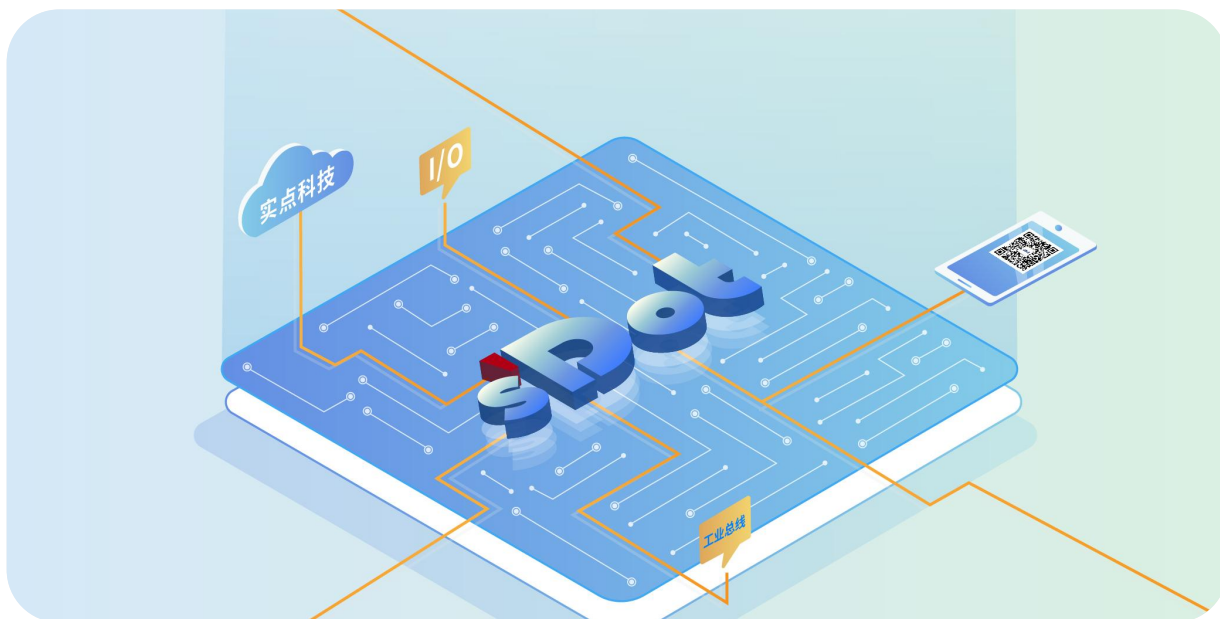




XBF5D & XBF5E series

I/O module

User Manual



Nanjing Solidot Electronic Technology Co., Ltd.

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1 Product Overview

1.1 Product Introduction

The XBF5D & XBF5E series discrete I/O modules are used in combination with discrete scalable couplers. The coupler handles fieldbus communication, connecting the expanded I/O modules to a real-time industrial Ethernet system, thereby enabling real-time data exchange between the expanded I/O modules and the coupler/controller.

The XBF5D & XBF5E series of discrete I/O modules offer 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 XBF5D & XBF5E 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 and analog modules to meet the needs of different applications.

- **Configurable input/output functions**

The module can be configured with DI/DO via DIP switches, or it can automatically adapt to the DI/DO function according to the wiring method.

- **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, and analog modules.

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

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 I/O modules.

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: Abbreviation for EtherCAT protocol PN: Abbreviation for PROFINET protocol
(4)	Number of expansion module interfaces	04: Four RJ45 expansion ports

2.1.2 I/O module naming rules

2.1.2.1 DIO Naming Rules

XBF 5D - 16 16 A +
(1) (2) (3) (4) (5) (6)

Serial Number	Meaning	Value description		
(1)	Product Type	XBF: XB6S Discrete I/O		
(2)	Product Series	5D: Discrete I/O numbering, spring-loaded terminals, RJ45 communication interface (angled type), IP20 protection rating.	5E: Discrete I/O numbering, spring-loaded terminals, RJ45 communication interface (angled type), IP65 protection rating.	
(3)	Number of input channels	Number of digital: 00, 08, 16, 32		
(4)	Number of output channels	Number of digital: 00, 08, 16, 32		
(5)	Output channel type	A: NPN	B: PNP	Default: No output channel
(6)	Is the output channel configurable?	Default: Channels are not configurable		+: Configurable input/output

2.1.2.2 AIO Naming Rules

XBF 5D - A 8 C
(1) (2) (3)(4)(5)

Serial Number	Meaning	Value description
(1)	Product Type	XBF: XB6S Discrete I/O

(2)	Product Series	5D: Discrete I/O numbering, spring-loaded terminals, RJ45 communication interface (angled type), IP20 protection rating.	5E: Discrete I/O numbering, spring-loaded terminals, RJ45 communication interface (angled type), IP65 protection rating.
(3)	Types of I/O modules	A: Analog signal	
(4)	Number of input channels	Analog: 4, 8	
(5)	Number of output channels	C: Configurable input/output channels	

2.2 Module list

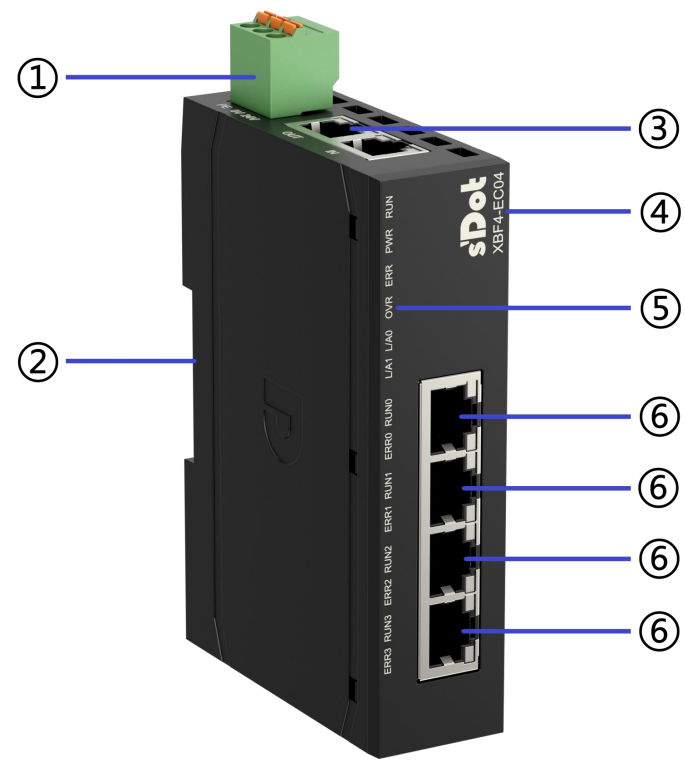
Model	Product Description
XBF4-EC04	Integrated Scalable EtherCAT busCoupler module
XBF4-EC04A	Integrated Scalable EtherCAT busCoupler module
XBF4-PN04	Integrated Scalable PROFINET busCoupler module
XBF5D-3200	32-channel digital input module, NPN/PNP compatible input, input filtering default 3ms, standard waterproof box, IP20 protection rating.
XBF5D-1600	16-channel digital input module, NPN/PNP compatible, input filtering default 3ms, standard waterproof box, IP20 protection rating.
XBF5D-1616A	16-channel digital input/16-channel digital output module Input is NPN/PNP compatible, input filtering default 3ms, output is NPN type, comes standard with a waterproof housing, protection rating IP20.
XBF5D-1616B	16-channel digital input/16-channel digital output module Input is NPN/PNP compatible, input filtering default 3ms, output is PNP type, comes standard with a waterproof housing, protection rating IP20.
XBF5D-1616A+	16-channel NPN input, 16-channel configurable NPN input/output digital module, input filtering default 3ms, standard waterproof housing, IP20 protection rating.
XBF5D-1616B+	16-channel PNP input, 16-channel configurable PNP input/output digital module, input filtering default 3ms, standard waterproof housing, IP20 protection rating.
XBF5D-0808A	8-channel digital input/8-channel digital output module Input is NPN/PNP compatible, input filtering default 3ms, output is NPN type, comes standard with a waterproof housing, protection rating IP20.
XBF5D-0808B	8-channel digital input/8-channel digital output module Input is NPN/PNP compatible, input filtering default 3ms, output is PNP type, comes standard with a waterproof housing, protection rating IP20.
XBF5D-0808A+	8-channel NPN input, 8-channel configurable NPN input/output digital module, input filtering default 3ms, standard waterproof housing, IP20 protection rating.
XBF5D-0808B+	8-channel PNP input, 8-channel configurable PNP input/output digital module, input filtering default 3ms, standard waterproof housing, IP20 protection rating.
XBF5D-0032A	32-channel digital output module, NPN output type, standard waterproof box, IP20 protection rating.
XBF5D-0032B	32-channel digital output module, PNP output type, standard waterproof box, IP20 protection rating.
XBF5D-0016A	16-channel digital output module, NPN output type, standard waterproof box, IP20 protection rating.
XBF5D-0016B	16-channel digital output module, PNP output type, standard waterproof box, IP20 protection rating.
XBF5E-3200	32-channel digital input module, NPN/PNP compatible input, input filtering default 3ms, standard waterproof box, IP65 protection rating.
XBF5E-1600	16-channel digital input module, NPN/PNP compatible, input filtering default 3ms, standard waterproof box, IP65 protection rating.
XBF5E-1616A	16-channel digital input/16-channel digital output module

	Input is NPN/PNP compatible, input filtering default 3ms, output is NPN type, comes standard with a waterproof housing, protection rating IP65.
XBF5E-1616B	16-channel digital input/16-channel digital output module Input is NPN/PNP compatible, input filtering default 3ms, output is PNP type, comes standard with a waterproof housing, protection rating IP65.
XBF5E-1616A+	16-channel NPN input, 16-channel configurable NPN input/output digital module, input filtering default 3ms, standard waterproof housing, IP65 protection rating.
XBF5E-1616B+	16-channel PNP input, 16-channel configurable PNP input/output digital module, input filtering default 3ms, standard waterproof housing, IP65 protection rating.
XBF5E-0808A	8-channel digital input/8-channel digital output module Input is NPN/PNP compatible, input filtering default 3ms, output is NPN type, comes standard with a waterproof housing, protection rating IP65.
XBF5E-0808B	8-channel digital input/8-channel digital output module Input is NPN/PNP compatible, input filtering default 3ms, output is PNP type, comes standard with a waterproof housing, protection rating IP65.
XBF5E-0808A+	8-channel NPN input, 8-channel configurable NPN input/output digital module, input filtering default 3ms, standard waterproof housing, IP65 protection rating.
XBF5E-0808B+	8-channel PNP input, 8-channel configurable PNP input/output digital module, input filtering default 3ms, standard waterproof housing, IP65 protection rating.
XBF5E-0032A	32-channel digital output module, NPN output type, standard waterproof box, IP65 protection rating.
XBF5E-0032B	32-channel digital output module, PNP output type, standard waterproof box, IP65 protection rating.
XBF5E-0016A	16-channel digital output module, NPN output type, standard waterproof box, IP65 protection rating.
XBF5E-0016B	16-channel digital output module, PNP output type, standard waterproof box, IP65 protection rating.
XBF5D-A8C	8-channel analog voltage and current input/output compatible module, standard waterproof box, IP20 protection rating.
XBF5D-A4C	4-channel analog voltage and current input/output compatible module, standard waterproof box, IP20 protection rating.
XBF5E-A8C	8-channel analog voltage and current input/output compatible module, standard waterproof box, IP65 protection rating.
XBF5E-A4C	4-channel analog voltage and current input/output compatible module, standard waterproof box, IP65 protection rating.

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
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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
			Extinguish	EtherCAT Init Status
PWR	Power indicator light	Green	ON	Coupler power supply is normal
			Extinguish	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
			Extinguish	EtherCAT communication is normal.
OVR	Overload indicator light	Red	ON	The power supply load reaches 90% ($\pm 5\%$) or more.
			Extinguish	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
			Extinguish	No network connection established or abnormal
L/A1	Network port OUT status indicator	Green	ON	Establish network connection
			Flashing	Connection established and data exchanged

			Extinguish	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.
			Extinguish	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.
			Extinguish	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

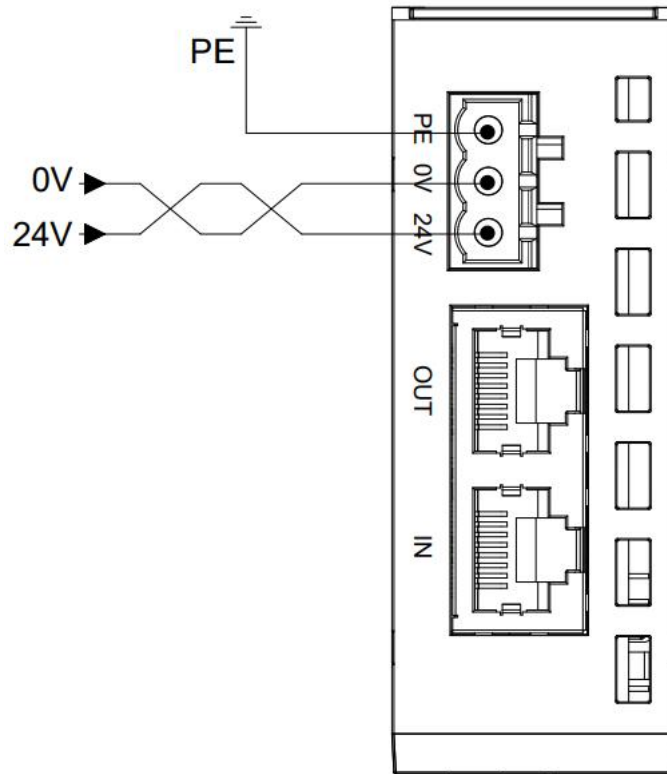
Power parameters	
Input voltage	SELV Input 24VDC (18V~36V)
Input current	<0.95A
Supply current	<500mA (maximum supply current for a single interface) <750mA (maximum supply current for all four interfaces)
Power supply voltage	20VDC~24VDC

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/Z Six 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		Support (automatic recovery mechanism)
Reverse connection protection		Support (automatic recovery mechanism)
Reverse connection protection		Support
Surge protection		Support

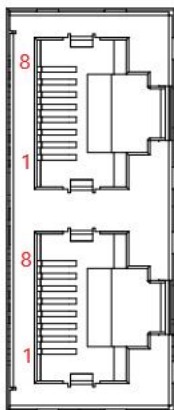
3.1.4 Power wiring diagram

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.



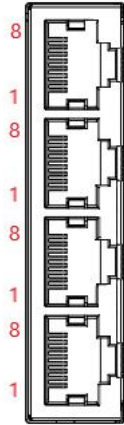
pin number	Signal
1	TD+
2	TD-
3	RD+
4	—
5	—
6	RD-
7	—
8	—

⚠ 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.



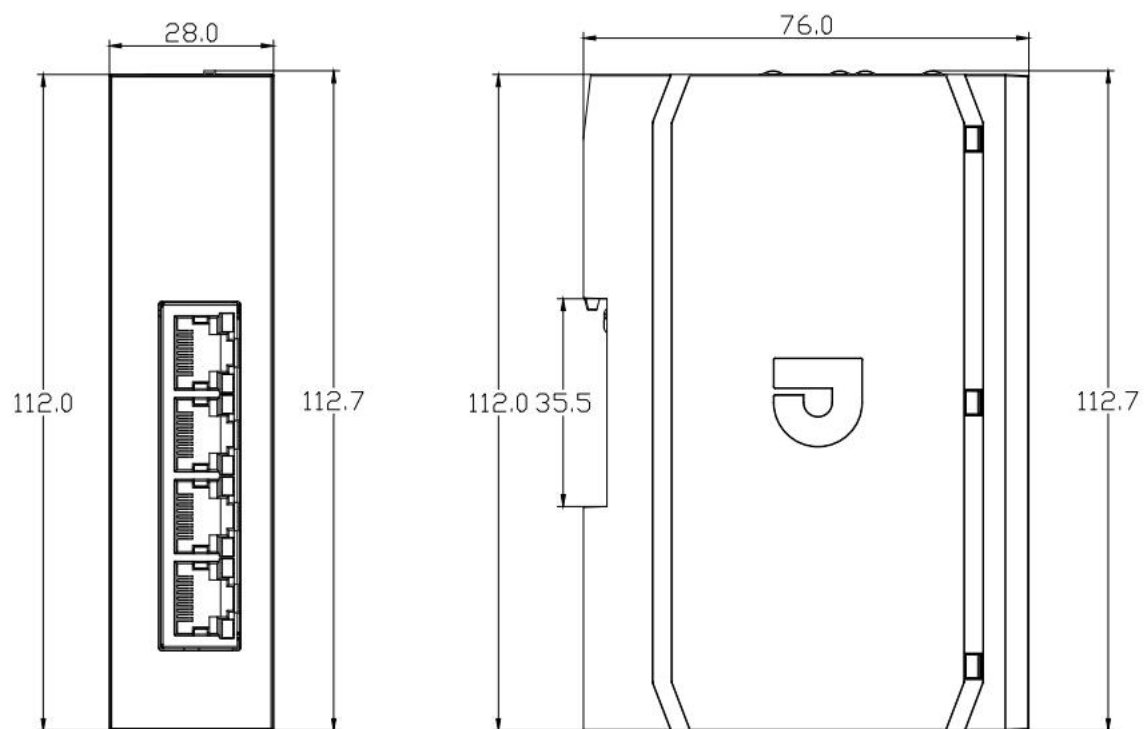
pin number	Signal
1	B
2	A
3	SGND
4	—
5	—
6	S24V
7	—
8	—

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.

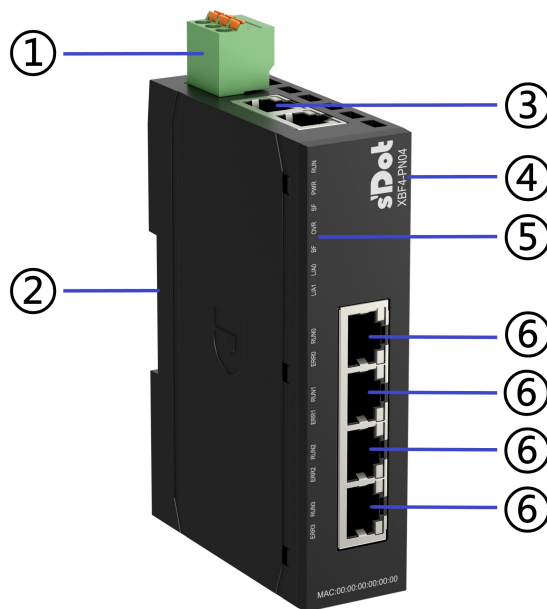
3.1.7 Outline Dimensions

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
			Extinguish	The device cannot start.
PWR	Power indicator light	Green	ON	Coupler power supply is normal
			Extinguish	The module is not powered on or the power supply is abnormal.
SF	System error indicator	Red	ON	There is a PROFINET alarm message.
			Extinguish	No PROFINET alarm information
BF	Bus fault indicator light	Red	ON	No network connection
			Flashing	No PROFINET connection established with the controller
			Extinguish	Establish PROFINET connection with controller
OVR	Overload indicator light	Red	ON	The power supply load reaches 90% ($\pm 5\%$) or more.
			Extinguish	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
			Extinguish	No network connection established or abnormal
L/A1	Network port OUT status indicator	Green	ON	Establish network connection
			Flashing	Connection established and data exchanged
			Extinguish	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.
			Extinguish	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.
			Extinguish	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

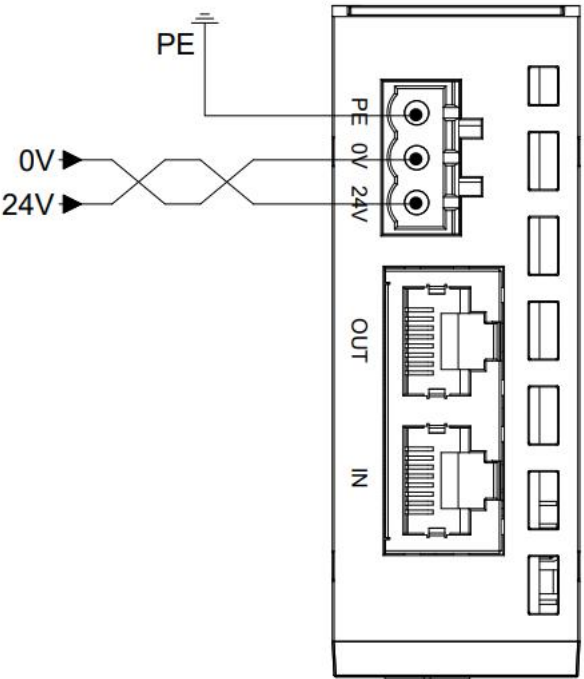
Power parameters	
Input voltage	SELV Input 24VDC (18V~36V)
Input current	<0.95A
Supply current	<500mA (maximum supply current for a single interface) <750mA (maximum supply current for all four interfaces)
Power supply voltage	20VDC~24VDC

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/Z Triaxial, 10 cycle/Axial (100min)
	Impact resistance	IEC 60068-2-27 Mechanical shock 150m/s ² ,11ms, ±X/Y/Z Six directions 3 Second-rate/Direction, Together 18 Second-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)
Reverse connection protection		Supports (automatic recovery)
Surge protection		Support

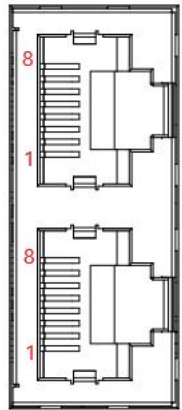
3.2.4 Power wiring diagram

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.



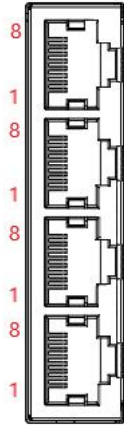
pin number	Signal
1	TD+
2	TD-
3	RD+
4	—
5	—
6	RD-
7	—
8	—

⚠ 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.



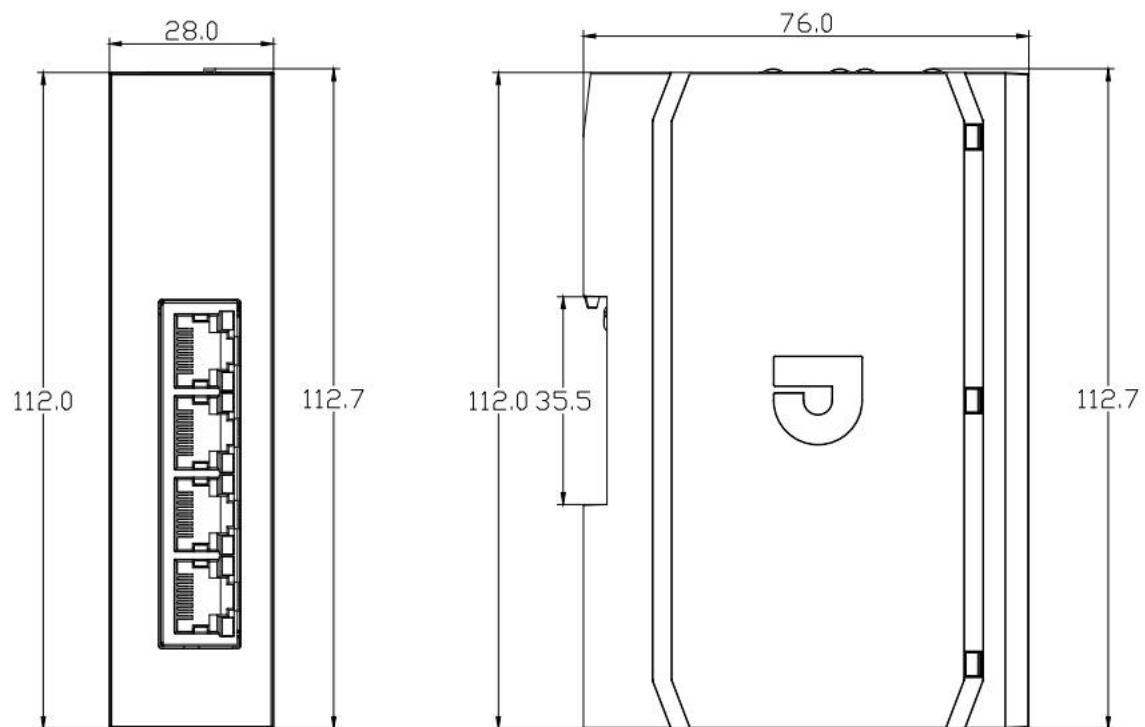
pin number	Signal
1	B
2	A
3	SGND
4	—
5	—
6	S24V
7	—
8	—

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

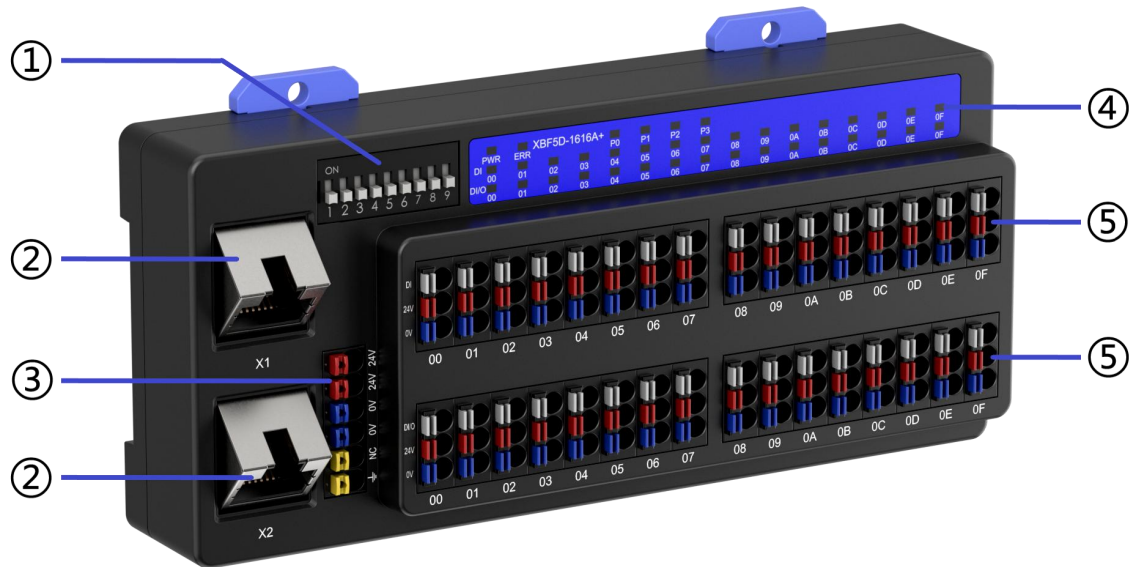
Coupler dimensions (unit: mm)



3.3 Digital I/O modules

3.3.1 Panel structure

3.3.1.1 Module panel



Serial Number	Name	Illustrate
①	binary DIP switch	Set station number, configure DI/DO
②	Extension Interface	2×RJ45
③	Power terminal	6P spring-loaded terminal block
④	System indicator lights and channel indicator lights	Indicates module power status, operating status, and channel status.
⑤	Input/output channels	Terminal blocks

3.3.1.2 Waterproof box structure



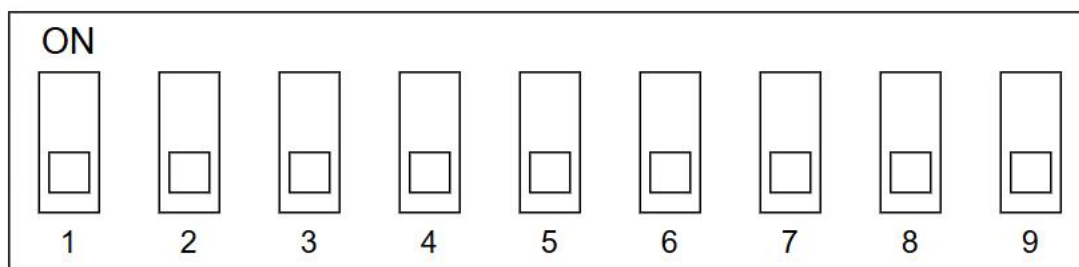
3.3.2 Indicator light function

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.
			Extinguish	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.
			Extinguish	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
			Extinguish	The module and coupler did not establish communication.
00~0F/10~1F	Input channel indicator	Green	ON	The module channel has a signal input.
			Extinguish	The module channel has no signal input or the signal input is abnormal.
00~0F/10~1F	Output channel indicator	Green	ON	The module channel has signal output.
			Extinguish	The module channel has no signal output or the signal output is abnormal.

3.3.3 DIP switch

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 binary 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 serially connect a maximum of 16 modules. The binary DIP switches and their meanings are shown in the following figure:



Binary DIP switch: The first 4 bits are used to set the station number, and the last 5 bits are used to switch between DI and DO input/output configurable digital input/output modules.

3.3.3.1 Station Number DIP Switch Setting Table

4321 DIP switch settings (binary)	Setting value	Station number value
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	A	A (10)
1011	B	B(11)
1100	C	C(12)
1101	D	D (13)
1110	E	E(14)
1111	F	F(15)

Remark:

1. 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.

- 2、 If the station number is set to be duplicated, the module will encounter communication errors or be unable to connect to the main station.

3.3.3.2 DI/DO DIP switch setting table available

When binary DIP switch 5 is set to 0, it means that the channel can be configured with DI/DO, which is determined by the DIP switch (see the table below for details). When it is set to 1, it means that the channel can be configured with DI/DO, which is adaptive by the module wiring.

DI/DO DIP switch setting table available (This takes effect when binary DIP switch 5 is set to 0)	
6. DIP switch settings (binary)	0: Channels 00~03 are output DO
	1: Channels 00~03 are input DI
7. DIP switch settings (binary)	0: Channels 04~07 are output DO
	1: Channels 04~07 are input DI
8. DIP switch settings (binary)	0: Channels 08~0B are output DO
	1: Channels 08~0B are input DI
9. DIP switch settings (binary)	0: Channels 0C~0F are output DO
	1: Channels 0C~0F are input DI

Remark:

- 1、 If you need to switch between DI and DO during communication, you must power on the entire module after the new settings are completed for the new settings to take effect.
- 2、 For 16-channel configurable I/O digital modules, binary DIP switches 5-9 are active. For 8-channel configurable I/O digital modules, binary DIP switches 5-7 are active. For other digital modules, binary DIP switches 5-9 are inactive.

3.3.4 Technical parameters

3.3.4.1 Digital input module parameters

Digital input		
Product Model	XBF5D-3200/XBF5E-3200	XBF5D-1600/XBF5E-1600
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤20mA	≤12mA
Input rated voltage	24VDC (20.4V~28.8V)	
Typical input current	5mA/ch (24VDC)	
Number of input signal points	32	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	150Hz (Filtering time: 3ms)	
Input impedance	5.4KΩ	
Isolation methods	Optical isolation	
Isolation and withstand voltage	500VAC	
Rated current consumption	20mA	12mA
Power consumption	0.48W	0.288W
Numeric input type	Type1/Type3	
Channel indicator lights	Green LED lights	

3.3.4.2 Digital Input/Output Module Parameters

Digital input		
Product Model	XBF5D-1616A/XBF5E-1616A	XBF5D-1616B/XBF5E-1616B
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤20mA	≤20mA
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	150Hz (Filtering time: 3ms)	
Input impedance	5.4KΩ	
Isolation methods	Optical isolation	
Isolation and withstand voltage	500VAC	
Rated current consumption	20mA	20mA
Power consumption	0.48W	0.48W
Numeric input type	Type1/Type3	
Channel indicator lights	Green LED lights	
Digital output		
Number of output signal points	16	
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	XBF5D-1616A+/XBF5E-1616A+	XBF5D-1616B+/XBF5E-1616B+
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤20mA	≤20mA
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
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	20mA	20mA
Power consumption	0.48W	0.48W
Numeric input type	Type1/Type3	
Channel indicator lights	Green LED lights	
Digital output		
Number of output signal points	16	
Output signal type	NPN	PNP
Configurable inputs and outputs	yes	
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	XBF5D-0808A/XBF5E-0808A	XBF5D-0808B/XBF5E-0808B
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤15mA	≤15mA
Input rated voltage	24VDC (20.4V~28.8V)	
Typical input current	5mA/ch (24VDC)	
Number of input signal points	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	15mA	15mA
Power consumption	0.36W	0.36W
Numeric input type	Type1/Type3	
Channel indicator lights	Green LED lights	
Digital output		
Number of output signal points	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	XBF5D-0808A+/XBF5E-0808A+	XBF5D-0808B+/XBF5E-0808B+
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤15mA	≤15mA
Input rated voltage	24VDC (20.4V~28.8V)	
Typical input current	5mA/ch (24VDC)	
Number of input signal points	8	
Input signal type	NPN	PNP
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	15mA	15mA
Power consumption	0.36W	0.36W
Numeric input type	Type1/Type3	
Channel indicator lights	Green LED lights	
Digital output		
Number of output signal points	8	
Output signal type	NPN	PNP
Configurable inputs and outputs	yes	
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

3.3.4.3 Digital output module parameters

Digital output		
Product Model	XBF5D-0032A/XBF5E-0032A	XBF5D-0032B/XBF5E-0032B
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤20mA	
Field-side input voltage range	24VDC (20.4V~28.8V)	
Number of output signal points	32	
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	20mA	
Power consumption	0.48W	
Channel indicator lights	Green LED lights	

Digital output		
Product Model	XBF5D-0016A/XBF5E-0016A	XBF5D-0016B/XBF5E-0016B
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤18mA	≤18mA
Field-side input voltage range	24VDC (20.4V~28.8V)	
Number of output signal points	16	
Output signal type	NPN	PNP
Output voltage drop	<1V	

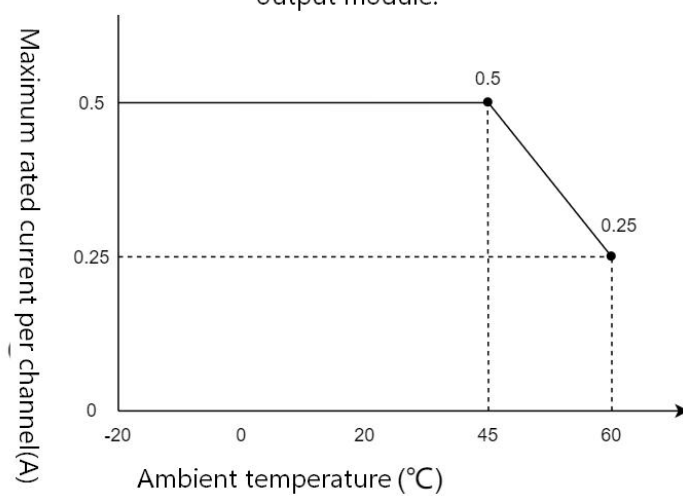
Output load type	Resistive load, inductive load, lamp load	
Single-channel rated current	Max: 0.5A (see details) Figure 1)	
Leakage current	<10uA	
reaction time	<150us	
Output channel protection	Short circuit protection (automatic recovery mechanism)	
Module protection	Reverse connection protection (automatic recovery mechanism), field-side surge protection	
Isolation methods	Optical isolation	
Isolation and withstand voltage	500VAC	
Rated current consumption	18mA	18mA
Power consumption	0.432W	0.432W
Channel indicator lights	Green LED lights	

3.3.4.4 General technical parameters

General technical parameters	
Specifications and dimensions	32 channels: $145 \times 75 \times 32.8\text{mm}$
	32-channel with waterproof box: $160 \times 127.7 \times 100\text{mm}$
	16 channels: $95.3 \times 75 \times 32.8\text{mm}$
	16-channel with waterproof box: $110 \times 128 \times 100\text{mm}$
weight	32 channels: 180g
	32-channel with waterproof case: 600g
	16 channels: 130g
	16-channel with waterproof case: 430g
Operating temperature	$-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$
Storage temperature	$-40^{\circ}\text{C} \sim +80^{\circ}\text{C}$
relative humidity	95%, no condensation
Altitude	$\leq 2000\text{m}$
Protection level	XBF5D Series: IP20
	XBF5E Series: IP65
Overvoltage category	I
Pollution level	Level 2
Module error self-recovery	Support
Disconnection check	Support
Firmware upgrade	Support
Short circuit protection	Supports (automatic recovery mechanism)
Reverse connection protection	Supports (automatic recovery mechanism)
Surge protection	Support

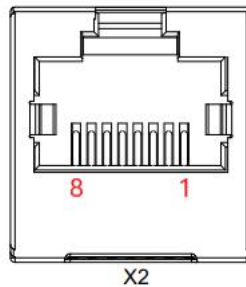
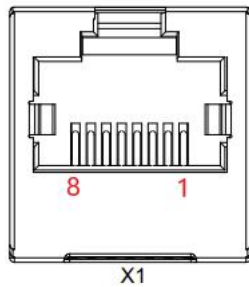
Figure 1:

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



3.3.5 I/O expansion interface

The XBF5D & XBF5E series I/O expansion interfaces use standard RJ45 network interfaces and standard crystal connectors. The pin assignments are shown in the table below.



