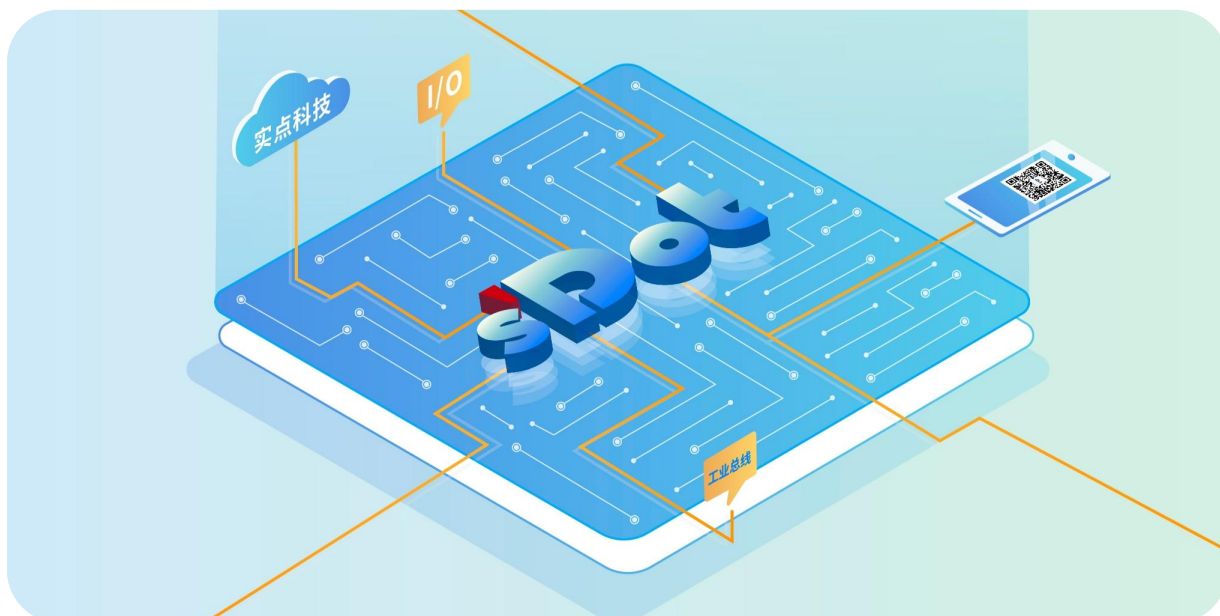




XBF4-EC04A Coupler

XBF4 Series Discrete I/O Modules

User Manual



Nanjing Solidot Electronic Technology Co., Ltd.

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Table of contents

1	Product Overview	1
1.1	Product Introduction	1
1.2	Product Features	1
1.3	Application methods	2
2	Naming Rules	5
2.1	Naming Rules	5
2.1.1	Coupler naming rules	5
2.1.2	I/O module naming rules	6
2.2	Module list	7
3	Module Introduction	8
3.1	EtherCAT coupler	8
3.1.1	Panel structure	8
3.1.2	Indicator light function	9
3.1.3	Product Parameters	11
3.1.3.1	Interface parameters	11
3.1.3.2	Power parameters	11
3.1.3.3	General parameters	12
3.1.4	Power wiring diagram	13
3.1.5	Bus wiring	13
3.1.6	Expansion interface wiring	14
3.1.7	Outline dimension drawing	14
3.2	Digital I/O modules	15
3.2.1	Panel structure	15
3.2.2	Indicator light function	15
3.2.3	Rotary DIP switch	16
3.2.4	Technical parameters	18
3.2.4.1	Digital input module parameters	18
3.2.4.2	Digital input/output module parameters	19
3.2.4.3	Digital output module parameters	20
3.2.4.4	General technical parameters	20
3.2.5	Discrete I/O expansion interface wiring	21

3.2.6	I/O Wiring Diagram	23
3.2.6.1	XBF4-3200	23
3.2.6.2	XBF4-1600	21
3.2.6.3	XBF4-1616A	22
3.2.6.4	XBF4-1616B	23
3.2.6.5	XBF4-0032A	24
3.2.6.6	XBF4-0032B	28
3.2.6.7	XBF4-0016A	29
3.2.6.8	XBF4-0016B	30
3.2.7	Outline dimension drawing	31
3.3	Analog I/O module	33
3.3.1	Panel structure	33
3.3.2	Indicator light function	33
3.3.3	Rotary DIP switch	34
3.3.4	Technical parameters	36
3.3.4.1	Analog current & voltage compatible input module parameters	36
3.3.4.2	Analog current & voltage compatible output module parameters	37
3.3.4.3	General technical parameters	37
3.3.5	Analog Current & Voltage Compatible Module Parameters	38
3.3.5.1	Current & Voltage Compatible Input Module Range Selection Table	38
3.3.5.2	Current & Voltage Compatible Output Module Range Selection Table	38
3.3.5.3	Current & Voltage Compatible Input Module Code Value Table	39
3.3.5.4	Current & Voltage Compatible Output Module Code Value Table	43
3.3.6	Discrete I/O expansion interface wiring	46
3.3.7	I/O Wiring Diagram	47
3.3.7.1	XBF4-A80	47
3.3.7.2	XBF4-A40	48
3.3.7.3	XBF4-A08	49
3.3.7.4	XBF4-A04	50
3.3.8	Outline dimension drawing	51
4	Installation and removal	53
4.1	Installation Guide	53
4.2	Installation and disassembly steps	54
4.3	Installation and disassembly diagram	55
5	Wiring	59
5.1	Terminal blocks	59

5.2	Wiring instructions and requirements	60
6	Use	62
6.1	Parameter Description	62
6.1.1	Digital input filtering	62
6.1.2	Clear/Hold digital output signal	63
6.1.3	Analog range settings	63
6.1.4	Analog input filtering	63
6.1.5	Analog output signal clear/hold	64
6.1.6	Analog signal power-off retention	64
6.1.7	Discrete I/O baud rate settings	65
6.2	Process data	66
6.2.1	Coupler process data	66
6.3	Fault code information	66
6.3.1	Coupler general fault codes	66
6.3.2	Fault Code Viewing	68
6.4	EtherCAT coupler configuration application	69
6.4.1	Application in the TwinCAT3 software environment	69
6.4.2	Application in CODESYS V3.5 software environment	88
6.4.3	Application in the AutoShop software environment	101
6.5	Firmware online upgrade	114
7	FAQ	119
7.1	Does the EtherCAT slave support ring network redundancy?	119

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 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, analog input modules, and analog output modules.

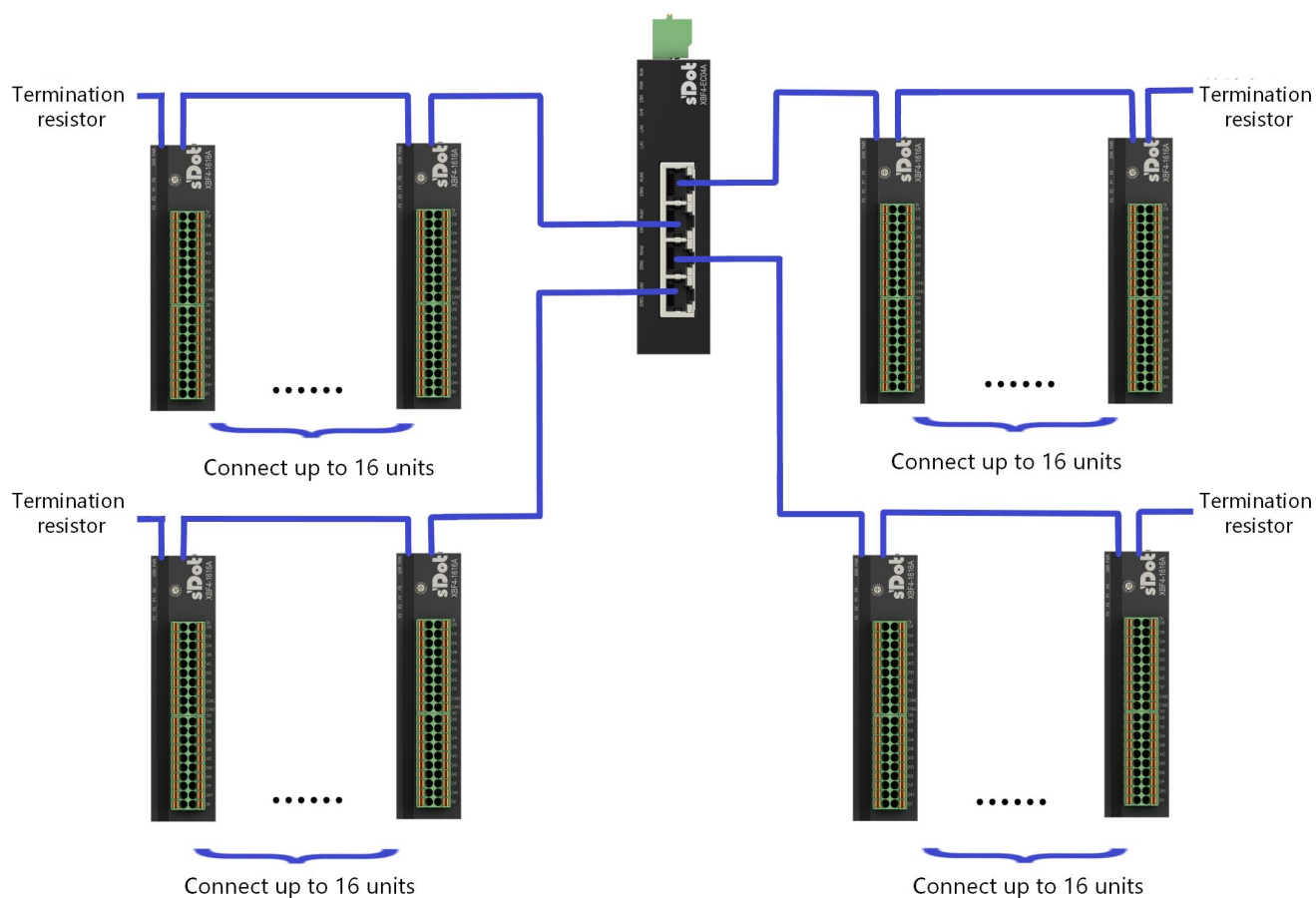
Application method: Application methods that combine modules such as couplers, digital signals, and analog signals.

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.

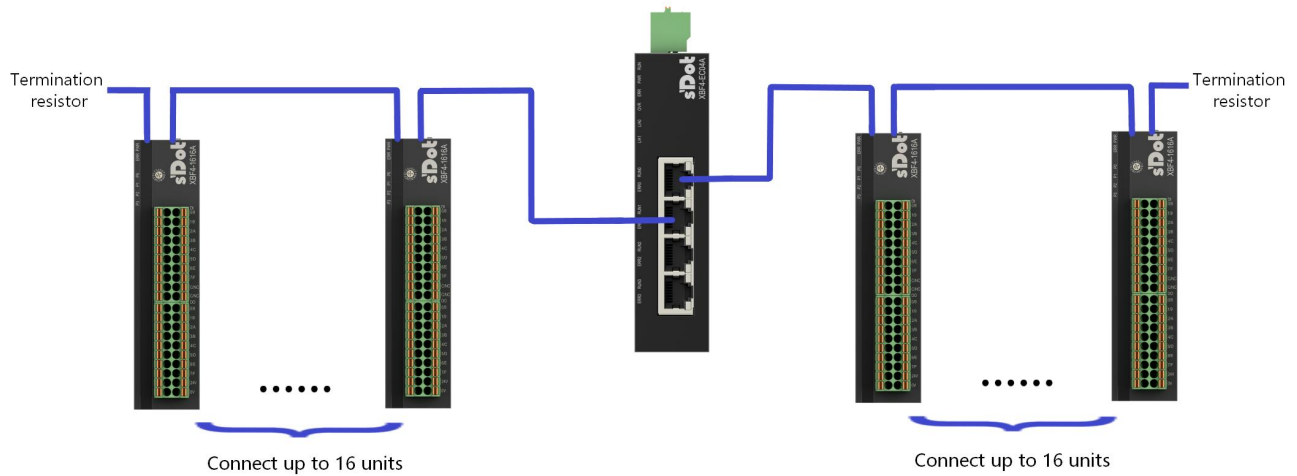
Configuration rules: The bus coupler has four module expansion interfaces (RJ45 type), each of which can serially connect up to 16 modules (module DIP switch station numbers 0~F, which cannot be repeated), and can be expanded to a maximum of 32 XB6S discrete I/O modules.

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 - EC 04 A
(1) (2) (3) (4) (5)

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
(5)	Model subdivision	A: Specifically designed for slotless host computer applications such as CODESYS and AutoShop.

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-EC04A	Integrated Scalable EtherCAT 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 default is 3ms, output is NPN type.	
XBF4-1616B	16-channel digital input/16-channel digital output module Input is NPN/PNP compatible, input filtering default is 3ms, output is PNP type.	
XBF4-0032A	32-channel digital output module, outputting NPN type	
XBF4-0032B	32-channel digital output module, PNP type output	
XBF4-0016A	16-channel digital output module, outputting NPN type	
XBF4-0016B	16-channel digital output module, outputting 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	

⑤	Module indicator and indicator light labels	Indicator module power status and operating status
⑥	Extension module interface	4×RJ45, expansion interface

3.1.2 Indicator light function

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

				communication was abnormal.
ERR0~3	Interface fault indicator light	Red	ON	Interface communication initialization failed or communication anomalies occurred, such as module offline or station number conflict.
			OFF	Expansion module not connected, or communication is normal.

