

HMI / PLC All-in-one User Manual

Thank you for choosing Coolmay HMI/PLC all-in-one. This manual mainly explains the features, general specifications and wiring methods of **HMI/PLC All-in-one**. Detailed programming for PLC please refers to <COOLMAY PLC Programming Manual> and HMI refers to <COOLMAY HMI Programming Manual>.

Main features of HMI/PLC All-in-one:

- Highly integrated and super powered. More specifications can be customized with large quantity.
- Support high-speed counting and high-speed pulse. High-speed counting can be added to at most 6 single-phase, 3 AB(Z) 10-100KHz. High-speed pulse can be added up to 4 or 5 20-200KHz.
- HMI has H and HA(S) series. PLC can be customized.
- Support special encryption for both HMI and PLC. Setting 12345678 as password of PLC can thoroughly prevent data from being read.
- 3.81MM pluggable terminals being adopted for easy wiring.
- Mitsubishi programming software for PLC, <COOLMAY HMI> software for HMI.

Safety Precautions

- Snap in installation. Please buckle the fixed snaps into the installation holes of the case sides. While handling the screw holes and connecting the wires, do not let the metal particle or wire bents fall into the air vent of the controllers. This may give rise to malfunction and misoperation.
- Avoid wiring or handling cable plugs with charge which may cause electric shock or damage the circuits.
- On seriously interfered occasions, shield cables should be adopted as the I/O cables of communication and high-frequency signals to enhance anti-interference ability. The grounding terminal FG being correctly connected can also enhance anti-interference ability.
- The working power supply is DC24V. Do not connect the I/O signal port to AC power source which is badly damaged. Please recheck the cable before charging. Do not touch any terminals whiling charging

Product Information

◆ Naming Rule EX2N - 70H - 24 M RT-4AD-2DA -V -A0 - 1C1 -1P - 485P/232H

- Series: EX2N
- HMI: 43H(A)/43KH(A): 4.3inch 50KH(A) :5inch 70H(A/AS):7inch 100HA:10inch
- I/O: 10: 5DI/5DO 16: 8DI/8DO 24:12DI/12DO etc.
- Module type: M: Main module of universal controller
- DO type: R: relay T: transistor RT: both relay and transistor
- AI: 4 channels for 43H, 12 for 70H/100H
- AO: 2 channels for 43H, 8 for 70H/100H
- AI type: EK: EK thermocouple JR: J-type thermocouple SR: S-type thermocouple
PT: Pt100 PT0: Pt1000 NTC: thermistor (10k/50k/100k)
V: 0-10V V5:0-5V A0: 0-20mA A4: 4-20mA
- AO type: V: 0-10V V5:0-5V A0: 0-20mA
- C1stands for single phase 100k high-speed counting, C2 for 100KHz AB phase counting C3 for 100KHz ABZ counting, C30 for 10KHz ABZ counting, at most 6 single phase 10KHz or 3 AB(Z) phase 10-100KHz can be custom-made. If 6 single phase 10KHz be made, the model should be 6C10.
- P for 100KHz high-speed pulse, P2 for 200KHz high-speed pulse
At most 4 100-200KHz can be customized for 43H, and 5 100-200KHz for 70H/100HA
- Optional COM port 485P/232P means the port is made in PLC
485H/232H means the port is made in HMI
As for 43H(A)/43KH(A)/50KH(A), only one RS232 can be added in HMI and one RS485 in PLC.
As for 70H(A/AS)/100HA, one RS232 or RS485 can be added in both HMI and PLC

