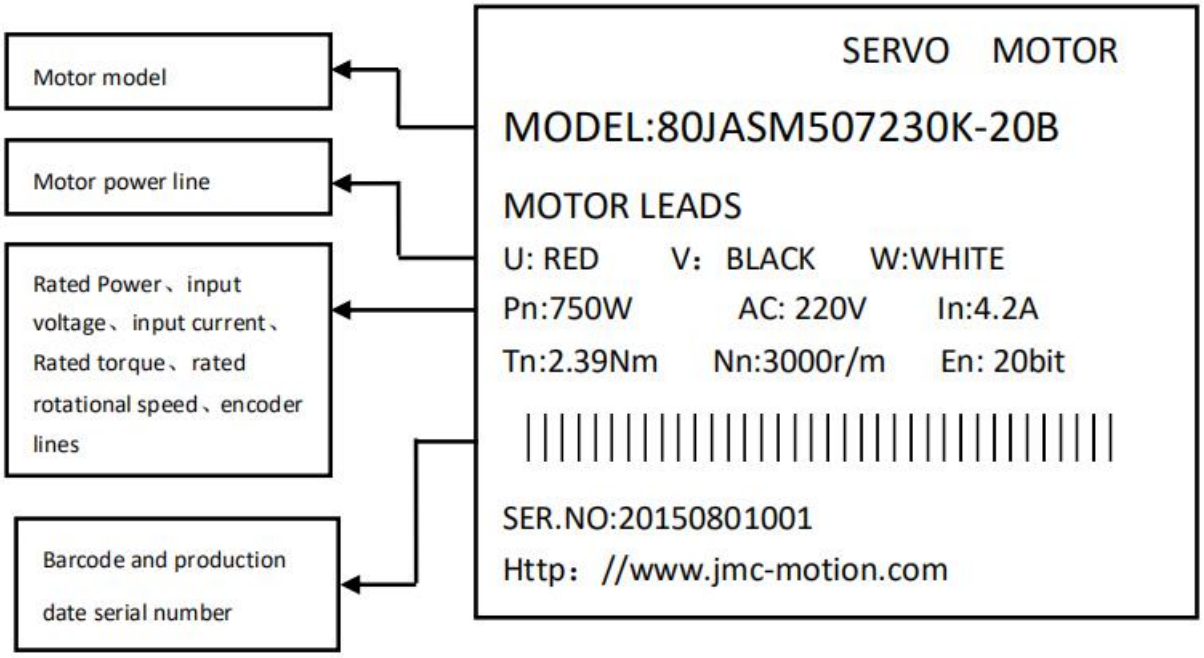


Fig. 105 Nameplate of Motor

2.3 Servo control system and Main power circuit connection

2.3.1 Wiring diagram of servo control system

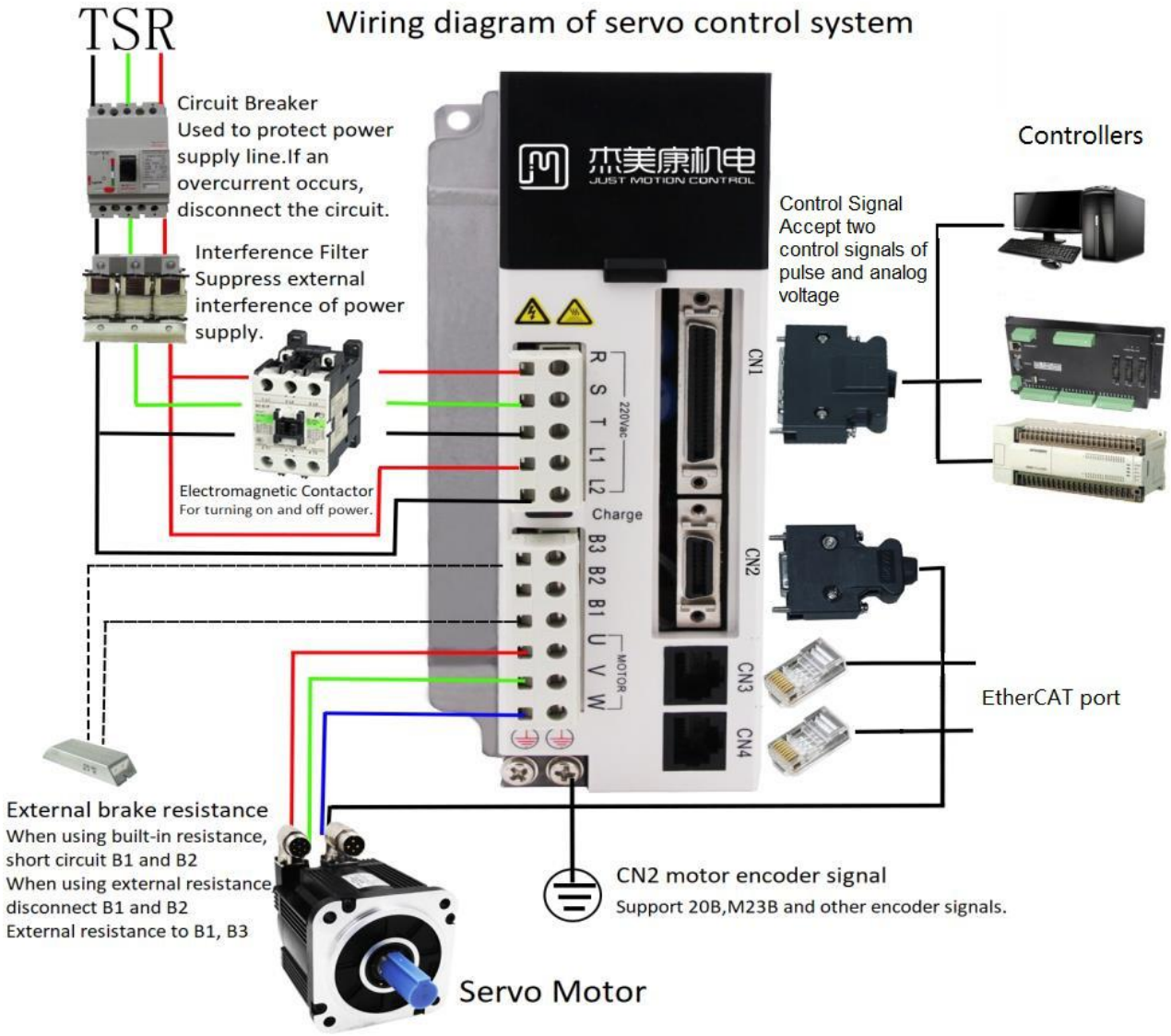


Fig 106 Wiring diagram of servo control system

The servo driver is directly connected to the industrial power supply, without the use of transformers and other power source isolation. In order to prevent cross electric shock accident of servo system, please use fuse or circuit breaker for wiring on input power supply. Because the servo driver has no built-in grounding protection circuit, in order to form a more secure system, please use a leakage circuit breaker with overload and short circuit protection or a dedicated leakage circuit breaker with supporting ground wire protection.

2.3.2 Main power circuit connection

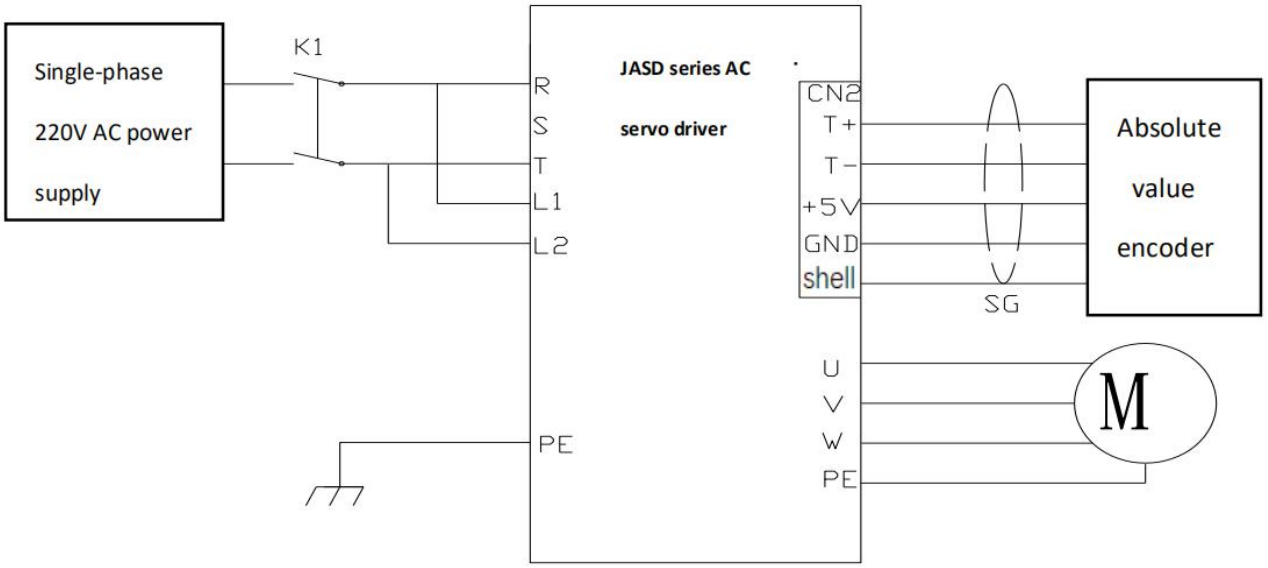


Fig. 107 single-phase power supply

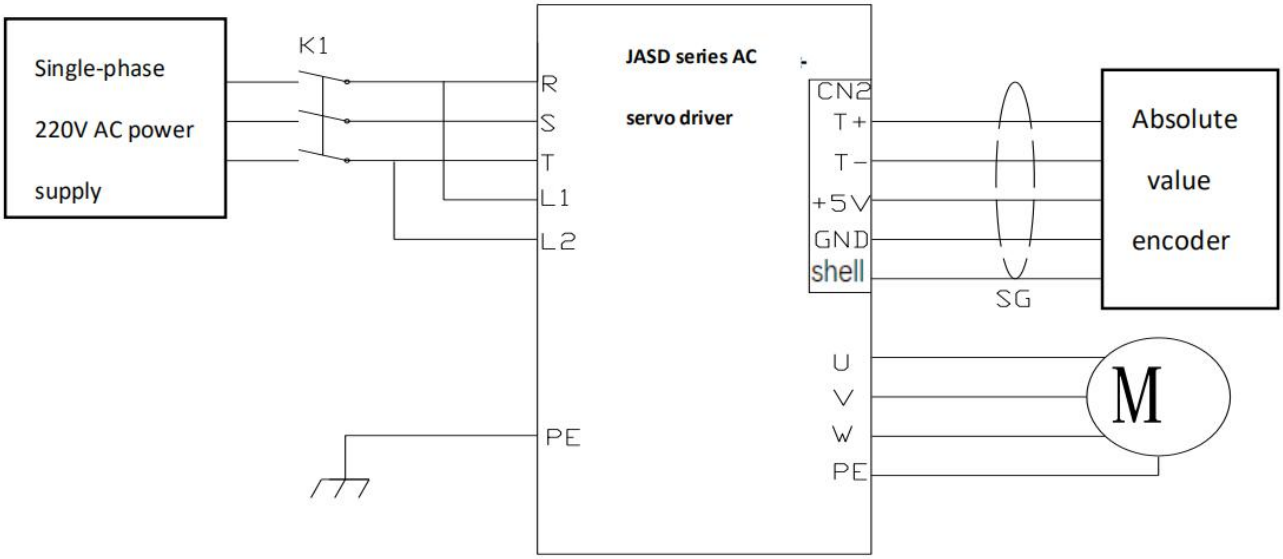


Fig. 108 Three-phase power supply

3 Port description and wiring

3.1 Description of servo driver CN1 control port

3.1.1 Definition of CN1 control port

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

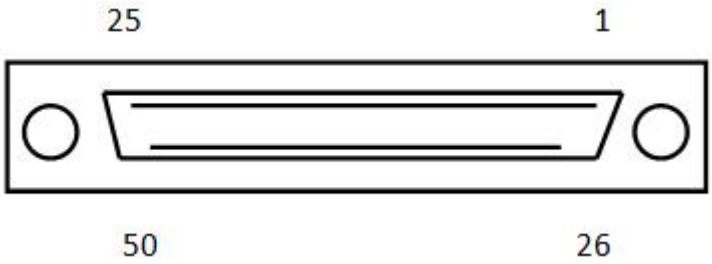


Fig. 109 Description of the ports on the back of the CN1 connector

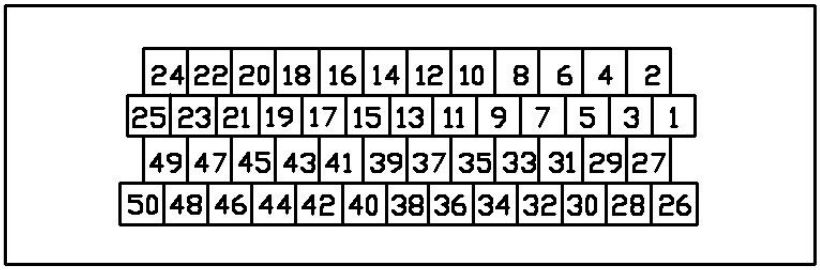


Fig. 110 Distribution diagram of SCSI-50P terminal pins on CN1 port

111 Physical map of SCSI-50P

Fig. 78 Definition of pins in CN1 terminal

Pin number	Label	Definition	Declaration
1	DO4+	Digital output +	Customize output port
2	DO3-	Digital output -	Customize output port
3	DO3+	Digital output +	Customize output port

4	DO2-	Digital output -	Customize output port
5	DO2+	Digital output +	Customize output port
6	DO1-	Digital output -	Customize output port
7	DO1+	Digital output +	Customize output port
8	DI4-	Digital input -	Customize input port
9	DI1-	Digital input -	Customize input port
10	DI2-	Digital input -	Customize input port
11	COM+	Common input	Active High 24V
12	GNDA	Emulation GND	
13	GNDA	Emulation GND	
14	NC	nop	
15	MON2	Analog data monitoring output 2	not currently supported
16	MON1	Analog data monitoring output 1	not currently supported
17	+24V	+24V output (outside I/O)	Maximum allowable output current: 150mA
18	T_REF	Torque analog control +	
19	GNDA	Emulation GND	
20	+12V	+12V output (simulate command)	Maximum allowable output current: 50 mA
21	OA+	Encoder A positive output	
22	OA-	Encoder A negative output	
23	OB-	Encoder B negative output	
24	OZ-	Encoder Z negative output	
25	OB+	Encoder B positive output	
26	DO4-	Digital output -	Customize output port
27	DO5-	Digital output -	Customize output port
28	DO5+	Digital output +	Customize output port
29	HPUL-	Digital input -	
30	DI8-	Digital input -	Customize input port
31	DI7-	Digital input -	Customize input port
32	DI6-	Digital input -	Customize input port
33	DI5-	Digital input -	Customize input port

34	DI3-	Digital input -	Customize input port
35	24V SIGN+	24V positive direction	Active High 24V
36	SIGN+	positive direction	Active High 5V
37	SIGN-	minus direction	Active low 0V
38	HPUL+	high-speed pulse +	
39	24V PULS+	24V pulse +	Active High 24V
40	HSIGN-	High Speed direction -	
41	PULS-	Pulse -	Active low 0V
42	V_REF	Velocity analog control +	
43	PULS+	Pulse +	Active High 5V
44	GND	Digital GND	
45	COM	+24V output GND	
46	HSIGN+	High Speed direction +	
47	COM	+24V output GND	
48	OCZ	Encoder Z Phase-open collector output	
49	COM	+24V output GND	
50	OZ+	Encoder Z positive output	

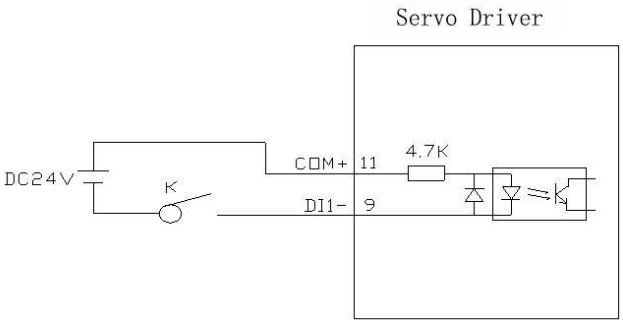
Notice:

1、When the CN1 terminals are connected, 24V PULS+ and PULS+ share PULS-, 24V SIGN+ and SIGN+ share SIGN-, The difference is just a 24V high level input and a 5V high level input.

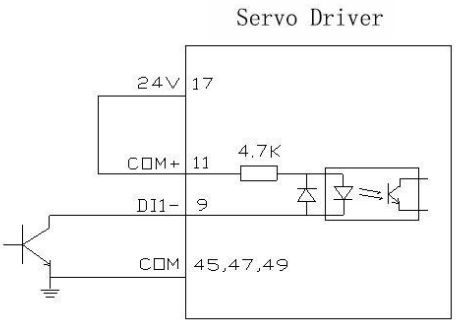
2、Digital input (DI) port、digital output (DO) port, Please set the custom function According to the parameter description.

3.1.2 Connection instructions for CN1 control ports

The digital input DI (DI1-DI8) can be connected by the switches, relays, and open-collector transistors. Power can be supplied from within the drive or from an external source. (Please Function setting of input I/O port can refer to chapter 8.2.7 for p06-xxI/O parameters)

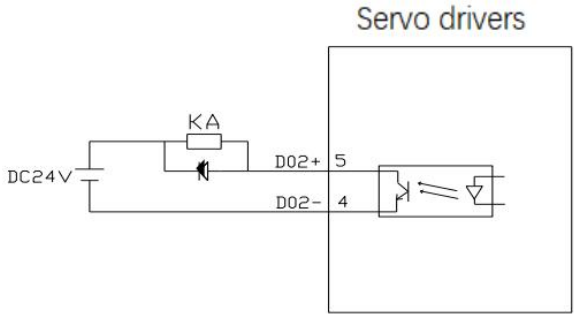


External power input

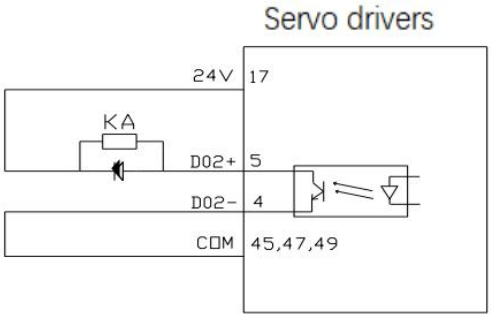


Internal power input

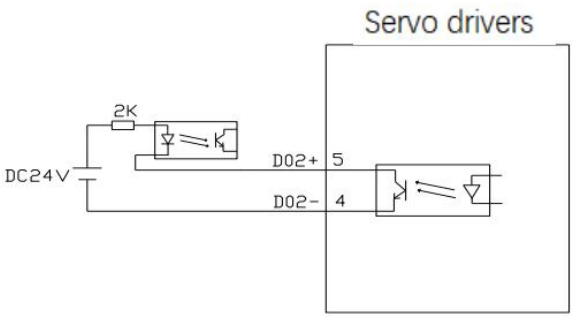
The digital output DO(DO1-DO5) can be connected with relays, photoelectric couplers, etc. The power supply provided inside the drive can be used or external power supply can be used. When using internal power supply, The 24V power supply inside the driver only provides 150mA. If the load is greater than 150mA, be sure to use an external power supply with a supply voltage range of 5-24v. (Function setting of input I/O port can refer to chapter 8.2.7 for p06-xxI/O parameters)



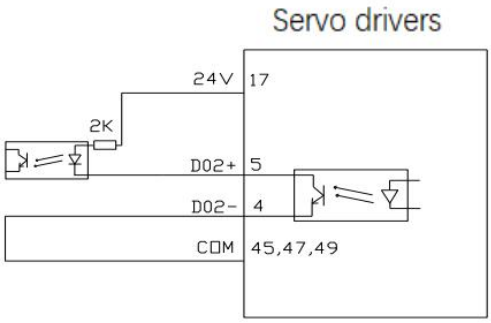
(Relay) External power supply



(Relay) Internal power supply

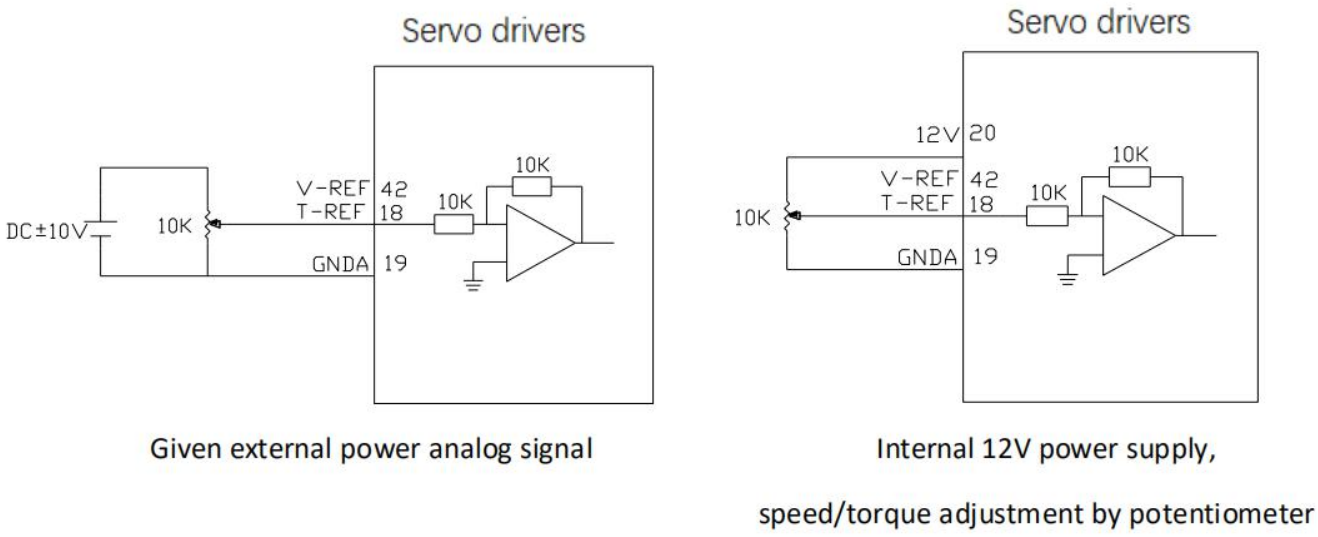


(Optocoupler) External power source



(Optocoupler) Internal power supply

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. For the specific setting method, please read the detailed description of parameters.



Given external power analog signal

Internal 12V power supply,

speed/torque adjustment by potentiometer

3.2 Description of the CN2 encoder port of the driver

3.2.1 Description of SCSI-20P encoder connector

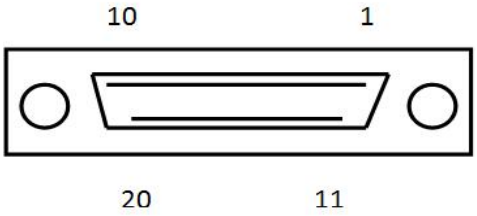


Fig. 112 Port description of CN2

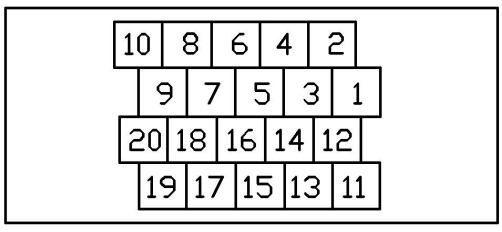


Fig. 113 Pin assignment of SCSI-20P terminal on CN2 port

Fig. 114 SCSI-20P physical map

Table 79 description of SCSI-20P encoder connector

Pin number	Label	Definition	Declaration
1	NC	nop	
2	EZ-	Encoder Z negative input	
3	NC	nop	
4	T-	Bus encoder T-	Special for bus drive
5	T+	Bus encoder T+	Special for bus drive
6	EW-	Magnet pole W negative input	
7	EB+	Encoder B positive input	
8	EW+	Magnet pole W positive input	
9	EB-	Encoder B negative input	
10	EZ+	Encoder Z positive input	
11	EA+	Encoder A positive input	
12	EA-	Encoder A negative input	
13	GND	Output power supply GND	
14	+5V	Output power supply 5V	
15	GND	Output power supply GND	
16	+5V	Output power supply 5V	
17	EV+	Magnet pole V positive input	
18	EV-	Magnet pole V negative input	
19	EU-	Magnet pole U negative input	

20	EU+	Magnet pole U positive input	

3.2.2 Description of 1394-6P encoder connector

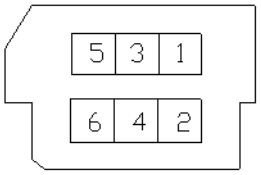


Fig. 115 Encoder connector

Table 80 Definition of encoder pin

Pin number	Label	Definition	Declaration
1	+5V	Output power supply 5V	
2	GND	Output power supply GND	
3	NC	nop	
4	NC	nop	
5	T+	Bus encoder T+	Special for bus drive
6	T-	Bus encoder T-	Special for bus drive

Notice: The connector of 1394-6p encoder is special for 400W driver and the following models. For wiring, please connect according to the sign of the terminal.

3.3 Description of the driver's CN3/CN4 port

CN4 is the input terminal (with red light), CN3 is the output terminal (with green light), please refer to "Communication Interface and Wiring" for details.