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

3.1.3 Product Parameters

3.1.3.1 Interface parameters

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

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

3.1.3.2 Power parameters

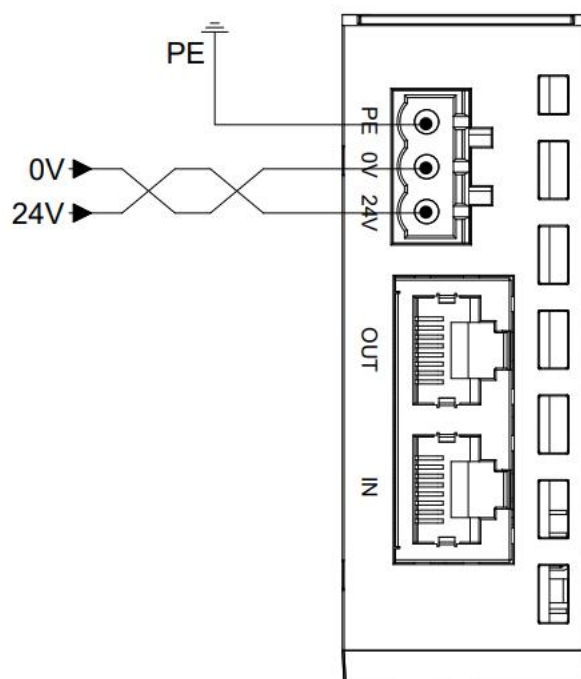
Power parameters	
Input voltage	SELV Input 24VDC (18V~36V)
Input current	<0.95A
Supply current	<500mA (maximum supply current for a single interface) <750mA (maximum supply current for all four interfaces)
Power supply voltage	20VDC~24VDC

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 60068-2-6sinusoidal vibration 5Hz~8.4Hz,3.5mm,8.4Hz~150Hz,1g X/Y/ZTriaxial 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
Module error self-recovery		support
Disconnection check		support
Accessing PDO via SDO		support
diagnosis		support
Alarm		support
Firmware upgrade		support
Short circuit protection		Supports (automatic recovery mechanism)
Reverse connection protection		Supports (automatic recovery mechanism)
Reverse connection protection		support
Surge protection		support

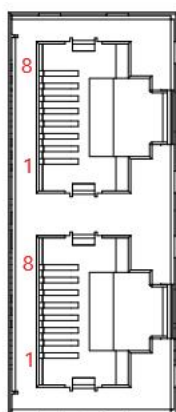
3.1.4 Power wiring diagram

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



3.1.5 Bus wiring

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



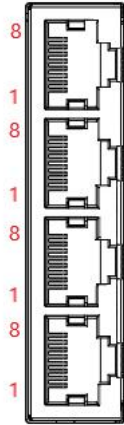
pin number	Signal
1	TD+
2	TD-
3	RD+
4	—
5	—
6	RD-
7	—
8	—

⚠ Precautions

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

3.1.6 Expansion interface wiring

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



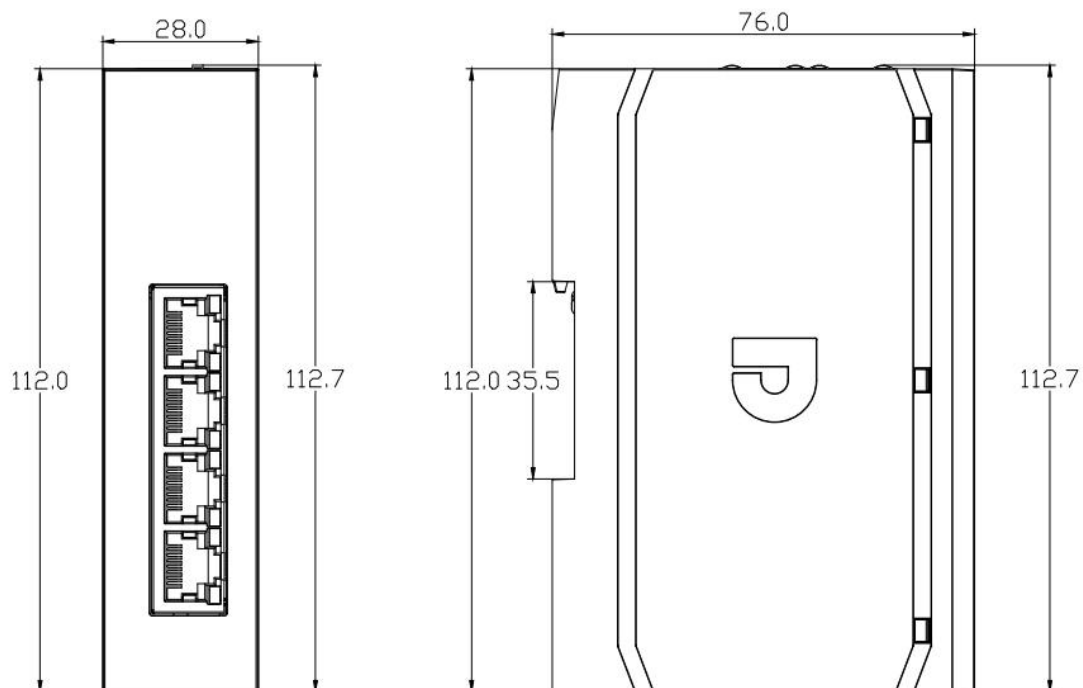
pin number	Signal
1	B
2	A
3	SGND
4	—
5	—
6	S24V
7	—
8	—

Precautions

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

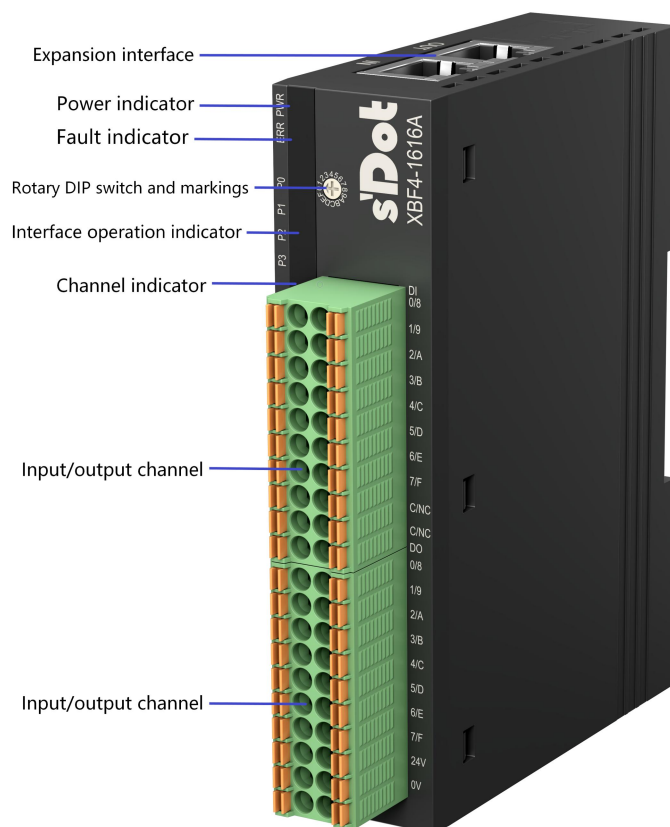
3.1.7 Outline dimension drawing

Coupler dimensions (unit: mm)



3.2 Digital I/O modules

3.2.1 Panel structure



3.2.2 Indicator light function

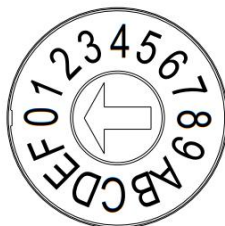
Digital I/O module indicator light definitions				
logo	name	color	state	Status Description
PWR	Power indicator light	Green	ON	The module's internal 3.3V power supply is powered on normally.
			OFF	The module's internal 3.3V power supply is malfunctioning.
ERR	Fault indicator light	Red	ON	Module communication 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 / below 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	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 / below 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	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	Green LED lights	

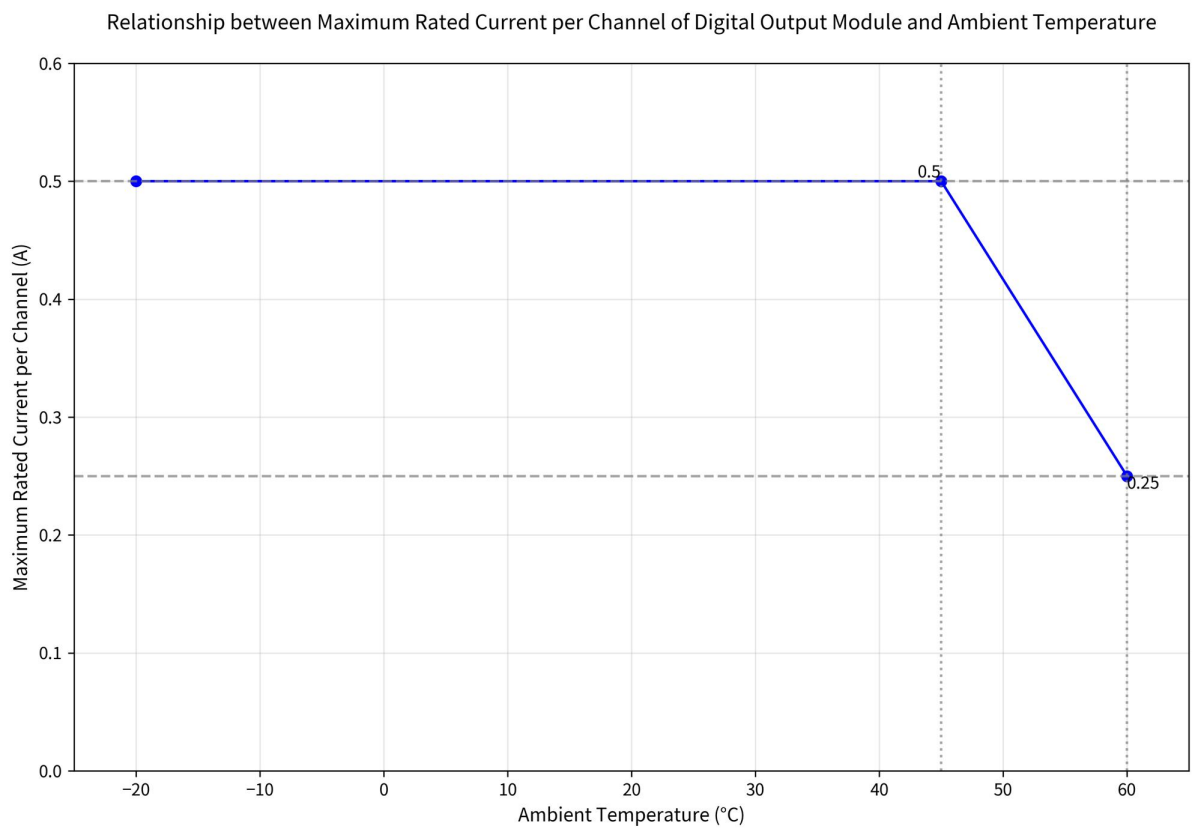
3.2.4.3 Digital output module parameters

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	Green LED lights			

3.2.4.4 General technical parameters

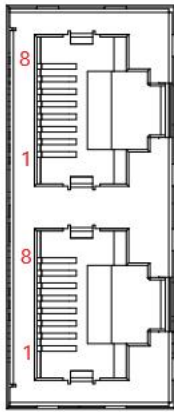
General technical parameters	
Specifications and dimensions	102×25×72mm
weight	125g
Operating temperature	-20°C~+60°C
Storage temperature	-40°C~+80°C
relative humidity	95%, no condensation
Altitude	≤2000m
Pollution level	Level 2
Protection level	IP20

Figure 1:



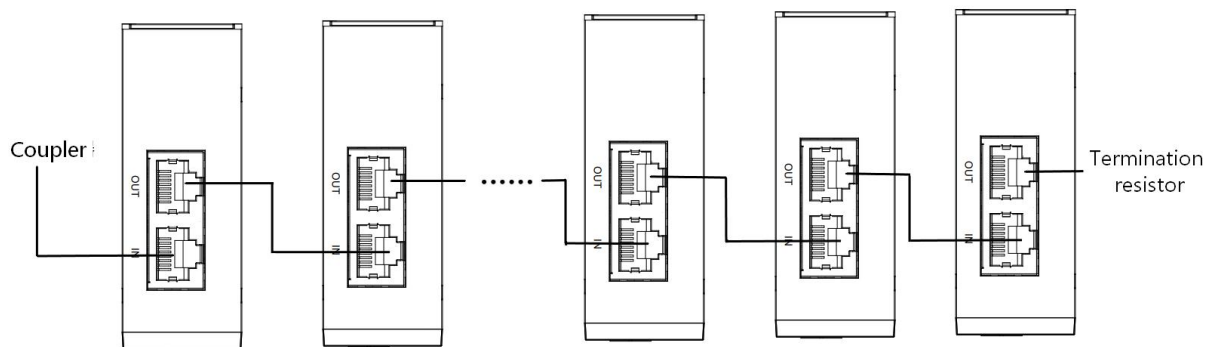
3.2.5 Discrete I/O expansion interface wiring

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.

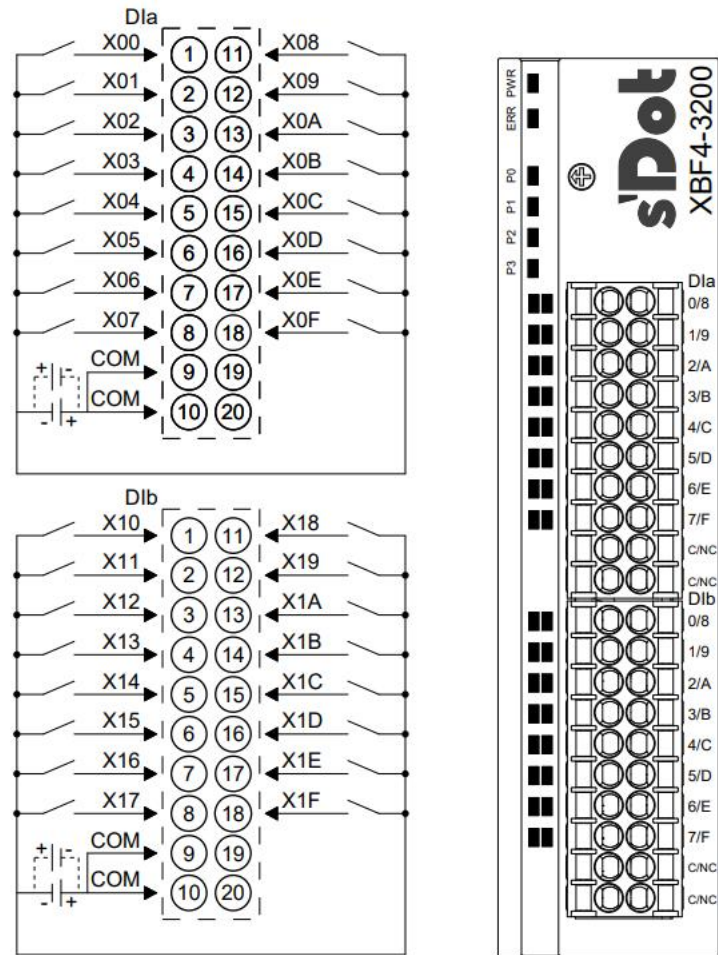


Precautions

- 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.

