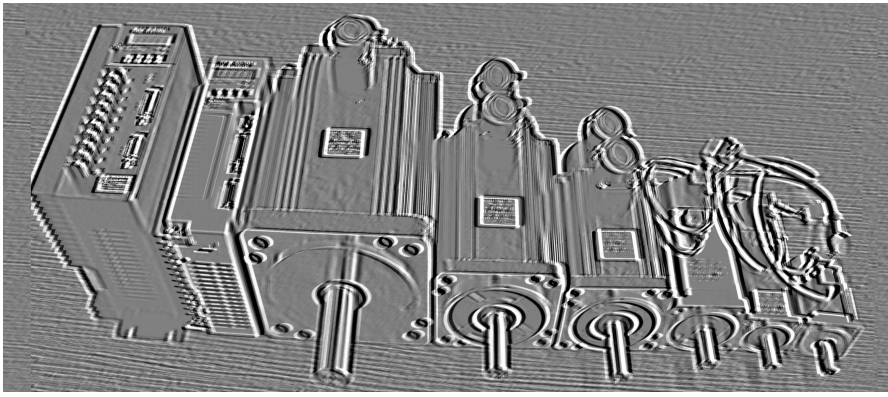
C7 -13i**C Absolute Value Series**

AC servo driver

Design and debugging part



CE
ISO9001

Contents

Safety Instruction

I. Personnel security

■ This product is a high-voltage and high-current product, which ensures that personnel are in the safe area of the moving mechanism when electrified.

■ This product is high voltage and high current product, and wrong operation may cause accidents such as arc burn and electric shock.

■ It is forbidden not to operate the wiring and electrify according to the instructions.

II. Safe occasions

■ This product is high voltage, high current products, it is forbidden to use electricity in combustible gas, corrosive gas, otherwise it may cause fire, explosion.。

■ It is forbidden to use electricity at the dripping place of flammable and explosive materials, which may cause fire and explosion.

■ It is forbidden to use it under the conditions of high humidity and moisture metal powder, which may cause electric shock to oneself and others, and other dangerous situations.

III. Safety of products and equipment

■ This product is a high voltage and high current product, and wrong connection will cause damage to the product.

■ PE terminal must be grounded, and ensure that the ground wire is reliably grounded.

■ L Series of this product is suitable for AC220V power supply; H Series is suitable for AC 380V power supply. Do not connect it incorrectly.

■ Products U, V and W should be connected with the motor for output, please do not connect with the input power supply.

■ U, V, W products for three-phase output do not connect wrong sequence, wrong connection may cause motor speed, equipment damage, and the product over-current damage.

■ Fasten all terminals, and all wiring specifications are strictly selected according to power.

■ It is forbidden to distribute power or touch terminals when the driver is powered on.

■ Do not touch the terminal within 5 minutes of power failure.

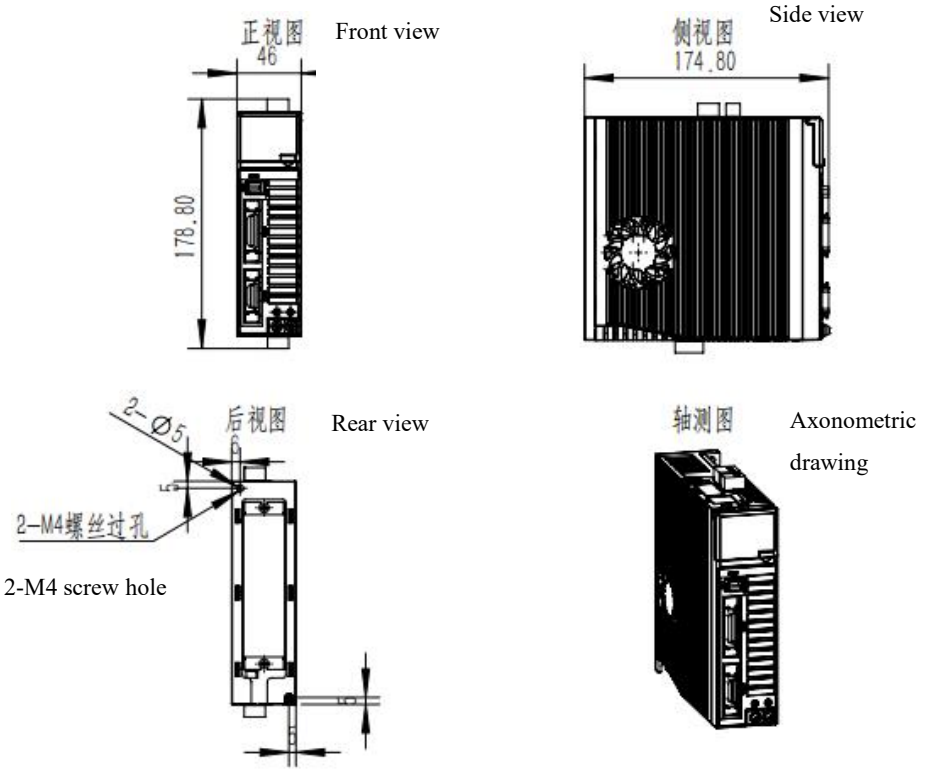
It is forbidden to touch the motor and cable when the motor is running to prevent accidental injuries such as scald and sprain.

Remarks

Chapter I Installation

1.1 Servo Driver Mounting Dimensions

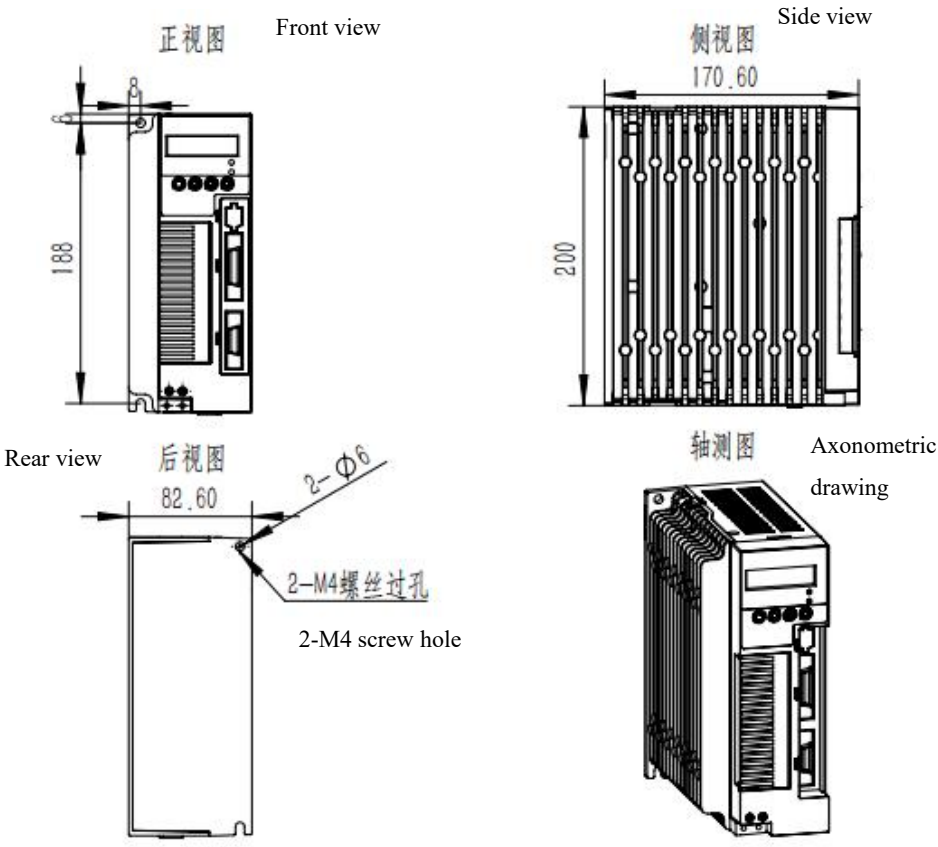
1.1.1 10A/22A/32A servo mounting dimensions (Unit: MM)



Recommended screw: 2-M4; Recommended locking torque: 1.2N.M

Fig.1.1.1 10A/22A/32A appearance dimension diagram

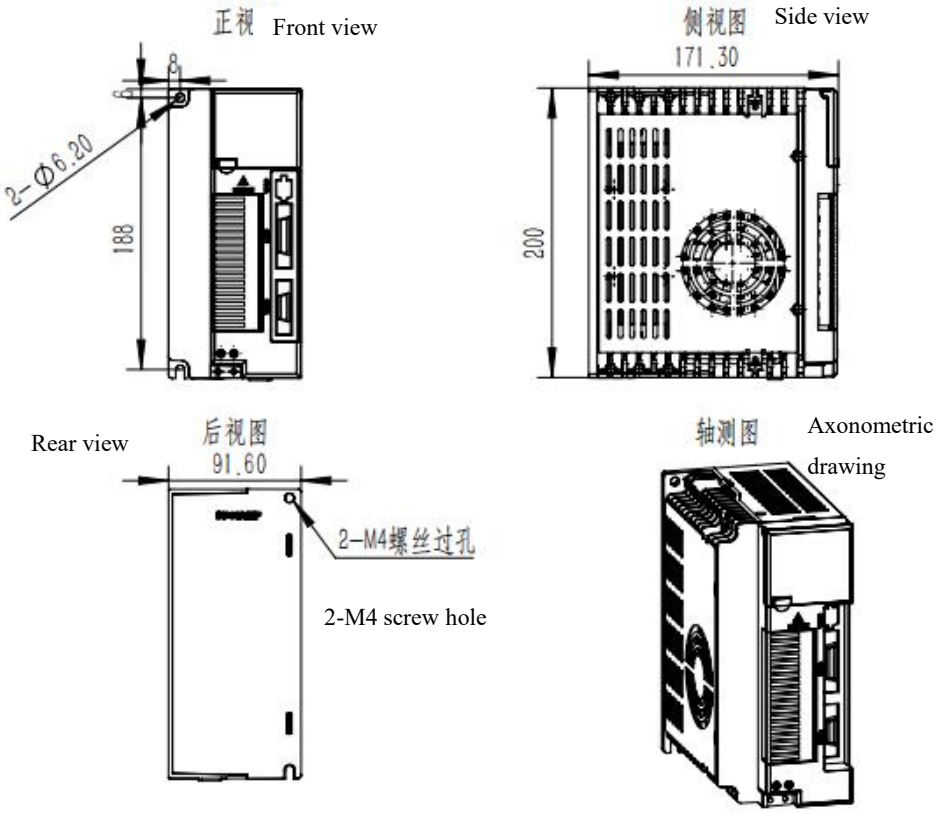
1.1.2 20A/30AServo Driver Mounting Dimensions(Unit: MM)



Recommended screw: 2-M4; Recommended locking torque: 1.2N.M

Fig.1.1.2 20A/30A appearance dimension diagram

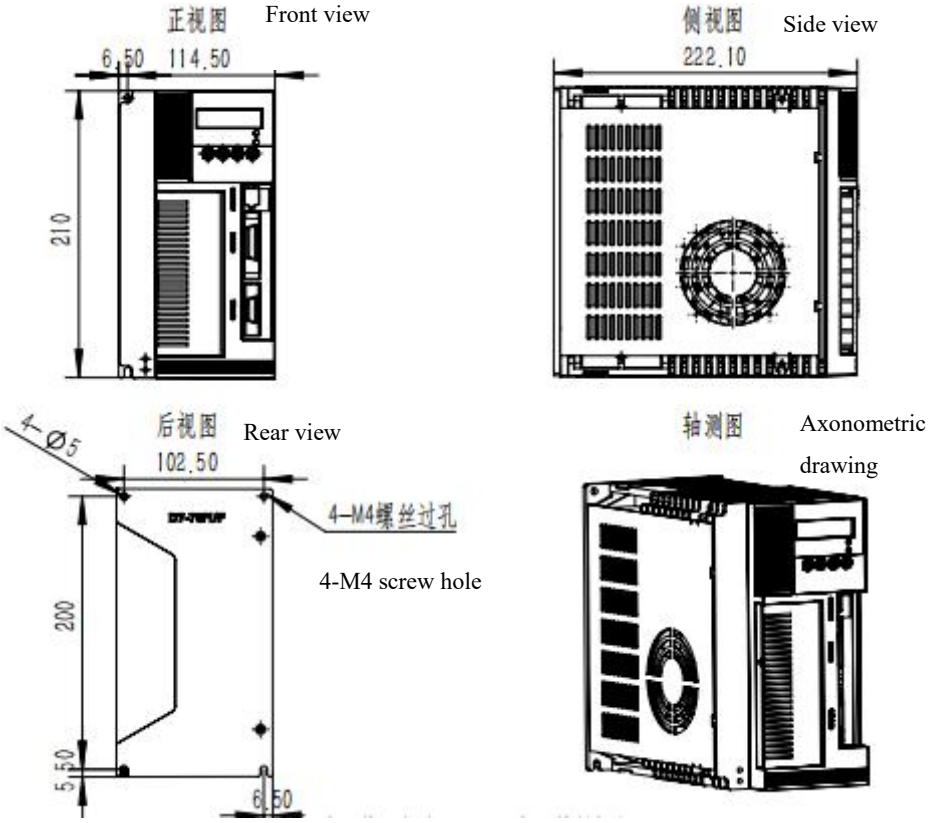
1.1.3 35A servo mounting dimensions (Unit: MM)



Recommended screw: 2-M4; Recommended locking torque: 1.2N.M

Fig.1.1.3 35A appearance dimension diagram

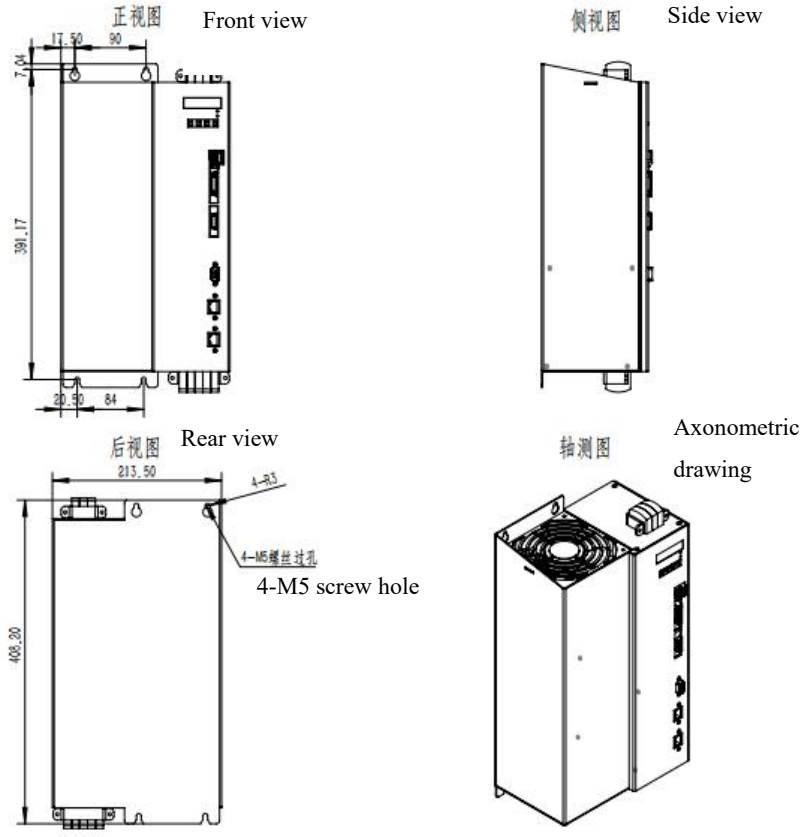
1.1.4 25A/50A/75A Servo Driver Mounting Dimensions(Unit: MM)



Recommended screw: 4-M4; Recommended locking torque: 1.2N.M

Fig.1.1.4 25A/50A/75A appearance dimension diagram

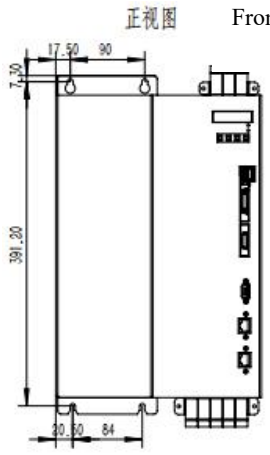
1.1.5 160A Servo Driver Mounting Dimensions(Unit: MM)



Recommended screw: 4-M5; Recommended locking torque: 2N.M

Fig.1.1.5 160A installation dimension diagram

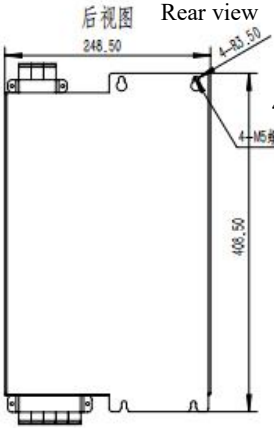
1.1.6 200A Servo Driver Mounting Dimensions(Unit: MM)



Front view

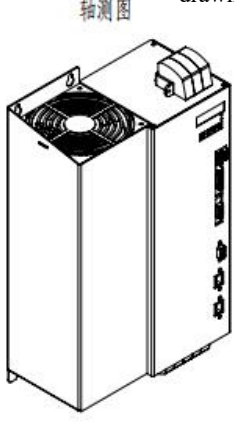
Side view

Axonometric drawing



Rear view

4-M5 screw hole



Recommended screw: 4-M5; Recommended locking torque: 2N.M

Fig.1.1.6 200A installation dimension diagram

1.2 Installation Situations

1. To ensure the normal operation of the driver, it is necessary to ensure that the temperature around the driver is below 50℃ and the relative humidity is below 90%. Long-term safe working temperature below 40℃.
2. The servo driver is prone to failure when it is used in corrosive gas, humidity, metal dust, water and processing liquid and harsh environment. Therefore, the working environment of the drive should be fully considered in the process of using and installing.
3. The vibration of the equipment directly or indirectly connected with the servo driver should be guaranteed below 0.5 G (4.9 m/S2) or less, so as to ensure the long-term stable operation of the servo driver.
4. The servo driver may be disturbed while interfering, so when installing the electric cabinet or complete set of equipment, we must pay attention to the wiring of strong electricity and weak electricity, because when the external interference signal is very strong, when the influence on the power line and control signal of the servo driver is serious, it will lead to the driver not working normally, and it may also make the driver misoperate. When the wiring is poor, the control equipment such as the upper computer will work unstably under the interference of driving. Pay attention to installing acoustic-magnetic rings, filters, isolation transformers, etc. at interference sources and interfered places. Special attention should be paid to the control signal lines of drivers which are easily disturbed, and reasonable routing and shielding measures should be taken.

1.3 Installation Direction and Space

1. Pay attention to the installation direction (see Fig.1.3).
2. Pay attention to the installation spacing (see Fig. 1.3).
3. 4 M5 screws can be fixed, and elastic pads need to be installed.
4. Servo must be installed in a relatively closed space, keep ventilation in the electric cabinet, install filter screens at the vents to prevent dust from entering, and clean them regularly to prevent blockage of airflow.

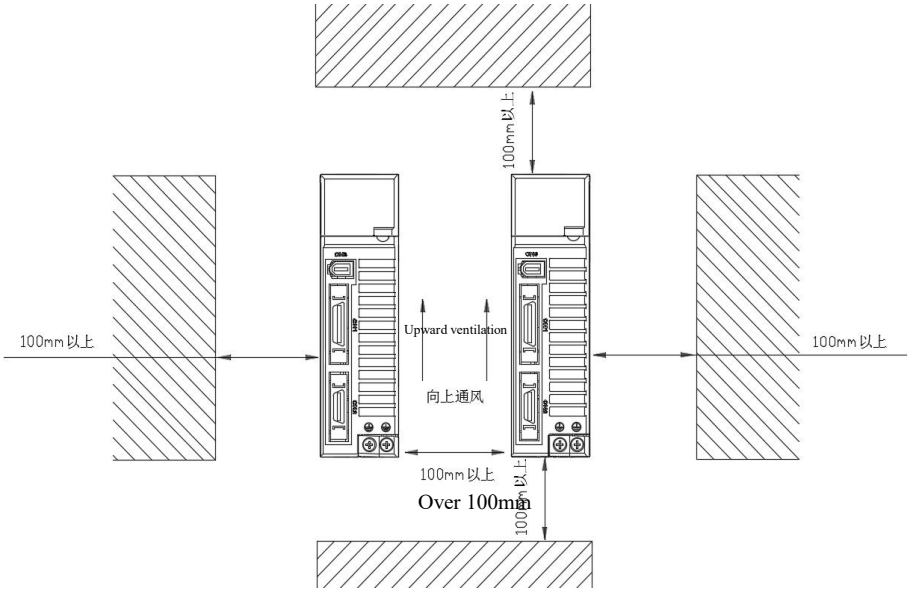


Fig.1.3 Installation orientation map

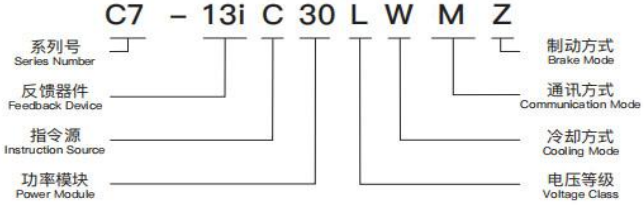
Chapter II Functional Overview

2.1 Servo C7 Series Basic Functions

Model		C7-13iC
Control power supply and main loop power supply		L: Power supply for single-phase or three-phase AC220V; H: Three-phase 380V supply voltage fluctuation:-15 ~ +10%, 50/60 Hz
Environment	Temperature	Operation: 0 ~ 55 ° C Storage:-40 ° C ~ 80 ° C
	Humidity	Not more than 90% (no condensation)
	Air index	There is no dust in the electric cabinet (conductive medium such as iron dust)
Control mode		1: Position control 2: Speed control 3: Torque control 4: JOG operation 5: Internal Speed Four Speed 6: Internal Position Control 7: Internal Torque Control 8: Position & Speed Control 9: Speed & Torque Control
External I/O		1: Enable 2: Reset 3: Position deviation cleared 4: Pulse, CCW, CW, Prohibited 5: Position Switch 6: Speed Selection 7: Zero Speed Clamp 8: Second Return Zero 9: Extended functions such as orientation and quasi-stop (option) 10: Positioning completed
Encoder feedback		10000p/r (standard), 17bit/23bit/biss/resolver (optional)
Communication mode		RS485/MECHATROLINK/EtheCAT/CANopen (option)
Load inertia		Less than 5 times of motor inertia
Monitoring function		Rotating speed, current position, command pulse accumulation, position deviation, motor current, running state, input and output terminals, Z pulse signal, etc.
Protection function		Overvoltage, overcurrent, overspeed, overload, abnormal feedback, etc.
Alarm function		When the servo works abnormally, it is accompanied by alarm output, LED flashing and red light
Gain adjustment		When the motor is running or stopping, the gain can be adjusted to match the motor performance
Adaptive motor		See Tables 2.21, 2.22, 2.23, 2.24, 2.25

Table 2.1 List of Functions

2.2 Servo Selection



系列号
Series Number

按产品特性及行业特点分类
Classified bu Features of Product and Profession

DO系列：标准型通用伺服
Standard Universal Servo

C7系列：切削精密伺服
Cutting percision Servo

X7系列：液电功率型伺服
Electro-hydraulic Power Servo

M7系列：同步高速主轴伺服
Synchronous High-speed Spindle Servo

A7系列：异步感应式伺服
Inductive Asynchronous Servo

D7系列：DD马达伺服
DD Motor Servo

F7系列：共母线多轴伺服
Common Bus Multi-axis Servo

N7系列：直线电机伺服
LSM Servo

W7系列：无感永磁同步伺服
Sensorless PMSM

T7系列：刀库/刀塔专用伺服
Special Servo for Tool Magazine / Tool Turret

R7系列：机器人专用伺服
Special Servo for Robot

E7系列：经济型伺服
Economical Servo

反馈器件
Feedback Device

1000: 2500C/T
13i: 17bit
23i: 23bit R:Resolver
R: 旋变
B: biss协议 B: biss protocol

指令源
Instruction Source

C: 位置/速度/转矩全功能
Functions of Position/Speed/Torque

A: 总线式
Bus-based Protocol

功率模块
Power Module

30: 30A
100: 100A

电压等级
Voltage Class

L: 单相/三相 220V
H: 三相 380V
B: 三相 220V

L:Single-phase/three-phase 220V

H:Three-phase 380V

B: Three-phase 220V

冷却方式
Cooling Mode

W: 自然冷却 W:Natural cooling
F: 风冷 F:Air Cooling
S: 液冷 S:Liquid Cooling

通讯方式
Communication Mode

W: 无
M: Modbus
M2: MECHATROLINK-II
M3: MECHATROLINK-III
C: CANopen
E: EtherCAT

制动方式
Brake Mode

W: 内置制动
Z: 外接制动

W: Built-in brake
Z: External brake

Model code	Adaptive driver (AC 220V)	Adaptive motor	Power (Kw)	Rated current (A)	Rated torque (Nm)
30	C7-13IC10L	40ST-M00130LMB	0.05	0.4	0.16
31	C7-13IC10L	40ST-M00330LMB	0.1	0.6	0.32
33	C7-13IC10L	60ST-M00630LMB	0.2	1.2	0.6
34	C7-13IC22L	60ST-M01330LMB	0.4	2.8	1.3
35	C7-13IC22L	60ST-M01930LMB	0.6	3.5	1.9
0	C7-13IC22L	80ST-M01330LMB	0.4	2.6	1.3
1	C7-13IC32L	80ST-M02430LMB	0.75	4.2	2.4
1	C7-13IC32L	80ST-M03330LMB	1.0	4.2	3.3
1	C7-13IC32L	80ST-M04030LMB	1.2	4.5	4
0	C7-13IC22L	90ST-M02430LMB	0.75	3	2.4
0	C7-13IC22L	90ST-M03520LMB	0.73	3	3.5
1	C7-13IC32L	90ST-M04025LMB	1	4	4
4	C7-13IC32L	110ST-M02030LMBB LMB	0.6	4	2
5	C7-13IC32L	110ST-M04030LMB	1.2	5	4
5	C7-13IC30L	110ST-M05030LMB	1.5	6	5
5	C7-13IC30L	110ST-M06020LMB	1.2	6	6
6	C7-13IC30L	110ST-M06030LMB	1.8	8	6
9	C7-13IC30L	130ST-M04025LMB	1	4	4
9	C7-13IC30L	130ST-M05025LMB	1.3	5	5
14	C7-13IC30L	130ST-M06025LMB	1.5	6	6
14	C7-13IC30L	130ST-M07720LMB	1.6	6	7.7
11	C7-13IC30L	130ST-M07725LMB	2.0	7.5	7.7
15	C7-13IC50B	130ST-M07730LMB	2.4	9	7.7
14	C7-13IC30L	130ST-M10015LMB	1.5	6	10

Table 2.21

Model code	Adaptive driver (AC 220V)	Adaptive motor	Power (Kw)	Rated current (A)	Rated torque (Nm)
15	C7-13IC50B	130ST-M10025LMB	2.6	10	10
15	C7-13IC50B	130ST-M15015LMB	2.3	9.5	15
15	C7-13IC50B	130ST-M12020LMB	2.4	10	12
14	C7-13IC50L	130ST-M07720LMB	1.6	6	7.7
11	C7-13IC50L	130ST-M07725LMB	2.0	7.5	7.7
15	C7-13IC50L	130ST-M07730LMB	2.4	9	7.7
14	C7-13IC50L	130ST-M10015LMB	1.5	6	10
15	C7-13IC50L	130ST-M10025LMB	2.6	10	10
15	C7-13IC50L	130ST-M15015LMB	2.3	9.5	15
17	C7-13IC50L	130ST-M15025LMB	3.9	17	15
17	C7-13IC50L	150ST-M12030LMB	3.6	16.5	12
17	C7-13IC50L	150ST-M15025LMB	3.8	16.5	15
17	C7-13IC50L	150ST-M18020LMB	3.6	16.5	18
19	C7-13IC50L	150ST-M23020LMB	4.7	20.5	23
19	C7-13IC50L	150ST-M27020LMB	5.5	20.5	27
15	C7-13IC50L	150ST-M12020LMB	2.4	10	12
12	C7-13IC50L	180ST-M17215LMB	2.7	10.5	17
12	C7-13IC50L	180ST-M19015LMB	3	12	19
13	C7-13IC50L	180ST-M21520LMB	4.5	16	21
12	C7-13IC75L	180ST-M27010LMB	2.9	12	27
13	C7-13IC75L	180ST-M27015LMB	4.3	16	27
13	C7-13IC75L	180ST-M35010LMB	3.7	16	35
19	C7-13IC75L	180ST-M35015LMB	5.5	24	35

Table 2.22

Model code	Adaptive driver (AC 220V)	Adaptive motor	Power (Kw)	Rated current (A)	Rated torque (Nm)
103	C7-13IC25H	130ST-M07720HMB	1.6	4	7.7
109	C7-13IC25H	130ST-M07725HMB	2.0	5.5	7.7
109	C7-13IC25H	130ST-M07730HMB	2.4	6.5	7.7
112	C7-13IC25H	130ST-M10015HMB	1.5	4.5	10
113	C7-13IC25H	130ST-M10025HMB	2.6	7	10
113	C7-13IC25H	130ST-M15015HMB	2.3	7	15
116	C7-13IC50H	130ST-M15025HMB	3.9	11.5	15
116	C7-13IC50H	150ST-M12030HMB	3.6	11.5	12
116	C7-13IC50H	150ST-M15025HMB	3.8	11.5	15
116	C7-13IC50H	150ST-M18020HMB	3.6	10.5	18
120	C7-13IC50H	150ST-M23020HMB	4.7	13.5	23
120	C7-13IC50H	150ST-M27020HMB	5.5	13.5	27
109	C7-13IC25H	180ST-M17215HMB	2.7	6.5	17
113	C7-13IC25H	180ST-M19015HMB	3	7.5	19
114	C7-13IC50H	180ST-M21520HMB	4.5	9.5	21
113	C7-13IC50H	180ST-M27010HMB	2.9	7.5	27
114	C7-13IC50H	180ST-M27015HMB	4.3	10	27
114	C7-13IC50H	180ST-M35010HMB	3.7	10	35
116	C7-13IC75H	180ST-M35015HMB	5.5	12	35
125	C7-13IC75H	180ST-M48015HMB	7.5	20	48

Table 2.23

Model code	Adaptive driver (AC 220V)	Adaptive motor	Power (Kw)	Rated current (A)	Rated torque (Nm)
102	C7-13IC25H	130ST-M04025HMB	1.0	3	4
102	C7-13IC25H	130ST-M05020HMB	1.0	3	5
102	C7-13IC25H	130ST-M05025HMB	1.3	3.5	5
112	C7-13IC25H	130ST-M06025HMB	1.5	4.5	6
103	C7-13IC25H	130ST-M07720HMB	1.6	4	7.7
109	C7-13IC25H	130ST-M07725HMB	2.0	5.5	7.7
109	C7-13IC25H	130ST-M07730HMB	2.4	6.5	7.7
112	C7-13IC25H	130ST-M10015HMB	1.5	4.5	10
113	C7-13IC35H	130ST-M10025HMB	2.6	7	10
113	C7-13IC35H	130ST-M15015HMB	2.3	7	15
116	C7-13IC35H	130ST-M15025HMB	3.9	11.5	15
116	C7-13IC35H	150ST-M15025HMB	3.8	11.5	15
114	C7-13IC35H	150ST-M18020HMB	3.6	10.5	18
120	C7-13IC50H	150ST-M23020HMB	4.7	13.5	23
120	C7-13IC50H	150ST-M27020HMB	5.5	13.5	27
114	C7-13IC50H	180ST-M18020HMB	3.6	10	18
120	C7-13IC50H	180ST-M23020HMB	4.7	13.5	23
120	C7-13IC50H	180ST-M27020HMB	5.5	13.5	27
120	C7-13IC50H	180ST-M36015HMB	5.6	14	36
120	C7-13IC50H	180ST-M23020HMB	4.7	13.5	23
120	C7-13IC50H	180ST-M27020HMB	5.5	13.5	27

Table 2.24

Model code	Adaptive driver (AC 220V)	Adaptive motor	Power (Kw)	Rated current (A)	Rated torque (Nm)
120	C7-13IC75H	180ST-M36015HMB	5.6	14	36
118	C7-13IC75H	180ST-M45015HMB	7.0	16.5	45
125	C7-13IC160H	180ST-M55015HMB	8.6	20.5	55
127	C7-13IC160H	180ST-M70016HMB	12.5	38	70
116	C7-13IC75H	200ST-M38015HMB	6	11.6	38
X	C7-13IC160H	200ST-M42020HMB	8.7	18.8	42
X	C7-13IC160H	200ST-M55015HMB	20.2	16.6	55
X	C7-13IC160H	200ST-M58020HMB	12	24.3	58
X	C7-13IC160H	200ST-M74015HMB	26.5	26.5	74
X	C7-13IC160H	200ST-M87020HMB	18.2	36.7	87
X	C7-13IC160H	200ST-M103015HMB	16.4	33.2	103
X	C7-13IC200H	200ST-M950020HMB	20.4	40.1	95
X	C7-13IC200H	200ST-M12805HMB	20	41	128
X	C7-13IC200H	200ST-M135020HMB	28.3	60.5	135
X	C7-13IC200H	200ST-M186015HMB	29	61	186
X	C7-13IC200H	200ST-M175020HMB	36.7	73.7	175
X	C7-13IC200H	264ST-M215020HMB	49	96	215
X	C7-13IC200H	264ST-M210015HMB	33	62	210
X	C7-13IC200H	264ST-M220015HMB	37	72.73	220
Remarks: Model code X is manually set according to the parameters of servo motor, and there is no built-in code					

Table 2.25

Remarks:

Chapter III Wiring

3.1 Notes

- ■Servo drive is a high-voltage and high-current product, and misconnection will cause personal injury and equipment damage.
- ■PE terminal must be grounded, and ensure that the ground wire is reliably grounded.
- ■L Series of this product is suitable for AC220V power supply; H Series is suitable for AC 380V power supply, do not connect wrong.
- ■Products U, V and W should be connected with the motor for output, please do not connect with the input power supply.
- ■U, V, W products for three-phase output do not connect wrong sequence, wrong connection may cause motor speed, equipment damage, and the product overcurrent burn out.
- ■Fasten all terminals, and all wiring specifications are strictly selected according to power.
- ■It is forbidden to distribute power or touch terminals when the driver is powered on.
- ■Do not touch the terminal within 5 minutes of power failure.
- ■It is forbidden to touch the motor and cable when the motor is running to prevent accidental injuries such as scald and sprain.