◆ Basic parameter

Diagram 1: Basic parameter

HMI/PLC all-in-one models/specifications	Switching value		Analog quantity (optional)		COM Port (optional)		High-speed counting (optional)			High-speed pulse (optional)
	D1	D0	AD	DA	HMI	PLC	single phase	AB phase	ABZ phase	
EX2N-43H(A)/43KH(A)/50KH(A)/70H(A/AS)/100HA-10M	5	5	At most 4 channels can be added for EX2N-43H(A)/43KH(A)/50KH(A), 12 for EX2N-43H(A)/43KH(A)/50KH(A), 8 for EX2N-70H(A/AS)/100HA Any one RS232 can be added in the HMI of EX2N-43H(A)/43KH(A)/50KH(A) and one RS232 or RS485 in the HMI of EX2N-70H(A/AS)/100HA Any one RS485 can be added in the PLC of EX2N-43H(A)/43KH(A)/50KH(A) and one RS232 or RS485 in the PLC of EX2N-70H(A/AS)/100HA Normally 2, 10K contained at most 6 channels can be added (4 10-100K and 2 5-10K) Normally 2, 10K contained at most 3 AB can be added (2 10-100k and 1 5-10K) At most 3ABZ can be added(1 10-100K, 2 5-10K) Normally 2-4 20K pulse output, at most 4 20-200K can be added in EX2N-43H(A)/43KH(A)/50KH(A) and 5 20-200K can be added in EX2N-70H(A/AS)/100HA	HMI		PLC		single phase	AB phase	ABZ phase
EX2N-43H(A)/43KH(A)/50KH(A)/70H(A/AS)/100HA-16M	8	8		HMI		PLC		single phase	AB phase	ABZ phase
EX2N-43H(A)/43KH(A)/50KH(A)/70H(A/AS)/100HA-20M	12	8		HMI		PLC		single phase	AB phase	ABZ phase
EX2N-43H(A)/43KH(A)/50KH(A)/70H(A/AS)/100HA-24M	12	12		HMI		PLC		single phase	AB phase	ABZ phase
EX2N-70H(A/AS)/100HA-30M	16	14		HMI		PLC		single phase	AB phase	ABZ phase
EX2N-70H(A/AS)/100HA-32M	16	16		HMI		PLC		single phase	AB phase	ABZ phase
EX2N-70H(A/AS)/100HA-36M	20	16		HMI		PLC		single phase	AB phase	ABZ phase
EX2N-70H(A/AS)/100HA-38M	20	18		HMI		PLC		single phase	AB phase	ABZ phase
EX2N-70H(A/AS)/100HA-40M	20	20		HMI		PLC		single phase	AB phase	ABZ phase
EX2N-70H(A/AS)/100HA-40M-S	24	16		HMI		PLC		single phase	AB phase	ABZ phase
EX2N-70H(A/AS)/100HA-44M	24	20		HMI		PLC		single phase	AB phase	ABZ phase

MT means transistor output, the max load is 500mA; MR means relay output, the max load is 5A; MRT means both relay and transistor, it is up to customers
H: Basic version; HV: Basic version with vertical display; HA: Updated version; HAV: Updated version with vertical display

