a WOLONG company

EtherCAT Integrated I/O

User Manual

Wolong Electric Group Co., Ltd.

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Table of Contents

1 Product Overview

1.1 Product profile

Integrated I/O modules equipped with EtherCAT industrial Ethernet bus feature small footprint, high real-time performance, and a rich variety of module types. They provide users with a range of ptions for achieving high-speed data collection, optimal system configuration, simple on-site wiring,and improved system reliability.

1.2 Product features

- Small footprint

  Compact structure and small footprint, only measuring 102 mm × 72 mm × 25 mm
- High speed

  Based on high-performance EtherCAT ASIC communication chips and parallel interface, and fast in speed
- Rich functional expansion options

  A full range of I/O types are available to support flexible expansion. A rich variety of digital, analog, temperature, pulse, and other modules can be integrated to meet demand of different application scenarios.
- Easy diagnosis

  An innovative channel indicator design is adopted. As the indicators are placed close to the channels, channel status is displayed intuitively and clearly, facilitating detection and maintenance.
- Easy configuration

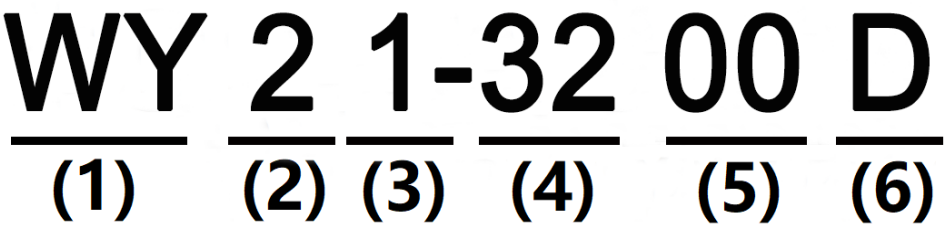
  The modules are easy to configure, and support all mainstream EtherCAT master stations.
- Easy installation

  Installation on standard DIN 35 mm rails

  Elastic terminal blocks are used for convenient and fast wiring.

2 Designation Rules

2.1 Designation rules



No.	Type	Description			
(1)	Product series	WY: Integrated I/O			
(2)	Bus protocol	1:PROFINET 2:EtherCAT			
(3)	I/O kind	1:Digital 2:Analog 3:Pulse output module 4:Encoder counting module			
(4)	Number of input pointsignal points	00,02,04,08,16,32			
(5)	Number of output pointsignal points	00,02,04,08,16,32			
(6)	Input output features	Code	Description	Code	Description
		D	NPN	I	Current type
		S	PNP	U	Voltage type
		J	Relay	A	Differential input

2.2 Model list

Model	Product description	
WY21-3200D	32-channel digital input module, NPN type	
WY21-3200S	32-channel digital input module, PNP type	
WY21-0032D	32-channel digital output module, NPN type	
WY21-0032S	32-channel digital output module, PNP type	
WY21-1616D	16-channel digital input-output module, NPN type	
WY21-1616S	16-channel digital input and output module, PNP type	
WY21-1600D	16-channel digital input module, NPN type	
WY21-1600S	16-channel digital input module, PNP type	
WY21-0016D	16-channel digital output module, NPN type	
WY21-0016S	16-channel digital output module, PNP type	
WY21-0012J	12-channel relay output module	
WY21-1612J	16-channel digital input (NPN / PNP type), 12-channel relay output module	
WY22-0800U	8-channel analog voltage input module	Optional ranges: -10~+10 V, 0~+10 V
WY22-0400U	4-channel analog volume voltage input module	
WY22-0008U	8-channel analog voltage output module	
WY22-0004U	4-channel analog volume voltage output module	
WY22-0800I	8-channel analog current input module	Optional ranges: 4~20 mA, 0~20 mA
WY22-0400I	4-channel analog current input module	
WY22-0008I	8-channel analog current output module	
WY22-0004I	4-channel analog current output module	

3 Product Parameters

3.1 General parameters

Interface parameters	
Bus protocol	EtherCAT
Number of I/O stations	Depending on master station configuration
Data transmission medium	Ethernet/EtherCAT CAT5 cable
Transmission distance	≤100 m (distance between stations)
Transmission speed	100 Mbps
Bus interface	2×RJ45
Technical parameters	
Configuration method	Through the main station
Power supply rating (range)	24 VDC （18V~36V ）
Electrical isolation	500 VAC
Weight	About 140g
Dimensions	102mm×72mm×25 mm
Working temperature	-10℃~+60℃
Storage temperature	-20℃~+75℃
Relative humidity	95%, with no condensation
Protection degree	IP20

3.2 Digital parameters

Digital input	
Rated voltage	24 VDC （18V~30V ）
Number of signal points	8, 16, 32
Signal type	NPN /PNP
"0" Signal voltage (NPN)	15~30 V
"1" Signal voltage (NPN)	-3~+3 V
"0" Signal voltage (PNP)	-3~+3 V
"1" Signal voltage (PNP)	15~30 V
Input filtering	3 ms
Input current	4 mA
Isolation method	Optical coupling isolation
Isolation with stand voltage	500 V AC
Channel indicator	Green LED
Digital output	
Rated voltage	24 VDC （18V~30V ）
Number of signal points	8, 16, 32
Signal type	NPN /PNP
Load type	Resistive load, inductive load
Single-channel rated current	NPN type Max250 mA PNP type Max: 500 mA
Port protection	Overvoltage and overcurrent protection
Isolation method	Optically-coupled isolation
Isolation with stand voltage	500 V
Channel indicator	Green LED
Relay output	
Rated voltage	24 VDC （18V~30V ）
Number of signal points	12
Isolation method	Optically-coupled, relay
Rated load	Single port: 4 A Common port: 8 A Whole module: 16 A
Connecting mode of the common terminal	4 points/1 common terminal
Channel indicator light	Green LED

3.3 Analog parameter

3.3.1 Technical parameter

Analog input	
Number of input points	4, 8
Input signal (voltage type)	-10~+10 V (-32768~32767) 0~+10 V (0~32767)
Input signal (current type)	0~20 mA (0~65535) 4~20 mA (0~65535)
Resolution	16 bits
Sampling rate	≤1 ksps
Accuracy	±0.1%
Input impedance (voltage type)	≥2 kΩ
Input impedance (current type)	100 Ω
Isolation with stand voltage	500 V AC
Channel indicator	Green LED
Analog output	
Number of output points	4, 8
Output signal (voltage-type)	-10~+10 V (-32768~32767) 0~+10 V (0~32767)
Output signal (current type)	0~20 mA (0~65535) 4~20 mA (0~65535)
Resolution	16 bits
Accuracy	±0.1%
Load impedance (voltage type)	≥2 kΩ
Load impedance (current type)	≤200 Ω
Isolation withstand voltage	500 V AC
Channel indicator	Green LED

3.3.2 Voltage I/O range selection and code value table

Voltage I/O range selection and code value range		
Range selection	0	1
Range	-10 ~+10 V	0~+10 V
Code value range	-32768~32767	0~32767
Voltage input formula	D =(65535/20)*U	D =(32767/10)*U
Voltage output formula	U =(D*20)/ 65535	U =(D *10)/32767
Code values table	Please see Table 1.	

Note: D: code value; U: voltage.

Table 1. Voltage code value table

range / **voltage**	**0 (-10~+10 V)**	**1 (0~+10 V)**
	Code value	**Code value**
-10	-32768	-
-9	-29491	-
-8	-26214	-
-7	-22938	-
-6	-19661	-
-5	-16384	-
-4	-13107	-
-3	-9830	-
-2	-6554	-
-1	-3277	-
0	0	0
1	3277	3277
2	6554	6553
3	9830	9830
4	13107	13107
5	16384	16384
6	19661	19660
7	22938	22937
8	26214	26214
9	29491	29490
10	32767	32767
	Code value = (65535 / 20) * voltage	Code value = (32767 / 10) * voltage
	Voltage = (code value * 20) / 65535	Voltage = (code value * 10) / 32767

3.3.3 Current I/O range selection and code value table

Current I/O range selection and code value range		
Range selection	0	1
Range	4~20 mA	0~20 mA
Code value range	0~65535	0~65535
Current input formula	D =65535/16*I-16384	D =65535/20*I
Current output formula	I =(D +16384)*16/65535	I =D*20/65535
Code values table	See Table 2 Current Value Table Table 1.	

Note: D: Code value; I: current.

Table 2. Current code value table

range / **current**	**0 (4~20 mA)**	**1 (0~20 mA)**
	Code value	**Code value**
0	-	0
1	-	3277
2	-	6554
3	-	9830
4	0	13107
5	4096	16384
6	8192	19661
7	12288	22937
8	16384	26214
9	20479	29491
10	24575	32768
11	28671	36044
12	32767	39321
13	36863	42598
14	40959	45875
15	45055	49151
16	49151	52428
17	53247	55705
18	57343	58982
19	61439	62258
20	65535	65535
	Code value =65535 / 16 * current-16384	Code value =65535 / 20 * current
	Current = (code value + 16384) * 16 / 65535	Current = code value * 20 / 65535

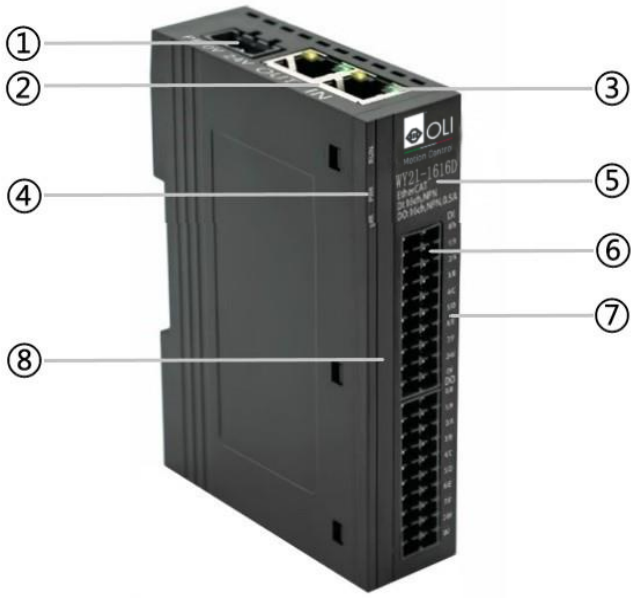
3.4 Common terminal expansion module parameters