3.2 Wiring Requirements

- ■ It is best to use three-phase isolated transformer for power supply.
- ■ The wire diameter of R, S, T, U, V, W and PE should be ≥ 1.5 mm^2.
- ■ All power terminals require cold pressing terminals to ensure firmness and reliability.
- ■ CN1 and CN2 are high-density signal plugs with shielded cables.
- ■ PE terminal connection requires yellow-green wire diameter ≥ 2.5 mm^2.

3.3 Wiring Methods

- ■It is best to use three-phase isolated transformer for power supply.
- ■The wire diameter of R, S, T, U, V, W and PE should be ≥ 1.5 mm2.
- ■All power terminals require cold pressing terminals to ensure firmness and reliability.
- ■CN1 and CN2 are high-density signal plugs, and both ends of the shielding layer are grounded and connected with the shell.
- ■PE terminal wires should be connected to the ground of the connected equipment housing and connected to the ground.

3.4 Typical Wiring

3.4.1 Position control (pulse type)

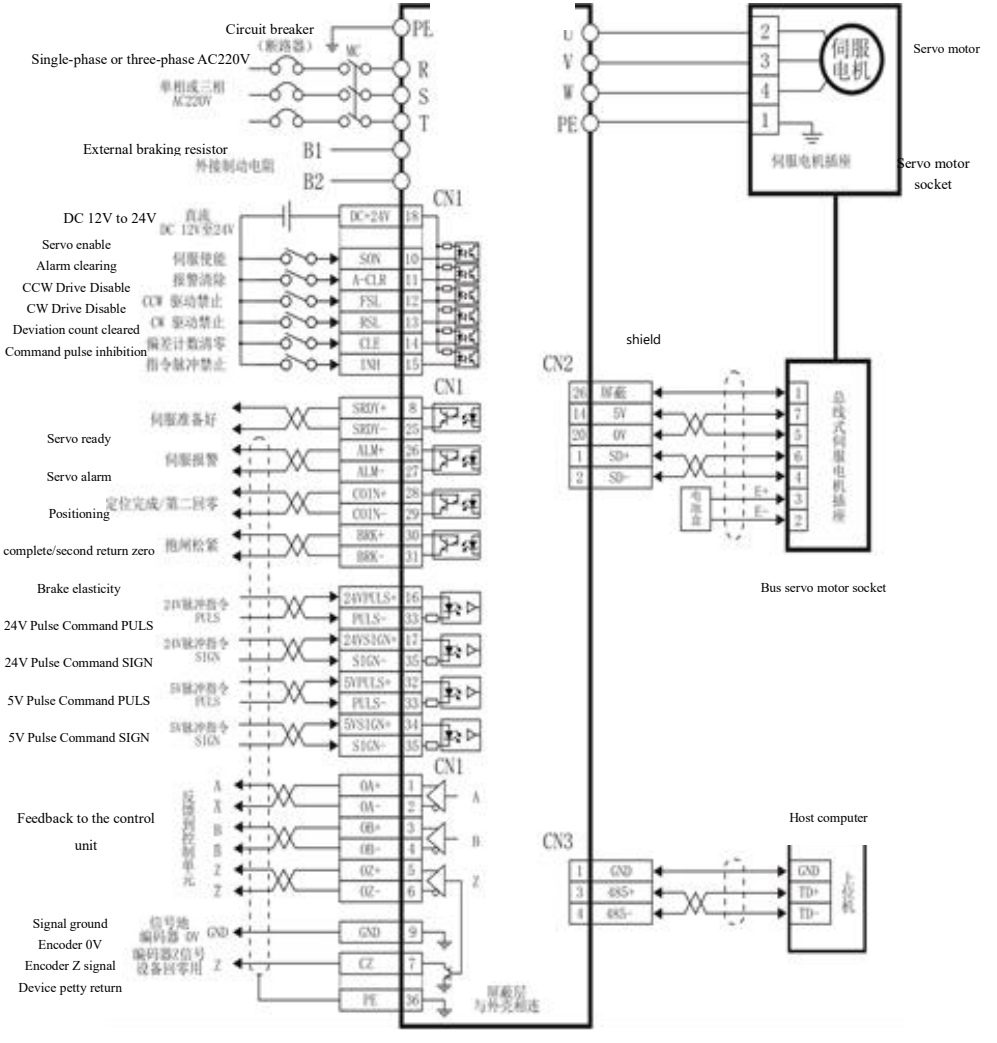
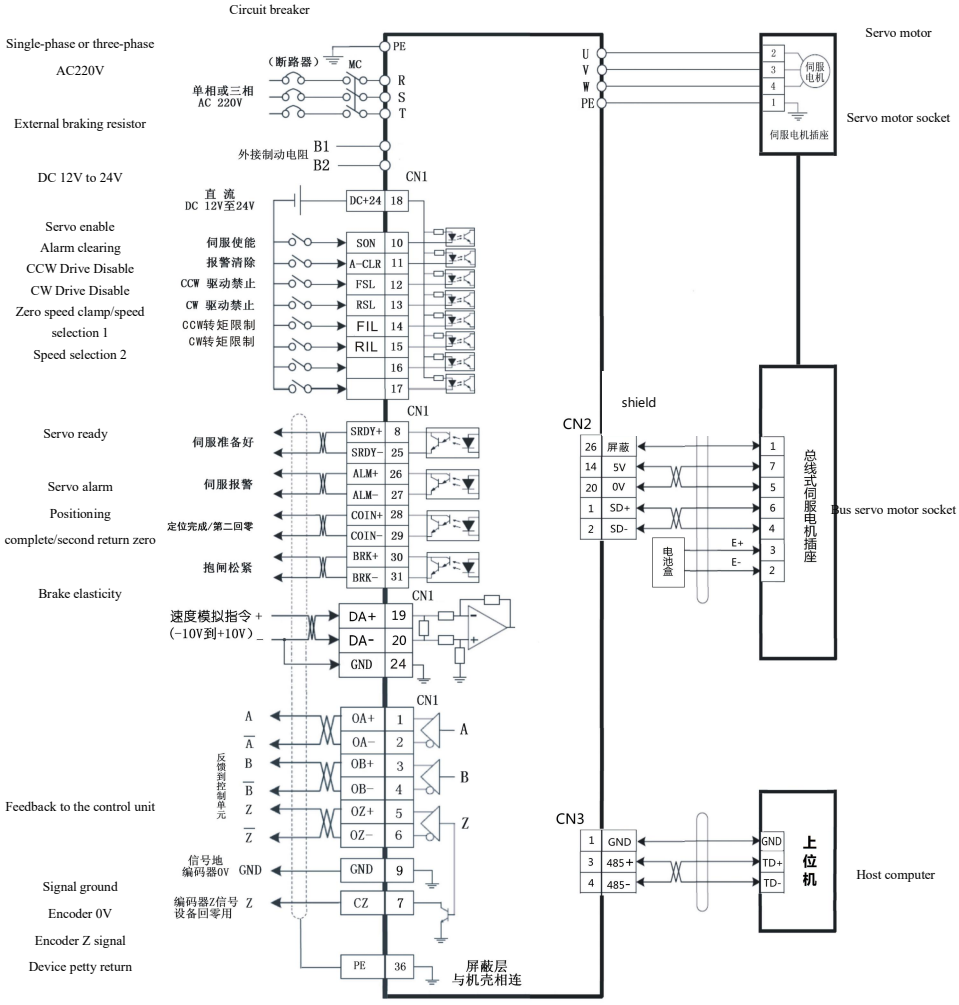


Fig. 3.4. 1 Position control wiring

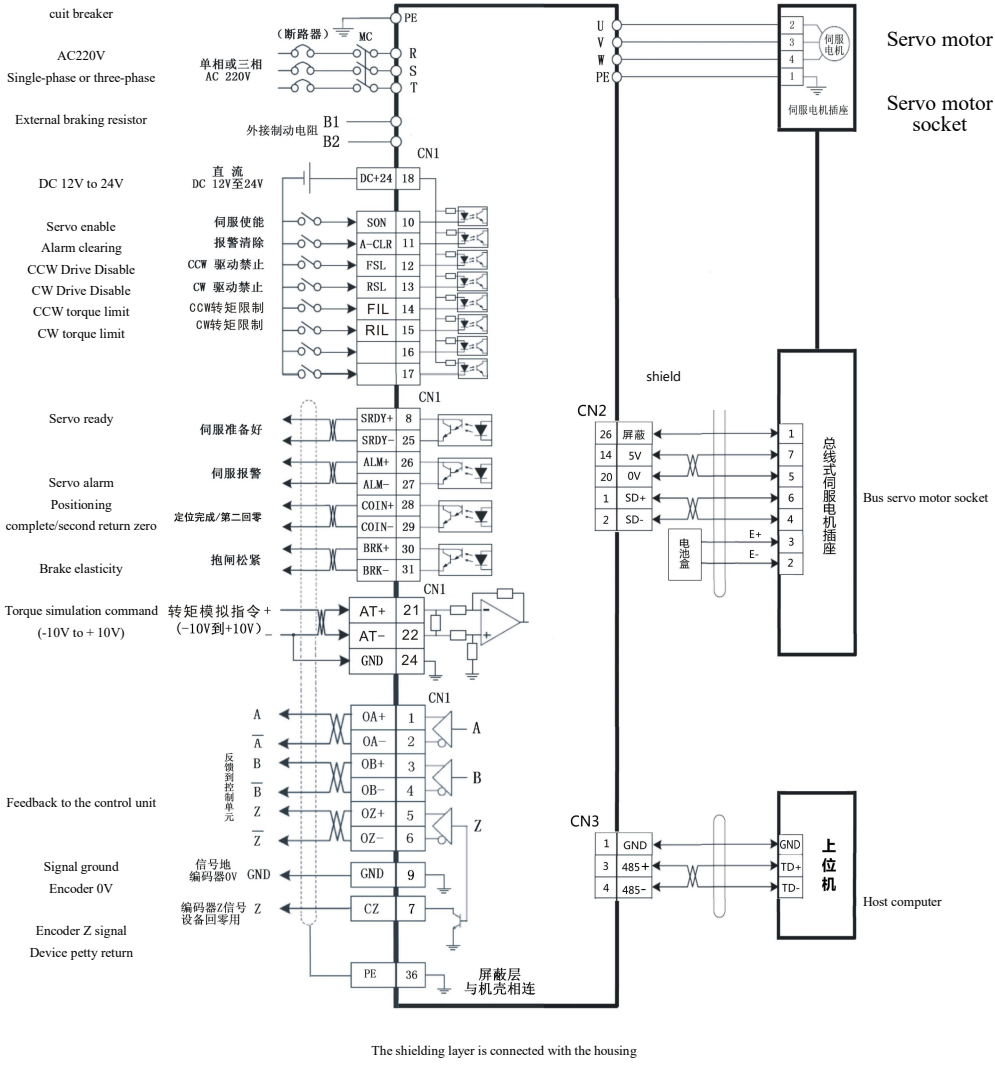
3.4.2 Speed Control (Analog)



The shielding layer is connected with the housing

Fig. 3.4.2 Speed control wiring

3.4.3 Torque Control (Analog)



The shielding layer is connected with the housing

Fig. 3.4.3 Torque control wiring

3.4.4 Wiring diagram of bus type motor encoder

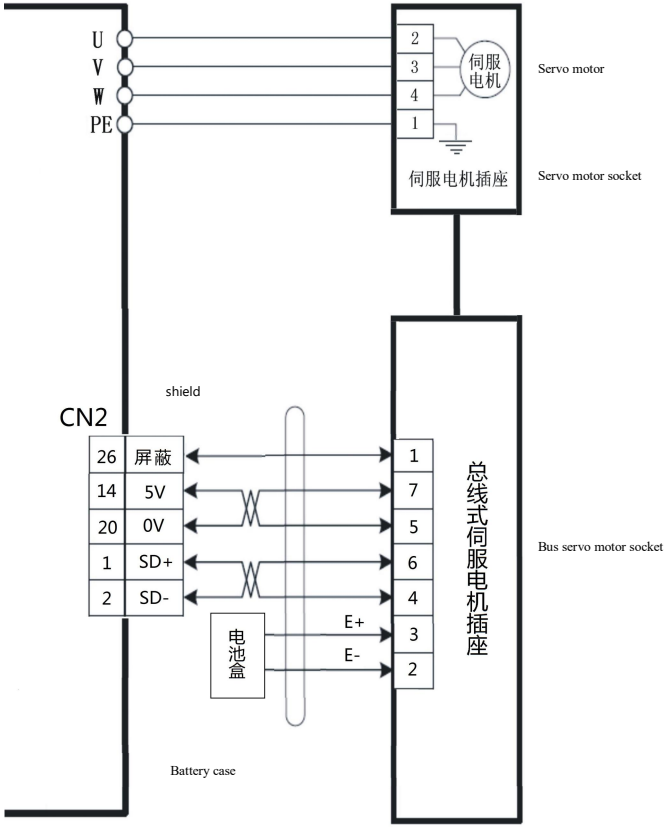


Fig. 3.4.4 Wiring diagram of Domochuan multi-turn absolute value encoder

3.5 Servo Motor Brake Wiring Diagram

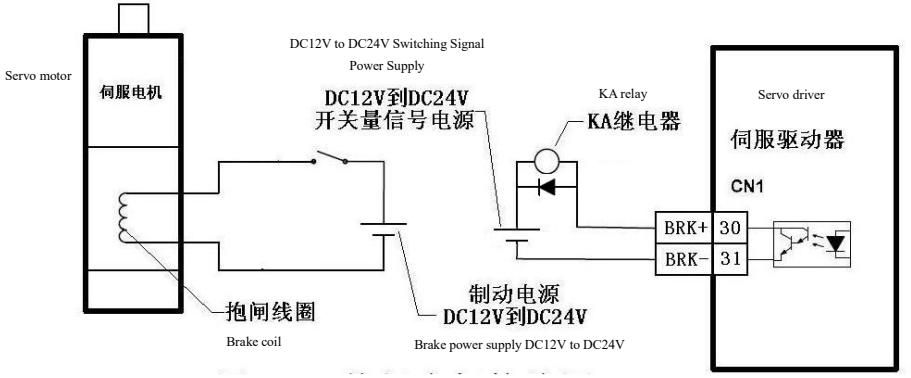


Fig. 3.5.1 Brake motor wiring diagram

Pin No.	Pin identification	Function description
1	DC+	DC power supply positive DC24V+
2	DC-	DC power supply negative 0V
3	PE	Shell grounding

Fig. 3.5.1 Internal contracting brake sockets for servo motors

- It is required that the brake power supply should be separated from the DC power supply of the upper computer and driver to prevent interference.
- The braking power supply of the brake has positive and negative poles, which cannot be connected to prevent short circuit.
- In order to improve the braking effect and response, freewheeling diodes (pay attention to positive and negative poles) can be added at both ends of the braking coil.

Chapter IV Interfaces

4.1 Servo Control Power Supply, Definition of High Power Terminal

Identification	Signal name	Function
R **S** **T**	Control loop, main loop power supply (connected by isolation transformer)	R, S and T can be connected to three-phase or single-phase 220V 50HZ power supply with any two terminals. The control power supply and main circuit power supply of this machine are designed in an integrated way. Note: It cannot be connected with motors U, V and W
PE	Input power grounding wire	It is connected with the equipment shell and the main power supply of the workshop.
B1 **B2**	External braking resistor	Usually, it is not required, because the driver has built-in resistance, and external braking resistance is selected in case of large inertia load.
U **V** **W**	Output to servo motor	U, V and W on servo terminals must correspond to those on servo motors and cannot be misplaced. If the motor is connected incorrectly, the servo will give an alarm, which may lead to damage to the servo and motor. Note: It cannot be connected to power supply R, S and T.
PE	Output motor ground wire	It is connected with servo motor housing PE.

4.2 Cn1 Interface, Control Signal Input/Output Definition

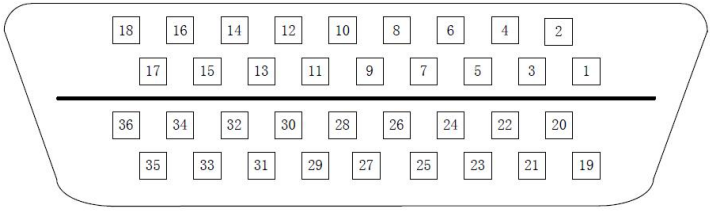


Fig. 4.2 Solder pad facing CN1 36 core plug

Pin	Identification	Signal name	Function
18	＋24V	Input power supply is positive	Common terminal of input terminal (connected to + 12V ~ + 24V power supply)
10	SON	Servo enable	Enable terminal: OFF when 0V is disconnected: the drive stops the motor in a free state. When 0V is turned ON, it is ON: the driving working motor is locked. After 40MS is enabled, commands can be received. This signal cannot be frequently switched on and off for motor start and stop.
11	A－CLR	Alarm Clear/Mode Switch	Alarm Clear/Mode Switch Terminal: OFF when 0V is disconnected: normal state or keep alarm state. ON when 0V is turned ON: clear the alarm. ■ Mode switching is effective when PA32=1.
12	FSL	CCW Drive Disable	Do not allow the servo motor to rotate the terminal counterclockwise: ■ When parameter PA20=0: OFF when 0V is disconnected: the servo motor can rotate counterclockwise.

			ON when 0V is turned ON: the servo motor is forbidden to rotate counterclockwise. ■ Equivalent to the effect of limit switch, PA55 can be set normally open and normally closed. Used in conjunction with parameter PA20, this function is blocked when it is 1.

Pin	Identification	Signal name	Function
13	FSR	CW Drive Disable	Do not allow the servo motor to rotate the terminal clockwise: ■ When parameter PA20=0: OFF when 0V is disconnected: the servo motor can rotate clockwise. ON when 0V is turned ON: the servo motor is forbidden to rotate clockwise. ■ Equivalent to the effect of limit switch, PA55 can be set normally open and normally closed. ■ Used in conjunction with parameter PA20, this function is blocked when it is 1.
14	CLE	The deviation counter is cleared	Position deviation counter clearing terminal 1: ■ In position control mode, that is, when PA4=0: OFF when 0V is turned OFF: the counter value is maintained. ON when 0V is connected: the position deviation counter is cleared.
	SC1	Internal Speed Selector Terminal 1	Internal speed selection terminal: ■ When parameters PA4=1 and PA22=0, it is the internal speed mode Four internal speeds are selected through the combination of SC1 (14 pins) and SC2 (15 pins) and the on-off of 0V: SC1 OFF, SC2 OFF: Internal speed 1; SC1 ON, SC2 OFF: Internal speed 2; SC1 OFF, SC2 ON: Internal Speed 3; SC1 ON, SC2 ON: Internal Speed 4; The four speeds can be changed by PA24, PA25, PA26 and PA27.
	ZERO	Zero speed clamp	Speed command analog zero setting terminal: ■ External analog speed mode when parameters PA4=1 and PA22=1: OFF when 0V is turned OFF: the speed command is an analog input value.

			ON when 0V is turned ON: the speed command is set to zero. External analog control PA22=2, 0 ~ + 10V control forward rotation During torque control, limit the motor to rotate the terminal clockwise: The value of parameter PA38 is valid when 0V is turned on, otherwise it is invalid. In torque control, parameter PA34 always plays a limiting role.
	CCW	0 ～ +10forward rotation	■External analog control PA22=2, 0 ~ + 10V control forward rotation
	RIL	CCWCW torque limit	During torque control, limit the motor to rotate the terminal clockwise: The value of parameter PA38 is valid when 0V is turned on, otherwise it is invalid. In torque control, parameter PA34 always plays a limiting role.

Pin	Identification	Signal name	Remarks
15	INH	**Command pulse inhibition**	Command Pulse Disable Terminal: ■ Under external position control mode when parameter PA4=0: OFF when 0V is turned OFF: the command pulse input is valid. ON when 0V is turned ON: command pulse input is prohibited. Internal Speed Selector Terminal 2:
	SC2	**Internal Speed Selector Terminal 2**	Internal Speed Selector Terminal 2: When parameters PA4=1 and PA22=0, it is the internal speed mode Four internal speeds (set by PA24, ~ PA27) are selected through the combination of SC1 (14 pins) and SC2 (15 pins) and the on-off of 0V:
	FIL	**CCW torque limit**	In torque control, parameter PA35 always plays a limiting role. External analog control PA22=2, 0 ~ + 10V control inversion; Example: 8 pins are connected to + 24V, and 25 pins are connected to the upper computer. When the servo is normal, the upper function receives the + 24V level.
	CW	**0 ~ +10 inversion**	■External analog control PA22=2, 0 ~ + 10V control inversion;
8	SRDY＋	**Servo ready to output**	Example: 8 pins are connected to + 24V, and 25 pins are connected to the upper computer. When the servo is normal, the upper function receives the + 24V level. When servo alarms, + 24V is disconnected from the upper computer. Example: 25 pins are connected to 0V, and 8 pins are connected to the upper computer.
25	SRDY－		

			When the servo is normal, the upper function receives 0V level. When servo alarm, 0V is disconnected from the upper computer (normally closed). ■ Through the parameter PA57, the level can be reversed or switched normally open and normally closed

Pin	Identification	Signal name	Remarks
26	ALM＋	Servo alarm output	Example: 26 pins are connected to + 24V, and 27 pins are connected to the upper computer. The upper function receives + 24V level when servo alarm occurs. When the servo is normal, + 24V is disconnected from the upper computer. Example: 27 pins are connected to 0V, and 26 pins are connected to the upper computer. When the servo is normal, the upper function receives 0V level. When servo alarm, 0V is disconnected from the upper computer (normally closed). ■ Through the parameter PA57, the level can be reversed or switched normally open and normally closed
27	ALM－		
28	COIN＋	The second zero (used by Siemens) Positioning completed or speed arrived (PA42 switch)	Example: 28 pins are connected to + 24V, and 29 pins are connected to the upper computer. When the positioning is completed or the speed reaches or zero, the upper function receives it + 24V level, otherwise + 24V is disconnected from the upper computer. Example: 29 pins are connected to 0V, and 28 pins are connected to the upper computer. When the positioning is completed or the speed reaches or zero, the upper function receives it 0V level, otherwise 0V is disconnected from the upper computer. ■ Through the parameter PA57, the level can be reversed or switched normally open and normally closed ■ Most of the machine tool industry is Siemens 801 and 802 CNC petty use
29	COIN－		
30	BRK＋	Elasticity of mechanical brake (lock brake)	Output of lock switch: Example: 30-pin connection + 24V, 31-pin connection relay coil positive. When the motor is enabled, the intermediate relay coil can receive + 24V level, otherwise + 24V is
31	BRK－		

			disconnected from the intermediate relay coil. Example: Pin 31 is connected to 0V, and Pin 30 is connected to negative relay coil. When the motor is enabled, the intermediate relay coil can receive 0V level, otherwise 0V is disconnected from the intermediate relay coil. ■ Through the parameter PA57, the level can be reversed or switched normally open and normally closed ■ PA47 Set Brake Delay Pass ■ PA48 Set Enable Delay Off

Pin	Identification	Signal name	Remarks
32/16	PULS＋	Command pulse PLUS input	External command pulse input terminal: ■ PA36 and PA37 set pulse filter coefficients to resist interference. ■ Pulse Input Form is set by parameter PA14 during position control PA14=0, pulse + direction (default). PA14=1, CCW/CW pulse mode. PA14=2, two-phase command pulse mode.
33	PULS－		
34/17	SIGN＋	Command pulse PLUS input	
35	SIGN－		
19	DA＋	Analog speed command input	External analog speed command input terminal. Speed control analog command input range-10V ~ + 10V
20	DA－		
23	GND	Analog input ground	Analog input ground
21	AT＋	Analog torque command input	External analog torque command input terminal. The input range of speed control analog command is-10V ~ + 10V.
22	AT－		
24	GND	Analog input ground	Analog input ground
1	OA+	Encoder Phase A	The ABZ signal of encoder is differential, and the output of driver is fed back to the upper computer.
2	OA-		
3	OB+	Encoder Phase B	
4	OB-		
5	OZ+	Encoder Phase Z	
6	OZ-		
7	CZ	Encoder Z-phase open collector output	For setting zero-finding point, there is only one Z-phase signal when the motor rotates once.
9	GND	Encoder 0V	Encoder Z-phase signal is output by collector open circuit, encoder Z-phase signal output is ON (conduction state), otherwise output OFF (cut-OFF state);
36	PE	Shield layer ground wire	Encoder 0V (common ground, or common ground with 36 pins)

4.3 Cn2 Interface, Encoder Input Signal Definition

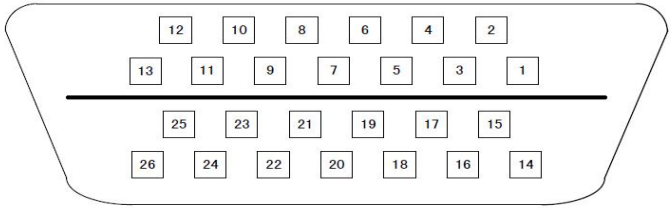


Fig. 4. 3- Solder pad facing CN2 26 core plug

Pin	Identification	Signal name	Remarks
14	＋5V	Encoder + 5V power supply	Supply power to encoder with shielded cable
20	0V	Encoder 0V ground	
1	SD＋	Encoder positive input	Connected to servo motor encoder SD +
2	SD－	Encoder negative input	Connected to servo motor encoder SD-
26	PE	Shield layer ground wire	It is connected with the metal shell to ensure reliable connection to the earth.

4.4 Cn3 Interface, 485 Interface Definition

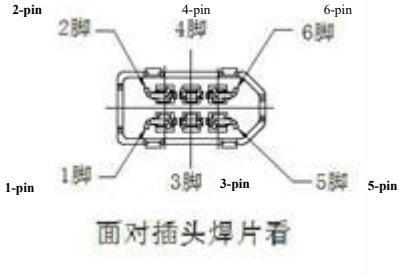


Fig. 4. 4 CN3 interface facing the plug pad

1: Driver CN3 interface definition (modbus standard protocol)

Pin number	1，2	3	4	5	6
Identification	GND	485+	485-	Empty	Empty

4.5 Principle of Switching Value Input Interface

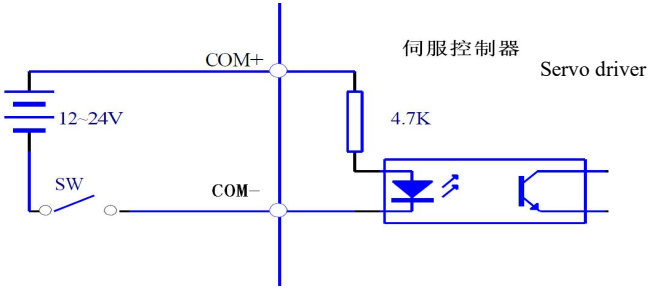


Fig. 4.5 Switch Value Input Interface

■External DC12V-24V power supply is required, and the current is ≥ 105 MA.