3.4 Description of power supply and motor power line port

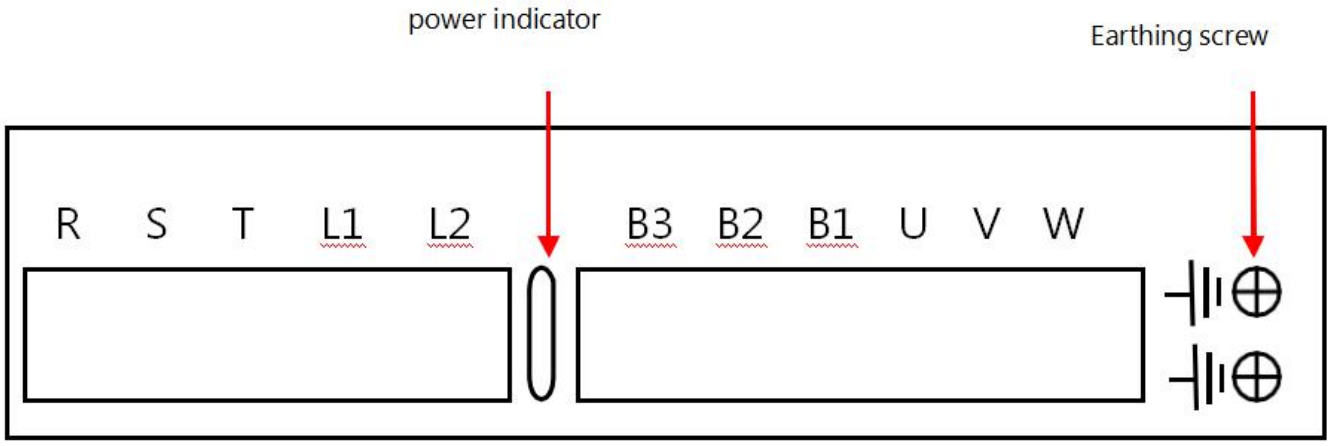


Fig. 116 Drive power line of 400W and below 400W

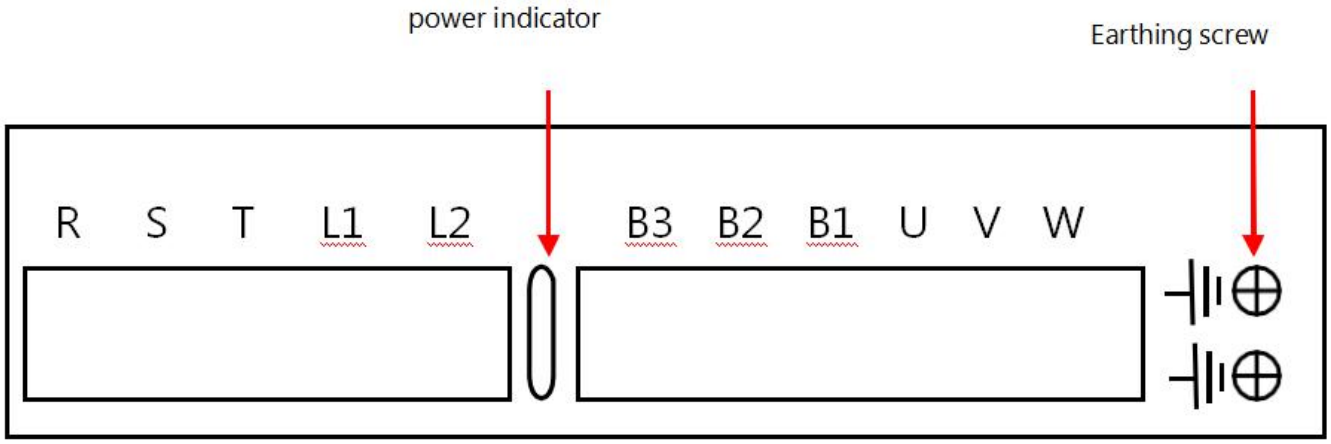


Fig 117 Drive power line of 750W and below 750W

Fig. 81 Power line port definition

Label	Definitionn	Declaration
R、S、T	The power supply input of the main circuit	For single/three-phase 220V ac, it is recommended to use three-phase power supply 0.4kw and below
L1、L2	The input end of the power supply in the control circuit	Connect to single - phase 220V AC

U、V、W	The connection end of the motor power line	Connect the power line of the motor
B1、B2、B3	The connection end of the regenerative resistor	When using the built-in regenerative resistance, short-connect B1 and B2 (our 750W and above drives have built-in regenerative resistance) When using external resistance, disconnect the short connection of B1 and B2, and connect both ends of the resistance to B1 and B3
Earthing screw	Driver protection GND screw	Connect the ground wire of power supply and motor
Power Indicator	Drive power indicator	Shows whether there is high voltage in the driver

1.Be sure to connect the electromagnetic contactor between the power supply and the main circuit power supply of the servo driver, so that in case of failure of the servo driver, the power can be cut off to prevent fire caused by excessive current.

2.There is no built-in regenerative resistance for drivers of 0.4kw and below. When the feedback energy exceeds the absorption capacity of capacitance, an overvoltage alarm of AL.402 will appear, and set P00-30, P00-31 and P00-32 to corresponding values, Refer to 8.2 specification of parameter analysis.

➢ 4 Installation instructions

4.1Installation dimension

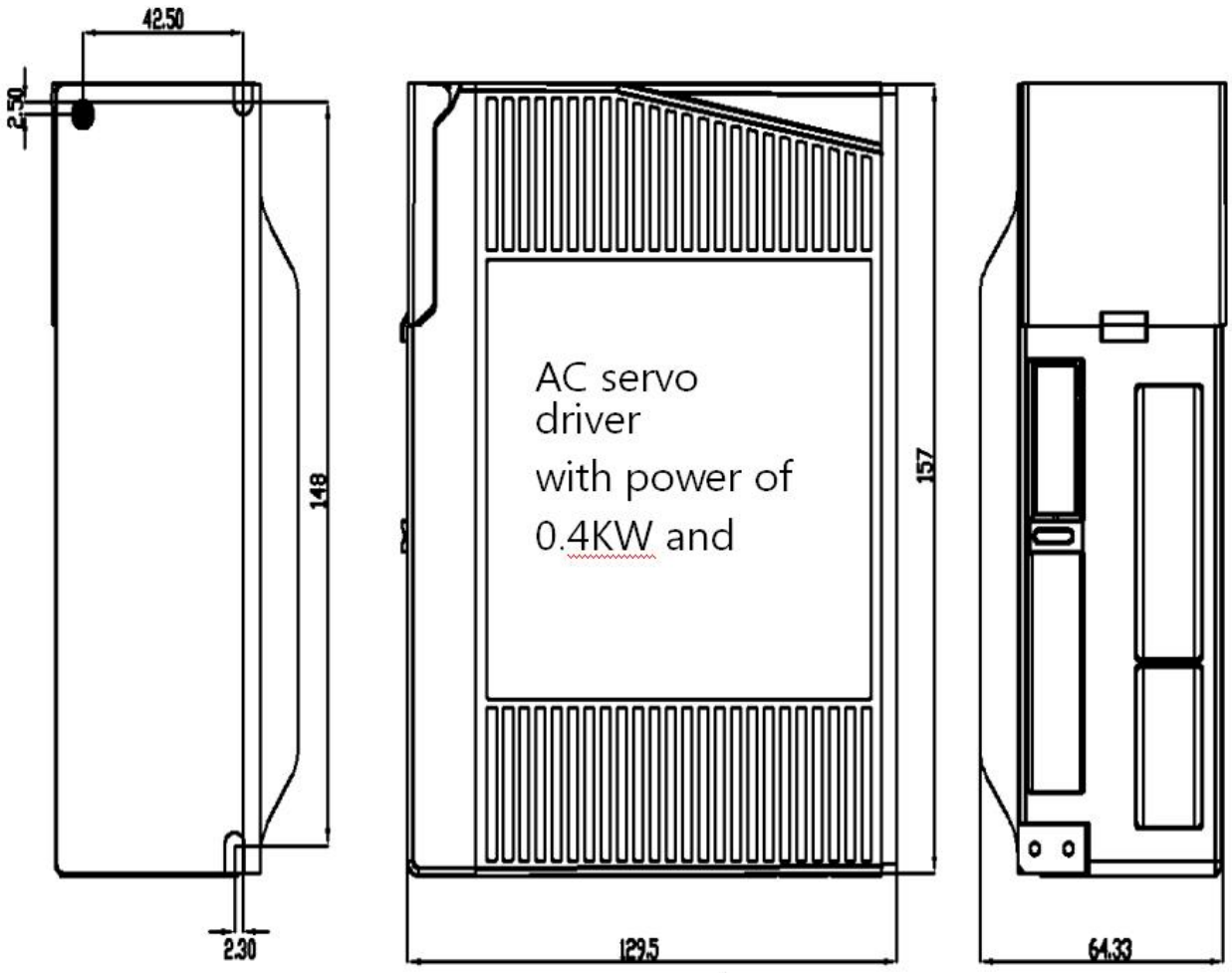


Fig. 118 AC servo driver with power of 400W and below (unit: mm)

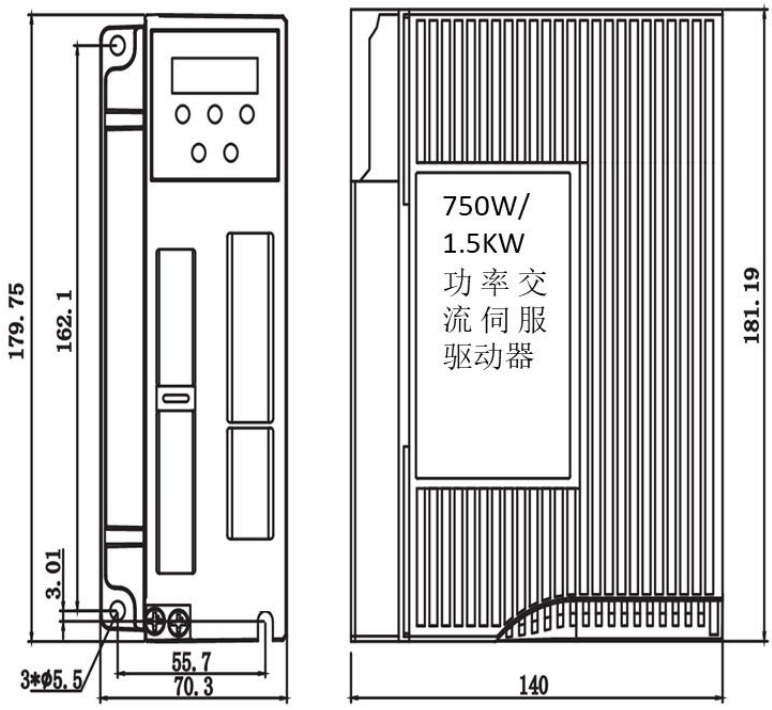


Fig. 119 750W / 1.5KW AC servo driver (unit: mm)

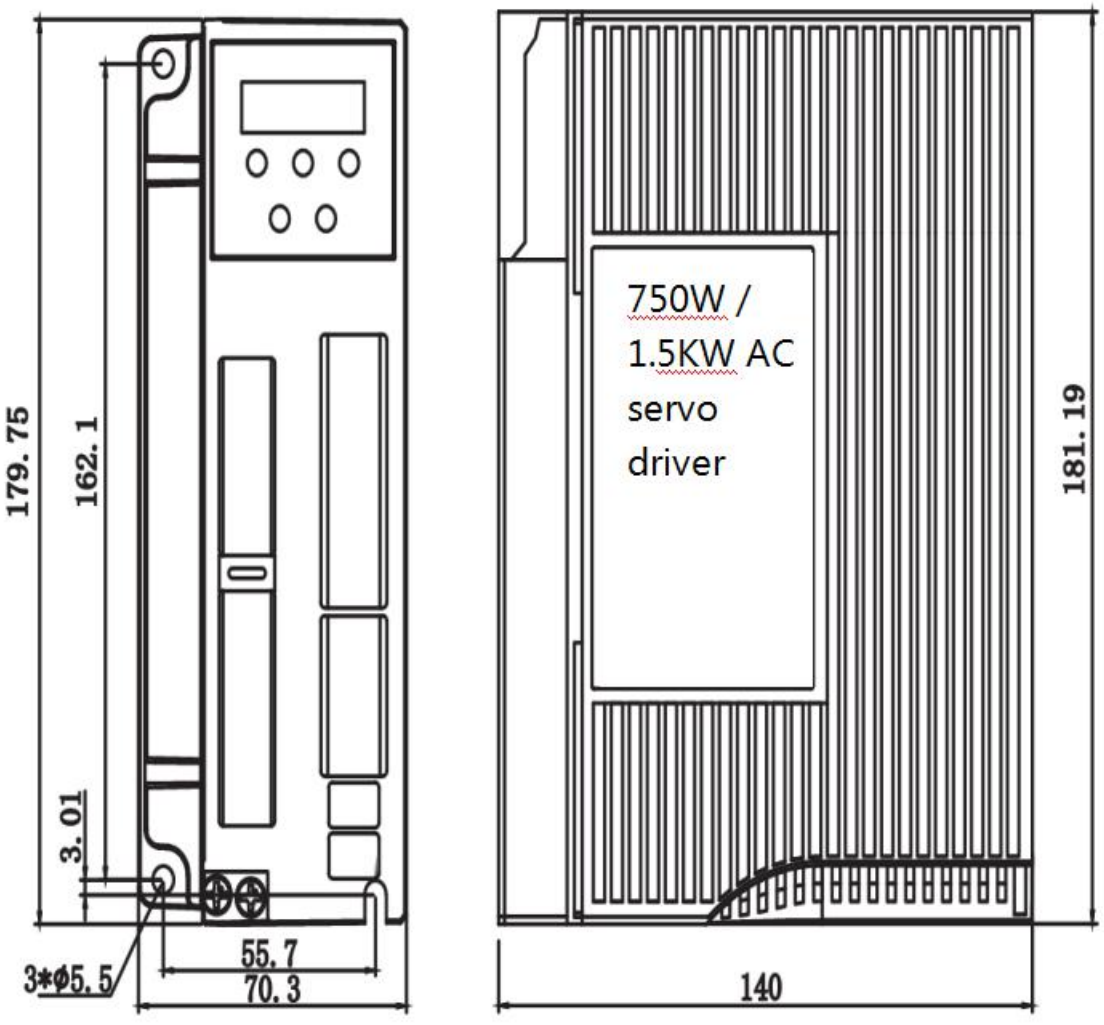


Fig. 120 AC servo driver with 2kW power (unit: mm)

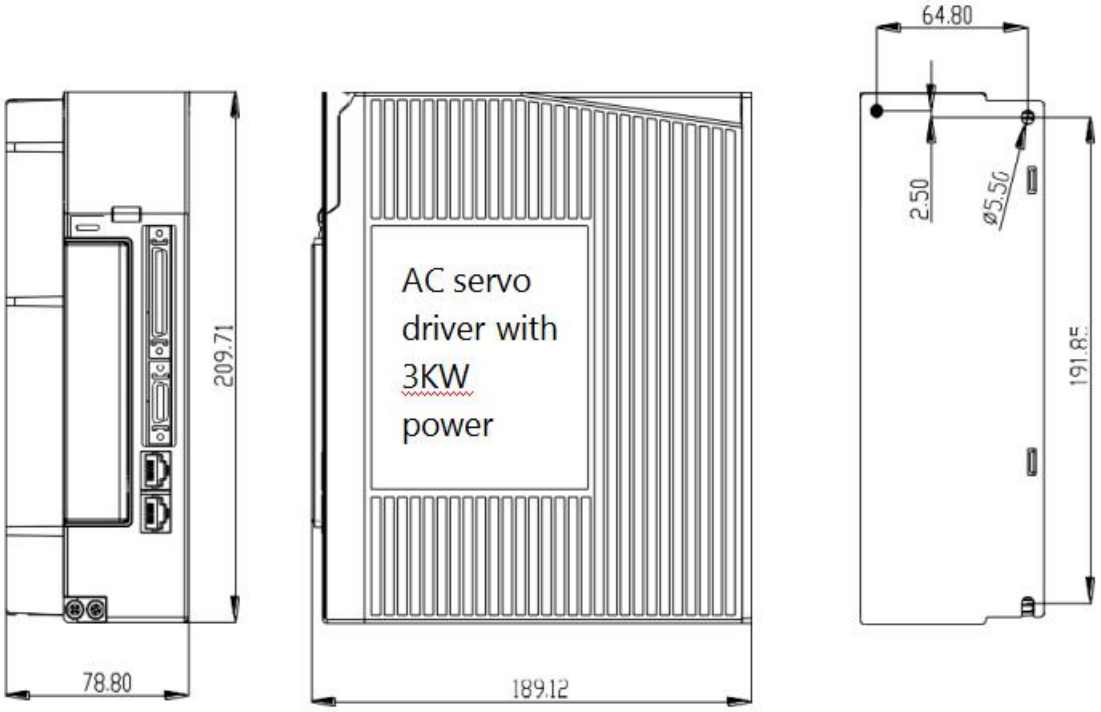


Fig. 121 AC servo driver with 3KW power (nuit: mm)

Notice:

1. The normal installation direction of the servo driver must be vertical, with the top facing upward to facilitate heat dissipation.

2. The device shall be well ventilated when the driver is installed, and the distance between multiple drivers shall not be less than 5CM when they are used side by side in the cabinet.

3. In order to ensure safe use, please make sure that the earthing protection terminal of the driver is well connected with the protective ground of the device!

4.2 Installation environment

The installation 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: 10% ~ 90% (no condensation).
2. Storage environment: -20℃ ~ +85℃;Humidity of storage environment: less than 90% (no condensation).
3. Vibration: below 0.5G.
4. Prevent dripping rain or damp conditions.
5. Avoid exposure to the sun.
6. Prevent oil mist, salt erosion.
7. Prevent corrosive liquids, gas, etc.
8. Prevent dust, cotton wool and metal particles from invading.

9. Stay away from radioactive materials and combustible materials.
10. Space should be reserved around the location of the drivers in the cabinet for convenient loading, unloading and maintenance.
11. Pay attention to the air flow in the cabinet, if necessary, add an external fan to enhance the air flow, reduce the drive environment temperature to facilitate heat dissipation; The long-term operating temperature is below 55℃.
12. Try to avoid vibration sources nearby, and install shock-absorbing devices such as vibration absorbers or anti-vibration rubber gaskets.
13. If there is an electromagnetic interference source nearby, and the power supply and control line of the driver are interfered, resulting in the wrong operation, noise filter can be added or various effective anti-interference measures can be adopted to ensure the normal operation of the driver. (the noise filter will increase the leakage current, so the isolation transformer should be installed at the input end of the driver power supply.)

➢ 5 Panel displays instructions and Settings

5.1 The instructions of the panel functions

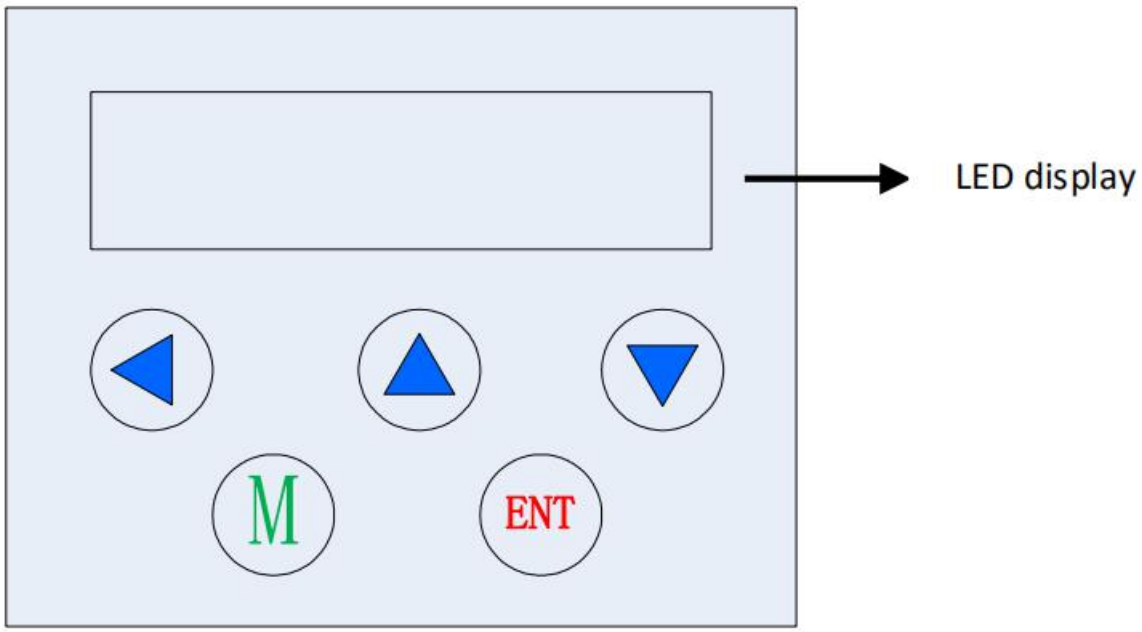


Figure 122 key panel

JASD series ac servo panel with six LED digital display state: 5 - bit key input command, Specific key functions are as follows:

:

Table. 82 Key Function

Panel key label	Definition	Explaination
	LEFT button	shift function Use to toggle high/low display in parameter mode
	UP button	Display changes, value added function
	DOWN button	Display changes, value reduction function
	M button	Function switch and undo exit
	ENT button	Identify or save functionality

Notice:

ENT button Hold for 3 seconds to confirm or save the function

Under the monitoring and parameter interface, long press ENT button to flip quickly

5.2 Switching process of operation mode

JASD series ac servo has four function modes; state display mode, monitoring mode, parameter setting mode and auxiliary mode. The switching process between them is as follows:

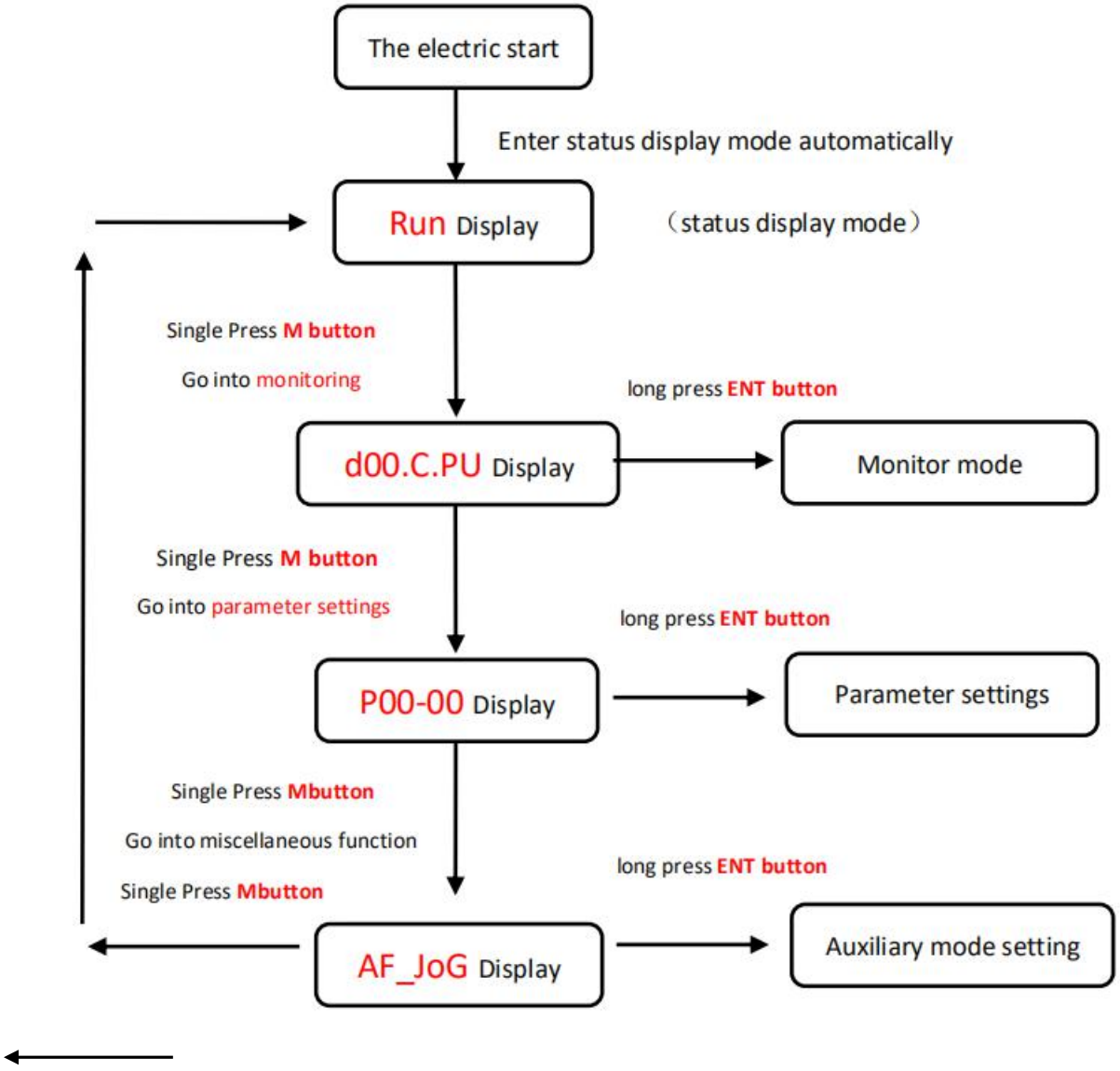


Figure 123 Switching process of operation mode

Note: after pressing ENT to enter the state of mode setting, you can exit the mode selection by pressing M

