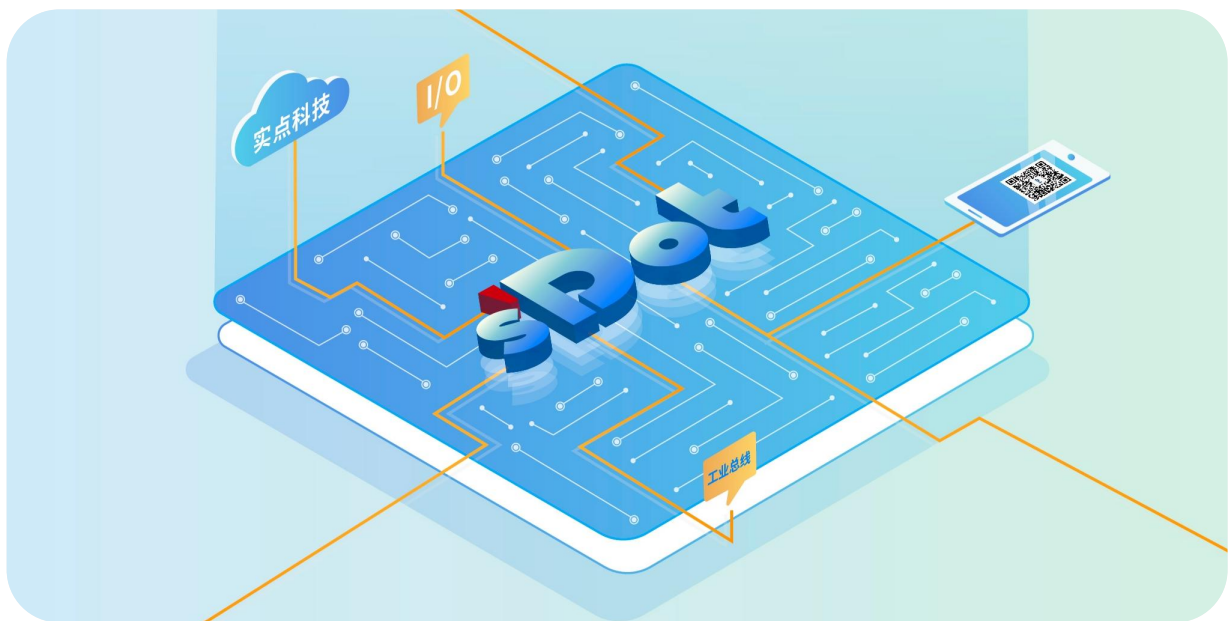




XBF4-PN04 Coupler

XBF4 Series Discrete I/O Modules

User Manual



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Nanjing Solidot Electronic Technology Co., Ltd.

Address: Building 40, No. 9-1, Yinlong Road, Jiangning District, Nanjing City, Jiangsu Province

Postal code: 211106

Telephone: 4007788929

Website: <http://www.solidotech.com>

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1 Product Overview

1.1 Product Introduction

The XBF4 series of 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 XBF4 series of discrete I/O modules offers a wide variety and high real-time performance, providing users with support for high-speed data acquisition, optimized system configuration, simplified field wiring, and improved system reliability.

1.2 Product Features

- **Small number of nodes required**
A node consists of a bus coupler and 1 to 32 XBF4 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 modules, capable of integrating various digital and analog current & voltage compatible modules to meet the needs of different applications.
- **High compatibility**
The bus coupler communication interface conforms to communication standards and supports mainstream master stations.
- **Small size**
It has a compact structure and occupies little space.
- **Easy to diagnose**
The indicator lights are complete, making the module status clear at a glance and facilitating testing and maintenance.
- **Fast**
Digital input module combination, baud rate 6MHz, maximum scan cycle approximately 1ms;

This is a combination of digital and analog input modules, with a baud rate of 6MHz and a maximum scan cycle of approximately 3.5ms. (The connected modules can handle up to 1024 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, analog input modules, and analog output modules.

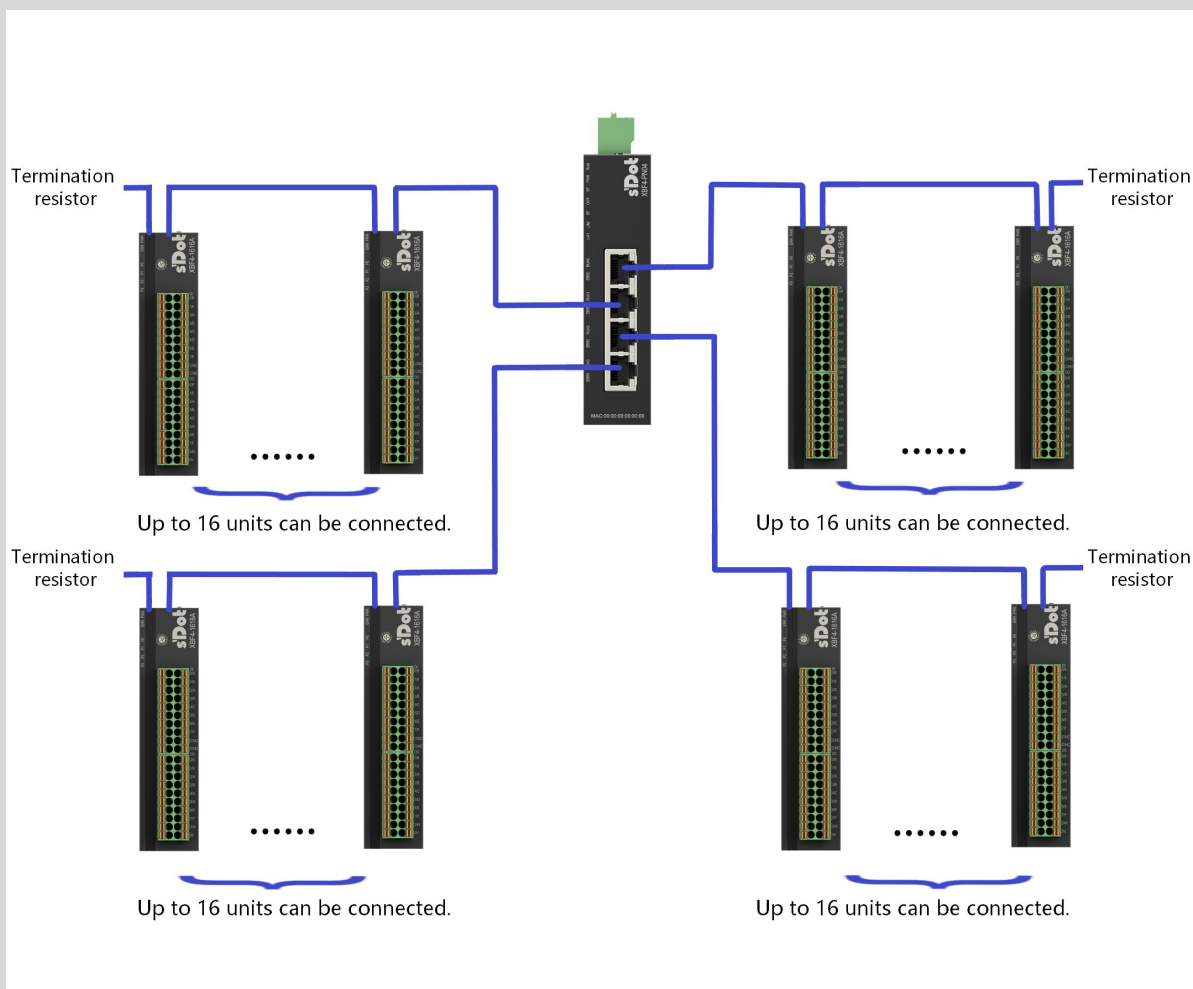
Application method: Application methods that combine modules such as couplers, digital signals, and analog signals.

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 XB6S discrete I/O modules.

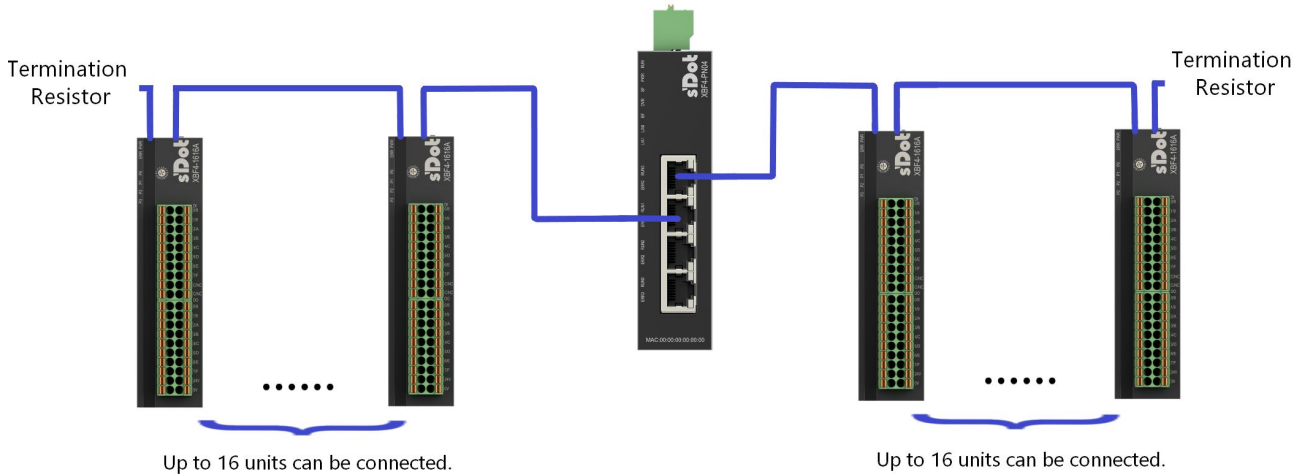
The product uses a combination of couplers and XB6S discrete I/O modules, and the following two types of topology combinations are provided for reference.

Product combination option 1 (all 4 interfaces are used, each interface can connect up to 16 XB6S discrete I/O modules, for a total of up to 32 XB6S discrete I/O modules)



Product combination method two (using 2 interfaces, each interface can connect up to 16 XB6S discrete I/O modules, for a total of up to 2*16 XB6S discrete I/O modules)

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



The first interface connects 16 modules;

The second interface connects to four modules;

The third interface connects to four modules;

The fourth interface connects to four modules;

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

2 Naming Rules

2.1 Naming Rules

2.1.1 Coupler naming rules

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

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

2.1.2 I/O module naming rules

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

serial number	meaning	Value description				
(1)	Product Type	XBF: XB6S Discrete I/O				
(2)	Product Series	4: Integrated				
(3)	Types of I/O modules	A: Analog Default: Digital				
(4)	Number of input signal points	Analog: 0, 4, 8 Digital: 00, 08, 16, 32				
(5)	Number of output signal points	Analog: 0, 4, 8 Digital: 00, 08, 16, 32				
(6)	Input/output characteristics	Digital			Analog	
		coding	Input	Output	coding	illustrate
		A	NPN/PNP compatible	NPN	V	voltage module
		B	NPN/PNP compatible	PNP	I	Current module
		default	NPN/PNP compatible	/	default	Analog current & voltage compatible

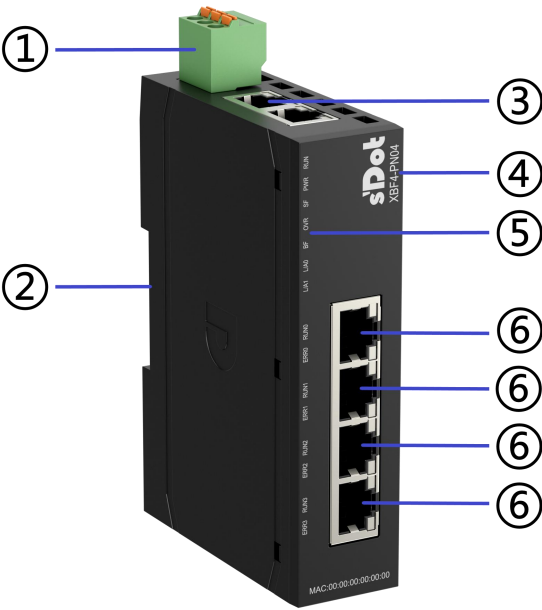
2.2 Module list

Model	Product Description	
XBF4-PN04	Integrated Scalable PROFINET busCoupler module	
XBF4-3200	32-channel digital input module, NPN/PNP compatible input, input filtering default 3ms	
XBF4-1600	16-channel digital input module, NPN/PNP compatible input, input filtering default 3ms	
XBF4-1616A	16-channel digital input/16-channel digital output module Input is NPN/PNP compatible, input filtering defaults to 3ms, output is NPN type.	
XBF4-1616B	16-channel digital input/16-channel digital output module Input is NPN/PNP compatible, input filtering defaults to 3ms, output is PNP type.	
XBF4-0032A	32-channel digital output module, output NPN type	
XBF4-0032B	32-channel digital output module, PNP type output	
XBF4-0016A	16-channel digital output module, output NPN type	
XBF4-0016B	16-channel digital output module, output PNP type	
XBF4-A80	8-channel analog current & voltage compatible input module	Single-ended signal, adjustable range: Disable, 0mA~20mA, 4mA~20mA, -20mA~+20mA. -10V~+10V, 0V~10V, -5V~+5V, 0V~5V, 1V~5V
XBF4-A40	4-channel analog current & voltage compatible input module	
XBF4-A08	8-channel analog current & voltage compatible output module	Single-ended signal, adjustable range: Disable, 0mA~20mA, 4mA~20mA, -10V~+10V, 0V~10V. -5V~+5V, 0V~5V, 1V~5V
XBF4-A04	4-channel analog current & voltage compatible output module	

3 Module Introduction

3.1 PROFINET 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, 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

3.1.2 Indicator light function

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

3.1.3 Product Parameters

3.1.3.1 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.

3.1.3.2 Power parameters

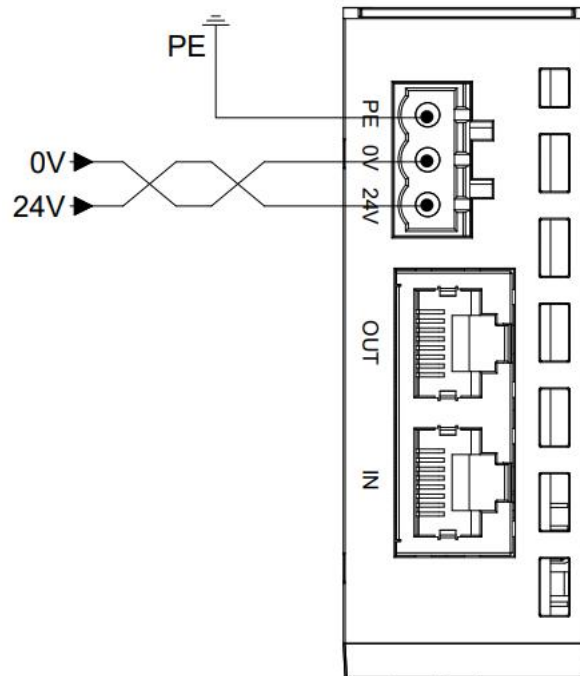
Power parameters	
Input voltage	SELV Input 24VDC (18V~36V)
Input current	<0.95A
Supply current	<500mA (maximum supply current for a single interface) <750mA (maximum supply current for all four interfaces)
Power supply voltage	20VDC~24VDC

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 60068-2-6 sinusoidal vibration 5Hz~8.4Hz,3.5mm,8.4Hz~150Hz,1g X/Y/Z Triaxial 10 cycle/Axial (100min)
	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
PROFINET IO RT		support
Abnormal self-recovery		support
Hardware testing		support
diagnosis		support
Alarm		support
Firmware upgrade		support
Short circuit protection		Supports (automatic recovery mechanism)
Reverse connection protection		Supports (automatic recovery mechanism)
Surge protection		support

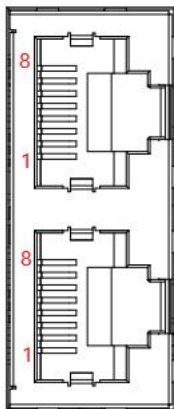
3.1.4 Power wiring diagram

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.



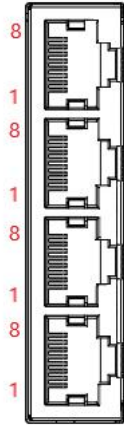
pin number	Signal
1	TD+
2	TD-
3	RD+
4	—
5	—
6	RD-
7	—
8	—

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.



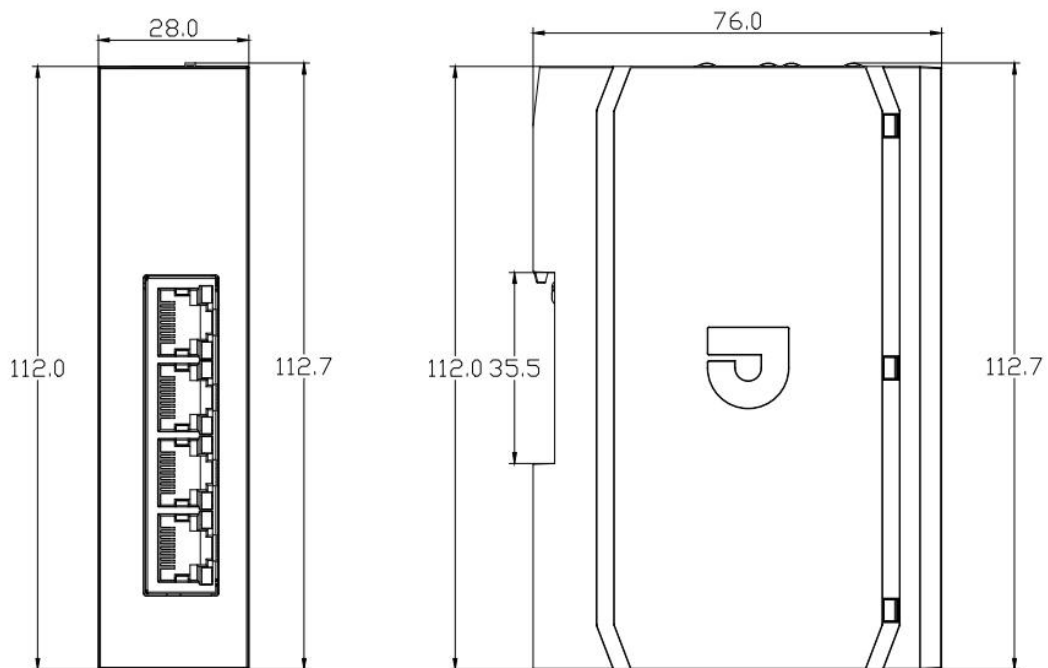
pin number	Signal
1	B
2	A
3	SGND
4	—
5	—
6	S24V
7	—
8	—

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.

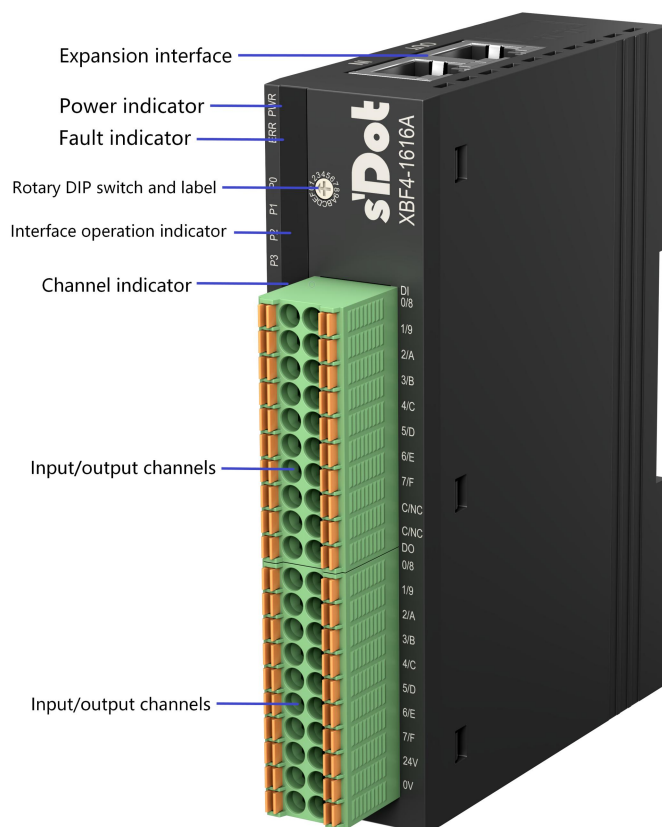
3.1.7 Outline dimension drawing

Coupler dimensions (unit: mm)



3.2 Digital I/O modules

3.2.1 Panel structure



3.2.2 Indicator light function

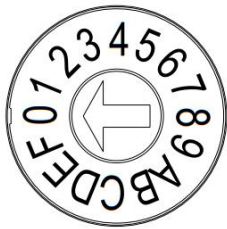
Digital I/O module indicator light definitions				
Logo	Name	Color	State	Status Description
PWR	Power indicator light	Green	ON	The module's internal 3.3V power supply is powered on normally.
			OFF	The module's internal 3.3V power supply is malfunctioning.
ERR	Fault indicator light	Red	ON	Module communication with the main station is abnormal.
			10Hz flicker	The online module upgrade has completed and is restarting.
			OFF	The module communicates normally with the main station.
Pn (n: 0~3)	Interface operation indicator light	Green	ON	In business data interaction, this simultaneously indicates that the module is connected to the nth interface of the coupler.

			flickering 1Hz	Initialization successful, no business data interaction.
			10Hz flicker	Firmware upgrade phase
			OFF	The module and coupler did not establish communication.
0~F	Input channel indicator	Green	ON	The module channel has a signal input.
			OFF	The module channel has no signal input or the signal input is abnormal.
0~F	Output channel indicator	Green	ON	The module channel has signal output.
			OFF	The module channel has no signal output or the signal output is abnormal.

3.2.3 Rotary DIP switch

Rotary DIP switch instructions

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



Station number rotary dial setting diagram

DIP switch settings	Setting value	Station number value
	0	0
	1	1
⋮	⋮	⋮
	B	B(11)
	C	C(12)

	D	D (13)
	E	E(14)
	F	F(15)

Remark:

- 1、 Please select a flat-top rotary dial switch with a 2mm opening.
- 2、 If the station number needs to be changed during communication, after the new station number is set, the entire I/O module group must be deleted and powered on again. The module must then be added and configured again for the new settings to take effect.
- 3、 If the station number is set to be duplicated, the module will encounter communication errors or be unable to connect to the main station.

3.2.4 Technical parameters

3.2.4.1 Digital input module parameters

Digital input		
Product Model	XBF4-3200	XBF4-1600
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤14mA	≤10mA
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	100us	
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	≤14mA	≤10mA
Power consumption	≤0.5W	≤0.5W
Numeric input type	Type1/Type3	
Channel indicator lights	Green LED lights	

3.2.4.2 Digital Input/Output Module Parameters

Digital input		
Product Model	XBF4-1616A	XBF4-1616B
Input power supply rated voltage	24VDC (20V~24V)	
Input power supply rated current	≤19mA	
Input rated voltage	24VDC (20.4V~28.8V)	
Typical input current	5mA/ch (24VDC)	
Number of input signal points	16	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	100us	
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	≤19mA	
Power consumption	≤0.6W	
Numeric input type	Type1/Type3	
Channel indicator lights	Green LED lights	
Digital output		
Number of output signal points	16	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	<200us
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	

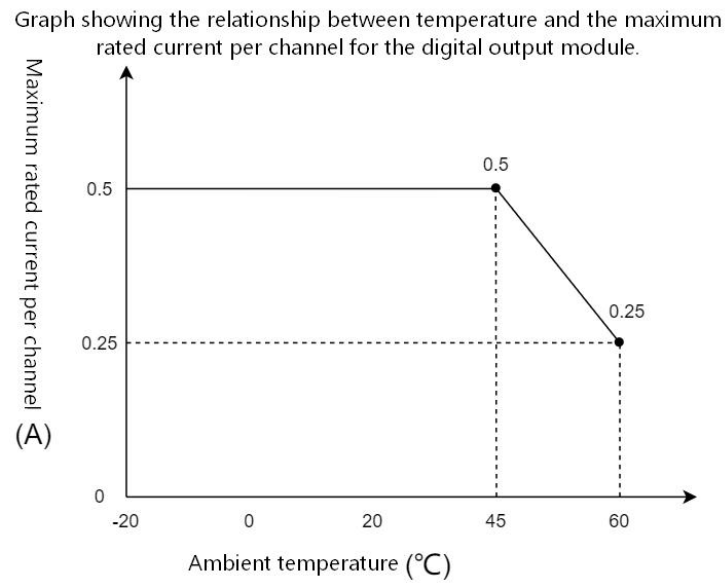
3.2.4.3 Digital output module parameters

Digital output				
Product Model	XBF4-0032A	XBF4-0032B	XBF4-0016A	XBF4-0016B
Input power supply rated voltage	24VDC (20V~24V)			
Input power supply rated current	≤23mA	≤23mA	≤15mA	≤15mA
Field-side input voltage range	24VDC (20.4V~28.8V)			
Number of output signal points	32	32	16	16
Output signal type	NPN	PNP	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	<200us	<150us	<200us
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	≤23mA	≤23mA	≤15mA	≤15mA
Power consumption	≤0.8W	≤0.8W	≤0.5W	≤0.5W
Channel indicator lights	Green LED lights			

3.2.4.4 General technical parameters

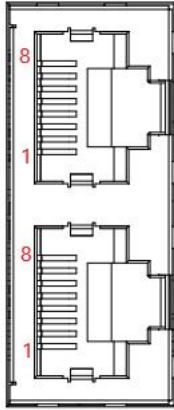
General technical parameters	
Specifications and dimensions	102×25×72mm
weight	125g
Operating temperature	-20°C~+60°C
Storage temperature	-40°C~+80°C
relative humidity	95%, no condensation
Altitude	≤2000m
Pollution level	Level 2
Protection level	IP20

Figure 1:



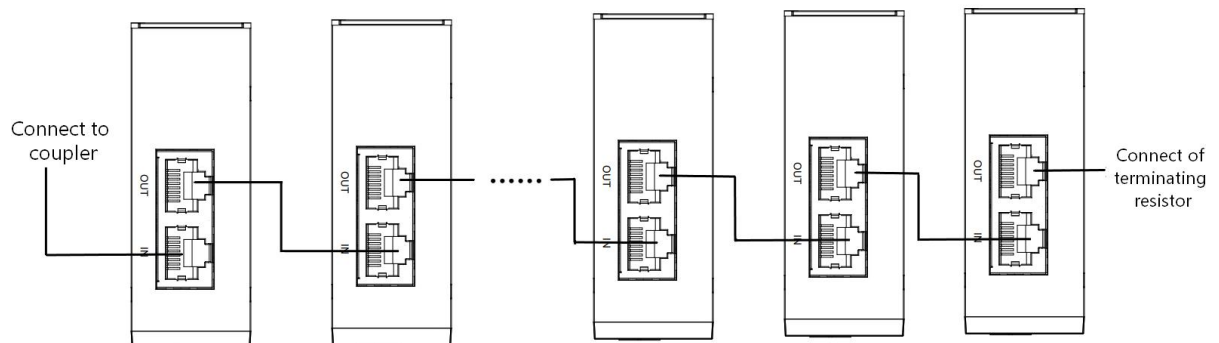
3.2.5 Discrete I/O expansion interface wiring