■If positive and negative connection will cause drive damage and can not work normally.

4.6 Principle of Switch Output Interface

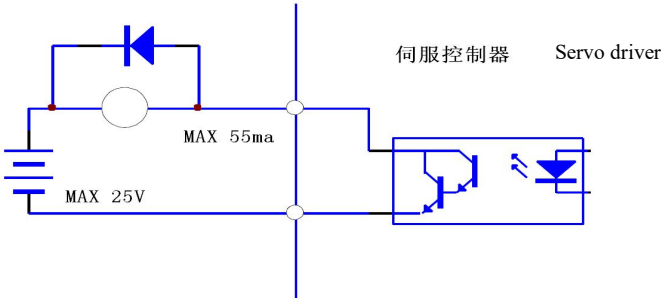


Fig. 4. 6 Switch Value Input Interface

■Maximum output voltage 25V, Maximum current ≤ 55MA.

■If positive and negative connection will cause drive damage and abnormal work.

■The output load is an inductive element, and the reverse parallel freewheeling diode is required (the polarity must be connected correctly or the driver will be damaged, which is equivalent to short circuit).

4.7 Principle of Pulse Quantity Input Interface

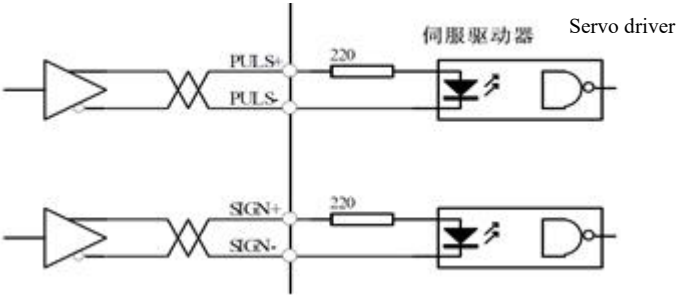


Fig. 4. 7-a pulse differential output mode

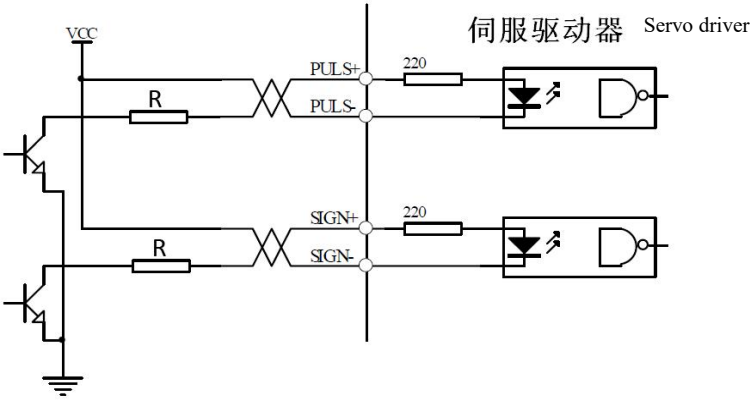


Fig. 4. 7-b pulsed single-ended output mode

■The differential pulse output form should be relatively reliable, and it is recommended to use AM26LS31 and other similar RS422 line drivers.

■The single-ended input mode is supplied with external power, and the working frequency will be reduced. There are the following empirical data:

Input voltage Vcc	Series resistance R
24V	1.4K~2K
12V	500Ω~820Ω
5V	80Ω~120Ω

4.8 Pulse Input Form

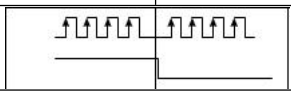
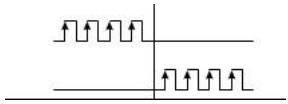
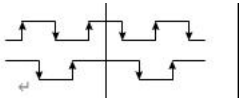
Pulse form	CCW operation	CW operation	Parameter selection
Pulse plus direction			PA14=0
CCW pulse CW pulse			Parameter PA14=1
AB biphasic orthogonal pulse			Parameter PA14=2

Fig. 4. 8 Pulse form

4.9 Principle of Analog Input Interface

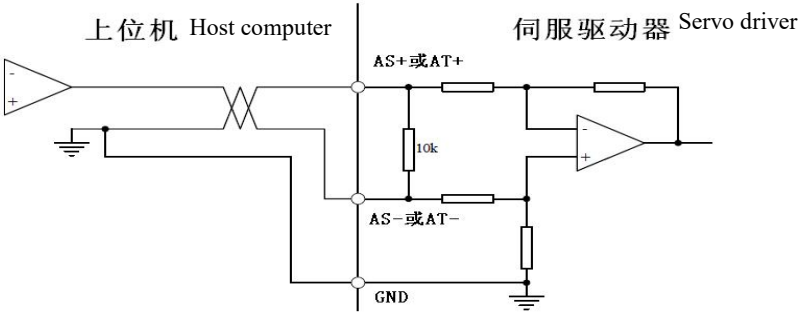


Fig. 4.9-a Analog differential input interface

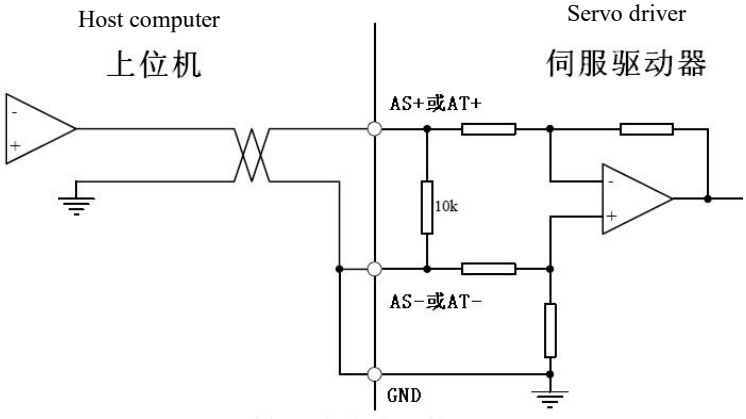


Fig. 4. 9-b Analog single-ended input interface

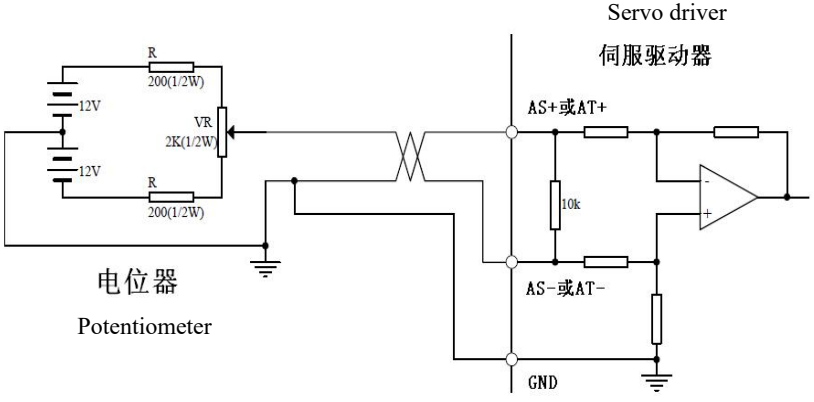


Fig. 4.9-c Analog Differential Potentiometer Input Interface

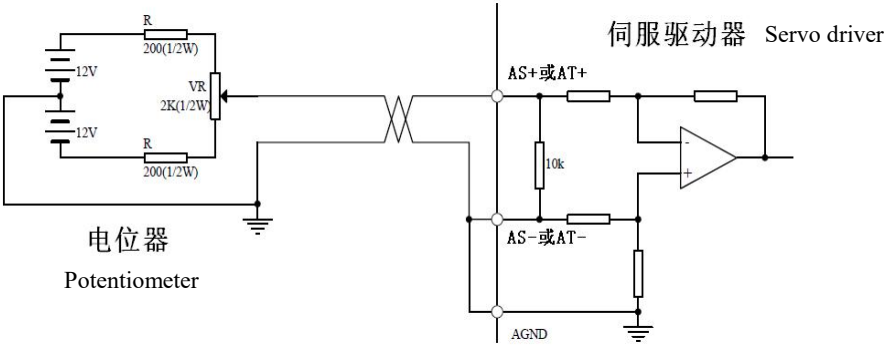


Fig. 4. 9-d Analog single-ended potentiometer input interface

- The analog input voltage cannot exceed the range of-10V ~ + 10V, otherwise the driver will be damaged.
- Analog quantities are biased because of attenuation and interference in wires and interface circuits. It is recommended to connect with shielded cable and ground at both ends. Threshold voltage can be set for parameter PA49 (unit: rpm).
- The deviation of analog quantity exists and must be adjusted. Parameter PA45 can compensate the deviation.

4.10 Feedback Interface Principle

4.10.1 Encoder Signal Output CN1 Interface (Differential Signal Driver to Host Computer)

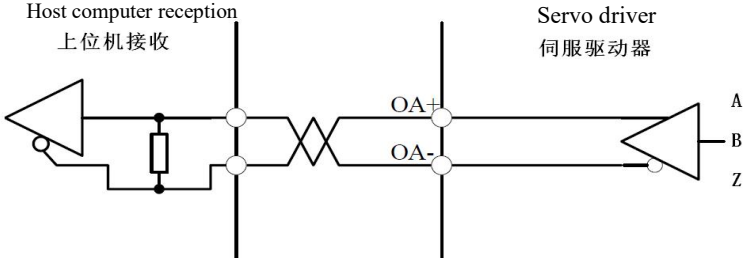


Fig. 4.10.1 CN1 Encoder Output Interface

- The encoder signal is output by differential driver AM26LS31 without isolation.
- The upper computer can adopt AM26LS32 receiving or high-speed photoelectric coupling receiving.

4.10.2 Encoder Z signal output CN1 interface (pins 7 and 9 output to the upper computer for change)

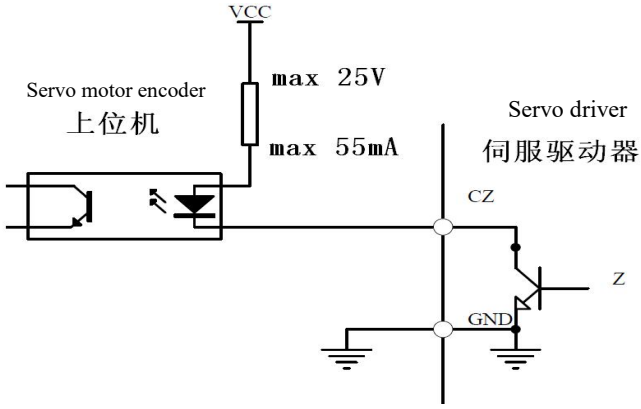


Fig. 4.10.2 CN1 Photoelectric Encoder Z Signal Output Interface

■This Z signal is an open collector output non-isolated, and the encoder Z signal is on or off.

■A high-speed optocoupler is required to receive this signal.

4.11 Second encoder interface definition

Pin	Identification	Signal name	Remarks
1	PE		
2	+5V	5V output	
3	NC		Hang in the air
4	GND	0V output	
5	S_ENCA+	Second encoder a + input	
6	S_ENCA-	Second encoder A-input	
7	S_ENCB+	Second encoder B + input	
8	S_ENCB-	Second encoder B-input	
9	S_ENCZ+	Second encoder Z + input	
10	S_ENCZ-	Second encoder Z-input	

Chapter V Display and Operation

5.1 Panel Operations

The panel consists of six LED digital tube displays and four buttons "↑, ↓, ←, Enter", a red light " Alm" and a green light " Run", which are used to display various system states and set parameters.

Figure 5.1 Operation Panel

Operations are hierarchical operations, as follows:

←key indicates the retreat, exit and cancellation of the level;

Enter" key indicates that the hierarchy advances, enters, and determines;

↑、↓keys indicate increasing or decreasing serial numbers or numerical values.

Alm red indicator lights up, indicating alarm, digital tube and alarm display.

Run green indicator lights up to indicate that the motor is enabled.

■When the decimal in the lower right corner of the digital tube is lit, it indicates that the current parameter value is in a modified state

■If the Alm red light is on and the alarm number "Err--xx" flashes, in order to drive the alarm, it is necessary to cut off the power in time and find out the alarm reason.

5.2 Parameter Structure Composition

The first layer selects the operation mode, and there are 9 modes. Press the ←key to return to the main menu, use the↑and ↓keys to select the mode, press Enter to Enter the second layer of the selected mode, and press the←key to return to the first layer.

DP--	------	Monitor status mode
PA--	------	Basic parameter mode
PE--	------	Functional parameter mode
PF--	------	Motor parameter mode
EE--	------	Parameter Management Mode
Sr--	------	Speed Test Operation Mode
Jr--	------	JOG Operation Mode
AU--	------	Automatic zero adjustment of analog quantity
Co--	------	Encoder nulling mode
OL--	------	Open Loop Operation Mode
Wr--	------	Encoder Write Mode
HA--	------	Alarm recording mode
Ft--	------	Notch recognition mode
Jt--	------	Inertia ratio recognition mode

Table 5.2 Mode Operation Diagram

5.3 Parameter Monitoring Mode（DP- -）

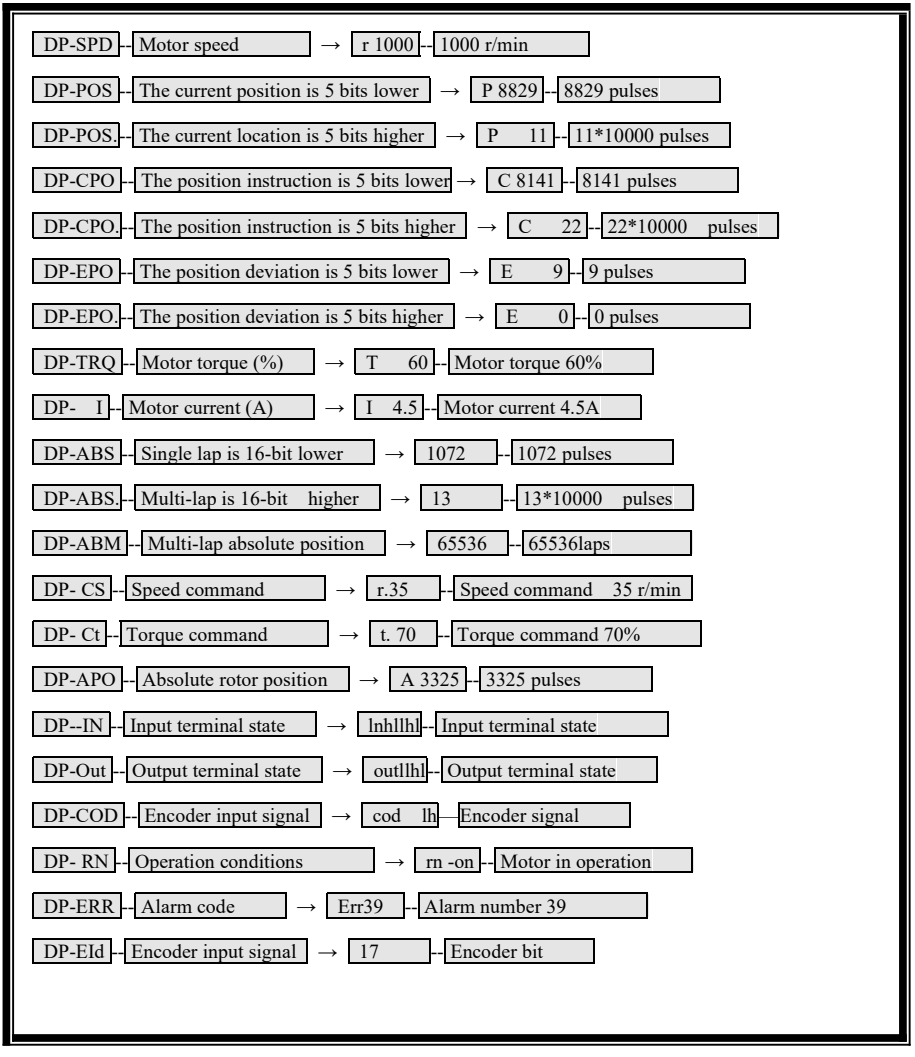


Table 5.3 Watch list diagram

- The input pulse quantity is the pulse amplified by the input electronic gear;
- Pulse quantity unit is servo internal pulse unit, 131072 pulses/revolution;
- The absolute position of the motor at one turn is represented by single-turn low-position DP-ABS and high-position DP-ABS. Decimal;
- The multi-turn signal of the motor is represented by DP-ABM decimal, which needs to ensure the normal power supply of the battery and automatically clear when there is no battery.

5.3.1 The status of the input terminal is displayed as shown in the following figure:

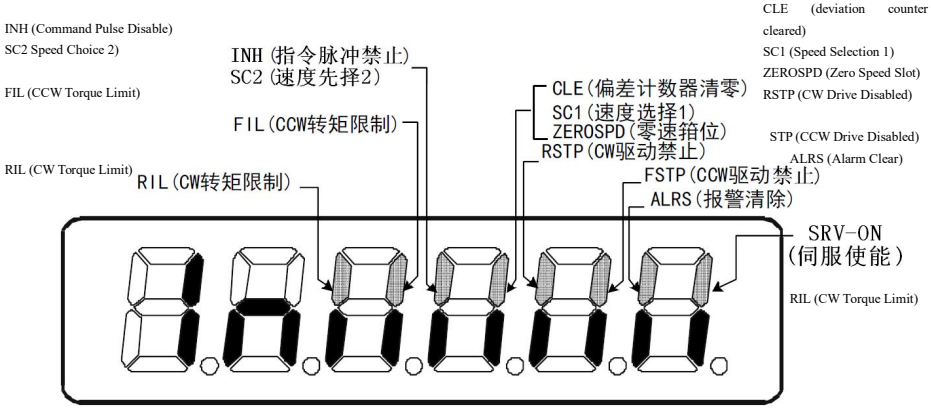


Figure 5.3. 1 Input terminal status display

(The signal input of stroke is ON when it is lit, and OFF when it is extinguished)

5.3.2 Output terminal status display, as shown in the following figure:

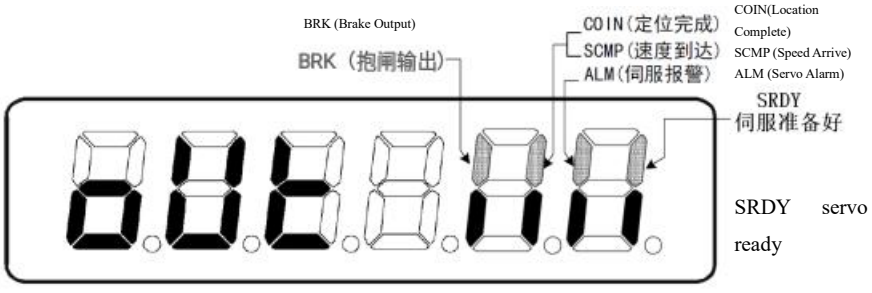


Figure 5.3. 2 Output terminal status display

(The signal input of stroke is ON when it is lit, and OFF when it is extinguished)

5.3.3 Encoder status is displayed as shown in the following figure:

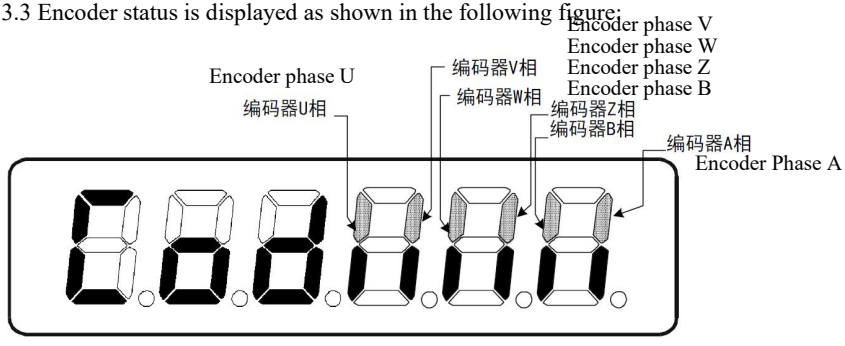


Figure 5.3. 3 Encoder feedback signal status display

(The signal input of stroke is ON when it is lit, and OFF when it is extinguished)

5.4 Parameter Modification Mode（PA- -）

Press the "Enter" key to Enter the "PA-" Parameter Modification Mode, press the ↑ and ↓ keys to add and subtract Parameter No., press the "Enter" key to Enter the modified parameter value, when the parameter is modified, the decimal point in the lower right corner of the digital tube will light up, then press the "Enter" key to confirm that the decimal point will go out, and press the ← key to return.

PA--0	-- Password parameters	→	315	-- User password
PA--3	-- Initial status display	→	0	-- Display motor revolutions
PA--4	-- Control mode selection	→	0	-- Position control mode

Table 5.4 Modifying Parameter Mode Operations

5.5 Parameter Management Mode（EE- -）

Press the "Enter" key to enter the "EE-" Parameter Management Mode, press the ↑ and ↓ keys to add and subtract parameter items, find the menu that should be saved or restored, press the "Enter" key for more than 3 seconds, and the "Finish" operation will be successful, which will take effect after power failure. If it fails or the password is incorrect, "Error-" will appear.

EE--SET	-- Parameter saving	→	Enter	Press for more than 3 seconds
EE--RD	-- Parameter reading	→	Enter	Press for more than 3 seconds
EE--BA	-- Backup Parameters	→	Enter	Press for more than 3 seconds
EE--RS	-- Restore Backups	→	Enter	Press for more than 3 seconds
EE--DEF	-- Restore default	→	Enter	Press for more than 3 seconds

Table 5.5 Parameter Management Mode Operations

5.5.1 EE-SET parameter is written, and the password of parameter PA-0 should be 315, which is mainly for permanent preservation of parameters. When the preservation is completed, it will not be affected by power failure. The modified parameters can be used after power-on again.

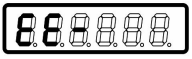
5.5.2 EE-BD parameter backup is to write the parameters with good effect in the existing servo state into the backup area of EEPROM and restore the backup.

5.5.3 EE-RS recovery backup is to restore the backup parameters of the backup area from EEPROM to the parameter table.

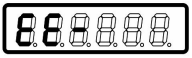
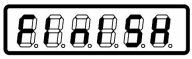
5.5.4 EE-DEF restores the default value. In the process of driver debugging, or when the parameters are confused and can't remember the modified parameters, the operation of restoring the default value (i.e., the factory value) can be carried out.

■ This recovery will not affect the motor parameters, and the servo motor parameters are read from the encoder;

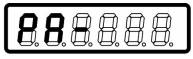
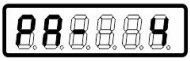
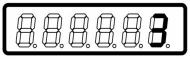
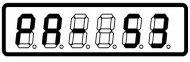
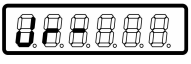
Restore the default setting method

Steps	Panel display	Key	Operation
1		↑↓←Enter	Press the ← key twice to select the function. If the parameter number does not display EE, press ↑↓ 。
2		↑↓←Enter	Press **Enter** and then press the ↑↓ key to display "EE-DEF".
3		↑↓←Enter	Press the **Enter** key for 3 seconds and then "FINISH" will be displayed.

Parameter saving setting method

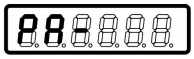
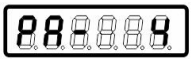
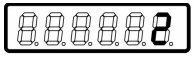
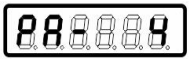
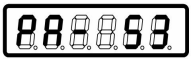
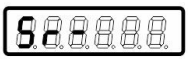
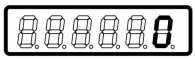
Steps	Panel display	Key	Operation
1		↑↓←Enter	Press the ← key twice to select the function. If the parameter number does not display EE, press the ↑↓.
2		↑↓←Enter	Press **Enter** and then press the ↑↓ key to display "EE-SET".
3		↑↓←Enter	Press the **Enter** key for 3 seconds and then "FINISH" will be displayed.

5.6 JOG INCHING OPERATION MODE（Jr- -）

Steps	Panel display	Key	Operation
1		↑↓←Enter	Press the ← key twice to select the function. If the parameter number does not show "PA", press the ↑↓.
2		↑↓←Enter	Press **Enter** and then press the ↑↓ key to display "PA-4".
3		↑↓←Enter	Press **Enter** to set the value "0" to "3" by pressing the ↑↓ key, and press **Enter** to confirm.
4		↑↓←Enter	Press the ← key to select the function.
5		↑↓←Enter	Press the ↑↓ key to display "PA-53".
6		↑↓←Enter	Press **Enter** to set the value "0" to "1", and press **Enter** to confirm.
10		↑↓←Enter	Press the ← key twice to select the function, press the ↑↓ key to select "Jr" and press **Enter** to confirm.
11		↑↓←Enter	Press the ↑↓ key to reverse the motor forward and backward.

5.6 JOG INCHING OPERATION MODE OPERATION

5.7 Speed Test Operation Mode（Sr- -）

Steps	Panel display	Key	Operation
1		↑↓←Enter	Press the ← key twice to select the function. If the parameter number does not show "PA", press the ↑↓.
2		↑↓←Enter	Press Enter and then press the ↑↓ key to display "PA-4".
3		↑↓←Enter	Press Enter to set the value "0" to "3" by pressing the ↑↓ key, and press Enter to confirm.
4		↑↓←Enter	Press the ← key to select the function.
5		↑↓←Enter	Press the ↑↓ key to display "PA-53".
6		↑↓←Enter	Press Enter to set the value "0" to "1", and press Enter to confirm.
7		↑↓←Enter	Press the ← key twice to select the function, press the ↑↓ key to select "Jr" and press Enter to confirm.
8		↑↓←Enter	Press the ↑↓ key to reverse the motor forward and backward.

5.7 Speed Test Operation Mode Operation

5.8 Analog Auto Zero Mode（AU- -）

5.8.1 Zero adjustment of speed analog quantity

Press the "Enter" key to Enter the "AU-spd" analog zero mode, and then press the "Enter" key for more than 3 seconds to Enter the "Start" speed analog zero state. After completion, "Finish" will be displayed and the zero drift value will be automatically saved to PA45 (or PA39). After that, you can also manually modify the PA45 (or PA39) zero drift value and save it manually.

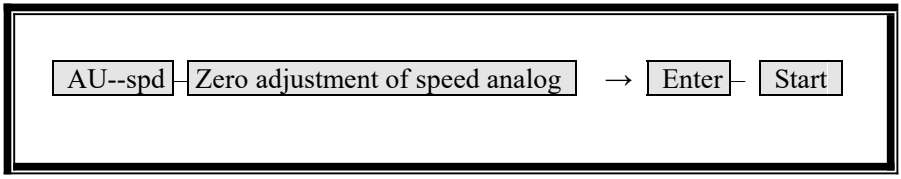


Table 5.8.1 Speed Analog Zero Mode Operation

■ Parameter PA49 can set the threshold voltage (unit: rpm).

5.8.2 Torque analog zero adjustment

Press the "Enter" key to Enter the "AU-trq" analog zero mode, and then press the "Enter" key for more than 3 seconds to Enter the "Start" speed analog zero state. After completion, "Finish" will be displayed and the zero drift value will be automatically saved to PA45 (or PA39). After that, you can also manually modify the PA45 (or PA39) zero drift value and save it manually.

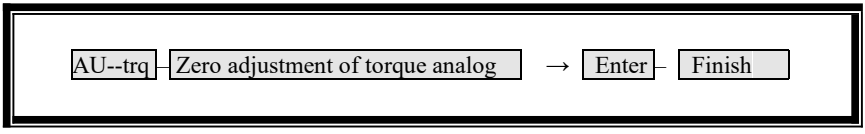


Table 5.8.2 Torque Analog Zero Mode Operation

5.9 Encoder Auto Zero Mode（CO- -）

5.9.1 The encoder automatically checks the zero bit

Parameter PA0=510: It is only used to check the zero adjustment accuracy of the motor. Press the "Enter" key to Enter the zero adjustment mode of the "CO-" encoder, and then press the "Enter" key for 3 seconds, showing "A.2000" as the locking process. The servo motor is locked, and the zero deviation of the motor is displayed after completion;

- This function can't clear the zero point of bus encoder, only check the zero point position with.

5.9.2 Encoder automatically checks zero position (this function is only used by motor factory)

Parameter PA0=620: Set the bus encoder position to zero, press the "Enter" key to Enter the "CO-" encoder zeroing mode, and then press the "Enter" key for 3 seconds. When "A.2000" is displayed, it is indicated as locking process. After the servo motor is locked, the zero deviation of the motor is displayed and set to zero immediately;

- Each motor more than a few cycles of operation can improve the motor zero-setting accuracy, the function of zero and zero.

5.9.3 Settings related to zero adjustment mode

PPA4=4 Zero Mode, PA53=0001 Internal Enable.

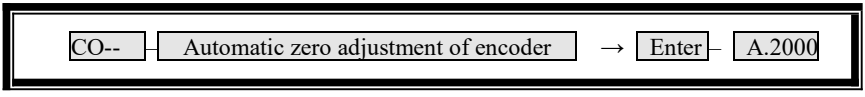


Table 5.9 Encoder Auto Zero Mode Operations

5.10 Open Loop Operation Mode（OL- -）

5.10.1 Open-loop operation

Press the "Enter" key to Enter the "OL-" Open Loop Operation Mode, and then press the "Enter" key for more than 3 seconds, and the Open Loop Operation Mode starts and the motor rotates. This function should not run for a long time

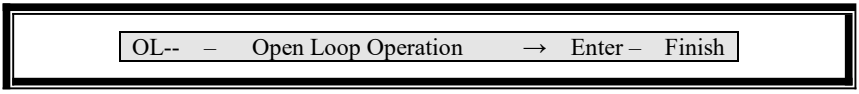


Figure 5.10 Open Loop Operation Mode Operation

5.11 Encoder Write Mode（WR- -）

5.11.1 The motor code is written into the encoder (refer to the code table in Chapter 2)

Parameter PA0=620, PA1 set the corresponding code of the motor (corresponding current value is enough)

Press "Enter" key to Enter "WR-" Encoder Write Mode, and then press "Enter" key for more than 3 seconds, and the "Finish" operation will succeed, which will take effect after power failure. If it fails or the password is incorrect, "Error-" will appear.