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

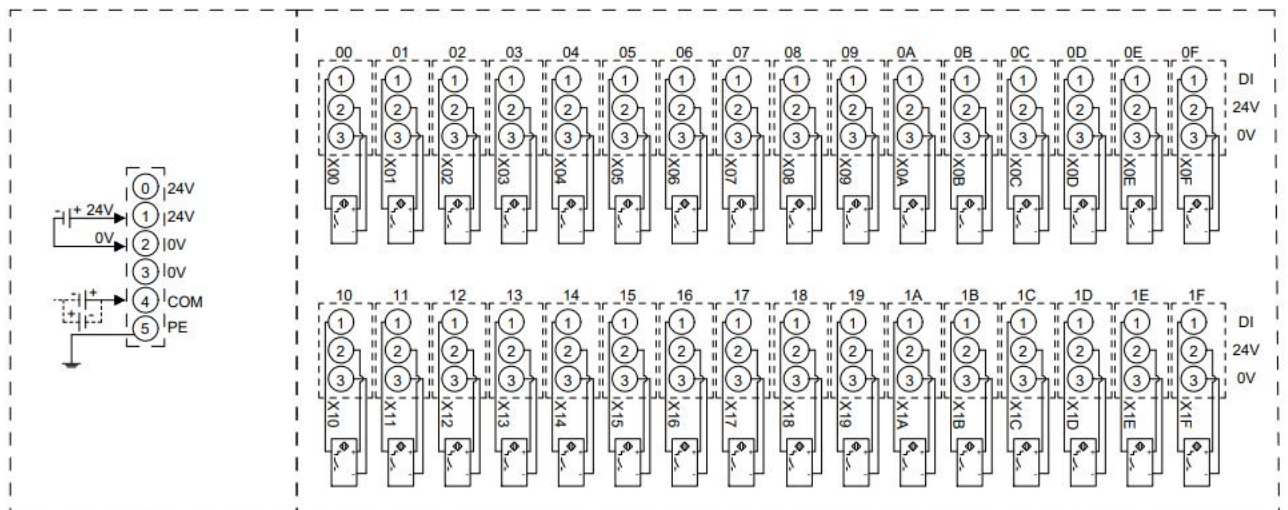
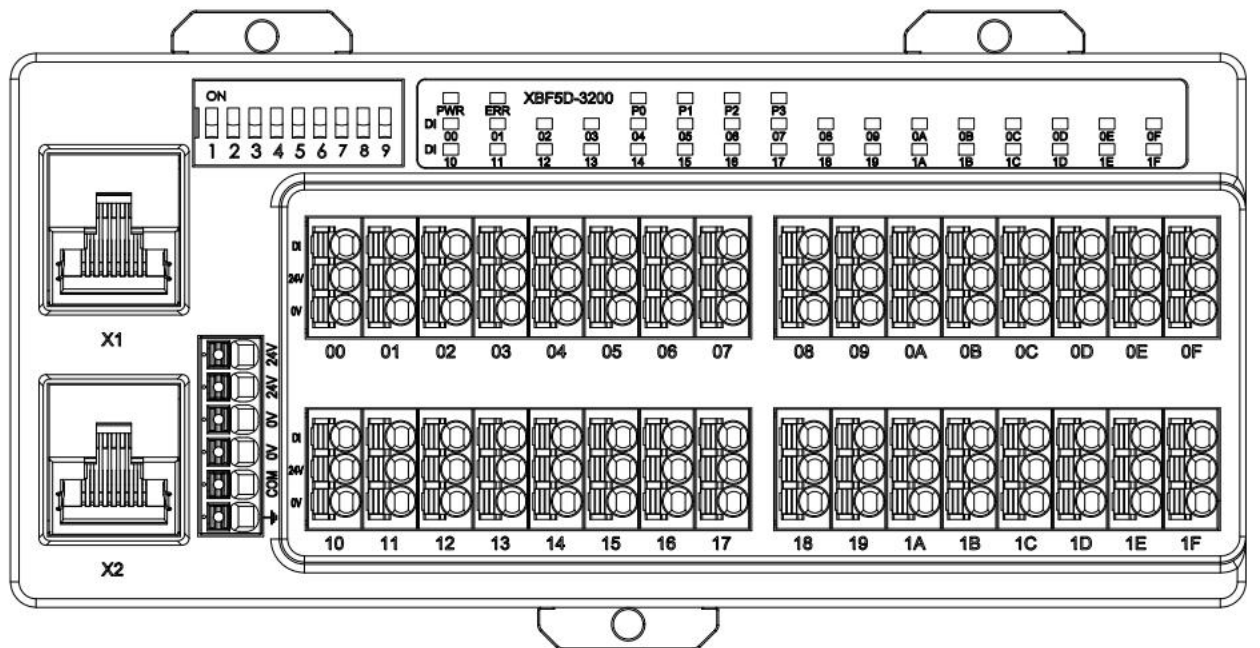
The I/O expansion interface provides two interfaces, one input and one output, which facilitates the connection of multiple I/O modules in series. A terminating resistor needs to be inserted on the unused I/O interface of the last I/O module.

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 I/O interface.

3.3.6 I/O Wiring Diagram

3.3.6.1 XBF5D-3200/XBF5E-3200

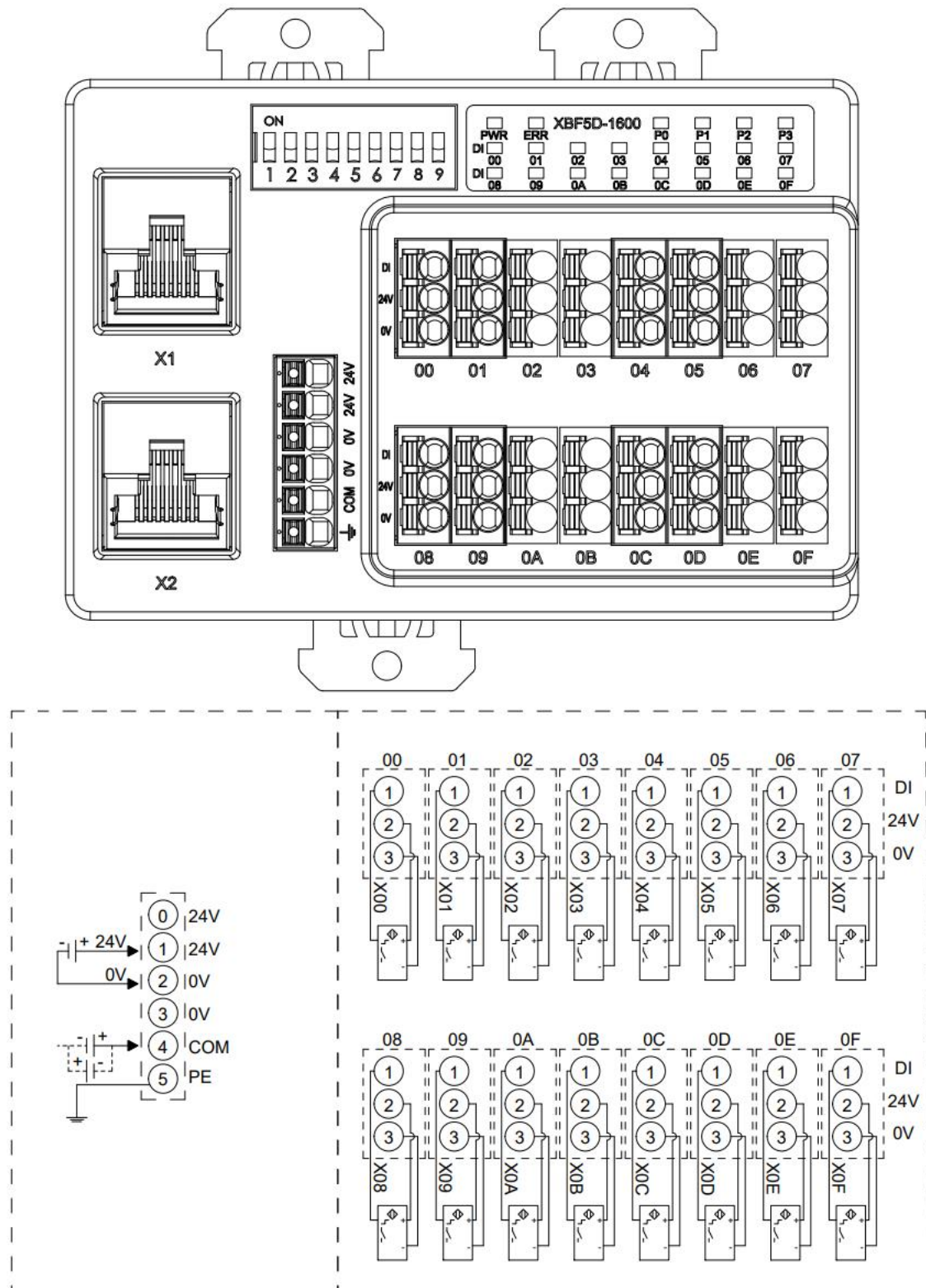


*24V internal conduction; 0V internal conduction

*COM is the common terminal for DI, compatible with NPN/PNP.

*The wiring section is the same as that of the XBF5D-3200 panel.

3.3.6.2 XBF5D-1600/XBF5E-1600

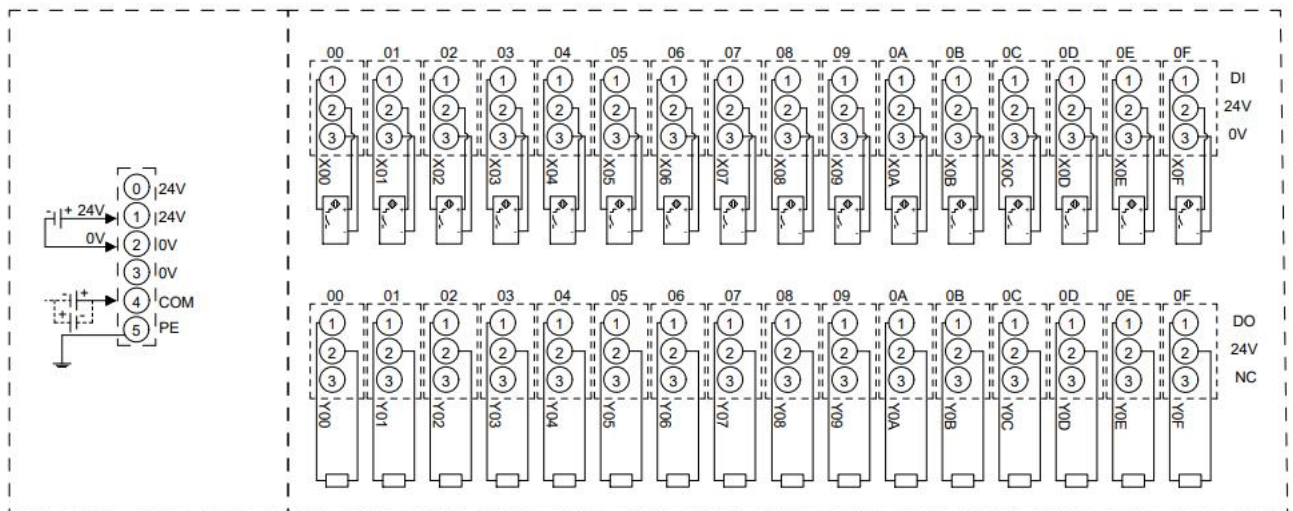
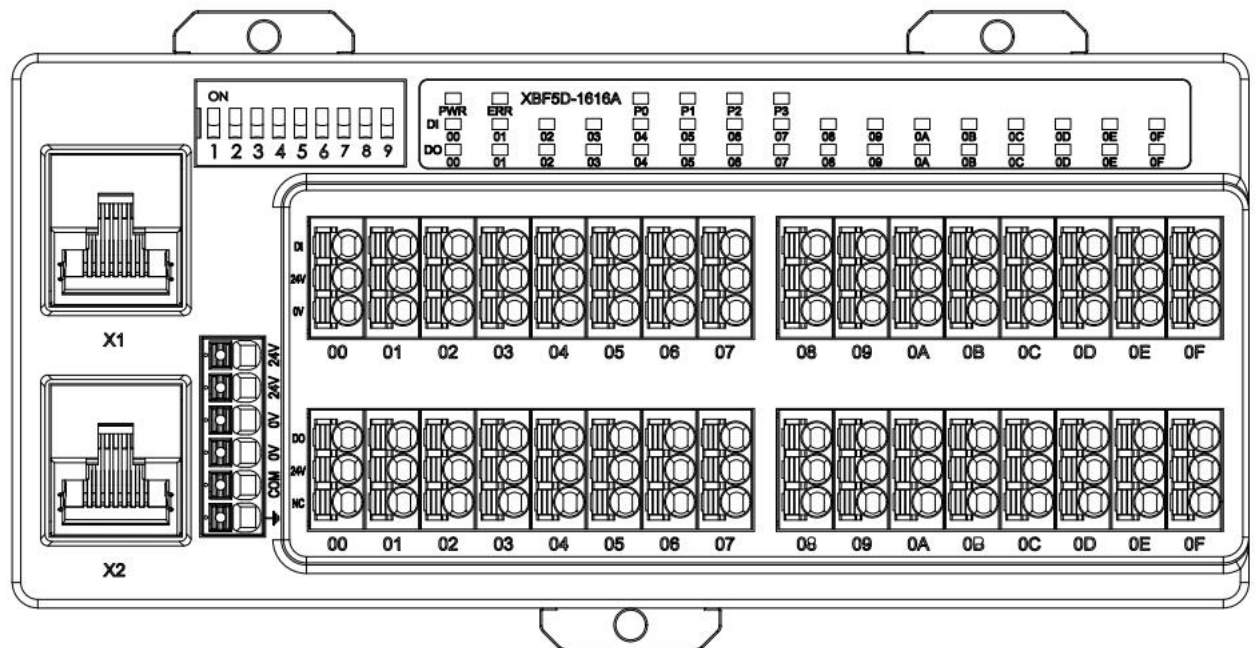


*24V internal conduction; 0V internal conduction

*COM is the common terminal for DI, compatible with NPN/PNP.

*The wiring section is the same as that of the XBF5D-1600 panel.

3.3.6.3 XBF5D-1616A/XBF5E-1616A

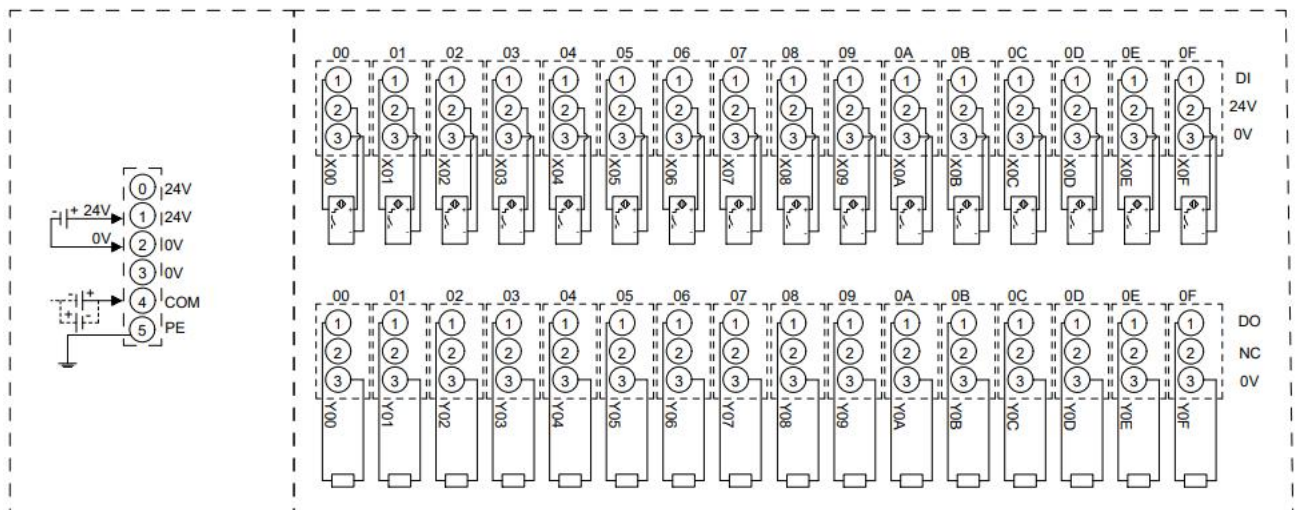
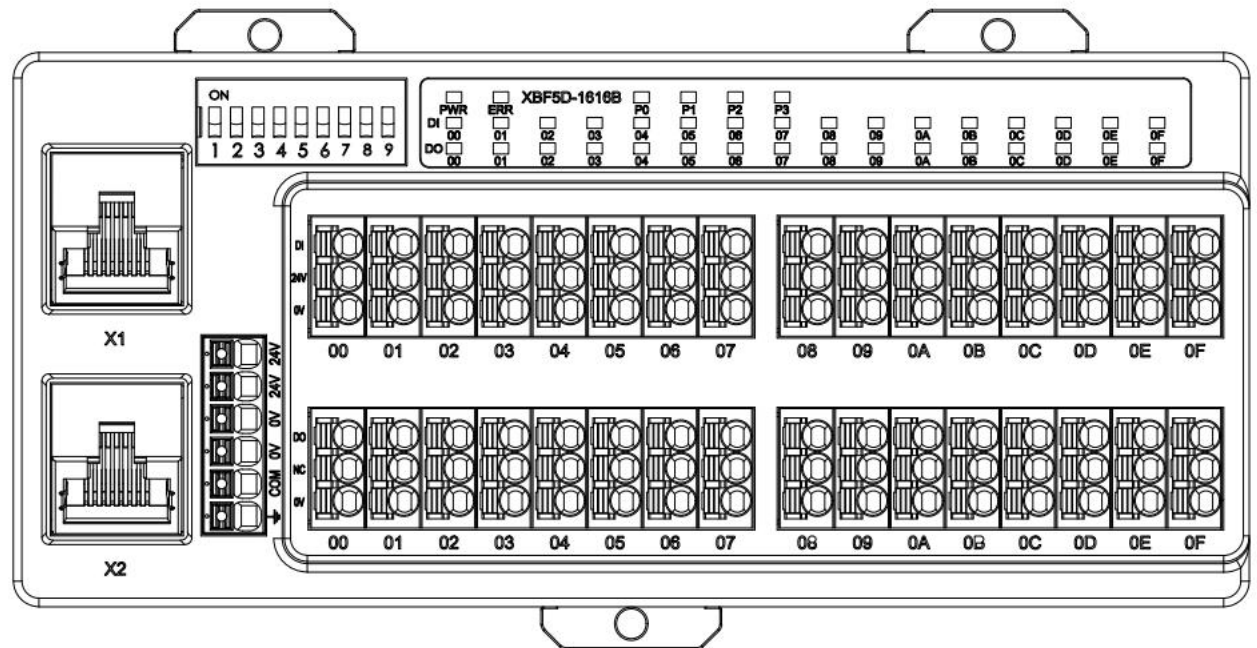


*24V internal conduction; 0V internal conduction

*COM is the common terminal for DI, compatible with NPN/PNP.

*The panel is taken as an example of XBF5D-1616A; the wiring is the same.

3.3.6.4 XBF5D-1616B/XBF5E-1616B

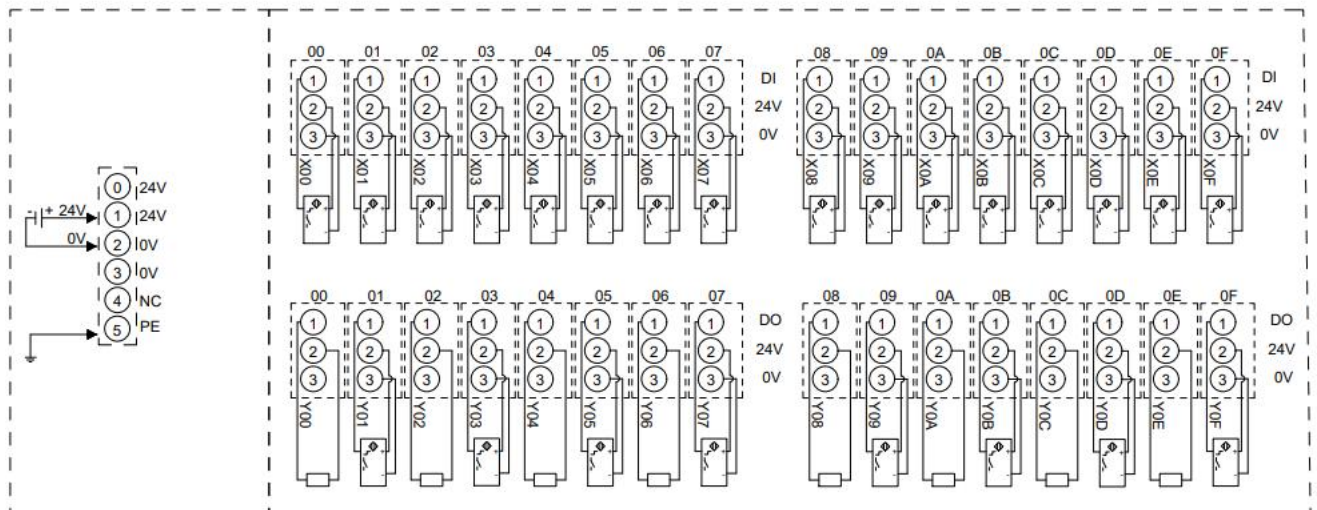
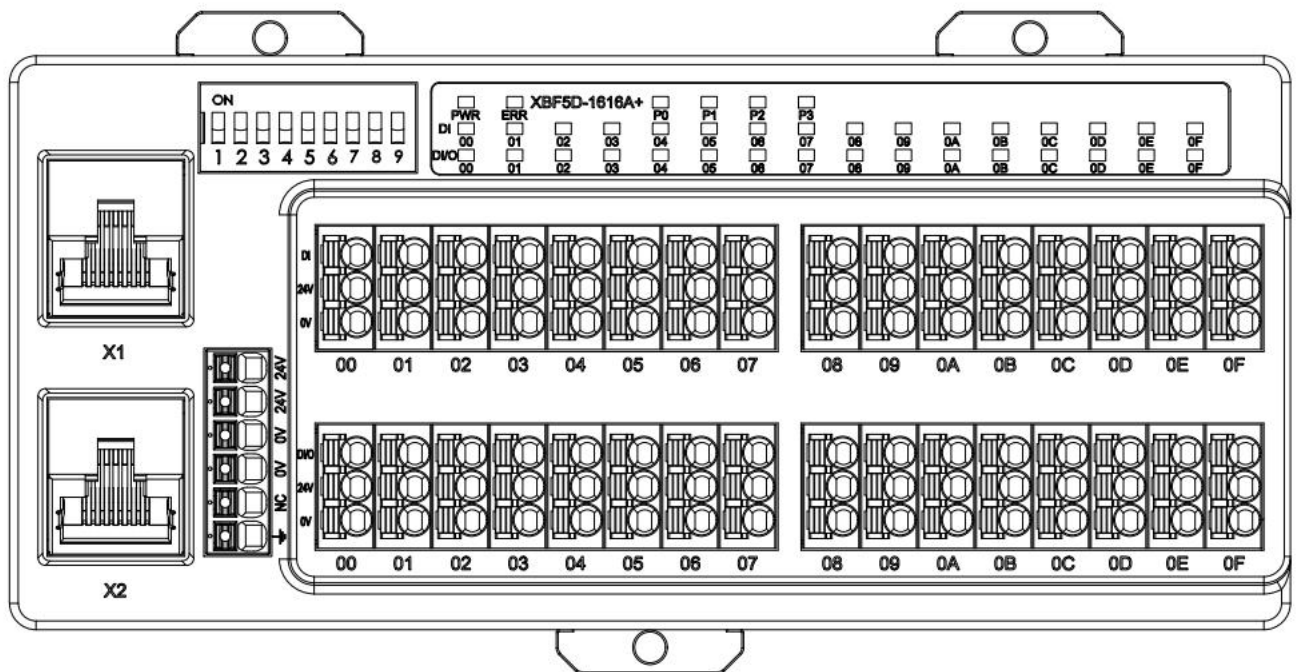


*24V internal conduction; 0V internal conduction

*COM is the common terminal for DI, compatible with NPN/PNP.

*The wiring section is the same as that of the XBF5D-1616B panel.

3.3.6.5 XBF5D-1616A+/XBF5E-1616A+



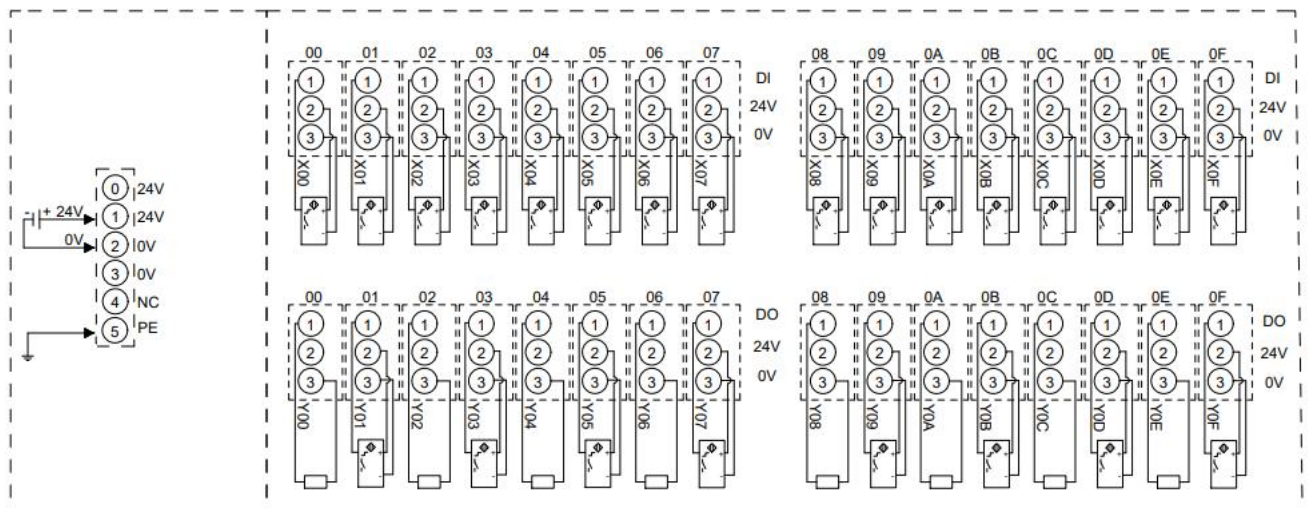
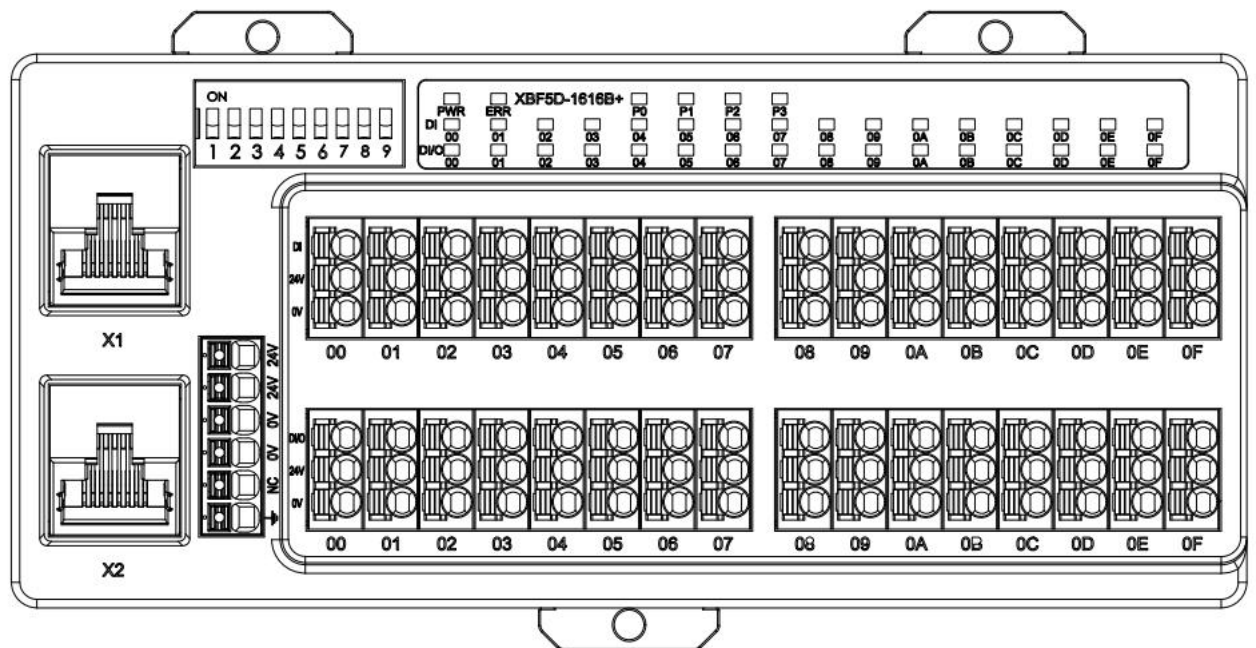
*24V internal conduction; 0V internal conduction

*The DI port can only use NPN input.

*The channels 00~0F below can be configured to DO/DI mode via DIP switches.

*The wiring section is the same as that of the XBF5D-1616A+ panel.

3.3.6.6 XBF5D-1616B+/XBF5E-1616B+



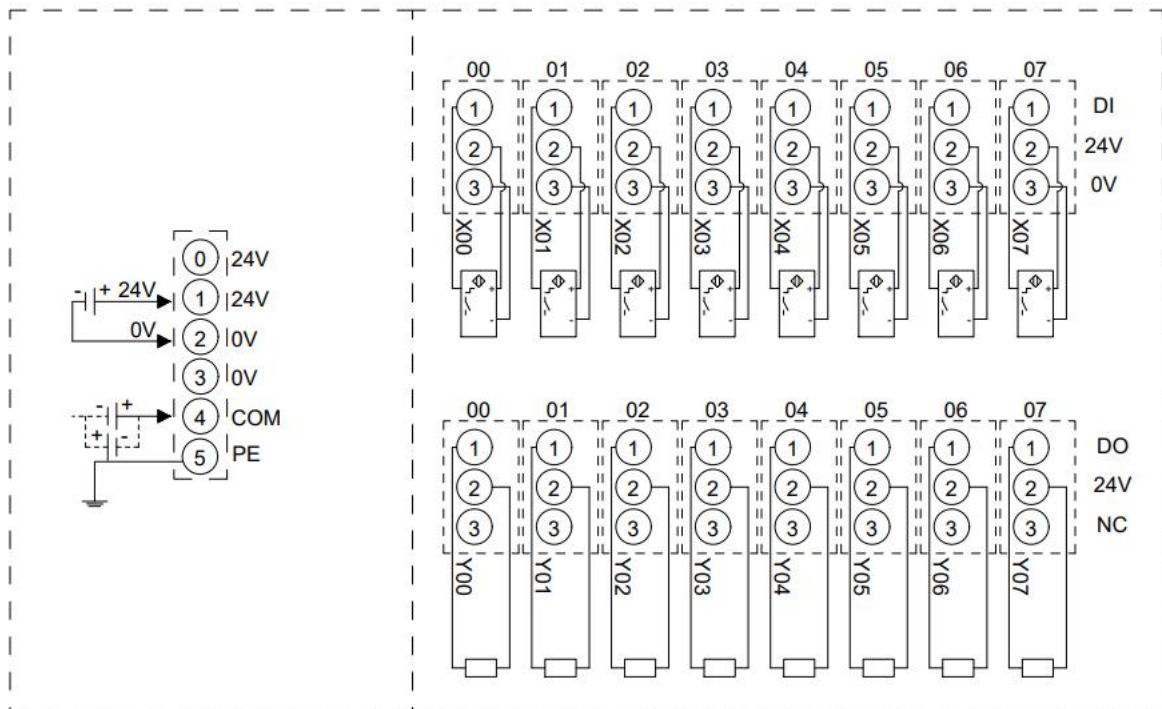
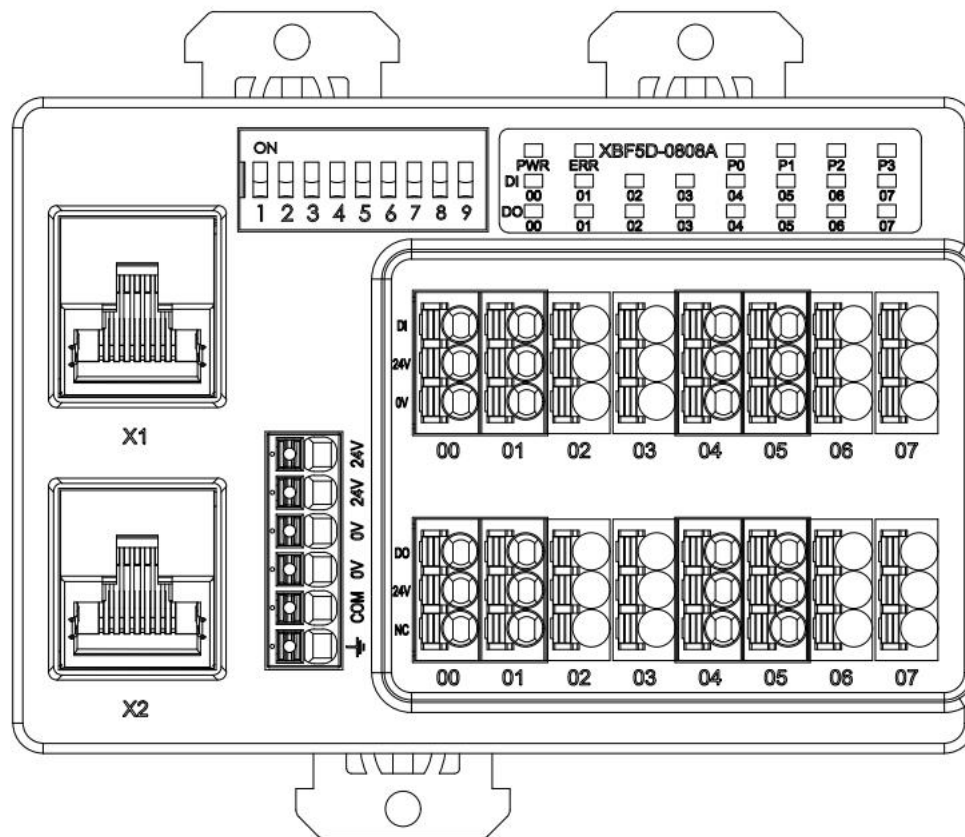
*24V internal conduction; 0V internal conduction

*DI ports can only use PNP inputs.

*The channels 00~0F below can be configured to DO/DI mode via DIP switches.

*The panel is taken as an example of XBF5D-1616B+, the wiring is the same.

3.3.6.7 XBF5D-0808A/XBF5E-0808A

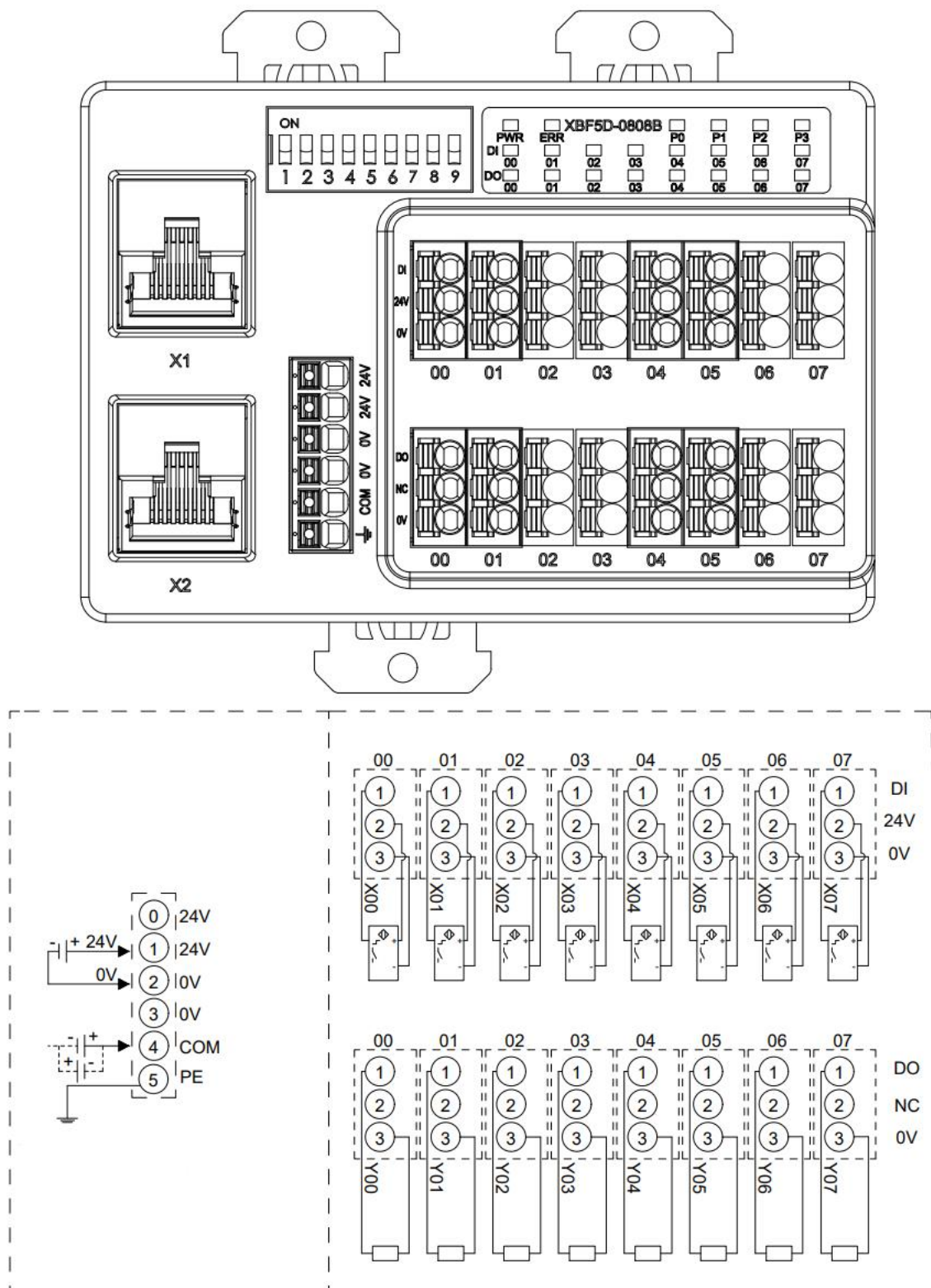


*24V internal conduction; 0V internal conduction

*COM is the common terminal for DI, compatible with NPN/PNP.

*The wiring section is the same as that of the XBF5D-0808A panel.

