

Coolmay EX3S series all-in-one user manual

Thank you for purchasing the Coolmay EX3S series all-in-one machine. This manual mainly explains the product characteristics, general specifications, and wiring methods of this series of touch screen PLC all-in-one machines. For detailed PLC programming, please refer to the "Coolmay EX3S Series Integrated Machine Programming Manual"; For the touch screen section, please refer to Coolmay TP60 Series Human Computer Interface User Manual.

The EX3S series touch screen PLC all-in-one machine has the following characteristics:

1. Adopting military grade 32-bit CPU+ASIC dual processors, it supports online monitoring and downloading, and the fastest execution speed of basic instructions is 0.24us.
2. Highly integrated. The maximum switch quantity is 24 inputs and 20 outputs, and the switch quantity output is a transistor, relay, or hybrid. The maximum analog quantity is 4 inputs and 2 outputs.
3. The communication port HMI comes with one RS232, and the PLC comes with one RS232 and one RS485, both of which can be used for connecting external devices for communication.
4. The transistor output supports motion positioning function, with up to 4 pulses of 200KHz. High speed counting can reach 4 single-phase or AB phase 200KHz.
5. The PLC program has a capacity of 30K steps, 12K hold registers, and supports programming languages such as instructions, ladder diagrams (LD), and step ladder diagrams (SFC).
6. Supports multiple interrupts, including input interrupts, timer interrupts, and counter interrupts, totaling 15 interrupt points.
7. Can be specially encrypted. The touch screen and PLC can be encrypted separately, and setting the PLC password to 12345678 can completely prohibit program reading.
8. Easy wiring. All wiring terminals adopt 3.81 pitch pluggable terminals, which are convenient for customers to use.

Production information

◆ Naming rules EX3S - 43C - 24 M RT - 4AD 2DA - 485/232P

1. Company product series EX3S: Coolmay economical touch screen PLC all-in-one machine
2. HMI type 43C: 4.3 inches 70C: 7 inches
3. Input/output points 24: 12DI12DO 44: 24DI20DO
4. Module classification M: General controller main module
5. Switch output type R: Relay output type; T: Transistor output type; RT: Hybrid output of transistor and relay
6. The maximum number of analog input points is 4
7. The maximum number of analog output points is 2
8. Analog input type 4.3-inch with 2 channels of voltage 0-10V+2 channels of current 0-20mA input; 7-inch with 4 channels of voltage 0-10V or 4 channels of current 0-20mA [depending on wiring usage]
9. Analog output type 4.3-inch, with 1 channel voltage 0-10V+1 channel current 0-20mA output; 7-inch with 2 channels of voltage 0-10V or 2 channels of current 0-20mA output [depending on wiring usage]
10. The communication port HMI comes with one RS232 interface; PLC comes with 1 RS232+1 RS485

◆ Table 1: Basic Parameters

Common models and specifications	Digital		Analog		COM.Port		High speed counting		High speed pulse Output
	DI	DO	AD	DA	HMI	PLC	single-phase	AB phase	
EX3S-43C-24MR	12	12	4	2	Comes with 1 RS232	Comes with 1 RS232+1 RS485	Conventional single-phase 4-channel 200KHz	Conventional AB phase 4-channel 200KHz	MT output: Conventional 4-channel Y0-Y3 is 200KHz
EX3S-43C-24MT	12	12	4	2					
EX3S-70C-44MT	24	20	4	2					
EX3S-70C-44MRT	24	20	4	2					

EX3S-43C-24M: Output as MR or MT, no mixed output; The MAX MR load is 2A, and the MAX MT load is 0.5A;
EX3S-70C-44MRT: Y0-Y7 fixed MT output, MAX load 0.5A; Y10-Y23 fixed MR output, with a MAX load of 2A.

