

## MX2N HMI PLC All-in-One User Manual

Thank you for using Coolmay HMI PLC all-in-one. This manual mainly introduce the product characteristics, specifications and wiring methods. More details, please refer to "Coolmay MX2N HMI PLC All-in-One Programming Manual". HMI details please refer to "Coolmay HMI Programming Manual".

### Main features:

- MX2N series is the first choice for small and medium-sized automation, with multifunctional, stable performance, convenient maintenance, safe and reliable.
- Max support 8 analog inputs and 2 analog outputs, 12 bit precision. Analogs can be directly read by registers and for data output.
- Supports multi-channel high-speed counting and high-speed pulse. Usually high-speed counting supports 6 channels of single-phase 10KHZ or 2 channels of AB phase 10KHZ, and can be customized as 6 channels of single-phase counting (4 channels of 60KHZ and 2 channels of 10KHZ) or 2 channels of AB phase 60KHZ. And high-speed pulse is 4 channels of 20KHZ and can be customized as 2 channels of 200KHZ and 2 channels of 100KHZ.
- The touch panel has no operating system with fast boot speed. The performance is equivalent to Coolmay MT90 series HMI.
- The HMI and PLC can be encrypted separately. PLC password with 12345678 can completely prohibit program reading, and cannot modify the clock data. (Note: PLC only supports 8-bit password encryption)
- Supports external interruption and watchdog function. Digital tube display function is optional. MX2N-70HB can select 1 channel to load cell (accuracy is 24 bits) or a CAN communication port.
- Applies space 3.81mm pluggable terminal, which is convenient for wiring.
- PLC is compatible with Mitsubishi programming software. HMI uses CoolMayHMI programming software.

### Product Details

#### Naming rules

MX2N - 70HB - 24 M RT-4AD 2DA - V - A0 - 1C1 - 1P - 485P/232H

- Product series: MX2N: MX2N series
- HMI type: 43HB: 4.3" 70HB: 7"
- Digital points: 16: 8DI/8DO 24: 12DI/12DO 38: 20DI/18DO 44: 24DI20DO
- Module classification: M: Universal main module
- Digital outputs (DO) type: R: Relay T: MOS/transistor RT: mixed
- Analog input (AD) points: 43HB: 4 70HB: 8 (70HB supports optional 1 weighing function, which occupies AD0~AD2)
- Analog outputs (DA) quantity: Max 2 channels
- AD type: G: Weighing function (occupies AD0~AD2)
- DA type: EK: Type E/K thermocouple J: Type J thermocouple (Only support 2-channel thermocouples, and 70HB will occupy AD4~AD7)
- DA type: NTC: Thermistor (10K/50K, 43HB occupies 2AD, 70HB occupies AD4, AD6 as common terminal) (Note: NTC cannot coexist with thermocouple types)
- C1: Single phase high speed counting, C2: AB phase, C3: ABC phase (Usually it supports 6 single-phase 10KHZ or 2 AB phase 10KHZ or 2 ABZ phase 10KHZ, and can be customized as 6 single-phase counting 60KHZ, or 2 AB phase 60KHZ, or 2 ABZ phase 60KHZ.)
- P: 100KHz high speed pulse, P2: 200KHz (Usually it is 4 channels of 20KHZ and can be customized as 2 channels of 200KHZ and 2 channels of 100KHZ)
- Optional communication ports: Refer to "Table 1: Basic parameters"

#### Basic parameters

Table 1: Basic parameters

Model	DI	DO	Analog (optional)		COM port (optional)		High speed counting (optional)		High speed pulse(optional)
			AD	DA	HMI	PLC	Single phase	AB (Z)	
MX2N-43HB-24M	12	12	4	2	1 Rs232 or 1 RS485	MX2N-70HB supports 1 RS485 (refit from default Rs232, not suggested) and 1 CAN port (cannot exist with weighing function)	Usually 6x 10KHz, and can customize 6 channels: 4x 60KHz and 2x 10KHz	Usually 2x 10KHz, and can customize 2x AB(Z) 60KHz	Usually 4x 20KHz, and can customize 2x 200KHz and 2x 100KHz
MX2N-70HB-16M	8	8							
MX2N-70HB-24M	12	12							
MX2N-70HB-38M	20	18							
MX2N-70HB-44M	24	20							

MX2N-43HB : MT is MOS output, max load 2A.  
 MX2N-70HB : Y0-Y3: MT is MOS output, max load 2A. Y4-Y23: MT is transistor output and max load 500mA. MR is relay output, max load 5A. MRT is mixed output, optional as per requirements.  
 HB : No operating system, and performance is same as Mt90 HMI.

