![Coolmay Automation Expert logo]

MX3G-C40/C75 Servo All-in-One User Manual

COOLMAY MECHATRONICS
MORE RELIABLE MOTORS AND DRIVES

Safety Caution

Before product storage, installation, wiring, operation, inspection or maintenance, the user must be familiar and comply with the following important matters to ensure to use the product safely .

⚠️ **Danger   Misoperation would cause danger and personal injury.**

⚠️ **Attention   Misoperation may cause danger, personal injury and   damage the equipment.**

🚫 **Prohibition   Behavior is strictly prohibited, otherwise it will lead to equipment damage or can not be used.**

1.Application

⚠️ Danger
● Forbidden to use the product when it is exposed to water gas, corrosive gas and combustible gas. Or it could cause an electric shock or a fire.   ● Forbidden to use products in places with more direct sunlight, dust, salt and metal powder.   ● Forbidden to use products in places where water, oil and medicine are dripping.

2.Wiring

⚠️ Danger
● Please ground the grounding terminal reliably. Poor grounding may cause electric shock or fire.   ● Please do not connect 380V power supply to 220 V servo drives, otherwise it will cause equipment damage and electric shock or fire.   ● The U、V、W motor output terminal and the motor wiring terminal must be connected one-to-one correspondence, otherwise the motor may cause equipment losing and casualties caused by the over speed vehicle.   ● Please fasten the power supply and motor output terminals, otherwise it may cause fire.

3.Operation

⚠️ Caution
● When the mechanical equipment starts operation, it must match proper parameters. If it does not adjust to the appropriate setting values, it may cause the mechanical equipment to lose controlling.   ● Before starting operation, please confirm if you can start emergency switch shutdown at any time.   ● Please test whether the servo motor is running normally without load firstly, and then connect the load to avoid unnecessary loss.   ● Do not switch on and off power frequently, otherwise it will cause drive overheating.

4.Working

🚫 Prohibition
● When the motor is running, it is forbidden to touch any parts in rotation, otherwise it will cause casualties.   ● When the equipment is in operation, it is forbidden to move connecting cables, otherwise it will cause injury to the person or damage to the equipment.

CONTENT

Chapter 1 Introduction of servo PLC integrated machine and system selection

1.1 Function outline of all-in-one

Coolmay servo PLC integrated machine is a DSP based, high-performance, high-precision, multi-function, network-based all digital servo driver. Servo PLC integrated machine is also known as "intelligent servo", "programmable servo driver", "programmable servo amplifier", which integrates servo drive technology, PLC technology and motion control technology. Ladder diagram programming can be carried out inside to complete the logic and data operation of PLC, and the synchronous control function of multi axis motor can be realized through the unique motion control instructions. It has the following advantages:

●   Integrated motion control, servo drive and PLC functions;

●   With RS485 interface, it supports Modbus protocol, etc;

●   Control loop power supply: provided by internal conversion, without external power supply;

●   17 bit single turn encoder signal output;

●   I/O port, 16 photoelectric isolation inputs /16 photoelectric isolation outputs

Intelligent servo is a part of servo system, which is mainly used in high-speed chip mounter, precision dispensing machine, solid crystal machine, laser cutting machine, robot, CNC machine tool, medical equipment, semiconductor and assembly equipment, printing, packaging, textile, aviation, aerospace and other requirements of high-speed, high-precision, high dynamic response, low noise, medium and large-scale automation equipment.

1.2 working principle

DSP (digital signal processor) as the control core, including motion control algorithm, PLC algorithm, servo control algorithm. The power board converts ac to DC through bridge rectifier circuit, and then drives three-phase synchronous AC servo motor through three-phase sinusoidal PWM inverter. The drive board takes DSP as the core and is responsible for signal acquisition, AD conversion, signal monitoring, data processing and data output of each servo module. Through the kernel program for different levels of task scheduling to complete communication, PLC, PWM pulse width modulation, AD conversion, pulse input acquisition and other functions.

1.3 Technical parameters

Servo drive series	Mx3g-c40 /C75 series servo PLC all-in-one
size	160 * 135 * 42
input power	Main circuit power supply: single-phase AC220V, voltage range 200V~240V, 50/60Hz Control loop power supply: internal conversion, no external power supply
PLC logic power supply voltage	DC24V
Drive motor	Linear (DDL), torque (DDR), voice coil, brushless, brushless servo motor
Control mode	Motion sequence, point to point, electronic gear, position, speed, torque control mode
Encoder feedback	17 bit single loop absolute value encoder
operation mode	Independent programmable control (PLC), external control (step pulse, PWM, encoder A/B), or distributed network control (Modbus/RS communication)
Communication type	RS485 (supports ModBUS and RS protocols)
Input,output signal	16 photoelectric isolated inputs 16 photoelectric isolated outputs, of which three high-speed pulses are programmable and general-purpose
Rated power (KW)	0.4KW/ 0.75kW
Rated current (A)	2.5A/3.0A

Rated current range of adaptive motor (A)	2.0~3.0A/3.0~4.0A
Program capacity	16K/step
High speed processing	I/O refresh command, input interrupt 6 points, timer interrupt 3 points
Data register	D0~D3999, 4000 points in total
Operating ambient temperature	-10~55 ℃ non freezing
Operating ambient humidity	10 ~99[RH%] non condensing
Storage temperature	-20℃~60℃(Maximum temperature guarantee: 80 ℃ for 72 hours)
Storage humidity	10 ~99[RH%] non condensing
Height	Normal use below 1000m altitude, derated use above 1000m altitude
Vibration / shock	4.9 (m/s2) /19.6 (m/s2)
Occasion	Indoor, no dust, no corrosive gas, no direct sunlight
Comprehensive protection design	Overcurrent, short circuit, grounding, overvoltage, undervoltage, I2t, control error

1.4 All-in-one system wiring and composition

Wiring diagram of servo all-in-one:
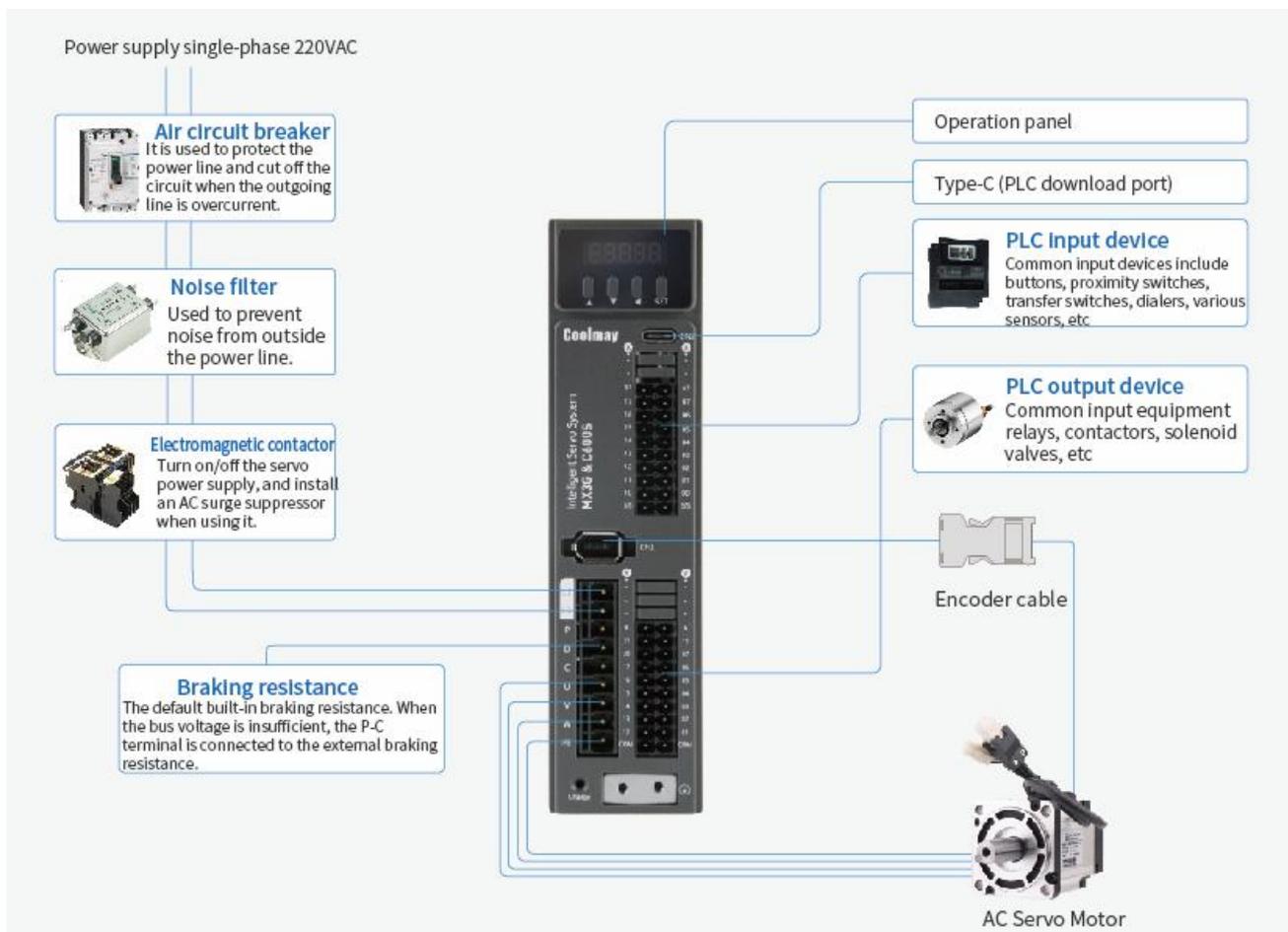
1.4.1 Terminal distribution connection diagram

Control signal input terminals:

Main circuit terminals:

Control signal output terminals:
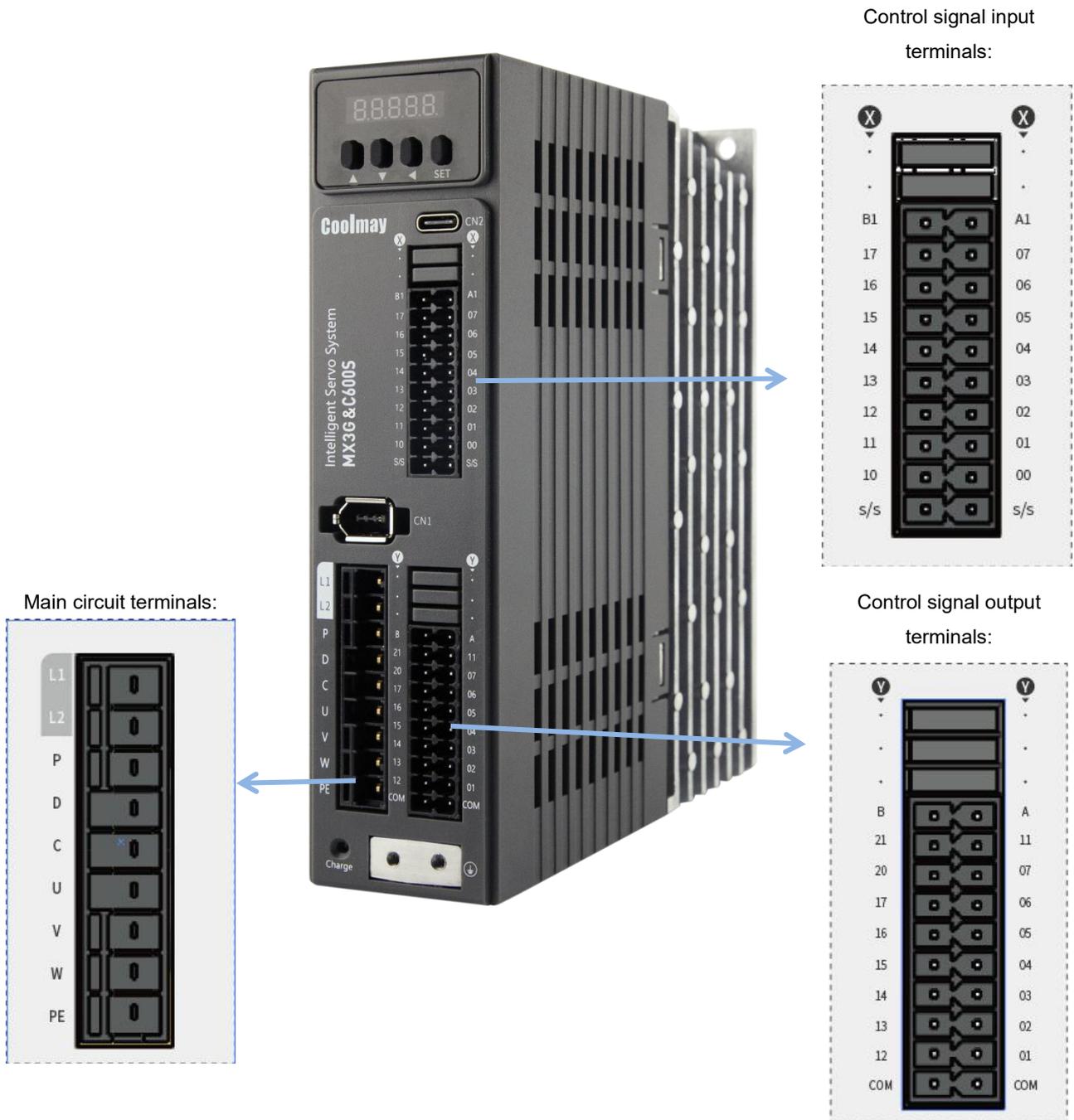
Terminal distribution	Signal name		Function
Main circuit terminal	Main circuit power input	L1、L2	single-phase 220VAC -15%~+10%，50/60Hz
	Braking resistance	P、D	When using the internal braking resistor, short circuit P and D. (factory default)
		P、C	When using external braking resistance, P and D are short circuited and disconnected, and then the external braking resistance wiring is connected between P and C respectively.
	Motor connection	U、V、W	Connect to servo motor U, V, W phase.
		PE	The driver grounding terminal , connect with the power supply

			and motor grounding terminal.
control signal input terminal	Digital input	X00~X07 X10~X17	Digital signal input, total 16 points, default passive NPN
		S/S	Digital signal input common terminal, connected to 24V+
control signal output terminal	Digital output	Y01~Y07 Y11~Y17 Y20~Y21	Digital signal MOS tube output, a total of 16 points, the maximum allowable load of 2A/ point, low-level NPN (Note: Y0, Y10 internal servo driver and PLC communication are occupied)
		COM	Digital signal output common terminal, connected to 0V
Communication terminal	servo driveRS485	A	RS-485 Positive end of signal
		B	RS-485 Negative end of signal
	built-in PLC RS485 (Serial port 3)	A1	RS-485 Positive end of signal
		B1	RS-485 Negative end of signal

Note: The "Internally connected with PLC serial port 2, Supports Modbus RTU protocol" text spans the A and B rows for servo driveRS485. The "Support Mitsubishi programming port protocol, Mitsubishi BD board protocol, RS protocol and Modbus protocol" text spans the A1 and B1 rows.

