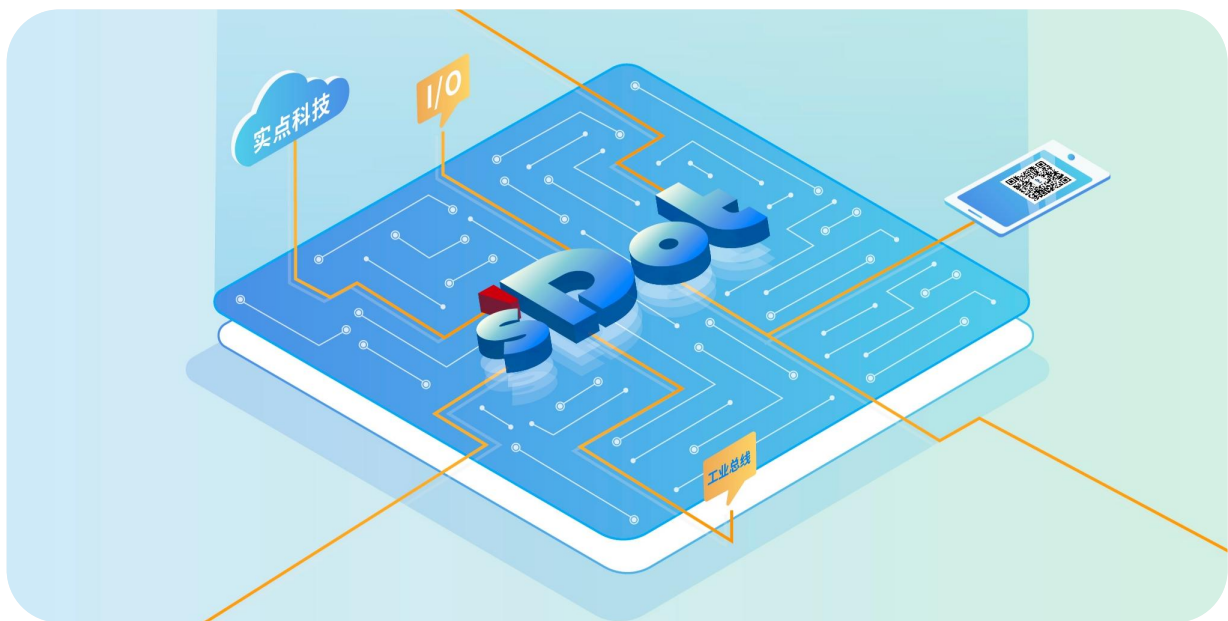




XBF2 series

Discrete I/O modules

User Manual



Nanjing Solidot Electronic Technology Co., Ltd.

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1 Product Overview

1.1 Product Introduction

The XBF2 series of discrete I/O modules are used in combination with discrete scalable couplers. The coupler handles fieldbus communication, connecting the extended I/O modules to a real-time industrial Ethernet system, thereby enabling real-time data exchange between the extended I/O modules and the coupler/controller.

The XBF2 series of discrete I/O modules offers a wide variety and high real-time performance, providing users with support for high-speed data acquisition, optimized system configuration, simplified field wiring, and improved system reliability.

1.2 Product Features

- **Small number of nodes required**
A node consists of a bus coupler and 1 to 32 XBF2 series discrete I/O modules.
- **Flexible expansion and configuration**
The bus coupler has four RJ45 expansion interfaces, which can be serially combined to connect various types of I/O modules.
- **Rich functionality**
It offers a complete range of I/O types and can integrate various digital modules, relay modules, etc., to meet the needs of different applications.
- **High compatibility**
The bus coupler communication interface conforms to communication standards and supports mainstream master stations.
- **Small size**
It has a compact structure and occupies little space.
- **Easy to diagnose**
The indicator lights are complete, making the module status clear at a glance and facilitating testing and maintenance.
- **Fast**
Digital input module combination, baud rate 6MHz, maximum scan cycle approximately 1ms;

This is a combination of digital and analog input modules, with a baud rate of 6MHz and a maximum scan cycle of approximately 3.5ms. (The connected modules can handle up to 1020 bytes of uplink and downlink data.)

- **Easy to install**

Mounted on DIN 35 mm standard rails.

It adopts spring-loaded terminal blocks, making wiring convenient and quick.

1.3 Application methods

The coupler module connects to the controller at the application site, while the I/O module connects to the input and output sensors at the application site. The typical data acquisition, processing, and control flow is as follows:

- a. The input I/O module collects various field signals and sends them to the coupler via the internal bus;
- b. The controller reads and processes data from the coupler via fieldbus or industrial Ethernet, and then writes the output data back to the coupler.
- c. The coupler then writes the output data to the output I/O module via the internal bus, thereby enabling device control.

Expandable I/O modules include digital input modules, digital output modules, digital input/output modules, relay modules, etc.

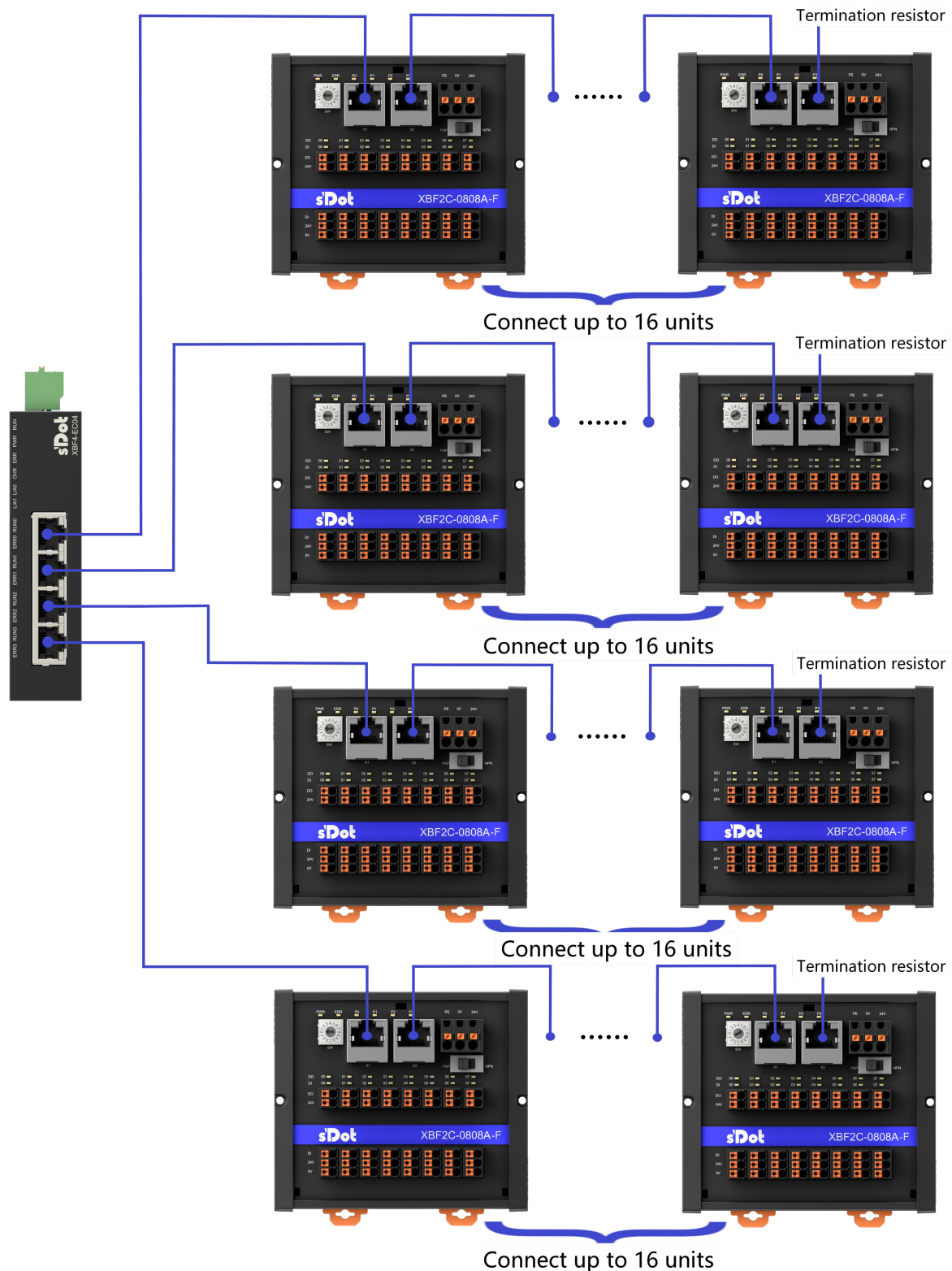
Application method:An application approach that combines modules such as couplers, digital signals, and relays.

Application configuration:Depending on the requirements of the main station's access capabilities, number of stations, number of I/O points, and function types, it can adapt to different models of I/O module combinations and configurations.

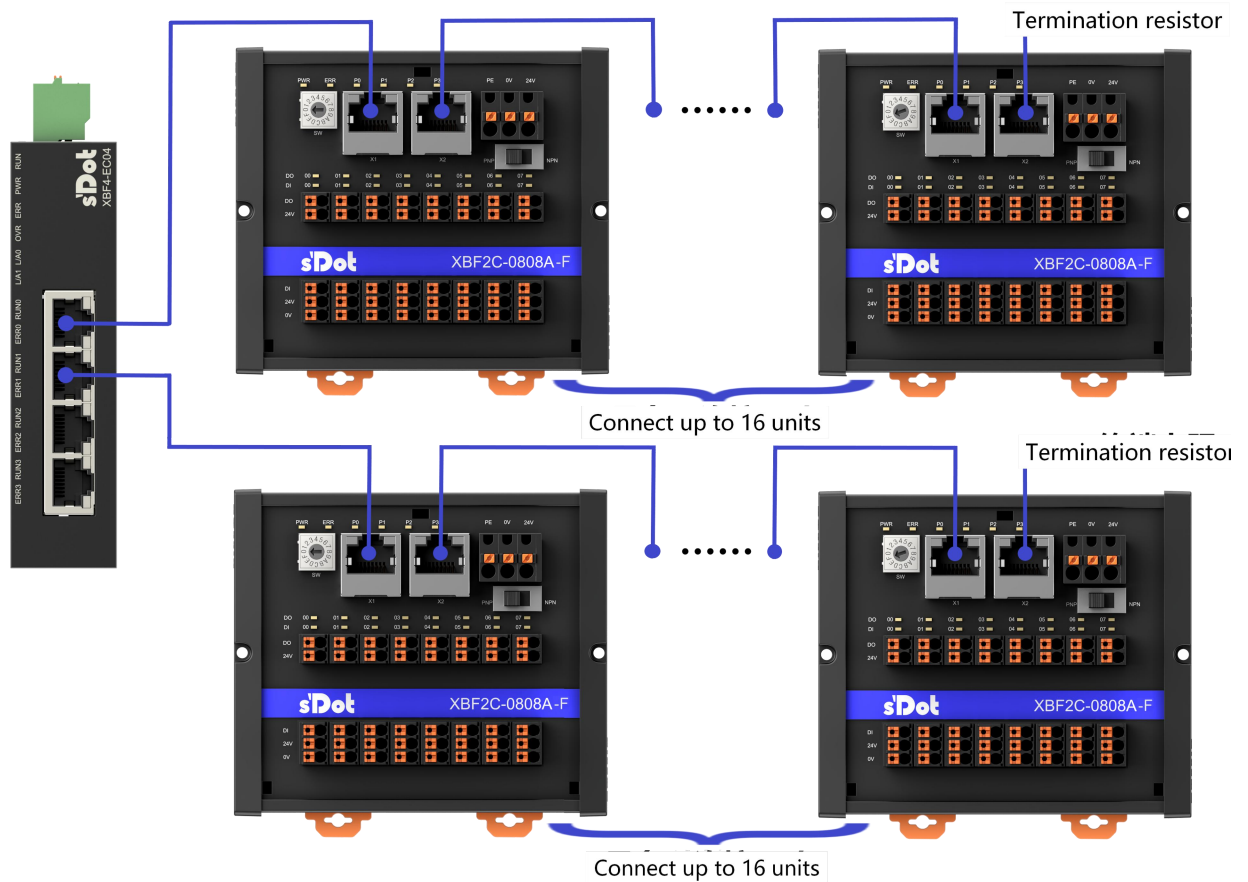
Configuration rules:The bus coupler has four module expansion interfaces (RJ45 type), each of which can serially connect up to 16 modules (module DIP switch station numbers 0~F, which cannot be repeated), and can be expanded to a maximum of 32 XB6S discrete I/O modules.

The product uses a combination of couplers and XBF6S discrete I/O modules, and the following two types of topology combinations are provided for reference.

Product combination option 1 (all 4 interfaces are used, each interface can connect up to 16 XBF6S discrete I/O modules, for a total of up to 32 XBF6S discrete I/O modules)



Product combination method two (using 2 interfaces, each interface can connect up to 16 XBF2C-0808A-F discrete I/O modules, for a total of up to 2*16 XBF2C-0808A-F discrete I/O modules)



Note: In addition to the two methods mentioned above, you can also combine them freely, for example:

- The first interface connects 16 modules;
- The second interface connects to four modules;
- The third interface connects to four modules;
- The fourth interface connects to four modules;

A total of 28 modules can be connected. In total, no more than 16 modules can be connected to a single interface, and no more than 32 modules can be connected to all interfaces. Otherwise, the power consumption will be too high, which may damage the bus coupler.

2 Naming Rules

2.1 Naming Rules

2.1.1 Coupler naming rules

XBF 4 - EC 04
(1) (2) (3) (4)

serial number	meaning	Value description
(1)	Product Type	XBF: XB6S Discrete I/O
(2)	Product Series	4: Integrated
(3)	Bus Protocol	EC: EtherCAT protocol PN: PROFINET protocol
(4)	Number of expansion module interfaces	04: Four RJ45 expansion ports

2.1.2 I/O module naming rules

XBF **2** **C** - **A** **0** **8** **V** - **F**
(1) **(2)****(3)** **(4)** **(5)****(6)****(7)** **(8)**

serial number	meaning	Value description				
(1)	Product Type	XBF: XB6S Discrete I/O				
(2)	Product Series	2: Terminal block type				
(3)	Terminal type	A: Spring-loaded terminal block, pluggable, 1 row of terminals C: Spring-loaded terminal block, pluggable, 2 rows of terminals D: Spring-loaded terminal, non-removable, 1 row of terminals E: Spring-loaded terminal, non-removable, 2 rows of terminals				
(4)	Types of I/O modules	A: Analog Default: Digital				
(5)	Number of input signal points	Analog: 0, 4, 8 Digital: 00, 08, 16, 32				
(6)	Number of output signal points	Analog: 0, 4, 8 Digital: 00, 08, 16, 32				
(7)	Input/output characteristics	Digital			Analog	
		Coding	Input	Output	Coding	Illustrate
		A	NPN/PNP compatible	NPN	V	voltage module
		B	NPN/PNP compatible	PNP	I	Current module
		default	NPN/PNP compatible	/	/	/
(8)	Does the option to add a dust cover support this item?	F: Dust cover optional. Default: Dust cover is not supported as an optional accessory.				

2.1.3 Relay Module Naming Rules

XBF 2 D - J 12 C4 - P01

(1) (2)(3) (4) (5) (6) (7)

serial number	meaning	Value description			
(1)	Product Type	XBF: XB6S Discrete I/O			
(2)	Product Series	2: Terminal block type			
(3)	Terminal type	A: Spring-loaded terminal block, pluggable, 1 row of terminals C: Spring-loaded terminal block, pluggable, 2 rows of terminals D: Spring-loaded terminal, non-removable, 1 row of terminals E: Spring-loaded terminal, non-removable, 2 rows of terminals			
(4)	Types of I/O modules	J: Relay			
(5)	Relay points	04, 08, 12, 16			
(6)	Number of public terminals in parallel	C1, C2, C4, C8			
(7)	Relay model	brand	code	series	Remark
		Omron	R03	G2R-2DC24	Two normally open and two normally closed
		Matsushita	P01	APAN3124	One always open

2.2 Module list

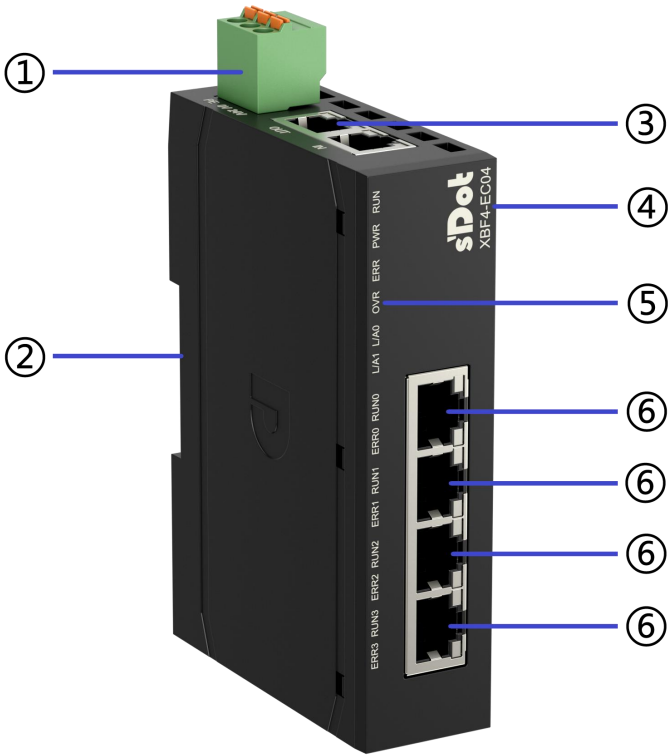
model	Product Description
XBF4-EC04	Integrated Scalable EtherCAT busCoupler module
XBF4-EC04A	Integrated Scalable EtherCAT busCoupler module
XBF4-PN04	Integrated Scalable PROFINET busCoupler module
XBF2C-1600-F	16-channel digital input terminal block module, NPN/PNP compatible input, input filtering default 3ms (dust cover optional).
XBF2C-0016A-F	16-channel digital output terminal block module, NPN output type (dust cover optional).
XBF2C-0016B-F	16-channel digital output terminal block module, PNP output type (dust cover optional).

XBF2C-0808A-F	8-channel digital input, 8-channel digital output terminal block module (dust cover optional) Input is NPN/PNP compatible, input filtering defaults to 3ms, output is NPN type.
XBF2C-0808B-F	8-channel digital input, 8-channel digital output terminal block module (dust cover optional) Input is NPN/PNP compatible, input filtering defaults to 3ms, output is PNP type.
XBF2D-J04C1-R03	4-channel terminal block type relay output module
XBF2D-J12C4-P01	12-channel terminal block type relay output module
XBF2D-J16C4-P01	16-channel terminal block type relay output module
XBF2E-1600	16-channel digital input terminal block module, NPN/PNP compatible input, input filtering default 3ms
XBF2E-0016A	16-channel digital output terminal block module, NPN output type
XBF2E-0016B	16-channel digital output terminal block module, PNP type output
XBF2E-0808A	8-channel digital input, 8-channel digital output terminal block module Input is NPN/PNP compatible, input filtering defaults to 3ms, output is NPN type.
XBF2E-0808B	8-channel digital input, 8-channel digital output terminal block module Input is NPN/PNP compatible, input filtering defaults to 3ms, output is PNP type.

3 Module Introduction

3.1 EtherCAT coupler

3.1.1 Panel structure



serial number	name	illustrate
①	Power terminal	3P spring-loaded terminal block
②	Guide rail slot	Suitable for mounting on DIN 35 mm guide rails
③	Bus interface	2×RJ45, EtherCAT bus interface
④	Module identifier	Marking module logo and model
⑤	Module indicator lights and indicator light labels	Indicator module power status and operating status

⑥	Extension module interface	4×RJ45, expansion interface
---	----------------------------	-----------------------------

3.1.2 Indicator light function

EtherCAT Coupler Indicator Definition				
logo	name	color	state	Status Description
RUN	Operating status indicator	Green	ON	EtherCAT OP status
			Flickering at 2.5Hz	EtherCAT PreOP status
			Single flash (always on for 200ms, then off for 1 second, cycling through different modes).	EtherCAT SafeOP Status
			10Hz flicker	Bootstrap status
			OFF	EtherCAT Init Status
PWR	Power indicator light	Green	ON	Coupler power supply is normal
			OFF	The module is not powered on or the power supply is abnormal.
ERR	Alarm indicator	Red	Hazard lights[1]	EtherCAT watchdog timeout
			Single flash (always on for 200ms, then off for 1 second, cycling through different modes).	Module local error
			Flickering at 2.5Hz	Common configuration error
			OFF	EtherCAT communication is normal.
OVR	Overload indicator light	Red	ON	The power supply load reaches 90% ($\pm 5\%$) or more.
			OFF	Power supply load is less than 90% ($\pm 5\%$)
L/A0	Network port IN status indicator	Green	ON	Establish network connection
			Flashing	Connection established and data exchanged
			OFF	No network connection established or abnormal
L/A1	Network port OUT status indicator	Green	ON	Establish network connection
			Flashing	Connection established and data exchanged
			OFF	No network connection established or abnormal
RUN0~3	Interface running status indicator	Green	ON	The interface and the extension module have business data interaction.
			flickering 1Hz	The interface establishes a connection with the extension module without exchanging business data.

			OFF	The interface and the expansion module failed to establish a connection or communication was abnormal.
ERR0~3	Interface fault indicator light	Red	ON	Interface communication initialization failed or communication anomalies occurred, such as module offline or station number conflict.
			OFF	Expansion module not connected, or communication is normal.

Note [1]: Double flashing means that the light stays on for 200ms and then turns off for 200ms, then stays on for 200ms and turns off for 1000ms, and so on in a cycle.

3.1.3 Product Parameters

3.1.3.1 Interface parameters

EtherCAT interface parameters					
Bus Protocol		EtherCAT			
Number of stations		It depends on the number of slave stations supported by the main station.			
Data transmission medium		Ethernet/EtherCAT CAT5 S/FTP cable			
Transmission rate		100Mbps			
Minimum cycle time		250us			
Transmission distance		≤100m (distance between stations)			
Bus interface		2×RJ45			
Coupler extension interface parameters					
Extension module interface		4×RJ45			
Maximum number of coupler slave stations connected in series		32			
Maximum number of slave stations connected in series on a single interface		16			
Data transmission medium		Ethernet/EtherCAT CAT5 S/FTP cable			
baud rate and corresponding scan cycle	baud rate	6MHz	3MHz	1MHz	115200Hz
	Typical data volume	1ms	1.5ms	3ms	22ms
	Maximum data volume	3.5ms	5.5ms	14.5ms	114ms
Transmission distance		≤50m (total distance from the coupler interface to the last I/O module of this branch, with a single interface supporting 16 modules)			
Maximum transmission distance between discrete I/O modules		30m			
Input/output process data volume	XBF-EC04	1020 Bytes[1]			
	XBF-EC04A	988 Bytes[1]			

Note [1]: The total length of uplink and downlink data does not exceed 1020Bytes/988Bytes.

3.1.3.2 Power parameters

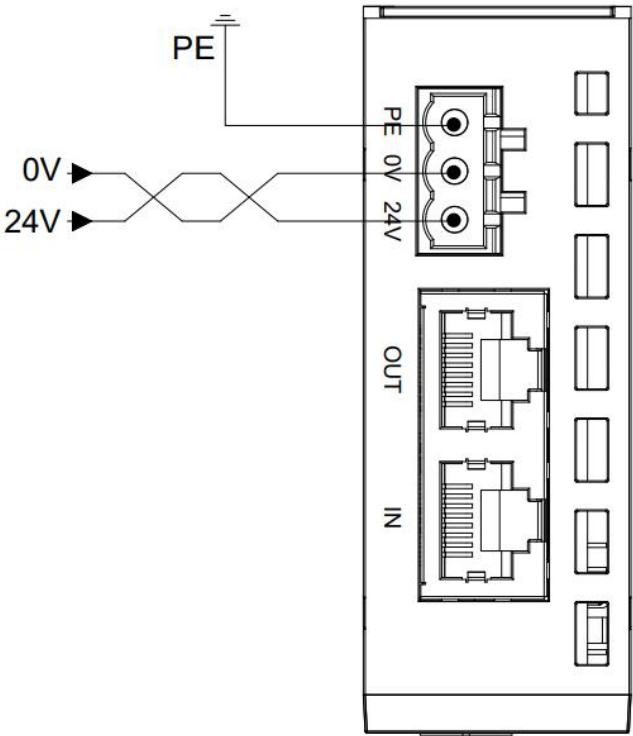
Power parameters	
Input voltage	SELV Input 24VDC (18V~36V)
Input current	<0.95A
Supply current	<500mA (maximum supply current for a single interface) <750mA (maximum supply current for all four interfaces)
Power supply voltage	20VDC~24VDC

3.1.3.3 General parameters

General technical parameters		
Specifications and dimensions		112.7×28×76mm
weight		140g
Usage Environment	Operating temperature	-20°C~+60°C
	Storage temperature	-40°C~+80°C
	relative humidity	95%, no condensation
	Altitude	≤2000m
	Vibration resistance	IEC 60068-2-6sinusoidal vibration 5Hz~8.4Hz,3.5mm,8.4Hz~150Hz,1g X/Y/ZTriaxial10One cycle/Axial (1)00min)
	Impact resistance	IEC 60068-2-27Mechanical shock 150m/s ² ,11ms, ±X/Y/ZSix directions 3Second-rate/Direction, Together18Second-rate
	Protection level	IP20
	Overvoltage category	I
	Pollution level	Level 2
Module error self-recovery		support
Disconnection check		support
Accessing PDO via SDO		support
diagnosis		support
Alarm		support
Firmware upgrade		support
Short circuit protection		Supports (automatic recovery mechanism)
Reverse connection protection		Supports (automatic recovery mechanism)
Reverse connection protection		support
Surge protection		support

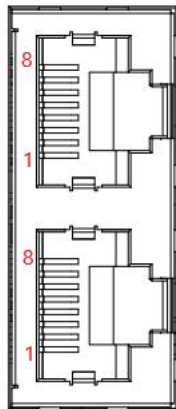
3.1.4 Power wiring diagram

Using a 24VDC power module, refer to the wiring method and connect the power supply according to the circuit shown in the diagram below, while ensuring that the PE is reliably grounded (twisted pair cable is recommended for the power supply).



3.1.5 Bus wiring

It uses a standard RJ45 network interface and a standard crystal connector. The pin assignments are shown in the table below.



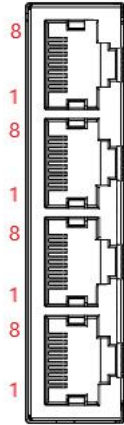
pin number	Signal
1	TD+
2	TD-
3	RD+
4	—
5	—
6	RD-
7	—
8	—

⚠ Precautions

- Category 5 or higher double-shielded (braided mesh + aluminum foil) STP cables are recommended for use as communication cables.
- The length of the cable between devices must not exceed 100m.

3.1.6 Expansion interface wiring

The expansion interface uses a standard RJ45 network interface and a standard crystal connector. The pin assignments are shown in the table below.



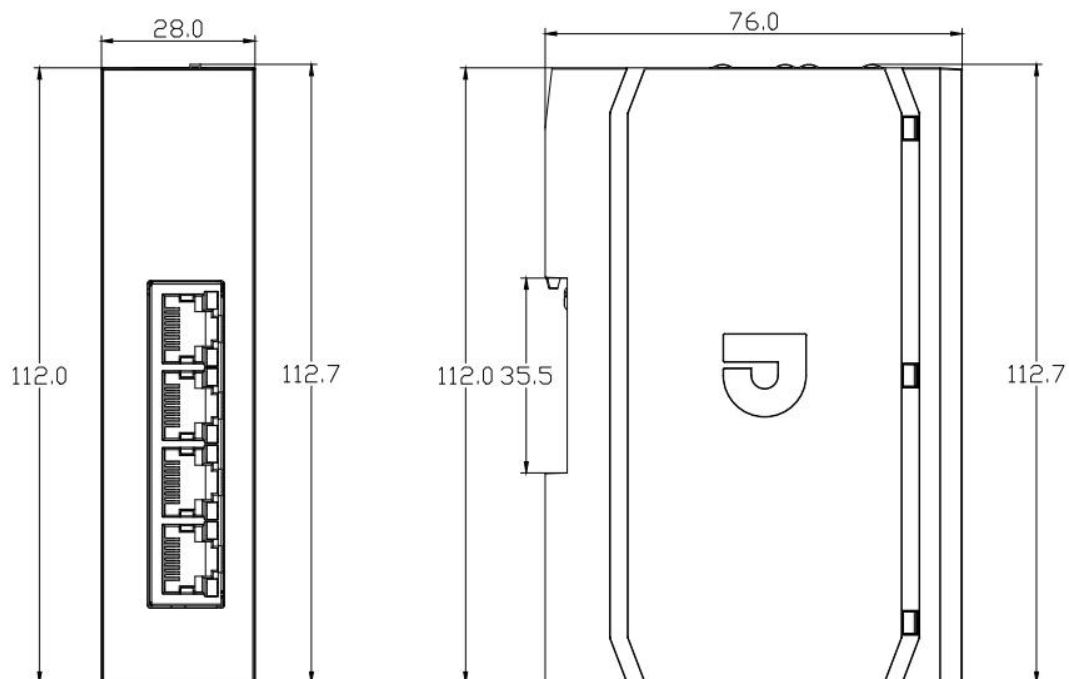
pin number	Signal
1	B
2	A
3	SGND
4	—
5	—
6	S24V
7	—
8	—

Precautions

- Category 5 or higher double-shielded (braided mesh + aluminum foil) STP cables are recommended for use as communication cables.
- The length of the cable between devices must not exceed 30m.
- Please do not connect to any device other than our product interface.

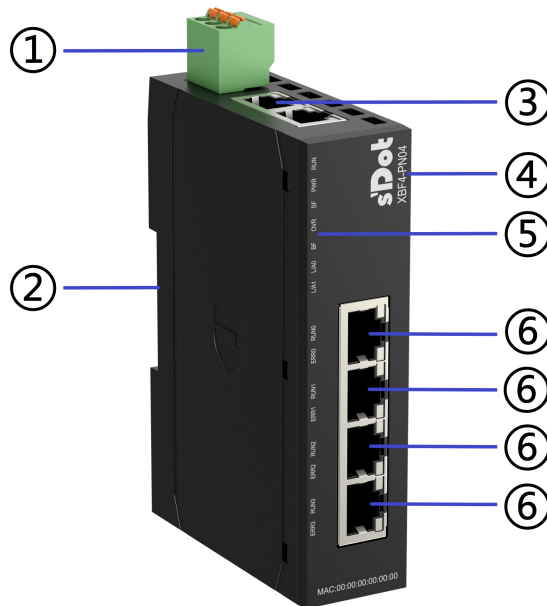
3.1.7 Outline Dimensions

Coupler dimensions (unit: mm)



3.2 PROFINET coupler

3.2.1 Panel structure



Serial number	Name	Illustrate
①	Power terminal	3P spring-loaded terminal block
②	Guide rail slot	Suitable for mounting on DIN 35 mm guide rails
③	Bus interface	2×RJ45, PROFINET bus interface
④	Module identifier	Marking module logo and model
⑤	Module indicator lights and indicator light labels	Indicator module power status and operating status
⑥	Extension module interface	4×RJ45, expansion interface

3.2.2 Indicator light function

PROFINET Coupler Indicator Definitions				
logo	name	color	state	Status Description
RUN	Operating status indicator	Green	ON	Equipment starts normally
			Flashing	Main controller startup failed
			OFF	The device cannot start.
PWR	Power indicator light	Green	ON	Coupler power supply is normal
			OFF	The module is not powered on or the power supply is abnormal.
SF	System error indicator	Red	ON	There is a PROFINET alarm message.
			OFF	No PROFINET alarm information
BF	Bus fault indicator light	Red	ON	No network connection
			Flashing	No PROFINET connection established with the controller
			OFF	Establish PROFINET connection with controller
OVR	Overload indicator light	Red	ON	The power supply load reaches 90% ($\pm 5\%$) or more.
			OFF	Power supply load is less than 90% ($\pm 5\%$)
L/A0	Network port IN status indicator	Green	ON	Establish network connection
			Flashing	Connection established and data exchanged
			OFF	No network connection established or abnormal
L/A1	Network port OUT status indicator	Green	ON	Establish network connection
			Flashing	Connection established and data exchanged
			OFF	No network connection established or abnormal
RUN0~3	Interface running status indicator	Green	ON	The interface and the extension module have business data interaction.
			flickering 1Hz	The interface establishes a connection with the extension module without exchanging business data.
			OFF	The interface and the expansion module failed to establish a connection or communication was abnormal.
ERR0~3	Interface fault indicator light	Red	ON	Interface communication initialization failed or communication anomalies occurred, such as module offline or station number conflict.
			OFF	Expansion module not connected, or communication is normal.

3.2.3 Product Parameters

3.2.3.1 Interface parameters

PROFINET interface parameters					
Bus Protocol		PROFINET			
Number of stations		It depends on the number of slave stations supported by the main station.			
Data transmission medium		Ethernet CAT5 cable			
Transmission rate		100Mbps			
Minimum loop time [1]		1ms			
Transmission distance		≤100m (distance between stations)			
Bus interface		2×RJ45			
Coupler extension interface parameters					
Extension module interface		4×RJ45			
Maximum number of coupler slave stations connected in series		32			
Maximum number of slave stations connected in series on a single interface		16			
Data transmission medium		Ethernet CAT5 cable			
baud rate and corresponding scan cycle	baud rate	6MHz	3MHz	1MHz	115200Hz
	Typical data volume	1ms	1.5ms	3ms	22ms
	Maximum data volume	3.5ms	5.5ms	14.5ms	114ms
Transmission distance		≤50m (total distance from the coupler interface to the last I/O module of this branch, with a single interface supporting 16 modules)			
Maximum transmission distance between discrete I/O modules		30m			
Input/output process data volume		1024 Bytes[2]			

Note [1]: Cycle time (scan cycle) between PLC and coupler.

Note [2]: The total length of uplink and downlink data does not exceed 1024 bytes.

3.2.3.2 Power parameters

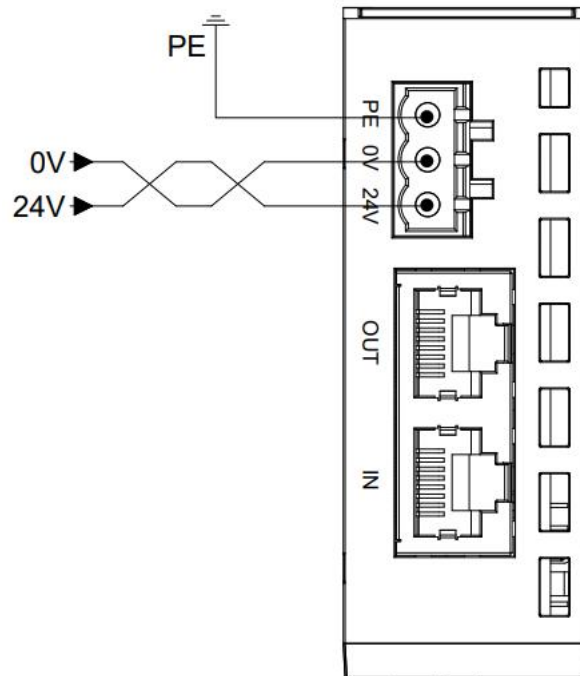
Power parameters	
Input voltage	SELV Input 24VDC (18V~36V)
Input current	<0.95A
Supply current	<500mA (maximum supply current for a single interface) <750mA (maximum supply current for all four interfaces)
Power supply voltage	20VDC~24VDC

3.2.3.3 General parameters

General technical parameters		
Specifications and dimensions		112.7×28×76mm
weight		140g
Usage Environment	Operating temperature	-20°C~+60°C
	Storage temperature	-40°C~+80°C
	relative humidity	95%, no condensation
	Altitude	≤2000m
	Vibration resistance	IEC 60068-2-6sinusoidal vibration 5Hz~8.4Hz,3.5mm,8.4Hz~150Hz,1g X/Y/ZTriaxial10One cycle/Axial (1)00min)
	Impact resistance	IEC 60068-2-27Mechanical shock 150m/s ² ,11ms, ±X/Y/ZSix directions 3Second-rate/Direction, Together18Second-rate
	Protection level	IP20
	Overvoltage category	I
	Pollution level	Level 2
PROFINET IO RT		support
Abnormal self-recovery		support
Hardware testing		support
diagnosis		support
Alarm		support
Firmware upgrade		support
Short circuit protection		Supports (automatic recovery mechanism)
Reverse connection protection		Supports (automatic recovery mechanism)
Surge protection		support

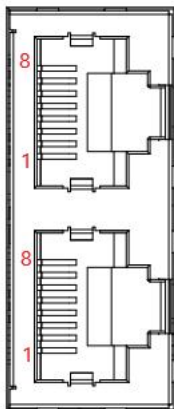
3.2.4 Power wiring diagram

Using a 24VDC power module, refer to the wiring method and connect the power supply according to the circuit shown in the diagram below, while ensuring that the PE is reliably grounded (twisted pair cable is recommended for the power supply).



3.2.5 Bus wiring

It uses a standard RJ45 network interface and a standard crystal connector. The pin assignments are shown in the table below.



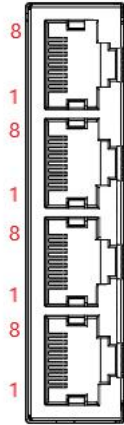
pin number	Signal
1	TD+
2	TD-
3	RD+
4	—
5	—
6	RD-
7	—
8	—

Precautions

- Category 5 or higher double-shielded (braided mesh + aluminum foil) STP cables are recommended for use as communication cables.
- The length of the cable between devices must not exceed 100m.

3.2.6 Expansion interface wiring

The expansion interface uses a standard RJ45 network interface and a standard crystal connector. The pin assignments are shown in the table below.



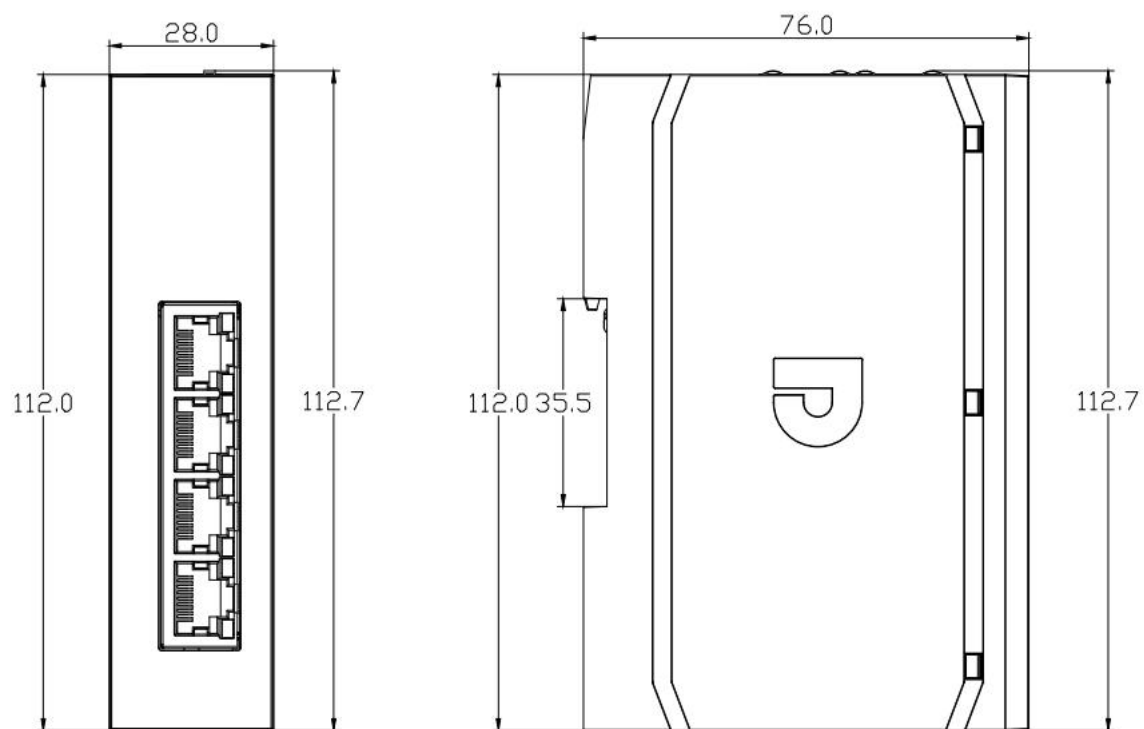
pin number	Signal
1	B
2	A
3	SGND
4	—
5	—
6	S24V
7	—
8	—

Precautions

- Category 5 or higher double-shielded (braided mesh + aluminum foil) STP cables are recommended for use as communication cables.
- The length of the cable between devices must not exceed 30m.
- Please do not connect to any device other than our product interface.

3.2.7 Outline Dimensions

Coupler dimensions (unit: mm)



3.3 Digital I/O modules

3.3.1 Panel structure

3.3.1.1 XBF2C series structure



serial number	name	illustrate
①	Module indicator lights and indicator light labels	Indicator module power status and operating status
②	Rotary DIP switch	Set station number
③	Extension Interface	2×RJ45
④	Channel indicator lights and signs	Indicate channel status
⑤	Input/output channels	Terminal blocks
⑥	Power terminal	3P spring-loaded terminal block
⑦	DIP switch	Input type for switching channels: NPN/PNP
⑧	Buckle	Used to fix the module to the guide rail.

3.3.1.2 XBF2C series includes dust cover I/O structure



3.3.1.3 XBF2E series structure



serial number	name	illustrate
①	Module indicator lights and indicator light labels	Indicator module power status and operating status
②	Channel indicator lights and signs	Indicate channel status
③	Rotary DIP switch	Set station number
④	Extension Interface	2×RJ45
⑤	DIP switch	Input type for switching channels: NPN/PNP
⑥	Power terminal	3P spring-loaded terminal block
⑦	Input/output channels	Terminal blocks
⑧	Buckle	Used to fix the module to the guide rail.

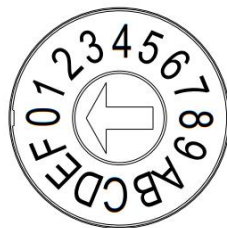
3.3.2 Indicator light function

Digital I/O module indicator light definitions				
logo	name	color	state	Status Description
PWR	Power indicator light	Green	ON	The module's internal 3.3V power supply is powered on normally.
			OFF	The module's internal 3.3V power supply is malfunctioning.
ERR	Fault indicator light	Red	ON	Module communication with the main station is abnormal.
			10Hz flicker	The online module upgrade has completed and is restarting.
			OFF	The module communicates normally with the main station.
Pn (n: 0~3)	Interface operation indicator light	Green	ON	In business data interaction, this simultaneously indicates that the module is connected to the nth interface of the coupler.
			flickering 1Hz	Initialization successful, no business data interaction.
			10Hz flicker	Firmware upgrade phase
			OFF	The module and coupler did not establish communication.
00~15	Input channel indicator	Green	ON	The module channel has a signal input.
			OFF	The module channel has no signal input or the signal input is abnormal.
00~15	Output channel indicator	Green	ON	The module channel has signal output.
			OFF	The module channel has no signal output or the signal output is abnormal.

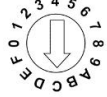
3.3.3 Rotary DIP switch

Rotary DIP switch instructions

When an I/O module combination acts as a slave in a configuration application, its station number in the network must first be set. The station number is set using a rotary DIP switch, with a range of 0 to F. A single coupler interface can occupy a maximum of 16 station numbers (station numbers cannot be repeated), therefore each coupler interface can connect a maximum of 16 modules serially. The DIP switches and their meanings are shown in the following diagram:



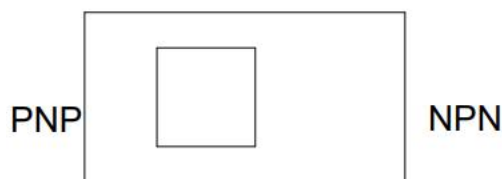
Station number rotary dial setting diagram

DIP switch settings	Setting value	Station number value
	0	0
	1	1
⋮	⋮	⋮
	B	B(11)
	C	C(12)
	D	D (13)
	E	E(14)
	F	F(15)

- Remark:**
- 1、 Please select a flat-top rotary dial switch with a 2mm opening.
 - 2、 If the station number needs to be changed during communication, after the new station number is set, the entire I/O module group must be deleted and the power is turned on

- again. The module must then be added and configured again for the new settings to take effect.**
- 3、 If the station number is set to be duplicated, the module will encounter communication errors or be unable to connect to the main station.**

3.3.4 PNP/NPN DIP switch



The PNP/NPN DIP switch is used to switch the input type of the module's digital input channel, enabling PNP/NPN compatibility.