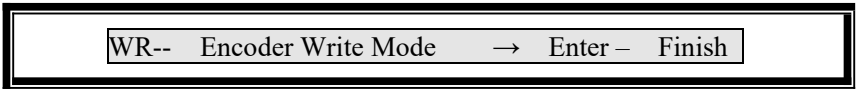


Table 5.11 Encoder Write Mode Operation

Remarks

Chapter VI Parameters

6.1 Parameter List [PA Mode]

Parameter No.	Parameter name	Unit	Parameter range	Default value
0	Parameter password	*	0~9999	510
1	Motor model of incremental encoder	*	*	*
2	Software version number	*	*	*
3	Initial state display	*	0~19	0
4	Selection of control mode	*	0~6	0
5	Velocity proportional gain	Hz	10~3000	150
6	Velocity integral time constant	mS	1~3000	100
7	Torque filter	%	20~3000	40
8	Velocity detection filter	%	20~3000	40
9	Position proportional gain	1/S	1~500	80
10	Position feedforward gain	%	0~100	0
11	Cut-off frequency of position feedforward filter	Hz	1~1200	300
12	Position command pulse divider	*	1~32767	1
13	Position command pulse frequency division denominator	*	1~32767	1
14	Position command pulse input mode	*	0~2	0
15	Position command pulse direction reversal	*	0~1	0
16	Location completion range	Pulse	0~30000	20
17	Position out-of-tolerance detection range	×100 Pulse	0~30000	400
18	Invalid position out-of-tolerance error	*	0~2	0
19	Position instruction smoothing filter	0.1mS	0~3000	0
20	Invalid driver inhibit input	*	0~2	1
21	JOG Running Speed	r/min	-3000~3000	120
22	Internal and external speed command selection	*	0~2	1

Parameter No.	Parameter name	Unit	Parameter range	Default value
23	Maximum speed limit	r/min	0~6000	3600
24	Internal Velocity 1	r/min	-3000~3000	0
25	Internal Speed 2 (Motor Zero Current)	r/min	-3000~3000	100
26	Internal Velocity 3	r/min	-3000~3000	300
27	Internal Velocity 4	r/min	-3000~3000	-100
28	Arrival speed	r/min	0~3000	500
29	Analog torque command input gain	0.1V /100 %	10~100	50
30	User torque overload alarm value	%	50~300	200
31	User torque overload alarm detection time	mS	10~30000	0
32	Control mode switching allowed	*	0~1	0
33	Analog torque input direction is reversed	*	0~1	0
34	Internal CCW torque limit	%	0~300	300
35	Internal CW torque limit	%	-300~0	-300
36	Filter coefficient of command pulse signal	*	0~3	1
37	Filter coefficient of command direction signal	*	0~3	0
38	External CCW, CW torque limit	%	0~300	100
39	Analog torque command zero drift compensation	*	-2000~2000	0
40	Acceleration time constant	mS	1~10000	100
41	Deceleration time constant	mS	1~10000	100
42	Multi-function terminal switching	Binary system	0000~1111	0001
43	Analog speed command gain	(r/min) / V	10~3000	300
44	Analog speed command direction reversal	*	0~1	0
45	Analog speed command zero drift compensation	*	-5000~5000	0

46	Analog speed command filter	Hz	0~1000	300
47	Brake delay conduction setting when motor is enabled	×10 mS	0~500	80

Parameter No.	Parameter name	Unit	Parameter range	Default value
48	Enable delayed off setting when the motor is closed	×10mS	0~500	0
49	When analog voltage sill value speed control	r/min	0~3000	0
50	Speed limit in torque control	r/min	0~5000	3600
51	Dynamic electronic gear is effective	*	0~1	0
52	Second position command pulse divider	*	1~32767	1
53	Forced ON input at low 4-bit input terminal	Binary system	0000~1111	0000
54	Forced ON input at the upper 4-bit input terminal	Binary system	0000~1111	0000
55	Inverse setting of low 4-bit input terminal	Binary system	0000~1111	0000
56	Inverse setting of high 4-bit input terminal	Binary system	0000~1111	0000
57	Output terminal reverses the control word	Binary system	0000~1111	0010
58	Demonstrate the time setting of mode 2	0.1S	1~30000	600
59	Demonstration mode selection	*	0~2	0
60	Proportional gain of current loop	*	*	800
61	Integration time constant of current loop	*	*	5
62	Retain (modification is not allowed)	*	*	*
63	Motor encoder zeroing offset value	Pulse	-32768~32768	16384
64	Retain (modification is not allowed)	*	*	*
65	Incremental encoder line number	Pulse	0~131072	2500
66	Encoder type selection	*	0~2	2
67	Motor Rated current	0.1A	0~130	100
68	Velocity proportional gain coefficient	*	0~500	100
69	Demonstration Mode 2 Maximum Speed Limit	r/min	0~6000	3000
70	Driver feedback pulse output setting	Pulse	0~30000	10000
71	Output direction selection of feedback pulse	*	0~1	1

Parameter No.	Parameter name	Unit	Parameter range	Default value
72	Feedback pulse output electronic gear molecule	*	1~32767	1
73	Feedback pulse output electronic gear denominator	*	1~32767	1
74	Switching of frequency doubling coefficient of servo receiving pulse	*	0~1	0
75	The second feedback pulse is low	Pulse	*	0
76	High position of second feedback pulse	Pulse	*	1
77	The direction of the second feedback pulse is reversed	*	0~1	0
78	Retain (modification is not allowed)	*	*	*
79	Retain (modification is not allowed)	*	*	*
80	485 Communication Axis Address Setting	*	0~5000	1
81	Selection of 485 communication baud rate	*	0~3	2
82	485 communication parity check selection	*	0~1	0
83	Retain (modification is not allowed)	*	*	*
84	Shielded battery alarm	*	0~1	0
85	Allow alarm number 3	*	0~1	0
86	Retain (modification is not allowed)	*	*	*
87	Retain (modification is not allowed)	*	*	*
88	Parameter saving	*	0~1	0
89	Retain (modification is not allowed)	*	*	*
90	Encoder single turn low 16-bit memory	Decimal	0~65536	0
91	Encoder single turn high 16-bit memory	Decimal	0~1	0
92	Encoder multi-turn low 16-bit memory	Decimal	0~65536	0
93	Scaling factor of speed proportional gain coefficient	Percentage	20~300	100
94	Current loop proportional gain scaling multiple	Percentage	20~300	100
95	Rotation monitoring	r/min	0~5000	*

Parameter No.	Parameter name	Unit	Parameter range	Default value
96	Current monitoring	0.1A	0~130	*
97	Alarm code monitoring	*	1~32767	*
98	Current loop integration time constant scaling multiple	Percentage	20~300	100
99	Reset Alarm No.40 (Battery Loss)	*	0~1	0

6.2 [Table of PE Functional Parameters]

Parameter No.	Parameter name	Unit	Parameter range	Default value
0	Reservation	*	*	*
1	Reservation	*	*	*
2	Reservation	*	*	*
3	Reservation	*	*	*
4	Reservation	*	*	*
5	Reservation	*	*	*
6	Reservation	*	*	*
7	Reservation	*	*	*
8	Reservation	*	*	*
9	Reservation	*	*	*
10	Notch filter function switch	Binary system	0000~0101	0000
11	Automatic adjustment switch of notch filter	Binary system	0000~0101	0101
12	Frequency of notch filter in the first segment	Hz	50~4000	0
13	Quality factor of notch filter in the first segment	0.01	50~500	80
14	Depth of notch filter in section 1	0.001	0~1000	0
15	Frequency of notch filter in the second segment	Hz	50~4000	0
16	Quality factor of notch filter in the second segment	0.01	50~500	80
17	Section 2 Notch Filter Depth	0.001	0~1000	0
18	Velocity deviation threshold of automatic notch filter	rpm	0~2000	50
19	Reservation	*	*	*
20	Reservation	*	*	*
21	Reservation	*	*	*

22	Reservation	*	*	*
23	Reservation	*	*	*
24	Reservation	*	*	*

Parameter No.	Parameter name	Unit	Parameter range	Default value
25	Reservation	*	*	*
26	Reservation	*	*	*
27	Reservation	*	*	*
28	Reservation	*	*	*
29	Reservation	*	*	*
30	Reservation	*	*	*
31	Reservation	*	*	*
32	Reservation	*	*	*
33	Reservation	*	*	*
34	Reservation	*	*	*
35	The first stage vibration suppression filter vibration suppression frequency	Hz	10~1000	150
36	The first stage vibration suppression filter vibration suppression gain	%	1~1000	100
37	Damping coefficient of vibration suppression filter in the first stage	%	0~300	0
38	Time compensation value of the first stage vibration suppression filter 1	0.01ms	0~1000	0
39	Time compensation value of vibration suppression filter in the first stage 2	0.01ms	0~1000	0
40	Double-loop measuring feed/friction compensation function switch	*	0000~1111	1000
41	Friction compensation gain	%	10~1000	100
42	Reservation	*	*	*
43	Friction compensation coefficient	%	0~100	0

44	Friction compensation frequency compensation value	0.1Hz	-10000~10000	0
45	Friction compensation gain compensation value	%	1~1000	100
46	Double-loop feeder gain measurement	Hz	1~500	40
47	Gain compensation value of double-loop measurement feed	%	0~1500	150
48	Reservation	*	*	*

Parameter No.	Parameter name	Unit	Parameter range	Defaul t value
49	Reservation	*	*	*
50	Running number of motor in inertia identification	0.1 round	1~300	30
51	Motor running speed in inertia identification	r/min	1~300	1000
52	Motor Running Acceleration in Inertia Identification	r/min/1ms	1~300	10
53	Inertia identification running pause time	0.01S	0~1000	0
54	Initial moment of inertia ratio in inertia identification	%	0~1000	200
55	Proportional gain of velocity loop in inertia identification	rad/s	10~3000	150
56	Integral time constant of velocity loop in inertia identification	0.1ms	2~5000	200
57	Position feedforward gain in inertia identification	%	0~100	100
58	Velocity deviation threshold in inertia identification	rpm	0~3000	500
59	Proportional gain of position loop in inertia identification	1/s	1~1000	40

6.3 [PF Motor Parameter Table]

Parameter No.	Parameter name	Unit	Parameter range	Defaul t value
0	Motor voltage grade	0-220V 1-380V	0~3	*
1	Rated power of motor	0.01Kw	0~32767	*
2	Rated current of motor	0.01A	0~32767	*
3	Rated torque of motor	0.01Nm	0~32767	*
4	Maximum torque of motor	0.01Nm	0~32767	*
5	Rated speed of motor	1rpm	0~32767	*
6	Maximum speed of motor	1rpm	0~32767	*
7	Motor moment of inertia	10-6Kgm2	0~32767	*
8	Magnetic pole logarithm of motor	*	0~32767	*
9	Phase resistance of motor	0.001Ω	0~32767	*
10	D-axis inductance of motor	0.01mH	0~32767	*
11	Q-axis inductance of motor	0.01mH	0~32767	*
12	Back EMF constant of motor	0.01V/Krpm	0~32767	*
13	Motor torque constant	0.001Nm/A	0~32767	*
14	Electrical time constant of motor	0.01ms	0~32767	*
15	Mechanical time constant of motor	0.01ms	0~32767	*
16	Motor zero offset is 16 bits lower	*	0~32767	*
17	Motor zero offset is 16 bits higher	*	0~32767	*
18	Type of motor encoder	*	0~32767	*
19	Motor encoder line number is	*	0~32767	*

	16 bits lower			
20	Motor encoder line number is low and high	*	0~32767	*
21	Motor encoder data writing control word	*	0~3	*

Parameter No.	Parameter name	Unit	Parameter range	Default value
22	Reservation	*	*	*
23	Reservation	*	*	*
24	Reservation	*	*	*
25	Reservation	*	*	*
26	Reservation	*	*	*
27	Reservation	*	*	*
28	Reservation	*	*	*
29	Reservation	*	*	*
30	Molecular adjustment factor of position command electronic gear	*	0~32767	1
31	Position command electronic gear denominator adjustment factor	*	0~32767	1
32	Molecular adjustment factor of position feedback electronic gear	*	0~32767	1
33	Position feedback electronic gear denominator adjustment factor	*	0~32767	1
34	Velocity feedback filtering factor	*	0~16	0
35	Reservation	*	*	*
36	Reservation	*	*	*
37	Reservation	*	*	*
38	Reservation	*	*	*
39	Reservation	*	*	*

40	Reservation	*	*	*
41	Full closed-loop control parameters	*	0~1	0

Parameter No.	Parameter name	Unit	Parameter range	Defaul t value
42	Full closed loop feedback type	*	0~3	0
43	Transmission bits of full closed-loop absolute value protocol	*	*	29
44	Mixed deviation detection range	%	1~1000	20
45	Mixed deviation detection time	ms	1~1000	100
46	Mechanical transmission electronic gear molecule	*	1~32767	1
47	Mechanical transmission electronic gear denominator	*	1~32767	1
48	Reservation	*	*	*
49	Function switch	*	0~15	0
50	Transmission bits of absolute value protocol of motor encoder	*	0~32	26
51	Reservation	*	*	*
52	Reservation	*	*	*
53	Reservation	*	*	*
54	Reservation	*	*	*
55	Reservation	*	*	*
56	Reservation	*	*	*
57	Reservation	*	*	*
58	Reservation	*	*	*
59	Reservation	*	*	*

6.4 [Explanation of PA Functional Parameters]

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
0	Parameter password	a. The user password is 315; b. Motor manufacturer code 510 (use with caution); c. Driver manufacturer password 620 (use carefully);	**0~9999** **[510]**
1	Model code	a. Use this function when incrementing the encoder; b. This function is shielded in the bus encoder;	**0~9999** **[0]**
2	Software version	a. Only display software version number, read-only parameters; b. This parameter is the integrated number of software and hardware;	**0~9999** **[*]**
3	Initial state display	The initial display state of the digital tube when the driver is powered on. 0: Display motor speed; 1: Display 5 digits lower than the current position; 2: Display 5 digits higher than the current position; 3. Display position instruction (instruction pulse accumulation) is 5 bits lower; 4. Display position command (command pulse accumulation) 5 bits higher; 5: The display position deviation is 5 bits lower; 6: The display position deviation is 5 bits higher; 7: Display motor torque; 8: Display motor current; 9: The absolute position of a single lap is low; 10: The absolute position of a single lap is high; 11: Low absolute position for multiple laps; 12: Display speed command; 13: Display torque command; 14: Display the absolute position of the rotor during one revolution; 15: Display the status of the input terminal; 16: Display the state of the output terminal; 17: Display the input signal of the encoder; 18: Display the running status; 19: Display the alarm code;	**0~19** **[0]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
4	Selection of control mode	0: Position control mode; 1. Speed control mode; A. The internal and external velocities are selected by parameter PA22; B. The internal speed is selected by the CN1 interface; Four internal speeds were selected by combining 14-foot SC1 and 15-foot SC2: SC1 OFF, SC2 OFF: Internal speed 1; Speed setting PA24 SC1 ON, SC2 OFF: Internal speed 2; Speed setting PA25 SC1 OFF, SC2 ON: Internal Speed 3; Speed setting PA26 SC1 ON, SC2 ON: Internal Speed 4; Speed setting PA27 2. Test operation control mode; 3: JOG control mode; The speed is set by parameter PA21. 4. Encoder zero adjustment mode; Used for motor factory adjustment coding disk zero point. 5. Open-loop operation mode; Used for detecting motors and encoders 6. Torque control mode;	**0~6** **[0]**
5	Velocity proportional gain	a. Enhance the proportional gain of the rigid setting speed loop regulator; b. The greater the setting value, the higher the gain and the greater the stiffness. Parameter values are determined according to the specific servo drive system model and load conditions. In general, the greater the load inertia, the greater the set value; c. Set a larger value as far as possible under the condition that the system does not generate oscillation;	**10~3000** **[150]**
6	Velocity integral time constant	a. Setting the integral time constant of the speed loop regulator; b. The motor overshoot can be restrained. The smaller the setting value, the faster the integration speed is, and the overshoot is easy to occur. If the setting value is too small, the response will slow down; c. According to the specific driving model and load inertia setting, the larger the load inertia, the larger the set value;	**1~3000** **[100]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
7	Torque filter	a.Noise-free setting of torque command filter characteristics; b. for suppressing resonance caused by torque; c. The larger the value, the greater the cut-off frequency, and the smaller the vibration and noise generated by the motor. If the load inertia is very large, the set value can be appropriately increased. If the value is too large, the response will slow down and may cause oscillation; d. The smaller the value, the smaller the cut-off frequency and the faster the response. If higher torque response is needed, the set value can be appropriately reduced;	**20~3000 [40]**
8	Velocity detection filter	a. De-noise setting speed detection filter characteristics; b. The greater the value, the greater the cut-off frequency, and the smaller the noise generated by the motor. If the load inertia is very large, the set value can be appropriately increased. If the value is too large, the response will change, which may cause oscillation. The smaller the value, the higher the cut-off frequency and the faster the speed feedback response. If higher speed response is needed, the set value can be appropriately reduced;	**20~3000 [40]**

9	Position proportional gain	a. Setting the proportional gain of the position loop regulator; b. The larger the setting value, the higher the gain, the greater the stiffness, and the smaller the position lag under the condition of the same frequency command pulse. However, too large a value may cause oscillation or overshoot; c. The parameter value is determined according to the specific servo drive system model and load condition;	**1~500** **[80]**
10	Position feedforward gain	a. Set the feed-forward gain of the position loop; b. When it is set to 100%, it means that under the command pulse of any frequency, the position lag is always 0; c. The feed-forward gain of the position loop increases, and the high-speed response characteristic of the control system improves, but the position loop of the system is unstable and prone to oscillation; d. Unless high response characteristics are required, the feedforward gain of the position loop is usually 0;	**0~100** **[0]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
11	Cut-off frequency of position feedforward filter	a. Set the cut-off frequency of the low-pass filter for the feed-forward amount of the position loop. b. The function of this filter is to increase the stability of compound position control.	**1~1200 [300]**
12	Position command pulse divider	**a**. If the system is programmed to run 5 mm (5000 pulses), the motor needs to rotate once: $\frac{\text{PA 12}}{\text{PA 13}} = \frac{\text{Pulse molecule}}{\text{Pulse denominator}} = \frac{\text{Actual feedback}}{\text{Command pulse}}$ $= \frac{\text{Motor encoder line number (2500 lines) X frequency multiplication number (4)}}{\text{Number of command pulses (5000)}}$ $= \frac{10000}{5000} = \frac{2}{1}$ **b.** If the motor is directly connected with the screw screw, the screw screw pitch is 6 mm: $\frac{\text{PA12}}{\text{PA13}} = \frac{10}{\text{Screw pitch (6)}} = \frac{5}{3}$ Note: CNC machine tools can be set with reference to b for more intuitive. Gear ratio range: $1/100 \leqslant G \leqslant 100$	**1~32767 [1]**
13	Position command pulse frequency division denominator		**1~32767 [1]**
14	Position command pulse input mode	You can configure 3 Pulse Input Forms: 0: Pulse + symbol; 1: CCW pulse/CW pulse; 2. Two-phase quadrature pulse input; See Fig. 4.7 Pulse Form on page 34	**0~2 [0]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
15	Position command pulse direction reversal	0: Default direction; 1. The direction is reversed;	**0~1** **[0]**
16	Location completion range	a. During position control, when the value in the position deviation counter is less than or equal to the set value, the position is COIN ON or OFF; b. Under other control modes, it is the speed arrival signal;	**0~3000** **[20]**
17	Position out-of-tolerance detection range	In the position control mode, when the count value of the position deviation counter is greater than the set value of the parameter, the servo driver gives an alarm;	**0~3000** **[400]**
18	Is the position out of tolerance detected	0: The detection is effective; 1: Shielding No.4 alarm, PA17 is invalid; 2: Shielding No.4 and No.6 alarms, PA17 is invalid;	**0~2** **[0]**
19	Position command smoothing filtering	This parameter can filter the command pulse smoothly and optimize the acceleration and deceleration when the upper computer has no acceleration and deceleration or exponential acceleration and deceleration. This filtering will not lose pulses, and the execution speed may be delayed.	**0~3000** **[0]**
20	Invalid driver inhibit input	0: CCW, CW input prohibition is valid; 1: CCW and CW inputs are prohibited and invalid; 2: CCW and CW inputs are prohibited and valid, and there is no alarm prompt;	**0~2** **[1]**
21	JOG Running Speed	Set forward and reverse speed settings when setting JOG mode.	**-3000~3000** **[120]**
22	Internal and external speed selection	0: Take the internal speed; 1: Take external analog quantity (-10V ~ + 10V); 2: Take external analog quantity (0 ~ + 10V; 14, 15 feet control positive and negative);	**0~2** **[1]**
23	Maximum speed limit	Setting the maximum speed limit of servo motor is related to servo motor, Set the maximum speed of the motor according to the parameter Motor model.	**0~6000** **[3600]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
24	Internal Velocity 1	When PA4=1 and PA22=0: When CNISC1 foot is OFF, SC2 foot is OFF, the internal speed is 1;	**-3000~3000 [0]**
25	Internal Velocity 2/Zero Current	a. When PA4=1 and PA22=0: When CNISC1 foot is ON and SC2 foot is OFF, the internal speed is 2; b. When PA4=4, set the percentage of motor zero-adjusting current;	**-3000~3000 [100]**
26	Internal Velocity 3	When PA4=1 and PA22=0: When CNISC1 foot is OFF and SC2 foot is ON, the internal speed is 3	**-3000~3000 [300]**
27	Internal Velocity 4	When PA4=1 and PA22=0: When CNISC1 foot is ON, SC2 foot is ON, the internal speed is 4	**-3000~3000 [-100]**
28	Arrival speed	In non-location mode: When the motor speed is greater than this set value, COIN: ON, otherwise OFF. This parameter only judges the motor speed, and has no directivity.	**0~3000 [500]**
29	Analog torque command input gain	a. Set the proportional relationship between the input voltage of analog torque and the actual operating torque of the motor; b. The unit of the set value is 0.1 V/100%; c. The default value is 50, corresponding to 5V/100%, that is, the input 5V voltage produces 100% Rated torque;	**10~100 [50]**
30	User torque overload	a. Set the user torque overload value, which is the percentage of Rated torque, and the torque limit value is protected in both forward and reverse directions regardless of direction;	**0~300 [200]**

	alarm value	b. When PA31 > 0, when motor torque > PA30 and duration > PA31, the driver gives an alarm, the alarm number is Err-29, and the motor stops running. After the alarm, the driver must be powered on again to clear the alarm;	

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
31	Torque overload detection time	Torque overload detection time in milliseconds; When 0, the user torque overload alarm function is invalid;	**0~30000 [0]**
32	Control mode switching allowed	0: The 11 pins of CN1 (A-CLR) are only effective for alarm clearing; 1: When the parameter PA4=0, the 11 pins (A-CLR) of CN1 are only valid for position and speed switching (the default position is valid); When parameter PA4=1, the 11-pin (A-CLR) of CN1 is only valid for speed and torque switching (default speed is valid); When parameter PA4=6, the 11-pin (A-CLR) of CN1 is only valid for torque and position switching. (The default torque is valid);	**0~1 [0]**
33	Torque command direction reversal	The polarity of analog torque input is reversed. 0: The analog torque command is timing and the torque direction is CCW;; 1: The analog speed command is timing and the torque direction is CW;	**0~1 [0]**
34	Internal CCW torque limit	Set the internal torque limit percentage value of the motor in CCW direction. Example: Set to 2 times Rated torque, then set the value to 200. This setting value is always valid.	**0~300 [250]**
35	Internal CW torque limit	Set the internal torque limit percentage value of the motor in CW direction. Example: If it is set to 2 times Rated torque, the value is set to-200. This setting value is always valid.	**0~-300 [-250]**
36	Filter coefficient of command pulse signal	PA4=0, valid for position control The larger the setting value, the stronger the anti-interference to the command pulse, and the smaller the frequency of the received pulse, which may also show that it cannot receive the pulse. The timing lead or lag of pulse and direction signals can be adjusted.	**0~3 [1]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
37	Filter coefficient of command direction signal	PA4=0, valid for position control The timing lead or lag of pulse and direction signals can be adjusted.	**0~3** **[0]**
38	External torque limit	PA4=6, when pin 14 or 15 of CN1 is connected to 0V: CCW, CW torque percentage limit, both positive and negative. PA38 is less than the set value of PA34 and PA35.	**0~300** **[100]**
39	Analog torque command zero drift compensation	The zero drift compensation for analog torque input is positive and negative offset.	**-5000~5000** **[0]**
40	Acceleration time constant	The setting value indicates the acceleration time of the motor from 0 to 1000r/min. Linear acceleration and deceleration characteristics are only used in speed control mode. If the upper machine has acceleration and deceleration characteristics, this parameter should be set to 1.	**1~10000** **[100]**
41	Deceleration time constant	The setting value indicates the deceleration time of the motor from 1000 ~ 0r/min. Linear acceleration and deceleration characteristics, only for speed control mode. If the upper machine has acceleration and deceleration characteristics, this parameter should be set to 1.	**1~10000** **[100]**
42	Multi-function terminal switching	0:15 alarm takes effect/1: Shield No.15 alarm; [0001] 0: Select the second zero/1: Select the positioning to complete; [0010] 0: The PA50 parameter limits the maximum rotation/1: The second analog quantity limits the maximum rotation/1; [0100]	**0000~1111** **[0001]**
43	Analog speed comman	Set the proportional relationship between the input voltage of analog speed and the actual running speed of the motor.	**10~3000** **[300]**

	d input gain	Example: Positive and negative 10V voltage corresponds to positive and negative 3000 revolutions, which can be set as 3000/10 = 300 r/min/v, that is, 1V corresponds to 300 revolutions	

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
44	Analog speed command direction reversal	Inverse the polarity of analog speed input 0: The analog speed command is timing and the speed direction is CCW;; 1: The analog speed command is timing and the speed direction is CW;	**0~1** **[0]**
45	Analog speed	The zero drift compensation for analog speed input is positive and negative offset. The value of this parameter will be automatically changed and saved when the analog quantity is automatically set to zero. See table 5.7 a on page 41	**-5000~5000** **[0]**
46	Instruction zero drift compensation	Low-pass filter for analog speed input. The larger the setting, the faster the response speed to the speed input analog quantity and the greater the noise; The smaller the setting, the slower the response speed and the smaller the noise;	**0~1000** **[300]**
47	Analog speed command filter	The maximum value of 500 is a delay of 5 seconds, and the default value is 0.8 seconds. Refers to the normal power-on of the drive, the motor is enabled first, and then the BRK +, BRK-delay conduction brake work, and it is not conductive when giving an alarm.	**0~500** **[80]**
48	Brake delay conduction setting when motor is enabled	The maximum value of 500 is a delay of 5 seconds, and the default value is 0 seconds. Refers to the normal drive power-on, BRK +, BRK-first disconnect the brake does not work to enable delay disconnect this period of time, alarm does not delay.	**0~500** **[0]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
49	Analog voltage sill value speed control	Speed control: Positive and negative voltage sill value setting of analog quantity.	**1~5000** **[0]**
50	Speed limit in torque control	a: Torque control: corresponds to the maximum speed limit. Note: Overspeed is easy to occur when no load; b: Torque control: 10V corresponding speed, PA42 switches the second analog quantity to limit the highest speed;	**1~5000** **[2500]**
51	Dynamic electronic gear	0: CN1 interface, the function of input terminal INH (command pulse prohibition) is effective; 1: CN1 interface, the function of input terminal INH (dynamic electronic gear switching) is effective, when INH terminal OFF, the input electronic gear is PA12/PA13; When the INH terminal is ON, the input electronic gear is PA52/PA13;	**0~1** **[0]**
52	Second position command pulse divider	When the PA51=1 command pulse is disabled: When the INH terminal is OFF, the input electronic gear is PA12/PA13; When the INH terminal is ON, the input electronic gear is PA52/PA13;	**0~32767** **[1]**
53	Forced ON input at low 4-bit input terminal	The following functions are ON and OFF with the change of parameters 0 and 1 without borrowing external lines. PA53 and PA54 operate the same way. SON: Servo enabled; [0001] A-CLR: Alarm clearing; [0010] FSTP: CCW Drive Prohibition; [0100] RSTP: CW driver disable; [1000]	**0000~1111** **[0000]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
54	Forced ON input at the upper 4-bit input terminal	CLE/SC1/ZEROSPD: Deviation counter clearing/speed selection 1/zero speed clamping; [0001] INH/SC2: Command Pulse Disable/Speed Select 2; [0010] FIL: CCW torque limit; [0100] RIL: CW torque limit; [1000]	**0000~1111 [0000]**
55	Logic reversal of low 4-bit input terminal	With the change of parameters 0, 1, to achieve the function of reverse (that is, the original external switch circuit input reverse, normally open to normally closed, normally closed to normally open.) SON: Servo enabled; [0001] A-CLR: Alarm clearing; [0010] FSTP: CCW Drive Prohibition; [0100] RSTP: CW driver disable; [1000]	**0000~1111 [0000]**
56	High 4-bit input terminal logic inversion	With the change of parameters 0, 1, to achieve the function of reverse (that is, the original external switch input circuit is reversed, normally open to normally closed, normally closed to normally open.) CLE/SC1/ZEROSPD: Error counter cleared/ Speed selection 1/zero speed clamp; [0001] INH/SC2: Command Pulse Disable/Speed Select 2; [0010] FIL: CCW torque limit; [0100] RIL: CW torque limit. [1000]	**0000~1111 [0000]**
57	Output terminal logic inversion	With the change of parameters 0, 1, to achieve the function of reverse (that is, the original external switch output circuit is reversed, normally open to normally closed, normally closed to normally open.) SRDY: Servo ready; [0001] ALM: Servo alarm; [0010] COIN: Location completion/speed arrival; [0100] BRK: Motor braking; [1000]	**0000~1111 [0010]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
58	Demonstrate the time setting of mode 2	When demonstrating Mode 2: The servo motor high-speed aging time setting, the unit is 0.1 minutes.	**1~30000** **[600]**
59	Demonstration mode selection	PA0=510 PA4=0 takes effect; 0: Turn off the demo mode; 1: Slow demonstration; 2: Quick demonstration;	**0~2** **[0]**
60	Proportional gain of current loop	The driver automatically adjusts this parameter according to the specification of the reading motor.	**0~32767** **[500]**
61	Integration time constant of current loop	The driver automatically adjusts this parameter according to the specification of the reading motor.	**0~32767** **[5]**
62	Reservation	Retain (modification is not allowed)	*****
63	Encoder zero bias value	When PA0=4 takes effect, the motor encoder zeroes the offset value.	**-32767~ 32767** **[0]**
65	Incremental encoder line number	Incremental encoder line number; Bus encoder This parameter is invalid;	**0~32767** **[2500]**
66	Encoder type selection	0: ordinary incremental photoelectric encoder; 1. Ordinary incremental line-saving photoelectric encoder; 2: Tamochuan bus multi-turn absolute value encoder (131072 lines);	**0~2** **[2]**
67	Rated current of motor	Rated current value for the motor: Example: 130ST-M03215LFB motor Rated current is 4.5 A, corresponding to the value of this parameter should be 45;	**0~130** **[100]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
68	Velocity proportional gain coefficient	The driver automatically adjusts this parameter according to the specification of the reading motor; This parameter is the coefficient of PA5 parameter; Gain of servo motor = PA5 * PA68;	**0~500 [100]**
69	Demonstration mode speed limit	Demo Mode 2, maximum speed limit during fast demo.	**0~32767 [3000]**
70	Driver feedback pulse output	Settable feedback pulse output The number of feedback pulses output when the motor rotates once.	**1~30000 [10000]**
71	Pulse output direction selection	Output direction selection of feedback pulse 0: Positive A/B feedback signal output; 1. Output of A/B feedback signal in reverse direction;	**0~1 [1]**
72	Pulse output molecule	Effective when PA70=0 Feedback pulses output electronic gear molecules.	**0~32767 [1]**
73	Pulse output denominator	Effective when PA70=0 Feedback pulse output electronic gear denominator.	**0~32767 [1]**
74	Receiving pulse frequency doubling switching	Switching of frequency doubling coefficient of servo driver receiving pulse 0: PA12/PA13 is 1/1 servo receiving 10000 pulses/loop; 1: PA12/PA13 is 1/1 servo receiving 131072 pulses/loop;	**0~1 [0]**
75	The number of full closed-loop feedback lines is low	Full closed loop feedback line number low PA76 * 10000 + PA75	**0~32767 [2500]**