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



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

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

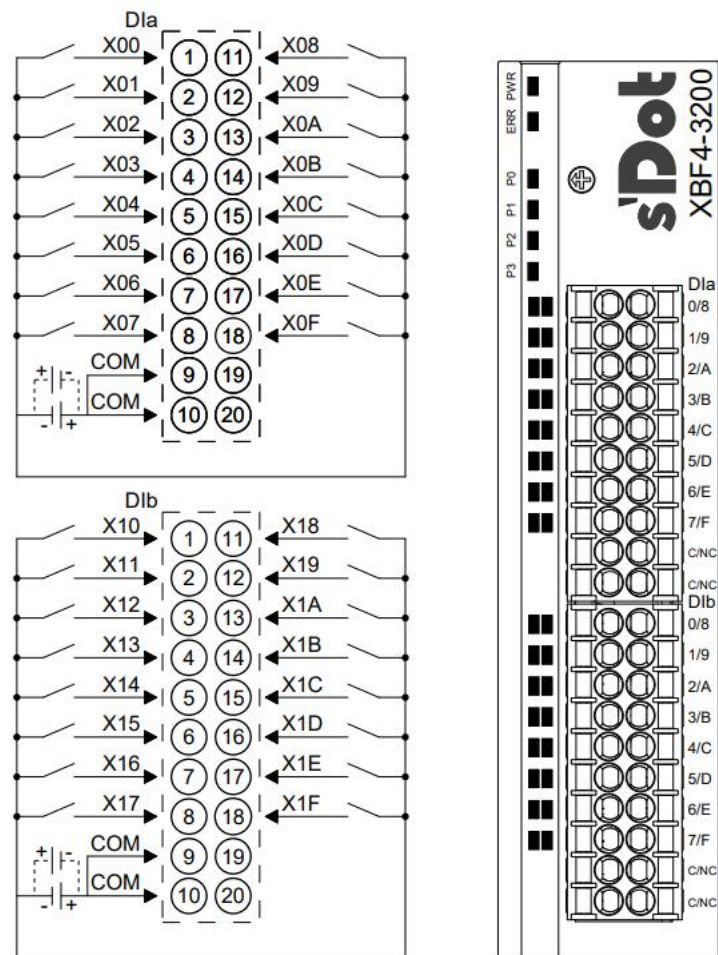


Precautions

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

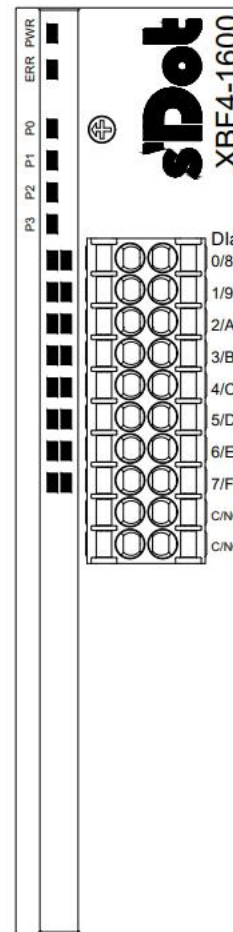
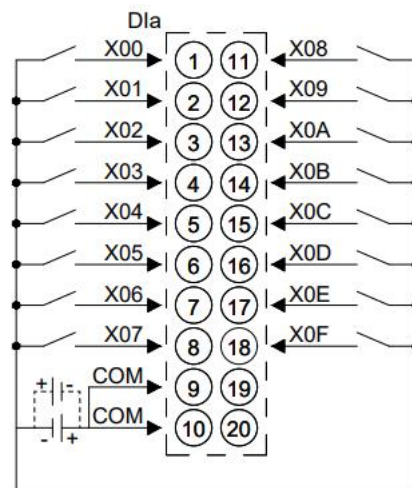
3.2.6 I/O Wiring Diagram

3.2.6.1 XBF4-3200



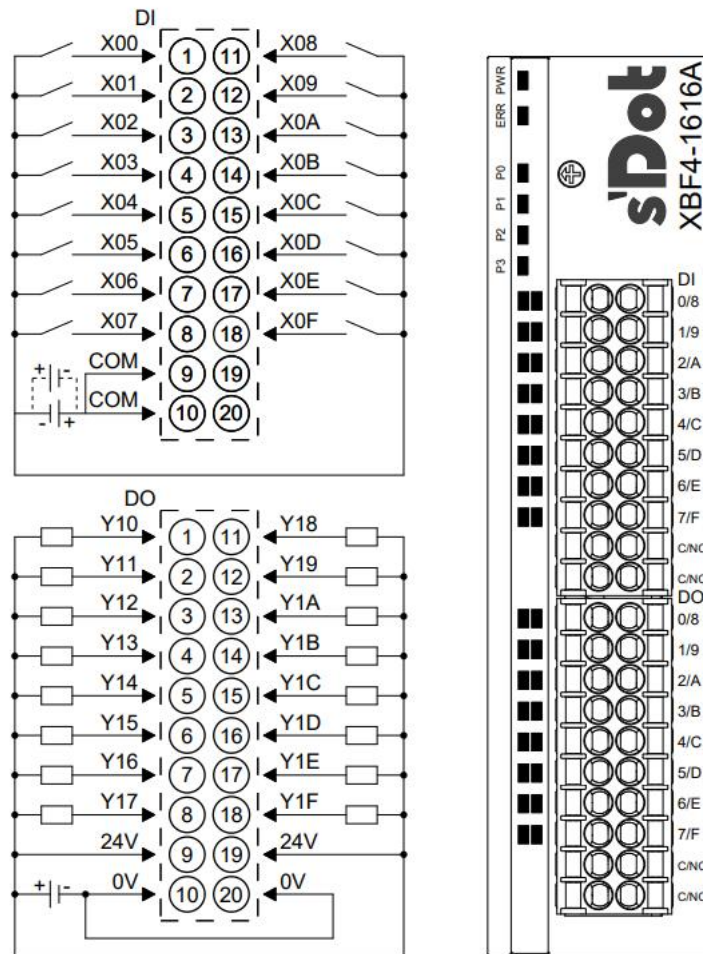
*COM internal communication is possible; D1a and D1b are not interconnected.

3.2.6.2 XBF4-1600



*COM internal conduction

3.2.6.3 XBF4-1616A

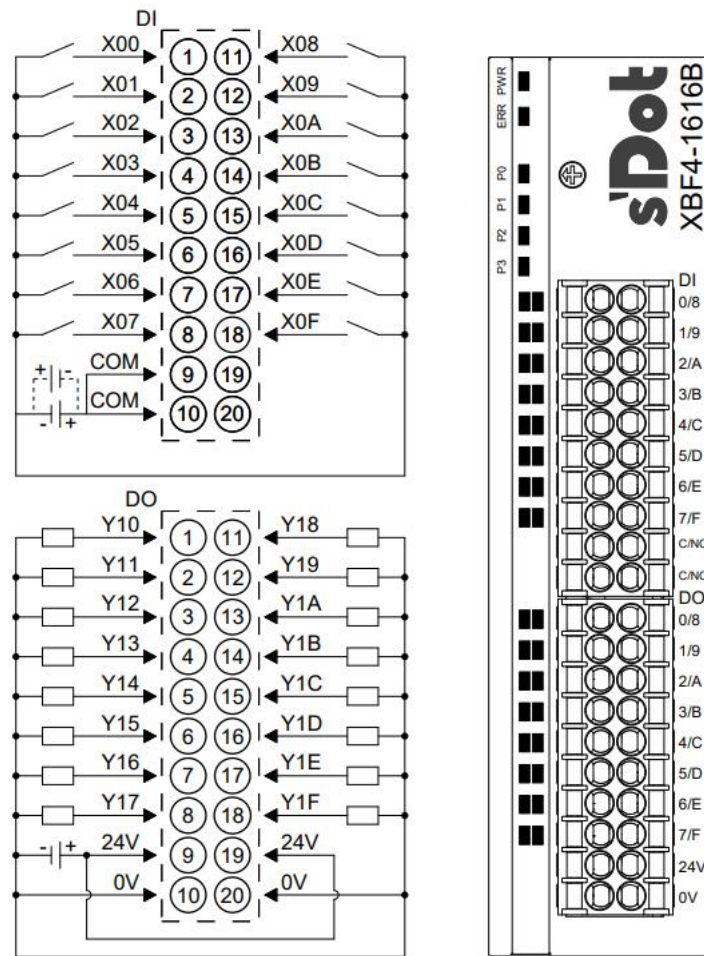


*24V internal conduction; 0V internal conduction; DI and DO are not interconnected.

*The load's common power supply must share the same power supply as the module.

*COM internal communication is possible; DI and DI do not communicate with each other.

3.2.6.4 XBF4-1616B

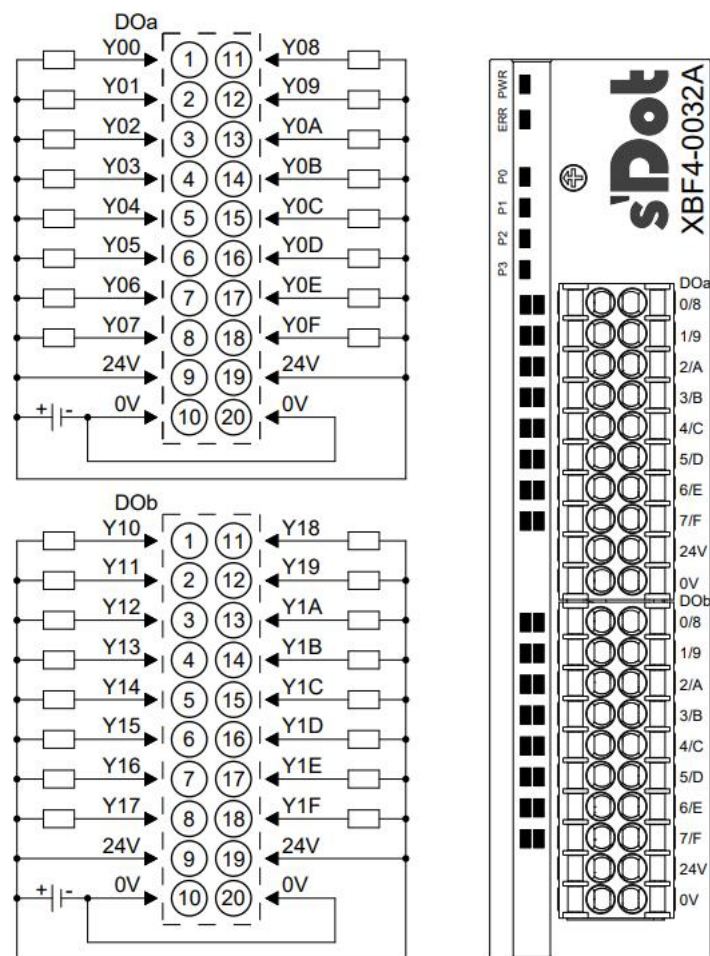


*24V internal conduction; 0V internal conduction; DI and DO are not interconnected.

*The load's common power supply must share the same power supply as the module.

*COM internal communication is possible; DI and DI do not communicate with each other.

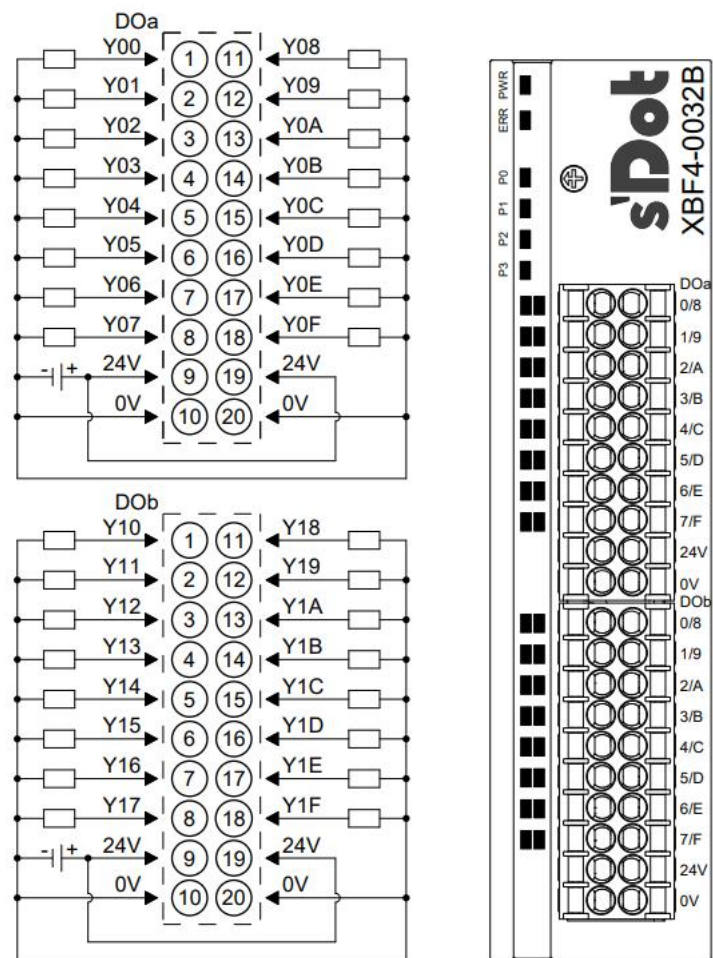
3.2.6.5 XBF4-0032A



*24V internal conduction; 0V internal conduction; DOa and DOb are not interconnected.

*The load's common power supply must share the same power supply as the module.

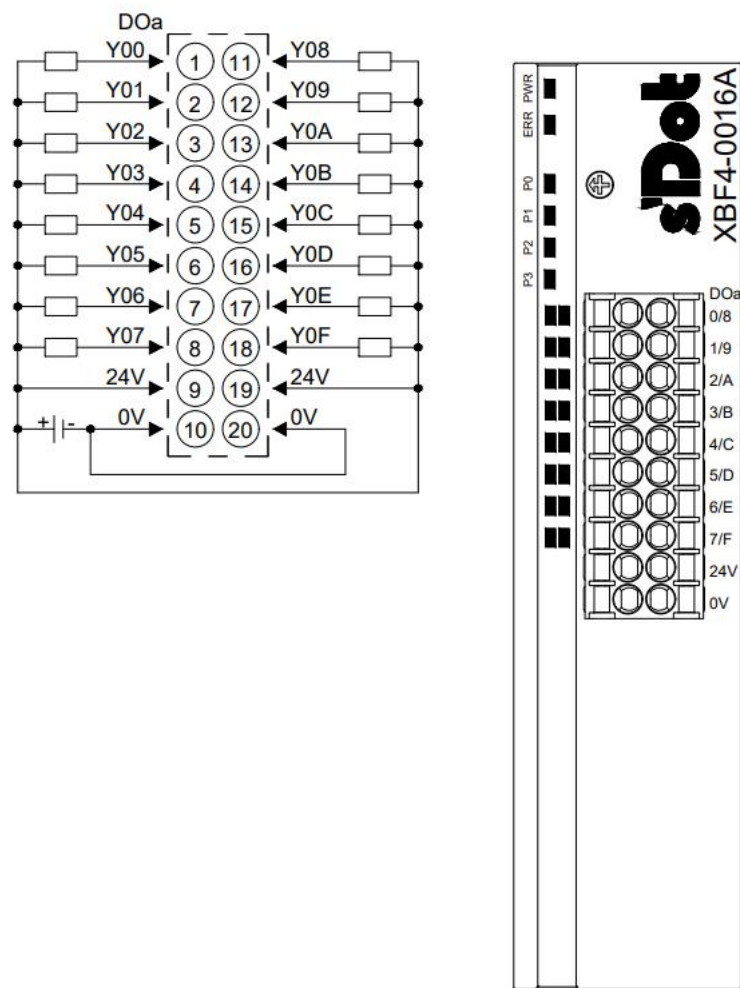
3.2.6.6 XBF4-0032B



*24V internal conduction; 0V internal conduction; DOa and DOb are not interconnected.

*The load's common power supply must share the same power supply as the module.

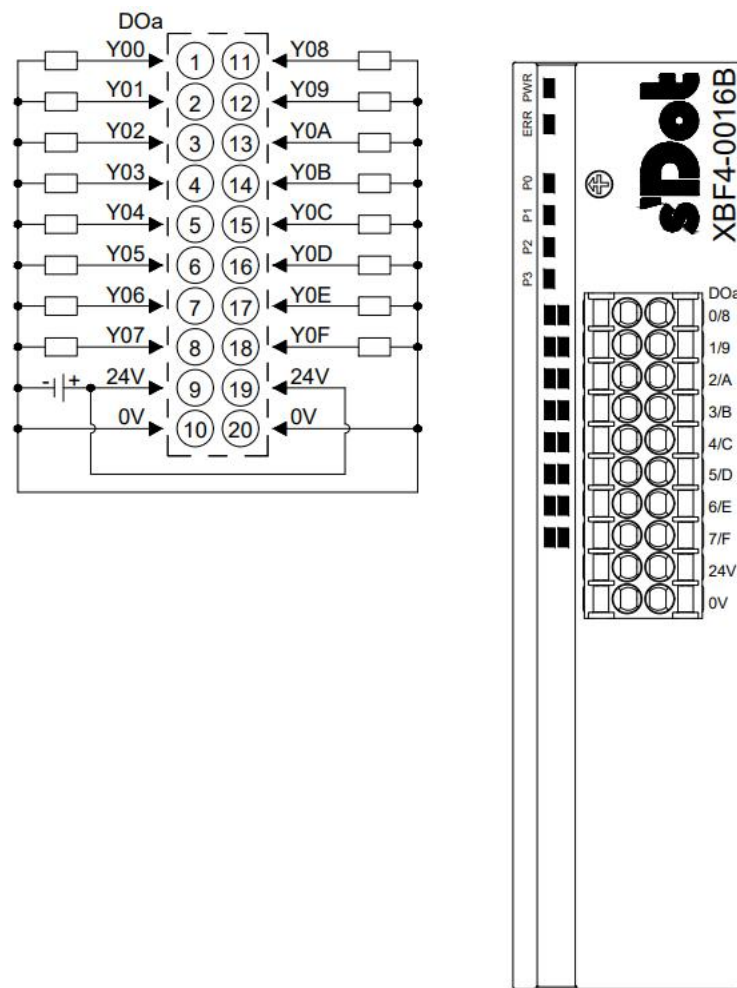
3.2.6.7 XBF4-0016A



*24V internal conduction; 0V internal conduction

*The load's common power supply must share the same power supply as the module.

3.2.6.8 XBF4-0016B

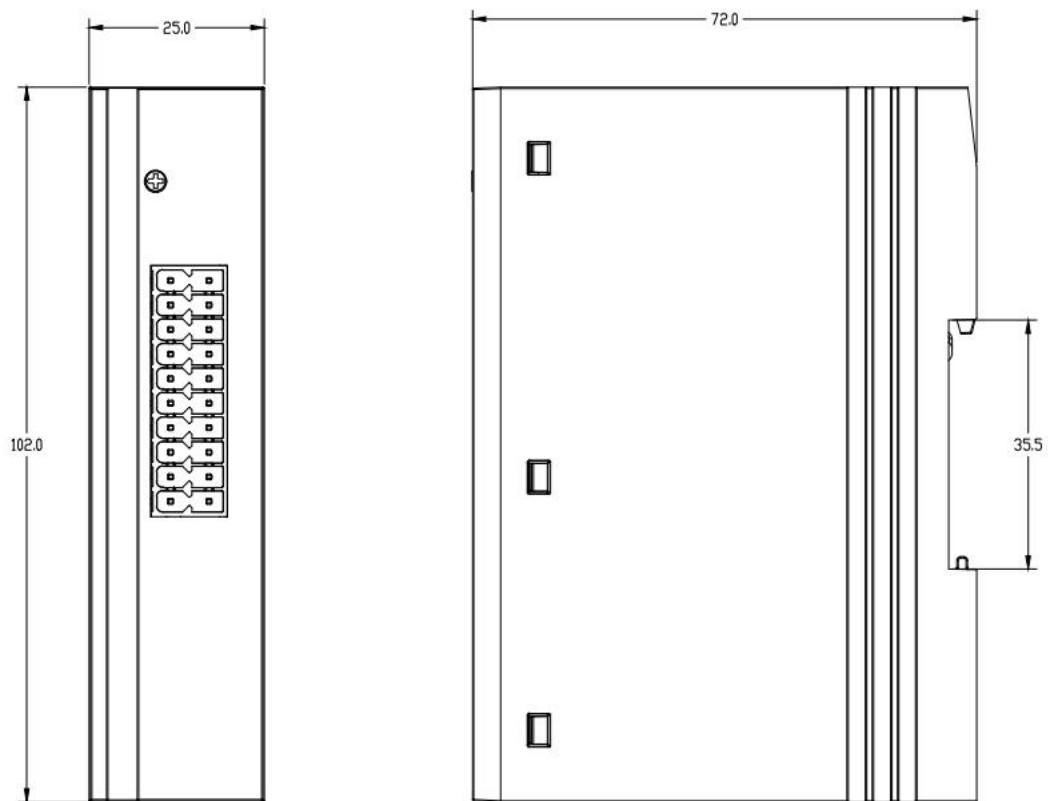


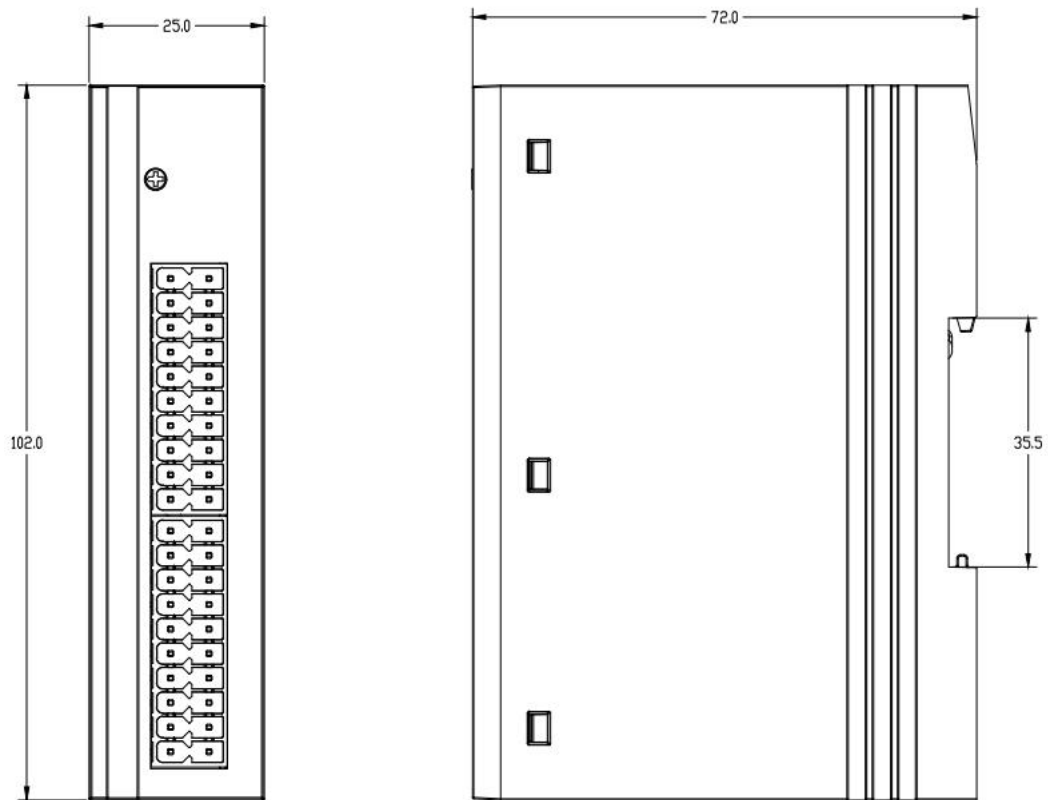
*24V internal conduction; 0V internal conduction

*The load's common power supply must share the same power supply as the module.

3.2.7 Outline dimension drawing

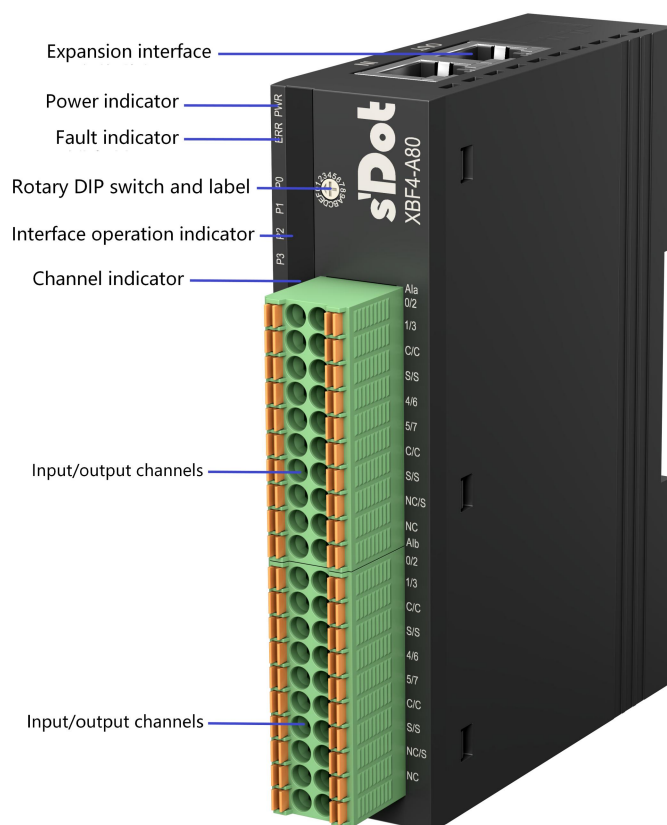
16-channel digital I/O module dimensions (unit: mm)



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

3.3 Analog I/O module

3.3.1 Panel structure



3.3.2 Indicator light function

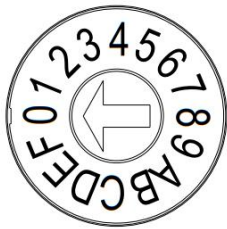
Analog I/O module indicator light definitions				
logo	name	color	state	Status Description
PWR	Power indicator light	Green	ON	The module's internal 3.3V power supply is powered on normally.
			OFF	The module's internal 3.3V power supply is malfunctioning.
ERR	Fault indicator light	red	ON	Module communication with the main station is abnormal.
			10Hz flicker	The online module upgrade has completed and is restarting.
			OFF	The module communicates normally with the main station.
Pn (n: 0~3)	Interface operation indicator light	Green	ON	In business data interaction, this simultaneously indicates that the module is connected to the n-th interface of the coupler.

			flickering 1Hz	Initialization successful, no business data interaction.
			10Hz flicker	Firmware upgrade phase
			OFF	The module and coupler did not establish communication.
0~7	Input channel indicator	Green	ON	The module channel has a signal input.
			OFF	The module channel has no signal input or the signal input is abnormal.
0~7	Output channel indicator	Green	ON	The module channel has signal output.
			OFF	The module channel has no signal output or the signal output is abnormal.

3.3.3 Rotary DIP switch

Rotary DIP switch instructions

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



Station number rotary dial setting diagram

DIP switch settings	Setting value	Station number value
	0	0
	1	1
⋮	⋮	⋮
	B	B(11)
	C	C(12)

	D	D (13)
	E	E(14)
	F	F(15)

Remark:

- 1、 Please select a flat-top rotary dial switch with a 2mm opening.
- 2、 If the station number needs to be changed during communication, after the new station number is set, the entire I/O module group must be deleted and powered on again. The module must then be added and configured again for the new settings to take effect.
- 3、 If the station number is set to be duplicated, the module will encounter communication errors or be unable to connect to the main station.