◆ Table 2: Electrical Parameters

Electrical parameters		
Input voltage	DC24V	
Digital input indicators		
Isolation method	Photoelectric coupling	
Input impedance	High speed input terminal 2.4K Ω	Normal input terminal 3.3K Ω
Input-ON	The input current at the high-speed input terminal is greater than 5.8mA/24V	The input current of the ordinary input terminal is greater than 9.9mA/24V
Input-OFF	The input current at the high-speed input end is less than 4.5mA/19V	The input current of the ordinary input terminal is less than 4mA/17V
Filtering function	There is a filtering function, and the filtering time can be set within the range of 0-60ms, with a default of 10ms	
High speed counting function	Conventional single-phase 4-channel 200KHz or AB phase 4-channel 200KHz	
Input voltage level	Passive NPN or PNP, common terminal isolation	

(Connect to the table)

Digital relay output indicators	
Maximum output current	Resistive load 2A/point, 8A/COM; Inductive load 1A/point, 4A/COM; Electric light load 30W/point, 120W/COM
Circuit power supply voltage	250 V AC/30V DC
Circuit insulation	Relay mechanical insulation
On response time	About 10ms
Mechanical lifespan (no load)	10 million times
Electrical lifespan (rated load)	100000 times
Output level	Constant open dry contact output, COM can be connected to positive or negative
Digital transistor output indicators	
Maximum output current	Resistive load 0.5A/point, 4A/COM; Inductive load 12W/24V DC; Electric light load 1.5W/24V DC
Circuit power supply voltage	DC24V
Circuit insulation	Optocoupler insulation
Isolation voltage (power supply external terminal)	1500VAC
On response time	MT output: Conventional 4-channel Y0-Y3 at 200KHz
High speed output frequency	MT output: Conventional 4-channel Y0-Y3 at 200KHz
Output level	Low level NPN, COM connected to negative
Analog input indicators	
Input signal	0-10V//0-20mA/4-20mA/other customized signals according to customer requirements
Response time	1 scanning cycle
Analog input points	4 channels
Accuracy	12bits
Analog output indicators	
Output signal	0-10V/0-20mA/4-20mA/other customized signals according to customer requirements
Analog output points	2 channels
Accuracy	12 bits
External Interface	
COM.Port	HMI comes with one RS232 interface; PLC comes with 1 RS232+1 RS485
Environmental	
Operation temperature	-20°C~50°C
Relative humidity	5%~95%RH
Storage temperature	-20°C~70°C
Vibration frequency	10-57Hz, amplitude 0.035mm; 57Hz-150Hz, acceleration 4.9m/s ² (10 times in each of the X, Y, and Z directions, totaling 80 minutes each)

Mechanical Design Reference

◆ Installation size

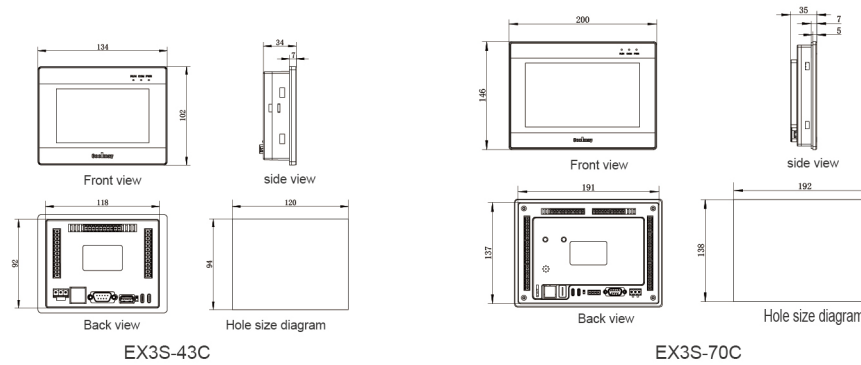


Figure 1 Installation dimension diagram

◆ Table 3: Dimensional Table

Model	MAX digital	MAX analog	Installation size		External dimensions W*H*D(mm)
			A(mm)	B(mm)	
EX3S-43C	12DI12DO	4AI2AO	120	94	134*102*34
EX3S-70C	24DI20DO	4AI2AO	192	138	200*146*36