5.3 Status display

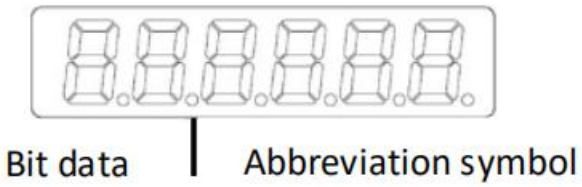


Fig. 124 Digital display

Table 83 Meaning of status display bit data

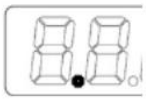
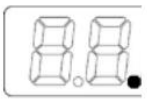
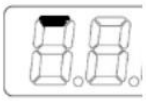
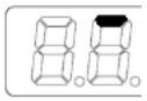
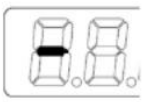
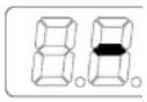
Display	Meaning	Display	Meaning
	Control circuit power on display		Main circuit power supply ready display
	Speed and torque control: consistent display of speed Position control: display after positioning		Rotate the check out display
	Base block display The light is ON at servo OFF state and OFF at ON state		Speed, torque control: speed command input Position control: instruction pulse input display

Table 84 Fig. 84 Meaning of abbreviation

Display	Meaning
	Servo not ready (power supply not on)
	Servo ready (servo motor is not power on)
	In servo enable state (servo motor is in power on)
	Indicates that the input port of the **forward overpass signal** is in a valid state, and the forward turn instruction of the motor is invalid
	Indicates that the input port of the **reverse overpass signal** is in a valid state, and the motor inversion instruction is invalid
	Related operation of servo completed correctly
	The servo is in the enabling state and cannot be operated. It must be turned off the enable then work
	Invalid value is entered, the servo does not perform the current operation
	The relevant parameters of the servo are locked, it will not work before unlocked.
	Servo fault display. Please refer to chapter 9 for fault definition

5.4 Write and save method for parameter setting

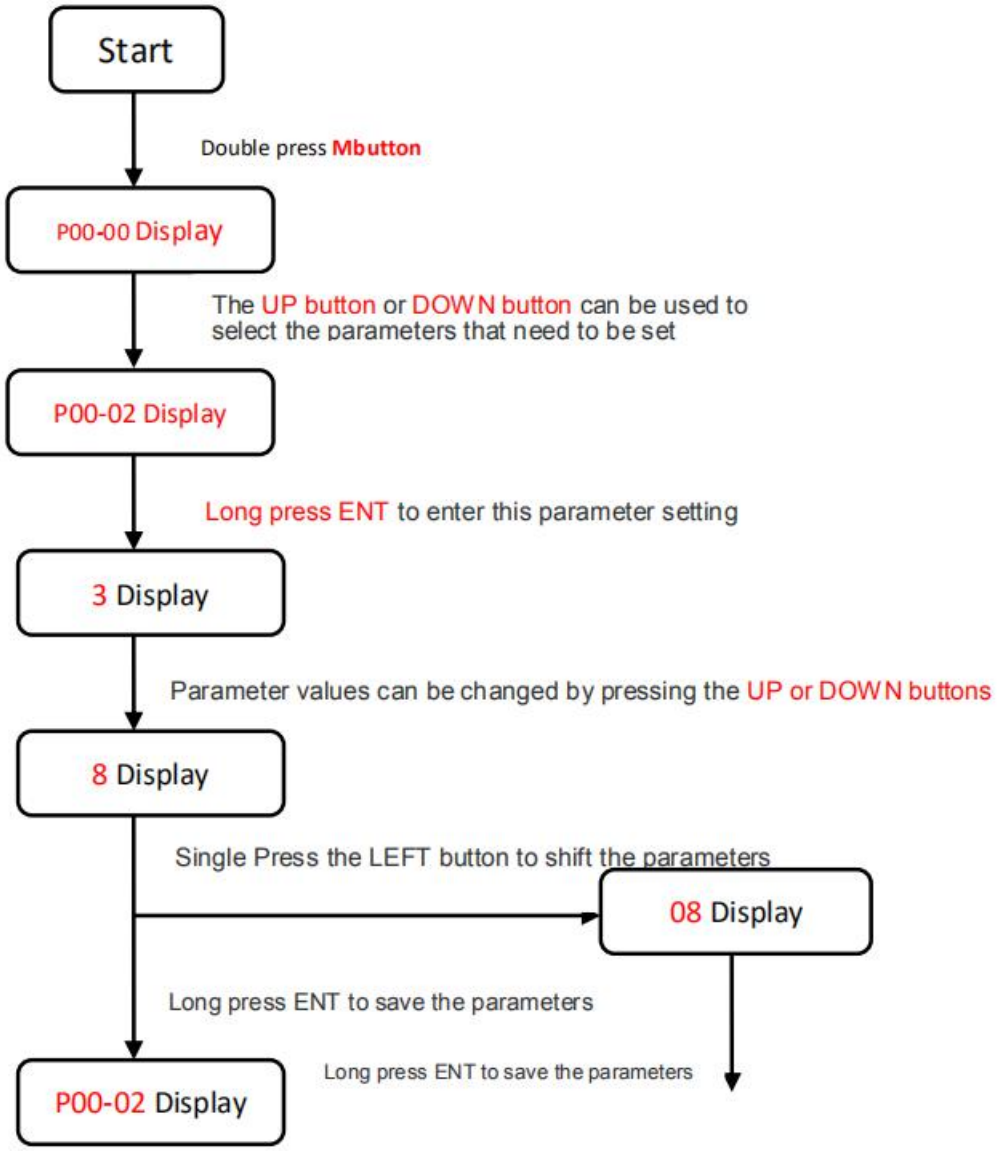


Fig. 125 writing and saving method of parameter setting

6 Control mode and setting

6.1 Position control

6.1.1 Position control wiring diagram

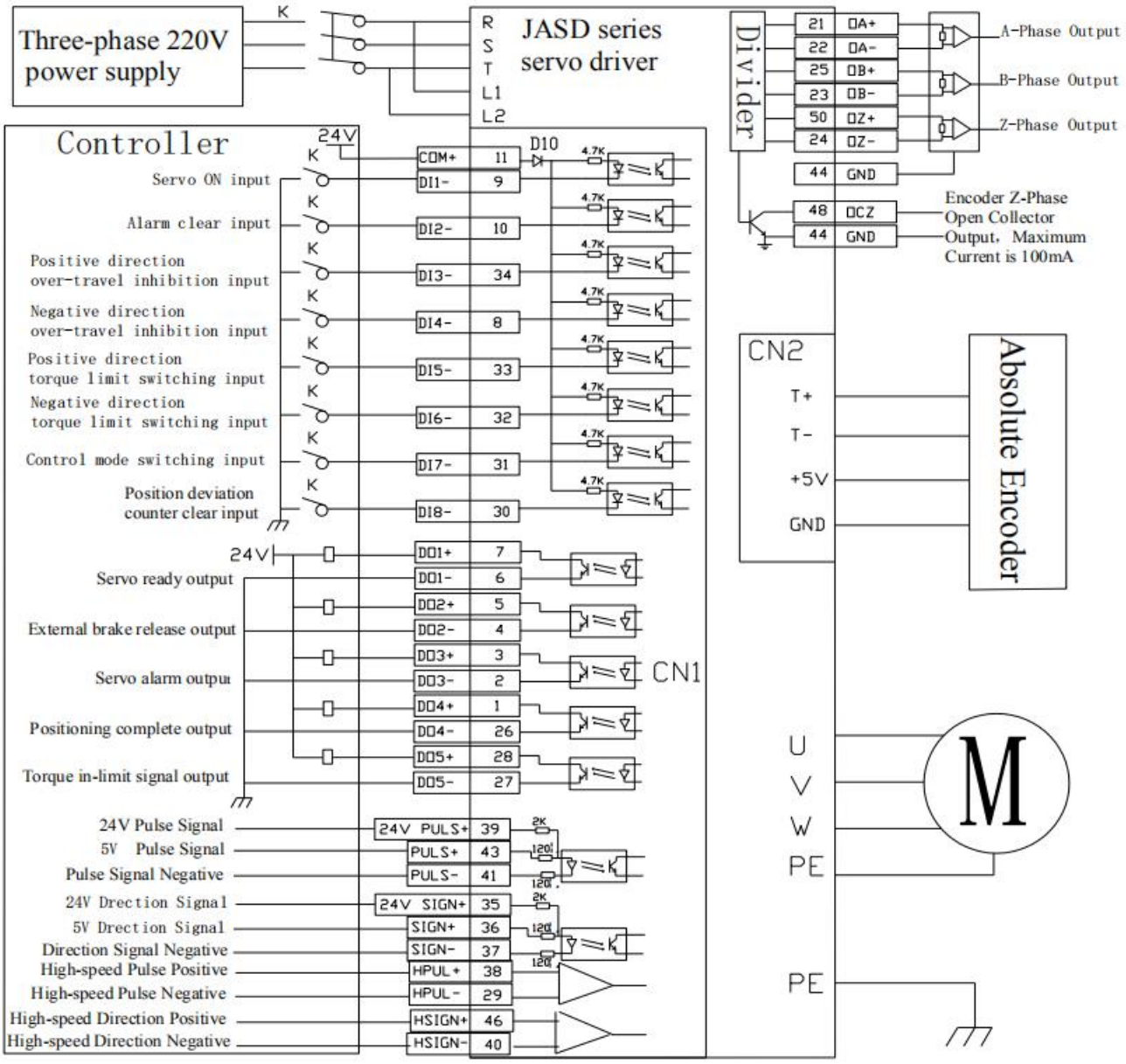
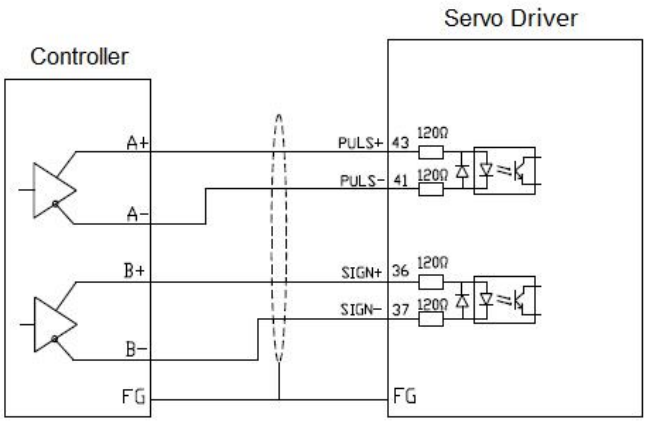


Fig. 126 Position control wiring diagram

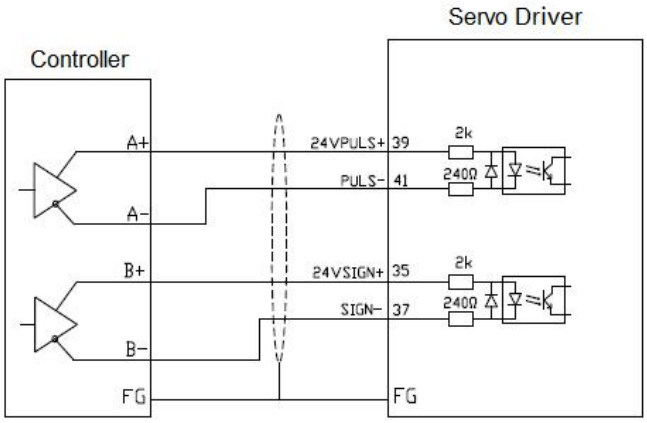
6.1.2 Position control wiring diagram

Controller end Direction + pulse input mode: the direction + pulse input mode can be divided into 5V and 24V signal input modes. Twisted pair wire connection can improve the

anti-interference capability. In general, this position control wiring method is often used in MCU controller system. The maximum input pulse frequency of this control is 500KHz

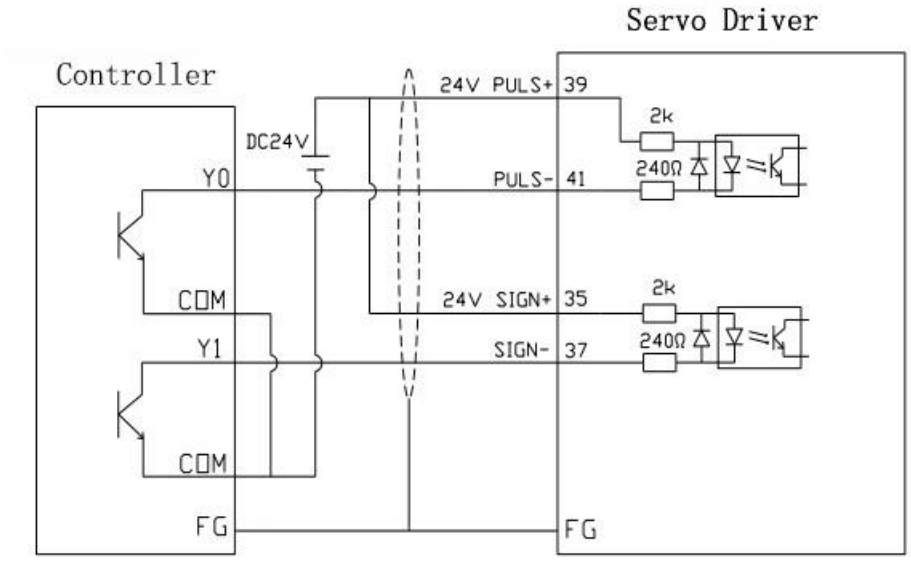


5V pulse + direction input mode

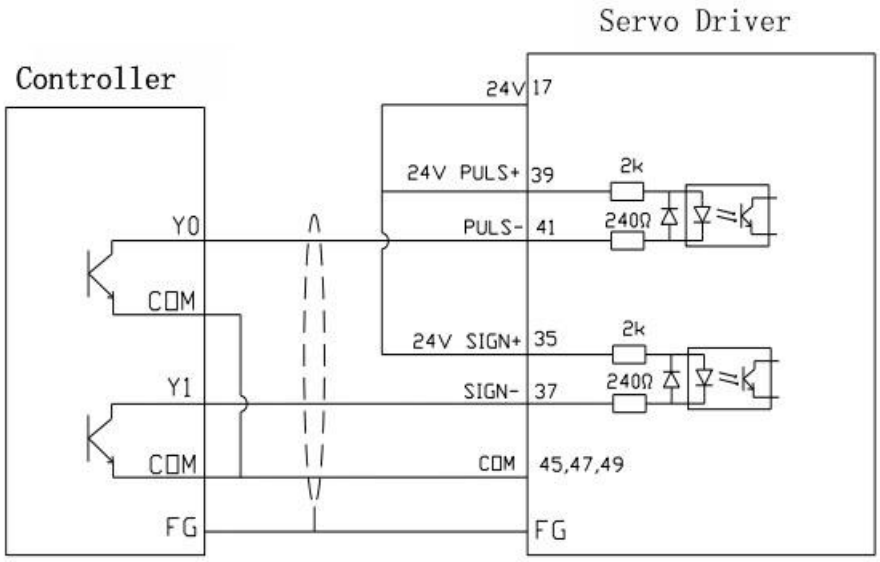


24V pulse + direction input mode

Controller - end collector open input mode description: single - end input mode can use either internal power supply or external power supply. But do not use dual power input to avoid damaging the drive. Generally, PLC controller system USES this kind of position control wiring method



Open collector USES external power supply



Open collector USES internal power supply

Note: high level must be between 3.3-5v when high speed pulse port is input

6.1.3 Description of position control mode parameters

Table 85 Description of parameters when in position control mode

Para code	Name	Range	Setting	Description
P01-01	Control Mode Setting	0-6	0	0: Position mode 1: Speed mode 2: Torque mode 3: Speed, torque 4: Position, speed 5: Position, Torque 6: Full closed loop
P00-05	Motor pole pairs	1-31	---	The specific parameter setting depends on the motor
P0-07	Encoder selection	0-3	---	
P00-10	Line number of incremental encoder	0-65535	---	
P03-00	Source of Location Command	0-1	0	0: Pulse command 1: Number given
P03-01	Command pulse mode	0-3	1	0: Orthogonal pulse command 1: Direction + pulse command 2 or 3: Double pulse

				command
P03-02	input terminal of Command pulse	0-1	0	0: low speed pulse 1: High-speed pulse
P03-03	Command pulse inversion	0-1	0	Set the initial direction of motor rotation
P03-09	Number of command pulses for one rotation of the motor	0-65535	0	Set according to user needs For details, please refer to the explanation of **parameter analysis**
P03-10	The numerator of electronic gear 1	1-65535	1	Set according to user needs For details, please refer to the explanation of **parameter analysis**
P03-11	Denominator of electronic gear 1	1-65535	1	

Note: For **gain parameters**, please adjust refer to "**Parameter Adjustment**".

6.1.4 Example of electronic gear ratio calculation

1.Ball screw drive

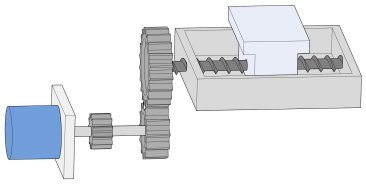


Fig. 127 Ball screw drive

Assumptions:

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

(2) Resolution of each turn of position ring of absolute value encoder: 17bit=131072

(3) load displacement corresponding to 1 position instruction (instruction 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)

$$\frac{B}{A}=\frac{131072}{10000}\times\frac{2}{1}=\frac{16384}{625}$$

Finally, the parameter p03-10 is set to 16384, and p03-11 is set to 625

2.Belt pulley drive

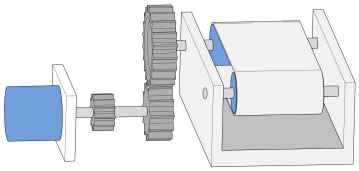


Fig. 128 Belt pulley drive

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: 17bit=131072

(3) Load displacement corresponding to 1 position instruction (instruction unit): 0.000005m Then:

According to (1) and (3), the value of position instruction (instruction unit) required for the pulley (load) to rotate 1 turn can be obtained:

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

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

$$\frac{B}{A}=\frac{131072}{125600}\times\frac{5}{1}=\frac{4096}{785}$$

Finally, P03-10 is set to 4096 and P03-11 is set to 785

1、Rotating load

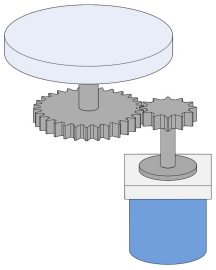


Fig. 129 Rotating load

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: 17bit=131072

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

Then:

According to (1) and (3), the value of position instruction (instruction unit) required for 1 rotation of the load is:

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

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

$$\frac{B}{A}=\frac{131072}{36000}\times\frac{10}{1}=\frac{8192}{225}$$

Finally, the parameter P03-10 is set to 8192 and P03-11 to 225

6.2 Speed control

6.2.1 Speed control wiring diagram

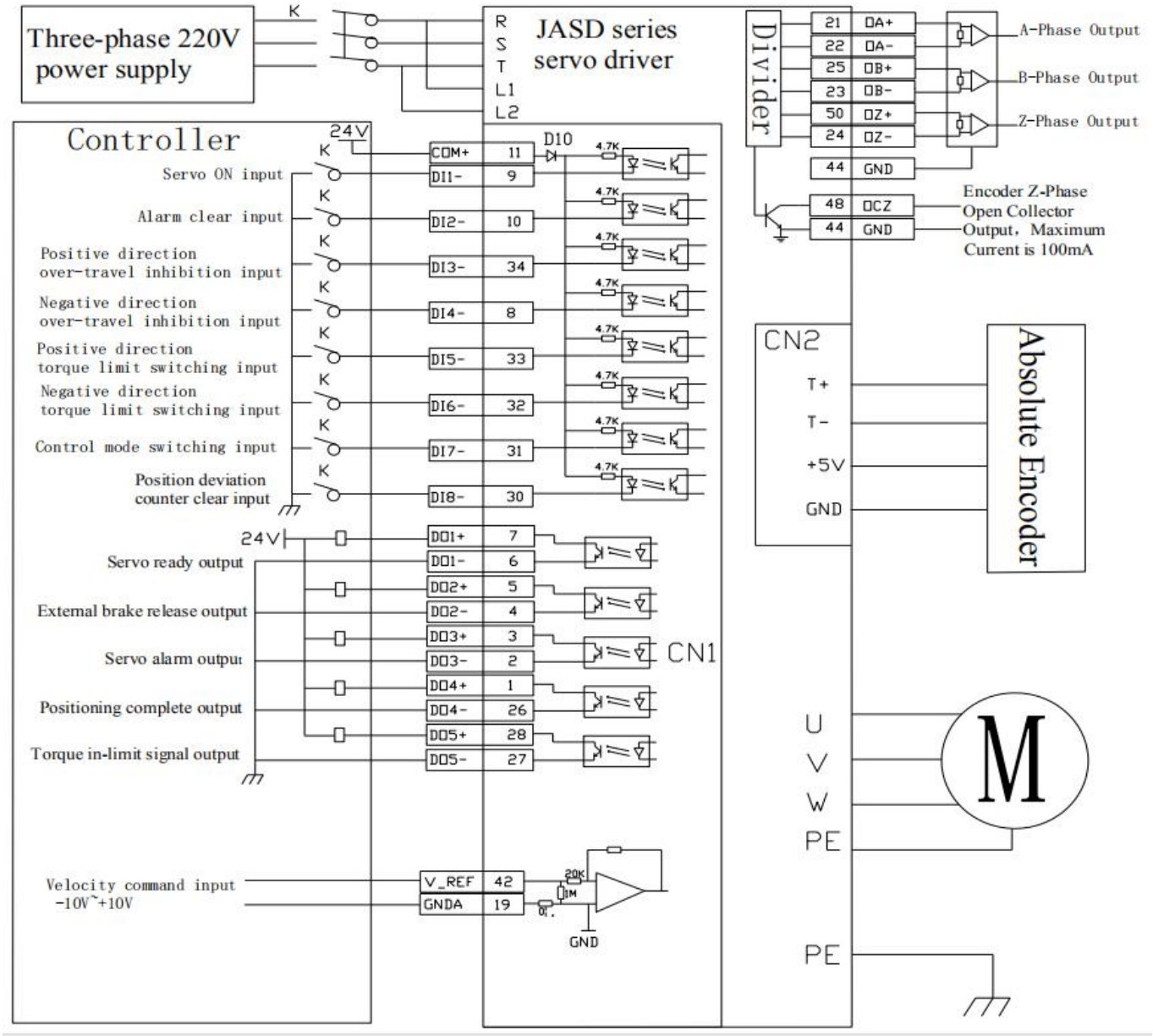


Fig. 130 Speed control wiring diagram

6.2.2 Parameter description of speed control mode

Table 86 Parameters description of speed control mode

Para code	Name	Setting range	setting	Description
P01-01	Setting the Control Mode	0-6	1	0: Position mode 1: Speed mode 2: Torque mode 3: Speed, torque 4: Position, speed 5: Position, torque 6: Full closed loop
P00-05	Pole pairs of motor	1-31	---	The specific parameter setting depends on the motor
P00-07	Encoder selection	0-3	---	
P00-10	Line number of incremental encoder	0-65535	---	
P04-00	Speed command source	0-3	0	0: External analog command 1: Digital command (parameter setting) 2: Digital command (communication) 3: Internal multiple sets of instructions
P04-01	Speed command analog inversion	0-1	0	Set the initial direction of motor rotation
P04-02	Given value of digital speed reference	-6000—6000	0	Set the rotating speed command value, IT is valid when P04-00 is 1 in speed mode
P04-06	Forward speed limit	0-6000		Limit forward speed
P04-07	Reverse speed limit	0-6000		Limit reverse speed
P06-40	Speed analog command input gain	10-2000		Set according to user needs, check the **parameter analysis**

				instructions for details

Note: For **gain parameters**, please do the adjustment refer to "**Parameter Adjustment**"