Diagram 2 : electrical parameters

Electrical parameters		
Input voltage	DC 24V	
Analog Input Index		
Isolation Mode	Photocoupling	
Input Impedance	High-speed input 3.3KΩ	Common input 4.3Ω
Input ON	Electric current of high-speed input is higher than 4.5mA	Electric current of common input is higher than 3.5mA
Input OFF	Electric current of both is lower than 1.5mA	
Filter Function	With filter function, the filter time can be set among 0-100ms, defaulted as 10ma	
High-speed Counting	Normally 2 single counting (X0/X3) or 2 AB phase counting (X0-X1/X3-X4) 10KHz At most 6 single counting can be customized (4 100KHz、 2 10KHz) Or 3 AB phase counting (2 100KHz、 1 10KHz) or 3 ABZ counting (1 100KHz、 2 5-10KHz)	
Common Port	COM connected with negative terminal	
Relay Output Index		
Max current	5A	
Load Voltage	AC220V,DC24V	
Circuit Insulation	Relay Mechanical Insulation	
ON respond time	About 10ms	
Mechanical Life(without load)	10 million times	
Electrical Life(rated load)	300K times	
Output Common Port	COM connected with negative terminal	
Transistor output Index		
Max current	500mA	
Voltage of power supply	DC24V	
Insulation of circuit	Optocoupler insulation	
Isolation voltage (external terminal)	1500VAC	
ON respond time	High-speed output : 10μs others: 0.5ms	
High-speed output frequency	Y0/Y1/Y6/Y7 Normally 20KHz, at most 4-5 100-200KHZ Y10 can be added while 5 channels is customized.	
Output Common Port	COM connected with negative terminal	
Analog Input index		
Input Signal	PT100/PT1000/Thermocouple/NTC/0-10V/0-20mA/4-20mA, other signals can be customized.	
Respond Time	One scan cycle	
AI Quantity	0-12 channels	
Accuracy	12bit, ±1%(full scale)	
Analog Output Index		
Output Signal	0-10V/0-20mA	
AO Quantity	0-8channels	
Accuracy	10位	
Interface		
COM Port	1 RS232, 1 HMI programming port, 1 USB port; As for 43H(A)/43KH(A)/50KH(A), only one RS232 can be added in HMI and one RS485 in PLC. As for 70H(A/AS)/100HA, one RS232 or RS485 can be added in both HMI and PLC. Ethernet port and audio optional.	
Environment		
Operating Temperature	-20°C~60°C	
Relative Humidity	5%~95%RH	
Storage Temperature	-20°C~70°C	
Vibrational Frequency	10-57Hz, amplitude 0.035mm; 57Hz-150Hz, accelerated speed 4.9m/s ² (10 times for directions X、 Y、 Z, 80 min. in total)	