Table 2: Electric parameters

Electric Parameters		
Input voltage	DC24V	
DI Indicator		
Isolation method	Photoelectric coupling	
Input resistance	High speed input terminal 3.3KΩ	Ordinary input terminal 4.3KΩ
Input is ON	High speed input 4.5mA	Ordinary input 3.5mA
Input is OFF	Input < 1.5mA	
Filter function	Filter can set from 0-100ms, default as 10ms	
High speed counting	Usually it supports 6 single-phase (X0-X5)10KHZ, or 2 AB phase 10KHZ or 2 ABZ phase 10KHZ, and can be customized as 6 single-phase counting 60KHZ, or 2 AB phase 60KHZ, or 2 ABZ phase 60KHZ.	
Input level	COM port connects negative terminal	
DO Indicator		
Allowed max current	5A	
Loom voltage	DC/AC24V~220V	
Circuit insulation	Relay mechanical insulation	
On response time	Approx. 10ms	
Mechanical life (no load)	10,000,000 times	
Electrical life (rated load)	300,000 times	
Output level	Normally open dry contact output, COM port can be connected to positive or negative.	
MOS/ Transistor Output Indicator		
Allowed max current	MOS: 2A/ Transistor: 500mA	
Loom voltage	DC12V~48V	
Circuit insulation	Optocoupler insulation	
Isolation voltage (power supply - external terminal)	1500VAC	
On response time	High speed output 10μs, others 0.5ms	
High speed output frequency	Usually Y0-Y3 is 20KHz. Can customized as 4 channels: Y0/Y1 200KHz, Y2/Y3 100KHz	
Output level	COM port connects negative terminal	
AD Indicator		
Input signal	EKJ thermocouple/NTC10K/NTC50K/0-10V/0-5V/0-20mA/Others	
Response time	Thermocouple 0-22 can be set, others fixed 22 scan period.	
AD quantity	0-8 channels	
Accuracy	12 bits	
DA Indicator		
Output signal	0-5V/0-10V/0-20mA/Others	
DA quantity	0-2 channels	
Accuracy	12 bits	
External Interface		
Programming port	HMI default 1 USB programming port, and PLC default 1 RS232 programming port	
COM port	Refer to "Table 1: Basic parameters"	
Ambient Conditions		
Working temperature	0°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 <sup>2</sup> (X, Y and Z 10 times respectively, total 80 minutes each)	

### Mechanical Design

#### Mouting dimension

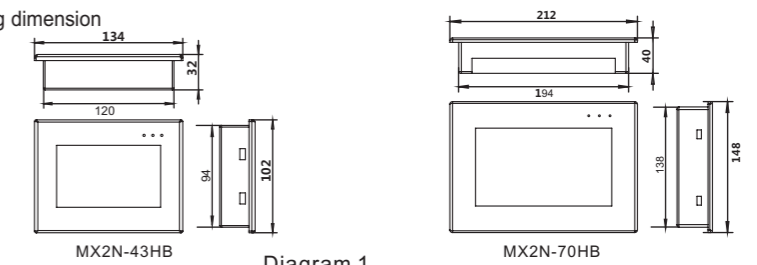


Diagram 1

Table 3: Mouting dimension

Model	Digital points	Max analog	Mounting dimension		Product Dimension W*H*D(mm)
			A(mm)	B(mm)	
MX2N-43HB	12DI/12DO	4AD/2DA	120	94	134*102*32
MX2N-70HB	24DI/20DO	8AD/2DA	194	138	212*148*40

※ OEM and ODM are supported.