76	The number of full closed-loop feedback lines is high	Full closed loop feedback line number low PA76 * 10000	**0~32767 [0]**
77	Full closed-loop feedback inverse control word	Whether the feedback of the second code wheel is reversed; 0: Do not reverse; 1: Inverse;	**0~1 [0]**
80	485 Communication Axis Address	a.485 Communication modbus rtu Protocol Representative Address: 1, 2, 3..... b. When the machine tool is used, the absolute position corresponds to reading: X axis, Y axis, Z axis … …	**1~32767 [1]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
81	485 communication baud rate	The corresponding baud rate is 0: 4800; 1: 9600; 2: 19200; 3:38 400; The data bit is 8; Stop bit is 1; RTU format; The longest read length is 10;	**0~3** **[2]**
82	485 communication parity check selection	0: Odd check; 1: Even check; 2: No check	**0~2** **[0]**
84	Shielded battery 40 # alarm	0: When the absolute value encoder is used, the alarm of No.40 battery is allowed to ensure the accuracy of multi-turn signal, and the alarm can be cleared only when the parameter PA99 is set to 1; (Invalid incremental encoder) 1: When the incremental encoder is used, the No.40 alarm is shielded, that is, it can be used when there is no battery, and there is no multi-turn signal memory at this time;	**0~1** **[0]**
85	Allow alarm number 3	0: Default shielding undervoltage alarm; 1: Allow undervoltage No.3 alarm;	**0~1** **[0]**
88	Parameter saving	Communication parameters: When the parameters are changed from 0 to 1, the parameters are saved once and restored to 0;	**0~1** **[0]**
90	Encoder single turn value is 16-bit low	a. Decimal: displayed as 0, 1... 32767,-32768...-1, 0; b. 485 Communication Unsigned Data Read 0, 1... 65535, 65536; (Invalid incremental encoder)	**0~65536** **[0]**
91	Encoder single turn value high 16-bit	a. Decimal, one-cycle value = PA90+PA91*65536; b. Display as 0, 1; (Invalid incremental encoder)	**0~1** **[0]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
92	Encoder multi-turn value low 16-bit value	a. Decimal: displayed as 0, 1... 32767,-32768...-1, 0; b.485 Communication Unsigned Data Read 0, 1... 65535, 65536; c. If this parameter is lost due to battery power loss, 40 # alarm will be given, and only PA99 parameter will be cleared, and power failure and CLR terminal cannot be cleared; d. Multi-turn value = PA92*131072; (Invalid incremental encoder)	**0~65536 [0]**
93	Scaling factor of speed proportional gain coefficient	Speed proportional gain PA5*PA93:	**20~300 [100]**
94	Current loop proportional gain scaling multiple	Current loop proportional gain PA60*PA94:	**20~300 [100]**
95	Rotation monitoring	Communication can read the motor rotation value	**0~5000**
96	Current monitoring	Communication can read motor current value	**0~5000**
97	Alarm code monitoring	Communication can read servo drive alarm code	**0~5000**

98	Current loop integration time constant scaling multiple	Current loop integration time constant PA61*PA98:	**20~300 [100]**
99	Reset battery power loss No.40 alarm	a. This parameter cannot be saved and is only used for battery alarm reset; b. This parameter only takes effect when PA84=0; c. PA84=0: When the battery is disconnected from the motor encoder, an alarm appears. After connection, only this parameter is set to 1 to clear the alarm; d. PA84=0: If the battery voltage is low, the alarm cannot be cleared when there is no battery, in order to ensure the accuracy of multi-turn signals; The battery voltage is normally stable at 3.6 V (incremental encoder is invalid)	**0~1 [0]**

6.5 [Detailed Explanation of PE Functional Parameters]

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
10	Notch filter function switch	0000: Segment 1 and Segment 2 notch filters are invalid 0001: The first notch filter is effective 0100: Segment 2 notch filter active 0101: Segment 1 and Segment 2 notch filters are both valid	**0000～0101 [0000]**
11	Automatic adjustment switch of notch filter	0000: The notch filters in the first and second segments are not automatically adjusted; 0001: Automatic adjustment of notch filter in section 1 0100: Automatic adjustment of notch filter in the second stage 0101: The notch filters in the first and second segments are automatically adjusted.	**0000～0101 [0000]**
12	Frequency of notch filter in the first segment		**50～4000 [0]**
13	Quality factor of notch filter in the first segment		**50～500 [80]**
14	Depth of notch filter in section 1		**0～1000 [0]**
15	Frequency of notch filter in the second segment		**50～4000 [0]**
16	Quality factor of notch filter in the second segment		**50～500 [80]**
17	Section 2 Notch Filter Depth		**0～1000 [0]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
18	Velocity deviation threshold of automatic notch filter		**0～2000 [50]**
35	The first stage vibration suppression filter vibration suppression frequency		**1～1000 [150]**
36	The first stage vibration suppression filter vibration suppression gain		**1～1000 [100]**
37	Vibration suppression coefficient of the first stage vibration suppression filter		**0～300 [0]**
38	The compensation value of the first stage vibration suppression filter is 1		**0～1000 [0]**
39	The compensation value of the first stage vibration suppression filter is 2		**0～1000 [0]**
40	Double-loop feeder and friction compensation function switch	0000: Double loop feed measurement and friction compensation closed 0001: Double-loop measurement feed is effective 0100: Friction compensation is effective 0101: Both double-loop measurement feed and friction compensation are effective 1000: The vibration suppression function in the first stage is effective	**0000～0101 [1000]**
41	Friction compensation gain	Percentage of proportional gain (bandwidth) of speed loop	**10～1000 [100]**
43	Friction compensation coefficient	Percentage of friction compensation torque	**0～100 [0]**
44	Friction compensation frequency compensation value		**-10000～10000 [0]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
45	Friction compensation gain compensation value	Friction compensation gain/friction compensation gain compensation	**1～1000 [100]**
46	Double-loop feeder gain measurement		**1～500 [40]**
47	Gain compensation value of double-loop measurement feed		**0～1500 [150]**
50	Running number of motor in inertia identification		**1～300 [30]**
51	Motor running speed in inertia identification		**1～3000 [1000]**
52	Motor Running Acceleration in Inertia Identification		**0～300 [10]**
53	Inertia identification running pause time		**0～1000 [0]**
54	Initial moment of inertia ratio in inertia identification		**0～1000 [200]**
55	Proportional gain of velocity loop in inertia identification		**10～3000 [150]**
56	Integral time constant of velocity loop in inertia identification		**2～3000 [200]**
57	Position feedforward gain in inertia identification		**0～100 [100]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
58	Velocity deviation threshold in inertia identification		**0～3000 [500]**
59	Proportional gain of position loop in inertia identification		**1～1000 [40]**

6.6 [Parameter Explanation of PF Motor] (Bus Drive does not have this function at present)

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
0	Motor voltage grade	0-220V 1-380V	**0～32767** **[0]**
1	Rated power of motor	0.01Kw	**0～32767** **[0]**
2	Rated current of motor	0.01A	**0～32767** **[0]**
3	Rated torque of motor	0.01Nm	**0～32767** **[0]**
4	Maximum torque of motor	0.01Nm	**0～32767** **[0]**
5	Rated speed of motor	1rpm	**0～32767** **[0]**
6	Maximum speed of motor	1rpm	**0～32767** **[0]**
7	Motor moment of inertia	10-6Kgm2	**0～32767** **[0]**
8	Magnetic pole logarithm of motor	0.001Ω	**0～32767** **[0]**
9	Phase resistance of motor	0.01mH	**0～32767** **[0]**
10	D-axis inductance of motor	0.01mH	**0～32767** **[0]**
11	Q-axis inductance of motor	0.01mH	**0～32767** **[0]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
12	Back EMF constant of motor	0.01V/Krpm	**0～32767 [0]**
13	Motor torque constant	0.001Nm/A	**0～32767 [0]**
14	Electrical time constant of motor	0.01ms	**0～32767 [0]**
15	Mechanical time constant of motor	0.01ms	**0～32767 [0]**
16	Motor zero offset is 16-bit low	17BIT encoder: 16384 23BIT encoder: 16384	**0～32767 [0]**
17	Motor zero offset high 16-bit	17BIT encoder: 0 23BIT encoder: 0	**0～32767 [0]**
18	Type of motor encoder	17BIT encoder: 16 23BIT encoder: 17	**0～32767 [0]**
19	Motor encoder line number low 16-bit	17BIT encoder: 0 23BIT encoder: 0	**0～32767 [0]**
20	Motor encoder line number is low and high	17BIT encoder: 2 23BIT encoder: 128	**0～32767 [0]**
21	Motor encoder data writing control word	Manual setting or serial debugging software to write the relevant parameters of the motor into PF-0-PF-20; Then PF21 is set to 1, and the driver starts to write the motor parameters to the encoder; In the parameter writing process, PF21 indicates the writing state; PF21 becomes 2, indicating that the parameter is being written; When PF21 is changed to 3, the parameter writing is completed; A change of PF21 to 15 indicates an error in parameter writing;	**0～3 [0]**

Parameter No.	Parameter name	Detailed explanation of function	Parameter range [Default value]
41	Full closed loop feedback type	0: Close 1: Open	**0～1** **[0]**
42	Full closed loop feedback type	1. The full closed-loop feedback type is square wave pulse; 2: The full closed-loop feedback type is BissC absolute value protocol; 3. The full closed-loop feedback type is EnDat absolute value protocol;	**0～3** **[0]**
43	Transmission bits of full closed-loop absolute value protocol	Full closed-loop absolute value protocol transmits bits, and absolute value encoder is available	**1～32** **[29]**
44	Mixed deviation detection range	The number of feedback lines in full closed loop is%, the deviation exceeds the number of lines in one circle of motor by 20%, and the driving report is 35 #	**0～1000** **[20]**
45	Mixed deviation detection time	Full closed loop feedback deviation detection time, when the deviation exceeds 100MS, drive alarm 35 #	**0～1000** **[100]**
46	Mechanical transmission electronic gear denominator	Mechanical transmission electronic gear molecule	**0～32767** **[1]**
47	Full closed loop feedback type	Mechanical transmission electronic gear denominator If the mechanical transmission reduction ratio is 2, set PF46 to 1 and PF47 to 2	**0～32767** **[1]**
49	Function switch		**0～15** **[0]**
50	Transmission bits of absolute value protocol of motor encoder	Absolute value encoder protocol transmission bit	**1～32** **[26]**

Chapter VII Troubleshooting and Diagnosis

7.1 Alarm List

(Table 7.1)

Alarm No.	Alarm name	Fault analysis
1	Overspeed	The speed of servo motor exceeds the set value
2	Overvoltage of main circuit	Three-phase or two-phase power supply voltage is too high or braking does not work
3	Main circuit undervoltage	Three-phase or two-phase supply voltage is too low
4	Position out of tolerance	The value of position deviation counter exceeds the set value and the voltage is too low
5	Motor overheating	Motor temperature is too high
6	Motor locked rotor	The motor is stuck, the transmission is not smooth, or the load is too large
7	Driver prohibition exception	CCW, CW have no input or parameter PA20 is not 1
11	IPM module failure	IPM Intelligent Module Failure
12	Overcurrent	Excessive motor current
13	Overload	Drive and motor overload (instantaneous overcurrent), transmission is not smooth
14	Brake failure	Brake resistance is broken or brake circuit is faulty
16	Thermal overload of motor	The electric calorific value of the motor exceeds the set value
17	Speed response fault	The speed error is too large for a long time
20	EEPROM error	EEPROM error, parameter save failed
22	Wire arrangement fault	Poor cable connection between control board and power board
29	User torque overload alarm	Motor load exceeds the value and duration set by the user
34	Software version mismatch	Software burning error or failure to restore factory value
35	The synchronization error of the second encoder is too large	Synchronization error of full closed loop feedback and motor feedback is larger than PA78
36	Bus Encoder Receive	Check the encoder wire, and pay attention to

	Error	double-ended grounding of shielded wire
37	Data comparison error checking of bus encoder	Check the encoder wire, and pay attention to double-ended grounding of shielded wire
39	Bus encoder feedback disconnection	Loose or disconnected encoder line connection
40	Bus Encoder Battery Loss of Power	Battery disconnection or low voltage
42	Error in reading motor parameters	Incomplete reading of motor parameters in motor encoder

Alarm No.	Alarm name	Fault analysis
43	Motor power mismatch	The rated current of the servo motor exceeds the rated current of the driver
44	Parameter exception	PF16 is not set correctly
45	MODBUS communication anomaly	Check RS485 connection and parameter format to eliminate interference
60	IPM module temperature is too high	IPM temperature is higher than PA103 set value
111	The second encoder is broken	The second encoder incremental encoder ABZ has broken line
112	Loss of Z pulse of second encoder	Z pulse loss of incremental encoder with second encoder

7.2 Troubleshooting

(Table 7.2)

Alarm No.	Alarm name	Running status	Causes	Solution
1	Overspeed	Power on state	■ Drive or motor failure	■ Replace the drive
			■ Check parameters	■ See if it is enabled internally
		When enabled	■ Short circuit between UVW of motor	■ Check the motor connection
			■ Encoder 0 bit deviation	■ Zero adjustment of motor encoder
			■ Incorrect servo parameters	■ Restore servo parameters
		During the operation of the motor	■ Short circuit of motor joint	■ Whether there is water inlet in the motor joint
			■ Command speed is too fast	■ Reduce command speed
			■ Unstable acceleration and deceleration	■ Adjust acceleration and deceleration constant
			■ Excessive load	■ Reduce the load
2	Overvoltage of main circuit	Power on state	■ Power supply voltage is too high	■ Reduce the supply voltage
			■ Power waveform is abnormal	■ Replace the power supply
			■ Server failure	■ Replace the server
		At runtime	■ Circuit board failure	■ Replace the server
			■ Brake circuit failure	■ Check brake resistance
3	Main circuit undervolt	Power on state	■ The main supply voltage is too low	■ Change the power supply
			■ Circuit board	■ Replace the server

	age		failure	
			■ Soft start circuit is broken	■ Replace the server
		At runtime	■ Insufficient transformer capacity	■ Increase transformer
			■ Loose power supply wiring	■ Fasten the terminal
			■ Circuit board failure	■ Replace the server
4	Position out of tolerance	At runtime	■ Command speed is too fast	■ Reduce command speed
			■ Input voltage is too low	■ Check R/S/T power supply
			■ Parameter PA17 is too small	■ Appropriate increase of parameters
			■ Loose or overloaded connection	■ Check fastening wiring

Alarm No.	Alarm name	Running status	Causes	Solution
5	Motor overheating	Power on state	■ Motor damage	■ Replace the motor
			■ Sensor connection is disconnected	■ Check the line and change the sensor
		At runtime	■ Motor power is too low	■ Replace high-power motor
			■ Short circuit of motor interface	■ Do a good job of waterproof and dustproof
			■ Incorrect servo parameters	■ Adapt to the Motor model
6	Motor locked rotor	At runtime	■ The transmission part is stuck	■ Disengage the mechanical part
			■ Excessive load	■ Reduce the load
			■ Motor fault	■ Replace the motor
7	Prohibit exceptions	Power on state	■ Check parameters and wiring	■ PA20, CW and CWW wiring
8	Position deviation counter overflow	At runtime	■ Motor locked rotor	■ Check the load
			■ Abnormal command frequency	■ The speed of the upper computer is reduced
			■ Wiring error	■ Check the line and connect the shielding layer
			■ Encoder damage	■ It is fragile and needs to be replaced
			■ Encoder 5V Low Voltage	■ Shorten the connection or change the drive
		At runtime	■ CN2 Plug Contact Bad	■ Fastening CN2 plug

			■ Hidden danger of cable virtual welding	■ Replace the cable
			■ Circuit board chip failure	■ Check interference and change servers
11	IPM module failure	Power on state	■ Circuit board failure	■ Replace the server
			■ Short circuit between UVW of motor	■ Check the line and replace the motor
		At runtime	■ Motor fault	■ Check the line and replace the motor
			■ Poor electrical connection	■ Check the line and prevent interference
12	Overcurrent	Power on state or at runtime	■ The motor is broken	■ Replace the motor
			■ Short circuit between UVW	■ Check the line and replace the server
			■ Overload	■ Change the high-power drive motor

Alarm No.	Alarm name	Running status	Causes	Solution
13	Overload	Power on state	■ Motor damage water inflow	■ Replace the motor
			■ Bad circuit board	■ Replace the server
		At runtime	■ Excessive mechanical load	■ Load reduction
			■ Mechanical transmission is not smooth	■ Check mechanical transmission parts
			■ Short circuit between UVW	■ Check the cable
			■ The brake is not released	■ Ensure the stability of brake power supply
14	Brake failure	Power on state	■ Circuit board failure	■ Replacement servo
		At runtime	■ Bad brake resistance	■ Check the brake resistance connection
			■ Insufficient braking capacity	■ Extend acceleration and deceleration time
			■ Excessive mechanical inertia	■ Reduce mechanical inertia
			■ Encoder UVW connection is incorrect	■ Check the connection and replace it
			■ Unstable encoder power supply	■ It is required that the voltage of 5V should be stable
			■ Wrong number of encoder lines	■ Adjust the number of lines corresponding to parameters
16	Therma	Power on	■ Servo parameter	■ Restore the

	l overloa d of motor	state	error	factory value
		At runtime	■ Poor mechanical transmission	■ Increase lubrication and reduce load
			■ Long overload time	■ Reduce load and smooth start and stop
17	Speed respons e fault	At runtime	■ Long-term error is too large	■ Adjust parameter position feedforward
			■ Start-stop time is too short	■ Adjust acceleration and deceleration time
20	ROM alarm	At runtime	■ Parameter storage alarm	■ Recovery parameter replacement servo
22	Wire arrange ment fault	Power on state	■ Replace cable	■ Plug and unplug the cable from the new
29	Insuffici ent torque	At runtime	■ Exceeding the set torque	■ Check the parameters PA30 and PA31
			■ Check motor selection	■ Refit motor
			■ Mechanical overload	■ Unload and try again
34	Softwar e version mismat ch	Power on state	■ Software burning error	■ Replace the drive
			■ Factory value not restored	■ DEF recovery parameters

Alarm No.	Alarm name	Running status	Causes	Solution
35	The synchronization error of the second encoder is too large	Runtime	■ Encoder feedback direction ■ Too heavy a load	■ The feedback direction of DP-POS and DP-SPO should be consistent ■ Check mechanical load
36	Bus Encoder Receive Error	Power on state	■ Encoder line disconnected	■ Tighten the encoder line
			■ Bad encoder	■ Replace encoder
			■ Encoder line error	■ Replace the correct encoder line
37	Data comparison error checking of bus encoder	Power on state	■ Encoder line disconnected	■ Tighten the encoder line
			■ Bad encoder	■ Replace encoder
			■ Encoder line error	■ Replace the correct encoder line
39	Bus encoder feedback disconnection	Power on state	■ Encoder line disconnected	■ Tighten the encoder line
			■ Bad encoder	■ Replace encoder
			■ Encoder line error	■ Replace the correct encoder line
40	Bus Encoder Battery Loss of Power	Power on state	■ Loose battery line	■ Check battery wiring
			■ Battery life expires	■ Replace the battery
			■ Bad encoder	■ Replace encoder
42	Error in reading motor	Power on state	■ Incorrect encoder parameters	■ Replace the motor
			■ Loose encoder line	■ Replace encoder

	parameters			line
43	Motor power mismatch	Power on state	■ Excessive motor selection	■ Replace the low power motor
			■ Low driving current	■ Replace the high power driver
44	PF16 anomaly	Power on state		■ Correctly match the encoder

Alarm No.	Alarm name	Running status	Causes	Solution
45	MODBUS communication anomaly	Power on state	■ Detect RS485 communication baud rate and check bit setting; 2. Detect whether the station address setting of the slave station RS485 communication is set ■ There are repetitions; 3. Detecting whether the baud rate of the slave station is consistent with that of the master station; 4. Whether the communication cable uses double-ended shielding;	
		At runtime	■ Detect RS485 communication baud rate and check bit setting; ■ Detecting whether the station address setting of the slave station RS485 communication is duplicated; ■ Detecting whether the baud rate of the slave station is consistent with that of the master station; 4. Whether the communication cable uses double-ended shielding;	
60	IPM module temperature is too high	At runtime	■ PIM temperature is too high	
111	The second encoder is broken	At runtime	■ Second feedback disconnection	
112	Loss of Z pulse of second encoder	At runtime	■ Loss of Z pulse of second encoder	

■ If the Alm red light is on and the alarm number "Err--xx" in the digital tube flashes, it is a driving alarm, so it is necessary to cut off the power in time and find out the alarm reason.

Chapter VIII Debugging and Application

8.1 Quick Debugging Note Item

8.1.1 Make sure the connection is correct

- R, S, T and U, V, W cannot be connected in reverse or loosened.
- L Series input voltage is three-phase 220V, H Series input voltage is three-phase 380V.
- Check that 18 pins in interface CN1 are connected with + 24V, and 36 and 9 pins are connected with 0V correctly, and the polarity cannot be reversed.
- Check whether + 5V in interface CN2 is correct, and the polarity cannot be reversed.
- Check that pin 1 or 2 in interface CN3 must be connected with upper computer 0V.
- Whether the motor connecting cable is short-circuited or grounded.
- The wiring of the same motor must correspond to the same driver.

8.1.2 Determine the power-on sequence

- C7-13I Serial Servo High Power and Control Power are energized at the same time.
- If the brake with lock brake motor does not need servo control, it must be satisfied that the brake is electrified more than 1 second after servo is enabled, so as to ensure the position accuracy and safety of the equipment.
- Because of the integrated design of high-voltage and control of C7-13I series servo, the design of power-off and delayed discharge of control and display circuit is adopted, and the internal high-voltage is cut off immediately after the power supply is cut off, and the display and control circuit is automatically cut off after delayed discharge for several seconds.

In order to use the drive smoothly, please read the following timing diagram carefully:

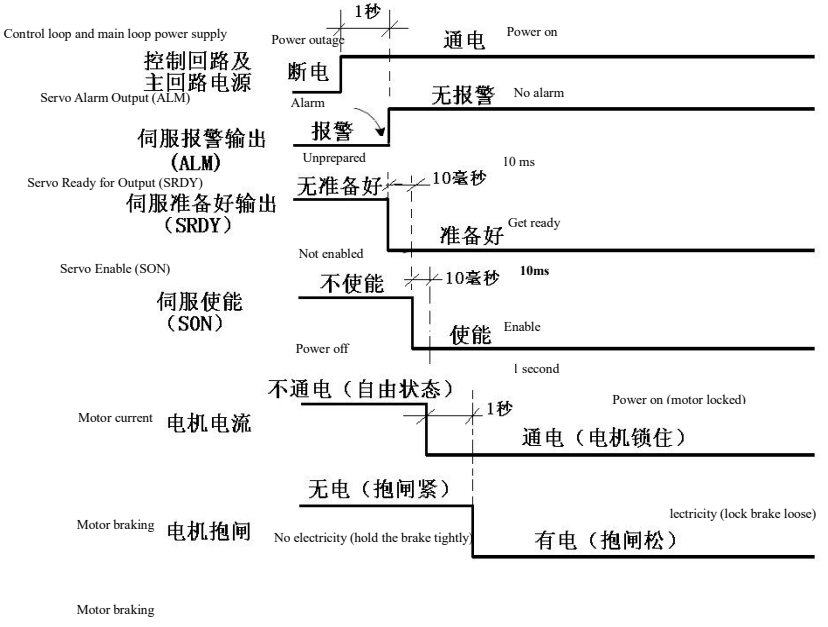


Fig. 8.1 Power-on and Alarm Sequence Diagram

8.2 Position Control (Quick Adjustment of Parameters After Power-on)

Example: C7-13iC30L drive with 110ST-M05415LMB motor (position control)

1. There is no problem in determining the three-phase 220V voltage between R, S and T after being electrified.

2. Do not turn on the servo enable signal temporarily, check whether there is an alarm, and observe the red light (ALM). If there is no red light, it works normally, so you can proceed to the next step.

3. When powered on, the driver will automatically adapt parameters through the bus encoder.

a. Enter Parameter Management Mode "EE-", adjust to "EE-def", press and hold the Enter key for 3 seconds, and then "Finish" appears, indicating that all other

parameters of the driver except motor parameters have recovered to the factory default values.

b. After restarting and powering on, check that several key parameters of position control (Table 8.1 below) are confirmed to be correct, the upper computer can give an enable signal (or internal enable), and give a pulse after the (Run) green light is on. And observe the dynamic effect of the motor, and modify the gain appropriately to adjust the motor characteristics.

PA-4	Control mode	→	Factory value is 0
PA-12	Electronic gear molecule	→	Factory value is 1
PA-13	Electronic gear denominator	→	Factory value is 1
PA-20	Invalid driver prohibition	→	Factory value is 1
PA-5	Velocity proportional gain	→	Factory value is 150
PA-6	Velocity proportional gain	→	Factory value is 20
PA-7	Torque filter	→	Factory value is 100
PA-8	Velocity detection filter	→	Factory value is 100
PA-9	Position proportional gain	→	Factory value is 80
PA-10	Position feedforward gain	→	Factory value is 0

Table 8.2 Adjustment of key parameters of position control

8.3 Speed Control (Quick Adjustment of Parameters After Power-on)

Example: C7-13iC30L drive with 110ST-M05415LMB motor (speed control)

1. There is no problem in determining the three-phase 220V voltage between R, S and T after being electrified.

2. Determine the differential input or single-ended input wiring of speed analog.

3. Do not turn on the servo enable signal temporarily, check whether there is an alarm, and observe the red light (ALM). If there is no red light, it works normally, so you can proceed to the next step.

4. When powered on, the driver will automatically adapt parameters through the bus encoder.

a. Enter Parameter Management Mode "EE-", adjust to "EE-def" and hold down the Enter key for 3 seconds. After "Finish" appears, it means that all parameters of the driver except motor parameters have been restored to the factory default values.

b. After re-energizing, several key parameters of speed control (Table 8.2 below) can be checked to be correct, and the upper computer can give an enable signal (or internal enable). After the (Run) green light is on, an analog signal can be given after automatic zero adjustment. And observe the dynamic effect of the motor, and modify the gain and zero drift value appropriately.

PA-4	Control mode	→	Setting is 1
PA-20	Invalid drive ban	→	Factory value is 1
PA-22	Internal and external speed instruction selection	→	Setting is 1
PA-40	Acceleration time constant	→	Set as needed
PA-41	Deceleration time constant	→	Set as needed
PA-43	Analog speed instruction gain	→	Set as needed
PA-45	Simulated speed zero drift compensation	→	Set as needed
PA-49	Simulated zero speed sill	→	Set as needed

Table 8.3 Adjustment of key parameters of speed control

8.4 Torque Control (Quick Adjustment of Parameters After Power-on)

Example: C7-13iC30Lc drive with 110ST-M05415LMB motor (torque control)

1. There is no problem in determining the three-phase 220V voltage between R, S and T after being electrified.

2. Determine the differential input or single-ended input connection of improved torque analog.

3. Do not turn on the servo enable signal temporarily, check whether there is an alarm, and observe the red light (Alm). If there is no red light, the work is normal, and the next step can be proceeded.

4. When powered on, the driver will automatically adapt parameters through the bus encoder.

a. Enter Parameter Management Mode "EE-", adjust to "EE-def" and hold down the Enter key for 3 seconds. After "Finish" appears, it means that all parameters of the driver except motor parameters have been restored to the factory default values.

b. After re-energizing, several key parameters of torque control (Table 8.3 below) can be checked to be correct, and the upper computer can give an enable signal (or internal enable). After the (Run) green light is on, an analog signal can be given after automatic zero adjustment. And observe the dynamic effect of the motor, and modify the gain and zero drift value appropriately.