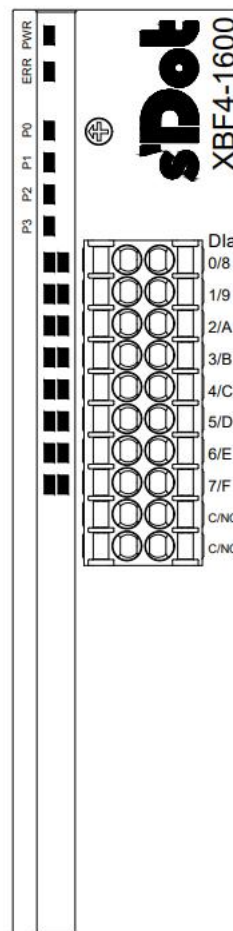
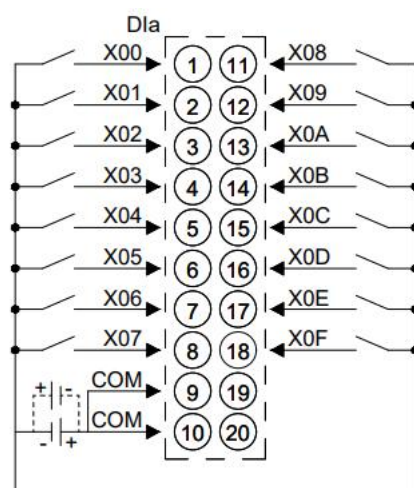
3.2.6 I/O Wiring Diagram

3.2.6.1 XBF4-3200



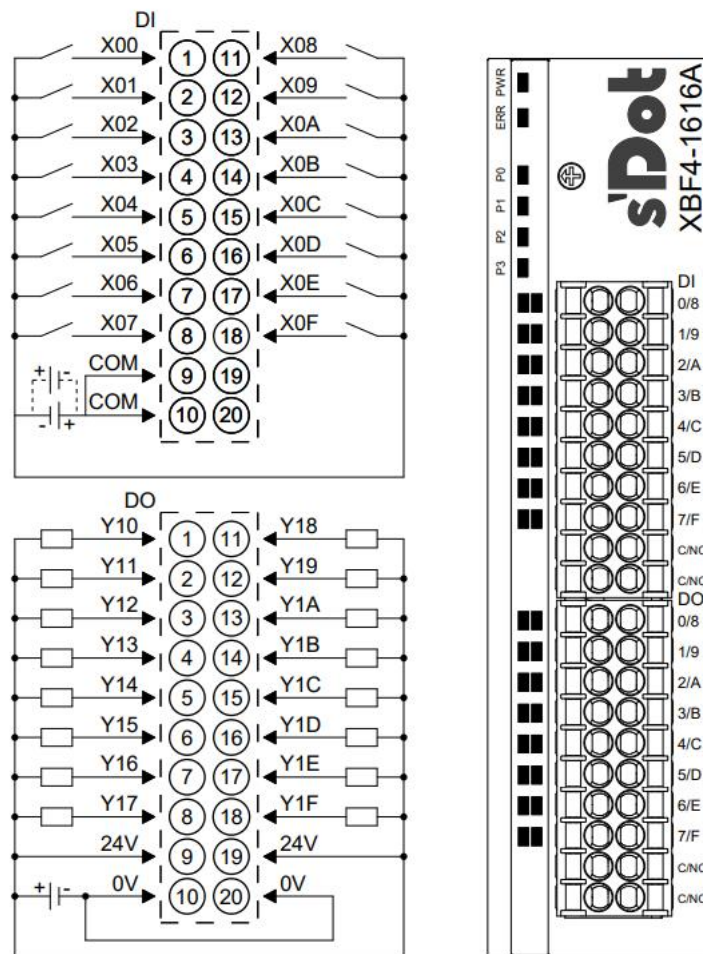
*COM internal communication is possible; DIA and DIB are not interconnected.

3.2.6.2 XBF4-1600



*COM internal conduction

3.2.6.3 XBF4-1616A

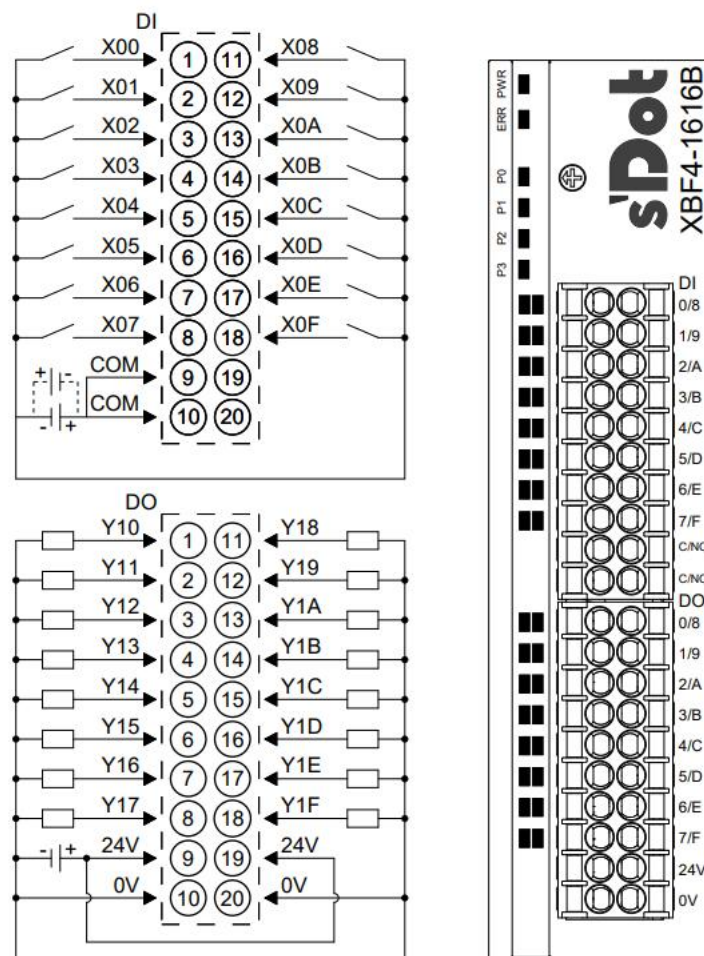


*24V internal conduction; 0V internal conduction; DI and DO are not interconnected.

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

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

3.2.6.4 XBF4-1616B

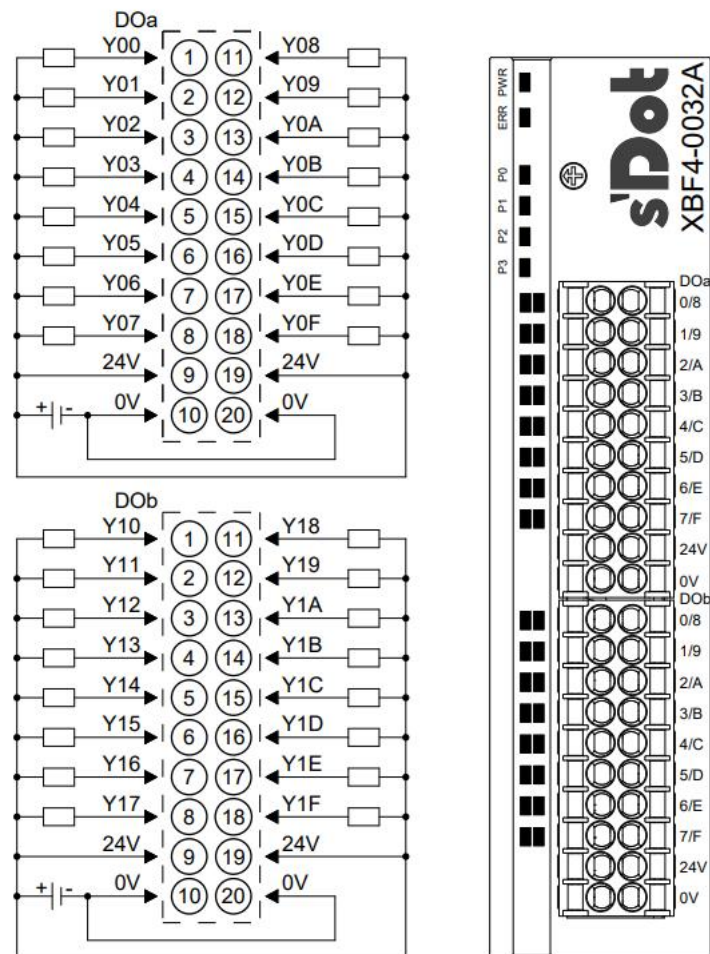


*24V internal conduction; 0V internal conduction; DI and DO are not interconnected.

*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.

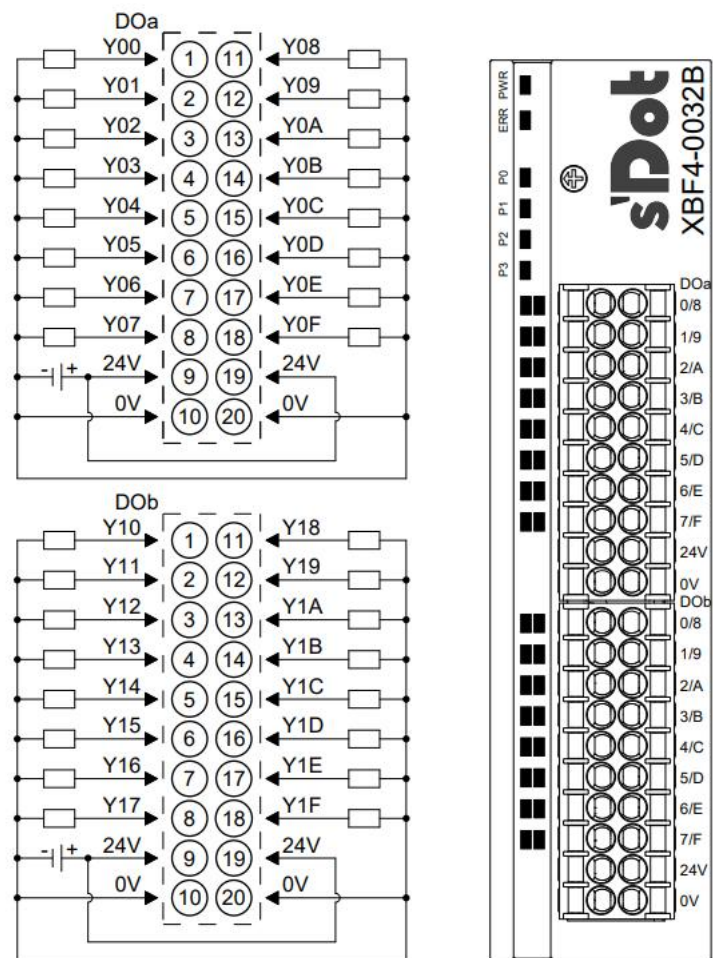
3.2.6.5 XBF4-0032A



*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.

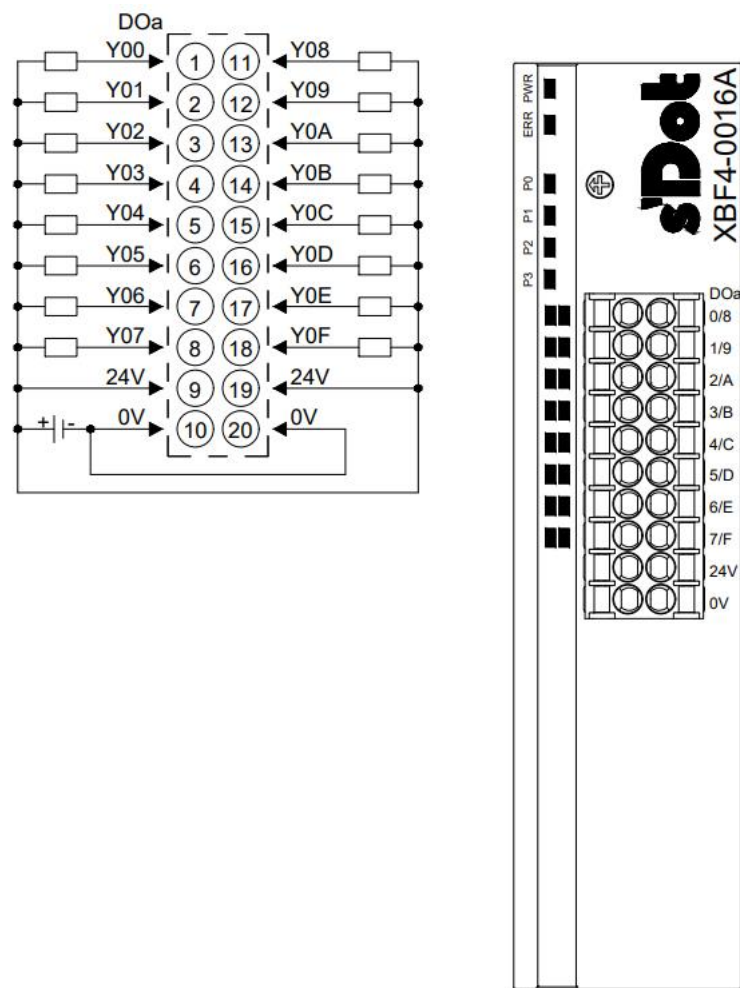
3.2.6.6 XBF4-0032B



*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.