6.3 Torque control

6.3.1 Torque control wiring diagram

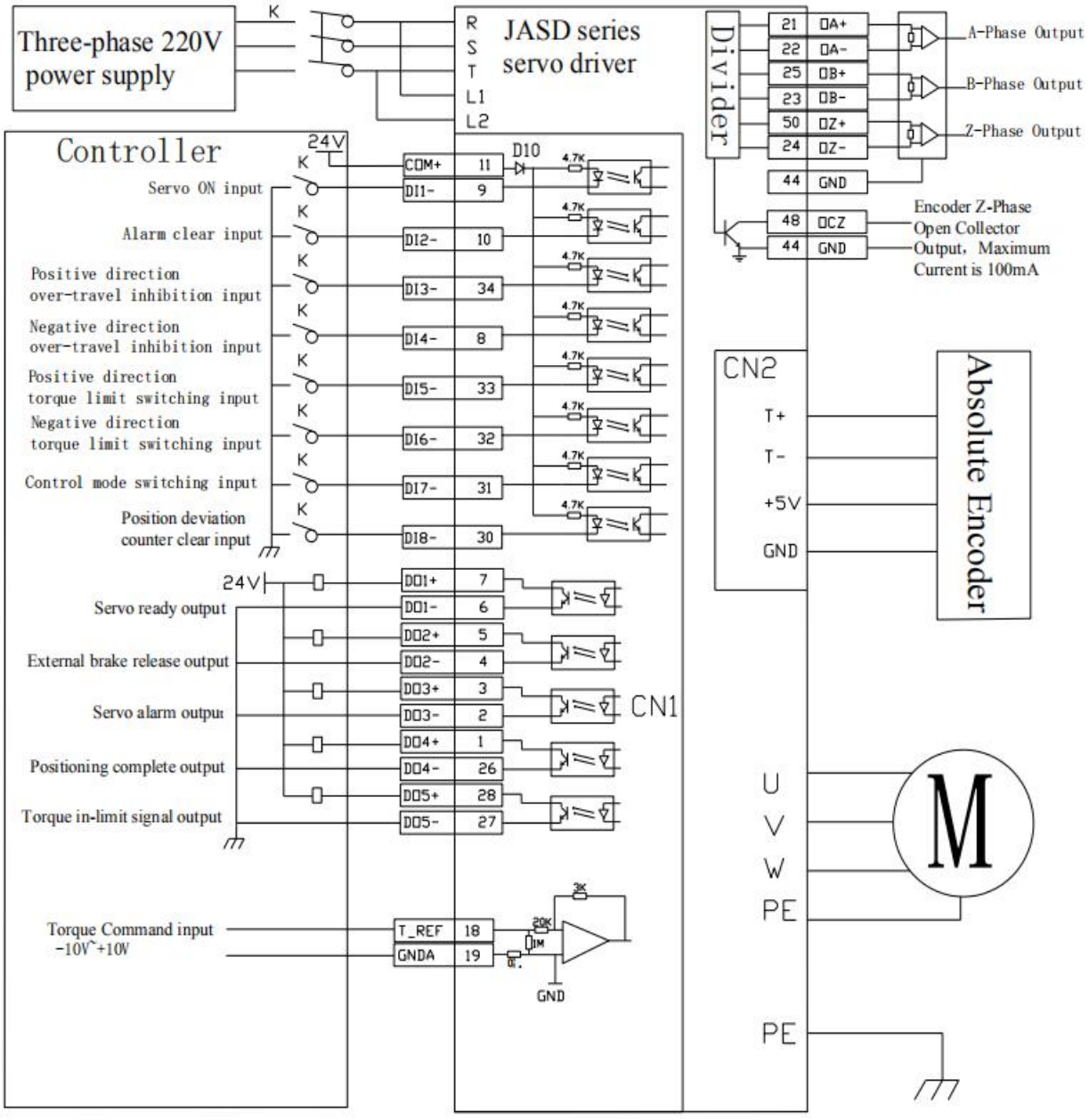


Fig. 131 Torque control wiring diagram

6.3.2 Parameters description in torque control mode

Table 87 Parameters description in torque control mode

Para code	Name	Setting range	set	Description
P01-01	Setting the control Mode	0-6	2	0: Position mode 1: Speed mode 2: Torque mode 3: Speed, torque 4: Position, speed 5: Position, torque 6: full closed loop
P00-05	Pole pairs of motor	1-31	---	The specific parameter setting depends on the motor
P00-07	Encoder selection	0-3	---	
P00-10	Line number of incremental encoder	0-65535	---	
P05-00	Source of torque command	0-3	0	0: External analog command (speed limit value is set by P05-02) 1: Digital command (speed limit value is set by P05-02) 2: External simulation command (speed limit value is determined by speed simulation command) 3: Digital command (speed limit value is determined by speed analog command)
P05-01	Torque command analog inversion	0-1	0	Set the initial direction of motor rotation
P05-02	Torque mode speed limit setting value	0-6000	1000	The maximum speed of the motor in setting torque mode. P05-00 is valid when it is 0 and 1
P05-05	Torque limit setting source	0-1	0	Source for adjusting torque limit
P05-10	Limit value of internal positive torque	0-300.0	200.0	Limit forward torque value

P05-11	Limit value of internal reverse torque	0-300.0	200.0	Limit reverse torque value
P06-43	Input gain of speed analog command	0-100	10	Set according to user needs. For details, please refer to the explanation of parameter analysis

➢ 7 Trial operation and parameter adjustment

7.1 Trial operation

7.1.1 Pre operation detection

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

Table 88 Precautions

Test before power on	1. Check whether the servo drive has obvious appearance damage 2. The connecting part of distribution terminal shall be insulated 3. Check whether there is anything inside the drive 4. Servo drivers, motors and external regenerative resistors shall not be placed on combustible objects 5. In order to avoid the failure of the electromagnetic brake, please check whether the circuit can be stopped immediately and cut off 6. Confirm whether the external power supply voltage of the servo driver meets the requirements 7. Confirm whether the U, V and W power lines, encoder lines and signal lines are connected correctly (confirm according to motor labels and instructions)
Power on detection	1. When the servo driver is powered on, do you hear the sound of relay action 2. Whether the servo driver power indicator and LED display are normal 3. Confirm whether the parameters are set correctly or not. Unexpected actions may occur depending on the mechanical characteristics, do not make extreme adjustments to the parameters

	4. Whether the servo motor is self-locking or not. 5.Please contact the manufacturer if the servo motor has vibration and too much sound during operation

7.1.2 No-load test

No-load test in JoG mode , the user don’t need to connect additional cables, for the sake of safety, please fix the motor base before the test, in order to avoid the danger from the reaction force as speed change of motor.

The simple wiring diagram in JoG mode is shown as below:

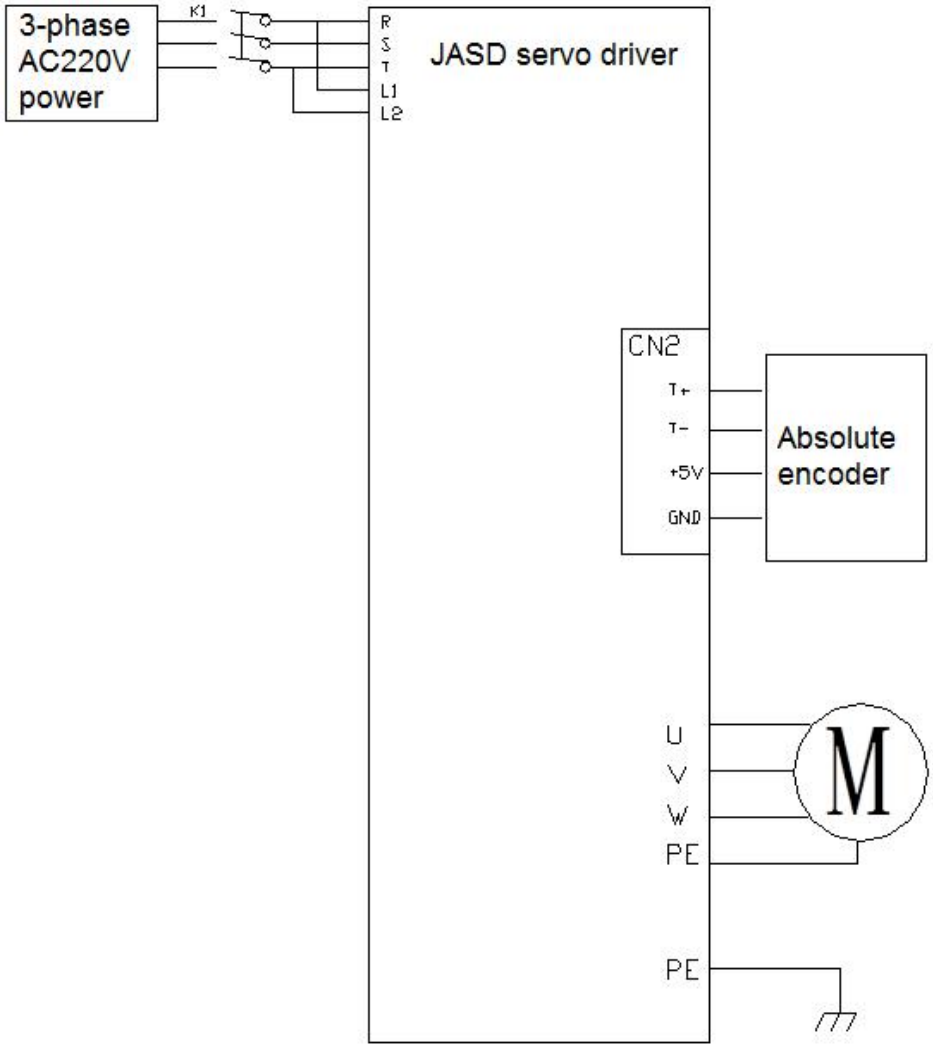


Fig. 132 Wiring diagram in JoG mode

Do the trail test of JoG mode according to the following flowchart

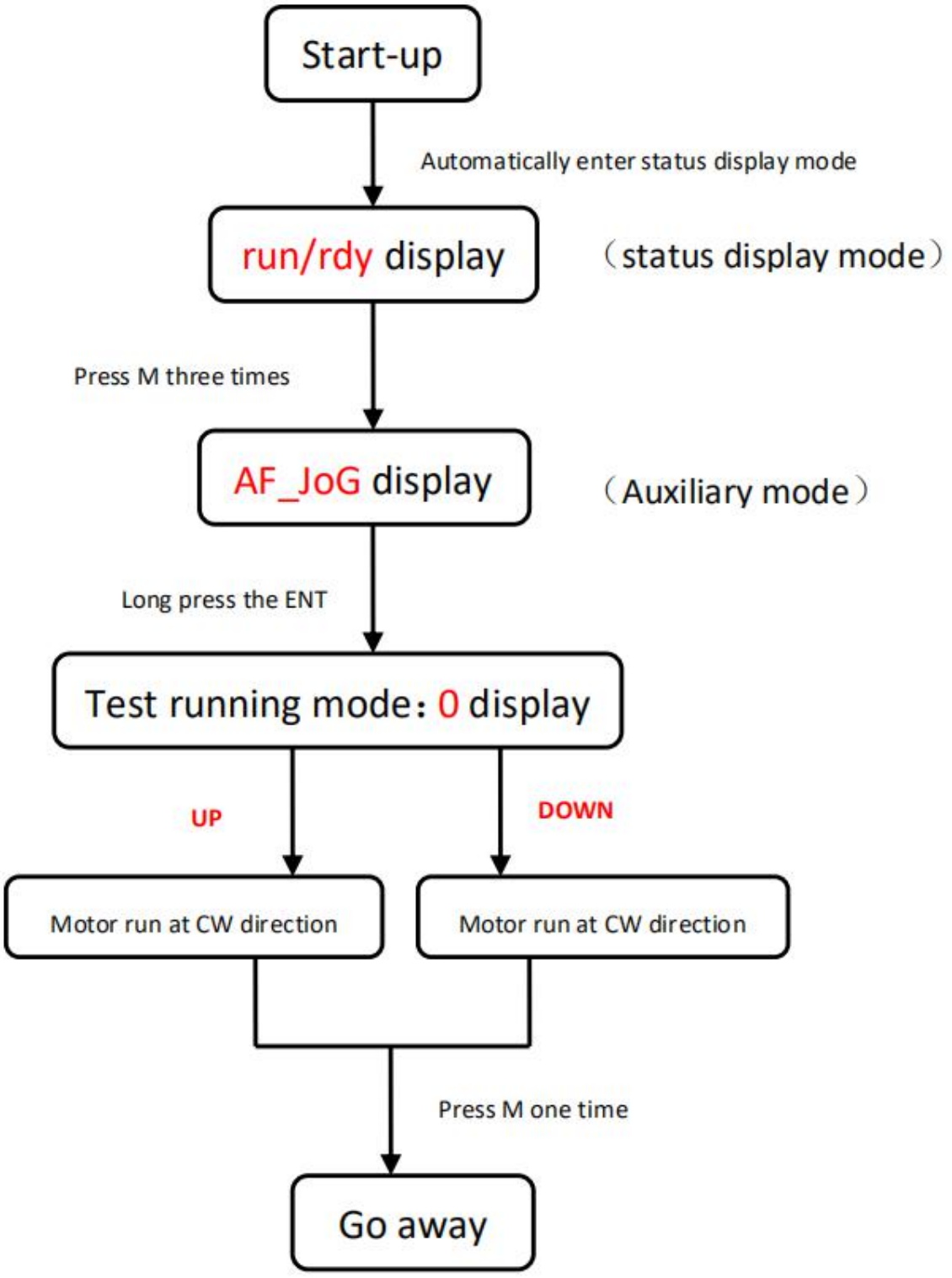


Fig. 133 Flow chart of JoG mode

7.2 Parameter adjustment

After selecting the appropriate control mode according to the equipment requirements,

you need to do reasonable adjustments to gain parameters of servo, to make servo driver can drive the motor quickly and accurately to maximize the mechanical performance.

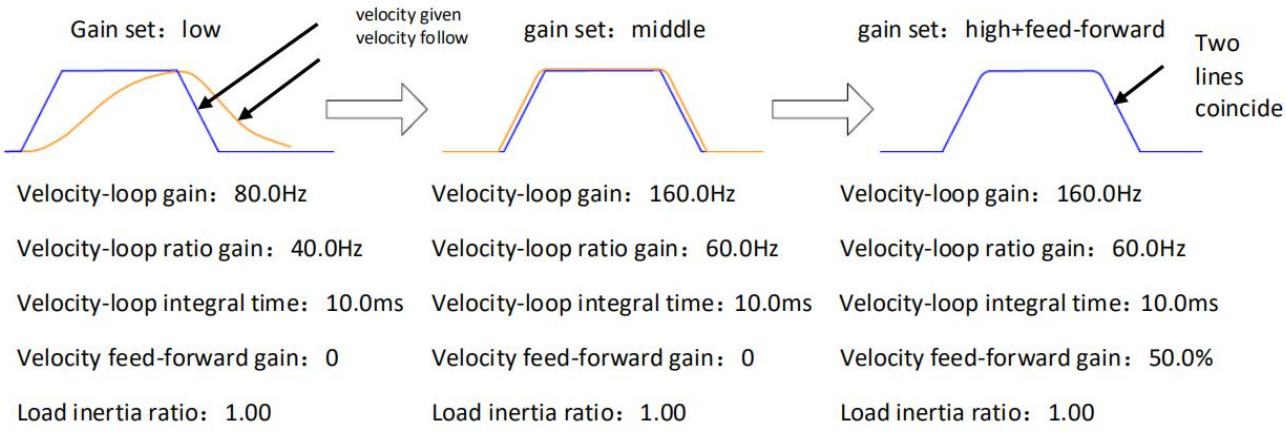
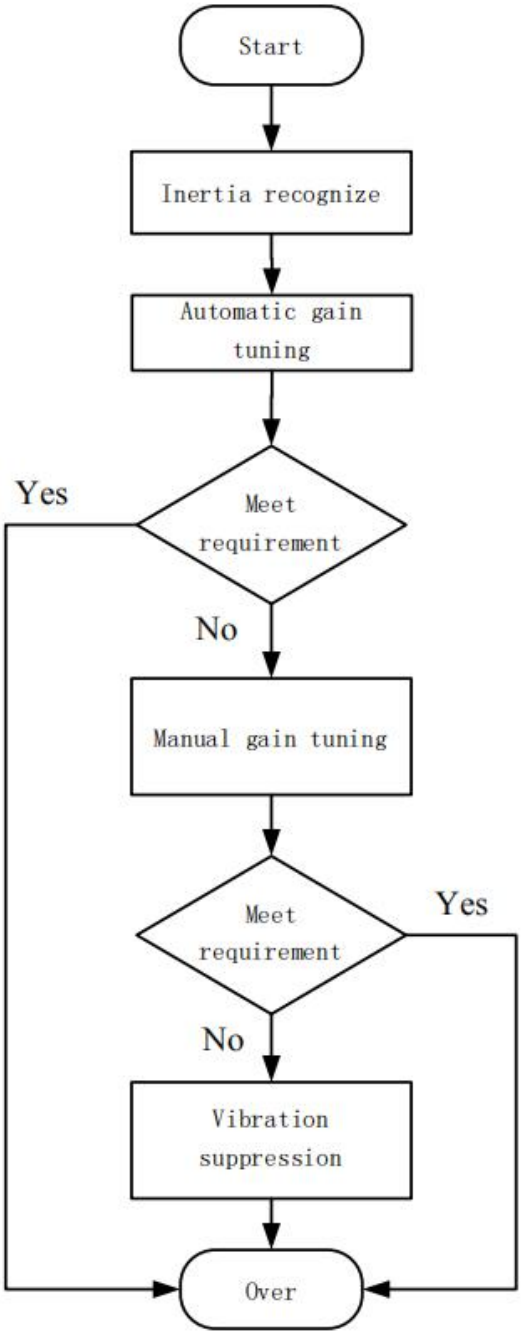


FIG. 134 Curves of different gains

The servo gain is adjusted by multiple loop parameters (position loop, velocity loop, filter & etc.), and they will affect each other. Therefore, the setting of the gain needs to be balance adjusted according to certain rules.



Input to P01-04 according to mechanical output inertial ratio or execute load rotor inertial recognition AF_JL.

Set P01-02 to be 1 or 2, gradually increasing P01-03 until noise heard according to request, and return back 2 steps under current rigidity grade.

Set P01-02 to be 0 after saving P01-00, P02-0, P02-10, P02-11, P02-13, P02-14, P08-20 manually, afterwards you can tune manually.

FIG. 135 Gain adjustment flow chart

7.3 Gain tuning manually

7.3.1 Basic parameter

When the automatic gain adjustment fails to achieve the desired 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:

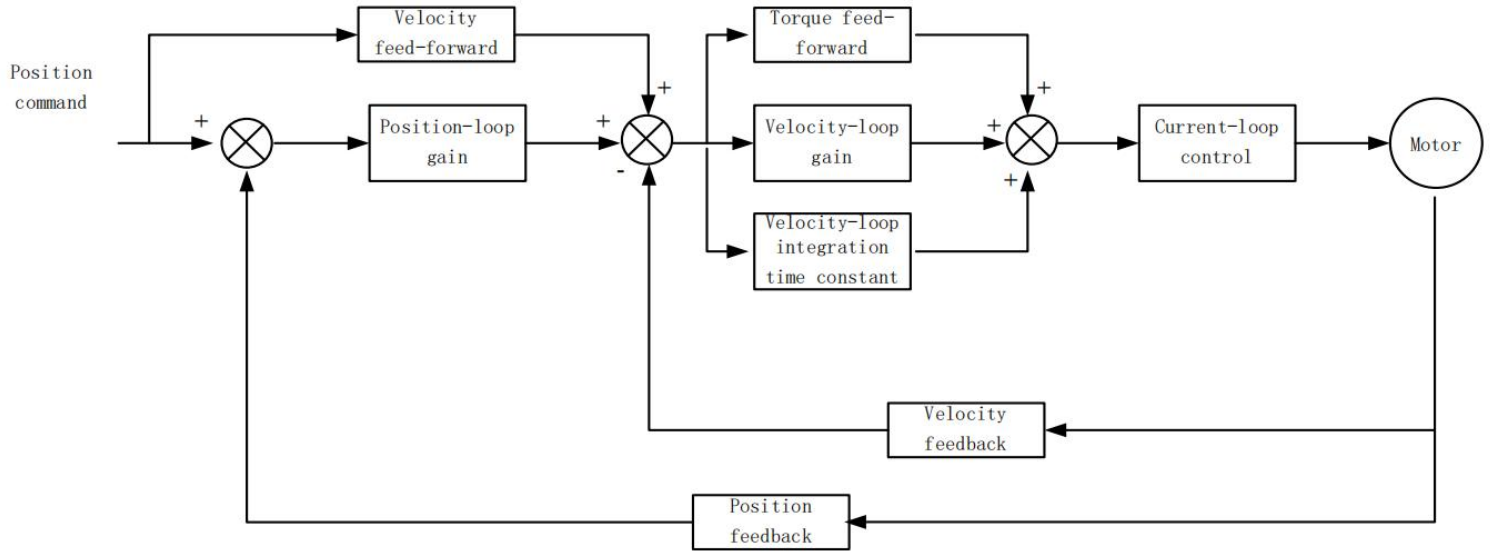


FIG. 136 Control block diagram of servo system

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

Speed loop gain: Increase the setting value as much as possible in case of no vibration and no noise, which can improve the speed following performance and speed up the positioning time.

Speed integral constant: The smaller the set value is, the faster the integral speed is and the stronger the integral effect is. If it is too small, it will cause vibration and noise.

Table 89 Basic gain parameters

parameter code	Name	setting range	setting	Introduction
P01-02	Real-time automatic tuning mode	0-2	2	0: Adjust the rigidity manually. 1: Adjusts rigidity automatically in standard mode. In this mode, the parameters P02-00, P02-01, P02-10, P02-11, P02-13, P02-14, P08-20 will be automatically set according to the rigidity level set by P01-03, it will not work if by manual. The following parameters are set by the user: P02-03 (speed feedforward gain), P02-04 (speed feedforward smoothing constant). 2: Adjusts the rigidity automatically in position mode. in this mode, the parameters P02-00, P02-01, P02-10, P02-11, P02-13, P02-14, P08-20 will be automatically set according to the

				rigidity level set by P01-03, it will not work if by manual. The following parameters will be fixed values and cannot be changed: P02-03 (Speed feedforward gain): 30.0% P02-04 (Speed feedforward smoothing constant): 0.50
P01-03	Adjustment of rigidity settings automatic in real time	0-31	13	Built-in 32 kinds of gain parameters, it works when P01-02 is set to 1, or 2. It can be directly called according to the actual situation. The larger the setting value, the stronger the rigidity.
P02-00	Position control gain 1	0-3000.0	80.0	▸ 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. ▸ Increase the value as much as possible without vibration. ▸ Gain at rest.
P02-01	Position control gain 2	0-3000.0	80.0	▸ 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. ▸ Increase the value as much as possible without vibration. ▸ Gain during exercise.
P02-03	Speed feedforward gain	0-100.0	30.0	For 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 feedforward gain is too large, the position loop of the system will be unstable, and it is easy to lead to overshoot and oscillation.
P02-04	Speed feedforward smoothing constant	0-64.00	0	This parameter is used to set the time constant of the speed loop feedforward filter. The larger the value, the greater the filtering effect, but at the same time the phase lag increases.

P02-10	Speed proportional gain	1-2000.0	40.0	▸ The larger the setting value, the greater the gain and rigidity. The parameter value is set according to the motor and load. ▸ Increase the value as much as possible without vibration. ▸ Gain at rest
P02-11	Speed integral constant	0.1-1000.0	10.0	▸ The integration time constant of the speed regulator. The smaller the setting value, the faster the integration speed and the greater the rigidity. If it is too small, vibration and noise may be generated. ▸ Try to reduce the value of this parameter if the system doesn't oscillate ▸ It responses to steady.
P02-12	Pseudo-differential feedforward control coefficient	0-100.0	100.0	▸ When set to 100.0%, the speed loop adopts PI control, and the dynamic response is fast; when set to 0, the speed loop integral effect is obvious, which can filter low-frequency interference, but the dynamic response is slow. ▸ By adjusting this coefficient, the speed loop can have a better dynamic response, and at the same time, it can increase the resistance to low-frequency interference.
P02-13	Speed proportiona gain 2	1-2000.0	45.0	▸ The larger the setting value, the greater the gain and rigidity. The parameter value is set according to the motor and load. ▸ Increase the value as much as possible without vibration. ▸ Gain during exercise.
P02-14	Speed integral constant	0.1-1000.0	1000.0	▸ The integration time constant of the speed regulator. The smaller the setting value, the faster the integration speed and the greater the rigidity. If it is

				too small, vibration and noise may be generated. ▸ Under the condition that the system does not oscillate, try to reduce the value of this parameter. ▸ It responses to steady
P02-15	Pseudo-differential feedforward control coefficient	0-100.0	100.0	▸ When set to 100.0%, the speed loop control in PI , and the dynamic response is fast; when set to 0, the speed loop integral effect is obvious, which can filter low-frequency interference, but the dynamic response is slow. ▸ the speed loop can have a better dynamic response by adjusting this coefficient, and it also can increase the resistance to low-frequency interference .

