

EX2N series 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. Normally digital point can be made maximum 24DI 20DO, analog can be made maximum 16AI 8AO. 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.

Product Information

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

- Series: EX2N:EX2N series
- 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 44:24DI/20DO 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(A)/43KH(A)/50KH(A), 12 for 70H(A/AS), 16 for 100HA
- AO: 2 channels for 43H(A)/43KH(A)/50KH(A), 8 for 70H(A/AS)/100HA
- AI type: EK: EK thermocouple JR: J-type thermocouple SR: S-type thermocouple BR: BR thermocouple PT: Pt1000 NTC: thermistor (10k/50k/100k)
V: 0-10 V5:0-5V A0: 0-20mA A4: 4-20mA
- AO type: V: 0-10V V5:0-5V A0: 0-20mA
- C1stands for single phase high-speed counting, C2 for AB phase counting C3 for ABZ counting, If 6 single phase 10KHz be made, the model should be 6C10.C30 for 10KHz ABZ counting, at most 6 single phase 10KHz or 3 AB(Z) phase 10-100KHz can be custom-made.
- P for 100KHz high-speed pulse, P2 for 200KHz high-speed pulse, 5P0 for 5 channels 20KHz
At most 4-5 channels 100-200KHz can be customized.
- 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	output
EX2N-43H(A)/43KH(A)/50KH(A)/70H(A/AS)/100HA-10M	5	5								
EX2N-43H(A)/43KH(A)/50KH(A)/70H(A/AS)/100HA-16M	8	8								
EX2N-43H(A)/43KH(A)/50KH(A)/70H(A/AS)/100HA-20M	12	8								
EX2N-43H(A)/43KH(A)/50KH(A)/70H(A/AS)/100HA-24M	12	12								
EX2N-70H(A/AS)/100HA-30M	16	14								
EX2N-70H(A/AS)/100HA-32M	16	16								
EX2N-70H(A/AS)/100HA-36M	20	16								
EX2N-70H(A/AS)/100HA-38M	20	18								
EX2N-70H(A/AS)/100HA-40M	20	20								
EX2N-70H(A/AS)/100HA-40M-S	24	16								
EX2N-70H(A/AS)/100HA-44M	24	20								

At most 4 channels can be added for EX2N-43H(A)/43KH(A)/50KH(A), for 70H(A/AS), 16 for 100HA(A)/43KH(A)/50KH(A), 8 for EX2N-70H(A/AS)/100HA(A)/43KH(A)/50KH(A).
Any one RS232 can be added in the HMI of EX2N-43H(A)/43KH(A)/50KH(A) and one RS232 or RS485 in the PLC of EX2N-70H(A/AS)/100HA(A).
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(A).
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

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
Digital Input Index	
Isolation Mode	Photocoupling

Diagram 2 : electrical parameters

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 10ms	
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	DC/AC24V~220V	
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	0-16 channels	
Accuracy	12bit, ±1%(full scale)	
Analog Output Index		
Output Signal	0-5V/0-10V/0-20mA/or other requirements depend on customers	
AO Quantity	0-8channels	
Accuracy	10位	
Interface		
COM Port	Come with 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	0°C~50°C	
Relative Humidity	5%~95%RH	
Storage Temperature	-20°C~70°C	
Vibrational Frequency	10-57Hz, amplitude 0.035mm; 57Hz-150Hz, accelerated speed4.9m/s ² (10 times for directions X、Y、Z, 80 min. in total)	