3.3.6.8 XBF5D-0808B/XBF5E-0808B

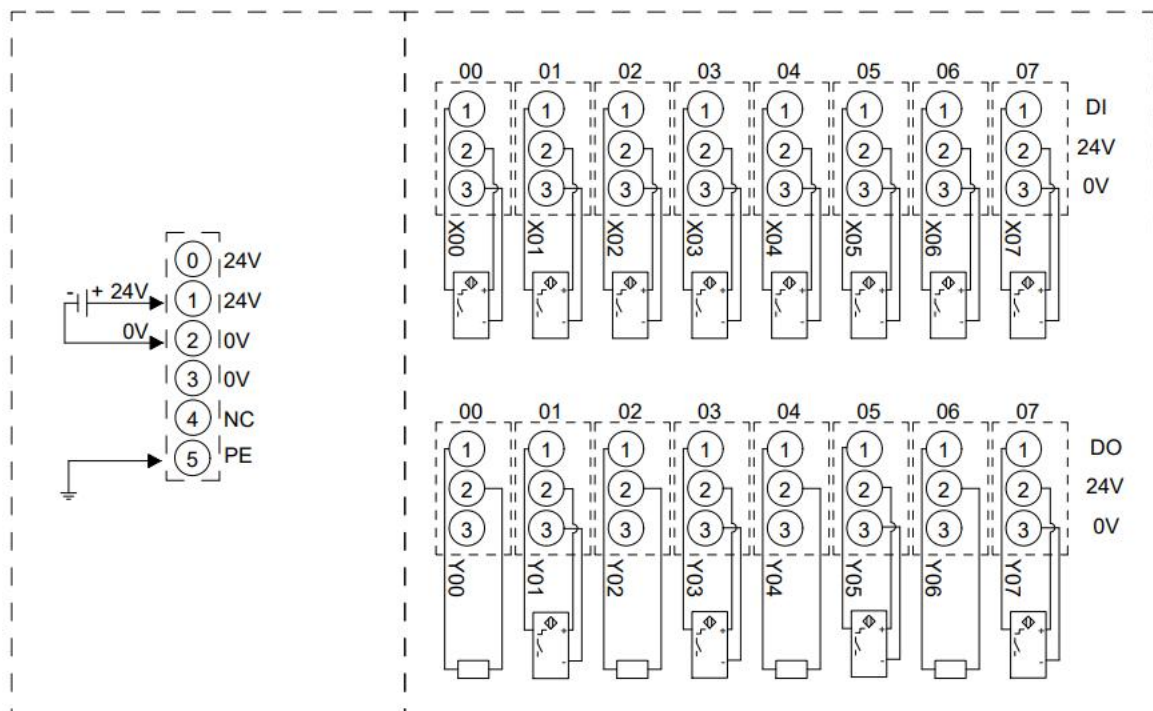
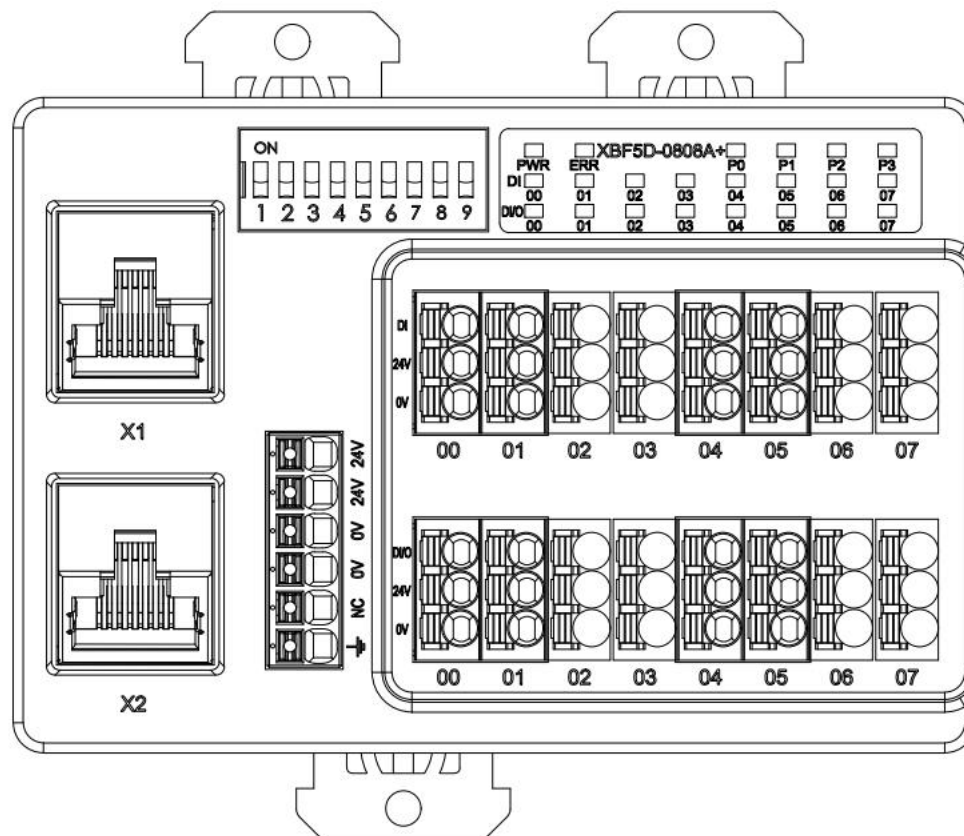


*24V internal conduction; 0V internal conduction

*COM is the common terminal for DI, compatible with NPN/PNP.

*The wiring section is the same as that of the XBF5D-0808B panel.

3.3.6.9 XBF5D-0808A+/XBF5E-0808A+



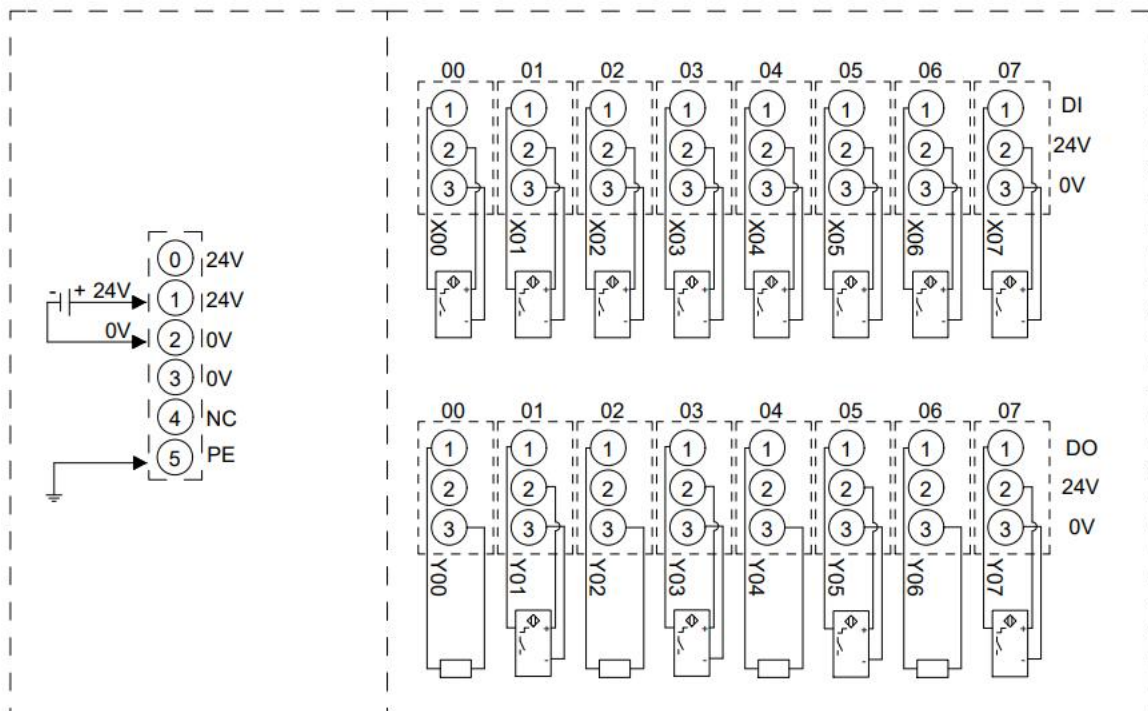
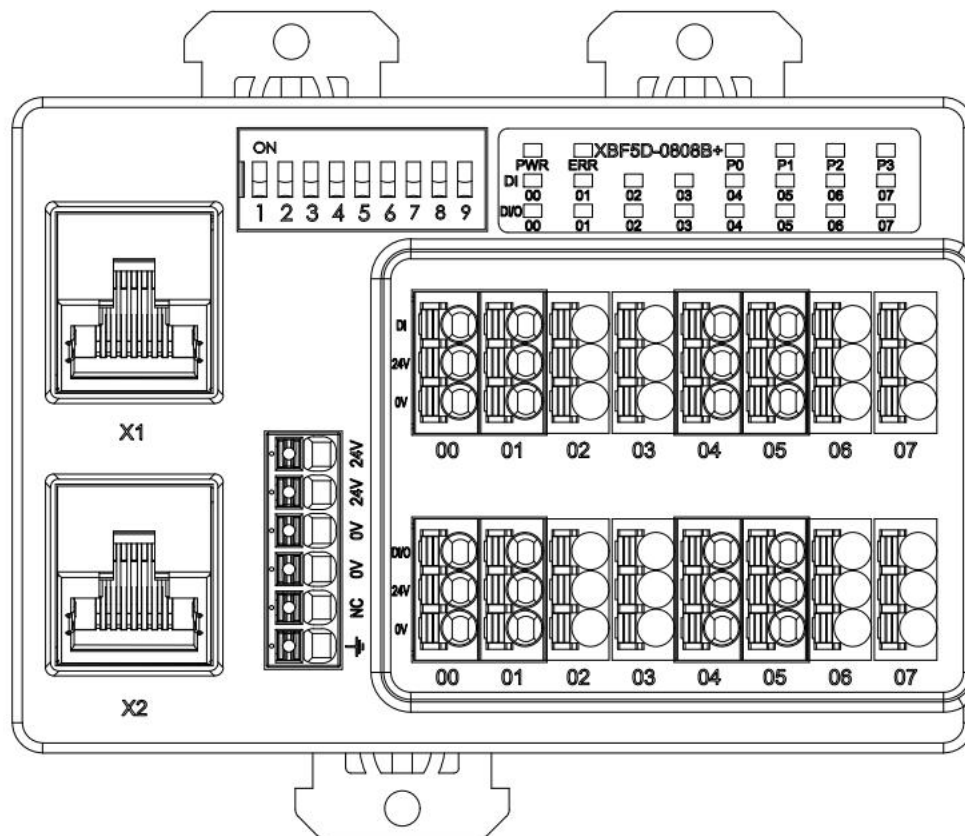
*24V internal conduction; 0V internal conduction

*The DI port can only use NPN input.

*Channels 00-07 below can be configured to DO/DI mode via DIP switches.

*The wiring section is the same as that of the XBF5D-0808A+ panel.

3.3.6.10 XBF5D-0808B+/XBF5E-0808B+



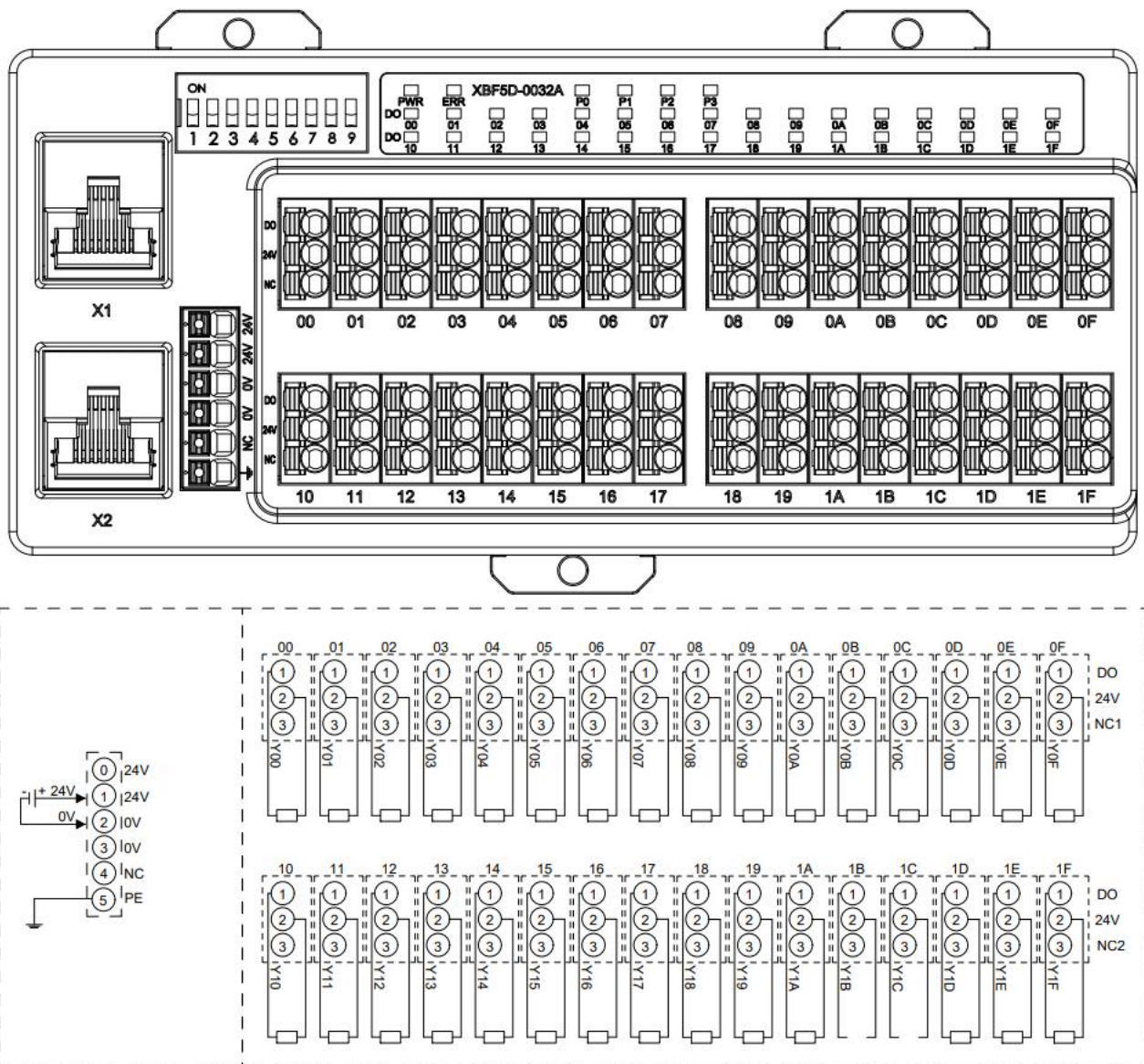
*24V internal conduction; 0V internal conduction

*DI ports can only use PNP inputs.

*Channels 00-07 below can be configured to DO/DI mode via DIP switches.

*The wiring section is the same as that of the XBF5D-0808B+ panel.

3.3.6.11 XBF5D-0032A/XBF5E-0032A

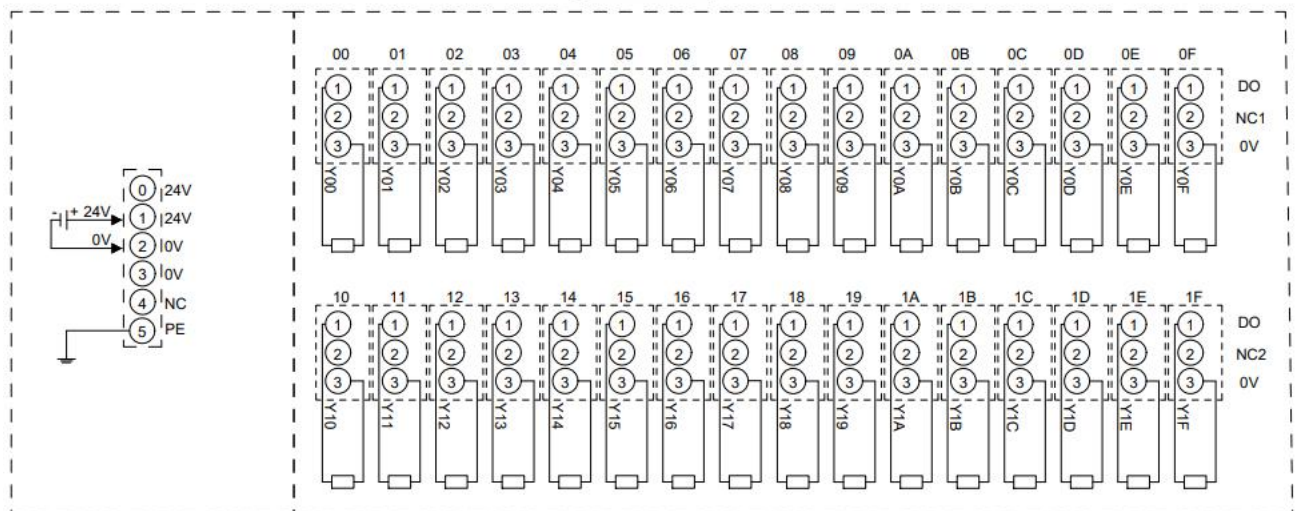
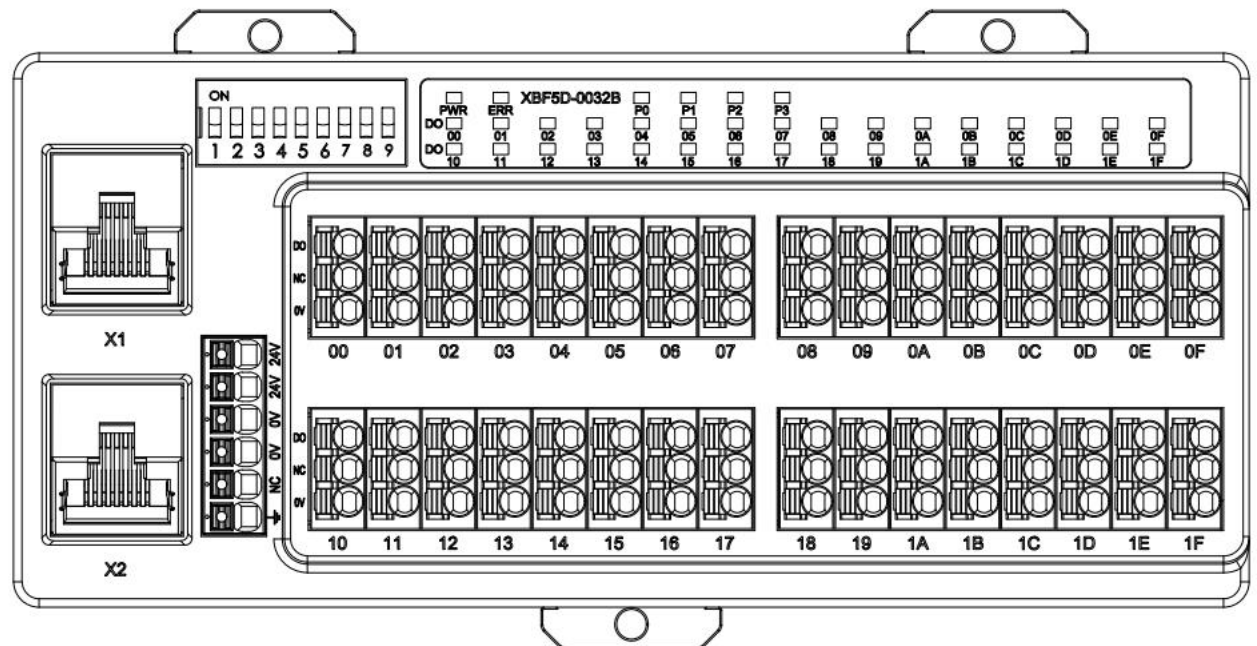


*24V internal conduction; 0V internal conduction

*NC1 is internally conductive; NC2 is internally conductive.

*The wiring section is the same as that of the XBF5D-0032A panel.

3.3.6.12 XBF5D-0032B/XBF5E-0032B

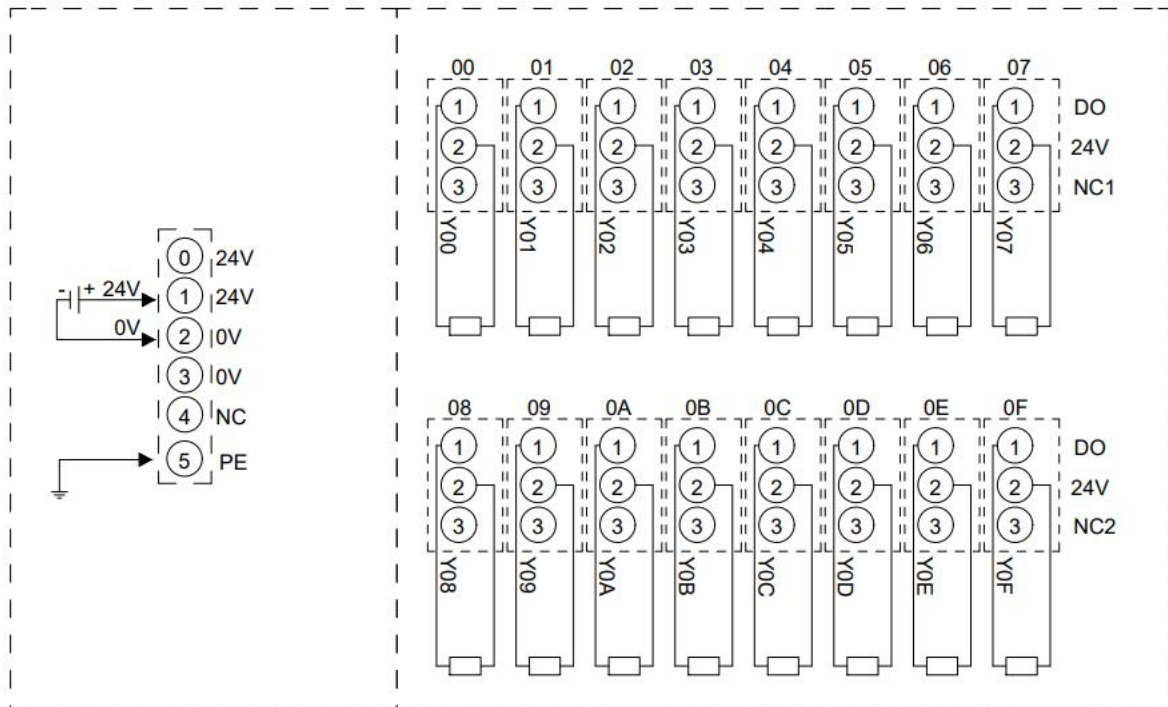
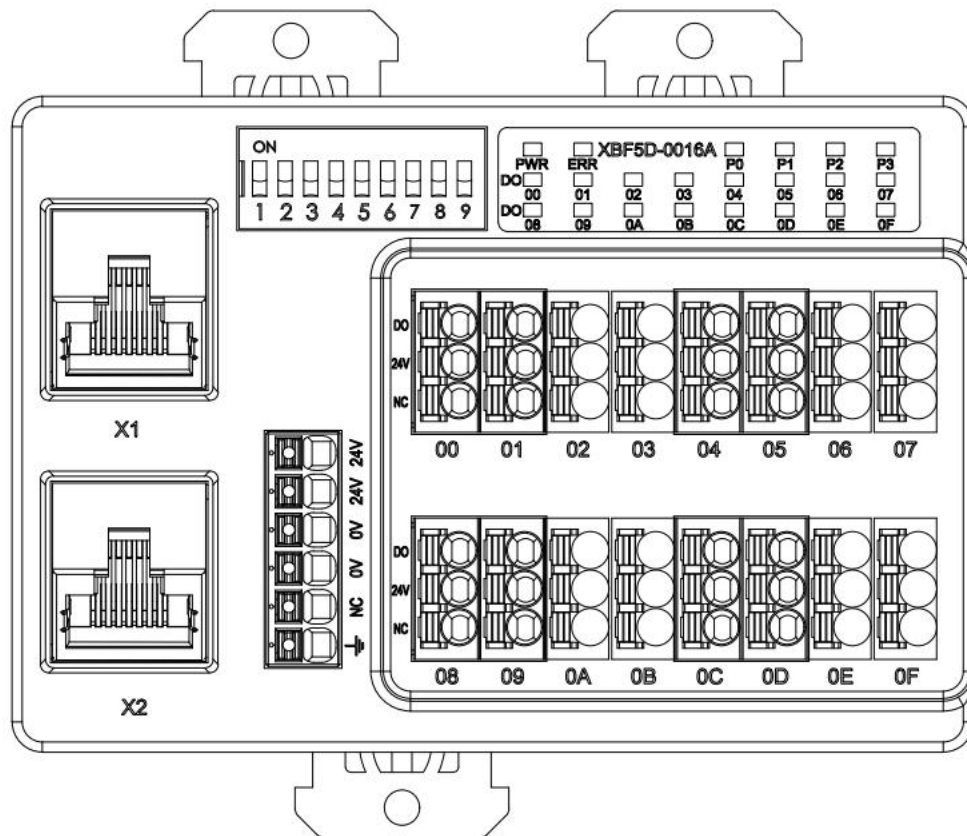


*24V internal conduction; 0V internal conduction

*NC1 is internally conductive; NC2 is internally conductive.

*The wiring section is the same as that of the XBF5D-0032B panel.

3.3.6.13 XBF5D-0016A/XBF5E-0016A

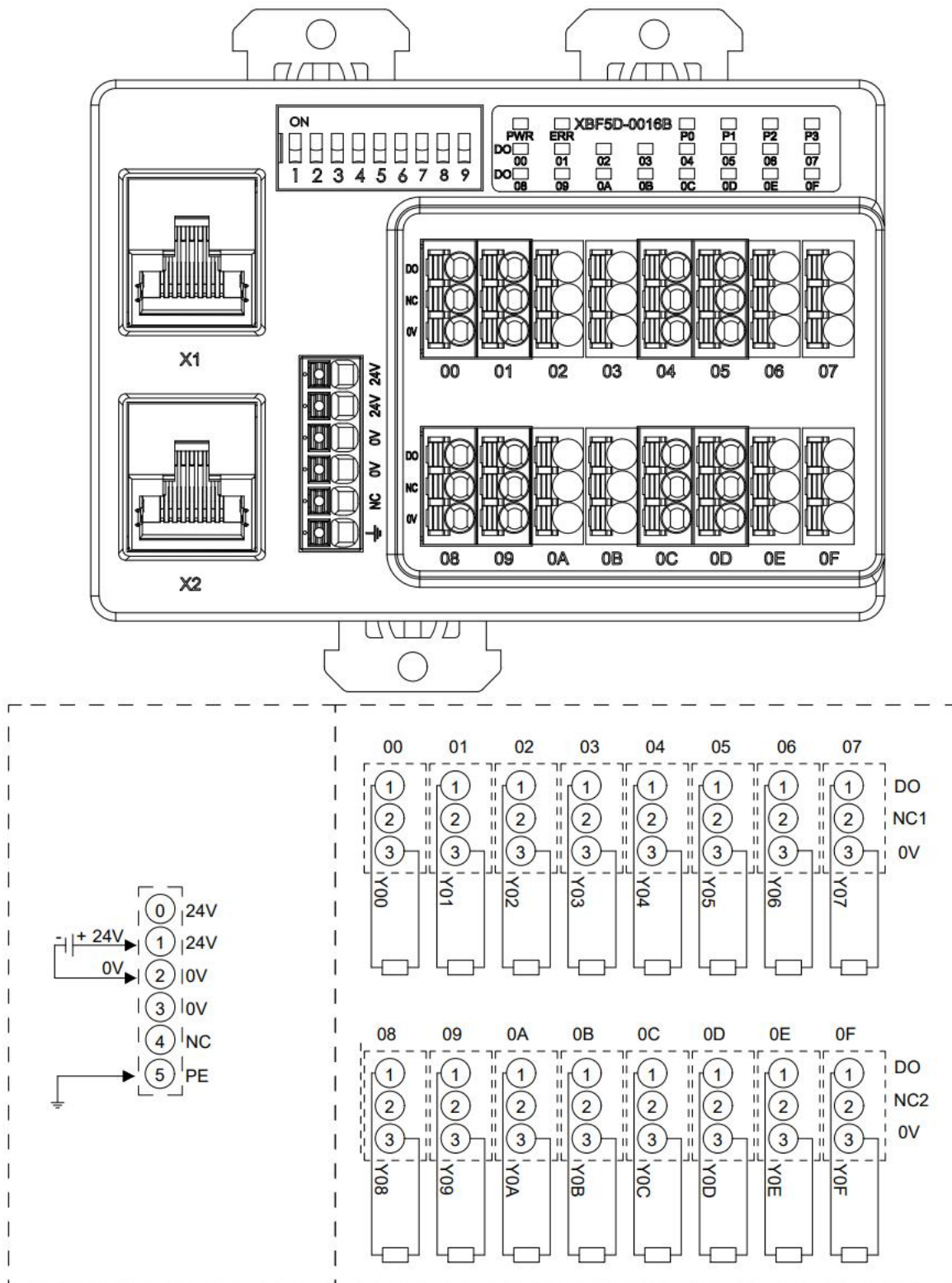


*24V internal conduction; 0V internal conduction

*NC1 is internally conductive; NC2 is internally conductive.

*The wiring section is the same as that of panel XBF5D-0016A.

3.3.6.14 XBF5D-0016B/XBF5E-0016B



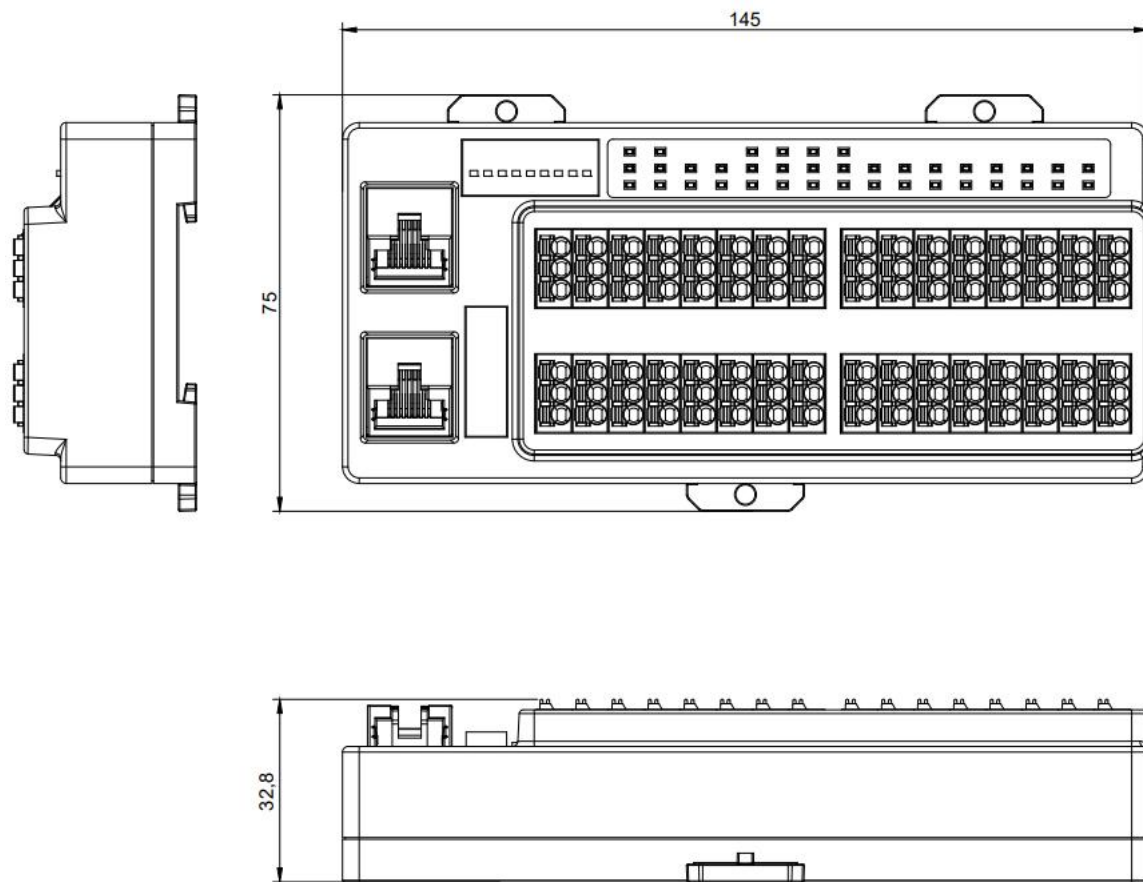
*24V internal conduction; 0V internal conduction

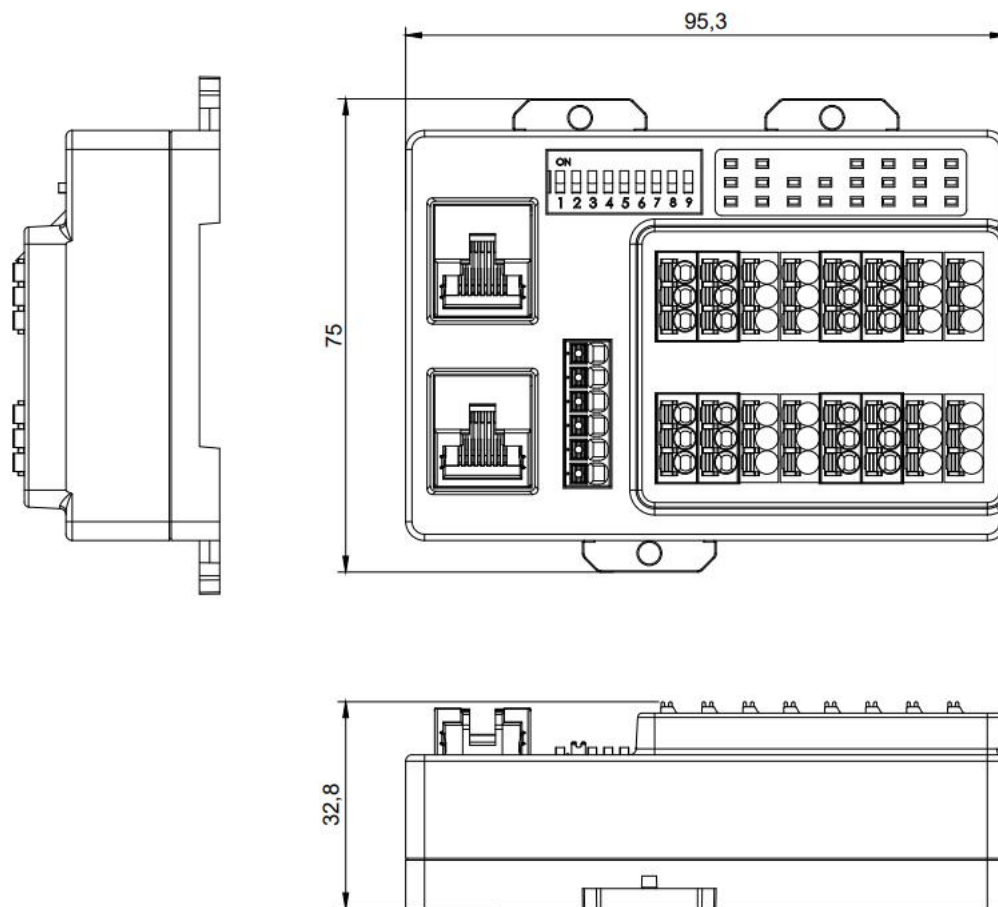
*NC1 is internally conductive; NC2 is internally conductive.

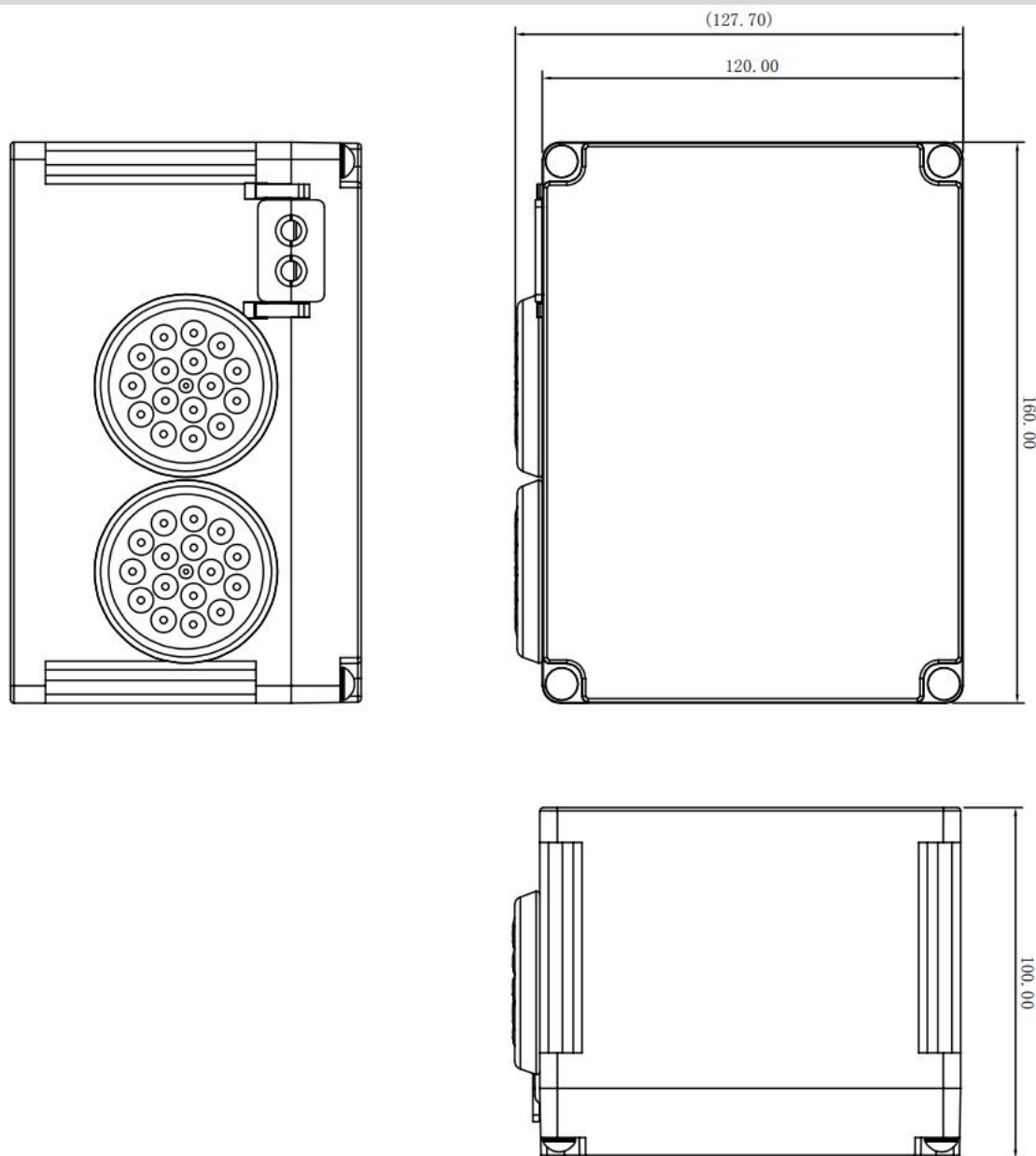
*The wiring section is the same as that of panel XBF5D-0016B.