Mechanical Design Reference

◆ Installation Dimensions

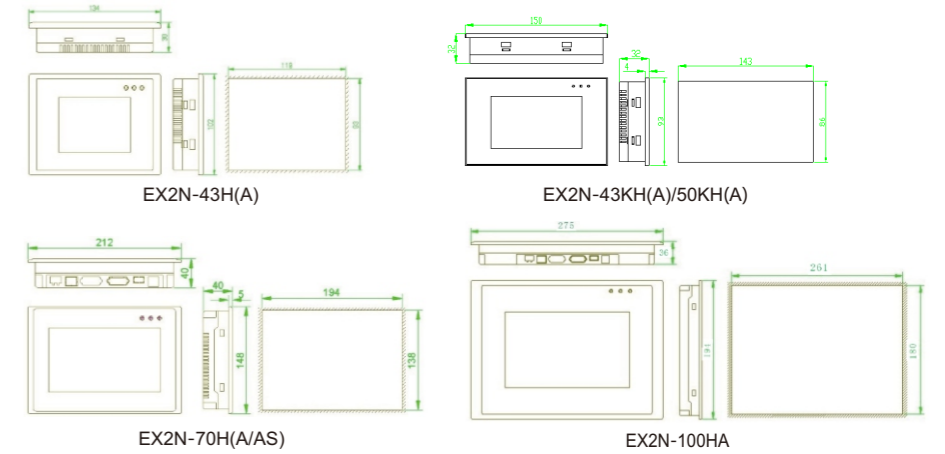


Diagram 1 Dimension Drawing

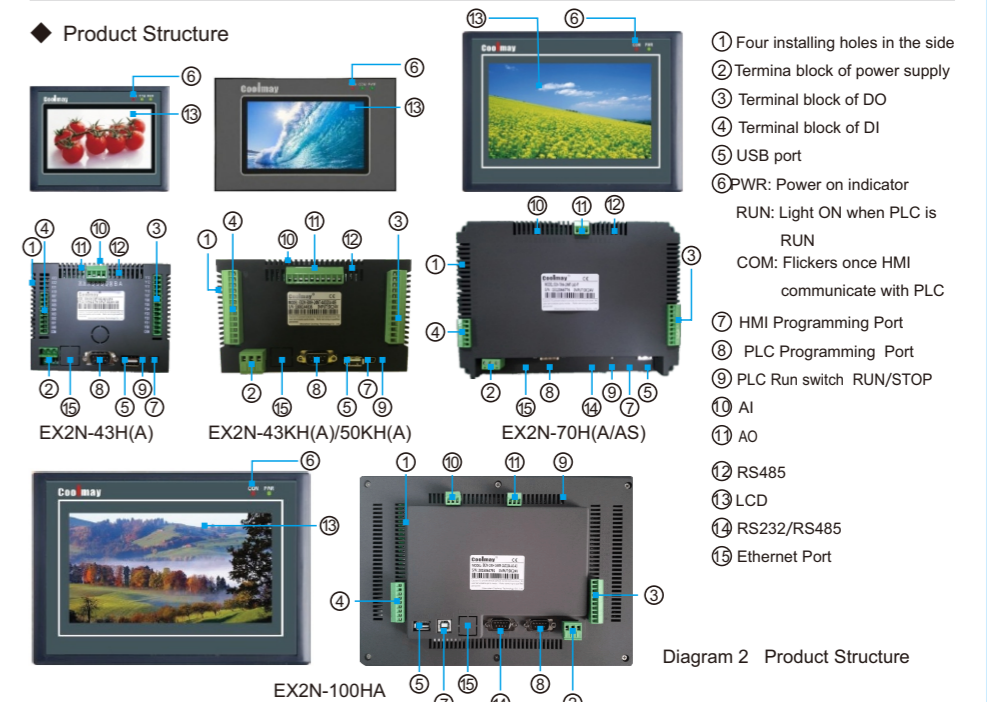
Diagram3: Cutout Size

Model	Max Points	Installation dimensions		Overall Size W*H*D(mm)
		A (mm)	B (mm)	
EX2N-43H(A)	24	119	93	134*102*30
EX2N-43KH(A)/50KH(A)	24	142	85	150*93.5*32
EX2N-70H(A/AS)	44	194	138	212*148*40
EX2N-100HA	44	261	180	275*194*36

More specifications can be customized with large quantity.

Electrical Design Reference

◆ Product Structure



- Four installing holes in the side
- Terminal block of power supply
- Terminal block of DO
- Terminal block of DI
- USB port
- PWR: Power on indicator
RUN: Light ON when PLC is RUN
COM: Flickers once HMI communicate with PLC
- HMI Programming Port
- PLC Programming Port
- PLC Run switch RUN/STOP
- AI
- AO
- RS485
- LCD
- RS232/RS485
- Ethernet Port

Diagram 2 Product Structure

◆ Hardware Interface

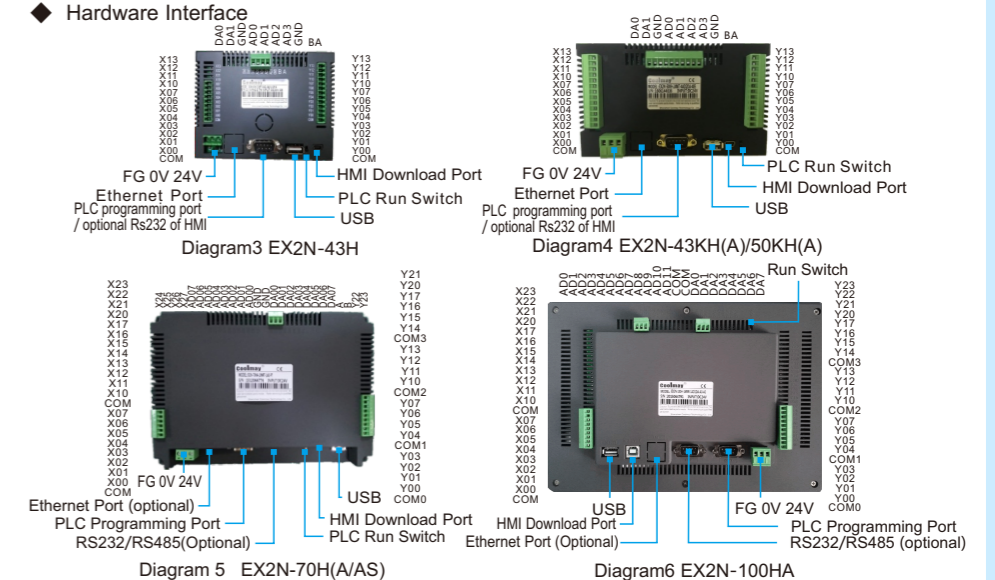


Diagram3 EX2N-43H

Diagram4 EX2N-43KH(A)/50KH(A)