### Electric Design

#### Product Structure

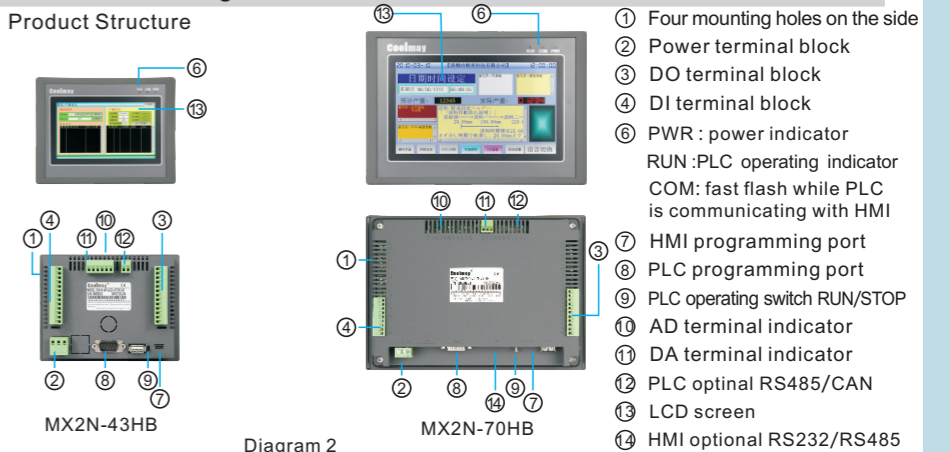


Diagram 2

#### Hardware Interface

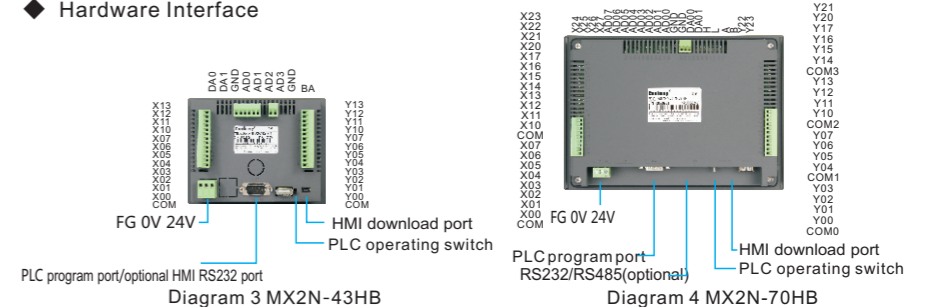


Diagram 3 MX2N-43HB

Diagram 4 MX2N-70HB

Terminal wiring: 22-14AWG wire. All terminals are pluggable. Special model interface, please refer to the product silk screen.

#### COM interface definition:

##### MX2N-43HB COM Pin Definition:

Pin	Signal	Descrip.
PLC program port		
2	RXD	Receive
3	TXD	Send
5	GND	Ground
HMI optional RS232		
4	TXD	Send
7	RXD	Receive
5	GND	Ground
HMI optional Rs485		
Terminal A		485+
Terminal B		485-

##### MX2N-70HB COM Pin Definition:

Pin	Signal	Description
COM1:PLC program port/COM2: HMI optional RS232		
2	RXD	Receive
3	TXD	Send
5	GND	Ground
COM2 : HMI optional Rs485		
1	A	485+
6	B	485-
PLC optional Rs485 and CAN port		
Terminal(485)	A	485+
	B	485-
Terminal(CAN)	H	
	L	



Diagram 6 COM1/COM2

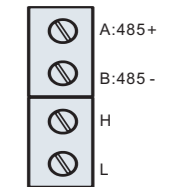


Diagram 7 Optional Terminals

#### COM port instructions:

- RS232(PLC program port)/MX2N-70HB optional RS485(refit from default Rs232): Support Mitsubishi program port, RS and Modbus RTU protocol (Modbus RTU communication parameters are set in D8120, station number set in D8121, and can be master or slave).
- Support RS, FROM, TO demands.

- CAN port (cannot exist with weighing function): Only applied to internal CAN networking (communication baud rate set in D8153, master or slave station number set in D8150, max support 32 slave. Master and slave max share 32 registers).
- Note: Detailed settings, please refer to "Coolmay MX2N HMI PLC All-in-One Programming Manual".

## Equivalent Circuit

The PLC has a built-in user switch state detection power supply (DC24V), and the user only needs to access the dry contact switch signal. If connecting to the output signal of the active transistor sensor, the OC output mode signal is required. The input wiring method is NPN, COM common cathode.