3.3.5 Technical parameters

3.3.5.1 Digital input module parameters

Digital input		
Product Model	XBF2C-1600-F	XBF2E-1600
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤7mA	≤9mA
Input rated voltage	24VDC (20.4V~28.8V)	
Typical input current	5mA/ch (24VDC)	
Number of input signal points	16	
Input signal type	NPN/PNP compatible	
Input signal form	direct voltage input form Sink input: NPN open-collector input form Source type input: PNP open collector input form	
OFF voltage/OFF current	-3V to +5V / less than 0.9mA	
ON voltage/ON current	11V~30V/2.1mA or more	
reaction time	<50us	
Input filtering	No filtering, 0.1ms, 0.2ms, 0.5ms, 1ms, 2ms, 3ms (factory setting), 4ms...18ms, 19ms, 20ms	
Maximum input frequency	120Hz (Filtering time: 3ms)	
Input impedance	5.4KΩ	
Isolation methods	Optical isolation	
Isolation and withstand voltage	500VAC	
Rated current consumption	7mA	9mA
Power consumption	0.168W	0.216W
Numeric input type	Type1/Type3	
Channel indicator lights	Green LED lights	

3.3.5.2 Digital Input/Output Module Parameters

Digital input		
Product Model	XBF2C-0808A-F	XBF2C-0808B-F
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤6mA	≤7mA
Input rated voltage	24VDC (20.4V~28.8V)	
Typical input current	5mA/ch (24VDC)	
Number of input signal points	8	8
Input signal type	NPN/PNP compatible	
Input signal form	direct voltage input form Sink input: NPN open-collector input form Source type input: PNP open collector input form	
OFF voltage/OFF current	-3V to +5V / less than 0.9mA	
ON voltage/ON current	11V~30V/2.1mA or more	
reaction time	<50us	
Input filtering	No filtering, 0.1ms, 0.2ms, 0.5ms, 1ms, 2ms, 3ms (factory setting), 4ms...18ms, 19ms, 20ms	
Maximum input frequency	150Hz (Filtering time: 3ms)	
Input impedance	5.4KΩ	
Isolation methods	Optical isolation	
Isolation and withstand voltage	500VAC	
Rated current consumption	6mA	7mA
Power consumption	0.144W	0.168W
Numeric input type	Type1/Type3	
Channel indicator lights	Green LED lights	
Digital output		
Number of output signal points	8	8
Output signal type	NPN	PNP
Field-side input voltage range	24VDC (20.4V~28.8V)	
Output voltage drop	<1V	
Output load type	Resistive load, inductive load, lamp load	
Single-channel rated current	Max: 0.5A (see details) Figure 1)	
Leakage current	<10uA	
reaction time	<150us	
Output channel protection	Short circuit protection (automatic recovery mechanism)	
Module protection	Reverse connection protection (automatic recovery mechanism), field-side surge protection	
Isolation methods	Optical isolation	
Isolation and withstand voltage	500VAC	
Channel indicator lights	Green LED lights	

Digital input		
Product Model	XBF2E-0808A	XBF2E-0808B
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤10mA	≤10mA
Input rated voltage	24VDC (20.4V~28.8V)	
Typical input current	5mA/ch (24VDC)	
Number of input signal points	8	8
Input signal type	NPN/PNP compatible	
Input signal form	direct voltage input form Sink input: NPN open-collector input form Source type input: PNP open collector input form	
OFF voltage/OFF current	-3V to +5V / below 0.9mA	
ON voltage/ON current	11V~30V/2.1mA or more	
reaction time	<50us	
Input filtering	No filtering, 0.1ms, 0.2ms, 0.5ms, 1ms, 2ms, 3ms (factory setting), 4ms...18ms, 19ms, 20ms	
Maximum input frequency	150Hz (Filtering time: 3ms)	
Input impedance	5.4KΩ	
Isolation methods	Optical isolation	
Isolation and withstand voltage	500VAC	
Rated current consumption	10mA	10mA
Power consumption	0.24W	0.24W
Numeric input type	Type1/Type3	
Channel indicator lights	Green LED lights	
Digital output		
Number of output signal points	8	8
Output signal type	NPN	PNP
Field-side input voltage range	24VDC (20.4V~28.8V)	
Output voltage drop	<1V	
Output load type	Resistive load, inductive load, lamp load	
Single-channel rated current	Max: 0.5A (see details) Figure 1)	
Leakage current	<10uA	
reaction time	<150us	
Output channel protection	Short circuit protection (automatic recovery mechanism)	
Module protection	Reverse connection protection (automatic recovery mechanism), field-side surge protection	
Isolation methods	Optical isolation	
Isolation and withstand voltage	500VAC	
Channel indicator lights	Green LED lights	

3.3.5.3 Digital output module parameters

Digital output		
Product Model	XBF2C-0016A-F	XBF2C-0016B-F
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤6mA	≤10mA
Field-side input voltage range	24VDC (20.4V~28.8V)	
Number of output signal points	16	16
Output signal type	NPN	PNP
Output voltage drop	<1V	
Output load type	Resistive load, inductive load, lamp load	
Single-channel rated current	Max: 0.5A (see details) Figure 1	
Leakage current	<10uA	
reaction time	<150us	
Output channel protection	Short circuit protection (automatic recovery mechanism)	
Module protection	Reverse connection protection (automatic recovery mechanism), field-side surge protection	
Isolation methods	Optical isolation	
Isolation and withstand voltage	500VAC	
Rated current consumption	6mA	10mA
Power consumption	0.144W	0.24W
Channel indicator lights	Green LED lights	

Digital output		
Product Model	XBF2E-0016A	XBF2E-0016B
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤9mA	≤11mA
Field-side input voltage range	24VDC (20.4V~28.8V)	
Number of output signal points	16	16
Output signal type	NPN	PNP
Output voltage drop	<1V	
Output load type	Resistive load, inductive load, lamp load	
Single-channel rated current	Max: 0.5A (see details) Figure 1	
Leakage current	<10uA	
reaction time	<150us	
Output channel protection	Short circuit protection (automatic recovery mechanism)	
Module protection	Reverse connection protection (automatic recovery mechanism), field-side surge protection	
Isolation methods	Optical isolation	
Isolation and withstand voltage	500VAC	
Rated current consumption	9mA	11mA
Power consumption	0.216W	0.264W
Channel indicator lights	Green LED lights	

3.3.5.4 Relay output module parameters

Relay output			
Product Model	XBF2D-J04C1-R03	XBF2D-J12C4-P01	XBF2D-J16C4-P01
Input power supply rated voltage	24VDC (20V~24V)		
Input power supply rated current	≤10mA	≤7mA	≤22mA
Field-side input voltage range	24VDC (20.4V~28.8V)		
Number of output signal points	4	12	16
Output format	Relay		
Output load type	Resistive load, inductive load, lamp load		
Single channel rated voltage	24VDC		
Single-channel rated current	Max: 2A (see details) Figure 2)		
Hardware output response time	10ms/10ms		
Module protection	Field-side reverse connection protection (automatic recovery mechanism), field-side surge protection		
Isolation methods	Optical isolation + relay isolation		
Isolation and withstand voltage	1500VAC		
Rated current consumption	10mA	7mA	22mA
Power consumption	0.24W	0.168W	0.52W
Mechanical life	Minimum 20 million operations (18,000 operations/hour)		
Electrical life	Minimum 100,000 operations (2A, 24VDC, inductive load)		
Channel indicator lights	Green LED lights		

3.3.5.5 General technical parameters

General technical parameters	
Specifications and dimensions	XBF2C: 98 × 90.5 × 44.5mm (excluding dust cover)
	XBF2C: 98 × 90.5 × 75.1mm (including dust cover)
	XBF2D-J04C1-R03/XBF2D-J12C4-P01: 118 × 90.5 × 43.1mm
	XBF2D-J16C4-P01: 145 × 90.5 × 43.1mm
	XBF2E: 130 × 63.5 × 36.1mm
weight	XBF2C: 155g (excluding dust cover)
	XBF2C: 200g (including dust cover)
	XBF2D-J04C1-R03/XBF2D-J12C4-P01: 205g
	XBF2D-J16C4-P01: 245g
	XBF2E: 170g
Operating temperature	-20°C~+60°C
Storage temperature	-40°C~+80°C
relative humidity	95%, no condensation
Altitude	≤2000m
Pollution level	Level 2
Protection level	IP20
Safety certification	UL certification, CE certification
Green certification	RoHS certification, REACH certification

Figure 1:

Graph showing the relationship between maximum rated current per DO channel and temperature.

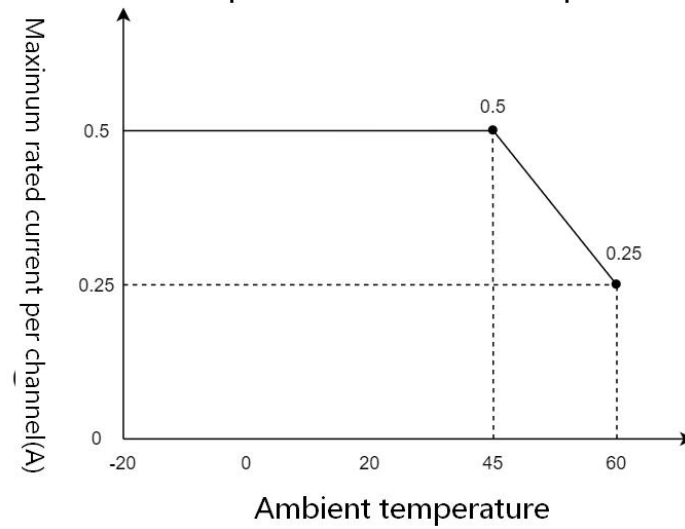
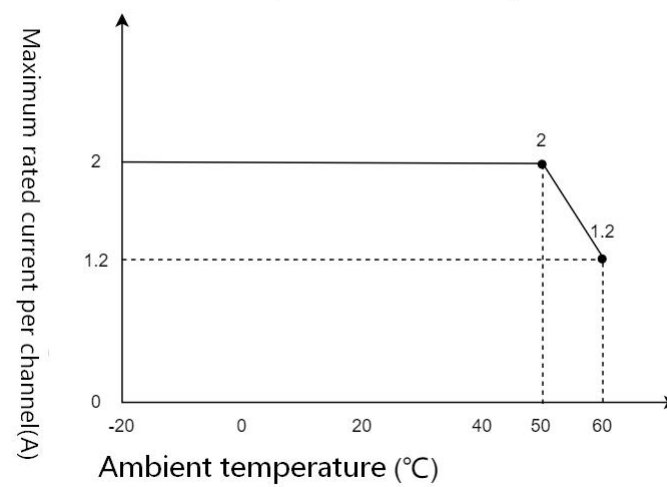


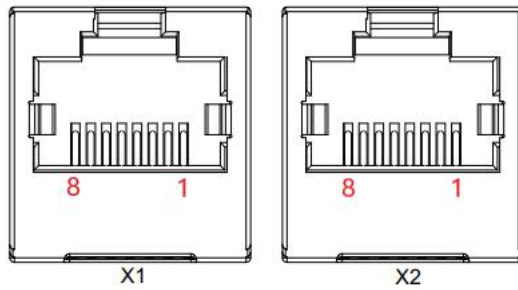
Figure 2:

Graph showing the relationship between temperature and the maximum rated current per channel for the relay output module.



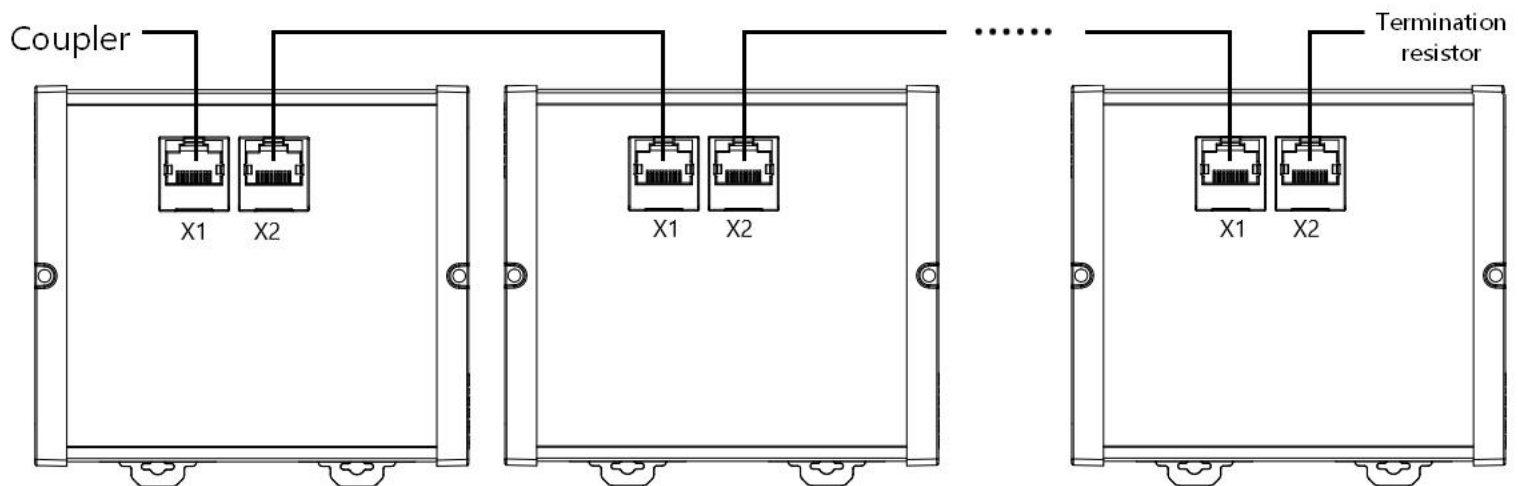
3.3.6 Discrete I/O expansion interface wiring

The discrete I/O expansion interface uses a standard RJ45 network interface and a standard crystal connector. The pin assignments are shown in the table below.



pin number	Signal
1	B
2	A
3	SGND
4	—
5	—
6	S24V
7	—
8	—

The discrete I/O expansion interface provides two interfaces, one input and one output, which facilitates the connection of multiple discrete I/O modules in series. A terminating resistor needs to be inserted into the unused discrete I/O interface of the last discrete I/O module. The wiring method of the discrete I/O expansion interface is shown in the figure below.

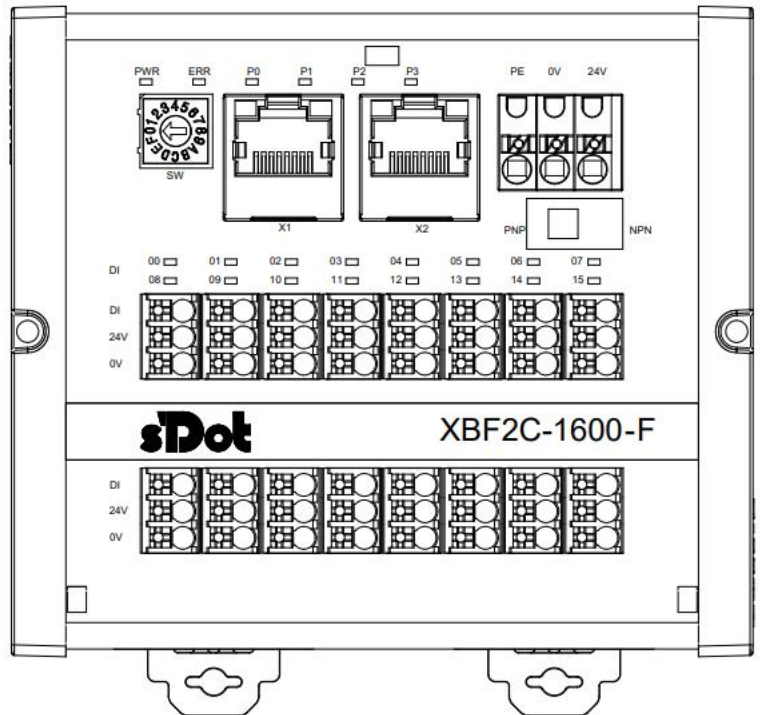
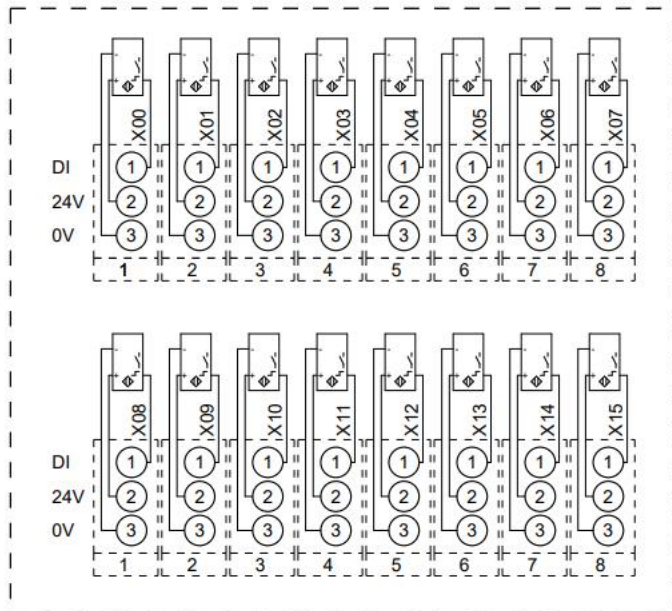


Precautions

- Category 5 or higher double-shielded (braided mesh + aluminum foil) STP cables are recommended for use as communication cables.
- The length of the cable between devices must not exceed 30m.
- Do not connect to any device other than our product's discrete I/O interface.

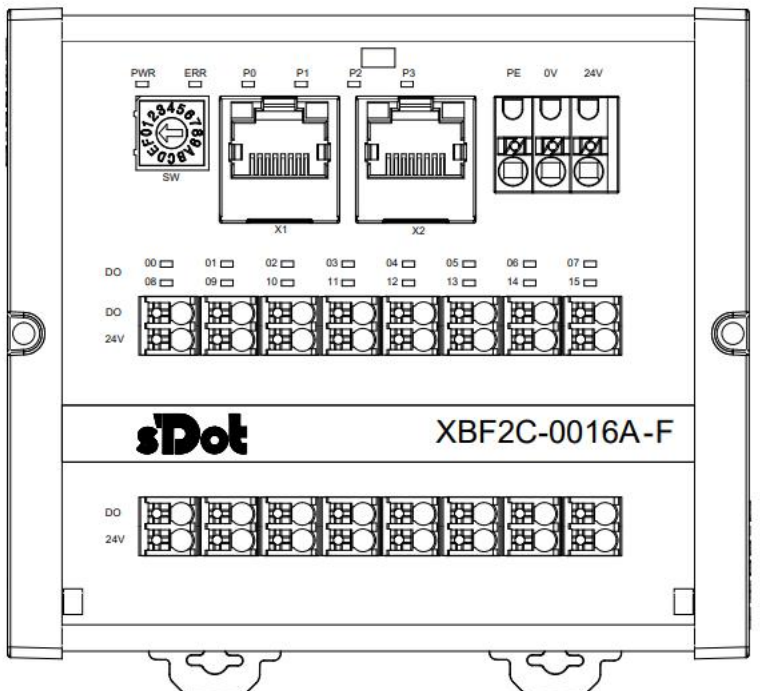
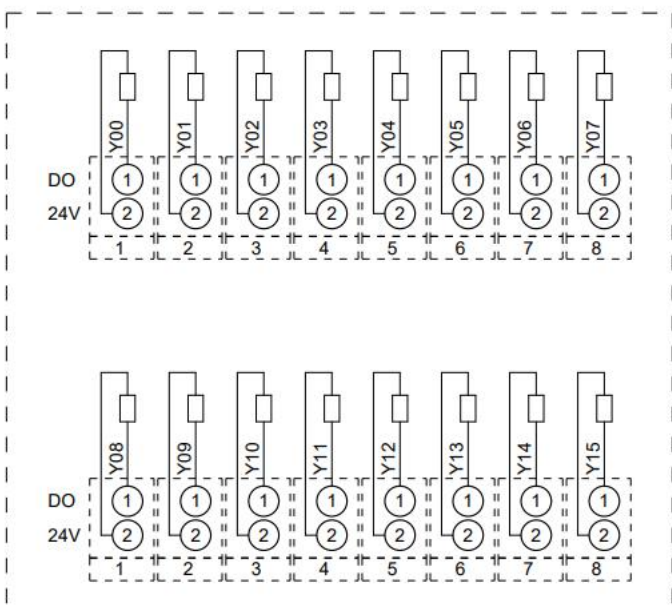
3.3.7 I/O Wiring Diagram

3.3.7.1 XBF2C-1600-F



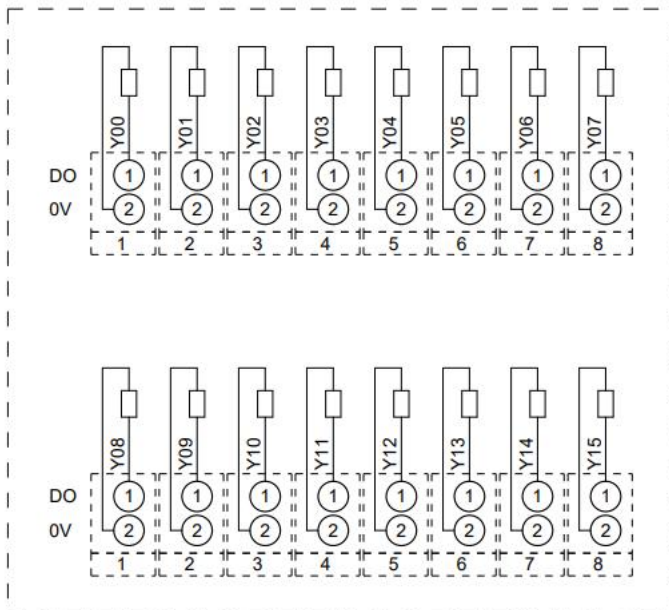
*24V internal conduction; 0V internal conduction

3.3.7.2 XBF2C-0016A-F

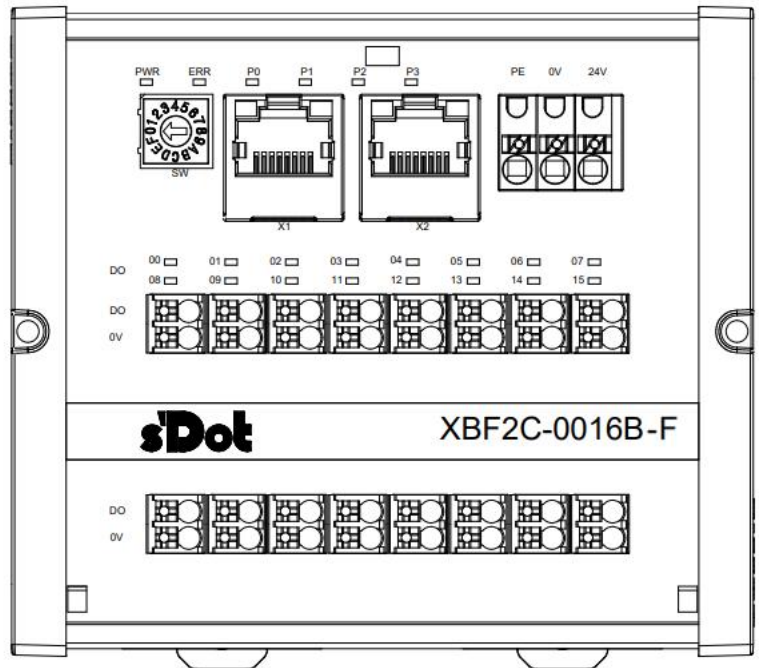


*24V internal conduction

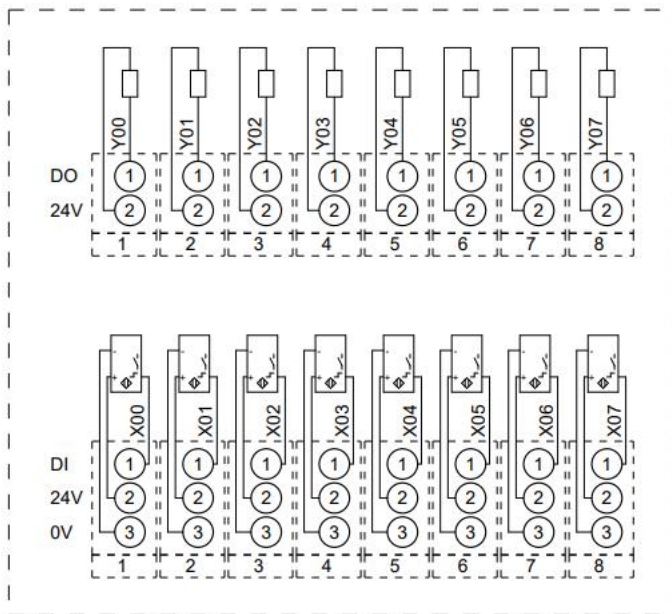
3.3.7.3 XBF2C-0016B-F



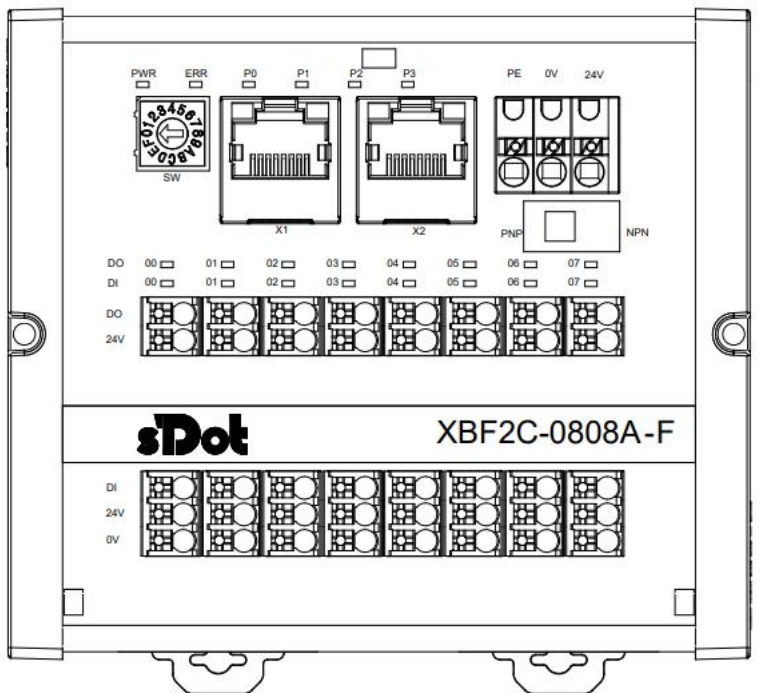
*0V Internal conduction



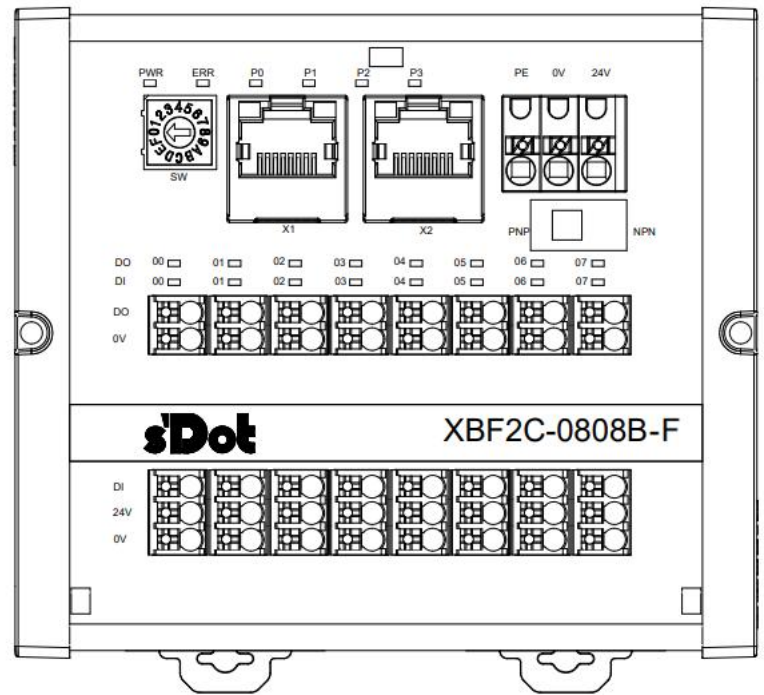
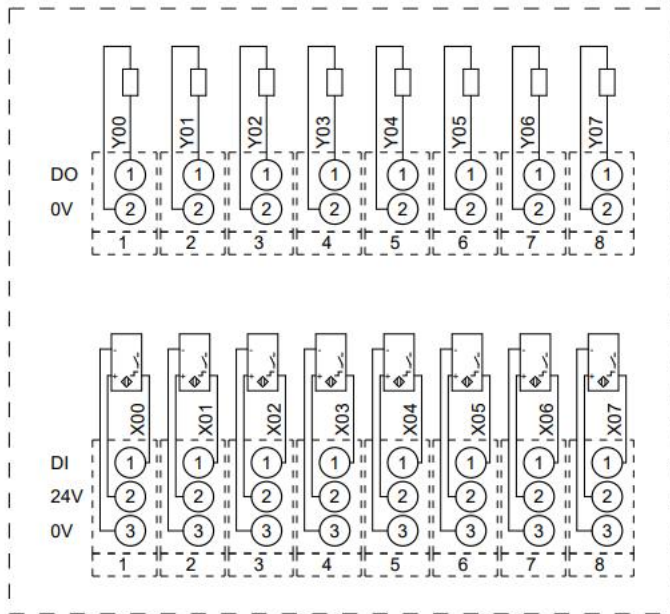
3.3.7.4 XBF2C-0808A-F



*24V internal conduction; 0V internal conduction

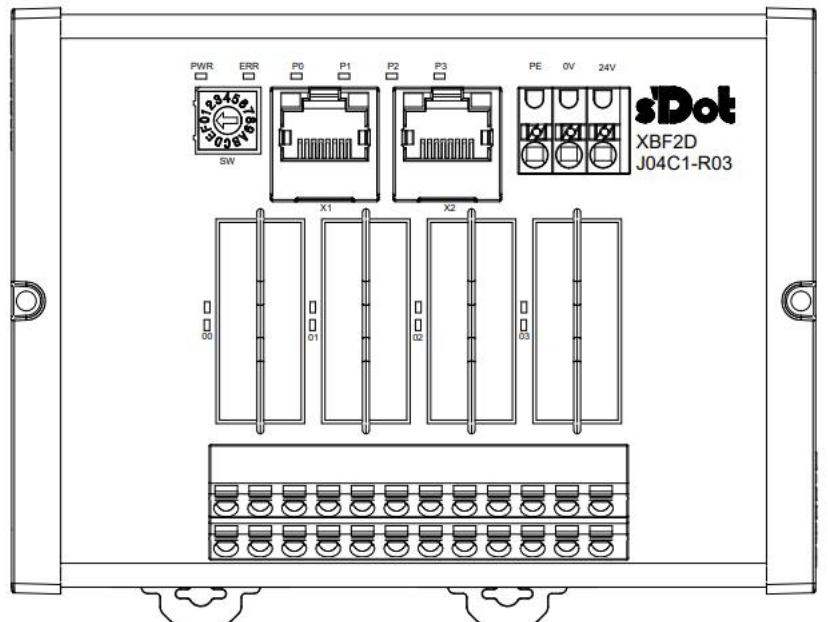
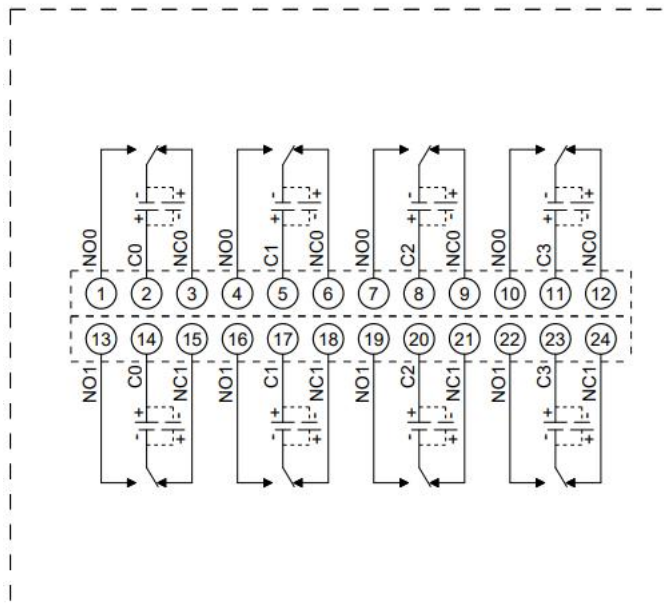


3.3.7.5 XBF2C-0808B-F



*24V internal conduction; 0V internal conduction

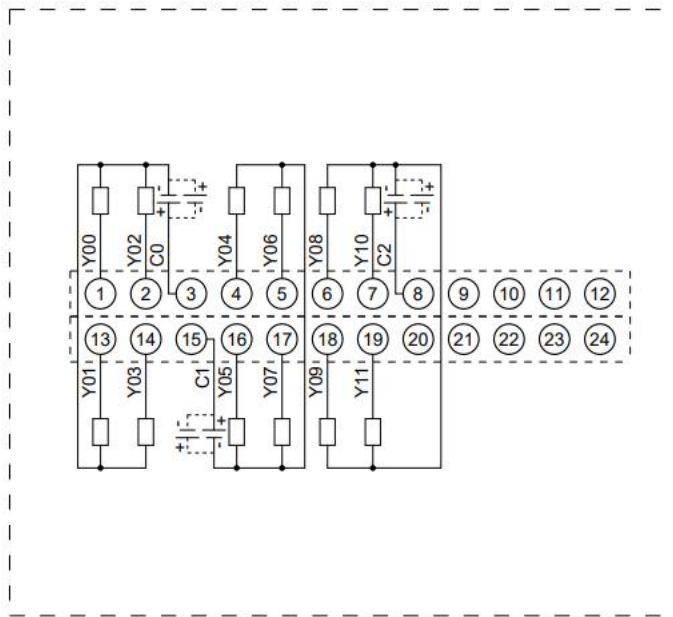
3.3.7.6 XBF2D-J04C1-R03



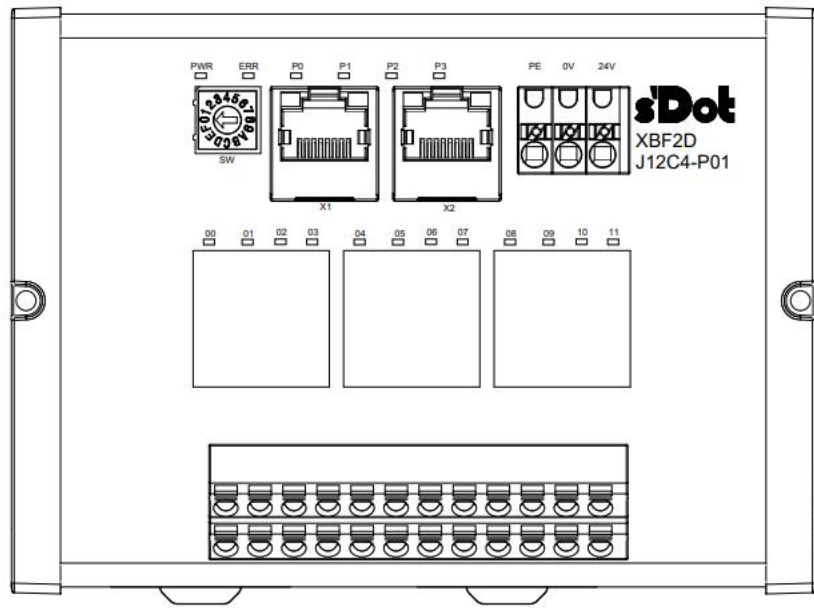
*C0~C3 are internally conductive;

*C0~C3 are not electrically connected to each other.

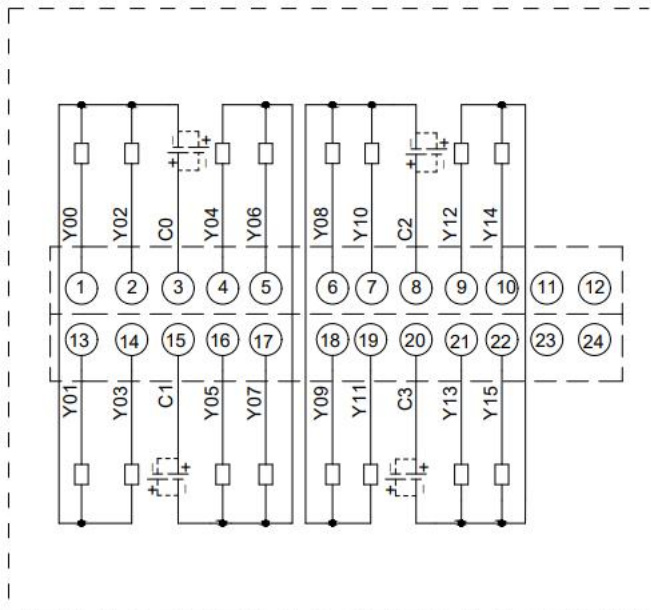
3.3.7.7 XBF2D-J12C4-P01



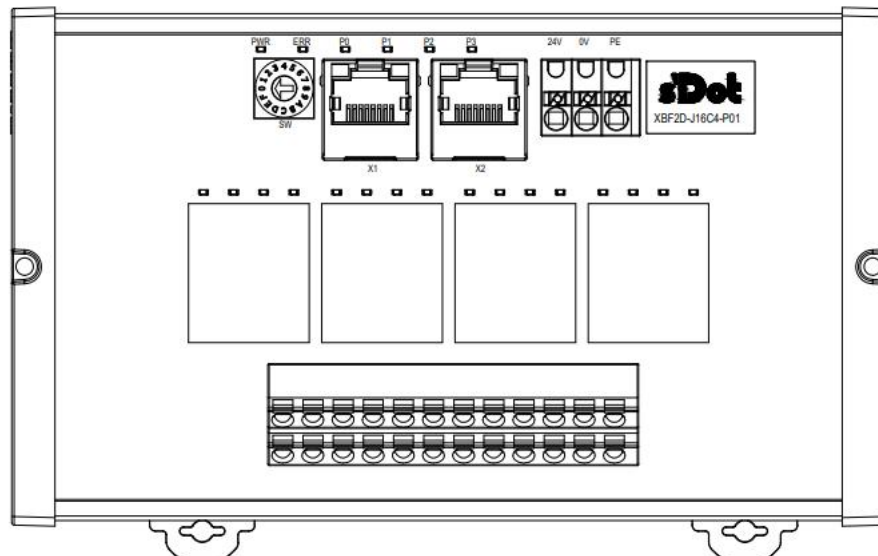
There is no conductivity between C0 and C2.



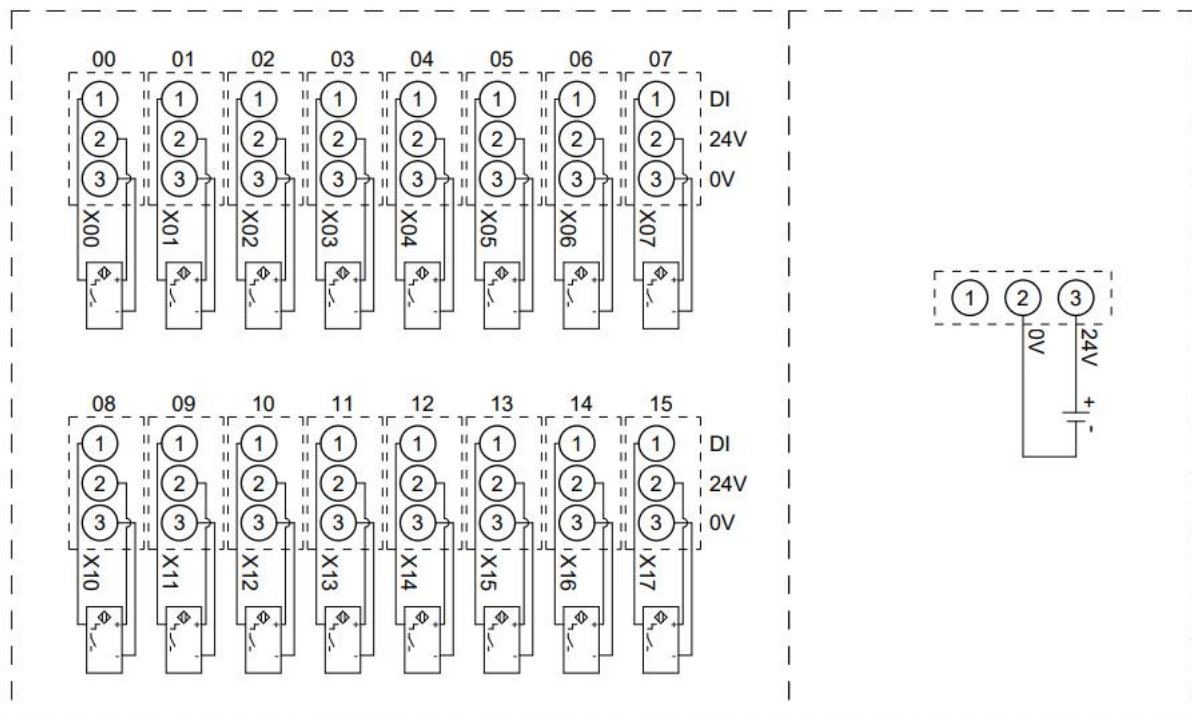
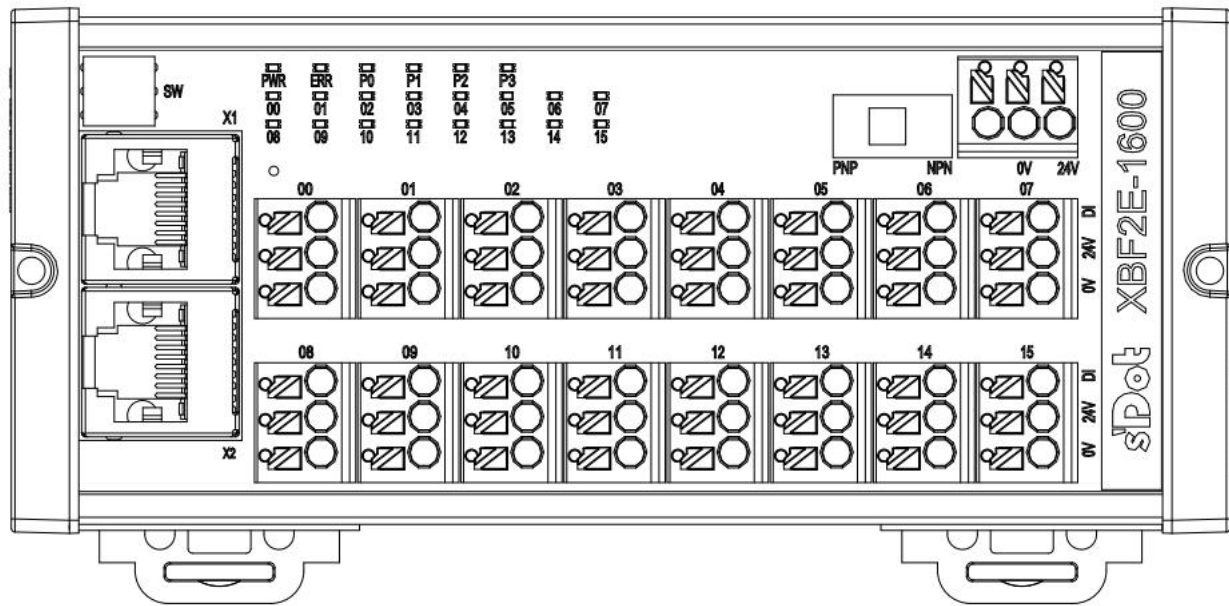
3.3.7.8 XBF2D-J16C4-P01



There is no conductivity between C0 and C3.