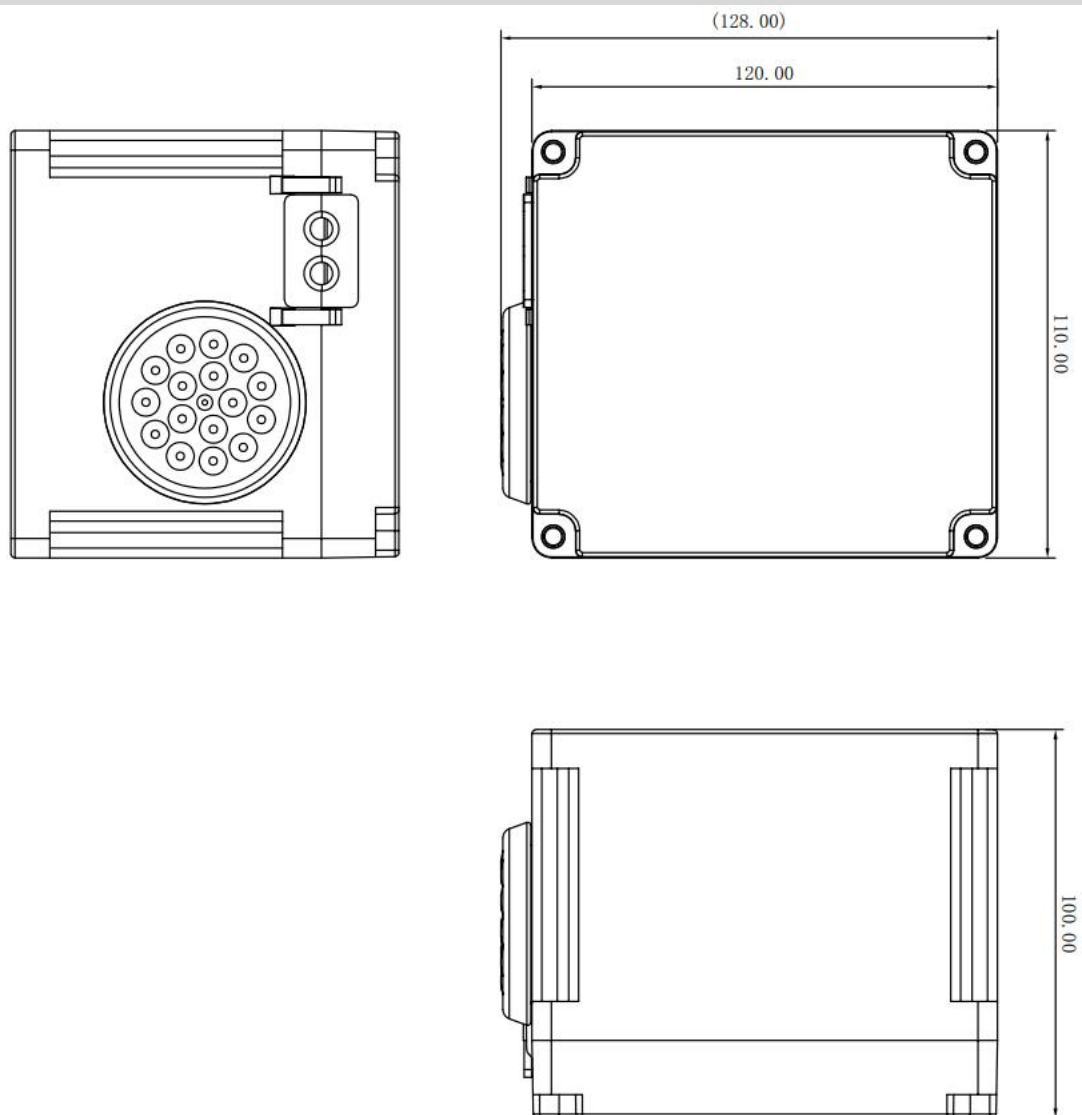
3.3.7 Outline Dimensions

32-channel I/O module dimensions (unit: mm)



16-channel I/O module dimensions (unit: mm)

32-channel I/O module including waterproof box dimensions (unit: mm)

16-channel I/O module including waterproof box dimensions (unit: mm)

3.4 Analog I/O module

3.4.1 Panel structure



Serial Number	Name	Illustrate
①	binary DIP switch	Set station number
②	Extension Interface	2×RJ45
③	Power terminal	6P spring-loaded terminal block
④	System indicator lights and channel indicator lights	Indicates module power status, operating status, and channel status.
⑤	Input/output channels	Terminal blocks

3.4.2 Indicator light function

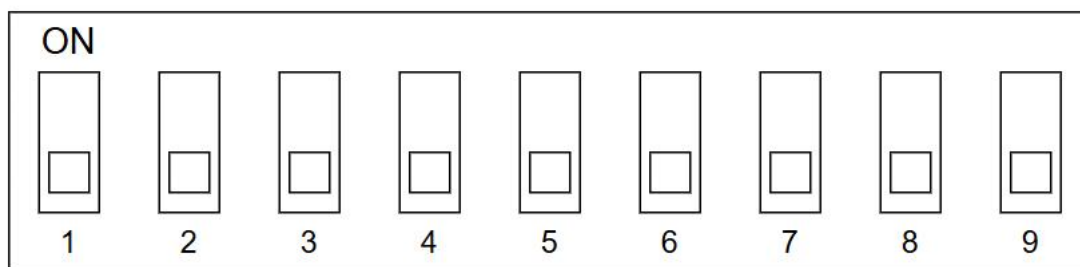
Analog I/O module indicator light definitions				
Logo	Name	Color	State	Status Description
PWR	Power indicator light	Green	ON	The module's internal 3.3V power supply is powered on normally.
			Extinguish	The module's internal 3.3V power supply is malfunctioning.
ERR	Fault indicator light	Red	ON	Module communication with the main station is abnormal.
			10Hz flicker	The online module upgrade has completed and is restarting.
			Extinguish	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
			Extinguish	The module and coupler did not establish communication.
A0~A7	Input channel indicator	Green	ON	The module channel has a signal input.
			Extinguish	The module channel has no signal input or the signal input is abnormal.
A0~A7	Output channel indicator	Green	ON	The module channel has signal output.
			Extinguish	The module channel has no signal output or the signal output is abnormal.

3.4.3 DIP switch

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 binary 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 serially connect a maximum of 16 modules. The binary DIP switches and their meanings are shown in the following figure:



Analog module binary DIP switch: The first 4 bits are used to set the station number, and the last 5 bits of the binary DIP switch have no function.

3.4.3.1 Station Number DIP Switch Setting Table

4321 DIP switch settings (binary)	Setting value	Station number value
0000	0	0
0001	1	1
0010	2	2
0011	3	3
0100	4	4
0101	5	5
0110	6	6
0111	7	7
1000	8	8
1001	9	9
1010	A	A (10)
1011	B	B(11)
1100	C	C(12)
1101	D	D (13)
1110	E	E(14)
1111	F	F(15)

Remark:

1. 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.

- 2、 If the station number is set to be duplicated, the module will encounter communication errors or be unable to connect to the main station.**

3.4.4 Technical parameters

3.4.4.1 Analog parameters

Analog input		
Product Model	XBF5D-A8C/XBF5E-A8C	
Input points	Maximum 8	Maximum 8
Input type	Voltage type	Current type
Input signal	Disable, 0V~10V, 0V~5V, 1V~5V, 0mA~20mA, 4mA~20mA (The range is adjustable, with the default value being 0V~10V)	
Input signal type	single-ended signal	
Channel reaction time	1ms/8ch	
resolution	16 bits	
Sampling rate (full channel)	≤1ksps	
accuracy	±0.1% at 25°C, ±0.3% over the entire temperature range.	
Input filtering	support	
Smooth series	1~200	
Input impedance (voltage type)	≥47kΩ	-
Input impedance (current type)	-	≤200Ω
Maximum allowable voltage for the channel (voltage type)	30V	-
Maximum allowable current for the channel (current type)	-	30mA
Input overload protection	Support clamp protection	Supports rate limiting protection
Input protection	±30V	±30mA
Isolation and withstand voltage	500VDC	
Rated current consumption	20mA	20mA
Power consumption	0.48W	0.48W
Analog output		
Product Model	XBF5D-A8C/XBF5E-A8C	
Output points	Maximum 8	Maximum 8
Output type	Voltage type	Current type
Output signal	Disable, 0V~10V, 0V~5V, 1V~5V, 0mA~20mA, 4mA~20mA (Adjustable measurement range)	
Channel reaction time	1ms/8ch	
resolution	13 bits	
accuracy	±0.1% at 25°C, ±0.3% over the entire temperature range.	

Load impedance (voltage type)	≥2kΩ (1kΩ accuracy: 0.3% at 25℃, ±0.5% at all temperatures)	-
Load impedance (current type)	-	≤500Ω
Output protection	Overload protection, open circuit protection, and short circuit protection (all with automatic recovery mechanisms).	
Isolation and withstand voltage	500VDC	
Rated current consumption	20mA	20mA
Power consumption	0.48W	0.48W
Clearing and retaining optional functions in non-OP state	support	
Analog input		
Product Model	XBF5D-A4C/XBF5E-A4C	
Input points	Maximum 4	Maximum 4
Input type	Voltage type	Current type
Input signal	Disable, 0V~10V, 0V~5V, 1V~5V, 0mA~20mA, 4mA~20mA (The range is adjustable, with the default value being 0V~10V)	
Input signal type	single-ended signal	
Channel reaction time	1ms/4ch	
resolution	16 bits	
Sampling rate (full channel)	≤1ksps	
accuracy	±0.1% at 25℃, ±0.3% over the entire temperature range.	
Input filtering	support	
Smooth series	1~200	
Input impedance (voltage type)	≥47kΩ	-
Input impedance (current type)	-	≤200Ω
Maximum allowable voltage for the channel (voltage type)	30V	-
Maximum allowable current for the channel (current type)	-	30mA
Input overload protection	Support clamp protection	Supports rate limiting protection
Input protection	±30V	±30mA
Isolation and withstand voltage	500VDC	
Rated current consumption	15mA	15mA

Power consumption	0.36W	0.36W
Analog output		
Product Model	XBF5D-A4C/XBF5E-A4C	
Output points	Maximum 4	Maximum 4
Output type	Voltage type	Current type
Output signal	Disable, 0V~10V, 0V~5V, 1V~5V, 0mA~20mA, 4mA~20mA (Adjustable measurement range)	
Channel reaction time	1ms/4ch	
resolution	13 bits	
accuracy	$\pm 0.1\%$ at 25°C, $\pm 0.3\%$ over the entire temperature range.	
Load impedance (voltage type)	$\geq 2k\Omega$ (1k Ω accuracy: 0.3% at 25°C, $\pm 0.5\%$ at all temperatures)	-
Load impedance (current type)	-	$\leq 500\Omega$
Output protection	Overload protection, open circuit protection, and short circuit protection (all with automatic recovery mechanisms).	
Isolation and withstand voltage	500VDC	
Rated current consumption	15mA	15mA
Power consumption	0.36W	0.36W
Clearing and retaining optional functions in non-OP state	support	

3.4.4.2 Voltage and current range selection table

Voltage and current range selection and code value range					
Range selection	Measuring range	Code value range	Voltage and current input calculation formulas	Voltage and current output calculation formulas	Code value mapping table
0	Disable indicates that the channel is not enabled.				
1 (default)	0V~10V	0~27648	$D=(27648/10)*U$	$U=(D*10)/27648$	See Code value table 3.4.4.3~3.4.4.6
2	0V~10V	0~32767	$D=(32767/10)*U$	$U=(D*10)/32767$	
3	0V~5V	0~27648	$D=(27648/5)*U$	$U=(D*5)/27648$	
4	0V~5V	0~32767	$D=(32767/5)*U$	$U=(D*5)/32767$	
5	1V~5V	0~27648	$D=(27648/4)*U-6912$	$U=(D+6912)*4/27648$	
6	0mA~20mA	0~27648	$D=(27648/20)*I$	$I=(D*20)/27648$	
7	4mA~20mA	0~27648	$D=(27648/16)*I-6912$	$I=((D+6912)*16)/27648$	

Note: D represents code value, U represents voltage, I represents current, and the default analog range is 1: 0V~10V (0~27648).

3.4.4.3 Voltage Input Code Value Table

range Voltage	0V~10V	0V~10V	0V~5V	0V~5V	1V~5V
	0~27648	0~32767	0~27648	0~32767	0~27648
	code value	code value	code value	code value	code value
0	0	0	0	0	-
0.296	818	970	1637	1940	-4866
1	2765	3277	5530	6554	0
2	5530	6554	11060	13107	6912
3	8294	9830	16588	19661	13824
4	11059	13107	22118	26214	20736
5	13824	16384	27648	32767	27648
5.5	15206	18022	30413	-	31104
5.704	15770	18690	-	-	32514
6	16589	19661	-	-	-
7	19354	22937	-	-	-
8	22118	26214	-	-	-
9	24883	29491	-	-	-
10	27648	32767	-	-	-
Code value formula	Code value $= (27648/10)*V$ oltage	Code value $= (32767/10)*V$ oltage	code value $= (27648/5)*V$ oltage	code value $= (32767/5)*V$ oltage	code value $= (27648/4)*V$ oltage-6912
Voltage formula	Voltage $= (\text{Code value} * 10) / 27648$	Voltage $= (\text{Code value} * 10) / 32767$	Voltage $= (\text{code value} * 5) / 27648$	Voltage $= (\text{code value} * 5) / 32767$	Voltage $= (\text{code value} + 6912) * 4 / 27648$

Note: ① When the voltage input range is selected as 0V~5V (0~27648), overshoot, overflow, and overflow alarm functions are supported. Overshoot occurs when the channel input range exceeds the range, and the normal calculated code value is displayed within 0V~5.5V. Overflow is displayed as 32767.

② When the voltage input range is selected as 0V~5V (0~32767), overflow and overflow alarm functions are supported. When overflow occurs, the display is 32767.

③ Voltage input range selection: 1V~5V (0~27648)It supports overshoot, overflow, and overflow alarm functions. Overshoot occurs when the channel input range exceeds the range, triggering an overshoot alarm.0.296VThe calculated code value is displayed within ~5.704V. Overflow or overflow will be displayed as -32768/32767.

3.4.4.4 Voltage output code value table

range Voltage	0V~10V	0V~10V	0V~5V	0V~5V	1V~5V
	0~27648	0~32767	0~27648	0~32767	0~27648
	code value	code value	code value	code value	code value
0	0	0	0	0	-
1	2765	3277	5530	6554	0
2	5530	6554	11060	13107	6912
3	8294	9830	16588	19661	13824
4	11059	13107	22118	26214	20736
5	13824	16384	27648	32767	27648
6	16589	19661	-	-	-
7	19354	22937	-	-	-
8	22118	26214	-	-	-
9	24883	29491	-	-	-
10	27648	32767	-	-	-
Code value formula	Code value = (27648/10)*Voltage	Code value = (32767/10)*Voltage	code value = (27648/5)*Voltage	code value = (32767/5)*Voltage	code value = (27648/4)*Voltage - 6912
Voltage formula	Voltage = (Code value * 10) / 27648	Voltage = (Code value * 10) / 32767	Voltage = (code value * 5) / 27648	Voltage = (code value * 5) / 32767	Voltage = (code value + 6912) * 4 / 27648

Note: ① The voltage output setting code value will not respond if it exceeds the range code value.

3.4.4.5 Current Input Code Value Table

range Current	4mA~20mA	0mA~20mA
	0~27648	0~27648
	code value	code value
0	-	0
1	-	1382
1.19	-4856	1645
2	-3456	2765
3	-1728	4147
4	0	5530
5	1728	6912
6	3456	8294
7	5184	9677
8	6912	11059
9	8640	12442
10	10368	13824
11	12096	15206
12	13824	16589
13	15552	17971
14	17280	19354
15	19008	20736
16	20736	22118
17	22464	23501
18	24192	24883
19	25920	26266
20	27648	27648
22.81	32504	31533
23.52	-	32514
Code value formula	Code value = (27648/16) * current - 6912	Code value = (27648/20) * current
Current formula	Current = ((Code value + 6912) * 16) / 27648	Current = ((code value * 20) / 27648

Note: ① When the current input range is selected as 4mA~20mA (0~27648), overshoot, overflow, and overflow alarm functions are supported. Overshoot occurs when the channel input range exceeds the range, and the normal calculated code value is displayed within the range of 1.19mA~22.81mA. Overflow occurs when the channel input current is greater than 22.81mA, and the maximum overshoot code value of 32767 is displayed, along with an alarm. Underflow occurs when the input current is less than 1.19mA, and the minimum overshoot code value of -32768 is displayed.

② When the current input range is selected from 0mA to 20mA (0~27648), overshoot, overflow, and overflow alarm functions are supported. Overshoot occurs when the channel input range exceeds the range, and the normal calculated code value is displayed within the range of 0mA to 23.52mA. Overflow occurs when the channel input current exceeds 23.52mA, and the maximum overshoot code value of 32767 is displayed, along with an alarm.

3.4.4.6 Current output code value table

range Current	4mA~20mA	0mA~20mA
	0~27648	0~27648
	code value	code value
0	-	0
1	-	1382
2	-	2765
3	-	4147
4	0	5530
5	1728	6912
6	3456	8294
7	5184	9677
8	6912	11059
9	8640	12442
10	10368	13824
11	12096	15206
12	13824	16589
13	15552	17971
14	17280	19354
15	19008	20736
16	20736	22118
17	22464	23501
18	24192	24883
19	25920	26266
20	27648	27648
Code value formula	Code value = (27648/16) * current - 6912	Code value = (27648/20) * current
Current formula	Current = ((Code value + 6912) * 16) / 27648	Current = ((code value * 20) / 27648

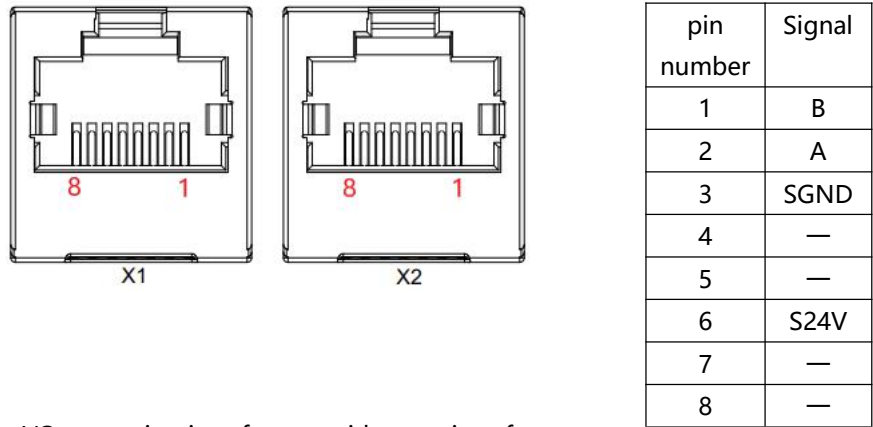
Note: ①The current output setting code value will not respond if it exceeds the range code value.

3.4.4.7 General technical parameters

General technical parameters	
Specifications and dimensions	8 channels: $145 \times 75 \times 32.8\text{mm}$
	8-channel with waterproof box: $160 \times 127.7 \times 100\text{mm}$
	4 channels: $95.3 \times 75 \times 32.8\text{mm}$
	4-channel with waterproof box: $110 \times 128 \times 100\text{mm}$
weight	8 channels: 180g
	8-channel with waterproof case: 600g
	4 channels: 130g
	4-channel waterproof case: 430g
Operating temperature	$-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$
Storage temperature	$-40^{\circ}\text{C} \sim +80^{\circ}\text{C}$
relative humidity	95%, no condensation
Altitude	$\leq 2000\text{m}$
Protection level	XBF5D Series: IP20
	XBF5E Series: IP65
Overvoltage category	I
Pollution level	Level 2
Firmware upgrade	support
Short circuit protection	Supports (automatic recovery)

3.4.5 I/O expansion interface

The XBF5D & XBF5E series I/O expansion interfaces use standard RJ45 network interfaces and standard crystal connectors. The pin assignments are shown in the table below.



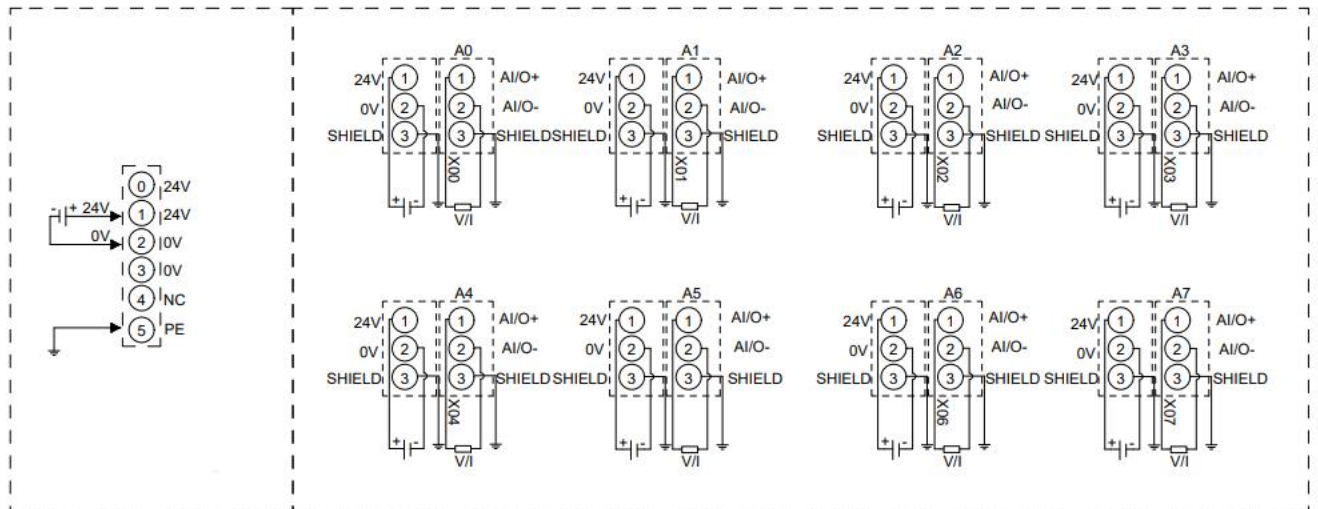
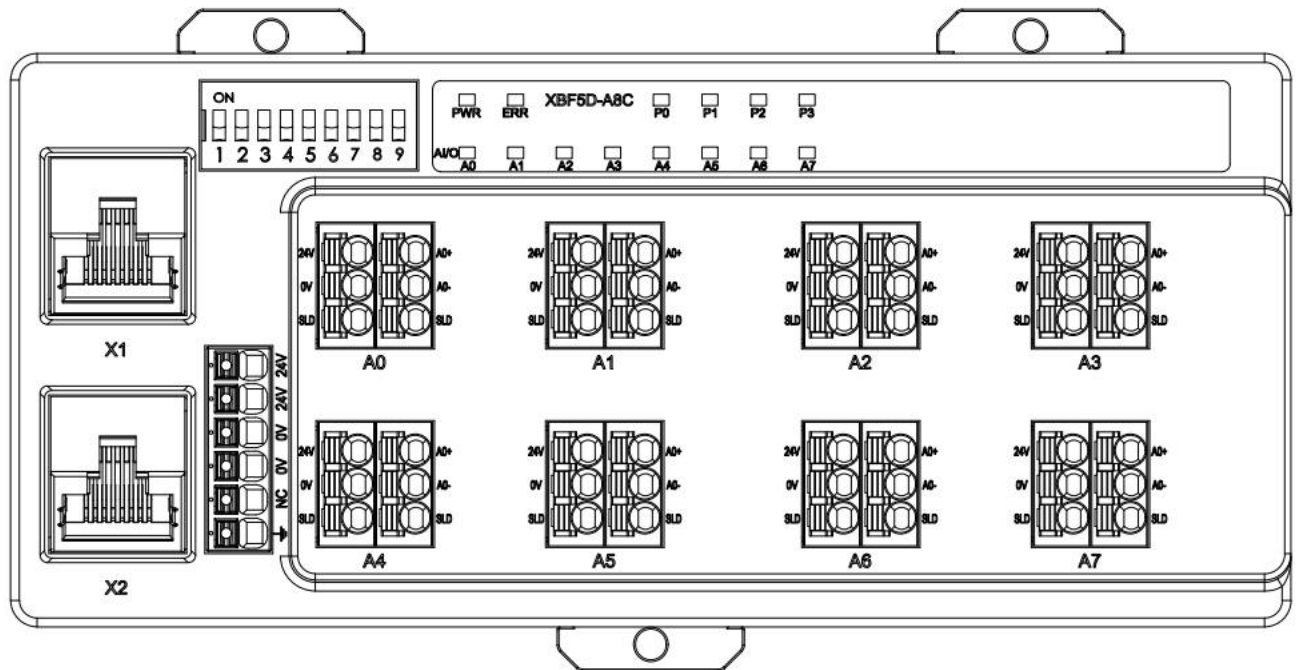
The I/O expansion interface provides two interfaces, one input and one output, which facilitates the connection of multiple I/O modules in series. A terminating resistor needs to be inserted on the unused I/O interface of the last I/O module.

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 I/O interface.

3.4.6 I/O Wiring Diagram

3.4.6.1 XBF5D-A8C/XBF5E-A8C



*24V internal conduction; 0V internal conduction

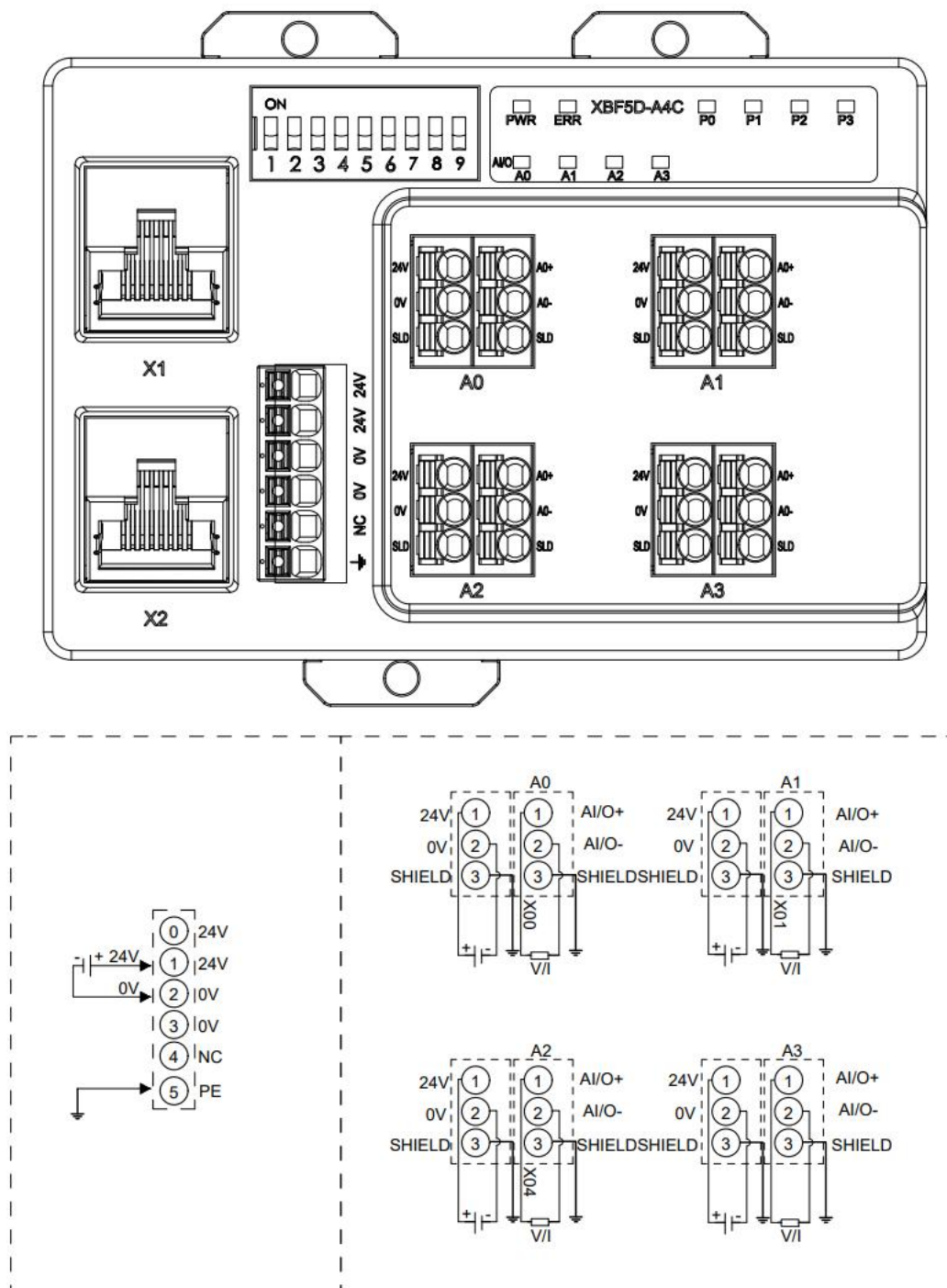
*SHIELD internal conduction

*All channels share the same load source

*Shielded twisted-pair cables are recommended for signal cables.

*The wiring section is the same as that of the XBF5D-A8C panel.

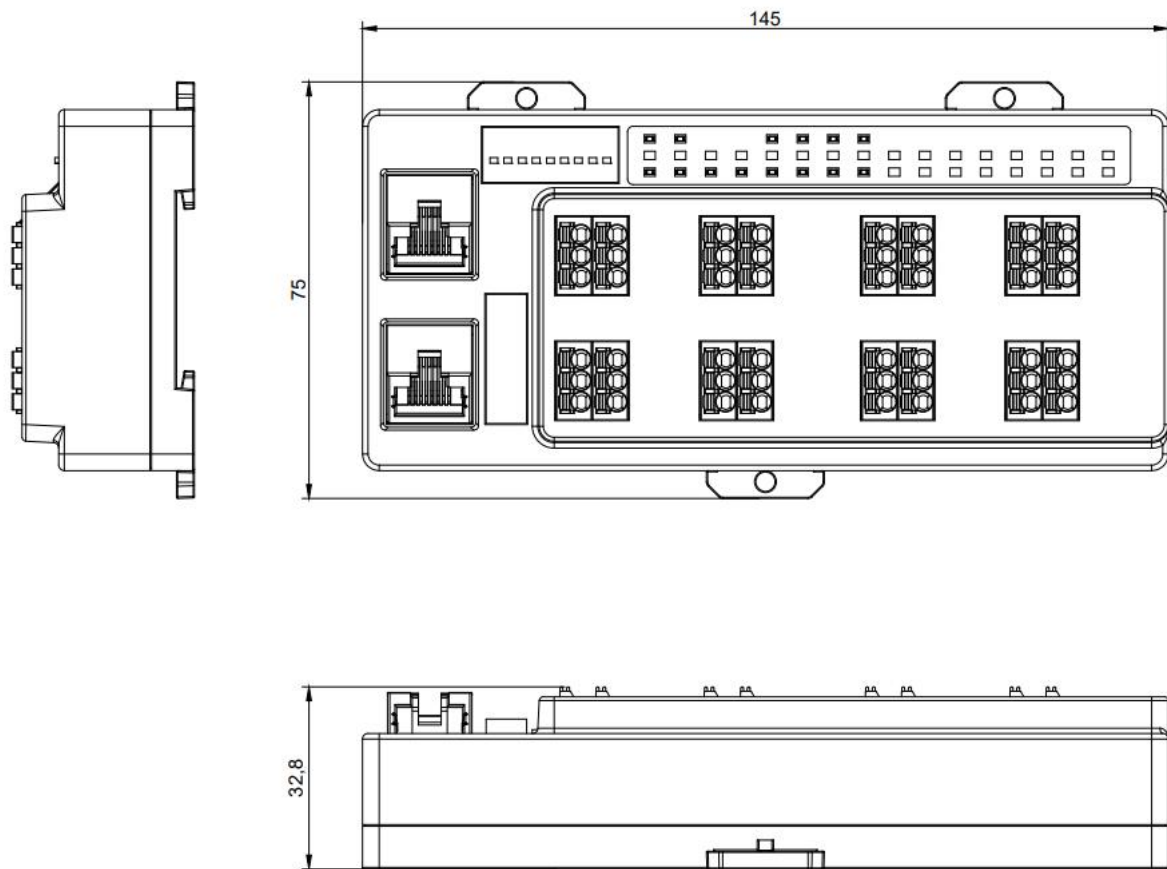
3.4.6.2 XBF5D-A4C/XBF5E-A4C

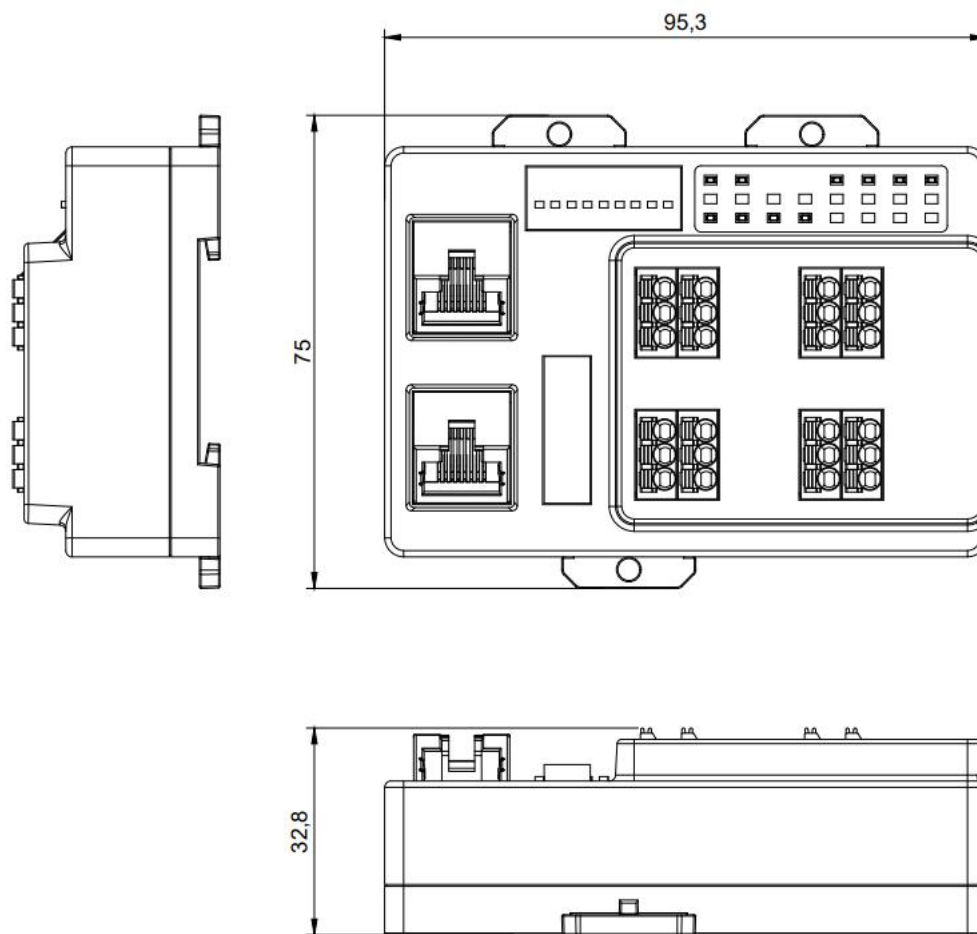


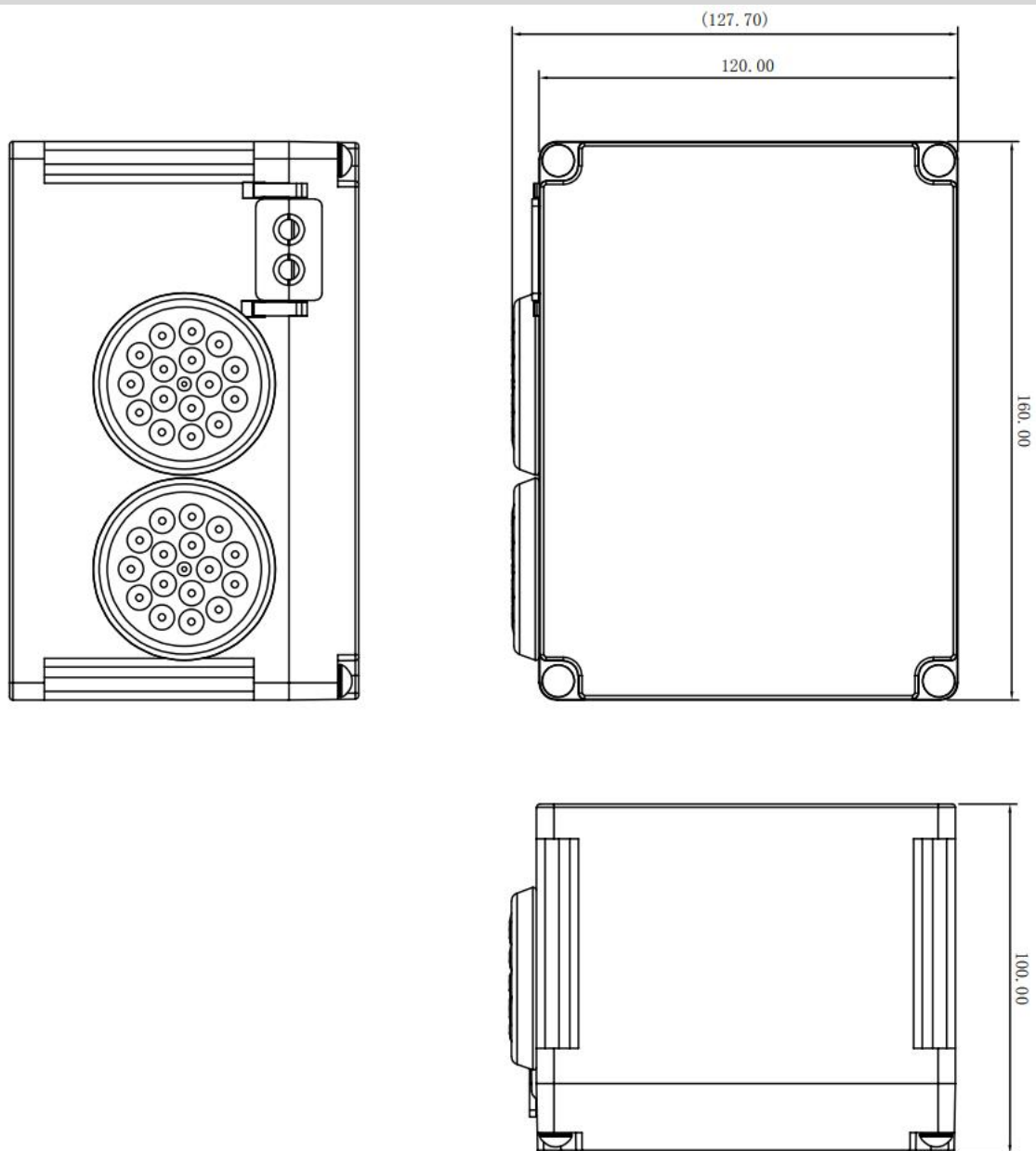
- *24V internal conduction; 0V internal conduction
- *SHIELD internal conduction
- *All channels share the same load source
- *Shielded twisted-pair cables are recommended for signal cables.
- *The wiring section is the same as that of the XBF5D-A4C panel.