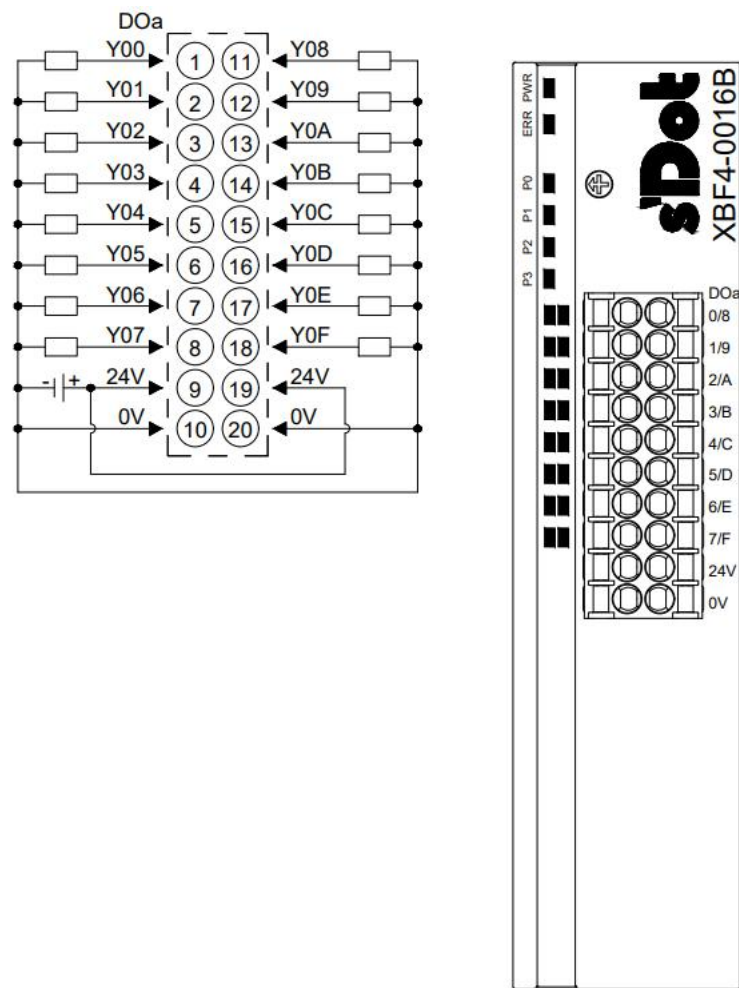
3.2.6.7 XBF4-0016A



*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

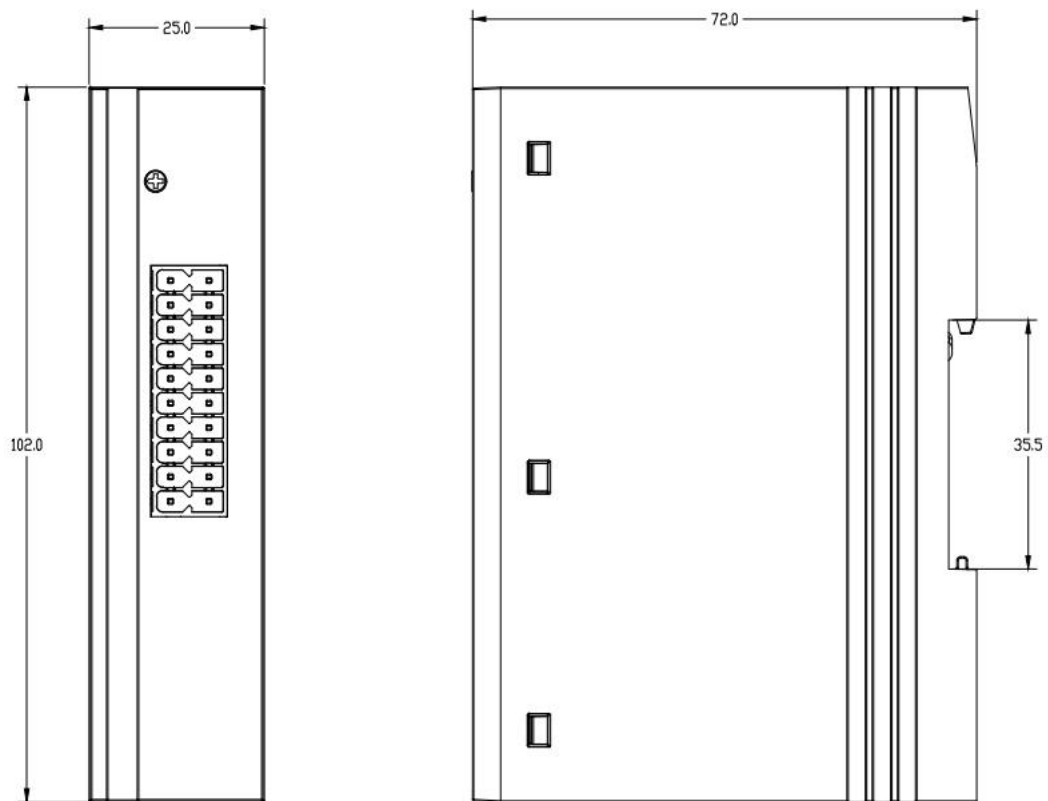


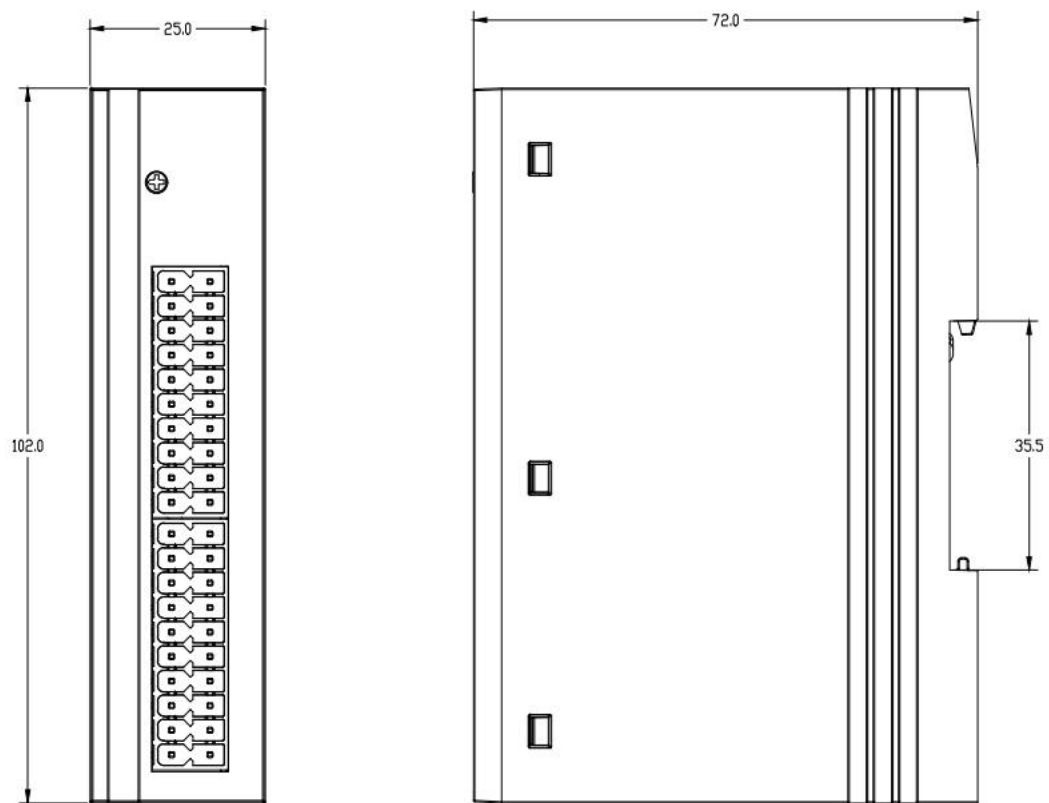
*24V internal conduction; 0V internal conduction

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

3.2.7 Outline dimension drawing

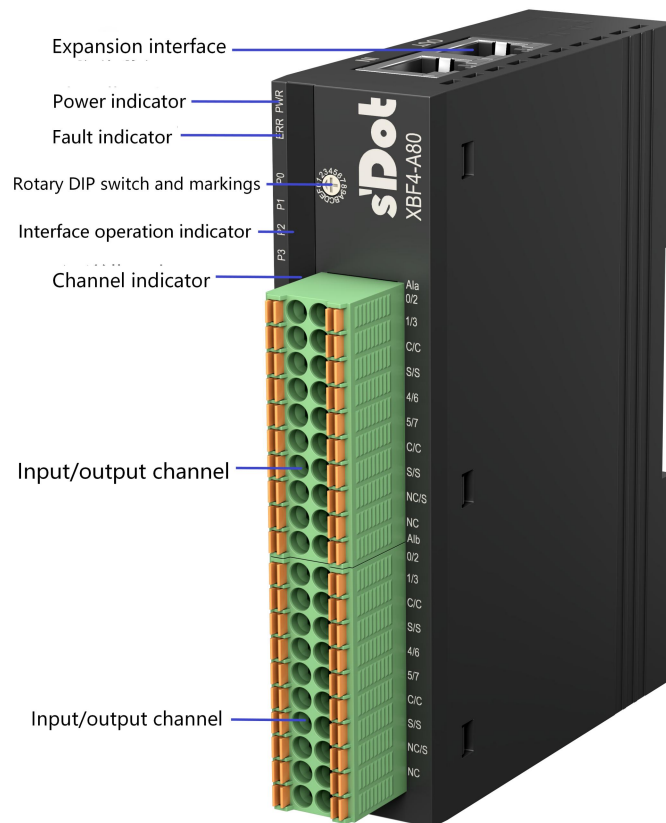
16-channel digital I/O module dimensions (unit: mm)



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

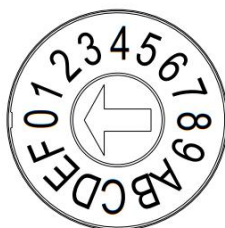
Analog I/O module indicator light definitions				
logo	name	color	state	Status Description
PWR	Power indicator light	green	ON	The module's internal 3.3V power supply is powered on normally.
			OFF	The module's internal 3.3V power supply is malfunctioning.
ERR	Fault indicator light	red	ON	Module communication 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 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.
0~7	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	$\leq 25\text{mA}$	$\leq 20\text{mA}$
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)	$\leq 1\text{ksps}$	
accuracy	$\pm 0.1\%$ at 25°C, $\pm 0.3\%$ over the entire temperature range.	
Input filtering	support	
Smooth series	1~200	
Input impedance (voltage)	$\geq 100\text{k}\Omega$	
Input impedance (current)	$\leq 100\Omega$	
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 $\pm 15\text{V}$ 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	$\pm 30\text{V}$ (voltage) / $\pm 30\text{mA}$ (current)	
Isolation and withstand voltage	500VDC	
Rated current consumption	25mA	20mA
Power consumption	0.6W	0.48W
Channel indicator	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	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 $= (55296/20) \times \text{Voltage}$	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: 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. 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. 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 = $(55296/10) * \text{Voltage}$	code value = $(65535/10) * \text{Voltage}$	code value = $(27648/5) * \text{Voltage}$	code value = $(32767/5) * \text{Voltage}$	code value = $(27648/4) * \text{Voltage} - 6912$
Voltage formula	$\text{Voltage} = (\text{code value} * 10) / 55296$	$\text{Voltage} = (\text{code value} * 10) / 65535$	$\text{Voltage} = (\text{code value} * 5) / 27648$	$\text{Voltage} = (\text{code value} * 5) / 32767$	$\text{Voltage} = (\text{code value} + 6912) * 4 / 27648$

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. $-0.296V \sim 0.296V$. 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 = $(\text{Code value} \times 10) / 32767$

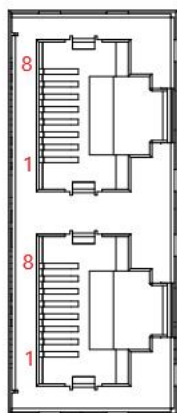
Note: Code values set outside the range for current & voltage compatible output modules will not take effect. For analog output modules, if the preset value of the cleared and retained parameters exceeds the code value range, the preset value will not take effect, and the previous valid value will be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

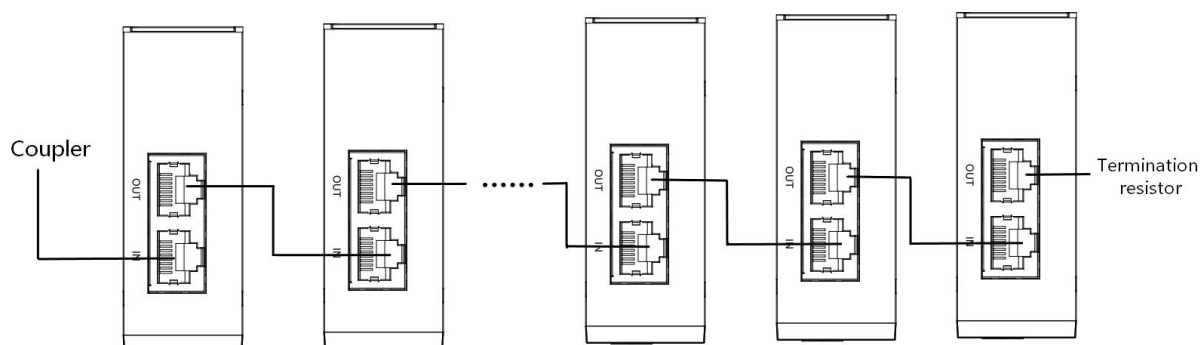
3.3.6 Discrete I/O expansion interface wiring

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.

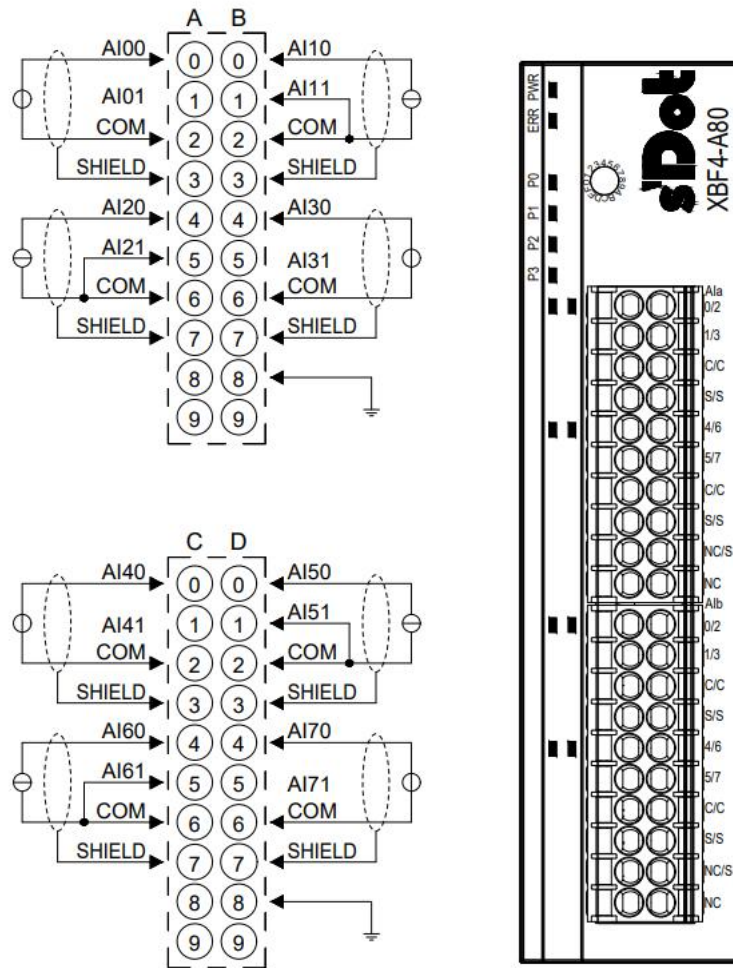


Precautions

- 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



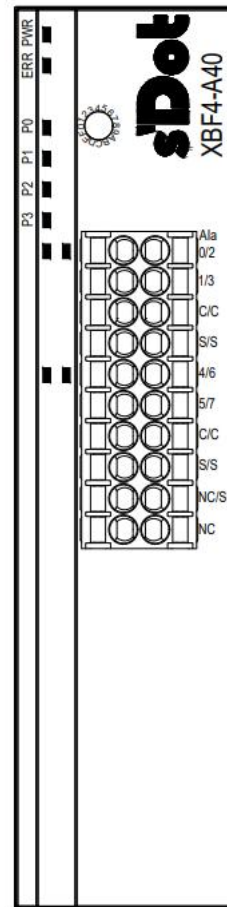
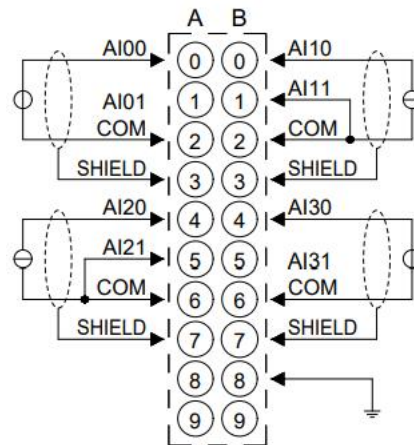
*COM internal conduction, SHIELD internal conduction

*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



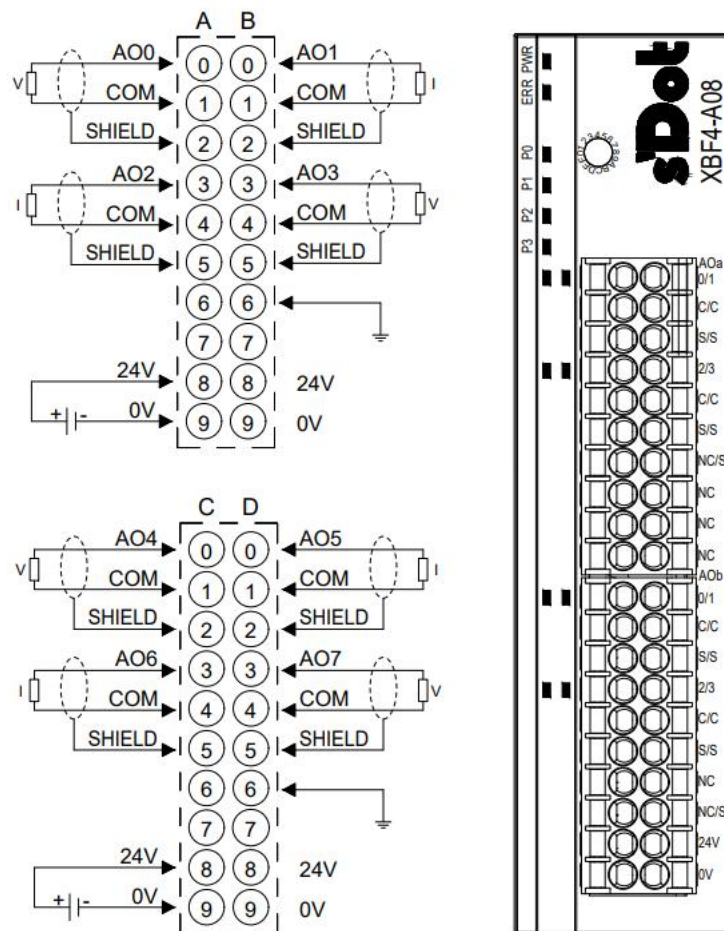
*COM internal conduction, SHIELD internal conduction