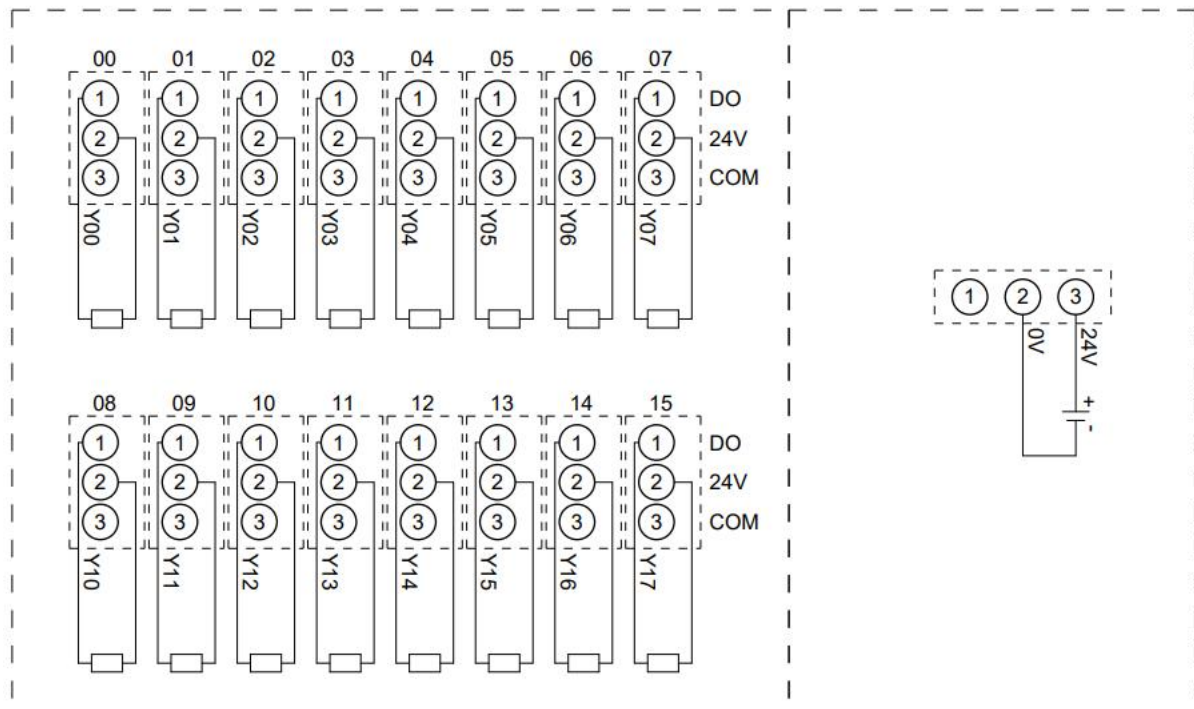
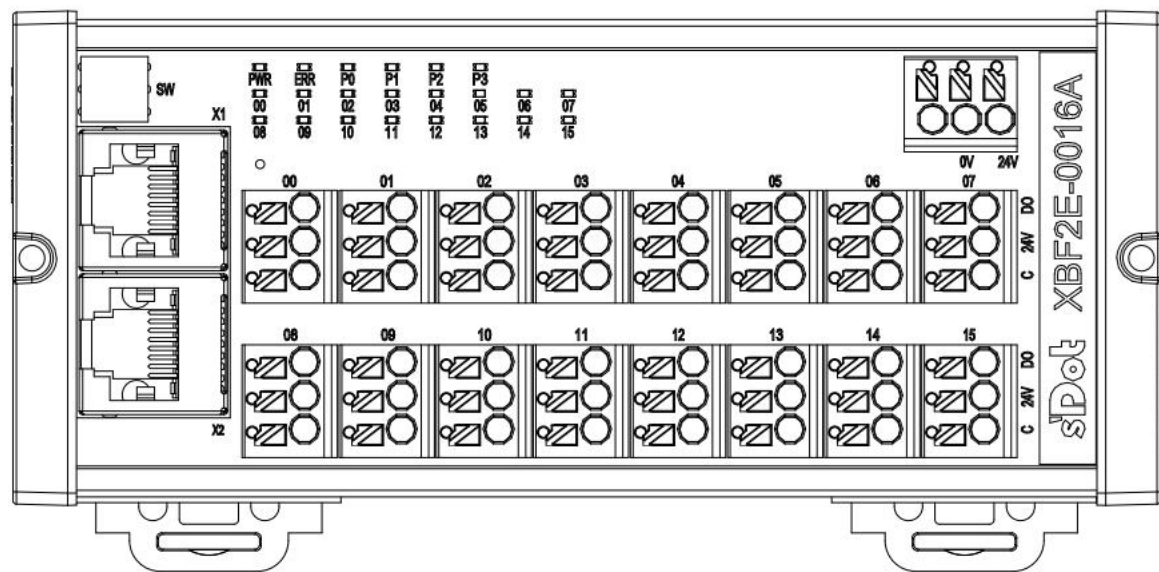


3.3.7.9 XBF2E-1600



*24V internal conduction; 0V internal conduction

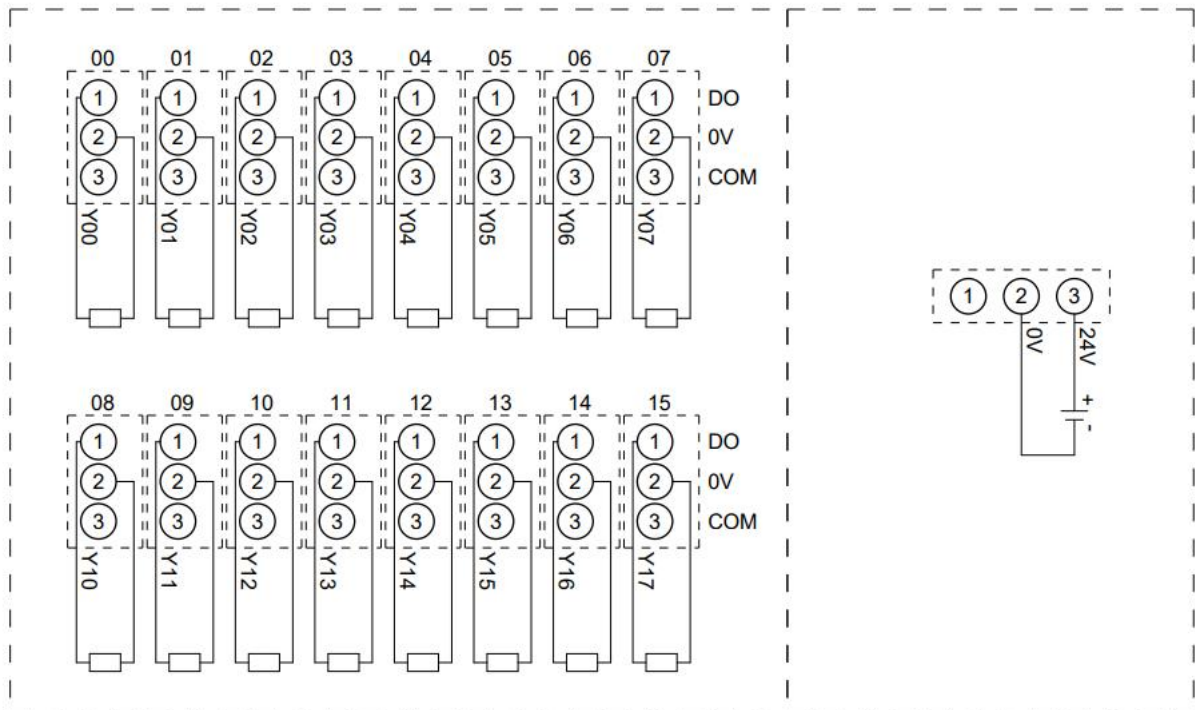
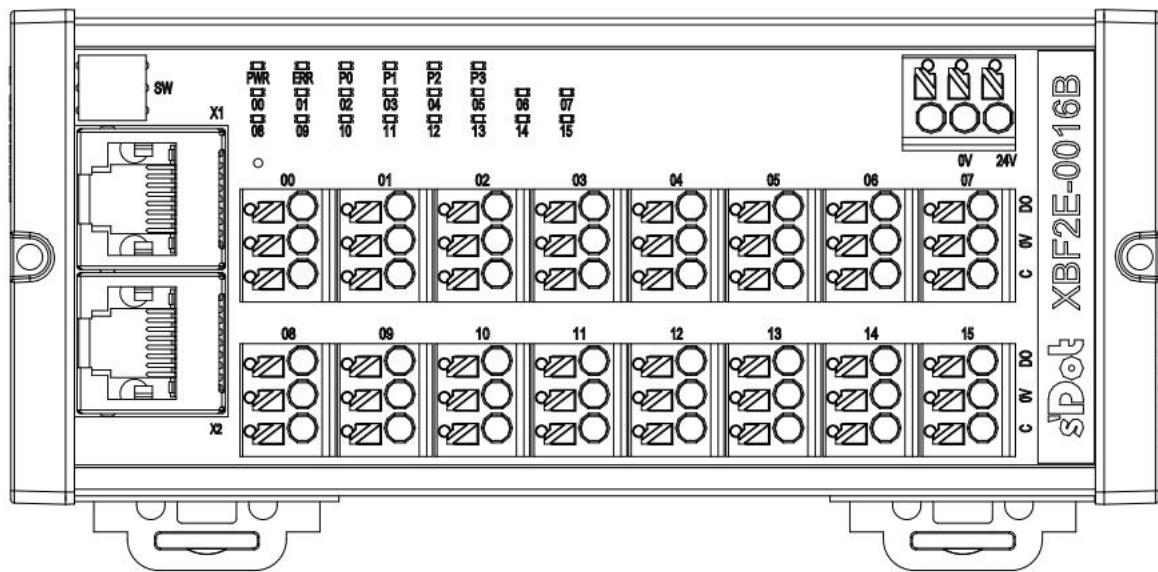
3.3.7.10 XBF2E-0016A



*24V internal conduction;

*The two rows of COM ports are internally connected, but not connected between the upper and lower rows.

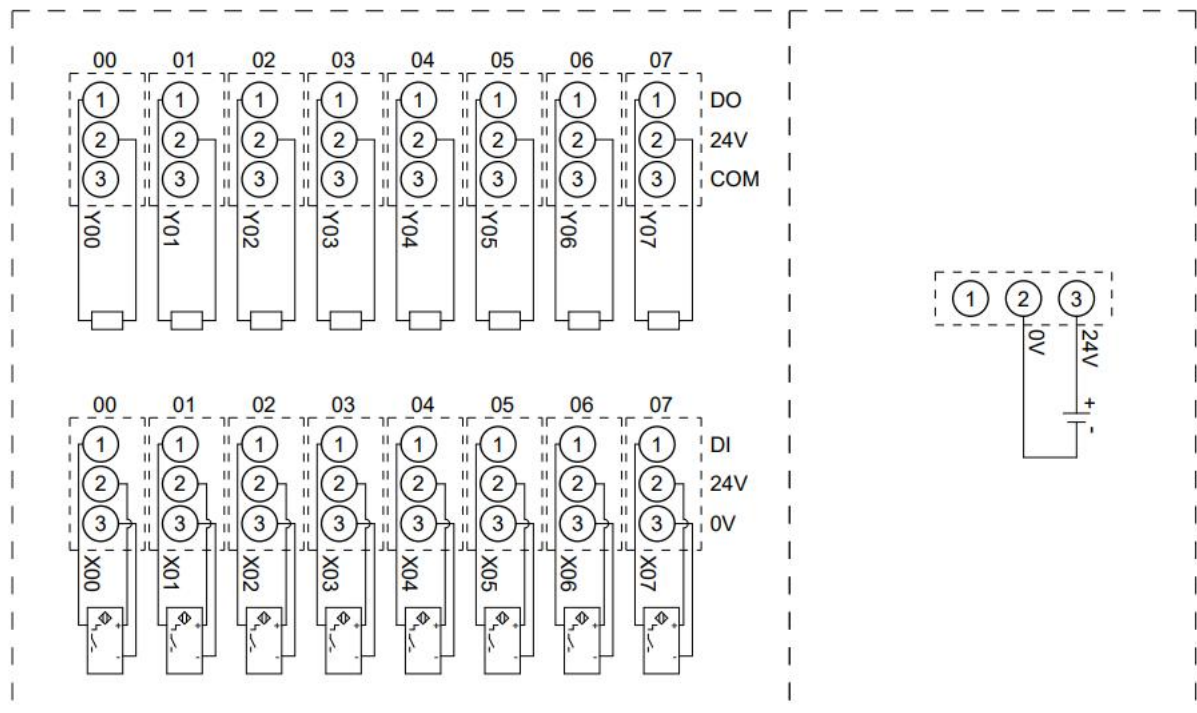
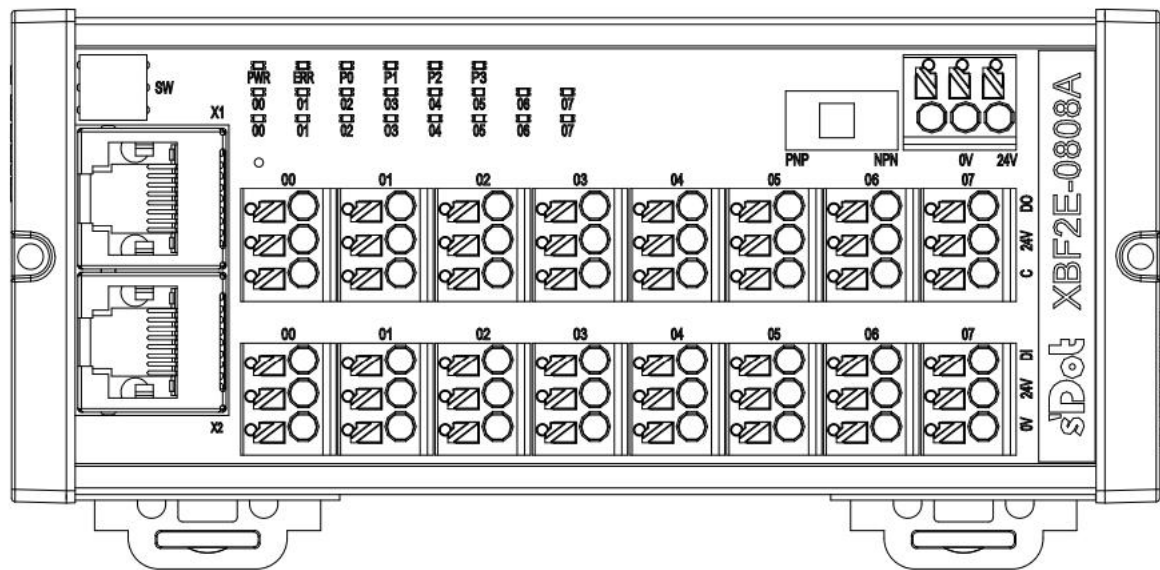
3.3.7.11 XBF2E-0016B



*0V internal conduction;

*The two rows of COM ports are internally connected, but not connected between the upper and lower rows.

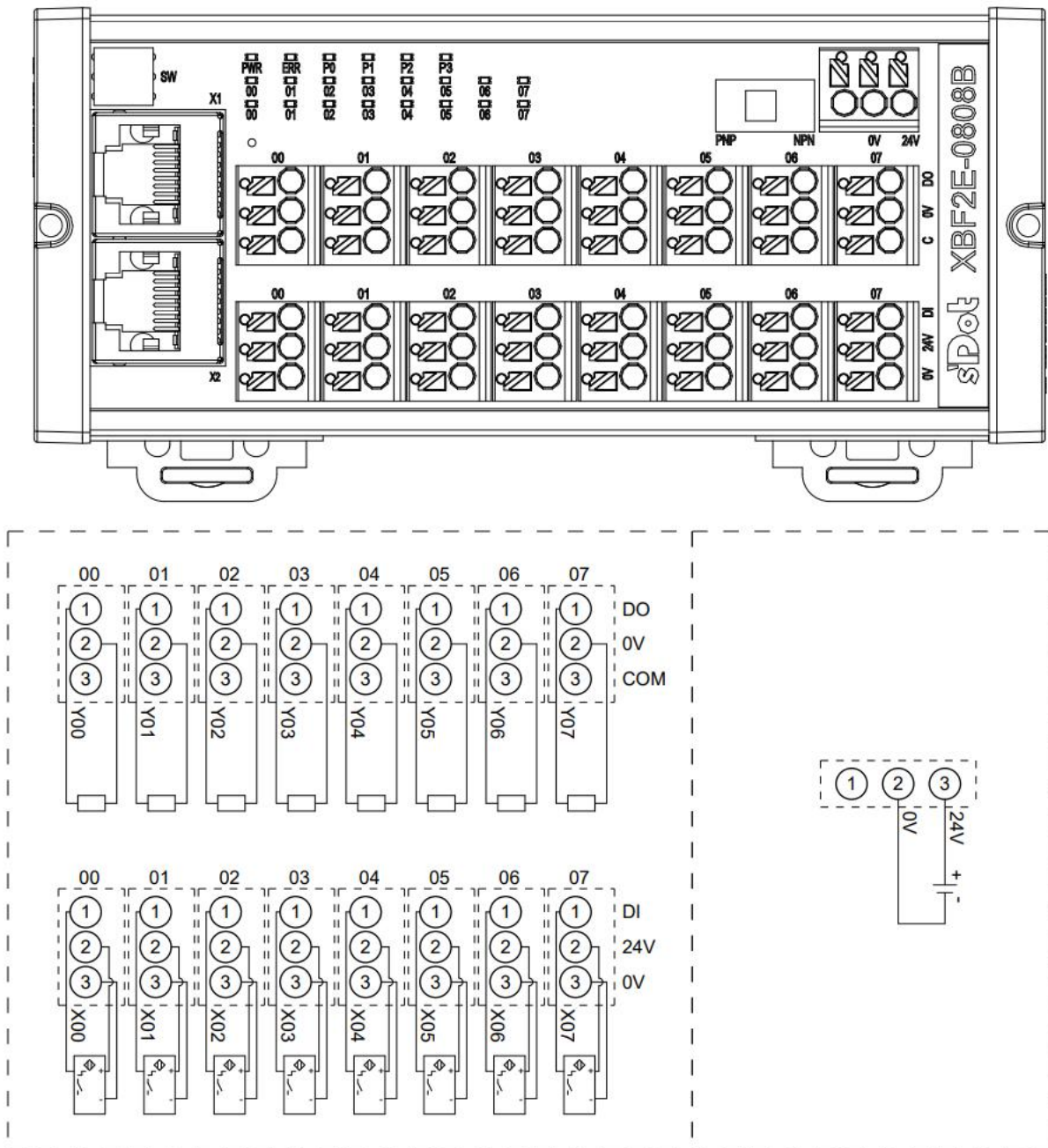
3.3.7.12 XBF2E-0808A



*24V internal conduction; 0V internal conduction

*COM internal conduction

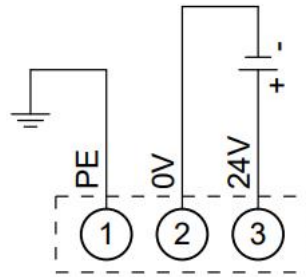
3.3.7.13 XBF2E-0808B



*24V internal conduction; 0V internal conduction

*COM internal conduction

3.3.8 Power wiring diagram

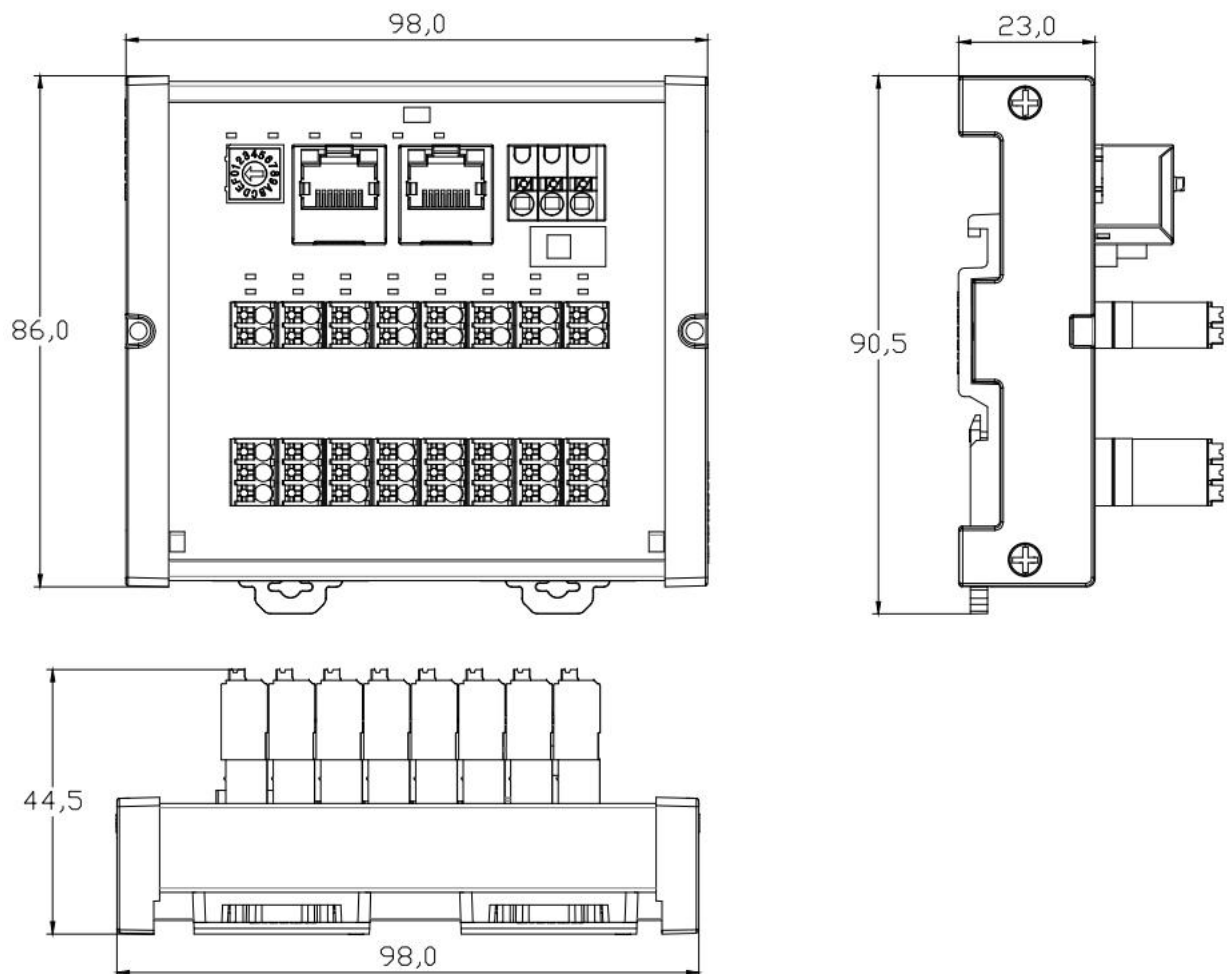


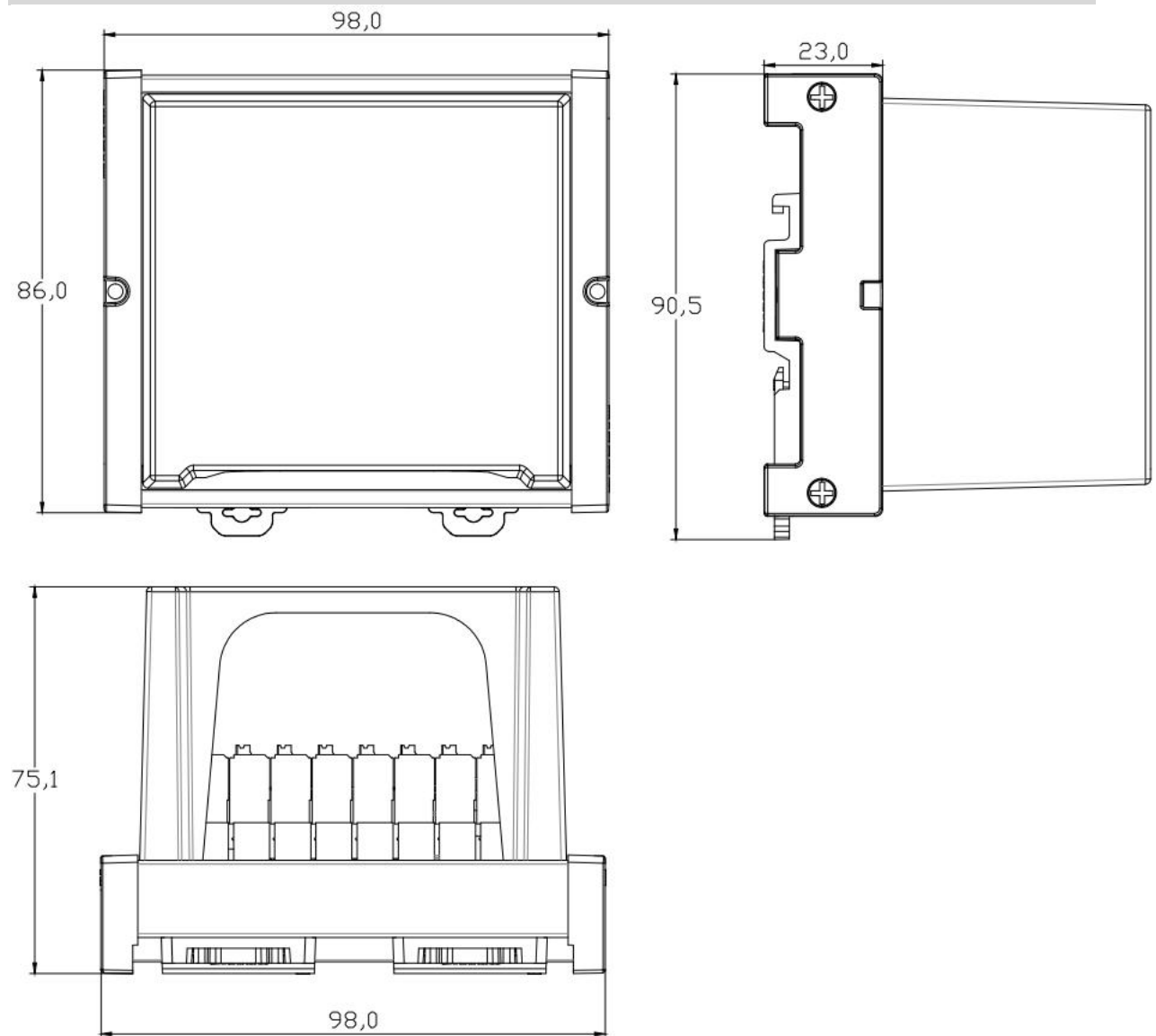
Note: Applicable to XBF2C and XBF2D series.

3.3.9 Outline Dimensions

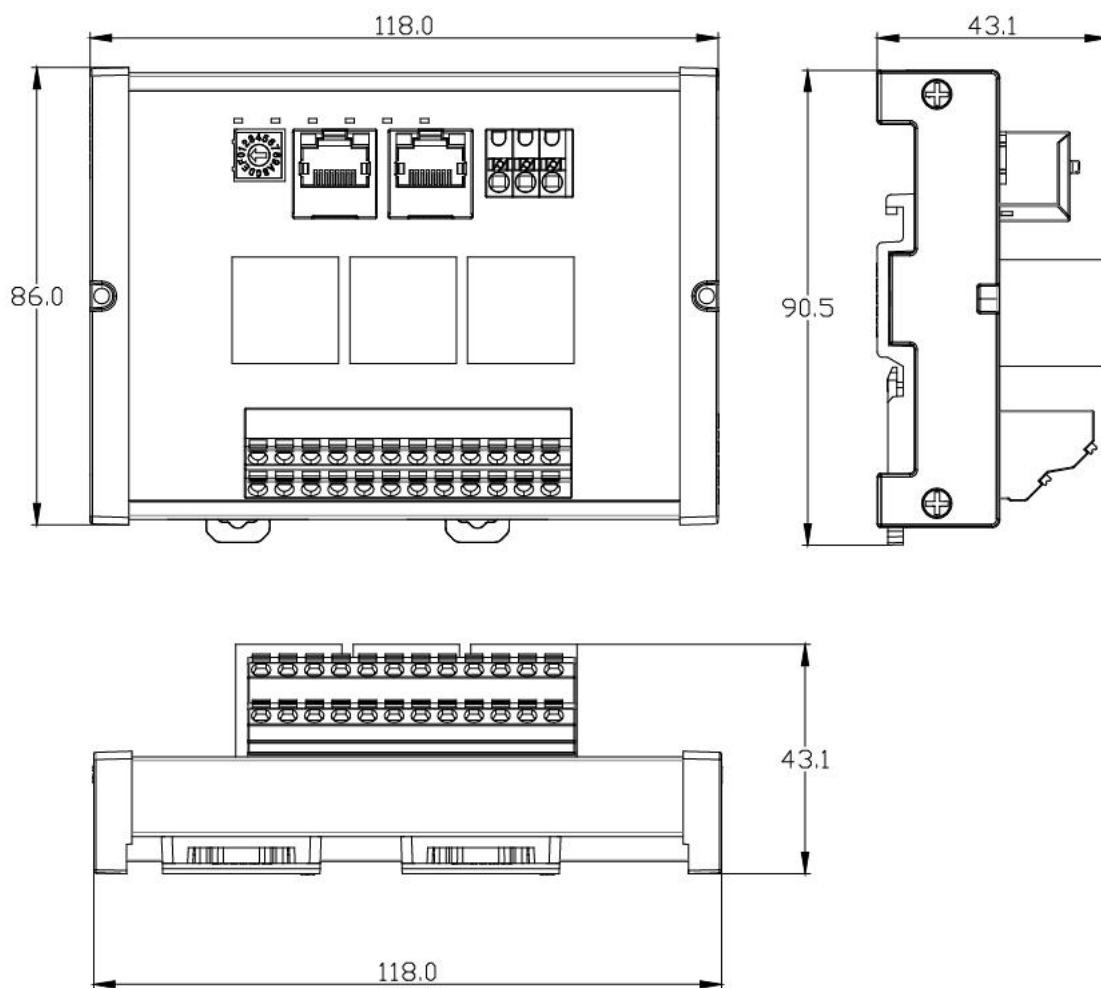
3.3.9.1 XBF2C Series

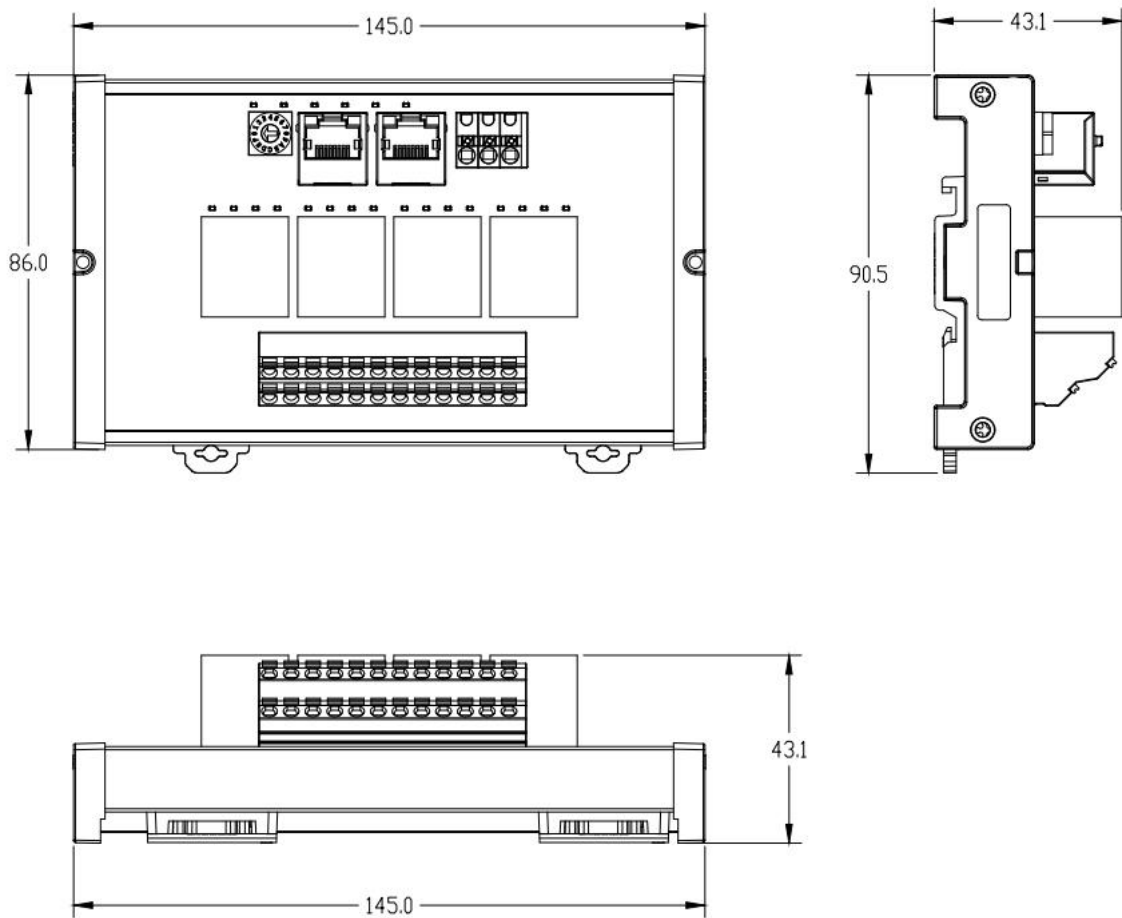
I/O module dimensions (excluding dust cover, unit: mm)



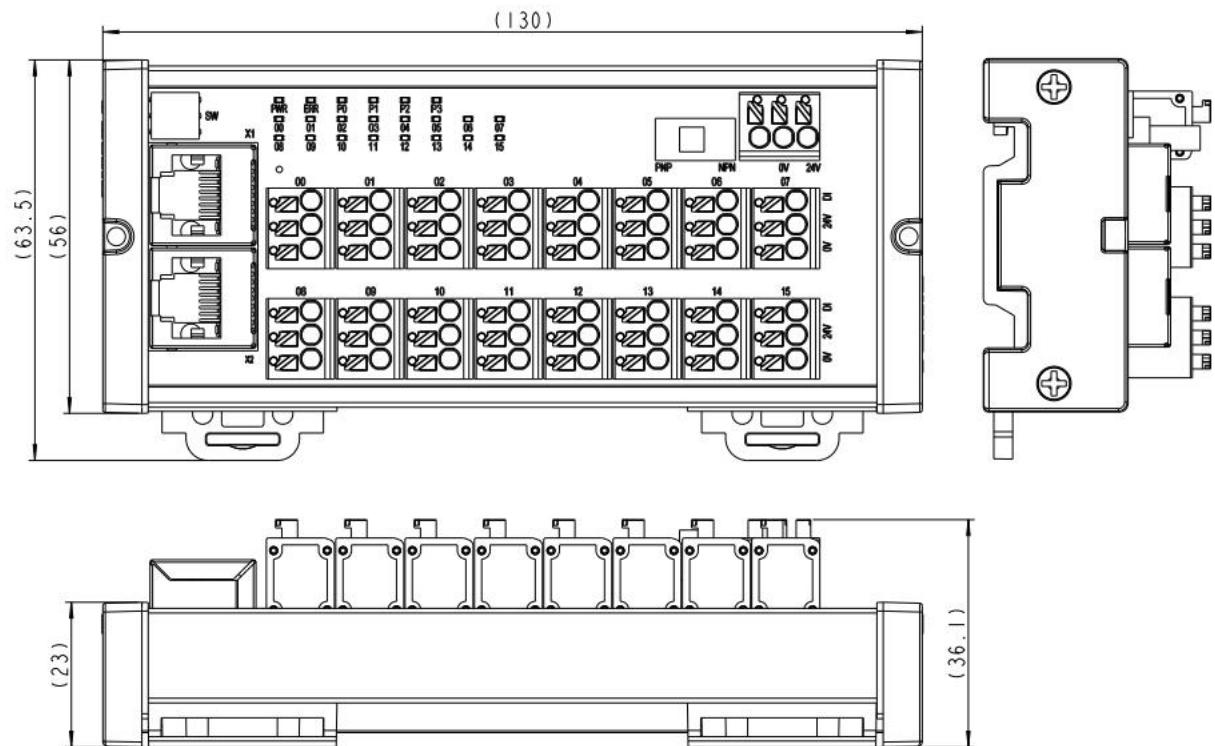
I/O module dimensions (including dust cover, unit: mm)

3.3.9.2 XBF2D series

XBF2D-J04C1-R03/XBF2D-J12C4-P01 relay module dimensions (unit: mm)

XBF2D-J16C4-P01 Relay Module Dimensions (unit: mm)

3.3.9.3 XBF2E Series

I/O module dimensions (unit: mm)

4 Installation and removal

4.1 Installation Guide

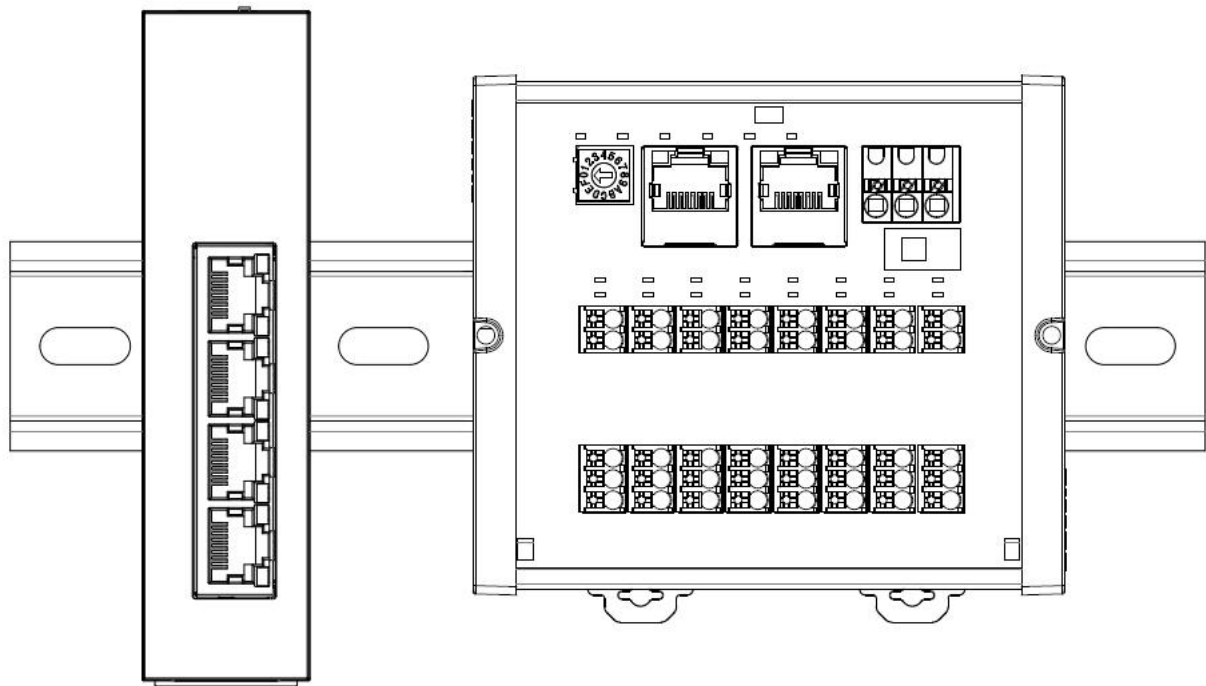
Installation/Removal Precautions

- The module has an IP20 protection rating and must be installed in a cabinet for indoor use.
- Ensure that the server rack has good ventilation (such as installing exhaust fans in the server rack).
- Do not install this device next to or above equipment that may cause overheating.
- Make sure to install the module vertically on the fixed guide rail and ensure that there is air circulation around it (there should be at least 50mm of air circulation space above and below the module).
- Installation/removal must be performed with the power off.

warn

- If the device is not used in accordance with the product user manual, the protection it provides may be compromised.
-

Ensure the module is installed vertically on the fixed guide rail.



4.2 Installation and disassembly steps

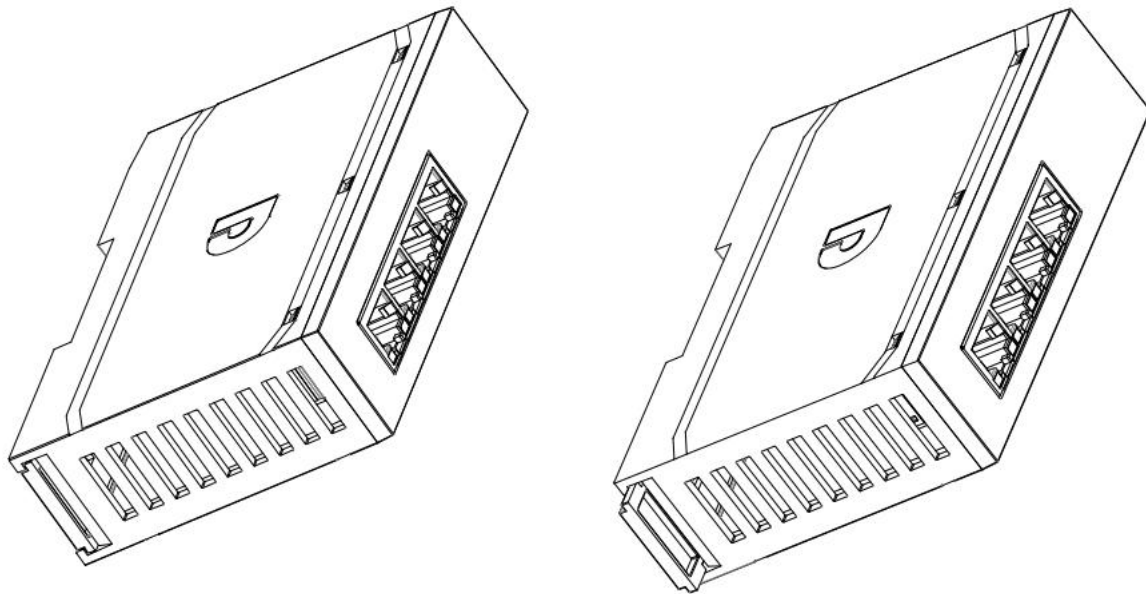
Module installation and removal	
Module installation steps	1. Push the clips at the bottom of the back of the module outwards until you hear a "click" sound.
	2. First, install the coupler module on the fixed guide rail. Align the upper edge of the coupler module slot with the upper edge of the guide rail and place the module into the guide rail.
	3. Press the lower edge of the module slot against the lower edge of the guide rail, push the buckle upwards until you hear a click, and the module installation is complete.
	4. Install the required I/O modules or functional modules in sequence on the right side of the coupler module.
Module disassembly steps	1. Insert a flathead screwdriver into the clip and apply force towards the module until you hear a click.
	2. Remove the module from the guide rail.

4.3 Installation and disassembly diagram

4.3.1 Coupler installation and disassembly diagram

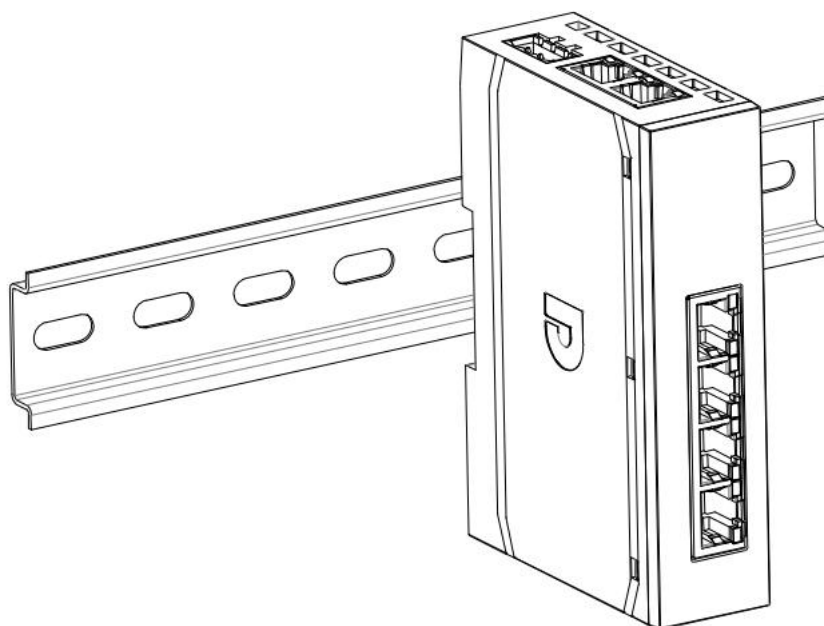
Coupler module installation

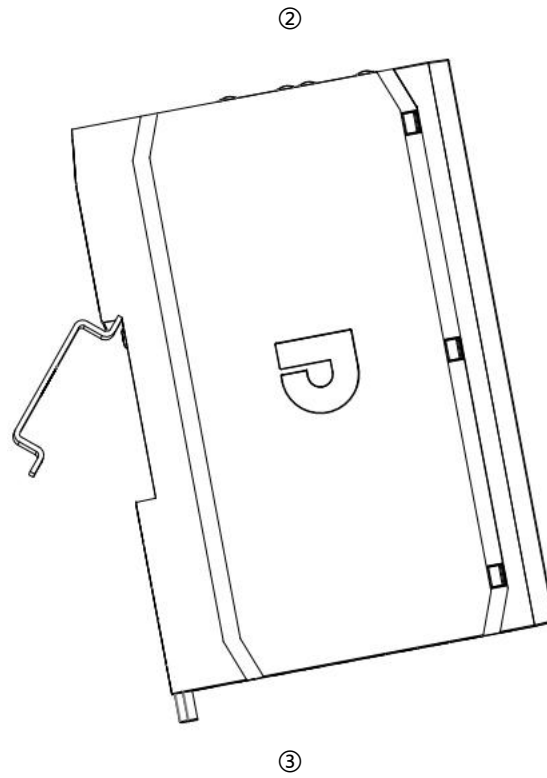
- Push the latch at the bottom of the back of the module outwards until you hear a "click" sound, as shown in Figure ① below.



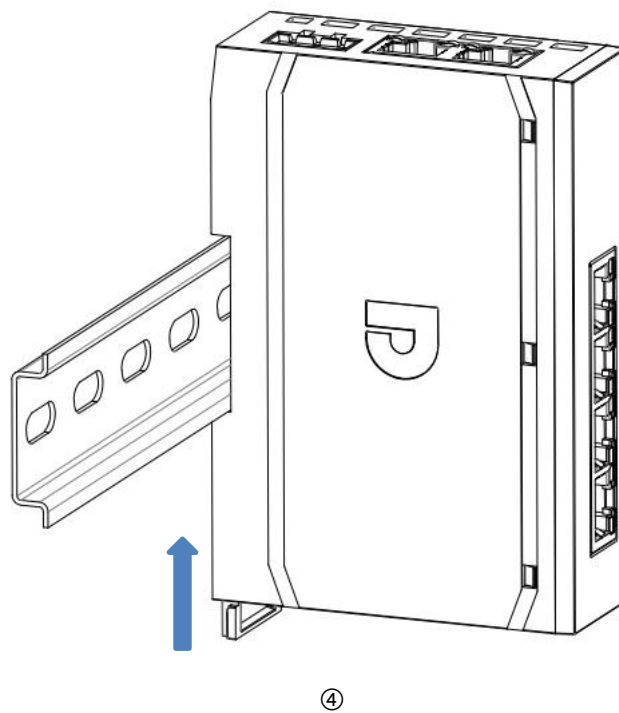
①

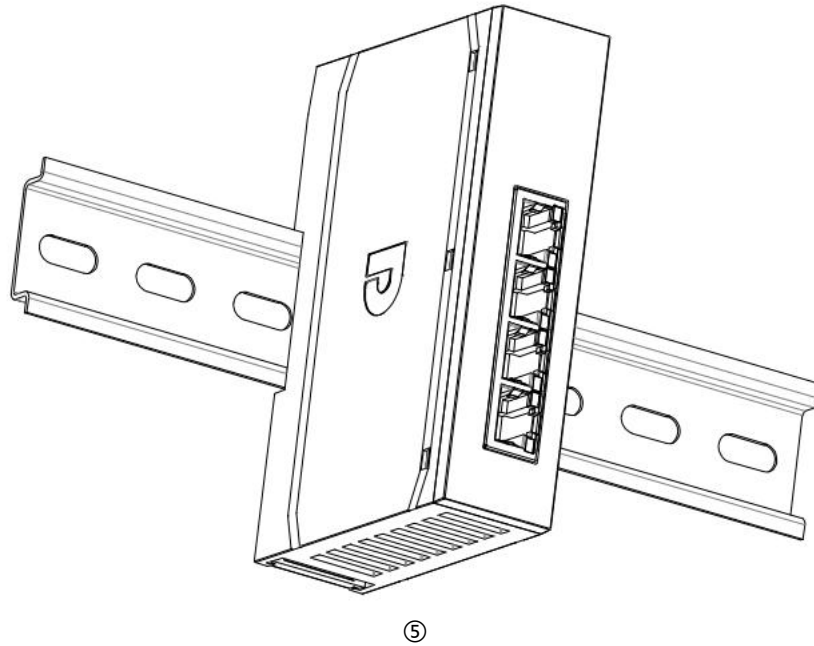
- First, install the coupler module on the fixed guide rail. Align the upper edge of the coupler module slot with the upper edge of the guide rail and place the module into the guide rail, as shown in Figures ② and ③ below.