※ More specifications can be customized for bulk customers

Electrical Design Reference

◆ Product structure

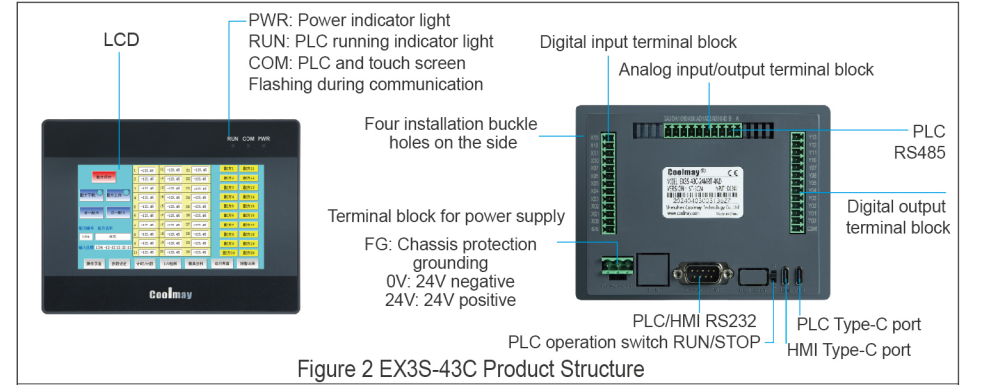


Figure 2 EX3S-43C Product Structure

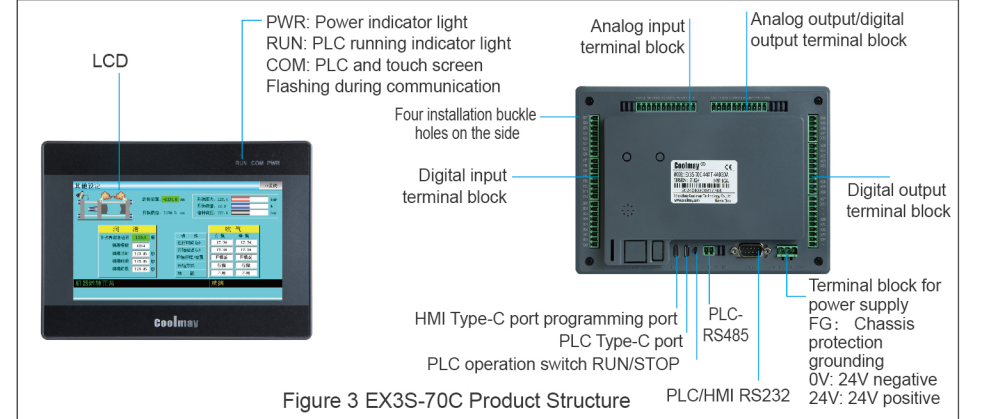


Figure 3 EX3S-70C Product Structure

◆ Hardware interface

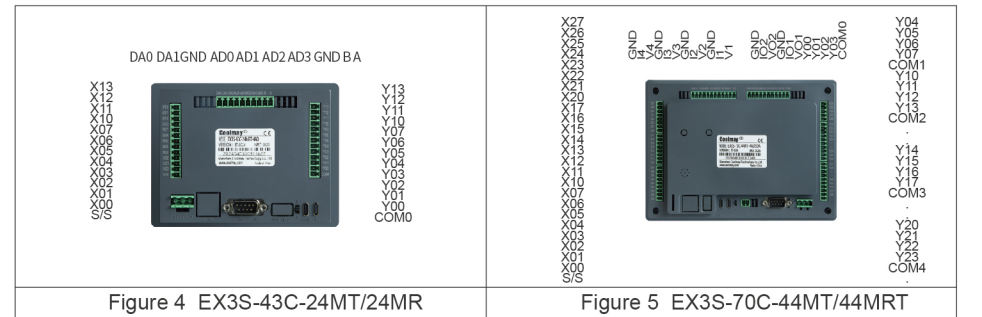


Figure 4 EX3S-43C-24MT/24MR

Figure 5 EX3S-70C-44MT/44MRT

Terminal wiring specification: 22-14AWG wire. The terminals of this series of models are all pluggable terminals. Please refer to the product silk screen for the identification of special model interfaces.