*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



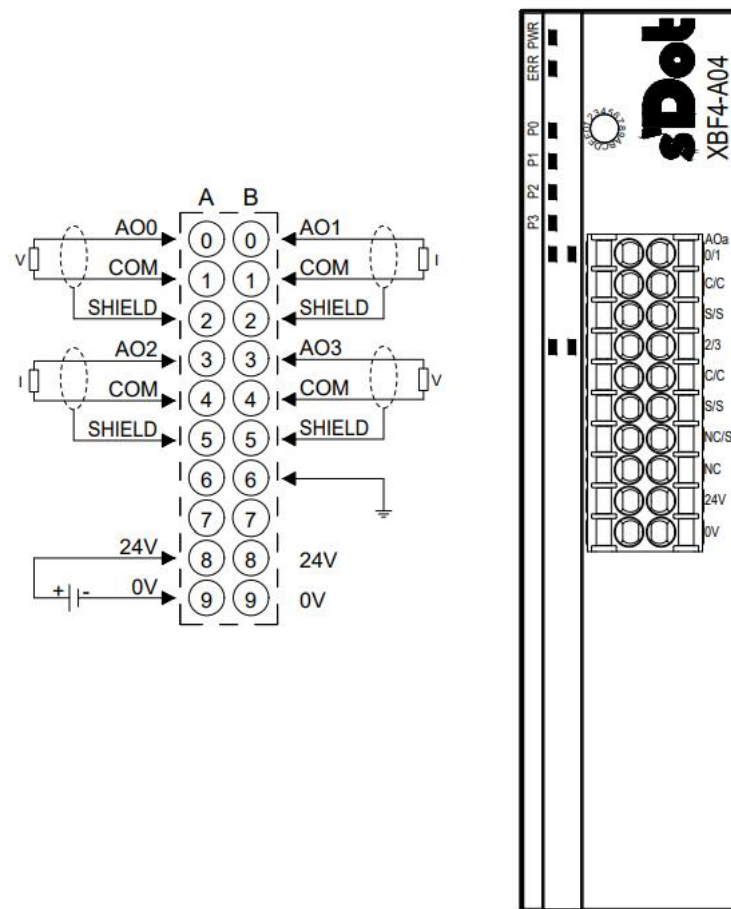
*24V internal conduction, 0V internal conduction

*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



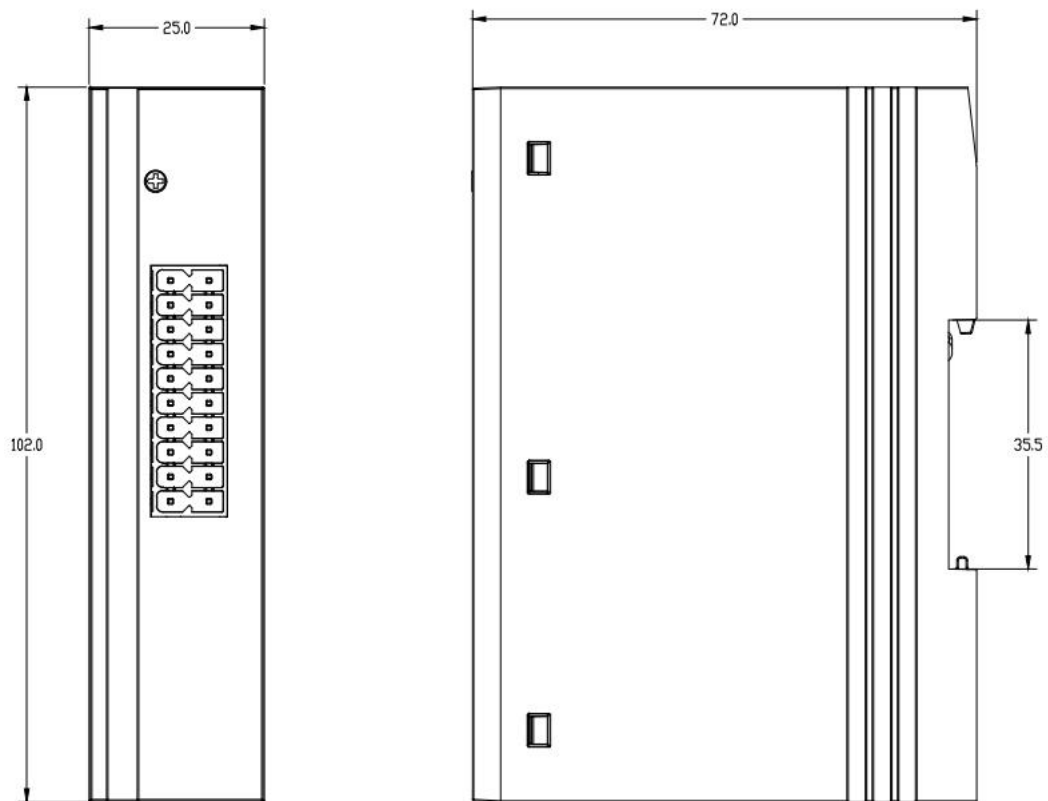
*COM internal conduction, SHIELD internal conduction

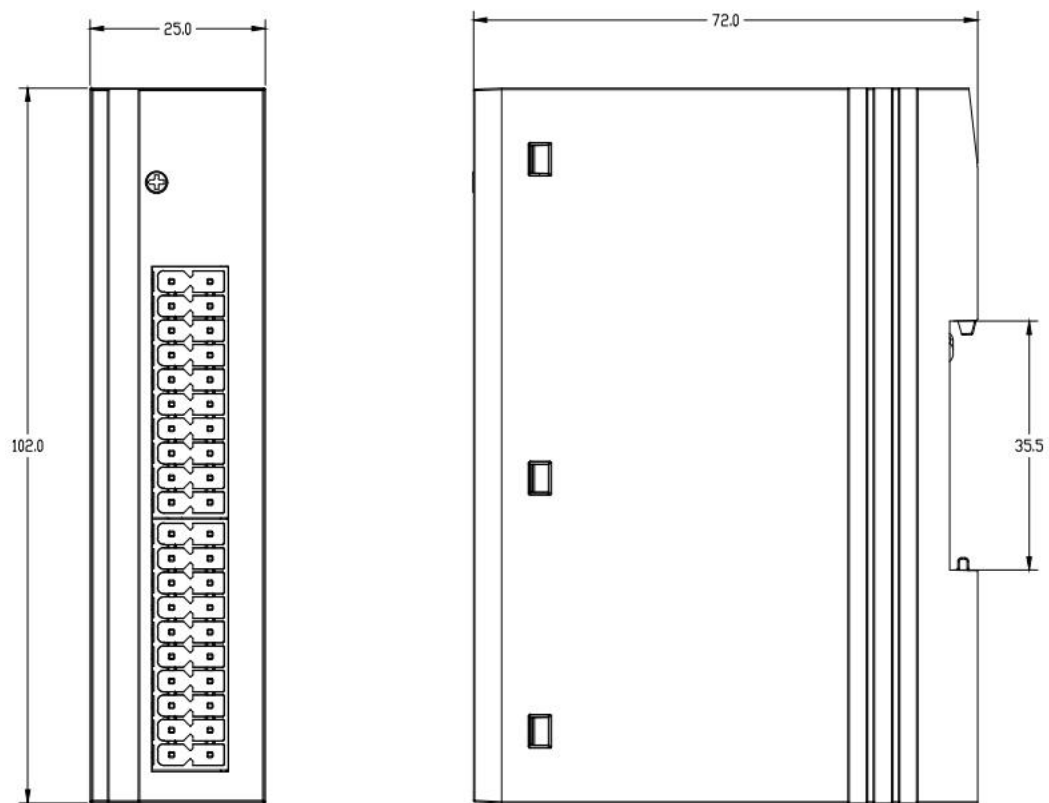
*All channels share the same load source

*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

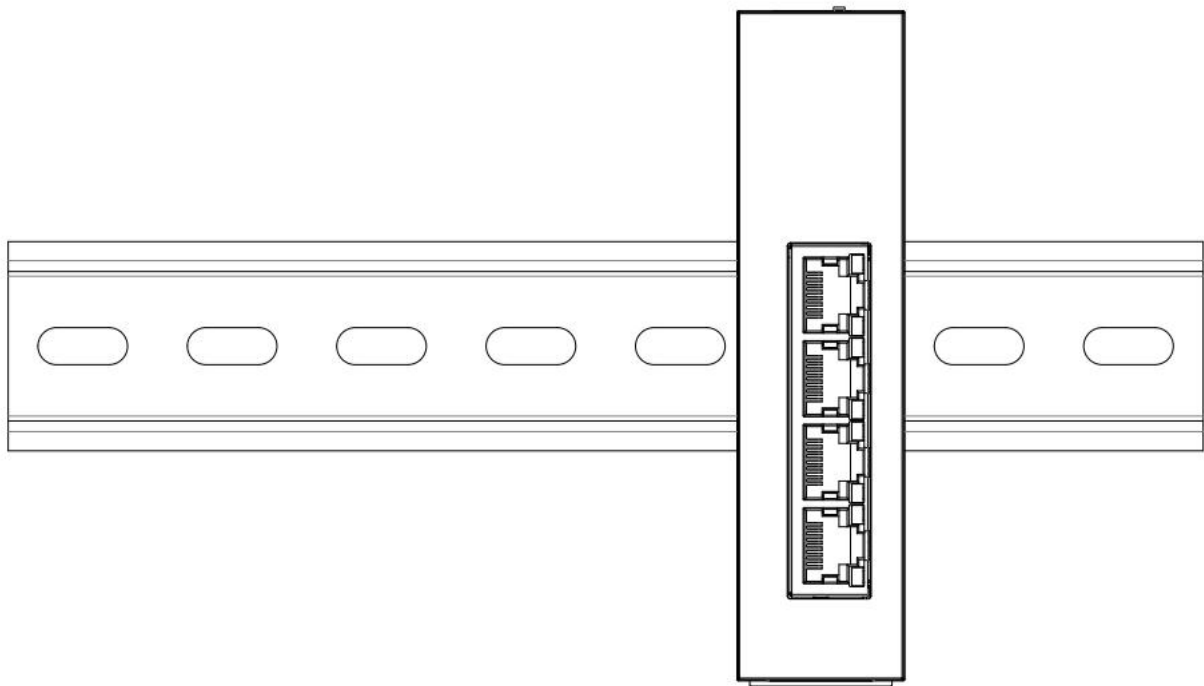
- The module has an IP20 protection rating and must be installed in a cabinet for indoor use.
- Ensure that the server rack has good ventilation (such as installing exhaust fans in the server rack).
- Do not install this device next to or above equipment that may cause overheating.
- Make sure to install 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.



warn

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

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



4.2 Installation and disassembly steps

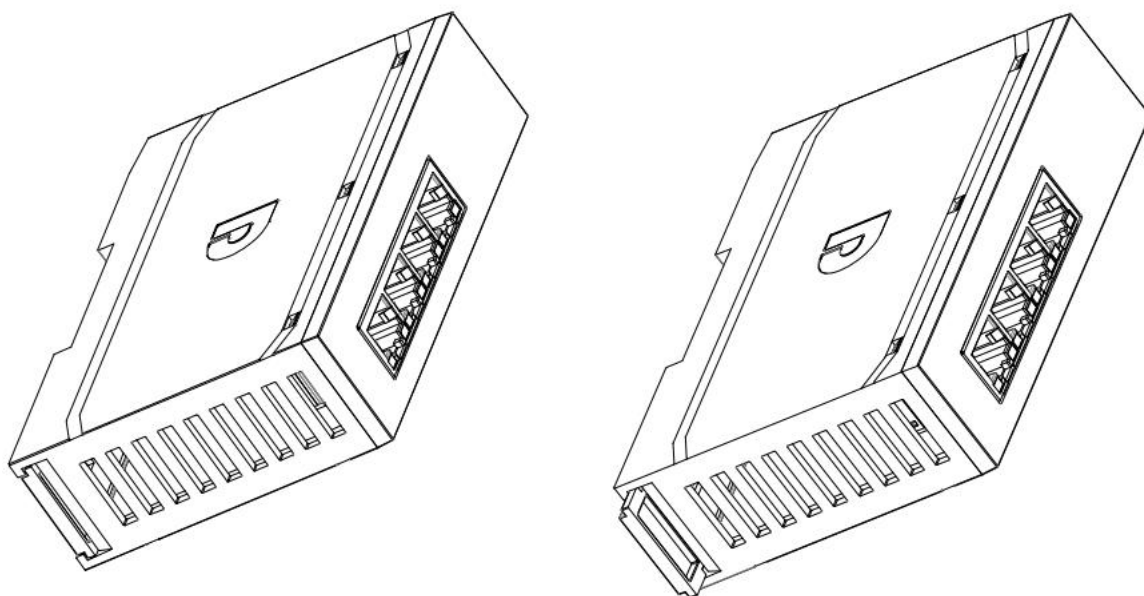
Module installation and removal	
Module installation steps	1. Push the clips at the bottom of the back of the module outwards until you hear a "click" sound.
	2. First, install the coupler module on the fixed guide rail. Align the upper edge of the coupler module slot with the upper edge of the guide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

4.3 Installation and disassembly diagram

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.

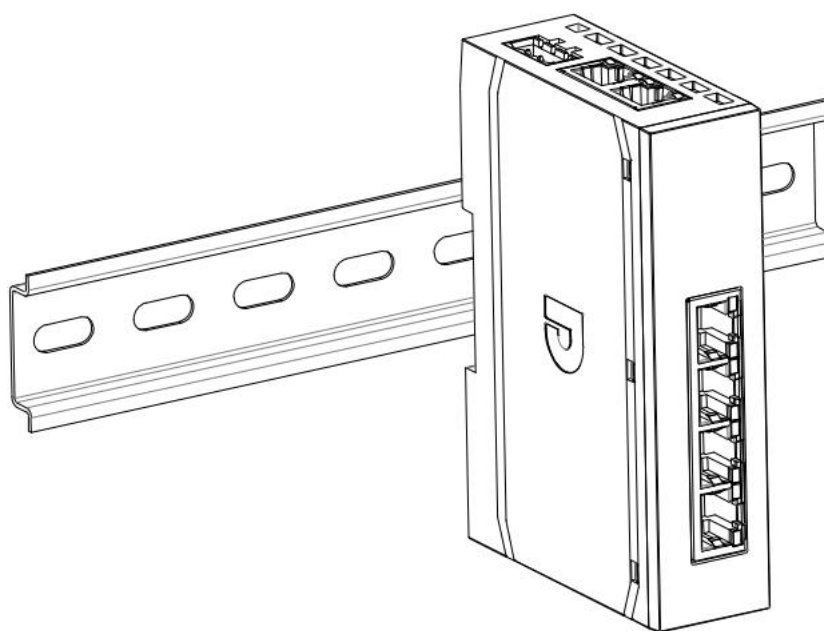
Coupler module installation

- 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.