7.3.2 Gain switching

The gain switching function can be triggered by the internal state of the servo or the external DI port. It is only effective in the position control and speed control modes. With gain switching, the following effects can be achieved

Switch to lower gain when the motor is static (servo enabled) to hold vibration

Switch to higher gain when the motor is static (servo enabled) to short positioning time

Switch to higher gain in the running state of the motor to obtain better command following performance;

Switch to different gain settings by external signals according to the use situation

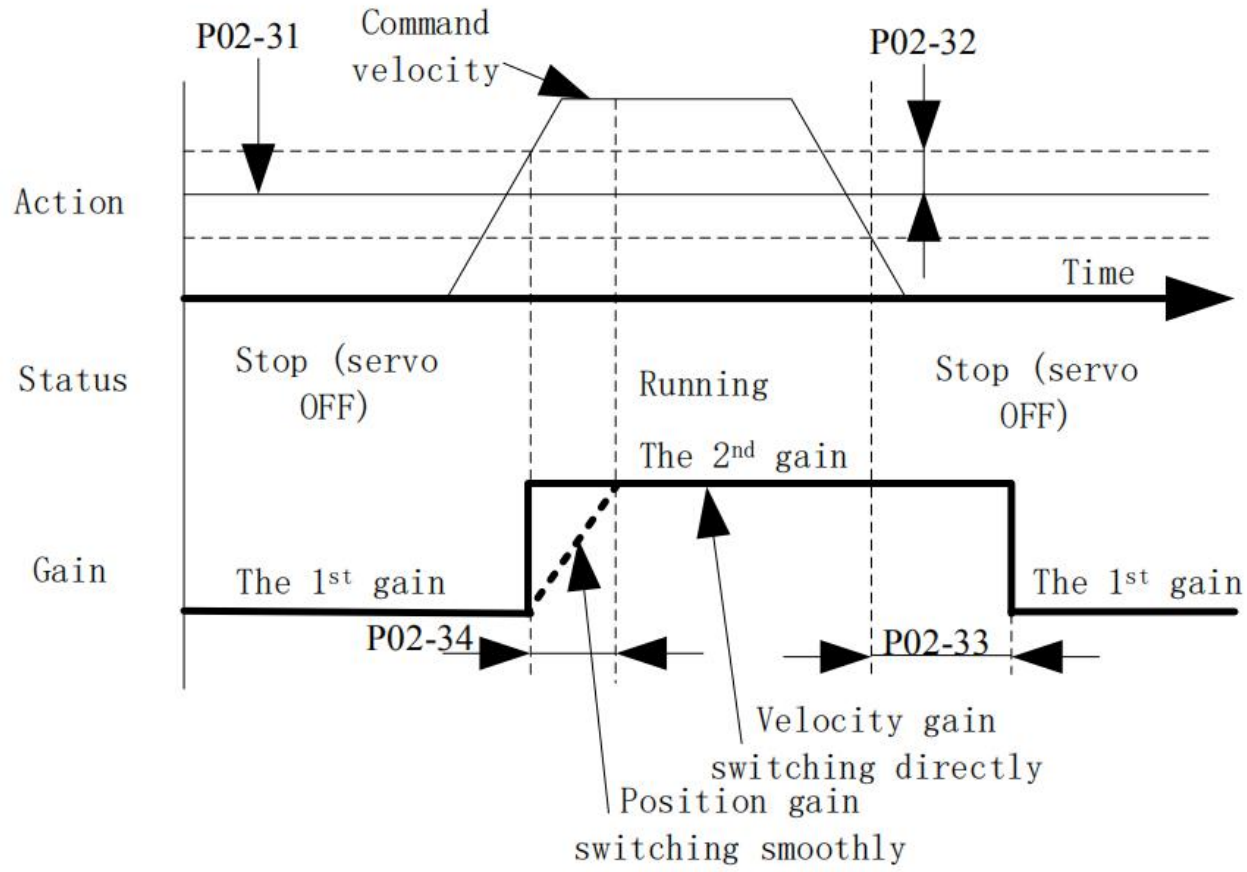


Figure 137 Gain switch

Table 90 Parameters about gain swift

Para code	Name	Set range	Default	Unit	Effective time
P02-30	Gain switching mode	0-10	7	---	Real time
P02-31	Gain switching grade	0-20000	800	---	Real time
P02-32	Gain switching lag	0-20000	100	---	Real time
P02-33	gain switching delay	0-1000.0	10.0	1ms	Real time
P02-34	Position gain switching time	0-1000.0	10.0	1ms	Effective at once

7.3.3 Feed-forward function

Speed feed-forward: During in position control, the speed control command required from the position command calculation is added to the output of the position regulator, which can reduce the position deviation to improve the response of the position control.

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

1、 Operation of speed feed forward

With the speed feed-forward smoothing constant set to be 50 (0.5ms), Increasing the speed feed-forward gain gradually to meet the system requirements. However, too large speed feed-forward gain will cause position overshoot which will make the setting time longer.

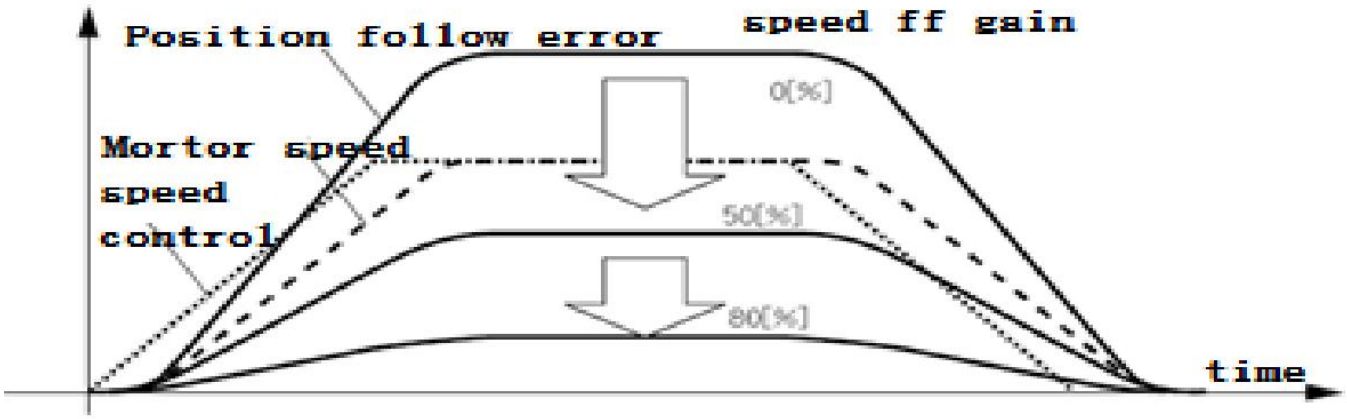


Fig.138 Speed feedforward function

2 Torque feed-forward operation

With the torque feed-forward smoothing constant set to be 50 (0.5ms).increasing the speed feed-forward gain gradually to meet the system requirements.

Table 91 Feedforward function related parameters

Para code	Name	Range	Default	Unit	Effective time
P02-03	Speed feed-forward gain	0-100.0	30.0	1.0%	Real time
P02-04	Speed feed-forward smooth constant	0-64.00	0.5	1ms	Real time
P02-19	Torque feed-forward gain	0-30000	0	1.0%	Real time
P02-20	torque feed-forward smooth constant	0-64.00	0.8	1ms	Real time

7.3.4 Disturbance observer

The disturbance torque value can be inferred by using the disturbance observer and compensated on the torque command to reduce the influence of disturbance torque and vibration. This observation function is valid in position mode and velocity mode.

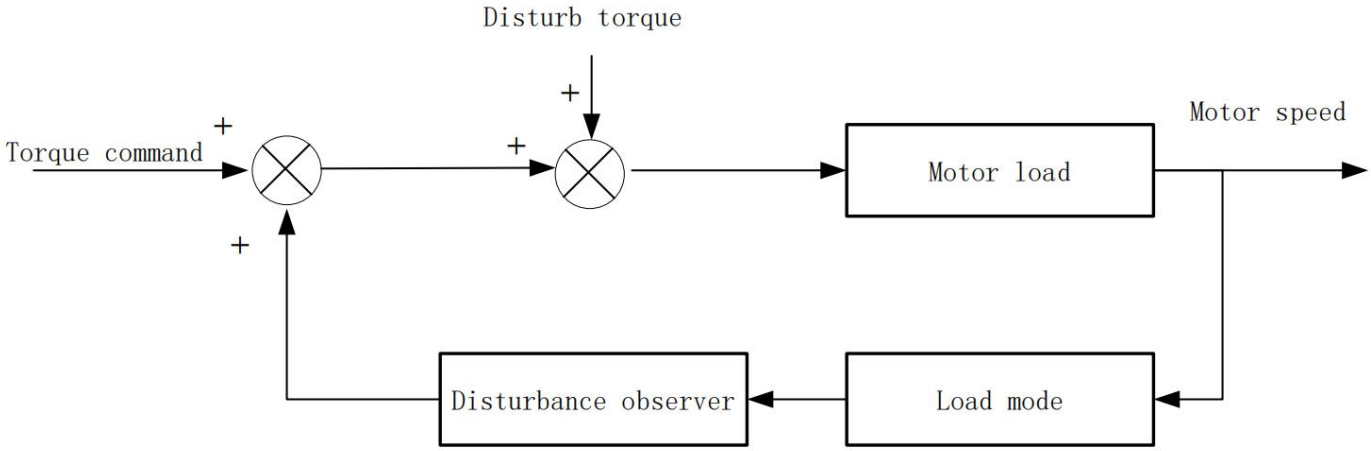


Fig. 139 Disturbance observer

Using instruction:

1. Set P08-26 (filter constant) to a larger value, and then increase P08-25 (compensation gain) gradually. At this time, the action sound may become louder; decrease P08-26 after confirming that the current compensation gain is effective,
2. It will improve the effect of disturbance torque suppression if increasing the gain gradually, but the noise becomes
3. After shortening the filter time constant, the disturbance torque with less delay can be estimated, and the effect of suppressing the influence of disturbance can be improved, but the noise will become louder.
4. Please look for a well-balanced setting.

Table. 92 Perturbation observer related parameters

Para code	Name	Range	Default	Unit	Effective time
P08-25	Disturbance torque compensation gain	0-100.0	0	%	Real time
P08-26	Disturbance torque filtering time constant	0-25.00	0.8	1ms	Real time

7.3.5 Resonance suppression

If the servo system is too rigid and responds too fast, it may cause resonance in the mechanical system. It can be improved by reducing the gain of the control loop. Without reducing the gain, resonance suppression can also be achieved by using a low-pass filter and a notch filter

1、Resonance frequency detection

The resonance frequency of the mechanical system can be observed through the monitoring item d26.1.Fr

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

The low-pass filter is used in the case when the vibration frequency is deviated, and it can have a good performance when used at high frequencies. By setting the filter time constant, it will attenuate resonance near the resonance frequency. However, the low-pass filter will make the system phase lag, reduce the bandwidth, and reduce the phase margin easily cause loop oscillation. Therefore, it can only be applied to high frequency vibration applications.

Filter deadline frequency (Hz) = 1/(2*pi*p08-20(ms)*0.001)

Table. 93 Torque command filter constant

Para code	Name	Rang	Default	Unit	Effective time
P08-20	Torque command filter constant	0-25.00	0.8	1ms	Real time

3、Notch filter

The notch filter is used when the system resonance frequency is fixed. The trap can reduce the mechanical resonance by reducing the gain at a specific frequency. After the trap is set correctly, the vibration can be effectively suppressed. You can try to increase the servo gain. There are 4 built-in traps in the servo. When P08-11 is set to 0, 4 sets of traps can be started at the same time, and parameters can be entered manually.

A. Self-adaptive notch mode

Through the self-adaptive notch filter function module, the servo system will automatically identify the current resonance frequency and automatically configure the notch parameters. Using instruction as following:

1. Set P08-11 to 1 or 2 according to the number of resonance points. When resonance occurs, you can first set P08-11 to 1 and turn on an adaptive trap. After gain adjustment, if new resonance occurs, then set P08-11 to 2 to turn on 2 adaptive traps Device.

2. When the servo is running, the third and fourth sets of trap parameters will be automatically updated, and the corresponding function code will be automatically stored every 30 minutes. After the storage, the trap parameters will also be retained after power off.

3. If the resonance is suppressed, it indicates that the adaptive notch has achieved its effect. After waiting for a period of stable operation of the servo, set P08-11 to 0,

and the notch parameters will be fixed to the last updated value. This operation can prevent the malfunction of the servo operation, which causes the trap parameters to be updated to the wrong value, but intensifies the vibration. If the vibration cannot be eliminated for a long time, please turn off the servo enable in time.

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

If there are more than two resonance frequency points, the adaptive notch filter cannot meet the demand, and the manual notch filter can be used at the same time.

Table 94 Adaptive notch filter mode selection

Para code	Name	Introduction
P08-11	Adaptive notch filter	Setting range: 0-4 0: The third and fourth notch parameters are no longer automatically updated and saved as current values. But allow manual input 1: One adaptive notch filter is effective, the third notch filter parameters are automatically updated, and cannot be entered manually 2: 2 adaptive notches are effective, the third and fourth notch parameters are automatically updated, and cannot be entered manually 3: Only detect resonance frequency 4: Clear the third and fourth notch parameters and restore to factory settings

B. Set the trap parameters manually

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

2. Enter the resonance frequency observed in the previous step into the notch parameters, and enter the width level and depth level of the group of notches at the same time.

3. If the vibration is suppressed, it means that the wave trap is working. You can continue to increase the gain and repeat the previous 2 steps when new vibrations appear.

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

C. Notch width class

$$\text{Notch Width Grade} = \frac{\text{Notch width}}{\text{Notch central frequency}}$$

The width of the notch means the frequency bandwidth with an amplitude attenuation rate of -3dB relative to the center frequency of the notch

D. D.Depth class of trap

$$\text{Notch Depth Grade} = \frac{\text{Output}}{\text{Input}}$$

When the depth level of the notch is 0, the input is completely suppressed at the center frequency; when the depth level is 100, the input can be completely passed at the center frequency.

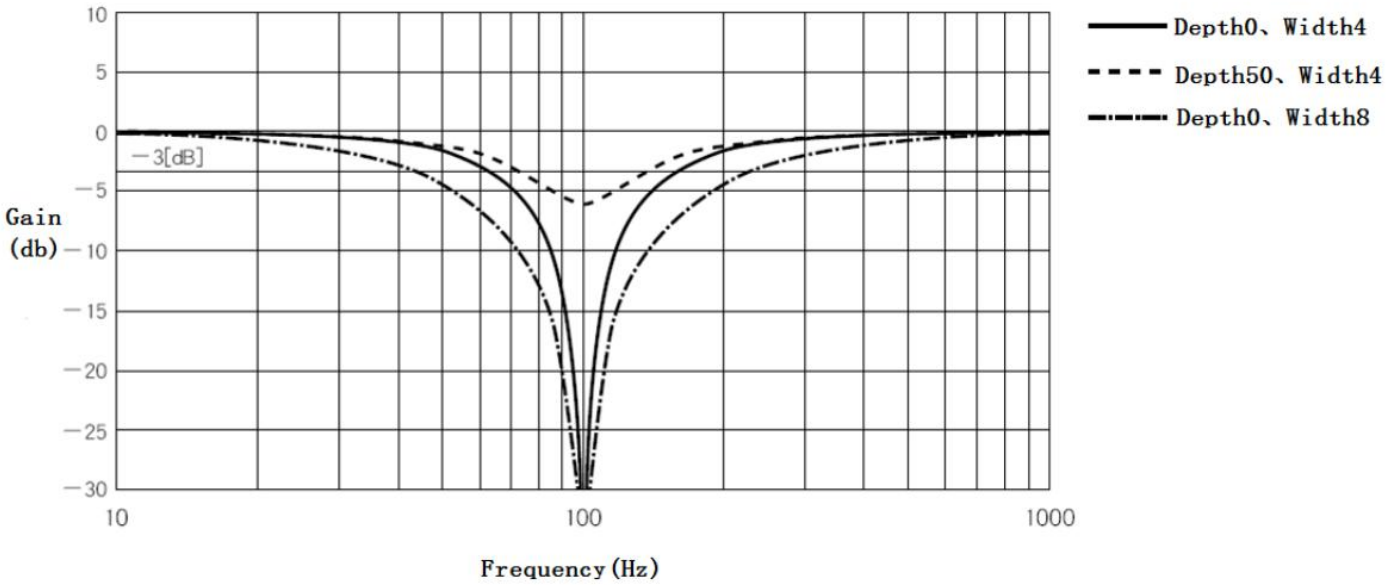


FIG. 140 Frequency characteristics of notch filter

Table 95: The relevant parameters of the notch filter are shown in the table below:

Para code	Name	Introduction
P08-30	Notch filter1 frequency	Setting range: 50-5000, unit: Hz Center frequency of notch 1 When set to 5000, the trap is invalid
P08-31	Notch filter1 Width	Setting range: 0-20 Notch width level of notch 1 Is the ratio of width to center frequency 设
P08-32	Notch filter1 Depth	Setting range: 0-99 Notch depth level of Notch 1 The ratio relationship between input and output for the center frequency of the notch

		filter The larger this parameter, the smaller the depth of the notch, the weaker the effect

The relevant parameters of the notch filter are shown in the following table:

Table 96 The relevant parameters of the notch filter

Para code	Name	Range	Default	Unit	Effective time
P08-11	Self-adaptive notch mode selection	0-4	0	---	Real time
P08-30	Notch filter 1 frequency	50-5000	5000	HZ	Real time
P08-31	Notch filter 1 width	0-20	2	---	Real time
P08-32	Notch filter 1 depth	0-99	0	---	Real time
P08-33	Notch filter 2 frequency	50-5000	5000	HZ	Real time
P08-34	Notch filter 2 width	0-20	2	---	Real time
P08-35	Notch filter 2 depth	0-99	0	---	Real time
P08-36	Notch filter 3 frequency	50-5000	5000	HZ	Real time
P08-37	Notch filter 3 width	0-20	2	---	Real time
P08-38	Notch filter 3 depth	0-99	0	---	Real time
P08-39	Notch filter 4 frequency	50-5000	5000	HZ	Real time
P08-40	Notch filter 4 width	0-20	2	---	Real time
P08-41	Notch filter 4 depth	0-99	0	---	Real time

➢ 8 Parameter and 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 Super function parameters

Table 97 Parameter list

Type	Para code	Name	Range	Default setting	unit	Setting way	Effective time
Motor and Driver parameter	P00-00	Motor number	0-65535	2000		Stop & Reset	Re-power on
	P00-01	Motor rated speed	1-6000	---	rpm	Stop & Reset	Re-power on
	P00-02	Motor rated torque	0.01-655.35	---	N.M	Stop & Reset	Re-power on
	P00-03	Motor rated current	0.01-655.35	---	A	Stop & Reset	Re-power on
	P00-04	Motor inertia	0.01-655.35	---	kg.cm²	Stop & Reset	Re-power on
	P00-05	Motor pole pairs	1-31	---	Polar logarithm	Stop & Reset	Re-power on
	P00-07	encoder selection	0-3	---	---	Stop & Reset	Re-power on
	P00-08	Line-saving incremental encoder	0-1	---	---	Stop & Reset	Re-power on
	P00-09	Absolute encoder type	0-1	---	---	Stop & Reset	Re-power on
	P00-10	Incremental encoder lines	0-65535	---		Stop & Reset	Re-power on
	P00-11	Incremental encoder Z pulse electrical angle	0-65535	---		Stop & Reset	Re-power on
	P00-12	Rotor initial angle 1	0-360	---	1°	Stop & Reset	Re-power on
	P00-13	Rotor initial angle 2	0-360	---	1°	Stop & Reset	Re-power on
	P00-14	Rotor initial angle 3	0-360	---	1°	Stop & Reset	Re-power on
	P00-15	Rotor initial angle 4	0-360	---	1°	Stop & Reset	Re-power on

	P00-16	Rotor initial angle 5	0-360	---	1°	Stop & Reset	Re-power on
	P00-17	Rotor initial angle 6	0-360	---	1°	Stop & Reset	Re-power on
	P00-20	Display settings on power-on interface	0-100	100	---	Running & setting	Re-power on
	P00-21	Communication baud rate RS232	0-3	0	---	Stop & reset	Re-power on
	P00-23	Slave address	0-255	1	---	Stop & reset	Re-power on
	P00-25	check way	0-3	1	---	Stop & reset	Re-power on
	P00-30	brake resistor setting	0-2	---	---	Stop & reset	Re-power on
	P00-31	extra brake resistor power	0-65535	---	10W	Running & setting	Real time
	P00-32	Extra brake resistor value	0-1000	---	1Ω	Stop & reset	Re-power on
	P00-40	Over-heating protection	0-1	1	---	Stop & reset	Re-power on
	P00-41	power off protection	0-1	1	---	Stop & reset	Re-power on
Main control parameter	P01-01	control mode setting	0-6	0	---	Stop & reset	Real time
	P01-02	Automatically tuning mode in real time	0-2	2	---	Running & setting	Real time
	P01-03	automatically tuning rigidity in real time	0-31	13	---	Running & setting	Real time
	P01-04	rotor inertial ratio	0-100.00	1	1 time	Running & setting	Real time

	P01-10	control mode after over travel	0-1	1	---	Running & setting	Real time
	P01-20	Dynamic brake delay	0-250	50	1ms	Running & setting	Real time
	P01-21	disable dynamic brake when power off	0-1	1	---	Running & setting	Real time
	P01-22	disable dynamic brake when servo OFF	0-1	1	---	Running & setting	Real time
	P01-23	disable dynamic brake when alarming	0-1	1	---	Running & setting	Real time
	P01-24	Disable dynamic brake when over travel	0-1	1	---	Running & setting	Real time
	P01-30	brake command - servo OFF delay (brake ON delay)	0-255	50	1ms	Running & Setting	Real time
	P01-31	brake output speed limitation	0-3000	100	1rpm	Running & setting	Real time
	P01-32	servo OFF brake command waiting time	0-255	50	1ms	Running & setting	Real time
	P01-40	out of control check ENA	0-1	1	---	Running & setting	Real time
Gain paremeter	P02-00	position control gain 1	0-3000.0	48.0	1/S	Running & setting	Real time
	P02-01	position control gain 2	0-3000.0	57.0	1/S	Running & setting	Real time
	P02-03	speed feed-forward gain	0-100.0	30.0	1.0%	Running & setting	Real time
	P02-04	Speed feed-forward	0-64.00	0.5	1ms	Running &	Real time

		smooth constant				setting	
	P02-10	speed ratio gain 1	1.0-2000.0	27.0	1Hz	Running & setting	Real time
	P02-11	Speed integral constant 1	0.1-1000.0	10.0	1ms	Running & setting	Real time
	P02-12	Fake differential feed-forward control ratio 1	0-100.0	100.0	1.0%	Running & setting	Real time
	P02-13	speed ratio gain 2	1.0-2000.0	27.0	1Hz	Running & setting	Real time
	P02-14	Speed integral constant 2	0.1-1000.0	1000.0	1ms	Running & setting	Real time
	P02-15	Fake differential feed-forward control ratio 2	0-100.0	100.0	1.0%	Running & setting	Real time
	P02-16	Speed integral error limit value	0-32767	25000	---	Stop & Reset	Real time
	P02-19	Torque feed-forward gain	0-30000	0	1.0%	Running & setting	Real time
	P02-20	Torque feed-forward smooth constant	0-64.00	0.8	1ms	Running & setting	Real time
	P02-30	Gain switching mode	0-10	7	---	Running & setting	Real time
	P02-31	Gain switching grade	0-20000	800	---	Running & setting	Real time
	P02-32	Gain switching lag	0-20000	100	---	Running & setting	Real time
	P02-33	Gain switching delay	0-1000.0	10.0	1ms	Running & setting	Real time
	P02-34	Position gain switching time	0-1000.0	10.0	1ms	Running & setting	Real time
	P02-40	Mode switch selection	0-4	0	---	Running & setting	Real time
	P02-41	Mode switch selection	0-20000	10000	---	Running & setting	Real time
	P02-50	Torque command added value	-100.0-100.0	0	1.0%	Running & setting	Real time
	P02-51	CW torque compensation	-100.0-100.0	0	1.0%	Running & setting	Real time

	P02-52	Reverse torque compensation	-100.0-100.0	0	1.0%	Running & setting	Real time
Positional parameter	P03-00	Source of location command	0-1	0	---	Stop & Reset	Real time
	P03-01	Instruction pulse mode	0-3	1	---	Stop & Reset	Real time
	P03-02	Instruction Pulse Input Terminal	0-1	0	---	Stop & Reset	Real time
	P03-03	Instruction Pulse Inversion	0-1	0	---	Stop & Reset	Real time
	P03-04	Position Pulse filtering	0-3	2	---	Running & setting	Real time
	P03-05	Positioning completion criteria	0-2	1	---	Running & setting	Real time
	P03-06	Location complete range	0-65535	100	Encoder unit	Running & setting	Real time
	P03-07	Position Feedback format	0-1	0	---	Stop & Reset	Real time
	P03-09	Number of instruction pulses per turn of motor	0-65535	0	Pulse	Running & setting	Re-power on
	P03-10	Electron Gear 1 molecule	1-65535	8192	---	Running & setting	Re-power on
	P03-11	Electronic gear 1 Denominator	1-65535	625	---	Running & setting	Re-power on
	P03-12	Electron Gear 1 is 16-bit higher	0-32767	0	---	Running & setting	Re-power on
	P03-15	Excessive position deviation setting	0-65535	30000	Command unit	Running & setting	Real time
	P03-16	Position Instruction smoothing filter time constant	0-1000.0	0	1ms	Running & setting	Real time
	P03-20	Position loop feedback	0-1	0	---	Running & setting	Real time
	P03-21	Encoder crossover output enable	0-1	1	---	Stop & Reset	Real time
	P03-22	Increment encoder	1-65535	1	---	Running &	Real time

		output pulse frequency division ratio molecule				setting	
	P03-23	Increment encoder output pulse frequency division ratio denominator	1-65535	1	---	Running & setting	Real time
	P03-25	Absolute number of output pulses per revolution of the motor	0-60000	2500	---	Running & setting	Real time
	P03-30	Linear encoder inversion	0-1	0	---	Stop & Reset	Real time
	P03-31	Linear encoder Z pulse polarity	0-1	1	---	Stop & Reset	Real time
	P03-40	Source of output pulse	0-1	0	---	Stop & Reset	Real time
	P03-42	Output Z pulse polarity	0-1	1	---	Stop & Reset	Real time
	P03-45	Digital Position Instruction caching mode	0-1	0	---	Stop & Reset	Real time
	P03-46	Maximum speed of motor at digital position command run time	0-6000	1000	---	Running & setting	Real time
	P03-50	The Gantry function enables	0-1	0	---	Stop & Reset	Real time
	P03-51	The input signal of Gantry function is reversed	0-1	0	---	Stop & Reset	Real time
	P03-52	Number of feedback pulses per turn of Gantry Motor	0-65535	10000	---	Stop & Reset	Real time
	P03-53	Gantry function	0-65535	10000	---	Running &	Real time

		position deviation too large settings				setting	
	P03-55	Gantry proportional gain	0-200	10	---	Running & setting	Real time
	P03-60	Origin regression enable control	0-6	0	---	Stop & Reset	Real time
	P03-61	Origin regression model	0-9	0	---	Stop & Reset	Real time
	P03-65	High speed searching for origin switch	0-3000	100	---	Running & setting	Real time
	P03-66	Low speed searching for origin switch	0-1000	10	---	Running & setting	Real time
	P03-67	Search origin switch acceleration and deceleration time	0-5000	0	---	Running & setting	Real time
	P03-68	Maximum time limit for searching origin	0-10000	0	---	Running & setting	Real time
	P03-69	H Mechanical Origin Offset H	0-65535	0	---	Running & setting	Real time
	P03-70	Mechanical Origin Offset L	0-65535	1000	---	Running & setting	Real time
Speed parameter	P04-00	Speed instruction source	0-3	0	---	Stop & Reset	Real time
	P04-01	Speed instruction Analog counter	0-1	0	---	Stop & Reset	Real time
	P04-02	Digital speed given value	-6000—6000	0	1rpm	Running & setting	Real time
	P04-03	Zero speed position clamp function	0-1	0	---	Running & setting	Real time
	P04-04	Zero speed position clamp speed threshold	0-6000	30	1rpm	Running & setting	Real time
	P04-05	Overspeed alarm value	0-6500	6400	1rpm	Running & setting	Real time