Diagram 5 EX2N-70H(A/AS)

Diagram6 EX2N-100HA

Interface:

- RS232(PLC programming port);support Mitsubishi programming port protocol.
- RS485(AB port)/RS232:support Mitsubishi programming port protocol, Mitsubishi serial protocol, Modbus(Modbus RTU/ASCII) parameters are set in D8120, station number is set in D8121, can be used as master or slave.
- RS485(A1 B1 port): support Mitsubishi programming port protocol and Modbus (Modbus RTU/ASCII)

Terminal wiring specification: 22-14AWG wire. Pluggable terminals adopted.

Communication interface definition:
 RS232 is the programming port, terminal blocks are DB9 male.
 As for 43H(A)/43KH(A)/50KH(A), only one RS232 can be added in HMI and one RS485 in PLC. As for 70H(A/AS)/100HA, one RS232 or RS485 can be added in both HMI and PLC.

EX2N-70H(A/AS) COM port Pin definition

Pin Number	Signal	Description
2	RXD	Receive
3	TXD	Transmit
5	GND	Ground
COM1:optional RS232 definition (PLC)		
4	TXD	Receive
7	RXD	Transmit
5	GND	Ground
COM1:optional RS485 definition (PLC) COM2:optional RS485 definition (HMI)		
1	A	485+
6	B	485-

EX2N-100HA COM port Pin definition

Pin Number	Signal	Description
2	RXD	Receive
3	TXD	Transmit
5	GND	Ground
COM2:optional RS232 definition (PLC)		
4	TXD	Receive
7	RXD	Transmit
5	GND	Ground
COM1:optional RS485 definition (HMI) COM2:optional RS485 definition (PLC)		
1	A	485+
6	B	485-



Diagram 7 COM1/COM2

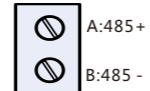


Diagram 8 RS485 (PLC)

EX2N-43H(A)/43KH(A)/50KH(A) COM port Pin definition

Pin Number	Signal	Description
2	RXD	Receive
3	TXD	Transmit
5	GND	Ground
PLC programming Port definition		
2	RXD	Receive
3	TXD	Transmit
5	GND	Ground
Optional RS232 definition (HMI)		
4	TXD	Receive
7	RXD	Transmit
5	GND	Ground

Equivalent Circuit

There is a power supply (DC24V) inside PLC to test switch state. The end user only need to put in the dry contact. The signal of OC output is needed if the output signal of active crystal sensor should be connected.

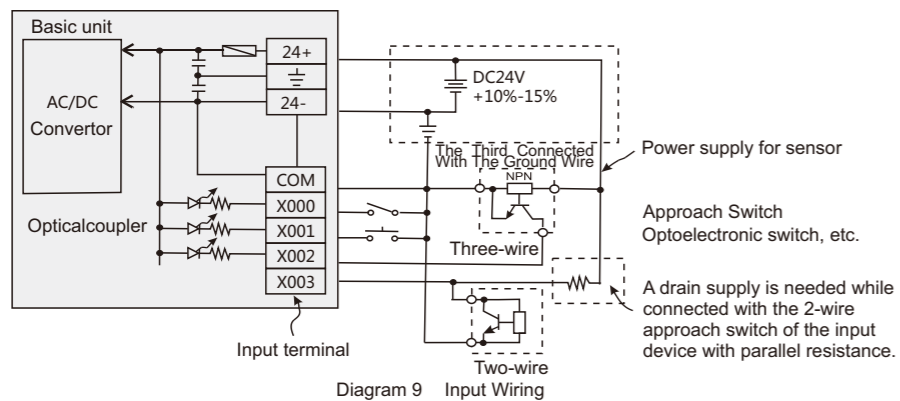


Diagram 9 Input Wiring

Diagram 10 is an equivalent circuit diagram of relay output module. There are several group of input terminals, each group is electrical isolation and the output electric shock of different groups should be connected with different power circuit.