Common terminal	
Rated voltage	125 VDC/250 VAC
Rated current	8 A
Number of common terminals	4 sets(10 P/set)

4 Panel

4.1 Product mix

Name and function description



	Name	Description
①	Power interface	3Pin push in terminal
②	Bus interface	2×RJ45
③	Network port indicator	Link and data transmission status
④	System indicator	Indicates the module status
⑤	Module identification	Mark the module model, bus type, etc
⑥	Channel interface	The 2×20Pin push in terminal
⑦	Channel ID	Corresponding channel position identification
⑧	Channel indicator	Indicates the corresponding channel signal status

4.2 Indicator light function

Name	ID	Color	Status	Description
Power	PWR	Green	ON	Normal status of working power supply
			OFF	Unpowered or abnormal power supply
Operating status indicator	RUN	Green	ON	Normal system operation
			OFF	In initialization or unpowered
			Flashing	5 Hz: Pre-OP status 2 Hz: Safe-OP status
Warning indicator	ERR	Red	ON	Special system operation occurred
			OFF	The system is running normally or is not powered up
Network port status indicator	IN	Green	ON	Network connection established
			OFF	Absent or abnormal network connection
		Yellow	Flashing	Connection established with data interaction
			OFF	No data interaction or abnormal status
	OUT	Green	ON	Network connection established
			OFF	Absent or abnormal network connection
		Yellow	Flashing	Connection established with data interaction
			OFF	No data interaction or abnormal status
Input channel status indicator	0 ~ F	Green	ON	Presence of signal input in module channel
			OFF	Absence of signal input in module channel or abnormal signal input
Output channel status indicator	0 ~ F	Green	ON	Presence of signal output in module channel
			OFF	Absence of signal output in module channel or abnormal signal output

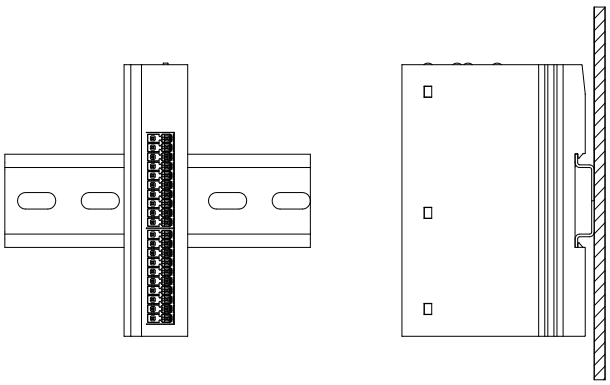
5 Installation and Disassembly

Installation\disassembly precautions

- Ensure that the cabinet is well ventilated (e.g., equipped with a fan).
- Do not install this equipment near or above any equipment that may cause overheating.
- Make sure to install modules vertically and maintain adequate clearance between the modules and nearby devices.
- Installation/disassembly operation may only be carried out after the power supply is cut off.

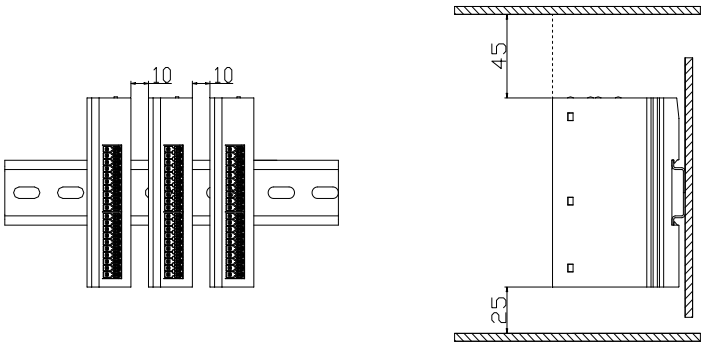
Installation direction

In order to maintain normal heat dissipation of the modules, make sure to install them vertically to ensure smooth airflow inside them.



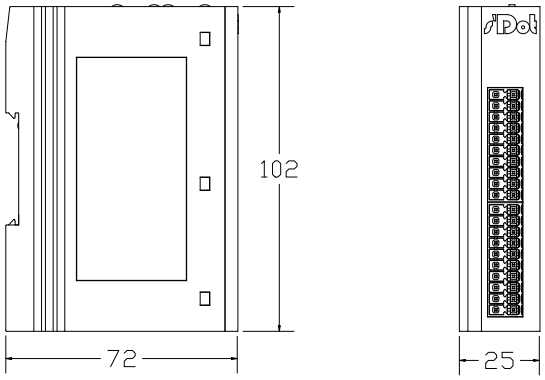
Minimum clearance

The protection degree of the modules is IP20, and they need to be installed inside boxes or cabinets. During installation, please follow the minimum distances (unit: mm) shown in the following figures between modules and those between modules and heating devices, other devices, or wiring slots.



5.1 Dimensions

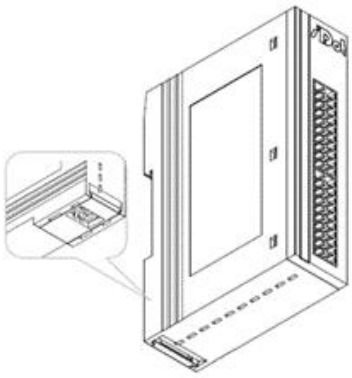
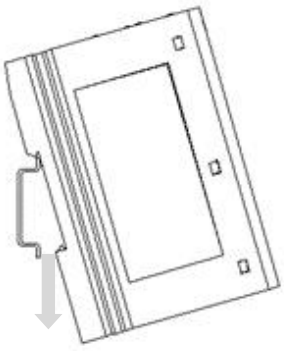
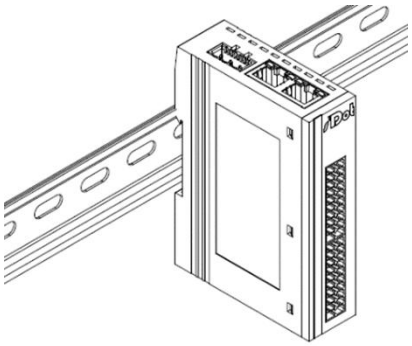
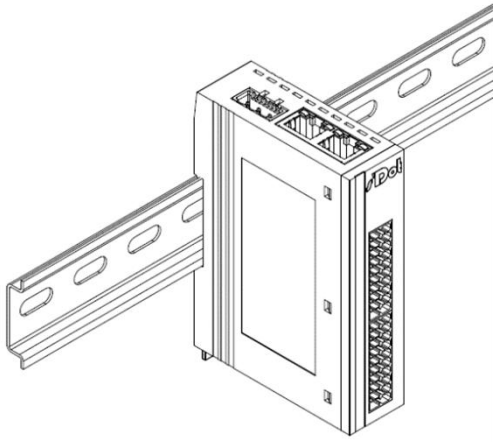
Dimension specification (in mm)

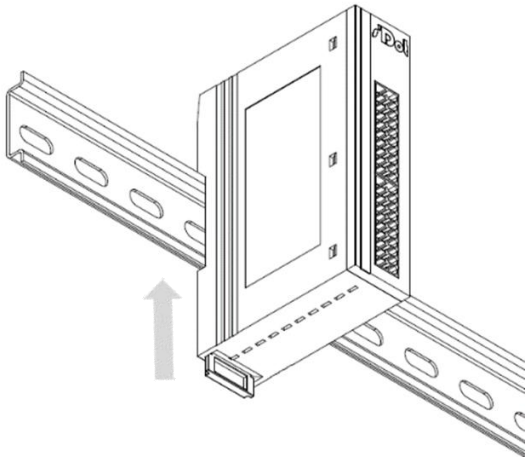


Install:

1. Up and down alignment;
2. DIN 35 mm Guide rail, buckle type installation.

5.2 Installation and disassembly

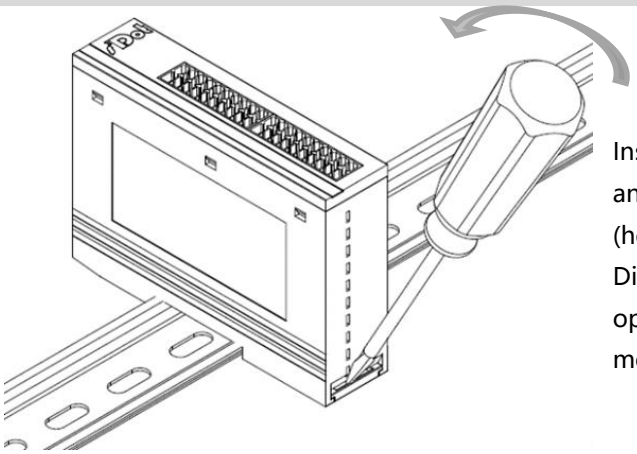
Installation	Step
 ①  ②	Push the buckle at the bottom of the module outward, push the buckle to Figure ① ②, and hear the "click" sound.
 ③  ④	The upper edge of the module buckle is aligned with the upper edge of the guide rail and put the module into the guide rail as shown in Figure ③ and ④.
 ⑤	The module placement is shown in Figure ⑤.



⑥

Push the buckle to the direction of the guide rail, hear the sound, and complete the module installation, as shown in Figure ⑥.

Disassembly	Step



⑦

Insert the word flat head into the buckle and push in the direction of the module (hear the sound) as shown in Figure ⑦. Disassemble the module according to the opposite operation of the installation module.

6 Wiring

6.1 Wiring terminal

Wiring terminal		
Signal wire terminal	Number of poles	2×20 P
	Line diameter	22~17 AWG 0.3~1.0 mm²
Power supply terminal	Number of poles	3
	Wire gauge	22~16 AWG 0.3~1.5 mm²
Bus interface	2×RJ45	Ethernet/Ether CAT CAT5 cable

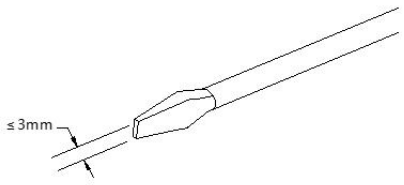
6.2 Wiring instructions and requirements

Power supply wiring precautions

- The module system side power supply and the field side power supply are configured separately. Do not mix them.
- The PE shall be reliably grounded.