1.4.2 Wiring instructions of braking resistor

If the internal braking resistor is used, the driver should short circuit P and D, that is, it can be used normally according to the factory state, as shown in Figure A. If the external braking resistor is used, the short circuit between P and D must be removed first, and then the external braking resistor must be bridged on P and C, as shown in Figure B:

Fig. A   Fig. B

NOTE
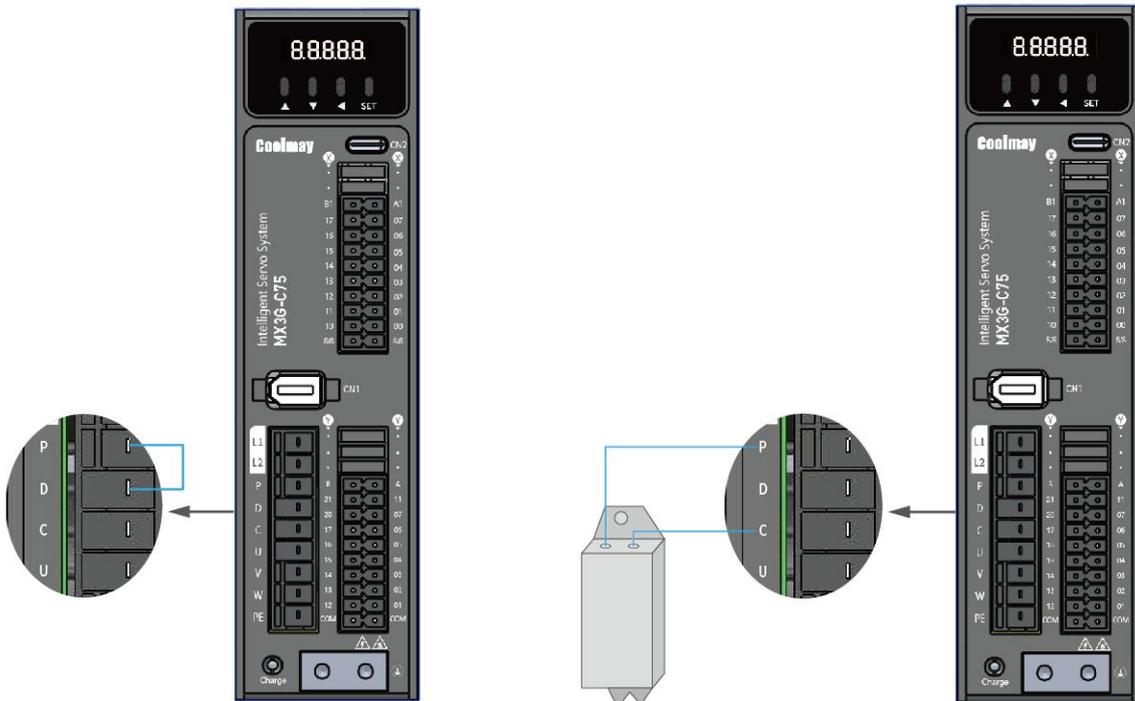
Precautions for braking resistance wiring：：
◆   Do not be less than the minimum allowable resistance value of 25 Ω, otherwise the driver will alarm or damage the driver；
◆   Please install the external braking resistor on non combustible objects such as metal.

1.4.3 Control signal terminal

1.4.3.1 PLC input signal interface

It is equipped with 16 channels of switching value input signals. PLC input (x) is external power supply DC24V leakage type (passive NPN), and the input signal is isolated by optocoupler. When using, connect the S/S to the 24V positive of the power supply.

Signal	Circuit wiring diagram
High-speed input	*Applicable to x0~x5
Common input	*Applicable to X6~X7，X10~x17
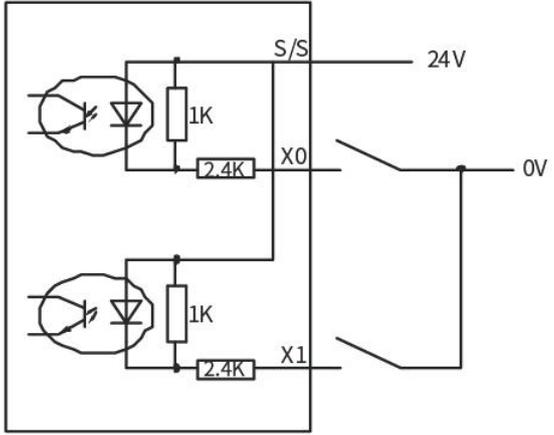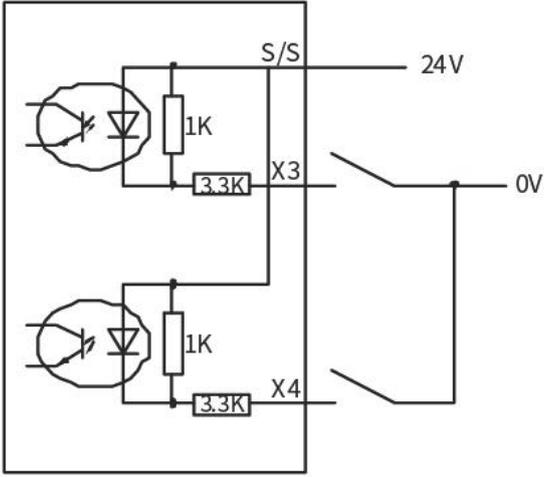
◆ DC24V power supply needs to be purchased separately. Pay attention to the polarity of the power supply used for the control signal when wiring.

1.4.3.2 PLC output signal interface

It has 16 channels of switch output signals, all of which are MOS tube output, and the load is 2A. It can only be used for DC DC24V load circuit. The output wiring mode is NPN, com common cathode.

Among them, y1-y3 is fixed as pulse output port, the conventional wiring load is only 0.1A, and the wiring mode is DC24V passive NPN output.

Signal	Circuit wiring diagram
High-speed output	 5K Ω resistor must be connected in series for 5V driver, but not for 24V driver *Applicable to Y1~Y3，the output two com are interlinked internally
Common output	 *Applicable to Y4~Y21, 13 points in total

◆ DC24V power supply needs to be purchased separately. Pay attention to the polarity of the power supply used for the control signal when wiring.

1.4.4 CN1 encoder signal terminal

1.4.4.1 CN1 terminal plug diagram

Connection diagram between CN1 encoder signal terminal and motor encoder. A 6 pins plug is used. The pin chart as followings:
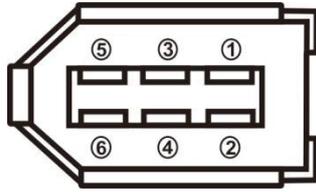
Pic 4.7 CN1 Incremental Encoder Signal Terminal

1.4.4.2 Encoder terminal signal description

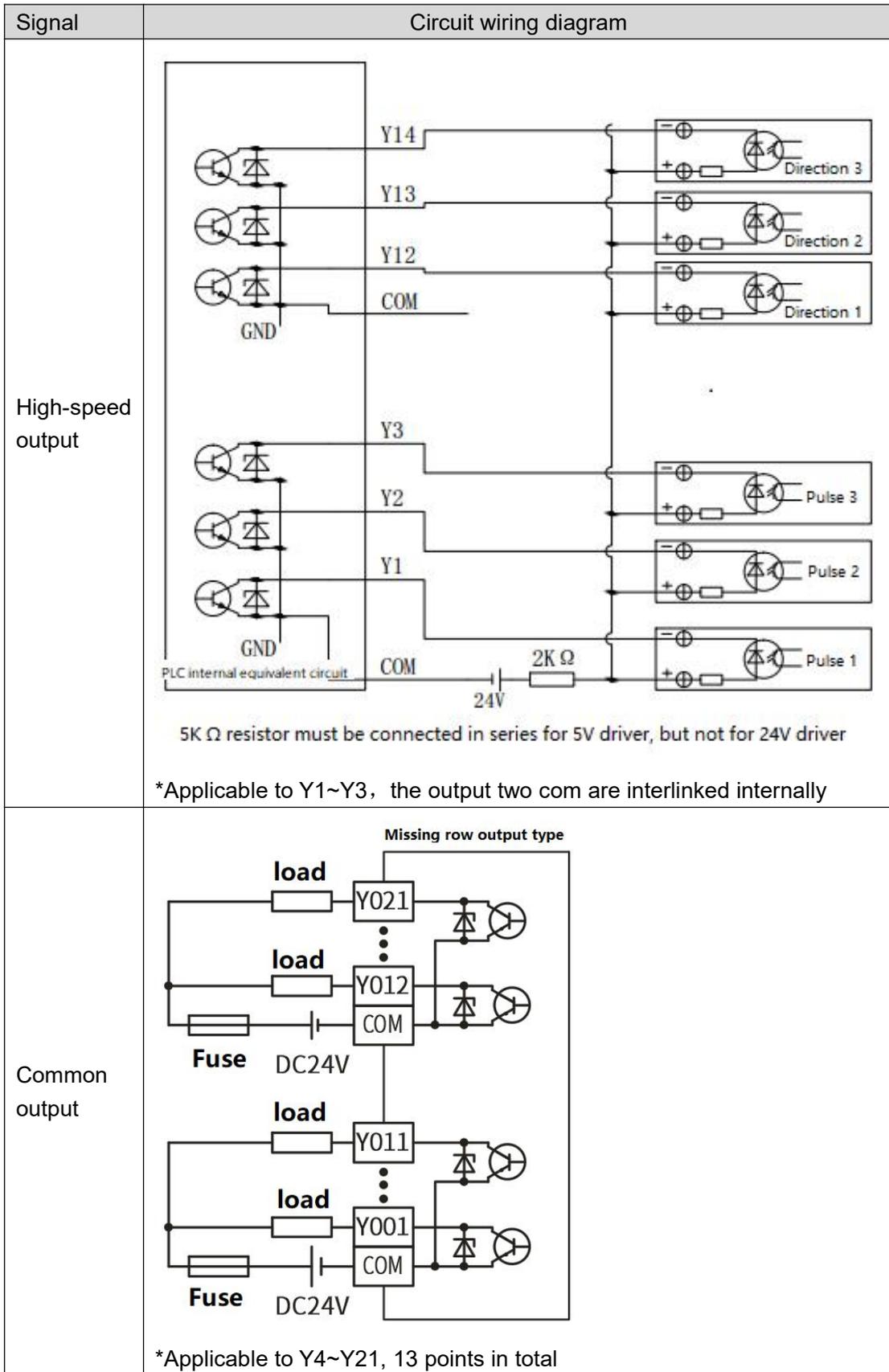| Signal Name		Pin No.	Introduction
Encoder Signal Power Supply	5V	5	Use 5V power supply (Provided by servo driver). If the cable is longer than 20m and prevent encoder from voltage dropping down, it is better to use multi wires or thick wires for power line and ground line.
	0V	6	
Absolute value encoder communication positive terminal	SD+	1	Absolute value encoder communication positive terminal
Absolute encoder communication negative terminal	SD-	2	Absolute encoder communication negative terminal
Null	NC	3	retain
Null	NC	4	retain
Shielded wire protective ground	Plug metal housing		Connect to the shielded layer of the encoder cable

1.4.5 Definition of special pins inside the all-in-one machine

Servo all-in-one machine is a full digital driver integrating servo drive technology, PLC technology and motion control technology. The servo and PLC have been wired internally, and the pin definitions are as follows:

PLC Pin number	Servo function	explanation
Y0	PULS-	Parameter FA14 setting working mode： ● Pulse + direction ● CCW/CW pulse ● A. B two phase quadrature pulse input ● Internal position control input
Y10	SIGN-	
Y22-Y25	DI1-DI4	Digital input 1-digital input 4, programmable definition

Y26	Servo restart	When Y26 is turned on, the servo restarts
X20-X23	DO1-DO4	Digital output 1- Digital output 4, programmable definition
DA0（D8050）	AS+/AGND	Analog speed/torque instruction input; Setting range: 0-4000 (0-2000 is a positive turn, 2000-400 is a reverse)
Serial port 2	RS485(A B)	When using internal PLC to control servo communication, terminal A and B should not be connected to external equipment

◆The corresponding pin of PLC in the ladder diagram can control the servo drive.

1.5 Model description of servo all-in-one and adaptive motor

1.5.1 Naming rules of servo PLC integrated machine

MX3G - C40 - 32MT

①   ②   ③

No	Implication
①	Coolmay technology MX3G series servo PLC all-in-one machine
②	Specific power of servo below 1KW, C40:50W~400W；C75:400W~750W
③	PLC I/O: 16 DI /16 DO

1.5.2 Naming rules of adaptive motor

CN7J - 60   04   30   A   3K   UAA

①   ②   ③   ④   ⑤   ⑥   ⑦

No.	Implication
①	Motor type: CN7J series.
②	Frame：60(mm)；80(mm)。
③	Power, 04 for 400W, 08 for 750W, and so on;
④	Maximum speed（×100RPM): 30 indicates the rated speed 3000rpm
⑤	Voltage level,A stands for 220V.
⑥	According to the encoder feedback, 3K represents the absolute value of a single turn of 17bit magnetic coding, 4K represents the absolute value of multiple turns of 17bit magnetic coding, and 3a represents the absolute value of 17bit optical coding.

⑦	Output shaft type, UAA for keyed and tapped hole, VBA for keyed tapped hole and brake.

1.5.3 Servo motor and servo driver adaptation table

Frame	Model	power(W)	speed(rpm)	Adapter driver	Matching encoder
60mm	CN7J-060430A3KUAA	400	3000	MX3G-C40-32MT	17 bit single turn absolute encoder
	CN7J-060430A3KVBA	400	3000		
80mm	CN7J-080830A3KUAA	750	3000	MX3G-C75-32MT	
	CN7J-080830A3KVBA	750	3000		

Chapter 2 Installation and size of servo PLC all-in-one and motor

2.1   Installation method of servo all-in-one

2.1.1 Drive installation method

● Installation direction

The normal mounting direction of the servo drive is vertical and upright..

● Fixed installation

During installation, please tighten the 2pcs M4 fixing screws at the back of the servo drive.

● Grounding

Be sure to ground the driver grounding terminal, otherwise there may be a risk of electric shock or interference to produce wrong action.

● Wiring requirement

When connecting the drive, please wire the cable down (refer to the below picture) to avoid any liquid attached on the cable and then it flows into the drive along with the cable.

● Installation interval

Refer to pic 2.1 for the distance between drives and installation intervals with other devices,and please note that the picture indicates the smallest size, in order to ensure the performance and life of the drives, please leave the full installation interval as far as possible.

● Cooling

The servo drive adopts natural cooling mode and forced heat dissipation mode.

● Installation considerations

 Prevent dust or iron chips from entering the servo drive when installing the electrical controlling cabinet.
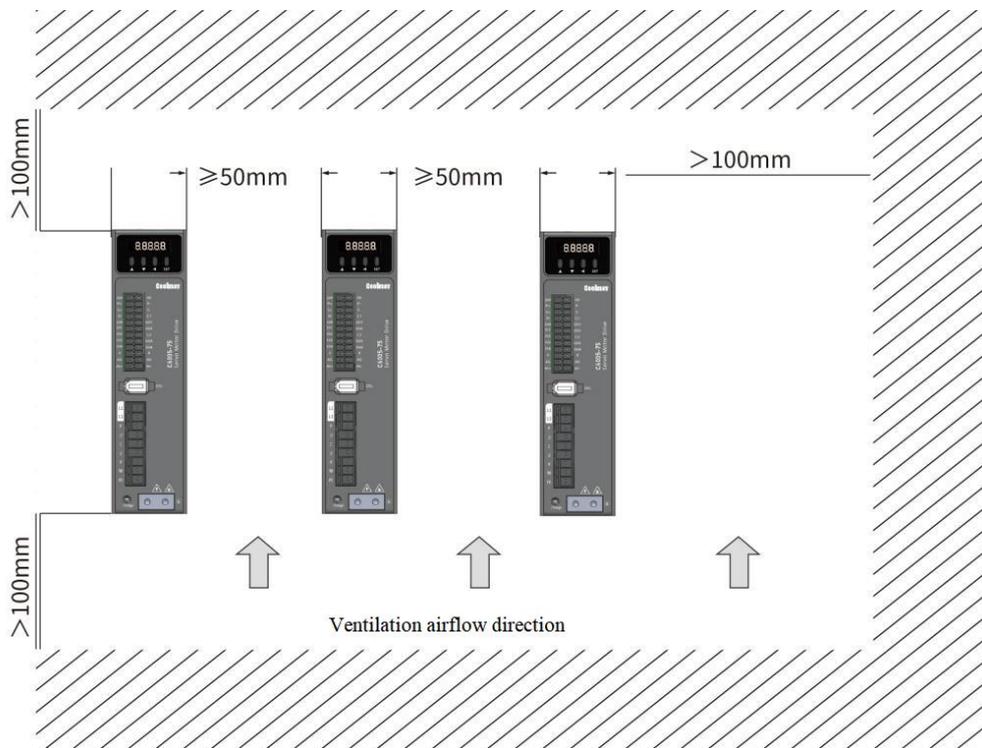
Pic 2.1   Installation interval

2.1.2   Environment Condition For Installation

      Since the environment conditions for servo driver installation have the direct influence to the normal function and service life of the servo driver, therefore the environment conditions must be conformed to the following conditions:

● Ambient temperature: 0 to 40℃; Ambient humidity: less than 80% (no condense).