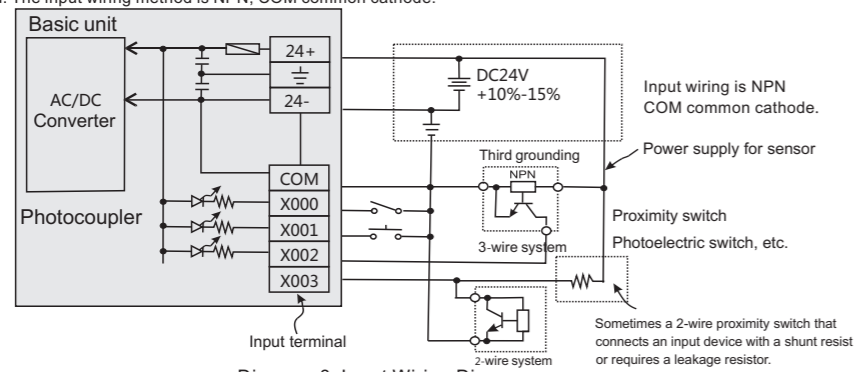


Diagram 8 Input Wiring Diagram

Figure 9 shows the equivalent circuit diagram of the relay output module. The output terminals are several groups. Each group is electrically isolated. The output contacts of different groups are connected to different power circuits.

To prevent the load from being short-circuited and other faults, burn out the PLC board. Please select the appropriate load for each load.

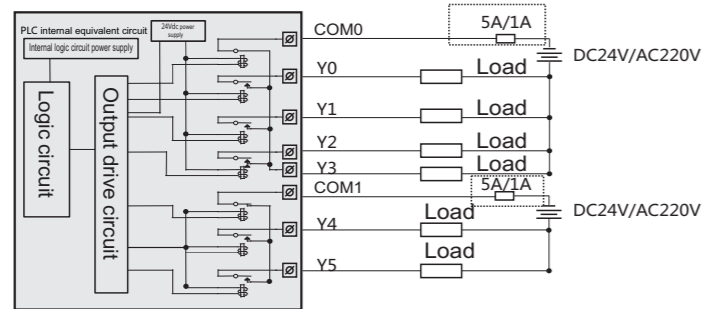


Diagram 9 Relay output equivalent circuit

To prevent the output units and PLC board wiring being burnt out by load short-circuit, please select appropriate fuse.

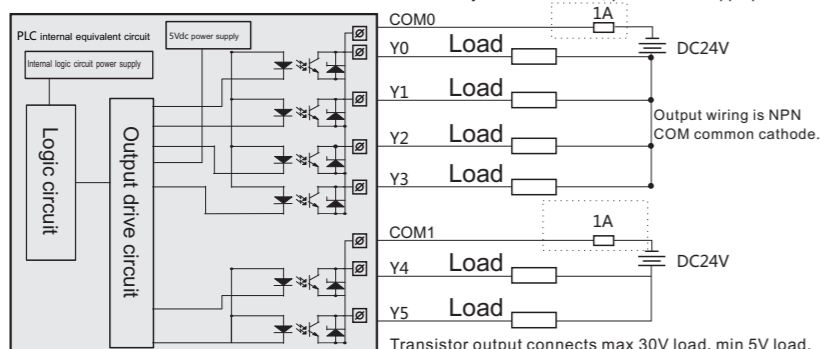


Diagram 10 Transistor output equivalent circuit

The equivalent circuit of the PLC output part of the transistor output type is shown in Diagram 10. The output terminals are in groups, each of which is electrically isolated, and different sets of output contacts can be connected to different power circuits. The transistor output can only be used for DC DC24V load loops. The output wiring method is NPN, COM common cathode.

For inductive loads connected to the AC loop, the external circuit should consider the RC transient voltage sink circuit. For the inductive load of the DC loop, adding a freewheeling diode should be considered, as shown in Diagram 11. Stepper or servo motor wiring is shown in Diagram 12. The 5V driver must have a 2KΩ resistor on the DC24V. 4 channels of high speed pulse are Y0, Y1, Y2, Y3.