◆ Definition of communication port pins for all-in-one machines

EX3S series all-in-one machine, with a built-in RS232 on the touch screen; The PLC comes with one RS232 and one RS485 (A, B) built-in. As shown in the table below:

Instructions for the COM port of the machine

COM DB9 port	Definition	Illustration
1	NC	PLC-RS232 (Serial port3) HMI-RS232
2	Receive(RXD)	
3	Send(TXD)	
5	Ground wire(GND)	
4	Send(TXD)	
7	Receive(RXD)	
8	NC	
9	NC	PLC-RS485 (Serial port2)
TerminalA	485+	
TerminalB	485-	

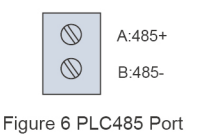


Figure 6 PLC RS485 Port



Figure 7 COM

Communication port description:

- ◆ PLC serial port 2: RS485 (A B ports): Supports Mitsubishi programming port protocol, free port protocol, and Modbus RTU/ASCII protocol
- ◆ PLC serial port 3: RS232/RS485 (A1 B1 port): Supports Mitsubishi programming port protocol, free port protocol, and Modbus RTU/ASCII protocol
- ※ When the PLC serves as the host, it supports ADPRW instructions, RD3A instructions, and WR3A instructions
- ※ Note: For detailed communication procedures, please refer to the "Coolmay EX3S Series all in one Machine Programming Manual"

Equivalent circuit

◆ Digital input wiring circuit

The input of the EX3S series all-in-one machine is a biphasic optocoupler, and the input signal is isolated from the power supply, with passive input; Users can choose NPN or PNP connection method. However, it should be noted that since the common terminals of the input points are all connected, a product can only have one wiring method and cannot be mixed.

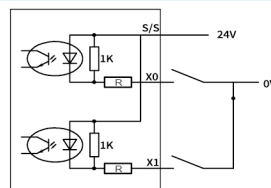


Figure 8 Input (NPN) wiring diagram
PLC digital NPN input wiring:

Port short circuit: The S/S of the PLC input terminal is connected to 24V, and the X terminal is connected to the power supply 0V, indicating that there is a signal input;
Two wire system (magnetic control switch): PLC switch input is connected to a two-wire magnetic control switch, with the positive pole of the magnetic control switch connected to the X terminal and the negative pole connected to 0V;
Three wire system (photoelectric sensor or encoder): The PLC switch is connected to the photoelectric sensor or encoder of the three wire system. The power supply of the sensor or encoder is connected to the positive pole of the power supply, and the signal line is connected to the X terminal; Encoders and photoelectric sensors require NPN type.

◆ Digital output wiring circuit

Figure 10 shows the equivalent circuit diagram of the relay output module, with several groups of output terminals that are electrically isolated from each other. The output contacts of different groups are connected to different power circuits.

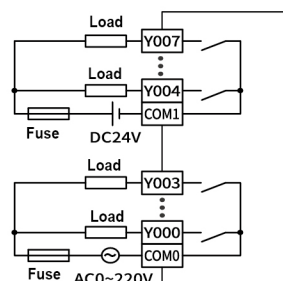


Figure 10 Equivalent circuit of relay output

The equivalent circuit of the output part of the transistor output type PLC is shown in Figure 11. As can also be seen from the figure, the output terminals are divided into several groups, and each group is electrically isolated. The output contacts of different groups can be connected to different power circuits; The transistor output can only be used for DC 24V load circuits. The output wiring method is NPN, COM common cathode.

For inductive loads connected to AC circuits, external circuits should consider RC instantaneous voltage absorption circuits; For the inductive load of the corresponding DC circuit, consideration should be given to adding a freewheeling diode, as shown in Figure 12. The wiring of the stepper or servo motor is shown in Figure 13. The PLC defaults to Y0-Y3 as pulse points, and the direction can be customized;

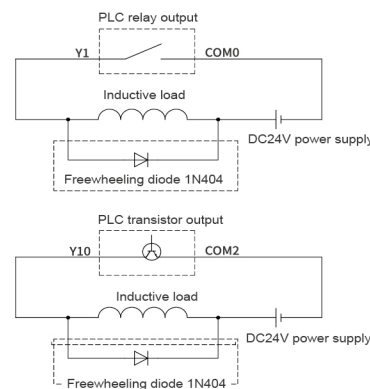


Figure 12 Schematic diagram of inductive load absorption circuit

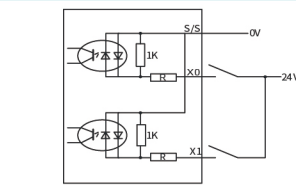


Figure 9 Input (PNP) wiring diagram
PLC digital PNP input wiring:

Port short circuit: The S/S of the PLC input terminal is connected to 0V, and the X terminal is connected to the 24V power supply, indicating that there is a signal input;
Two wire system (magnetic control switch): PLC switch input is connected to a two-wire magnetic control switch, with the negative pole of the magnetic control switch connected to the X terminal and the positive pole connected to 24V;
Three wire system (photoelectric sensor or encoder): The PLC switch is connected to the photoelectric sensor or encoder of the three wire system. The power supply of the sensor or encoder is connected to the positive pole of the power supply, and the signal line is connected to the X terminal; The encoder and photoelectric sensor require PNP type.

Three wire system (photoelectric sensor or encoder): The PLC switch is connected to the photoelectric sensor or encoder of the three wire system. The power supply of the sensor or encoder is connected to the positive pole of the power supply, and the signal line is connected to the X terminal; The encoder and photoelectric sensor require PNP type.

Leakage type output type

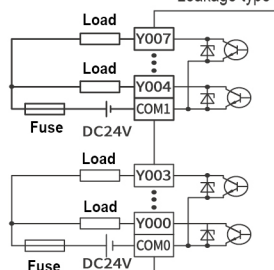


Figure 11 Equivalent circuit of transistor output

For inductive loads connected to AC circuits, external circuits should consider RC instantaneous voltage absorption circuits; For the inductive load of the corresponding DC circuit, consideration should be given to adding a freewheeling diode, as shown in Figure 12. The wiring of the stepper or servo motor is shown in Figure 13. The PLC defaults to Y0-Y3 as pulse points, and the direction can be customized;

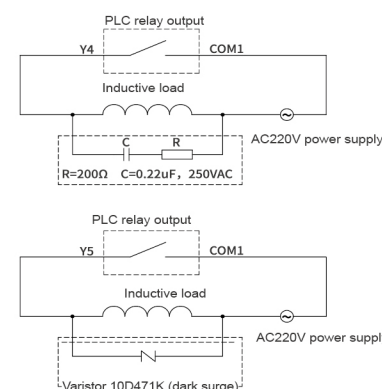


Figure 12 Schematic diagram of inductive load absorption circuit

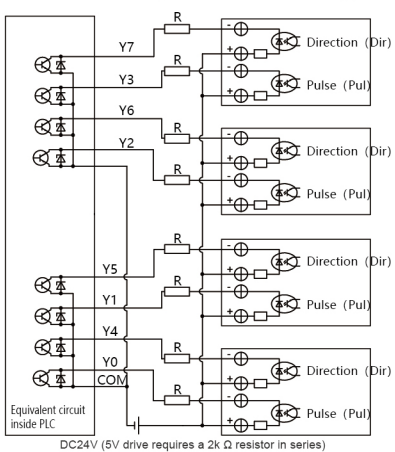


Figure 13 Pulse output wiring diagram

◆ Note: All internal circuits shown in the diagram are for reference only

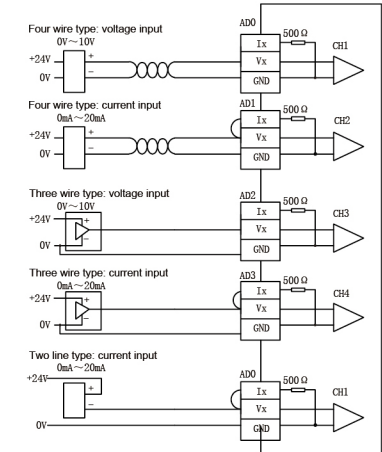


Figure 14 Analog input wiring of 70C all-in-one machine (x=1-4)

◆ PLC analog wiring

70C analog input has a maximum of 4 channels, analog output has 2 channels, and the negative terminals are connected to the GND of the analog input/output terminals. The input and output types are voltage 0-10V or current 0-20mA [can be freely wired and selected for use]. As shown in Figure 14 and Figure 15.