- Storage temperature: -40 to 50℃; Storage humidity: less than 93% (no condense).

- Vibration: less than 0.5G.

- Preventive measure shall be taken against raindrop or moist environment.

- Avoid direct sunlight.

- Preventive measure shall be taken against corrosion by oil mist and salinity.

- Keep away from radioactive and inflammable substances.

- Free from corrosive liquid and gas.

2.1.3 Servo Motor Installation

- For horizontal installation : In order to prevent water, oil, etc. from entering inside of the servo motor, please put the cable connector downward.

- For vertical installation: if the shaft of the servo motor is in upward direction with a speed reducer, some prevention measure shall be taken against entering inside of the servo motor by oil come from the speed reducer.

- In case of installation or removing the servomotor, please do not hit the servo motor with a hammer, otherwise the shaft and the encoder can be damaged.

2.1.4 Motor Rotation Direction Definition

The motor rotating direction description in this handbook is defined as facing the shaft of the servo motor, if the rotating shaft is in counterclockwise direction will be called as positive direction, or in clockwise as reversal direction.
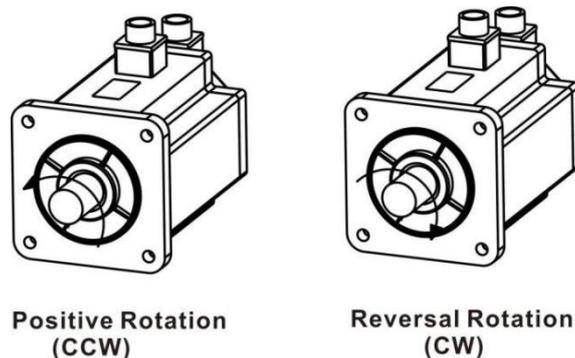
Pic 2.2   Motor Rotation Direction

2.2 MX3G-C40/MX3G-C75 installation dimensions
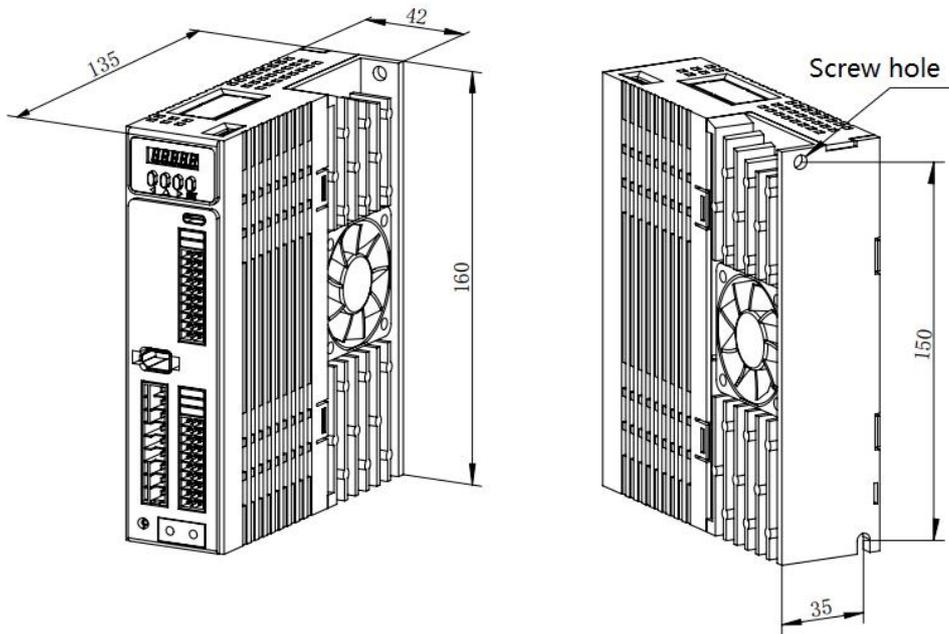
Pic 2.3 MX3G-C40/MX3G-C75 Series Dimensions

> **NOTE**
>
> ◆ The base of the MX3G-C40-32MT does not have a cooling fan.

2.3 Motor Dimension

● Installation dimension of 60-frame motor (see Pic. 2.4 and Table 2-1)
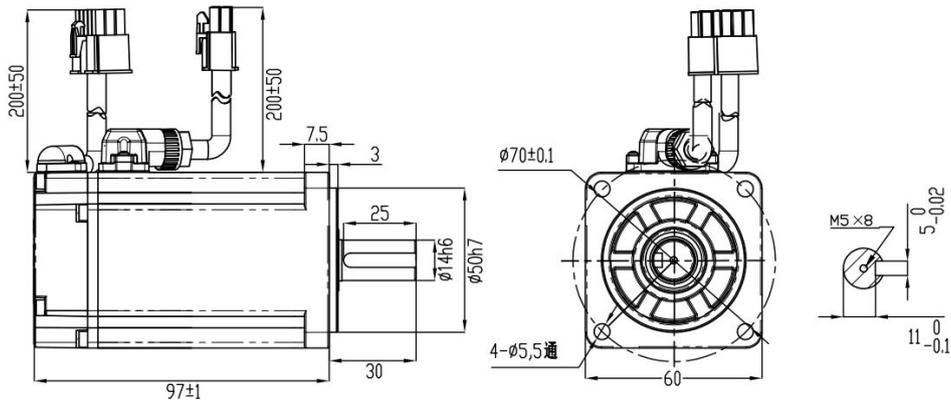
Pic. 2.4 60 Motors and Table 2-1

Model	CN7J-060430A3KUAA	CN7J-060430A3KVBA
L （mm）	98	136

● Installation dimensions of 80 base motor (see Pic. 2.5 and table 2-2):
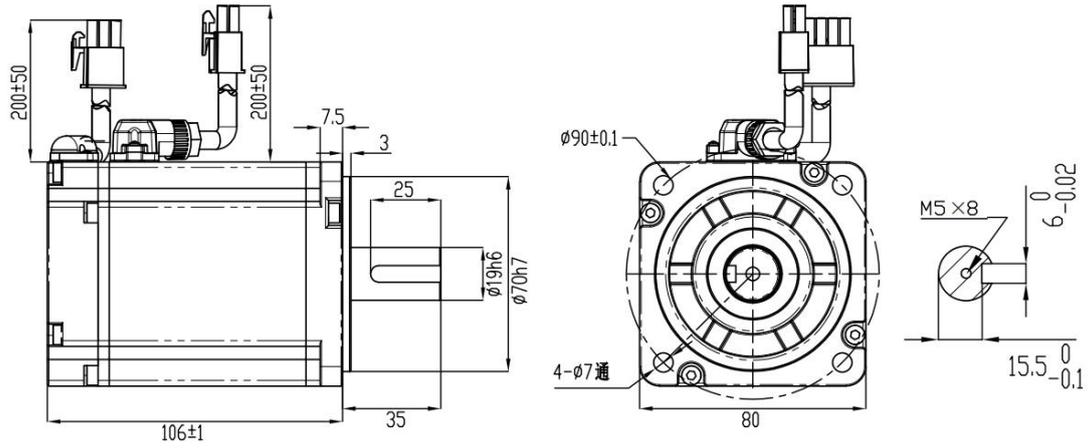
Pic 2.5　80 motor and tables 2-2

Model	CN7J-080830A3KUAA	HN7J-080830A3KVBA
L（mm）	107	147

Chapter 3 Operation and Display

3.1 Drive Panel Introduction

3.1.1 Panel composition

The panel consists of 5 digital LED and 4 buttons including ▲、▼、◀、SET to display all system status and set parameters. The operation is hierarchical. ◀ button indicates "back" and SET button indicates "forward" while it also has the meaning of "Enter" and ◀ button also has the meaning of "Cancel" and "Exit". ▲button indicates "Increasing " and ▼button indicates "decreasing". If you press the▲button or▼button and maintain it, you would get a duplicate result and stay longer, the repetition rate is higher.
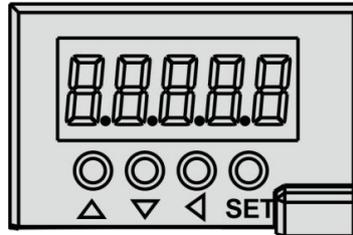
Pic. 3.1 Drive Panel Display

3.1.2 Front Keys Introduction

Key	Name	Function
▲	Increasing	Increase sequence number or value;Press down and hold to repeat increasing.
▼	Reducing	Decrease sequence number or value;Press down and hold to repeat decreasing.
◀	Exit	Menu exit; Cancel the operation
SET	Confirm	Menu entered; Confirm the operation

3.2 Main Menu

The first layer is the main menu and has 8 operating modes in total. Press ▲or ▼button to change the operation mode. Then press SET button to enter into the second layer and executes a concrete operation. Press ◀ button returns to the main menu from the second layer.
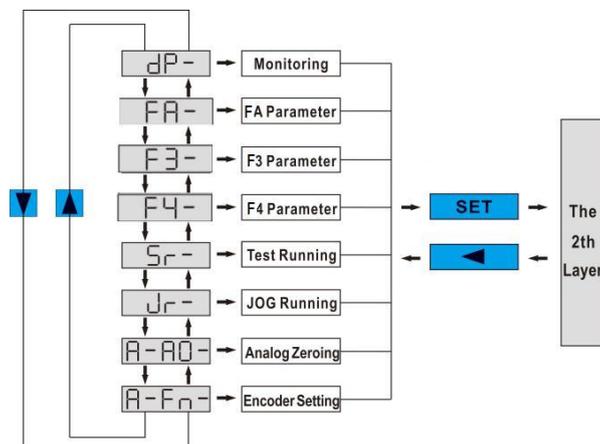
Pic. 3.2 Main Menu

3.3 Steps To Set Parameters

The parameter is represented by parameter segment + parameter number. The hundred digits are the segment number, and the ten digits and the one digit are the parameter number. For example, for parameter fa53, the segment number is "FA", the parameter number is "53", and the display is "FA-53".

Select parameter setting "F -" under the main menu, and press SET to enter the parameter setting mode. First, select the parameter section with▲, ▼. After selection, press the SET to enter the parameter number selection of this section. Secondly, select the parameter number with▲,▼. After selection, press the SET to display the parameter value.

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

3.4 Status Monitoring

In the first layer,select "DP--" and press SET button to enter into monitoring mode. There are 23 displays in total. Users select the desired display mode with ▲or ▼key, and then press SET button to enter into the specific states.

Status	Operation	Example	Definition
F-SFd		r 1000	Motor speed:1000r / min
F-FoS		04580	The current position:124580
F-FoS.		P. 12	
F-CFo		C4581	Position command:124581
F-CFo.		C. 12	
F-EFo	SET	E 4	Position deviation:4 pulses
F-EFo.		E. 0	
F-tr9		t 0.70	Motor torque 70%
F- 1		1 2.3	Motor current 2.3A
F-Cnt		Cnt 0	Control mode 0：position control
F- CS		r. 500	In speed mode,analog input speed: 500 r/min
F- Ct		t 0.50	In torque mode,analog input torque:50%
F-AFo		A3265	Absolute rotor position:3265
F-AFo.		A. 0	
F- In		n IIII	Input terminal
F-oUt		oUtiIII	Output terminal
F-UdC		UC336	Line voltage:336V
F-Err		Err 4	No.4 alarm
F- rL	SET	rL-on	Relay open
		rL.-oF	Relay Uncharged

		rL-Er	Relay alarming
F- rn		rn - on	Main circuit working normally
		rn.-oF	Main circuit Uncharged
		rn-CH	Main circuit not enabled
		rn-Er	Main circuit alarming
F- US		U-on	Line voltage normally
		U-.LoU	Line voltage too low
		U-Err	Line voltage alarming
F- AS		43210	Absolute motor position876543210
F- AS.		A.8765	

3.5 Analog Quantity Zeroing Adjustment

Using this function,the servo drive can check analog zero offset automatically and write the offset value into parameter FA39 or FA45. The operation has saved offset parameter to EEPROM, so it is unnecessary to write parameters again.

Firstly choose analog zero adjustment mode"A-A0" and press SET key to enter into the second layer. Select speed analog zeroing"A-SPd" or torque analog zeroing "A-Trq" and then keep pressing SET key for more than 3s. When it displays "donE", the activation is completed.

3.6 Encoder Selection

Select "F-res" to reset the encoder and make the encoder multi-circle information zeroing. By setting F3-36 parameter , the single-circle information can be cleared to achieve the purpose of setting the original point. Select" F-clr" to clear the encoder NO. 53 alarm caused by battery power down. After long press the SET key for more than 3 seconds and show "donE", the operation is activate. After that, press the ◄ key to return to the upper menu.

3.7 How To Reset Default Parameters

To recover default parameters when:
- The parameters are scrambled and the system can not work properly.

The steps to recover default parameters as follow:

1. Please connect the motor with the driver and power on. The driver will automatically read the motor parameters and match the motor model.
2. Set password (FA0) to 318.
3. Do the followings:

Press the ◄ key to return to the main menu and to select "FA-"with ▲ or ▼ key. Press the **SET** key to enter into the second layer and press the ▲ or ▼ key to make FA=0.Then press the **SET** key to enter into the third layer and set FA0 =385, pressing the **SET** key to save it. Next, press the ◄ key to return to the "FA-" and set the FA1=DEF-. Long press the **SET** key for 5 seconds and after the LED indicator lights flicker several times, the operation is completed Finally, it will work after repower on.