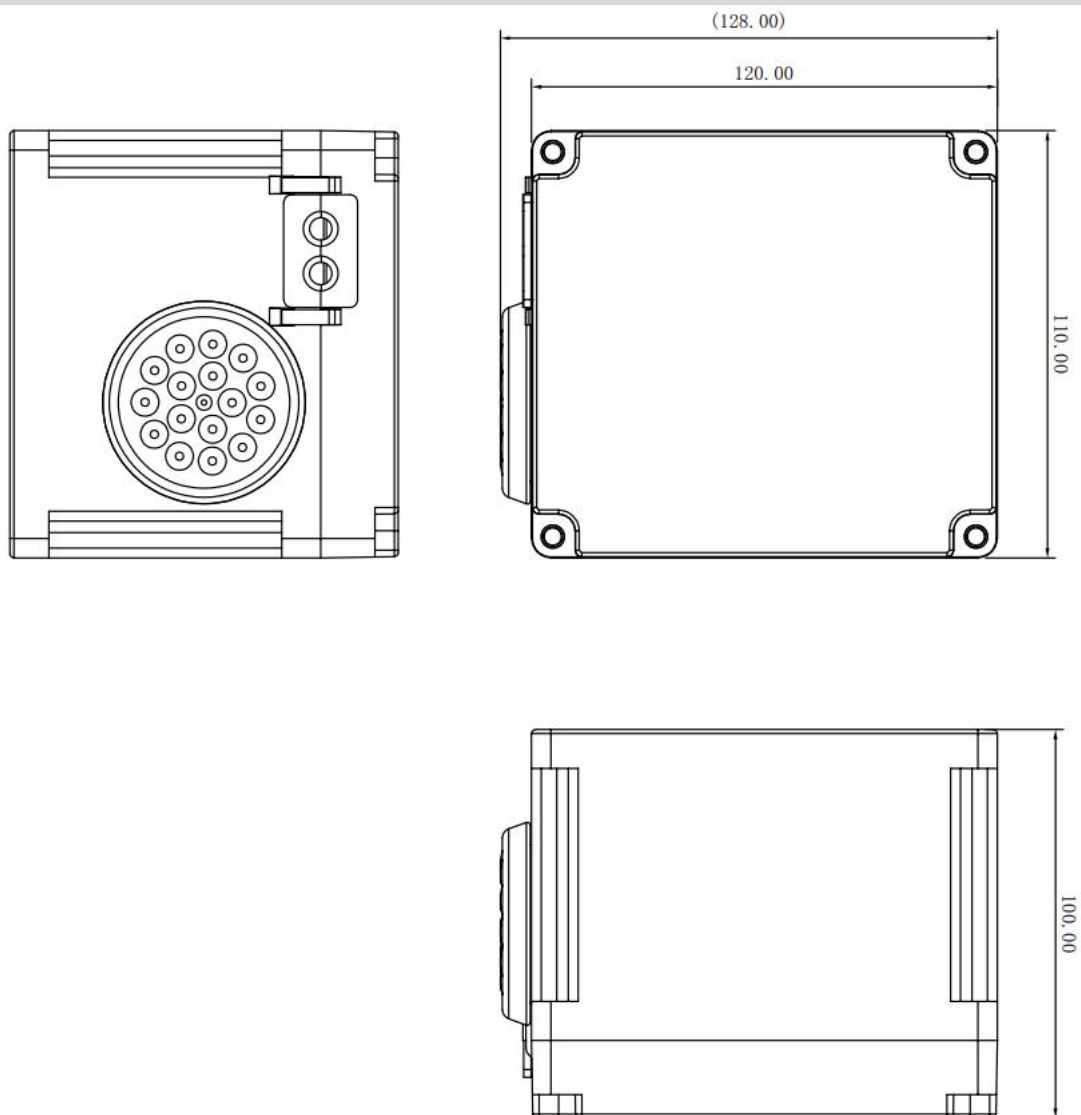
3.4.7 Outline Dimensions

8-channel I/O module dimensions (unit: mm)



4-channel I/O module dimensions (unit: mm)

8-channel I/O module including waterproof box dimensions (unit: mm)

4-channel I/O module with waterproof housing dimensions (unit: mm)

4 Installation and removal

4.1 Installation Guide

Installation/Removal Precautions

- Modules with an IP20 protection rating 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.
-

4.2 Installation and disassembly steps

Module installation and removal	
Coupler installation steps	1. Push the clip at the bottom of the back of the coupler outward until you hear a "click".
	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 coupler module slot against the lower edge of the guide rail, push the buckle upwards until you hear a click, and the coupler module installation is complete.
	4. Install the required I/O modules sequentially on the right side of the coupler module.
I/O module installation steps	1. Place the waterproof box base of the I/O module firmly against the mounting surface, insert the screws and tighten them to secure it, ensuring that all four corner screws are tightened in place and the installation is firm and not loose.
	2. Push the latches at the bottom of the back of the I/O module outwards until you hear a "click" sound.
	3. Place the I/O module into the fixing slot inside the waterproof box, align the buckle holes of the I/O module with the reserved screw holes in the slot, and fix it in place with screws.
	4. Connect the RJ45 expansion interface of the I/O module through the network cable connection hole on the bottom edge of the waterproof box. Follow the I/O module wiring diagram and connect the wires through the protective coil on the side of the waterproof box.
	5. Align the top cover of the waterproof box with the reserved screw holes on the base of the waterproof box, insert the screws and tighten them to ensure that all four corner screws are tightened in place and the installation is secure and not loose.
Coupler disassembly steps	1. Disconnect all external wiring on the coupler module, including RJ45 extension cables, power cables, etc.
	2. Insert a flathead screwdriver into the clip and apply force towards the module until you hear a click.
	3. Remove the module from the guide rail.
I/O module disassembly steps	1. Loosen and remove the four corner screws securing the waterproof box cover, then remove the cover to expose the internal I/O module.
	2. Remove all external wiring from the I/O module, including RJ45 extension cables and signal and power cables connected through the protective coil on the side of the waterproof box.
	3. Remove the screws that secure the I/O module in the waterproof box slot.
	4. Gently remove the I/O module from its mounting slot in the waterproof box.
	5. Remove the fixing screws at the four corners of the waterproof box base, remove the base from the mounting surface, and complete the overall disassembly.

5 Wiring

5.1 Terminal blocks



Terminal blocks		
Coupler power terminals	Rated voltage	320V
	Rated current	20A
	Extreme number	3P
	wire diameter	22~16 AWG 0.3~1.5 mm ²
I/O module power terminals	Rated voltage	300V
	Rated current	7A
	Extreme number	6P
	wire diameter	28~18 AWG 0.2~0.75 mm ²
I/O module signal line terminals (i.e., input/output terminals)	Rated voltage	300V
	Rated current	8A
	Extreme number	32×3P/16×3P/8×3P
	wire diameter	22~16 AWG 0.3~1.5 mm ²
IP65 cable tie protection ring (XBF5E series wiring)	cable outer diameter	4mm×1
		7.2mm×16
Waterproof box with network cable hole	aperture	6~7.5mm ×2
Coupler Expansion Module Interface	4×RJ45	UTP or STP of Category 5 or higher (STP recommended)
I/O module expansion interface	2×RJ45	UTP or STP of Category 5 or higher (STP recommended)

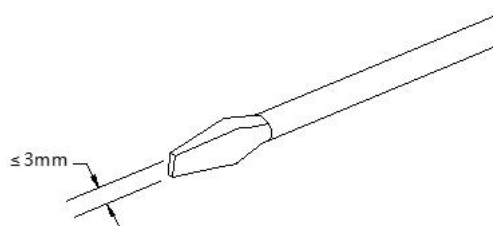
5.2 Wiring instructions and requirements

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

The recommended cable stripping length for power terminals is 8~10 mm.

The recommended cable stripping length for signal line terminals is 9~10 mm.



Wiring method

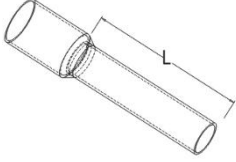
For a single-strand rigid wire, after stripping the wire to the corresponding length, press the button and insert the single-strand wire directly into the corresponding end hole.



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 (mm ²)
 Tubular insulated terminals L The length is 8~10mm	E0308	0.3
	E0508	0.5
	E7508	0.75
	E1008	1.0
	E1508	1.5
	E0310	0.3
	E0510	0.5
	E7510	0.75
	E1010	1.0
	E1510	1.5

! Warn

- Only copper wires can be used for wiring.

! warn

- Cable temperature: 80°C.

6 Use

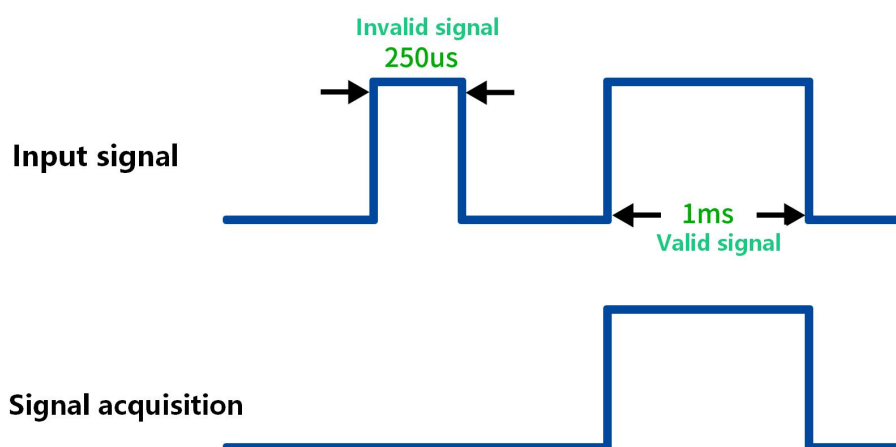
6.1 Parameter Description

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 from operation 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 Analog input/output selection

The analog voltage and current compatible module can be configured with analog input or output mode Configure, and can select AI or AO according to application needs.

Analog input/output selection parameters				
Parameter name	Parameter meaning	Parameter values	Parameter value meaning	default value
Mode Configure Chx	Input/output selection	0	Input: Analog input	0
		1	Output analog signal output	

6.1.4 Analog range settings

The Range Select setting is used to set the range of analog signals. Each channel can be configured individually (see details for range settings).[3.4.4.2 Voltage and Current Range Selection Table](#)).

Analog range setting parameters				
Parameter name	Parameter meaning	Parameter values	Parameter value meaning	default value
Range Select Chx	Analog range selection	0	Disable	1
		1	0V~10V (0~27648)	
		2	0V~10V (0~32767)	
		3	0V~5V (0~27648)	
		4	0V~5V (0~32767)	
		5	1V~5V (0~27648)	
		6	0mA~20mA (0~27648)	
		7	4mA~20mA (0~27648)	

6.1.5 Analog output signal clear/hold

The clear/hold function is for modules with output channels. This function configures the output mode of the output channel when the PDO is invalid. This parameter supports the following output states:

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

Maintain output: The module's output channel continues to output even when communication is interrupted.

Output preset value: When communication is disconnected, the module output channel outputs a preset value.

The analog output clear and hold 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 output clear.

Analog output module clear hold parameters				
Parameter name	Parameter meaning	Parameter values	Parameter value meaning	default value
TemplateMode	Template mode	1	Clear all channels and output.	1
		2	Hold all channels to maintain output.	
		3	Preset all channel output preset values	
TemplateValue Chx	Single channel clear/keep configuration	0	TemplateValue is the template mode value, meaning single-channel mode is not enabled.	0
		1	Clear single-channel output.	

		2	Hold single channel to maintain output.	
		3	Preset Single Channel Output Preset Value	
Preset Value Chx	Single channel preset value	Code value range	Output code value corresponding to current/voltage value (Corresponding range code value table)	0

Note: When the overall module setting (template mode) is configured to 3, that is, when the full channel output preset value is effective, the preset value is based on the preset code value of channel 0 in the single channel preset value, and the full channel output is performed.

6.1.6 Analog input filtering

● Analog input filtering function

The analog input filtering function can internally average the data after A/D conversion to reduce the impact of fluctuations in the input signal due to noise and other factors.

The analog input is processed by moving average with a specified number of A/D conversions.

● Filtering function configuration

Each channel can be configured individually, with a configuration range of 1 to 200, and a default of 10 times.

Analog input filtering parameters				
Parameter name	Parameter meaning	Parameter values	Parameter value meaning	default value
Filter Chx	Analog input filtering	1~200	A/D conversion count processed by moving average	10

6.1.7 Analog signal power-off retention

The analog parameters support the function of saving all configuration parameters of the module when communication is interrupted due to abnormal power failure. Analog modules all support power failure saving by default.

This manual uses TwinCAT3 and TIA Portal V17 as examples to introduce the parameter configuration method of the XBF4-EC4/XBF4-PN04 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 6.4.1](#). After making the modifications, be sure to power it on again.

6.2 Fault code information

6.2.1 Coupler general fault codes

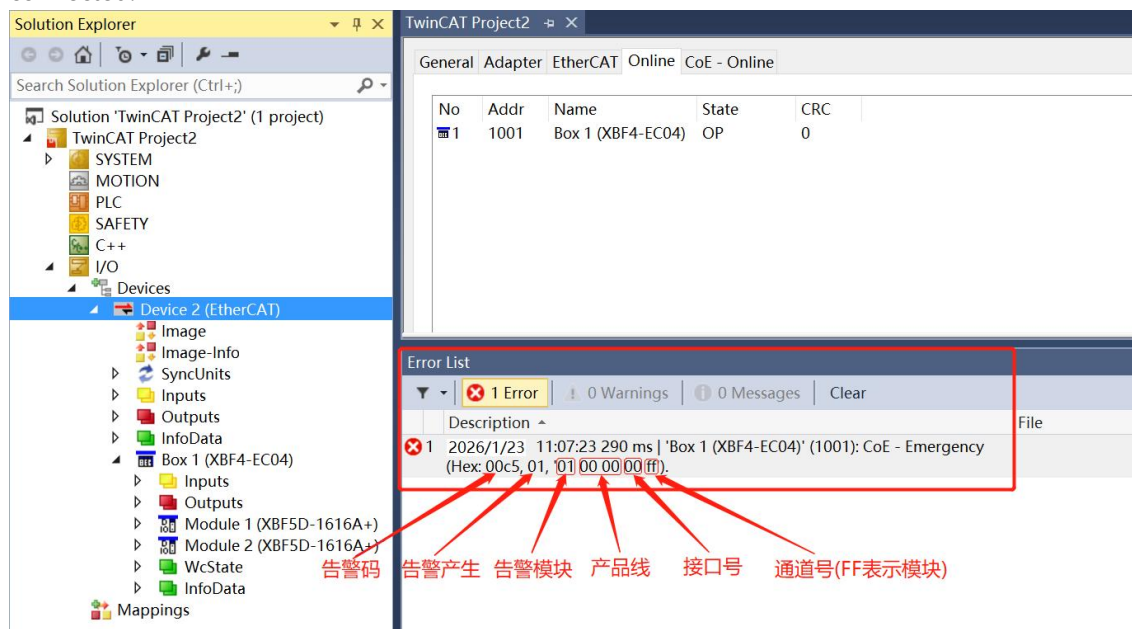
category	serial number	Error Type	Error code	Event Name	Event Code (2#)	Event code (10#)	Event code (16#)	processing method
General Error	2	Online upgrade error	1	Firmware upgrade error	000000010000001	129	0x0081	Try upgrading again, check for environmental interference, and check if the firmware is 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.
	6	Channel error	4	Analog channel overflow	0000000110000100	388	0x0184	Check whether the input signal of the corresponding channel exceeds the measurement range and whether the output signal exceeds the configurable range.
	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.
Digital quantity	1	Adaptive error	0	When the DI channel is adaptively set to 1, there is a malfunction in setting the corresponding DO control address to 1 [1].	0001000001000000	4160	0x1040	Check whether the input and output channels of the configurable module are both set to 1. Channel DO is reset, and the alarm is cleared.

Note [1]: In configurable channel adaptive mode, when the DI input signal is 1, the corresponding channel can no longer be controlled by DO, otherwise an alarm will be triggered.

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 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: XBF5D-3200 + XBF5D-1616A} + {Coupler Interface 1: XBF5D-A8C} topology as an example.
- **One computer, pre-installed with TwinCAT3 software.**
- **EtherCAT dedicated shielded cable**
- **One switching power supply**
- **Device configuration file**

- **Hardware configuration and wiring**

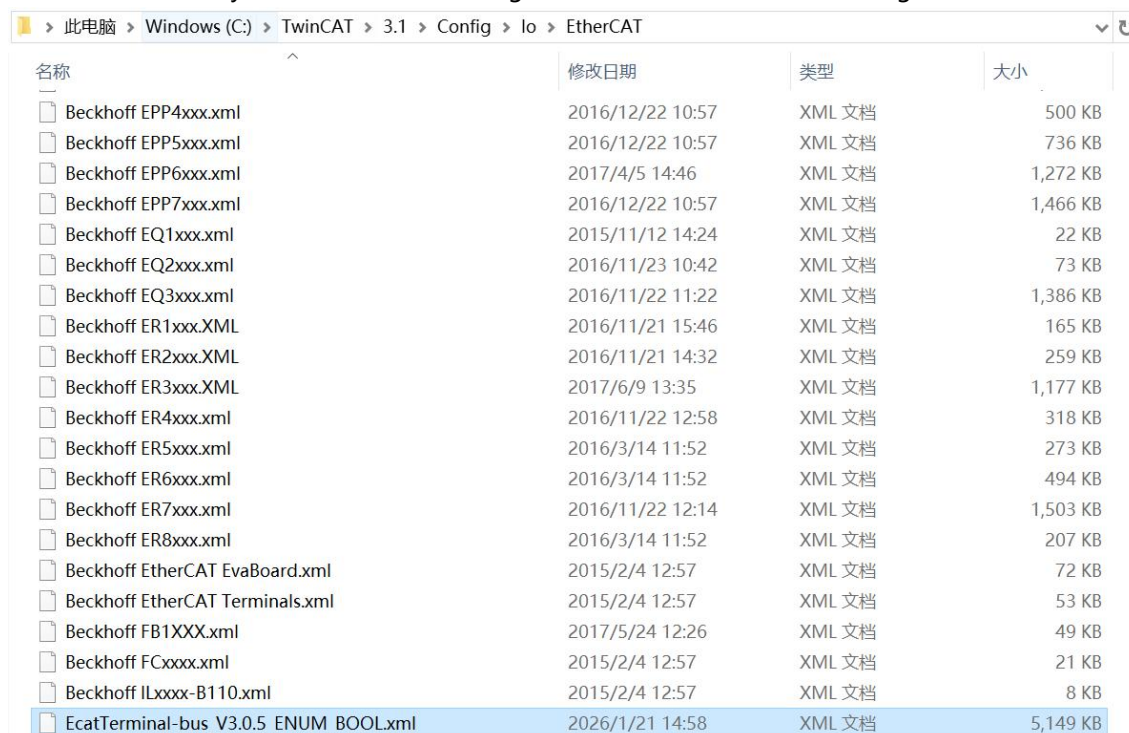
Please follow the instructions [4 Installation and Removal](#) and [5. Wiring](#) "Required Operation"

- **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-bus_V3.0.5_ENUM_BOOL.xml) in the TwinCAT installation directory "C:\TwinCAT\3.1\Config\Io\EtherCAT", as shown in the figure below.



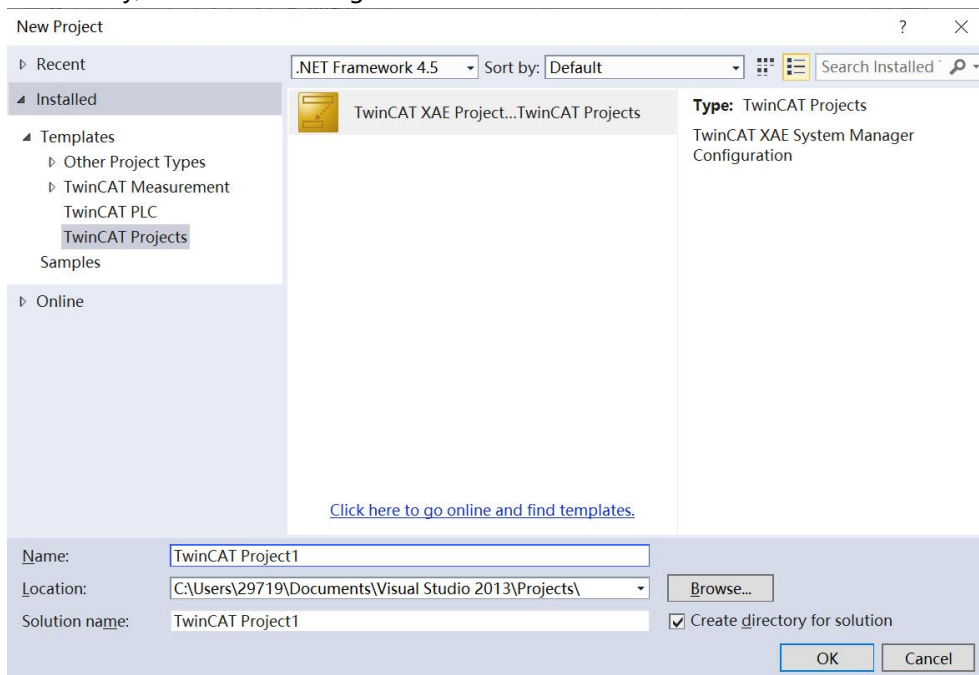
名称	修改日期	类型	大小
Beckhoff EPP4xxx.xml	2016/12/22 10:57	XML 文档	500 KB
Beckhoff EPP5xxx.xml	2016/12/22 10:57	XML 文档	736 KB
Beckhoff EPP6xxx.xml	2017/4/5 14:46	XML 文档	1,272 KB
Beckhoff EPP7xxx.xml	2016/12/22 10:57	XML 文档	1,466 KB
Beckhoff EQ1xxx.xml	2015/11/12 14:24	XML 文档	22 KB
Beckhoff EQ2xxx.xml	2016/11/23 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 ILxxx-B110.xml	2015/2/4 12:57	XML 文档	8 KB
EcatTerminal-bus_V3.0.5_ENUM_BOOL.xml	2026/1/21 14:58	XML 文档	5,149 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.

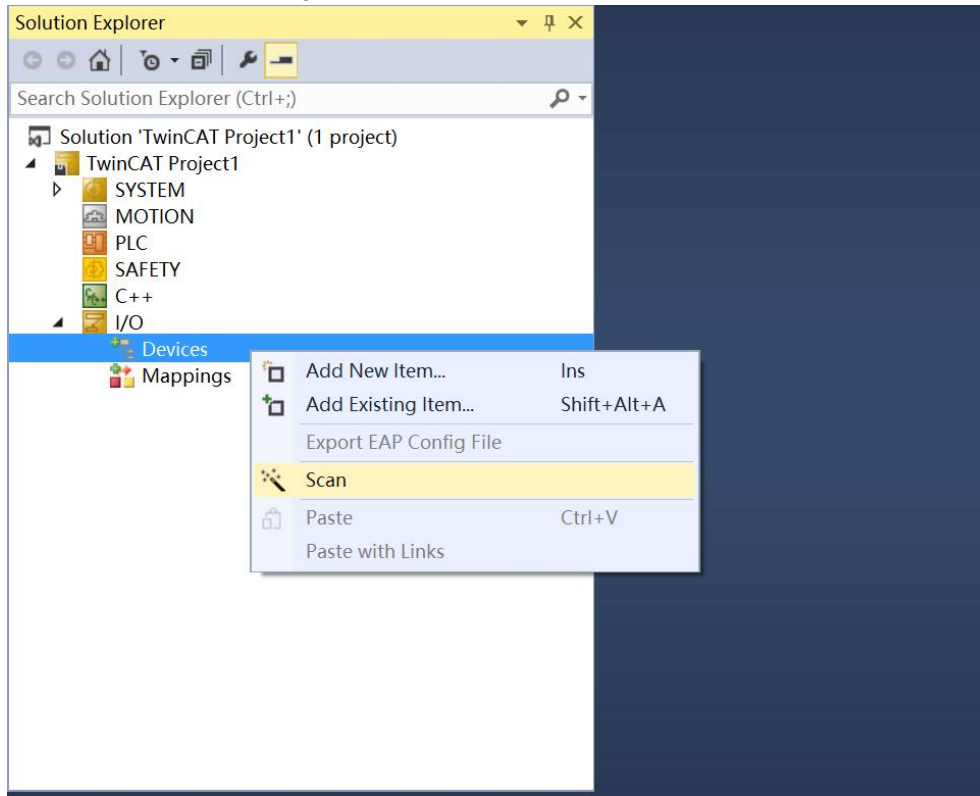


4. Add device

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

➤ **Scanning equipment**

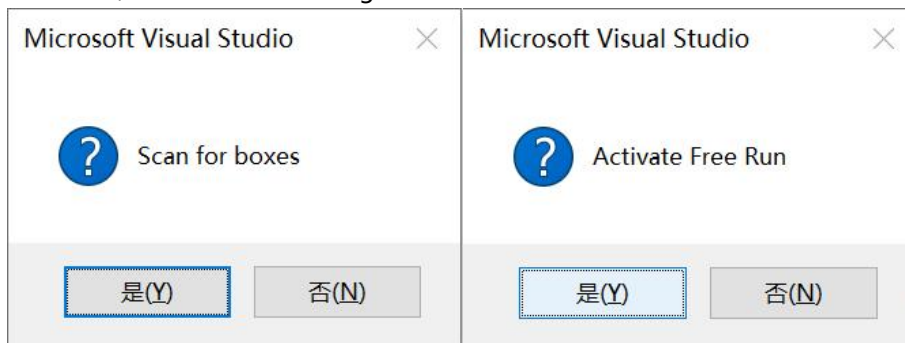
- a. After creating the project, right-click the "Scan" option under "I/O -> Devices" to scan for slave devices, as shown in the figure below.



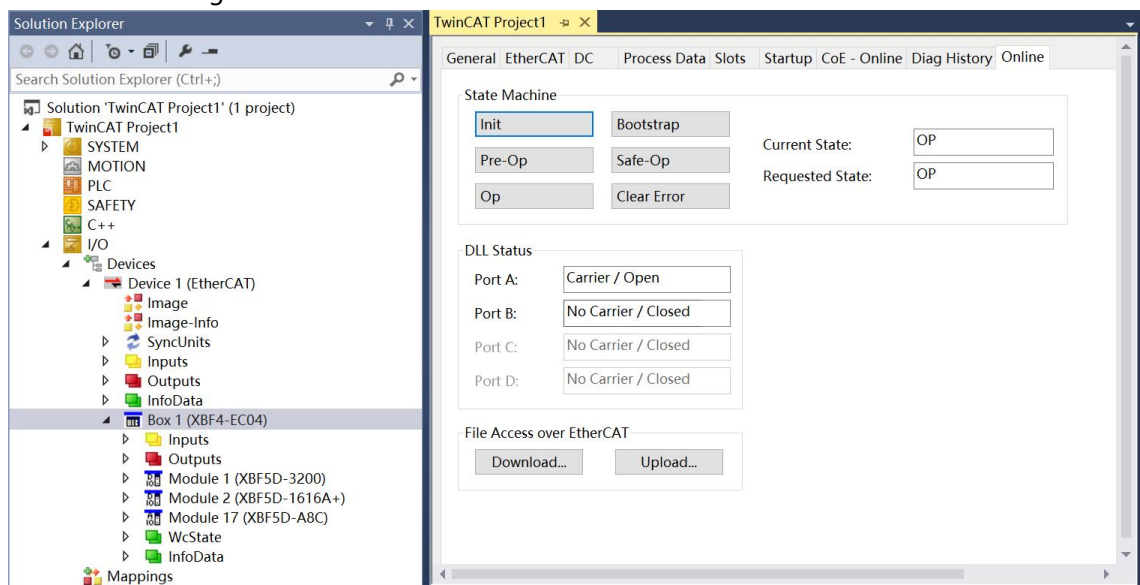
- b. Select the "Local Area Connection" network adapter, as shown in the image below.



- 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.

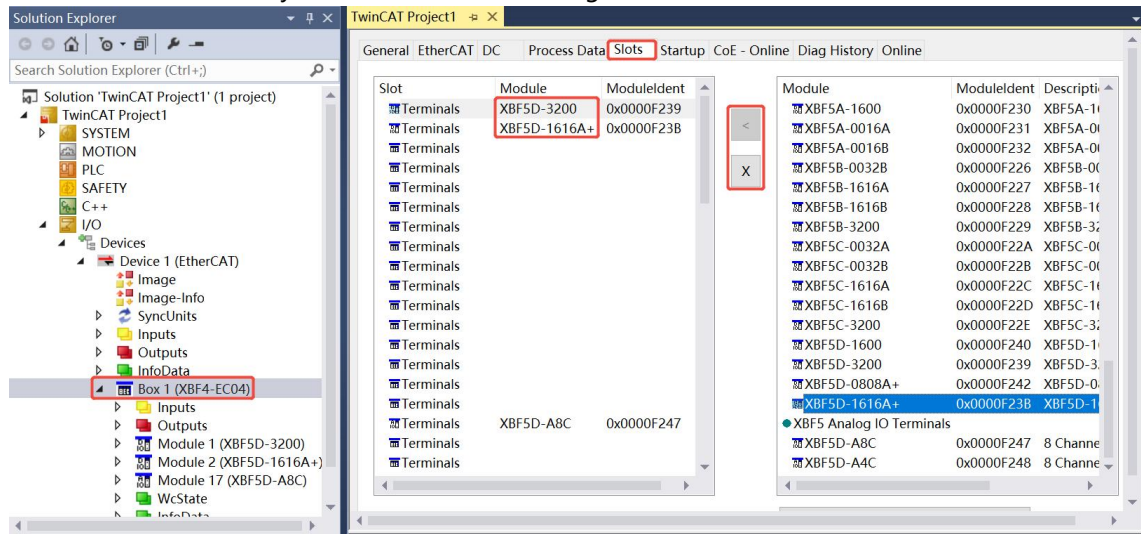


- d. After the device is scanned, you can see Box1 (XBF4-EC04), Module1 (XBF5D-3200), Module2 (XBF5D-1616A+), and Module17 (XBF5D-A8C) in the left navigation tree. TwinCAT is in "OP" state under "Online". You can also observe that the RUN light of the slave device is always on, as shown in the figure below.



➤ **Add manually**

- a. 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: the expansion interface number corresponding to the slave module connected to the coupler $\times 16$ + slave module DIP switch number.

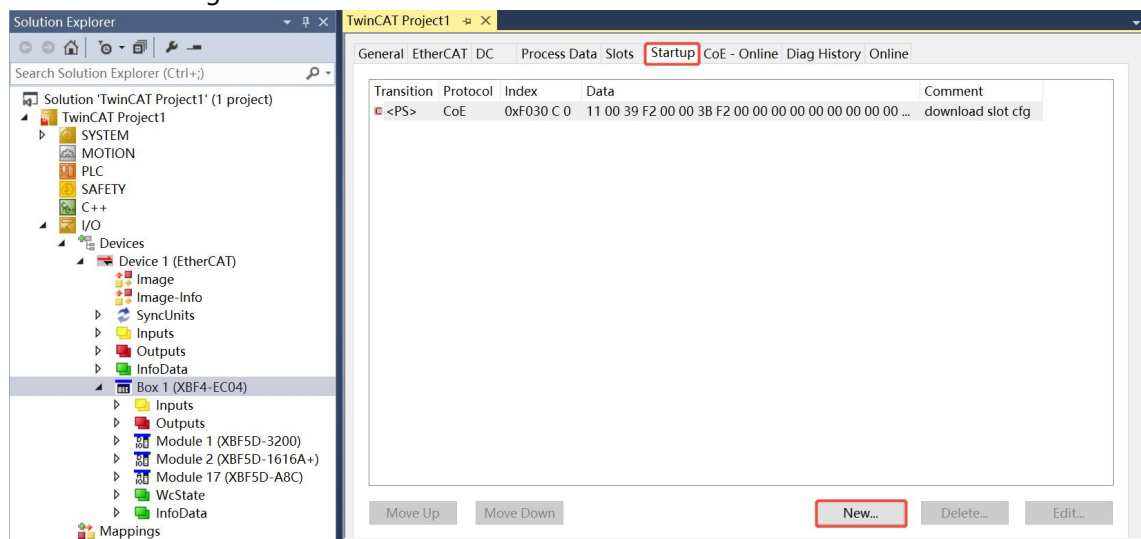
For example: (Module 1) XBF5D-3200: $0 \times 16 + 0 = 0$ -- Terminals 0;

(Module 2) XBF5D-1616A+: $0 \times 16 + 1 = 1$ -- Terminals 1;

(Module 17) XBF5D-A8C: $1 \times 16 + 0 = 16$ -- 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.



Edit CANopen Startup Entry

☐ I -> P
 ☒ P -> S
 ☐ S -> P
 ☐ S -> O
 ☐ O -> S

Index (hex):
 Sub-Index (dec):

☐ Validate
 ☐ Complete Access

Data (hexbin):
 Hex Edit...

Validate Mask:

Comment:
 Edit Entry...

Index	Name	Flags	Value	Unit
10F1:0	Error Settings	RW		
10F3:0	Diagnosis History	RO	> 5 <	
1C32:0	SM output parameter		> 32 <	
1C33:0	SM input parameter		> 32 <	
2000:0	XBF5D-3200 Config	RO	> 1 <	
2010:0	XBF5D-1616A+ Config	RO	> 18 <	
2100:0	XBF5D-A8C Config	RO	> 41 <	
5F00:0	Bus Feature	RW	> 5 <	
F030:0	Configured Module Ide...	RW	> 0 <	

- b. For example, to modify the parameters of Module1 (XBF5D-3200), click the "+" in front of Index 2000:0 to expand the parameter menu and configure the digital input filtering; the output signal clear/hold function parameters of Module2 (XBF5D-1616A+) are shown in the figure below.

Edit CANopen Startup Entry

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

Index (hex): 2000
 Sub-Index (dec): 0

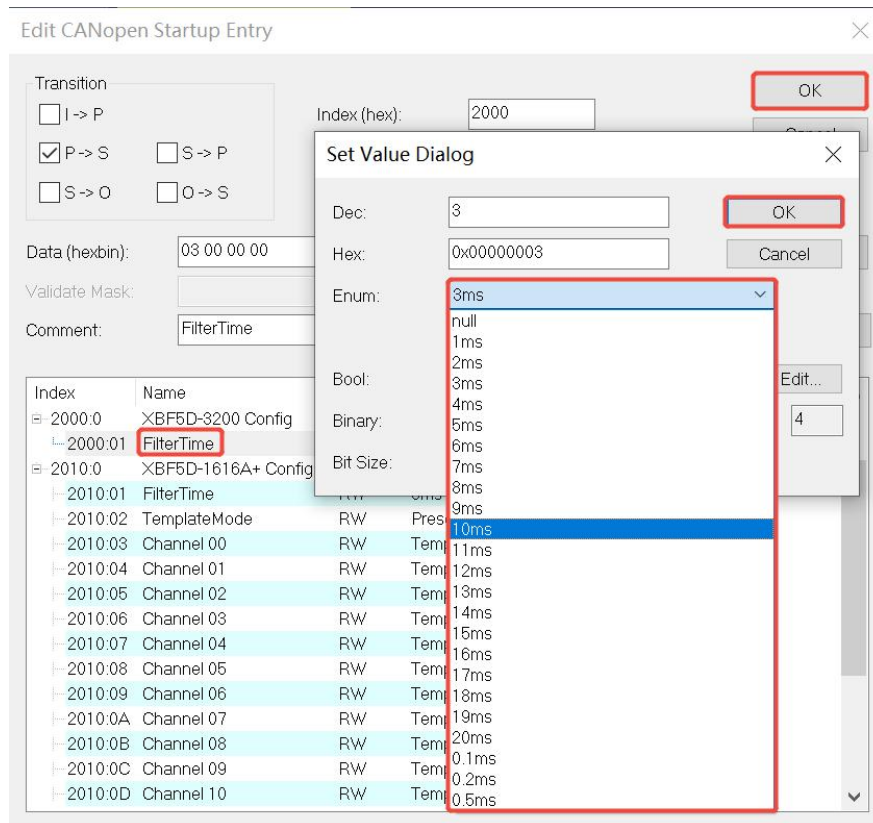
☐ Validate ☐ Complete Access

Data (hexbin): 01
 Validate Mask:
 Comment: SubIndex 000

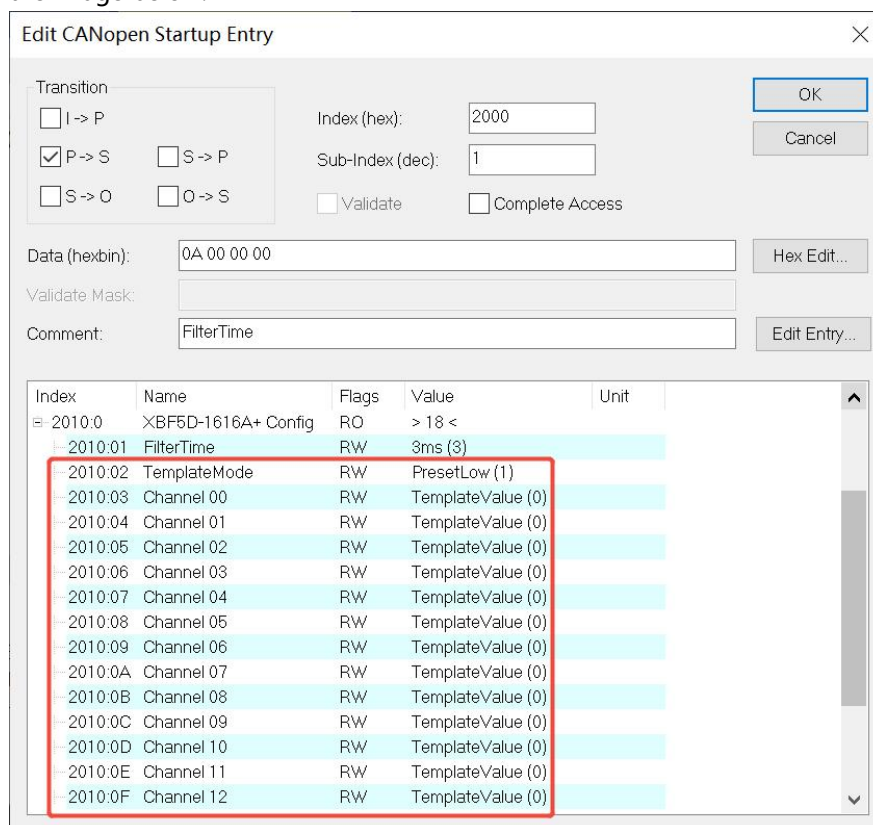
OK Cancel Hex Edit... Edit Entry...