Requirements for the wiring tools

The terminal adopts the screw-free design, and the installation and disassembly of the cables can be used One-type screwdriver operation (specification: 3mm).



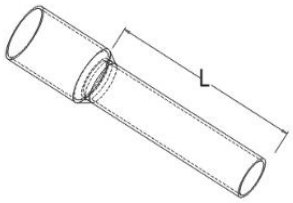
Deplication length requirements

The recommended stripping length is 10 mm.

Wiring method

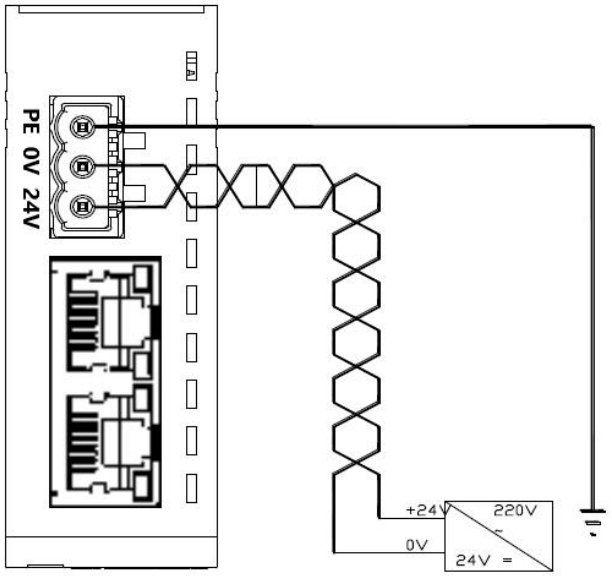
Single strand hard wire, after stripping the corresponding length of the wire, the down button will insert the single strand at the same time.

Multiple flexible wire, after stripping the corresponding length, use the corresponding standard cold pressure terminal (pipe insulation terminal, reference specification is shown in the following table), and lower the pressure button to insert the wire at the same time.

Specification table of pipe-type insulated end head		
Specification	Model	Cable section area mm²
 Length of the tube-type insulated terminal L is 10 mm	E0310	0.3
	E0510	0.5
	E7510	0.75
	E1010	1.0
	E1510	1.5

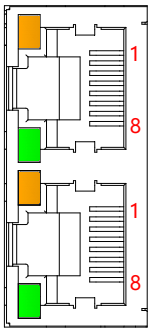
Power supply wiring

The module power supply is DC24V, and twisted pair is recommended for the power cord. The power supply wiring is shown in the following figure.



Bus wiring

Standard RJ 45 network interface and standard crystal connector, pin allocation as shown in the following figure.



The pin number	signal
1	T D+
2	T D-
3	R D+
4	one
5	one
6	R D-
7	one
8	one

☛ matters need attention

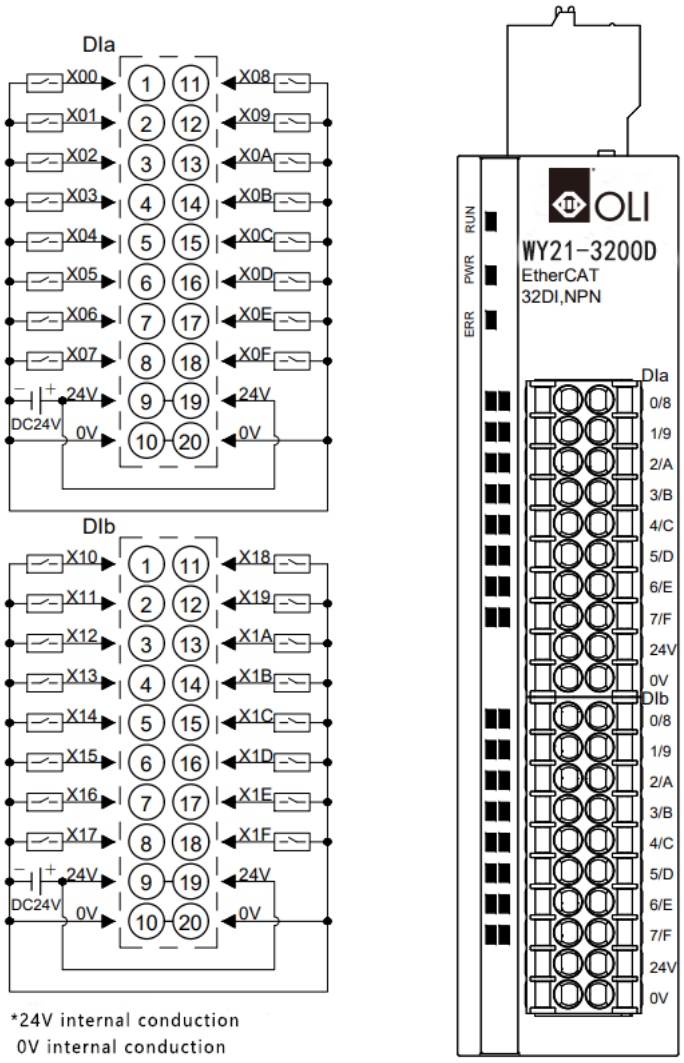
- Category 5 or higher-level double-shielded (braided wire + aluminum foil) STP cable is recommended as communication cable.
- The length of cables between devices should not exceed 100 m.

Signal and load power supply wiring

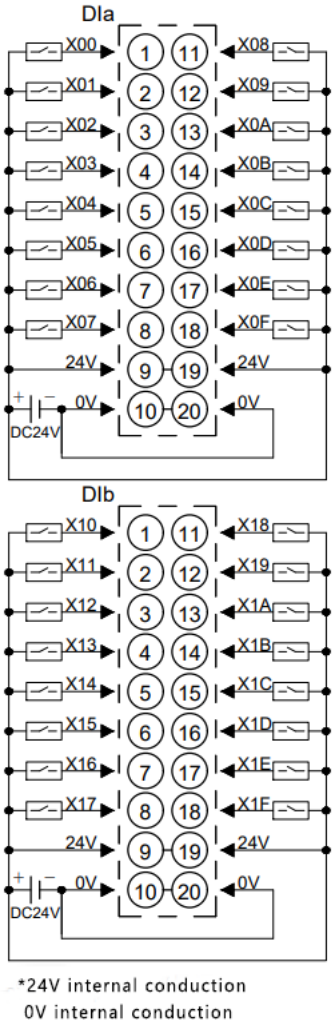
The load power supply uses DC 24V power supply. For the load power supply and signal line, refer to the wiring diagram of the corresponding I / O module and the wiring method to press the cable into the terminal (refer to6.3 I / O module wiring diagram).