3.3.4 Technical parameters

3.3.4.1 Analog current & voltage compatible input module parameters

Analog current & voltage compatible input module		
Product Model	XBF4-A80	XBF4-A40
Bus input power supply rated voltage	24VDC (20V~24V)	
Bus input power supply rated current	≤25mA	≤20mA
Input points	8	4
Input type	Current & Voltage Compatible	
Input signal	Disable, 0mA~20mA, 4mA~20mA, -20mA~+20mA, -10V~+10V, 0V~10V, -5V~+5V, 0V~5V, 1V~5V (range adjustable, default is 4mA~20mA)	
Input signal type	single-ended signal	
Channel reaction time	1ms / ch	
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)	≥100kΩ	
Input impedance (current)	≤100Ω	
Maximum allowable voltage (voltage) for the channel	30V	
Maximum allowable current (current) for the channel	30mA	
The system must not be affected	In the event of a short circuit due to a fault in the ±15V power supply, the system's +5V power supply must not be affected.	
Potential isolation	There is no isolation between channels, isolation between channels and the backplane bus, and isolation between channels and the power supply voltage.	
Input overload protection	Supports clamping protection (voltage) / Supports current limiting protection (current).	
Input protection	±30V (voltage) / ±30mA (current)	
Isolation and withstand voltage	500VDC	
Rated current consumption	25mA	20mA
Power consumption	0.6W	0.48W
Channel indicator lights	Green LED lights	
Current/voltage input disconnection detection	support	

3.3.4.2 Analog current & voltage compatible output module parameters

Analog current & voltage compatible output module		
Product Model	XBF4-A08	XBF4-A04
Bus input power supply rated voltage	24VDC (20V~24V)	
Bus input power supply rated current	≤25mA	≤20mA
Field-side input voltage range	24VDC (20.4V~28.8V)	
Output points	8	4
Output type	Current & Voltage Compatible	
Output signal	Disable, 0mA~20mA, 4mA~20mA, -10V~+10V, 0V~10V, -5V~+5V, 0V~5V, 1V~5V (range adjustable, default is 4mA~20mA)	
Channel reaction time	400us / ch	
resolution	16 bits	
accuracy	±0.1% at 25°C, ±0.3% over the entire temperature range.	
Load impedance (voltage)	≥2kΩ (Accuracy: ±1‰ at 25°C, ±3‰ at full temperature)	
Load impedance (current)	≤600Ω	
The system must not be affected	In the event of a short circuit due to a fault in the ±15V power supply, the system's +5V power supply must not be affected.	
Output protection	Overload protection, open circuit protection, and short circuit protection (all with automatic recovery mechanisms).	
Potential isolation	There is no isolation between channels, isolation between channels and the backplane bus, and isolation between channels and the power supply voltage.	
Isolation and withstand voltage	500VDC	
Rated current consumption	25mA	20mA
Power consumption	0.6W	0.48W
Clearing and retaining optional functions in non-OP state	support	
Channel indicator lights	Green LED lights	
On-site power supply testing	support	

3.3.4.3 General technical parameters

General technical parameters	
Specifications and dimensions	102×25×72mm
weight	110g
Operating temperature	-20°C~+60°C
Storage temperature	-40°C~+80°C
relative humidity	95%, no condensation
Altitude	≤2000m
Pollution level	Level 2
Protection level	IP20

3.3.5 Analog Current & Voltage Compatible Module Parameters

3.3.5.1 Current & Voltage Compatible Input Module Range Selection Table

Current & Voltage Compatible Input Module Range Selection and Code Value Range					
Range selection	Measuring range	Code value range	Current/Voltage Input Calculation Formula	Current/Voltage Output Calculation Formula	Code value mapping table
0	Disable indicates that the channel is not enabled.				
1	0mA~20mA	0~27648	$D=(27648/20)*I$	$I=(D*20)/27648$	See 3.3.5.3 Current & Voltage Compatible Input Module Code Value Table
2 (default)	4mA~20mA	0~27648	$D=(27648/16)*I-6912$	$I=((D+6912)*16)/27648$	
3	-20mA~+20mA	-27648~27648	$D=(55296/40)*I$	$I=(D*40)/55296$	
4	-10V~+10V	-27648~27648	$D=(55296/20)*U$	$U=(D*20)/55296$	
5	-10V~+10V	-32768~32767	$D=(65535/20)*U$	$U=(D*20)/65535$	
6	0V~10V	0~27648	$D=(27648/10)*U$	$U=(D*10)/27648$	
7	0V~10V	0~32767	$D=(32767/10)*U$	$U=(D*10)/32767$	
8	-5V~+5V	-27648~27648	$D=(55296/10)*U$	$U=(D*10)/55296$	
9	-5V~+5V	-32768~32767	$D=(65535/10)*U$	$U=(D*10)/65535$	
10	0V~5V	0~27648	$D=(27648/5)*U$	$U=(D*5)/27648$	
11	0V~5V	0~32767	$D=(32767/5)*U$	$U=(D*5)/32767$	
12	1V~5V	0~27648	$D=(27648/4)*U-6912$	$U=(D+6912)*4/27648$	

3.3.5.2 Current & Voltage Compatible Output Module Range Selection Table

Current & Voltage Compatible Output Module Range Selection and Code Value Range					
Range selection	Measuring range	Code value range	Current/Voltage Input Calculation Formula	Current/Voltage Output Calculation Formula	Code value mapping table
0	Disable indicates that the channel is not enabled.				
1	0mA~20mA	0~27648	$D=(27648/20)*I$	$I=(D*20)/27648$	See 3.3.5.4 Current & Voltage Compatible Output Module Code Value Table
2 (default)	4mA~20mA	0~27648	$D=(27648/16)*I-6912$	$I=((D+6912)*16)/27648$	
3	-10V~+10V	-27648~27648	$D=(55296/20)*U$	$U=(D*20)/55296$	
4	-10V~+10V	-32768~32767	$D=(65535/20)*U$	$U=(D*20)/65535$	
5	0V~10V	0~27648	$D=(27648/10)*U$	$U=(D*10)/27648$	
6	0V~10V	0~32767	$D=(32767/10)*U$	$U=(D*10)/32767$	
7	-5V~+5V	-27648~27648	$D=(55296/10)*U$	$U=(D*10)/55296$	
8	-5V~+5V	-32768~32767	$D=(65535/10)*U$	$U=(D*10)/65535$	
9	0V~5V	0~27648	$D=(27648/5)*U$	$U=(D*5)/27648$	
10	0V~5V	0~32767	$D=(32767/5)*U$	$U=(D*5)/32767$	
11	1V~5V	0~27648	$D=(27648/4)*U-6912$	$U=(D+6912)*4/27648$	

3.3.5.3 Current & Voltage Compatible Input Module Code Value Table

range Current	0mA~20mA	4mA~20mA	-20mA~+20mA
	0~27648	0~27648	-27648~27648
	code value	code value	code value
-23.52	-	-	-32512
-20	-	-	-27648
-15	-	-	-20736
-10	-	-	-13824
-5	-	-	-6912
-3.52	-4864	-	-4864
-1	-1382	-	-1382
0	0	-	0
1	1382	-	1382
1.19	1645	-4856	1645
2	2765	-3456	2765
3	4147	-1728	4147
4	5530	0	5530
5	6912	1728	6912
6	8294	3456	8294
7	9677	5184	9677
8	11059	6912	11059
9	12442	8640	12442
10	13824	10368	13824
11	15206	12096	15206
12	16589	13824	16589
13	17971	15552	17971
14	19354	17280	19354
15	20736	19008	20736
16	22118	20736	22118
17	23501	22464	23501
18	24883	24192	24883
19	26266	25920	26266
20	27648	27648	27648
22.81	31538	32511	31533
23.52	32511	-	32511
Code value formula	Code value = (27648/20) * current	Code value = (27648/16) * current - 6912	Code value = (55296/40) * current

Note: ① When the current & voltage compatible input module range is selected from 0mA to 20mA (0~27648), it supports overshoot $\pm 3.52\text{mA}$ and supports overflow and overflow alarm functions. Overshoot occurs when the channel input range exceeds the range. -3.52mA~23.52mA. The value displayed within mA is the normal calculated code value. Overflow or overflow is displayed as -32768/32767.

② The current & voltage compatible input module supports overshoot $\pm 2.81\text{mA}$ when the range selection is $4\text{mA}\sim 20\text{mA}$ ($0\sim 27648$), and supports overflow and overflow alarm functions. Overshoot occurs when the channel input range exceeds the range. $1.19\text{mA}\sim 2$ The normal calculation code value is displayed within 2.81mA . Overflow and overflow are displayed as $-32768/32767$.

③ The current & voltage compatible input module supports overshoot $\pm 3.52\text{mA}$ when the range selection is -20mA to 20mA (-27648 to 27648), and supports overflow and overflow alarm functions. Overshoot occurs when the channel input range exceeds the range. $-23.52\text{mA}\sim 23.52$ The value displayed within mA is the normal calculated code value. Overflow or overflow is displayed as $-32768/32767$.

range Voltage	$-10\text{V}\sim +10\text{V}$	$-10\text{V}\sim +10\text{V}$	$0\text{V}\sim 10\text{V}$	$0\text{V}\sim 10\text{V}$
	$-27648\sim 27648$	$-32768\sim 32767$	$0\sim 27648$	$0\sim 32767$
	code value	code value	code value	code value
-11.759	-31512	-	-	-
-10	-27648	-32768	-	-
-9	-24883	-29491	-	-
-8	-22118	-26214	-	-
-7	-19354	-22937	-	-
-6	-16589	-19661	-	-
-5	-13824	-16384	-	-
-4	-11059	-13107	-	-
-3	-8294	-9830	-	-
-2	-5530	-6554	-	-
-1.759	-4864	-5764	-4864	-
-1	-2765	-3277	-2765	-
0	0	0	0	0
1	2765	3277	2765	3277
2	5530	6554	5530	6554
3	8294	9830	8294	9830
4	11059	13107	11059	13107
5	13824	16384	13824	16384
6	16589	19661	16589	19661
7	19354	22937	19354	22937
8	22118	26214	22118	26214
9	24883	29491	24883	29491
10	27648	32767	27648	32767
11.759	31511	-	31511	-
Code value formula	Code value $= (55296/20) * \text{Voltage}$	Code value $= (65535/20) * \text{Voltage}$	Code value $= (27648/10) * \text{Voltage}$	Code value $= (32767/10) * \text{Voltage}$
Voltage formula	Voltage $= (\text{Code value} * 20) / 55296$	Voltage $= (\text{Code value} * 20) / 65535$	Voltage $= (\text{Code value} * 10) / 27648$	Voltage $= (\text{Code value} * 10) / 32767$

Note: ① The current & voltage compatible input module supports overshoot $\pm 1.759V$ when the range is selected as $-10V \sim +10V$ ($-27648 \sim 27648$), and supports overflow and overflow alarm functions. Overshoot occurs when the channel input range exceeds the range. $-11.759V \sim 11.759V$. The calculated code value is displayed within $1.759V$. Overflow or overflow is displayed as $-32768/32767$.

② The current & voltage compatible input module does not support overshoot when the range selection is $-10V \sim +10V$ ($-32768 \sim 32767$), but supports overflow and overflow alarm functions. Overflow is displayed as $-32768/32767$.

③ The current & voltage compatible input module supports overshoot $\pm 1.759V$ when the range selection is $0V \sim 10V$ ($0 \sim 27648$), and supports overflow and overflow alarm functions. Overshoot occurs when the channel input range exceeds the range. $-1.759V \sim 11.759V$. The calculated code value is displayed within $1.759V$. Overflow or overflow is displayed as $-32768/32767$.

④ The current & voltage compatible input module does not support overshoot when the range is selected from $0V$ to $10V$ ($0 \sim 32767$), but supports overflow and overflow alarm functions. Overflow is displayed as $0/32767$.

range Voltage	$-5V \sim +5V$	$-5V \sim +5V$	$0V \sim 5V$	$0V \sim 5V$	$1V \sim 5V$
	$-27648 \sim 27648$	$-32768 \sim 32767$	$0 \sim 27648$	$0 \sim 32767$	$0 \sim 27648$
	code value	code value	code value	code value	code value
-5.879	-32512	-	-	-	-
-5	-27648	-32768	-	-	-
-4	-22118	-26214	-	-	-
-3	-16588	-19661	-	-	-
-2	-11060	-13107	-	-	-
-1	-5530	-6554	-	-	-
-0.879	-4864	-5761	-4864	-	-
0	0	0	0	0	-
0.296	1637	1940	1637	1940	-4864
1	5530	6554	5530	6554	0
2	11060	13107	11060	13107	6912
3	16588	19661	16588	19661	13824
4	22118	26214	22118	26214	20736
5	27648	32767	27648	32767	27648
5.704	31541	-	31541	-	32511
5.879	32511	-	32511	-	-
Code value formula	code value=(55296/10)*Voltage	code value=(65535/10)*Voltage	code value=(27648/5)*Voltage	code value=(32767/5)*Voltage	code value=(27648/4)*Voltage-6912
Voltage formula	Voltage=(code value*10)/55296	Voltage=(code value*10)/65535	Voltage=(code value*5)/27648	Voltage=(code value*5)/32767	Voltage=(code value+6912)*4/27648

Note: ① When the current & voltage compatible input module range is selected as $-5V \sim +5V$ ($-27648 \sim 27648$), it supports overshoot $\pm 0.879V$ and supports overflow and overflow alarm functions.

Overshoot occurs when the channel input range exceeds the range. $-5.879V \sim 5V$. The calculated code value is displayed within $0.879V$. Overflow or overflow is displayed as $-32768/32767$.

② The current & voltage compatible input module does not support overshoot when the range is selected as $-5V \sim +5V$ ($-32768 \sim 32767$), but supports overflow and overflow alarm functions. Overflow is displayed as $-32768/32767$.

③ The current & voltage compatible input module supports overshoot $\pm 0.879V$ when the range is selected from $0V$ to $5V$ ($0 \sim 27648$), and supports overflow and overflow alarm functions. Overshoot occurs when the channel input range exceeds the range. $-0.879V \sim 0.879V$. The calculated code value is displayed within the range of V to $5.879V$. Overflow or overflow is displayed as $-32768/32767$.

④ The current & voltage compatible input module does not support overshoot when the range is selected from $0V$ to $5V$ (0 to 32767), but supports overflow and overflow alarm functions. Overflow is displayed as $0/32767$.

⑤ The current & voltage compatible input module supports overshoot $\pm 0.704V$ when the range is selected from $1V$ to $5V$ (0 to 27648), and supports overflow and overflow alarm functions. Overshoot occurs when the channel input range exceeds the range. $0.296V \sim 0.704V$. The calculated code value is displayed within the range of V to $5.704V$. Overflow or overflow is displayed as $-32768/32767$.

3.3.5.4 Current & Voltage Compatible Output Module Code Value Table

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

Note: Code values set outside the range for current & voltage compatible output modules will not take effect. For analog output modules, if the preset value of the cleared and retained parameters exceeds the code value range, the preset value will not take effect, and the previous valid value will be maintained.

range Voltage	-10V~+10V	-10V~+10V	0V~10V	0V~10V
	-27648~27648	-32768~32767	0~27648	0~32767
	code value	code value	code value	code value
-10	-27648	-32768	-	-
-9	-24883	-29491	-	-
-8	-22118	-26214	-	-
-7	-19354	-22937	-	-
-6	-16589	-19661	-	-
-5	-13824	-16384	-	-
-4	-11059	-13107	-	-
-3	-8294	-9830	-	-
-2	-5530	-6554	-	-
-1	-2765	-3277	-	-
0	0	0	0	0
1	2765	3277	2765	3277
2	5530	6554	5530	6554
3	8294	9830	8294	9830
4	11059	13107	11059	13107
5	13824	16384	13824	16384
6	16589	19661	16589	19661
7	19354	22937	19354	22937
8	22118	26214	22118	26214
9	24883	29491	24883	29491
10	27648	32767	27648	32767
Code value formula	Code value = $(55296/20) \times \text{Voltage}$	Code value = $(65535/20) \times \text{Voltage}$	Code value = $(27648/10) \times \text{Voltage}$	Code value = $(32767/10) \times \text{Voltage}$
Voltage formula	Voltage = $(\text{Code value} \times 20) / 55296$	Voltage = $(\text{Code value} \times 20) / 65535$	Voltage = $(\text{Code value} \times 10) / 27648$	Voltage = $(\text{Code value} \times 10) / 32767$

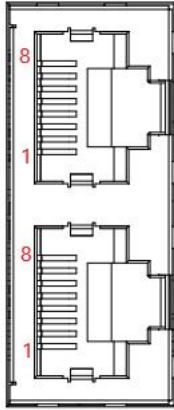
Note: Code values set outside the range for current & voltage compatible output modules will not take effect. For analog output modules, if the preset value of the cleared and retained parameters exceeds the code value range, the preset value will not take effect, and the previous valid value will be maintained.

range Voltage	-5V~+5V	-5V~+5V	0V~5V	0V~5V	1V~5V
	-27648~27648	-32768~32767	0~27648	0~32767	0~27648
	code value	code value	code value	code value	code value
-5	-27648	-32768	-	-	-
-4	-22118	-26214	-	-	-
-3	-16588	-19661	-	-	-
-2	-11060	-13107	-	-	-
-1	-5530	-6554	-	-	-
0	0	0	0	0	-
1	5530	6554	5530	6554	0
2	11060	13107	11060	13107	6912
3	16588	19661	16588	19661	13824
4	22118	26214	22118	26214	20736
5	27648	32767	27648	32767	27648
Code value formula	code value=(55296/10)*Voltage	code value=(65535/10)*Voltage	code value=(27648/5)*Voltage	code value=(32767/5)*Voltage	code value=(27648/4)*Voltage-6912
Voltage formula	Voltage=(code value*10)/55296	Voltage=(code value*10)/ 65535	Voltage=(code value*5)/27648	Voltage=(code value*5)/ 32767	Voltage=(code value+6912)*4/27648

Note: Code values set outside the range for current & voltage compatible output modules will not take effect. For analog output modules, if the preset value of the cleared and retained parameters exceeds the code value range, the preset value will not take effect, and the previous valid value will be maintained.

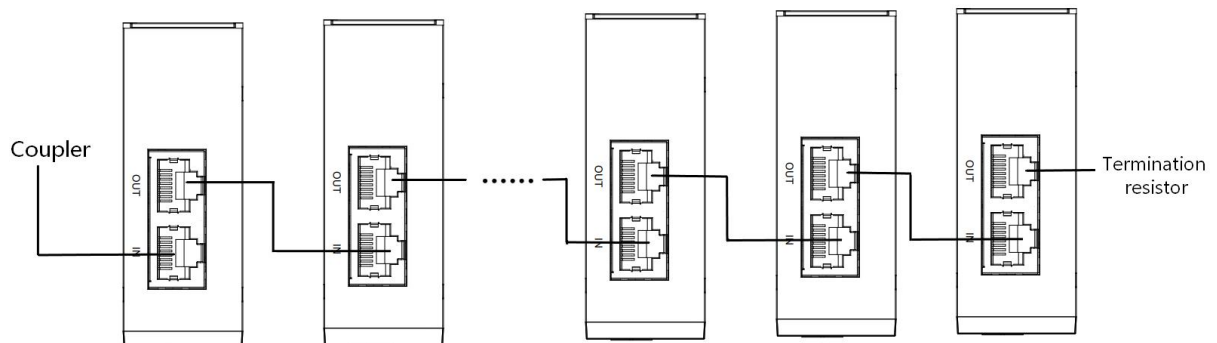
3.3.6 Discrete I/O expansion interface wiring

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



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

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

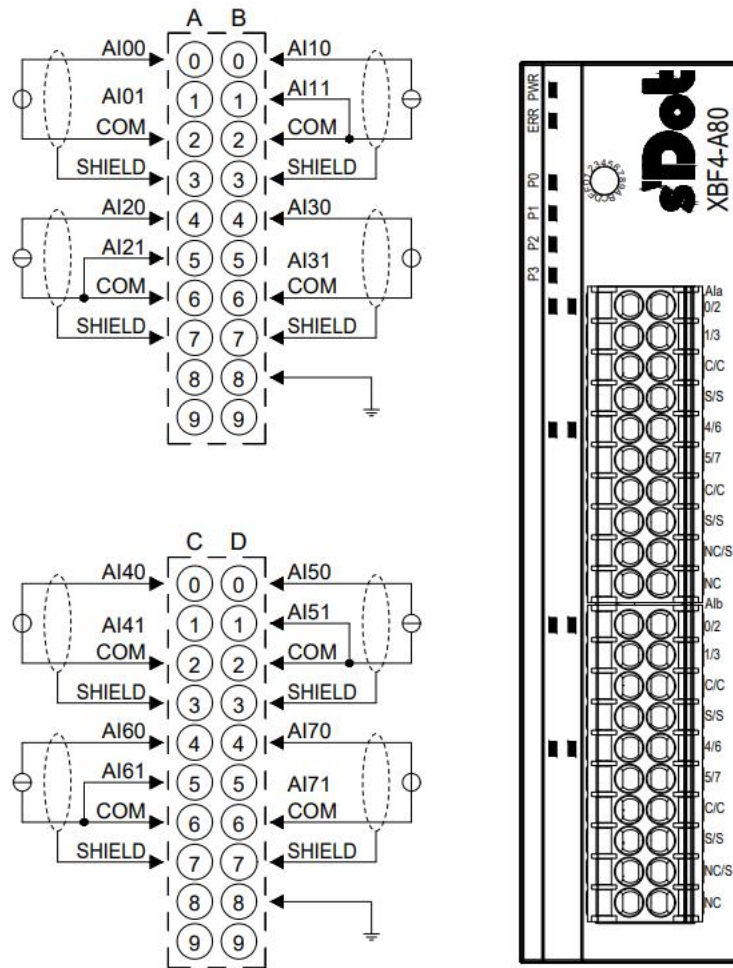


Precautions

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

3.3.7 I/O Wiring Diagram

3.3.7.1 XBF4-A80



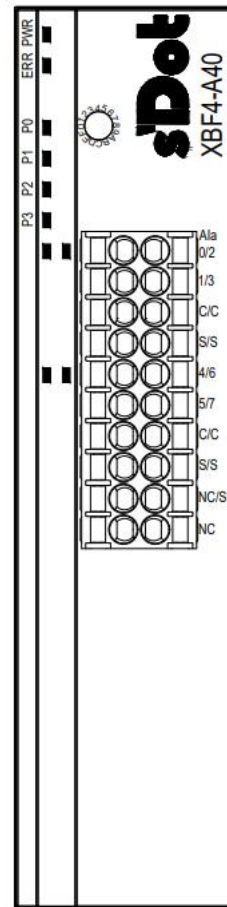
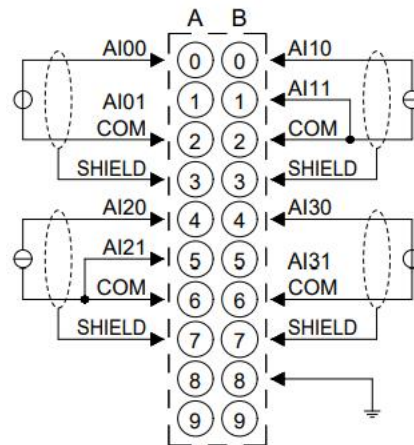
*COM internal conduction, SHIELD internal conduction

*For current-mode applications, AIx1+ and COM need to be shorted externally.

*All channels must have the same load source.

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

3.3.7.2 XBF4-A40



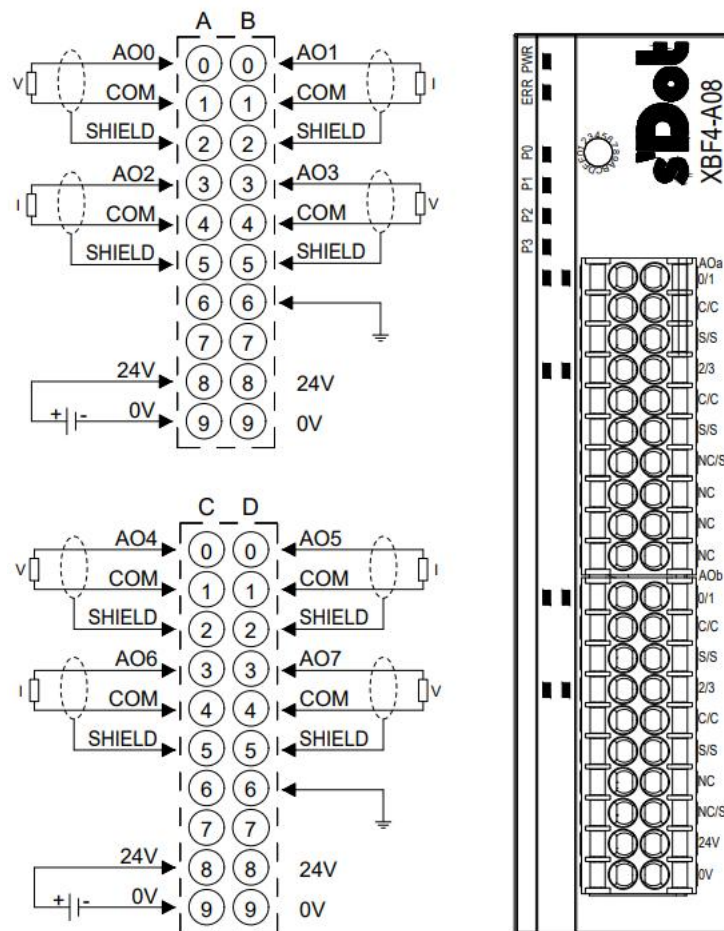
*COM internal conduction, SHIELD internal conduction

*For current-mode applications, AIx1+ and COM need to be shorted externally.

*All channels must have the same load source.