Index	Name	Flags	Value	Unit
2000:0	XBF5D-3200 Config	RO	> 1 <	
2000:01	FilterTime	RW	3ms (3)	
2010:0	XBF5D-1616A+ Config	RO	> 18 <	
2010:01	FilterTime	RW	3ms (3)	
2010:02	TemplateMode	RW	PresetLow (1)	
2010:03	Channel 00	RW	TemplateValue (0)	
2010:04	Channel 01	RW	TemplateValue (0)	
2010:05	Channel 02	RW	TemplateValue (0)	
2010:06	Channel 03	RW	TemplateValue (0)	
2010:07	Channel 04	RW	TemplateValue (0)	
2010:08	Channel 05	RW	TemplateValue (0)	
2010:09	Channel 06	RW	TemplateValue (0)	
2010:0A	Channel 07	RW	TemplateValue (0)	
2010:0B	Channel 08	RW	TemplateValue (0)	
2010:0C	Channel 09	RW	TemplateValue (0)	
2010:0D	Channel 10	RW	TemplateValue (0)	

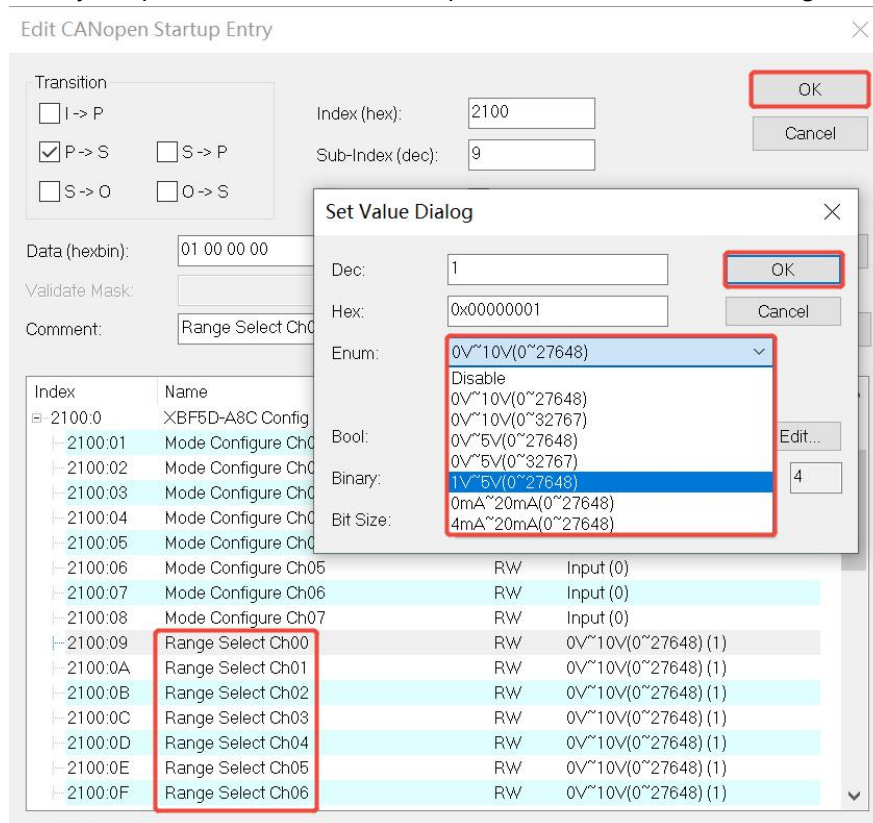
- c. The digital input filtering time FilterTime can be set from 0 to 20ms. Double-click "FilterTime" and modify the parameter value in the drop-down box, as shown in the figure below.



- 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. Taking the analog quantity range setting as an example, double-click "Range Select" and modify the parameter value in the drop-down box, as shown in the figure below.



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

Edit CANopen Startup Entry

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

Index (hex): 2000
 Sub-Index (dec): 1
☐ Validate ☐ Complete Access

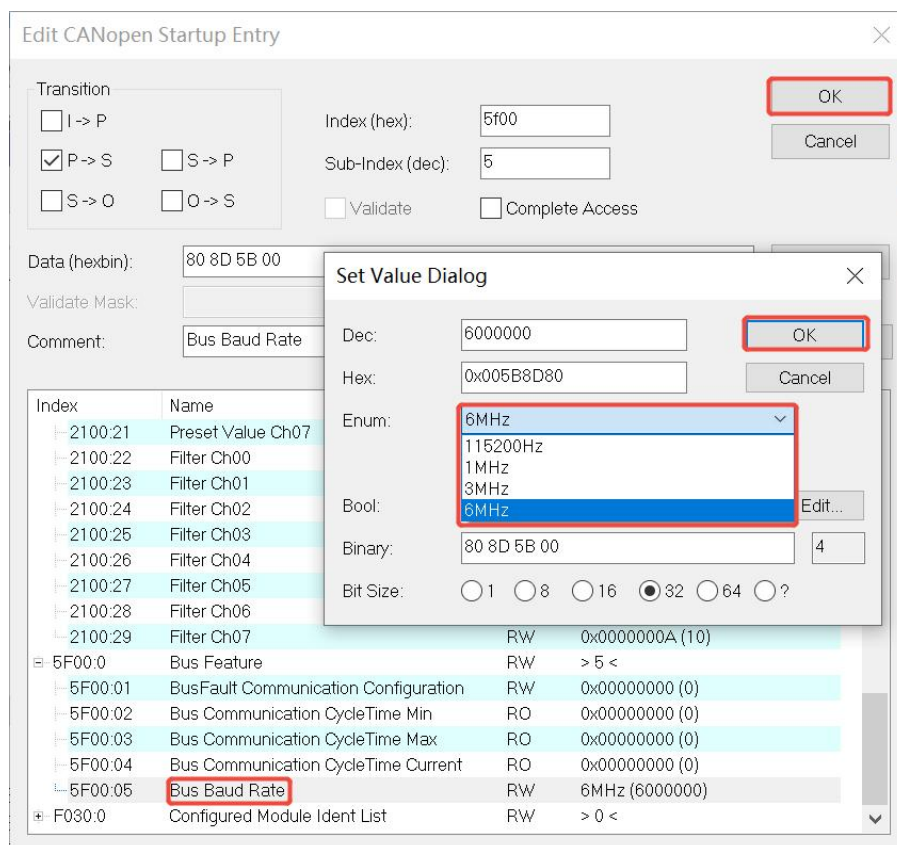
Data (hexbin): 0A 00 00 00
 Hex Edit...

Validate Mask:

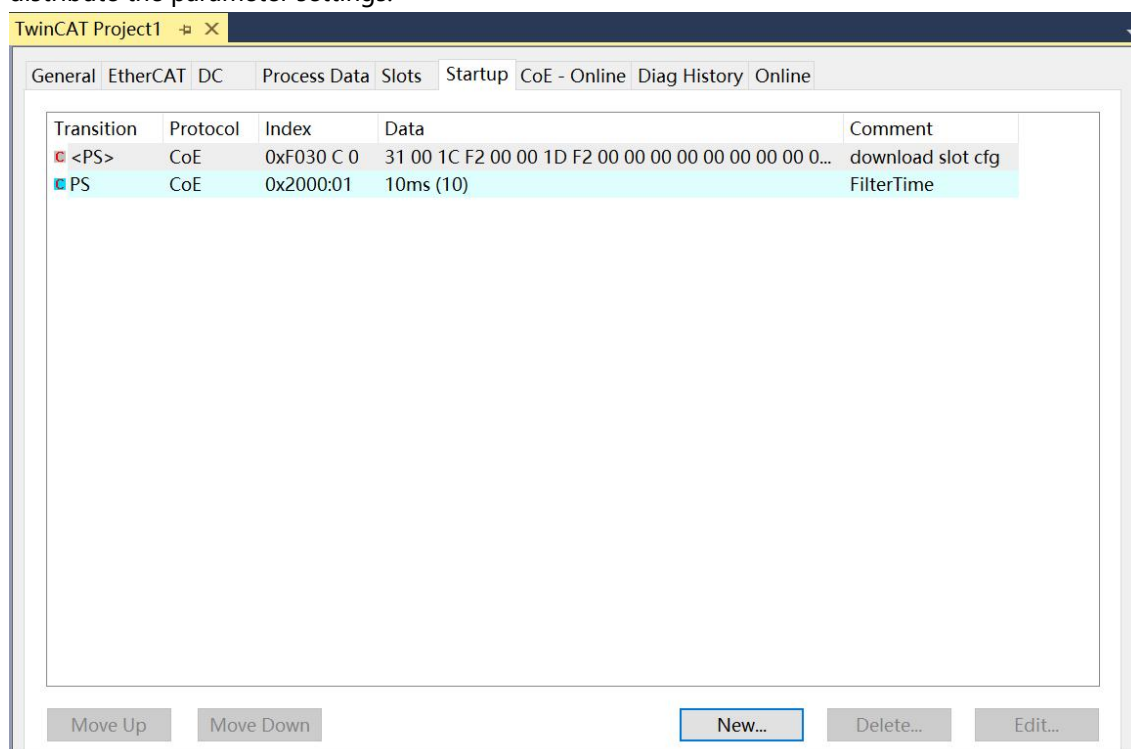
Comment: FilterTime
 Edit Entry...

Index	Name	Flags	Value	Unit
2010:0B	Channel 08	RW	TemplateValue (0)	
2010:0C	Channel 09	RW	TemplateValue (0)	
2010:0D	Channel 10	RW	TemplateValue (0)	
2010:0E	Channel 11	RW	TemplateValue (0)	
2010:0F	Channel 12	RW	TemplateValue (0)	
2010:10	Channel 13	RW	TemplateValue (0)	
2010:11	Channel 14	RW	TemplateValue (0)	
2010:12	Channel 15	RW	TemplateValue (0)	
2100:0	XBF5D-A8C Config	RO	> 41 <	
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. 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.



- h. 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

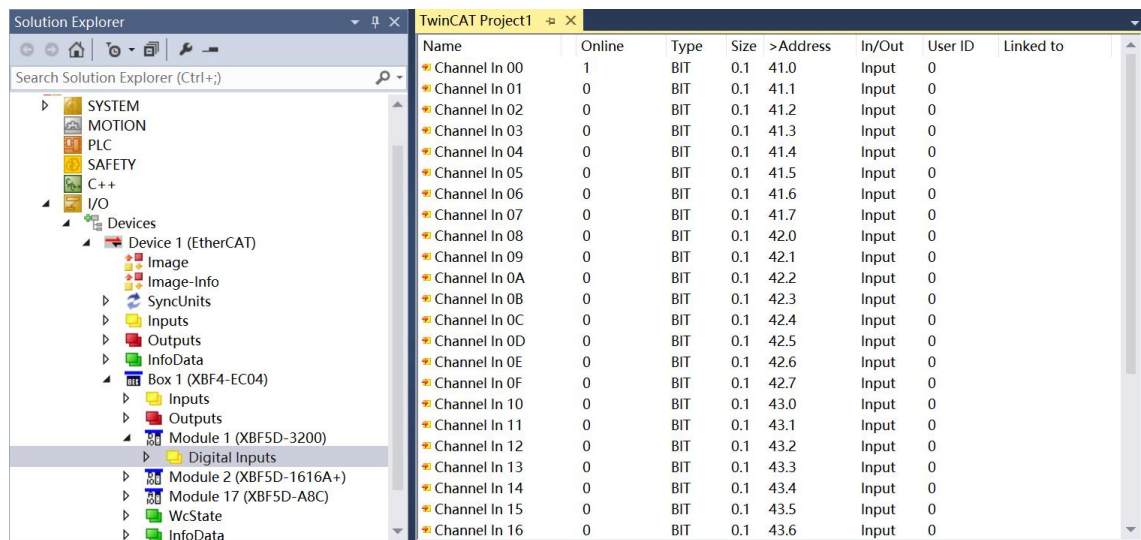
- a. The left-hand navigation tree "Module1 -> Digital Inputs" displays the upstream data of the module, used to monitor the module's input, as shown in the figure below.

Name	Online	Type	Size	>Address	In/Out	User ID	Linked to
Channel In 00	0	BIT	0.1	41.0	Input	0	
Channel In 01	0	BIT	0.1	41.1	Input	0	
Channel In 02	0	BIT	0.1	41.2	Input	0	
Channel In 03	0	BIT	0.1	41.3	Input	0	
Channel In 04	0	BIT	0.1	41.4	Input	0	
Channel In 05	0	BIT	0.1	41.5	Input	0	
Channel In 06	0	BIT	0.1	41.6	Input	0	
Channel In 07	0	BIT	0.1	41.7	Input	0	
Channel In 08	0	BIT	0.1	42.0	Input	0	
Channel In 09	0	BIT	0.1	42.1	Input	0	
Channel In 0A	0	BIT	0.1	42.2	Input	0	
Channel In 0B	0	BIT	0.1	42.3	Input	0	
Channel In 0C	0	BIT	0.1	42.4	Input	0	
Channel In 0D	0	BIT	0.1	42.5	Input	0	
Channel In 0E	0	BIT	0.1	42.6	Input	0	
Channel In 0F	0	BIT	0.1	42.7	Input	0	
Channel In 10	0	BIT	0.1	43.0	Input	0	
Channel In 11	0	BIT	0.1	43.1	Input	0	
Channel In 12	0	BIT	0.1	43.2	Input	0	
Channel In 13	0	BIT	0.1	43.3	Input	0	
Channel In 14	0	BIT	0.1	43.4	Input	0	
Channel In 15	0	BIT	0.1	43.5	Input	0	
Channel In 16	0	BIT	0.1	43.6	Input	0	

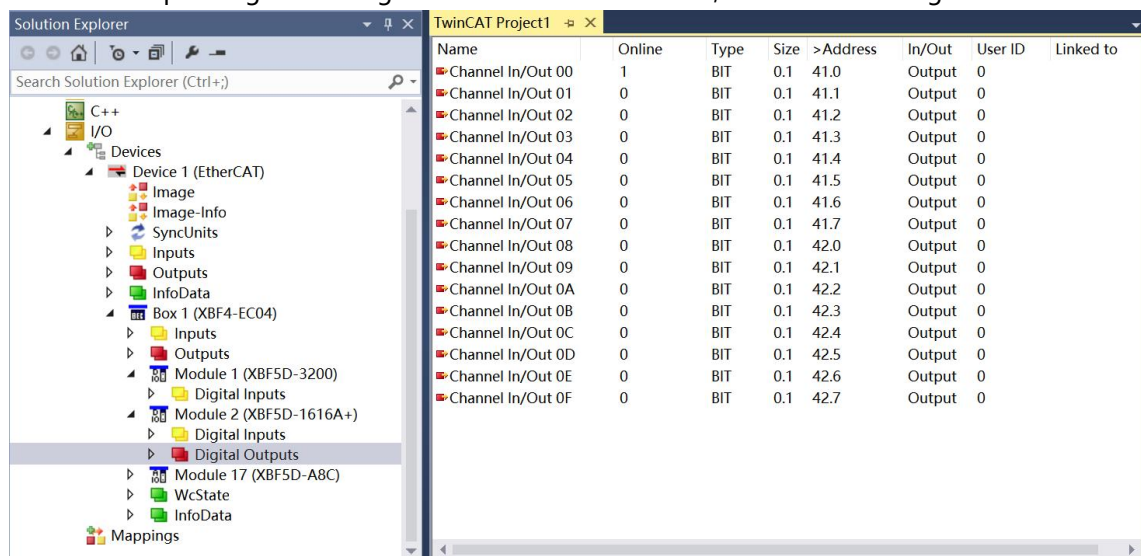
- b. The left-hand navigation tree "Module2 -> Digital Outputs" displays the module's downstream data, which is used to control the module's output, as shown in the figure below.

Name	Online	Type	Size	>Address	In/Out	User ID	Linked to
Channel In/Out 00	0	BIT	0.1	41.0	Output	0	
Channel In/Out 01	0	BIT	0.1	41.1	Output	0	
Channel In/Out 02	0	BIT	0.1	41.2	Output	0	
Channel In/Out 03	0	BIT	0.1	41.3	Output	0	
Channel In/Out 04	0	BIT	0.1	41.4	Output	0	
Channel In/Out 05	0	BIT	0.1	41.5	Output	0	
Channel In/Out 06	0	BIT	0.1	41.6	Output	0	
Channel In/Out 07	0	BIT	0.1	41.7	Output	0	
Channel In/Out 08	0	BIT	0.1	42.0	Output	0	
Channel In/Out 09	0	BIT	0.1	42.1	Output	0	
Channel In/Out 0A	0	BIT	0.1	42.2	Output	0	
Channel In/Out 0B	0	BIT	0.1	42.3	Output	0	
Channel In/Out 0C	0	BIT	0.1	42.4	Output	0	
Channel In/Out 0D	0	BIT	0.1	42.5	Output	0	
Channel In/Out 0E	0	BIT	0.1	42.6	Output	0	
Channel In/Out 0F	0	BIT	0.1	42.7	Output	0	

- c. Taking channel 0 of Module1 (XBF5D-3200) as an example, if there is a valid voltage input to input channel 0 of this module, it can be observed in "Module1 -> Digital Inputs", as shown in the figure below.



- d. Taking the output channel 0 of Module2 (XBF5D-1616A+) as an example, if you want the digital output channel 0 of this module to output, you can click on Channel 0 in "Module2 -> Digital Outputs", right-click on the corresponding "Online" and select "Online Write '1'". You will then see the corresponding channel light illuminate on the module, as shown in the figure below.



- e. Taking the analog input module Module17 (XBF5D-A8C) as an example, with channel 0 configured as the output and the other channels as inputs, writing "0x (006C)" to Outputs -> Channel 0 will illuminate the channel 0 indicator light, as shown in the image below.

The Solution Explorer on the left shows the project structure. Under 'I/O' > 'Devices' > 'Device 1 (EtherCAT)' > 'Box 1 (XBF4-EC04)' > 'Module 17 (XBF5D-A8C)', the 'Outputs' folder is selected.

Name	Online	Type	Size	>Address	In/Out	User ID	Linked to
Channel 0	108 (0x006c)	INT	2.0	43.0	Output	0	
Channel 1	0	INT	2.0	45.0	Output	0	
Channel 2	0	INT	2.0	47.0	Output	0	
Channel 3	0	INT	2.0	49.0	Output	0	
Channel 4	0	INT	2.0	51.0	Output	0	
Channel 5	0	INT	2.0	53.0	Output	0	
Channel 6	0	INT	2.0	55.0	Output	0	
Channel 7	0	INT	2.0	57.0	Output	0	

- f. When a valid voltage is input to module channel 1, the input value “108” , which is “16#006c” , can be monitored in Inputs -> Channel 1, as shown in the figure below.

The Solution Explorer on the left shows the project structure. Under 'I/O' > 'Devices' > 'Device 1 (EtherCAT)' > 'Box 1 (XBF4-EC04)' > 'Module 17 (XBF5D-A8C)', the 'Inputs' folder is selected.

Name	Online	Type	Size	>Address	In/Out	User ID	Linked to
Channel 0	0	INT	2.0	49.0	Input	0	
Channel 1	108 (0x006c)	INT	2.0	51.0	Input	0	
Channel 2	0	INT	2.0	53.0	Input	0	
Channel 3	0	INT	2.0	55.0	Input	0	
Channel 4	0	INT	2.0	57.0	Input	0	
Channel 5	0	INT	2.0	59.0	Input	0	
Channel 6	0	INT	2.0	61.0	Input	0	
Channel 7	0	INT	2.0	63.0	Input	0	

6.4 PROFINET configuration applications

6.4.1 Application in the TIA Portal V17 software environment

1、Preparation

- **Hardware environment**

- **Module preparation:** This guide uses the XBF4-PN04 + {Coupler Interface 0: XBF5D-1616A} + {Coupler Interface 1: XBF5D-A8C} 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**

- **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.



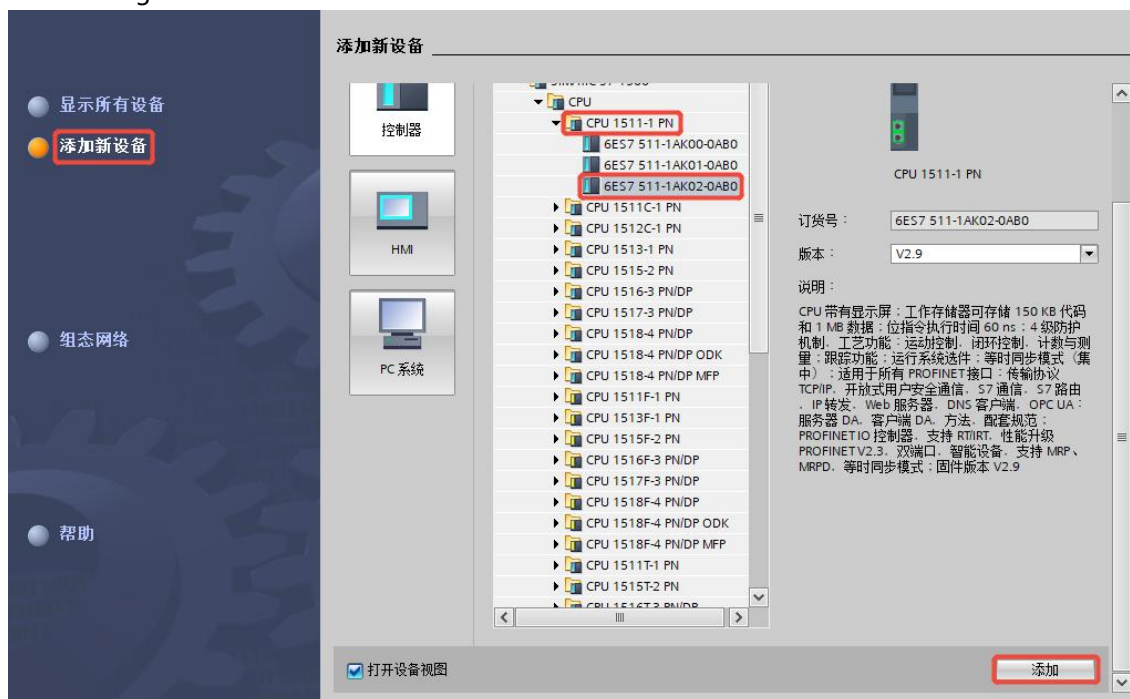
- ◆ Project name: Custom, you can keep the default.
- ◆ Path: The path where the project is saved. You can keep the default path.
- ◆ Version: You can keep the default.
- ◆ Author: You can keep the default setting.
- ◆ Note: This is customizable and can be left blank.

3、Add PLC controller

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

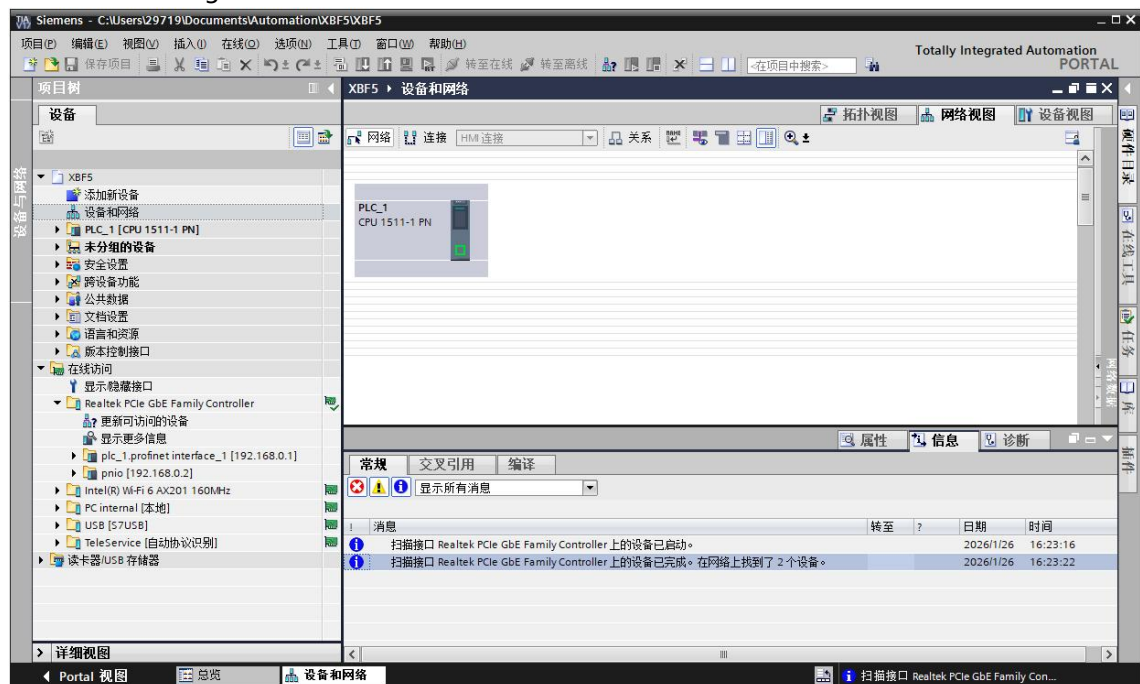


- b. Click "Add New Device", select the PLC model you are currently using, and click "Add", as shown in the image below. After adding, you can see that the PLC has been added to the device navigation tree.



4. Scan connection device

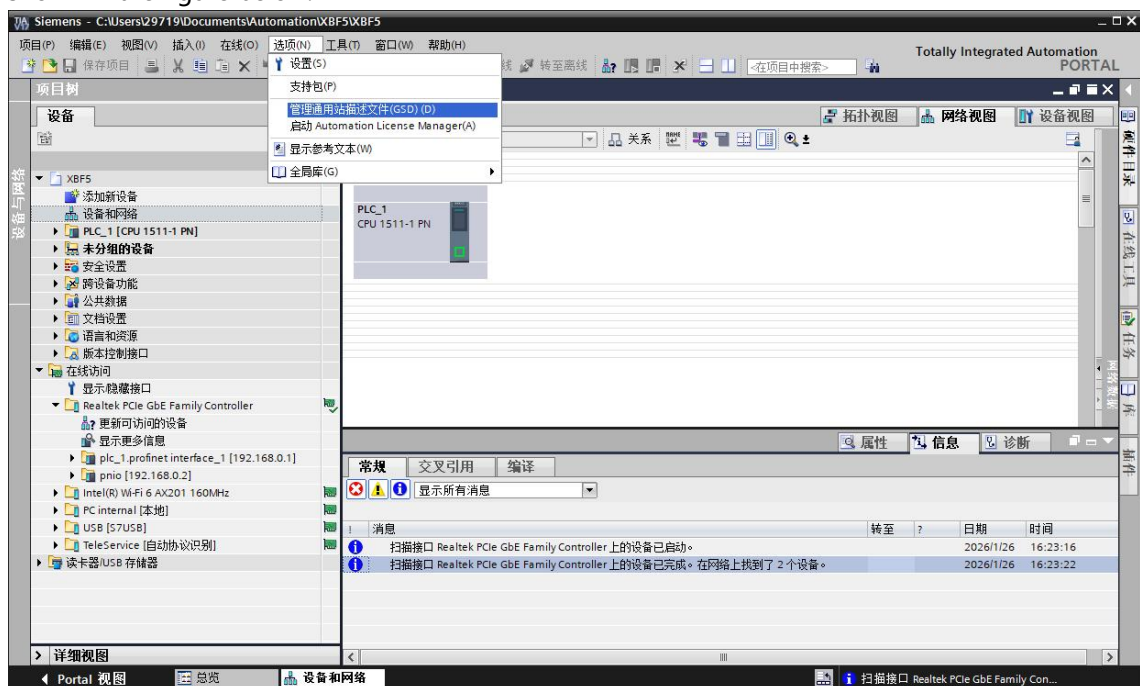
- Click "Online Access -> Update Accessible Devices" in the left navigation tree, as shown in the image below. Once the update is complete, the connected slave devices will be displayed, as shown in the image below.



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.

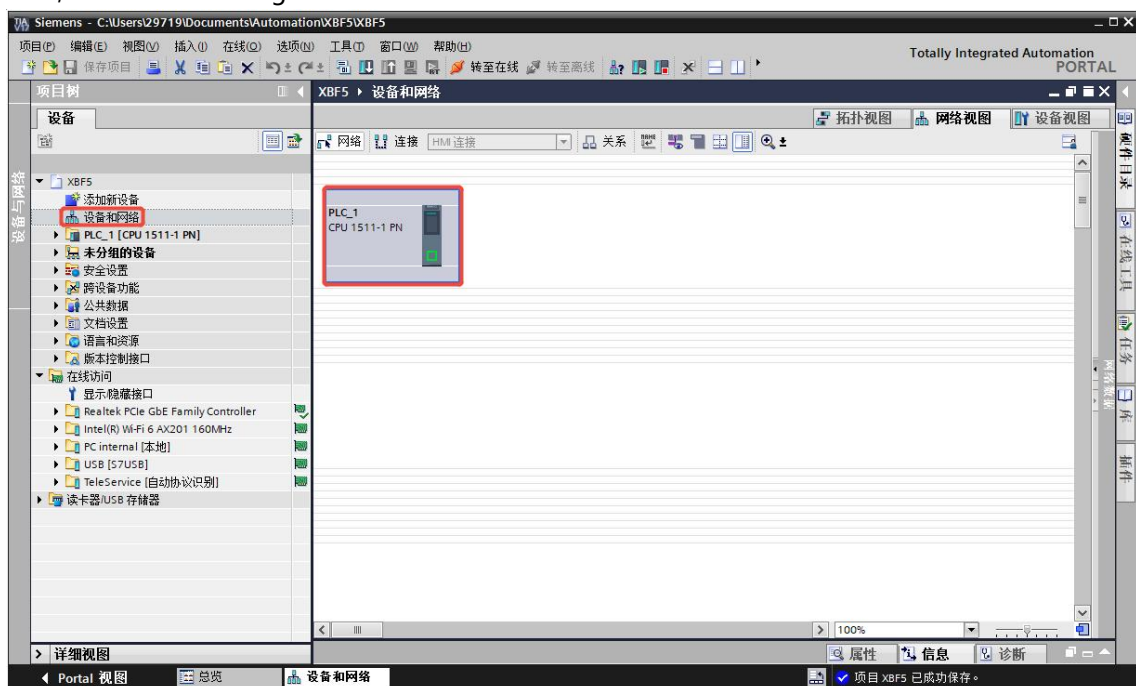


- b. Click "Source Path" to select the folder, and check if the status of the GSD file to be added is "Not Installed". If not, click the "Install" button; if already installed, click "Cancel" to skip the installation steps. As shown in the figure below.

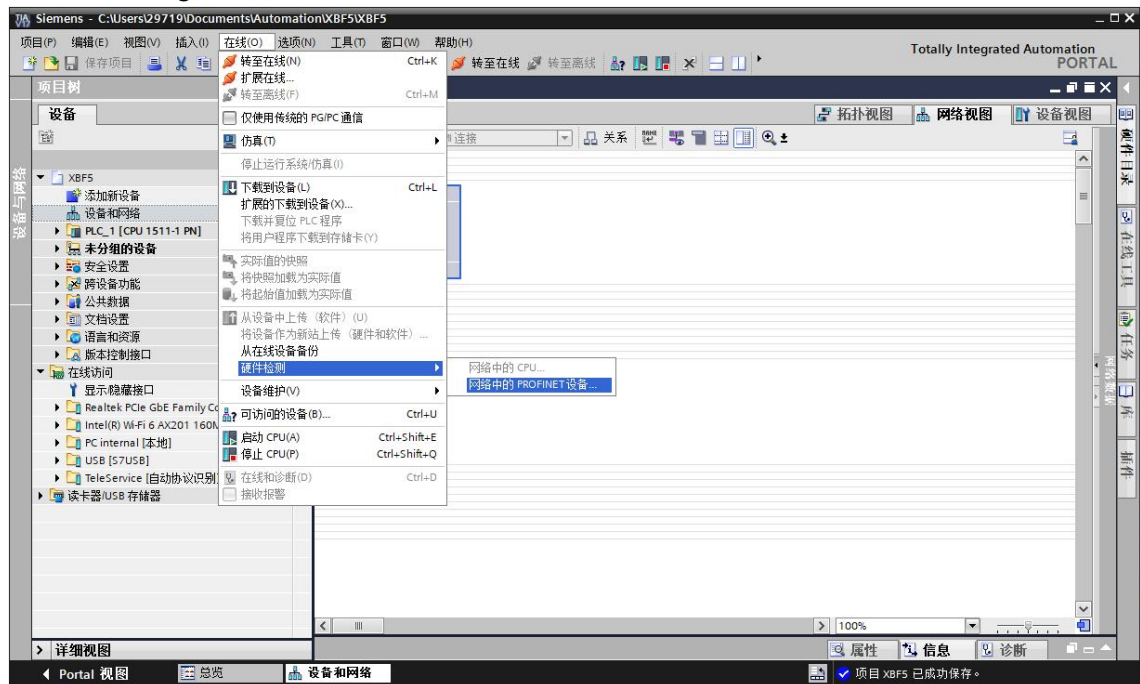


6、Hardware detection and device addition

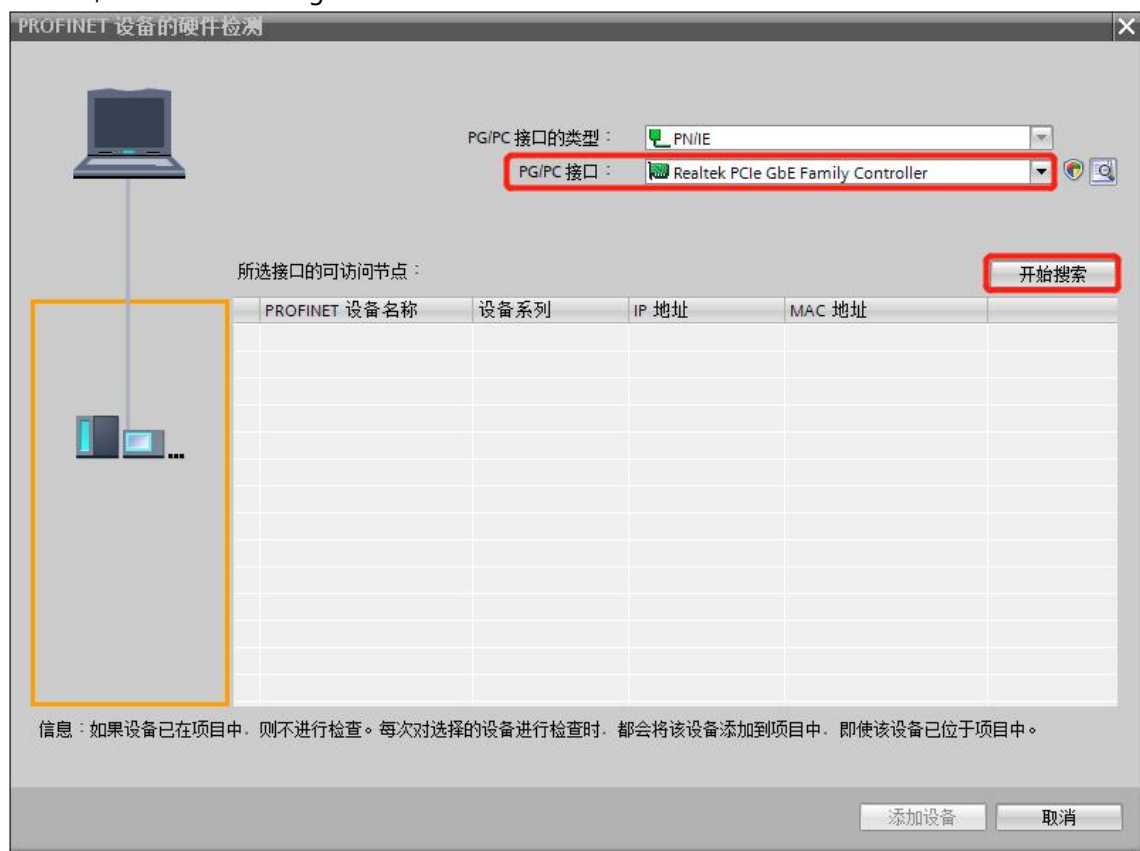
- a. Double-click "Device and Network" in the left navigation tree, and select PLC in the network view, as shown in the figure below.