Mechanical Design Reference

◆ Installation Dimensions

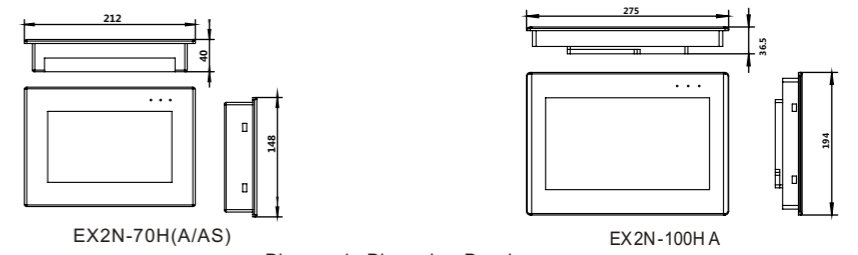
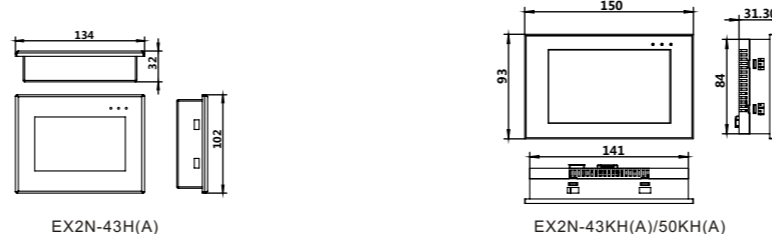


Diagram 1 Dimension Drawing

Diagram3: Cutout Size

Model	Max digital	Max analog	Installation dimensions		Overall Size W*H*D(mm)
			A (mm)	B (mm)	
EX2N-43H(A)	12DI/12DO	4DI/2DO	119	93	134*102*30
EX2N-43KH(A)/50KH(A)	12DI/12DO	4DI/2DO	143	86	150*93*32
EX2N-70H(A/AS)	24DI/20DO	12DI/8DO	194	138	212*148*40
EX2N-100HA	24DI/20DO	16DI/8DO	261	180	275*194*36

More specifications can be customized with large quantity.