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

3.3.7.3 XBF4-A08



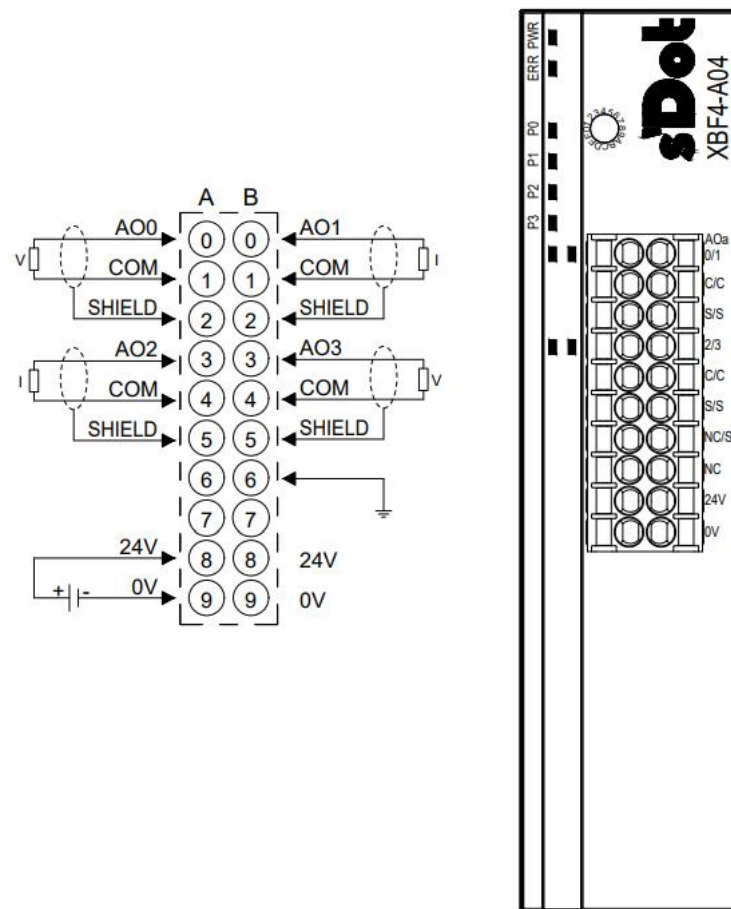
*24V internal conduction, 0V internal conduction

*COM internal conduction, SHIELD internal conduction

*All channels share the same load source

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

3.3.7.4 XBF4-A04



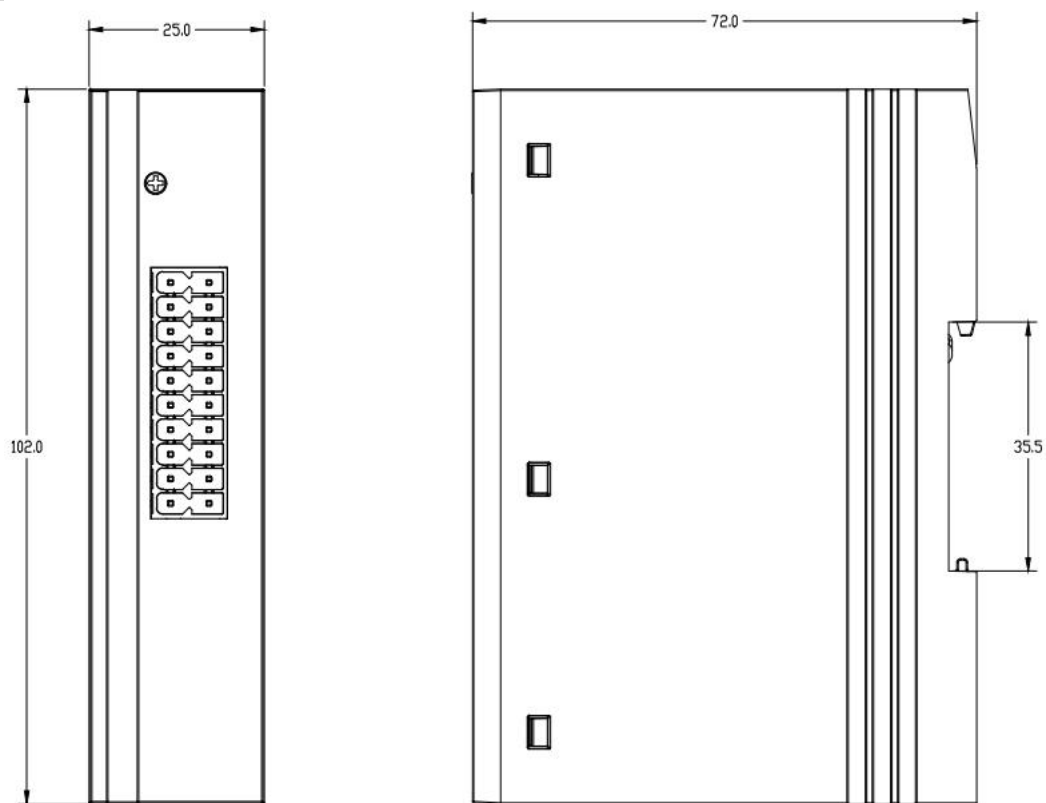
*COM internal conduction, SHIELD internal conduction

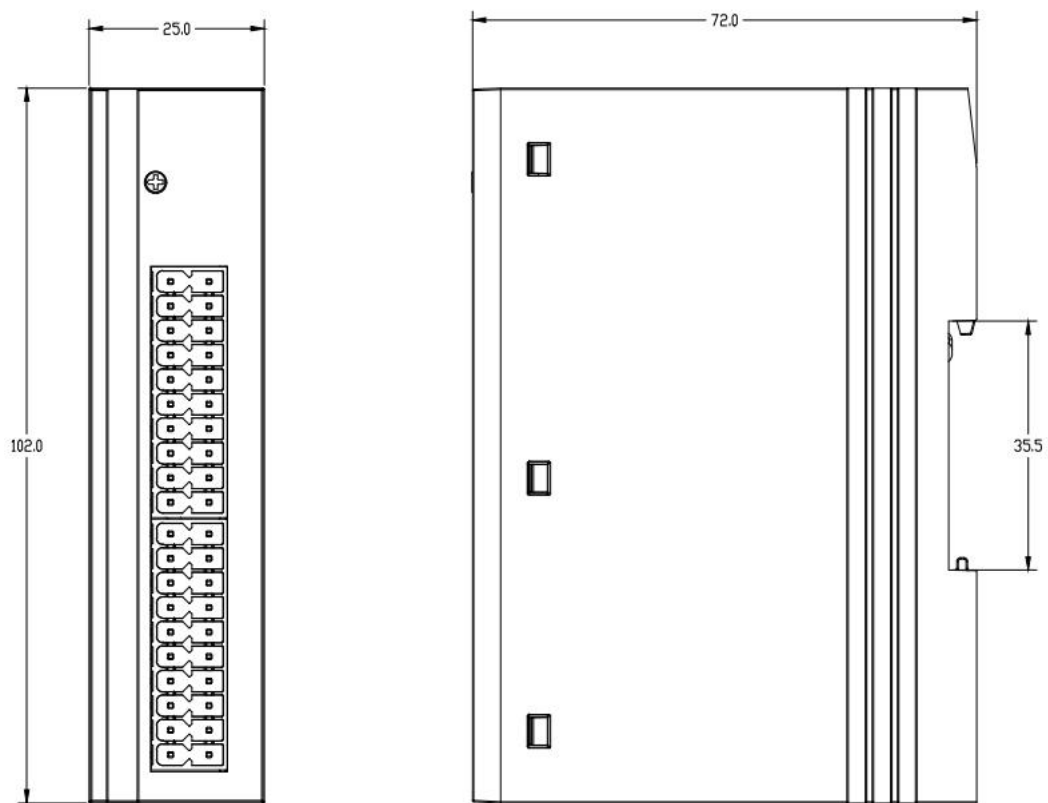
*All channels share the same load source

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

3.3.8 Outline dimension drawing

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



Dimensions of an 8-channel analog I/O module (in mm)

4 Installation and removal

4.1 Installation Guide

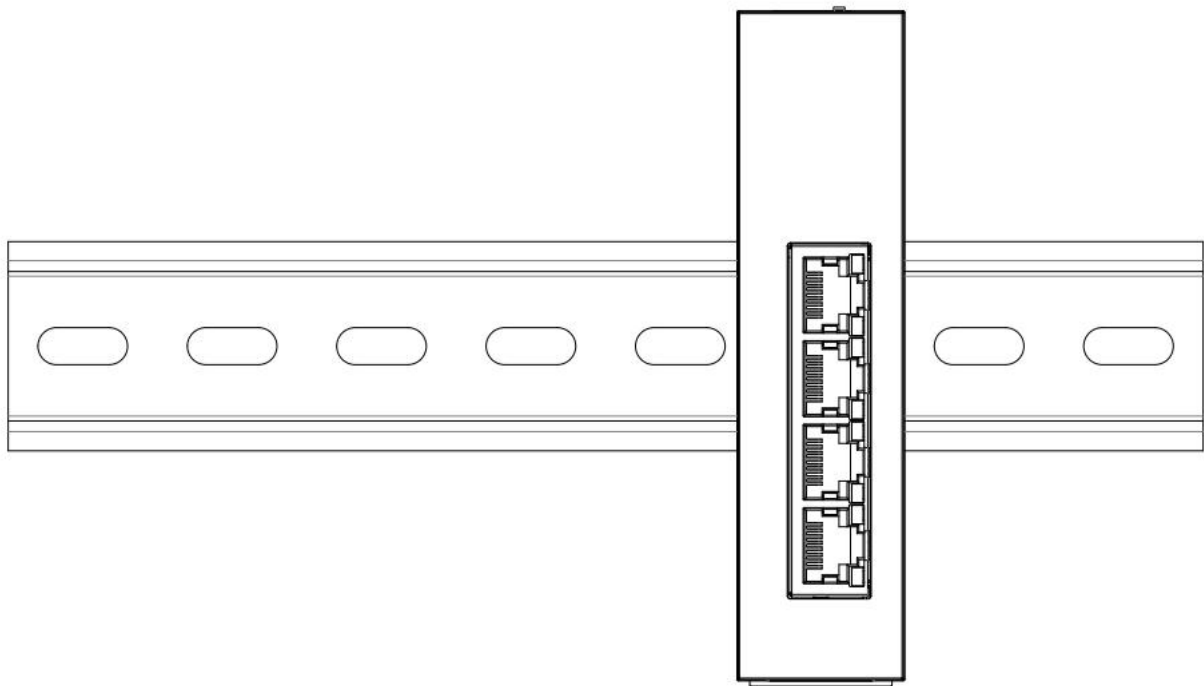
Installation/Removal Precautions

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



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

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



4.2 Installation and disassembly steps

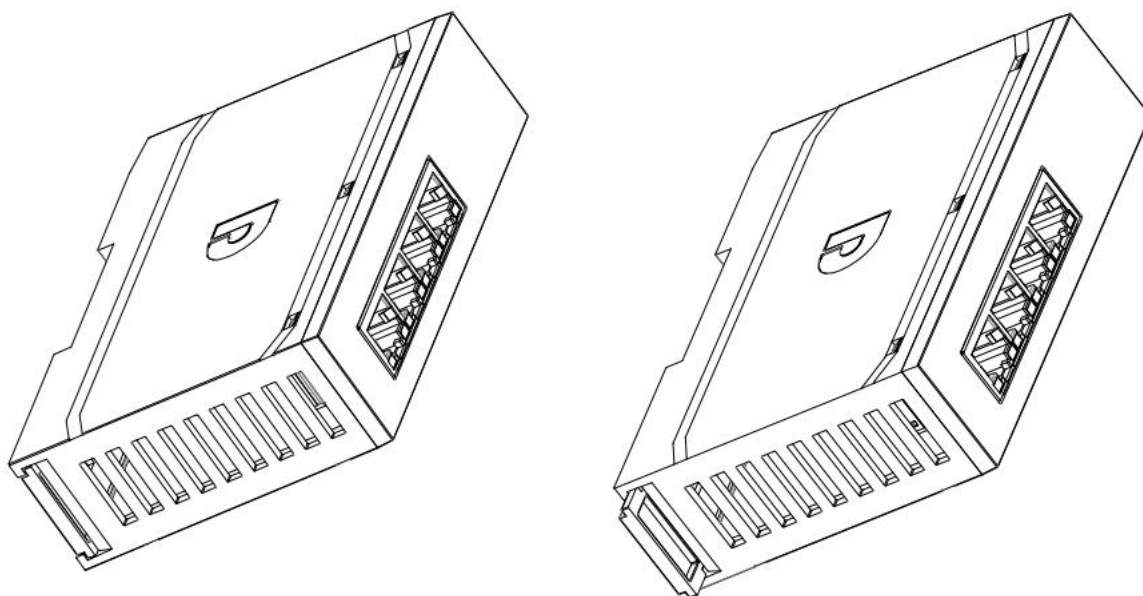
Module installation and removal	
Module installation steps	1. Push the clips at the bottom of the back of the module outwards until you hear a "click" sound.
	2. First, install the coupler module on the fixed guide rail. Align the upper edge of the coupler module slot with the upper edge of the guide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

4.3 Installation and disassembly diagram

The following installation and disassembly steps are described using the coupler as an example. The installation and disassembly steps for the I/O module are the same as those for the coupler.

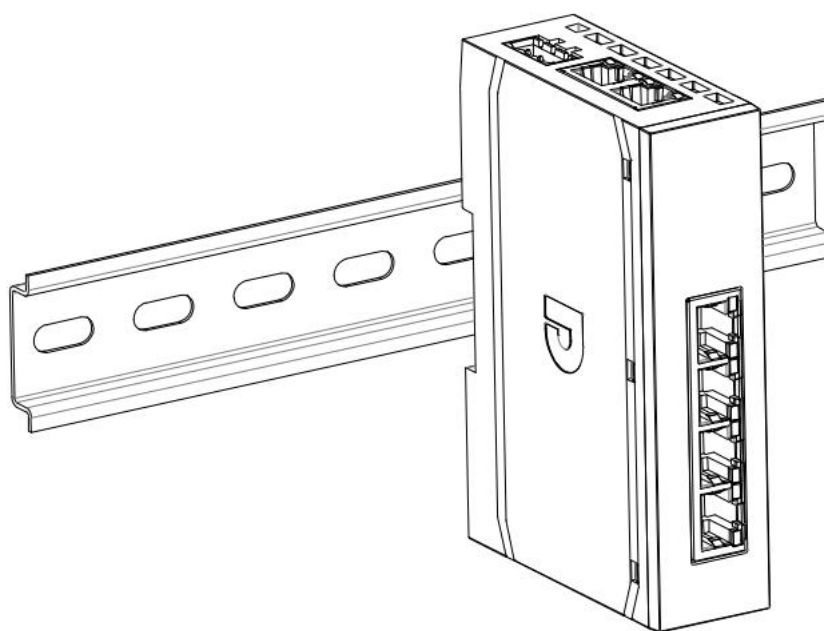
Coupler module installation

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

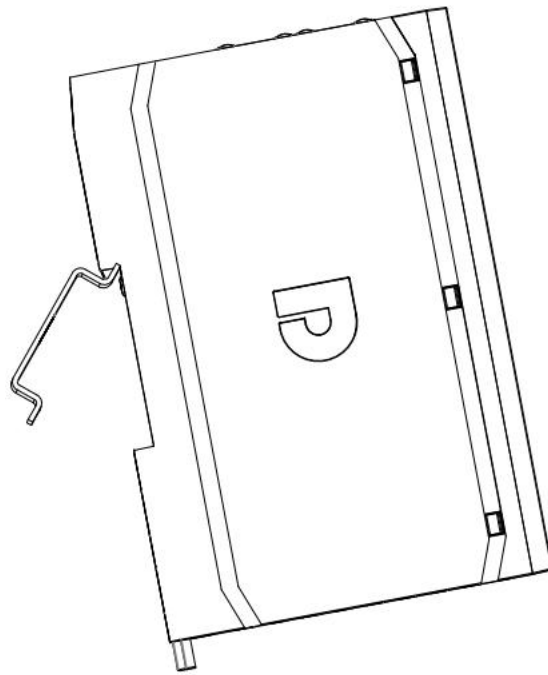


①

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

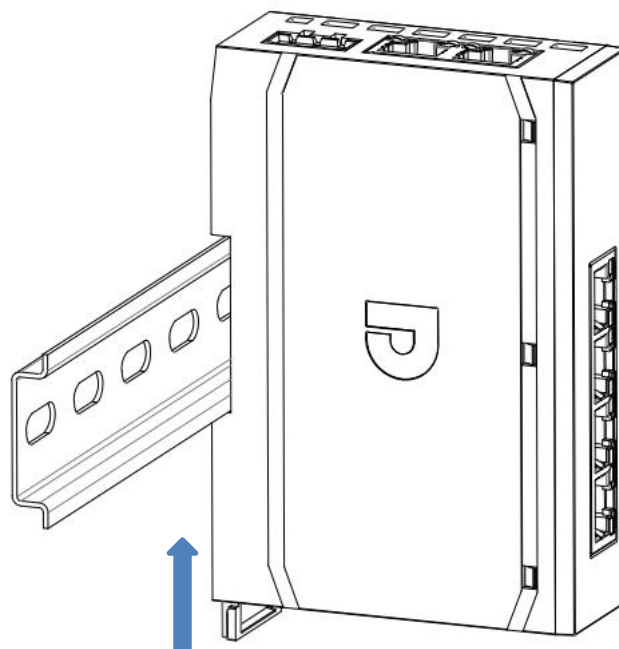


②

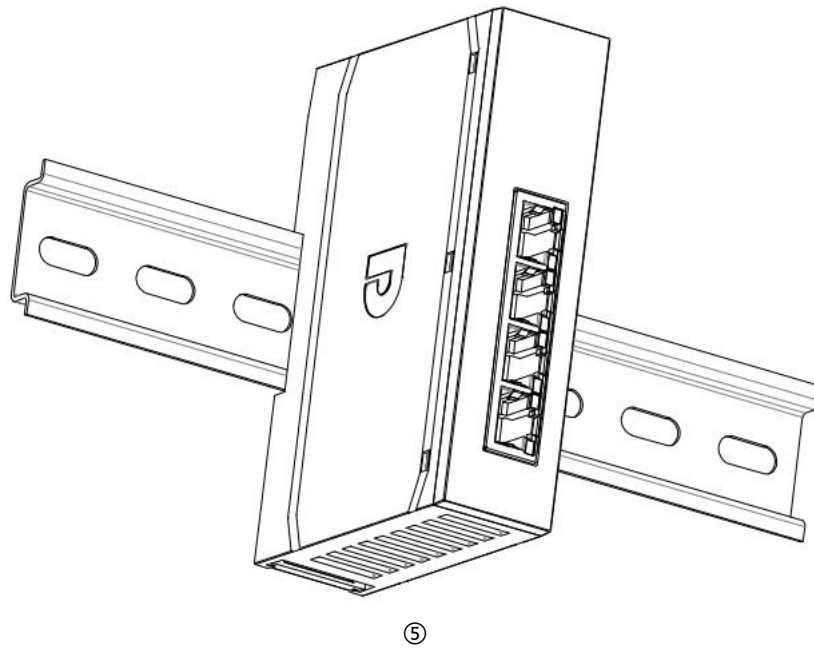


③

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

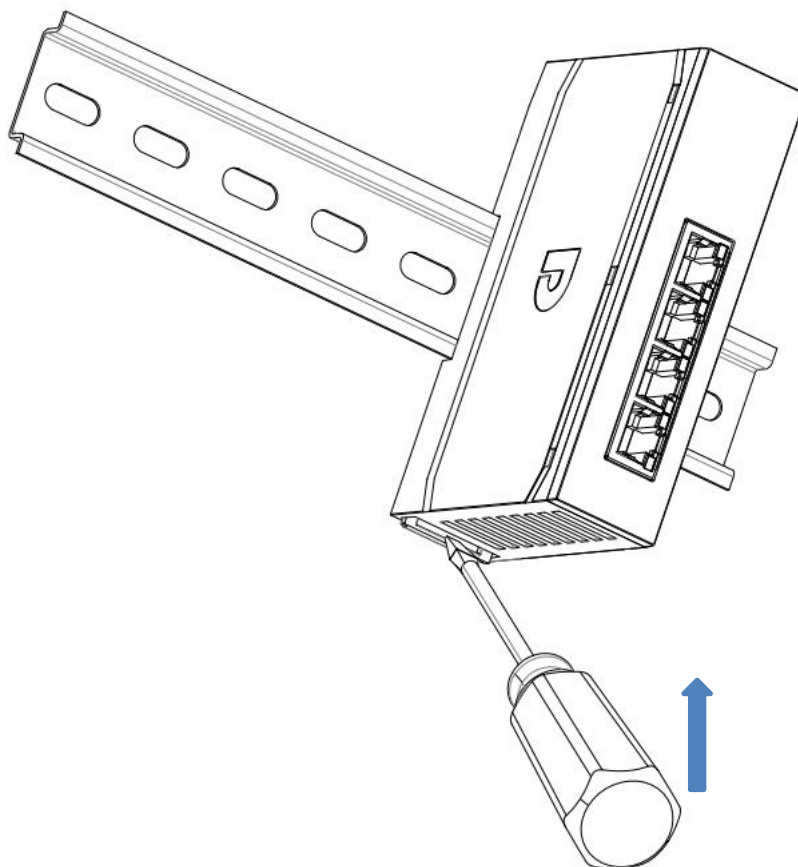


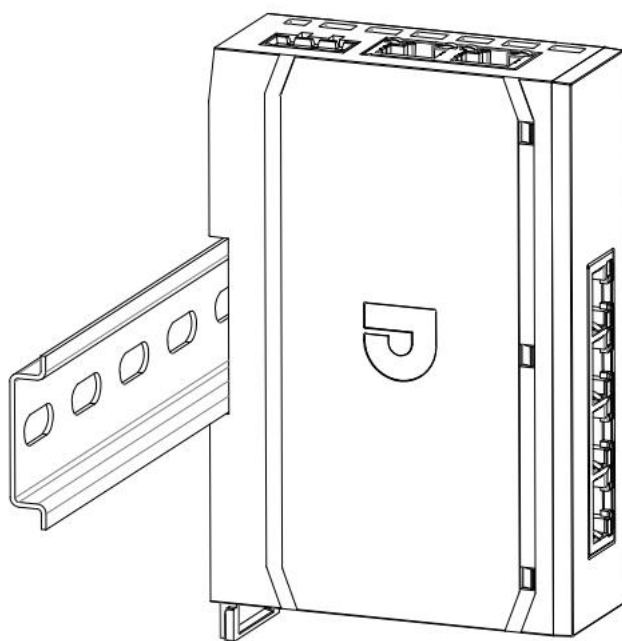
④



Coupler disassembly

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





⑦

5 Wiring

5.1 Terminal blocks



Terminal blocks		
XBF4-PN04 power terminal	Rated voltage	320V
	Rated current	20A
	Pole number	3P
	wire diameter	22~16 AWG 0.3~1.5 mm ²
XBF4 series I/O signal line terminals (i.e., input/output terminals)	Rated voltage	200V
	Rated current	9.5A
	Pole number	2×20P
	wire diameter	22~17 AWG 0.3~1.0 mm ²
Discrete I/O interface	2×RJ45	UTP or STP of Category 5 or higher (STP recommended)
Coupler Expansion Module Interface	4×RJ45	UTP or STP of Category 5 or higher (STP recommended)

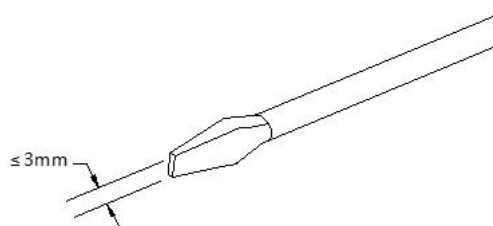
5.2 Wiring instructions and requirements

Power connection precautions

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

Wiring tool requirements

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



Stripping length requirements

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



Wiring method

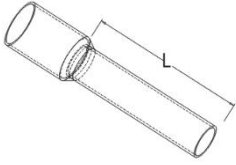
For a single-strand rigid wire, after stripping the wire to the corresponding length, press the button and insert the single-strand wire directly into the corresponding end hole.



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 10mm	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

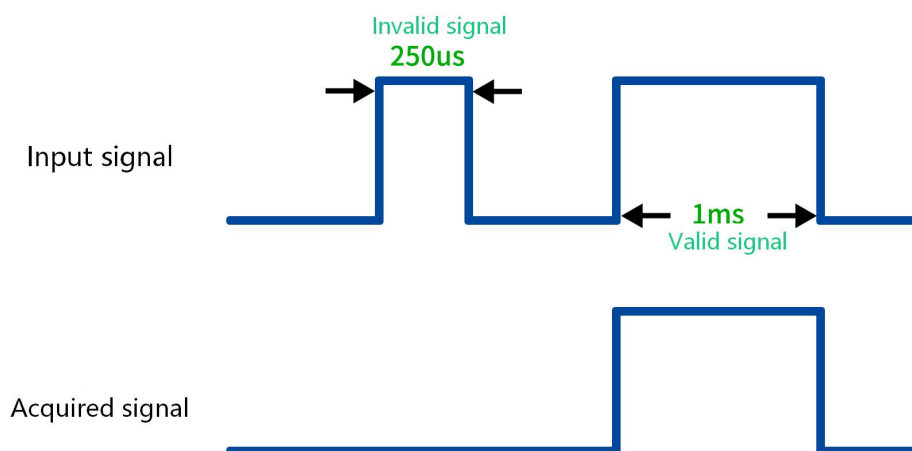
6.1 Parameter Description

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 running or with the coupler network cable disconnected). This parameter supports the following output states:

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

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

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

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

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

6.1.3 Digital input value when module fails

When a module malfunctions, the input value of the digital input module can be preset as needed, and you can choose to input 0 or keep the last input value.

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).[3.3.4 Analog Parameters](#)).

6.1.5 Analog input filtering

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.

6.1.6 Analog output signal clear/hold

The Clear/Hold function is for modules with output channels. This function configures the output mode of the output channels in non-OP states (stopped/coupler cable disconnected/discrete I/O offline). 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	0	Clear all channels and output.	0
		1	Hold all channels to maintain output.	
		2	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 2, 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.

6.1.7 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.

6.1.8 Coupler parameters

6.1.8.1 Alarm function settings

The alarm function can be enabled or disabled in the coupler module parameters; the alarm function is enabled by default.

6.1.8.2 PLC stop status output control

The output states of DO (digital output) and AO (analog output) when the PLC is stopped can be set in the coupler module parameters. See the table below for details:

PLC stop status output control		
Parameter name	Parameter value meaning	default value
PLC Stop Status DO Control	Hold and maintain output.	Hold
	Output Clear 0 means clear the output to 0.	
	Output Set 1 means setting the output to 1.	
PLC Stop Status AO Control	Hold and maintain output.	Hold
	Output Clear 0 means clear the output to 0.	

6.1.8.3 IO communication exception configuration function

IO communication exception configuration parameters The interaction state of discrete I/O can be configured when a communication failure occurs in a certain I/O module during operation. The parameter can be configured to the following three states:

Abnormal and not interactive (Default state): When a module encounters an error, the coupler will no longer exchange process data. The original interaction can be resumed after the module error disappears.

Stop communication When a module malfunctions, the coupler stops interacting. Even after the malfunction disappears, communication does not resume. A power cycle is required to restore the original interaction.

Interactive exceptions When a module malfunctions, all modules following the malfunctioning module are considered offline. Normal modules preceding the malfunctioning module can interact normally with the coupler, and the coupler can monitor these modules normally. Once the malfunctioning module recovers, the original interaction can be restored (soft hot-swap functionality).

6.1.8.4 baud rate configuration

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

This manual uses TIA Portal V17 as an example to introduce the parameter configuration method of the XBF4-PN04 coupler + I/O module combination. For detailed steps, please refer to [link/reference needed]. [Parameter settings in section 6.6.1](#) After making the modifications, be sure to power it on again.

6.2 Process data

6.2.1 Coupler process data

The coupler's uplink data allows you to view the location of slave modules. The coupler can connect to a maximum of 32 slave modules, occupying a total of 32 bytes. Each module occupies 1 byte to store its unique identifier (the extension interface number corresponding to the module's connection to the coupler + the module's DIP switch station number). The location of slave modules is shown in the table below:

Structure of slave module location	
BIT7~BIT4	BIT3~BIT0
The extension interface number corresponding to the module access coupler	Module DIP switch station number

Example: 0x00 -- This module is connected to coupler expansion interface 0, and the module DIP switch station number is 0;

0x01--This module is connected to coupler expansion interface 0, and the module DIP switch station number is 1;

0x10 -- This module is connected to coupler expansion interface 1, and the module DIP switch station number is 0.

6.3 Fault code information

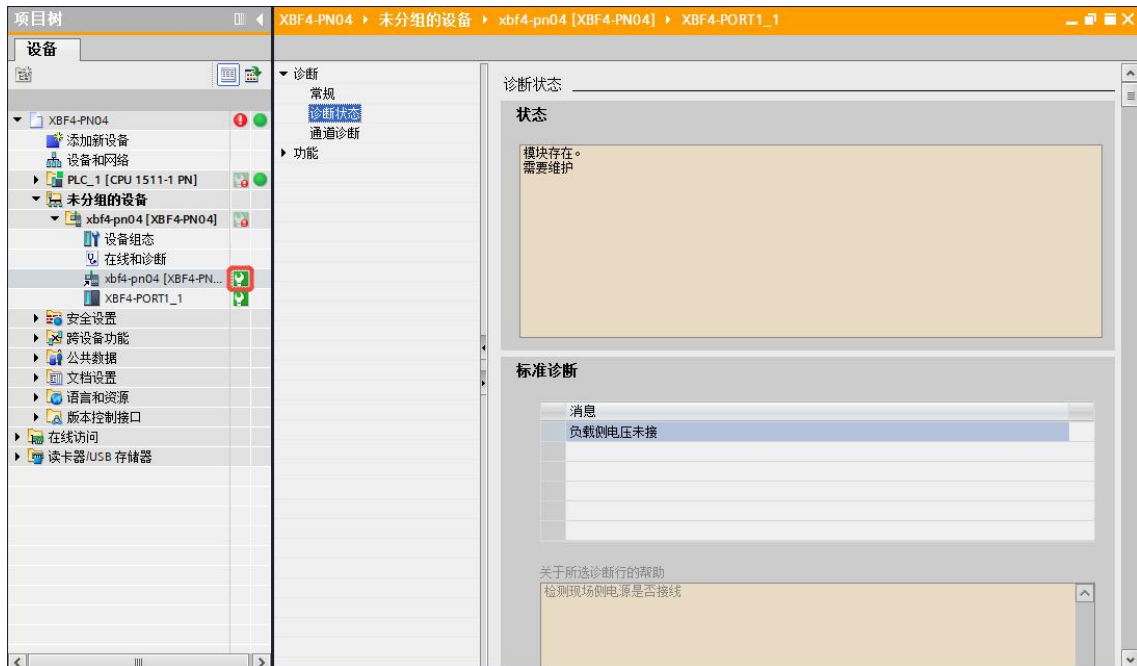
6.3.1 Coupler general fault codes

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.	000000010000010	130	0x0082	Check if the files are correct, and if there are any abnormalities or interferences in the modules.
	3	Voltage error	5	Load-side voltage not connected	000000011000101	197	0x00C5	Check if the on-site power supply is connected.