Chapter 4　Parameter function description

4.1 FA group parameters

Drive	MX3G-C40-32M	MX3G-C75-32M
Motor	40-00130	80-01330
	40-00330	80-02430
	60-00630	80-03230
	60-01330	--
	60-01930	--
	80-01330	--

No.	Name	Function	Rang	Default Value
0	Password	1. User code:315. 2. Motor model code:385.	0-9999	315
1	Motor selection	The parameter is read-only and can not be modified. The driver automatically identifies the motor model.	40-80	Table 4-1
2	Software version	The software version can be read but can't be modified.		
3	Initial display status	0:Display motor speed. 1:Display the current position is 5-bit low. 2:Display the current position is 5-bit high. 3:Display position command. (command pulse accumulation) is 5-bit low. 4:Display position command. (command pulse accumulation) is 5-bit high. 5:Display position deviation is 5-bit low. 6:Display position deviation is 5-bit high. 7:Display motor torque. 8:Display motor current. 9:Display control mode. 10:Display temperature. 11:Display speed command.. 12:Display torque command. 13:Display absolute position of the rotor in a roll is 5-bit low. 14:Display absolute position of the rotor in a roll is 5-bit high. 15:Display input terminal state. 16:Display output terminal state. 17:Display encoder input signal. 18:Display voltage value of main line of main circuit. 19:Display alarming code. 20:Display logic chip version number. 21:Display the actuation state of the relay. 22:Display external voltage state. 23:Display external voltage state. 24:Absolute position 5-bit low. 25: Absolute position 5-bit high.	0-25	0

No.	Name	Function	Rang	Default Value
4	Control mode selection	To set control method: 0: position control mode 1: speed control mode 2: torque control mode 3:position + speed control mode 4:position + torque control mode 5:speed + torque control mode 6:encoder zeroing mode	0-6	0
5	Proportional gain of speed loop	1.Set the proportional gain of speed loop. 2.The value is bigger, the gain is higher and rigidity is stronger. The parameter value is set according to your exact servo driving system model and the load. Generally, the greater the load inertia, the bigger the value. 3.Please set a little high value if the system condition does not generate oscillation.	5-2000 Hz	150
6	Speed integral constant	1.To set the integral time constant of the speed loop regulator. 2.The value is smaller, the integral speed is faster and the servo rigidity is stronger.But if it is too small, it will happen over controlling.	1-1000 ms	75
7	Torque filter	1.To set the characters of torque command filter. 2.To suppress resonance generated by torque. 3.The value is smaller, the cut-off frequency is lower and vibration with noise generated by the motor is less. If the load inertia is great, reducing the setting value is recommended. If the value is too small, it would lead to low response, which would result in shaking. 4.The value is bigger, the cut-off frequency is higher and the response frequency is quicker. If you need higher torque response frequency, it is recommended to increase the setting value.	20-500%	100
8	Speed detection filter	1. To set the characters of speed detection filter. 2. The value is smaller, the cut-off frequency is lower and noise from the motor is smaller. If the load inertia is great, reducing the setting value is recommended. If the value is too small, it would lead to low response, which would result in shaking. 3. The value is bigger, the cut-off frequency is higher and the response frequency is quicker. If you need higher torque response frequency, it is recommended to increase the setting value.	20-500%	100
9	Proportional gain of position loop	1.To set the proportional gain of position loop . 2.The value is bigger, the gain is higher and its rigidity is stronger. So the position lag is smaller under the same frequency command pulse condition. But if it is too big, it will happen oscillation. 3.The parameter value is set according to your exact	1-1000	80

No.	Name	Function	Rang	Default Value
		servo driving system model and the load.		
11	Command pulses of each motor revolution	1.To set command pulses of each motor revolution. 2.When it is set to 0, FA-12(numerator of electronic gear for position command pulses), FA-13(denominator of electronic gear for position command pulses) are valid.	0-30000	10000
12	1st numerator of electronic gear for position command pulse	1.Set the electric gear ratio for position command pulse. 2.In position control mode,it is convenient to match all kinds of pulse source through set the parameter FA12 and FA13, which helps to reach ideal control resolution(angle/pulse). 3. $P×G=N×C×4$ P: pulses of input command; G:electric gear ratio; N:numbers of motor rotation ; C:solutions of photoelectric encoder in per rotation, the default value is 2500. 4.For example, input command pulse P is 6400, servo motor rotate a roll: $G=(N×131072)/P=(1×131072)/6400=512/25$, So FA12 should be set to 512, FA13 should be set to 25. 5.The numerator of electronic gear for command pulse is decided by Gear1 and Gear2. The denominator is decided by FA13. The details as following: _(see table below)_ Remark: 0=OFF, 1=ON.	0-32767	0
13	Denominator of position command pulse	Refers to parameter FA12.	1-32767	10000
14	Input mode of position command pulse	1.Set the input mode of position command pulse. 1.To set one of 4 input modes: 0: Pulse+Direction. 1: CCW pulse/CW pulse. 2: phase A and phase B orthogonal input. 3: Internal position input. Remark: CCW: observe from the motor axial direction. It defines CCW in counter clock wise and CW in clock wise.	0-3	0

Table referenced in parameter 12:

DI Signal		Denominator
Gear 2	Gear 1	
0	0	1st Numerator(FA12)
0	1	2nd Numerator(FA77)
1	0	3rd Numerator(FA78)
1	1	4th Numerator(FA79)

15	Direction of command pulses	Set to: 0:Normal direction. 1:Reverse position command pulse.	0-1	0
16	The rang of positioning completion	1. Set the positioning completion pulse range under position control. 2. This parameter provides the basis for the drive to judge whether the positioning is completed in the position control mode. When the number of remaining pulses in the position deviation counter is less than or equal to the set value of this parameter, the COIN (positioning completion) of the digital output DO is ON, otherwise it is OFF. 3. The comparator has hysteresis function. Set by parameter FA84.	0-30000 pulses	130
17	Detection of over-travel range	1.Set alarming detection range of over travel.. 2.In position control mode, if the value in position deviation counter is over than the setting value, the drive will alarm.	0-30000×100 pulses	6000
18	Invalid over-travel error	Set to: 0: The alarming detection of over travel is valid. 1: The alarming detection of over travel is invalid, and it stops detecting the error .	0-1	0
19	Position command smooth filter	1.To filter the instruction pulse with exponential acceleration and deceleration, and the value represents the time constant. 2.The filter does not lose input pulses, but would occur command delay . 3.The filter applies in (1. PC controller without acceleration and deceleration function. (2. The electronic gear frequency is a little big(>10). (3.The command frequency is a little low. 4.When the motor runs, there are step jumps and unsmooth. 5.When set to value"0", the filter does not work.	0-1000×0.1 ms	100
20	Invalid input of drive inhibition	To set: 0: CCW drive inhibition or CW drive inhibition is effective. If the switch of CCW drive inhibition is ON, CCW drive is permitted.If the switch of CCW drive inhibition is OFF, CCW torque keeps 0.The same as CW drive inhibition. If both CCW and CW drive inhibition are OFF, it will come to error alarms of drive inhibition input. 1: Cancel CCW or CW drive inhibition. No matter what state of the switch of CCW or CW drive inhibition is, CCW or CW drive is allowed.Meanwhile,if the switches of CCW and CW drive inhibition are OFF, it will still not alarm..	0-1	1

No.	Name	Function	Rang	Default Value
21	JOG speed	Set the running speed of JOG operating.	0-6000 r/min	100
22	The source of speed command	In speed control mode, it sets the source of speed command. It means: 0: Analog Terminal AS+,AS- input analog speed command. 1:Internal speed command is decided by SF1 and SF2 of digital input(DI): Note: 1=ON, 0=OFF. 2: Analog speed command+internal speed command: 3: JOG speed command, if carries out JOG operation,it is needed to set. 4: Keyboard speed command, if carries out Sr operation,it needs to set the parameter. 5:IO terminal controls JOG operation.	0-5	0
23	Highest speed limit	Set the highest speed of the ac motor. 1.It doesn't matter with rotating direction. 2.If the setting value is beyond of rated speed, the real highest speed is set as the rated speed.	0-6000r/min	5000
24	Internal speed selection 1	1.Set the internal speed 1. 2.In speed control mode(FA22=0), when SF1 and SF2 are OFF, internal speed 1 is the speed command.	-6000-6000 r/min	100
25	Internal speed selection 2	1.Set the internal speed 2. 2.In speed control mode(FA22=0), when SF1 is ON,while SF2 is OFF, internal speed 2 is the speed command.	-6000-6000 r/min	500

Table within row 22 (option 1):

DI Signal		Speed Command
SF2	SF1	
0	0	Internal Speed1(FA24)
0	1	Internal Speed2(FA25)
1	0	Internal Speed2(FA26)
1	1	Internal Speed2(FA27)

Table within row 22 (option 2):

DI Signal		Speed Command
SF2	SF1	
0	0	Analog Speed Command
0	1	Internal Speed2(FA25)
1	0	Internal Speed2(FA26)
1	1	Internal Speed2(FA27)

26	Internal speed selection 3	1.Set the internal speed 3. 2.In speed control mode(FA22=0), when SF1 is OFF,while SF2 is ON, internal speed 3 is the speed command.	-6000-6000 r/min	1000
27	Internal speed selection 4	1.Set the internal speed 4. 2.In speed control mode(FA22=0), when SF1 and SF2 are ON, internal speed 4 is the speed command.	-6000-6000 r/min	2000
28	Speed arrival	1.1. When the motor speed exceeds this parameter, the ASP (speed reached) of the digital output DO is ON, otherwise it is OFF. 2.2. The comparator has hysteresis function, which is set by parameter FA87.. 3.It also has the polarity setting function: FA88 / FA28 / Comparator 0 / > 0 / No direction for speed 1 / > 0 / Only detect CCW speed 1 / < 0 / Only detect CW speed	0-3000 r/min	3000
29	Gain of analog quantity torque command	1.Set the proportion for input voltage of analog torque and the actual motor running torque. 2. The setting value unit is 0.1v/100%. 3. The default value is 30, corresponding to 3v/100%, while it means if the input voltage is 3V, it would generate 100% rated torque.	10-100 (0.1v/ 100%)	30
30	The alarm value of torque overload	1.The value is the percentage of rated torque. The limit is independent to direction and CW or CCW direction is protected. 2.When FA31＞9, motor torque＞FA30 and duration＞FA31, the drive alarms and the code is Err-29. The motor stops working. It must repower on after clearing errors.	1-300	300
31	The detection time for torque overload	1.The detection time for torque overload, unit:ms. Detection time=FA31×0.1. 2.When set to 0~9, the function of torque overload alarming is prohibited. Generally,the value is set as 0.	0-32767	0

The comparator table within parameter 28:

FA88	FA28	Comparator
0	> 0	No direction for speed
1	> 0	Only detect CCW speed
1	< 0	Only detect CW speed

32	The source of torque command	In torque control mode, it sets the source of torque command. It means: 0:Analog torque command, it inputs by analog terminal AS+ and AS-. 1:Internal torque command, it is decided by TRO1 and TRQ2 of digital input(DI): Note: 0=OFF, 1=ON 2:Analog torque command+internal torque command:	0-1	0

1:Internal torque command table:

DI Signal		Torque Command
TRQ2	TRQ1	
0	0	Internal Torque1(FA64)
0	1	Internal Torque2(FA65)
1	0	Internal Torque3(FA66)
1	1	Internal Torque4(FA67)

2:Analog torque command+internal torque command table:

DI Signal		Torque Command
TRQ2	TRQ1	
0	0	Analog Torque Command
0	1	Internal Torque2(FA65)
1	0	Internal Torque3(FA66)
1	1	Internal Torque4(FA67)

33	The input direction of analog torque command	Reverse the input polarity of analog torque.	0-1	0
34	Internal CCW torque limit	1.The setting value is the percentage of rated torque.For example,it is set to 2 times of the rated torque, the value is 200. 2. At any time, this restriction is valid. 3. If the setting value is over than the max overload capacity, the actual torque limit is the max overload capacity that is permitted.	0-300%	300
35	Internal CW torque limit	1.The setting value is the percentage of rated torque.For example,it is set to 2 times of the rated torque, the value is 200. 2. At any time, this restriction is valid. 3. If the setting value is over than the max overload capacity, the actual torque limit is the max overload capacity that is permitted.	-300-0%	-300

36	External CCW torque limit	1.The setting value is the percentage of rated torque, for example, it is set to 1 time of rated torque, the value is 100. 2.Only when the input terminal(FIL) of CCW torque limit is ON is it valid. 3.When the limit is valid, the actual torque limit is the Minimum value of max overload capacity ,internal CCW torque limit and external CCW torque limit.	0-300%	100
37	External CW torque limit	Set external torque limit of the motor CW direction. 1.The setting value is the percentage of rated torque, for example, it is set to 1 time of rated torque, the value is -100. 2.Only when the input terminal(RIL) of CW torque limit is ON is it valid. 3.When the limit is valid, the actual torque limit is the Minimum value of max overload capacity ,internal CCW torque limit and external CCW torque limit.	-300-0%	-100
38	Temperature alarm	Set drive temperature up to max limitation.	200-1350	
39	Zero offset compensation of analog torque command	Make an offset adjustment for analog torque command with this parameter.	-2000-2000	0
40	Acceleration time constant	The value means the motor of acceleration time from 0r/min to 1000r/min. 1.Linear acceleration and deceleration characteristics. 2.It only applies in speed control mode and internal position control mode, and other modes are invalid..	1-10000ms	100
41	Deceleration time constant	The value means the deceleration time of the motor from 1000r/min to 0r/min. 1.Linear acceleration and deceleration characteristics. 2.It only applies in speed control mode and internal position control mode, while other modes are invalid.	1-10000ms	100
42	S type acceleration and deceleration time constant	It makes the motor start and stop working stably and sets a part of time of S type acceleration and deceleration curve.	0-1000ms	0
43	Gain of analog speed command	Set the proportion for analog speed input voltage and actual motor running speed.	10-3000 r/min/v	300
44	Direction of analog speed	Reverse the input polarity of analog speed. 1. Set to 0 and analog speed command is positive,the speed direction is CCW.	0-1	0

		2. Set to 1 and analog speed command is positive,the speed direction is CW.		
No.	Name	Function	Rang	Default Value
45	Zero offset compensation of analog speed command	Zero offset compensation for analog speed input.	-5000-5000	0
46	Filter of analog speed command	1.The input low pass filter of analog speed 2.The setting value is bigger, the response frequency is quicker to speed input analog quantity and the influence of signal noise is louder.	1-1000 Hz	300
47	The setting of mechanical brake when the motor stops	1.It defines the delay time from BRK=ON and BRK=OFF to the motor current cutting off when the motor stops rotating. 2.To avoid a small displacement or working drop of the motor, the parameter should not be less than the delay time of mechanical braking.	0-200×10ms	0
48	The setting of mechanical brake when the motor rotates	1.It defines the delay time from the motor current cutting off to BRK=ON and BRK=OFF when the motor rotates. 2.To avoid a damage to the brake, the parameter makes the motor slow down and then makes the mechanical brake work. 3. The actual action time is the time it takes to drop from FA48 or current motor speed to FA49, and taking the minimum value.	0-200×10ms	50
49	The working speed of the mechanical brake when the motor rotates	1. It defines the speed value from motor current cut-off to mechanical brake action (output terminal BRK from ON to OFF) during motor working. 2.The actual action time is the time it takes to drop from FA48 or current motor speed to FA49, and taking the minimum value.	0-3000 r/min	100
50	Speed limit in torque control mode	1:In torque control mode, the motor running speed is limited in the range of this parameter. 2:It can prevent over speed in light load.	0-5000 r/min	3000
53	Servo force enable	To set : 0: The enable signal is controlled by SON of digital input(DI). 1:Software force to servo on.	0-1	0
54	The delay closing time of servo enable	It defines the time to delay cutting off the motor current after the servo enable signal is turned off.	0-30000ms	0
55	Effective level control word of input terminals	1.To reverse the input terminals. For unreversed terminals, it is valid when the switch is closed, while it is invalid when the switch is open. For reversed terminals, it is invalid when the switch is closed, while it is valid when the switch is open.	0000-1111	0000