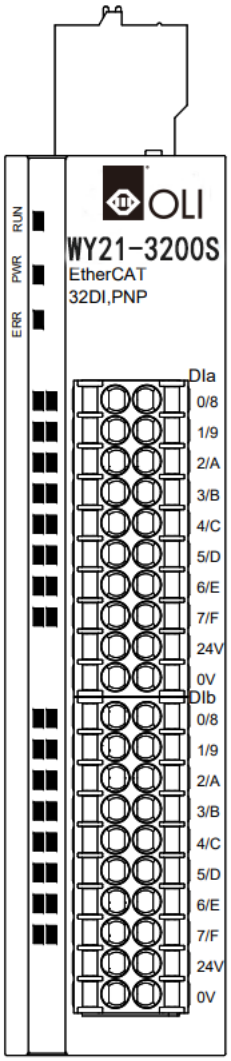
6.3 Wiring diagrams

6.3.1 WY21-3200D

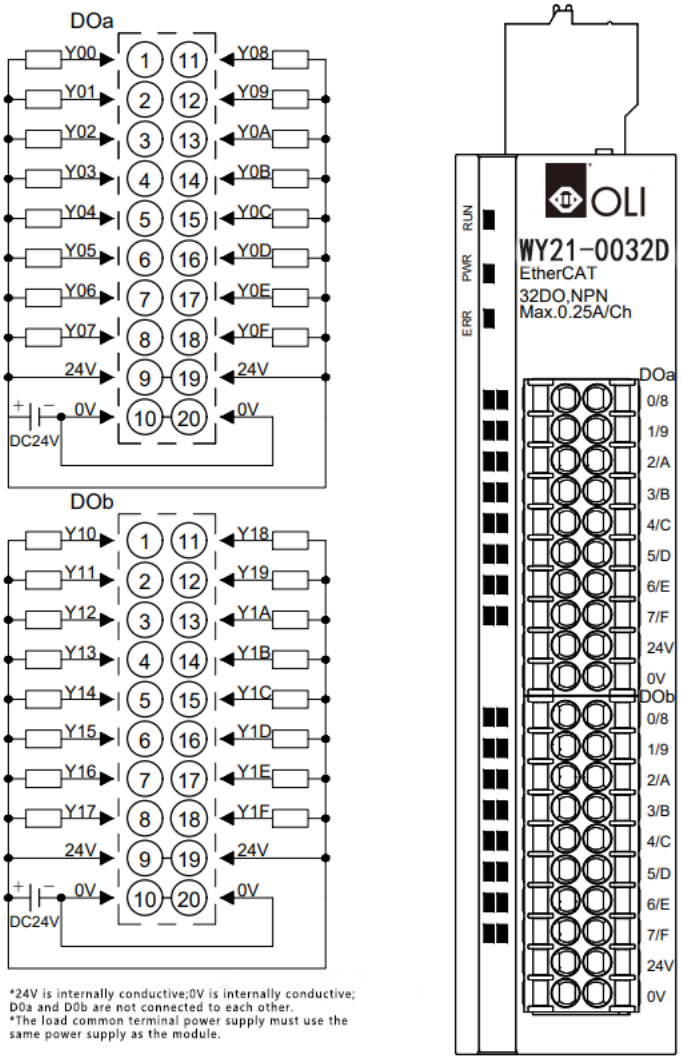


6.3.2 WY21-3200S



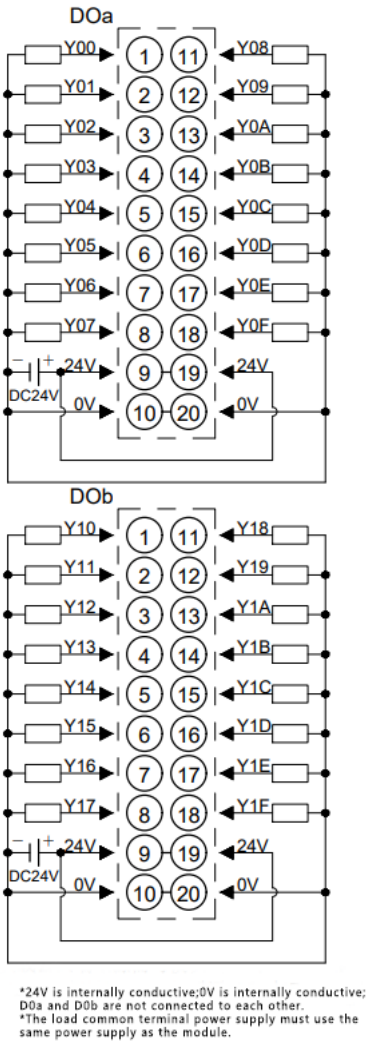


6.3.3 WY21-0032D

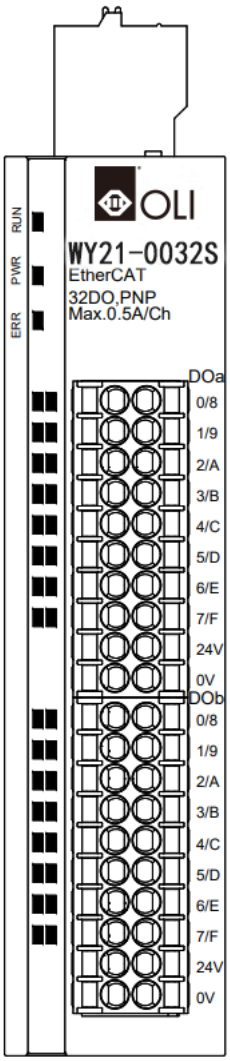


*24V is internally conductive;0V is internally conductive;
D0a and D0b are not connected to each other.
*The load common terminal power supply must use the same power supply as the module.

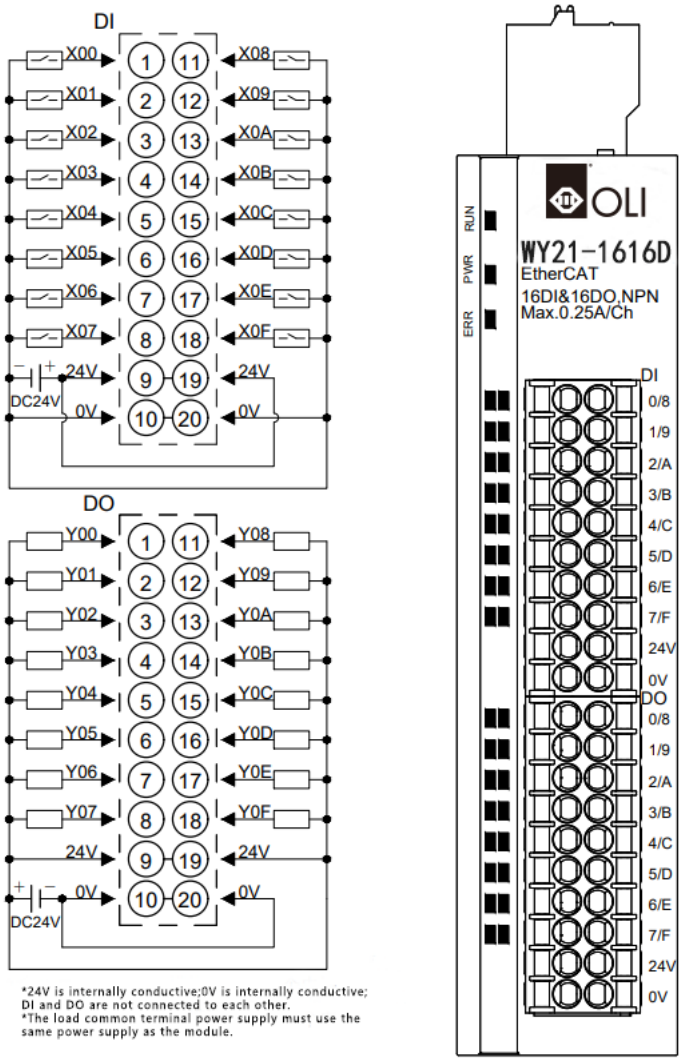
6.3.4 WY21-0032S



*24V is internally conductive;0V is internally conductive; D0a and D0b are not connected to each other.
*The load common terminal power supply must use the same power supply as the module.

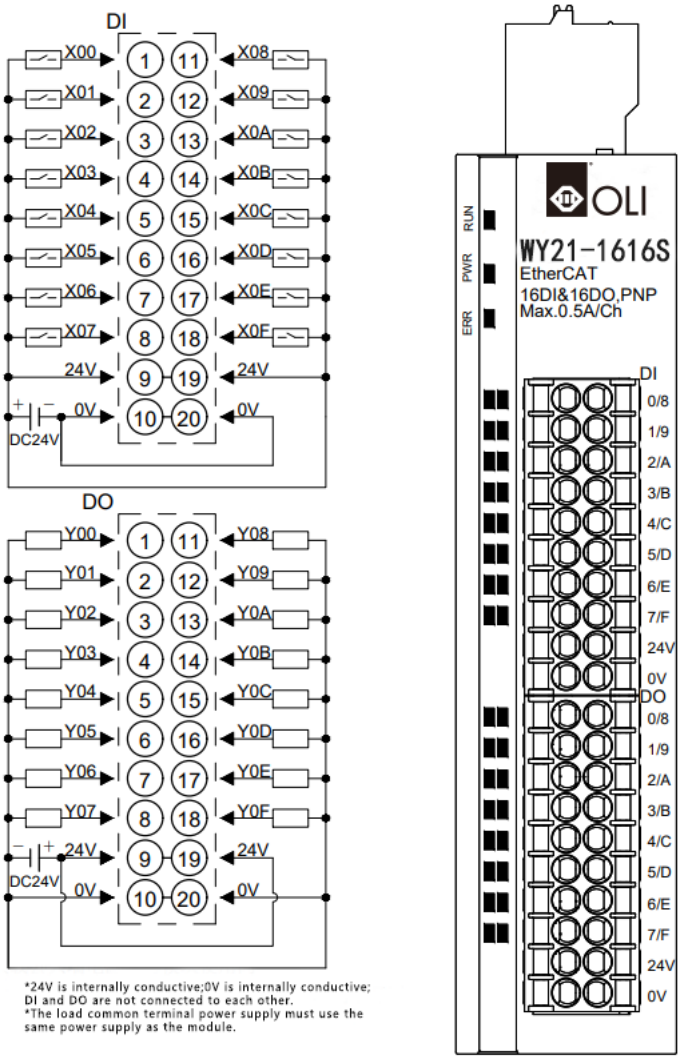


6.3.5 WY21-1616D



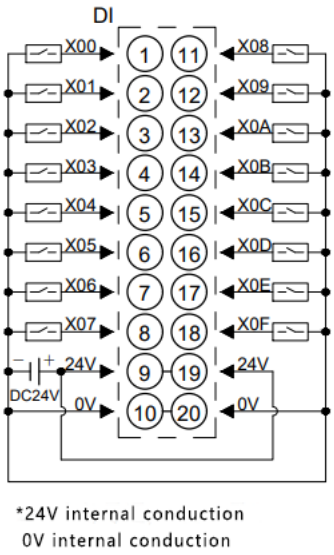
*24V is internally conductive;0V is internally conductive;
DI and DO are not connected to each other.
*The load common terminal power supply must use the same power supply as the module.

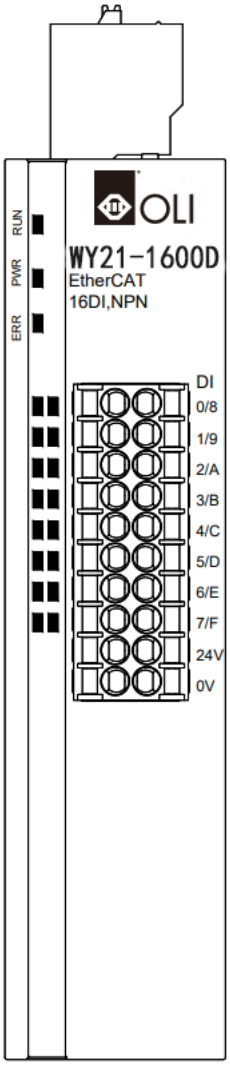
6.3.6 WY21-1616S



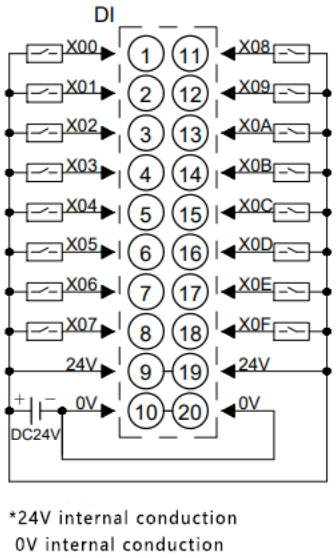
*24V is internally conductive;0V is internally conductive;
DI and DO are not connected to each other.
*The load common terminal power supply must use the same power supply as the module.