	6	Channel error	4	overflowing from the channel	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	0000000001000101	69	0x0045	Check if the module DIP switches under the corresponding expansion interface of the coupler are duplicated.

6.3.2 Fault Code Viewing

Taking TIA Portal V17 as an example, when a device malfunctions during project operation, clicking the wrench icon to the right of the device name at the bottom of the project tree will display detailed diagnostic status and alarm information. As shown in the figure below, it indicates that the load-side voltage is not connected, and you can check whether the field-side power supply is connected.



6.4 MRP ring network redundancy

PROFINET's media redundancy mechanism ensures the continued operation of the entire system even if a disconnection/connection failure occurs somewhere in the PROFINET network. Typical reconfiguration time is 200ms, and each ring network supports up to 50 devices.

Medium redundancy This is achieved by transforming a linear network topology into a ring network topology. In a media-redundant ring network, there is a redundancy manager, and the other nodes (PROFINET IO controllers/devices) are called redundant clients. When a disconnection/connection failure occurs somewhere in the PROFINET network, the redundancy manager detects this fault, reconstructs the interrupted network, and allows the system to continue operating.

The media redundancy network structure has the following advantages:

- The media redundancy structure significantly improves the availability of the equipment because the failure of a single device has no impact on communication.
- The necessary maintenance work can be carried out without any time pressure, as the factory does not need to shut down during the maintenance process.
- When a network failure occurs, it can perform rapid network diagnosis and speed up troubleshooting.
- In the event of a malfunction, the costs incurred due to production stoppages will be reduced.

MRP ring network configuration rules:

- All nodes must support MRP and the MRP protocol must be enabled.
- All devices must be interconnected via ring network ports.
- All devices in the ring network belong to the same redundancy domain.
- In a ring network, a maximum of 50 devices can be connected; otherwise, the reassembly time will exceed 200ms.
- One device in the ring network can be used as a redundancy manager, while the other devices are redundant clients.
- All partner ports within the ring have the same settings.

The MRP network reconstruction time is 200ms, during which I/O communication is interrupted. Therefore, to ensure that no I/O failures occur and faults are reported during network reconstruction, the watchdog timer of the I/O device needs to be set to more than 200ms.

For detailed instructions on operating the media redundancy function, please refer to [link/reference].[The section on ring network redundancy configuration is introduced in section 6.6.2.](#)

6.5 Hardware testing

The module supports automatic coupler scanning in Siemens TIA Portal automation software. See details for operating instructions.[Section 6.6.1 Hardware Detection and Device Addition.](#)

6.6 PROFINET Coupler Configuration Application

6.6.1 Application in the TIA Portal V17 software environment

1、Preparation

- **Hardware environment**

- **Module preparation:** This instruction uses the topology XBF4-PN04 + {Coupler Interface 0: XBF4-3200 + XBF4-0032A} + {Coupler Interface 1: XBF4-0032B + XBF4-1616B} + {Coupler Interface 2: XBF4-1616B + XBF4-3200} + {Coupler Interface 3: XBF4-A40 + XBF4-A04} as an example.
- **One computer, pre-installed with TIA Portal V17 software.**
- **One Siemens PLC is required.** This instruction manual uses the Siemens S7-1500 CPU 1511-1 PN as an example.
- **Special shielded cable**
- **One switching power supply**
- **Device configuration file**
Configuration file retrieval
address: <https://www.solidotech.com/cn/resources/configuration-files>

- **Hardware configuration and wiring**

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

2、New construction projects

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



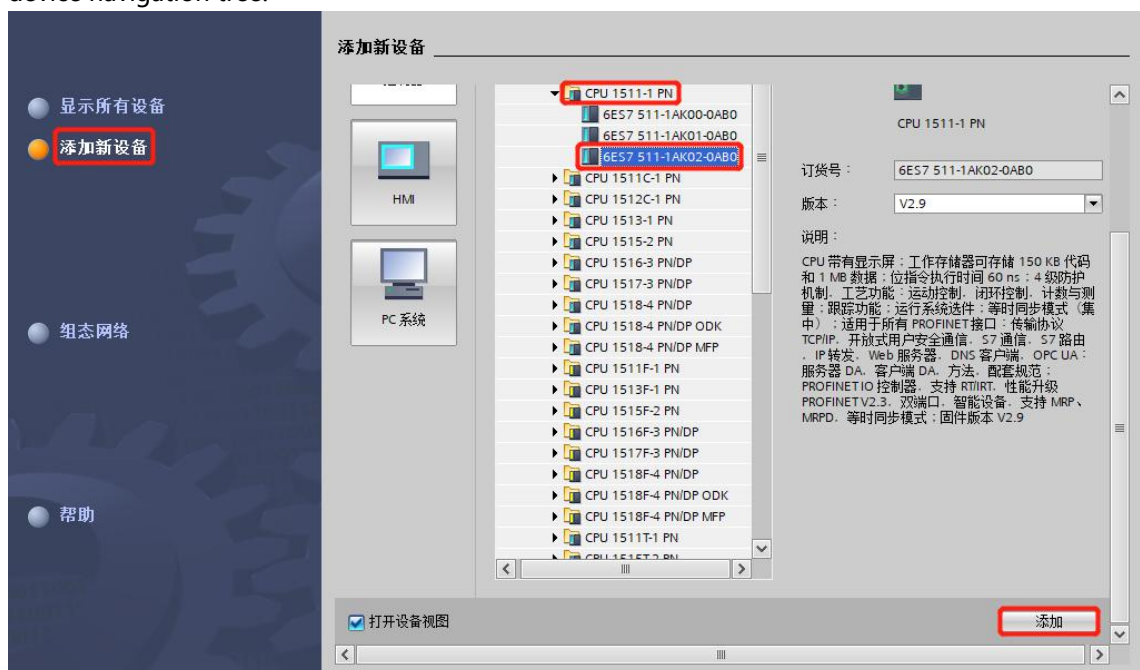
- ◆ Project name: Custom, you can keep the default.
- ◆ Path: The path where the project is saved. You can keep the default path.
- ◆ Version: You can keep the default.
- ◆ Author: You can keep the default setting.
- ◆ Note: This is customizable and can be left blank.

3. Add PLC controller

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

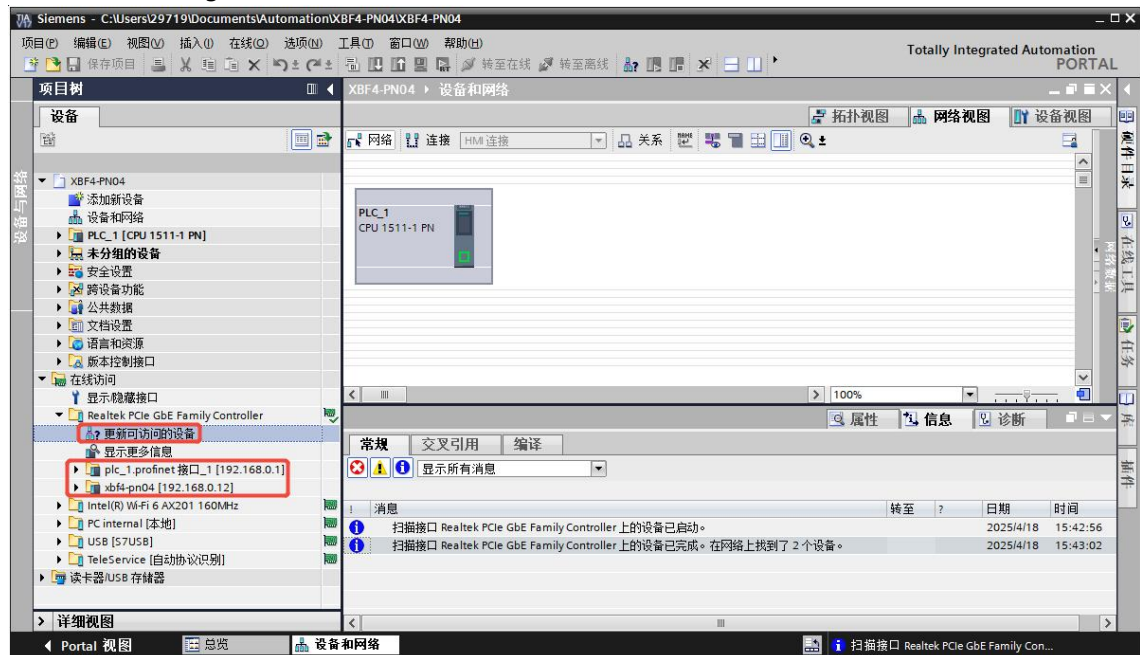


- b. Click "Add New Device", select the PLC model you are currently using, and click "Add", as shown in the image below. After adding, you can see that the PLC has been added to the device navigation tree.



4. Scan connection device

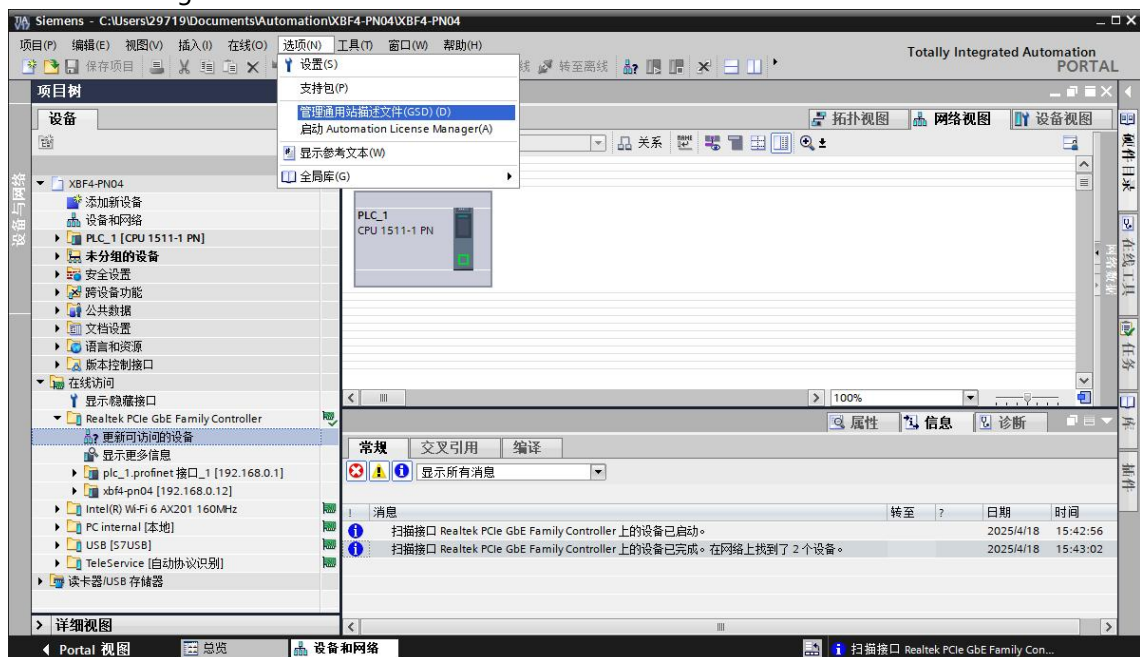
- Click "Online Access -> Update Accessible Devices" in the left navigation tree, as shown in the image below. Once the update is complete, the connected slave devices will be displayed, as shown in the image below.



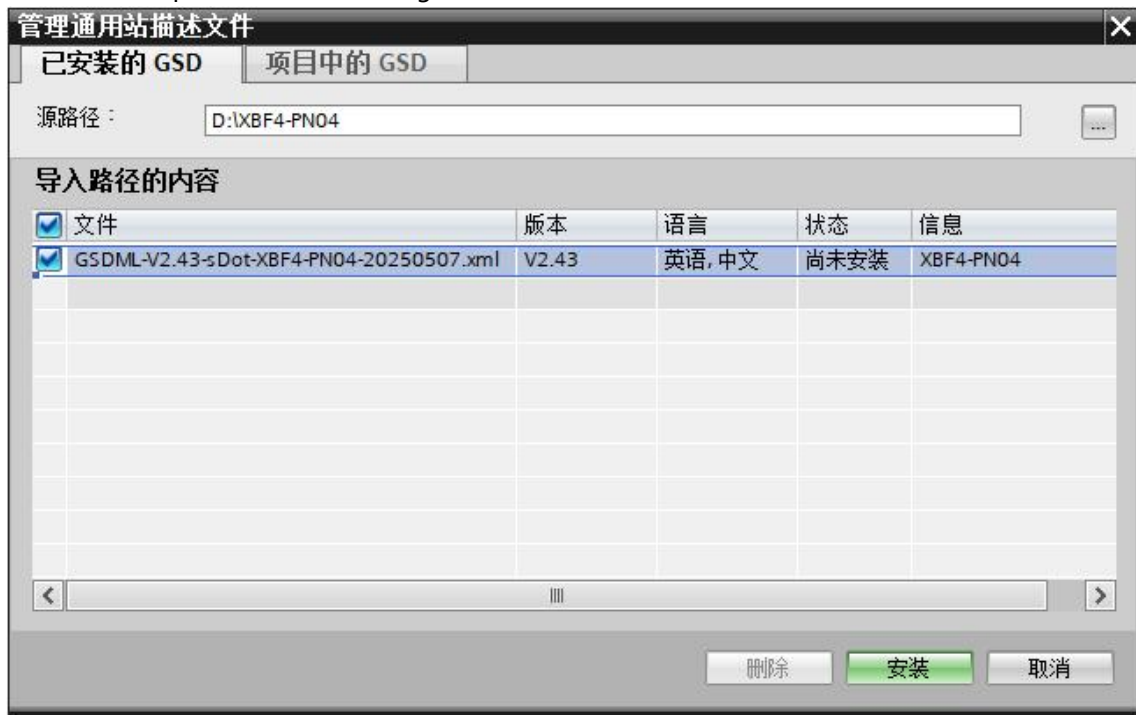
The computer's IP address must be on the same network segment as the PLC. If they are not on the same network segment, change the computer's IP address and repeat the above steps.

5. Add GSD configuration file

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

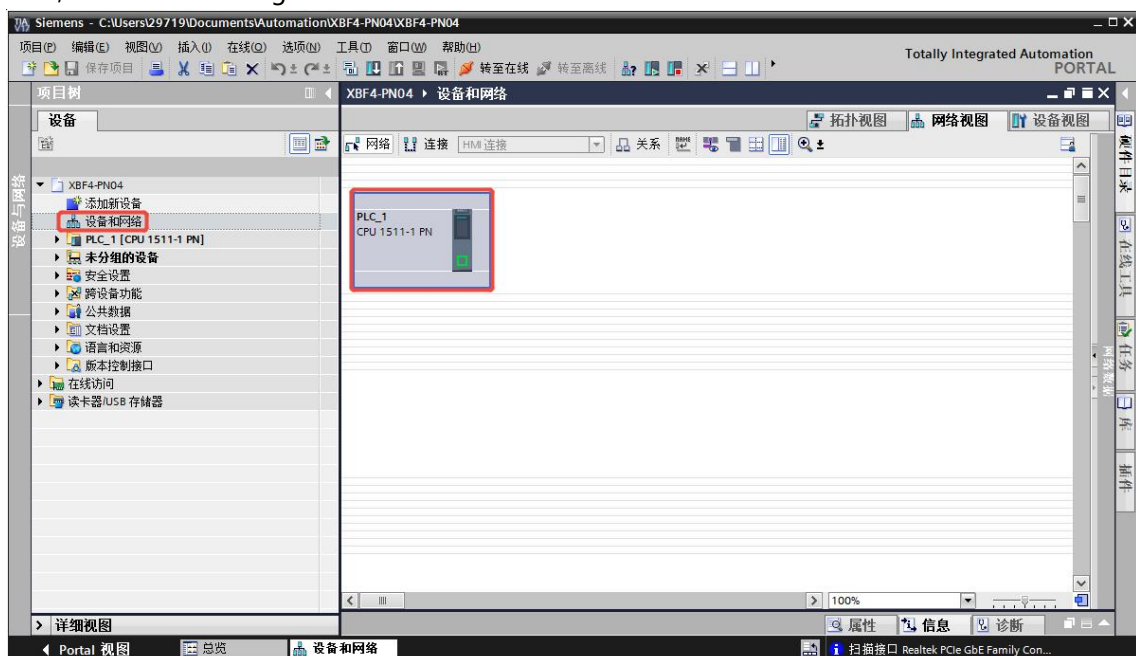


- b. Click "Source Path" to select the folder, and check if the status of the GSD file to be added is "Not Installed". If not, click the "Install" button; if already installed, click "Cancel" to skip the installation steps. As shown in the figure below.

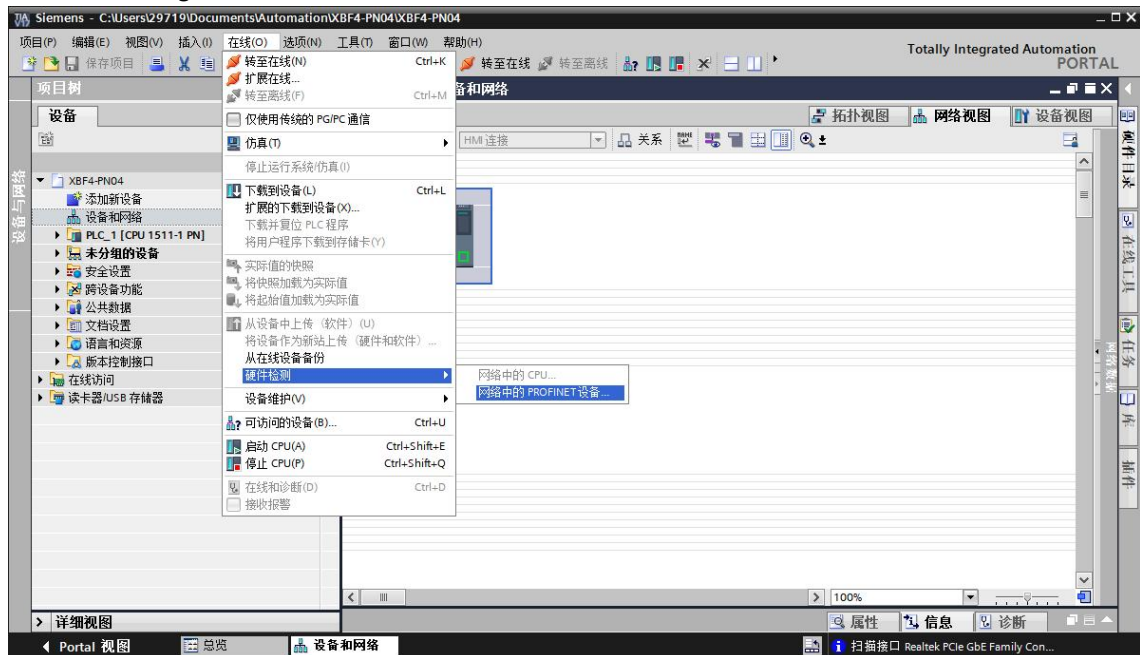


6、Hardware detection and device addition

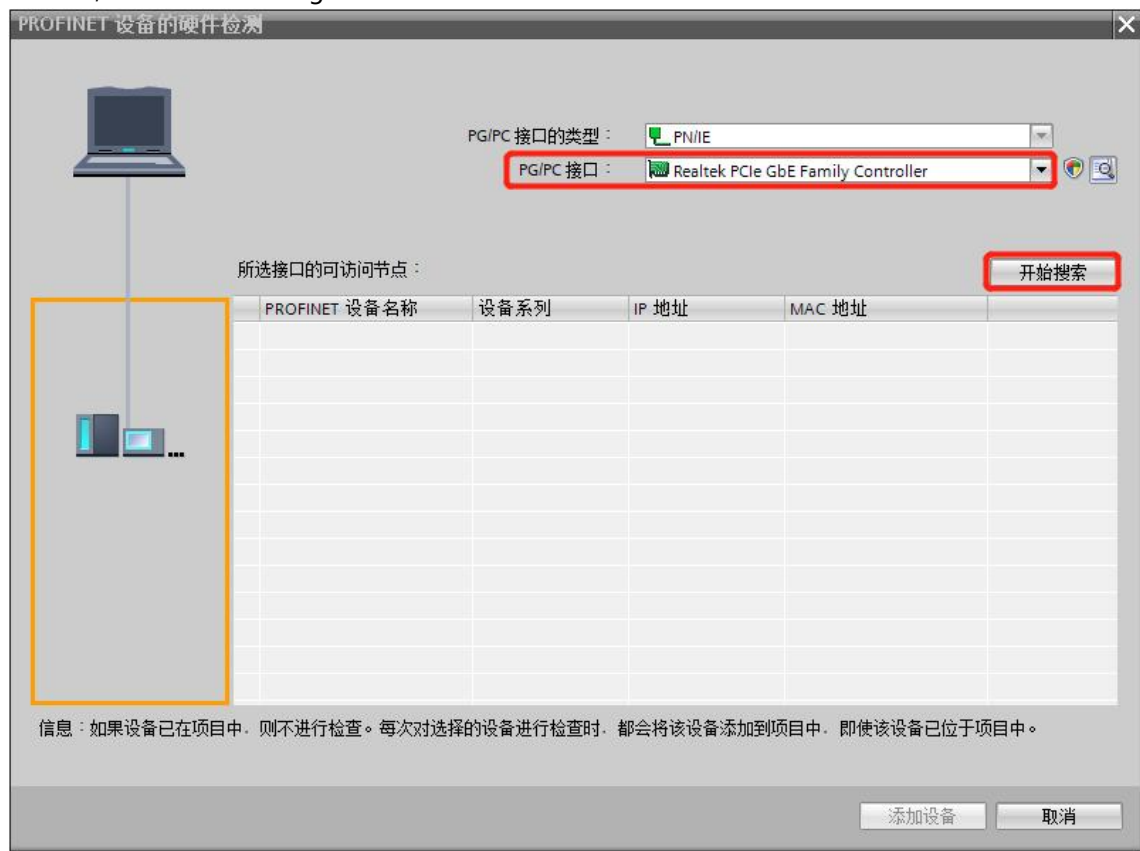
- a. Double-click "Device and Network" in the left navigation tree, and select PLC in the network view, as shown in the figure below.



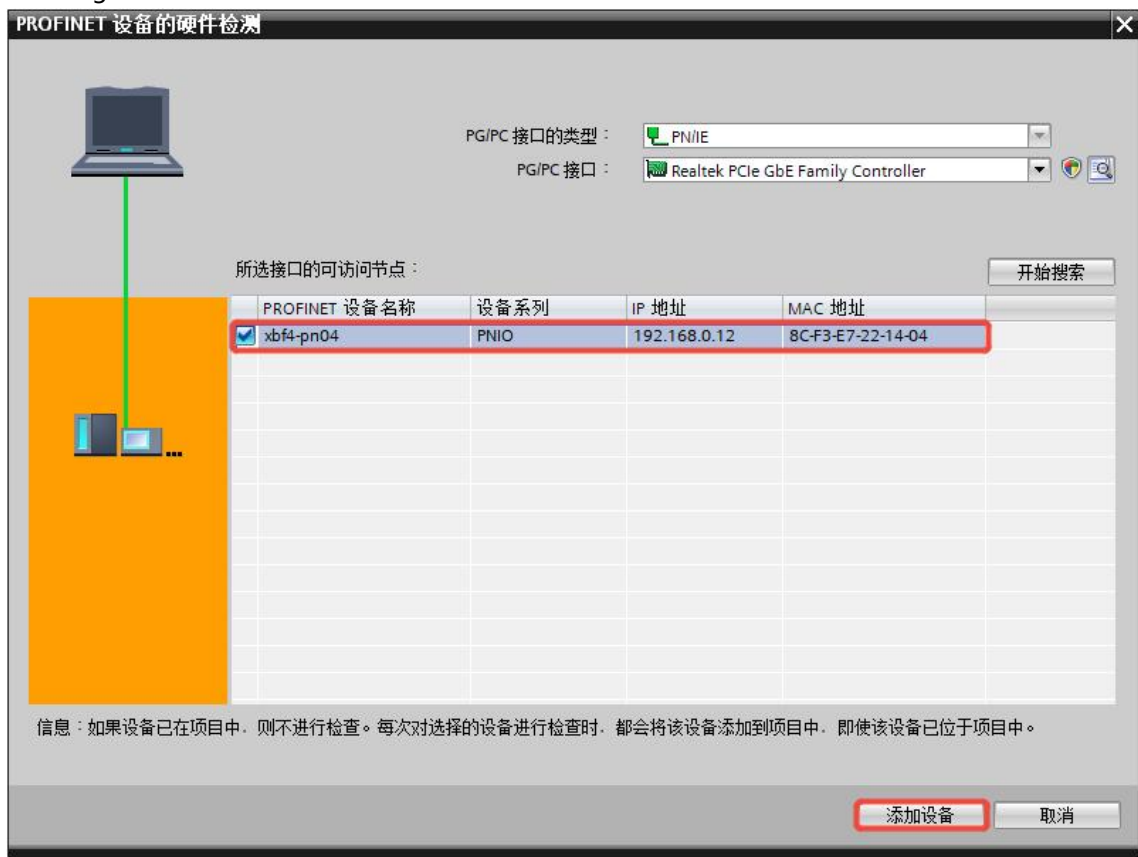
- b. In the menu bar, select "Online -> Hardware Detection -> PROFINET Devices in Network", as shown in the figure below.



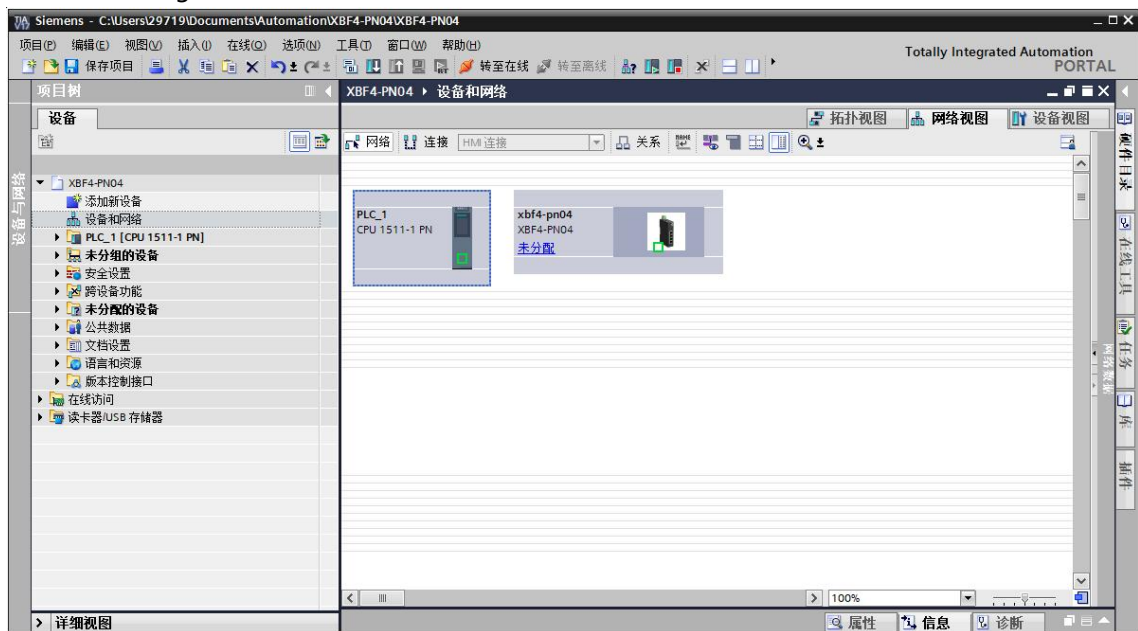
- c. A hardware detection window will pop up. Select the correct PG/PC interface and click "Start Search", as shown in the figure below.