		2.Represented by a binary digit of 4 bits. If it is 0, it means the input terminal dose not reverse. While it is 1, it means the terminal reverses. The binary digit represents the input terminals as following: <table><tr><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr></table> 0: high level is active. 1: low level is active.		
57	Effective level control word of output terminals	1.To reverse the output terminals. For reversed terminals,the definitions of breaking over and cut-off is contrary to standard definitions 2.Represented by a binary digit of 4 bits. If it is 0, it means the input terminal dose not reverse. While it is 1, it means the terminal reverses. The binary digit represents the input terminals as following: <table><tr><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>DO4</td><td>DO3</td><td>DO2</td><td>DO1</td></tr></table> 0: high level is active. 1: low level is active.	0000-1111	0000
58	Removing jitter time constant of I/O input terminal	1.Set the removing jitter filter time for input terminal. 2.The value is smaller, the terminal input response frequency is quicker. 3.The value is bigger, the anti-jamming performance of input terminal is better, but the response frequency becomes slow.	1-20ms	2
59	Effective command pulse edge	Set to: 0: the rising edge is effective. 1:the falling edge is effective.	0-1	0
60	Soft reset	Set to: 0:Soft reset is invalid. 1:Soft reset is effective and the system will restart.	0-1	0
61	System alarm clear	Set to: 0: System alarm clear is invalid. 1: System alarm clear is effective.	0-1	0
62	Encoder selection	4: single-turn absolute encoder. 5: multi-turn absolute encoder.	4,5	determined by the motor
63	Load inertia ratio	1.Set the load inertia ratio of the motor rotating inertia. 2.The setting value=((load inertia+rotating inertia) / rotating inertia)×100.	1-500	100
64	Internal torque 1	In torque control mode(FA4=2), when TRQ1=OFF, TRQ2=OFF, internal torque 1 is as the torque command.	-300-300	0
65	Internal torque 2	In torque control mode(FA4=2), when TRQ1=ON, TRQ2=OFF, internal torque 2 is as the torque command.	-300-300	0
66	Internal torque 3	In torque control mode(FA4=2), when TRQ1=OFF, TRQ2=ON, internal torque 3 is as the torque command.	-300-300	0
67	Internal torque 4	In torque control mode(FA4=2), when TRQ1=ON, TRQ2=ON internal torque 4 is as the torque command.	-300-300	0

71	MODBUS ID NO.	MODBUS communication address.	1-254	1
72	MODBUS communication baud rate	MODBUS communication baud rate.	48-1152×100	96
73	MODBUS protocol selection	0: 8, N, 2 (MODBUS, RTU) 1：8，E，1 （MODBUS, RTU) 2：8，O，1 （MODBUS, RTU) The parameter decide the communication protocol. Value 8 represents the transmitted data is 8 bits; N,E,O indicate odd or even: N: do not use this bit. E: it represents 1 is even bit. O: it represents 1 is odd bit. Value 1 or 2 indicates communication of 1 bit or 2 bits.	0-3	0
74	Communication error handling	When communication happens error, if choose: 0: keep working. 1: alarm and stop working.	0-1	0
75	Zero-speed detection point	1.If the motor running speed is less than the value of this parameter, the ZSP(zero speed) of digital output(DO) is ON, or else OFF. 2.If ZCLAMP of digital input(DI) is ON and speed command is less than the value of this parameter, the value of speed command is forced to be zero.	0-1000 r/min	10
76	Speed coincidence range	When the difference between the actual speed and the instruction speed is less than this setting, the UCO2N(speed coincidence) is ON, otherwise OFF.	0-1000 r/min	10
77	2nd numerator of electronic gear for position command pulse	Refers to parameter FA12.	0-32767	0
78	3rd numerator of electronic gear for position command pulse	Refers to parameter FA12.	0-32767	0

79	4th numerator of electronic gear for position command pulse	Refers to parameter FA12.	0-32767	0
80	Effective level of command direction signal	Set to: 0:High level is positive direction. 1:Low level is positive direction.	0-1	0
81	PULS signal filter of command pulse	1.To filter the input PULS signal. 2.The default value is the max pulse input frequency: 500KHz(kpps). The value is bigger, the max input frequency is slower. 3.To filter the noise from the signal line in order to avoid incorrect counting happening. If it goes wrong due to the incorrect counting, you can increase the value of this parameter properly. 4. After editing this parameter, please save it and recharge. Then it is effective.	0-15	4
82	SIGN signal filter of command pulse	1.To filtering the input SIGN signal. 2.The default value is the max pulse input frequency: 500KHz(kpps) The value is bigger, the max input frequency is slower. 3.To filter the noise from the signal line in order to avoid incorrect counting happening. If it goes wrong due to the incorrect counting, you can increase the value of this parameter properly. 4. After edited this parameter, must save it and recharge. Then it is effective.	0-15	4
83	CWL/CCWL inhibit way	When the machine touches the mechanical limit switch and strike CW/CCW limit , you can choose the following methods to prohibit with this parameters. 0: To limit the torque in this direction to be 0. 1: To prohibit the input pulse in this direction.	0-1	0
84	Hysteresis for positioning completion	1.Set pulse completion range in position control mode. 2. when the number of remaining pulses in the position deviation counter is less than or equal to the setting value of this parameter, the digital output of COIN(position completion) is ON, otherwise OFF. 3.Comparator has the function of hysteresis, which is set by FA85.	0-32767 pulses	65
85	The range of near position	1. To set the pulse range of near position under the position control mode. 2. When the pulse number in position deviation counter is smaller than or equal to the setting value of this parameter,	0-32767 pulses	6500

		the digital output (DO) NEAR(approach position) is ON, otherwise is OFF. 3. The comparator has hysteresis function set by FA86. 4. Use this function in case that in near positioning, the host controller is accepting the NEAR signal to carry on the preparation to the next step. In general, this parameter value should be bigger than FA16.		
86	Hysteresis for approach positioning	Refer to parameter FA85.	0-32767 pulses	650
87	Hysteresis of arrival speed	1. When the motor speed exceeds this parameter, the digital output ASP (speed arrival) is ON, otherwise OFF. 2. The comparator has hysteresis function. 3. It has polarity setting function: **FA88** / **FA28** / **Comparator** 0 / >0 / Speed without direction 1 / >0 / Only detect positive speed 1 / <0 / Only detect reversal speed	0-5000 r/min	30
88	Polarity of arrival speed	Refers to parameter FA87.	0-1	0
89	Arrival torque	1. When the motor torque exceeds this parameter, the digital output ATRQ (torque arrival) is ON, otherwise OFF. 2. The comparator has hysteresis function set by FA90. 3. It has polarity setting function: **FA91** / **FA89** / **Comparator** 0 / >0 / Torque without direction 1 / >0 / Only detect positive speed 1 / <0 / Only detect reversal speed	-300%-300%	100
90	Hysteresis of arrival torque	1.If the motor torque is bigger than FA90, the ATRQ(torque arrival) of digital output(DO) is ON, otherwise it is OFF. 2.The comparator has hysteresis function set by FA90. 3.It also has polarity setting function: **FA91** / **FA89** / **Comparator** 0 / >0 / Torque without direction 1 / >0 / Only detect positive speed 1 / <0 / Only detect reversal speed	0-300%	5
91	Polarity of arrival torque	1.If the motor torque is bigger than FA91, the ATRQ(torque arrival) of digital output(DO) is ON, otherwise it is OFF. 2.The comparator has hysteresis function and it is set by	0-1	0

		FA90. 3.It also has polarity setting function:		

FA91	FA89	Comparator
0	>0	Torque without direction
1	>0	Only detect positive speed
	<0	Only detect reversal speed

92	Hysteresis of zero speed detection	1. The motor speed is lower than the value of this parameter, ZSP(zero speed) of digital output is ON, or else OFF. 2. The comparator has hysteresis function.	0-1000 r/min	5
94	The delay time of brake on	1. Set the delay time for the electromagnetic brake to open. 2. When the system changes from the disabled state to the enabled state, define the delay time from the opening of the motor current to the release of the electromagnetic brake (DO output terminal BRK ON).	0-200 ms	0
95	Motor encoder resolution	Motor encoder resolution，2^{17}=13107 and the setting value 17. Please modify it carefully.	10-32	17
96	Motor polarity	It is motor polarity. Please modify it carefully.	1-360	5
97	Motor zero offset angle	Encoder zero bit and motor zero bias angle, which is etermined by the motor.	0-3600	1800
99	Maximum duty cycle on brake	Maximum duty cycle on brake	5-90	50
100	Filter selection of position loop	0：digital moving average filter. 1：index smooth filter.	0-1	0
101	Position loop feedforward gain	Feedforward can reduce the position tracking error in position control. When it is set to 100, the position tracking error is always 0 under any frequency instruction pulse.	0-100	0
102	The feedforward filter time constant of position loop	The position loop feedforward filter can increase the stability of feedforward control.	20-500	100
103	Z signal output pulse width	Z signal output pulse width.	1-200	50
104	RS output function selection	Set to: 0: It can use 485 communication function 1: There is no 485 communication function, which can add a programmable output and output differential signal (Z signal is as default).	0-1	0

4.2 F3 group multifunctional terminal series parameters
4.2.1 List of F3 series parameters

The 4 inputs/4 outputs of the servo drive are connected to the PLC internally, Y22-Y25 corresponds to servo DI1-DI4, X20-X23 corresponds to servo DO1-DO4; the defined values of terminal input and output can be changed through the series parameters of the F3 group to complete various Input and output definitions. (The input terminal is active low by default).

Parameter	Name	Range	Default Value
F3-0	Digital input DI1 function	0-99	1
F3-1	Digital input DI2 function	0-99	2
F3-2	Digital input DI3 function	0-99	3
F3-3	Digital input DI4 function	0-99	4
F3-4	Digital input DI5 function	0-99	0
F3-5	Digital input DI6 function	0-99	0
F3-13	Low 16-bit current position value	-32768 - 32767	0
F3-14	High 16-bit current position value	-32768 - 32767	0
F3-15	Digital input DI forced effective1	00000000-11111111	00000000
F3-16	Digital input DI forced effective2	00000000-11111111	00000000
F3-17	Digital input DI forced effective3	00000000-11111111	00000000
F3-18	Digital input DI forced effective4	00000000-11111111	00000000
F3-19	Digital input DI forced effective5	00000000-11111111	00000000
F3-20	Digital output DO1 function	0-99	2
F3-21	Digital output DO2 function	0-99	3
F3-22	Digital output DO3 function	0-99	5
F3-23	Digital output DO4 function	0-99	8
F3-24	Digital output DO5 function	0-99	18
F3-30	Virtual input terminal control	0-2	0
F3-31	The State value of virtual input terminal	00000000-11111111	00000000
F3-32	Display mode of motor position, instruction position, position difference, single turn absolute position	0：motor resolution displays increment. 1: motor resolution displays absolute position. 2: upper computer (FA11) resolution displays increment. 3: upper computer resolution displays absolute position.	0
F3-33	The State value of virtual output terminal	0000-1111	0000
F3-34	Reset to zero encoder multiple circle data	0-1	0
F3-35	Clear encoder fault alarm	0-1	0
F3-36	The current position is zero at the single-turn position (F3-34 is set to 1)	0-1	0
F3-37	0: single turn+ multi-turn position 64 bits data.	0-1	0

	1: single turn position and multi-turn position.		
F3-38	Virtual I/O input DI1 function	0-99	0
F3-39	Virtual I/O input DI2 function	0-99	0
F3-40	Virtual I/O input DI3 function	0-99	0
F3-41	Virtual I/O input DI4 function	0-99	0
F3-42	Virtual I/O input DI5 function	0-99	0
F3-43	Virtual I/O input DI6 function	0-99	0
F3-44	Virtual I/O input DI7 function	0-99	0
F3-45	Virtual I/O input DI8 function	0-99	0

Remark:

1. F3-30=0, the number of IO input is 4 decided by DI1~DI4 and the corresponding parameter F3-0~F3-3.

2. F3-30=1, the number of IO input is 8 decided by F3-31 and the corresponding parameter F3-38~F3-45.

3. F3-30=2, the number of IO input is 12 decided by DI1~DI4 and F3-31 and the corresponding parameter

F3-0~F3-3 and F3-38~F3-45.

4. This port can be set to differential output when FA104=1 for F3-24.

4.2.2 DI Function Explanation

The input terminal corresponds to y22-y25 (the parameters of the four terminals corresponding to F3 group are p3-0, p3-1, p3-2, p3-3) to define the value.

Value	Symbol	Function	Explanation
0	NULL	No	Input state dose not effect system.
1	SON	Servo Enable	Input terminal of servo enable. OFF: servo driver can not be enabled and serv omotor is not excited. ON:servo driver is enabled and servomotor is excited.
2	ARST	Alarm Clear	Input terminal of alarm clearance. When an alarm occurs and if the alarm is allowed clearance, the rising edge(from OFF becomes ON) of ARST will clear the alarm. Attention: only a part of alarms are allowed to clear.
3	CCWL	CCW Drive Inhibition	1.Input terminal of CCW drive inhibition: OFF：Inhibit CCW running. ON：Enable CCW running. 2.Use this function for protection of the mechanical traveling limit.The function is controlled by the parameter FA20. Pay attention to that the default value of FA20 neglects this function.Therefore needs to modify FA20 if need to use this function: (1)：When FA20=0，the function of input inhibition is effective. Whether to inhibit is decided by FA83. (2)：When FA20=1, the function of input inhibition is not effective.

			Whether to inhibit is not decided by FA83 3. Inhibition function is valid(FA20=0): (1) FA83=0, CCW torque limit is 0,but it does not limit CCW pulse input. **(2)** FA83=1, it does not inhibit CCW pulse input.
4	CWL	CW Drive Inhibition	1.The input terminal of CW drive inhibition OFF：Inhibit CCW running. ON：Enable CW running. 2.Use this function for protection of the mechanical traveling limit.The function is controlled by the parameter FA20. Pay attention to that the default value of FA20 neglects this function.Therefore needs to modify FA20 if need to use this function: (1)：When FA20=0，the function of input inhibition is effective. Whether to inhibit for CW is decided by FA83. (2)：When FA20=1, the function of input inhibition is not effective. Whether to inhibit for CW is not decided by FA83 3.Inhibition function is valid(FA20=0): (1)：FA83=0, CW torque limit is 0,but it does not limit CW pulse input. FA83=1, it does not inhibit CW pulse input.
5	TCCW	CCW Torque Limitation	OFF ：Torque is not limited by parameter FA36 in CCW direction. ON ：Torque is limited by parameter FA36 in CCW direction. Attention: Whether the TCCW is effective or not, the torque is also limited by FA34 in CCW direction.
6	TCW	CW Torque Limitation	OFF：Torque is not limited by parameter FA37 in CW direction. ON ：Torque is limited by parameter FA37 in CW direction. Attention: Whether the TCW is effective or not, the torque is also limited by FA35 in CW direction.
7	ZCLAMP	Zero Speed Clamping	When it is satisfied with the followings, the function of zero speed clamping is open(speed is forced to zero): 1: speed control mode(FA4=1), and choose external speed(FA22=0); 2：ZCLAMP ON; 3：speed command is lower than the value of FA75 When any one of the above conditions is not satisfied, it will perform normal speed control.
8	CZERO	Zero Command	In speed or torque control mode, speed or torque command: OFF：Normal command ON:：Zero command
9	CINV	Instruction Reverse	In speed or torque control mode, speed or torque command: OFF：Normal command ON：Command reversed
10	SF1	Speed Choice 1	In speed control mode(FA4=1), and choose internal
11	SF2	Speed Choice 2	speed(FA22=1). SF1 and SF2 combinations are used to select different internal speeds: SF2 OFF SF1 OFF: internal speed 1FA-24)

			SF2 OFF SF1 ON: internal speed 2(FA-25)
			SF2 ON　SF1 OFF:internal speed 3(FA-26)
			SF2 ON　SF1 ON:internal speed 4(FA-27)
13	TRQ1	Torque Choice 1	In torque control mode(FA4=2), and choose internal
14	TRQ2	Torque Choice 2	torque(FA32=1). TRQ1 and TRQ2 combinations are used to select different internal torque: TRQ2 OFF TRQ1 OFF:　internal torque1(FA64) TRQ2 OFF TRQ1 ON:　 internal torque2(FA65) TRQ2 ON　TRQ1 OFF:　internal torque3(FA66) TRQ2 ON　TRQ1 ON:　 internal torque4(FA67)
16	CMODE	Composite Mode	When FA4 is set to 3, 4, 5, it is in mix control mode. It can change control mode with this input terminal: (1)FA4=3, CMODE OFF, it is position control mode; CMODE ON, it is speed control mode; (2)FA4=4, CMODE OFF, it is position control mode; CMODE ON, it is torque control mode; (3)FA4=5, CMODE OFF, it is speed control mode; CMODE ON, it is torque control mode.
18	GEAR1	Electronic Gear 1	When FA11=0, Gear1 and Gear2 combinations are used to select different numerator of gear ratio:
19	GEAR2	Electronic Gear 2	GEAR2 OFF GEAR1 OFF: numerator 1(FA-12) GEAR2 OFF GEAR1 ON: numerator 2 (FA-77) GEAR2 ON　GEAR1 OFF: numerator 3(FA-78) GEAR2 ON　GEAR1 ON: numerator 4(FA-79)
20	CLR	Position Deviation Clear	In position control mode, the position deviation counter clear input terminals.
21	INH	Pulse Input Inhibition	In position control mode, position command pulse inhibit terminals: OFF: The input command pulse is valid. ON : The input command pulse input is prohibited.
22	JOGP	CCW Inching	In speed control mode, FA22=5, connect to the signal, the motor is in inching in CCW and speed is set by FA21. Attention: If the signal is connected to CW inching, inching function does not work.
23	JOGN	CW Inching	In speed control mode, FA22=5, connect to the signal, the motor is in inching in CW and speed is set by FA21. Attention: If the signal is connected to CCW inching, inching function does not work.
27	HOLD	Internal Position Control Command Stops	In internal position register mode, the motor will stop rotating if the signal is active(It can only work when internal position mode FA-14=3).
28	CTRG	Internal Position Command Triggers	In internal position register mode, the signal will be triggered once the internal position register control commands(POS0-2) are chosen, and then the motor will rotate according to the internal position register command. Only when ZSPD=1(digital output) it would receive a next internal position command trigger.