6.3.7 WY21-1600D

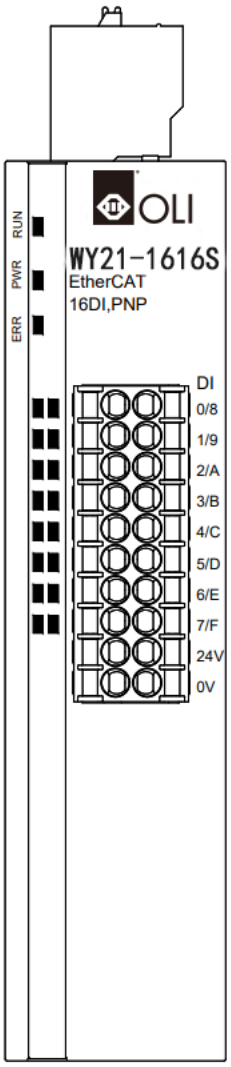




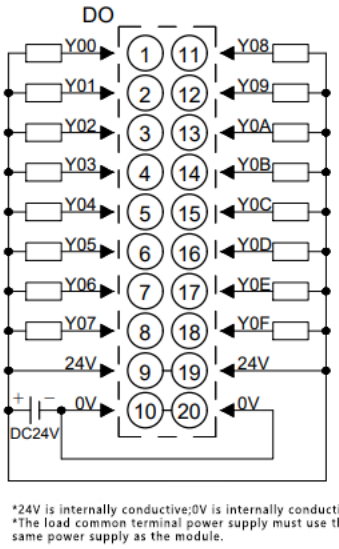
6.3.8 WY21-1600S



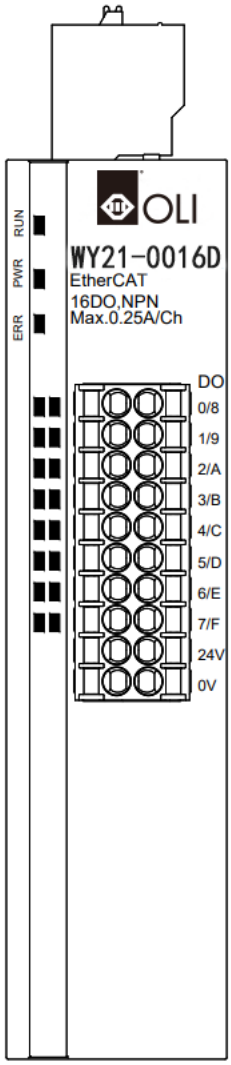
*24V internal conduction
0V internal conduction



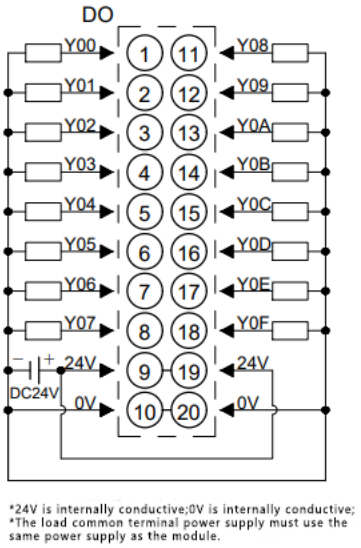
6.3.9 WY21-0016D



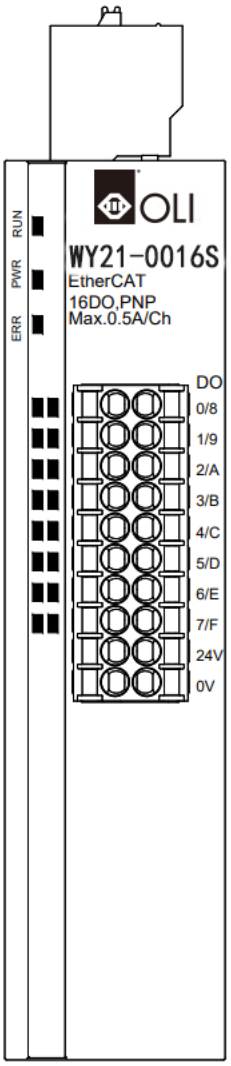
*24V is internally conductive;0V is internally conductive;
*The load common terminal power supply must use the same power supply as the module.



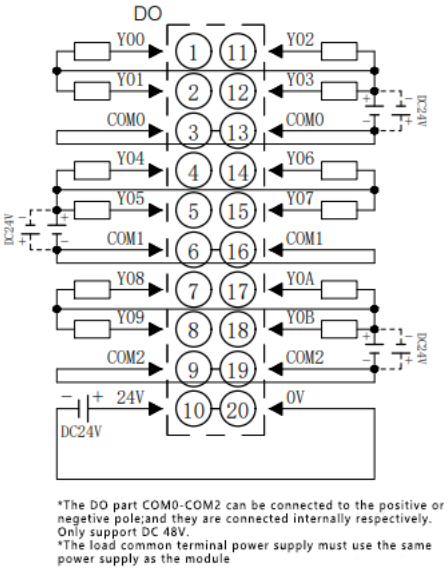
6.3.10 WY21-0016S



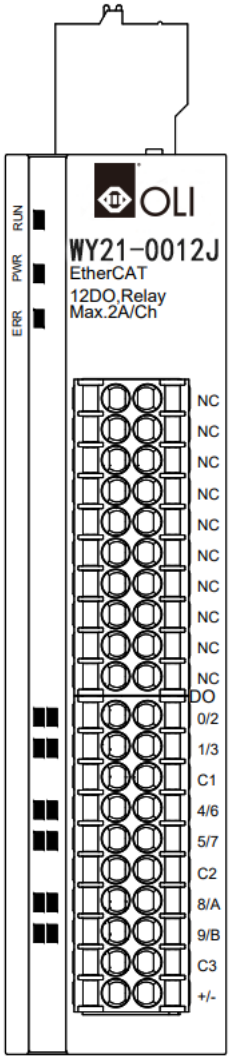
*24V is internally conductive;0V is internally conductive;
*The load common terminal power supply must use the same power supply as the module.



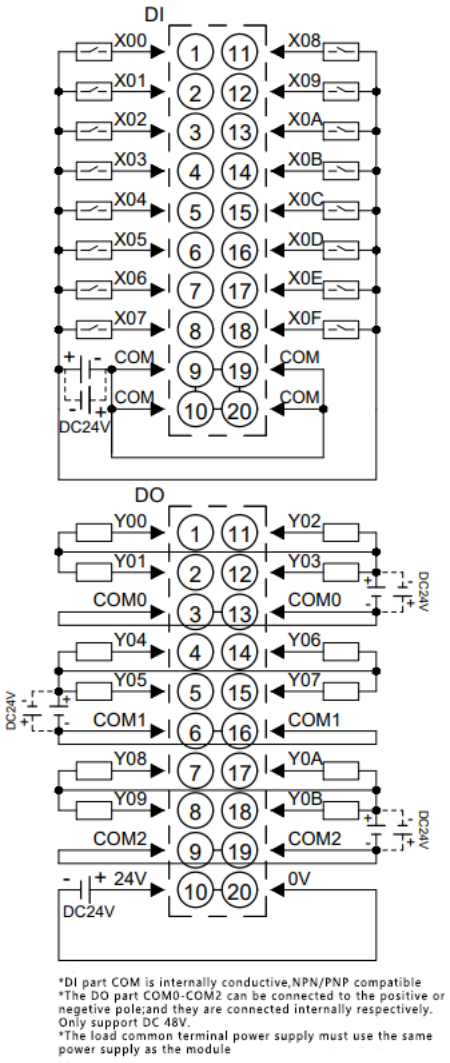
6.3.17 WY21-0012J

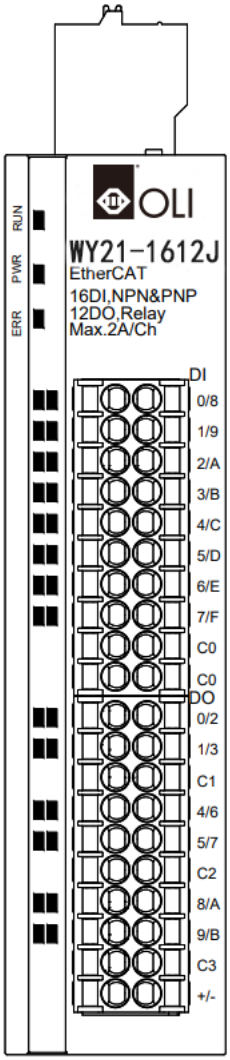


*The DO part COM0-COM2 can be connected to the positive or negetive pole;and they are connected internally respectively. Only support DC 48V.
*The load common terminal power supply must use the same power supply as the module