Please choose proper insurance for each load to out the output unit and the plate wires of the plc due to the load circuit and other problems.

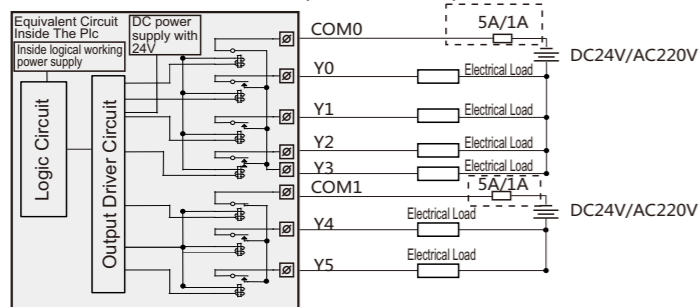


Diagram 10 Equivalent Circuit of Relay Output

Please choose proper insurance for each load to avoid burning out the output unit and the plate wires of the plc due to the load circuit and other problems.

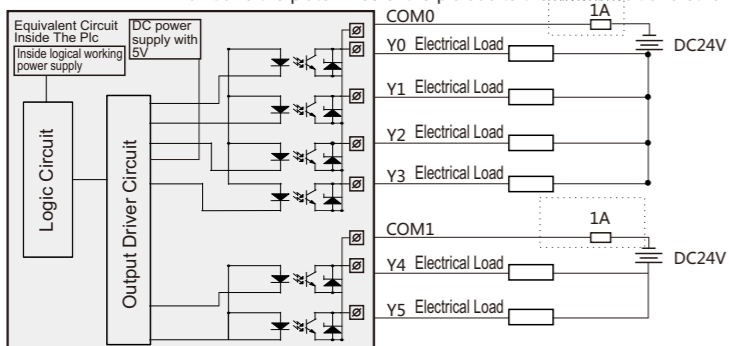


Diagram 11 Equivalent Circuit of Transistor Output

Diagram 11 is equivalent circuit diagram of transistor output. As the diagram shows, there are several groups of input terminals, each group is electrical isolation and the output electric shock of different group should be connected with different power circuit. The transistor output can be only used for load circuit with DC24V.

As for inductive load connected with AC circuits, RC instantaneous voltage absorbing circuit should be considered as outside circuit. As for inductive load connected with DC circuits, free-wheeling diode should be added, shown as diagram 12.

Wiring diagram of stepping motor or serve motor is shown as diagram 12. DC24Vof 5V Driver must be used together with a 2 KΩ resistance.