Electrical Design Reference

◆ Product Structure

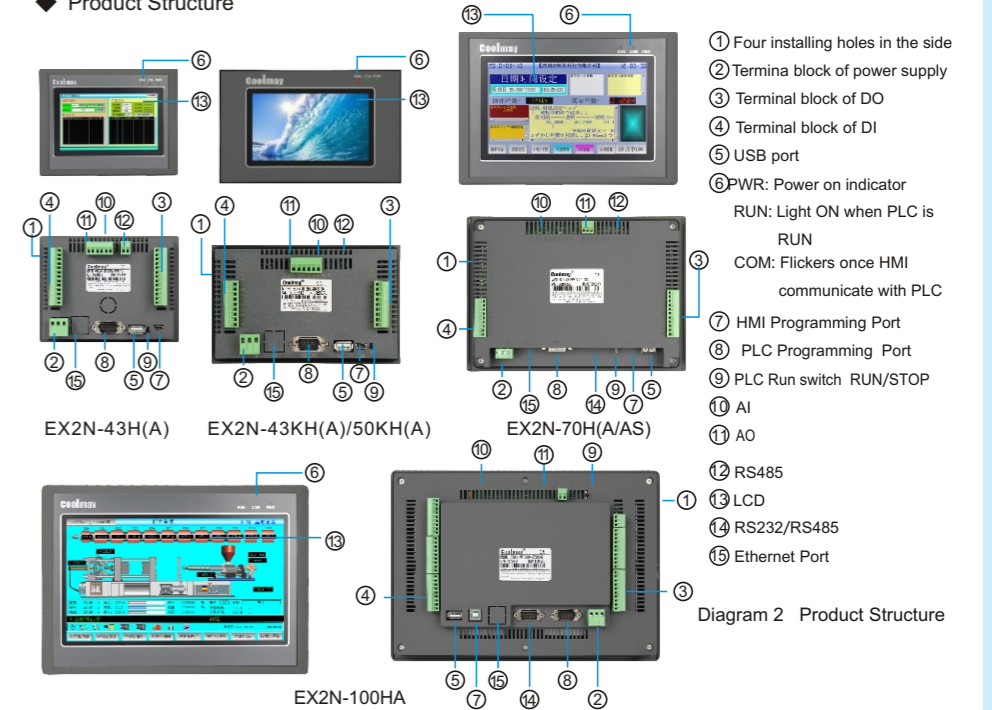


Diagram 2 Product Structure

◆ Hardware Interface

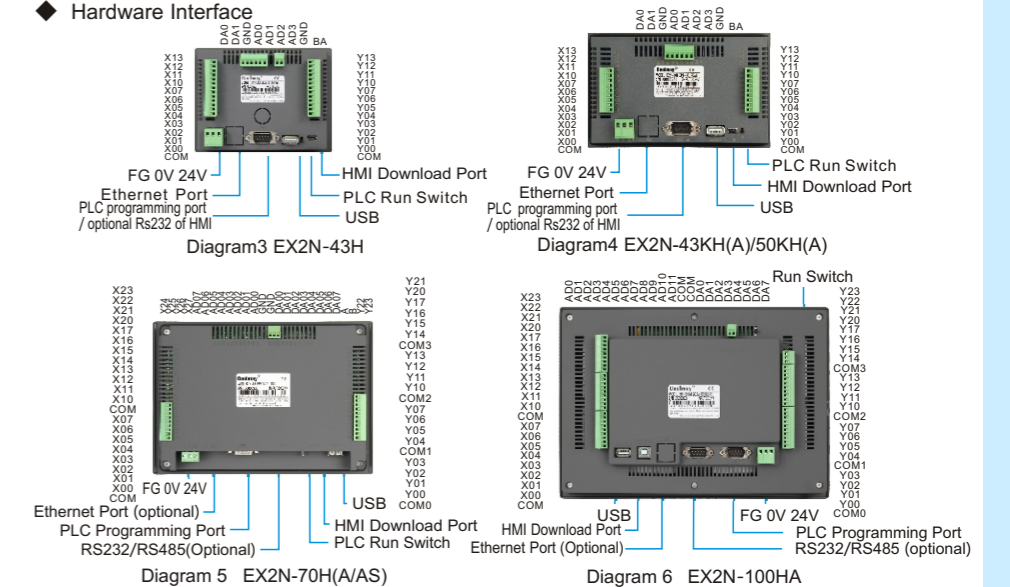


Diagram 5 EX2N-70H(A/AS)

Diagram 6 EX2N-100HA

Terminal wiring specifications: 22-14AWG wire. The terminals of this series are all pluggable terminals.
 Communication interface definition:
 The hardware standard configuration programming port of the whole machine is RS232, and the interface terminal is DB9 male 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.

Interface:

- 1.RS232(PLC programming port);support Mitsubishi programming port protocol.
- 2.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.



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

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

Diagram 8 RS485 (PLC)

Pin Number	Signal	Description
EX2N-43H(A)/43KH(A)/50KH(A) COM port Pin definition		
PLC programming Port definition		
2	RXD	Receive
3	TXD	Transmit
5	GND	Ground
Optional RS232 definition (HMI)		
4	TXD	Transmit
7	RXD	Receive
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.

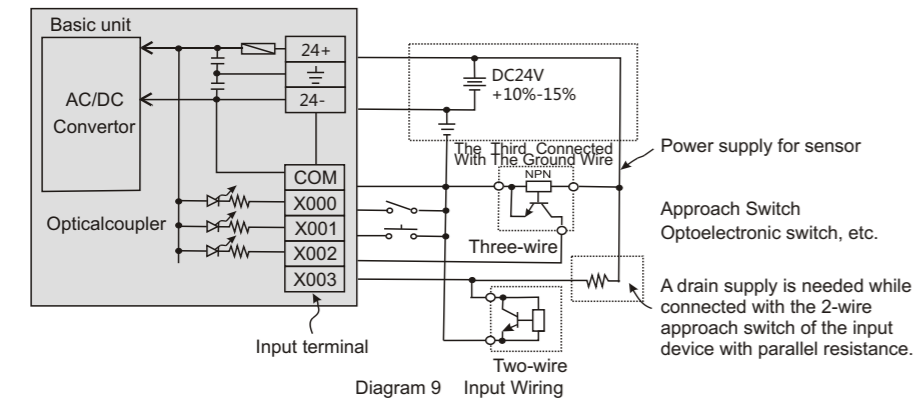


Diagram 9 Input Wiring

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.