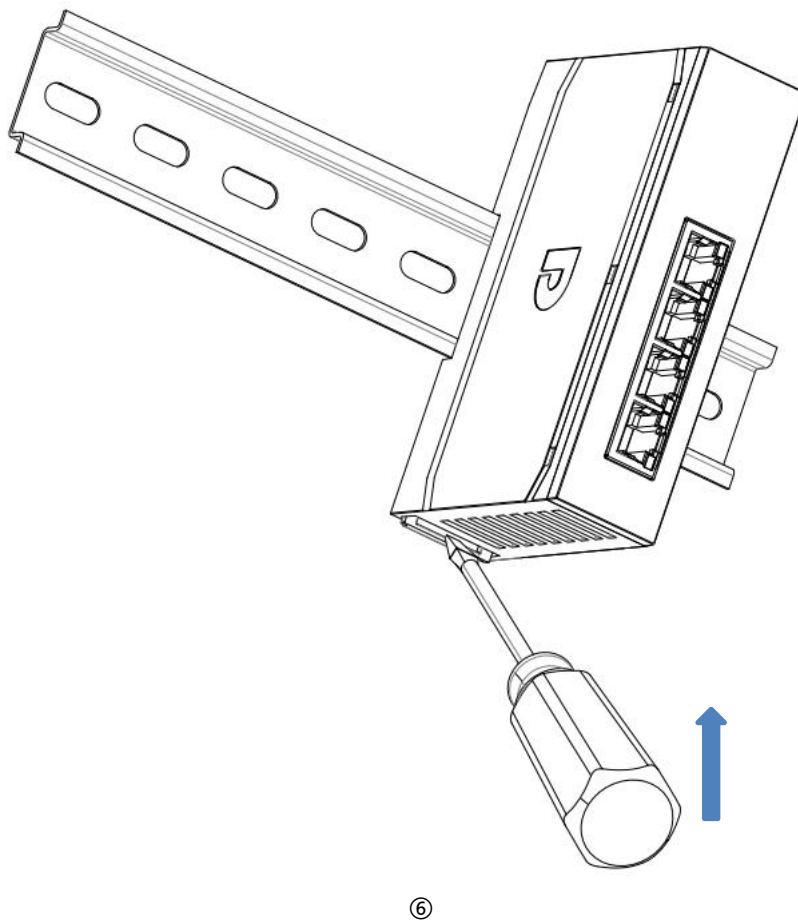
- Place the lower edge of the module slot against the lower edge of the guide rail, and push the buckle upwards until you hear a click. This completes the module installation, as shown in Figures ④ and ⑤ below.

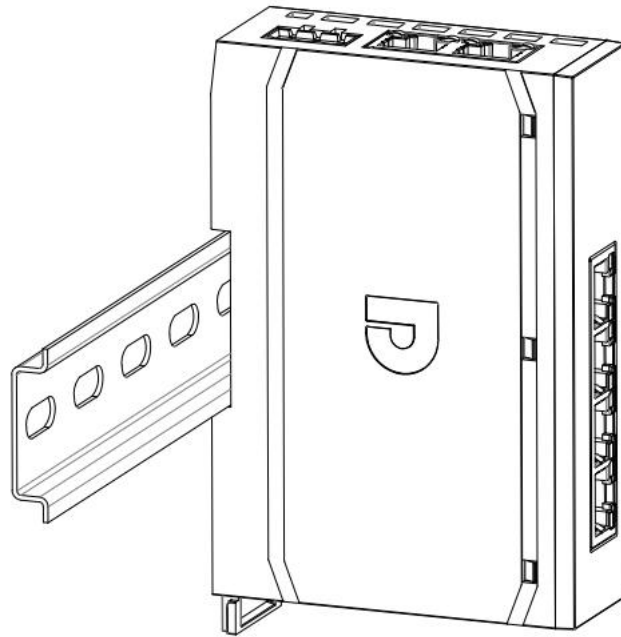




Coupler disassembly

- Insert a flathead screwdriver into the clip and apply force towards the module until you hear a click, as shown in Figures 6 and 7 below. At this point, the module can be removed from the guide rail.



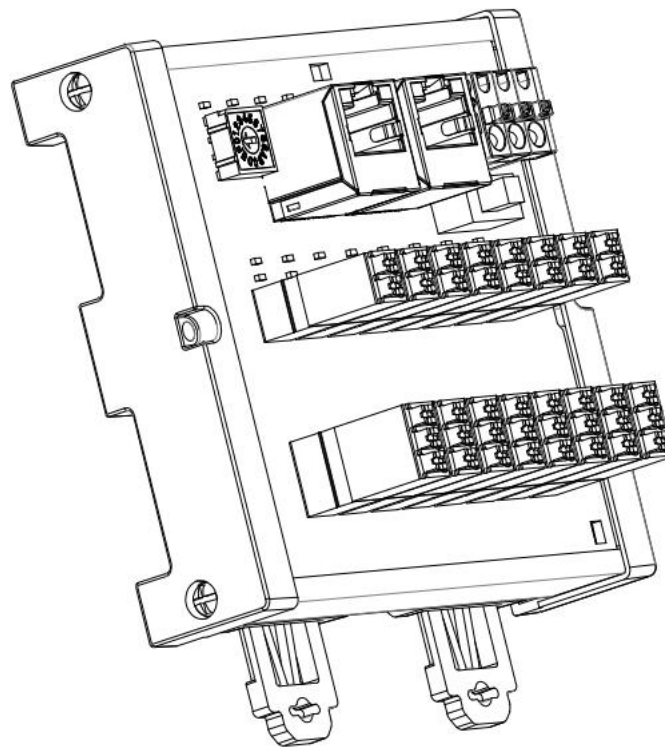


⑦

4.3.2 I/O module installation and removal diagram

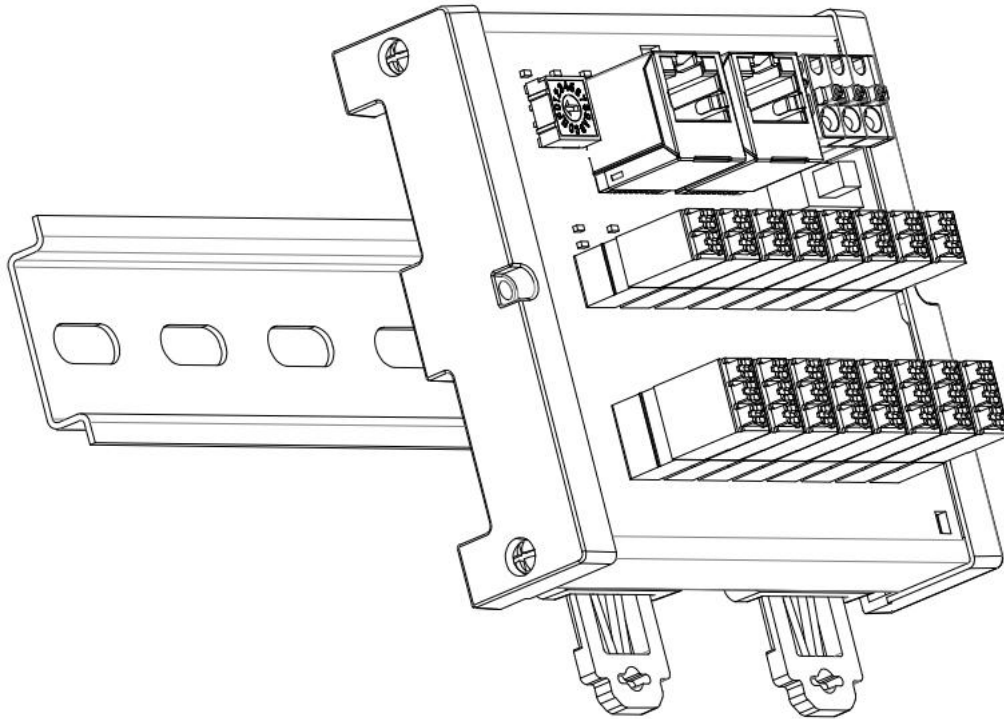
I/O module installation (taking XBF2C series as an example)

- Push the latch at the bottom of the back of the module outwards until you hear a "click" sound, as shown in Figure ① below.

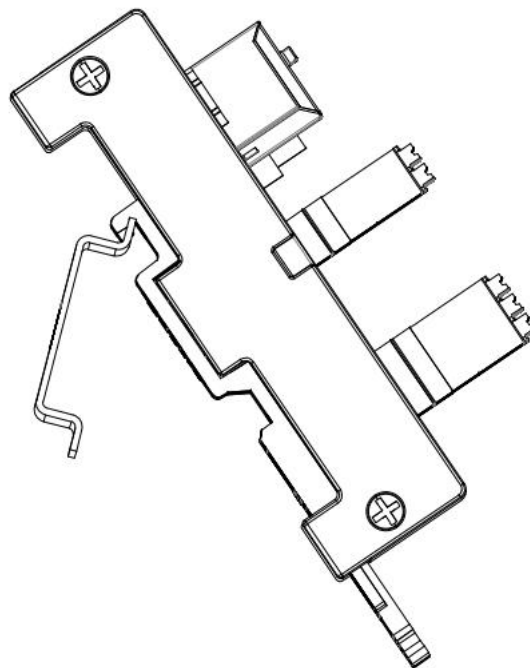


①

- Install the module on the fixed guide rail, align the upper edge of the module slot with the upper edge of the guide rail, and place the module into the guide rail, as shown in Figures ② and ③ below.

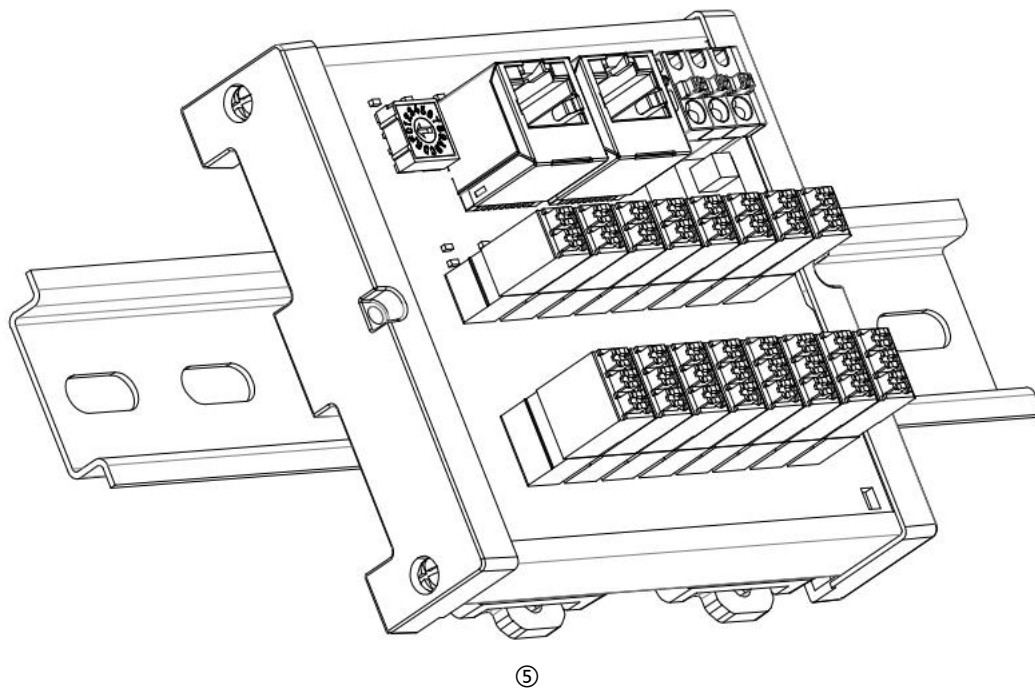
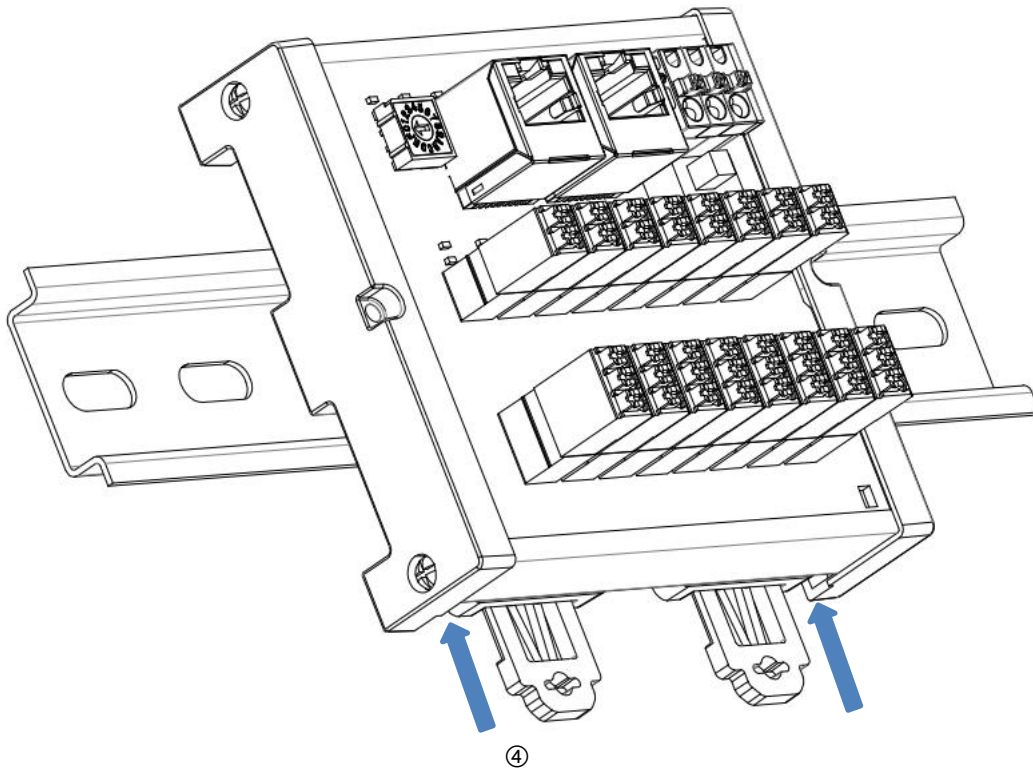


②



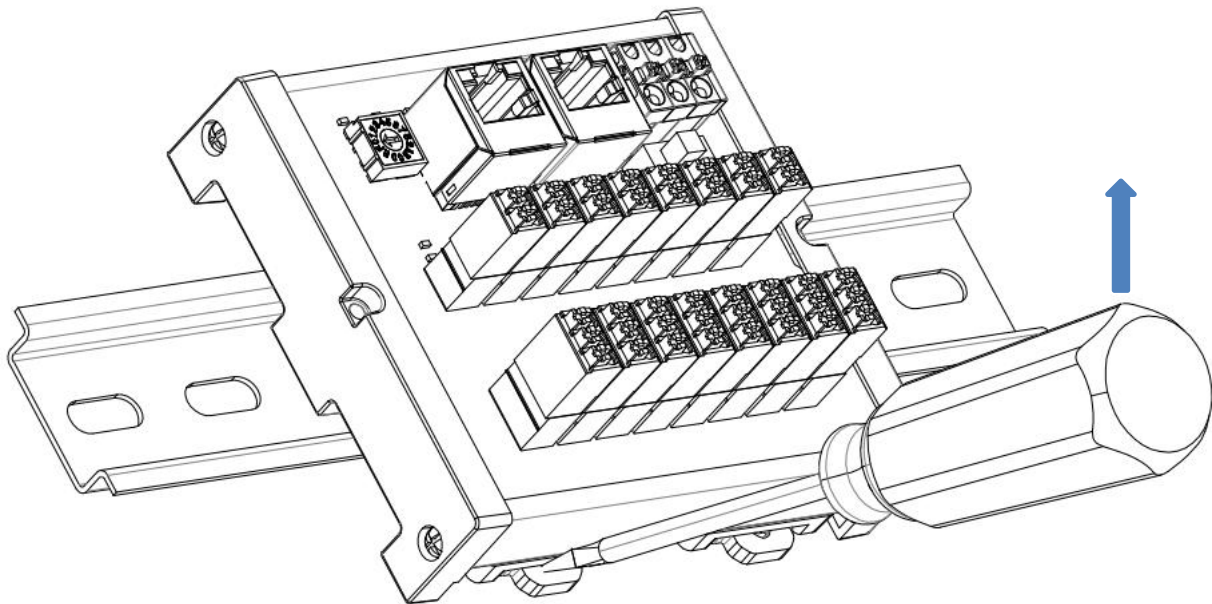
③

- Place the lower edge of the module slot against the lower edge of the guide rail, and push the buckle upwards until you hear a click. This completes the module installation, as shown in Figures ④ and ⑤ below.



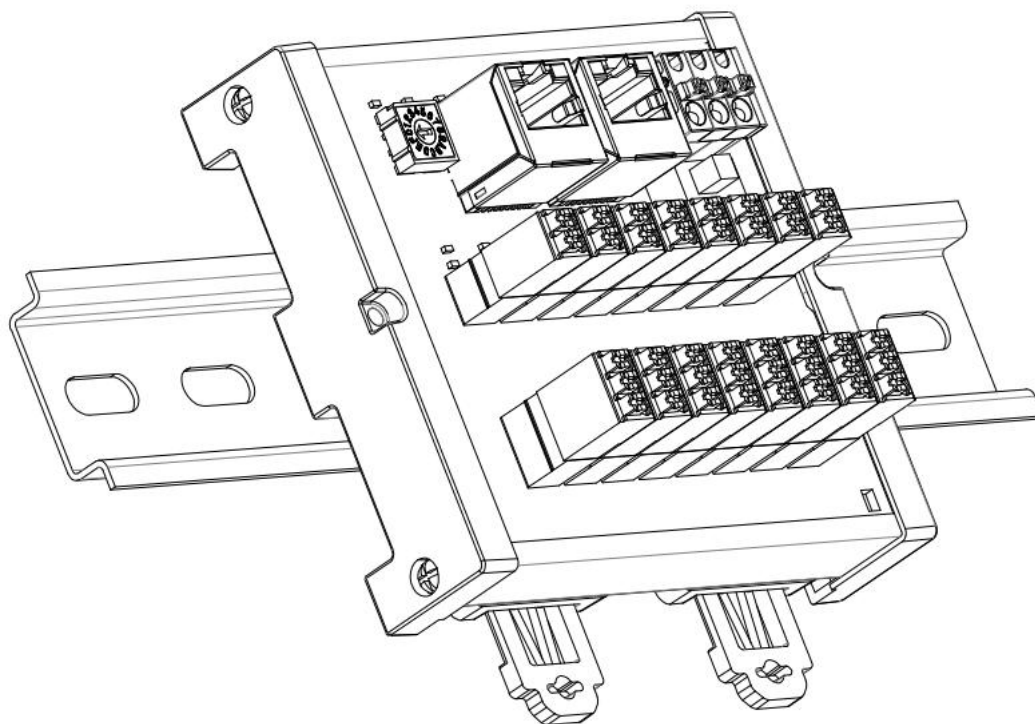
I/O module disassembly (taking the XBF2C series as an example)

- Insert a flathead screwdriver into the clip and apply force towards the module until you hear a click, as shown in Figures 6 and 7 below. At this point, the module can be removed from the guide



rail.

⑥



⑦

5 Wiring

5.1 Terminal blocks



Terminal blocks		
XBF4-EC04/XBF4-PN04 Power Terminals	Rated voltage	320V
	Rated current	20A
	Extreme number	3P
	wire diameter	22~16 AWG 0.3~1.5 mm ²
XBF2C and XBF2D series power terminals	Rated voltage	300V
	Rated current	10A
	Extreme number	3P
	wire diameter	28~16 AWG 0.2~1.5 mm ²
XBF2C series I/O signal line terminals (i.e., input/output terminals)	Rated voltage	250V
	Rated current	8A
	Extreme number	16P+16P/16P+24P/24P+24P
	wire diameter	28~16 AWG 0.2~1.0 mm ²
XBF2D series relay signal line terminals (i.e., output terminals)	Rated voltage	300V
	Rated current	10A
	Extreme number	24P
	wire diameter	30~16 AWG 0.2~1.5 mm ²
XBF2E series power terminals and signal line terminals	Rated voltage	300V
	Rated current	8A
	Extreme number	3P/16*3P
	wire diameter	20~16 AWG 0.2~1.5 mm ²
Discrete I/O interface	2×RJ45	UTP or STP of Category 5 or higher (STP recommended)
Coupler Expansion Module Interface	4×RJ45	UTP or STP of Category 5 or higher (STP recommended)

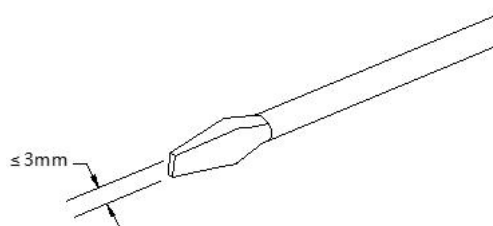
5.2 Wiring instructions and requirements

Power connection precautions

- The power supply for the module system side and the power supply for the field side should be configured and used separately. Do not mix them.
- The PE element must be reliably grounded.

Wiring tool requirements

The power terminals and signal terminals feature a screwless design, allowing for cable installation and removal using a flathead screwdriver (size: $\leq 3\text{mm}$).



Stripping length requirements

For the XBF2C and XBF2D series power and signal line terminals, a cable stripping length of 10 mm is recommended.

The recommended cable stripping length for the XBF2E series power and signal line terminals is 8~9 mm.



Wiring method

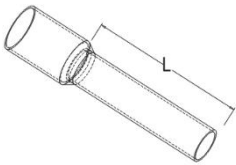
For a single-strand rigid wire, after stripping the wire to the corresponding length, press the button and insert the single-strand wire directly into the corresponding end hole.



After stripping the wire to the corresponding length, the multi-strand flexible wire can be directly connected or used with the corresponding standard cold-pressed terminals (tubular insulated terminals, see the table below for reference specifications). Pressing down the button will insert the insulated terminal directly into the corresponding end hole.



The specifications for power supply terminals and signal line terminals are shown in the table below:

Specifications of tubular insulated ends		
Specifications	model	conductor cross-sectional area (mm²)
 Tubular insulated terminals L The length is 10mm	E0310	0.3
	E0510	0.5
	E7510	0.75
	E1010	1.0
	E1510	1.5
Tubular insulated terminals L The length is 8 mm	E0508	0.5
	E7508	0.75
	E1008	1.0
	E1508	1.5

 warn

- Only copper wires can be used for wiring.

 warn

- Cable temperature: 80°C.

6 Use

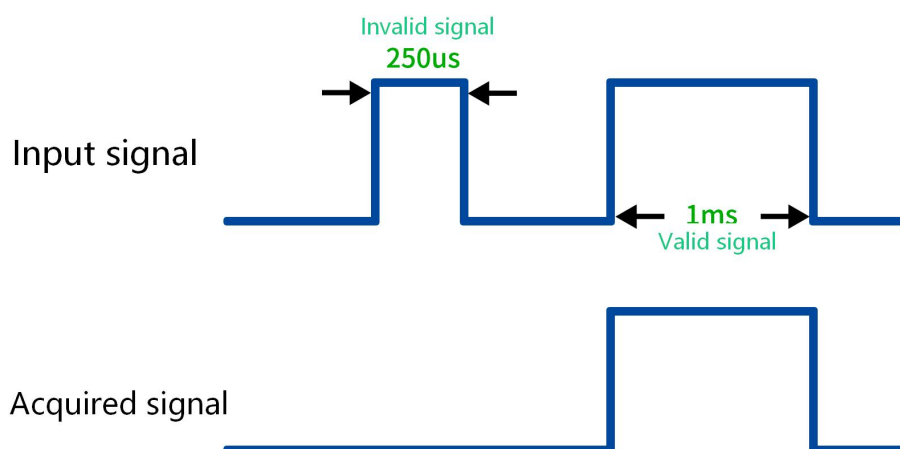
6.1 Parameter Description

6.1.1 Digital input filtering

Digital input filtering prevents unexpected rapid changes in input signals from causing switch contact skipping or electrical noise. Digital input filtering supports single-module settings; each module can be configured independently, but individual channels cannot.

The default setting for the digital input filter FilterTime is 3ms, with supported settings of no filtering, 0.1ms, 0.2ms, 0.5ms, 1ms, 2ms, 3ms (factory setting), 4ms...18ms, 19ms, and 20ms. When configured to 3ms, noise within 3ms can be filtered out. A 3ms input filter time means that a single signal transitioning from "0" to "1" or from "1" to "0" must take 3ms to be detected; single high or low pulses shorter than 3ms will not be detected.

Function Description: When the input filter is configured to 1ms, noise within 1ms can be filtered out. As shown in the figure below, a signal input of 250us will be considered an invalid signal; single high or low pulses shorter than 1ms will not be detected; signals of 1ms and longer can be acquired.



6.1.2 Clear/hold digital output signal

The clear/hold function is for modules with output channels. This function configures the output mode of the output channels when the module is not in an OP state (stopped running or with the coupler network cable disconnected). This parameter supports the following output states:

Clear output: When communication is disconnected, the module output channel will automatically clear the output, i.e., output 0.

Output valid value: When communication is disconnected, the module output channel continues to output a valid value, that is, output 1.

Retain the previous output value: When communication is disconnected, the module output channel retains the previous output value.

The digital clear and retain function supports both module-wide settings (template mode) and single-channel settings (single-channel mode). Any channel can be configured using either single-channel mode or template mode, with single-channel mode having higher priority than template mode. Specific configuration methods are shown in the table below; the default is module-wide clear output.

Clear and hold parameters of digital output module				
Parameter name	Parameter meaning	Parameter values	Parameter value meaning	default value
TemplateMode	Template mode	1	PresetLow clears the output, i.e., outputs 0.	1
		2	PresetHigh outputs a valid value, i.e., 1.	
		3	KeepMode retains the previous output value.	
Channel x	Single-channel mode settings	0	TemplateValue is the template mode value, meaning single-channel mode is not enabled.	0
		1	PresetLow clears the output, i.e., outputs 0.	
		2	PresetHigh outputs a valid value, i.e., 1.	
		3	KeepMode retains the previous output value.	

6.1.3 baud rate settings

Discrete I/O supports baud rate auto-adaptive function. The master station can be set with different baud rates, and after a power outage and restart, it can communicate with the slave station according to the set baud rate. If there is no power outage and restart, it will still operate at the baud rate before the setting.

This manual uses TwinCAT3 and Sysmac Studio as examples to introduce the parameter configuration method of the XBF4-EC4 coupler + I/O module combination. For detailed steps, please refer to [link/reference].[Parameter configuration in section 6.3.1](#) and [Parameter settings in section 6.3.2](#). After making the modifications, be sure to power it on again.

6.2 Fault code information

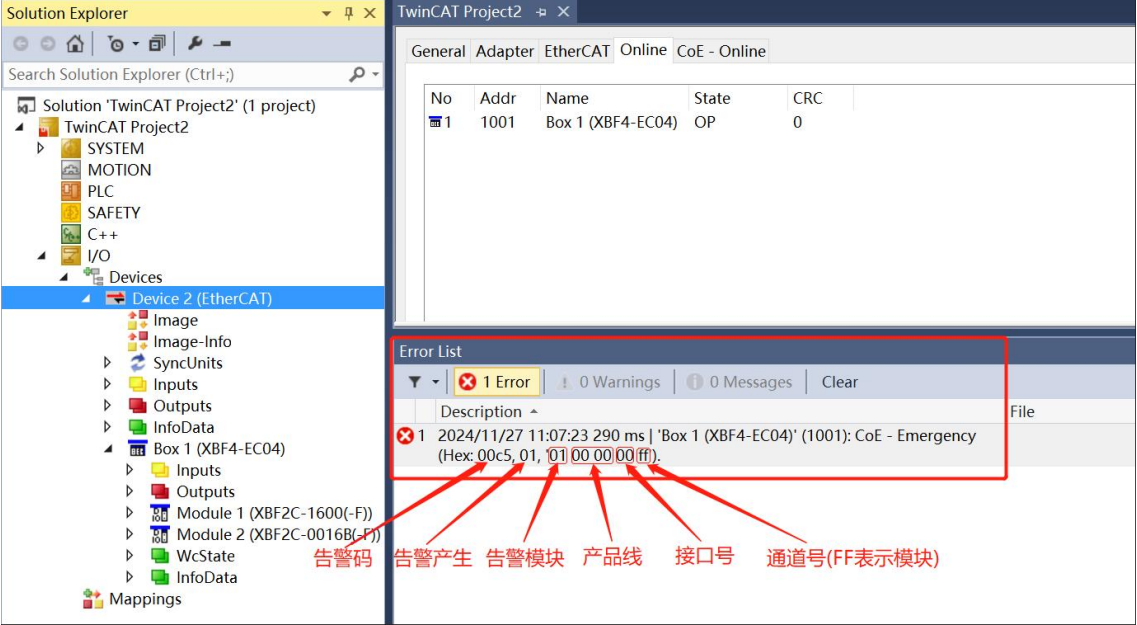
6.2.1 Coupler general fault codes

category	serial number	Error Type	Error code	Event Name	Event Code (2#)	Event code (10#)	Event code (16#)	processing method
General Error	2	Online upgrade error	1	Firmware upgrade error	000000010000001	129	0x0081	Try upgrading again, check for environmental interference, and check if the firmware is too large, etc.
			2	Firmware is incompatible with the current module model.	0000000010000010	130	0x0082	Check if the files are correct, and whether there are any abnormalities or interferences in the modules.
	3	Voltage error	5	Load-side voltage not connected	0000000011000101	197	0x00C5	Check if the on-site power supply is connected.
	7	Parameter error	0	Parameter setting error	0000000111000000	448	0x01C0	Check module parameter settings
	63	Communication error	1	Initialization failed	0000111111000001	4033	0x0FC1	Check if the module connection is normal.
			2	Communication timeout	0000111111000010	4034	0x0FC2	Check if the module has any abnormalities or interference.
			3	Module disconnected	0000111111000011	4035	0x0FC3	Check if the module is online or experiencing interference, etc.
			4	CRC error in parsing data	0000111111000100	4036	0x0FC4	Check if the module has any abnormalities or interference.
			5	DIP switch conflict	000000001000101	69	0x0045	Check if the module DIP switches under the

								corresponding expansion interface of the coupler are duplicated.
--	--	--	--	--	--	--	--	--

6.2.2 Fault Code Viewing

Taking TwinCAT3 software as an example, view the alarm information below Error in the Error List window, as shown in the figure below. The alarm code is Hex: 00c5, which means voltage error. The voltage on the load side is not connected. You can check whether the power supply on the field side is connected.



The methods for viewing event information are shown in the table below:

Structure of event information							
byte0	byte1	byte2	byte3	byte4	byte5	byte6	byte7
Event Code		Event Status	Alarm module	Product Line		Interface number	Channel number
		For example, 0x01: Event generated. 0x00: Event disappears	For example, 0~F: module DIP switches 0xFF: Coupler			Interface 0 Interface 1 Interface 2 Interface 3	For example, 0xFF: module-level event. 0x00: Channel number

6.3 EtherCAT coupler configuration application

6.3.1 Application in the TwinCAT3 software environment

1、Preparation

- **Hardware environment**

- **Module preparation:** This instruction uses the XBF4-EC04+{Coupler Interface 0: XBF2C-1600-F+XBF2C-0016B-F}+{Coupler Interface 1: XBF2C-0016A-F+XBF2C-0808A-F}+{Coupler Interface 2: XBF2C-0016B-F+XBF2D-J12C4-P01}+{Coupler Interface 3: XBF2C-0808A-F+XBF2C-0016A-F} topology as an example.
- **One computer, pre-installed with TwinCAT3 software.**
- **EtherCAT dedicated shielded cable**
- **One switching power supply**
- **Device configuration file**

Configuration file retrieval

address:<https://www.solidotech.com/cn/resources/configuration-files>

- **Hardware configuration and wiring**

Please follow the instructions [4 Installation and Removal](#) and [5. Wiring](#) "Required Operation"

- **Computer IP Requirements**

Configure the computer's IP address and the PLC's IP address to ensure they are on the same network segment.

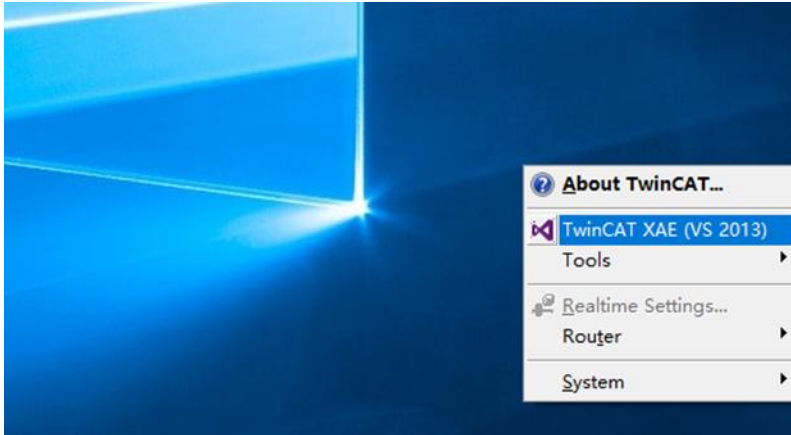
2、Pre-configured configuration files

Place the ESI configuration file (EcatTerminal-XBF4_V1.1.0_ENUM.xml) in the TwinCAT installation directory "C:\TwinCAT\3.1\Config\Io\EtherCAT", as shown in the image below.

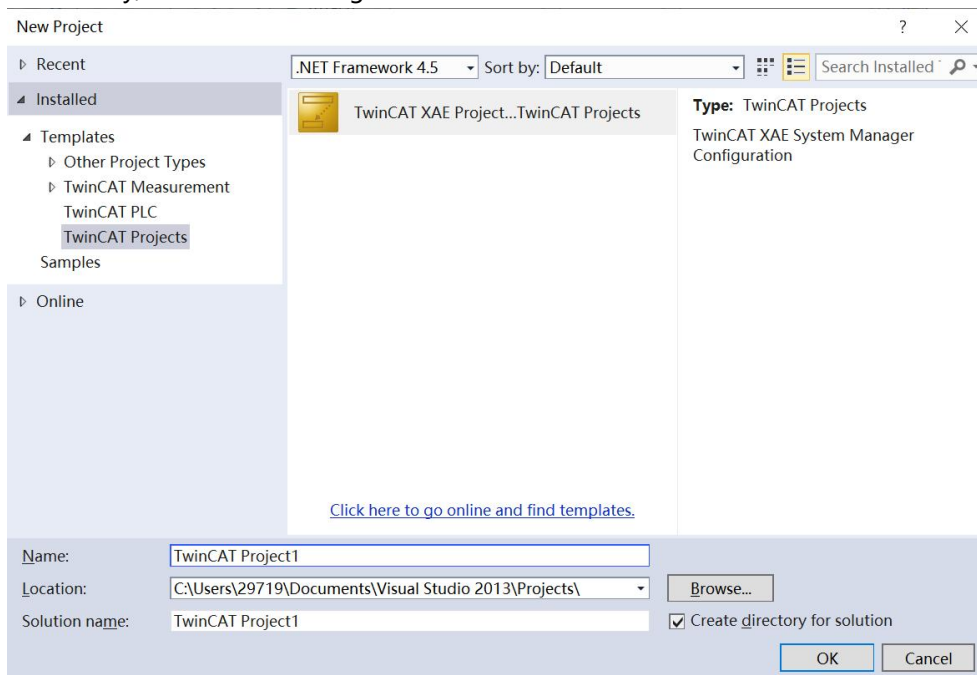
 > 此电脑 > Windows (C:) > TwinCAT > 3.1 > Config > Io > EtherCAT				  在 EtherCAT ...
名称	修改日期	类型	大小	
 Beckhoff EPP5xxx.xml	2016/12/22 10:57	XML 文档	130 KB	
 Beckhoff EPP6xxx.xml	2017/4/5 14:46	XML 文档	1,272 KB	
 Beckhoff EPP7xxx.xml	2016/12/22 10:57	XML 文档	1,466 KB	
 Beckhoff EQ1xxx.xml	2015/11/12 14:24	XML 文档	22 KB	
 Beckhoff EQ2xxx.xml	2016/11/23 10:42	XML 文档	73 KB	
 Beckhoff EQ3xxx.xml	2016/11/22 11:22	XML 文档	1,386 KB	
 Beckhoff ER1xxx.XML	2016/11/21 15:46	XML 文档	165 KB	
 Beckhoff ER2xxx.XML	2016/11/21 14:32	XML 文档	259 KB	
 Beckhoff ER3xxx.XML	2017/6/9 13:35	XML 文档	1,177 KB	
 Beckhoff ER4xxx.xml	2016/11/22 12:58	XML 文档	318 KB	
 Beckhoff ER5xxx.xml	2016/3/14 11:52	XML 文档	273 KB	
 Beckhoff ER6xxx.xml	2016/3/14 11:52	XML 文档	494 KB	
 Beckhoff ER7xxx.xml	2016/11/22 12:14	XML 文档	1,503 KB	
 Beckhoff ER8xxx.xml	2016/3/14 11:52	XML 文档	207 KB	
 Beckhoff EtherCAT EvaBoard.xml	2015/2/4 12:57	XML 文档	72 KB	
 Beckhoff EtherCAT Terminals.xml	2015/2/4 12:57	XML 文档	53 KB	
 Beckhoff FB1XXX.xml	2017/5/24 12:26	XML 文档	49 KB	
 Beckhoff FCxxx.xml	2015/2/4 12:57	XML 文档	21 KB	
 Beckhoff ILxxxx-B110.xml	2015/2/4 12:57	XML 文档	8 KB	
 EcatTerminal-XBF4_V1.1.0_ENUM.xml	2024/11/22 14:23	XML 文档	1,863 KB	

3. Create a project

- a. Click the TwinCAT icon in the lower right corner of the desktop, select "TwinCAT XAE (VS xxxx)" to open the TwinCAT software, as shown in the image below.



- b. Click "New TwinCAT Project". In the pop-up window, "Name" and "Solution name" correspond to the project name and solution name, respectively, and "Location" corresponds to the project path. These three items can be left as default. Then click "OK". The project will be created successfully, as shown in the figure below.

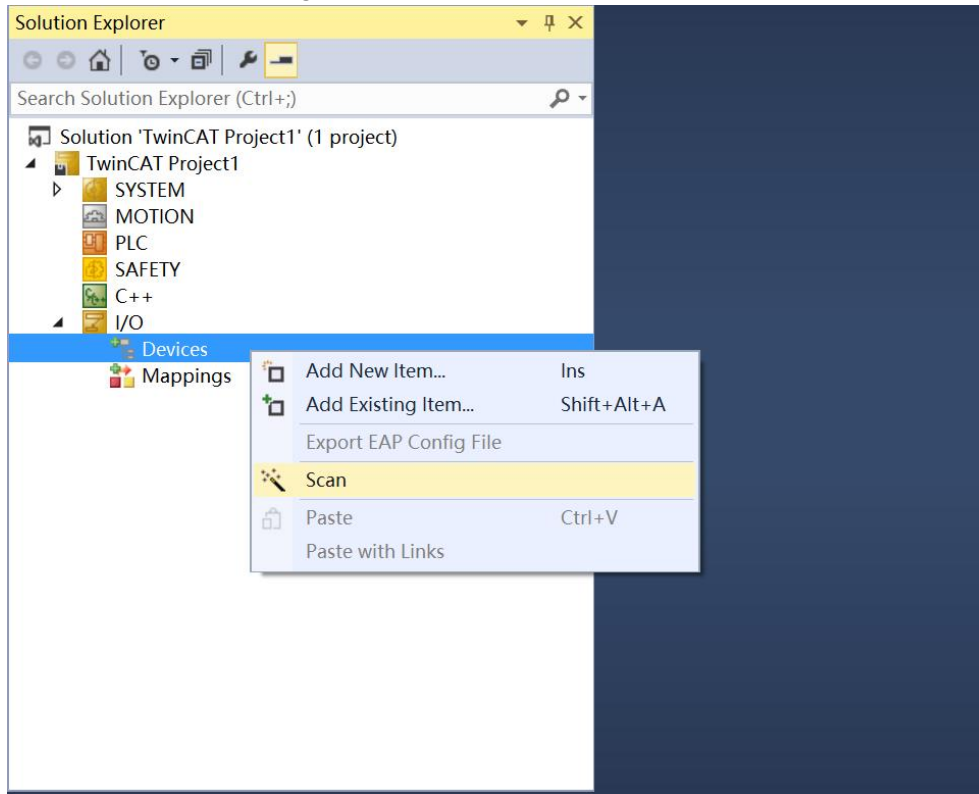


4. Add device

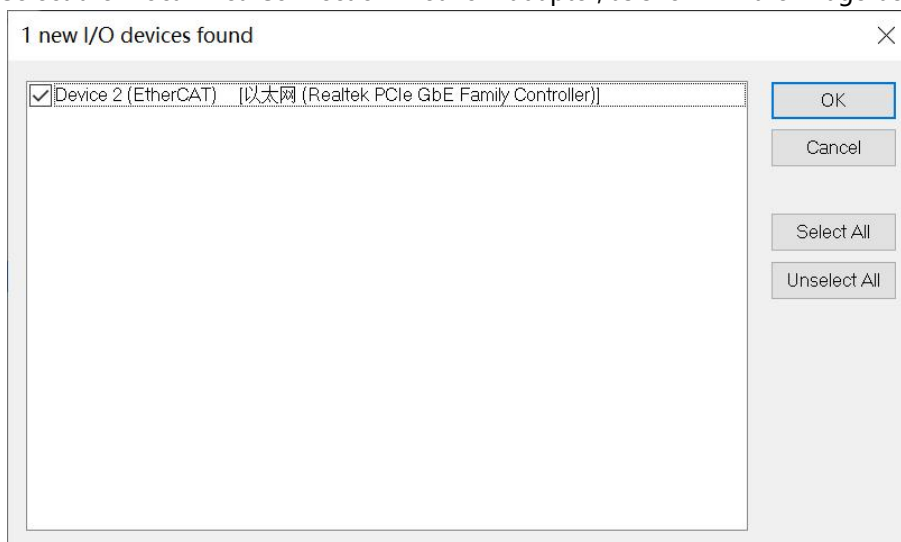
There are two ways to add a device: scanning the device or adding it manually.

➤ Scanning equipment

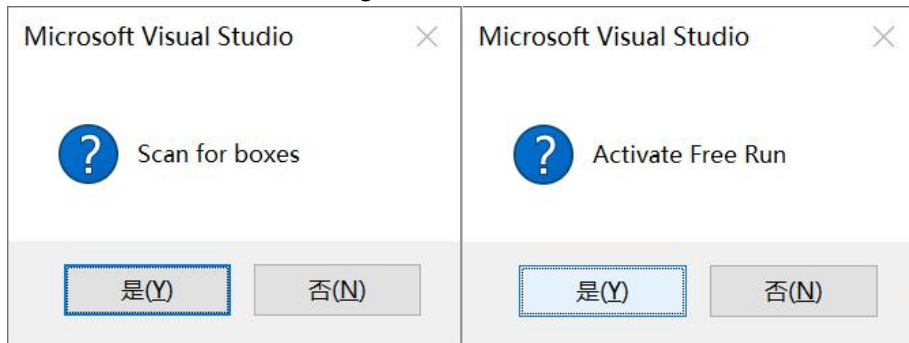
- a. After creating the project, right-click the "Scan" option under "I/O -> Devices" to scan for slave devices, as shown in the figure below.