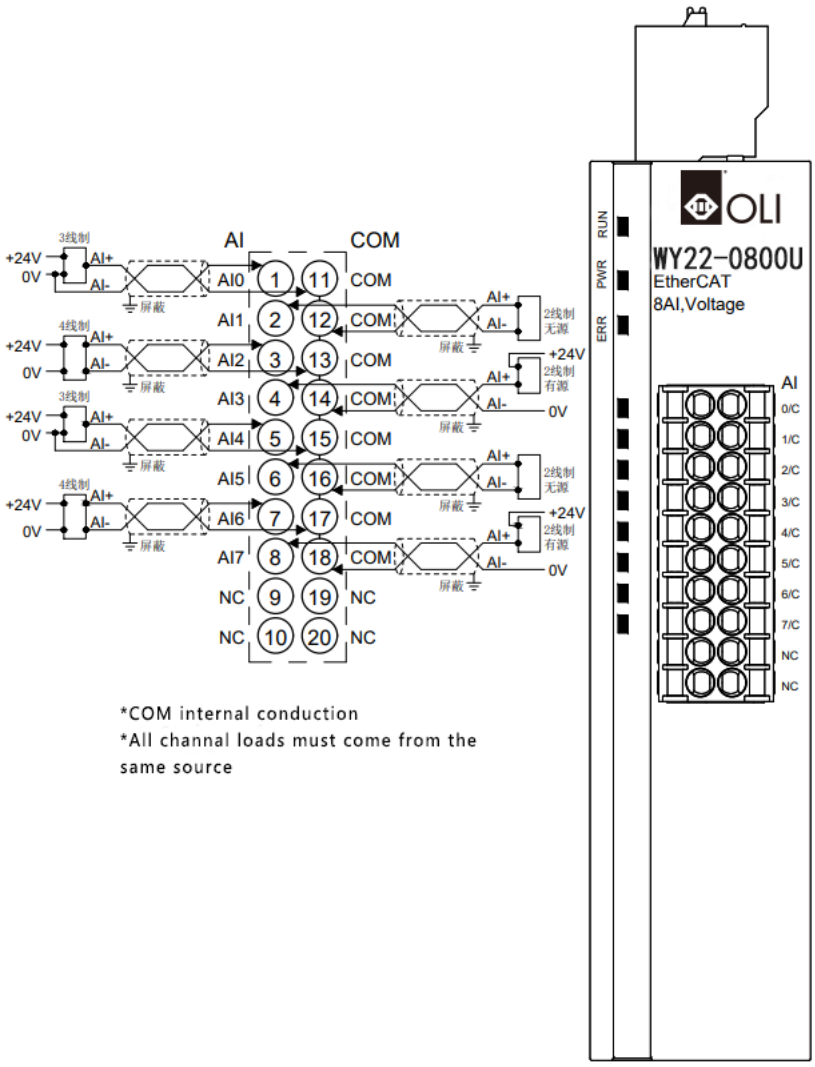


6.3.18 WY21-1612J



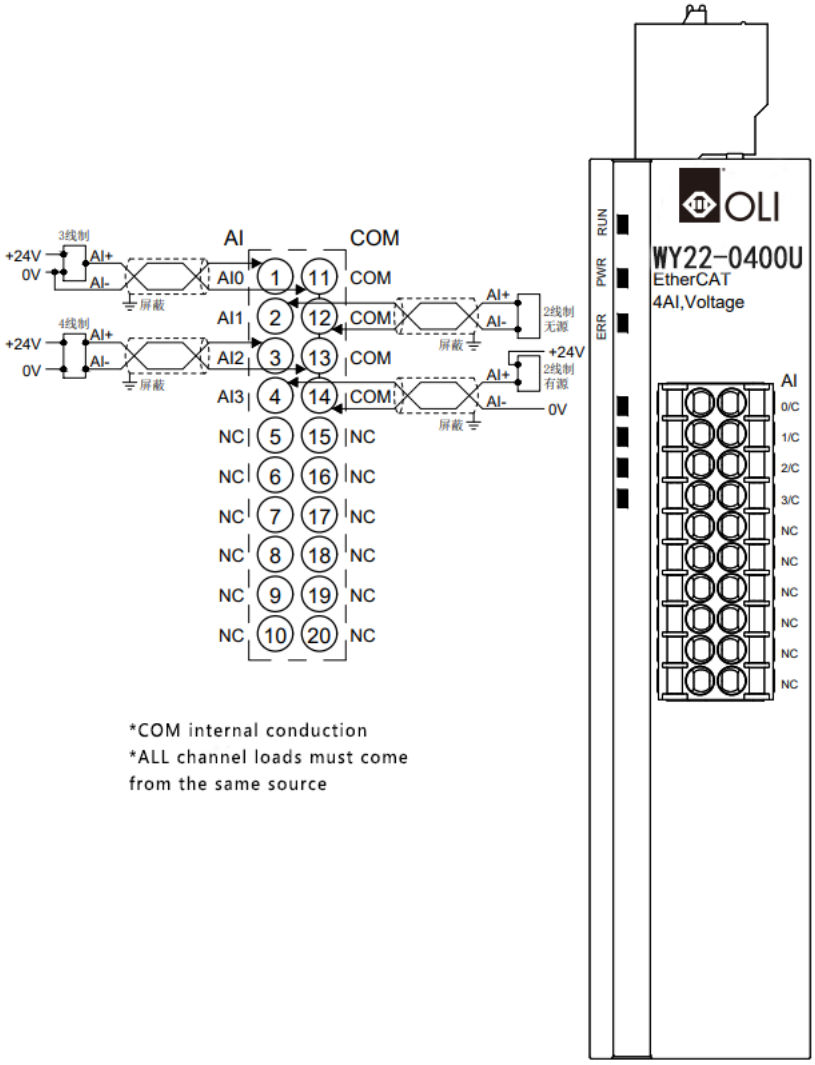


6.3.19 WY22-0800U



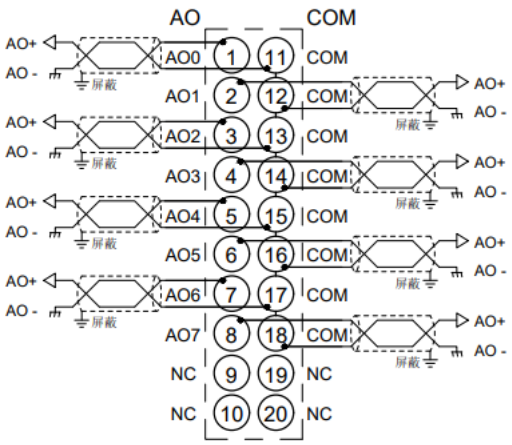
*COM internal conduction
*All channal loads must come from the same source

6.3.20 WY22-0400U

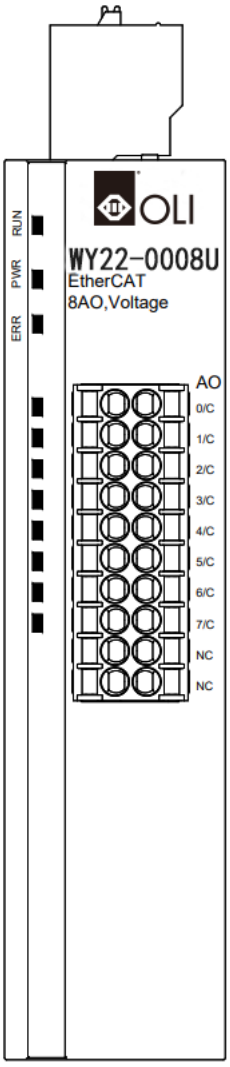


*COM internal conduction
*ALL channel loads must come from the same source

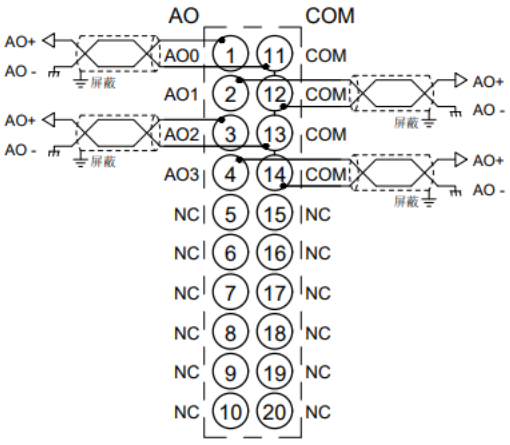
6.3.21 WY22-0008U



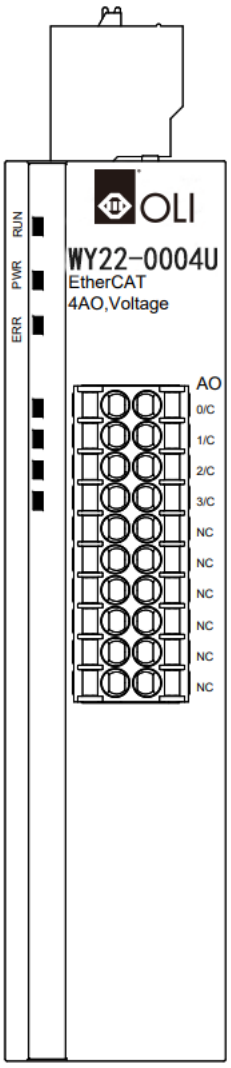
*COM internal conduction
*ALL channel loads must come from the same source