	P04-06	Forward speed limit	0-6000	5000	1rpm	Running & setting	Real time
	P04-07	Reverse speed limit	0-6000	5000	1rpm	Running & setting	Real time
	P04-10	Zero velocity detection value	0-200.0	2	1rpm	Running & setting	Real time
	P04-11	Rotation detection value	0-200.0	30	1rpm	Running & setting	Real time
	P04-12	Consistent range of velocity	0-200.0	30	1rpm	Running & setting	Real time
	P04-14	Acceleration time	0-10000	0	1ms/1000 rpm	Running & setting	Real time
	P04-15	Deceleration time	0-10000	0		Running & setting	Real time
	P04-30	Internal setting speed 1	0-6000	0	1rpm	Running & setting	Real time
	P04-31	Internal setting speed 2	-6000—6000	0	1rpm	Running & setting	Real time
	P04-32	Internal setting speed 3	-6000—6000	0	1rpm	Running & setting	Real time
	P04-33	Internal setting speed 4	-6000—6000	0	1rpm	Running & setting	Real time
	P04-34	Internal setting speed 5	-6000—6000	0	1rpm	Running & setting	Real time
	P04-35	Internal setting speed 6	-6000—6000	0	1rpm	Running & setting	Real time
	P04-36	Internal setting speed 7	-6000—6000	0	1rpm	Running & setting	Real time
	P04-37	Internal setting speed 8	-6000—6000	0	1rpm	Running & setting	Real time
Torque parameter	P05-00	Torque instruction source	0-3	0	---	Stop & Reset	Real time
	P05-01	Inverse Torque instruction analog	0-1	0	---	Stop & Reset	Real time

	P05-02	Torque mode speed limit given value	0-6000	1000	1rpm	Running & setting	Real time
	P05-05	Torque limiter source	0-1	0	---	Stop & Reset	Real time
	P05-06	Torque limit check out delay	0-10000	0	ms	Running & setting	Real time
	P05-10	Internal Forward Torque limit	0-300.0	200.0	1.0%	Running & setting	Real time
	P05-11	Internal reverse torque limit	0-300.0	200.0	1.0%	Running & setting	Real time
	P05-12	External Positive Torque limit	0-300.0	100.0	1.0%	Running & setting	Real time
	P05-13	External Reverse torque limit	0-300.0	100.0	1.0%	Running & setting	Real time
I/O Parameter	P06-00	DI1 Effective level of input port DI1	0-4	0	---	Running & setting	Re-power on
	P06-01	DI1 input port function selection (Servo ON)	0-18	1	---	Running & setting	Re-power on
	P06-02	DI2 input port function selection (alarm clear)	0-4	0	---	Running & setting	Re-power on
	P06-03	DI2 input port function selection (alarm clear)	0-18	2	---	Running & setting	Re-poweron
	P06-04	DI3 Effective level of input port	0-4	0	---	Running & setting	Re-poweron
	P06-05	DI3 input port function selection (forward overtrip)	0-18	3	---	Running & setting	Re-poweron
	P06-06	DI4 input port effective level	0-4	0	---	Running & setting	Re-poweron
	P06-07	DI4 input port function selection (reverse overtrip)	0-18	4	---	Running & setting	Re-poweron
	P06-08	DI5 Effective level of input port	0-4	0	---	Running & setting	Re-poweron
	P06-09	DI5 input port	0-18	7	---	Running &	Re-poweron

		function selection(Default: Forward torque external torque limit)				setting	
	P06-10	DI6 Effective level of input port	0-4	0	---	Running & setting	Re-poweron
	P06-11	DI6 input port function selection (Default: External torque limit on reverse side)	0-18	8	---	Running & setting	Re-poweron
	P06-12	DI7 Effective level of input port	0-4	0	---	Running & setting	Re-poweron
	P06-13	D17 input port function selection (Default: function model change)	0-18	5	---	Running & setting	Re-poweron
	P06-16	DI8 Effective level of input port	0-4	0	---	Running & setting	Re-poweron
	P06-17	D17 input port function selection (Default: position instruction clear)	0-18	16	---	Running & setting	Re-poweron
	P06-20	DO1 Valid level of output port	0-1	1	---	Running & setting	Re-poweron
	P06-21	DO1 Function change of output port (fault:serve ready)	0-11	3	---	Running & setting	Re-poweron
	P06-22	DO2 Valid level of output port	0/1	1	---	Running & setting	Re-poweron
	P06-23	DO2 Function change of output port (fault: brake open)	0-11	2	---	Running & setting	Re-poweron
	P06-24	DO3 Valid level of output port	0/1	1	---	Running & setting	Re-poweron
	P06-25	DO3 Function change of output port (fault: Alarm output)	0-11	1	---	Running & setting	Re-poweron

	P06-26	DO4 Valid level of output port	0/1	1	---	Running & setting	Re-poweron
	P06-27	DO4 Function change of output port (fault: position completed)	0-11	4	---	Running & setting	Re-poweron
	P06-28	DO5 Valid level of output port	0/1	1	---	Running & setting	Re-poweron
	P06-29	DO5 output port function selection (torque limit detection)	0-11	8	---	Running & setting	Re-poweron
	P06-40	Speed analog command input gain	10-2000	500	1rpm/V	Running & setting	Real time
	P06-41	Speed analog command filter constant	0-65535	0.8	1ms	Running & setting	Real time
	P06-42	Speed analog command offset	-10.000 —10.000	0	1V	Running & setting	Real time
	P06-43	Torque analog command gain	0.0-100.0	10	%	Running & setting	Real time
	P06-44	Torque analog command filter constant	0-64.00	0.8	1ms	Running & setting	Real time
	P06-45	Torque analog command offset	-10.000 —10.000	0	1V	Running & setting	Real time
	P06-46	Speed analog instruction dead zone	0-10.000	0	1V	Running & setting	Real time
	P06-47	Torque analog instruction dead zone	0-10.000	0	1V	Running & setting	Real time
Advanced function parameters	P08-01	Load rotation routine identification mode	0-1	0	---	Running & setting	Real time
	P08-02	Inertia identification maximum speed	100-2000	800	1rpm	Running & setting	Real time
	P08-03	Inertia identification acceleration and deceleration time	20-800	100	1ms	Running & setting	Real time
	P08-04	Wait time after single inertia	50-10000	1000	1ms	Running & setting	Real time

		identification is completed					
	P08-05	The number of motor rotations required to complete a single inertia		1.33	ring 圈	Running & setting	Real time
	P08-11	Adaptive notch mode selection	0-4	0	---	Running & setting	Real time
	P08-20	Torque command filter constant	0-25.00	0.8	1ms	Running & setting	Real time
	P08-25	Disturbance torque compensation gain	0-100.0	0	%	Running & setting	Real time
	P08-26	Disturbance torque filtering time constant	0-25.00	0.8	1ms	Running & setting	Real time
	P08-30	Notch Filter 1 frequency	50-5000	5000	HZ	Running & setting	Real time
	P08-31	Notch Filter 1 width	0-20	2	---	Running & setting	Real time
	P08-32	Notch Filter 1 depth	0-99	0	---	Running & setting	Real time
	P08-33	Notch Filter 2 frequency	50-5000	5000	HZ	Running & setting	Real time
	P08-34	Notch Filter 2 width	0-20	2	---	Running & setting	Real time
	P08-35	Notch Filter 2 depth	0-99	0	---	Running & setting	Real time
	P08-36	Notch Filter 3 frequency	50-5000	5000	HZ	Running & setting	Real time
	P08-37	Notch Filter 3 width	0-20	2	---	Running & setting	Real time
	P08-38	Notch Filter 3 depth	0-99	0	---	Running & setting	Real time
	P08-39	Notch Filter 4 frequency	50-5000	5000	HZ	Running & setting	Real time
	P08-40	Notch Filter 4 width	0-20	2	---	Running & setting	Real time
	P08-41	Notch Filter 4 depth	0-99	0	---	Running & setting	Real time

8.2 Parameter Description

8.2.1 P00-XX motor and driver parameter

Table 98 P00-XX motor and driver parameter

Para code	Name	Description
P00-00	motor number	Default set 0: P0-01 to P0-17 is available 2000: Absolute encoder, P0-01 to P0-05 identified by driver
P00-01	rated speed	Set range: 1~6000 rpm; unit: rpm; default value.
P00-02	rated torque	Set range 0.01-655.35 N.m; unit: N.M default value.
P00-03	Rated current	Set range: 0.01-655.35A, unit: A Default value
P00-04	Rotor inertia	Set range: 0.01-655.35kg.cm²; unit: kg.cm² Default value
P00-05	Pole pairs	Set range:1-31 pairs; unit: opposite Default value
P00-07	Encoder option	Range: 0-3 0&1: incremental encoder 2: Single-turn absolute encoder 3: Multi-turn absolute encoder
P00-08	Line-saving incremental encoder	Range: 0-1 0: non line-saving; 1: line-saving;
P00-09	Absolute encoder	Range: 0-1 0: Tamagawa encoder 1: Nikon encoder
P00-10	Incremental encoder lines	Default set
P00-11	incremental encoder Z pulse electric angle	Default set

P00-12	Rotor initial angle 1	Default set
P00-13	Rotor initial angle 2	Default set
P00-14	Rotor initial angle 3	Default set
P00-15	Rotor initial angle 4	Default set
P00-16	Rotor initial angle 5	Default set
P00-17	Rotor initial angle 6	Default set
P00-20	Display settings on power-on interface	Set range:0-100; Default:100. Set by customer It shows operation status while driver power-on if set value to 100. Other parameter refer to 8.3 chapter. For example: If want driver show d08.F.SP, please set value to 8.
P00-21	RS232 communication baud rate selection	Set range: 0-3; Default:2 Choose baud rate to communicate with PC: 0：9600 1：19200 2：57600 3：115200
P00-23	slave station	Set range: 0-255; Default:1; Set according to device required.
P00-25	Check way	Setting range 0-3, default 1 0: No parity, 2 stop bits 1: Even parity, 1 stop bit 2: odd parity, 1 stop bit 3: No parity, 1 stop bit
P00-30	Braking resistor setting	Set range: 0-2. 0: inside resistor. 1: use outside resistor. 2: No braking resistor.
P00-31	Outsider braking resistor power	Setting range: 0-65536, Unit: 10W. Set value according to outsider braking resistor. For example: set 4, it means resistor power is 40W.
P00-32	Outsider braking resistor value	Setting range :0-1000 Unit: ohm. Set value according to outsider braking resistor
P00-40	Over temperature protection setting	Setting range: 0-1 0: Close over temperature protection 1: Open over temperature protection

P00-41	Control power failure protection settings	Setting range: 0-1 0: turn off the power-off protection function of the control power supply 1: Turn on the power-off protection function of the control power supply

8.2.2 P01-xx main control parameter

Table 99 P01-xx main control parameters

Para code	Name	Description
P00-00	motor number	Default set 0: P0-01 to P0-17 is available 2000: Absolute encoder, P0-01 to P0-05 identified by driver
P00-01	rated speed	Set range: 1~6000 rpm; unit: rpm; default value.
P00-02	rated torque	Set range 0.01-655.35 N.m; unit: N.M default value.
P00-03	Rated current	Set range: 0.01-655.35A, unit: A Default value
P00-04	Rotor inertia	Set range: 0.01-655.35kg.cm²; unit: kg.cm² Default value
P00-05	Pole pairs	Set range:1-31 pairs; unit: opposite Default value
P00-07	Encoder option	Range: 0-3 0&1: incremental encoder 2: Single-turn absolute encoder 3: Multi-turn absolute encoder
P00-08	Line-saving incremental encoder	Range: 0-1 0: non line-saving; 1: line-saving;
P00-09	Absolute encoder	Range: 0-1 0: Tamagawa encoder 1: Nikon encoder
P00-10	Incremental encoder lines	Default set
P00-11	incremental encoder Z pulse electric angle	Default set

P00-12	Rotor initial angle 1	Default set
P00-13	Rotor initial angle 2	Default set
P00-14	Rotor initial angle 3	Default set
P00-15	Rotor initial angle 4	Default set
P00-16	Rotor initial angle 5	Default set
P00-17	Rotor initial angle 6	Default set
P00-20	Display settings on power-on interface	Set range:0-100; Default:100. Set by customer It shows operation status while driver power-on if set value to 100. Other parameter refer to 8.3 chapter. For example: If want driver show d08.F.SP, please set value to 8.
P00-21	RS232 communication baud rate selection	Set range: 0-3; Default:2 Choose baud rate to communicate with PC: 0：9600 1：19200 2：57600 3：115200
P00-23	slave station	Set range: 0-255; Default:1; Set according to device required.
P00-25	Check way	Setting range 0-3, default 1 0: No parity, 2 stop bits 1: Even parity, 1 stop bit 2: odd parity, 1 stop bit 3: No parity, 1 stop bit
P00-30	Braking resistor setting	Set range: 0-2. 0: inside resistor. 1: use outside resistor. 2: No braking resistor.
P00-31	Outsider braking resistor power	Setting range: 0-65536, Unit: 10W. Set value according to outsider braking resistor. For example: set 4, it means resistor power is 40W.
P00-32	Outsider braking resistor value	Setting range :0-1000 Unit: ohm. Set value according to outsider braking resistor
P00-40	Over temperature protection setting	Setting range: 0-1 0: Close over temperature protection 1: Open over temperature protection

P00-41	protection settings if control power failure	Setting range: 0-1 0: turn off the power-off protection function of the control power supply 1: Turn on the power-off protection function of the control power supply

8.2.3 P02-xx Gain assorted parameter

Table 100 P02-XX Gain parameter

Para code	Name	Description
P02-00	Position control gain 1	Setting range: 0-3000.0, unit: 1 / S Position loop regulator scale gain. The larger the parameter value set, the higher the gain ratio is, the greater the stiffness is, the smaller the position tracking error will be, and the faster the response. However, too large a parameter can easily cause vibration and overshoot. This parameter is for steady state response.
P02-01	Position control gain2	Setting range: 0-3000.0, unit: 1 / S Position loop regulator scale gain. The larger the parameter value set, the higher the gain ratio is, the greater the stiffness is, the smaller the position tracking error will be, and the faster the response. However, too large a parameter can easily cause vibration and overshoot. This parameter is for dynamic response.
P02-03	Speed feedforward gain	Setting range: 0-100.0, unit: 1.0% The feedforward gain of the speed loop. The larger the parameter value set, the smaller the system position tracking error and the faster the response. However, if the feedforward gain is too large, the position loop of the system will be unstable, which will easily cause overshoot and vibration.

P02-04	Speed feedforward smoothing constant	Setting range: 0-64.00, unit: ms This parameter is used to set the speed loop feedforward filtering time constant. The larger the value set, the larger the filtering effect, but at the same time the phase lag increases.
P02-10	1Speed proportional gain 1	Setting range: 1.0-2000.0, unit: Hz The larger the speed proportional gain is, the larger the servo stiffness is and the faster the speed response is. However, if it is too large, it is easy to generate vibration and noise. Under the condition that the system does not oscillate, increase this parameter value as much as possible. This parameter is for a static response.
P02-11	Speed integral constant 1	Setting range: 1.0-1000, Unit: ms. Speed regulator integration time constant. The smaller the setting value, the faster the integration speed, the greater the stiffness, and the vibration is too easy to produce noise if it is too small. When the system does not oscillate, reduce this parameter value as much as possible. This parameter is for steady state response.
P02-12	Pseudo-differential feedforward control coefficient 1	Setting range: 0-100.0, unit: 1.0% When set to 100.0%, the speed loop adopts PI control, and the dynamic response is fast; when set to 0, the speed loop integral effect is obvious, which can filter low-frequency interference, but the dynamic response is slow. By adjusting this coefficient, the speed loop can have a better dynamic response, and it can increase the resistance to low-frequency interference.
P02-13	speed proportional gain2	Setting range: 1.0-2000.0, unit: Hz The larger the speed proportional gain is, the larger the servo stiffness is and the faster the speed response is. However, if it is too large, it is easy to generate vibration and noise. Under the system has no vibration, increase this parameter value as much as possible. This parameter is for dynamic response.

P02-14	Speed integral constant 2	Setting range: 1.0-1000.0, unit: ms Speed regulator integration time constant. The smaller the setting value, the faster the integration speed, the greater the stiffness is, and the vibration is too easy to produce noise if it is too small. Under the system has no vibration, reduce this parameter value as much as possible. This parameter is for dynamic response.
P02-15	Pseudo-differential feedforward control coefficient 2	Setting range: 0-100.0, unit: 1.0% When set to 100.0%, the speed loop PI control, and the dynamic response is fast; when set to 0, the speed loop integral effect is obvious, which can filter low-frequency interference, but the dynamic response is slow. By adjusting this coefficient, the speed loop can have a better dynamic response, and at the same time, it can increase the resistance to low-frequency interference.
P02-16	Speed integral error limit value	Setting range: 0-32767 Speed integral error limit value
P02-19	Torque feedforward gain	Setting range: 0-30000, unit: 1.0% Set the current loop feedforward weighting value. This parameter adds the current loop after weighting the differential of the speed command.
P02-20	Torque feed-forward smoothing constant	Setting range: 0-64.00, unit: ms This parameter is used to set the torque feedforward filtering time constant.

<table>
<tr><td>P02-30</td><td>Gain switching mode</td><td>Setting range: 0-10
The condition to set the 1st and 2nd gain switching mode
<table>
<tr><th>value</th><th>Switching condition</th><th>Remark</th></tr>
<tr><td>0</td><td>fix to the 1st gain</td><td>P02-00、P02-10、P02-11、P02-12</td></tr>
<tr><td>1</td><td>fix to the 2nd gain</td><td>P02-01、P02-13、P02-14、P02-15</td></tr>
<tr><td>2</td><td>Use DI input switching</td><td>Need to set the DI port to 9 (gain switching input)
Invalid: first gain
Effective: second gain</td></tr>
<tr><td>3</td><td>Big torque command value</td><td>When the torque command is greater than the threshold (determined by P02-31 and P02-32), it switches to the second gain. When it is less than the threshold and exceeds the P02-33 delay setting, it switches to the first gain.</td></tr>
<tr><td>4</td><td>Speed command changes a lot</td><td>When the speed command change is greater than the threshold (determined by P02-31 and P02-32), it switches to the second gain. When it is less than the threshold and exceeds the P02-33 delay setting, it switches to the first gain.</td></tr>
<tr><td>5</td><td>Big speed command value</td><td>When the speed command is greater than the threshold (determined by P02-31 and P02-32), it switches to the second gain. When it is less than the threshold and exceeds the P02-33 delay setting, it switches to the first gain.</td></tr>
<tr><td>6</td><td>Large position deviation</td><td>When the position deviation is greater than the threshold (determined by P02-31 and P02-32), switch to the second gain. When it is less than the threshold and exceeds the P02-33 delay setting, it switches to the</td></tr>
</table></td></tr>
<tr><td>P02-30</td><td>Gain switching mode</td><td></td></tr>
</table>

		first gain.
7	There is position command	Switch to the second gain when there is a position command. When the position command ends and the P02-33 delay setting is exceeded, it switches to the first gain.
8	Incomplete positioning	Switch to the second gain when positioning is not completed. When the positioning is completed and the P02-33 delay setting is exceeded, it switches to the first gain.
9	Actual speed is big	Switch to the second gain when the actual speed is greater than the threshold (determined by P02-31 and P02-32). When it is less than the threshold and exceeds the P02-33 delay setting, it switches to the first gain.
10	With position command + actual speed	Switch to the second gain when there is a position command. When there is no position command and the actual speed is less than the threshold (determined by P02-31 and P02-32), and when the delay setting of P02-33 is exceeded, it switches to the first gain.

P02-31	Gain switching level	Setting range: 0-20000 Judgment threshold when gain is switched. Torque unit: 1000bit = 25% of rated torque Speed unit: 1000bit = 200 rpm Position unit: 131072bit per revolution
P02-32	Gain switching hysteresis	Setting range: 0-20000 Hysteresis level at gain switching Torque unit: 1000bit = 25% of rated torque Speed unit: 1000bit = 200 rpm Position unit: 131072bit per revolution
P02-33	Gain switching delay	Setting range: 0-1000.0, unit: ms When switching from the second gain to the first gain, the time from when the trigger condition is met to the actual switching.
P02-34	Position gain switching time	Setting range: 0-1000.0, unit: ms Time for position control gain 1 to smoothly switch to position control gain 2

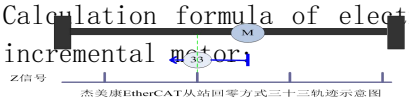
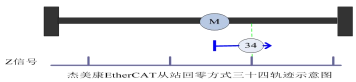
<table>
<tr>
<td>P02-40</td>
<td>Mode switch selection</td>
<td>Setting range: 0-4
Set the conditions of speed loop PI control and P control
<table>
<tr><th>value</th><th>Judge condition</th><th>Remark</th></tr>
<tr><td>0</td><td>Torque command</td><td>When the torque command is less than P02-41, the threshold is set to PI control, while it is bigger than P02-41, then set to P control.</td></tr>
<tr><td>1</td><td>Speend command</td><td>When the speed command is less than P02-41, the threshold is set to PI control. If the speed command is greater than P02-41, the threshold is set to P control.</td></tr>
<tr><td>2</td><td>Acceleration</td><td>When the acceleration is less than P02-41, the threshold is set to PI control. If the acceleration is greater than P02-41, the threshold is set to P control.</td></tr>
<tr><td>3</td><td>Position deviation</td><td>When the position deviation is less than P02-41, the threshold is set to PI control. If the position deviation is greater than P02-41, the threshold is set to P control.</td></tr>
<tr><td>4</td><td>Modeless switch</td><td>Speed loop maintains PI control and no longer switches</td></tr>
</table>
</td>
</tr>
<tr>
<td>P02-41</td>
<td>Mode switch level</td>
<td>Setting range: 0-20000
Set the threshold for switching.
Torque unit: 1000bit = 25% of rated torque
Speed unit: 1000bit = 200 rpm
Position unit: 131072bit per revolution</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</table>

P02-50	Torque command added value	Setting range: -100.0-100, unit: 1.0% Valid in position control mode. This value is superimposed on the torque reference value and is used for vertical axis static torque compensation.
P02-51	Forward torque compensation	Setting range: -100.0-100.0, unit: 1.0% Valid in position control mode. For compensating forward static friction
P02-52	Reverse torque compensation	Setting range: -100.0-100.0, unit: 1.0% Valid in position control mode. Used to compensate reverse static friction

8.2.4 P03-xx P03-xx Position parameters

Chart 101 P03-XX Position parameter

Para code	Name	Description
P03-00	Source of position command	0: pulse command 1: Given the number, use it when communicating with control
P03-01	Command pulse mode	0: Quadrature pulse command (90° phase difference two-phase pulse) 1: Direction+ pulse command 2or 3:Double pulse command (CW+CCW)
P03-02	Instruction Pulse Input Terminal	Use to specify the pulse input port in the CN1 port 0: low speed pulse port 1: high speed pulse port
P03-03	Instruction Pulse Inversion	Used to adjust the direction of the pulse instruction count 0: Normal 1: In The Opposite Direction
P03-04	Position Pulse filter setting	Set range: 0-3 Unit: us 0: 0.1us。 1: 0.4us 2: 0.8us 3: 1.6us.