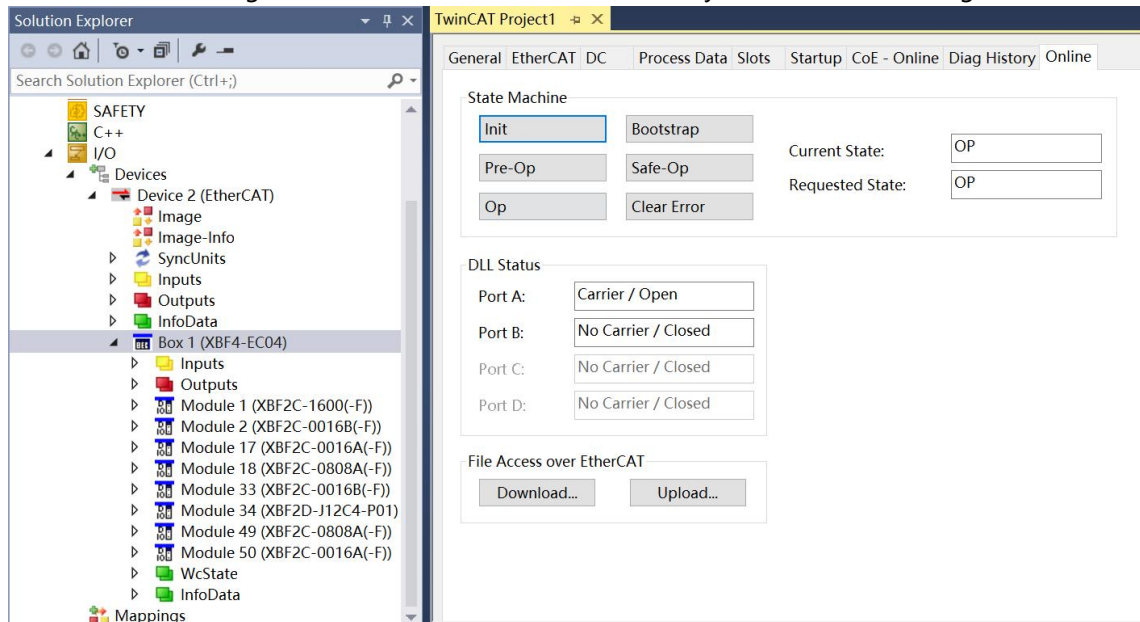
- b. Select the "Local Area Connection" network adapter, as shown in the image below.



- c. In the pop-up window "Scan for boxes", click "Yes"; in the pop-up window "Activate Free Run", click "Yes", as shown in the image below.

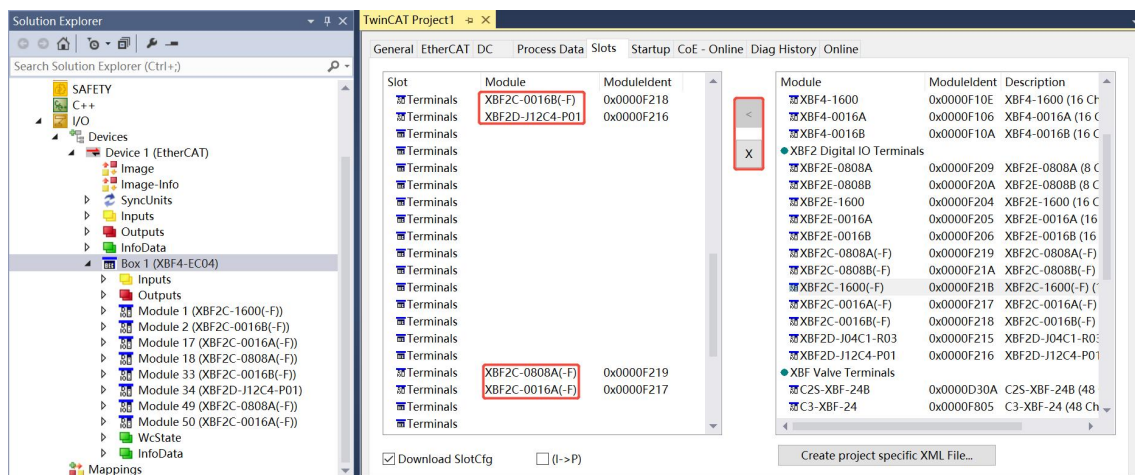
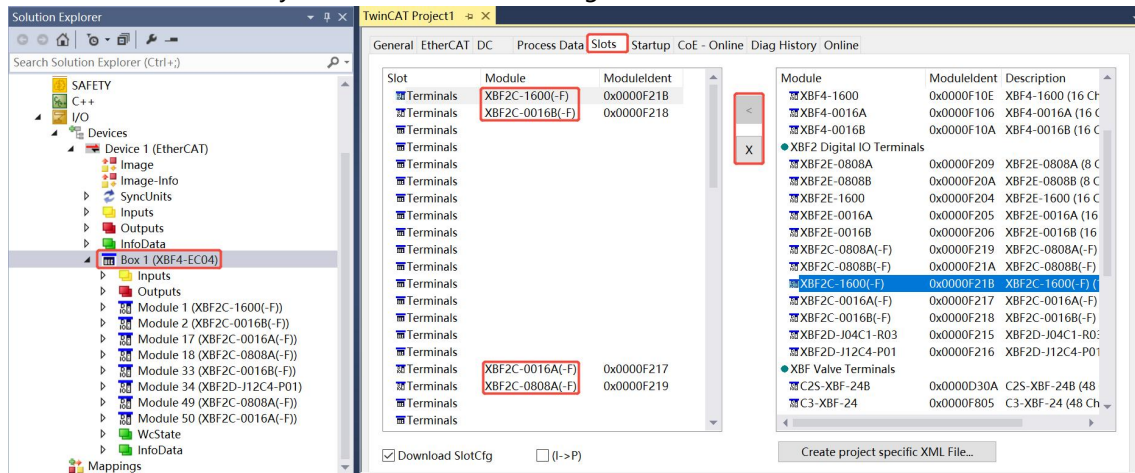


- d. After the device is scanned, the navigation tree on the left will show Box1 (XBF4-EC04), Module1 (XBF2C-1600-F), Module2 (XBF2C-0016B-F), Module17 (XBF2C-0016A-F), Module18 (XBF2C-0808A-F), Module33 (XBF2C-0016B-F), Module34 (XBF2D-J12C4-P01), Module49 (XBF2C-0808A-F), and Module50 (XBF2C-0016A-F). Under "Online", TwinCAT will be in "OP" state, and the RUN light on the slave device will be constantly lit, as shown in the figure below.



➤ Add manually

- After adding the coupler, on the "Slots" page, click according to the actual topology.  and . Add the modules one by one, as shown in the image below.



Note: Slave module slot location: Expansion interface number corresponding to the slave module connection coupler $\times 16$ + slave module DIP switch number;

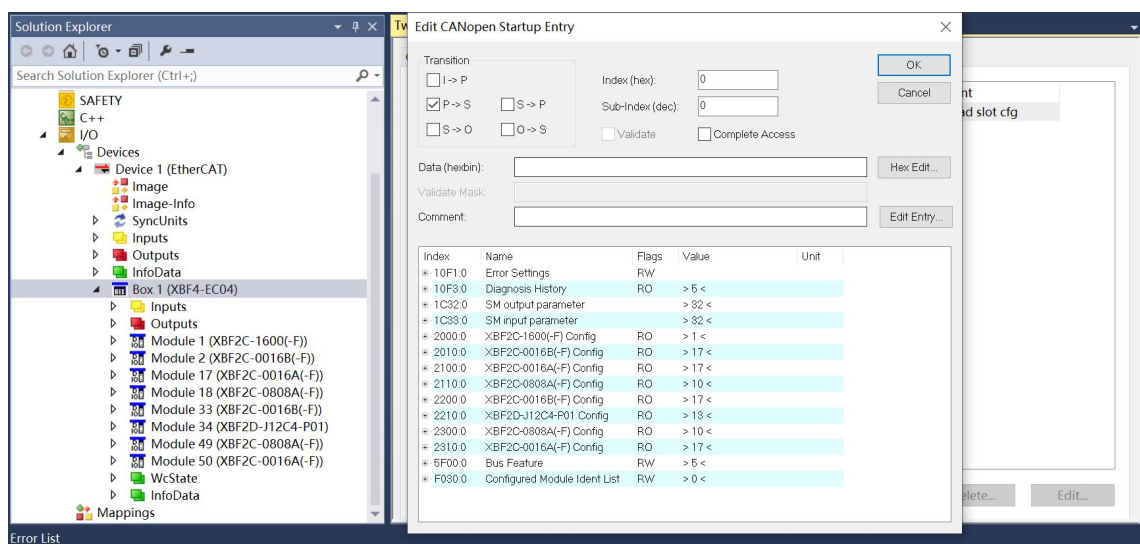
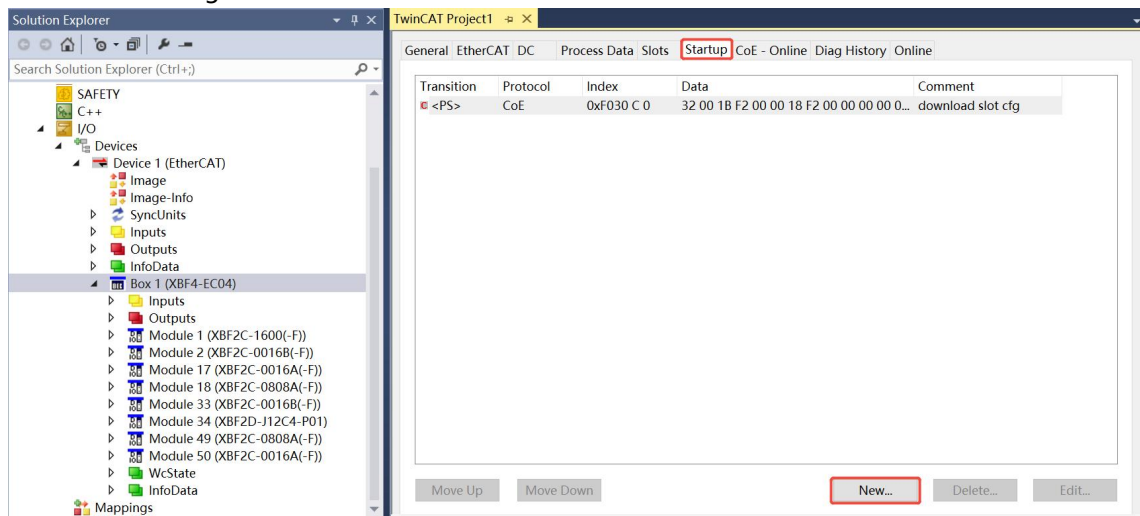
For example: (Module 1) XBF2C-1600-F: $0 \times 16 + 0 = 0$ -- Terminals 0;

(Module 2) XBF2C-0016B-F: $0 \times 16 + 1 = 1$ -- Terminals 1;

(Module 17) XBF2C-0016A-F: $1 \times 16 + 0 = 16$ -- Terminals 16.

5. Parameter configuration

- a. Clicking "Box1 -> Startup -> New" in the left navigation tree will take you to the configuration parameter editing page, where you will enter the "Edit CANopen Startup Entry" interface, as shown in the image below.



- b. For example, to modify the configuration parameters of Module18 (XBF2C-0808A-F), click the "+" in front of Index 2110:0 to expand the configuration parameter menu, where you can configure the digital input filtering and output signal clear/hold functions, as shown in the figure below.

Edit CANopen Startup Entry

Transition:
☐ I → P
☒ P → S
☐ S → P
☐ S → O
☐ O → S

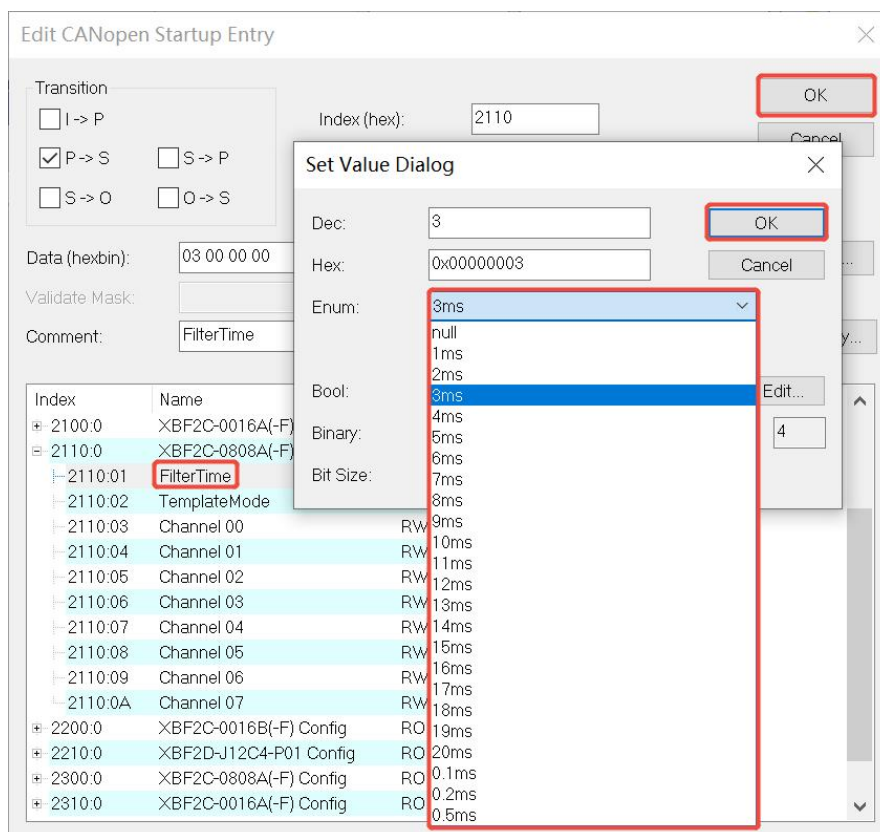
Index (hex):
 Sub-Index (dec):
☐ Validate ☐ Complete Access

Data (hexbin):
 Validate Mask:
 Comment:

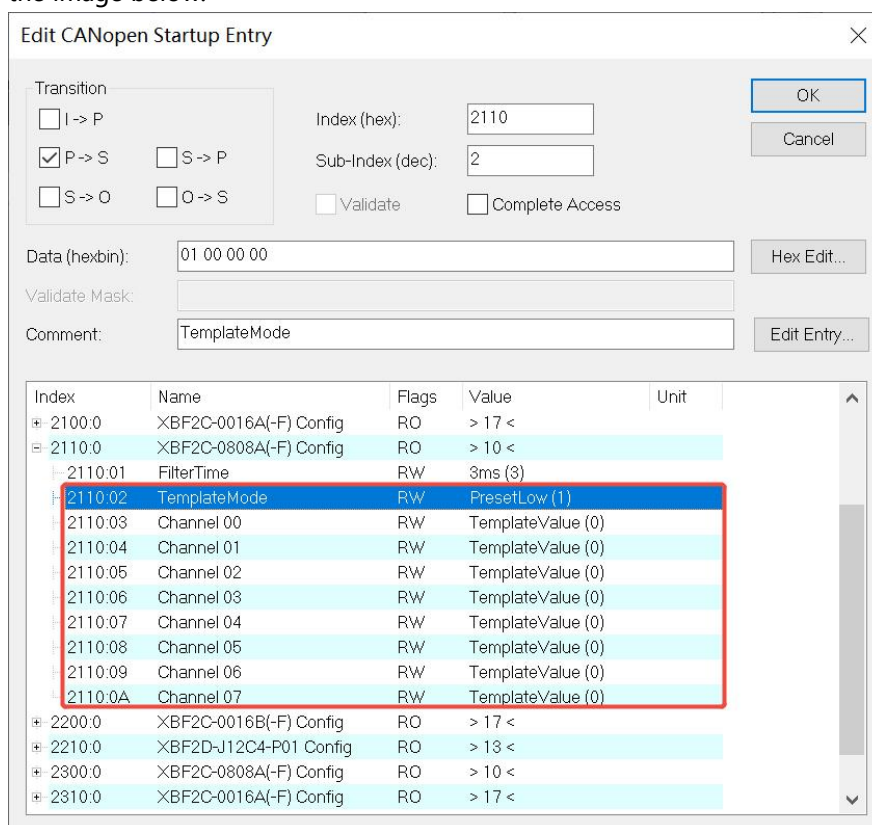
Buttons: OK, Cancel, Hex Edit..., Edit Entry...

Index	Name	Flags	Value	Unit
2100:0	XBF2C-0016A(-F) Config	RO	> 17 <	
2110:0	XBF2C-0808A(-F) Config	RO	> 10 <	
2110:01	FilterTime	RW	3ms (3)	
2110:02	TemplateMode	RW	PresetLow (1)	
2110:03	Channel 00	RW	TemplateValue (0)	
2110:04	Channel 01	RW	TemplateValue (0)	
2110:05	Channel 02	RW	TemplateValue (0)	
2110:06	Channel 03	RW	TemplateValue (0)	
2110:07	Channel 04	RW	TemplateValue (0)	
2110:08	Channel 05	RW	TemplateValue (0)	
2110:09	Channel 06	RW	TemplateValue (0)	
2110:0A	Channel 07	RW	TemplateValue (0)	
2200:0	XBF2C-0016B(-F) Config	RO	> 17 <	
2210:0	XBF2D-J12C4-P01 Config	RO	> 13 <	
2300:0	XBF2C-0808A(-F) Config	RO	> 10 <	
2310:0	XBF2C-0016A(-F) Config	RO	> 17 <	

- c. The digital input filtering time FilterTime can be set from 0 to 20ms. Double-click "Filter Time" and modify the parameter value in the drop-down box, as shown in the figure below.



- d. The digital output signal clear/hold function is preset to output clear mode for all channels by default. Module channels can be configured individually; see the corresponding relationship below. [6.1.2 Clearing/Holding Digital Output Signals](#) After configuration, click "OK", as shown in the image below.



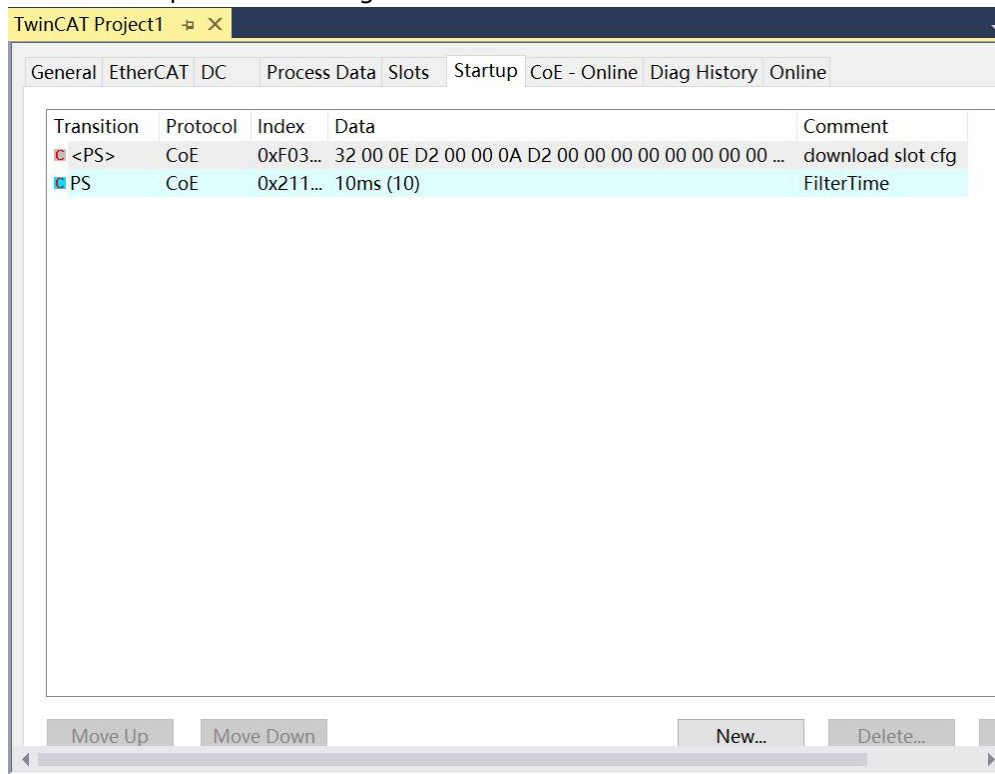
- e. For example, to modify the baud rate configuration parameter, click the "+" in front of Index 5F00:0 to expand the configuration parameter menu, as shown in the figure below.

Index	Name	Flags	Value	Unit
1C33:0	SM input parameter		> 32 <	
2000:0	XBF2C-1600(-F) Config	RO	> 1 <	
2010:0	XBF2C-0016B(-F) Config	RO	> 17 <	
2100:0	XBF2C-0016A(-F) Config	RO	> 17 <	
2110:0	XBF2C-0808A(-F) Config	RO	> 10 <	
2200:0	XBF2C-0016B(-F) Config	RO	> 17 <	
2210:0	XBF2D-J12C4-P01 Config	RO	> 13 <	
2300:0	XBF2C-0808A(-F) Config	RO	> 10 <	
2310:0	XBF2C-0016A(-F) Config	RO	> 17 <	
5F00:0	Bus Feature	RW	> 5 <	
5F00:01	BusFault Communication Configuration	RW	0x00000000 (0)	
5F00:02	Bus Communication CycleTime Min	RO	0x00000000 (0)	
5F00:03	Bus Communication CycleTime Max	RO	0x00000000 (0)	
5F00:04	Bus Communication CycleTime Current	RO	0x00000000 (0)	
5F00:05	Bus Baud Rate	RW	6MHz (6000000)	
F030:0	Configured Module Ident List	RW	> 0 <	

- f. The Bus Baud Rate can be set to 6MHz, 3MHz, 1MHz, or 115200Hz. Double-click "Bus Baud Rate" and modify the parameter value in the drop-down box, as shown in the figure below.

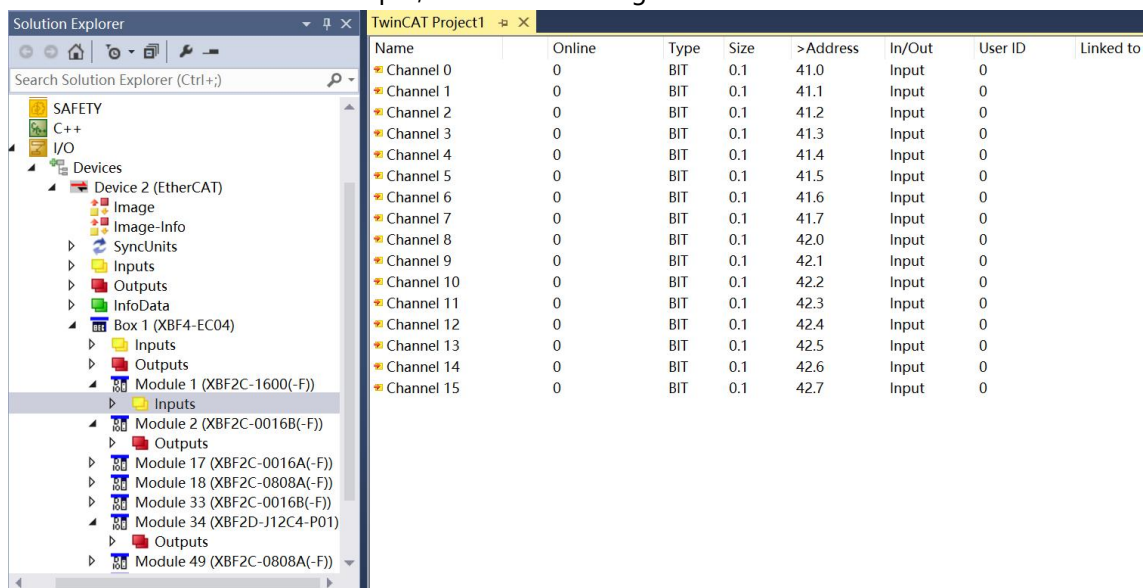
Index	Name	Flags	Value	Unit
1C33:0	SM input parameter		> 32 <	
2000:0	XBF2C-1600(-F) Config	RO	> 1 <	
2010:0	XBF2C-0016B(-F) Config	RO	> 17 <	
2100:0	XBF2C-0016A(-F) Config	RO	> 17 <	
2110:0	XBF2C-0808A(-F) Config	RO	> 10 <	
2200:0	XBF2C-0016B(-F) Config	RO	> 17 <	
2210:0	XBF2D-J12C4-P01 Config	RO	> 13 <	
2300:0	XBF2C-0808A(-F) Config	RO	> 10 <	
2310:0	XBF2C-0016A(-F) Config	RO	> 17 <	
5F00:0	Bus Feature	RW	> 5 <	
5F00:01	BusFault Communication Configuration	RW	0x00000000 (0)	
5F00:02	Bus Communication CycleTime Min	RO	0x00000000 (0)	
5F00:03	Bus Communication CycleTime Max	RO	0x00000000 (0)	
5F00:04	Bus Communication CycleTime Current	RO	0x00000000 (0)	
5F00:05	Bus Baud Rate	RW	6MHz (6000000)	
F030:0	Configured Module Ident List	RW	> 0 <	

- g. After modifying the parameters, you can see the modified parameter items and values below Startup, as shown in the image below. After setting the parameters, a Reload operation and a power-on restart of the module are required to enable the main station to automatically distribute the parameter settings.

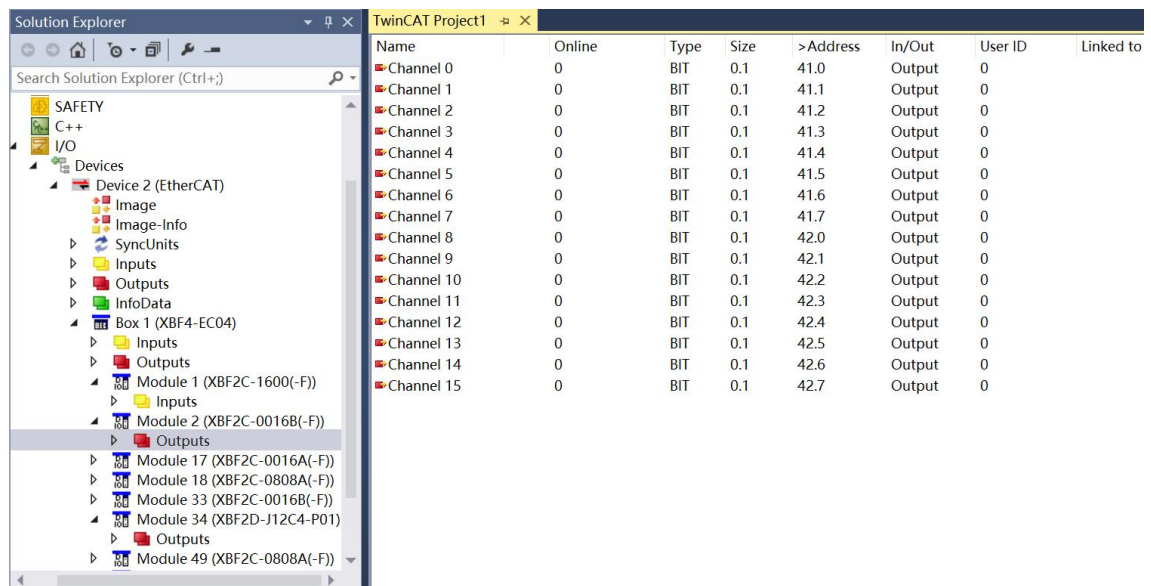


6. Verify basic functions

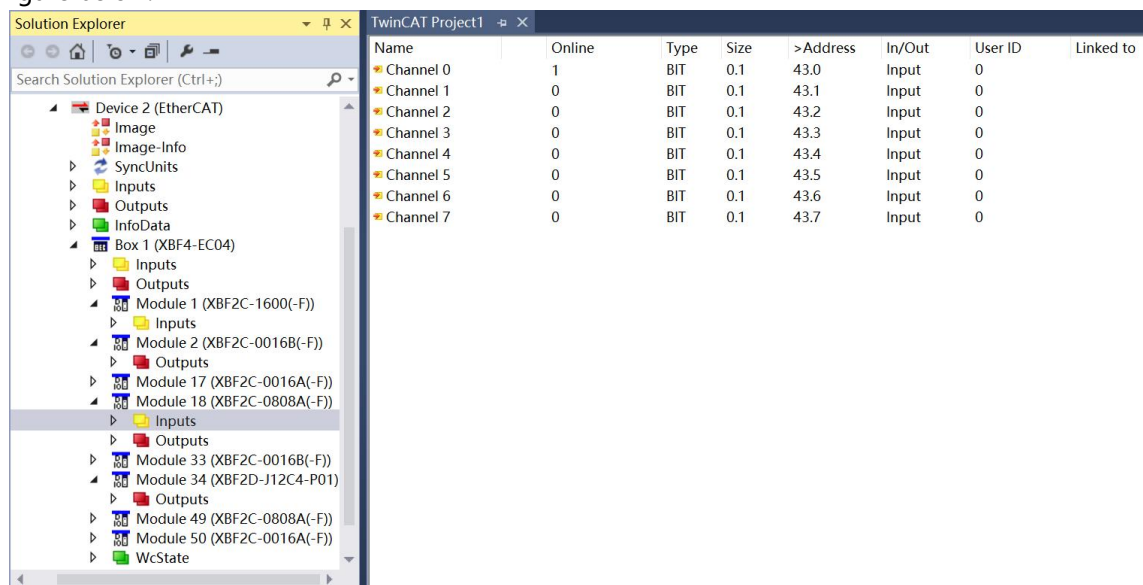
- a. The left-hand navigation tree "Module -> Inputs" displays the upstream data of the module, used to monitor the module's input, as shown in the figure below.



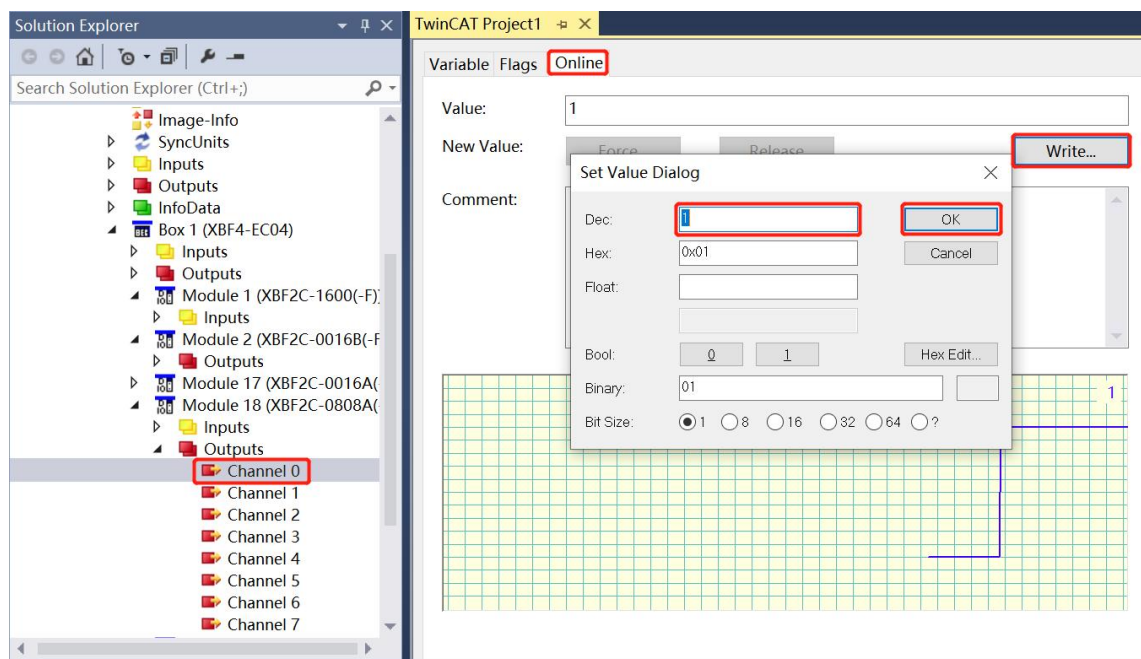
- b. The left-hand navigation tree "Module 1 -> Outputs" displays the module's downstream data, which is used to control the module's output, as shown in the figure below.



- c. Taking channel 0 of Module18 (XBF2C-0808A-F) as an example, if there is a valid voltage input to input channel 0 of this module, it can be observed in "Module18 -> Inputs", as shown in the figure below.



- d. Taking channel 0 of Module18 (XBF2C-0808A-F) as an example, if you want the digital output channel 0 of this module to output, you can click Channel 0 in "Module18 -> Outputs", click "Write" in the corresponding "Online" field, and enter the value "1" in the "Dec" field of the corresponding dialog box. You can then see the corresponding channel light on the module, as shown in the figure below.



6.3.2 Applications in the Sysmac Studio software environment

1、Preparation

- **Hardware environment**

- **Module preparation:** This instruction uses the XBF4-EC04+{Coupler Interface 0: XBF2C-1600-F+XBF2C-0016B-F}+{Coupler Interface 1: XBF2C-0016A-F+XBF2C-0808A-F}+{Coupler Interface 2: XBF2C-0016B-F+XBF2D-J12C4-P01}+{Coupler Interface 3: XBF2C-0808A-F+XBF2C-0016A-F} topology as an example.
- **One computer, pre-installed with Sysmac Studio software.**
- **This instruction manual uses one Omron PLC, model NJ301-1100, as an example.**
- **EtherCAT dedicated shielded cable**
- **One switching power supply**
- **Device configuration file**

Configuration file retrieval address:

<https://www.solidotech.com/cn/resources/configuration-files>

- **Hardware configuration and wiring**

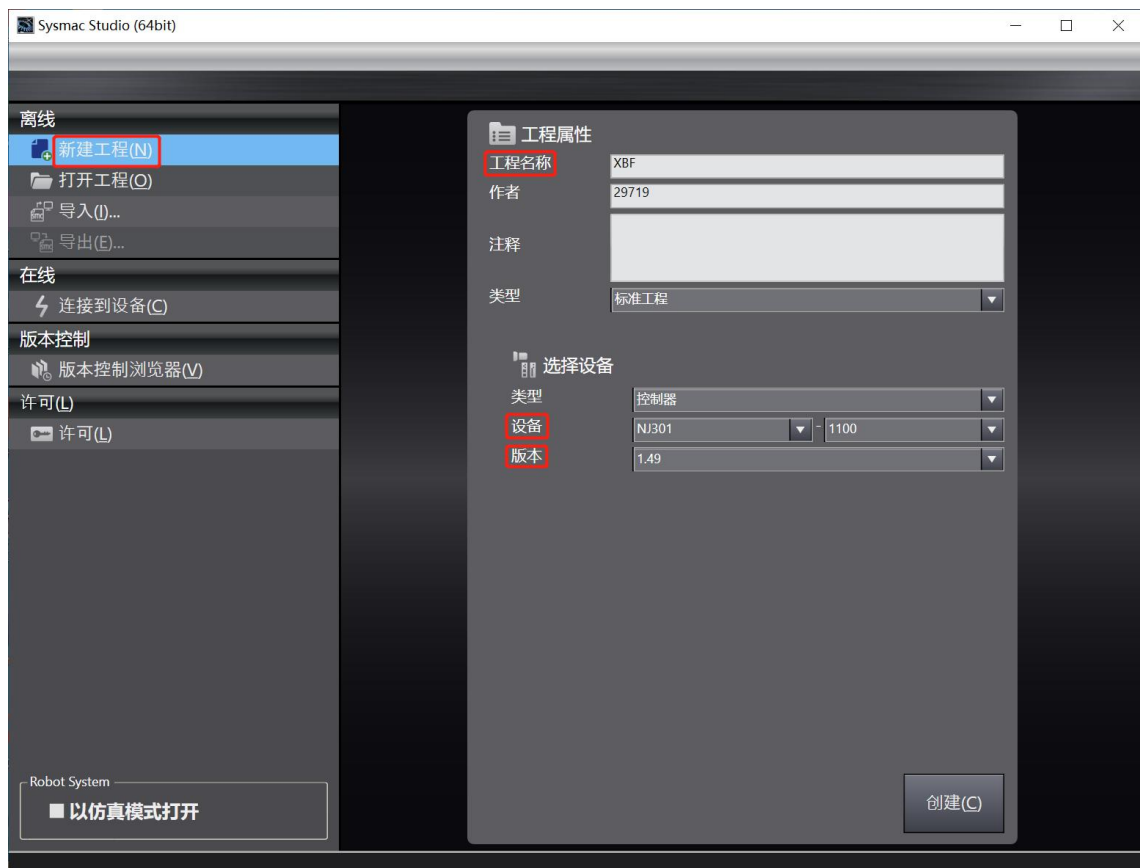
Please follow the instructions [4 Installation and Removal](#) and [5. Wiring](#) "Required Operation"

- **Computer IP Requirements**

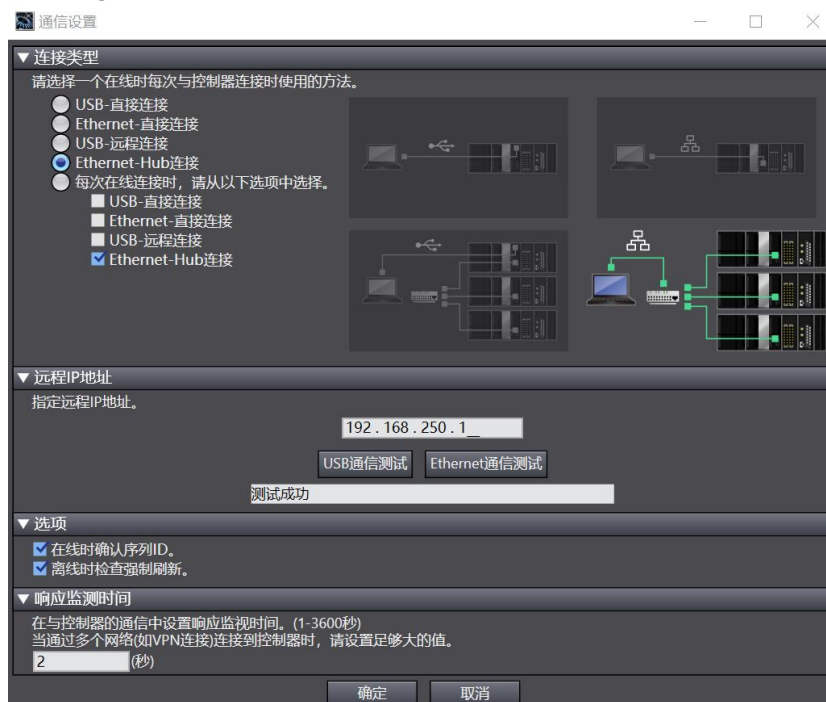
Configure the computer's IP address and the PLC's IP address to ensure they are on the same network segment.

2、New construction projects

- a. Open Sysmac Studio and click "New Project".



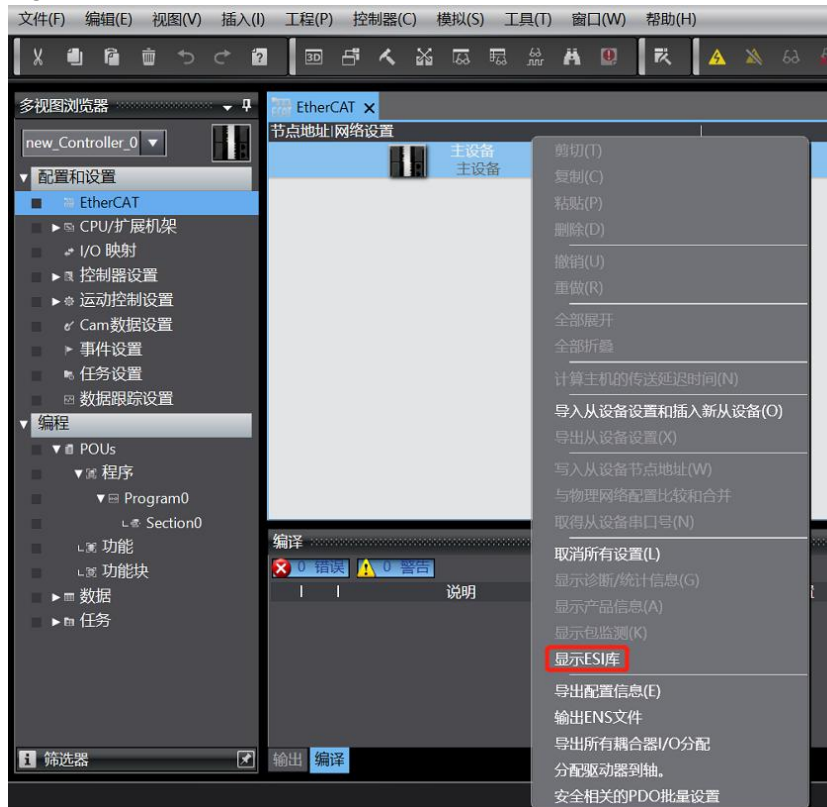
- Project Name: Custom.
 - Select Device: Select the corresponding PLC model for "Device" and select the corresponding version number for "Version".
- b. After entering the project properties, click "Create".
- c. Click "Controller -> Communication Settings" in the menu bar, select the method to use each time you connect to the controller when online, and enter the "Remote IP Address", as shown in the figure below.



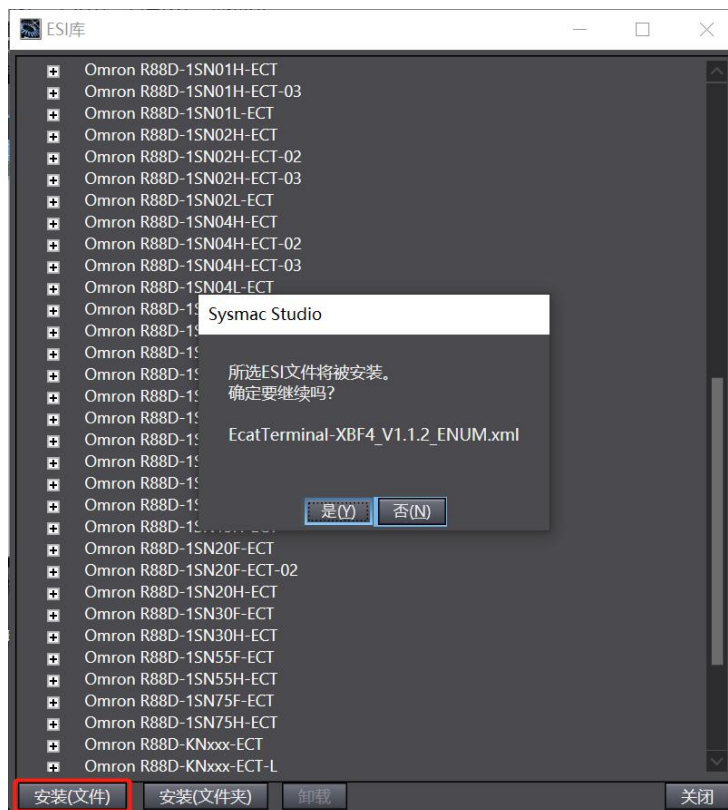
- d. Click "Ethernet Communication Test", and the system displays that the test was successful.

3. Install XML file

- a. Expand "Configuration and Settings" in the left navigation tree and double-click "EtherCAT".
- b. Right-click "Master Device" and select "Show ESI Libraries", as shown in the figure below.



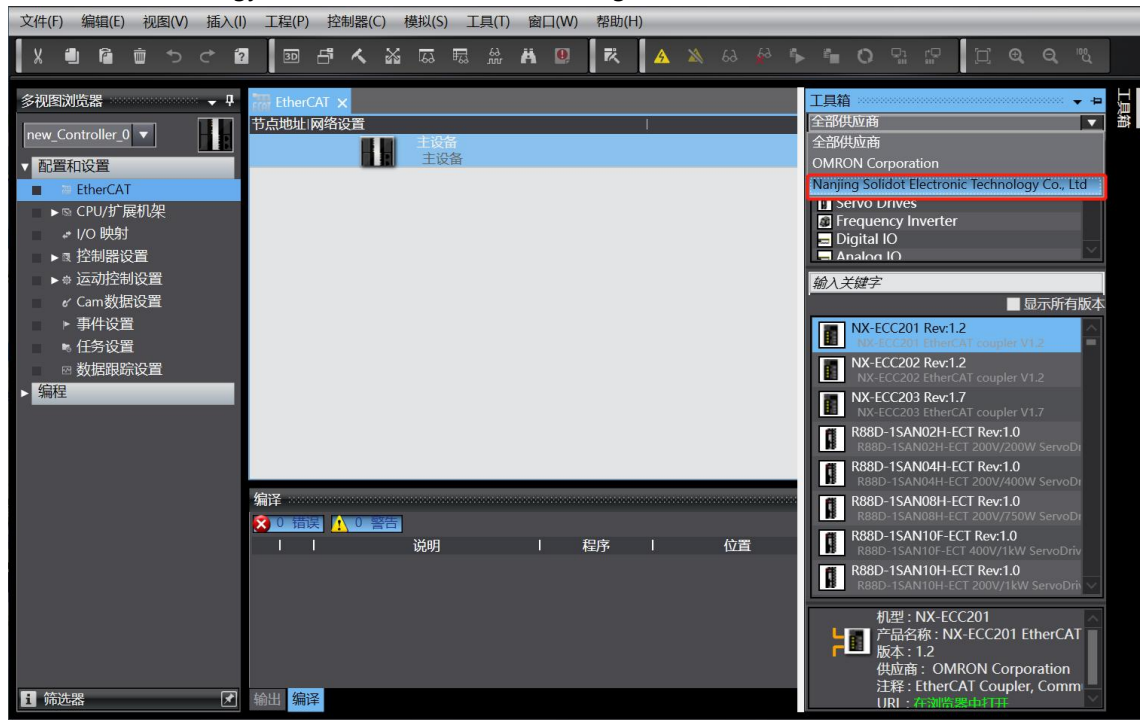
- c. In the pop-up "ESI Library" window, click "Install (File)", select the XML file path of the module, and click "Yes" to complete the installation, as shown in the figure below.