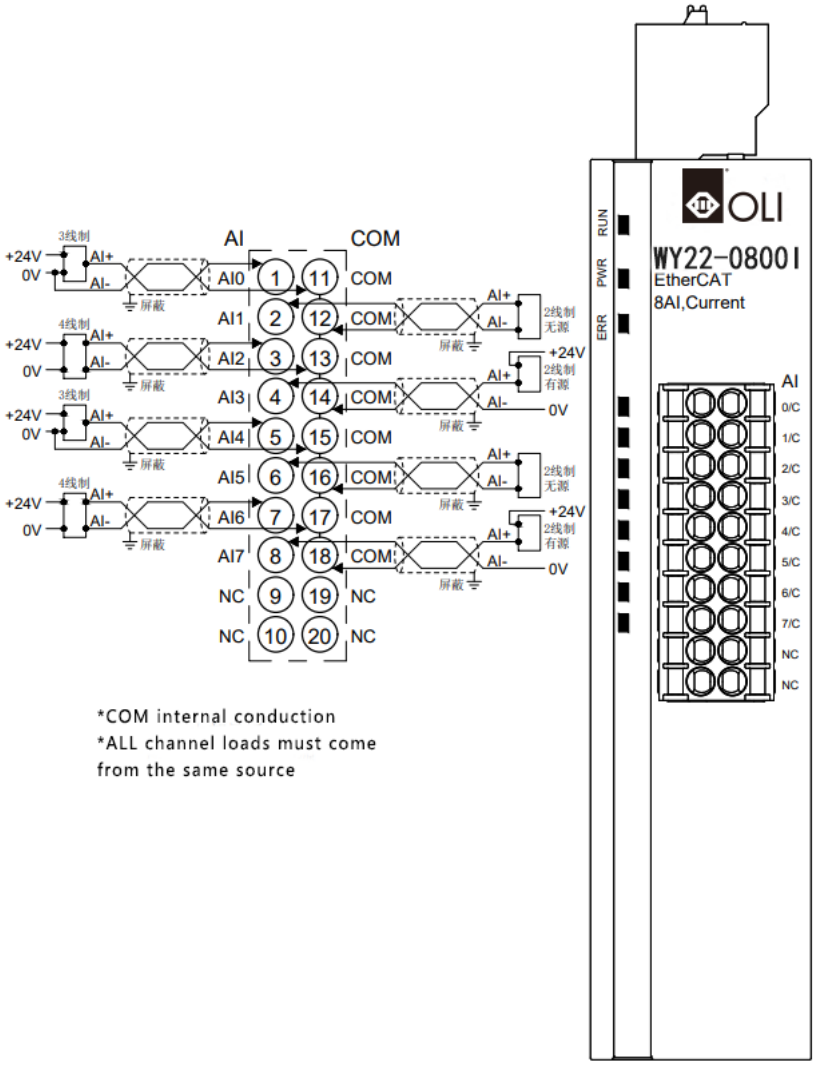
6.3.22 WY22-0004U



*COM internal conduction
*ALL channel loads must come from the same source

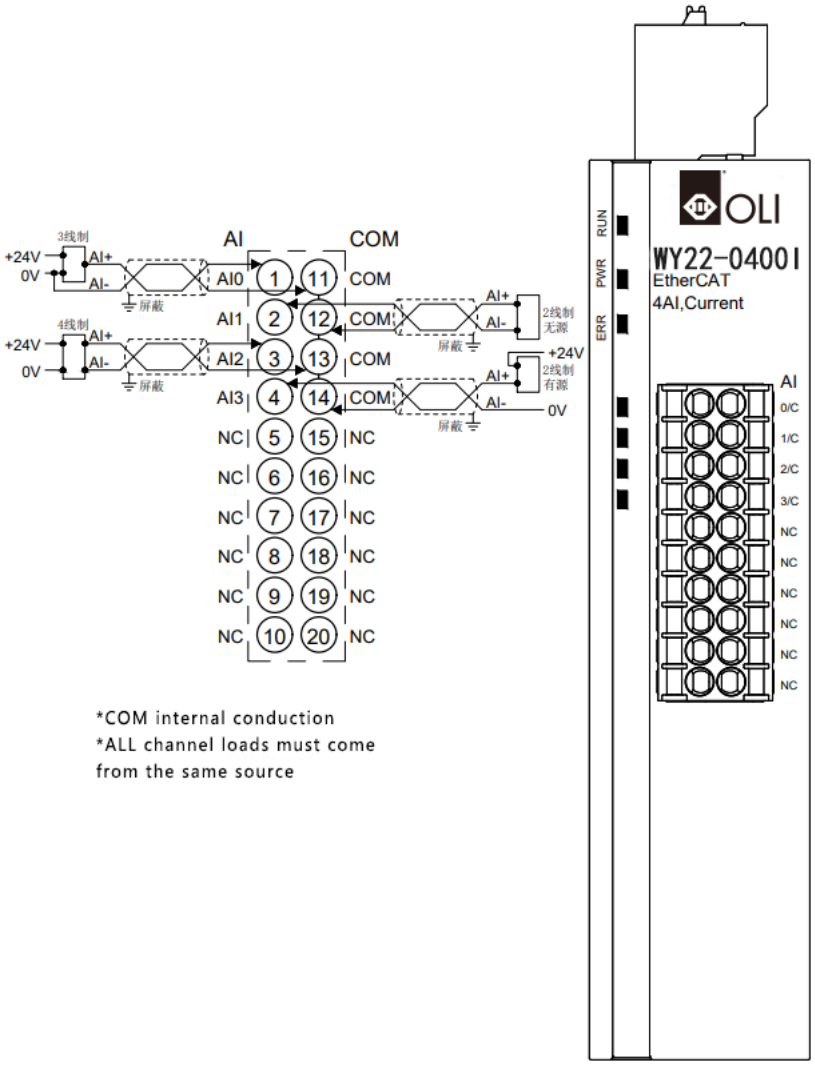


6.3.23 WY22-0800I



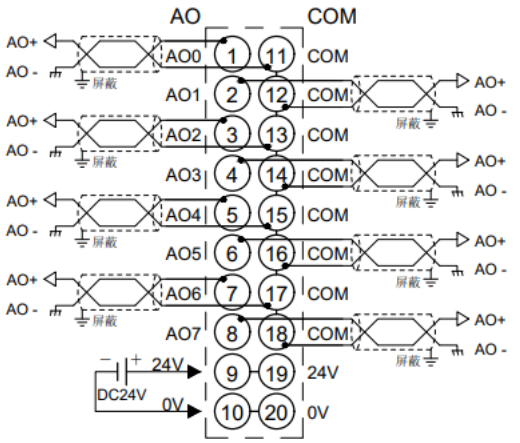
*COM internal conduction
*ALL channel loads must come from the same source

6.3.24 WY22-0400I

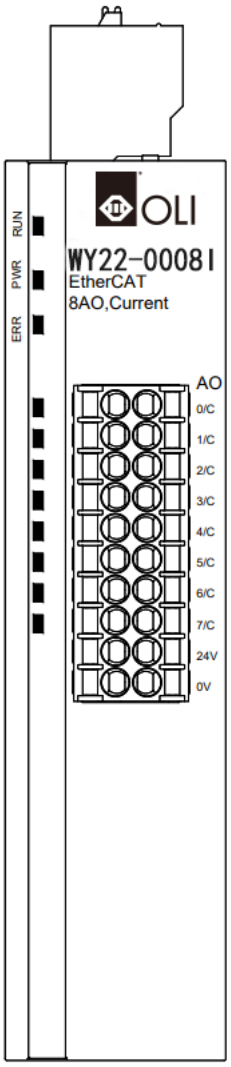


*COM internal conduction
*ALL channel loads must come from the same source

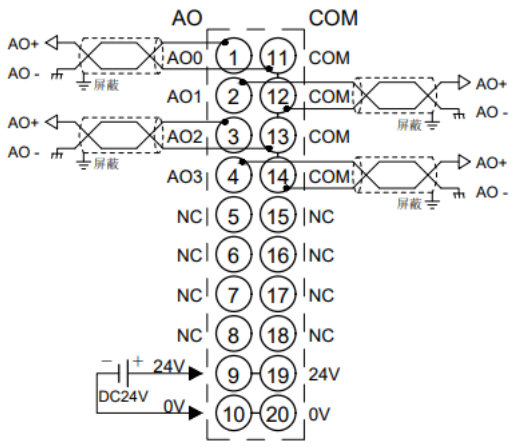
6.3.25 WY22-0008I



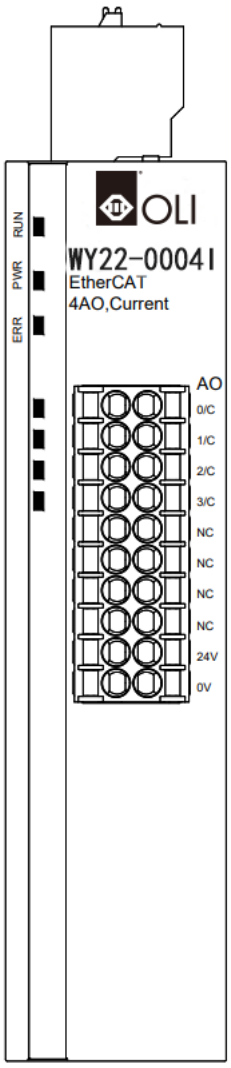
*COM internal conduction
*ALL channel loads must come from the same source
*24V internal conduction;0V internal conduction



6.3.26 WY22-0004I



*COM internal conduction
*ALL channel loads must come from the same source
*24V internal conduction;0V internal conduction



7 Operation

7.1 Parameters and functional configuration

This manual uses the Twin CAT3 software platform as an example to introduce the module parameters, functions, and configuration methods.

7.1.1 Digital output clearing/holding function

The clearing/holding function is for modules with output that can be configured for module output actions in an abnormal bus state.

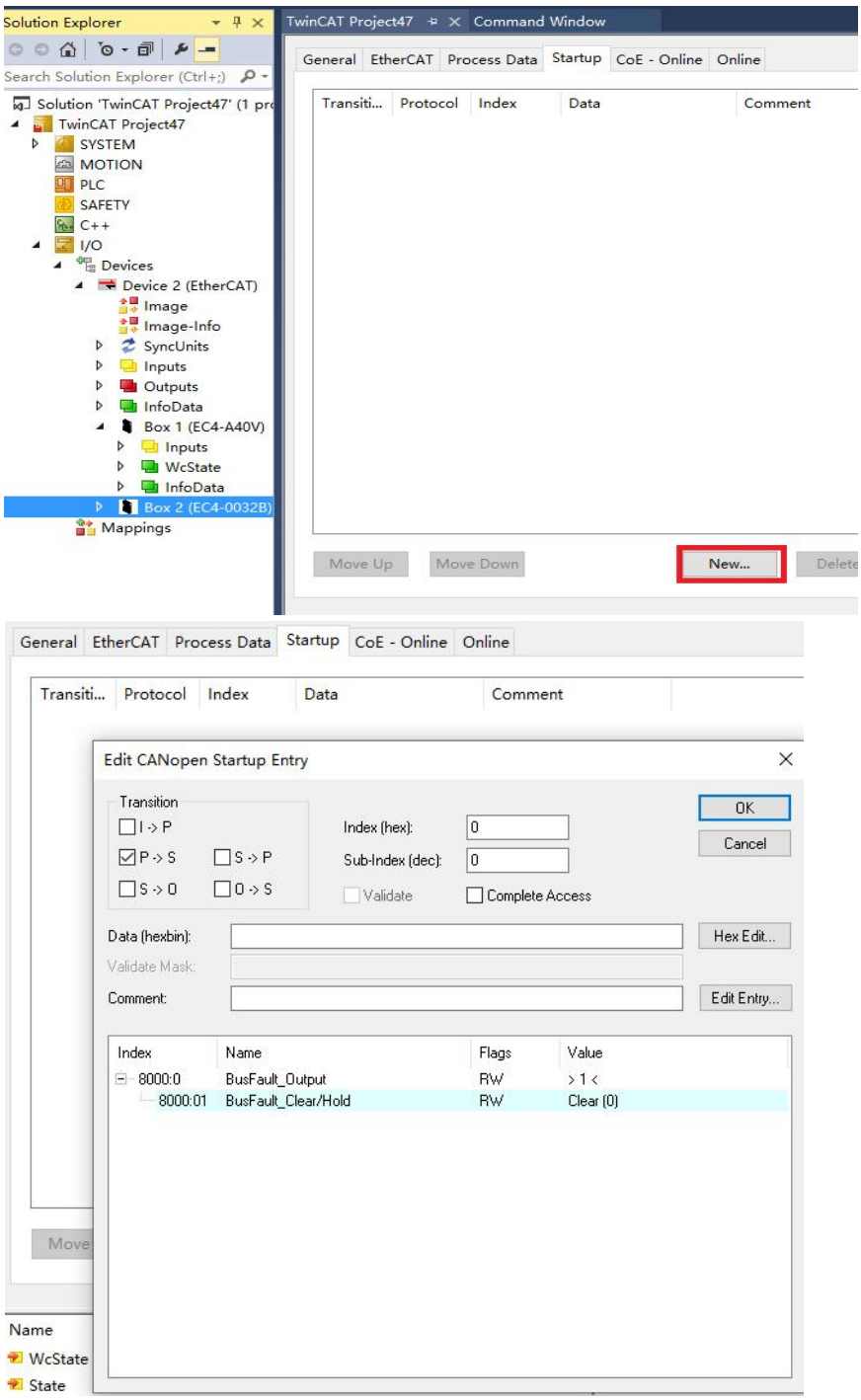
Empty output: the module output channel will automatically empty the output when the communication is disconnected