P03-05	Positioning completion criteria	0: Output when position deviation is less than P03-06 setting value 1: Output when position is given, and output when position deviation is less than P03-06 setting value 2: Output when position is given (after filtering), and output when position deviation is less than P03-06 setting value
P03-06	Location complete range	Set range:0-65535 Unit: encoder unit Use to set a threshold value for positioning completion output. When the absolute value motor is used, the encoder is calculated at 131072 bit per turn. Using incremental encoder motor, each turn is calculated by the number of encoder lines * 4.
P03-07	Position feedback format	Set range:0-1 0: Incremental format 1: Multi-loop absolute value format
P03-09	Number of instruction pulses per turn of motor	Setting range: 0-65535 Absolute encoder motor is effectively used to set motor rotation number of instructions pulse. When this parameter is set to 0, P03-10 and P03-11 are valid
P03-10	Electron Gear 1 molecule	When absolute value motor is used, see example of calculation method of electronic gear ratio Calculation formula of electronic gear ratio of incremental motor:   Note: 20BThe molecule of encoder is 131072 17B The molecule of encoder is 160000
P03-11	Electronic gear 1 Denominator	
P03-12	Electron Gear 1 molecular high position	Set range :0-32767 Use this can expand the Electronic gear ratio Molecule value=P03-12*10000+P03-10
P03-15	Position deviation setting is too big	Setting range: 0-65535, Unit: Instruction Unit * 10 set the number of pulse to allow deviation, more than the set value will alarm. EXAMPLE: Setting a value of 20, the drive alerts Al. 501 when the follow deviation exceeds 20 * 10(position deviation is too large)

P03-16	Position Instruction smoothing filter constant	Setting range: 1000, in Ms Setting time constant of position instruction smoothing filter
P03-20	Position feedback source	Setting Position Feedback Source 0: Encoder 1: Raster scale
P03-21	Encoder frequency division output enable	Setting CN1 port if it has function of Encoder frequency division output enable: 0: close enable. 1: open enable
P03-22	Increment encoder output pulse frequency division ratio molecule	When using incremental encoder, set the number of output pulses of cN1 port. P03-23 should be less than or equal to p03-22, calculation formula: $G = \frac{\text{Molecule}}{\text{Denominato r}} = \frac{C \times 4}{P \times 4}$ C : Encoder line P : Desired output A, B pulses per revolution Example : The number of encoder lines is 2500 ; The number of A, B pulses per revolution is 500 ; $G = \frac{C \times 4}{P \times 4} = \frac{2500 \times 4}{500 \times 4} = \frac{5}{1}$
P03-23	Delta encoder output pulse frequency divider	
P03-25	Absolute number of output pulses per revolution of the motor	Set Range: 0-60000 Set absolute value motor rotation around, A, B frequency pulse output number. EXAMPLE: set the value of 2048, then each rotation of the motor, A and B signal output 2048 pulses
P03-30	LINEAR encoder	Set the grating ruler Input A, b phase sequence is reversed NO yes
P03-31	Polarity of Z pulse of linear encoder	Set the effective level of grating ruler input Z signal 0: low level 1: High level
P03-40	Output pulse source	Set CN1 terminal in the frequency-division Output Signal Source 0: Pulse output, alarm not output 1: Motor output 2: Pulse Output 3: Grating Ruler
P03-42	Output Z pulse Polarity	Set CN1 TERMINAL FREQUENCY OUTPUT SIGNAL Z effective level 0: Low Level 1: High Level

P03-45	Digital quantity instruction cache mode	Setting range: 0-1 0: No caching (immediate execution) 1: CACHING (new data executed after last data execution)
P03-46	Maximum speed of motor at digital position command run time	Setting range: 0-6000 Sets the maximum speed of the motor when the Digital Position Command runs

8.2.5 P04-xx Speed parameter

Chart P04-XX speed parameter

Para code	Name	Description
P04-00	Speed instruction source	0: External Analog Instruction 1: Digital Instruction (Parameter Setting) 2: Digital Instruction (Communication) 3: Internal Multiple instruction sets
P04-01	Speed instruction analog reverse	The polarity relation used to adjust analog quantity is 0: Normal 1: Polarity is reversed
P04-02	Digital speed given value	Setting range:-6000-6000, Unit: rpm when P04-00 is set to 1, P04-02 is the speed control setting
P04-03	Zero speed position clamp function	0: non-position Clamp Function 1: Position Clamp function When speed control mode is applied and the following conditions are met, enter Position lock mode A: P04-03 set to 1 B: Speed instruction absolute value less than P04-04 SET THRESHOLD C: External Input Port function set to 10(zero fixed) and in input valid state

P04-04	Zero speed position clamp speed threshold	]Setting range: 0-6000, unit: rpm Setting speed instruction threshold to trigger zero speed position clamp function
P04-05	Over speed alarm value	Set range : 0-6500, Unit: rpm Setting the maximum allowable RPM above the setting will trigger a 420 overspeed alarm
P04-06	Forward speed limit	Set range: 0-6000, Unit: rpm Limit forward speed of motor
P04-07	Reverse speed limit	Set range: -6000-0, Unit: rpm Limit reverse speed of motor
P04-10	Zero velocity detection value	Set range: 0-200.0, Unit: rpm Set Zero speed detection threshold, motor speed below the threshold can be output through the output port "zero speed motor output" signal
P04-11	Rotation detection value	Set range: 0-200.0, Unit: rpm Set Motor rotation detection threshold, motor rotation speed higher than the value can be displayed through the LED panel status
P04-12	Consistent range of velocity	Set range: 0-200.0, Unit: rpm Set speed consistent signal threshold value, when motor speed and instruction speed difference in the threshold value range, can output "speed consistent output" signal through the output port
P04-14	Acceleration time	Set range: 0-10000, Unit: 1ms/1000rpm Set the acceleration time in speed control
P04-15	deceleration time	Set range: 0-10000, Unit: 1ms/1000rpm Set the deceleration time in speed control

<table>
<tr>
<td>P04-30

P04-37</td>
<td>1-8 inside speed set</td>
<td>Set range: -6000—6000, Unit: rpm
Parameters P04-30 to P04-37, respectively set internal speed 1 to internal speed 8, the internal speed switch method is as follows: when the speed loop control, P04-00 SET 3, the corresponding input port function is defined as 13,14,15 internal rotation speed switching, which is realized by setting the input port function to 13,14,15 on-off state combination, as shown in the following table
<table>
<tr><th>DI13</th><th>DI14</th><th>DI15</th><th>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>
<tr><td>1</td><td>1</td><td>0</td><td>P04-33</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>P04-34</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>P04-35</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>P04-36</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>P04-37</td></tr>
</table>
</td>
</tr>
</table>

8.2.6 P05-xx Torque parameter

Chart 103 P05-XX Torque parameter

Para code	Name	Description
P05-00	Torque instruction source	0: External Analog Instruction (speed limit set by P05-02) 1: Digital Instruction (speed limit set by P05-02) 2: External Analog Instruction (speed limit set by speed analog instruction) 3: Digital Instruction (speed limit set by speed analog instruction)
P05-01	Inverse Torque instruction analog	Used to adjust the Torque Direction 0: Normal 1: Direction reverse

<table>
<tr><td>P05-02</td><td>Torque mode speed limit given value</td><td>Setting range: 0-maximum speed, unit: RPM
set the maximum speed of motor when torque mode, prevent no-load motor speed too high cause mechanical damage torque control mode effective</td></tr>
<tr><td>P05-05</td><td>Torque limiter source</td><td>Source for adjusting Torque Limits 0: Internal Digital (set by P05-10, P05-11 or P05-12, P05-13)1: External Analog (given by external analog input T-REF). In this mode, the positive and negative limits are the same.</td></tr>
<tr><td>P05-06</td><td>Torque limit check out delay</td><td>Setting range: 0-10000, unit: Ms Setting DO port output torque limit detection output signal delay time</td></tr>
<tr><td>P05-10</td><td>Internal Forward Torque limit</td><td>Setting range: 0-300.0, unit: 1.0% limit motor forward output, 100 means 1 times Torque, 300 means 3 times torque when the torque output reaches the limit value, the output signal can be detected through DO port output torque limit</td></tr>
<tr><td>P05-11</td><td>Internal reverse torque limit</td><td>Setting range:-300.0-0, unit: 1.0% limit motor reverse output, 100 means 1 times Torque, 300 means 3 times torque when the torque output reaches the limit value, the output signal can be detected through the DO port output torque limit</td></tr>
<tr><td>P05-12</td><td>External Positive Torque limit</td><td>Setting range: 0-300.0, unit: 1.0%
This function, you need to use one of the external input port in CN1 to switch, the choice of the Di port input port function set to 7(positive side external torque limit) . The control mode can be switched by controlling the logical state of the port.
<table><tr><td>Port logic</td><td>Torque limited value</td></tr><tr><td>Valid</td><td>External Limited value P05-12</td></tr><tr><td>Invalid</td><td>Internal Limited value P05-10</td></tr></table>If the DI function is not assigned, the system default torque limit value is P05-10. When the torque output reaches the limit value, the output signal can be detected through the DO port output torque limit</td></tr>
</table>

<table>
<tr>
<td>P05-13</td>
<td>External reverse Torque limit</td>
<td>Setting range: 0-300.0, unit: 1.0%
This feature requires the use of an external input port in CN1 to switch, the choice of the DI port input port function set to 8(reverse side external torque limit). The control mode can be switched by controlling the logical state of the port.
<table><tr><td>Port logic</td><td>Torque limited value</td></tr><tr><td>Valid</td><td>External Limited value P05-13</td></tr><tr><td>invalid</td><td>Internal Limited value P05-11</td></tr></table>If the DI function is not assigned, the default torque limit amplitude of the system is p05-11. When the torque output reaches the limit value, the output signal can be detected through the Do port output torque limit</td>
</tr>
</table>

8.2.7 P06-xx I/O Parameter

Chart 104 P06-XX I/O Parameter

Para code	Name	Description
P06-00	DI1Effective level of input port	Set range: 0-4, Factory set:0 Set valid input of di1 input port of cN1 0: valid for low level (optocoupler on) 1: Valid for high level (optocoupler off) 2: Rising edge effective 3: Falling edge effective 4: Both rising and falling edge are effective

P06-01	DI1 Input Port function selection	Set range: 0-24, Factory set: 13 Set the function of DI1 input port of cN1 0: invalid pin 1: servo ON 2: Alarm clear 3: Forward over travel signal input 4: Reverse over travel signal input 5: Control mode switching 6: P action command input 7: Positive side external torque limit 8: Reverse side external torque limit 9: Gain switching input 10: Zero fixed input 11: Command pulse inhibit input 12: Encoder absolute value data required input 13: CW limited input 14: HW limited input 15: CWW limited input 16: Position command clear input 17: Pole detection input 18: Command pulse input rate switching input 19: Gantry simultaneous movement enable 20: Gantry alignment clear signal 21: origin switch signal 22: origin reset start signal 23: Detector PIN 1 input 24: Detector PIN 2 input
P06-02	DI2Effective level of input port	see P06-00
P06-03	DI2 Function choose of input port	see P06-01, factory set: 14
P06-04	DI3 Valid power level of input port	seeP06-00
P06-05	DI3 Function choose of input port	seeP06-01, factory set: 15.
P06-06	DI4 Effective level of input port	see 06-00
P06-07	DI4 Function choose of input port	see P06-01, factory set: 23.
P06-08	DI5 Effective level of input port	see P06-00

P06-09	DI5 Function choose of input port	see P06-01, factory set: 24
P06-10	DI6 Effective level of input port	see P06-00
P06-11	DI6 Function choose of input port	see P06-01, factory set: 8
P06-12	DI7 Effective level of input port	see P06-00
P06-13	DI7 Function choose of input port	see P06-01, factory set: 5
P06-16	DI8 Effective level of input port	see P06-00
P06-17	DI8 Function choose of input port	see P06-01, factory set : 16
P06-20	DO1 Effective level of input port	Set range: 0-1, factory set:1 0: When the State is valid, optocoupler cut-off 1: When the State is valid, optocoupler on
P06-21	DO1 Function choose of input port	Set range: 0-13, factory set: 4 0: Pins unworkable. 1: Alarm output 2: Lock Open Output 3: Servo Ready Output 4: Positioning Completed Output 5: Positioning close to output 6: Speed consistent output 7: Motor Zero speed output 8: Torque limit detected output 9: Speed limit detected output 10: Warning output 11: Instruction Pulse Input Rate Switching output 12: origin regression complete output 13: electrical origin regression complete output
P06-22	DO2 Effective level of input port	see P06-20
P06-23	DO2 Function choose of output port	see P06-21, factory set: 2

P06-24	DO3 Function choose of output port	see P06-20
P06-25	DO3 Function choose of output port	see P06-21, factory set: 1
P06-26	DO4 Function choose of output port	see P06-20
P06-27	DO4 Function choose of output port	see P06-21, factory set: 0
P06-28	DO5 Function choose of output port	see P06-20
P06-29	DO5 Function choose of output port	see P06-21, factory set: 8
P06-40	Speed analog instruction input gain	Set range: 10-2000, Unit 1rpm/V Set the CN1 input between the simulation command and the Speed Control Command Coefficient Example: 500 on behalf of Each v corresponding to 500 RPM
P06-41	Speed analog command filter constant	Set range: 0—64.00, Unit : ms Set the time factor of analog instruction filtering for CN1 input
P06-42	Velocity analog instruction offset	Set range: -10.000—10.000, Unit : V Set The simulated instruction zero offset for CN1 input
P06-43	Torque simulation instruction gain	Set range: 0—100.0, Unit 1% Set the coefficient between the analog command input by cN1 and the speed control command For example, 30.0 represents 30% of rated torque per V
P06-44	Torque analog instruction filter constant	Set range: 0—64.00, Unit : ms Set the time factor of analog instruction filtering for CN1 input
P06-45	Torque analog instruction offset	Set range: -10.000—10.000, Unit V Set The simulated instruction zero offset for CN1 input

P06-46	Speed analog instruction dead zone	Set range: 0—10.000, Unit V Set the dead time voltage value of the speed analog command. When the analog quantity is set within the range of the positive and negative values, the system will default to zero
P06-47	Torque analog instruction dead zone	Set range: 0—10.000, Unit V Set the dead-time voltage value of the torque simulation instruction. When the analog is given in the range of the positive and negative values, the system defaults to zero

8.2.8 P08-xx Advanced function Parameter

Chart 105 P08-XX Advanced function parameter

Para code	Name	Description
P08-01	Load rotation routine identification mode	Set range: 0-1 0: valid 1: invalid
P08-02	Maximum speed of inertia identification	Set range: 100-2000, Unit: rpm The maximum speed of the motor in off-line inertia identification
P08-03	Inertia identification acceleration and deceleration time	Set range: 20-800, Unit: ms The acceleration and deceleration time of motor when off-line inertia identification
P08-04	Wait time after single inertia identification is completed	Set range: 50-10000, Unit : ms When the moment of inertia identification is off-line, the waiting time after the single moment of inertia identification is completed
P08-05	The number of motor rotations required to complete a single inertia	This parameter is based on P08-02, P08-03, P08-04 set conditions automatically generated the value of the rotation circle

P08-11	Adaptive notch mode selection	Set range: 0-4 0: The parameters of the third and fourth notch are no longer automatically updated and are saved to the current value. However, manual input of 1:1 adaptive notch filter is valid, and the parameters of the third notch filter are automatically updated. Manual input of 2:2 adaptive notch filter is valid, and the parameters of the third and fourth notch filters are automatically updated, can Not Manually Input 3: Only Detect Resonance Frequency 4: Clear the third, the fourth notch filter parameters, restore to the factory settings
P08-20	Torque command filter constant1	Set range: 0-25.00, Unit: ms Torque instruction filter time constant 1, when there is a motor running, the value can be appropriately set to large.
P08-25	Disturbance torque compensation gain	Set range: 0-100.0 Observed Gain Coefficient of disturbing torque. The larger the value is, the stronger the anti-disturbance Torque is, but the action noise may also be increased.
P08-26	Disturbance torque filtering time constant	Set range: 0-25.00, Unit: ms The bigger the value is, the stronger the filtering effect is, and the action noise can be suppressed. However, if the disturbance is too large, the phase delay will result and the disturbance torque will be suppressed.
P08-30	Notch Filter 1 frequency	Set Range: Set Range: 50-5000, Unit: HZ Notch 1 center frequency Set to 5000, notch invalid
P08-31	Notch Filter 1 width	Set range: 0-20 Set Range: 0-20 Notch 1 notch width level is the ratio of the width to the central frequency

P08-32	Notch Filter 1 depth	Set range: 0-99 The notch depth grade of Notch 1 is the ratio between the central frequency input and output of Notch 1. The larger the parameter, the smaller the notch depth and the weaker the effect
P08-33	Notch Filter 2 frequency	same as P08-30
P08-34	Notch Filter 2 width	same asP08-31
P08-35	Notch Filter 2 depth	same asP08-32
P08-36	Notch Filter 3 frequency	same asP08-30
P08-37	Notch Filter 3 width	same asP08-31
P08-38	Notch Filter 3 depth	same asP08-32
P08-39	Notch Filter 4 frequency	same asP08-30
P08-40	Notch Filter 4 width	same asP08-31
P08-41	Notch Filter 4 depth	same asP08-32

8.3 List of monitor items

Chart 106 List of monitor items

Display serial number	Display item	Description	Unit
d00.C.PU	Sum of position instruction pulses	This parameter can monitor the number of pulses sent by the user to the servo driver, which can confirm whether there is the phenomenon of missing pulses	user unit

d01.F.PU	Sum of position feedback pulses	This parameter can monitor the pulse number of servo motor feedback. The unit is consistent with the User Input Instruction Unit	user unit
d02.E.PU	Number of position deviation pulses	This parameter can monitor the pulse number of the position lag in the process of the SERVO system. The unit is consistent with the User Input Instruction Unit	user unit
d03.C.PE	Sum of pulses at a given position	This parameter can monitor the number of pulses sent by the user to the servo drive. Unit: 131072 bit per turn when using absolute value motor. Use Incremental encoder motor, then each turn according to encoder line number * 4 calculate.	Encoder unit
d04.F.PE	Sum of position feedback pulses	This parameter can monitor the pulse number of servo motor feedback. Unit: 131072 bit per turn when using absolute value motor. Use Incremental encoder motor, then each turn according to encoder line number * 4 calculate.	Encoder unit
d05.E.PE	Number of position deviation pulses	This parameter can monitor the pulse number of the position lag in the process of the SERVO system. Unit: 131072 bit per turn when using absolute value motor. Use Incremental encoder motor, then each turn according to encoder line number * 4 calculate.	Encoder unit
d06.C.Fr	Pulse Command input frequency	This parameter can monitor the input frequency of external pulse instruction	KPPS
d07.C.SP	Speed Control Command	This parameter can monitor the servo given speed when the servo motor is running	rpm
d08.F.SP	Motor speed	This parameter can monitor the speed of servo motor when it is running	rpm
d09.C.tQ	Torque instruction	This parameter can monitor the Torque of the servo motor when it is running	%
d10.F.tQ	Feedback value of torque	This parameter can monitor the Torque of the servo motor when it 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 servo motor after power-on	%
d13.oL	Overload rate	This parameter can monitor the servo motor's load occupancy in the past 10 seconds	%
d14.rG	Regeneration load rate	This parameter monitors the load rate of the regeneration resistor	%
d16.I.Io	Input IO status	This parameter can monitor the input port status of CN1. The upper vertical bar represents the high level (optocoupler cut-off) , the lower vertical bar represents the low level optocoupler on)	Binary system
d17.o.Io	Output IO status	This parameter can monitor the output port status of CN1. The upper vertical bar represents the high level (optocoupler through), the lower vertical bar represents the low level optocoupler cut-off)	Binary system
d18.AnG	Mechanical angle of motor	This parameter can monitor the mechanical angle of the motor and rotate 1 turn is 360 degrees	0.1 degree
d19.HAL	Motor UVW phase sequence	This parameter can monitor the phase sequence position of the incremental encoder motor	
d20.ASS	Absolute Value Encoder single-loop value	This parameter can monitor the feedback value of absolute encoder, rotating a circle between 0000-ffff	Decimal system
d21.ASM	Absolute Value Encoder multi-loop value	This parameter can monitor the number of turns of the absolute encoder motor	
d22.J-L	Moment of inertia ratio	This parameter can monitor the real-time inertia of the load of the motor	%
d23.dcp	Main Circuit Voltage (AC value)	This parameter can monitor the input voltage value of the main circuit	V
d24.Ath	Drive temperature	This parameter can monitor the drive temperature	Degree Centigrade
d25.tiE	Cumulative running time	This parameter monitors the drive elapsed time, in seconds	seconds
d26.1.Fr	Resonance 1	This parameter can monitor resonance frequency 1	Hz
d28.2.Fr	Resonance 2	This parameter can monitor resonance frequency 2	Hz

d30.Ai1	Analog quantity instruction 1 input voltage (V_REF)	This parameter can monitor the input voltage value of CN1 analog command.	0.01V
d31.Ai2	Analog quantity instruction 1 input (T_REF)	This parameter can monitor the input voltage value of CN1 analog command.	0.01V

8.4 Auxiliary function

Chart 107 Assistant Function

Serial number	Display item	Function	Operation
1	AF_JoG	JOG trial run	1. Press the M button in the action panel to switch to auxiliary mode AF, operate the Up / Down button to AF, press ENT button to enter the Jog mode of operation. The default Jog speed is 300 RPM. 2. Press the Up button, and the motor turns forward at 300 R / Min; press the Down button, and the motor turns back at 300 R / Min. 3. Long press ENT button to enter the speed edit menu. Edit the speed by using a combination of Up, Down and Left buttons, then press ENT for a long time to re enter Jog mode. This setting is not saved after the rollout of Jog mode. 4. Press M to exit Jog mode.
2	AF_run	Force enable operate speed mode	1. Press the M button in the action panel to switch to auxiliary mode AF, operate the Up / Down button to AF, press ENT button to enter the working mode. 2. Press the Up button, the motor is rotating, long press the Up button, the motor speed will continue to increase; press the Down button, the motor reverse, long press the Up button, the motor speed will continue to increase. 3. Press the M button to exit the mode.
3	AF_oF1	Automatic Zero Drift calibration for analog input 1 (VCMD)	1. Press the **M** button in the action panel to switch to auxiliary mode **AF_xxx**, press the Up / Down button to **AF_of1**, press **ENT** button to display **clr.Ai1**. 2. Long press ENT key until finsh flicker appears, that is to complete the automatic calibration of analog input 1 zero drift. (speed analog) 3. Press the M button to exit the mode.

4	AF_oF2	Automatic Zero Drift calibration for analog input 2 (TCMD)	1.Press the **M** button in the action panel to switch to auxiliary mode **AF_xxx**, press the Up / Down button to **AF_of2**, press **ENT** button to display **clr.Ai1**. 2.Long press **ENT** key until finsh flicker appears, that is to complete the automatic calibration of analog input 1 zero drift.(torque analog) 3. Press the M button to exit the mode.
5	AF_oF3	U, W current Automatic zero drift calibration	Same AF_oF1 Note: when performing this function, the servo must be in the off enable state, otherwise the finsh flashing page will not appear, and the automatic calibration cannot be completed
6	AF_En0	Absolute encoder fault clearing	1. Press the M button in the action panel to switch to auxiliary mode AF, press the Up / Down button to AF, press ENT button to display CLC. Err. 2. Long press ENT button until finsh flashes, that is, complete absolute encoder troubleshooting. 3. Press the M button to exit the mode.
7	AF_En1	Absolute value encoder multi-turn value resetting	1. Press the M button in the action panel to switch to auxiliary mode AF, press the Up / Down button to AF, press ENT button to display CLC. Ash. 2. Long press ENT key until finsh flashes, that is, complete absolute encoder multi-turn value resetting. 3. Press the M button to exit the mode.
8	AF_ini	recover to factory setup	Contact with factory
9	AF_Err	The failure records display	1. Press the M button in the operations panel to switch to auxiliary mode AF, operate the Up / Down button to AF, press ENT button to display the past 8 historical failure information. The left Digit 0 represents the last failure 2. Press the Up button to display the past failures one by one. Long press ENT button, can show the time of failure, time coordinates reference D 25. Tie. 3. Press the M button to exit the mode. Note: A fault that occurs during multiple ups and downs in 30 minutes may have a recording time deviation of 30 minutes.