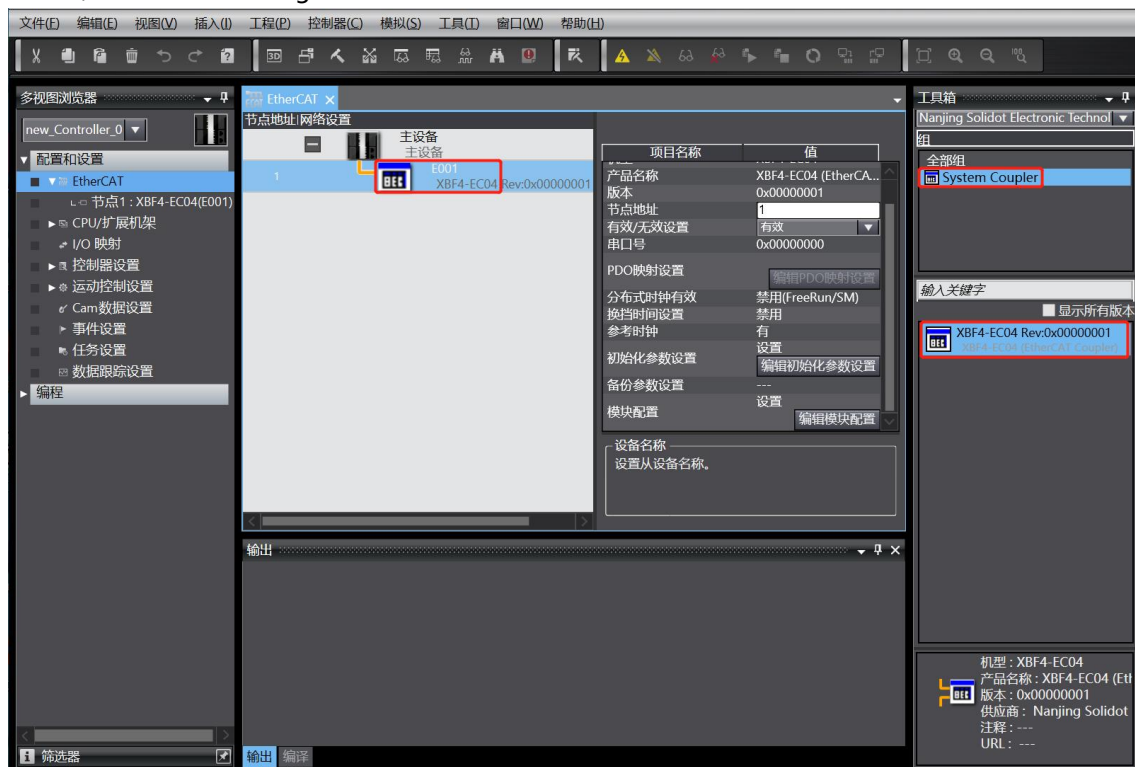
4. Add device

There are two ways to add a device: online scanning and offline addition. This guide will use offline addition as an example.

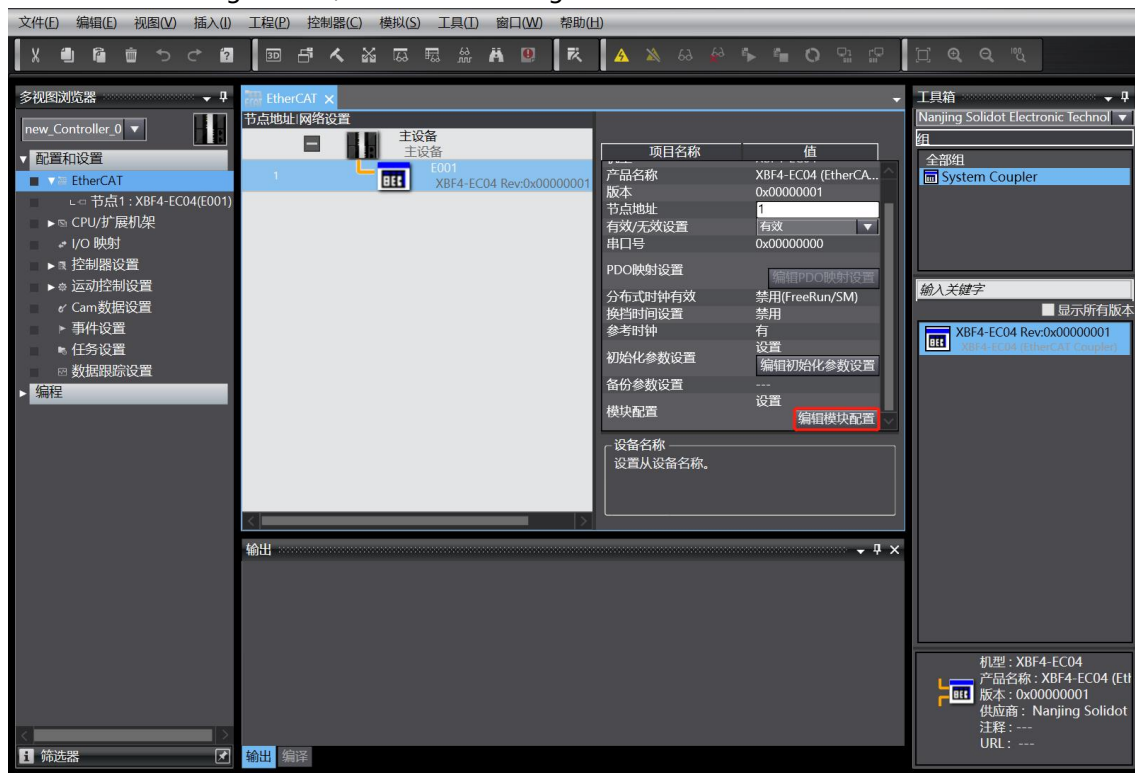
- a. In the "Toolbox" section on the right, click to expand all suppliers and select "Nanjing Solidot Electronic Technology Co., Ltd.", as shown in the image below.



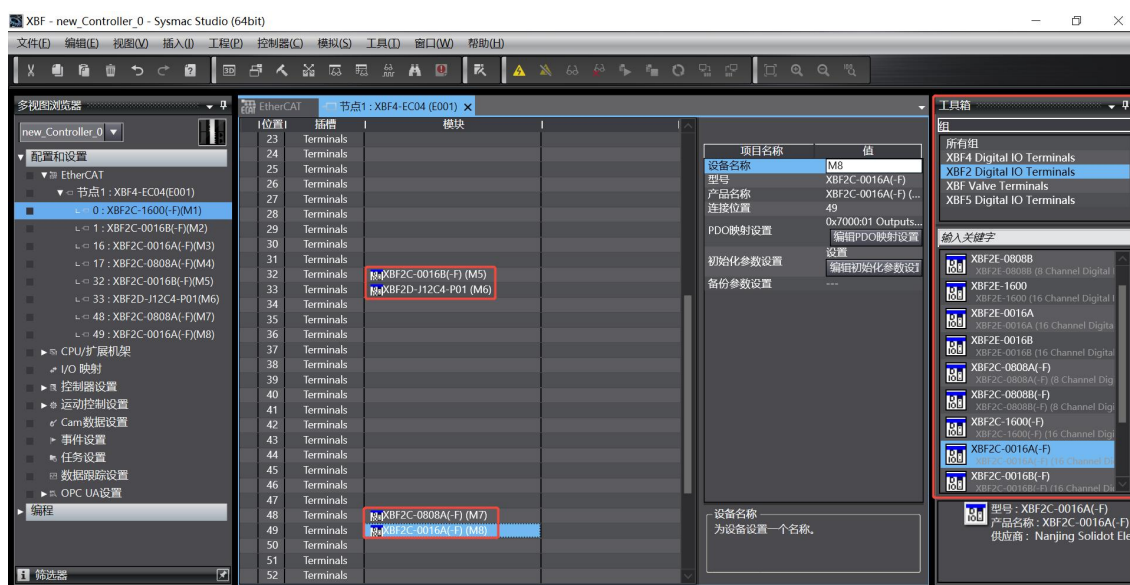
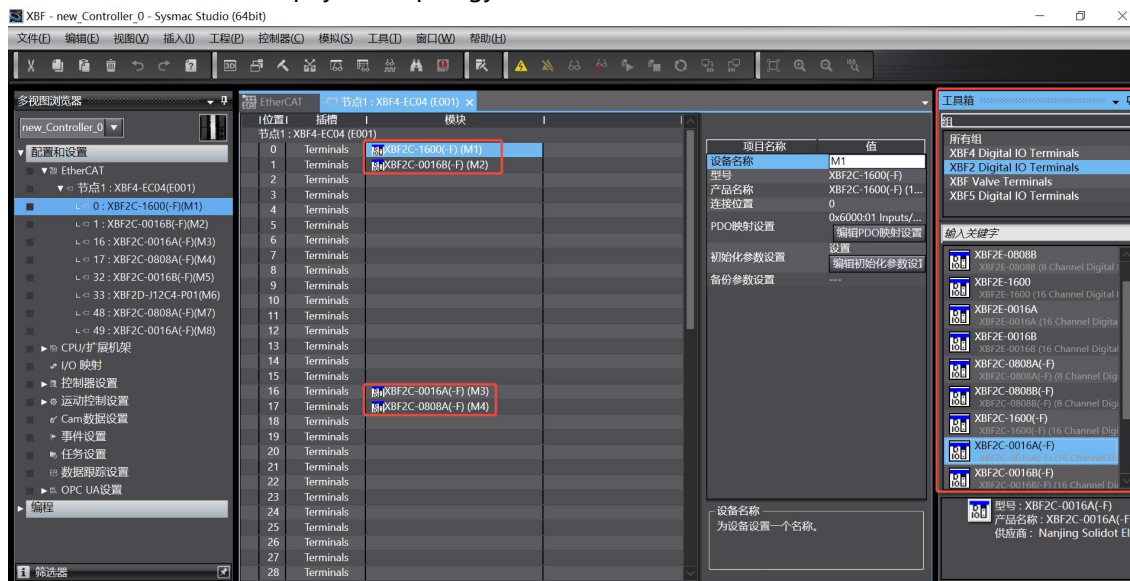
- b. Click to select System Coupler, double-click the XBF4-EC04 coupler module, and add a slave device, as shown in the figure below.



- c. On the EtherCAT main page, select the newly added XBF4-EC04 coupler module and choose "Edit Module Configuration", as shown in the figure below.



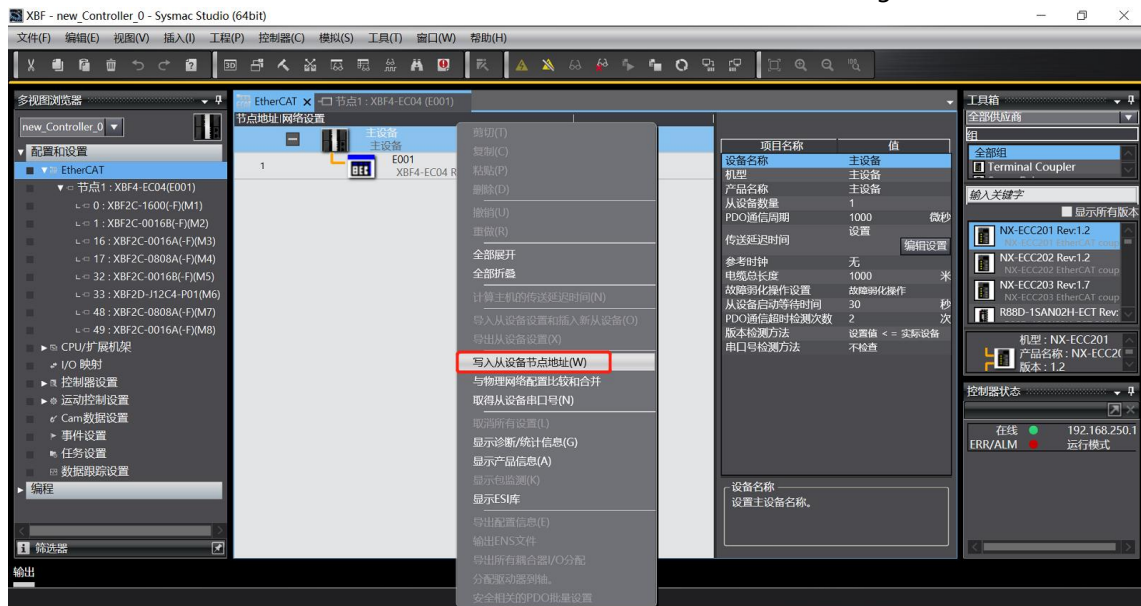
- d. Position the cursor in "Modules," then click on a module in the toolbox list on the right. Add I/O modules one by one, following the order of their configuration. Note: The order and model number must match the physical topology!



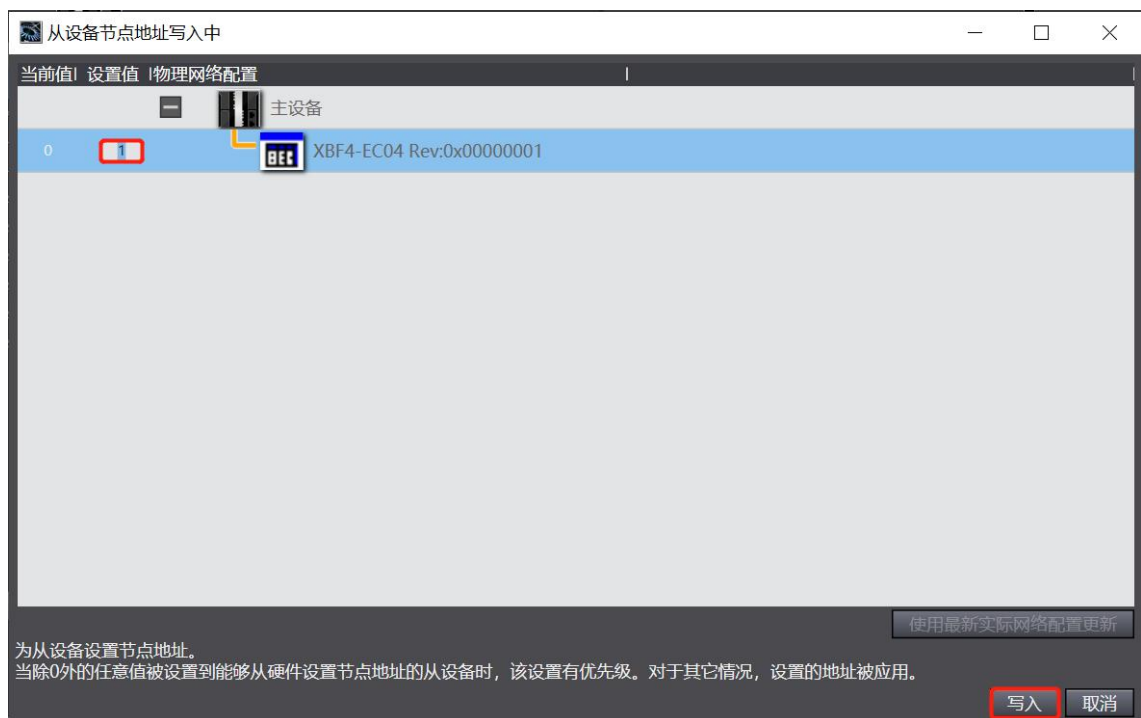
Note: Slave module slot location: Slave module connection coupler corresponding expansion network port number $\times 16$ + slave module DIP switch number;
 For example: XBF2C-1600-F(M1): $0 \times 16 + 0 = 0$ -- Terminals 0;
 XBF2C-0016B-F(M2): $0 \times 16 + 1 = 1$ -- Terminals 1;
 XBF2C-0016A-F(M3): $1 \times 16 + 0 = 16$ -- Terminals 16.

5. Set node address

- a. Click "Controller -> Online" in the menu bar to switch the controller to online status. Right-click the master device and select "Write Slave Node Address", as shown in the figure below.



- b. In the window for setting the node address, click the value under Setting Value, enter the node address, and click "Write" to change the slave device node address, as shown in the figure below.

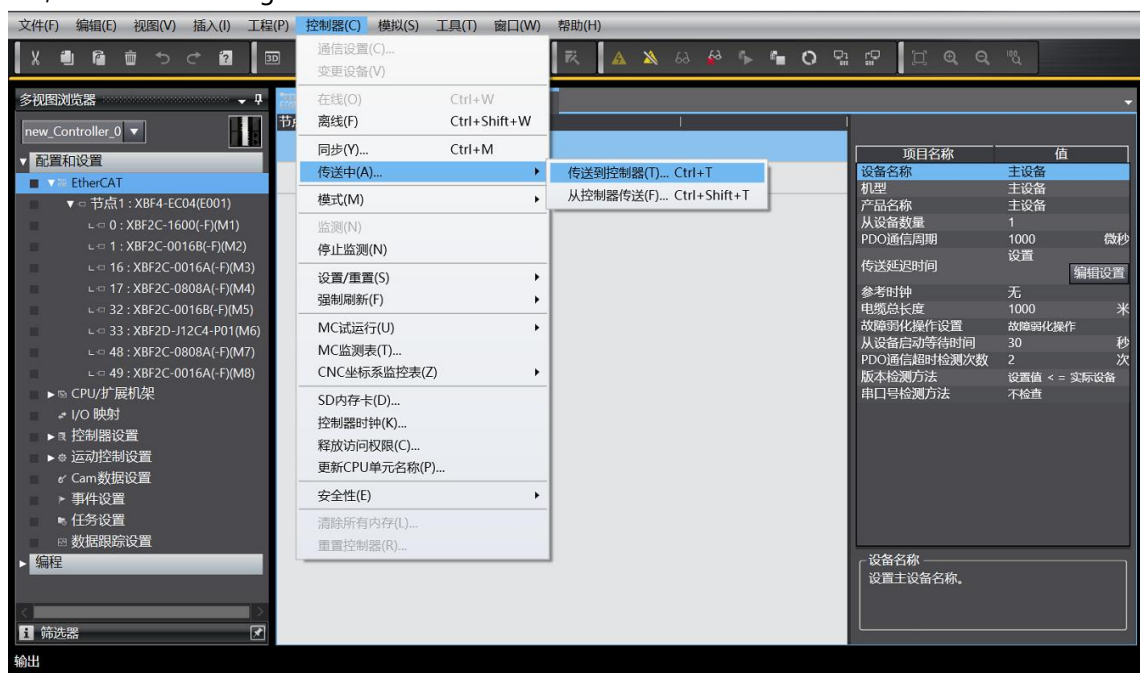


- c. After writing, a power-on prompt will appear as shown in the image below. Click "Write" and then restart the slave device power as prompted.

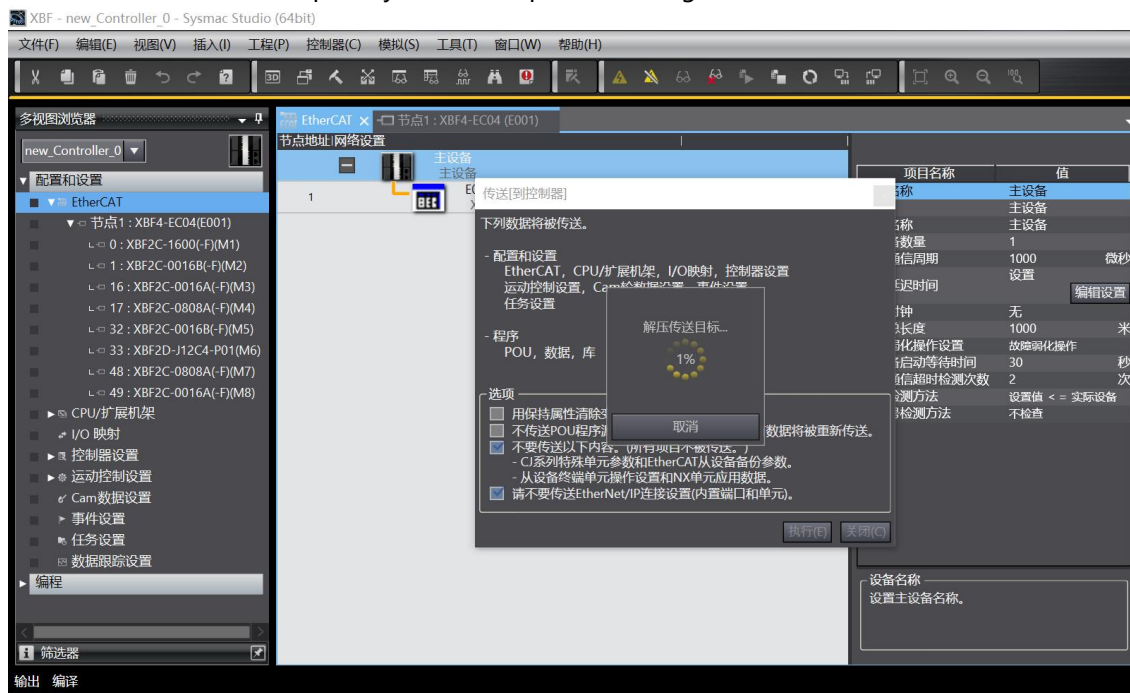


6. Download the configuration to the PLC

- a. Click the "Controller -> Transmitting (A) -> Transmitting to Controller (T)" button in the menu bar, as shown in the figure below.

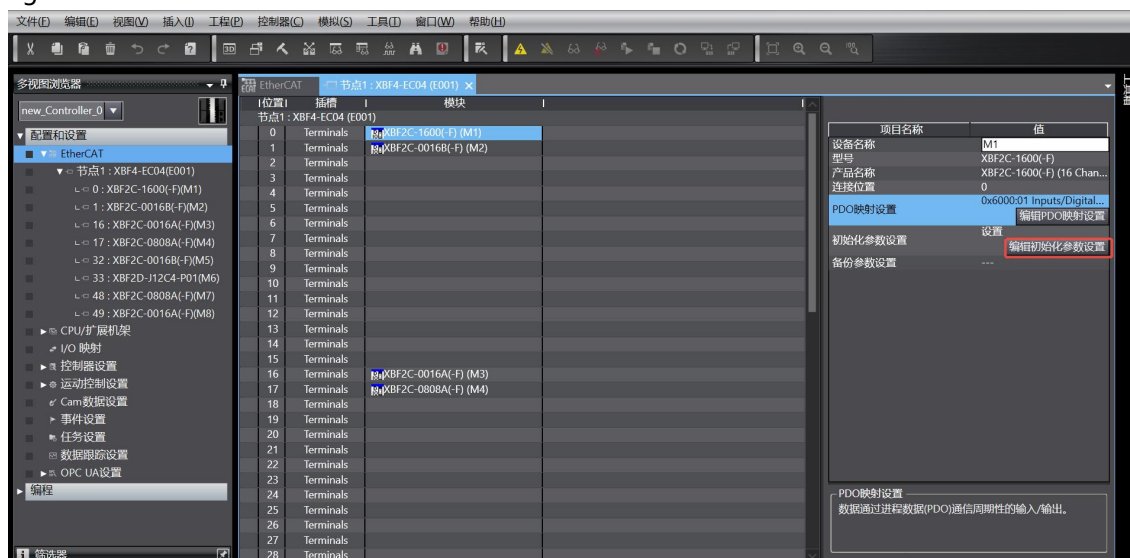


- b. Download the configuration to the PLC. A confirmation window will pop up. Click "Execute". In the subsequent pop-up windows, click "Yes/OK" in sequence, as shown in the figure below. After the download is complete, you need to power it on again.



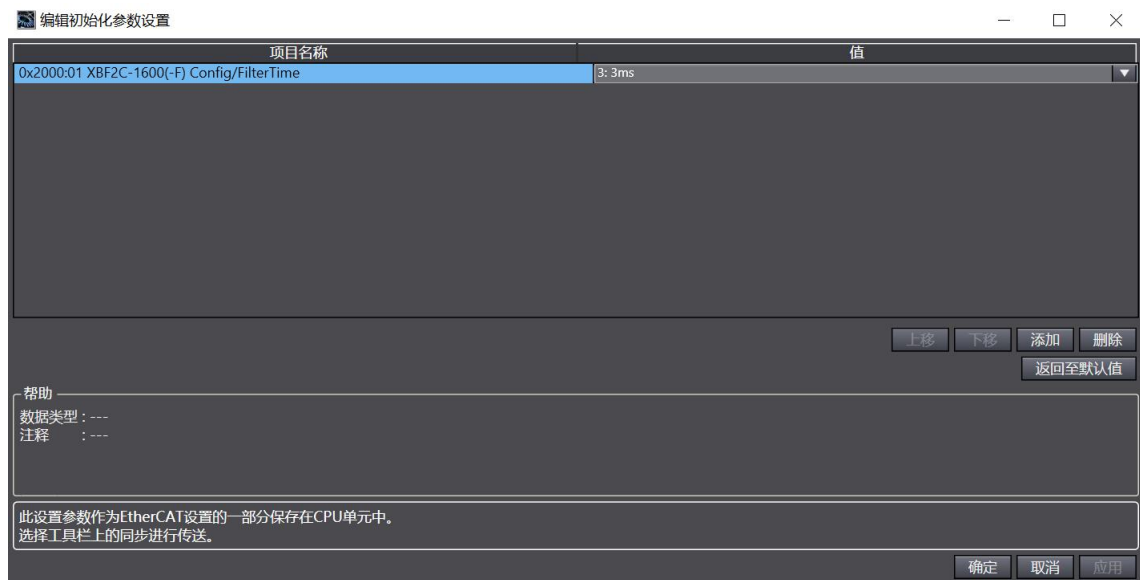
7. Parameter settings

- a. Switch the configuration to offline mode. On the module configuration page of node 1, select the XBF2C-1600-F module and click "Edit Initialization Parameter Settings", as shown in the figure below.

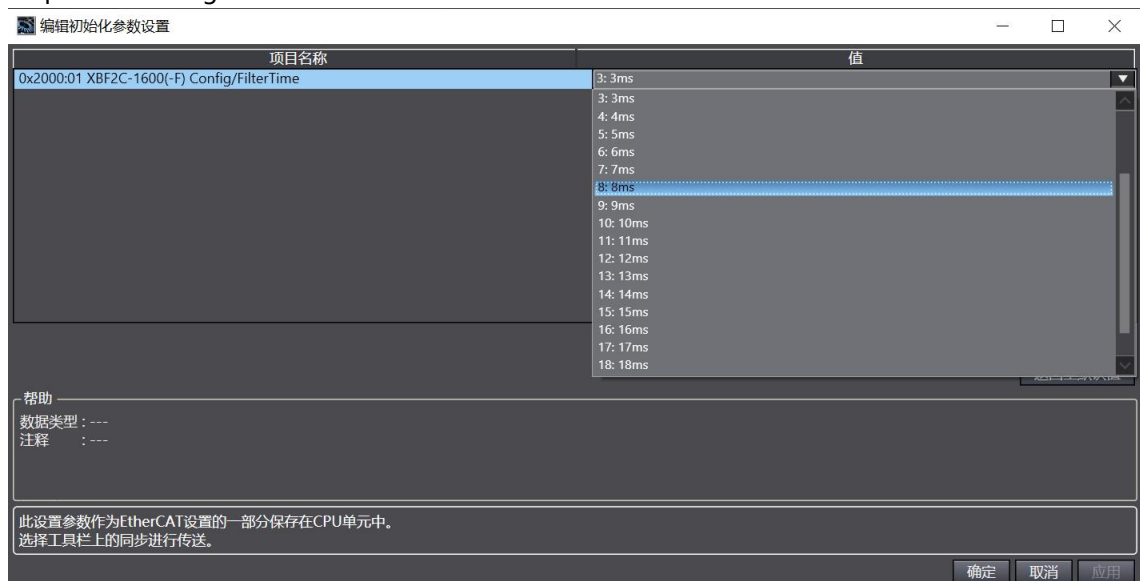


Note: If the PLC firmware version is too low, so the EC_CoESDOWrite and EC_CoESDORRead instructions are needed to write and read the SDO address.

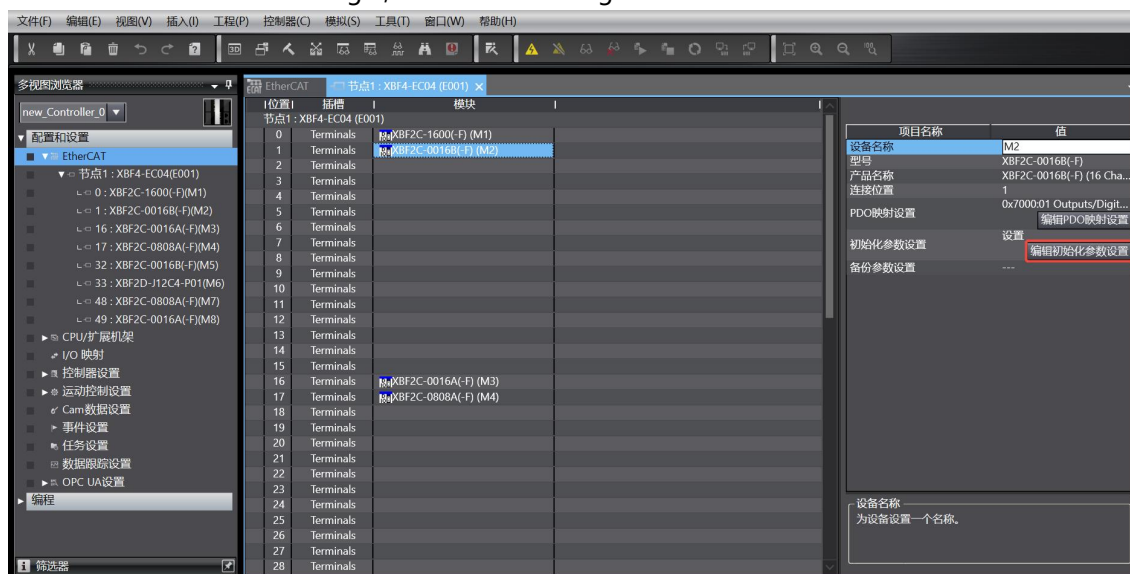
- b. existThe XBF2C-1600-F parameter settings page allows you to configure digital input filtering, as shown in the figure below.



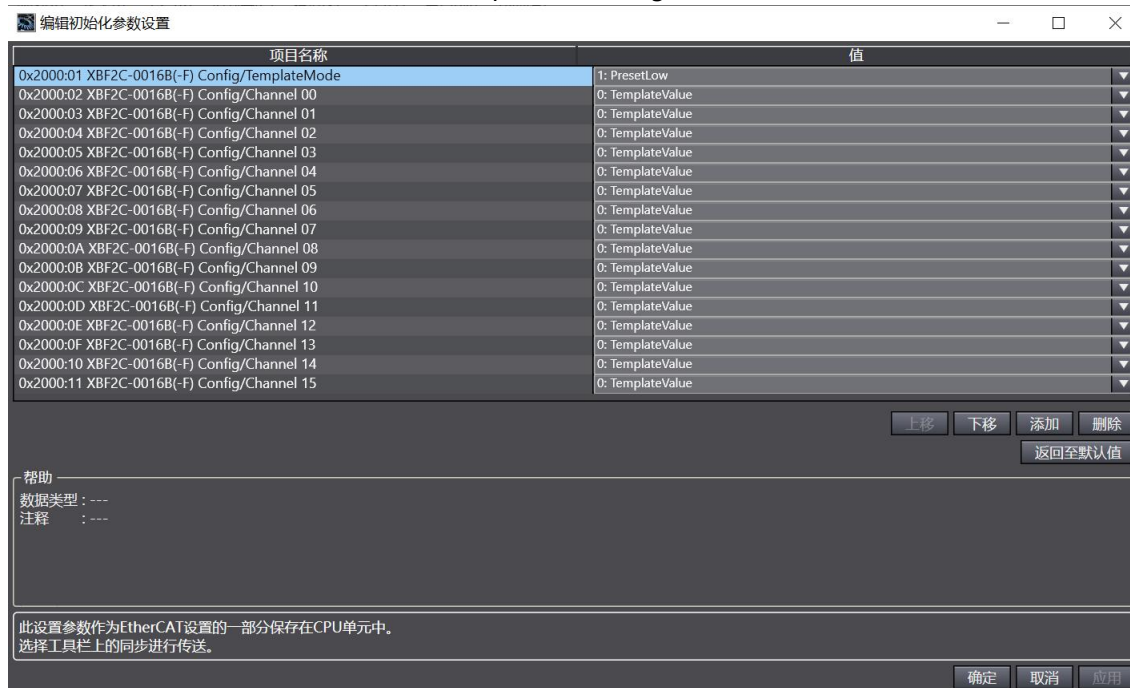
- c. The digital input filtering time (FilterTime) can be set from 0 to 20ms. After configuration, click "Apply" and then "OK," as shown in the image below. After all parameters are configured, the program needs to be downloaded to the PLC again, and both the PLC and the module need to be powered on again.



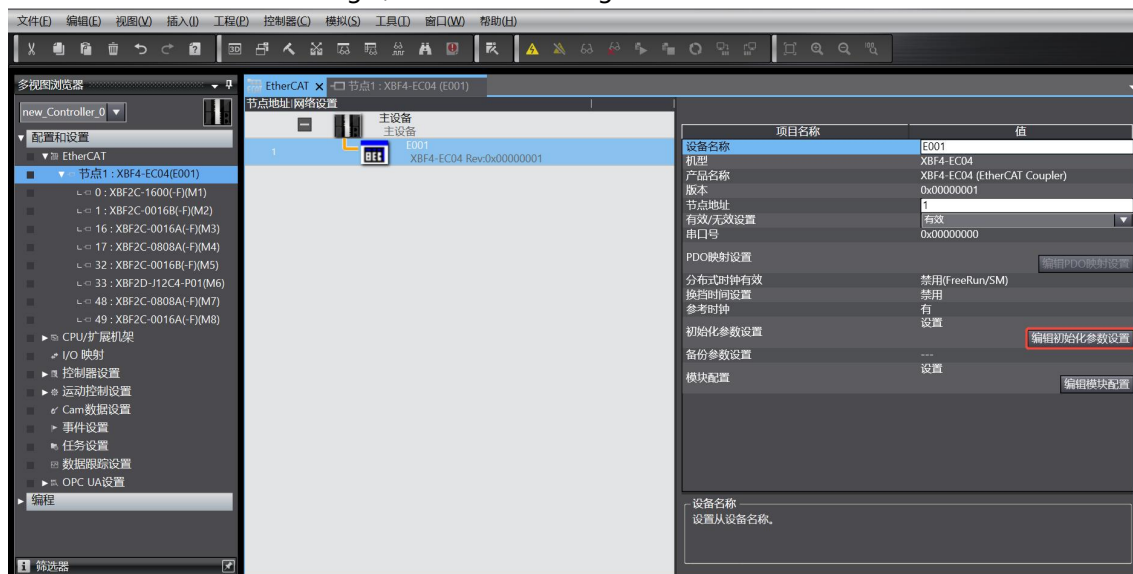
- d. On the module configuration page of node 1, select the XBF2C-0016B-F module and click "Edit Initialization Parameter Settings", as shown in the figure below.



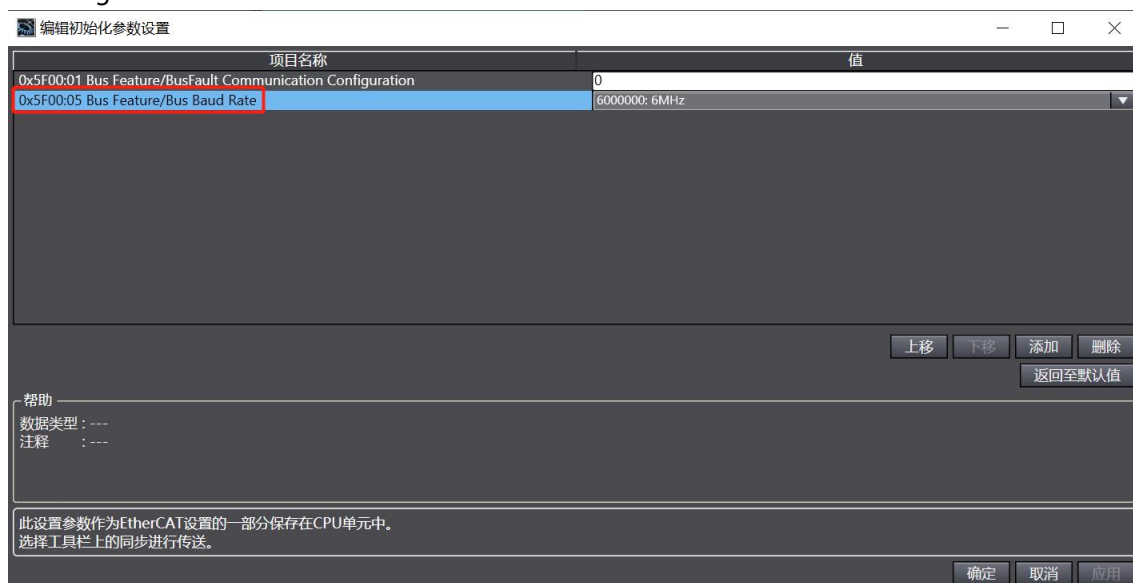
- e. On the XBF2C-0016B-F parameter settings page, you can configure the output signal clear/hold function. The default setting for all channels is output clear mode. Individual module channels can be configured; see the corresponding information for details. [6.1.2 Clearing/Holding Digital Output Signals](#) After configuration, click "Apply" and then "OK", as shown in the image below. After all parameters are configured, the program needs to be downloaded to the PLC again, and both the PLC and module need to be powered on again.



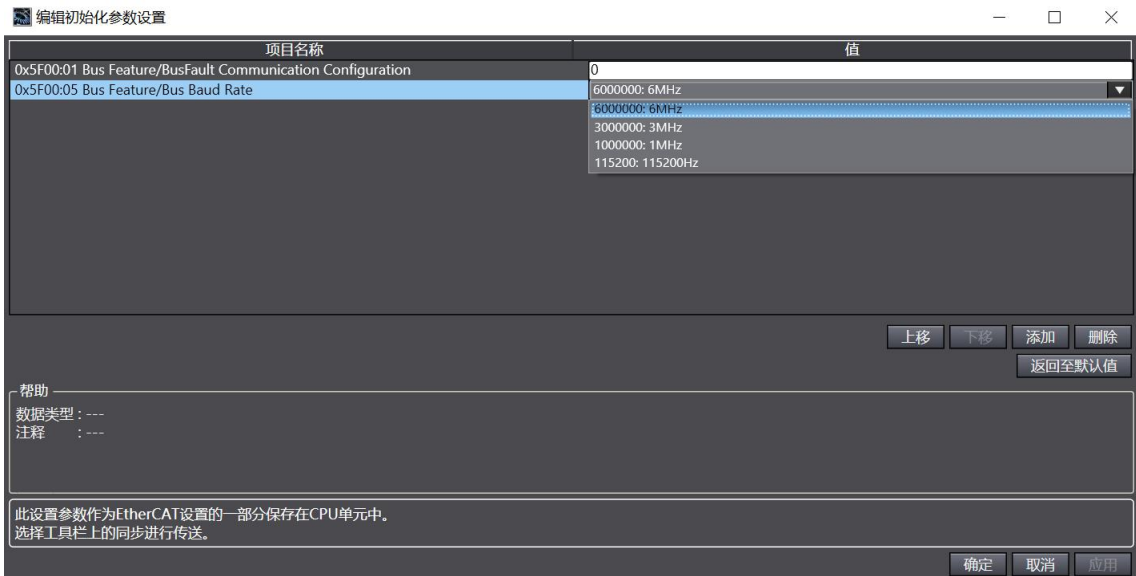
- f. On the EtherCAT main page, select the XBF4-EC04 coupler module and choose "Edit Initialization Parameter Settings", as shown in the figure below.



- g. On the XBF4-EC4 coupler parameter settings page, you can configure the baud rate, as shown in the figure below.

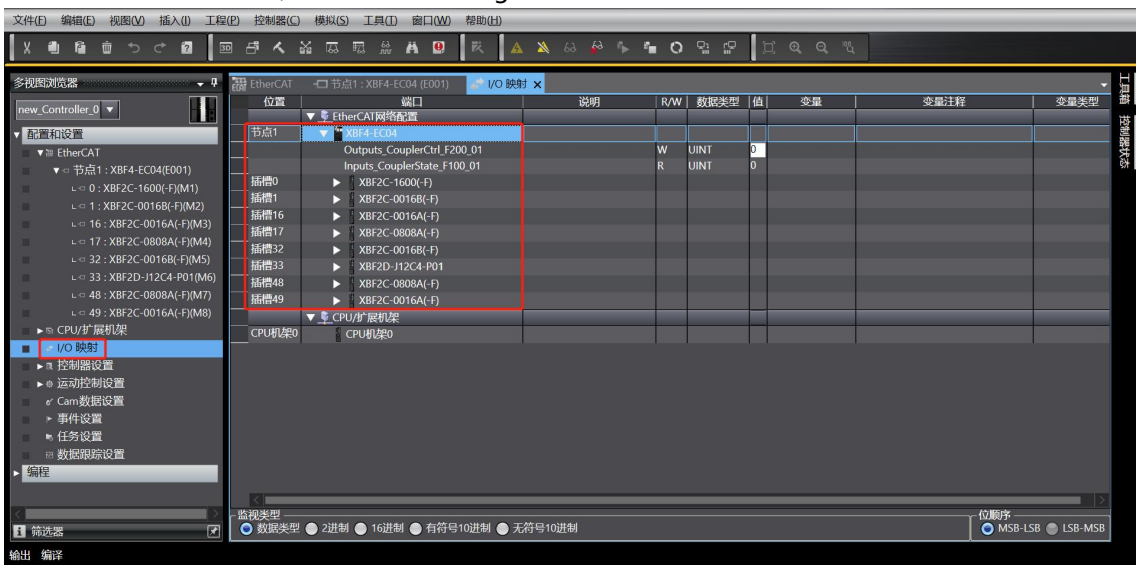


- h. The Bus Baud Rate can be set to 6MHz, 3MHz, 1MHz, or 115200Hz. After configuration, click "Apply" and then "OK," as shown in the image below. After all parameters are configured, the program needs to be downloaded to the PLC again, and both the PLC and the module need to be powered on again.

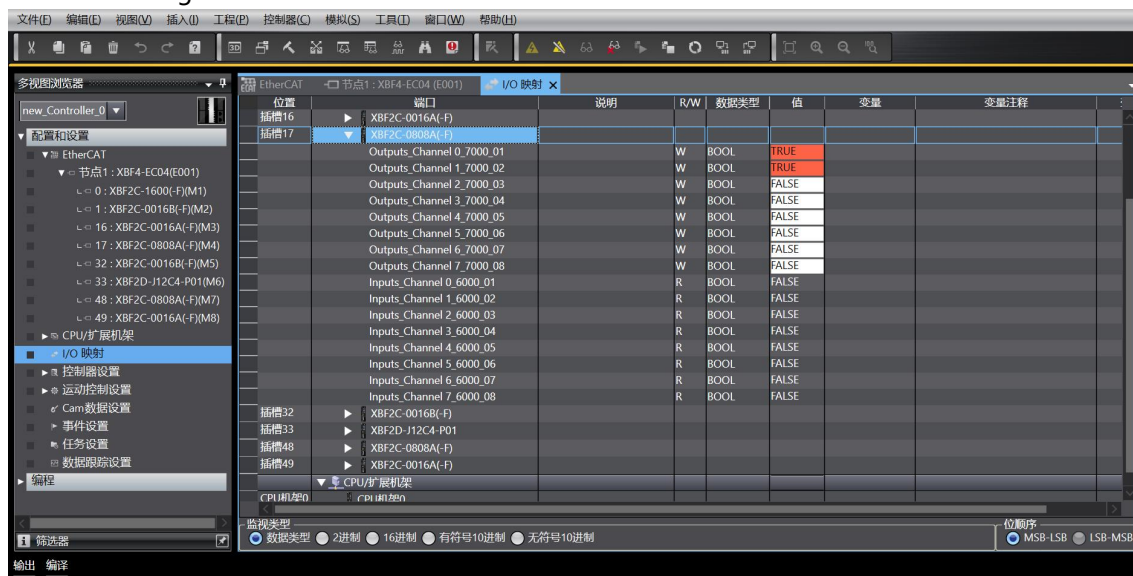


7、I/O function

- a. Double-clicking "I/O Mapping" in the left navigation tree will display the mapping table for each module in the topology, allowing you to monitor the input and output values of each channel of each module, as shown in the figure below.



- b. For example, expand the mapping table of the XBF2C-0808A-F digital modules. When an effective voltage is input to the input channel, the input value can be monitored in the mapping table; the output channel can be forced to output by modifying the channel value, as shown in the figure below.



6.4 PROFINET Coupler Configuration Application

6.4.1 Application in the TIA Portal V17 software environment

1、Preparation

- **Hardware environment**

- **Module preparation:** This instruction uses the XBF4-PN04+{Coupler Interface 0: XBF2E-1600+XBF2E-0808B}+{Coupler Interface 1: XBF2E-1600+XBF2E-0808B}+{Coupler Interface 2: XBF2E-0016B+XBF2C-0016B-F}+{Coupler Interface 3: XBF2C-0808A-F} topology as an example.
- **One computer, pre-installed with TIA Portal V17 software.**
- **One Siemens PLC is required.** This instruction manual uses the Siemens S7-1500 CPU 1511-1 PN as an example.
- **Special shielded cable**
- **One switching power supply**
- **Device configuration file**
Configuration file retrieval
address:<https://www.solidotech.com/cn/resources/configuration-files>

- **Hardware configuration and wiring**

Please follow the instructions [4 Installation and Removal](#) and [5. Wiring](#) "Required Operation"

2、New construction projects

- Open the TIA Portal V17 software, click "Create New Project", enter all the information and click the "Create" button, as shown in the figure below.