29	POS0	Internal Position Command Selection0	The corresponding relationship of the internal position selection:				
			Position Command	POS2	POS1	POS0	CTRG	Parameter
			F1	0	0	0	↑	F4-2
								F4-3
30	POS1	Internal Position Command Selection1	F2	0	0	1	↑	F4-5
								F4-6
			F3	0	1	0	↑	F4-8
								F4-9
			F4	0	1	1	↑	F4-11
								F4-12
31	POS2	Internal Position Command Selection2	F5	1	0	0	↑	F4-14
								F4-15
			F6	1	0	1	↑	F4-17
								F4-18
			F7	1	1	0	↑	F4-20
								F4-21
			F8	1	1	1	↑	F4-23
								F4-24
33	SHOM	Starting Origin Regression	In internal position register mode,it needs to search for origin. The signal turns on and starts searching for the origin function(Refer to the setting of F4-34).				
34	ORGP	Origin Of Regression	In internal position register mode,it needs to search for origin. The signal turns on and starts searching for the origin function(Refer to the setting of F4-32).				

4.2.3 DO Function Explanation

The output terminal corresponds to x20-y23 (the parameters of the four terminals corresponding to F3 group are p3-20, p3-21, p3-22, p3-23) definition value.

Value	Symbol	Function	Explanation
1	ON	Always Valid	Forced output ON.
2	RDY	Servo Ready	OFF ：Main power supply is off, or alarm occurs; ON：Main power supply is normal, no alarm occurs
3	ALM	Alarm	OFF ：alarm occurs. ON ：no alarm occurs.
4	ZSP	Zero Speed	In speed or torque control mode: OFF：motor speed is higher than the value of FA75 (no direction). ON：motor speed is higher than the value of FA75 (no direction).
5	COIN	Positioning Completion	In position control mode: OFF:position deviation is bigger than parameter FA16. ON: position deviation is bigger than parameterFA16.
6	ASP	Arrival Speed	In speed or torque control mode:

			OFF :motor speed is lower than parameter FA28. ON : motor speed is higher than parameterFA28. Polarity function can be set referring to the explanation of FA28.
Value	Symbol	Function	Explanation
7	ATRQ	Arrival Torque	OFF : motor torque is lower than parameter FA89; ON : motor torque is higher than parameter FA89. Polarity function can be set referring to the explanation of FA89.
8	BRK	Electromagnetic Brake	OFF : electromagnetic brake applies the brake. ON : electromagnetic brake releases the brake.
9	RUN	Servo Running	OFF : servo motor does not excite. ON : servo motor has excited.
10	NEAR	Near Position	In position control mode: OFF: position deviation is bigger than parameter FA85. ON: position deviation is smaller than parameter FA85.
11	TRQL	Torque Limitation	OFF : motor torque has not reached the limitation. ON : motor torque has reached the limitation. Torque limitation is set byFA34,FA35,FA36 and FA37.
12	SPL	Speed Limitation	In torque control mode: OFF : motor speed has not reached the limitation. ON : motor speed has reached the limitation. Speed limitation is set byFA50.
13	VCOIN	Speed Consistency	OFF: The absolute value of the difference between the actual rotational speed and the instruction speed is bigger than FA76. ON: The absolute value of the difference between the actual rotational speed and the instruction speed is smaller than FA76.
15	HOME	Origin Regression Completion	OFF: No signal output when the origin regression doesn't complete. ON: The signal outputs when the origin regression completes.
16	CMDOK	Internal Position Command Completion	OFF: No signal output when internal position command doesn't complete or internal position command doesn't stop. ON: The signal outputs after the setting time of F4-1 when internal position command completes or internal position command stops.

4.2.4 DI Forced Valid

There are 5 parameters(F3-15, F3-16, F3-17,F3-18,F3-19) in group F3 and they can force DI valid.

(1) Corresponding functions for F3-15 is represented by 8-bit binary:

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

(2) Corresponding functions for F3-16 is represented by 8-bit binary:

Number	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Function	CMODE	NULL	TRQ2	TRQ1	NULL	SF2	SF1	CINV

(3) Corresponding functions for F3-17 is represented by 8-bit binary:

Number	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0

Function	NULL	JOGN	JOGP	INH	CLR	GEAR2	GEAR1	NULL

(4) Corresponding functions for F3-18 is represented by 8-bit binary:

Number	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Function	NULL	POS2	POS1	POS0	CTRG	HOLD	NULL	NULL

(5) Corresponding functions for F3-19 is represented by 8-bit binary:

Number	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Function	NULL	NULL	NULL	NULL	NULL	NULL	ORGP	SHOM

Parameter Meaning:

One of 5 parameters	Corresponding Function	Result
0	Unplanned	OFF（invalid）
	Already Planned	It is up to signals
1	Unplanned Or Already Planned	ON（forced valid）

> **NOTE**
> ◆ Being planned means that the parameter has been selected by the input terminal in the F3-0~F3-3.

4.3 F4 Group Parameters For Internal Position Command

No.	Name	Function	Rang	Default Value
F4-0	Internal position instruction control mode	0: Absolute position command, suitable for FA62 = 5 multi-turn encoder mode; 1: Incremental position command; 2: Absolute position command, suitable for FA62 = 4 single-turn encoder mode.	0-2	0
F4-1	The digital output delay of internal position completion	1. When the internal position command is completed or stops,the output internal position command completes (CMDOK) this DO signal after the delay time set by F4-1. 2. Only when the delay time F4-1=0 and CMDOK=1 can it receive trigger internal position command. 3. Only when the delay time F4=1 is not 0 and CMDOK=1 can it receive the internal position command triggered by CTRG.	0-200 ms	0
F4-2	The setting of position cycle numbers for internal position command 1	To set position cycles of the first internal position.	-30000-30000	0
F4-3	The setting of pulse number in position cycle for internal	1. To set position pulses of the first internal position. 2. Internal position command=the setting value of the first internal position cycles+the setting value of the first internal position pulses.	+/-max.cnt/rev	0

No.	Name	Function	Rang	Default Value
	position command 1	(Max is the pulse number of the motor rotation for each roll, please refer to the settings of FA11,FA12 and FA13).		
F4-4	The move speed of Internal position instruction 1	To set the move speed of internal position instruction 1.	0-5000 r/min	1000
F4-5	The number of position cycles of internal position instruction 2	To set the number of position cycles of the second stage internal position.	-30000-30000	0
F4-6	The pulse number setting in position loop of internal position instruction 2	1. To set the position pulses of the second stage internal position. 2. Internal position instruction 2=the position cycles setting of the second internal position+the pulse number setting of the second internal position.	+/-max.cnt/rev	0
F4-7	The move speed of internal position instruction 2	To set the move speed of internal position instruction 2.	0-5000 r/min	1000
F4-8	The position cycles of internal position instruction 3	To set the position cycles of the third stage internal position instruction.	-30000-30000	0
F4-9	The pulse number setting in position loop of internal position instruction 3	1. To set the position pulses of the third stage internal position. 2. Internal position instruction 3=the position cycles setting of the third internal position+the pulse number setting of the third internal position.	+/-max.cnt/rev	0
F4-10	The move speed of internal position instruction 3	To set the move speed of internal position instruction 3.	0-5000 r/min	1000
F4-11	The number of position cycles of internal position instruction 4	To set the number of position cycles of the fourth stage internal position.	-30000-30000	0
F4-12	The pulse number setting in position loop of internal position instruction 4	1. To set the position pulses of the 4th stage internal position. 2. Internal position instruction 4=the position cycles setting of the 4th internal position+the pulse number setting of the 4th internal position.	+/-max.cnt/rev	0

No.	Name	Function	Rang	Default Value
F4-13	The move speed of internal position instruction 4	To set the move speed of internal position instruction 4.	0-5000 r/min	1000
F4-14	The position cycles of internal position instruction 5	To set the position cycles of the 5th stage internal position instruction.	-30000-30000	0
F4-15	The pulse number setting in position loop of internal position instruction 5	1. To set the position pulses of the 5th stage internal position. 2. Internal position instruction 3=the position cycles setting of the 5th internal position+the pulse number setting of the third internal position.	+/-max.cnt/rev	0
F4-16	The move speed of internal position instruction 5	To set the move speed of internal position instruction 5.	0-5000 r/min	1000
F4-17	The number of position cycles of internal position instruction 6	To set the number of position cycles of the sixth stage internal position.	-30000-30000	0
F4-18	The pulse number setting in position loop of internal position instruction 6	1. To set the position pulses of the 6th stage internal position. 2. Internal position instruction 6=the position cycles setting of the 6th internal position+the pulse number setting of the 6th internal position.	+/-max.cnt/rev	0
F4-19	The position cycles of internal position instruction 7	To set the position cycles of the 7th stage internal position instruction.	0-5000 r/min	1000
F4-20	The position cycles of internal position instruction 7	To set the position cycles of the 7th stage internal position instruction.	-30000-30000	0
F4-21	The pulse number setting in position loop of internal position instruction 7	1. To set the position pulses of the 7th stage internal position. 2. Internal position instruction 7=the position cycles setting of the 7th internal position+the pulse number setting of the 7th internal position.	+/-max.cnt/rev	0
F4-22	The move speed of internal position instruction 7	To set the move speed of internal position instruction 7.	0-5000 r/min	1000

No.	Name	Function	Rang	Default Value
F4-23	The number of position cycles of internal position instruction 8	To set the number of position cycles of the eighth stage internal position.	-30000-30000	0
F4-24	The pulse number setting in position loop of internal position instruction 8	1. To set the position pulses of the 8th stage internal position. 2. Internal position instruction 8=the position cycles setting of the 8th internal position+the pulse number setting of the 8th internal position.	+/-max.cnt/rev	0
F4-25	The move speed of internal position instruction 8	To set the move speed of internal position instruction 8.	0-5000 r/min	1000
F4-32	The type of origin detector and setting of finding direction	0: Forward direction origin regression and CCWL is as regression origin. 1: Reverse direction origin regression and CWL is as regression origin. 2: Forward direction origin regression and ORGP is as regression origin. 3: Reverse direction origin regression and ORGP is as regression origin. 4: Forward looking for Z pulse as the origin of regression. 5: Reverse looking for Z pulse as the origin of regression.	0-5	0
F4-33	Set the mode of short distance movement to the origin	0: Find the reference origin and return to search for the Z phase pulse as the mechanical origin. 1: Find the reference origin and keep forward for the Z phase pulse as the mechanical origin. 2: Find the rising edge of the detector ORGP as the mechanical origin. (when it is 2, only the type of origin detector and the setting value of the search direction can be used as 2, 3,4 or 5.)	0-2	0
F4-34	Origin trigger start mode	0: Close origin regression function. 1: Automatically perform origin regression when it is powering on. 2: Trigger the origin regression function by the input contact of the origin search function.	0-2	0
F4-35	The setting of origin stop mode	0: The motor slows down and pulls back to the origin when the origin detection completed. 1: The motor slows forward and stops when the origin detection completed.	0-1	0

F4-36	The speed setting of origin regress in the first stage of high speed (HSPD1)	To set homing speed at 1st stage.	1-2000 r/min	1000
F4-37	The speed setting of origin regress in the first stage of high speed(HSPD2)	To set the speed of origin regression in the second stage of high speed.	1-500 r/min	50
F4-38	The cycle number of origin regression offset(HOF1)	To set the cycle number of origin regression offset.	-30000-30000	0
F4-39	The pulse number of origin regression offset(HOF2)	1: To set the pulse number of origin regression offset. 2: When the parameter function HOF1 and HOF2 are set to 0, the origin is defined as Z pulse or ORGP by the origin regression mode. If they are not 0, the origin will define the above Z pulse plus last pulse offset HOF1 ×10000+HOF2 as the new origin.	+/-max.cnt/rev	0
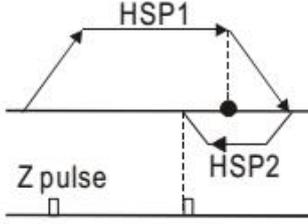
Chapter 5 Error Code

No.	Error Name	Introduction
--	Normal	
1	Over speed	Motor speed over than the setting values.
2	Main circuit over voltage	The voltage of main circuit is too high.
3	Main circuit under voltage	The voltage of main circuit is too low.
4	Position overshoot	The value of position deviation counter is over than the setting value.
5	Drive overheat	The temperature of the drive is high.
6	Speed amplifier saturation fault	Speed adjustment for long time saturation.
7	Drive inhibit error	Speed adjustment in saturation for long time.
8	Position deviation accumulation was out of range	Absolute value of position deviation accumulation is over than 2^{30}.
11	IPM module error	IPM smart module error.
13	Drive overload	Servo drive and motor overload(overheat instantaneously).
14	Brake fault	Brake circuit error.
18	Relay switch fault	The real state of relay is different from control state.
19	Delay to open the brake	Pulse inputs before opening.
20	EEPROM error	EEPROM error.
21	FPGA module fault	FPGA module fault.
22	The stored parameters and parameters stored in encoder mismatch	The value of FA62 was changed resulting in paramters mismatching.
23	Current collecting circuit fault	Current collecting circuit fault.
29	Alarm for torque overload	Motor load exceeds user-set values and range.
38	Failure to read or write encoder EEPROM communication	The encoder cable was not connected Or the encoder interface circuit fault.
39	Data CRC checking error	The motor encoder hasn't written dataes and all are 0.
40	Model not supported	Driver does not support this motor model.
41	Need to switch motor model	The current motor is inconsistent with the selected model of the drive.
42	AC input under voltage	AC input under voltage.
47	Over voltage when main circuit in powering up	Over voltage when main circuit in powering up.
50	Encoder communication fault	Driver and encoder are not connected.
51	Encoder communication abnormal	After the encoder established the communication, there appears the interrupt and disconnection.
52	Encoder battery voltage insufficient alarm	Encoder battery voltage insufficient alarm, but information did not lost and needs to be replaced as soon as possible.
53	Encoder battery voltage error alarm	Encoder battery voltage error alarm, and storage information has occurred error needing to reset encoder.
54	Encoder error alarm	Encoder non-battery alarm, but need to reset encoder again.
55	CRC check occurs errors for 3 times in a row	Encoder communication received data CRC validation 3 consecutive errors.
56	MODBUS frame is too long.	MODBUS frame data received is too long.
57	Abnormal MODBUS communication format	Improper setting of communication parameters or incorrect address or value.