PA-4	Control mode	→	Setting is 6
PA-20	Invalid drive ban	→	Factory value is 1
PA-40	Acceleration time constant	→	Set as needed
PA-41	Deceleration time constant	→	Set as needed
PA-43	Analog speed instruction gain	→	Set as needed
PA-45	Simulated speed zero drift compensation	→	Set as needed
PA-49	Simulated zero speed sill	→	Set as needed

Table 8.4 Adjustment of key parameters of torque control

8.5 Dynamic Electronic Application

■Mainly for position control applications.

■The so-called dynamic electronic gear:

■It refers to the dynamic switching of electronic gear ratio through the on-off of input terminals in servo drive operation.

■Mainly reflected in: the upper computer maximum output frequency limit, when the electronic gear ratio value is very small, the pulse resolution is high, the maximum speed can not be reached. However, in order to meet the maximum speed, the proportion of electronic gears in the upper computer will be very large, and the position resolution will be low. When the position resolution is low, the transmission accuracy will be affected (the system will send out a pulse only when the system command is 2 microns). In order to improve the speed and transmission accuracy, a number of electronic gear ratios with different ratios are added to switch, so as to achieve better results.

■Example: In the application of CNC machine tools, the first electronic gear ratio is set as "1/1", "PA12/PA13" and the second electronic gear ratio is "10/1", "PA52/PA13".

■G91 G01 X 10 F100//First gear ratio 1: 1 is 10mm

■M 16//NC Machine Tool M Code PLC Outputs a Point to Make INH Signal

■G91 G01 X10 F100//Second gear ratio 10: 1 is 100mm

■M17//NC machine tool M code PLC turns off INH signal

■M30//End of program

PA--4	Control mode	→	Setting is 0
PA--20	Invalid drive ban	→	Factory value is 1
PA-12	Electronic gear molecule	→	1
PA-13	Electronic gear denominator	→	1
PA-52	The second electronic gear ratio molecule	→	1

Table 8.5 Electronic Gear Ratio Parameter Adjustment

8.6 Debugging Typical Problems

1. (Run) Enable the green light is not on

a. Check whether the three-phase R, S and T voltages are normal.

b. CN1 Interface 18 pins, + 24V is correct.

c. CN1 Interface 10 pins, whether and 0V connected.

d. If the lamp is not on, try again with internal enable PA53=0001.

2. "Err-36, Err-37, Err-39, Err-40, Err-44" alarm appears

Photoelectric encoder is a typical fragile sensitive element, which needs to be protected in every link

a. The above alarm indicates that there is a problem with the encoder or encoder connection.

b. Whether the shielding layer is well grounded at both ends, and the plug has water or impurities.

c. Whether the long connection will attenuate the encoder power supply at 5V.

d. Interference problem, whether there is a strong magnetic and strong electrical line next to it, and if so, isolate it as much as possible.

3. Jitter of servo motor

a. Determine whether the load and inertia of the servo motor are within the allowable range of the motor.

b. Adjust parameters PA-5, PA-6 and PA-9.

c. Observe the difference of motor jitter at high speed and low speed to add and subtract parameters.

4. Noise in servo motor

a. Determine the load and inertia of the servo motor within the allowable range of the motor.

b. Adjust parameters PA-5, PA-7, PA-8 and PA-9.

c. Observe the difference of motor noise at high speed, low speed and stop to add and subtract parameters.

5. Setting of electronic gear ratio

Take CNC machine tools as an example:

a. The servo motor is directly connected with the screw (the motor rotates 1 revolution and the screw rotates 1 revolution)

■If the numerical control system is programmed to 10MM, it will send out 10000 pulses

■The photoelectric encoder is 2500 lines

■The screw pitch is 6MM

PA12 / PA13:

= (command value mm) * (number of encoder lines) * (quadruple frequency)/(pitch) * (number of pulses)

= 10*2500*4/6*10000

= 5/3

Namely: PA12=5, PA13=3 ;

b. There is a reducer between the servo motor and the screw (the motor rotates 5 times and the screw rotates 2 times)

■If the numerical control system is programmed to send out 10000 pulses at 10MM

■The photoelectric encoder is 2500 lines

■The screw pitch is 6MM

PA12 / PA13:

= (command value mm) * (number of encoder lines) * (quadruple frequency) * (number of motor turns)/(pitch) * (number of pulses) * (number of screw turns)

= 10*2500*4*5/6*10000*2

= 25/6

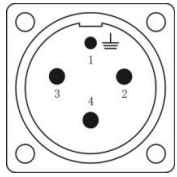
Namely: PA12=25, PA13=6 ;

Chapter IX Servo Motor Part

9.1 Servo Motor Plug Definition and Connection

I. Power socket (4 cores):

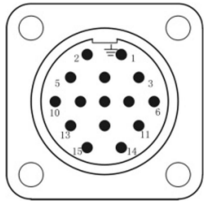
Winding lead	U	V	W	⏚
Socket No.	2	3	4	1



U, V and W are the lead ends of servo motor winding coils. Round butt plugs are used for 80-stand motors.

II. Feedback element socket:

■Standard incremental encoder (F) socket (15 cores):

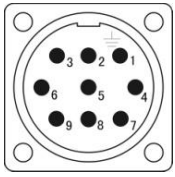


Signal	+5 V	0V	A+	A-	B+	B-	Z+	Z-	U+	U-	V+	V-	W+	W-	⏚
Socket No.	2	3	4	7	5	8	6	9	10	13	11	14	12	15	1

A +, B +, Z +, A-, B-, Z-, U +, U-, V +, V-, W +, W-signals are incremental encoder output signals.

■ Wire -saving incremental encoder (F1) socket (9 cores):

Signal	+5 V	0V	A+	A-	B+	B-	Z+	Z-	⏚
Socket No.	2	3	4	7	5	8	6	9	1



A +, B +, Z +, A-, B-, Z-signals (composite signals) are output signals of line-saving encoder.Round butt plugs are used for 80-stand motors.

■ Bus Encoder (M) socket (7 cores):

Signal	+5V	0V	SD+	SD-	E+	E-	⏚
Socket No.	7	5	6	4	3	2	1

SD + and SD-are data output signals; E + and E-are battery leads.

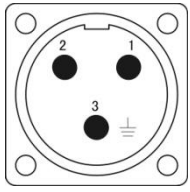
■Resolver (R) socket (7 cores):

Signal	R1	R2	S1	S3	S2	S4	⏚
Socket No.	2	3	4	5	6	7	1

R1-R2 is the primary signal; S1-S3 and S2-S4 are secondary signals.

III. Power loss brake (lock brake) socket:

Power supply	VDC (DC Power Supply), non-polar access requirements.		⏚
Socket No.	1	2	3



Parameters of 110 frame equipped with power loss brake:
Working voltage: 24VDC (-15% ~ + 10%), working current: ≤ 0. 6A, braking torque: ≥ 8 Nm.
Parameters of 130 frame equipped with power loss brake:
Working voltage: 24VDC (-15% ~ + 10%), working current: ≤ 0. 6A, braking torque: ≥ 12 Nm.
Parameters of 150 frame equipped with power loss brake:
Working voltage: 100VDC (-15% ~ + 10%), working current: ≤ 0. 4A, braking torque: ≥ 30 Nm.

9.2 Servo Motor Selection Instructions

■Parametric characteristics

Frame (mm): 40 ~ 264	Rated torque （Nm）：1.3～27
Rated speed (rpm): 1500 ~ 6000	Rated power （Kw）：0.05～37
Standard Feedback Component: Incremental Encoder (2500C/T)	Loss of power brake: optional
Insulation grade: B	Protection level: sealed self-cooling IP65
Pole pair: 4	Installation method: flange
Ambient temperature: 0 ~ 55 ℃	Ambient humidity: less than 90% (no condensation)
Excitation mode: permanent magnet type	Adaptive driver operating voltage (VAC): 220

■Description of servo motor model number:

110	ST	–	M	020	30	L	F	B	Z
(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)	(9)

(1) Base number

(2) AC permanent magnet synchronous servo motor

(3) Feed element type: photoelectric encoder

(4) Rated torque: Three digits × 0.1Nm

(5) Rated speed: Two digits × 100rpm

(6) Driver working voltage (VAC): L 220V; H 380V ；

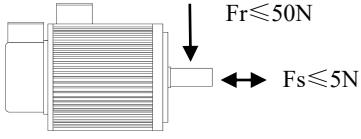
(7) Optional encoder code: S-sine cosine encoder (131072 C/T)
F - Incremental encoder (2500 C/T) F1- Provincial incremental encoder (2500C/T)
M-Absolute R-Rotational

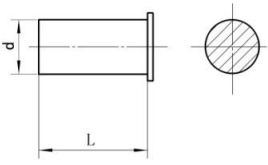
(8) Medium inertia

(9) Installed a power loss brake

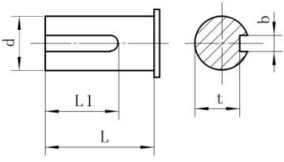
9.3 Size and Selection Parameters of Servo Motor

■ 40 bases

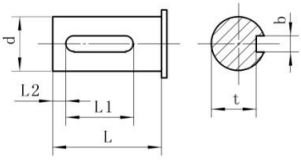
Motor model	40ST-M00130LMB	40ST-M00330LMB
Power	0.05Kw	0.1 Kw
Rated torque	0.16Nm	0.32Nm
Rated speed	3000 rpm	3000 rpm
Rated current	0.4A	0.6 A
Rotor inertia	0.025×10^{-4} Kgm^2	0.025×10^{-4} Kgm^2
Maximum current	1.2A	1.8 A
Maximum torque	0.48Nm	0.96 Nm
Maximum radial and axial forces:		



Type A Key

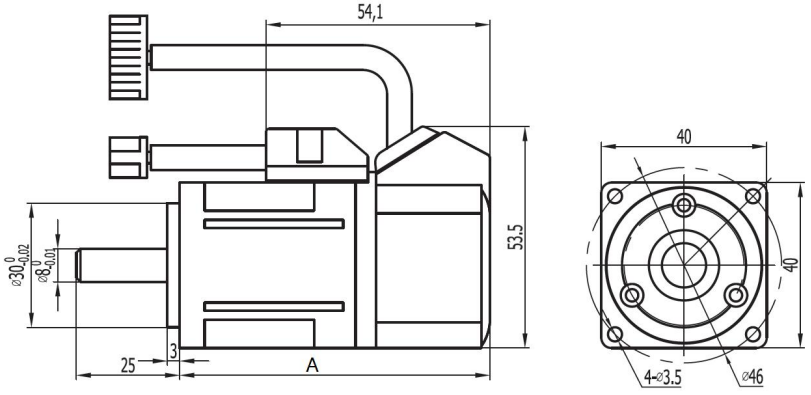


Type B Key



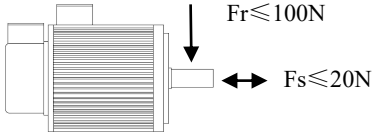
Type C Key

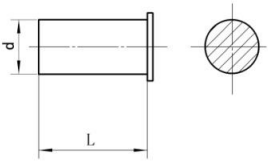
40 bases:



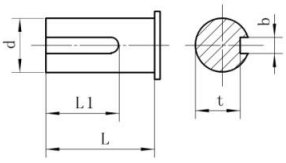
Model	A (mm)	B (mm)	L (mm)	L1 (mm)	d (mm)	b (mm)	t (mm)
40ST-M00130LMB	75	54.1	22	19	Φ8 0 -0.013	3.5 0 -0.03	0 -0.1
40ST-M00330LMB	90	54.1	22	19	Φ8 0 -0.013	3.5 0 -0.03	0 -0.1

■ 60 bases

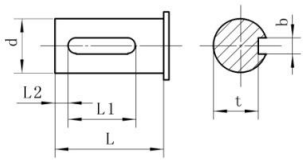
Motor model	60ST-M00630LMB	60ST-M01330LMB	60ST-M01930LMB
Power	0.2 Kw	0.4 Kw	0.6 Kw
Rated torque	0.64Nm	1.3Nm	1.9 Nm
Rated speed	3000 rpm	3000 rpm	3000 rpm
Rated current	1.2A	2.8A	3.5A
Rotor inertia	0.175×10^{-4} Kgm^2	0.29×10^{-4} Kgm^2	0.39×10^{-4} Kgm^2
Maximum current	3.6 A	8.4 A	10.5A
Maximum torque	1.9 Nm	3.9 Nm	5.7 Nm
Maximum radial and axial forces:			



Type A Key

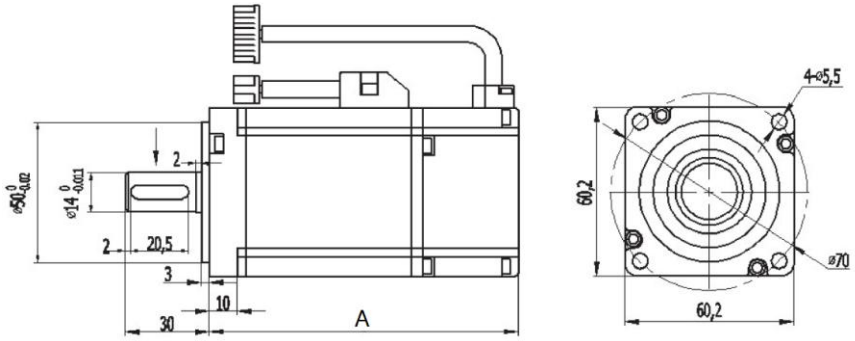


Type B Key



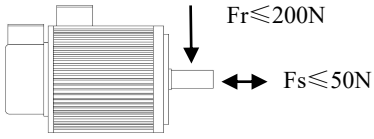
Type C Key

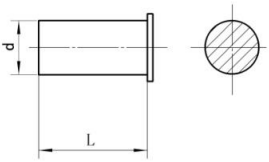
60bases:



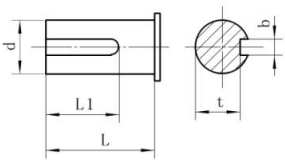
Model	A (mm)	B (mm)	L (mm)	L1 (mm)	d (mm)	b (mm)	t (mm)
60ST-M00630LMB	116	54.1	25	20	Φ14 0 -0.013	5.5 0 -0.03	11 0 -0.1
60ST-M01330LMB	141	54.1	25	20	Φ14 0 -0.013	5.5 0 -0.03	11 0 -0.1
60ST-M01930LMB	169	54.1	25	20	Φ14 0 -0.013	5.5 0 -0.03	11 0 -0.1

■ 80 bases

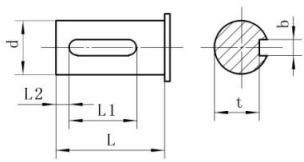
Motor model	80ST-M01330LMB	80ST-M02430LMB	80ST-M03330LMB
Power	0.4 Kw	0.75 Kw	1.0 Kw
Rated torque	1.3 Nm	2.4 Nm	3.3 Nm
Rated speed	3000 rpm	3000 rpm	3000 rpm
Rated current	2.6 A	4.2 A	4.2 A
Rotor inertia	0.74×10^{-4} Kgm^2	1.2×10^{-4} Kgm^2	1.58×10^{-4} Kgm^2
Maximum current	7.8 A	12.6 A	12.6 A
Maximum torque	3.9 Nm	7.2 Nm	9.9 Nm
Maximum radial and axial forces:			



TYPE A KEY

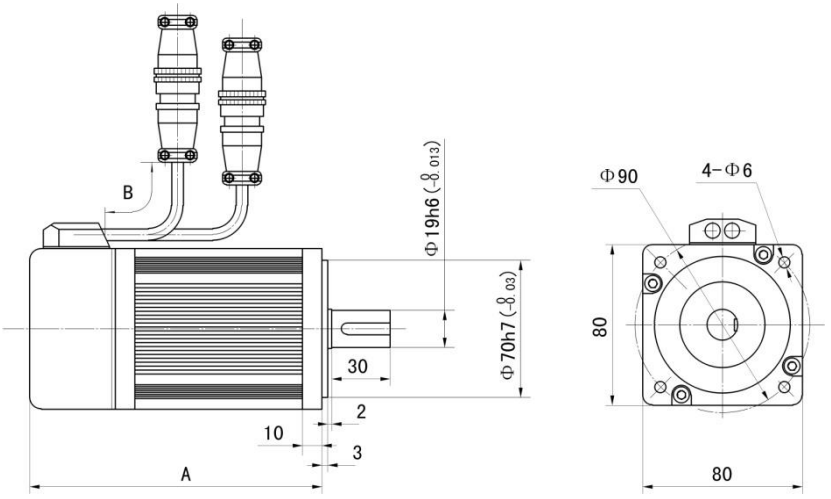


TYPE B KEY



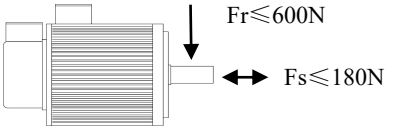
TYPE C KEY

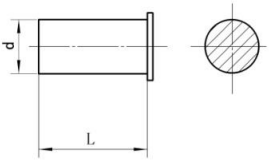
80bases:



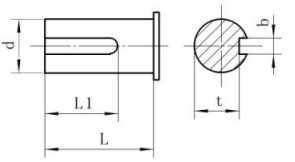
Model	A (mm)	B (mm)	L (mm)	L1 (mm)	d (mm)	b (mm)	t (mm)
80ST-M01330LMB	128	500	30	25	Φ19 0 -0.013	6 0 -0.03	15.5 0 -0.1
80ST-M02430LMB	150	500	30	25	Φ19 0 -0.013	6 0 -0.03	15.5 0 -0.1
80ST-M03330LMB	165	500	30	25	Φ19 0 -0.013	6 0 -0.03	15.5 0 -0.1

■ 110 bases

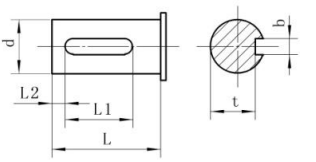
Motor model	110ST-M02030 LMB	110ST-M04030 LMB	110ST-M05030 LMB	110ST-M06020 LMB	110ST-M06030 LMB
Power	0.6 Kw	1.2 Kw	1.5 Kw	1.2 Kw	1.6 Kw
Rated torque	2.0 Nm	4.0 Nm	5.0 Nm	6.0 Nm	6.0 Nm
Rated speed	3000 rpm	3000 rpm	3000 rpm	2000 rpm	3000 rpm
Rated current	4.0 A	5.0 A	6.0 A	6.0 A	8.0 A
Rotor inertia	0.425×10^{-3} Kgm^2 (0.489×10^{-3} Kgm^2)	0.828×10^{-3} Kgm^2 (0.892×10^{-3} Kgm^2)	0.915×10^{-3} Kgm^2 (0.979×10^{-3} Kgm^2)	1.111×10^{-3} Kgm^2 (1.175×10^{-3} Kgm^2)	1.111×10^{-3} Kgm^2 (1.175×10^{-3} Kgm^2)
Maximum current	12.0 A	15.0 A	18.0 A	18.0 A	24.0 A
Maximum torque	6.0 Nm	12.0 Nm	15.0 Nm	18.0 Nm	18.0 Nm
Maximum radial and axial forces:					



TYPE A KEY

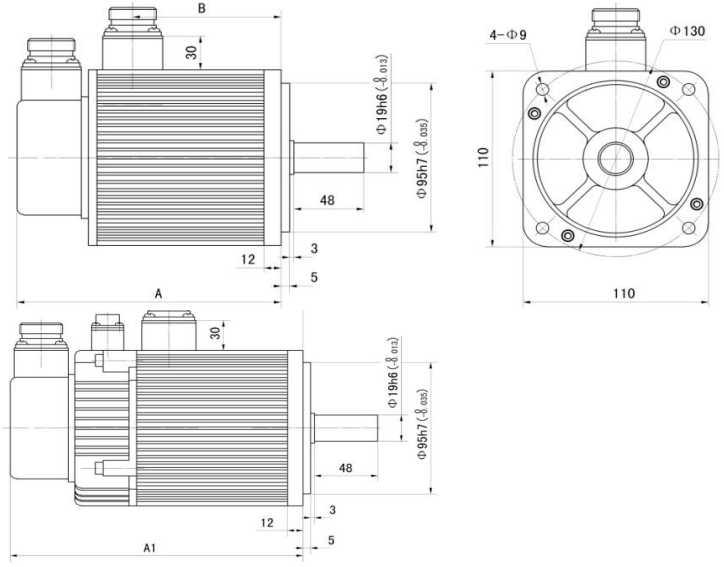


TYPE B KEY



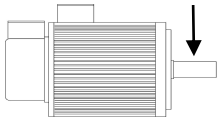
TYPE C KEY

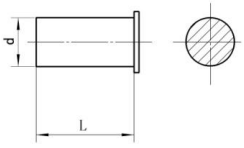
110 bases:



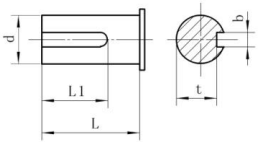
Model	A (mm)	A1 (mm)	B (mm)	L (mm)	L1 (mm)	L2 (mm)	d (mm)	b (mm)	t (mm)
110ST-M02030LMB	158	200	76	48	40	3	Φ19 0 -0.013	6 0 -0.03	15.5 0 -0.1
110ST-M04030LMB	185	227	102	48	40	3	Φ19 0 -0.013	6 0 -0.03	15.5 0 -0.1
110ST-M05030LMB	200	242	118	48	40	3	Φ19 0 -0.013	6 0 -0.03	15.5 0 -0.1
110ST-M06020LMB	217	259	134	48	40	3	Φ19 0 -0.013	6 0 -0.03	15.5 0 -0.1
110ST-M06030LMB									

■ 130 bases

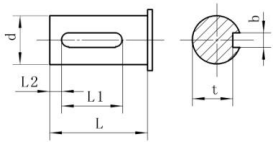
Motor model	130ST-M04025LMB	130ST-M05020LMB	130ST-M05025LMB	130ST-M06025LMB
Power	1.0 Kw	1.0 Kw	1.3 Kw	1.5 Kw
Rated torque	4.0 Nm	5.0 Nm	5.0 Nm	6.0 Nm
Rated speed	2500 rpm	2000 rpm	2500 rpm	2500 rpm
Rated current	4.0 A	5.0 A	5.0 A	6.0 A
Rotor inertia	1.101×10^{-3} Kgm^2 (1.268×10^{-3} Kgm^2)	1.333×10^{-3} Kgm^2 (1.50×10^{-3} Kgm^2)	1.333×10^{-3} Kgm^2 (1.50×10^{-3} Kgm^2)	1.544×10^{-3} Kgm^2 (1.711×10^{-3} Kgm^2)
Maximum current	12.0 A	15.0 A	15.0 A	18.0 A
Maximum torque	12.0 Nm	15.0 Nm	15.0 Nm	18.0 Nm
Maximum radial and axial forces:	 Fr≤900N Fs≤300N			



TYPE A KEY

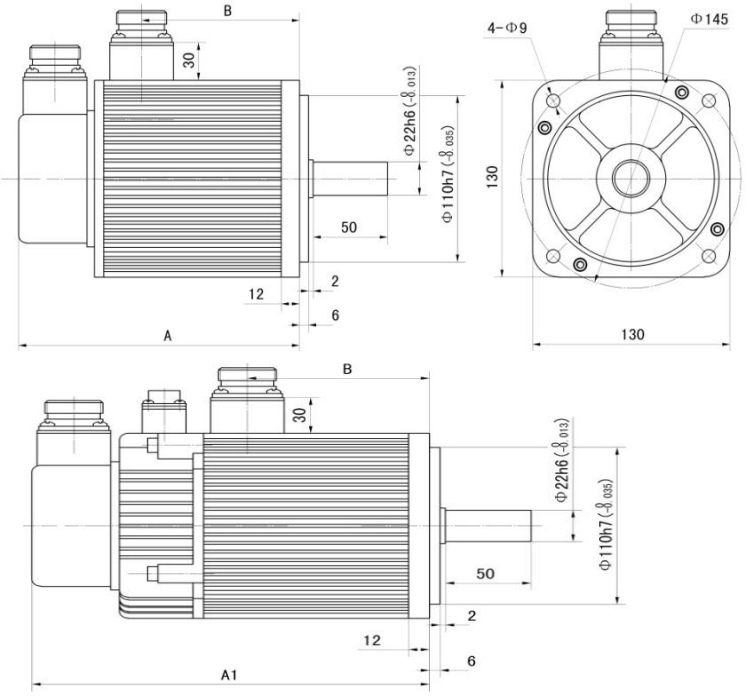


TYPE B KEY



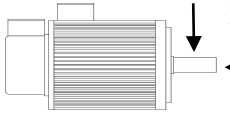
TYPE C KEY

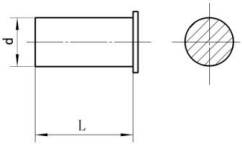
130 bases:



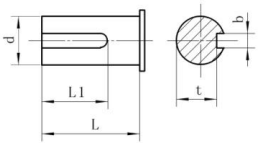
Model	A (mm)	A1 (mm)	B (mm)	L (mm)	L1 (mm)	L2 (mm)	d (mm)	b (mm)	t (mm)
130ST-M04025 LMB	163	205	80	50	40	5	Φ22 0 -0.013	6 0 -0.03	18.5 0 -0.1
130ST-M05020 LMB	171	213	89	50	40	5	Φ22 0 -0.013	6 0 -0.03	18.5 0 -0.1
130ST-M05025 LMB									
130ST-M06025 LMB	181	223	98	50	40	5	Φ22 0 -0.013	6 0 -0.03	18.5 0 -0.1

■ 130 bases

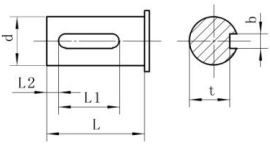
Motor model	130ST-M07720 LMB	130ST-M07725 LMB	130ST-M07730 LMB	130ST-M10015LMB
Power	1.6 Kw	2.0 Kw	2.4 Kw	1.5 Kw
Rated torque	7.7 Nm	7.7 Nm	7.7 Nm	10Nm
Rated speed	2000 rpm	2500 rpm	3000 rpm	1500 rpm
Rated current	6.0 A	7.5	9.0	6.0
Rotor inertia	2.017×10^{-3} Kgm^2 （2.184×10^{-3} Kgm^2）	2.017×10^{-3} Kgm^2 （2.184×10^{-3} Kgm^2）	2.017×10^{-3} Kgm^2 （2.184×10^{-3} Kgm^2）	2.595×10^{-3} Kgm^2 （2.762×10^{-3} Kgm^2）
Maximum current	18.0 A	20.7 A	27.0 A	18.0 A
Maximum torque	23.1Nm	23.1 Nm	23.1 Nm	30.0 Nm
Maximum radial and axial forces:				



Type A Key

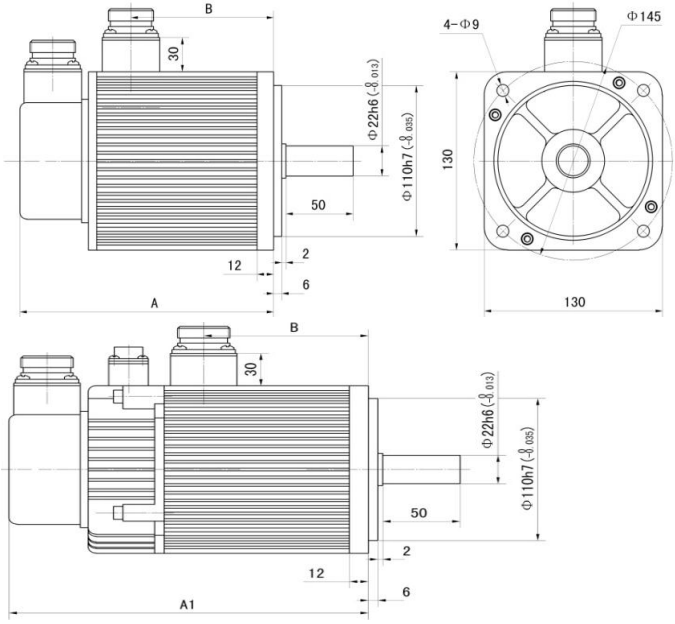


Type B Key



Type C Key

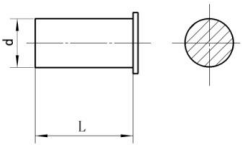
130 bases:



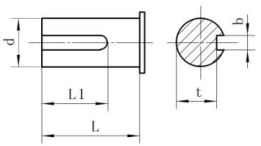
Model	A (mm)	A1 (mm)	B (mm)	L (mm)	L1 (mm)	L2 (mm)	d (mm)	b (mm)	t (mm)
130ST-M07720 LMB	195	237	112	50	40	5	Φ22 0 -0.013	6 0 -0.03	18.5 0 -0.1
130ST-M07725 LMB									
130ST-M07730 LMB									
130ST-M10015 LMB	219	261	136	50	40	5	Φ22 0 -0.013	6 0 -0.03	18.5 0 -0.1

■ 130 bases

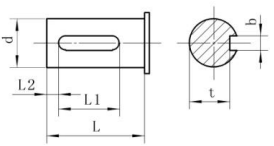
Motor model	130ST-M10025LMB	130ST-M15015LMB	130ST-M15025LMB
Power	2.6 Kw	2.3 Kw	3.9 Kw
Rated torque	10.0 Nm	15.0 Nm	15.0 Nm
Rated speed	2500 rpm	1500 rpm	2500 rpm
Rated current	10.0 A	9.5 A	17.0 A
Rotor inertia	2.595×10^{-3} Kgm^2 (2.762×10^{-3} Kgm^2)	4.32×10^{-3} Kgm^2 (4.487×10^{-3} Kgm^2)	4.32×10^{-3} Kgm^2 (4.487×10^{-3} Kgm^2)
Maximum current	30.0 A	28.5 A	51.0 A
Maximum torque	30.0 Nm	45.0 Nm	45.0 Nm