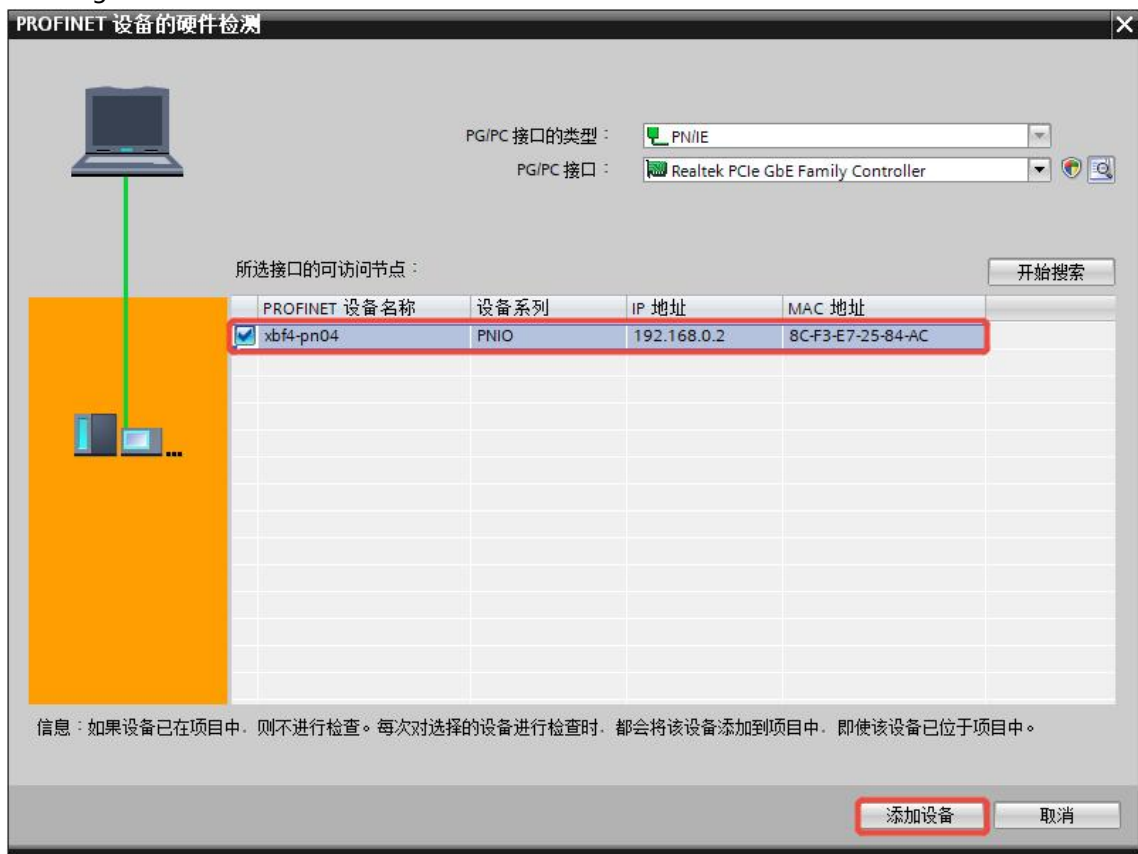
- b. In the menu bar, select "Online -> Hardware Detection -> PROFINET Devices in Network", as shown in the figure below.



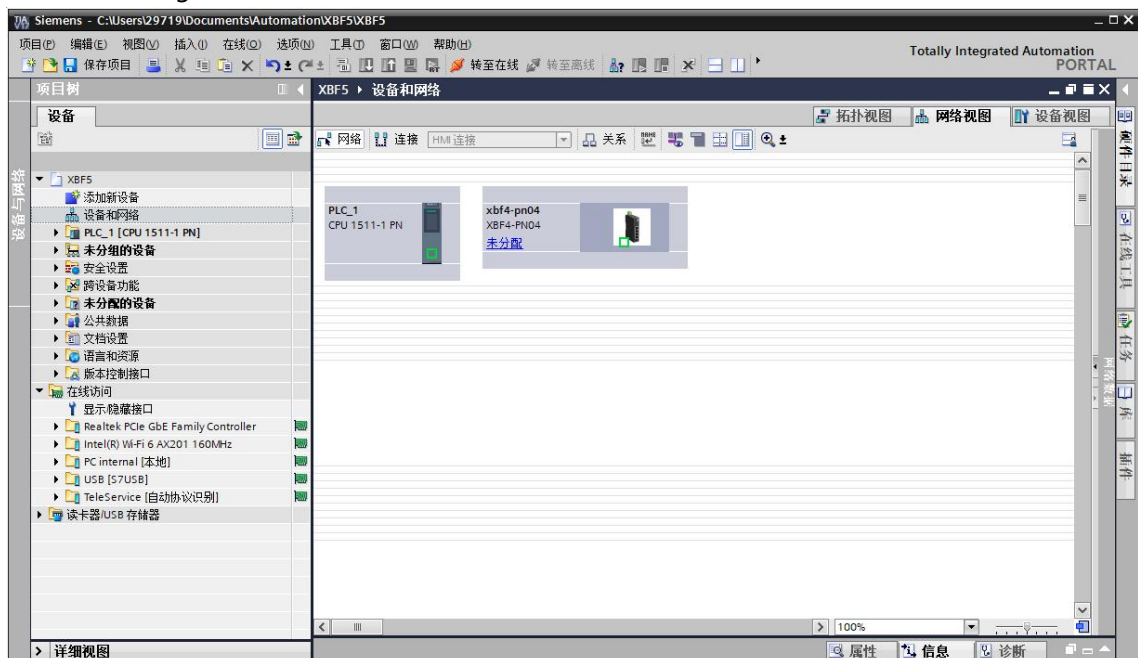
- c. A hardware detection window will pop up. Select the correct PG/PC interface and click "Start Search", as shown in the figure below.



- 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.

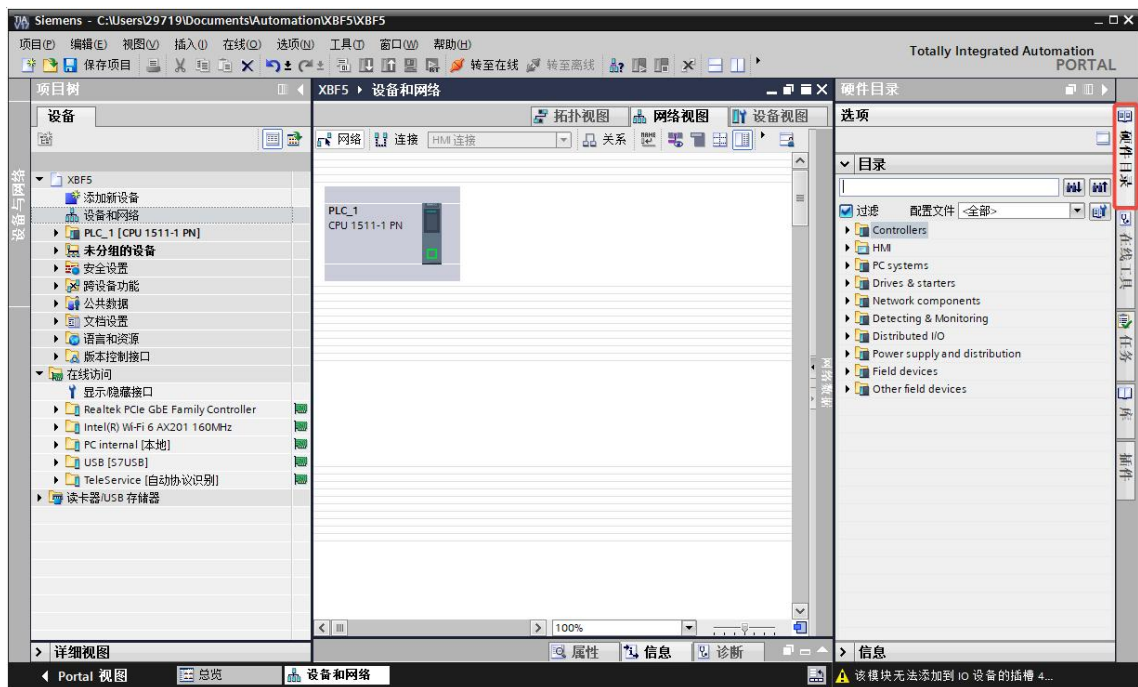


Note: The I/O module DIP switch station number must be consistent with the slot number set in the diagram. The DIP switch station numbers 0~F correspond to slots 1~16 of the four coupler interfaces respectively.

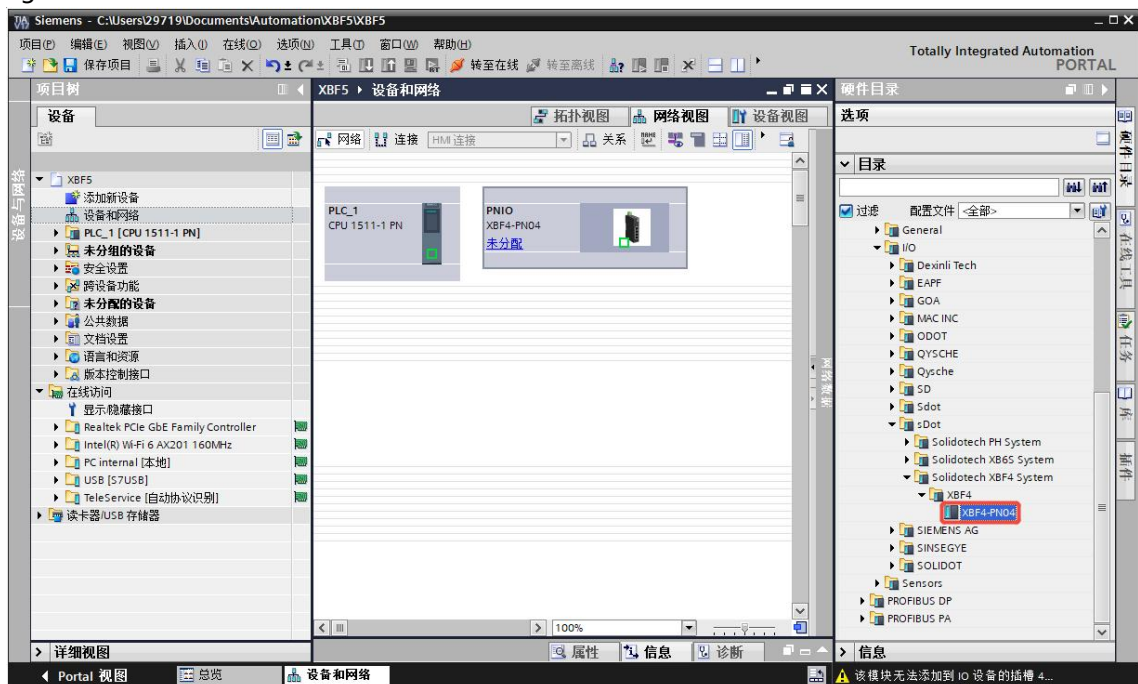
7、Manually add slave devices

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

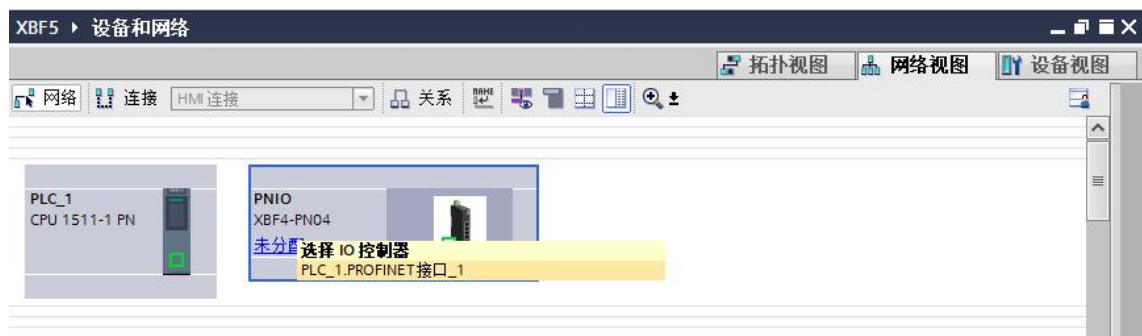
- Double-click "Devices and Networks" in the left navigation bar.
- Click the vertical "Hardware Catalog" button on the right, and the catalog will be displayed as shown in the image below.



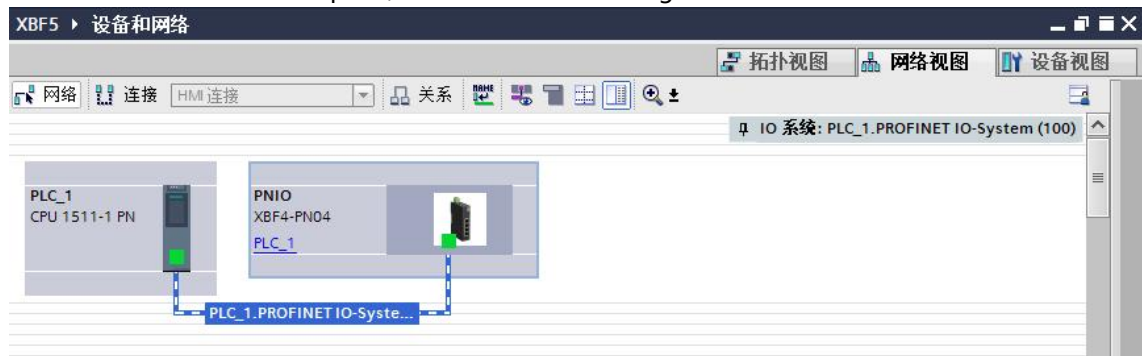
- c. Select "Other field devices -> PROFINET IO -> I/O -> sDot -> Solidotech XBF4 System -> XBF4 -> XBF4-PN04", then drag or double-click XBF4-PN04 to the "Network View", as shown in the figure below.



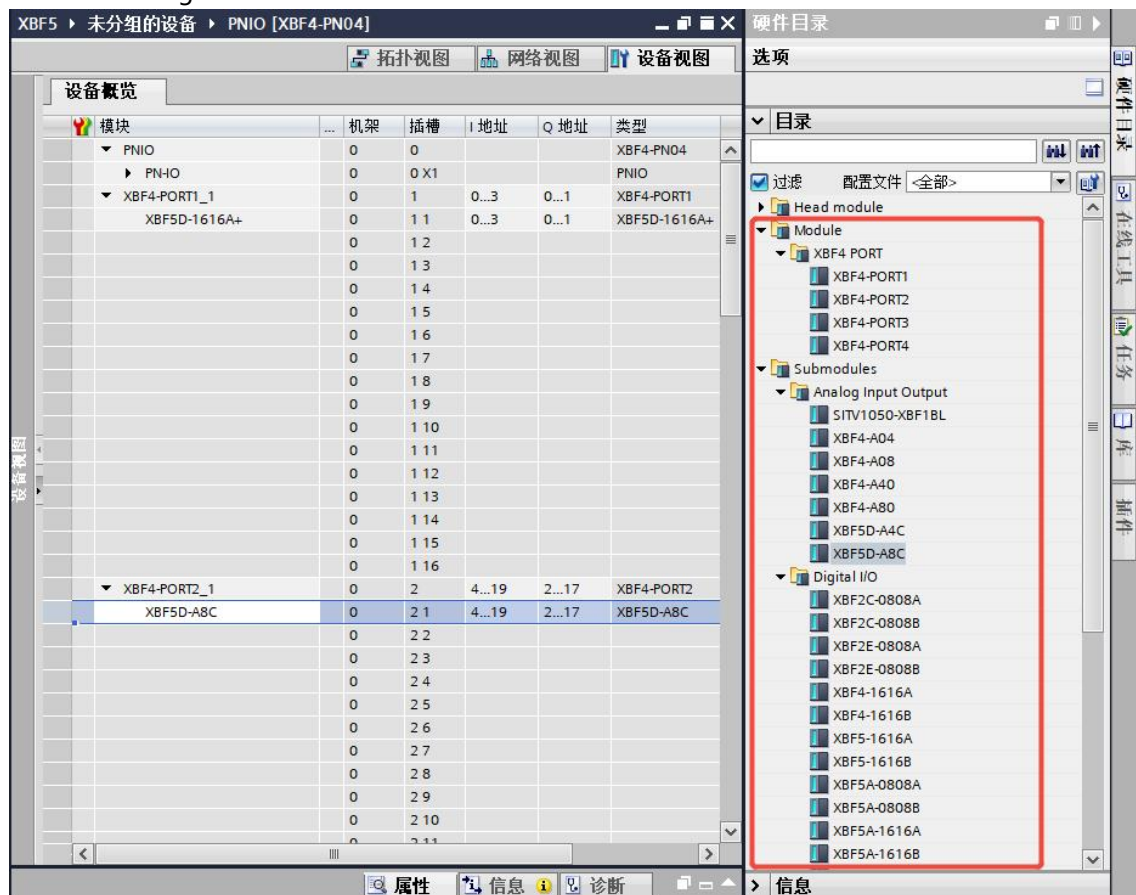
- d. Switch to network view, click "Unassigned (blue text)" on the coupler (slave) device, and select "PLC_1.PROFINET Interface_1", as shown in the figure below.



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



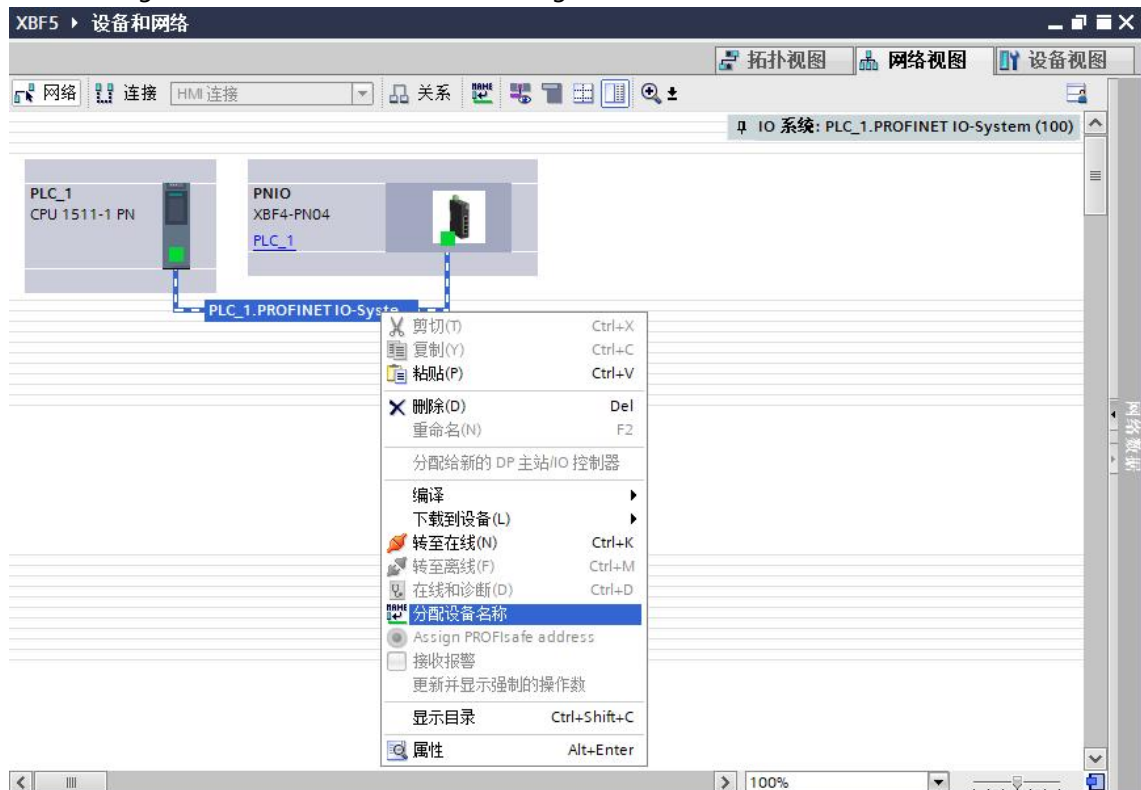
- f. Click "Device View" to enter the coupler's device overview. Under "Hardware Catalog" on the right, drag and drop to add couplers according to the actual topology. The interface and I/O modules (the order must match the actual topology, otherwise communication will fail) are shown in the figure below.



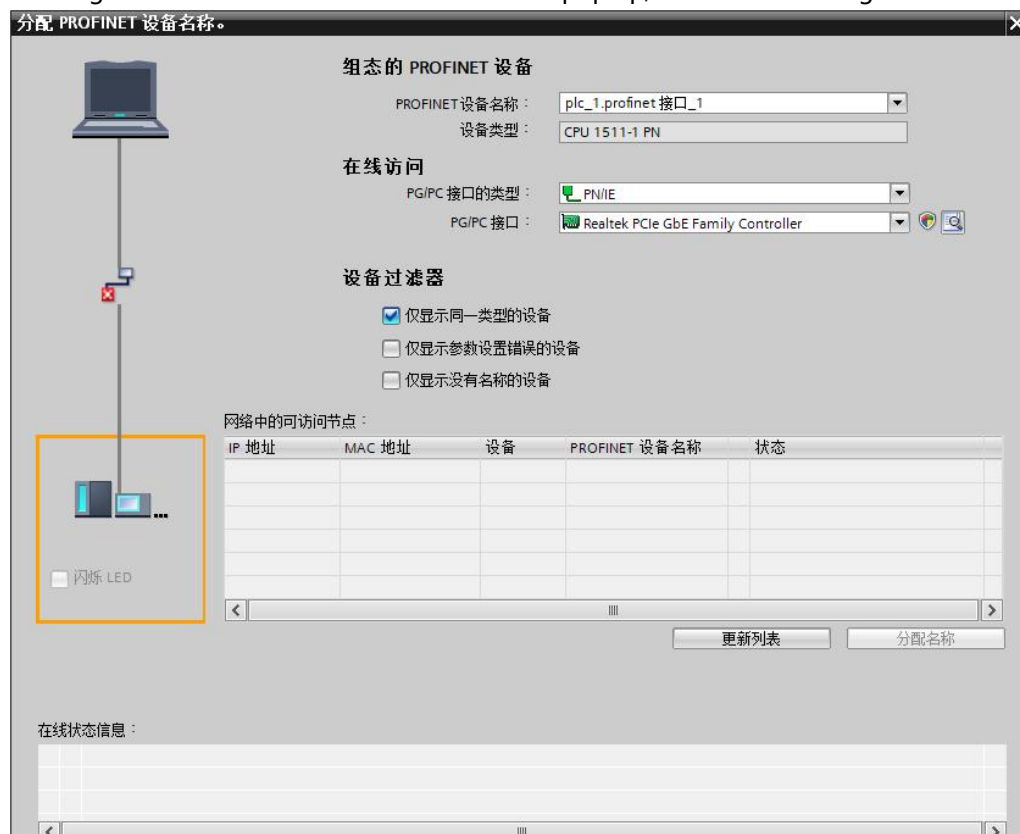
Note: The I/O module DIP switch station number must be consistent with the slot number set in the diagram. The DIP switch station numbers 0~F correspond to slots 1~16 of the four coupler interfaces respectively.

8. Assign device name

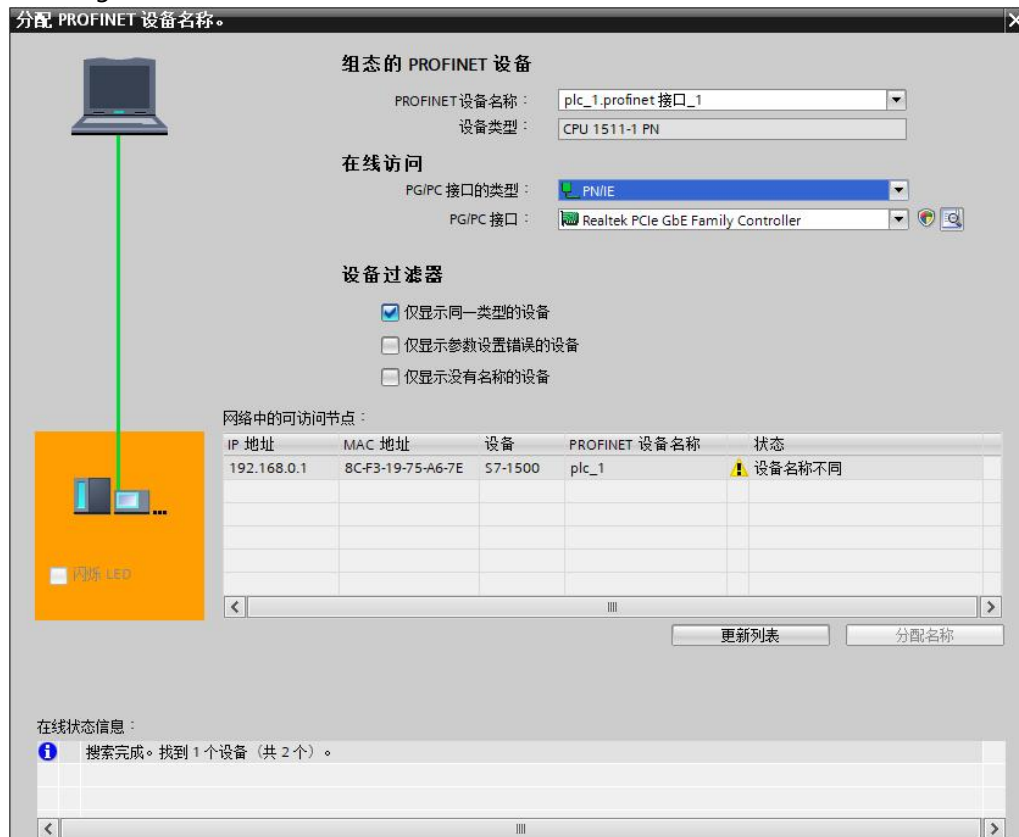
- In the network view, right-click the connection cable between the PLC and the coupler, and select "Assign Device Name", as shown in the figure below.



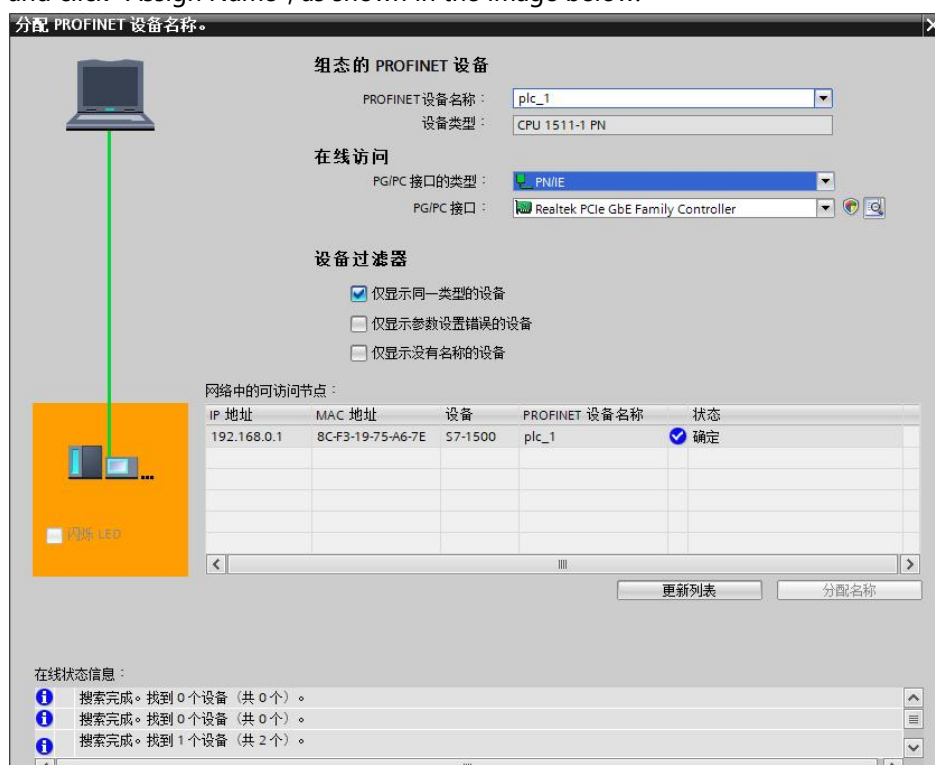
- A "Assign PROFINET Device Name" window will pop up, as shown in the figure below.



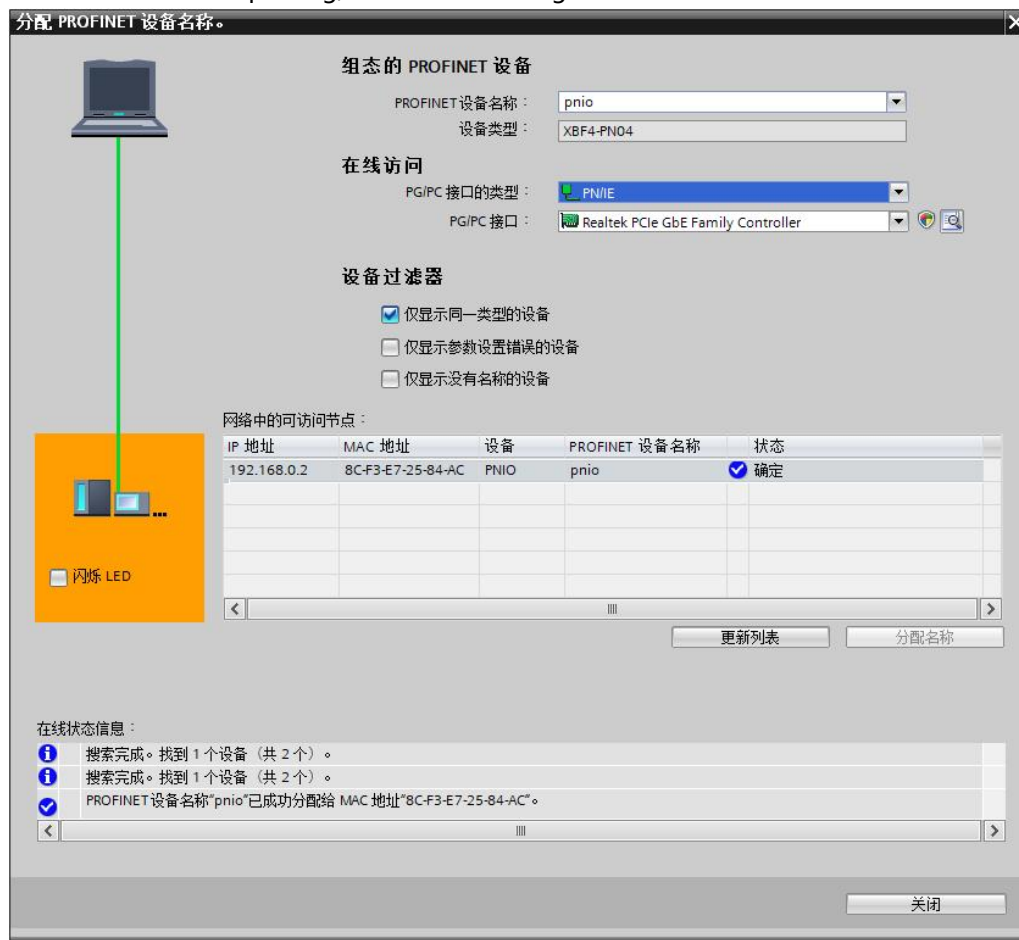
- c. Select PLC as the device name, click "Update List", and the update will be completed as shown in the figure below.



- 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.



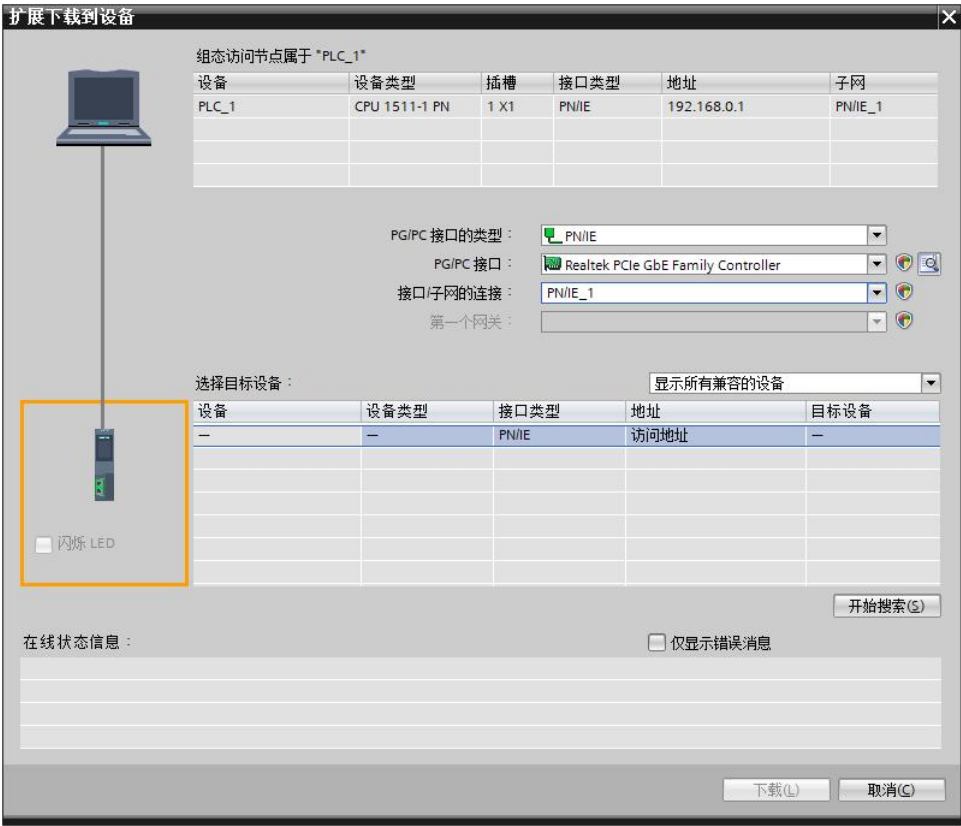
- e. Select "Coupler" as the device name, click "Update List," and then assign a name using the same method after updating, as shown in the figure below.



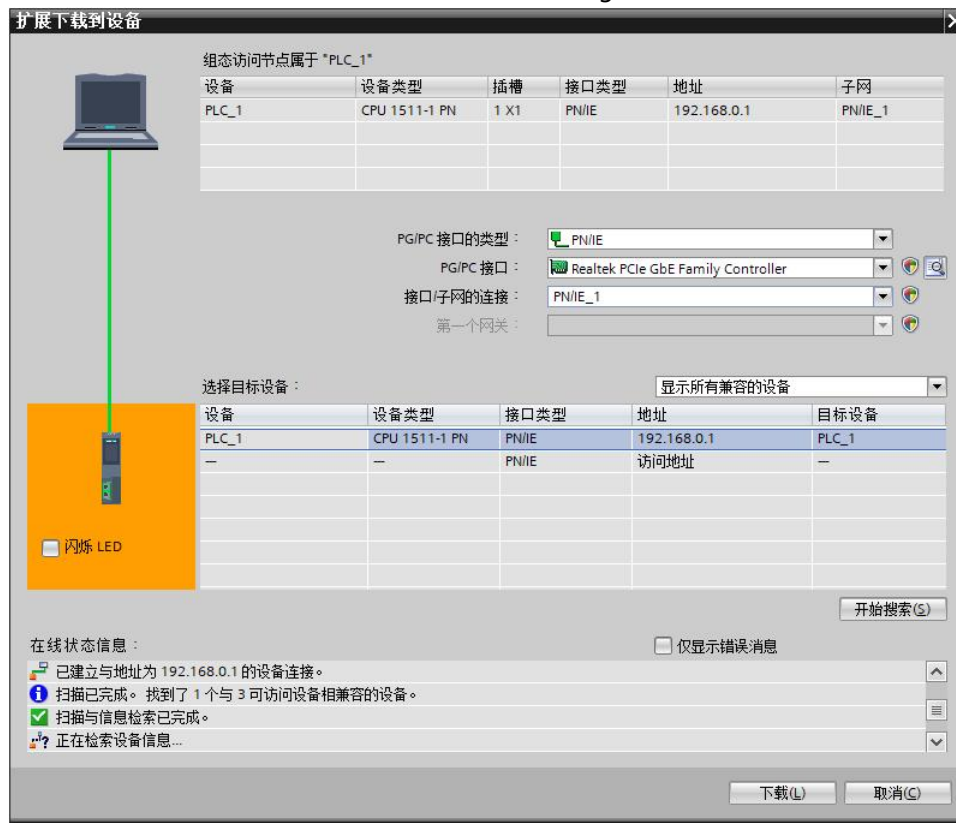
- f. Check if the MAC address on the module's silkscreen matches the MAC address of the assigned device name. Click "Close".

9、Download configuration structure

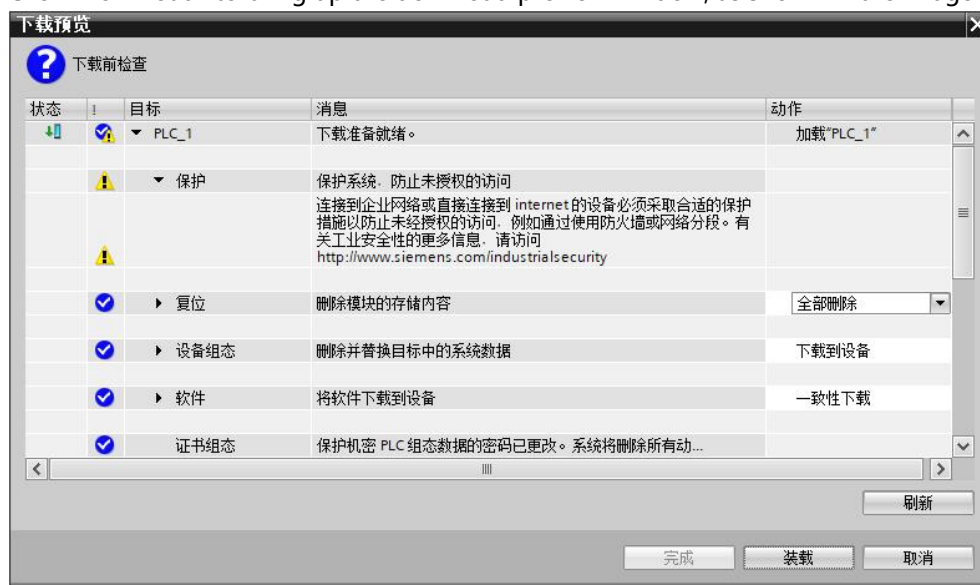
- a. In the network view, select the PLC. First, click the Compile button in the menu bar, then click the Download button to download the current configuration to the PLC.
- b. In the pop-up "Download extension to device" interface, configure as shown in the image below.