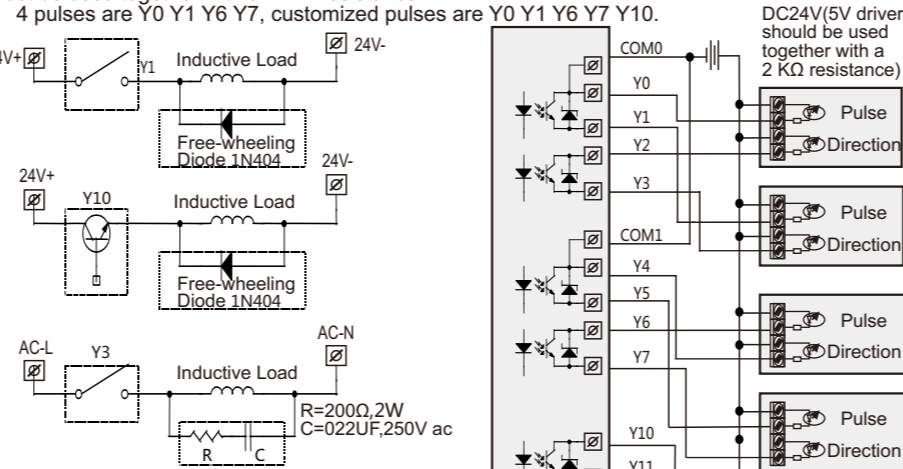


Diagram 12 Inductive Load Absorbing Circuit

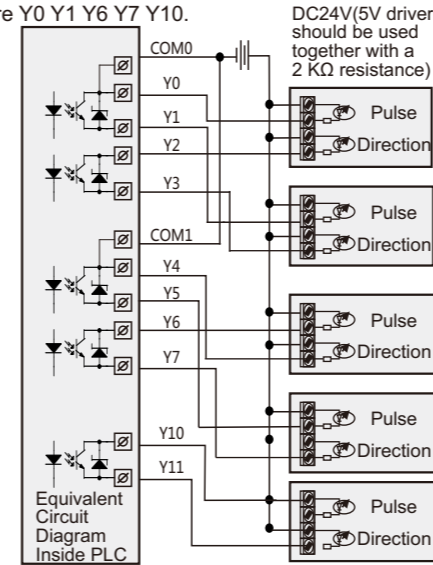


Diagram 13 Pulse Wiring

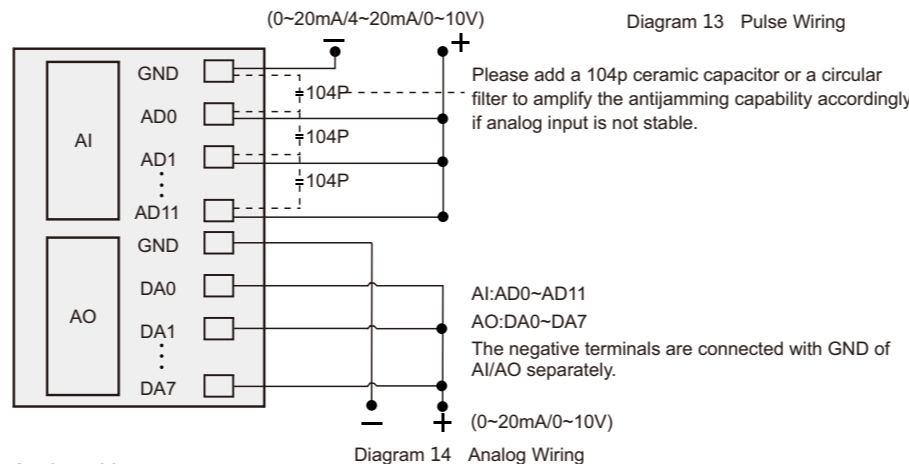


Diagram 14 Analog Wiring

Analog wiring

Two-wire: the power supply's positive pole is connect with the transmitter's positive pole. The transmitter's negative pole is connect with AD, the power supply's negative pole is connect with GND, generally as the wiring of 4-20mA/0-20mA transmitter.

Three-wire: the power supply's positive pole is connect with the transmitter's positive pole. The power supply's negative pole and the signal output cathode are the same terminal. The transmitter output is connect with AD.

Four-wire: the positive and negative poles of the power supply are connect with the transmitter's positive and negative poles separately. The positive and negative poles of transmitter output are connect with AD and GND separately.

When the analog is temperature, two wires should be connect with AD and GND separately. As for three-wire PT100, it should be merged into two wire.

Anti-interface processing

- The strong current and the weak current should be wired separately and cannot connect with ground. When there is a strong current, please add a circular on the power port. Besides, proper grounding processing should be conducted according to the chassis
- When there is a interface, 104 ceramic chip can be added and effective grounding should be conducted.