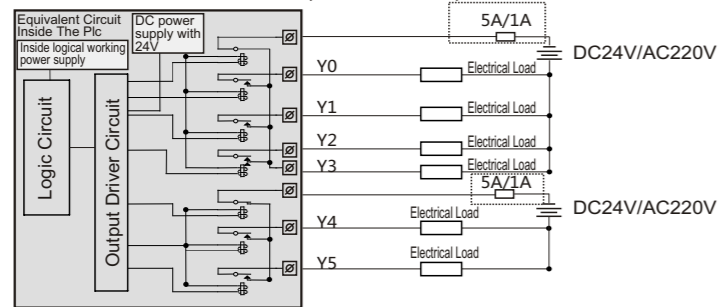


Diagram 10 Equivalent Circuit of Relay Output

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.

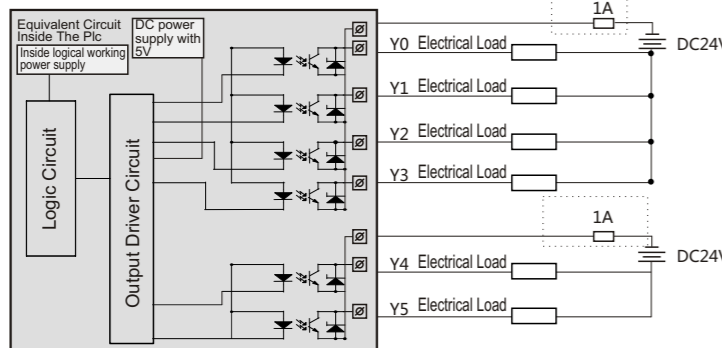


Diagram 11 Equivalent Circuit of Transistor Output

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 KO resistance.

4 pulses are Y0 Y1 Y6 Y7, customized pulses are Y0 Y1 Y6 Y7 Y10.