58	Single turn position error	Single turn position offset stored by the drive exceeds encoder resolution.
59	Encoder reporting CF error	Encoder continuously reports CF domain error and is needed reset encoder.

Chapter 6 Alarm processing method

No.	Alarm name	Running state	Reason	Processing method
1	Over speed	Appears when the control power is turned on	1. The control circuit board is faulty. 2. Encoder failure.	1. Replace the servo driver. 2. Replace the servo motor.
		Appears during motor operation	The input command pulse frequency is too high.	Correctly set the input command pulse.
			The acceleration / deceleration time constant is too small, which makes the speed overshoot too large.	Increase the acceleration / deceleration time constant.
			The input electronic gear ratio is too large.	Setting correctly.
			Encoder failure.	Replace the servo motor.
			Poor encoder cable.	Replace the encoder cable
			The servo system is unstable, causing overshoot.	1. Reset the relevant gain value. 2. If the gain cannot be set to an appropriate value, reduce the load inertia ratio.
		Appears when the motor is just started	Excessive load.	1. Reduce the load. 2. Replace the driver and motor with higher power.
			1. Encoder zero error. 2. Motor UVW lead is wrongly connected. 3. Wrong cable connection of encoder.	1. Replace the servo motor. 2. Ask the manufacturer to reset the encoder zero point. 3. Correct wiring.
2	Main circuit overvoltage	Appears when the control power is turned on	Circuit board failure.	Replace the servo driver.
		Appears when the main power is turned on	1. The power supply voltage is too high. 2. The power supply voltage waveform is abnormal.	Check the power supply.
		Appears during motor operation	The brake resistance wiring is disconnected.	Rewire.
			1. The brake transistor is damaged. 2. The internal braking resistance is damaged.	Replace the servo driver.
			Insufficient capacity of braking circuit.	1. Reduce the start and stop frequency. 2. Increase the acceleration and deceleration time constant.

No.	Alarm name	Running state	Reason	Processing method
				3. Reduce the torque limit.
				4. Reduce load inertia.
				5. Replace the driver and motor with higher power.
4	Position out of tolerance	Appears when the control power is turned on	Circuit board failure.	Replace the servo driver.
		Turn on the main power supply and control line, input the pulse command, and the motor will not rotate or reverse	1. Encoder zero point change. 2. Encoder failure.	1. Readjust encoder zero point. 2. Replace the servo motor.
		Position proportional gain is too small. Position proportional gain is too small.	Position proportional gain is too small.	Increase the detection range of position out of tolerance.
			Position proportional gain is too small.	Increase the gain value.
			Insufficient torque.	1. Check the torque limit value. 2. Reduce load capacity. 3. Replace the driver and motor with higher power.
			Command pulse frequency is too high.	Reduce the frequency.
			Encoder zero change.	Readjust the encoder zero point.
5	Drive overheating	Appears when the drive was running	1. Circuit board failure. 2. The temperature of the driver is too high.	1. Reduce the temperature of the driver. 2. Replace the servo driver.
6	Speed amplification Saturation fault	Appears during motor operation	1. The load is too large. 2. The motor is mechanically stuck.	1. Reduce the load. 2. Replace the driver and motor with higher power. 3. Check the mechanical part of the load.
7	Drive inhibit exception		The CCW / CW drive inhibit input terminals are disconnected.	Check the wiring.
8	Position deviation Counter overflow		1. The motor is mechanically stuck. 2. The input command pulse is abnormal.	1. Check the mechanical part of the load. 2. Check the command pulse. 3. Check whether the motor rotates according to the command pulse.
9	IPM module failure	Appears when the control power is turned	Circuit board failure.	Replace the servo driver.

			1. The power supply voltage is low. 2. Overheating.	1. Check the drive. 2. Power on again. 3. Replace the drive.
20		on		
		Appears during motor operation	Short circuit between driver and UVW.	Check the wiring.
			Poor grounding.	Properly grounded.
			The motor insulation is damaged.	Replace the motor.
			Disturbed.	1. Add line filter. 2. Keep away from interference sources.

No.	Alarm name	Running state	Reason	Processing method
10	Overload	Appears when the control power is turned on	Circuit board failure.	Replace the servo driver.
		Appears during motor operation	Operate in excess of the rated torque.	1. Check the load. 2. Reduce the start and stop frequency. 3. Reduce the torque limit. 4. Replace the driver and motor with higher power.
			Keep the brake not open.	Check the holding brake.
			Unstable oscillation of motor.	1. Adjust the gain. 2. Increase acceleration / deceleration time. 3. Reduce load inertia.
			1. One phase of UVW is broken. 2. Encoder connection error.	Check the wiring.
11	Brake failure		Brake circuit failure.	Replace drive
12	Relay switch failure		The relay is damaged.	Return to the factory for maintenance.
19	Holding brake delay Not open		The FA94 parameter value is set too large, the control pulse is coming, and the holding brake has not been opened.	Reduce the parameter value of pa94.
20	EEPROM error		The chip or circuit board is damaged.	1. Replace the servo driver. 2. After repair, you must reset the drive model (FA10) and restore the default parameters.
21	FPGA		The function of FPGA module	Replace the drive.

No.	Alarm name	Running state	Reason	Processing method
	module failure		is abnormal.	
22	The parameter storage does not match the encoder parameter storage	Modify the parameter value of pa62, and the encoder type is changed	To switch the encoder type, you need to reset the system.	Set FA61 to 1 and restart the power supply.

No.	Alarm name	Running state	Reason	Processing method
23	Current acquisition circuit fault		Current acquisition circuit failure.	Replace the servo driver.
29	User torque overload alarm		1. The parameters of pa30 and pa31 are unreasonable. 2.Unexpected heavy load occurs.	1. Modify parameters. 2. Repair machinery.
30	Encoder Z pulse loss		1. Z pulse does not exist and encoder is broken. 2.Poor cable or shielding. 3.The shielding ground wire is not connected properly. 4.Encoder interface circuit failure.	1. Replace the encoder. 2. Check the encoder interface circuit.
31	Encoder UVW signal error		1. The encoder UVW signal is damaged. 2. Encoder Z signal is damaged. 3. Poor cable or shielding. 4. The shielding ground wire is not connected properly. 5. Encoder interface circuit failure.	1. Replace the encoder. 2. Check the encoder interface circuit.
32	Illegal encoding of encoder UVW signal		1. The encoder UVW signal is damaged. 2. Poor cable. 3. Poor cable shielding. 4. The shielding ground wire is not connected properly. 5. Encoder interface	1. Replace the encoder. 2. Check the encoder interface circuit.

No.	Alarm name	Running state	Reason	Processing method
			circuit failure.	
33	Provincial type Encoder alarm		Parameter settings do not match.	Set FA62 parameters correctly.
34	UVW signal instability, jumping		UVW signal is poor.	Check the wiring.
39	Data CRC check error		The motor encoder has not written data, which are all 0.	Write the motor parameters of the corresponding model into the encoder.
40	Model not supported		The drive does not support this motor model.	Use a matching motor.
41	Need to switch motor model		The current motor is inconsistent with the selected model of the drive.	Manually switch the model to the current model.

No.	Alarm name	Running state	Reason	Processing method
42	AC input voltage too low	Operation during power failure	1. Normal. 2. The external AC voltage input is too low.	Check AC220V input.
47	The voltage of the main circuit is too high during power on		1. External AC voltage input is too high. 2. Main circuit fault.	1. Check AC220V input. 2. Replace the drive.
50	Encoder communication failure		No communication connection between the driver and the encoder is established.	Connect the encoder cable and power on again.
51	Encoder communication abnormality		After the encoder communication is established, it is interrupted and disconnected.	Connect the encoder cable and power on again.。
52	Encoder battery voltage insufficient alarm		The encoder gives an alarm when the battery voltage is insufficient, and the information is not lost, but it needs to be replaced as soon as possible.	Replace the encoder battery
53	Encoder battery voltage error alarm		The encoder battery voltage error alarm, the stored information has been wrong, and the encoder needs to be reset.	The encoder battery is exhausted and must be replaced.
54	Encoder error alarm		The encoder is not a battery alarm, but it needs to reset the encoder.	Reset the encoder.

55	CRC check error for 5 consecutive times		The driver receives the data CRC verification of the encoder and makes errors for more than 5 consecutive times	Check the hardware circuit related to encoder communication
56	Modbus frame too long error		1. The communication protocol does not match. 2. Disturbed.	1. Confirm the frame length. 2. Add line filter to keep away from interference.
57	Modbus communication format is abnormal.		1. Communication parameters are not set properly. 2. The communication address or value is incorrect.	Replace the drive.
58	Single lap position value error		The single turn position offset value stored by the driver exceeds the encoder resolution.	Power on again.
59	Encoder reports CF error		The encoder continuously reports CF domain errors and needs to reset the encoder.	Reset the encoder.

Chapter 7 PLC function

7.1 characteristics of PLC

◆ The upper computer programming software is compatible with GX Developer8.86/GX Works2.

(it supports ladder diagram and SFC language, does not support structured programming, and does not support the use of labels).

◆ Super functional. Compatible with FX3S series PLC, fast operation.

◆ Adopt military-grade 32-bit CPU, fast speed, more suitable for industrial environment with high electromagnetic interference.

◆ Special encryption function, completely eliminate illegal reading. With 8-bit encryption and the login keyword set to 12345678, the function of reading ladder program can be completely closed, thus protecting the user's program.

◆ Comes with a TYPE-C PLC programming port with faster download speed and supports online reading and writing programs; comes with an RS485, supports Mitsubishi programming port protocol/MODBUS protocol/RS protocol, easy to achieve PLC interconnection and human-machine interface and inverter and other external equipment communication

◆ The high-speed pulse output is normally 4 channels, with each channel of y0~y1 100kHz and each channel of y2~y3 50KHz (where Y0 is occupied by internal servo)

◆ High-speed counting conventional 2 channels single phase 60KHz+4 channels 10KHz or 1 channel AB(Z) phase 30KHz +1 channel AB(Z) phase 5KHz.

◆ Servo all-in-one machine PLC switching value 16DI /16DO; Transistor output, input and output are isolated by optocoupler.

7.2 PLC software component number

Software component name	Content		
Input / output relay			
Input relay	X000~X017	16 points	The number of soft components is octal number; The total input and output is 32 points
Output relay	Y001~Y023 (Y0,Y10 for servo)	16 points	
Auxiliary relay			
General use	M0~M383	384 points	
EEPROM Keep using	M384~M511	128 points	
General use	M512~M1535	1024 points	
Special use	M8000~M8511	512 points	
state			
For initial state (EEPROM keep)	S0~S9	10 points	
EEPROM keep using	S10~S127	118 points	
General use	S128~S255	128 points	
Timer (ON delay timer)			
100ms	T0~T31	32 points	0.1~3,276.7 seconds
100ms/10ms※1	T32~T62	31 points	0.1~3,276.7 秒/0.01~327.67 seconds M8028 =ON ， T32~T62 change to the 10ms timer
1ms	T63~T127	65 points	0.001~32.767 seconds
1ms Cumulative type (EEPROM keep)	T128~T131	4 points	0.001~32.767 seconds

100ms Cumulative type (EEPROM keep)	T132~T137	6 points	0.1~3,276.7 seconds
Counter			
increment count for general use(16 bit)	C0~C15	16 points	Counter for 0~32,767
EEPROM increment count for keeping use(16bit)	C16~C31	16 points	Counter for 0~32,767
General use in two directions(32bit)	C200~C234	35 points	Counter for -2,147, 483, 648~+2,147, 483,647
High speed counter			
Single-phase single-count input bidirectional (32 bits) (EEPROM keep)	C235~C245		Counter for -2,147,483,648~+2,147,483,647 Software counter Single phase: 2 channels 60KHz+4 channels 10KHz Dual phase: 1 channel AB(Z) phase 30KHz + 1 channel AB(Z) phase 5KHz
Single-phase double-count input bidirectional (32 bits) (EEPROM keep)	C246~C250		
Dual-phase dual-count input bidirectional (32 bits) (EEPROM keep)	C251~C255		
Data register (32bit when used in pairs)			
General use(16 bit)	D0~D127 D256~D999	872 points	
EEPROM keep using(16bit)	D128~D255 D1000~D3999	3128 points	
Special use (16 bit)	D8000~D8511	512 points	
For indexing(16 bit)	V0~V7,Z0~Z7	16 points	
Pointer			
JUMP、CALL For branching	P0~F255	256 points	CJ instruction、For CALL instruction
Input interrupt	I0□□~I5□□	6 points	
timer interrupt	I6□□~I8□□	3 points	
Nesting			
For master control	N0~N7	8 points	For MC instruction
constant			
Decimal number (k)	16 bit	-32,768~+32,767	
	32 bit	-2,147,483,648~+2,147,483,647	
Hexadecimal number (H)	16 bit	0000~FFFF	
	32 bit	00000000~FFFFFFFF	
Real Numbers (E)	32 bit	-1.0×2128~-1.0×2-126,0,1.0×2-126~1.0×2128 It can be expressed in the form of decimal point and index	

※1: The 10ms timer will be affected by the scan cycle. If the scan period is 12ms, the timer will be executed once every 12ms.

◆   For more detailed functions of PLC, please refer to "Coolmay MX3G series PLC programming manual"

◆   For detailed instruction usage of PLC, please refer to "Coolmay full series PLC instruction programming manual"

Chapter 8 RS-485 Communication Function

8.1 Servo driver RS-485 (A B) communication

8.1.1 Communication parameters

With RS-485 serial communication function, using Modbus RTU protocol can realize many functions such as servo system parameter change and servo system status monitoring.

Parameter	Name	Range	Default value
FA-71	Drive ID number (station number)	1~254	1

When using RS-485 communication, the station number of the servo driver needs to be set to different values by this parameter. The setting range of the station number address is 1~254, and the default value is 1. This station number represents the absolute address of the driver in the communication network. Repeated setting of the station number will lead to failure of normal communication.

Parameter	Name	Range	Default value
FA-72	Modbus communication baud rate	48~1152x100	96

Select the baud rate of RS-485 communication through this parameter, and the selected communication baud rate must be consistent with the communication baud rate of the upper controller.

Parameter Meaning:

Select 96 × 100, the baud rate is 9600

In addition, the communication protocol of RS-485 should be consistent with that of the upper controller. The specific setting values are as follows:

8, N, 2（MODBUS, RTU）

The number 8 represents that the transmitted data is 8 bits; The letter N indicates that parity bits are not used; The number 2 indicates that the end bit is 2.

Parameter	Name	Range	Default value
FA-73	Modbus communication protocol selection	0~2	0

Select the communication protocol of RS-485 through this parameter. The selected communication protocol must be consistent with the communication protocol of the upper controller. The specific setting values are as follows:

0: 8, N, 2（MODBUS，RTU）

1: 8, E, 1（MODBUS，RTU）

2: 8, O, 1（MODBUS，RTU）

The number 8 represents that the transmitted data is 8 bits; The letters N, E and O represent parity bits, N represents not using this bit, E represents 1 even bit, and O represents 1 odd bit; The number 1 indicates that the end bit is 1, and the number 2 indicates that the end bit is 2.

8.1.2 Parameter writing and reading

1. Writing of FA group parameters

For all FA parameters of the servo drive, please refer to the corresponding chapters in the manual. Each parameter is represented by 16bit data, the communication address of each parameter is determined by the parameter serial number, and the address is 16bits. The example of the address of parameter: parameter 1 (FA-0) is represented as 0X0000, parameter 2 (FA-1) is represented as 0X0001, and other parameters are deduced in turn.