Type A Key

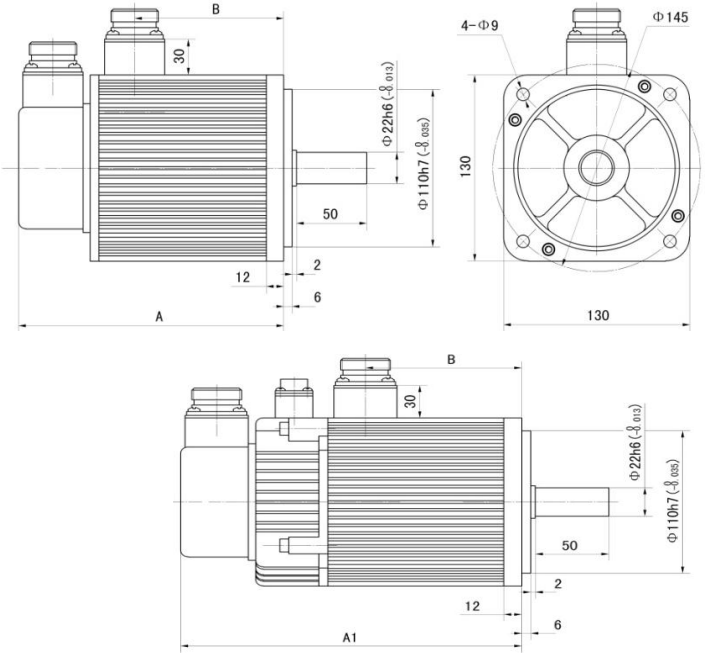


Type B Key



Type C Key

130 bases:



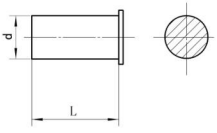
Model	A (mm)	A1 (mm)	B (mm)	L (mm)	L1 (mm)	L2 (mm)	d (mm)	b (mm)	t (mm)
130ST-M10025 LMB	219	261	136	50	40	**5**	Φ22 0 -0.013	6 0 -0.03	18.5 0 -0.1
130ST-M15015 LMB	267	309	184	50	40	**5**	Φ22 0 -0.013	6 0 -0.03	18.5 0 -0.1
130ST-M15025 LMB									

■ 150 bases

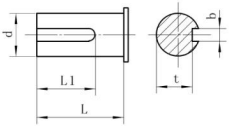
Motor model	150ST-M15025LMB	150ST-M18020LMB
Power	3.8 Kw	3.6 Kw
Rated torque	15.0 Nm	18.0 Nm
Rated speed	2500 rpm	2000 rpm
Rated current	16.5 A	16.5 A
Rotor inertia	6.15×10^{-3} Kgm^2 （6.75×10^{-3} Kgm^2）	6.33×10^{-3} Kgm^2 （6.93×10^{-3} Kgm^2）
Maximum current	49.5 A	49.5 A
Maximum torque	45.0 Nm	54.0 Nm

■ 150 bases

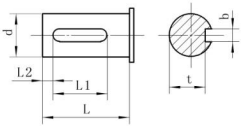
Motor model	150ST-M23020LMB	150ST-M27020LMB
Power	4.7 Kw	5.5 Kw
Rated torque	23.0 Nm	27.0 Nm
Rated speed	2000 rpm	2000 rpm
Rated current	20.5 A	20.5 A
Rotor inertia	8.94×10^{-3} Kgm^2 （9.54×10^{-3} Kgm^2）	11.19×10^{-3} Kgm^2 （11.79×10^{-3} Kgm^2）
Maximum current	61.5 A	61.5 A
Maximum torque	69.0 Nm	81.0 Nm



Type A key

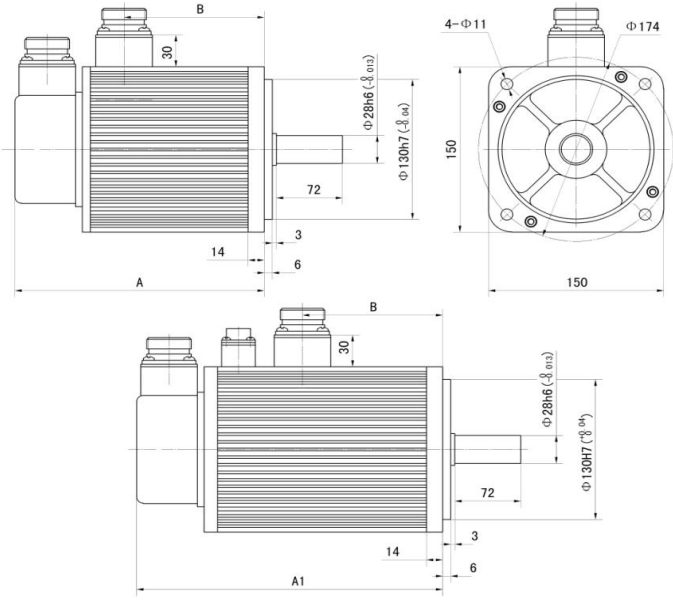


Type B key



Type C key

150 bases:



Model	A (mm)	A1 (mm)	L (mm)	L1 (mm)	L2 (mm)	d (mm)	b (mm)	t (mm)
150ST-M15025LMB	231	293	72	60 (Type B) 55 (Type C)	5	Φ28 0 -0.013	8 0 -0.03	24 0 -0.1
150ST-M18020LMB	250	312	72	60 (Type B) 55 (Type C)	5	Φ28 0 -0.013	8 0 -0.03	24 0 -0.1
150ST-M23020LMB	280	342	72	60 (Type B) 55 (Type C)	5	Φ28 0 -0.013	8 0 -0.03	24 0 -0.1
150ST-M27020LMB	306	368	72	60 (Type B) 55 (Type C)	5	Φ28 0 -0.013	8 0 -0.03	24 0 -0.1

■180 bases:

Motor model	Rated power Kw	Rated current A	Rated torque Nm	Rated speed Rpm
180-027020HMB	5.5	13.5	27	2000
180-036020HMB	7.5	20	36	2000
180-045018HMB	9	23.5	45	1800
180-055018HMB	11	30	55	1800
180-070016HMB	12.5	38	70	1600

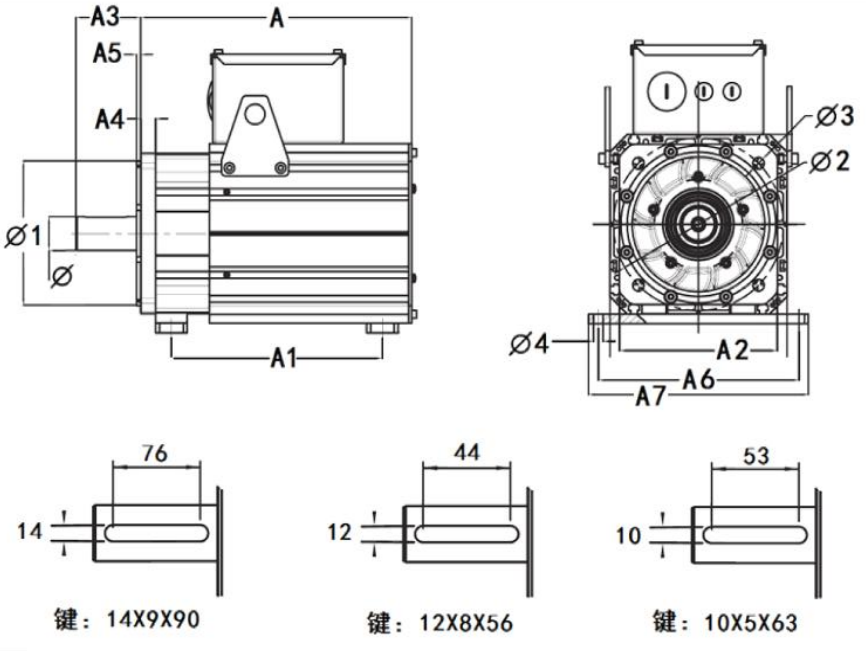
■200 bases:

Motor model	Rated power Kw	Rated current A	Rated torque Nm	Rated speed Rpm
200-038015HMB	6	11.6	38	1500
200-042020HMB	8.7	18.8	42	2000
200-055015HMB	20.2	16.6	55	1500
200-058020HMB	12	24.3	58	2000
200-074015HMB	26.5	26.5	74	1500
200-087020HMB	18.2	36.7	87	2000
200-103015HMB	16.4	33.2	103	1500
200-095620HMB	20.4	40.1	95.6	2000
200-128015HMB	20	41	128	1500
200-135020HMB	28.3	60.5	135	2000
200-186015HMB	29	61	186	1500
200-175020HMB	36.7	73.7	175	2000

■264 bases:

Motor model	Rated power Kw	Rated current A	Rated torque Nm	Rated speed Rpm
264-220015HMB	37	72.73	220	1500
264-215020HMB	49	96	215	2000
264-210015HMB	33	62	210	1500
264-269020HMB	56.3	120.7	269	2000
264-380015HMB	60	106	380	1500
264-349017HMB	62	145	349	1700
264-450015HMB	70	130	450	1500
264-481018HMB	91	196	481	1800

180 ~ 264 bases:



Key **key** **key**

Servo motor model	A	A1	A2	A3	A4	A5	A6	A7	∅	∅1	∅2	∅3	∅4
180-027020HMB	337	*	180	79	20	4	*	*	35	150	200	13.5	*
180-036020HMB	361	*	180	79	20	4	*	*	35	150	200	13.5	*
180-045018HMB	381	*	180	79	20	4	*	*	35	150	200	13.5	*
180-055018HMB	415	*	180	79	20	4	*	*	35	150	200	13.5	*
180-070016HMB	447	*	180	79	20	4	*	*	35	150	200	13.5	*

Servo motor model	A	A1	A2	A3	A4	A5	A6	A7	∅	∅1	∅2	∅3	∅4
200-042020HMB	344	267	200	82	19	5	254	278	42	180	215	14.5	12
200-058020HMB	379	285	200	82	19	5	254	278	42	180	215	14.5	12
200-087020HMB	416	312	200	82	19	5	254	278	42	180	215	14.5	12
200-095620HMB	457	354	200	82	19	5	254	278	42	180	215	14.5	12
200-135020HMB	488	396	200	82	19	5	254	278	42	180	215	14.5	12
200-175020HMB	559	471	200	82	19	5	254	278	42	180	215	14.5	12
264-215020HMB	470	262	264	112	32	4	356	384	48	250	300	19	18
264-269020HMB	577	370	264	112	32	4	356	384	48	250	300	19	18
264-349017HMB	684	476	264	112	32	4	356	384	48	250	300	19	18
264-481018HMB	791	583	264	112	32	4	356	384	48	250	300	19	18

Appendix

Appendix1
Example of communication between driver and Mitsubishi plc485

1. Driver moC7bus communication settings (driver needs 485 communication function model)

Before communication, the parameters related to communication in the driver should be set in advance, and the upper computer will communicate with the driver according to the corresponding communication setting parameters.

PA--80	485 communication axis address	485 communication modbus rtu protocol representative address: 1, 2, 3.....	**1~32767 [1]**
PA--81	485 communication baud rate	The corresponding baud rate is 0: 4800; 1: 9600; 2: 19200; 3:38 400; The data bit is 8; Stop bit is 1; RTU format; The longest read length is 10;	**0~3 [2]**
PA--82	485 communication parity check	0: Odd check; 1: Even check; 2: No check	**0~2 [0]**

2. Data frame format

The driver MoC7Bus communication from our company uses RTU mode, and the characters sent are expressed in hexadecimal numbers. The specific frame format is defined as follows:

Substation No.	Function code	Data	CRC CHECK CODE
1 byte	1 byte	N bytes	2 bytes, Low byte in front

Where, the data format (11 bits) when each byte is transmitted is as follows:

Start bit	Data bit	Parity bit	Stop bit
1-bit	8-bit	0-bit (no parity), 1-bit (odd parity or even parity)	2-bit (no check), 1-bit (check)

When data is sent, the low bit is before and the high bit is after.

3. Read and write of driver parameters

(1) Read of parameters (continuous read of multiple parameters)

Request:

Substation No.	Function code	Start address		Register bytes（N）		CRC CHECK CODE	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
Drive station address	0x03	High byte	Low byte	High byte	Low byte	Low byte	High byte

Response:

Substation No.	Function code	Register bytes（N*2）		Register contents			CRC CHECK CODE	
1 byte	1 byte	2 bytes		N*2 bytes			2 bytes	
Drive station address	0x03	High byte	Low byte	High byte	Low byte	.....	Low byte	High byte

(2) Write of parameters

Request:

Substation No.	Function code	Start address		Register contents		CRC CHECK CODE	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
Drive station address	0x06	High byte	Low byte	High byte	Low byte	Low byte	High byte

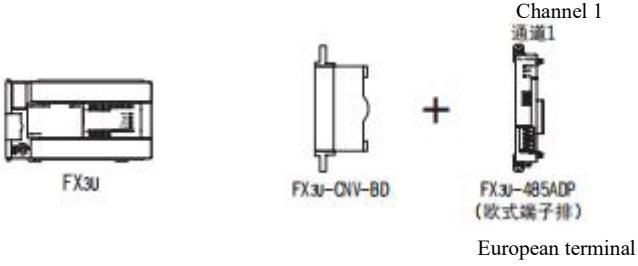
Response:

Substation No.	Function code	Start address		Register contents		CRC CHECK CODE	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
Drive station address	0x06	High byte	Low byte	High byte	Low byte	Low byte	High byte

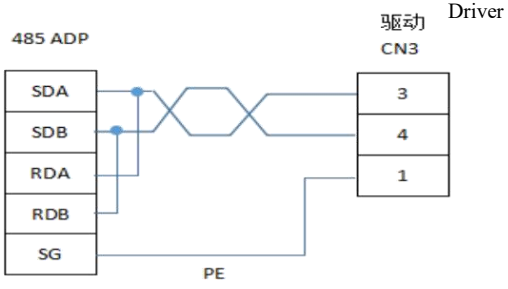
4. Drive parameter modobus address

The PA mode parameters of the driver can be viewed or modified through communication, and the modobus address of the parameter register in the sending message is in hexadecimal format of Parameter No. For example, read the PA-95 motor speed, and convert 95 to 5F in hexadecimal.

5. PLC hardware description (the plc model used in this example is FX3U, and the driver is with 485 communication model. Refer to the basic program prepared by Mitsubishi Communication Manual. If the configuration is different, please change it according to Mitsubishi Communication Manual)



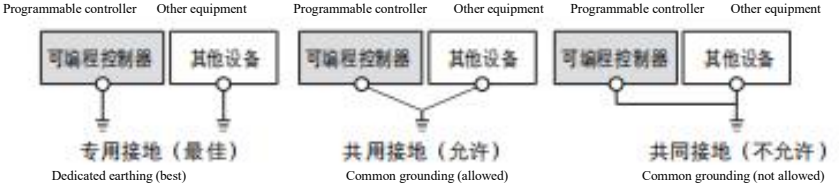
6. Connection of RS-485 Communication



Built-in resistor of FX3U-485ADP is set to 110 ohm position

7. Grounding

① Please implement the following contents when grounding
② Please use Class D grounding. (Ground resistance below 100 ohms)
③ Please use special grounding as much as possible.
④ If special grounding cannot be used, please use "common grounding" in the following figure
⑤ Please use grounding wire with thickness above AWG14 (2MM)



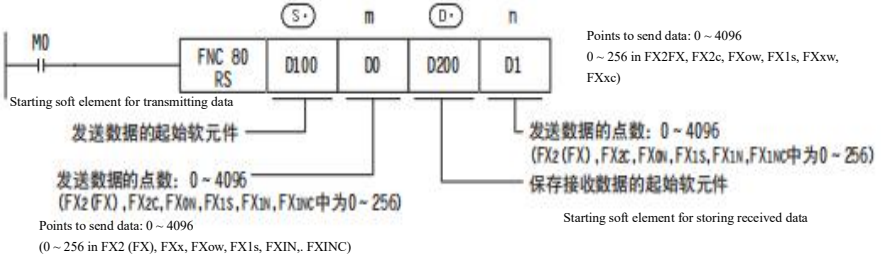
8. Mitsubishi FX3U PLC uses 485 communication related software components

Soft component number	Name	Content
M8063	Serial Channel Error (Channel 1)	Set ON when a communication error occurs When serial communication error (M8063) is ON, save the error code in D8063.
M8120	Used to maintain communication settings	Maintain the communication setting state. (for FXov programmable controller).
M8121	Wait to send flag bit	Set ON while waiting to send
M8122	Send a request	After setting the send request, start sending.
M8123	End of reception flag bit	It can be ON at the end of reception. When the reception end flag bit (M8123) is ON, no more data can be received.
M8124	Flag bit of wave cutting detection	Set ON synchronously with CD signal
M8129*1	Flag bit for judging timeout	When the data is received, it is within the time set in timeout time setting D8129). Set ON when the data to be received is not received
M8161	8-bit processing mode	Sending and receiving data is switched between 16-bit data and 8-bit data. 00: 8-bit mode OFF: 16-bit mode
***1. FXoN FX2 (FX), FX2c, and FX2N (below Ver.2. 00) have not yet corresponded.**		

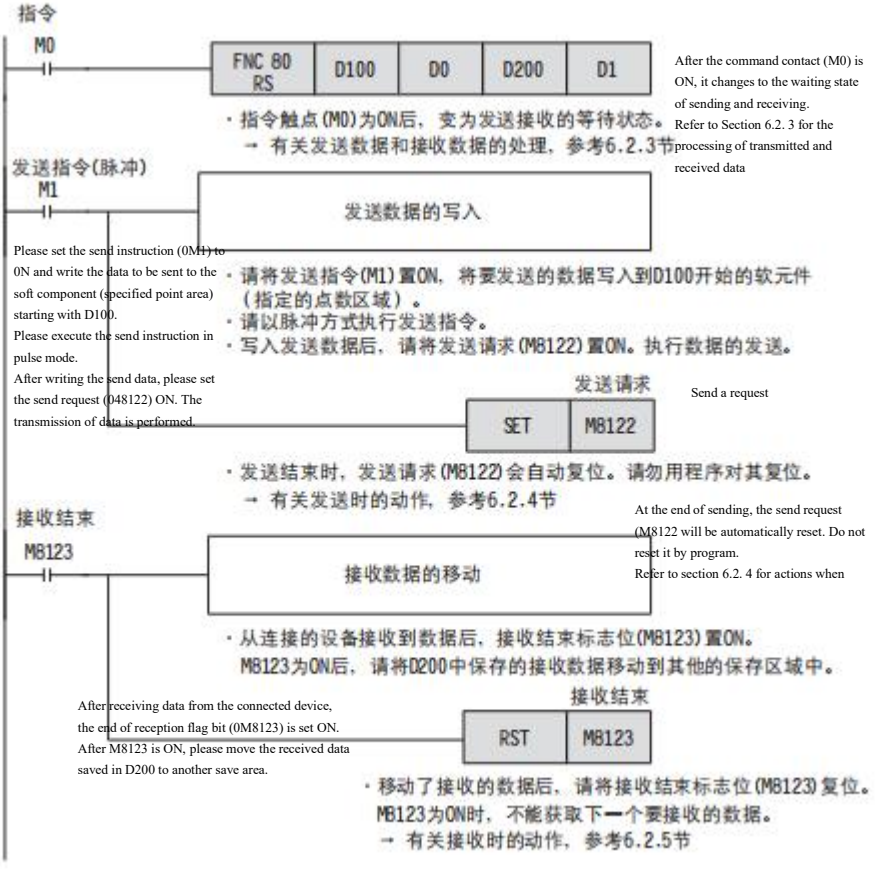
Soft component number	Name	Content
D8063	Display error code	When the serial pass estimation error (6063) is 0, the error code is saved in D8063.
D8120	Setting of communication format	You can set the communication format.
D8122	Remaining points of transmitted data	Save the remaining points of the sent data.
D8123	Monitoring of receiving points	Save the points of received data.
D8124	Header	Set header, machine start value: STX (HO2)
D8125	End of report	No final report, initial value: ETX (HO3)
D8129*1	Setting of timeout time	Set the timeout time.
D8045* 2	Display general estimation parameters	Save the communication parameters set in the programmable controller.
D8419*2	Display running mode	Save the executing communication function
* 1. FXoN FX2 (FX), FX2c, FX2N (below Ver.2. 00) are not yet corresponding * 2. Only FX3U and FX3uc programmable controllers correspond		

9. Use of RS instruction

1. Instruction interpretation



2. Use of instructions



Instruction

After the command contact (M0) is ON, it changes to the waiting state of sending and receiving.
Refer to Section 6.2. 3 for the processing of transmitted and received data

Send command

(pulse)

Please set the send instruction (0M1) to 0N and write the data to be sent to the soft component (specified point area) starting with D100.
Please execute the send instruction in pulse mode.
After writing the send data, please set the send request (048122) ON. The transmission of data is performed.

Send a request

End of reception

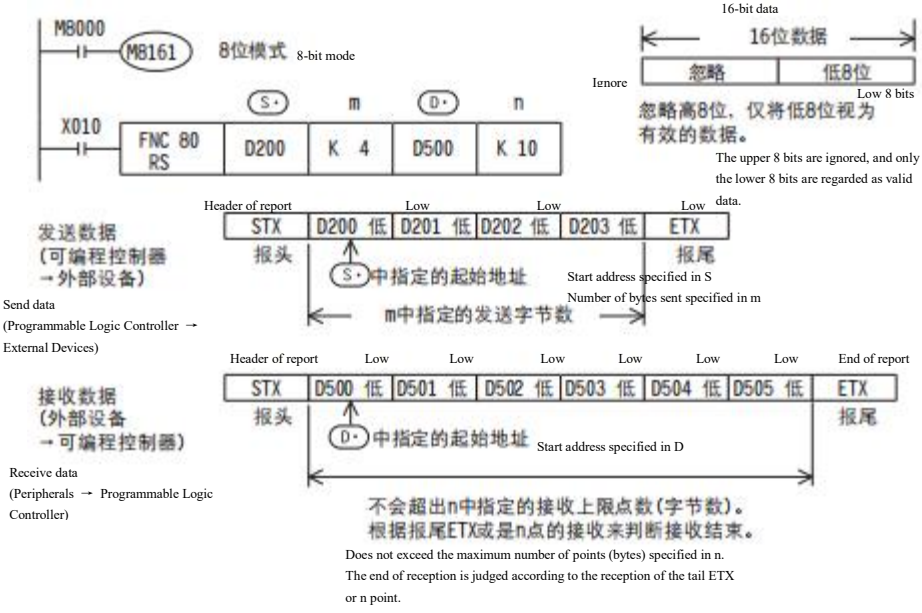
At the end of sending, the send request (M8122 will be automatically reset. Do not reset it by program.
Refer to section 6.2. 4 for actions when

After receiving data from the connected device, the end of reception flag bit (0M8123) is set ON.
After M8123 is ON, please move the received data saved in D200 to another save area.

After moving the received data, please reset the end of reception flag bit (M8123).
When MB123 is ON, the next data to be received cannot be fetched.
Refer to Section 6.2. 5 for actions when receiving

3. Choice of 16-bit 8-bit mode

8-bit processing mode when M8161 is ON and 16-bit processing mode when M8161 is OFF. As shown in the following figure, when M8161 is set, only the lower 8-bit of the first 4 bytes of D200 are sent as valid data. Only low 8-bit is valid when receiving. This communication example uses 8-bit mode.



4. Setting of D8120 (modify as needed)

Bit number	Name	Content		
		0 (bit OFF)		1 (bit ON)
b0	Data length	7-bit		8-bit
b1b2	Parity check	b2, b1 (0.0): None (0.1): Odd Check (00D) (1, 1): EVEN Check (EVEN)		
b3	Stop bit	1-bit		2 -bit
b4b5b6b7	Baud rate (bps)	b7,b6,b5,b4 (0,0,1,1):300 (0,1,0,0):600 (0,1,0,1):1,200 (0,1,1,0):2,400		b7,b6,b5,b4 (0,1,1,1):4,800 (1,0,0,0):9,600 (1,0,0,1)19,200
b8	Header of report	N/A		Yes (08124),Initial value: STX (02H)
b9	End of report	N/A		Yes (08125),Initial value: ETX (03H)
b10b11	Control line	No agreement		b11,b10 (0, 0): No < RS-232C interface > (0.1): Normal mode < RS-232C interface > (1.0): Interlink mode < RS-232C interface > (FX2N, FX3U, FX2NC, FX3UC above Ver.2. 00) (1.1) : Modem mode < RS-232C Interface, RS-485/RS-422 Interface *2
		Computer link		b11,b10 (0, 0): RS-485/RS-422 interface (1.0): RS-232C interface
b12	Can't be used			
b13*1	And check	Do not attach		Additional
b14*1	Agreement.	No agreement		Private protocol
b15*1	Control sequence	Protocol Format 1		Protocol Format 4

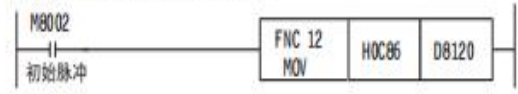
1. When using protocol-free communication, please be sure to use it in "0" state.

2. RS2 instruction can set up to 4 headers and trailers.

3. When RS2 instruction is used to execute protocol-free communication, sum check is attached after the end of the report.

In the case of additional sum check, please be sure to set the end of the report.

设定通信功能用的程序如下所示。The program used to set up the communication function is as follows.



Initial pulse

```
                b15                    b0
D8120 = [  0000  1100  1000  0110  ]
             0     C     8     6
```

数据长度	7位
奇偶校验	偶校验(EVEN)
停止位	1位
波特率	9,600bps
协议	无协议
报头	无
报尾	无
控制线	RS-485通信

Data length	7 -bit
Parity check	EVEN check (EVEN)
Stop bit	1-bit
Baud rate	9,600bps
Agreement	No agreement
Header of report	None
None	None
Control line	RS-485 communication

9. MoC7bus-rtu protocol message description

Send message format:

Slave station No.	Function code	Data area	CRC-16 check low bit	CRC-16 check high bit
8-bit	8-bit	N*8-bit	8-bit	8-bit

Data format returned:

Slave station No.	Function code	Returns the number of bytes of data	Return data	CRC16 CHECKSUM
8-bit	8-bit	8-bit	N*8-bit	16-bit

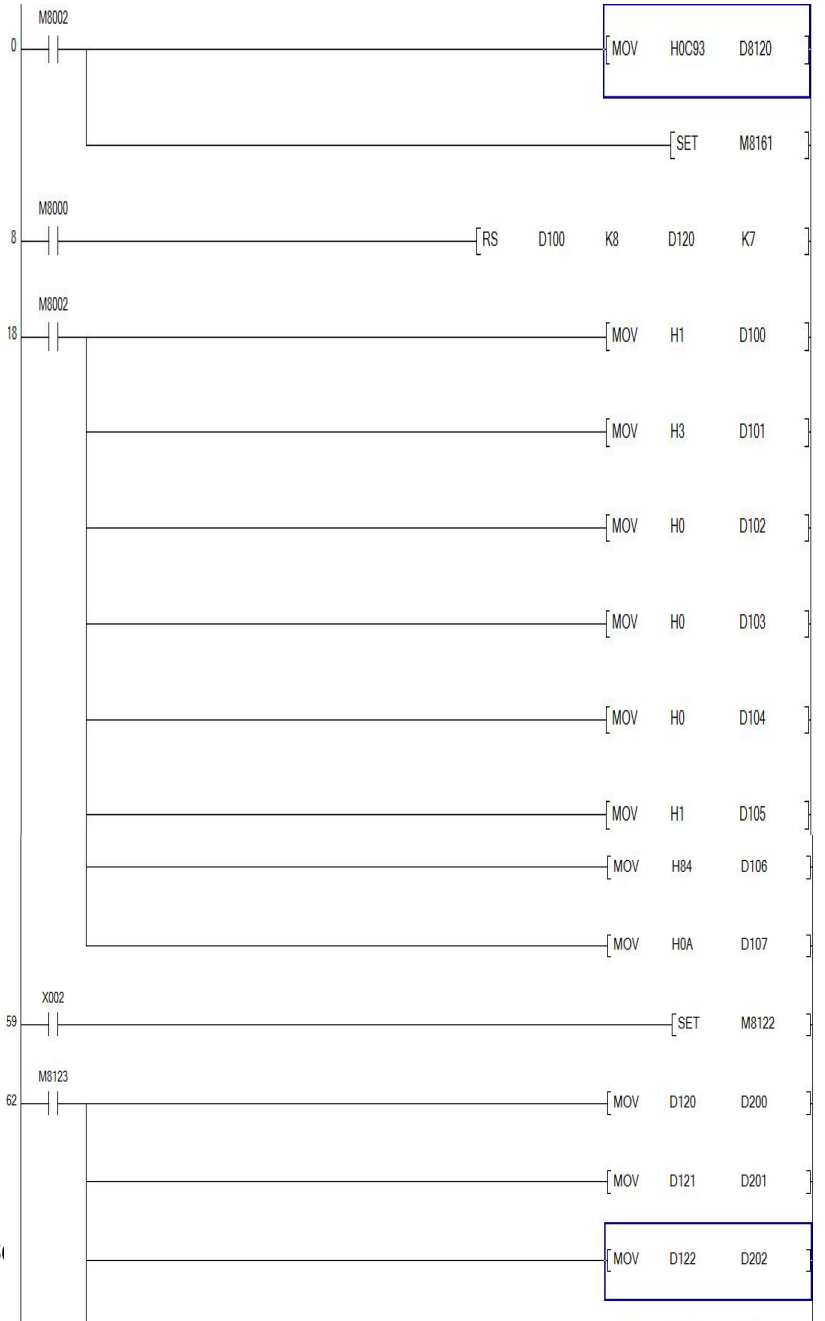
The slave number is 1 byte, and its value ranges from 0 to FFH. Exceptionally, if this value is 0, it is used as the broadcast message identification of the master station. Therefore, the slave number used physically can only be between 01H and FFH (i.e. between 1 and 255).

The function code is 1 byte, which is used to select a command (read, write or answer to check whether it is correct, etc.), and the valid function code range is between 1 ~ 255. This drive supports 03H read and 06H write commands.

The data area records the address and number of registers read. For example, this example reads the parameters of pa0, and the data area is 00 00 00 01. (The data type is hexadecimal. The first 16 bits are the address, and the last 16 bits are the number of reads.)

Please refer to modobus-rtu protocol CRC calculation method, or use software calculation.

10. Sample program



① This example reads the driver pa0 parameters

② D100 places the moC7bus address of the drive, corresponding to the drive pa80 here 0X01.

③ D101 places the function code, where 0X03 is the read function.

④ The address of the drive register read by D102 D103 is 0X00 here.

⑤ The number of D104 D105 placed and read is 0X01 here.

⑥ D106 D107 is CRC check, which can be calculated by software or with reference to crc-16/moC7nus calculation method.

⑦ Set m8122 to read driver parameters when X2 is executed.