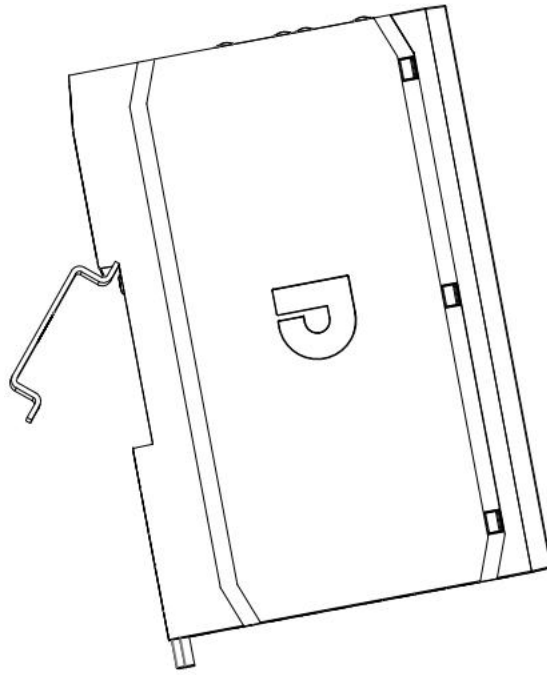


①

- 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.

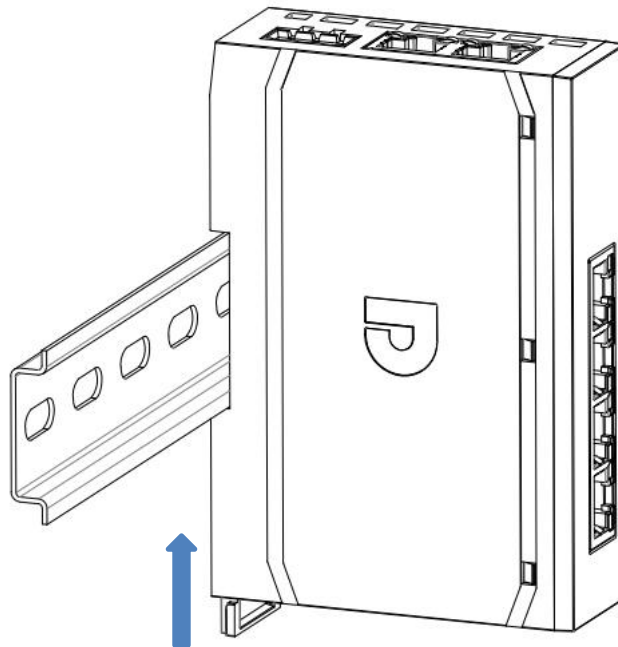


②

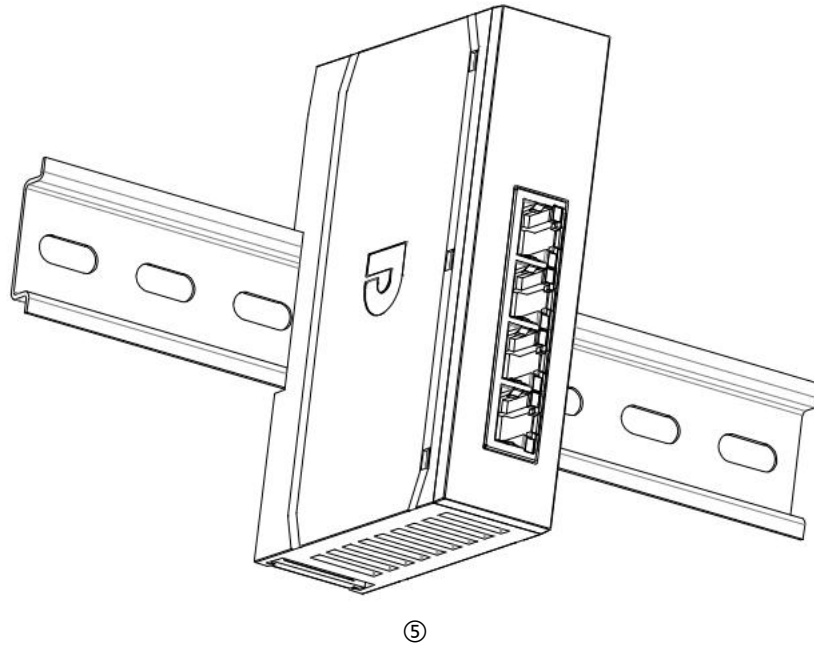


③

- 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.

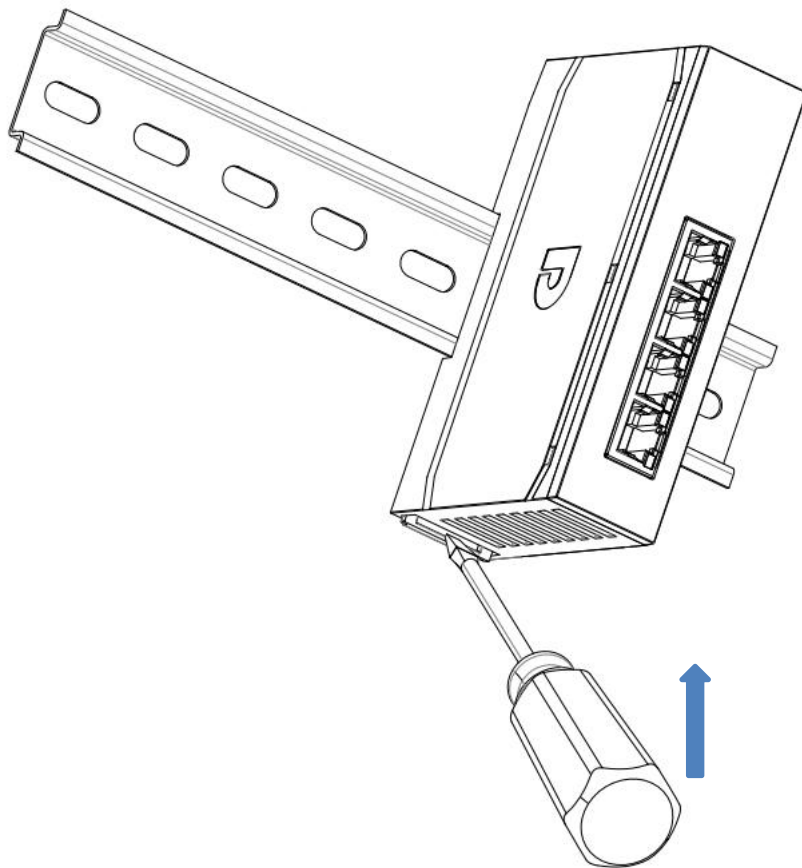


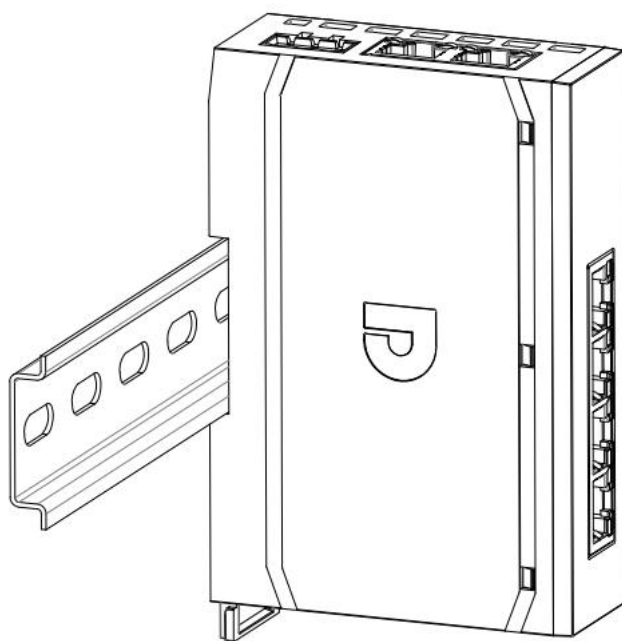
④



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, the module can be removed from the guide rail.





⑦

5 Wiring

5.1 Terminal blocks



Terminal blocks		
XBF4-EC04A 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)

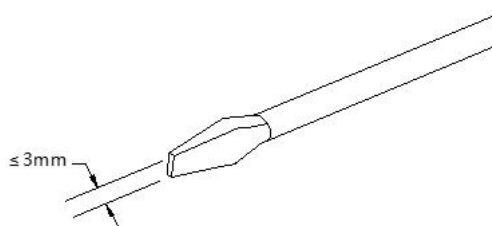
5.2 Wiring instructions and requirements

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

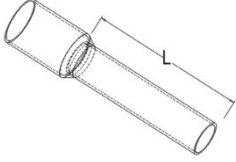
For a single-strand rigid wire, after stripping the wire to the corresponding length, press the button and insert the single-strand wire directly into the corresponding end hole.



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

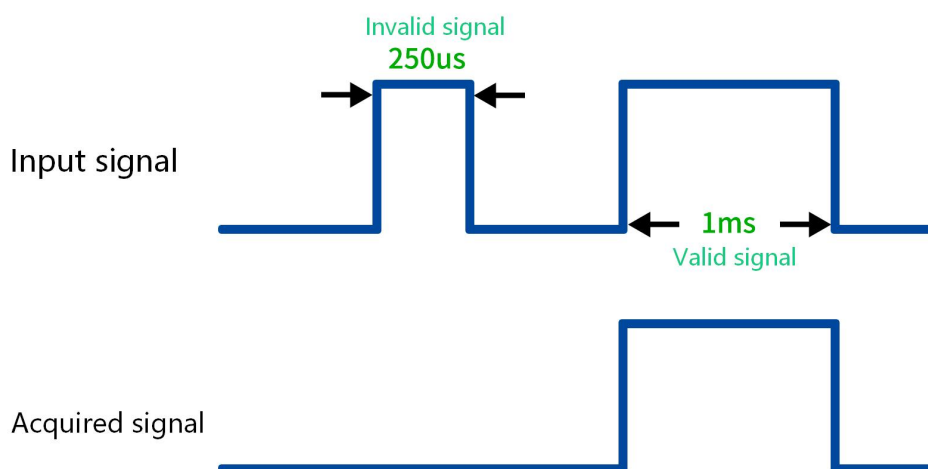
6.1 Parameter Description

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 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](#)).

6.1.4 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.

6.1.5 Analog output signal clear/hold

The Clear/Hold function is for modules with output channels. This function configures the output mode of the output 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.

6.1.6 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.

6.1.7 Discrete I/O baud rate settings

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

This manual uses TwinCAT3 as an example to introduce the parameter configuration method of the XBF4-EC04A coupler + I/O module combination. For detailed steps, please refer to [link/reference].[Parameter settings in section 6.4.1](#) 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

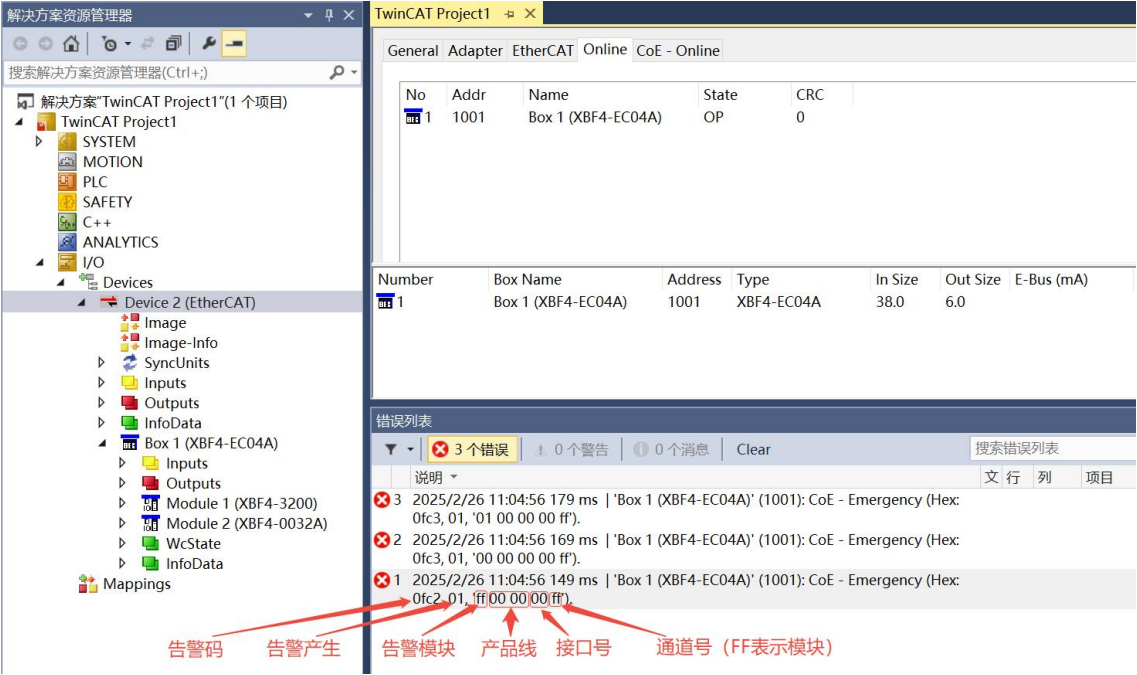
6.3.1 Coupler general fault codes

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.	0000000010000010	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	0000000011000101	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 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: 0fc2, which means communication error or communication timeout. You can check whether there is any abnormality or interference in the module.



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

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

6.4 EtherCAT coupler configuration application

6.4.1 Application in the TwinCAT3 software environment

1、Preparation

- **Hardware environment**

- **Module preparation:** This instruction uses the topology XBF4-EC04A + {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 TwinCAT3 software.**
- **EtherCAT dedicated shielded cable**
- **One switching power supply**
- **Device configuration file**

Configuration file retrieval

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

- **Hardware configuration and wiring**

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

2、Pre-configured configuration files

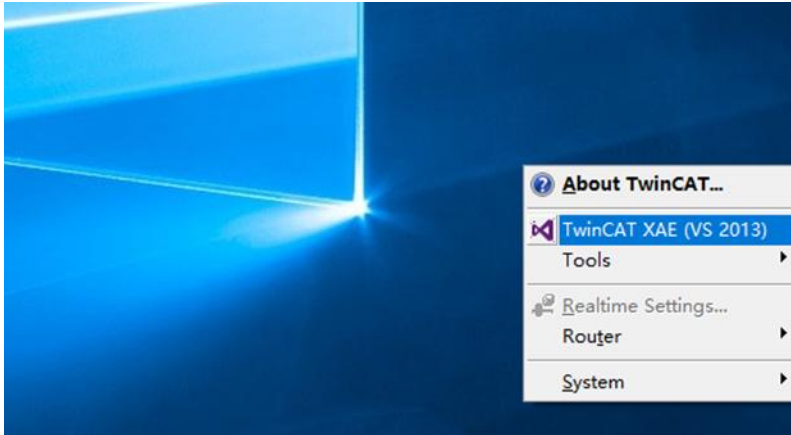
Place the ESI configuration file (EcatTerminal-XBF4_V2.1.0_ENUM.xml) in the TwinCAT installation directory "C:\TwinCAT\3.1\Config\Io\EtherCAT", as shown in the image below.