2. Writing of F3 group parameters

For all F3 parameters of the servo drive, please refer to the corresponding chapters in the manual. Each parameter is represented by 16bit data, the communication address of each parameter is determined by the parameter serial number, and the address is 16bits. The example of the address of parameter: parameter 1 (F3-0) is represented as 0x0100H, parameter 16 (F3-15) is represented as

0x010FH, and other parameters are deduced in turn.

3. Writing of F4 group parameters

For all F4 parameters of the servo drive, please refer to the corresponding chapter of the manual. Each parameter is represented by 16bit data, the communication address of each parameter is determined by the parameter serial number, and the address is 16bits. The example of the address of parameter: parameter 1 (F4-0) is represented as 0x0200H, parameter 16 (F4-15) is represented as 0x020FH, and other parameters are deduced in turn.

4. Parameter format description for parameter writing and reading

Format description of parameters that can be written and read through communication; the parameters to be read and written must be integer numbers in decimal. During the operation, the corresponding multiples are enlarged to make them into decimal integers. Arguments in binary format are actually used during read and write operations as their decimal equivalent. The details are as follows. For details of the changing method of each parameter of the FA group, please refer to the description in the corresponding chapter of the parameter in the manual:

FA group parameter serial number	Instruction manual display value	Communication operation value	Transformation
1	315	315	constant
63	1.00	100	100x magnification
57	0100 (binary)	4(decimal)	binary to decimal

8.1.3 Status monitoring

The internal state quantity of the servo drive can be read out through the RS-485 communication port, but cannot be written. The state quantity is stored in 16bit data, in which the value is accurate to decimal places. When read out through the communication port, the value is amplified by 10 times and 100 times. This situation is the same as the parameter reading part, and the assembly sequence of the relevant state quantities is as follows:

1000H: Display motor speed

1001H: Display current position (pulse) low 16 bits

1002H: Display current position (pulse) high 16 bits

1003H: Display position command (pulse) low 16 bits

1004H: Display position command (pulse) high 16 bits

1005H: Display position deviation (pulse) low 16 bits

1006H: Display position deviation (pulse) high 16 bits

1007H: Display motor torque

1008H: Display motor current

1009H: Display the current control mode

100AH: Display current temperature

100BH: Display speed command

100CH: Display torque command

100DH: Displays the absolute position of the rotor during one revolution low 16 bit

100EH: Displays the absolute position of the rotor during one revolution high 16 bit

100FH: Display input terminal status

1010H: Display output terminal status

1011H: Display encoder input signal

1012H: Display the main circuit bus voltage value

1013H: Display alarm code

1014H: Displays the logic chip version number

1015H: Display relay pull-in status

1016H: Display Running status

1017H: Displays the external voltage status

1018H: Displays the absolute position value of 15bit~0bit

1019H: Display 31bit ~ 16bit of absolute position value

101AH: Display 47bit ~ 32bit of absolute position value

101BH: Display 63bit ~ 48bit of absolute position value

8.1.4 Parameter temporary storage and temporary storage address

According to the use needs of customers, there is a need to constantly update parameter values during the operation of the driver. In order to ensure the life of EEPROM and speed up the efficiency of program execution, the parameter temporary storage function is added. When modifying parameters using the corresponding temporary storage address, the parameters can be modified but not saved.. After the drive is powered on again, the parameter will return to its original value. As follows:

The communication address for saving the forward torque limit value is 0x0022. When the parameter is modified to 200 by using this address, the parameter is saved into EEPROM. After the driver is powered off, the parameter 200 will not be lost; The communication address for temporary storage of the forward torque limit value is 0x00a2. When the torque limit value is modified to 200 by using this address, the parameter value will take effect immediately after it is set, but after power on again, the initial value will be restored to 300.

See 1 in 8.2 and the parameter description section in the corresponding driver manual for the communication address of the FA group parameter storage parameter; The communication address of the FA group parameter temporary storage is the address offset 0x0080 of the saved parameter, as follows:

(1) The saving parameter communication address of the forward torque limit value is 0x0022. After the offset is 0x00 80,

The communication address of the temporary storage parameter of the forward torque limit value is 0x00a2.

(2) The storage parameter communication address of the reverse torque limit value is 0x0023. After the offset is 0x00 80,

The communication address of the temporary storage parameter of the reverse torque limit value is 0x00a3.

8.1.5 RS485 Communication Address Comparison Table

FA parameter								
Parameter serial number decimal	Parameter address		Parameter serial number decimal	Parameter address		Parameter serial number decimal	Parameter address	
	Hexadecimal	Octal		Hexadecimal	Octal		Hexadecimal	Octal
0	0X0000	0	37	0X0025	45	74	0X004A	112
1	0X0001	1	38	0X0026	46	75	0X004B	113
2	0X0002	2	39	0X0027	47	76	0X004C	114
3	0X0003	3	40	0X0028	50	77	0X004D	115
4	0X0004	4	41	0X0029	51	78	0X004E	116
5	0X0005	5	42	0X002A	52	79	0X004F	117
6	0X0006	6	43	0X002B	53	80	0X0050	120
7	0X0007	7	44	0X002C	54	81	0X0051	121
8	0X0008	10	45	0X002D	55	82	0X0052	122
9	0X0009	11	46	0X002E	56	83	0X0053	123
10	0X000A	12	47	0X002F	57	84	0X0054	124
11	0X000B	13	48	0X0030	60	85	0X0055	125

12	0X000C	14	49	0X0031	61	86	0X0056	126
13	0X000D	15	50	0X0032	62	87	0X0057	127
14	0X000E	16	51	0X0033	63	88	0X0058	130
15	0X000F	17	52	0X0034	64	89	0X0059	131
16	0X0010	20	53	0X0035	65	90	0X005A	132
17	0X0011	21	54	0X0036	66	91	0X005B	133
18	0X0012	22	55	0X0037	67	92	0X005C	134
19	0X0013	23	56	0X0038	70	93	0X005D	135
20	0X0014	24	57	0X0039	71	94	0X005E	136
21	0X0015	25	58	0X003A	72	95	0X005F	137
22	0X0016	26	59	0X003B	73	96	0X0060	140
23	0X0017	27	60	0X003C	74	97	0X0061	141
24	0X0018	30	61	0X003D	75	98	0X0062	142
25	0X0019	31	62	0X003E	76	99	0X0063	143
26	0X001A	32	63	0X003F	77	100	0X0064	144
27	0X001B	33	64	0X0040	100	101	0X0065	145
28	0X001C	34	65	0X0041	101	102	0X0066	146
29	0X001D	35	66	0X0042	102	103	0X0067	147
30	0X001E	36	67	0X0043	103	104	0X0068	150
31	0X001F	37	68	0X0044	104	107	0X006B	153
32	0X0020	40	69	0X0045	105			
33	0X0021	41	70	0X0046	106	252	0X00FC	374
34	0X0022	42	71	0X0047	107	253	0X00FD	375
35	0X0023	43	72	0X0048	110	254	0X00FE	376
36	0X0024	44	73	0X0049	111	255	0X00FF	377

Note: The octal address is the communication address for Modbus debugging wizard

8.1.6 Built in PLC and servo communication

The all-in-one machine uses PLC control to read servo parameters using serial port 2. When using the built-in PLC to control the servo, terminals A and B cannot be connected to other control devices.

The special registers used are as follows:

M8196: The enable flag of using programming interface protocol and other protocols.

M8125: The enable flag of MODBUS and the original Mitsubishi function.

M8122: RS command sending flag (set this position to 1 when using, and automatically reset after sending).

M8123: The receive end flag of RS command and needs to be reset manually.

M8124: RS command data receiving.

M8161: 8-bit/16-bit mode flag of RS instruction.

M8128: Correct flag of RD3A/WR3A receives.

M8129: RD3A/WR3A communication timeout flag (when communication timeout occurs, the flag position is ON).

M8029: Communication completion flag (when using the ADPRW command, the communication completion flag needs to be reset manually).

D8120: save the communication parameters of Modbus RTU/ASCII protocol. See the setting introduction in the table for details.

D8121: Save the host or slave station number. (This value must be set to the maximum K255 when being a

host)

D8129: RD3A and WR3A timeout. (The unit is milliseconds. It is recommended to set: when the communication rate is set to be greater than or equal to 9600, the D8129 is set to be 10~20; when the communication rate is set to be less than 9600, the D8129 is set to be 20~50;)

D8126: Number of interval cycles. Default=10 (times).

D8397: The ADPRW command uses serial port 2, set D8397 to 0.

D8120   parameter setting

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

b0	The length of the data 0:7bit 1:8 bit
b1 b2	Parity(b2,b1) 00:None 01:Odd 11:Even
b3	Stop bit 0:1bit 1:2bit
b4 b5 b6 b7	Baud rate (b7,b6,b5,b4) (0100):600bps (0101):1200bps (0110):2400bps (0111):4800bps (1000):9600bps (1001):19200bps (1010):38400bps (1011):57600bps (1101):115200bps
b8 b9 b10 b11	set 0
b12	RTU/ASCII mode setting 0:RTU 1:ASCII
b13	set 1
b14	set 1
b15	set 1

Communication examples:

When used as Modbus RTU protocol: set M8196=1, M8125=1; D8120 is set as communication parameter, and D8121 is set as slave station number. For example, set D8120=HE081, D8121=H1 (communication parameter is 9600/8/n/1, slave station number is 1).

The communication parameters are consistent with the settings of the servo driver. The following procedures can be used to read and write the data of the servo driver:

```
   M8002
0  ──┤ ├──────────────────────────────────[ MOV    H0E081    D8120  ]

                              <Set RD3A to use serial port 2        >

                                            ─[ MOV    K0        D299   ]

                              < Read the number of registers        >

                                            ─[ MOV    K10       D300   ]

                                            <timeout                  >

                                            ─[ MOV    K10       D8129  ]

                      <k255 needs to be set for D8121 when it is a host >

                                            ─[ MOV    K255      D8121  ]

                                            <Number of intervals       >

                                            ─[ MOV    K20       D8126  ]

                              <M8196 Set 1 use serial port 2 flag      >

                                            ─[ SET    M8196  ]

                      <M8125 setting 1 means using modbus RTU function >

                                            ─[ SET    M8125  ]

                                            <Read data of alarm code H1013 >

   M8000
35 ──┤ ├───────────────────────────────[ RD3A   K1    H1013   D300  ]

                              <M8128 is the receives correct flag for RD3A >
        M8128
        ──┤ ├─────────────────────────────[ RST    M8128  ]
                  │
                  └───────────────────────[ INC    D20    ]

                              <M8129 is the RD3A communication timeout flag>
        M8129
        ──┤ ├─────────────────────────────[ RST    M8129  ]
                  │
                  └───────────────────────[ INC    D30    ]

57  ─────────────────────────────────────[ END   ]
```
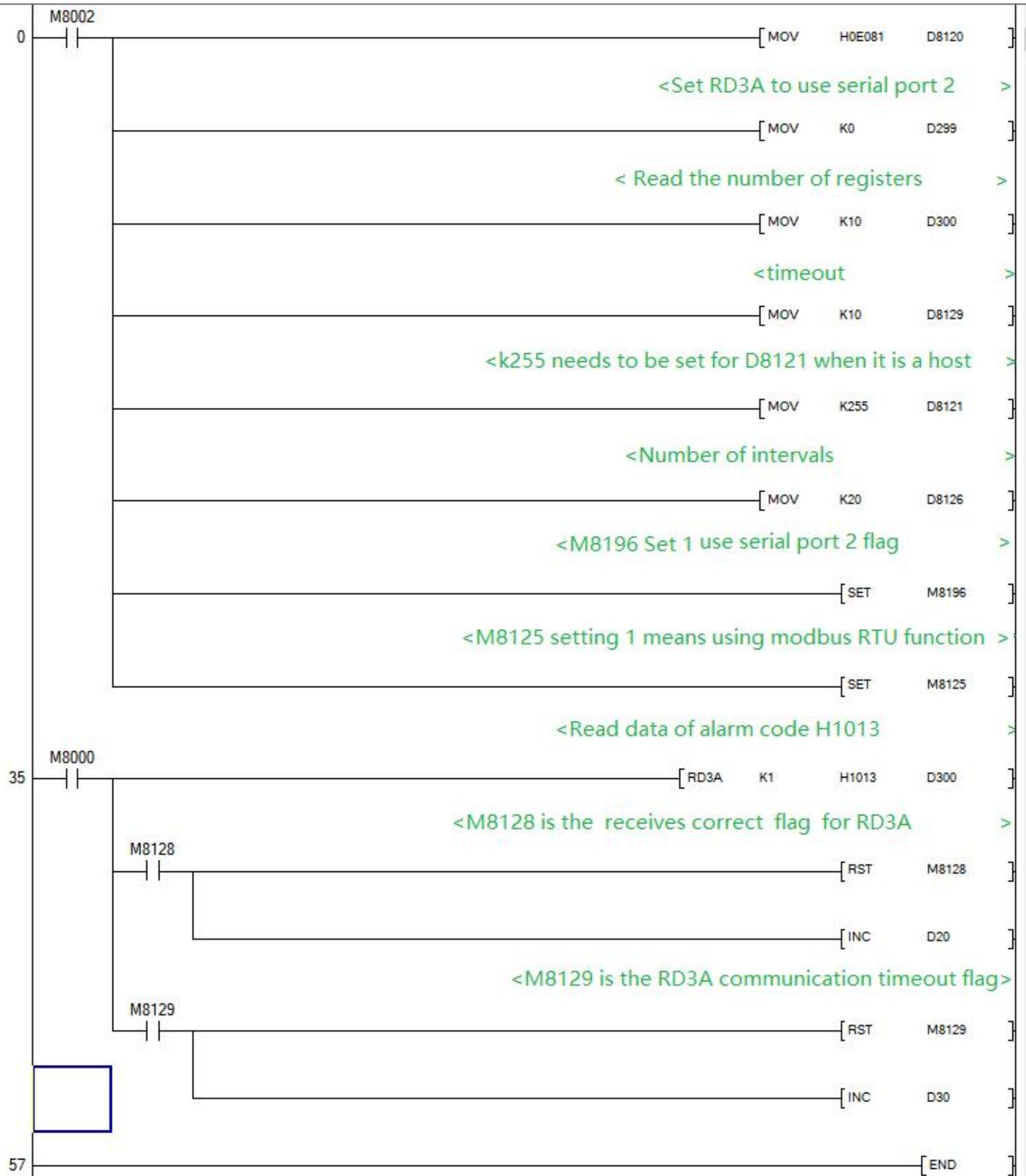
Program explanation: use RD3A to read the data of servo drive alarm code H1013, and use WR3A command to control the data written by servo drive.

8.2 For the usage of PLC RS-485 (A1 B1 serial port 3), please refer to "Coolmay MX3G Series PLC Programming Manual"

Attachment Version Change Record

Date	Version after change	Content of change
May 2022	V22.51	◆ Release of the first edition
June 2022	V22.61	◆ Modify 1.1Function outline of all-in-one and 1.3 technical parameters
Aug. 2022	V22.81	◆ Modify parameters: PA→FA; P1→F1;P2→F2; P3→F2; P4→F4; P5→F5; P6→F6; P7→F7; P8→F8; and some related drawings ◆ 1.5.2 Naming rules of adaptive motor ⑥ -- modify some parameters
Sep.2022	V22.91	◆ Added chapters 8 — 8.1.2, 8.1.3, 8.1.4
Jan. 2023	V23.11	◆ Add 8.1.5 RS485 communication address comparison table
Mar. 2023	V23.31	◆ 1.4.1 Communication terminal: serial port 2 → serial port 3, serial port 3 → serial port 2 ◆ 1.4.5 Definition of special pins inside the all-in-one machine: serial port 3 → serial port 2 ◆ 3.7 Parameter default value recovery: change password 385 → 318 ◆ 8.1.6 The built-in PLC and servo communication are changed to serial port 2 communication (case, data etc.)