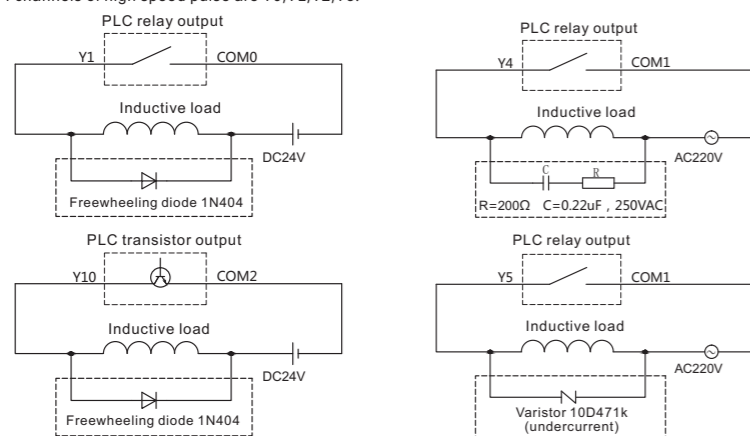


Diagram 11 Inductive load absorption circuit

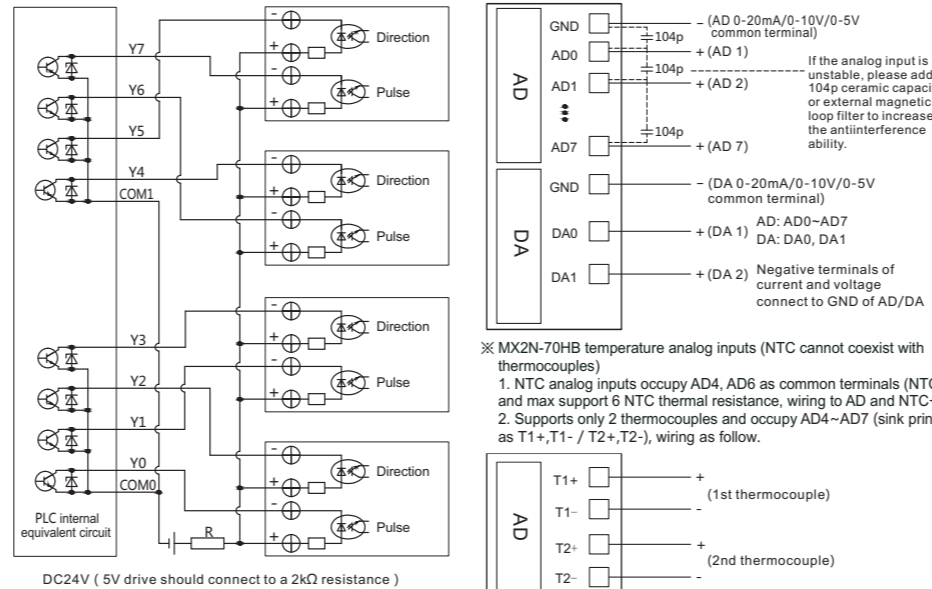


Diagram 12 Pulse output wiring

Diagram 13 MX2N-70HB Analog wiring

When select weighing function, it will cover AD0~AD2(sink print as E+, S-, S+, E- on the product.)

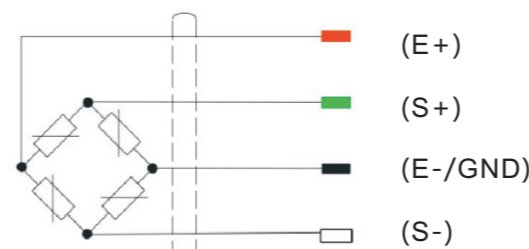


Diagram 14 Load cell sensor wiring

## PLC analog wiring

**2-Wire system:** The anode of the power supply connects to that of the transmitter. The cathode of the transmitter connects to AD terminal. The cathode of the supply connects to GND terminal. Usually it is the wiring method of transmitters with 4-20mA/0-20mA.

**3-Wire System:** The anode of the supply connects to that of the transmitter. The cathode of the supply and signal output are same terminal, and the transmitter output connects to AD terminal.

**4-Wire System:** The anode and cathode of the power supply connect to those of the transmitter respectively. The anode and cathode of the transmitter output connect to AD and GND respectively.

**Note:** 1 channel NTC or thermocouple of MX2N-43HB occupies 2AD, and max 2-channel NTC or thermocouples can be optional. Two wire of the sensor connects to AD0 and AD1, or AD2 and AD3 respectively (NTC and thermocouples cannot coexist).

GND common terminal can be shared for current or voltage analog.

## PLC anti-interference treatment

1. Strong electricity and weak electricity should be routed separately. When there is strong electrical interference, add a magnetic ring at the power supply end and grounding properly according to the case type.