Programming Reference

◆ **Devices Distribution and Statement of Power-down Save**

	EX2N-43H(A)/43KH(A)/50KH(A)-24M	EX2N-70H(A/AS)-44M	EX2N-100HA-44M
Input X	X00~X13 12 points	X00~X27 24 points	X00~X27 24 points
Output Y	Y00~Y13 12 points	Y00~Y23 20 points	Y00~Y23 20 points
Auxiliary relay M	[M0~M499] 500 points General	[M500~M1535] 1036 points Holding	M8000~M8255 256 points Special
State S	[S0~S499] 500 points General	[S500~S999] 500points Holding	
Timer T	T0~T199 200 points 100ms general	[T200~T245] 46 points 10ms general [T246~T249] 4 points 1ms accumulation holding	[T250~T255] 6 points 100ms actuary Holding
Counter C	16bit Up Counter		High-speed Counter
	[C0~C 99] 100points General [C100~C199] 100 points Holding	32bit Up/Down Counter	[C235~C255] 5 points Holding
Data register D,V,Z	[D0~D199] 200points General [D200~D999] 800points Holding	[D000~D625] 256 points Special	V0~V7 Z0~Z7 16points Index
Nested Pointers	N0~N7 8points Master Control		P 0~P127 128points Please use branch pointer while jumping to a subprogram
Constant	K	16bit -32,768~32,767	32bit -2,147,483,648~2,147,483,647
	H	16bit 0~FFFFH	32bit 0~FFFFFFFFH

◆ **Analog Register**

Analog Input(AD):
 EX2N-43H(A)/43KH(A)/50KH(A)-MT/MR/MRT-4AD2DA

AD	Register Value	Magnification Correction (units: milli)	Size Correction	Circle setting of analog sampling
AD0-AD3	D8030-D8033	D8040-D8043	D8070-D8073	D8050-D8053
Cold end	D8038	D8048	D8078	
Note : D8038is the cold end of thermocouple. K-type set D8049=1				

EX2N-70H(A/AS)/100HA-MT/MR/MRT-12AD8DA

AD	Register Value	Magnification Correction (units: milli)	Size Correction	Circle setting of analog sampling
AD0-AD11	D8030-D8041	D8200-D8211	D8220-D8231	D8050-D8061
Cold End	D8042	D8212	D8232	
Note : D8042 is the cold end of thermocouple. K-type set D8213=1				

Analog Output(DA):
 EX2N-43H(A)/43KH(A)/50KH(A)-MT/MR/MRT-4AD2DA

DA	Register Value	Set Value	Current/Voltage	Resolution	Start Contact
DA0-DA1	D8080-D8081	0-1000	0-10V/0-20mA	10mV/0.02mA	M8080 be driven ON

EX2N-70H(A/AS)/100HA-MT/MR/MRT-12AD8DA

DA	Register Value	Set Value	Current/Voltage	Resolution	Start Contact
DA0-DA3	D8080-D8083	0-1000	0-10V/0-20mA	10mV/0.02mA	M8080 be driven ON
DA4-DA7	D8084-D8087	0-1000	0-10V/0-20mA	10mV/0.02mA	M8080 be driven ON

* The defaulted data of the circle setting of analog sampling is 32, the mix can be setted as 1

The power-down save of all-in-one's devices is permanent retention. Namely, all the devices of the holding section won't lose while the module is power off. Chargeable batteries are used for the real-time clock to ensure that the clock is presenting the real time. All the power-down save function should ensure that the voltage of the power supply (DC24V) should above 23V and the power on time of PLC should above 2mins, or there will be an error with the function of power-down save.

* Programming Software

PLC: Compatible with MITSUBISHI GX8.52 and WORKS 2 HMI : 《CoolMayHMI Programming Software》

Detailed materials please refer to:

《CoolMay HMI Programming Manual》 《HMI/PLC All-in-one User Manual》 《CoolMayHMI User Manual》

《MITSUBISHI FX Programming Manual》