1. For analog input/output signal lines, please use isolation lines and isolate them from other power lines.
2. If the analog input is connected to a current signal, the Vx and Ix (x=1-4) terminals must be short circuited.

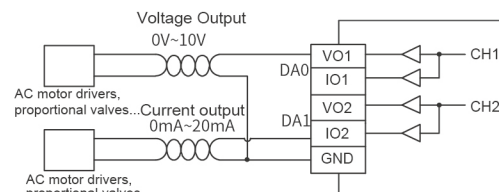


Figure 15 70C PLC Analog Output Wiring

The maximum number of analog inputs for 43C is 4, and there are 2 analog outputs. The negative terminals are connected to the GND of the analog input/output terminals. The input and output types are voltage 0-10V or current 0-20mA. As shown in Figure 16.

Two wire system: the positive pole of the power supply is connected to the positive pole of the transmitter, the negative pole of the transmitter is connected to the AD terminal, and the negative pole of the power supply is connected to the GND terminal. Generally, the wiring method for 4-20mA/0-20mA transmitters is used;
Three wire system: the positive pole of the power supply is connected to the positive pole of the transmitter, the negative pole of the power supply and the negative pole of the signal output are the same terminal, and the signal output of the transmitter is connected to the AD terminal;
Four wire system: The positive and negative poles of the power supply are connected to the positive and negative poles of the transmitter, respectively. The positive and negative poles of the transmitter signal output are connected to the AD terminal and GND terminal, respectively;

PLC anti-interference processing

1. Strong and weak electricity should be wired separately and cannot be grounded together; When there is strong electrical interference, add a magnetic ring at the power supply end; And carry out correct and effective grounding treatment according to the type of casing.
2. When the analog signal is disturbed, a 104 ceramic capacitor can be added for filtering and correctly and effectively grounded.

※For more detailed information, please refer to the official website "PLC anti-interference processing methods"

Programming reference

◆ Software component allocation and power-off maintenance instructions

MAX digitals	EX3S-43C-24M	EX3S-70C-44M
Digital input X	X00~X13 12 points	X00~X27 24 points
Digital output Y	Y00~Y13 12 points	Y00~Y23 20 points
Auxiliary relay M	[M383] 384 points for general use/[M384~M1535] 1152 points for holding/[M1536~M7679] 6144 points for general use [M88000~M8511] 512 points for special use	
Status S	[S0~S9] 10point for initial state/[S10~S999] 990point for holding/[S1000~S4095] 3096point for general use	
Timer T	[T0~T199] 200 points 100ms for general use/[T250~T255] 6 points 100ms for holding use [T246~T249] 4-point 1ms cumulative retention use/[T256~T319] 64 point 1ms general use [T200~T245] 46 o'clock 10ms generally used The 10ms timer will be affected by the scanning cycle. If the scanning cycle is 12ms, the timer will execute once every 12ms.	
Counter C	16 bit up/down counter	32-bit up/down counter high-speed counter
Data Register D	[D0~D127] 128 point general use/[D128~D7999] 7872 point holding use/[D8000~D8511] 512 point special use	
Data registers V, Z	[V0~V7] [Z0~Z7] 16 points For addressing purposes	
Pointer JUMP, CALL for branches	[P0~P255] 256 points / [P0~P1280] 1281 points	
Nesting	[N0~N7] 8-points for main control	
Interruption	[I0 □□~I5 □□] Used for 6-point input interruption/[I6 □□~I8 □□] Used for 3-point timer interruption/[I10 □□□~I60 □□] Used for 6-point counter interruption	
Constant	K	16 bits -32,768~32,767
	H	16 bits 0~FFFFH

◆ Analog input register (AD stands for analog input) with an accuracy of 12 bits supports direct reading of registers:

D [8030]~D [8033] are the input values corresponding to the analog quantities [AD0~AD3], channel switch D8114; The analog input type is 0-10V or 0-20mA (4-20mA), which can be selected according to the wiring requirements.

No.	Register reading value	Channel switch register
AD0	D8030	Started when D8114.0~D8114.3=1
AD1	D8031	
AD2	D8032	
AD3	D8033	

◆ Sampling of analog input

D8073 is the number of sampling periods: range 0-7, default=7; After modification, restart to take effect. If D8073=1, then one PLC scanning cycle samples once and changes the value in the analog input once. D8100 is the number of filtering cycles: range 0-32767, default value=5.