2. When the analog is interfered, 104 ceramic capacitors can be added for filtering and grounding properly.

## Programming Reference

### ◆ Instructions of device allocation and power-down retention instructions

	MX2N-43HB-24M	MX2N-70HB-44M
DI X	X00~X13 12DI	X00~X27 24DI
DO Y	Y00~Y13 12DO	Y00~Y23 24DO
Auxiliary relay M	[M0~M383] 384 points, general use/[M384~M1535] 1052 points, retention use/[M8000~M8255] 256 points, special use	
State relay S	[S0~S9] 10 points, general use/[S10~S999] 990 points, retention	
Timer T	[T0~T199] 200 points, 100ms, general use/[T200~T245] 46 points, 10ms, general use/[T246~T249] 4 points, 1ms retention use/[T250~T255] 6 points 100ms, retention use	
Counter C	16-bit increase counter	32-bit increase and decrease counter High speed counter
Data registers D, V, Z	[C0~C15] 16 points, general use, [C16~C199] 184 points, retention use [D0~D199] 200 points, general use/[D200~D7999] 7800 points, retention use/ [D8000~D8195] 196 points, special retention use/[D8196~D8255] 59 points, special use	[C235~C240 single phase]/[C251, C253, C254 AB phase] 9 points, retention use [V0~V7], [Z0~Z7] 16 points, address changing
Nested pointer	[N0~N7] 8 points, master/[P0~P127] 128 points, Jump, subroutine with branch pointer/[I0~I15] 16 points, external interruption use	
Constant	K	16 bits, -32,768~32,767
	H	32 bits, -2,147,483,648~2,147,483,647
		32 bits, 0~FFFFFFFH

## ◆ AD Registers

The analog input can be max 8 channels, and the precision is 12 bits. (Supports thermistor NTC (10K/50K) analog inputs, and 70HB occupies AD4 and AD6 as common terminals, max 6 channels)

No	AD registers	Analog sampling filter times
AD0	D8030	Fixed as 22 PLC scan period
AD1	D8031	
⋮	⋮	
AD6	D8036	
AD7	D8037	

Thermocouple analog reading registers (Only supports 2 thermocouples, and cannot coexist with NTC)

No	Thermocouple registers	Thermocouple sampling filter times
1st channel	D8094	D8090(0-22, default as 0)
2nd channel	D8095	
Cold end	D8093	

## Load cell sensor reading registers

Start position	Read registers(32 bits)	Register of weighing filter times
M8112	D8112 D8113	D8114

※ Note: Analog input range and register corresponding values, please refer to "Coolmay MX2N HMI PLC All-in-One Programming Manual"

## ◆ DA Registers

No	DA registers	Value range	Output range
DA0	D8096	0-4095	0-10V/0-5V/0-20mA
DA1	D8097	0-4095	

※ When PLC in in STOP, D8096 D8097 automatically set as 0, DA is also 0.

When DA setting is wrong, 6712 fault will be checked, DA set as 0.

The soft components retention of HMI PLC all-in-one is eternal retention, i.e. All soft components in the maintained area will not lose. Real-time clock applies rechargeable battery to keep it at the current time. All power retention functions must ensure it is more than 23V when DC24V supply connects with loads, and PLC power-on time should be more than 2 minutes, or the power retention will be abnormal.

\* Programming software

PLC: compatible with Mitsubishi PLC programming software GX Developer8.52 and GX Works2

HMI: CoolMayHMI programming software

\* More details, please refer to "CoolMay MX2N HMI PLC All-in-One Programming Manual", "CoolMayHMI User Manual", "Mitsubishi FX Programming Manual".

## TIPS

## MX2N HMI PLC All-in-One User Manual

— Please read carefully the related manuals before using our products, and use this product under the environmental conditions specified in this manual.

- Power on after confirmed the voltage (24VDC, >18W) and right wiring to avoid damage.
- Tighten the screws or the rail while mounting the product to avoid falling off.
- Avoid wiring or plug the cable with electricity, or it is easy to cause electric shock or circuit damage. When the product emits odor or abnormal sound, please immediately switch off the power. While processing screw holes or wiring, do not drop the metal chips and wire head into the ventilation hole of the controller, which may cause product failure and disoperation.
- Do not tie power cables and communication cables together or close and keep them at a distance of 10cm or more. Strong and weak currents need to be separated and correctly grounded. In severe interference situations, input and output cables of the communication and high-frequency signals should use shielded cables to improve anti-jamming performance. The grounding terminal FG on this unit must be properly grounded to improve the anti-interference ability.
- The COM of DI/DO (transistor) is common cathode.
- Please do not disassemble the product or change the wiring. Or it will possible to cause breakdown, malfunction, loss, or fire.
- While installing or disassembling the product, ensure to turn off all power. Or it may cause malfunction and breakdown.

Shenzhen Coolmay Technology Co., Ltd

Tel.: 0755-86950416/ 86960332/ 26051858/ 26400661

Fax: 0755-26400661-808

QQ: 800053919

Email: 800053919@b.qq.com

Website: www.coolmay.com



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