此电脑 > 本地磁盘 (C:) > TwinCAT > 3.1 > Config > Io > EtherCAT

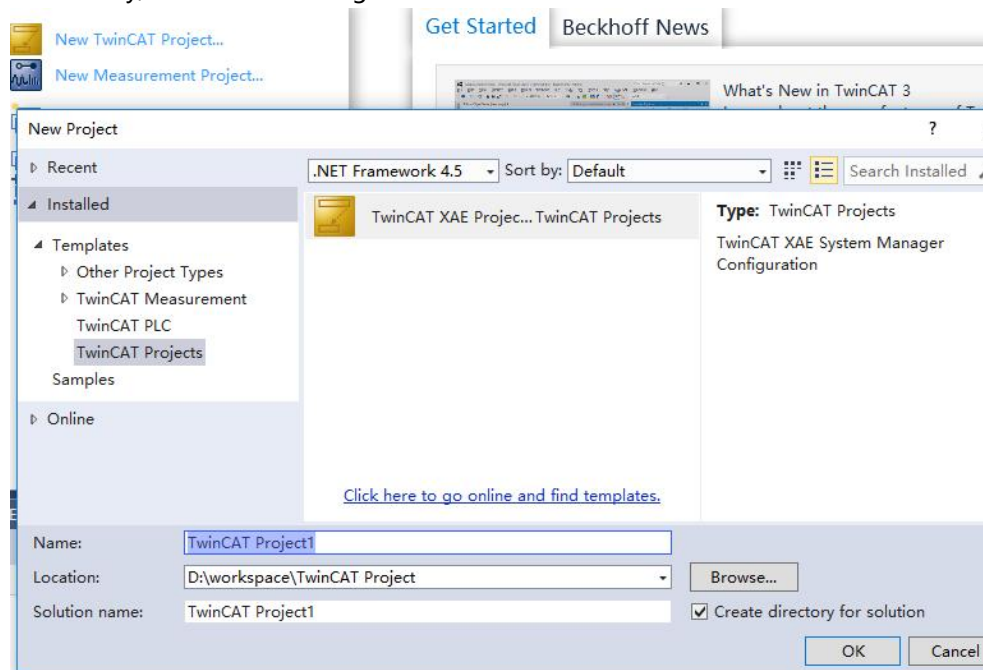
名称	修改日期	类型	大小
Beckhoff EPP3xxx.xml	2022/6/20 7:53	XML 文档	6,414 KB
Beckhoff EPP4xxx.xml	2022/6/20 7:53	XML 文档	603 KB
Beckhoff EPP5xxx.xml	2022/6/20 7:53	XML 文档	780 KB
Beckhoff EPP6xxx.xml	2022/8/22 14:55	XML 文档	2,932 KB
Beckhoff EPP7xxx.xml	2022/6/20 7:53	XML 文档	2,715 KB
Beckhoff EPP9xxx.xml	2022/2/18 16:16	XML 文档	199 KB
Beckhoff EPx9xx.xml	2022/2/18 16:16	XML 文档	921 KB
Beckhoff EQ1xxx.xml	2022/6/20 7:53	XML 文档	22 KB
Beckhoff EQ2xxx.xml	2022/6/20 7:53	XML 文档	73 KB
Beckhoff EQ3xxx.xml	2022/6/20 7:53	XML 文档	1,386 KB
Beckhoff ER1xxx.XML	2022/6/20 7:53	XML 文档	244 KB
Beckhoff ER2xxx.XML	2022/6/20 7:53	XML 文档	261 KB
Beckhoff ER3xxx.XML	2022/6/20 7:53	XML 文档	1,177 KB
Beckhoff ER4xxx.xml	2022/6/20 7:53	XML 文档	318 KB
Beckhoff ER5xxx.xml	2022/6/20 7:53	XML 文档	273 KB
Beckhoff ER6xxx.xml	2022/8/22 14:55	XML 文档	2,040 KB
Beckhoff ER7xxx.xml	2022/6/20 7:53	XML 文档	2,717 KB
Beckhoff ER8xxx.xml	2022/6/20 7:53	XML 文档	207 KB
Beckhoff EtherCAT EvaBoard.xml	2022/2/18 16:16	XML 文档	72 KB
Beckhoff EtherCAT Terminals.xml	2022/2/18 16:16	XML 文档	54 KB
Beckhoff FB1XXX.xml	2022/2/18 16:16	XML 文档	49 KB
Beckhoff FCxxxx.xml	2022/2/18 16:16	XML 文档	21 KB
Beckhoff FM3xxx.xml	2022/2/18 16:16	XML 文档	367 KB
Beckhoff ILxxxx-B110.xml	2022/2/18 16:16	XML 文档	8 KB
EcatTerminal-XBF4_V2.0.1_ENUM.xml	2025/2/12 13:33	XML 文档	837 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.

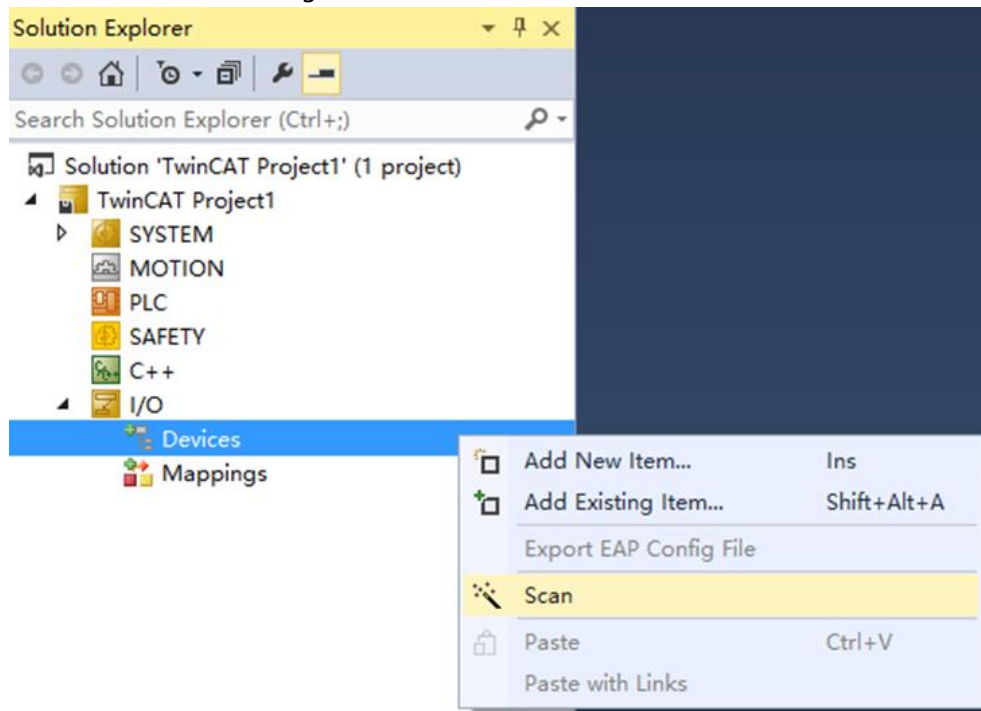


- b. Click "New TwinCAT Project". In the pop-up window, "Name" and "Solution name" correspond to the project name and solution name, respectively, and "Location" corresponds to the project path. These three items can be left as default. Then click "OK". The project will be created successfully, as shown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

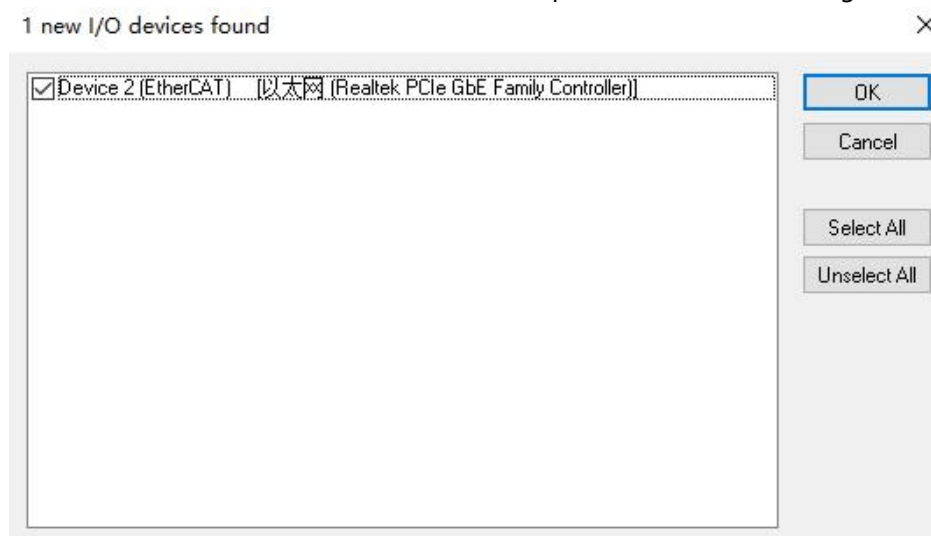


4. Scanning equipment

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



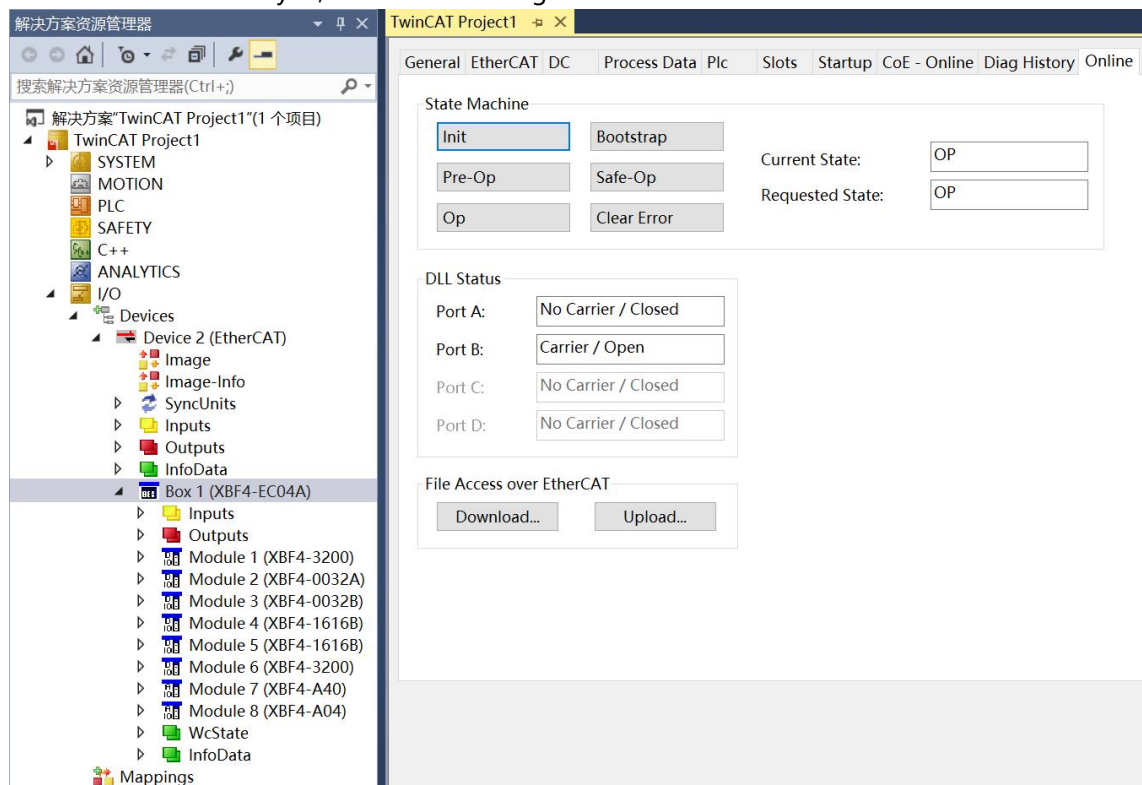
- b. Select the "Local Area Connection" network adapter, as shown in the image below.



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

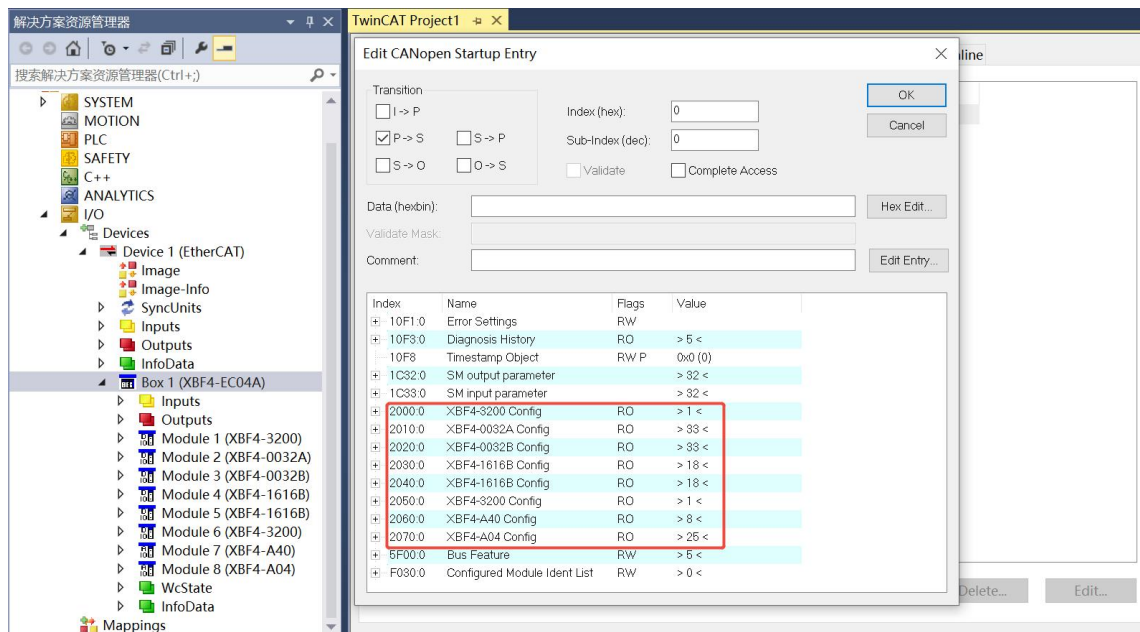
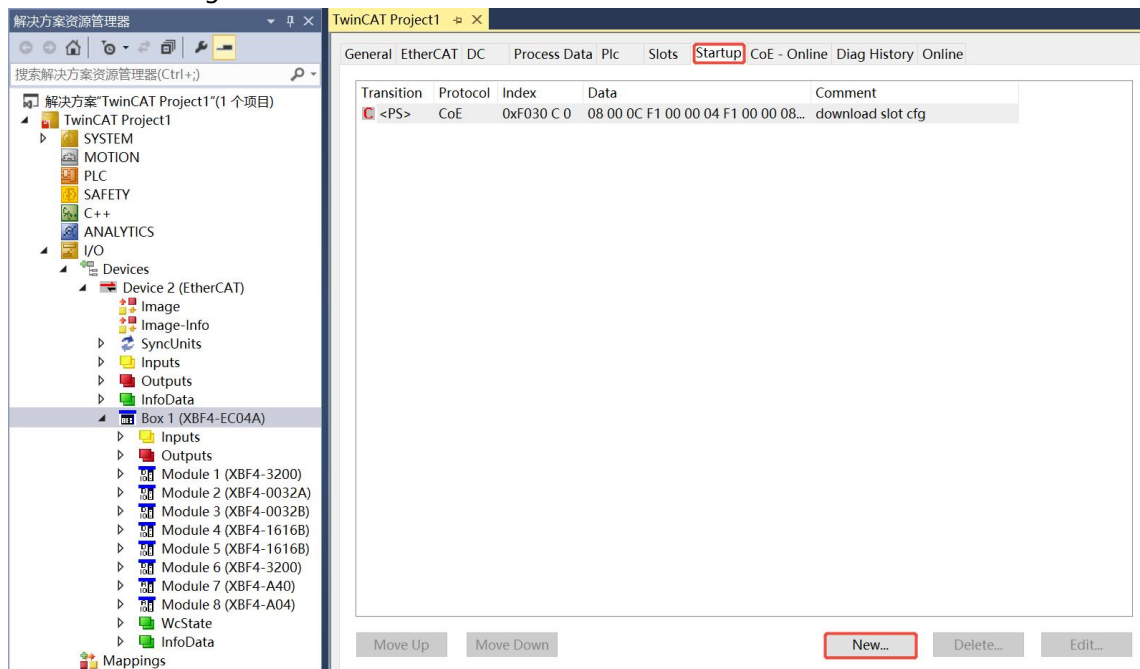