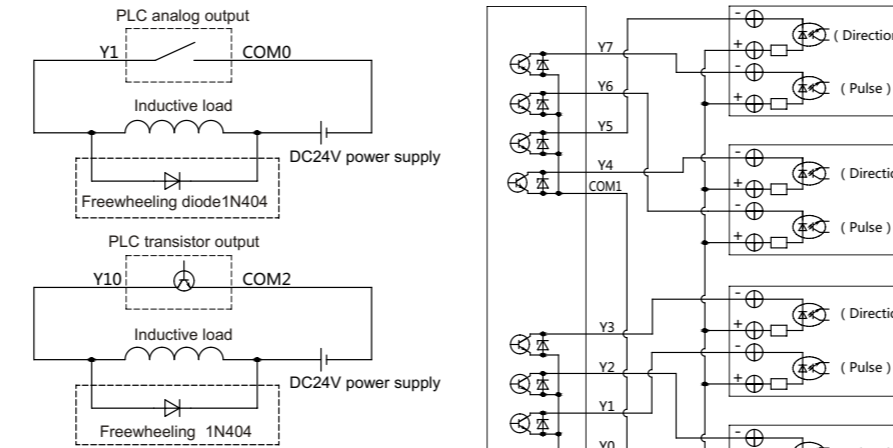


Diagram 12 Inductive Load Absorbing Circuit

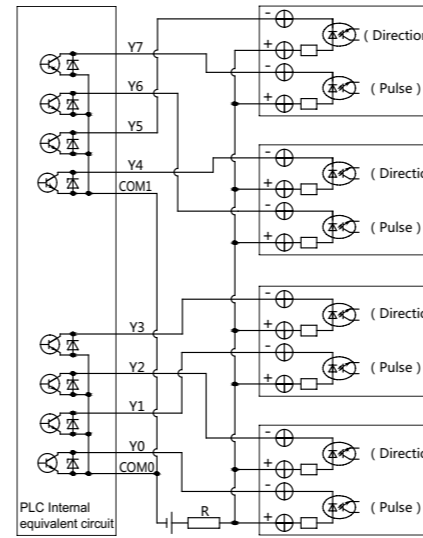


Diagram 13 Pulse Wiring

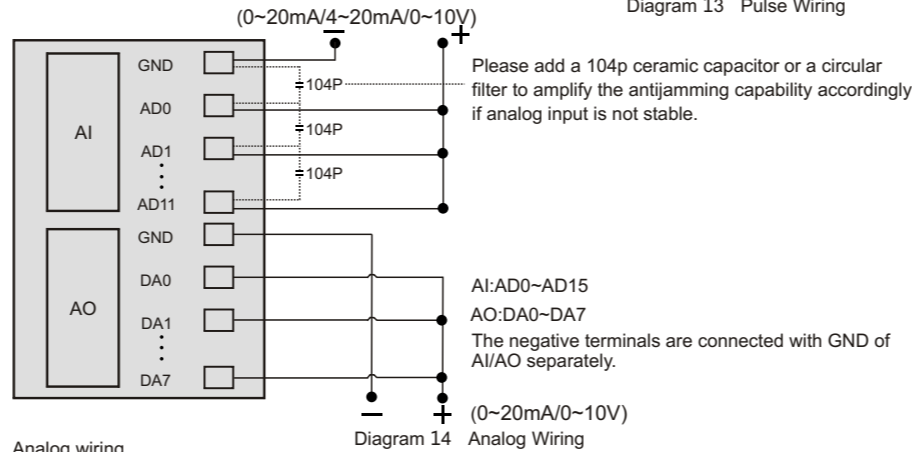


Diagram 14 Analog Wiring

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

1. 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
2. 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	[T246~T249] 4 points 1ms accumulation holding	[T250~T255] 6 points 100ms actuary Holding
Counter C	16bit Up Counter	32bit Up/Down Counter	High-speed Counter
Data register D,V,Z	[D0~D199] 200points General [C100~C199] 100 points Holding	[C200~C234] 35points Holding	[C235~C255] 5 points Holding
Nested Pointers	[D000~D865] 866 points Special	[D866~D899] 34 points Special	V0~V7 Z0~Z7 16points Index
Constant	K 16bit -32,768~32,767 H 16bit 0~FFFFH	32bit -2,147,483,648~2,147,483,647	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 few models of EX2N-100HA support

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				

EX2N-100HA-MT/MR/MRT-16AD8DA

AD	Register Value	Magnification Correction (units: milli)	Size Correction	Circle setting of analog sampling
AD0-AD15	D8030-D8045	D8200-D8215	D8220-D8235	D8050-D8065
Cold End	D8045	D8219	D8239	
Note : D8045 is the cold end of thermocouple. K-type set D8240=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)/-MT/MR/MRT-12AD8DA/EX2N-100HA/-MT/MR/MRT-16AD8DA

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 analog sampling period sets the register value: the default value of the temperature type is 1000; the current and voltage types default to 32; the minimum can be set to 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》

TIPS

EX2N series HMI / PLC All-in-one User Manual

Before using this product, please read the relevant manual Carefully use the product under the environmental conditions specified in the manual.

1. In case of damaging the product, please confirm power supply range first (the regular power supply only limited to 24V DC, we suggest you to use the power supply which output voltage is 18W or higher than 18W), and wiring correctly, then electrify it.
2. Before installing the product, please tighten the screw and clamp guide to avoid falling.
3. Please do not wiring or plug cable when the power is on, otherwise it may cause electric shock or circuit damage. Disconnect the power switch immediately when the product smells or sounds not drop metal shavings and wire tips into the control vent holes during abnormal. Do screwing hole and wiring, which may cause product malfunctions and faults.
4. Please do not tie the power cord and communication cable together or let them too close, you should keep them for more than 10cm distance. The strong and weak electricity should be separated and properly grounded. If the interference is serious the communication and high frequency signal input and output cables should be the shielded cables to improve anti-jamming performance. The grounding terminal FG on this unit must be properly grounded, which can improve the anti-interference ability.
5. The digital input is an externally powered DC24V leakage type (passive NPN) with the input signal isolated from the power supply. When using, connect S/S to 24V positive external power supply.
6. The COM of the binary input / output (transistor) is common to the cathode.
7. Do not disassemble the product or modify the wiring optionally. Otherwise it may cause fault, malfunction, loss, or fire.
8. Please make sure to turn off the all power when you install or dismantle the product, otherwise it may cause malfunction or fault.

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