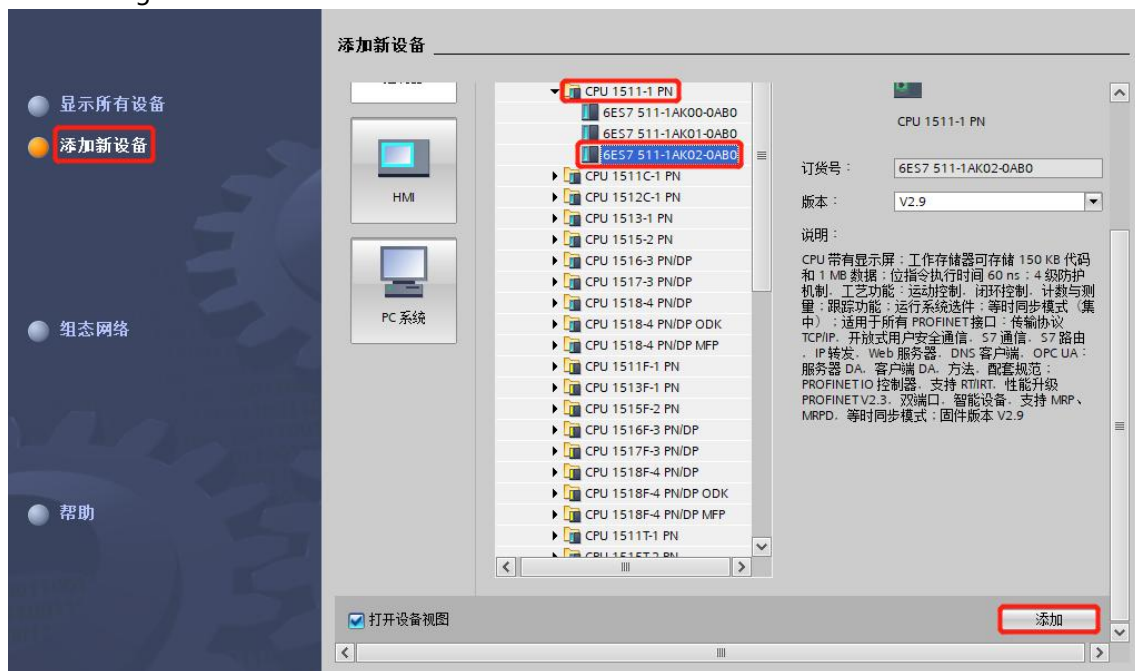
- ◆ **Project name:** Custom, you can keep the default.
- ◆ **Path:** The path where the project is saved. You can keep the default path.
- ◆ **Version:** You can keep the default.
- ◆ **Author:** You can keep the default setting.
- ◆ **Note:** This is customizable and can be left blank.

3. Add PLC controller

- a. Click "Configure Devices", as shown in the figure below.

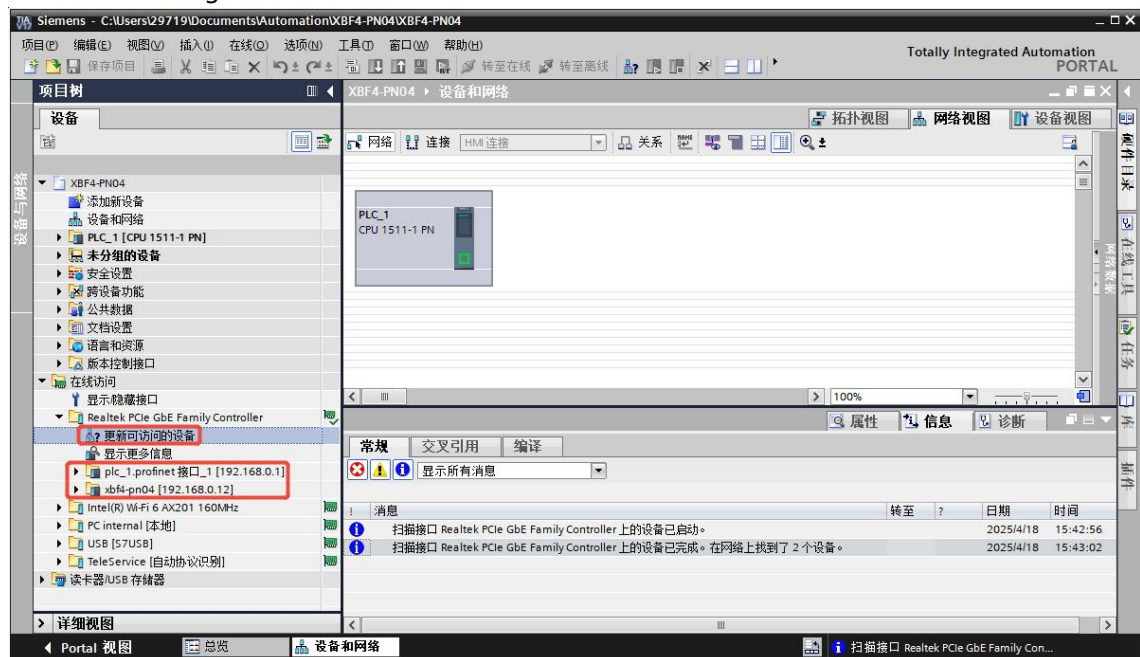


- b. Click "Add New Device", select the PLC model you are currently using, and click "Add", as shown in the image below. After adding, you can see that the PLC has been added to the device navigation tree.



4. Scan connection device

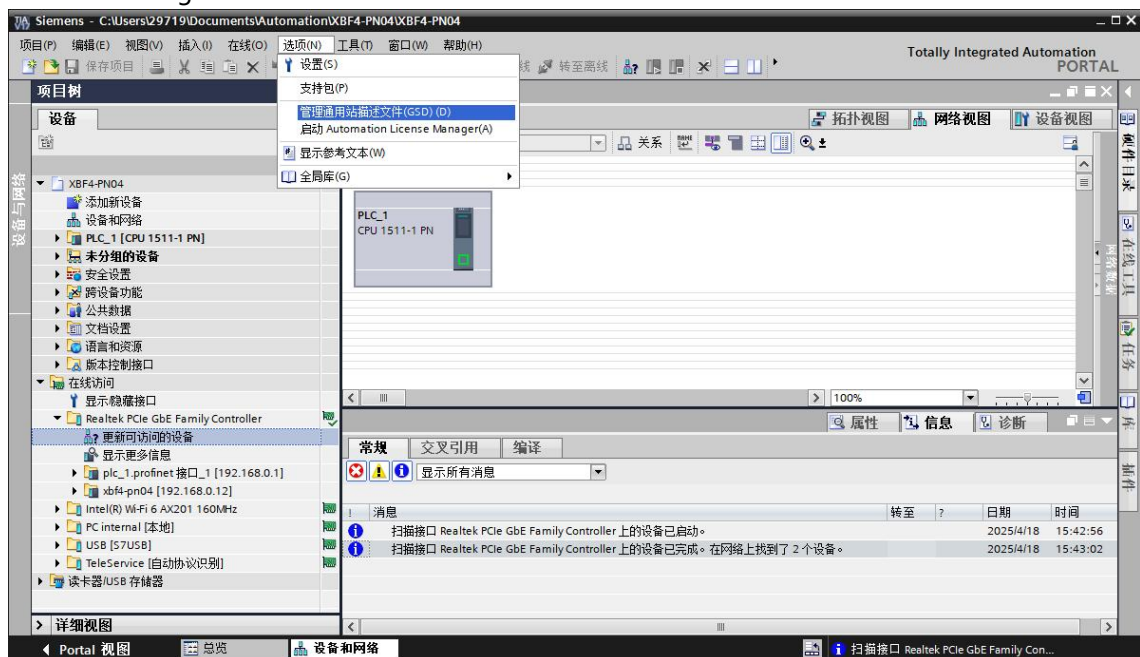
- Click "Online Access -> Update Accessible Devices" in the left navigation tree, as shown in the image below. Once the update is complete, the connected slave devices will be displayed, as shown in the image below.



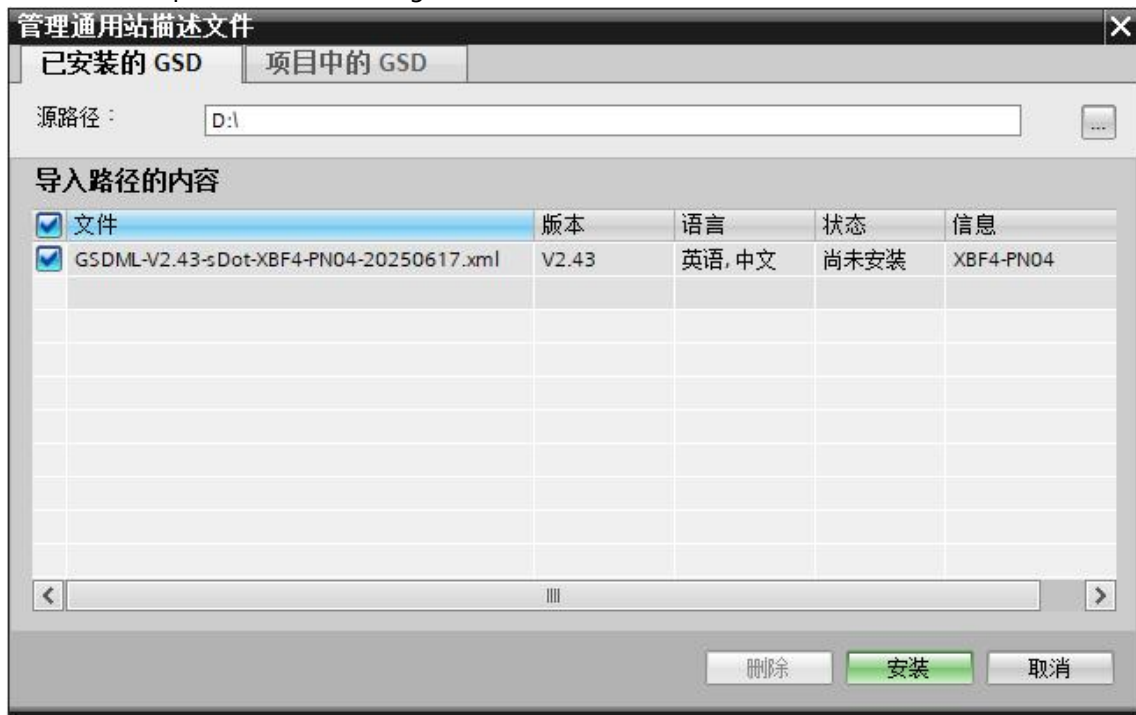
The computer's IP address must be on the same network segment as the PLC. If they are not on the same network segment, change the computer's IP address and repeat the above steps.

5. Add GSD configuration file

- In the menu bar, select "Options -> Manage Generic Station Description Files (GSDML)(D)". As shown in the figure below.

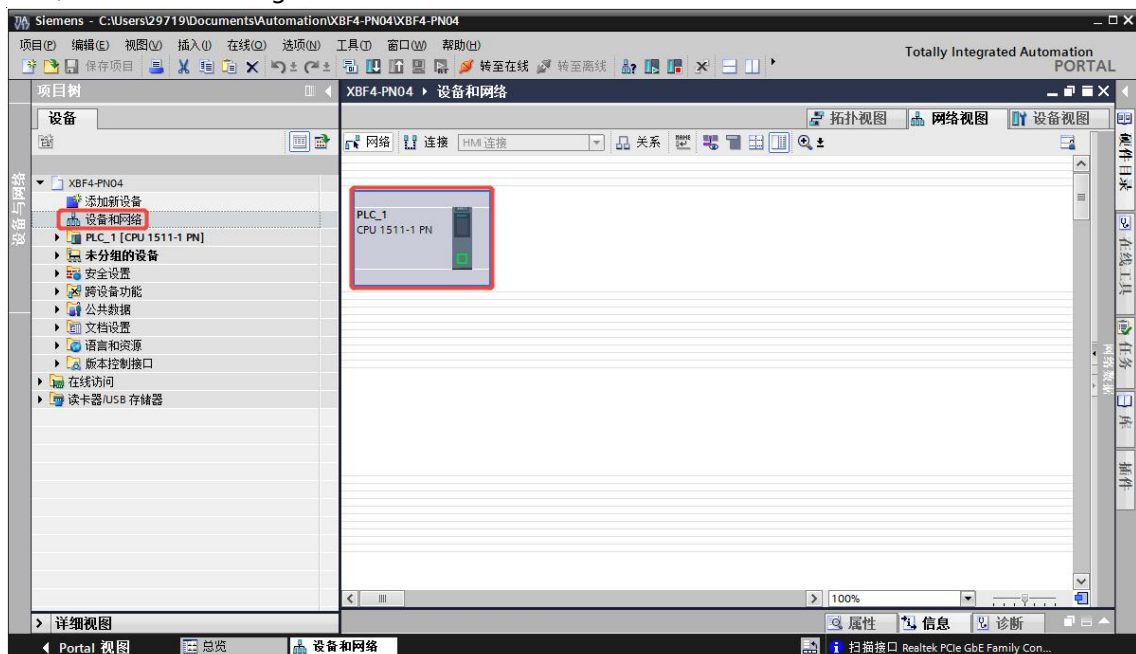


- b. Click "Source Path" to select the folder, and check if the status of the GSD file to be added is "Not Installed". If not, click the "Install" button; if already installed, click "Cancel" to skip the installation steps. As shown in the figure below.

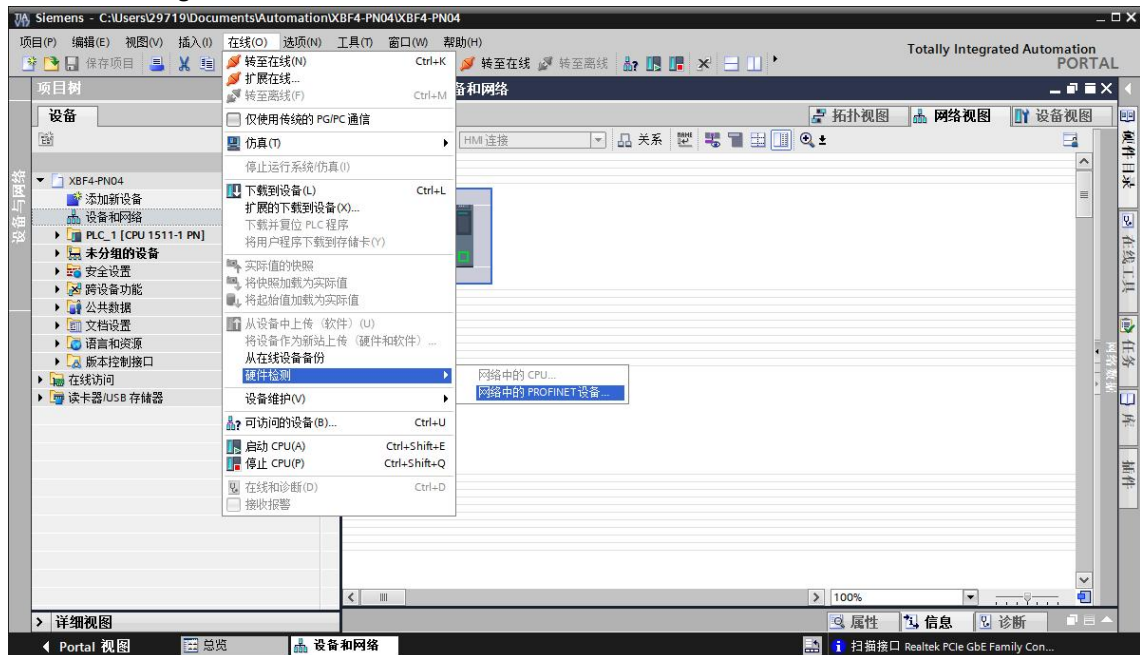


6、Hardware detection and device addition

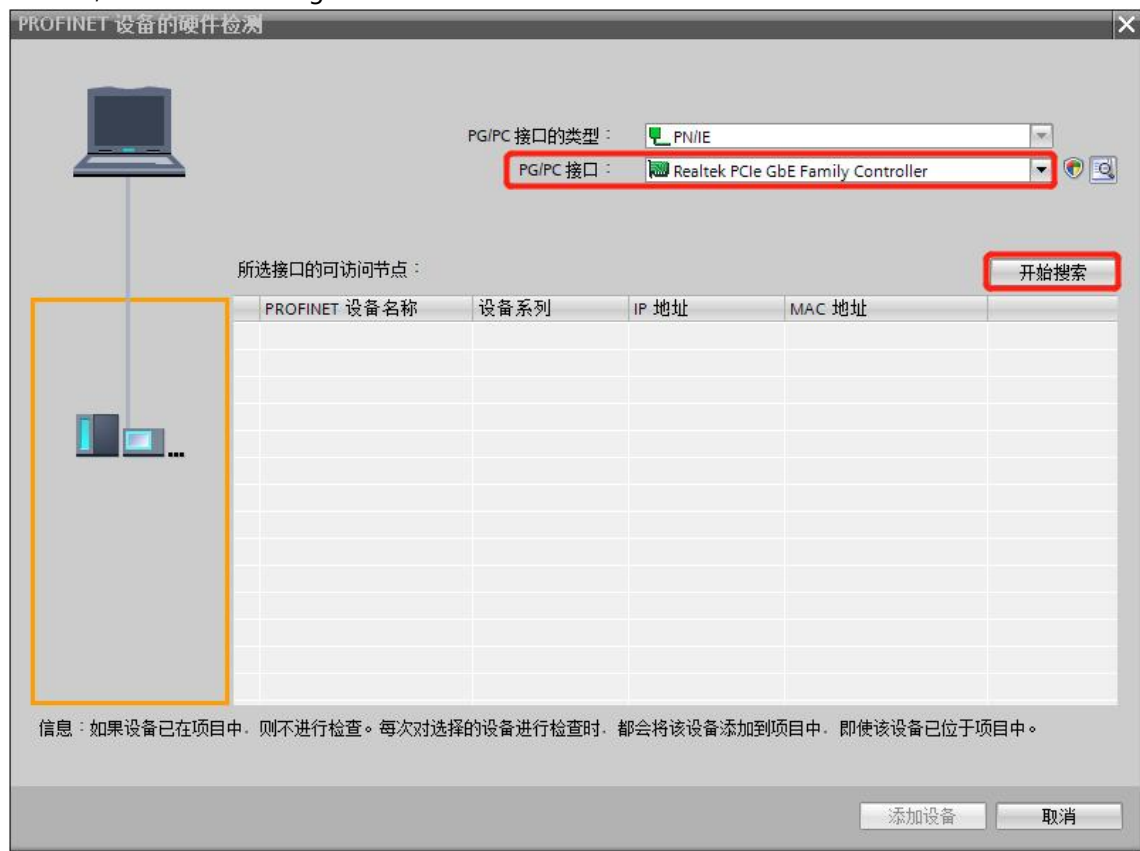
- a. Double-click "Device and Network" in the left navigation tree, and select PLC in the network view, as shown in the figure below.



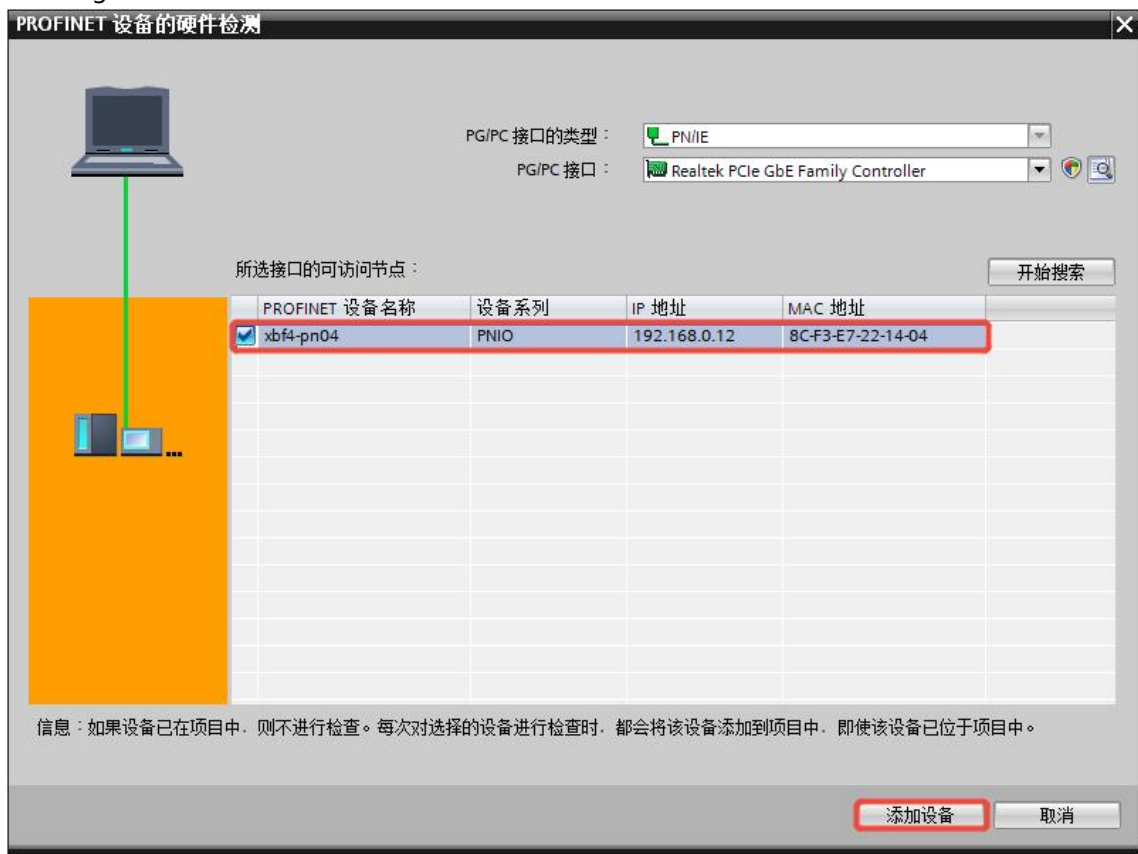
- b. In the menu bar, select "Online -> Hardware Detection -> PROFINET Devices in Network", as shown in the figure below.



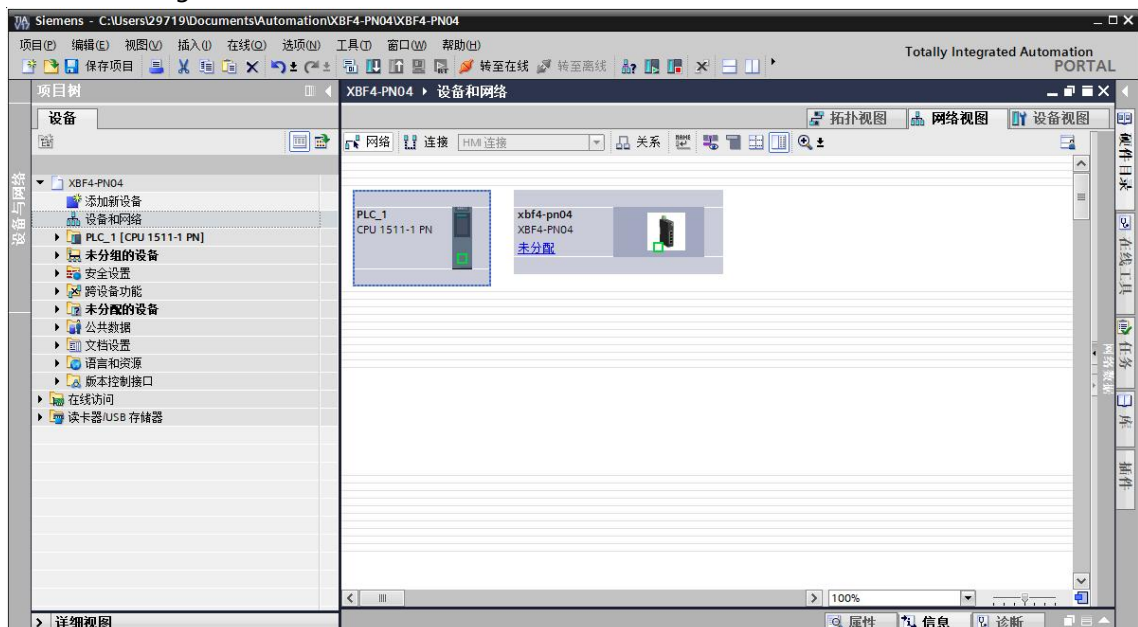
- c. A hardware detection window will pop up. Select the correct PG/PC interface and click "Start Search", as shown in the figure below.



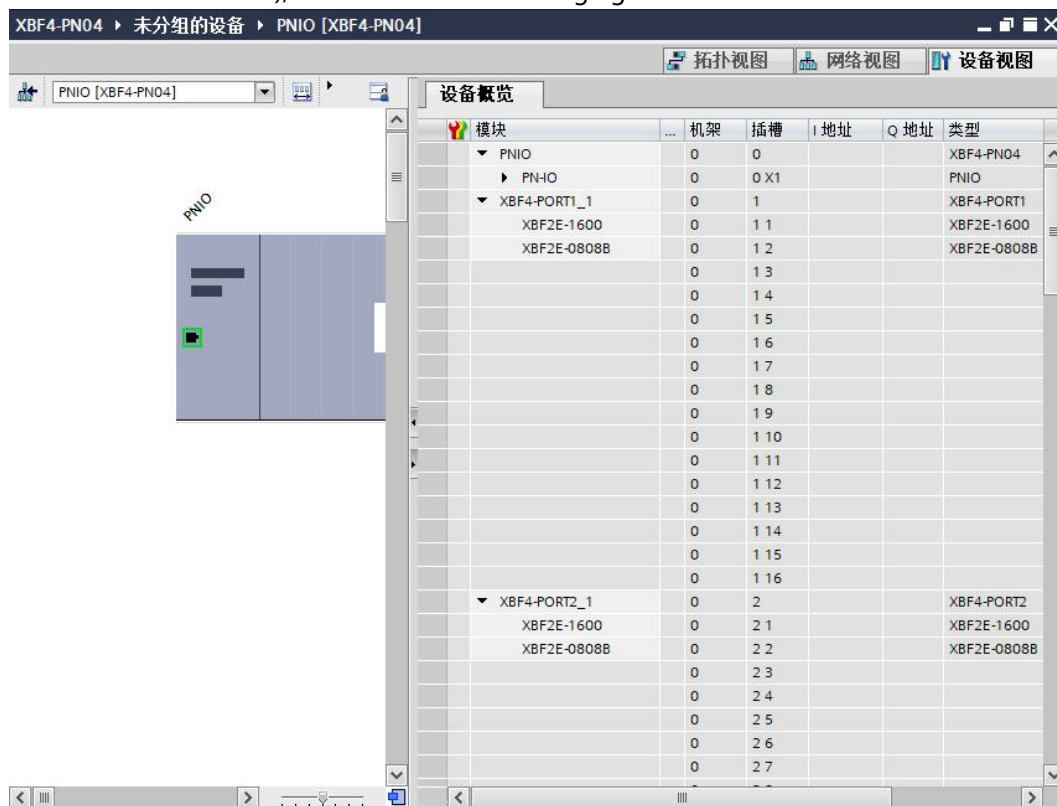
- d. To detect coupler devices in the network, select the coupler and click "Add Device," as shown in the image below.



- e. After the coupler is successfully added, you can see the coupler icon in the network view, as shown in the figure below.



- f. Select the coupler icon, switch to the device view, and add the I/O modules manually. In the "Hardware Directory" on the right, drag and drop the coupler interface and I/O modules according to the actual topology (the order must match the actual topology, otherwise communication will fail), as shown in the following figure.

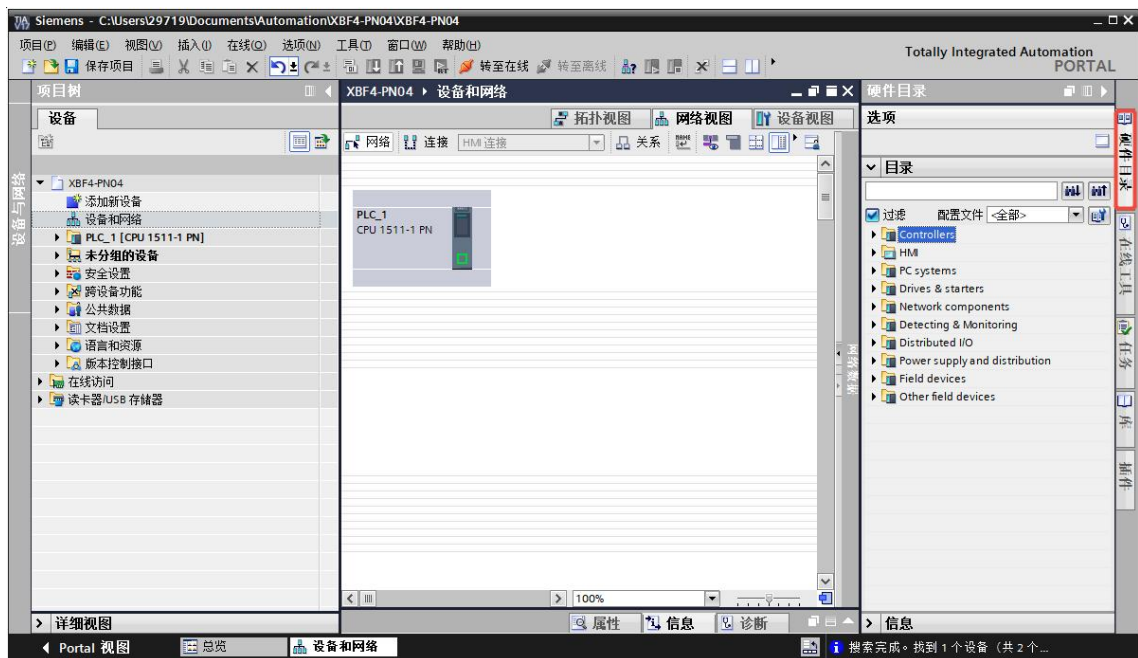


Note: The I/O module DIP switch station number must be consistent with the slot number set in the diagram. The DIP switch station numbers 0~F correspond to slots 1~16 of the four coupler interfaces respectively.

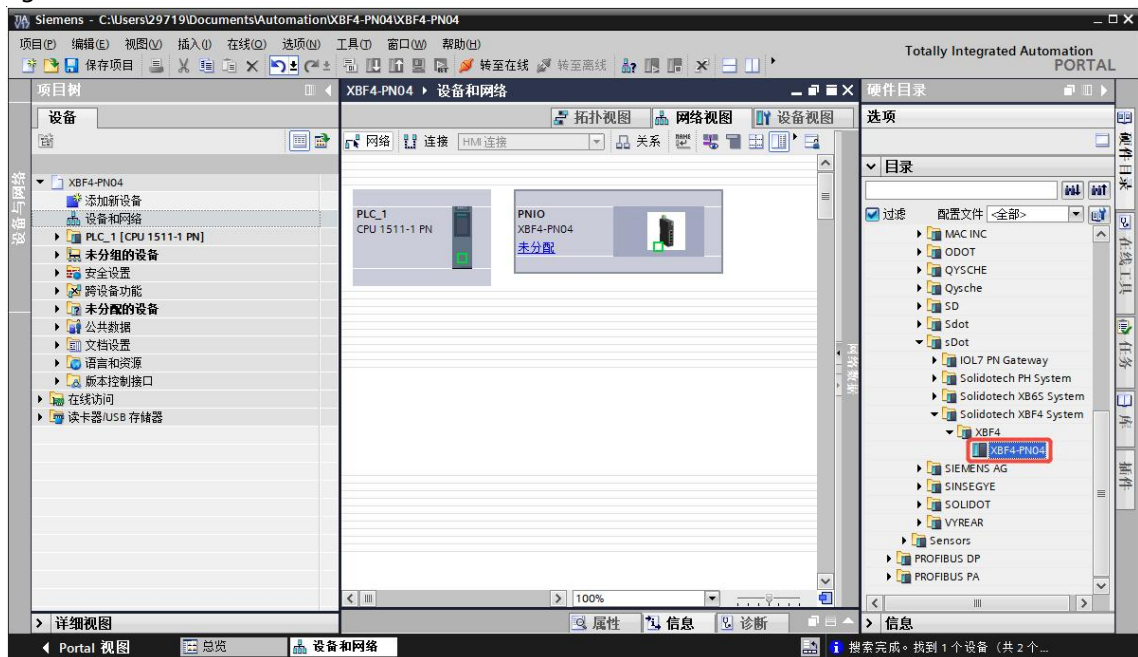
7、Manually add slave devices

Besides adding devices through hardware detection, you can also add them manually, as detailed below.

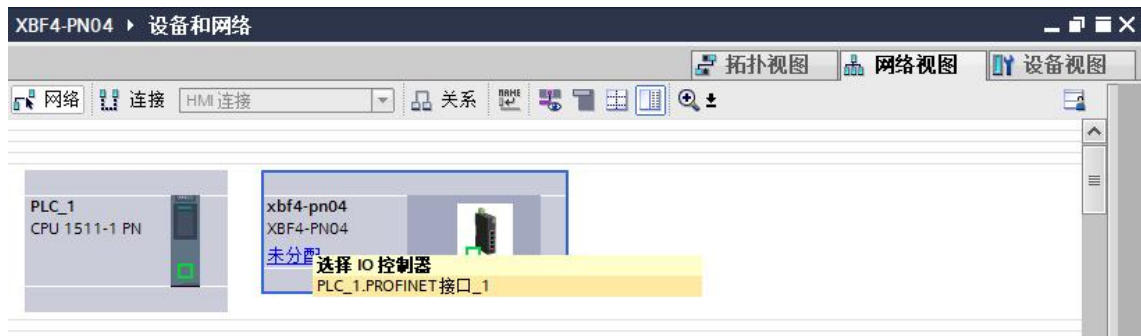
- Double-click "Devices and Networks" in the left navigation bar.
- Click the vertical "Hardware Catalog" button on the right, and the catalog will be displayed as shown in the image below.



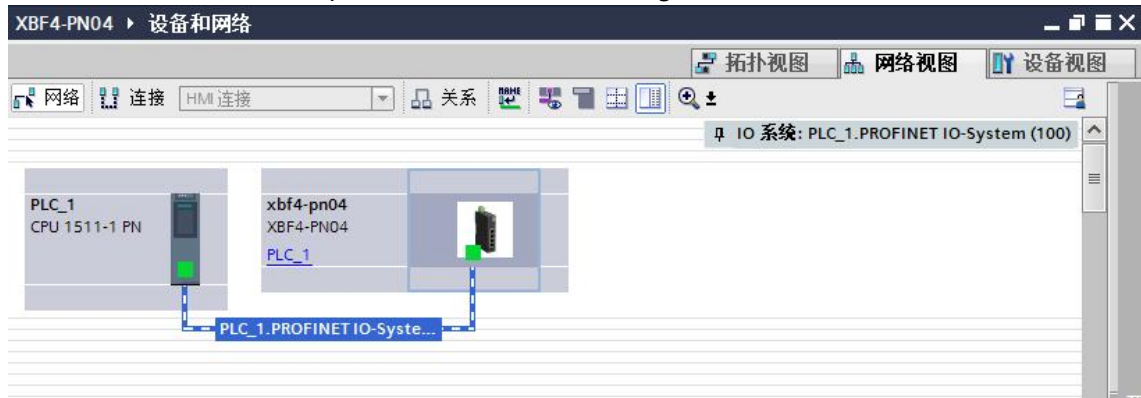
- c. Select "Other field devices -> PROFINET IO -> I/O -> sDot -> Solidotech XBF4 System -> XBF4 -> XBF4-PN04", then drag or double-click XBF4-PN04 to the "Network View", as shown in the figure below.



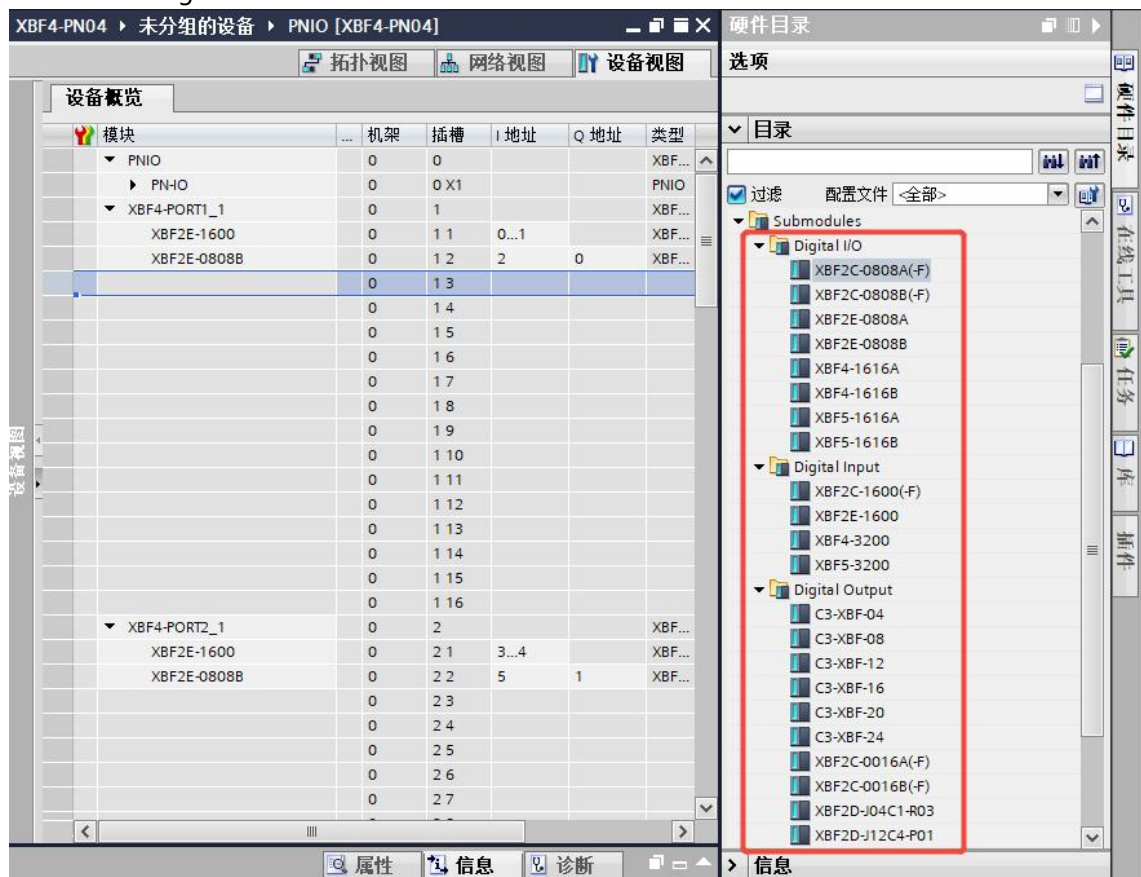
- d. Switch to network view, click "Unassigned (blue text)" on the coupler (slave) device, and select "PLC_1.PROFINET Interface_1", as shown in the figure below.



- e. Once the connection is complete, it will look like the image below.



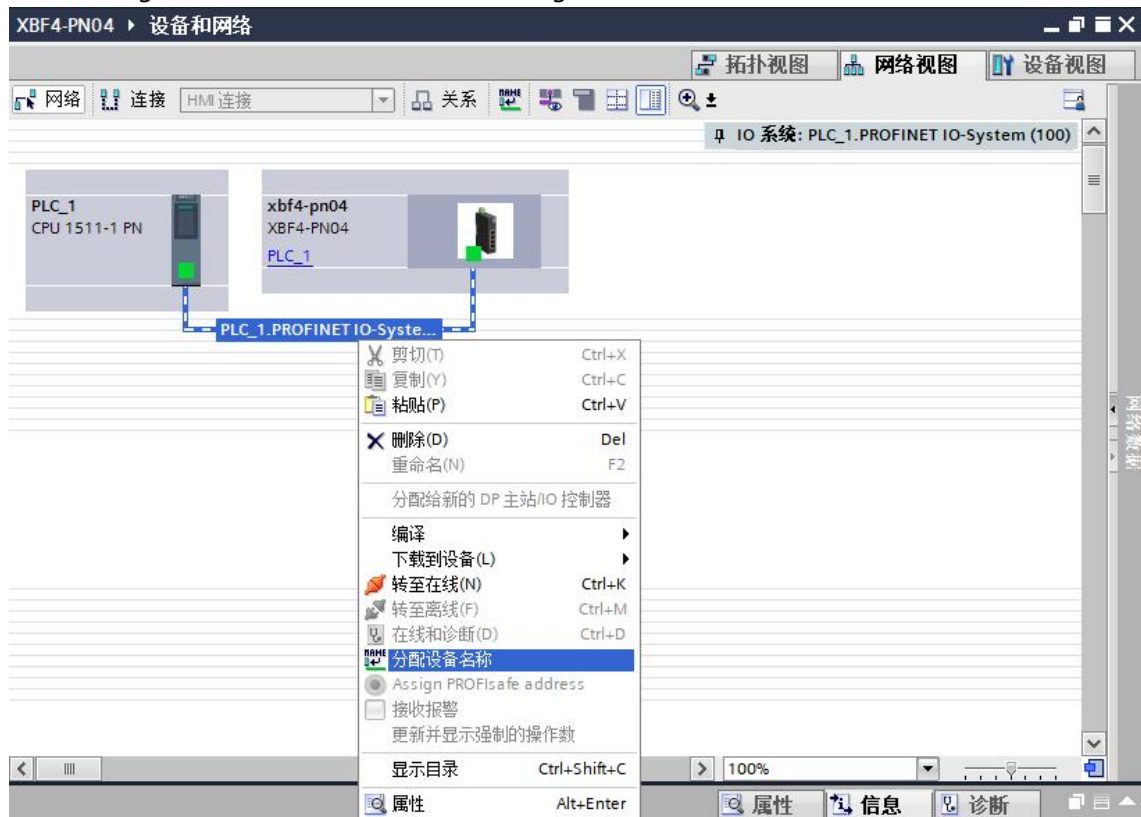
- f. Click "Device View" to enter the coupler's device overview. Under "Hardware Catalog" on the right, drag and drop to add couplers according to the actual topology. The interface and I/O modules (the order must match the actual topology, otherwise communication will fail) are shown in the figure below.



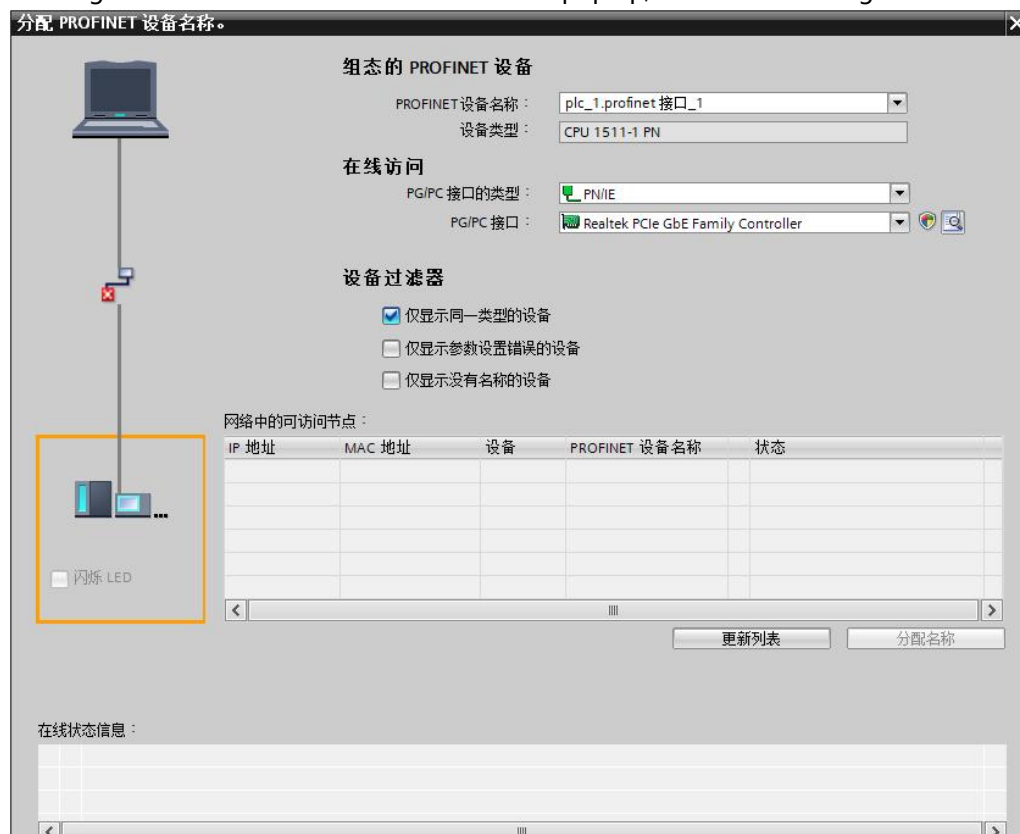
Note: The I/O module DIP switch station number must be consistent with the slot number set in the diagram. The DIP switch station numbers 0~F correspond to slots 1~16 of the four coupler interfaces respectively.