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



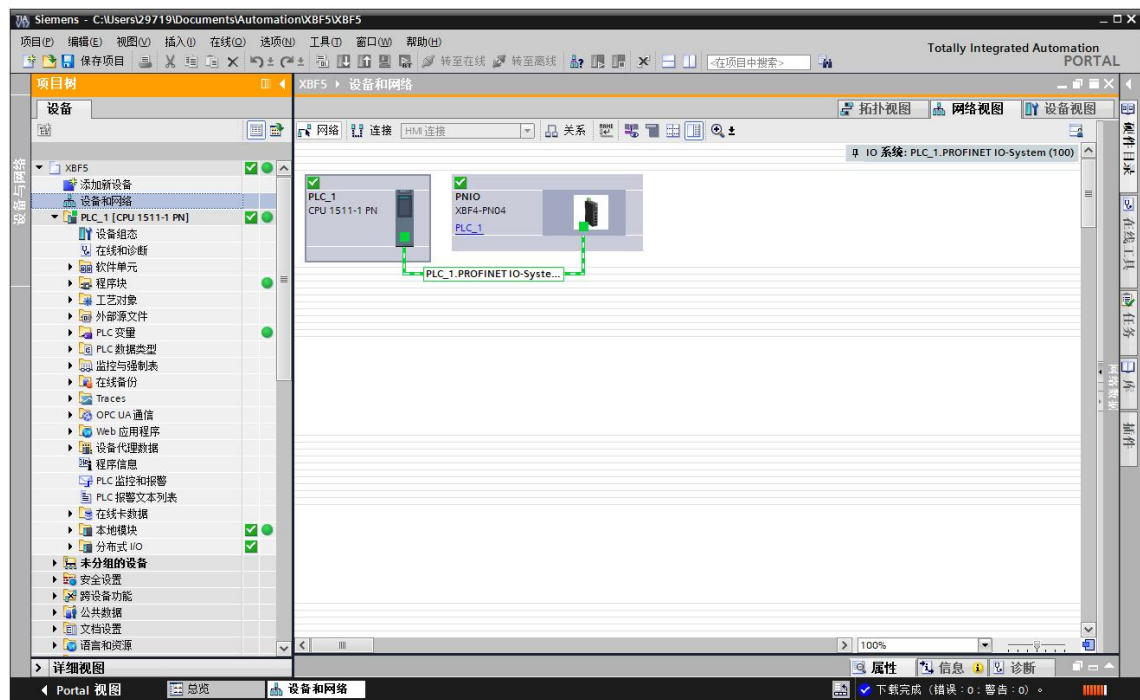
- d. Click "Download" to bring up the download preview window, as shown in the image below.



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

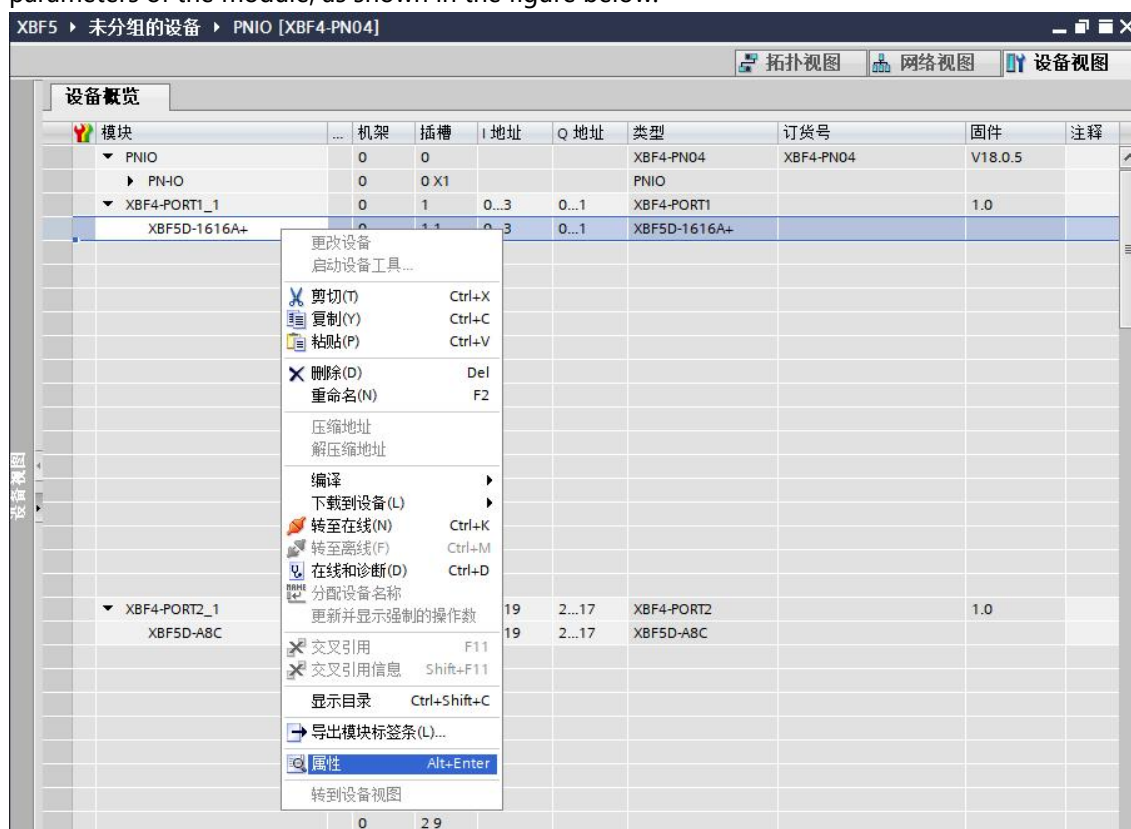
10、Communication connection

- 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.

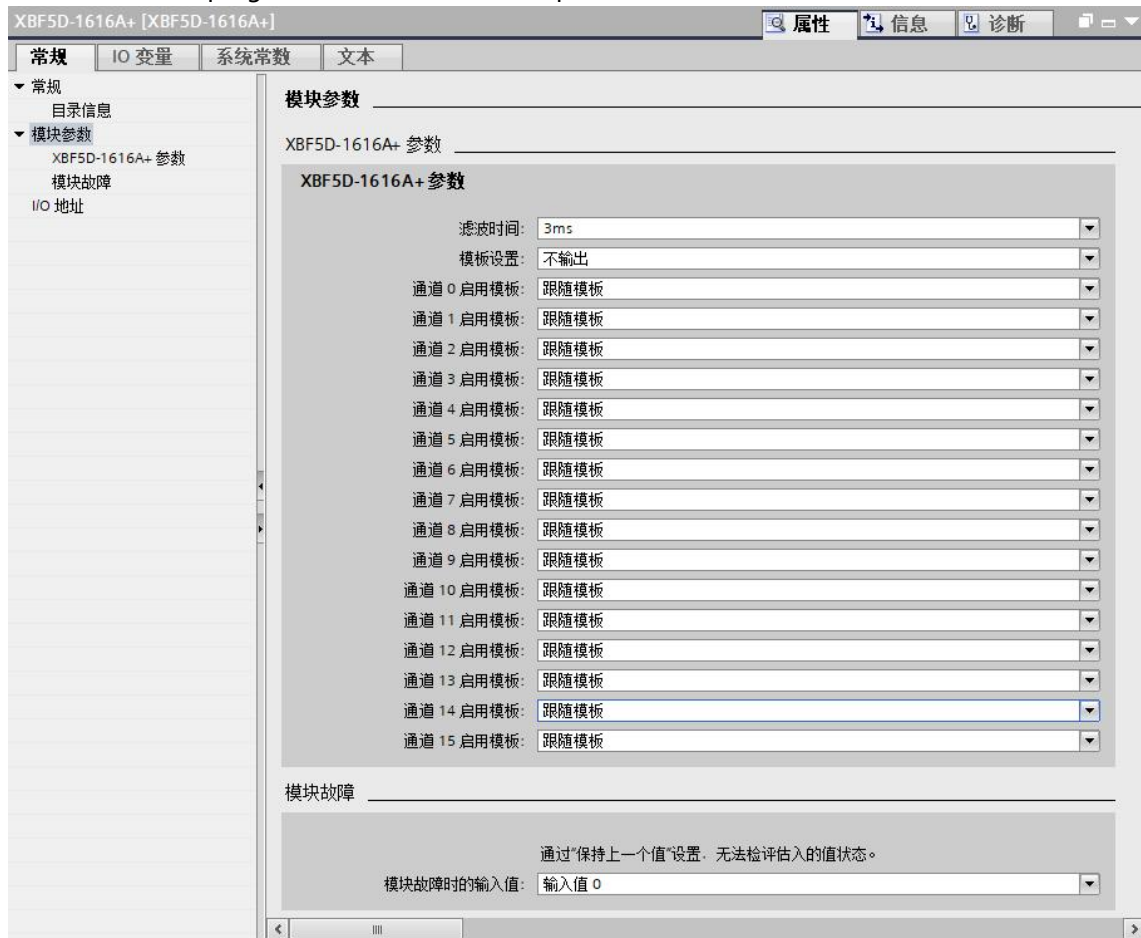


11、Parameter settings

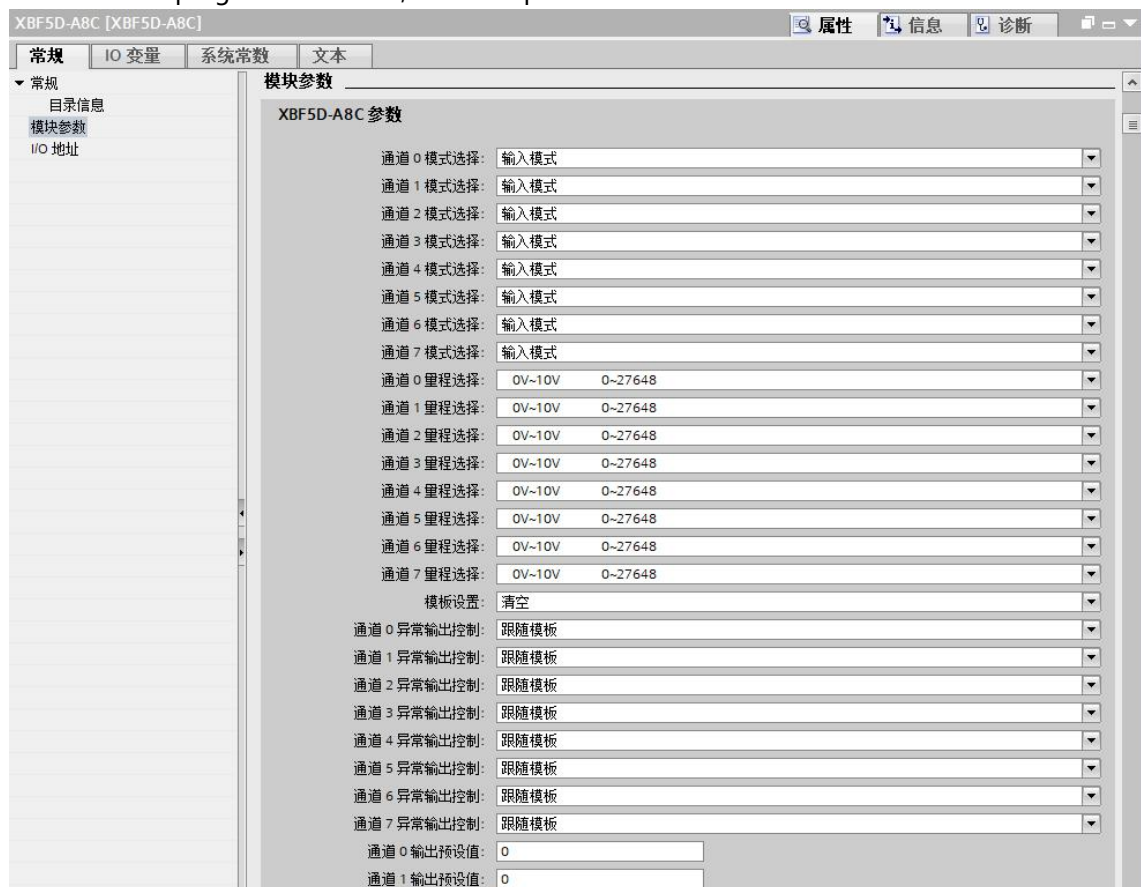
- a. In offline mode, open "Network View", select the coupler module, switch to device view, right-click the XBF5D-1616A+ module, and click the "Properties" button to view and set various parameters of the module, as shown in the figure below.



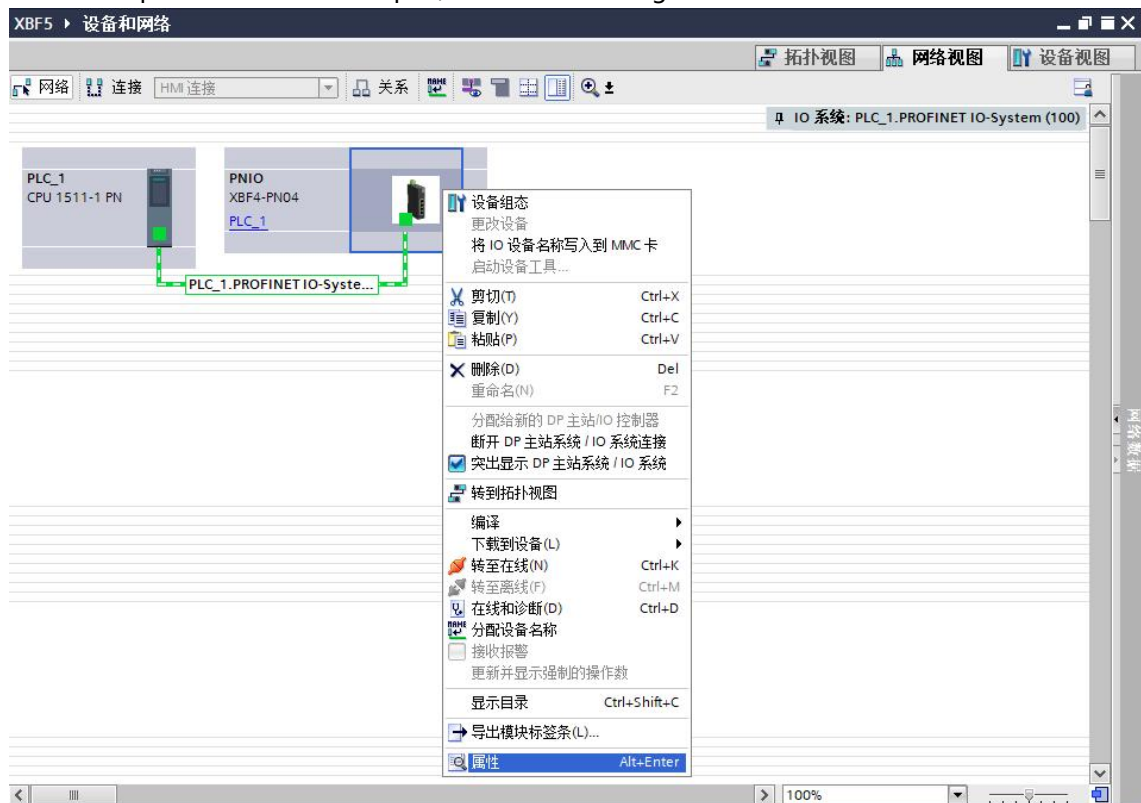
- b. On the XBF5D-1616A+ properties page, click "Module Parameters," as shown in the image below. The parameters can be configured according to actual usage needs. After configuration, re-download the program to the PLC, and then power on both the PLC and the module.



- c. View the parameters of XBF5D-A8C in the same way, as shown in the figure 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.



- d. 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.

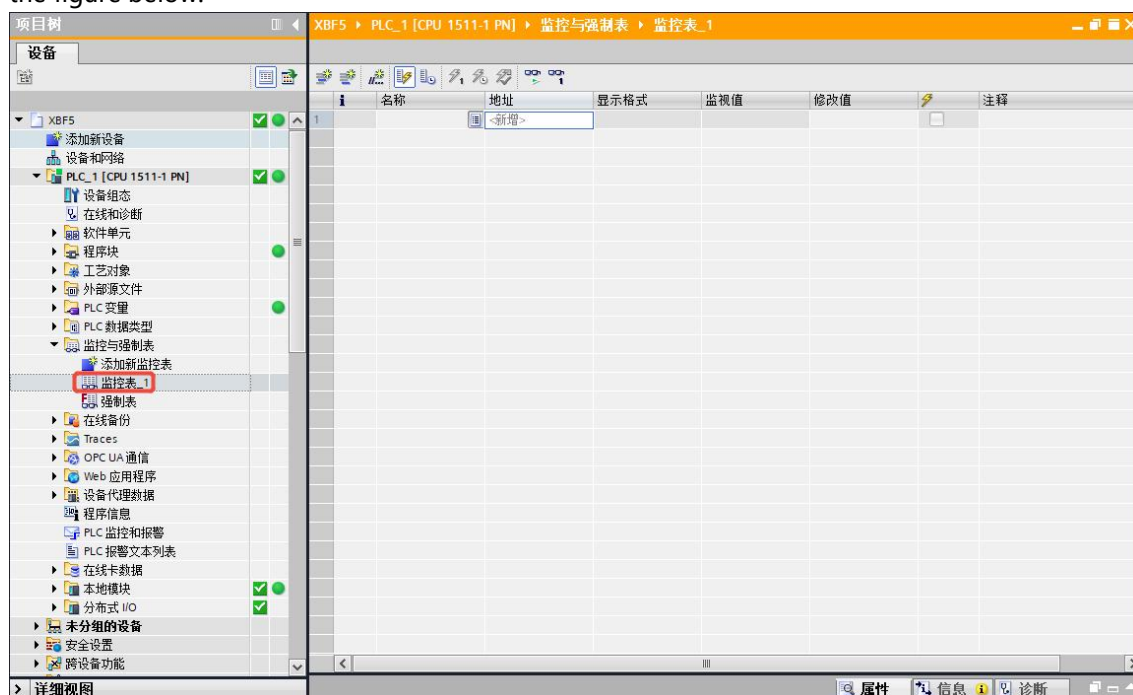


- e. On the coupler properties page, click "Module Parameters," as shown in the image below. Alarm function enable/disable, PLC stop status DO/AO output control, IO communication exception configuration, and baud rate configuration parameters can be configured according to actual usage needs. After configuration, re-download the program to the PLC, and then power on both the PLC and the module.



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.

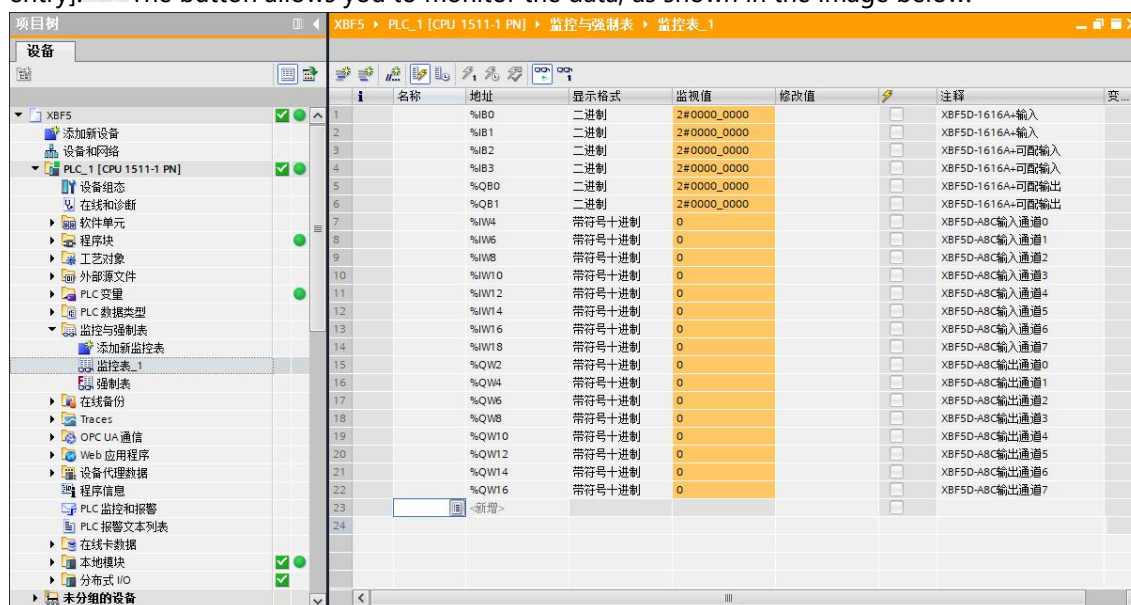


- b. Open "Device View" to view the channel I address (channel address of input signal) and Q address (channel address of output signal) of each module in the device overview. For example, the "I address" of the XBF5D-1616A+ module is 0 to 3, and the "Q address" of the XBF5D-1616A+ module is 0 to 1, as shown in the figure below.

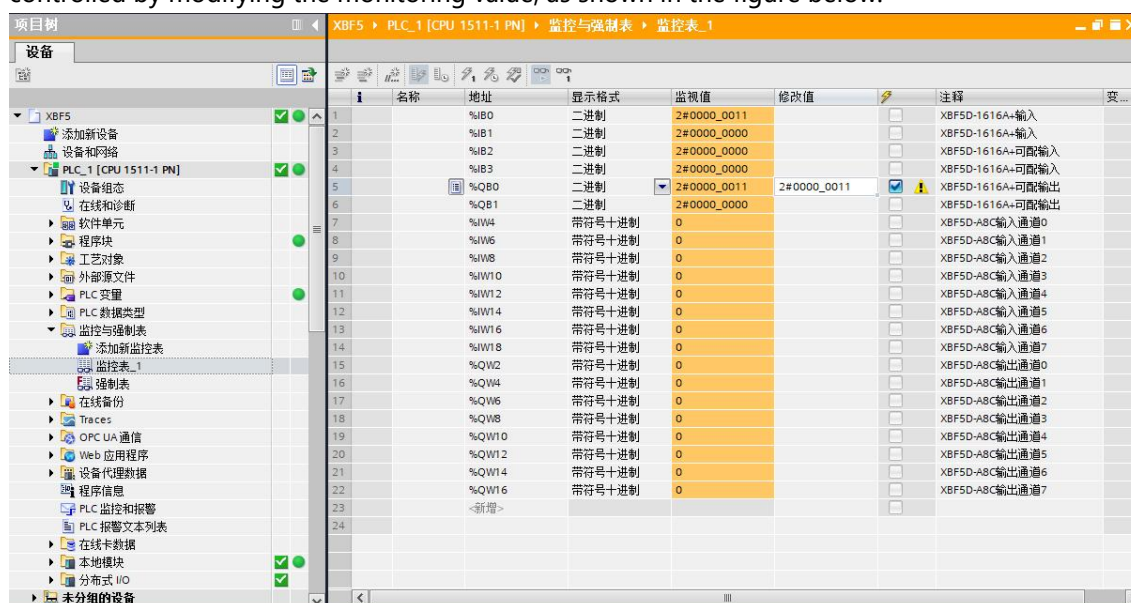
XBF5 ▶ 未分组的设备 ▶ PNIO [XBF4-PN04]									
设备概览									
模块	机架	插槽	I 地址	Q 地址	类型	订货号	固件	注释	
PNIO	0	0			XBF4-PN04	XBF4-PN04	V18.0.5		
PN-HO	0	0 X1			PNIO				
XBF4-PORT1_1	0	1	0...3	0...1	XBF4-PORT1		1.0		
XBF5D-1616A+	0	1 1	0...3	0...1	XBF5D-1616A+				
	0	1 2							
	0	1 3							
	0	1 4							
	0	1 5							
	0	1 6							
	0	1 7							
	0	1 8							
	0	1 9							
	0	1 10							
	0	1 11							
	0	1 12							
	0	1 13							
	0	1 14							
	0	1 15							
	0	1 16							
XBF4-PORT2_1	0	2	4...19	2...17	XBF4-PORT2		1.0		
XBF5D-A8C	0	2 1	4...19	2...17	XBF5D-A8C				
	0	2 2							

- c. In the address cells of the monitoring table, enter the input/output channel addresses, such as "IB0" to "IB3", "QB0" to "QB1", and press "Enter". After completing all the entries, click [link to

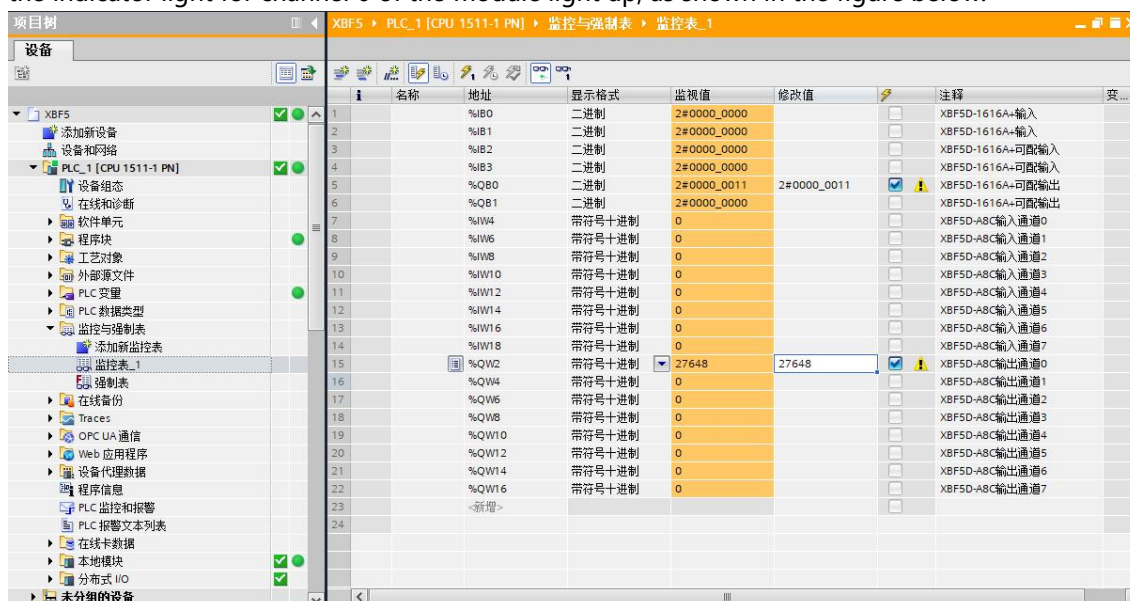
entry].  The button allows you to monitor the data, as shown in the image below.



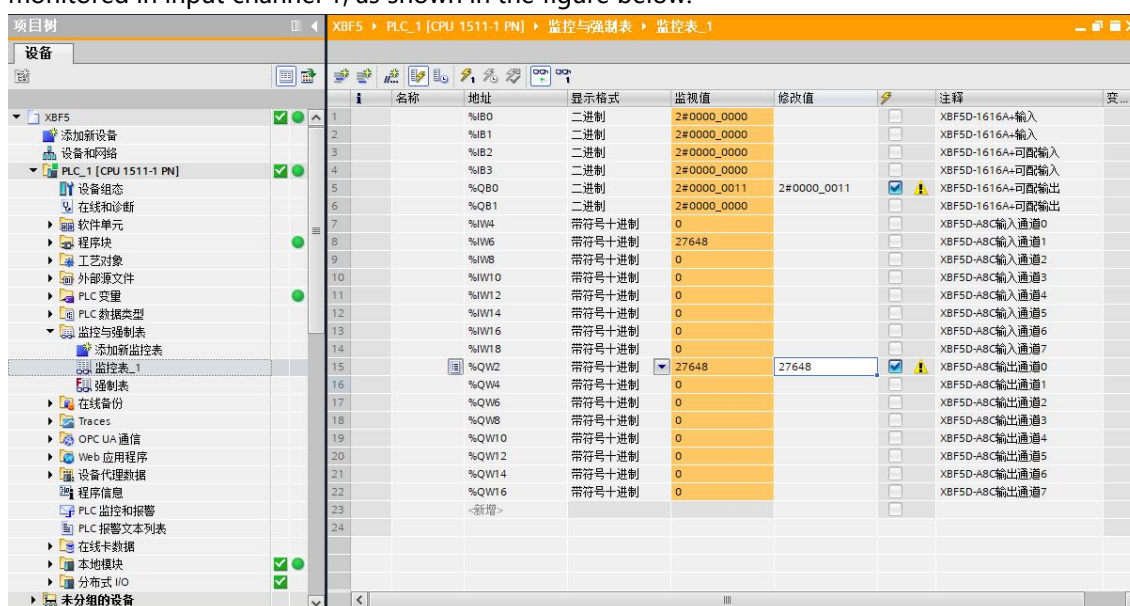
- d. Taking input channels 0 and 1 of the XBF5D-1616A+ module as an example, when there is a valid voltage input to input channels 0 and 1, it can be observed in the monitoring value cell of the monitoring table; the output channels of the XBF5D-1616A+ module can be forcibly controlled by modifying the monitoring value, as shown in the figure below.



- e. Taking the analog module Module17 (XBF5D-A8C) as an example, with channel 0 configured as the output and the other channels as inputs, write "27648" into output channel 0. You will see the indicator light for channel 0 of the module light up, as shown in the figure below.

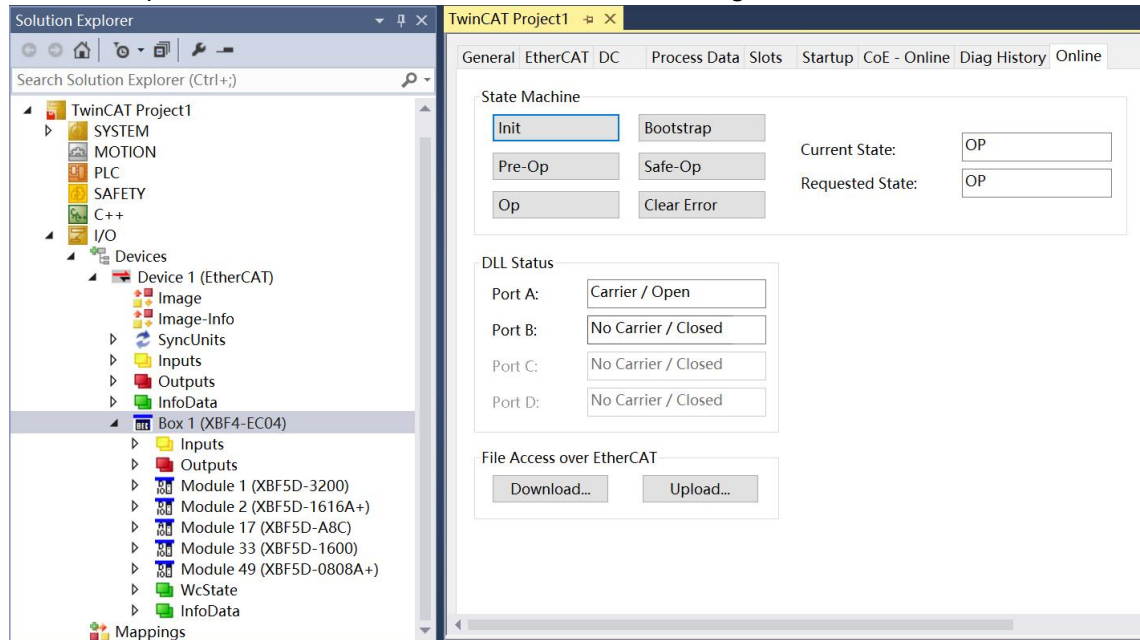


- f. When an effective voltage is input to module channel 1, the input value "27648" can be monitored in input channel 1, as shown in the figure below.

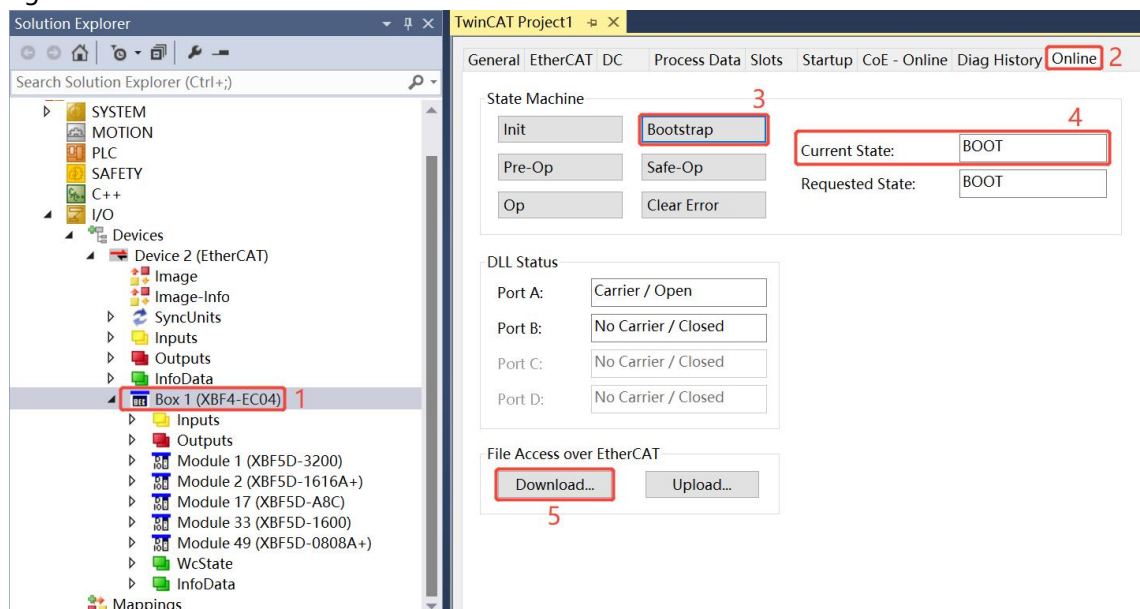


6.5 Firmware online upgrade

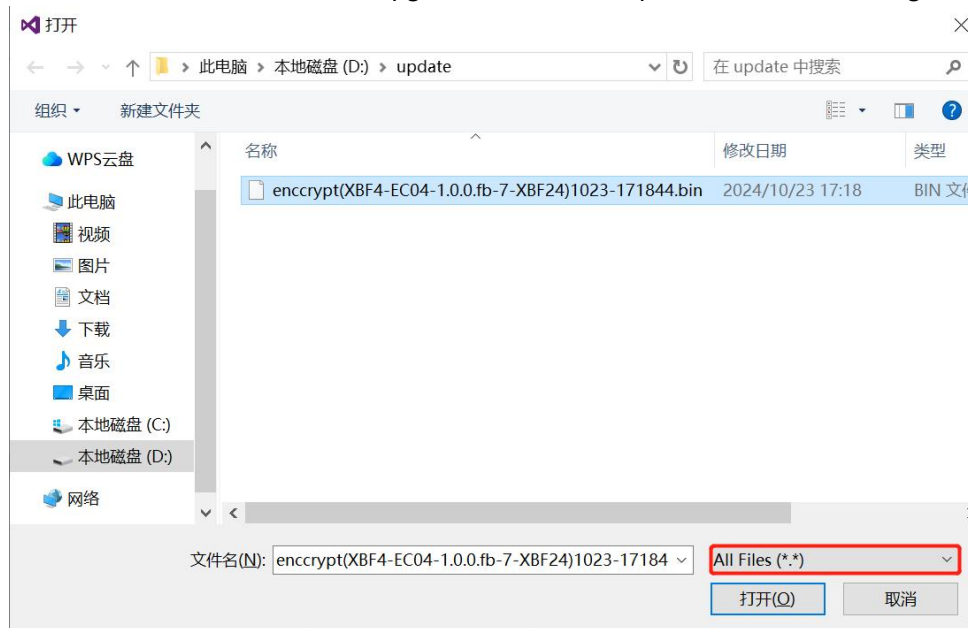
- 1、Taking TwinCAT3 software as an example, the topology is XBF4-EC04+{Coupler Interface 0: XBF5D-3200+XBF5D-1616A+}+{Coupler Interface 1: XBF5D-A8C}+{Coupler Interface 2: XBF5D-1600}+{Coupler Interface 3: XBF5D-0808A+}, as shown in the figure below.



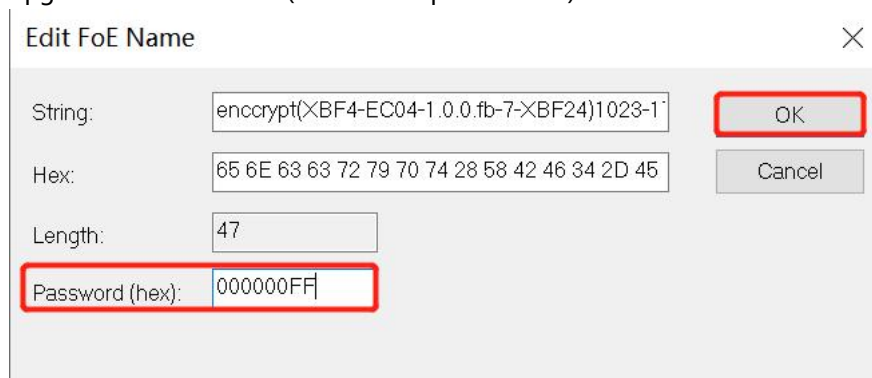
- 2、Click the coupler "XBF4-EC04" in the left navigation tree, click the "Online" option in the right menu, click the "Bootstrap" option in State Machine, wait for Current State to display "BOOT" status, and then click the "Download" option in File Access over EtherCAT below, as shown in the figure below.



- 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 (XBF5D-3200) is 0, and the DIP switch number is 00, so the Password is 0x000;

The extension interface number of Module 2 (XBF5D-1616A+) is 0, and the DIP switch number is 01, so the password is 0x001.

The extension interface number of Module 17 (XBF5D-A8C) is 1, and the DIP switch number is 00, so the password is 0x100.

The extension interface number of Module 33 (XBF5D-1600) is 2, and the DIP switch number is 00, so the password is 0x200.

The extension interface number of Module 49 (XBF5D-0808A+) is 3, and the DIP switch number is 00, so the password is 0x300.

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 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.