Maintain output: The module output channel keeps the output when the communication is disconnected

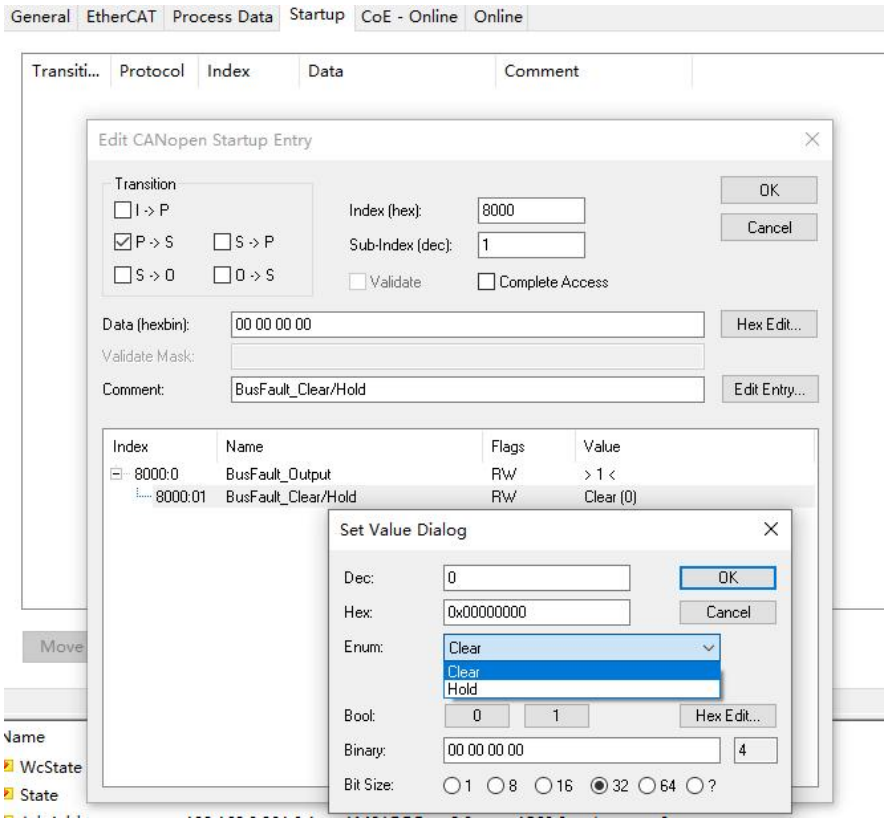
In the case of abnormal bus, the temporary default is the empty state.

- **collocation**

  A、 In the configuration interface, click "New" in "Startup" to enter the "Edit CAN open Startup Entry" interface, as shown in the figure below.



B、 Double-click "8000:01 B us F ault_C lear / Hold" to clear / hold function settings, as shown in the following figure.



Note: After the configuration is complete, download the configuration and the program again.

7.1.2 Digital input filtering time

Digital input filtering prevents unexpected rapid changes in the input pointsignal that may be caused by switch contact jumps or electrical noise. The digital input filter is currently fixed and configured as 3ms, which can filter out the clutter within 3ms, and the channel cannot be configured separately.

The input filter time of 3 ms indicates that a single signal changes from "0" to "1" or from "1" to "0" for 3 ms can be detected, while a single high or low pulses shorter than 3 ms will not be detected.

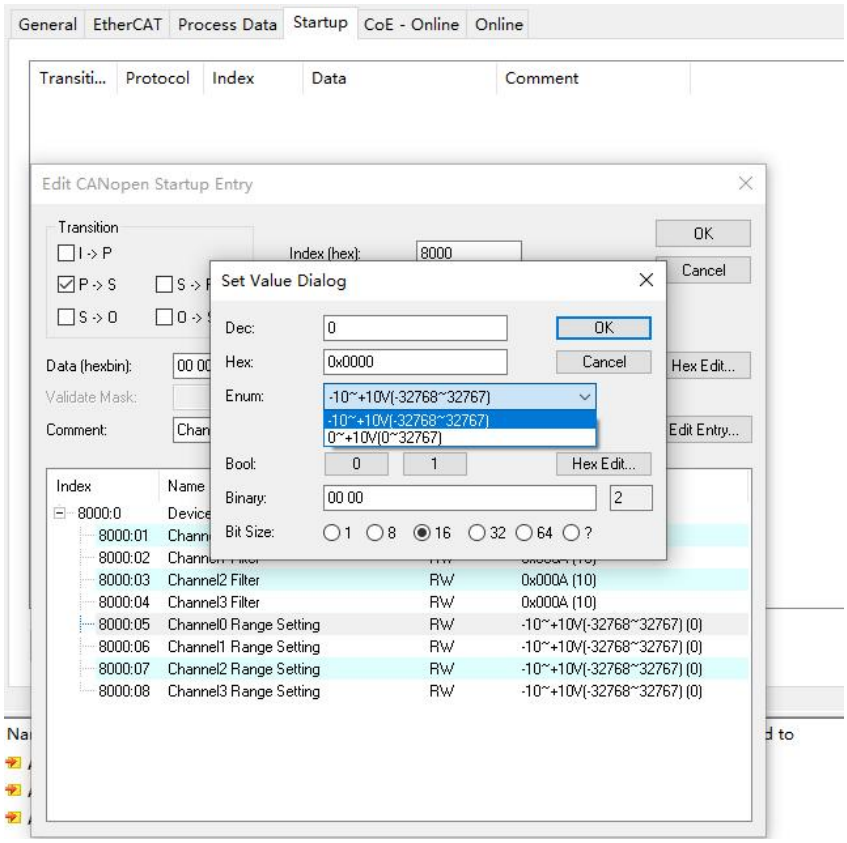
7.1.3 Analog range configuration function

Analog range setting function for the analog input and output module, can set the analog range range.(For details, see"3.3 analog quantity parameters")

- **collocation**

A、 In the configuration interface, click "New" in the "Startup" to enter the "E dit CAN open Startup E ntry" interface.

B、 Double-click 8000:05 C hannel 0 R ange S etting to select the range range setting.



Note: After the configuration is complete, download the configuration and the program again.

7.1.4 Analog filtering parameter configuration function

- **Analog quantity input filter function**

Analog input filtering function, the A / D transformed data can be averaged internally, used to reduce the fluctuation of the input pointsignal due to noise.

The analog quantity input is processed on a moving average with the specified A / D conversion times.

- **Filter function configuration**

Each channel can be configured separately, configuration range: 1~1024; default 10;

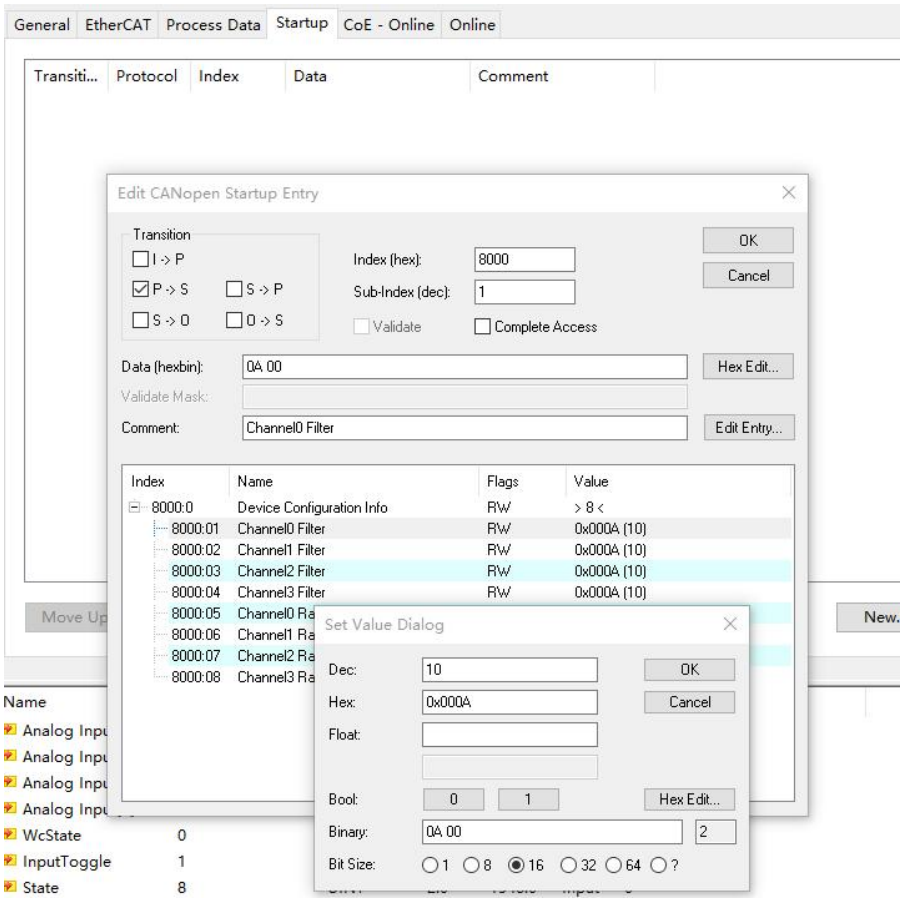
The sampling rate of 8-channel module is: 1.25 KHZ / 8 channel (800us / 8 channel);

The sampling rate of 4-channel module is: 2.5 KHZ / 4 channel (400us / 4 channel).

- **collocation**

A、 In the configuration interface, click "New" in the "Startup" to enter the "E dit CAN open Startup E ntry" interface.

B、 Double-click 8000:05 C hannel 0 F ilter to select range range settings.



Note: After the configuration is complete, download the configuration and the program again.

8 FAQ

8.1 Failure to find a device in the software

1. Confirm that the ESI profile is installed correctly.
2. Confirm that the ESI profile, version is accurate.
3. Whether to restart the Twin CAT software after installing the ESI profile.

8.2 Failure to start operation of a device

1. Confirm whether the project is established correctly.
2. Confirm the relevant setting of the node station number.
3. Make ify the power supply is normal.
4. EtherCAT The communication line is normal.
5. Re-power the device after changing from the device node address.