Appendix 2
Driver with Siemens CNC system
(With Siemens 802S/801/802C/808D)

1: Drive parameter setting requirements are as follows

Parameter No.	Parameter name	Unit	Parameter range	Default value
5	Velocity proportional gain	Hz	50~2000	150
36	Filter coefficient of command pulse signal	%	0～3	1

Note:

■ The driving parameters PA36=1 and PA37=0 when Siemens system is equipped, otherwise the repeated positioning accuracy will be affected.

■ If the deviation of returning to zero is inconsistent, the driving No.5 parameter can be appropriately increased.

■ Pins 36 and 9 of the driver CN1 interface must be connected with the shielding layer and the metal shell of the system. Otherwise, the return to zero accuracy will be affected.

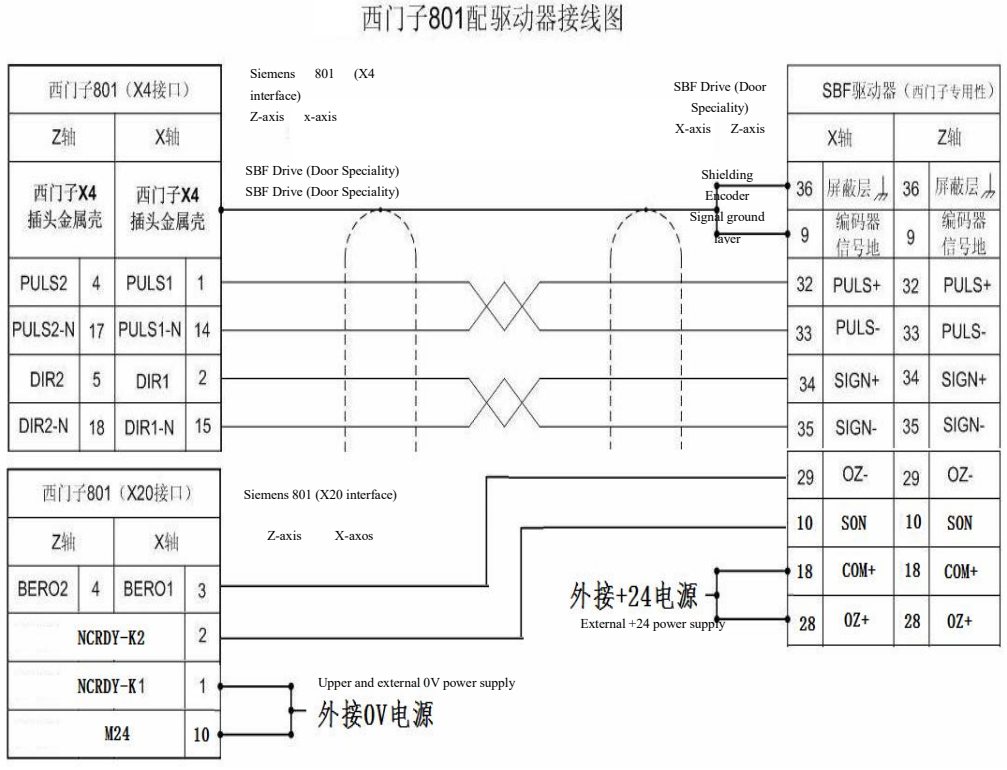
2: Siemens system parameter setting requirements are as follows

Parameter No.	Parameter name	Required value
34040	Search of Z pulse velocity	500～2000

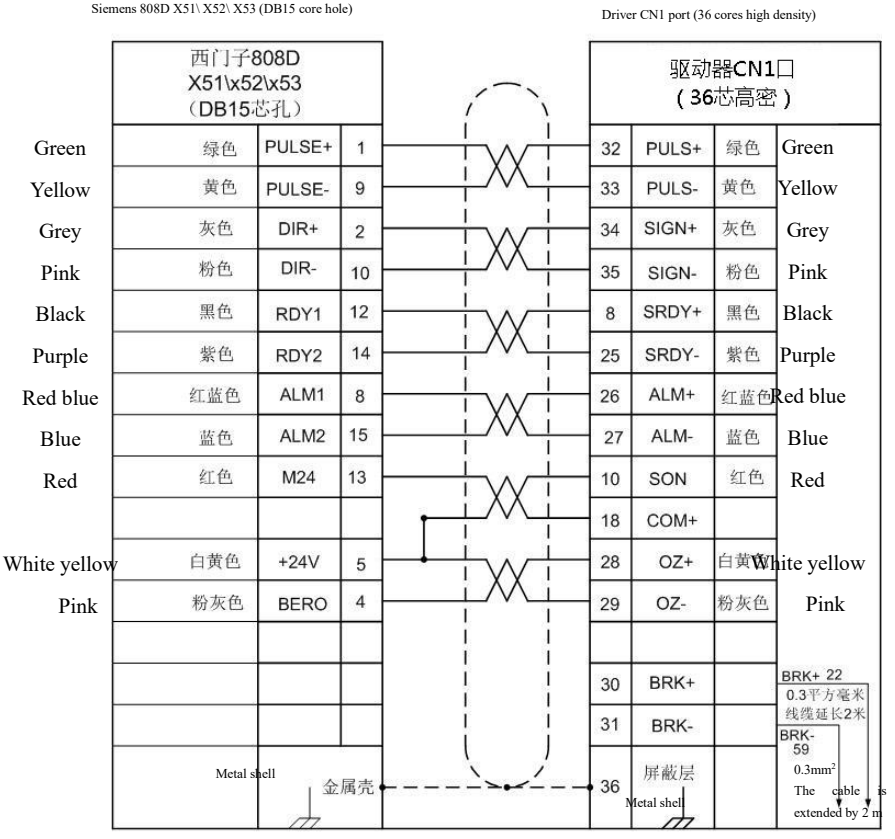
Note:

■ If there is a large deviation back to zero, the system parameter 34040 can be appropriately increased.

Appendix 3
Wiring diagram of driver with Siemens 801/802S system



Appendix 4
Wiring diagram of driver with Siemens 808D system



成对做线时，一根如上图纸做，一根30、31脚不用焊延长线。

驱动器参数修改：PA-36改为2，

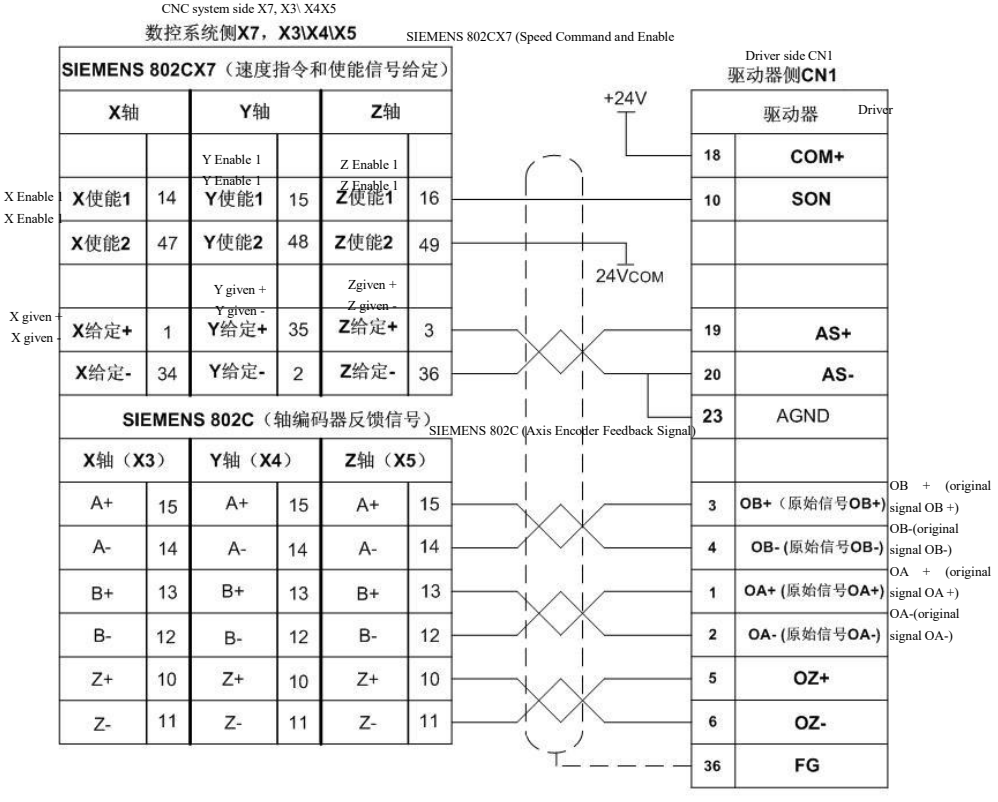
PA-57修改方法：当 系统显示驱动器报警，而驱动器实际未报警，可修改此参数，方法为，将此参数的倒数第二位0000取反即可，即：1改0、0改1.

When making wires in pairs, one should be made as shown in the above drawings, and one 30, 31 legs should not be welded with extension wires.

Driver parameter modification: PA-36 is changed to 2,

PA-57 Modification method: When the system shows the driver alarm, but the driver does not actually alarm, you can modify this parameter. The method is to reverse the penultimate bit 0000 of this parameter, that is, 1 to 0, 0 to 1.

Appendix 5
Wiring diagram of driver with Siemens 802C system



驱动器参数调整：**PA-4**调整为**1**、 **PA-22**调整为**1**、**PA-43**按需要设置

西门子**802C**系统参数调整：西门子**802C**系统的参数**30130**要改为“**1**”。

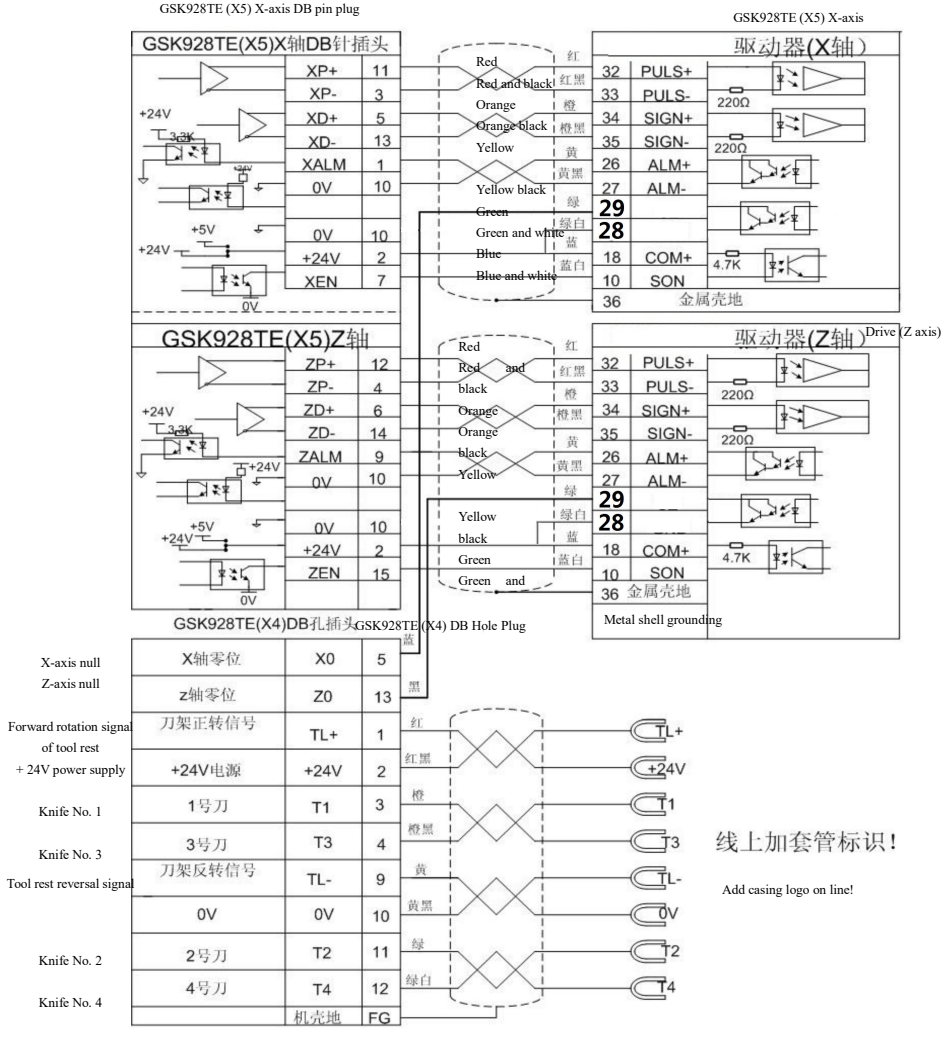
按以上接线图接好线后，先调整好以上参数，再系统上电，驱动器上电，打开驱动器使能，系统保持零速状态，调整驱动器**AU-Spd**(模拟量速度零偏自动调整）。调整方法为：在驱动器的第一层菜单界面找到**AU**,再按**enter**一次，显示**AU-Spd**,再按住**Enter**不放，并保持**3**秒，就会显示**FINISH**（成功），最后保存参数即可。

Driver parameter adjustment: PA-4 is adjusted to 1, PA-22 is adjusted to 1, and PA-43 is set as required

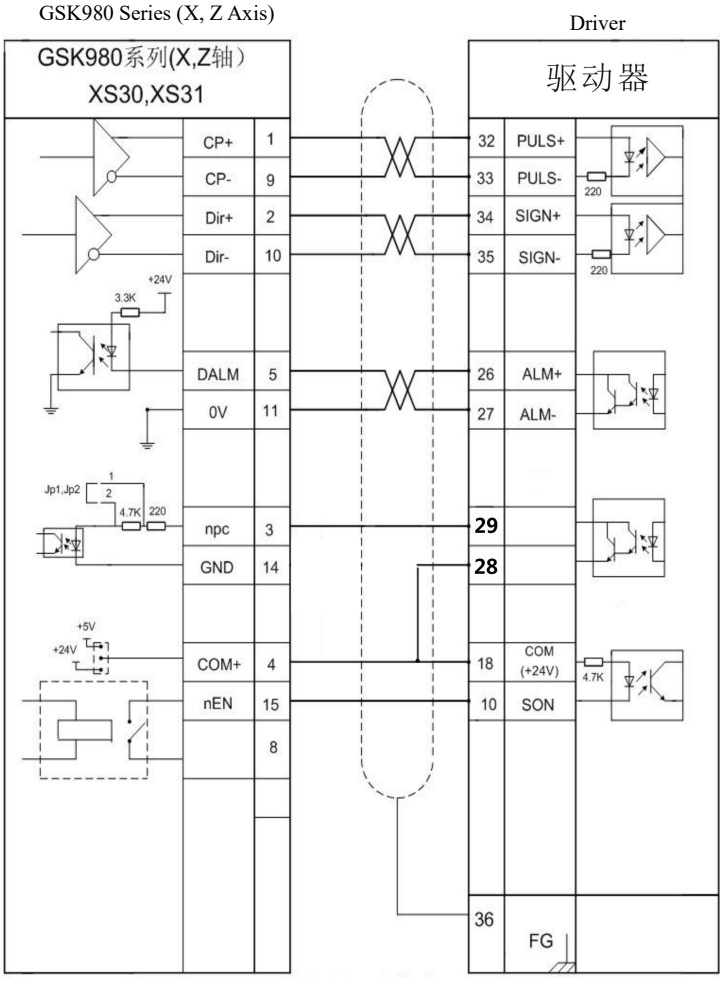
Siemens 802C system parameter adjustment: The parameter 30130 of the 802C system should be changed to "1".

After connecting the wires according to the above wiring diagram, adjust the above parameters first, then power up the system, power up the driver, open the driver to enable, keep the system in zero speed state, and adjust the driver AU-Spd (automatic adjustment of analog speed bias). The adjustment method is: find AU in the--layer menu interface of the drive, press Enter again to display AU-Spd, hold Enter again, and keep it for 3 seconds, then FINISH will be displayed, and finally save the parameters.

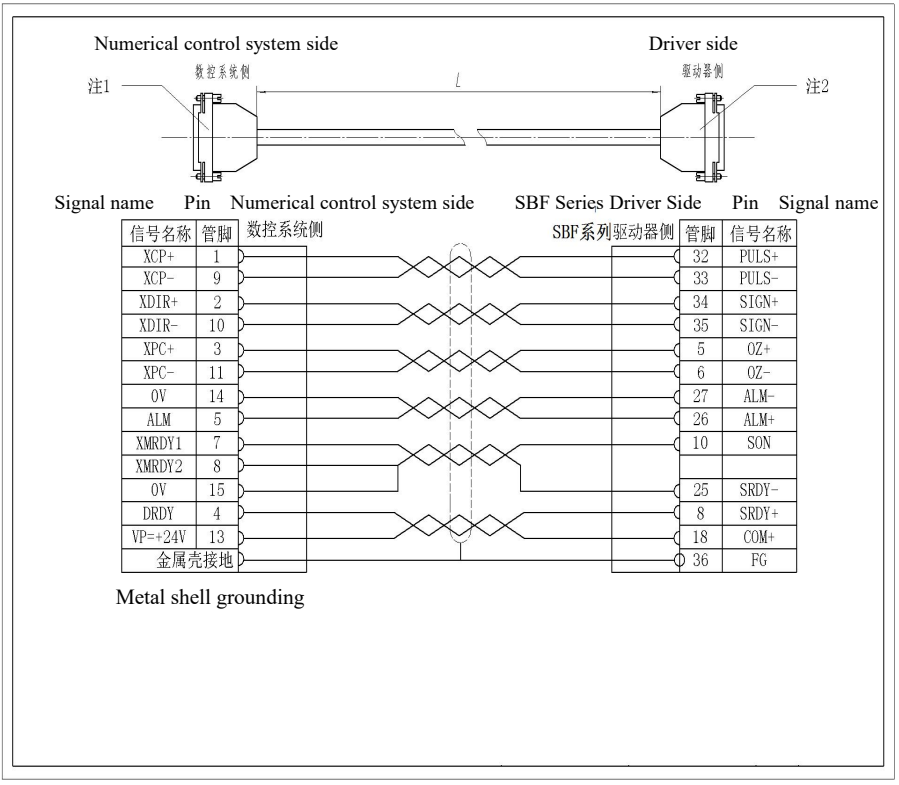
Appendix 6
Wiring diagram of driver with GSK 928 system



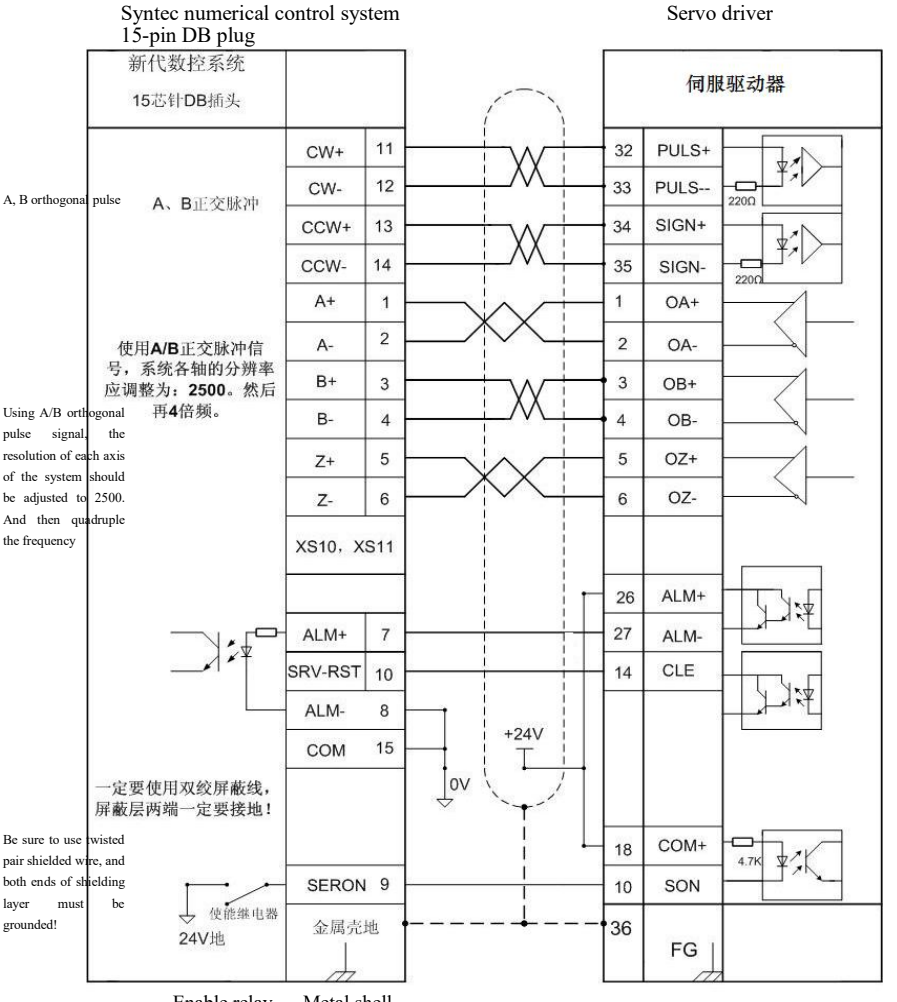
Appendix 7
Wiring diagram of driver with GSK 980 system



Appendix 8
Wiring diagram of driver with KND CNC system



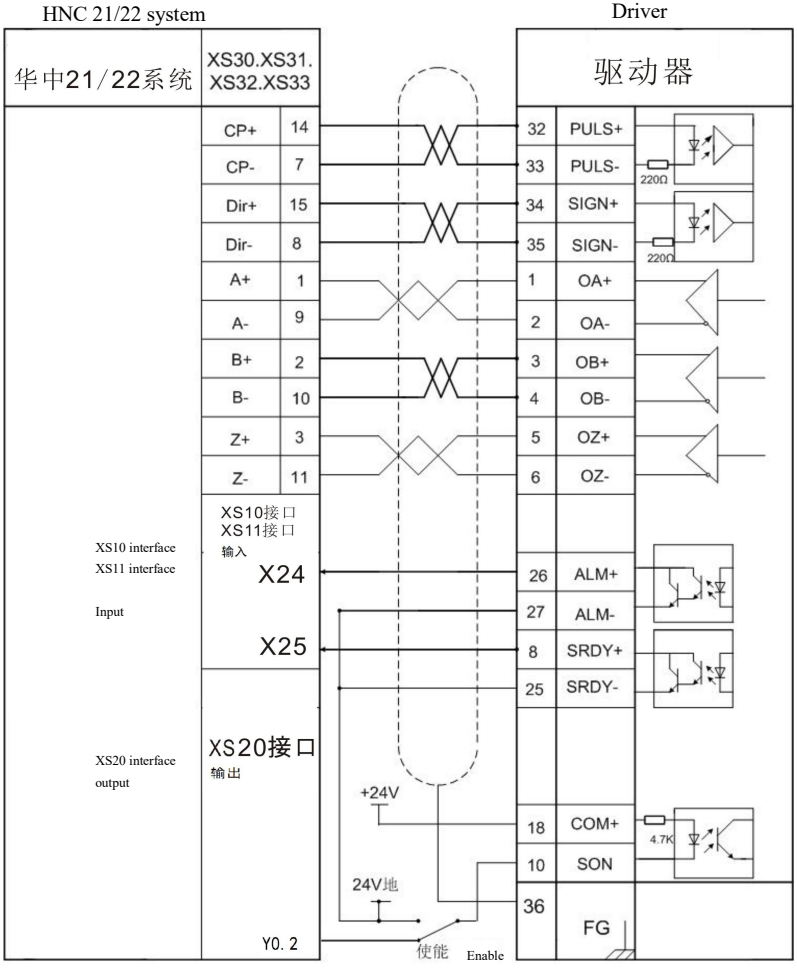
Appendix 9
Wiring diagram of driver with Syntec EZ4 system



位置控制方式接线图

Wiring diagram of position control

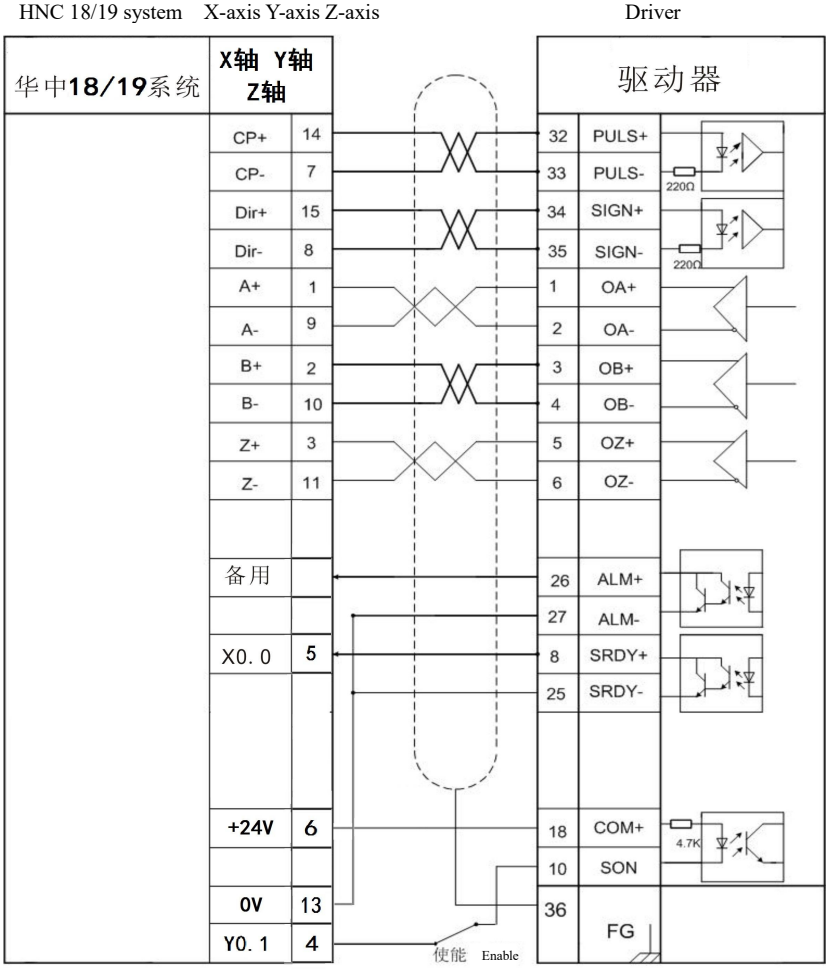
Appendix 10
Wiring diagram of driver with HNC 21/22 system in driver distribution



位置控制方式接线图

Wiring diagram of position control

Appendix 11
Wiring diagram of driver with HNC 18/19 system



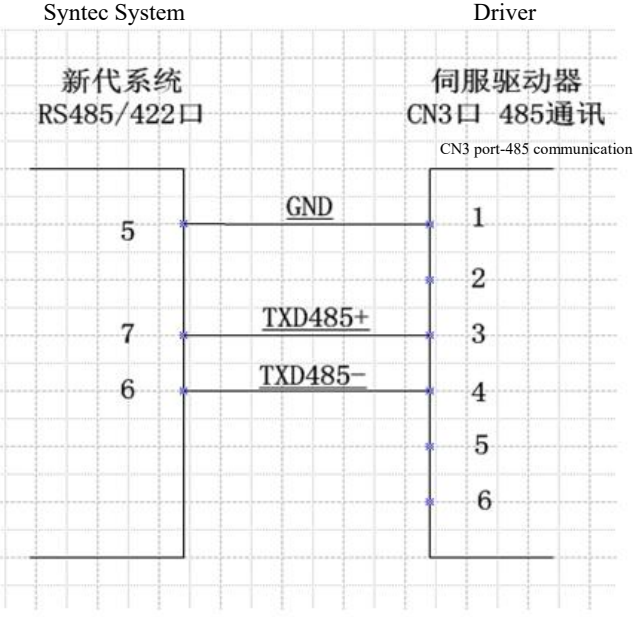
位置控制方式接线图

Wiring diagram of position control mode

Appendix 12

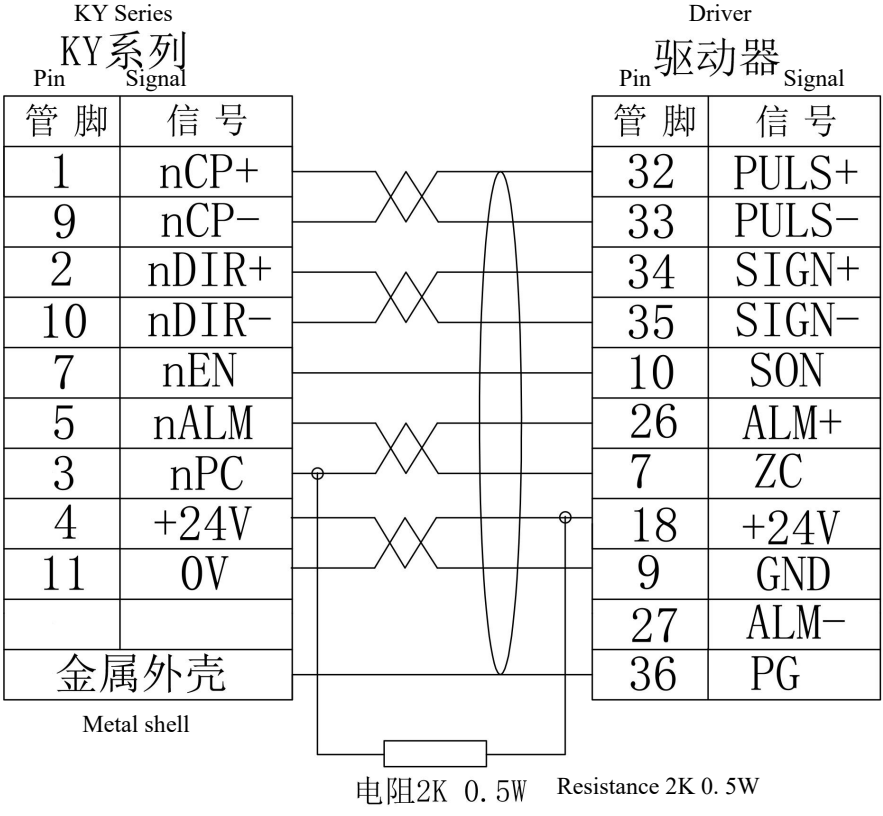
Absolute value CN3 port wiring diagram

(Drivers and Syntec Systems)



Note: GND must be welded, otherwise communication will be interrupted.

Appendix 13
Wiring diagram of driver with Guangzhou Keyuan series system



Wiring diagram of position control mode

This product and instructions are for general industrial use. Please contact the manufacturer when it involves medical, aviation, aerospace, nuclear energy and other equipment directly related to life safety.

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