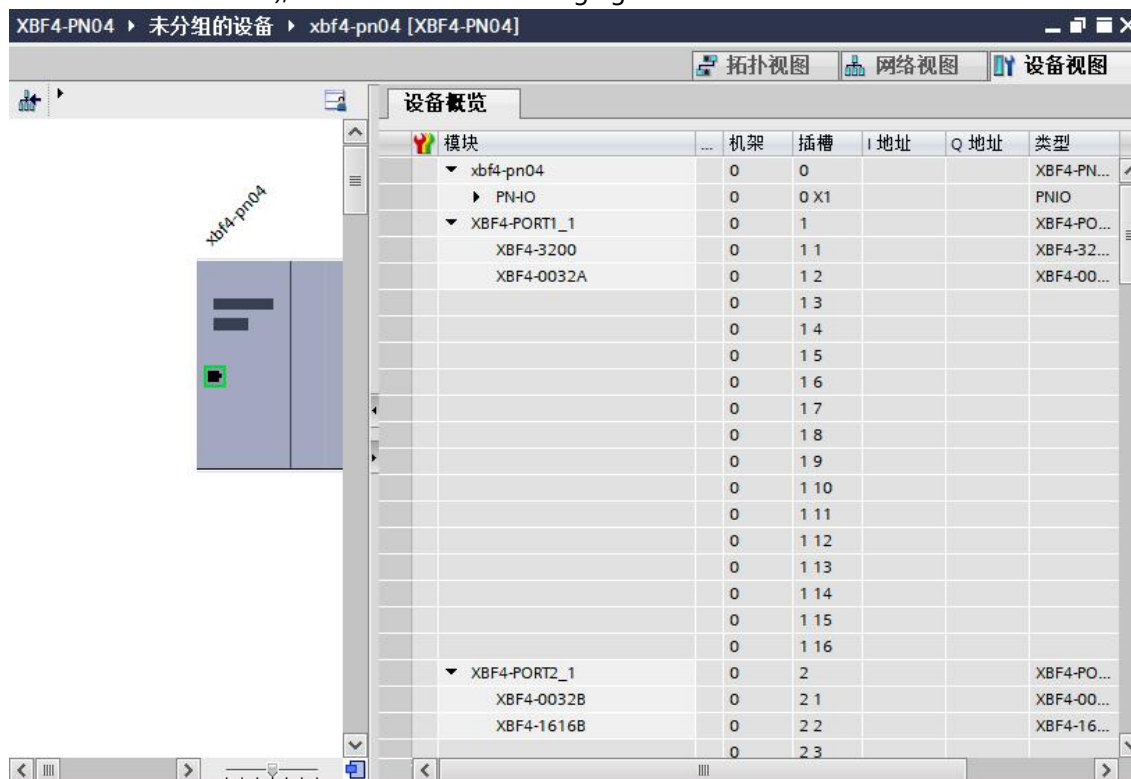
- d. To detect coupler devices in the network, select the coupler and click "Add Device," as shown in the image below.



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



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

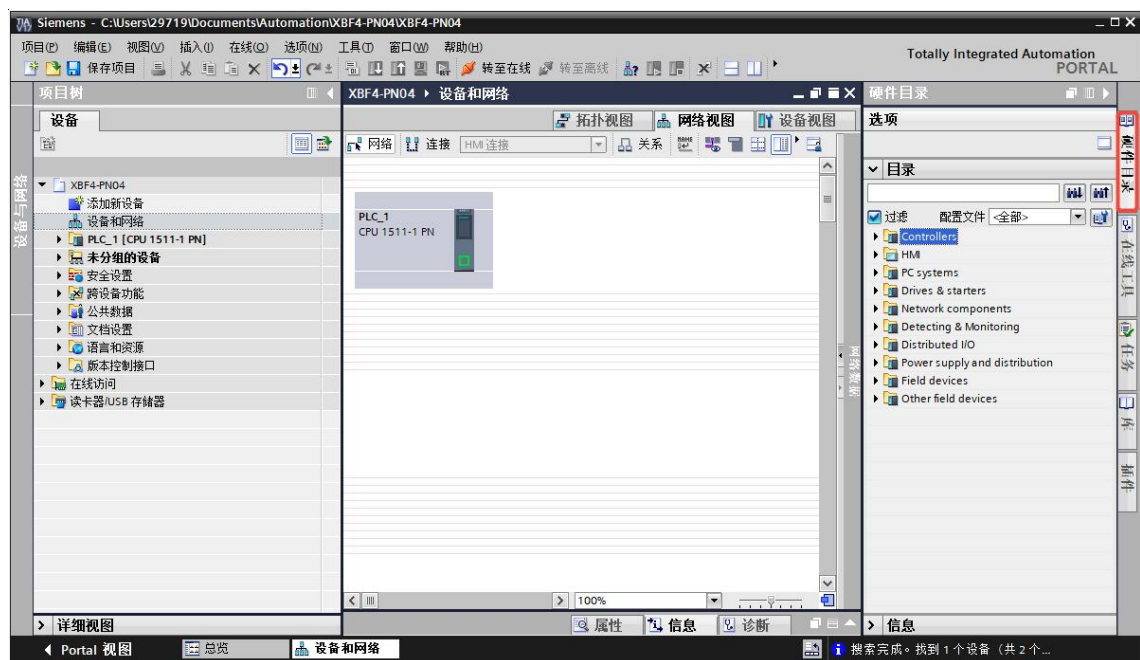


Note: The I/O module DIP switch station number must be consistent with the slot number set in the diagram. The DIP switch station numbers 0~F correspond to slots 1~16 of the four coupler interfaces respectively.

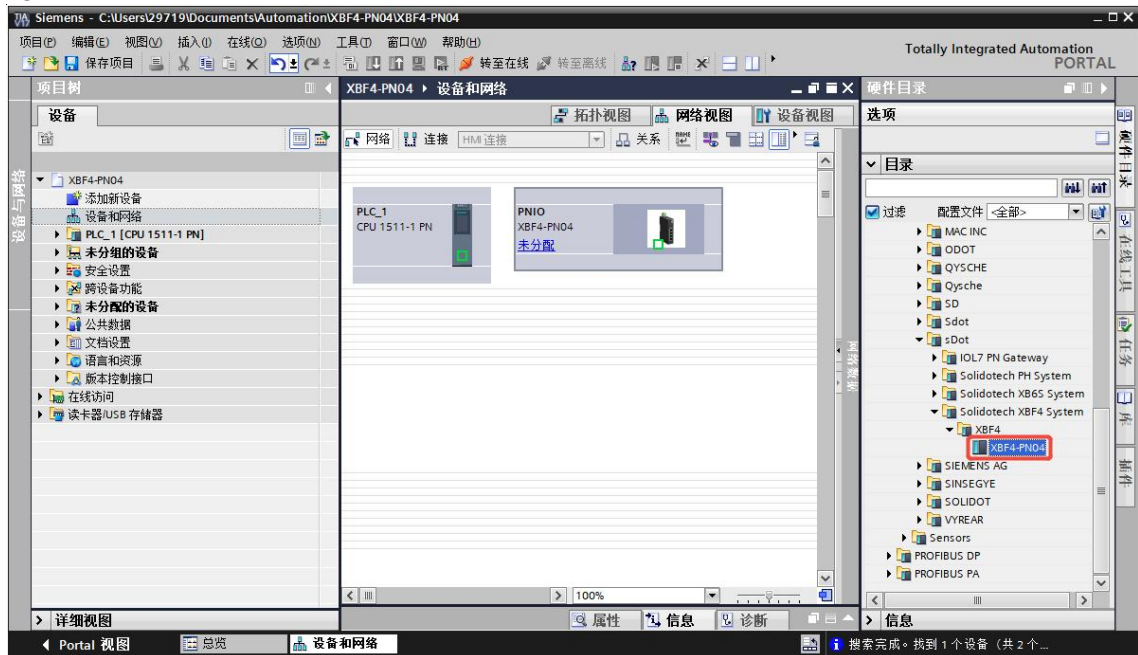
7. Manually add slave devices

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

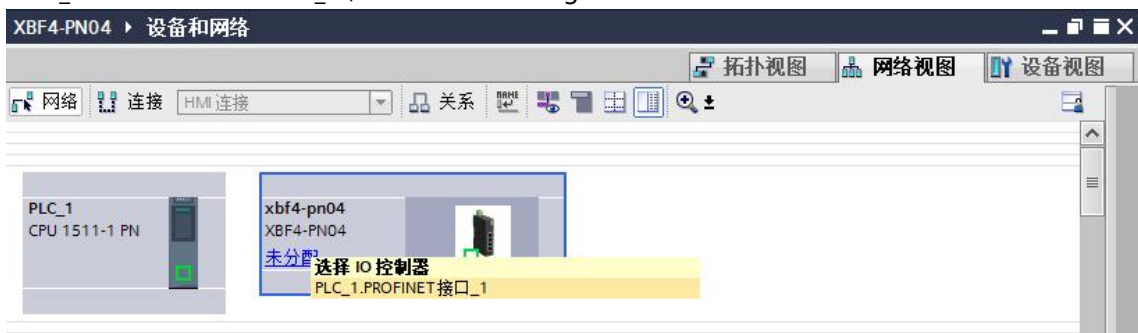
- Double-click "Devices and Networks" in the left navigation bar.
- Click the vertical "Hardware Catalog" button on the right, and the catalog will be displayed as shown in the image below.



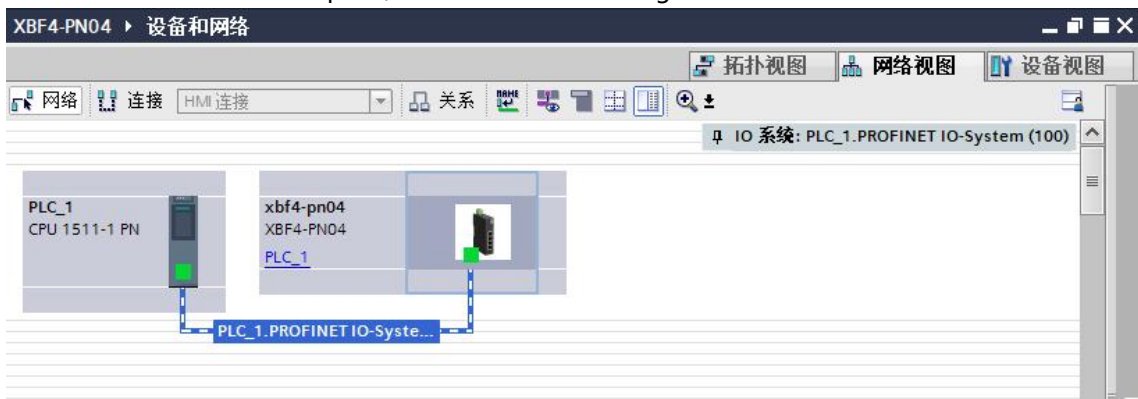
- c. Select "Other field devices -> PROFINET IO -> I/O -> sDot -> Solidotech XBF4 System -> XBF4 -> XBF4-PN04", then drag or double-click XBF4-PN04 to the "Network View", as shown in the figure below.



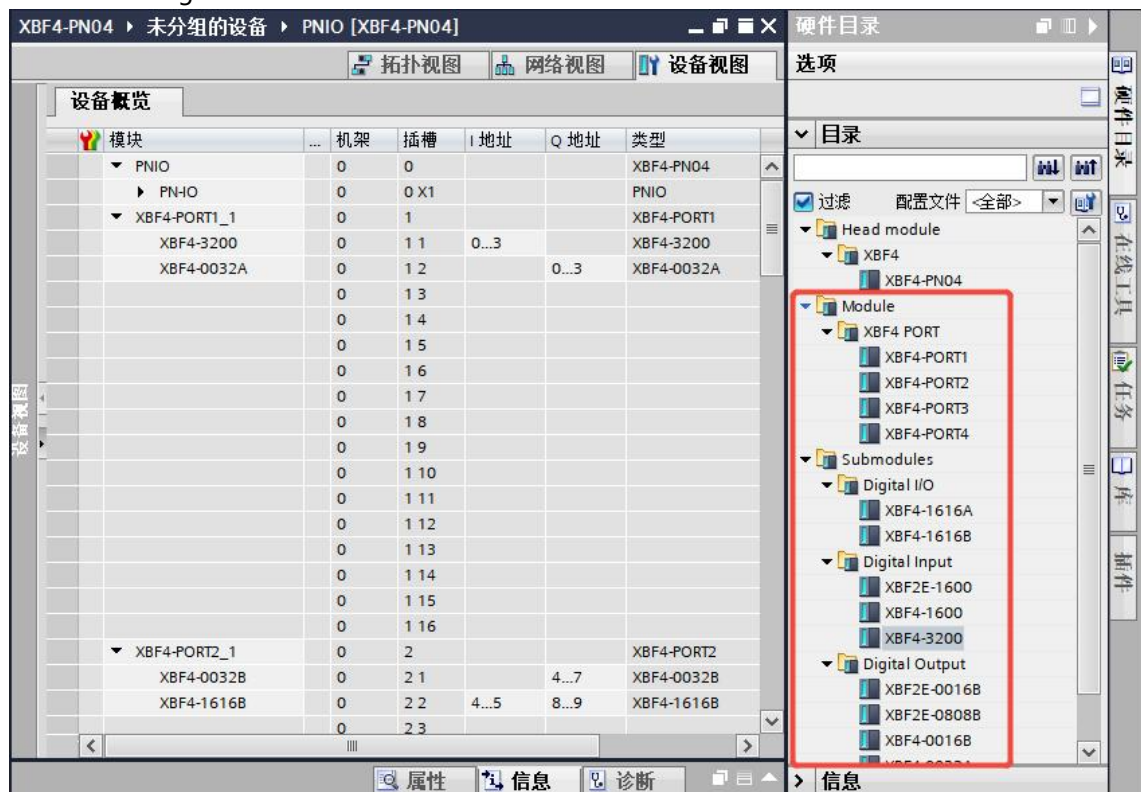
- d. Switch to network view, click "Unassigned (blue text)" on the coupler (slave) device, and select "PLC_1.PROFINET Interface_1", as shown in the figure below.



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



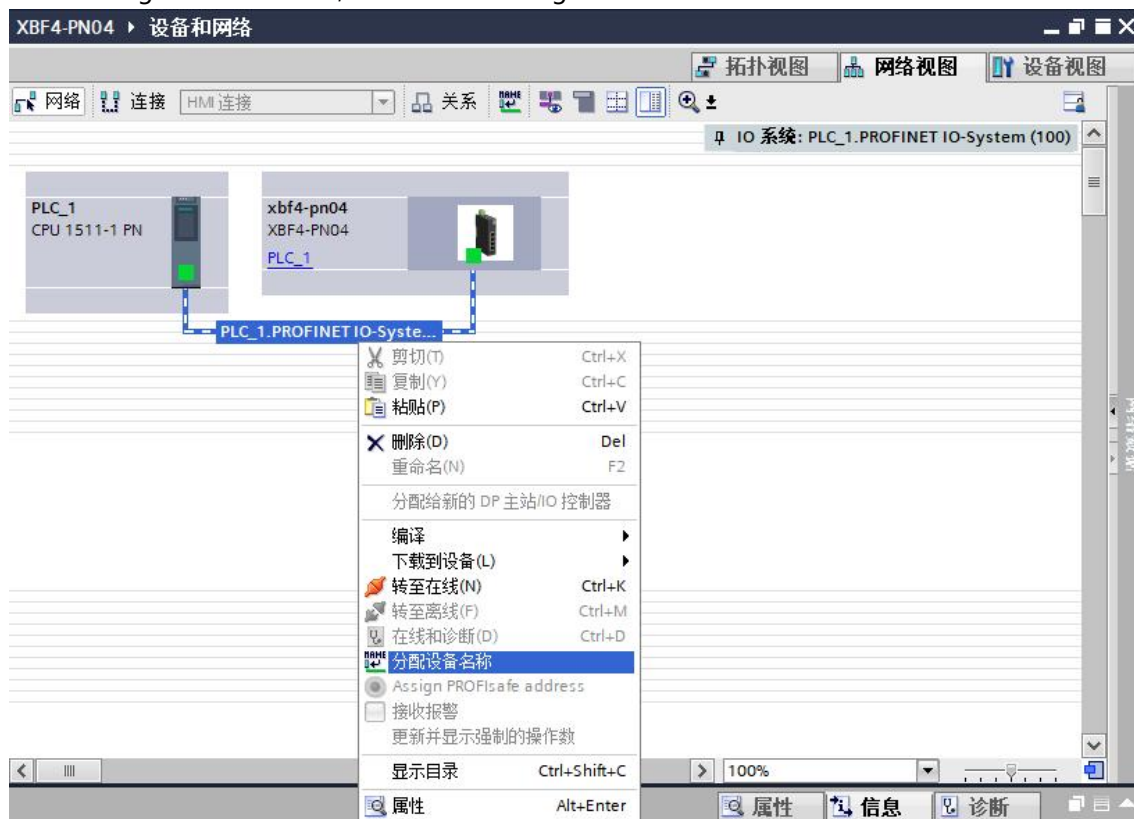
- f. Click "Device View" to enter the coupler's device overview. Under "Hardware Catalog" on the right, drag and drop to add couplers according to the actual topology. The interface and I/O modules (the order must match the actual topology, otherwise communication will fail) are shown in the figure below.



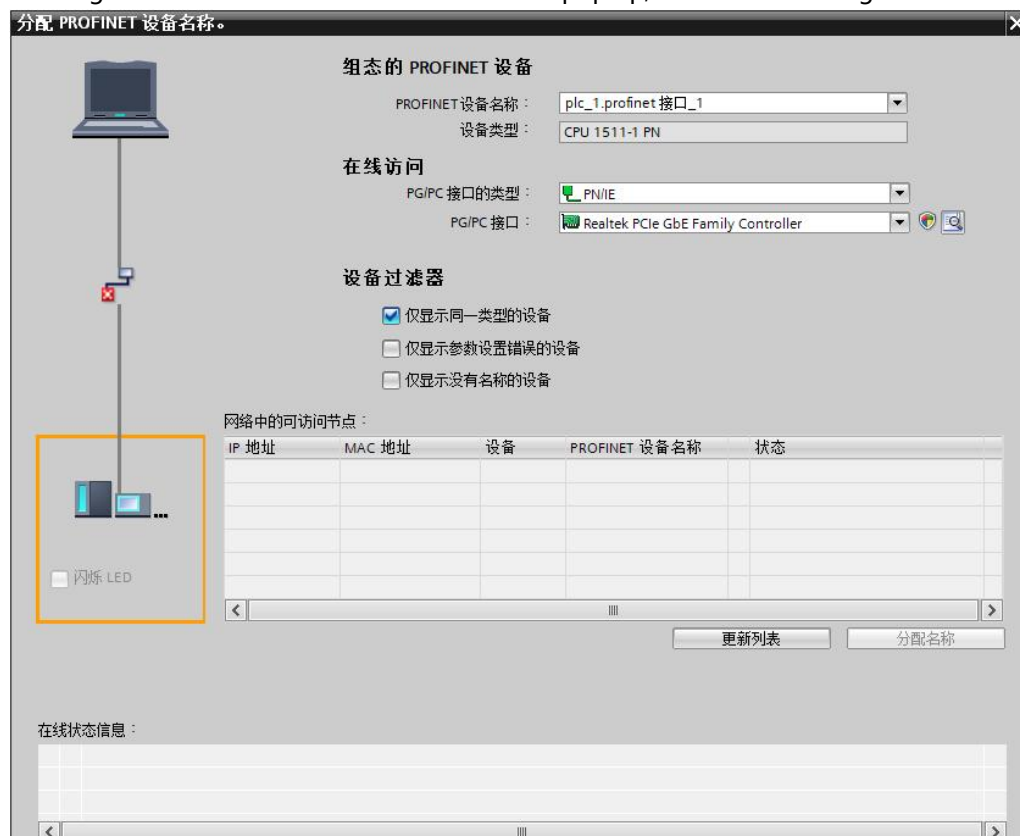
Note: The I/O module DIP switch station number must be consistent with the slot number set in the diagram. The DIP switch station numbers 0~F correspond to slots 1~16 of the four coupler interfaces respectively.

8. Assign device name

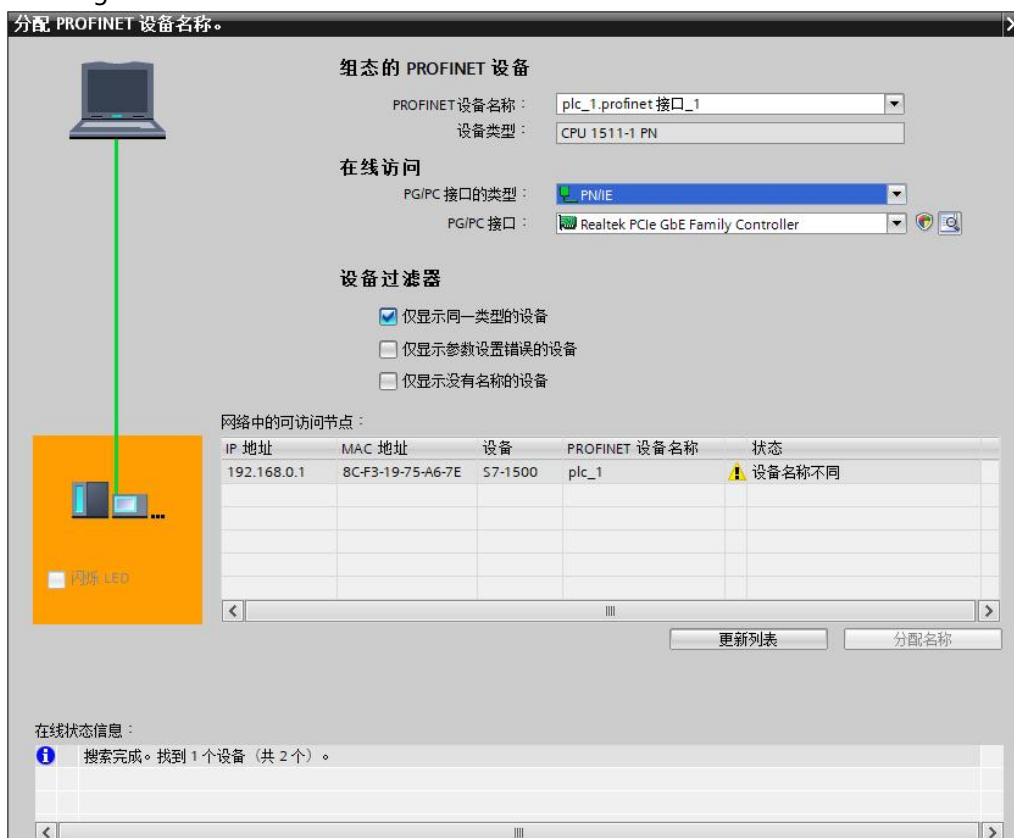
- In the network view, right-click the connection cable between the PLC and the coupler, and select "Assign Device Name", as shown in the figure below.



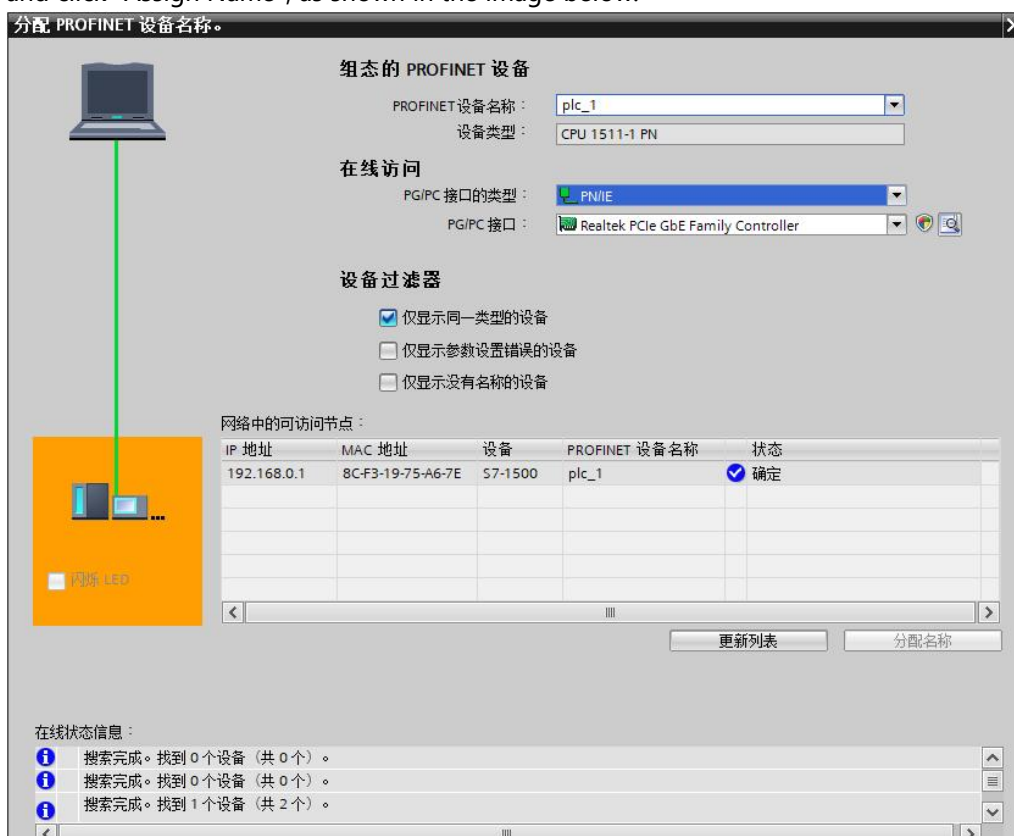
- A "Assign PROFINET Device Name" window will pop up, as shown in the figure below.



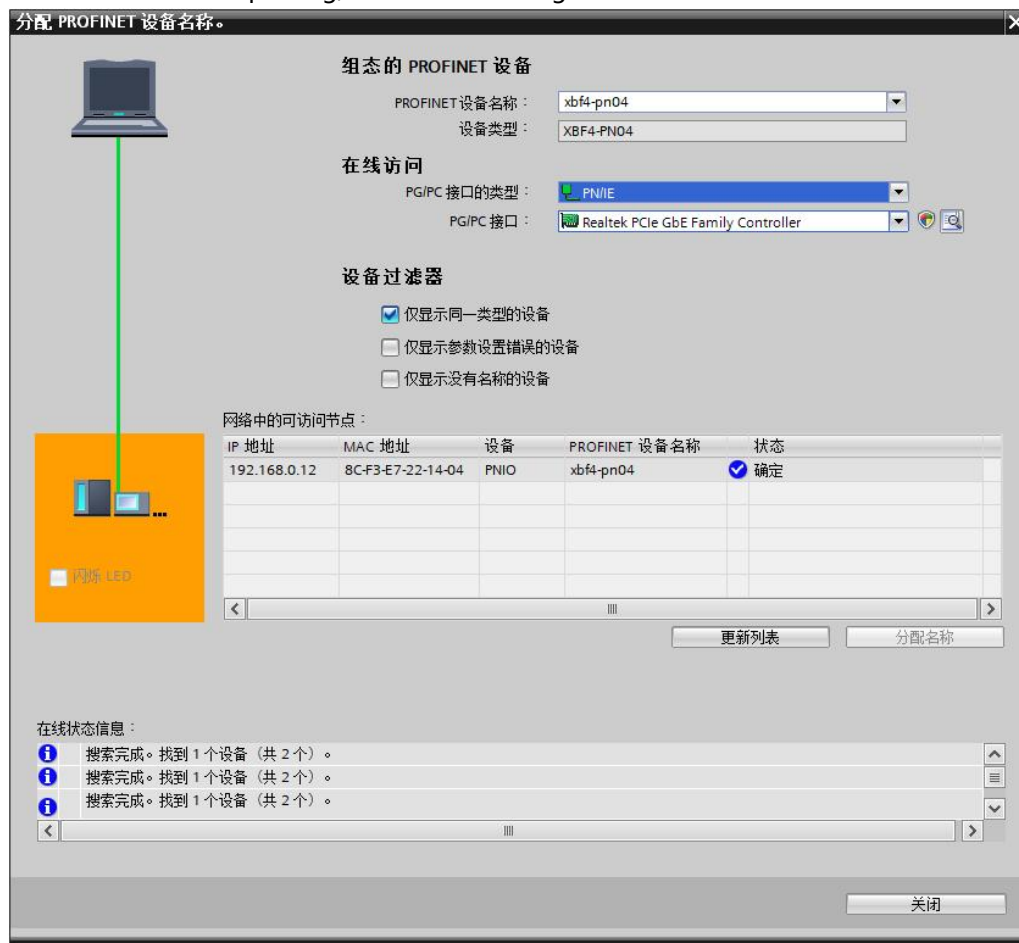
- c. Select PLC as the device name, click "Update List", and the update will be completed as shown in the figure below.