10	AF_uEr	Version display	1. Press the M button of the operation panel to switch to auxiliary mode AF, operate the Up / Down button to AF, press ENT button to display the SERVO information. 2. Press the M button to exit the mode.
11	AF_unL	Operation Permission Setting	1. Press the M button of the action panel to switch to the auxiliary mode AF, operate the Up / Down button to AF, press the ENT button to edit the action permissions. 0: The parameters are all locked, can not be changed; 1: The P00-XX parameters are locked, other can be changed; 2: No Lock, can be changed. Set 0,1 value, power down to save. Set 2, power off do not save. 2. Press the M button to exit the mode.
12	AF_ Io	Forced output port level	1. Press the M button of the action panel to switch to the auxiliary mode AF, operate the Up / Down button to AF, press the ENT button to edit. 2. Press the M button to exit the mode. The output port reverts to its original output state.
13	AF_J-L	Load inertia ratio measurement	1. Press the M key on the operation panel, switch to the auxiliary mode AF - XXX, operate the up / down key to AF_J-L, and press the ENT key to measure the inertia ratio. 2. Long press up key or down key, the motor will run back and forth according to the maximum speed set by p08-02, acceleration and deceleration time set by p08-03, waiting time set by p08-04, and turns set by p08-05 until the load inertia ratio appears. 3. Press the M key to exit the mode. 4. Record the measured value and write it into p01-04 (moment of inertia ratio) parameter

Chapter 9 Fault Analysis and Treatment

9.1 Fault alarm information list

Chart 108 Fault alarm list

Alarm Type	Alarm Code	Alarm content
Hardware Fault	AL.051	Eeprom parameter abnormal
	AL.052	Programmable Logic configuration fault
	AL.053	Initialization Failed
	AL.054	System abnormal
	AL.060	Product model Select fault
	AL.061	Product matching fault
	AL.062	Parameter storage fault
	AL.063	over current checkout
	AL.064	Servo power on , Self-Test find out the output short circuit fault
	AL.065	servo unit built-in Fan stop
	AL.066	servo unit control power supply low voltage
	AL.070	AD Sample fault1
	AL.071	Current sample fault
	AL.100	Parametric combination abnormal
	AL.101	AI Setting fault
	AL.102	DI distributing fault
	AL.105	Electronic gear Configuration error
	AL.106	Frequency splitting pulse output Setting abnormal
	AL.110	Need to power-on again after the parameter setting
	AL.120	Servo ON Instruction invalid
Operational Faults	AL.400	Power wire loss phase
	AL.401	Under voltage
	AL.402	Over voltage
	AL.410	Overload (instantaneous Maximum load)
	AL.411	Drive overload
	AL.412	Motor overload (Continuous maximum load)
	AL.420	Over speed
	AL.421	Lose Control check out
	AL.422	runaway fault
	AL.425	AI collect sample over voltage
	AL.430	Regeneration of Abnormal
	AL.431	Regeneration of overload
	AL.432	Regeneration of Short circuit Open circuit
	AL.435	Stroke current Limited overload resistance
	AL.436	DB overload
Operational Faults	AL.440	Radiator overheat
	AL.441	Motor overheat fault
	AL.500	Output frequency division over speed
	AL.501	Position deviation is too large
	AL.502	Full closed loop encoder position and Motor position error are too large
	AL.505	Pulse Command input pulse abnormal

	AL.510	Gantry synchronization deviation deviation is large
	AL.550	Inertia identification failure fault
	AL.551	back to origin Point timeout fault
	AL.552	Angle Identification failure fault
Encoder Fault	AL.600	Encoder output power short circuit fault
	AL.610	Incremental encoder gets out of line
	AL.611	Incremental encoder Z signal loss
	AL.620	Absolute Encoder gets out of line
	AL.621	Read and write motor encoder EEPROM parameter abnormal
	AL.622	motor encoder EEPROM data parity error
	AL.640	Absolute encoder overspeed
	AL.641	Absolute encoder overheat
	AL.642	Absolute encoder battery low voltage alarm
	AL.643	Absolute encoder Battery low voltage fault
	AL.644	Absolute encoder multi-turn fault
	AL.645	Absolute encoder multi-turn overflow fault
	AL.646	Absolute encoder communication error 1
	AL.647	Absolute encoder count error 2
	AL.648	Absolute encoder communication error 3
	AL.649	Absolute encoder communication error 4
	AL.650	Absolute encoder communication error 5
	AL.651	Absolute encoder communication error 6
	AL.652	Absolute encoder multi-turn Multiple faults
Warning	AL.900	Location deviation is too large
	AL.901	When servo ON, Location deviation is too large
	AL.910	Motor overload
	AL.912	Drive overload
	AL.920	Regeneration of overload
	AL.921	DB overload
	AL.925	External regeneration bleeder resistor is too small
	AL.930	Absolute encoder’s battery Fault
	AL.941	Need to power-on again after Parameters changing
	AL.942	Write EEPROM frequent warnings
	AL.943	Abnormal serial communication
	AL.950	Over run Warning
	AL.951	Absolute encoder angle initialization warning
	AL.971	Under voltage warning
	AL.990	Radiator overheat warning
	AL.991	Input phase loss warning

9.2 Cause and treatment of fault alarm

AL.051: EEPROM parameter abnormal

Causes of fault alarm	Fault alarm checking	Disposal measures
servo unit EEPROM data abnormal	Check connection	Correct connection, reconnect power, If always appear, then change a drive

AL.052: Programmable logical configuration fault

Causes of fault alarm	Fault alarm checking	Disposal measures
Master control MCU power-on initialization exception, Serial port baud rate setting is too high	Check connections, Check the baud rate of serial communication parameters P00-21	Reduce the baud rate of Serial Communication, If always appear, then change a drive

AL.053: Initialization Failed

Causes of fault alarm	Fault alarm checking	Disposal measures
Master control MCU power-on initialization failed	check connections reconnect power	If always appear, then change a drive

AL.054: System error

Causes of fault alarm	Fault alarm checking	Disposal measures
Master control MCU operation abnormal	check connections reconnect power	If always appear, then change a drive

AL.060: Product model selection fault

Causes of fault alarm	Fault alarm checking	Disposal measures
Product parameter setting does not match the actual hardware	Detect whether the servo unit can support the mtor	Set product parameters correctly If always appear, then contact the manufacturer
The drive power does not match the motor power	The rated current of the selected motor is greater than or much less than the output current of the driver	Use the matching motor and driver units

AL.061: Products matching fault

Causes of fault alarm	Fault alarm checking	Disposal measures
servo unit and servo motor does not match	Detect whether the servo unit can support the motor	Replace the matching motor and servo units

AL.063: Overcurrent detection

Causes of fault alarm	Fault alarm checking	Disposal measures
Servo unit power module current is too large	U,V,W wiring whether is short Circuit. Whether short circuit between B1 & B3	Correct connection, If always appear, then change a drive

AL.066: Servo Unit controls the power supply voltage is low

Causes of fault alarm	Fault alarm checking	Disposal measures
Control power supply L,N power voltage is too low	check connections Measure L, N , whether the voltage is lower than 140VAC	Correct connection, If always appear, then change a drive

AL.071：Current collect sample fault

Causes of fault alarm	Fault alarm checking	Disposal measures
abnormal collect sample data in current sensor	check connections whether is correct	Correct connection, If always appear, then change a drive

AL.100：Parameter combination anomaly

Causes of fault alarm	Fault alarm checking	Disposal measures
Parameter setting error	Check the set (p03-07) parameters	Set parameters correctly If it always appears, initialize the parameter

AL.102：DI distribution fault

Causes of fault alarm	Fault alarm checking	Disposal measures
At least two functions of input ports have the same selection.	Check input port function selection parameters.	Set parameters correctly The drive is recharged

AL.103：DO distribution fault

Causes of fault alarm	Fault alarm checking	Disposal measures
At least two functions of output ports have the same selection.	Check output port function selection paramgeter.	Set parameters correctly The drive is recharged

AL.105：Electronic gear setting error

Causes of fault alarm	Fault alarm checking	Disposal measures
Electronic gear ratio setting error	Check electronic gear ratio setting parameters. P03-10, P03-11	Set the electronic gear ratio correctly
Gantry output pulse set too small	Check the feedback pulse number of the gantry motor for one turn: p03-52 must be greater than 128	Set the feedback pulse number of the gantry motor for one turn

AL.106：Frequency division pulse output setting is abnormal

Causes of fault alarm	Fault alarm checking	Disposal measures
The output parameters of frequency division pulse are set out of range	Check the setting parameters of frequency division pulse output. P03-22, p03-23, p03-25	Set the output parameters of frequency division pulse correctly Incremental encoder p03-22 ≤ p03-23 Bus encoder p03-25 <65535 The drive is recharged

AL.110：The power should be recharged after the parameters are set

Causes of fault alarm	Fault alarm checking	Disposal measures
After setting the servo parameters, it shall be powered on again to take effect	The drive is recharged	The drive is recharged

AL.120: Servo ON command invalid alarm

Causes of fault alarm	Fault alarm checking	Disposal measures
When the servo is ON, the power supply input ports R, S and T are not powered	Check wiring and input voltage	Check wiring and input voltage

AL.400 Power lines loss phase

Causes of fault alarm	Fault alarm checking	Disposal measures
R.S.T three phases to Driver power supply loss phase	Check wiring and input voltage	Check wiring and input voltage

AL.401: Under voltage

Causes of fault alarm	Fault alarm checking	Disposal measures
Main circuit input voltage lower than rated voltage value or no input voltage	Check whether the input R,S and T of the main circuit is correct and what the voltage value is. The bus voltage can be monitored through d23.dcp	Ensure proper wiring, use correct voltage source or series regulator

AL.402 Over voltage

Causes of fault alarm	Fault alarm checking	Disposal measures
The input voltage of the main circuit is higher than the rated voltage	Test the input voltage of the main circuit with a voltmeter	Use the correct voltage source or tandem regulator
Driver hardware failure	When the input voltage is confirmed to be correct, the overvoltage alarm still remains	Please send it back to distributor or original factory for maintenance
No regenerated resistance or regenerated resistance is not selected correctly	Verify that p00-30 is set to 0 or 1	Correct setting and external regenerative resistance

AL.410: Overload (instantaneous maximum load)

Causes of fault alarm	Fault alarm checking	Disposal measures
The machine is stuck when the motor starts	Check if mechanical connection is jammed	Adjusting mechanical structure
Driver hardware failure	Confirm that the mechanical part is still alarming normally	Please send it back to distributor or original factory for maintenanc

AL.412: Motor overload (continuous maximum load)

Causes of fault alarm	Fault alarm checking	Disposal measures
Continuous use beyond the rated load of the drive	Monitoring can be done through d13.ol. In monitoring mode	Switch to a higher power motor or lower load

Improper parameter setting of control system	1. Whether the mechanical system is installed 2. Set the acceleration constant too fast 3. Whether the parameters of gain class are set correctly	1. Adjust the gain of the control loop 2. Acceleration and deceleration setting time slows down
Motor connection error	Check U, V and W wiring	Correct connection

AL.420 Over speed

Causes of fault alarm	Fault alarm checking	Disposal measures
Input speed command too high	Use the signal detector to check if the incoming signal is normal	Adjust the frequency of the input signal
Incorrect setting of overspeed judgment parameters	Test whether p04-05 (overspeed alarm value) is set reasonably	Set p04-05 (overspeed alarm value) correctly

AL.421: Out of control check out

Causes of fault alarm	Fault alarm checking	Disposal measures
Motor power line U, V, W wiring wrong.	Check the connection	Correct connection
Motor parameters are not set correctly	Check P00-05; And encoder parameter setting is correct or not	Set parameters correctly In torque mode, set p01-40 to 0 to turn off the out-of-control check out function

AL.430: Abnormal regeneration

Causes of fault alarm	Fault alarm checking	Disposal measures
The regenerative resistance is wrong or not connected to the external regenerative resistance	Check the connection status of the regenerated resistance	If the connection is normal, please return the drive to the factory for maintenance
Parameter setting error	Please confirm the parameter Settings for p00-30, p00-31 and p00-32	Set parameter values correctly

AL.431: Regeneration of overload

Causes of fault alarm	Fault alarm checking	Disposal measures
The regenerative resistance is wrong or not connected to the external regenerative resistance	Check the connection status of the regenerated resistance and whether the regenerated resistance value and power are suitable	Select the appropriate regenerative resistance

AL.432: Regenerative short circuit, open circuit

Causes of fault alarm	Fault alarm checking	Disposal measures
Regenerative short circuit	Check port B1/B3 for short circuit	If there is no short circuit in B1/B3 and the alarm still appears, please return the driver to the factory for maintenance
Regenerative open circuit	Please confirm the parameter Settings for p00-30, p00-31 and p00-32	Set parameter values correctly

AL.440: Radiator overheating

Causes of fault alarm	Fault alarm checking	Disposal measures
The internal temperature of the drive is above 95℃	Check whether the heat dissipation condition of the drive is good	Improve the heat dissipation condition of the drive. If the alarm still appears, please return the drive to the factory for maintenance

AL.501: Excessive position deviation

Causes of fault alarm	Fault alarm checking	Disposal measures
Position deviation is too large and parameter setting is too small	Confirm p03-15 (position deviation is too large) parameter setting	Increase the set value of p03-15 (position deviation is too large)
The gain value is set too low	Confirm whether the gain class parameters are properly set	Re-adjust the gain class parameters correctly
Internal torque limiter is set too small	Confirm internal torque limiter	Re-adjust the internal torque limiter correctly
Excessive external load	Check external load	Load reduction or high power motor replacement

AL.505: P Command input pulse exception

Causes of fault alarm	Fault alarm checking	Disposal measures
The pulse command frequency is higher than the rated input frequency	Use the pulse frequency meter to detect if the input frequency is higher than the rated input frequency	Set the input pulse frequency correctly

AL.551: Back to the origin timeout failure

Causes of fault alarm	Fault alarm checking	Disposal measures
The operation back to the origin is timed out	Confirm whether the parameter p03-68 (maximum time limit for searching origin) is reasonable	Set p03-68 correctly

AL.600: Short circuit fault of encoder output power supply

Causes of fault alarm	Fault alarm checking	Disposal measures
Encoder power connection error	Check whether the encoder power supply +5V and GND are connected in reverse	Correct connection

AL.610: Delta encoder off-line

Causes of fault alarm	Fault alarm checking	Disposal measures
Delta encoder HallU, HallV, HallW signal exception	Check the encoder wiring	Correct connection

AL.620: Bus encoder off line

Causes of fault alarm	Fault alarm checking	Disposal measures
Bus encoder communication failed	Check the encoder wiring	Correct connection

AL.621: Read/write motor encoder EEPROM parameters are abnormal

Causes of fault alarm	Fault alarm checking	Disposal measures
Encoder read and write exception	Check the encoder wiring,	Correct connection

AL.640: Bus encoder overspeed

Causes of fault alarm	Fault alarm checking	Disposal measures
Bus encoder speed value is more than 6000rpm	Check the encoder wiring Make sure the encoder shield wire is properly connected	Reduce the speed If the connection is normal, please return the drive to the factory for maintenance

AL 642, AL 643: Bus encoder battery failure

Causes of fault alarm	Fault alarm checking	Disposal measures
When the bus encoder is set to multi-coil absolute value, the external battery voltage is low	Check the external battery voltage of the encoder and confirm that it is higher than 3.0v	replace the battery,

AL.645: ModBus encoder multi-loop overflow fault

Causes of fault alarm	Fault alarm checking	Disposal measures
The number of turns of the bus encoder is out of range	Check if P00-09 is 1. The multi-turn absolute motor cannot turn in one direction for a long time.	Clear multiple values using the directive AF_En1

AL.647: Bus-type encoder counts exceptions

Causes of fault alarm	Fault alarm checking	Disposal measures
Separate encoder has big deviation	Check the encoder	Install the encoder correctly

AL943: Abnormal serial communication

Causes of fault alarm	Fault alarm checking	Disposal measures
Serial communication interference The serial port baud rate is set too high	Check the wiring Check the baud rate parameter p00-21 for serial communication	Add a filter to the wire Reduce the baud rate of serial communication

➢ 10 Special function usage

10.1 Gantry synchronization function

10.1.1 Function Description

Large-span machinery now basically uses the gantry beam connection mode and is driven by two motors. In order to improve the synchronization of the two axes, the synchronization mode needs to be adopted. The previous synchronization is realized by the upper computer, and the servo is only used as the actuator. The gantry simultaneous control is completely completed by the servo driver. The host computer only performs simple open-loop position control and logic control.

10.1.2 Achieve Gantry function wire diagram

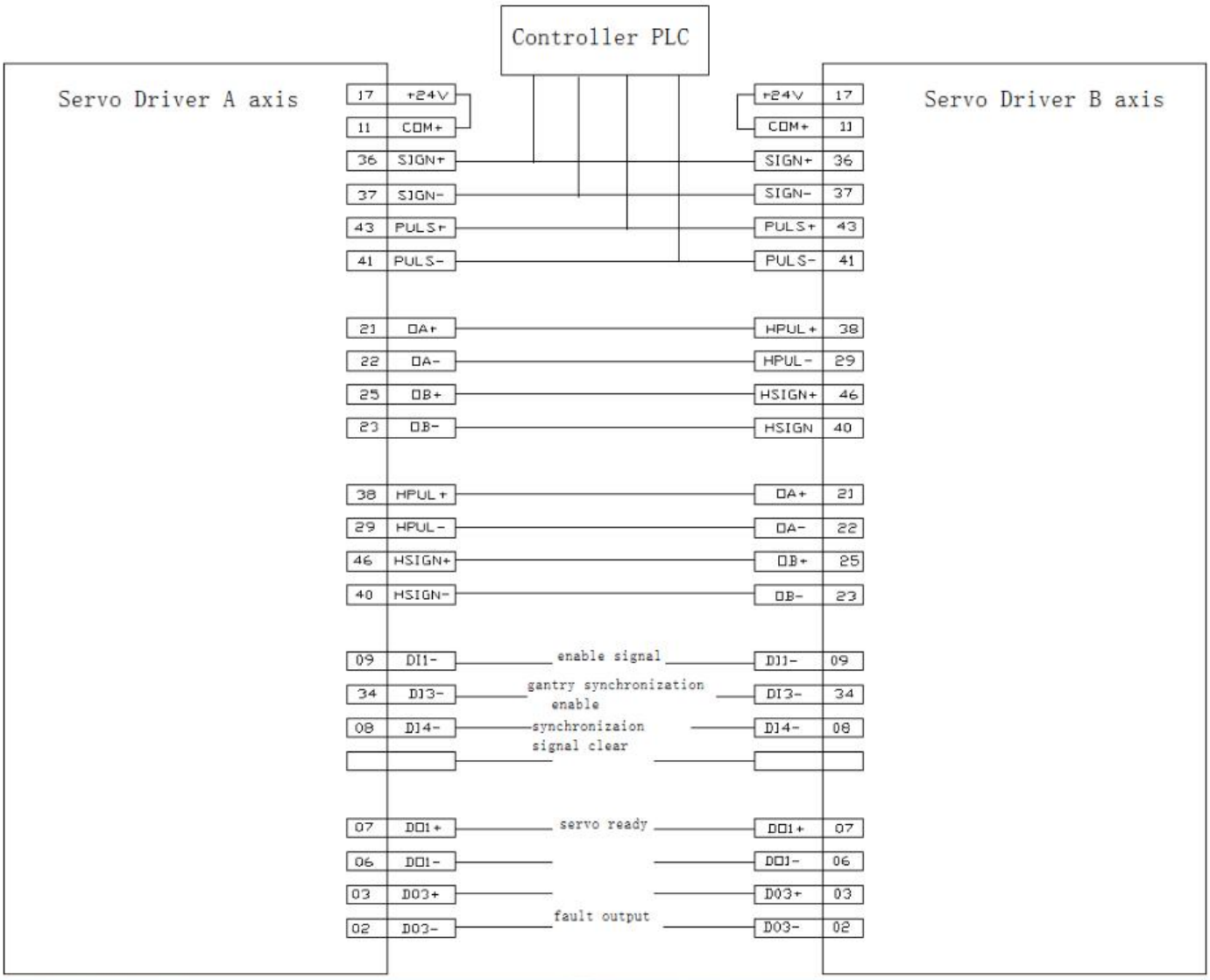


Chart 141 Achieve gantry function wire diagram

10.1.3 Servo basic set and description

Chart 109 Gantry Function basic set and description

Parameter code	Description	Set range
P03-25	absolute encoder motor outputs pulse quantity per rotation	Set range:0-60000 Setting the value of absolute motor rotates one revolution. it means the quantity of each A and B frequency division pulses output Example: If the setting value is 2048, the A and B signals will output 2048 pulses for each motor rotation
P03-50	Gantry function enable	Set range:0-1 Default:0 0: no this function 1: use gantry function.
P03-51	Gantry function input signal invert	Set range: 0. Default:0 0: No invert 1: Invert
P03-52	feedback pulses quantity for one revolution of gantry function motor	Set range:0-65535, default: 1000. Ganry function opens, feedback pulses quantity for onerevolustion of driver. Note: need to set the same value to both synchronization axises.
P03-53	Gantry function position deviation too many setting.	Set range:0-65535, Default:10000 Gantry function position deviation too many setting: (P03-53) *10command unit. It will alarm if the action value exceeded the set value. AL.510(synchronization deviation too big.)
P03-55	Gantry function synchronize position scale gain.	Set range: 0-200 It will improve synchronization to two axises if bigger value was set, reduce deviation. But it will cause vibration and noise if too big value be set.
P06-01	DI1 Input port function option	DI1 set to 1, servo ON
P06-05	DI3 Input port function option	DI3 set 19, Ganry synchronization function enable
P06-07	DI4 Input port function option	DI4set 20, Ganry synchronization function clear

10.1.4 Synchronization set ON

After the above gantry synchronization parameter setting is completed, observe the feedback pulse amount of the other axis through d03.C.PE to determine whether the gantry synchronization wiring is correct. If the pulse wiring is correct, then enterinto the synchronization setting step ON.

Synchronously open parameter settings:

P03-50 Set 1: Gantry simultaneous motion enable

This parameter is set to gantry synchronous enable. In this mechanical system, the enable signal is given by the host computer. The steps are:

After power on, it can be aligned through the homing mode or manually. After completion, the gantry synchronization function is enabled, and the simultaneous deviation is cleared, and then the servo drive enters the gantry synchronous operation state.

10.2 Home position return function

10.2.1 Functional description

Home point: The mechanical home point, which can stand for the home point switch switch or the Z signal position of the motor, which is set by the function code P03-61

Zero point: It is the target point, which can be expressed as the home point + offset (set by P03-69/P03-70). When P03-69/P03-70 is set to 0, the zero point coincides with the home point.

The homing function refers to the position control mode, when the servo enable is ON, after the homing function is triggered, the servo motor will actively find the zero point and complete the positioning function.

10.2.2 Servo basic settings and description

Table 110 Basic settings and description of the homing return function

Parameter code	Description	Setting Range and description
P03-60	Homing return enable control	Set range:0-6, Default: 0 Set homing return mode and trigger signal source 0: close homing return mode 1: Starts homing return mode immediately after power on. 2: Starts homing return mode immediately 3: Start electrical zero command 4: Set the local position as homing point.
P03-61	Homing return model	Set range:0-9, Default:0

		During homing return operation, set the control signal source for the zero position return direction, deceleration point, and the home point. 0: Return to zero in positive direction, deceleration point and home point are home point switches 1: Return to zero in reverse direction, deceleration point and home point are home point switches 2: Return to zero in positive direction, deceleration point and home point are motor Z signal. 3: Return to zero in reverse direction, deceleration point and home point are motor Z signal. 4: Return to zero in positive direction, deceleration point is home point switche, and home point is Z signal. 5: Return to zero in reverse direction, deceleration point is home point switche, and home point is Z signal. 6: Return to zero in positive direction, deceleration point and home point switche are forward overtravel switches. 7: Return to zero in reverse direction, deceleration point and home point switche are reverse overtravel switches. 8: Return to zero in positive direction, deceleration point is forward overtravel switche, and home point is Z signal. 9: Return to zero in reverse direction, deceleration point is reverse overtravel switche, and home point is Z signal.
P03-65	The Speed when searching for origin switch_high speed	Setting range: 0-3000, Default:100 When setting the home point return to zero, search the high-speed value of the deceleration point signal. When electrical return to zero, the motor always runs at high speed of P03-65.
P03-66	The Speed when searching for origin switch_low speed	Setting range: 0-1000, default:10 Setting the low-speed value when home point return to zero and search the home point. The setting speed value should be low enough to prevent mechanical shock during shutdown.
P03-67	Search home switch acceleration/deceleration time	Set the time for the motor to change from 0 to 1000 rpm when the home point return. Unit: MS.
P03-68	Maximum searching home point time limit	Limit the total time of homing, and alarm AL.551 (back-to-home time-out fault) will occur if its time out.
P03-69	Mechanical homing	Set the high and low values of the absolute position of

	offset H	the motor after homing. Calculation method of total offset: Offset＝(P03-69)*65535+(P03-70)
P03-70	Mechanical homing offset L	
P06-01	DI1 input port function option	DI1 set: 1, servo: ON
P06-05	DI3 input port function option	DI3 set:3, Positive overtravel signal input
P06-07	DI4 input port function option	DI4 set:4, Reverse overtravel signal input
P06-09	DI5 input port function option	DI5 set:21, Home point switch signal
P06-11	DI6 input port function option	DI6 set:22, Home point return start signal

10.2.3 Precautions for Return to Home point

If the deceleration point signal is valid and the home signal is valid without decelerating sufficiently, the final positioning may become unstable. Fully consider the displacement required for deceleration, and then set the deceleration point and the origin signal input position. The acceleration/deceleration time of searching for the home point (P03-67) and the speed_high speed (P03-65) of searching for the home switch will also affect the positioning stability, and therefore should be considered when setting.

10.3 Absolute encoder use

10.3.1 Function description

Using a servo motor with an absolute encoder, an absolute value detection system can be constructed by the host device. The absolute value detection system eliminates the need to perform a return-to-origin operation every time the power is turned on. This function is based on Modbus or CANopen communication to read the absolute encoder turns and position data, and the host device processes and controls the related functions of the absolute encoder.

10.3.2 Basic settings and description of servo based on bus communication

When a system using an absolute encoder is put into use, it is necessary to initialize the number of rotations (the AF-En0 absolute encoder multi-turn value is cleared). Therefore, an alarm related to the absolute encoder will occur when initialization is required such as when the power is turned on for the first time. By setting (initializing) the absolute

encoder, after executing the rotation number data initialization, the alarm related to the absolute encoder will be cleared.

Table 111 Basic settings and description of servo based on bus communication

Parameter code	name	Set range and description
P00-23	Slave address	Set range:0-255, Default:1 Set value according to device requirement.
P00-07	Encoder selection	Set range: 0-3, Default:3 0、1: incremental encoder; 2: ; Single-turn absolute encoder encoder 3: Multi-turn absolute encoder encoder

10.3.3 Absolute encoder related alarm processing

Table 112 Absolute encoder related alarm processing

Alarm code	Cause of fault alarm	Fault alarm check	Disposal measures
AL.640	Bus encoder overspeed	Appears on first use	Clear the alarm via AF-EN0 (see parameters and functions for details)
AL.642 AL.643	When the bus encoder is set to multi-turn absolute value, the external battery voltage is low	Check the voltage of the encoder external battery and confirm that it is higher than 3.0V	Replace the battery and clear the alarm through AF-EN0 (see parameters and functions for details)
AL.644 AL.645	Abnormal reading of multi-turn data, or multi-turn data greater than 32767	Check d21.ASH (see parameter and function for details)	If the multi-turn value is greater than 32767, clear the multi-turn data through AF-EN1 (see parameters and functions for details)
AL.930	Absolute encoder battery fault	Check the voltage of encoder external battery	Replace the battery and clear the alarm through AF-EN0 (see parameters and functions for details)