8. Assign device name

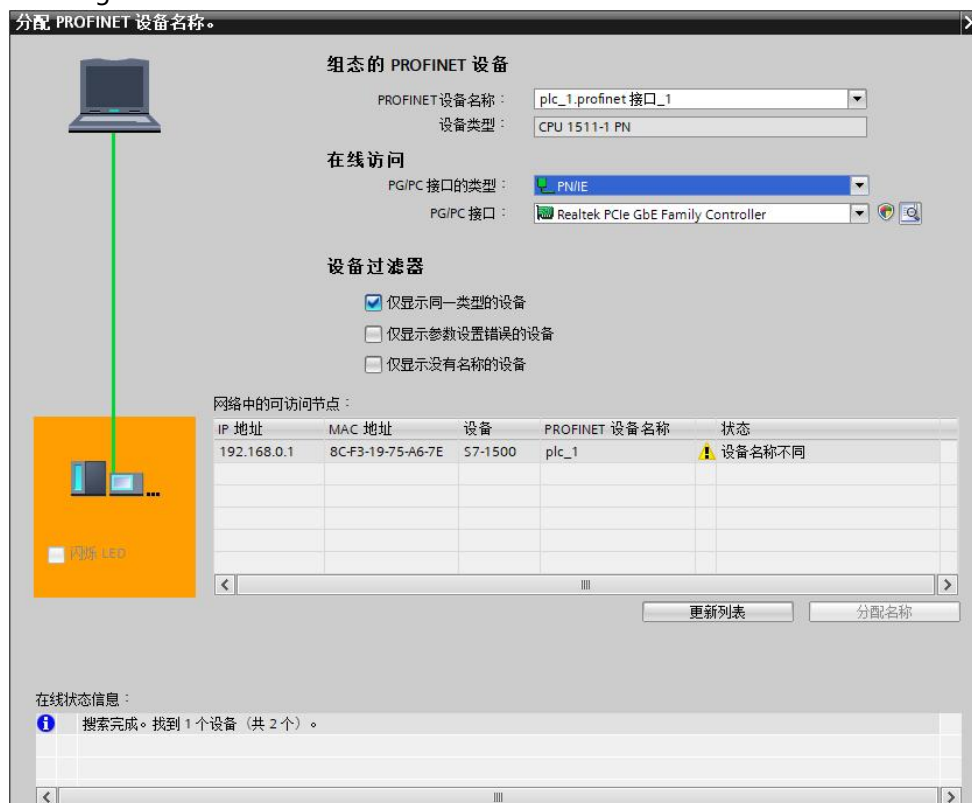
- In the network view, right-click the connection cable between the PLC and the coupler, and select "Assign Device Name", as shown in the figure below.



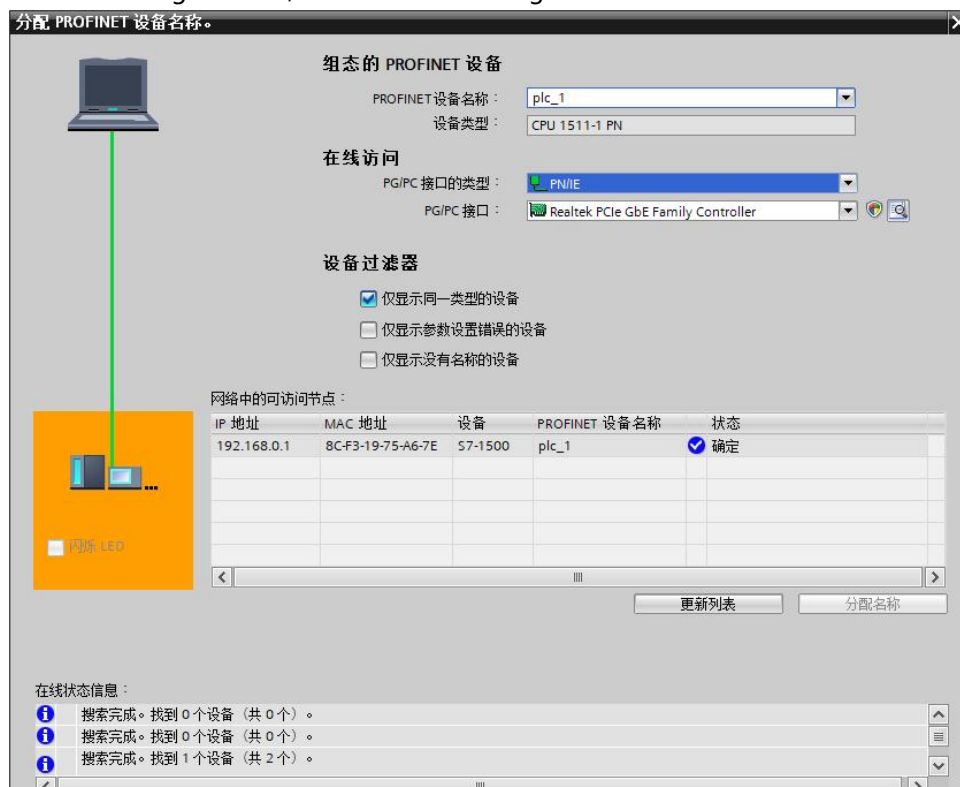
- A "Assign PROFINET Device Name" window will pop up, as shown in the figure below.



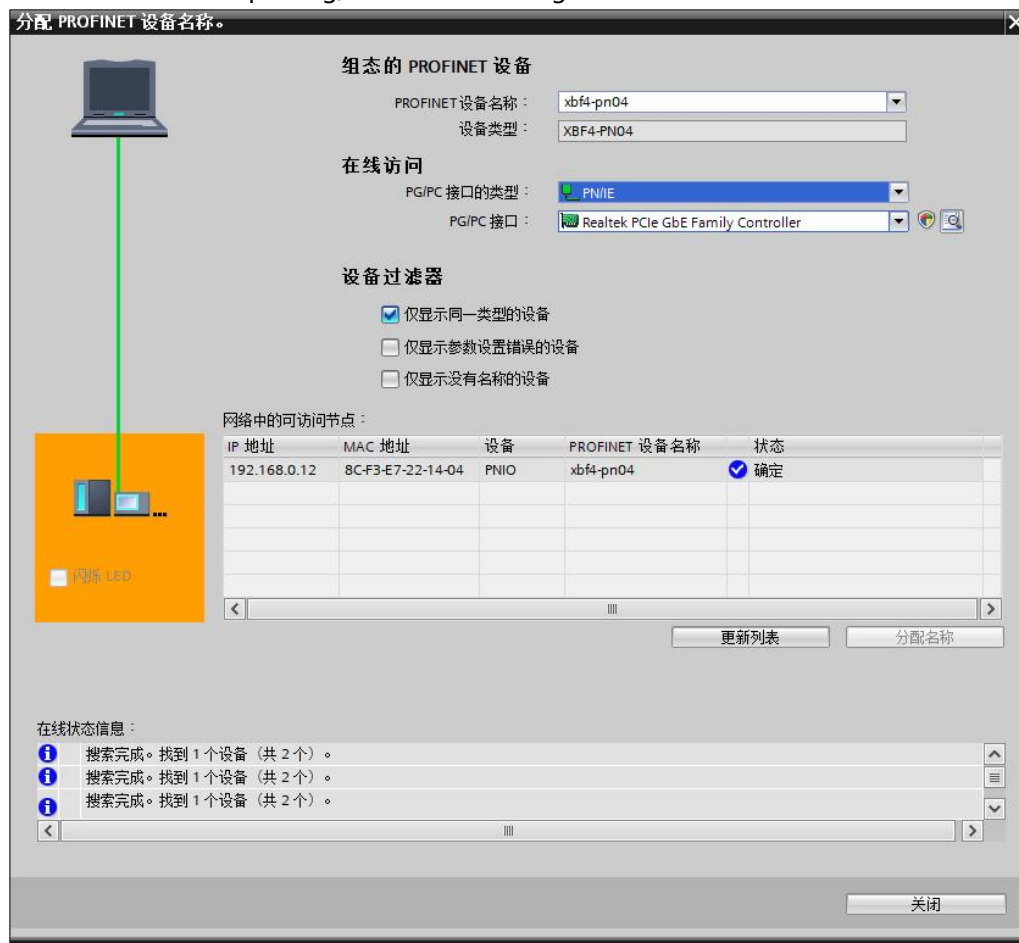
- c. Select PLC as the device name, click "Update List", and the update will be completed as shown in the figure below.



- d. Check if the node's status is "OK" in "Accessible Nodes in the Network". If not, select the device and click "Assign Name", as shown in the image below.



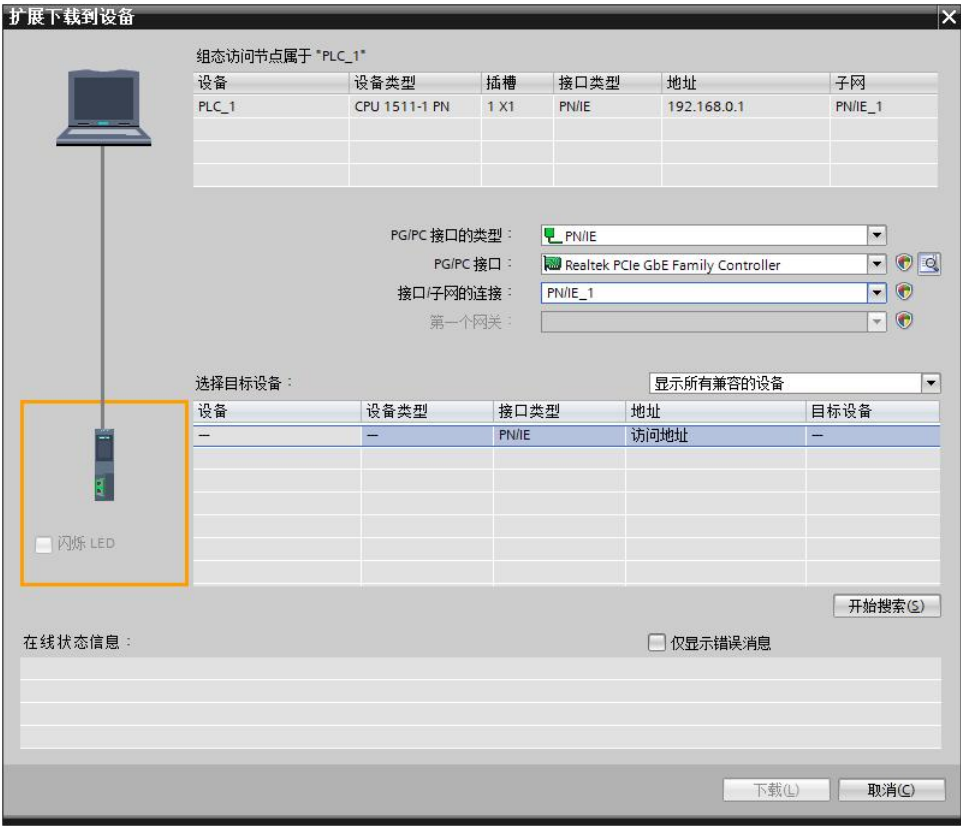
- e. Select "Coupler" as the device name, click "Update List," and then assign a name using the same method after updating, as shown in the figure below.



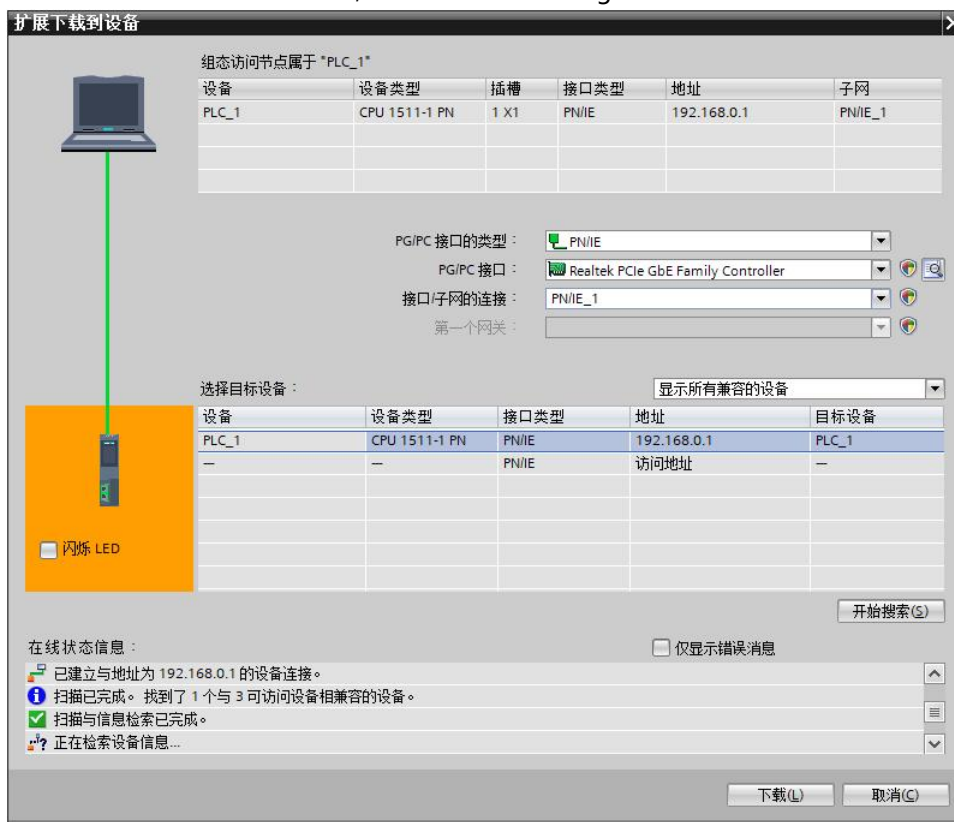
- f. Check if the MAC address on the module's silkscreen matches the MAC address of the assigned device name. Click "Close".

9、Download configuration structure

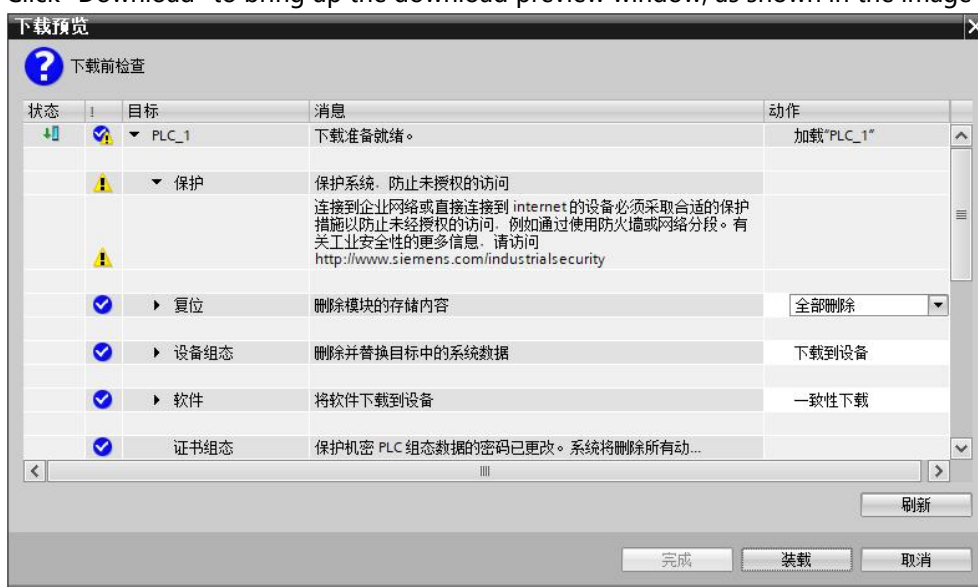
- a. In the network view, select the PLC. First, click the Compile button in the menu bar, then click the Download button to download the current configuration to the PLC.
- b. In the pop-up "Download extension to device" interface, configure as shown in the image below.



- c. Click the "Start Search" button, as shown in the image below.



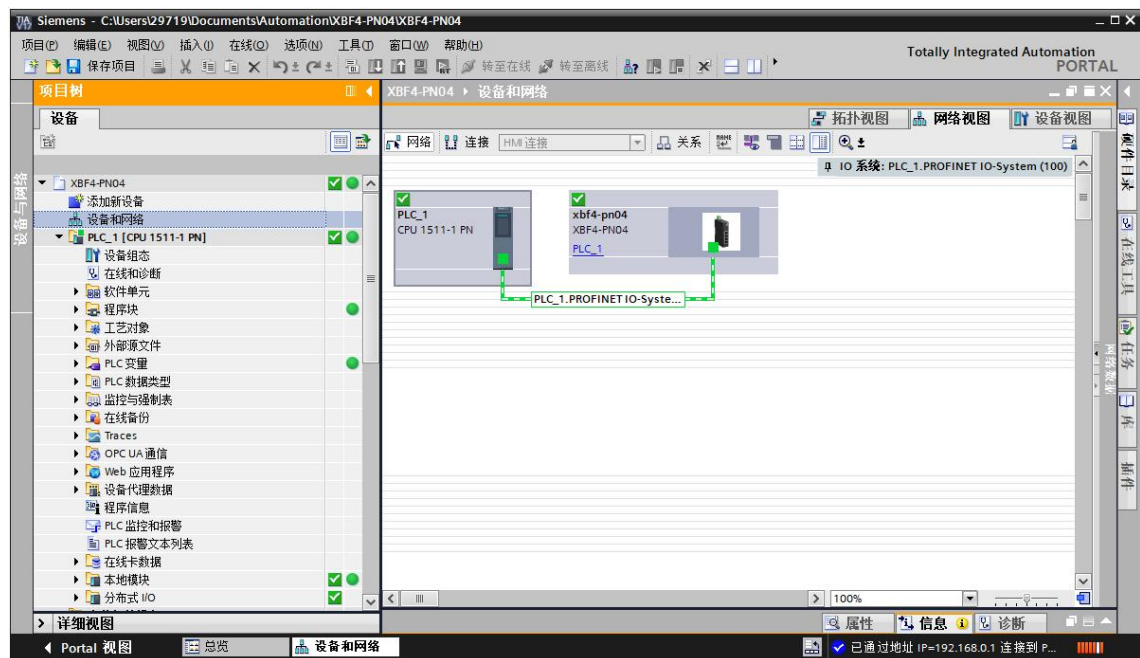
- d. Click "Download" to bring up the download preview window, as shown in the image below.



- e. Click "Load".
f. Click "Finish".
g. Power on the device again.

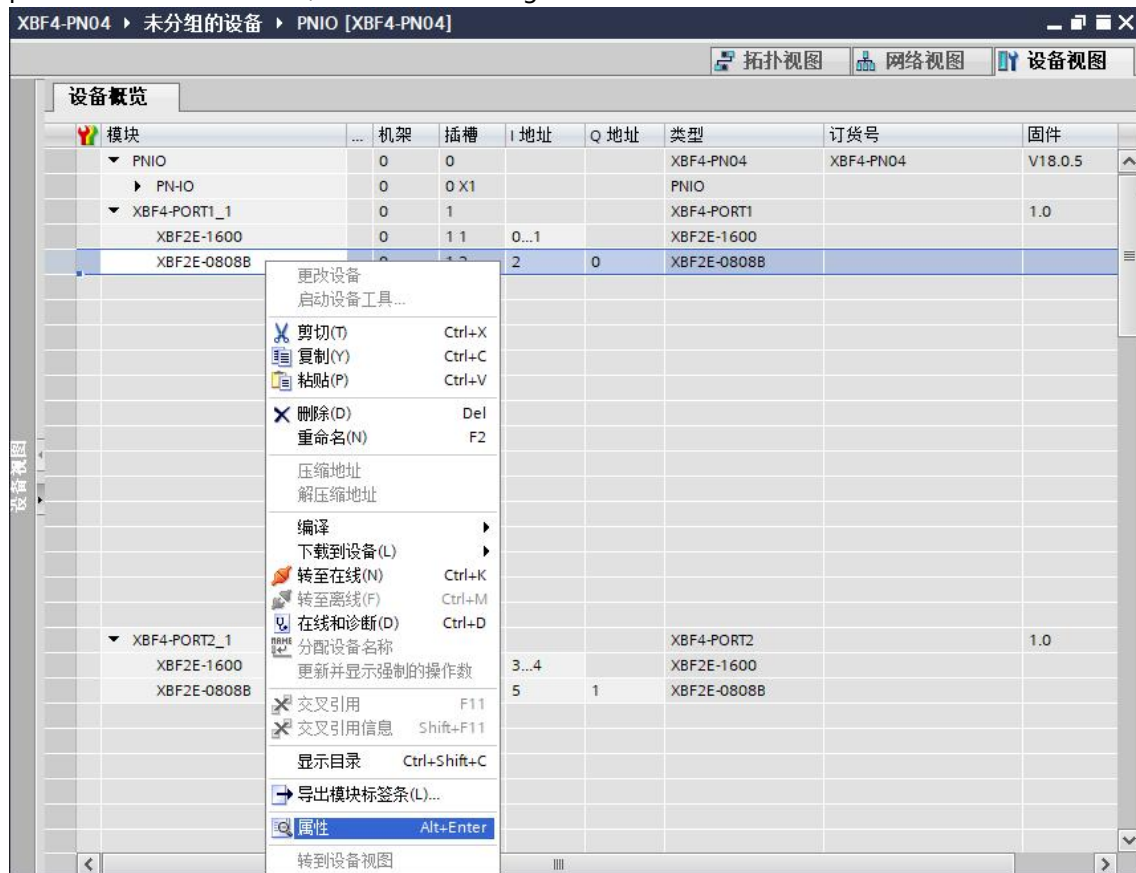
10、Communication connection

- a. Click the "Start CPU" button in the menu bar, then click the "Go to Online" button. If both icons are green, the connection is successful, as shown in the image below.

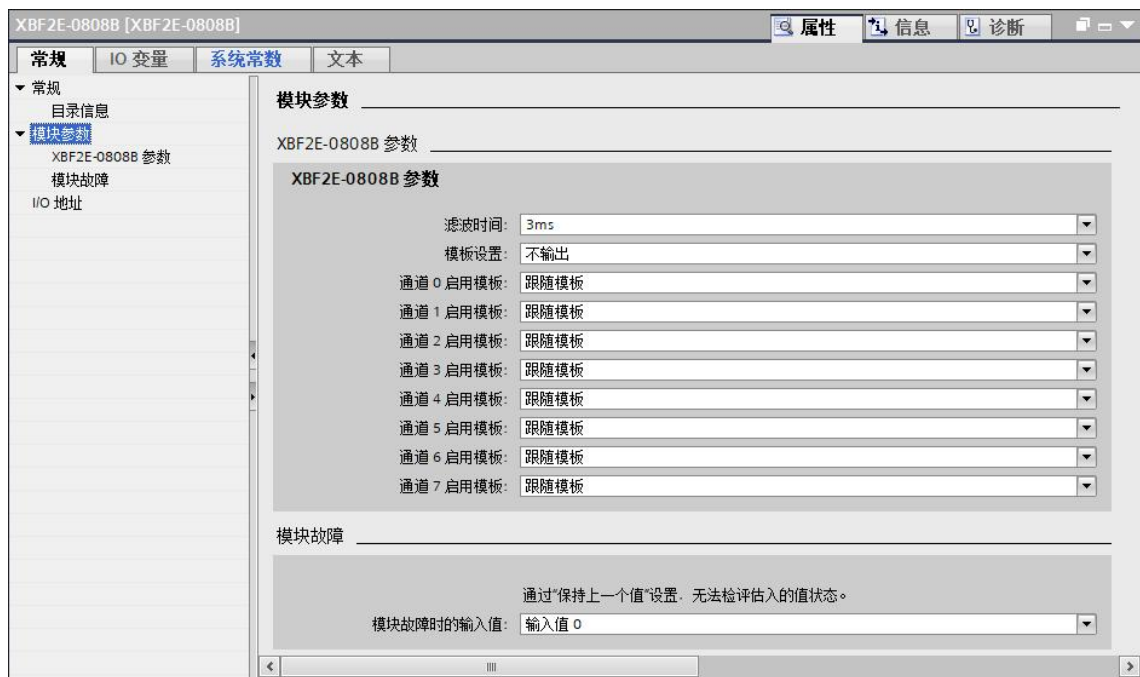


11、Parameter settings

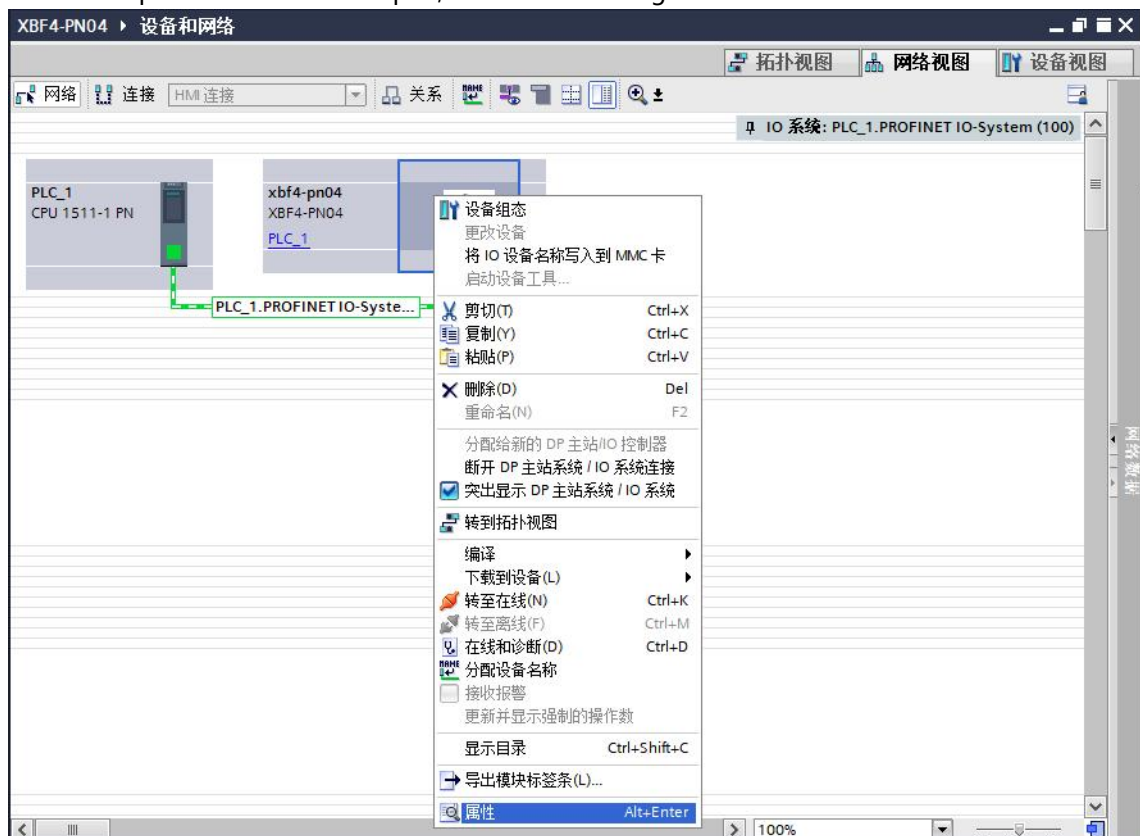
- a. In offline mode, open "Network View", select the coupler module, switch to device view, right-click the XBF2E-0808B module, and click the "Properties" button to view and set various parameters of the module, as shown in the figure below.



- b. On the XBF2E-0808B properties page, click "Module Parameters," as shown in the image below. The parameters can be configured according to actual usage needs. After configuration, re-download the program to the PLC, and then power on both the PLC and the module.



- c. Right-click the coupler icon in the network view and click the "Properties" button to view and set various parameters of the coupler, as shown in the figure below.



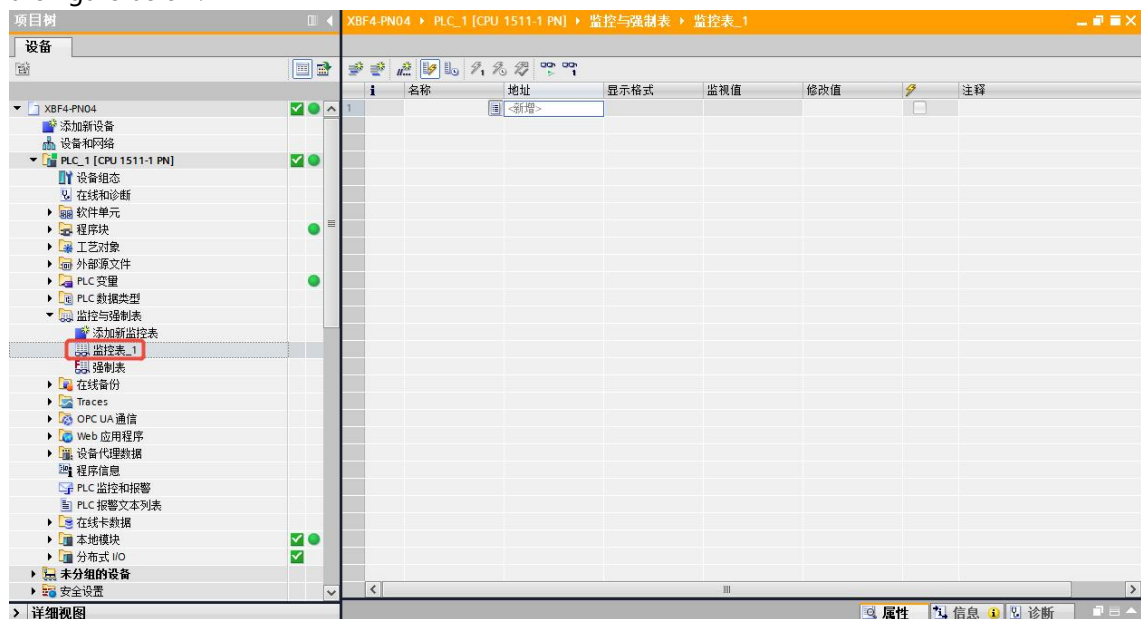
- d. On the coupler properties page, click "Module Parameters," as shown in the image below. The alarm function enable/disable, PLC stop status DO output control, and baud rate configuration are three parameters that can be configured according to actual usage needs. After

configuration, re-download the program to the PLC, and then power on both the PLC and the module.



12、 Functional verification

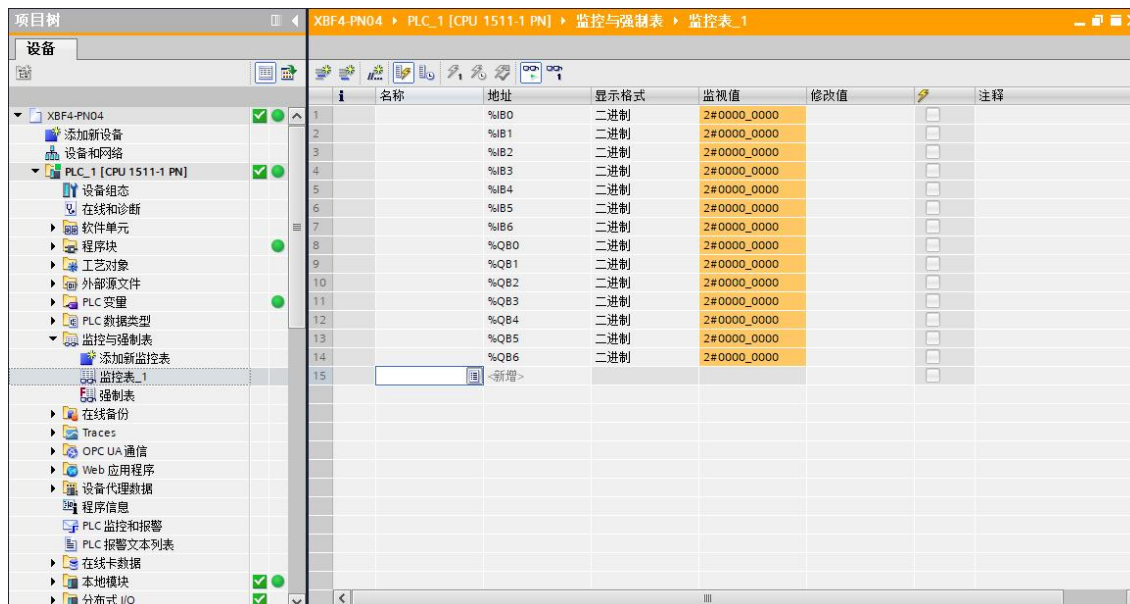
- a. Expand the project navigation on the left and select "Monitoring & Enforcement Tables". Double-click "Add New Monitoring Table" to add a new monitoring table, as shown in the figure below.



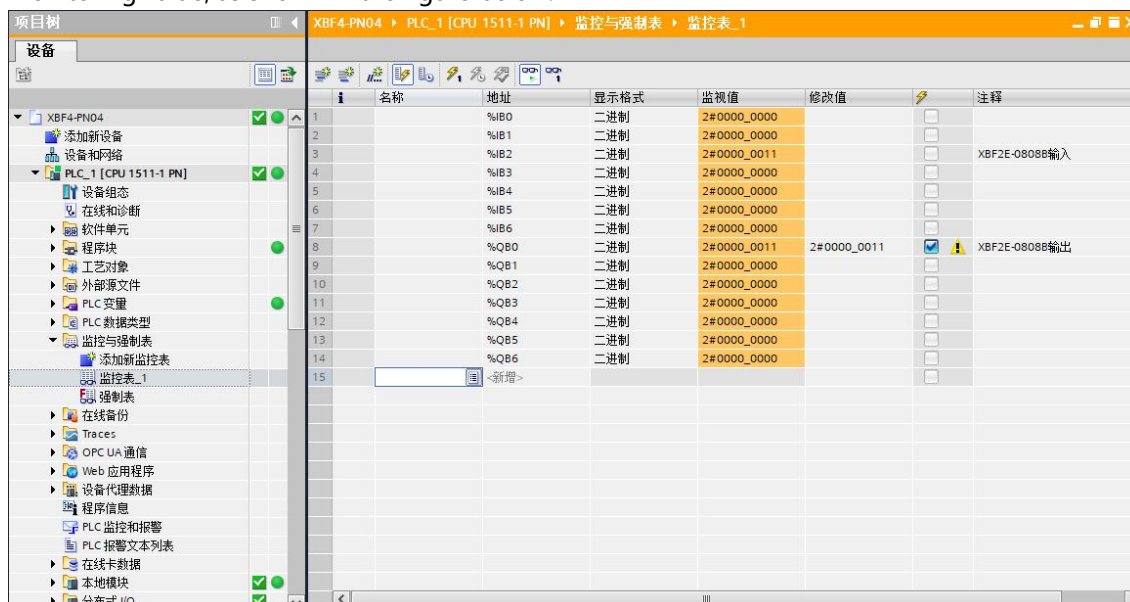
- b. Open "Device View" to view the channel I address (channel address of input signal) and Q address (channel address of output signal) of each module in the device overview. For example, the "I address" of the XBF2E-1600 module can be found to be between 0 and 1, as shown in the figure below.



- c. In the address cells of the monitoring table, enter the input/output channel addresses, such as "IB0" to "IB6", "QB0" to "QB6", and press "Enter". After completing all the entries, click [the command/button].  The button allows you to monitor the data, as shown in the image below.

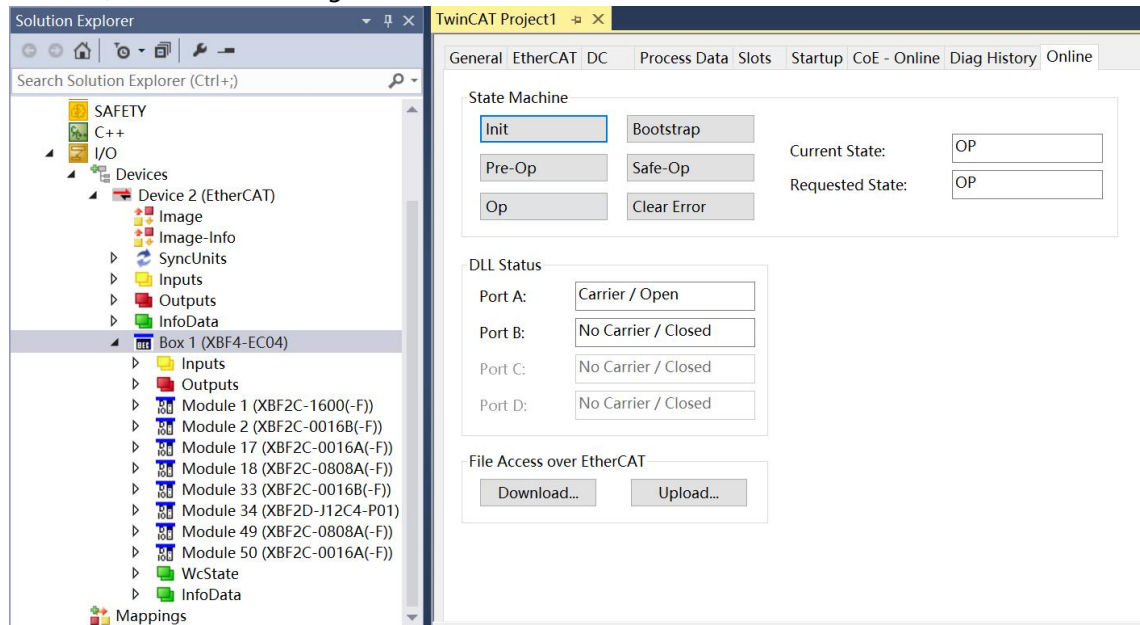


- d. Taking input channels 0 and 1 as an example, when there is a valid voltage input to input channels 0 and 1 of the XBF2E-0808B module, it can be observed in the monitoring value cell of the monitoring table; the output channel can be forcibly controlled by modifying the monitoring value, as shown in the figure below.

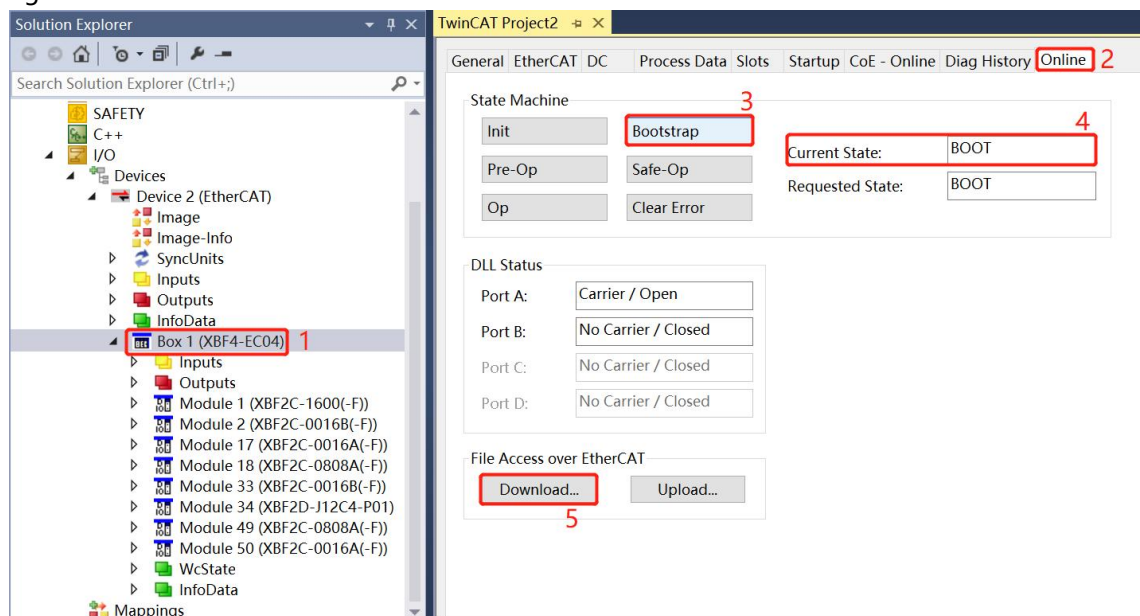


6.5 Firmware online upgrade

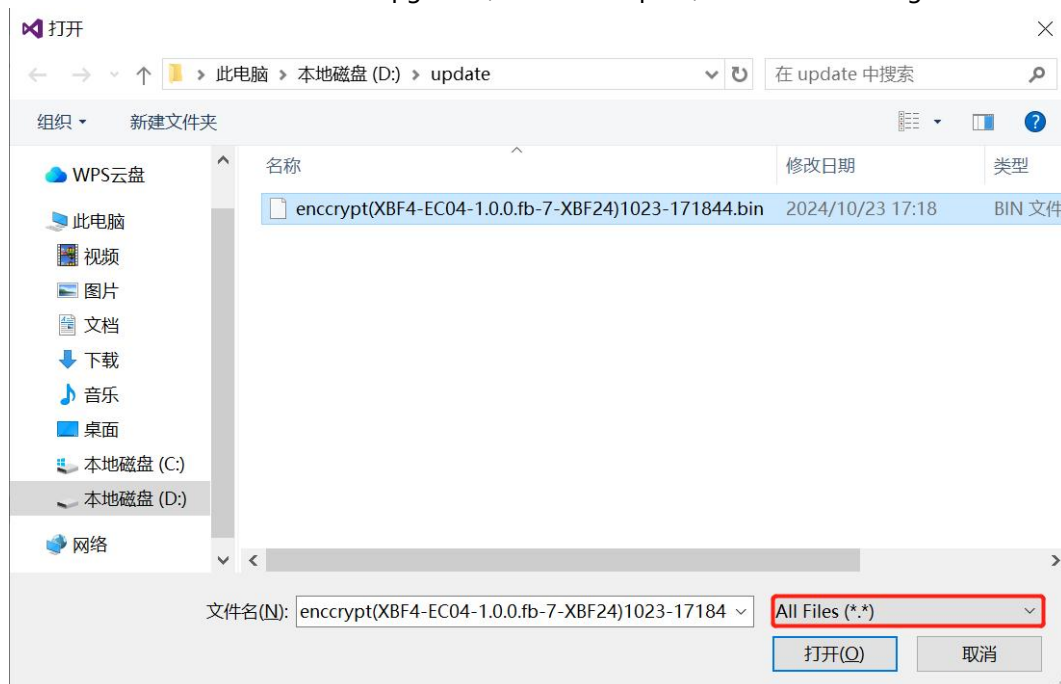
- 1、Taking TwinCAT3 software as an example, the topology is XBF4-EC04+{Coupler Interface 0: XBF2C-1600-F+XBF2C-0016B-F}+{Coupler Interface 1: XBF2C-0016A-F+XBF2C-0808A-F}+{Coupler Interface 2: XBF2C-0016B-F+XBF2D-J12C4-P01}+{Coupler Interface 3: XBF2C-0808A-F+XBF2C-0016A-F}, as shown in the figure below.



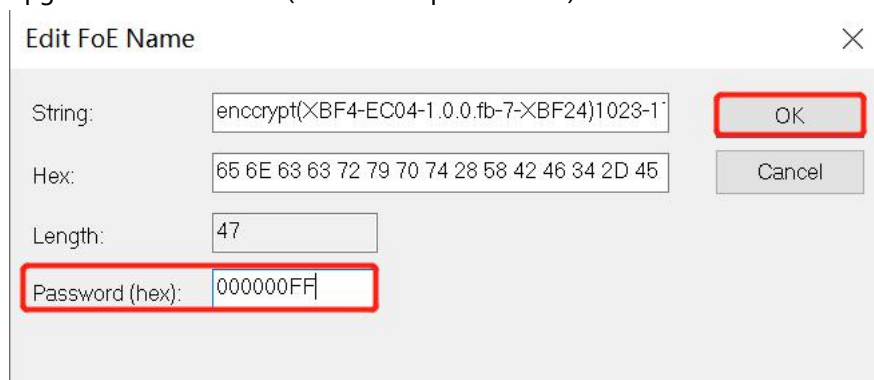
- 2、Click the coupler "XBF4-EC04" in the left navigation tree, click the "Online" option in the right menu, click the "Bootstrap" option in State Machine, wait for Current State to display "BOOT" status, and then click the "Download" option in File Access over EtherCAT below, as shown in the figure below.



- 3、 In the pop-up file opening window, select the "All Files" option, select the bin file corresponding to the module that needs to be upgraded, and click "Open", as shown in the figure below.



- 4、 A settings window will pop up. Enter the password; a password of 0xff indicates an upgrade for the coupler. Click "OK" to proceed with the upgrade, as shown in the image below. After confirming the upgrade, observe the progress bar and module behavior to confirm whether the upgrade was successful (see next step for details).



Note: 1) Coupler upgrade password: 0xFF.

2) Password for upgrading the slave module: the extension interface number (0~3) corresponding to the slave module access coupler + the slave module DIP switch number (00~0F);

For example, the expansion interface number of Module 1 (XBF2C-1600-F) is 0, and the DIP switch number is 00, so the Password is 0x000;

The extension interface number of Module 2 (XBF2C-0016B-F) is 0, and the DIP switch number is 01, so the password is 0x001.

The extension interface number of Module 17 (XBF2C-0016A-F) is 1, and the DIP switch number is 00, so the password is 0x100.

The extension interface number of Module 18 (XBF2C-0808A-F) is 1, and the DIP switch number is 01, so the password is 0x101;

The extension interface number of Module 33 (XBF2C-0016B-F) is 2, and the DIP switch number is 00, so the password is 0x200.

The extension interface number of Module 34 (XBF2D-J12C4-P01) is 2, and the DIP switch number is 01, so the password is 0x201;

The extension interface number of Module 49 (XBF2C-0808A-F) is 3, and the DIP switch number is 00, so the password is 0x300.

The extension interface number of Module 50 (XBF2C-0016A-F) is 3, and the DIP switch number is 01, so the password is 0x301.

5. Successful upgrade process for different modules

EtherCAT coupler online upgrade:

- 1) Once the progress bar is full, the RUN and ERR indicators on the coupler will flash briefly and then turn off, indicating a successful upgrade.
- 2) After a successful online upgrade, you need to manually switch to OP mode before you can re-establish the connection.
- 3) If you need to upgrade again, you need to switch the OP state back to the BOOT state.

Online upgrade of I/O modules:

- 1) The discrete I/O module interface operation indicator Pn (n: 0~3, green light) and ERR light (red light) will flash sequentially. After the flashing ends, the upgrade is successful (after the upgrade is completed, you need to power it on and off to connect normally).
- 2) Other modules can be upgraded without interrupting power.