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



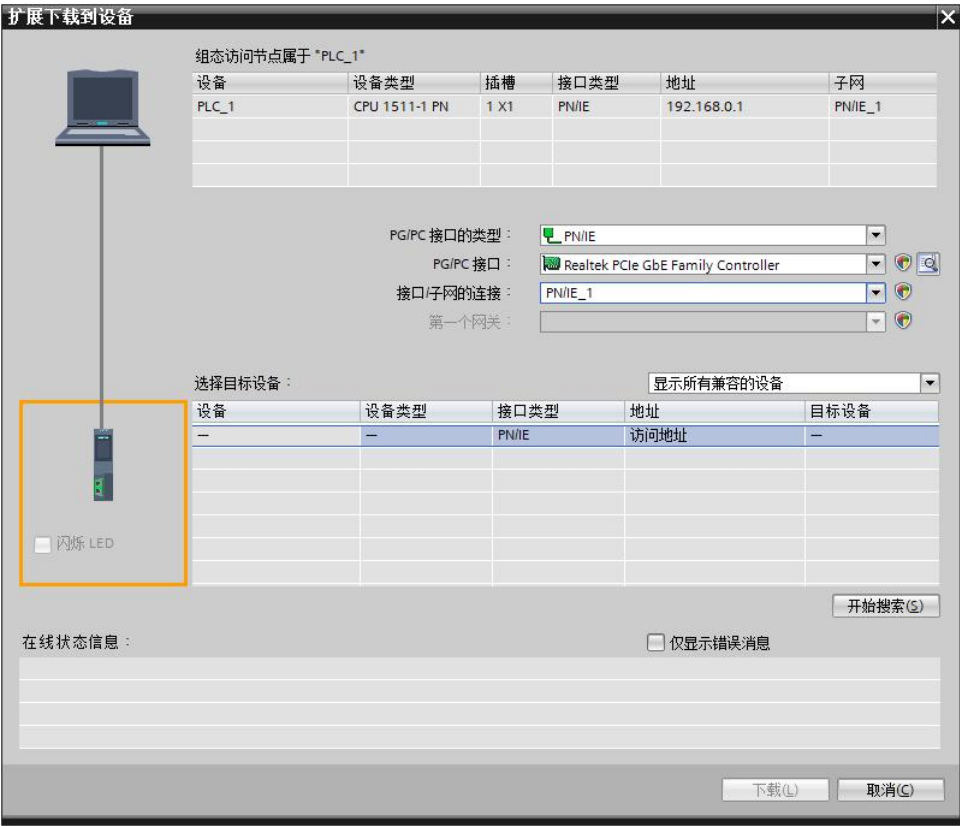
- e. Select "Coupler" as the device name, click "Update List," and then assign a name using the same method after updating, as shown in the figure below.



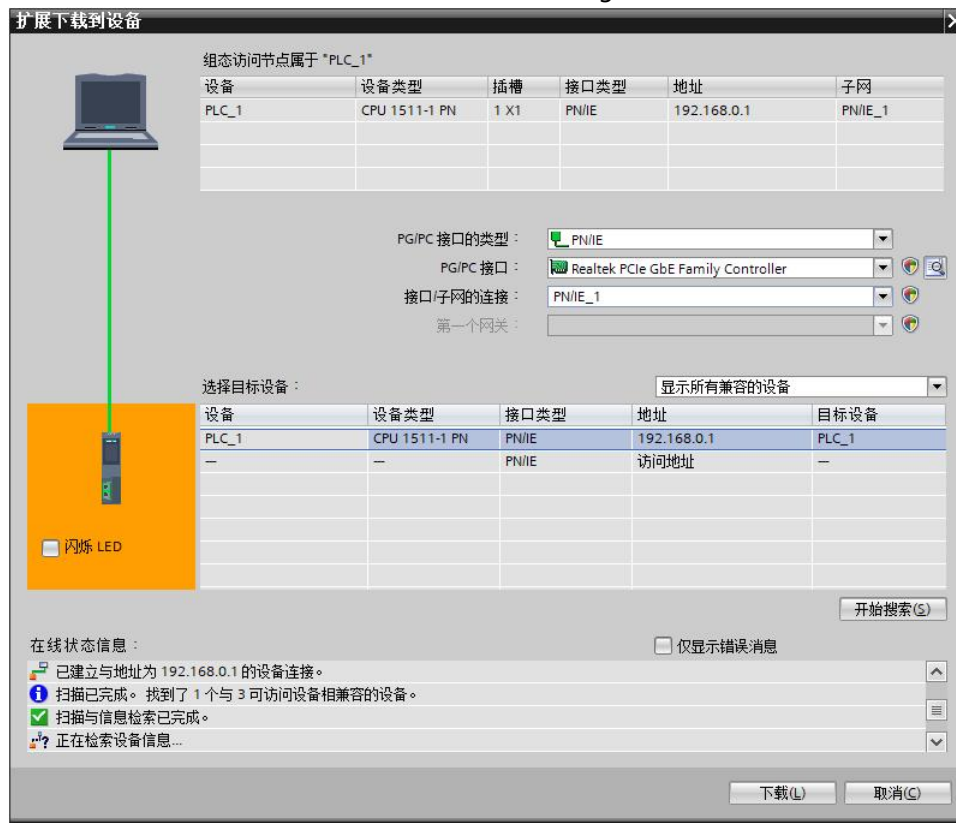
- f. Check if the MAC address on the module's silkscreen matches the MAC address of the assigned device name. Click "Close".

9、Download configuration structure

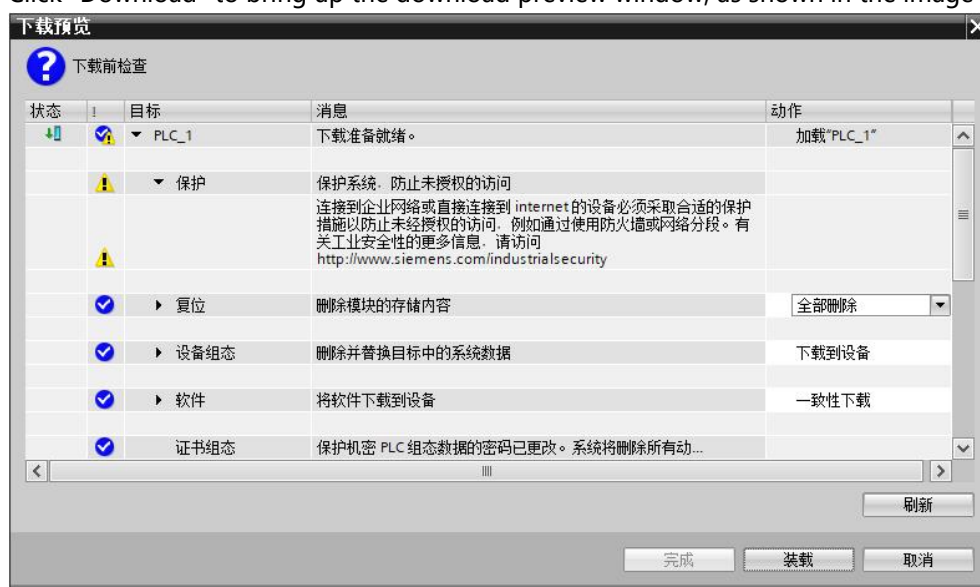
- a. In the network view, select the PLC. First, click the Compile button in the menu bar, then click the Download button to download the current configuration to the PLC.
- b. In the pop-up "Download extension to device" interface, configure as shown in the image below.



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



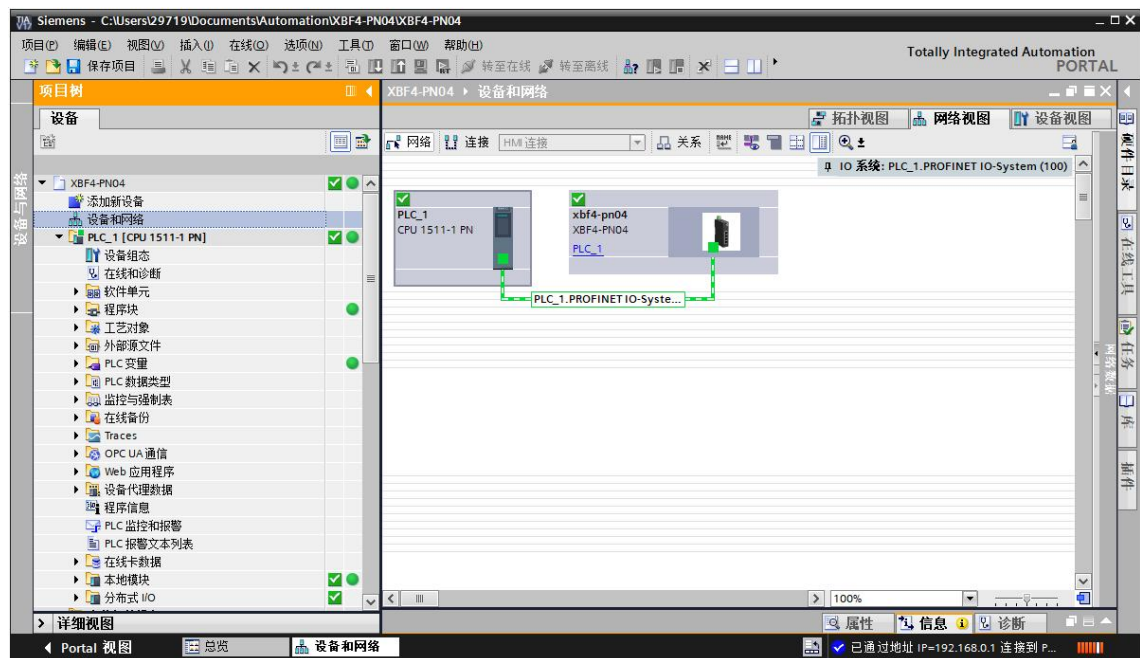
- d. Click "Download" to bring up the download preview window, as shown in the image below.



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

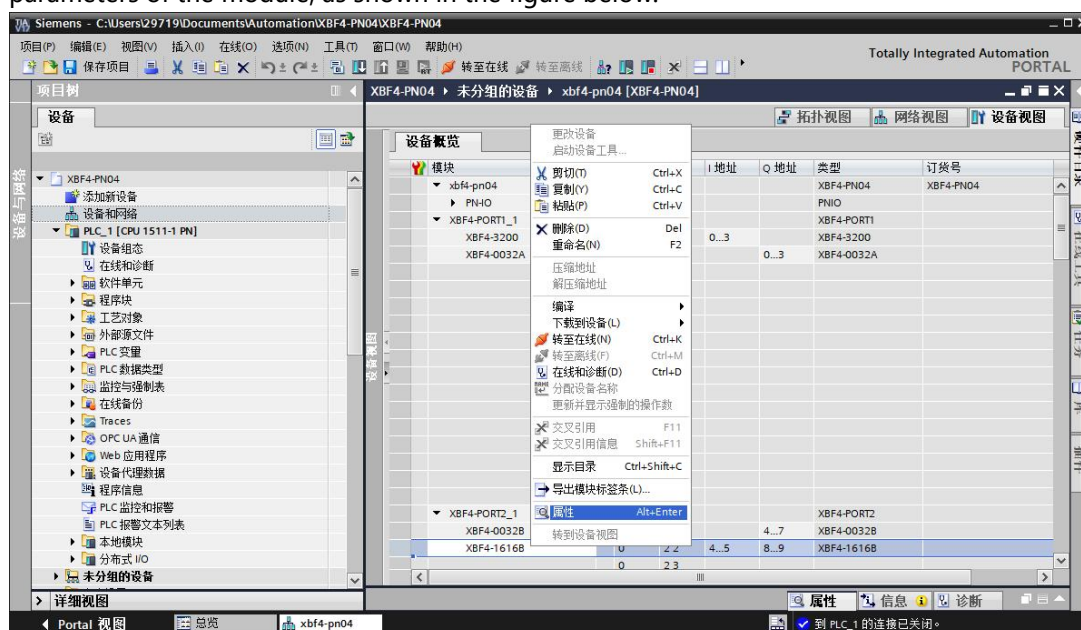
10、 Communication connection

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

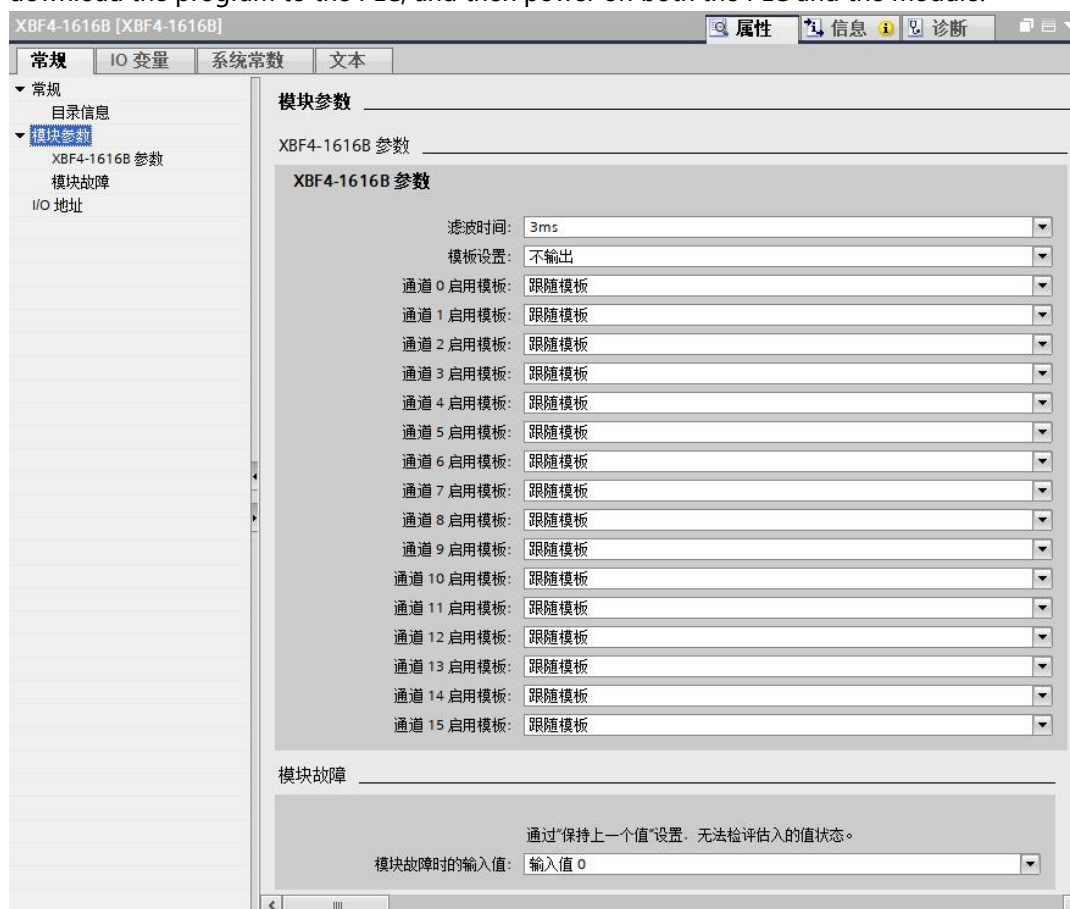


11、Parameter settings

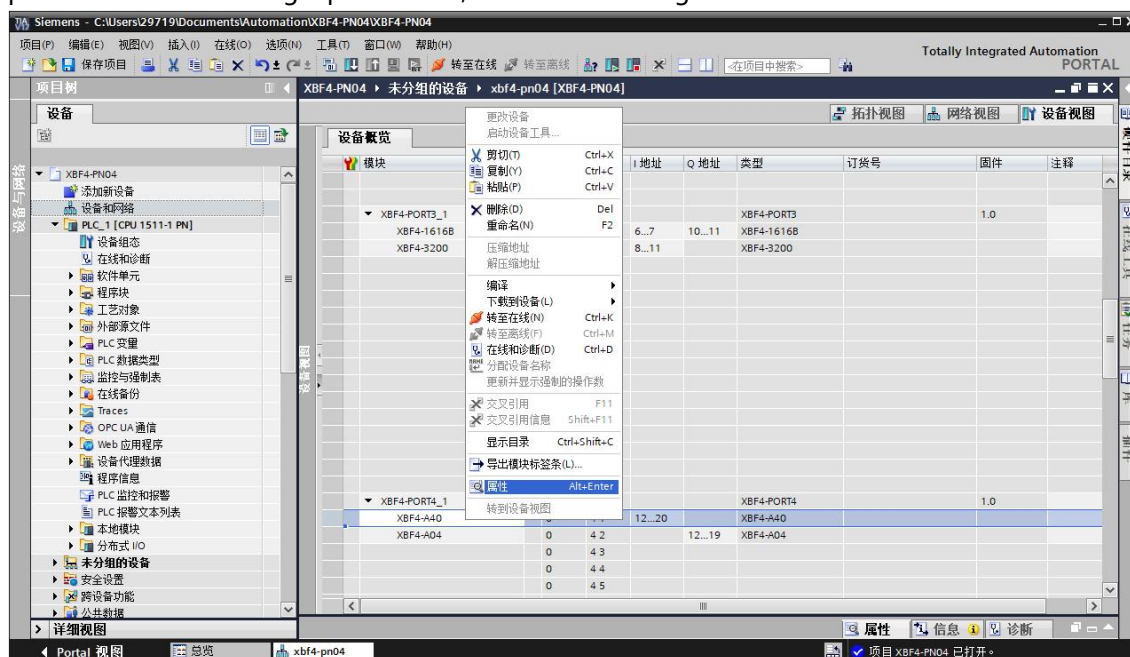
- In offline mode, open "Network View", select the coupler module, switch to device view, right-click the XBF4-1616B module, and click the "Properties" button to view and set various parameters of the module, as shown in the figure below.



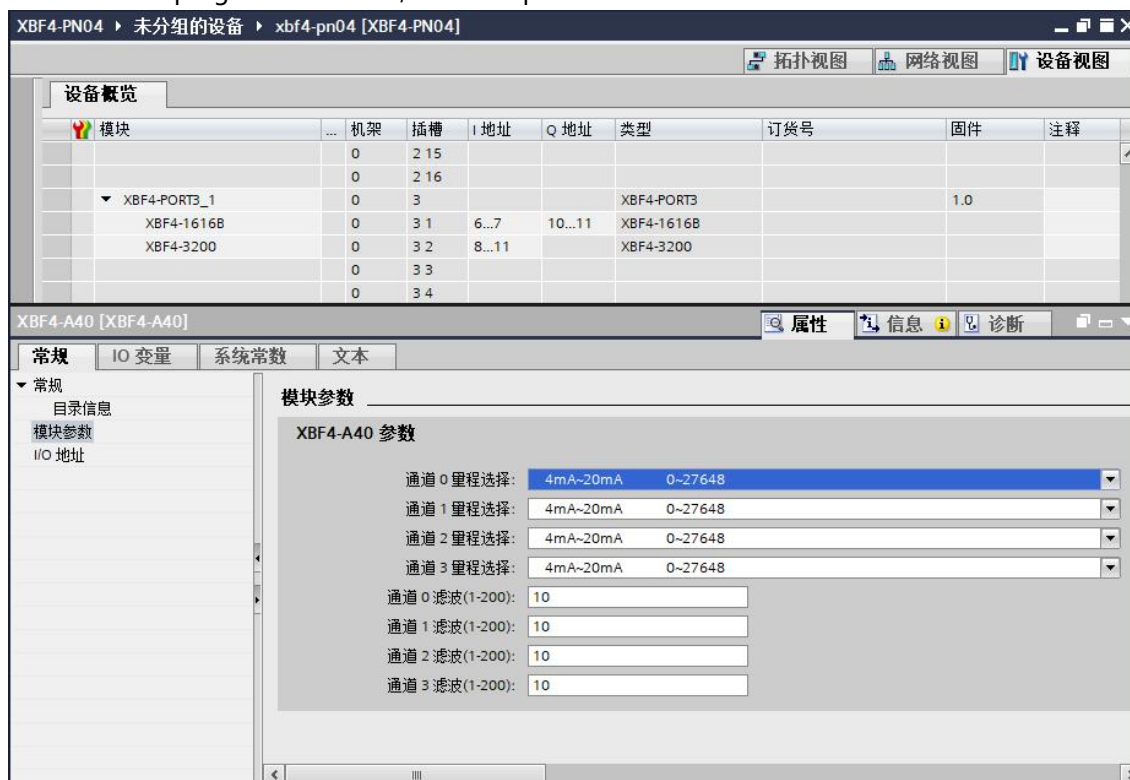
- On the XBF4-1616B properties page, click "Module Parameters," as shown in the image below. The parameters can be configured according to actual usage needs. After configuration, re-download the program to the PLC, and then power on both the PLC and the module.



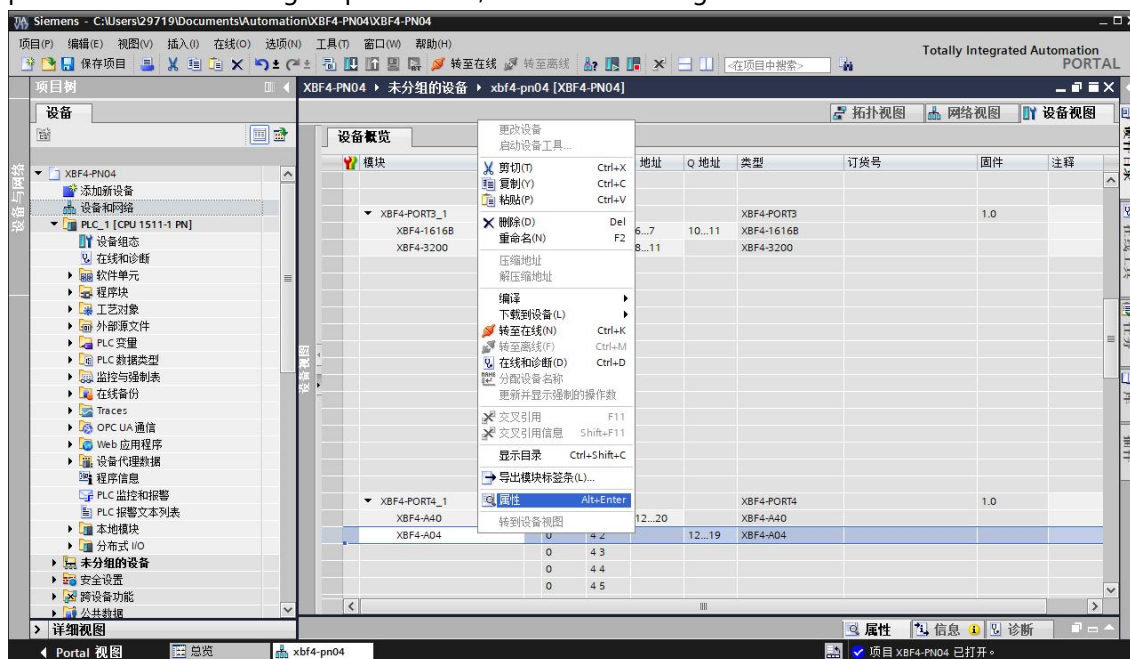
- c. Right-click the XBF4-A40 module and click the "Properties" button to view and set various parameters of the analog input module, as shown in the figure below.



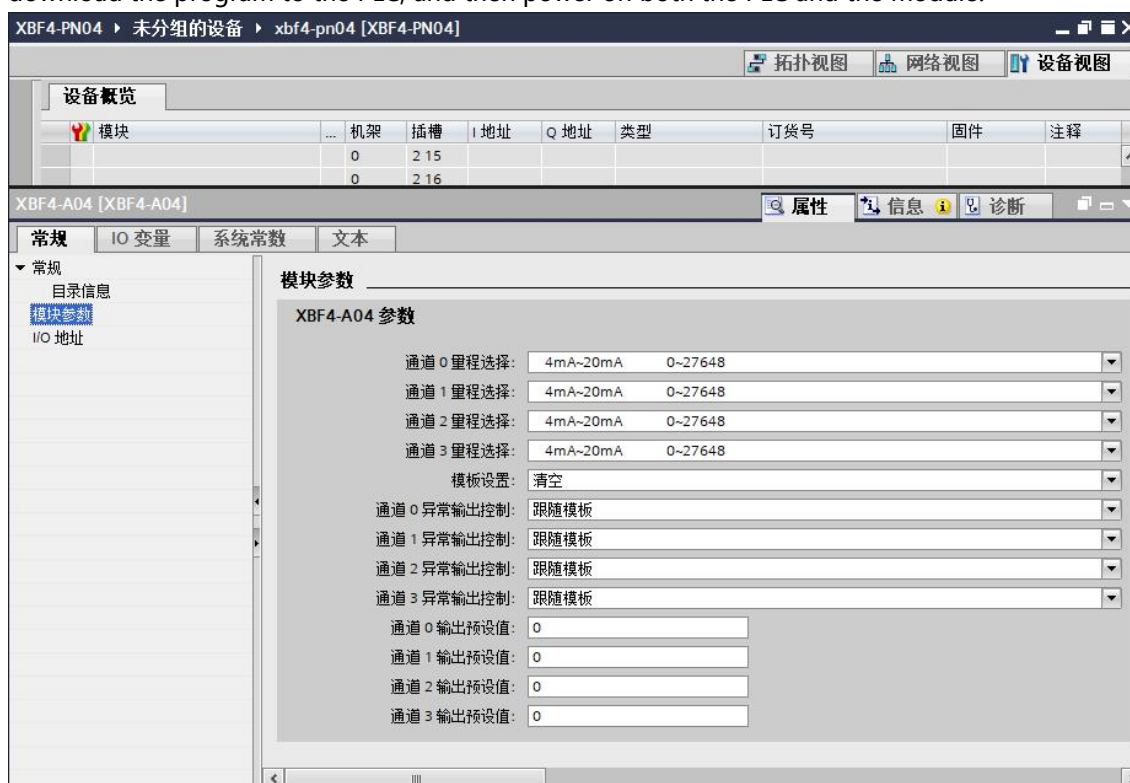
- d. On the XBF4-A40 properties page, click "Module Parameters," as shown in the image below. The parameters can be configured according to actual usage needs. After configuration, re-download the program to the PLC, and then power on both the PLC and the module.