※ Note: For the analog input range and corresponding register values, please refer to the "Coolmay EX3S Series Integrated Machine Programming Manual"

◆ Analog output register (DA represents analog output, with an accuracy of 12 bits); Support direct register assignment operation

The output type comes with 2 channels of voltage 0-10V or 2 channels of current 0-20mA [can be freely wired to choose the type of use]. The range of setting values is shown in the table below.

No.	Register address	Range of set values	Description
DA0	D8050	0-4000	Write value automatic conversion output
DA1	D8051	0-4000	

The soft components of the touch screen PLC all-in-one machine are permanently held when the module is powered off, that is, all soft components in the holding area are not lost after the module is powered off. All power-off hold functions must ensure that the voltage of the DC24V power supply with load is above 23V, and the power on time of the PLC is greater than 2 minutes, otherwise abnormal power-off functions may occur.

Programming software: PLC: Coolmay VTool Pro Programming Software HMI: Coolmay TPWorks Touchscreen Programming Software For detailed information, please refer to the "Coolmay EX3S Series All in One Programming Manual" and "Coolmay TP&TK60 Series Touchscreen User Manual"

TIPS

EX3S series all-in-one user manual
— Before using this product, please carefully read the relevant manual and use it under the environmental conditions specified in the manual.

1. Please confirm the power supply voltage range of this product (conventional product power supply is limited to DC 24V! It is recommended that the output power of the power supply be 18W or above) and correct wiring before powering on to avoid damage.
2. When installing this product, please be sure to tighten the screws or clamp the guide rail to avoid detachment.
3. Avoid wiring and plugging cable plugs when they are live, as this can easily cause electric shock or circuit damage; When the product emits an odor or abnormal sound, please immediately disconnect the power switch; When machining screw holes and wiring, do not let the metal wire end fall into the ventilation hole of the controller, as this may cause product failure and misoperation.
4. Do not tie the power cord and communication cable together or place them too close. Keep a distance of at least 10cm; Strong and weak electricity need to be separated and properly and effectively grounded; In situations with severe interference, shielded cables should be used for communication and high-frequency signal input and output to improve anti-interference performance. The grounding terminal FG on this machine must be correctly grounded to improve its anti-interference ability.
5. The switch input is powered by external DC24V, and the input signal is isolated from the power supply. It supports PNP or NPN connection and can choose one wiring method during use. It does not support mixed connection, otherwise it may cause damage to the machine.
6. Switching output includes transistors and relays, and different types have different common terminal connections. Attention should be paid when using them.
7. Please do not disassemble the product or modify the wiring at will. Otherwise, it may cause malfunctions, misoperations, losses, and fires.
8. When installing and disassembling the product, please be sure to cut off all power sources, otherwise it will cause equipment malfunction and failure.

Product Warranty Statement

Dear customer:
Sincerely thank you for choosing this product. As our user, you will receive our company's high-quality service of "free repair service and lifelong technical support for product quality problems caused by non-human damage or disassembly within two years from the date of purchase (one and a half years for LCD screen and touchpad). During the warranty period, if there is a hardware malfunction caused by the product itself, our company will provide customers with free replacement or repair services. Please do not disassemble and repair the product yourself. Our products are labeled with anti-disassembly labels, and only our company and authorized professionals can repair our products. Any unauthorized disassembly and repair of the product by other personnel is equivalent to automatically waiving the warranty services provided by our company.

- Situations not covered by the free warranty service:
- Damage caused by human factors (external impact or collision, improper use, etc.)
 - The product has been disassembled, modified, or repaired without authorization
 - Damage caused by external factors such as lightning strikes, water ingress into the power supply, and falls
 - Damage caused by incorrect installation or use by the user
 - The device has exceeded the warranty service period

If you need to repair, please fill in the following items:

Product Name: _____ Customer Name: _____
Product model: _____ contact number: _____
Product serial number: _____ Purchase date: _____
Problem remarks: _____

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The model specifications and information related to the product in this manual are subject to change without prior notice