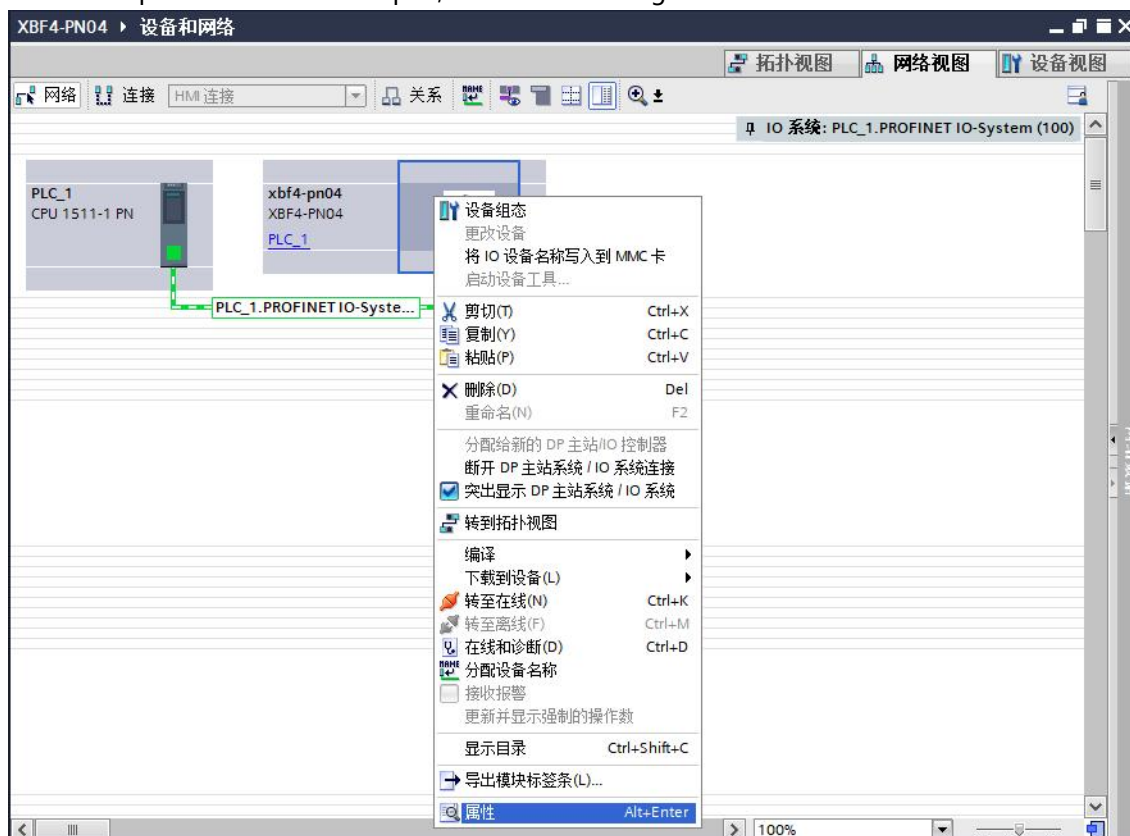
- e. Right-click the XBF4-A04 module and click the "Properties" button to view and set various parameters of the analog output module, as shown in the figure below.



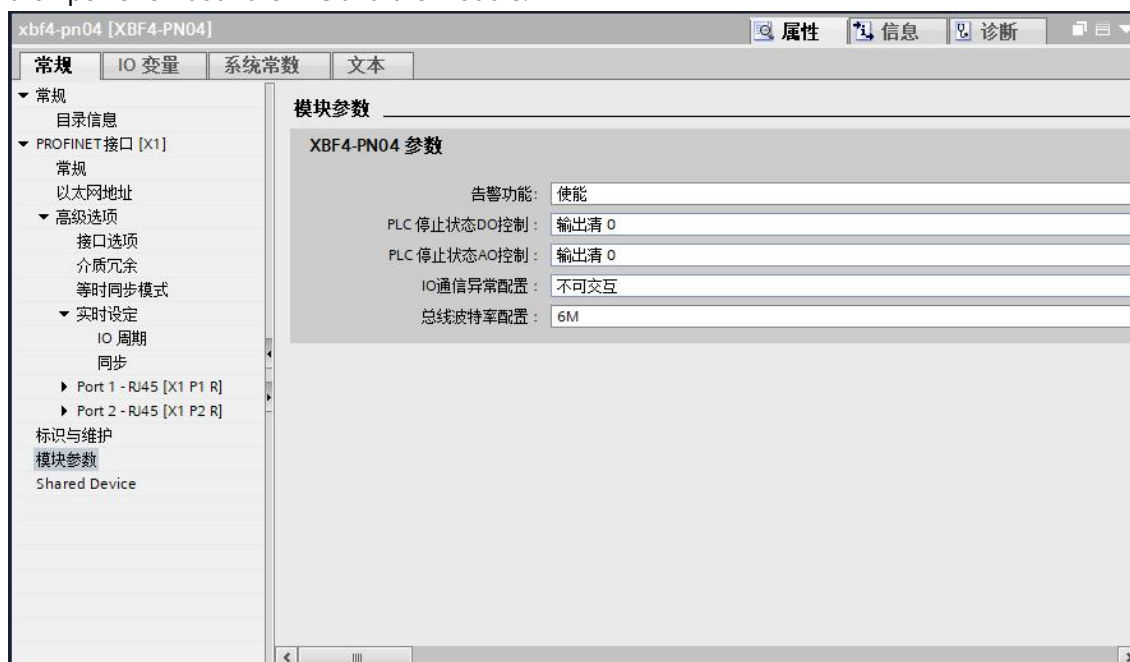
- f. On the XBF4-A04 properties page, click "Module Parameters," as shown in the image below. The parameters can be configured according to actual usage needs. After configuration, re-download the program to the PLC, and then power on both the PLC and the module.



- g. 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.

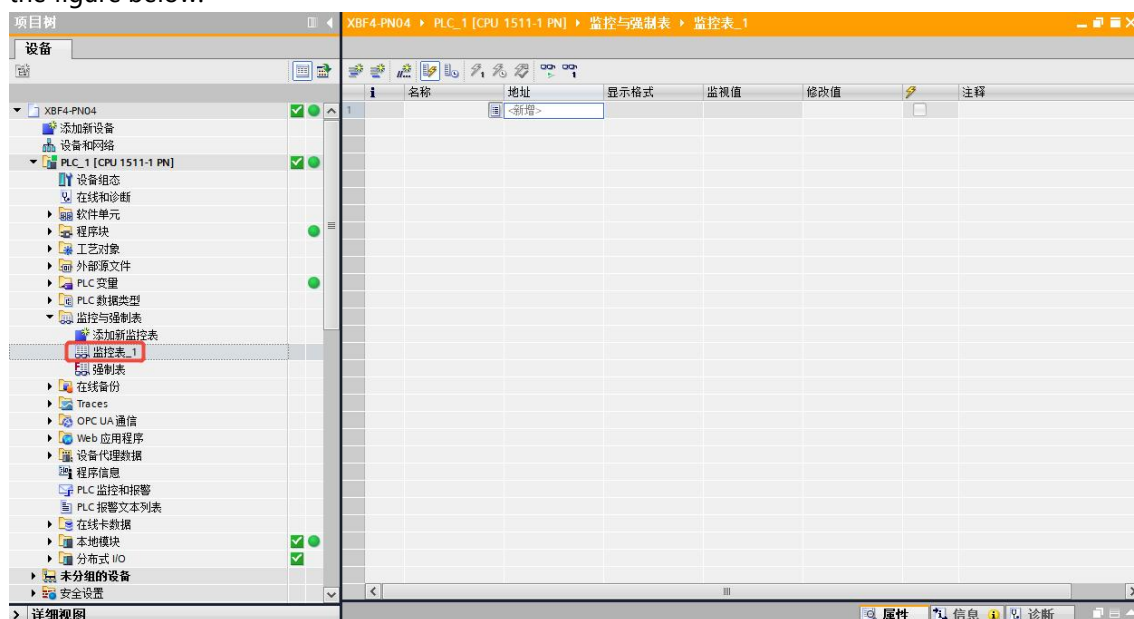


- h. On the coupler properties page, click "Module Parameters," as shown in the image below. The four parameters—alarm function enable/disable, PLC stop status AO and DO output control, IO communication exception configuration, and baud rate configuration—can be configured according to actual usage needs. 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.

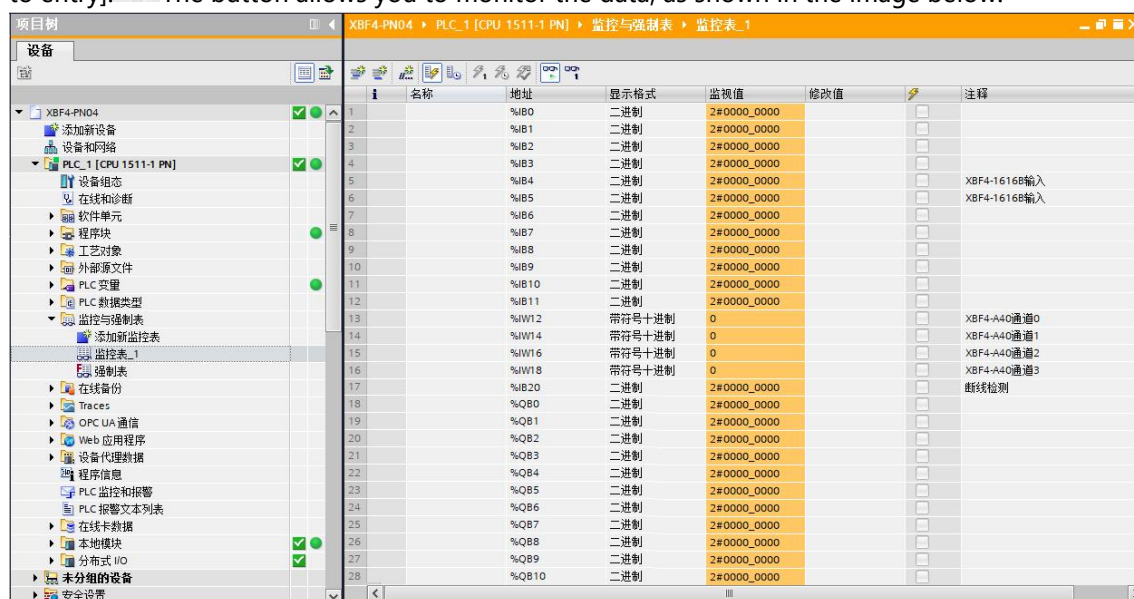


- b. Open "Device View" to view the channel I address (channel address of input signal) and Q address (channel address of output signal) of each module in the device overview. For example, the "I address" of the XBF4-1616B module is 4 to 5, and the "Q address" is 8 to 9, as shown in the figure below.

XBF4-PN04 > 未分组的设备 > xbf4-pn04 [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	
xbf4-pn04	0	0			XBF4-PN04	XBF4-PN04	V1.0.f	
PN-IO	0	0 X1			PNIO			
XBF4-PORT1_1	0	1			XBF4-PORT1		1.0	
XBF4-3200	0	1 1	0...3		XBF4-3200			
XBF4-0032A	0	1 2		0...3	XBF4-0032A			
	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			XBF4-PORT2		1.0	
XBF4-0032B	0	2 1		4...7	XBF4-0032B			
XBF4-1616B	0	2 2	4...5	8...9	XBF4-1616B			
	0	2 3						

- c. In the address cells of the monitoring table, enter the input/output channel addresses, such as "IB0" to "IB20", "QB0" to "QB19", 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.



名称	地址	显示格式	监视值	修改值	注释
%B0	%B0	二进制	2#0000_0000		
%B1	%B1	二进制	2#0000_0000		
%B2	%B2	二进制	2#0000_0000		
%B3	%B3	二进制	2#0000_0000		
%B4	%B4	二进制	2#0000_0000		XBF4-1616B输入
%B5	%B5	二进制	2#0000_0000		XBF4-1616B输入
%B6	%B6	二进制	2#0000_0000		
%B7	%B7	二进制	2#0000_0000		
%B8	%B8	二进制	2#0000_0000		
%B9	%B9	二进制	2#0000_0000		
%B10	%B10	二进制	2#0000_0000		
%B11	%B11	二进制	2#0000_0000		
%W12	%W12	带符号十进制	0		XBF4-A40通道0
%W14	%W14	带符号十进制	0		XBF4-A40通道1
%W16	%W16	带符号十进制	0		XBF4-A40通道2
%W18	%W18	带符号十进制	0		XBF4-A40通道3
%B20	%B20	二进制	2#0000_0000		断线检测
%Q80	%Q80	二进制	2#0000_0000		
%Q81	%Q81	二进制	2#0000_0000		
%Q82	%Q82	二进制	2#0000_0000		
%Q83	%Q83	二进制	2#0000_0000		
%Q84	%Q84	二进制	2#0000_0000		
%Q85	%Q85	二进制	2#0000_0000		
%Q86	%Q86	二进制	2#0000_0000		
%Q87	%Q87	二进制	2#0000_0000		
%Q88	%Q88	二进制	2#0000_0000		
%Q89	%Q89	二进制	2#0000_0000		
%Q810	%Q810	二进制	2#0000_0000		

Note: If Open Detected is 1 (2#0001), it means that a disconnection was detected in Channel 0 voltage/current mode.

If the Open Detected value is 2 (2#0010), it means that a disconnection has been detected in Channel 1 voltage/current mode.

If the Open Detected value is 4 (2#0100), it means that a disconnection has been detected in Channel 2 voltage/current mode.

If the Open Detected value is 8 (2#1000), it means that a disconnection has been detected in Channel 3 voltage/current mode.

When multiple channels alarm, the alarms are summed. If Open Detected is 3 (2#0011), it means that a disconnection was detected in the voltage/current mode of Channel 0 and Channel 1.

If Open Detected is 15 (2#1111), it means that a disconnection was detected in the voltage/current mode of Channel 0~Channel 3.

- d. Taking input channels 0 and 1 of the XBF4-1616B 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 channel can be forcibly controlled by modifying the monitoring value, as shown in the figure below.

项目树

XBF4-PN04 > PLC_1 [CPU 1511-1 PN] > 监控与强制表 > 监控表_1

设备

XBF4-PN04

添加新设备

设备和网络

PLC_1 [CPU 1511-1 PN]

设备组态

在线和诊断

软件单元

程序块

工艺对象

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添加新监控表

强制表

在线备份

Traces

OPC UA 通信

Web 应用程序

设备代理数据

程序信息

PLC 监控和报警

PLC 报警文本列表

在线卡数据

本地模块

分布式 I/O

未分组的设备

安全设置

名称	地址	显示格式	监视值	修改值	注释
1	%IB0	二进制	2#0000_0000		
2	%IB1	二进制	2#0000_0000		
3	%IB2	二进制	2#0000_0000		
4	%IB3	二进制	2#0000_0000		
5	%IB4	二进制	2#0000_0011		XBF4-1616B输入
6	%IB5	二进制	2#0000_0000		XBF4-1616B输入
7	%IB6	二进制	2#0000_0000		
8	%IB7	二进制	2#0000_0000		
9	%IB8	二进制	2#0000_0000		
10	%IB9	二进制	2#0000_0000		
11	%IB10	二进制	2#0000_0000		
12	%IB11	二进制	2#0000_0000		
13	%IW12	带符号十进制	0		XBF4-A40通道0
14	%IW14	带符号十进制	0		XBF4-A40通道1
15	%IW16	带符号十进制	0		XBF4-A40通道2
16	%IW18	带符号十进制	0		XBF4-A40通道3
17	%IB20	二进制	2#0000_0000		断线检测
18	%QB0	二进制	2#0000_0000		
19	%QB1	二进制	2#0000_0000		
20	%QB2	二进制	2#0000_0000		
21	%QB3	二进制	2#0000_0000		
22	%QB4	二进制	2#0000_0000		
23	%QB5	二进制	2#0000_0000		
24	%QB6	二进制	2#0000_0000		
25	%QB7	二进制	2#0000_0000		
26	%QB8	二进制	2#0000_0000		XBF4-1616B输出
27	%QB9	二进制	2#0000_0011	2#0000_0011	XBF4-1616B输出
28	%QB10	二进制	2#0000_0000		

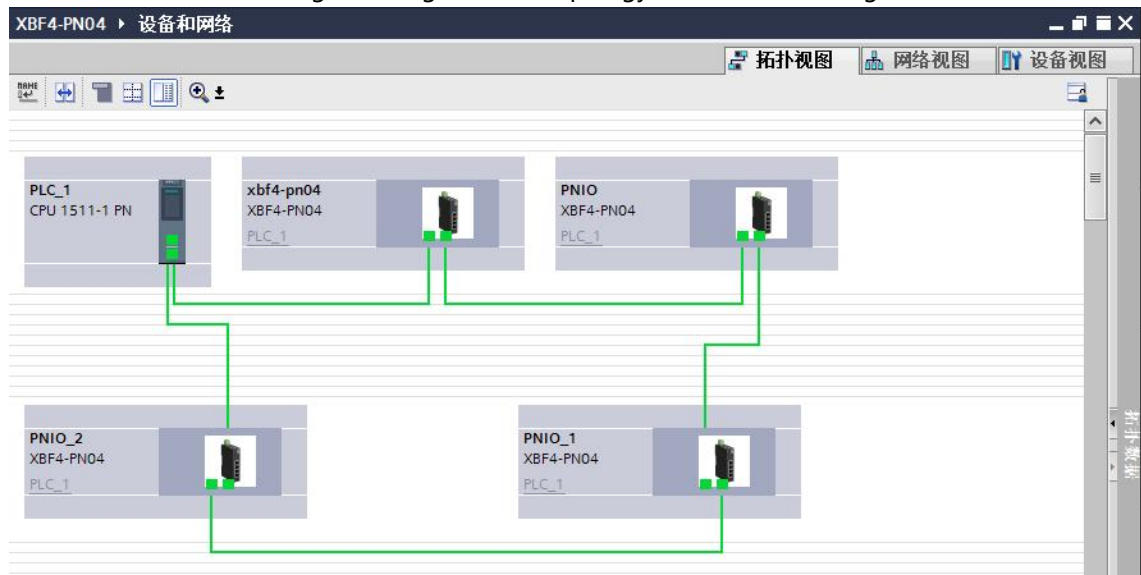
6.6.2 Ring network redundancy configuration application

1、Preparation

- **Hardware environment**
 - **Module preparation:** This instruction uses the XBF4-PN04+XBF4-PN04+XBF4-PN04+XBF4-PN04 network topology as an example.
 - **One computer, pre-installed with TIA Portal V17 software.**
 - **One Siemens PLC is required. This instruction manual uses the Siemens S7-1500 CPU 1511-1 PN as an example.**
 - **Special shielded cable**
 - **One switching power supply**
 - **Device configuration file**
Configuration file retrieval address:
<https://www.solidotech.com/cn/resources/configuration-files>
- **Hardware configuration and wiring**
Please follow the instructions [4 Installation and Removal](#) and [5. Wiring](#) "Required Operation"

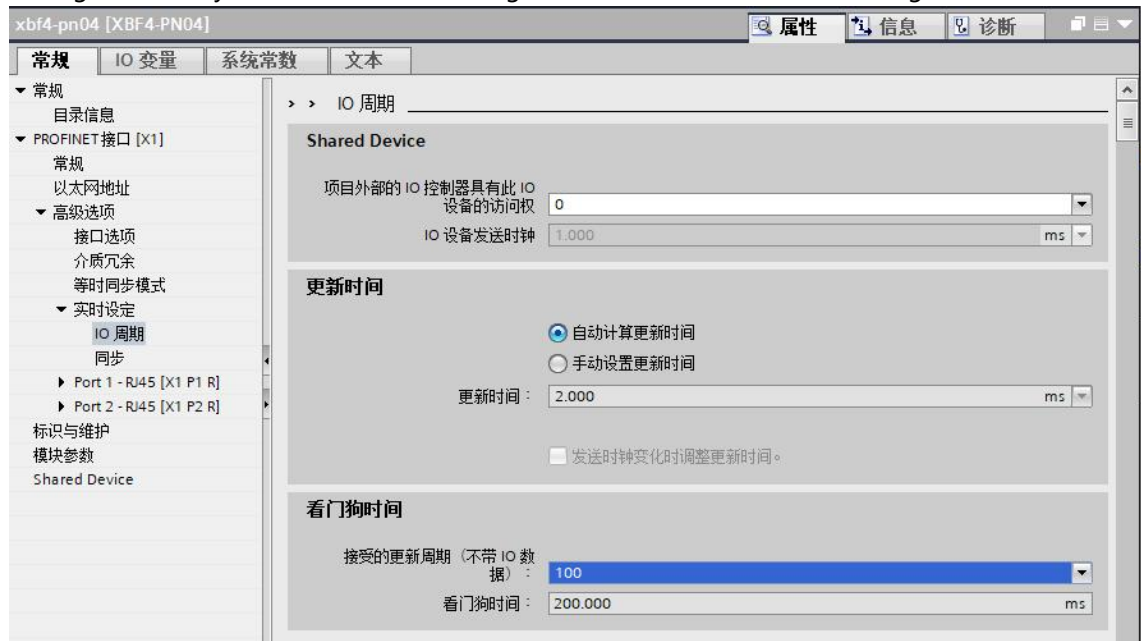
2、Ring network redundancy

- a. Create a project in TIA Portal V17 software and add the PLC+ XBF4-PN04+XBF4-PN04+XBF4-PN04+XBF4-PN04 network topology to the network configuration. The steps for configuring the file and adding devices are the same as in section 6.6.1.
- b. Create a topology configuration in the topology view, connecting the two interfaces of each device end to end to configure a ring network topology, as shown in the figure below.

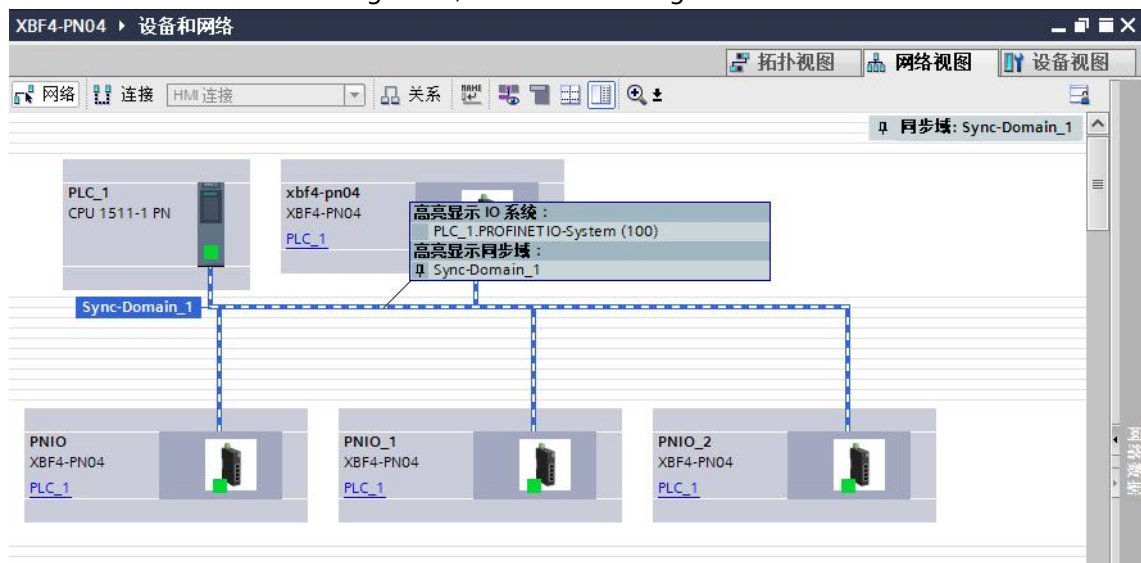


- c. Assign a device name to each device (PLC and coupler) in the network view.

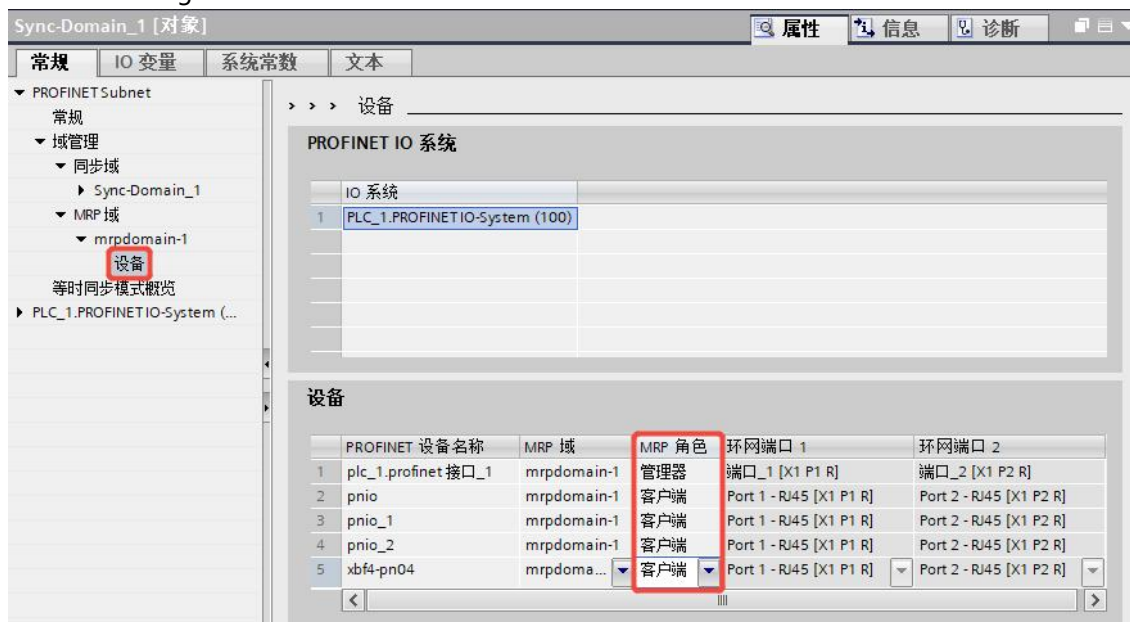
- d. Set the IO cycle for each device (PLC and coupler). Taking the coupler as an example, right-click the coupler icon in the network view, click the "Properties" button, find the watchdog time setting in the IO cycle, and set the watchdog time to 200ms, as shown in the figure below.



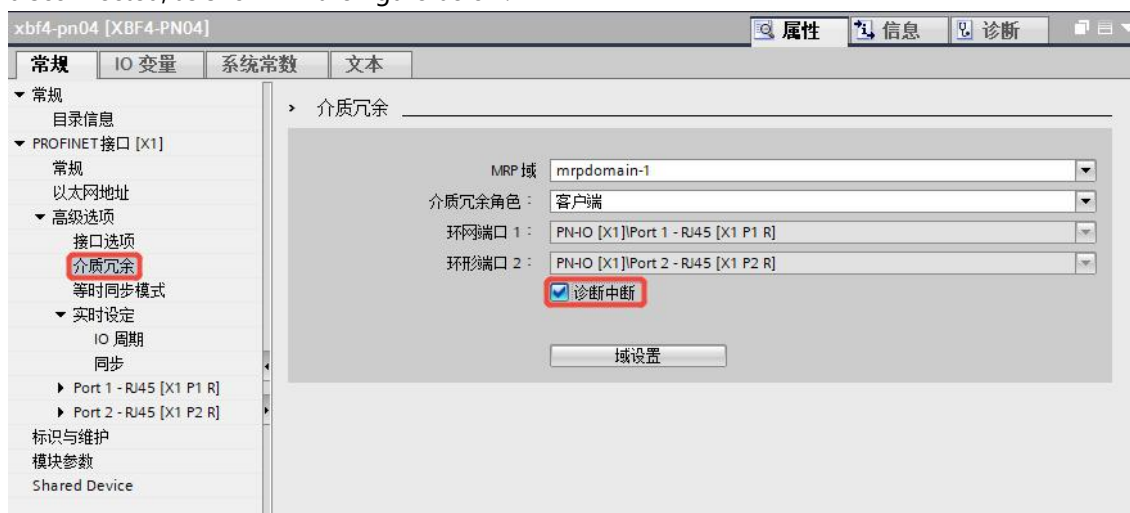
- e. In the network view, highlight the synchronization domain. Click on the synchronization domain network to enter domain management, as shown in the figure below.



- f. On the MRP domain management page, assign MRP roles and ring network ports to each device. In this example, the PLC is set as the manager and the coupler is set as the client, as shown in the figure below.



- g. After compiling and downloading the program, check the device status in the online topology view to see if it is normal.
- h. If the diagnostic interruption function is selected, a diagnostic interruption will be generated when there is a wiring or port error on the ring network port or when the ring network is disconnected, as shown in the figure below.



- i. In the topology view, you can quickly identify the point of failure when a port is faulty or a device malfunctions.