- d. After the device is scanned, the navigation tree on the left will show Box 1 (XBF4-EC04A), Module 1 (XBF4-3200), Module 2 (XBF4-0032A), Module 3 (XBF4-0032B), Module 4 (XBF4-1616B), Module 5 (XBF4-1616B), Module 6 (XBF4-3200), Module 7 (XBF4-A40), and Module 8 (XBF4-A04). Under "Online", TwinCAT will be in "OP" state, and the RUN light on the slave device will be constantly lit, as shown in the figure below.



5. Parameter configuration

- Clicking "Box 1 -> Startup -> New" in the left navigation tree will take you to the configuration parameter editing page, where you will enter the "Edit CANopen Startup Entry" interface, as shown in the image below.



- b. For example, to modify the configuration parameters of Module 4 (XBF4-1616B), click the "+" in front of Index 2030:0 to expand the configuration parameter menu, where you can configure the digital input filtering and output signal clear/hold functions, as shown in the figure below.

Edit CANopen Startup Entry

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

Index (hex): 0
 Sub-Index (dec): 0
☐ Validate ☐ Complete Access

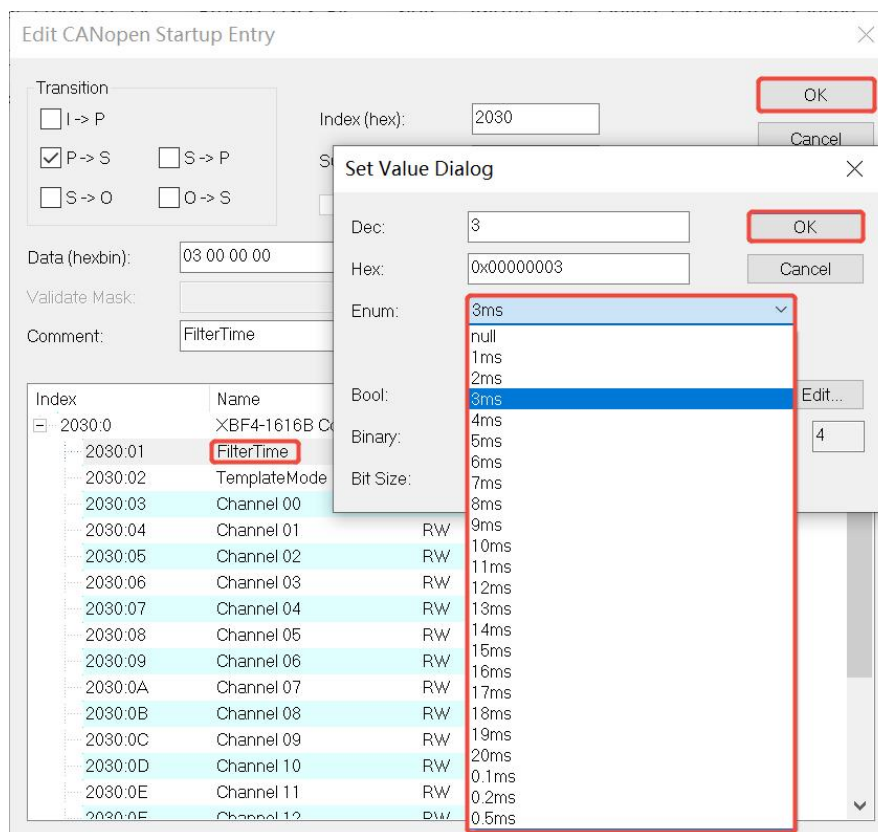
Data (hexbin): Hex Edit...

Validate Mask:

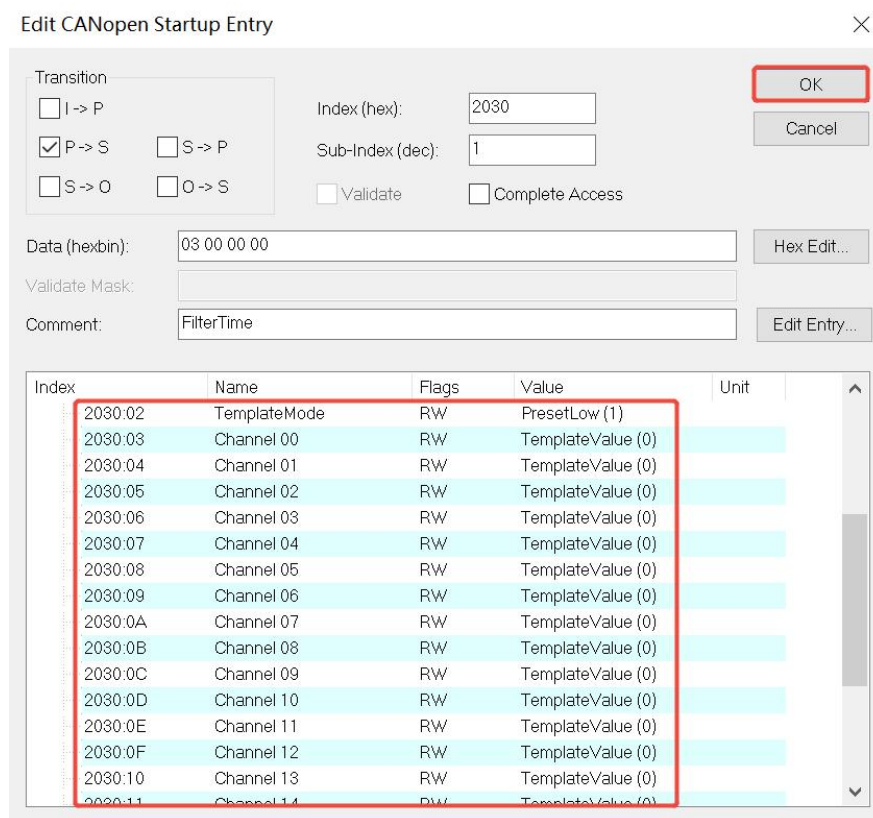
Comment: Edit Entry...

Index	Name	Flags	Value	Unit
2030:0	XBF4-1616B Config	RO	> 18 <	
2030:01	FilterTime	RW	3ms (3)	
2030:02	TemplateMode	RW	PresetLow (1)	
2030:03	Channel 00	RW	TemplateValue (0)	
2030:04	Channel 01	RW	TemplateValue (0)	
2030:05	Channel 02	RW	TemplateValue (0)	
2030:06	Channel 03	RW	TemplateValue (0)	
2030:07	Channel 04	RW	TemplateValue (0)	
2030:08	Channel 05	RW	TemplateValue (0)	
2030:09	Channel 06	RW	TemplateValue (0)	
2030:0A	Channel 07	RW	TemplateValue (0)	
2030:0B	Channel 08	RW	TemplateValue (0)	
2030:0C	Channel 09	RW	TemplateValue (0)	
2030:0D	Channel 10	RW	TemplateValue (0)	
2030:0E	Channel 11	RW	TemplateValue (0)	
2030:0F	Channel 12	RW	TemplateValue (0)	

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



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



- e. For example, to modify the configuration parameters of Module7 (XBF4-A40), click the "+" in front of Index 2060:0 to expand the configuration parameter menu, where you can configure the analog voltage or current range and analog input filtering parameters, as shown in the figure below.

Edit CANopen Startup Entry

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

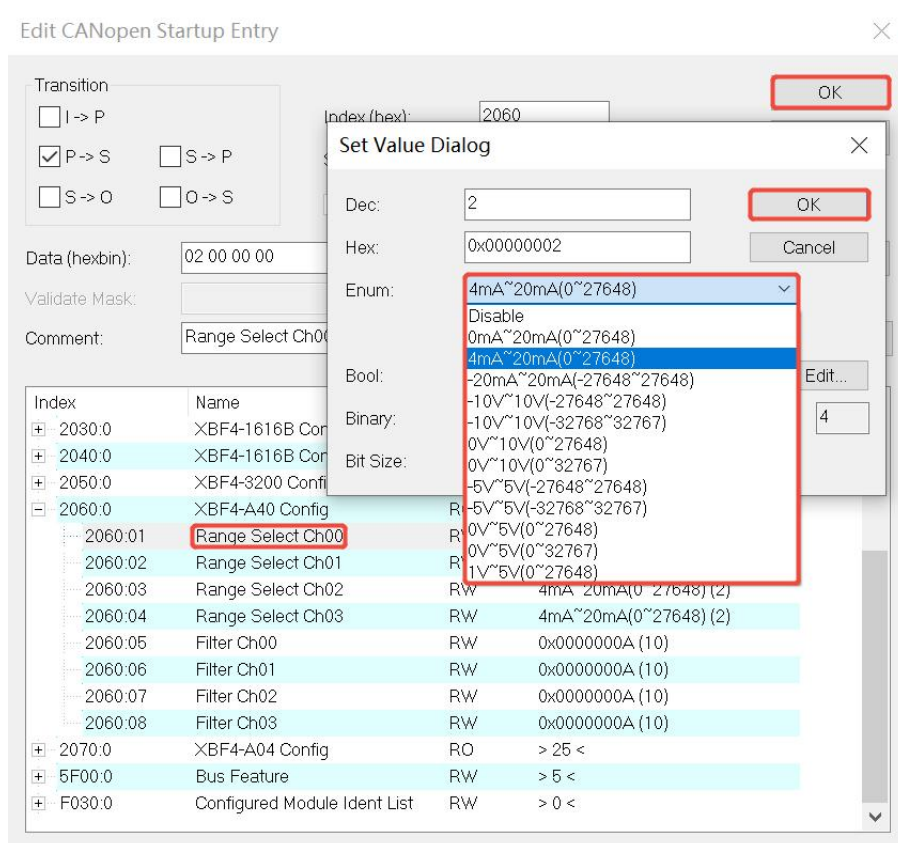
Index (hex):
 Sub-Index (dec):
☐ Validate ☐ Complete Access

Data (hexbin):
 Validate Mask:
 Comment:

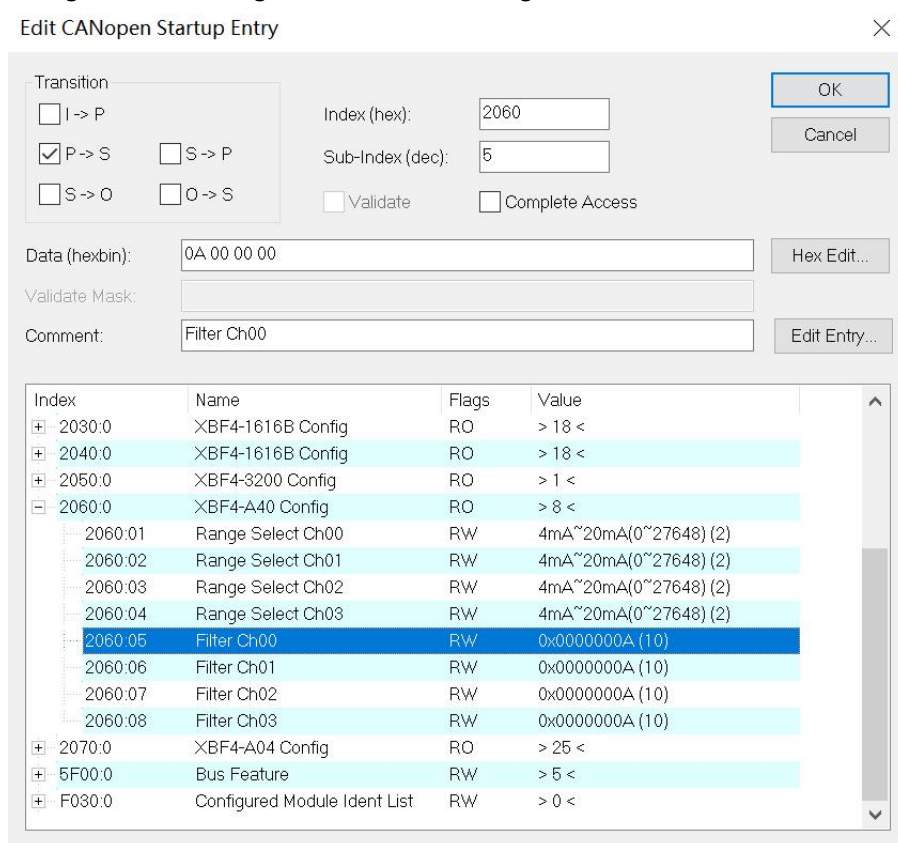
OK Cancel Hex Edit... Edit Entry...

Index	Name	Flags	Value
2030:0	XBF4-1616B Config	RO	> 18 <
2040:0	XBF4-1616B Config	RO	> 18 <
2050:0	XBF4-3200 Config	RO	> 1 <
2060:0	XBF4-A40 Config	RO	> 8 <
2060:01	Range Select Ch00	RW	4mA~20mA(0~27648) (2)
2060:02	Range Select Ch01	RW	4mA~20mA(0~27648) (2)
2060:03	Range Select Ch02	RW	4mA~20mA(0~27648) (2)
2060:04	Range Select Ch03	RW	4mA~20mA(0~27648) (2)
2060:05	Filter Ch00	RW	0x0000000A (10)
2060:06	Filter Ch01	RW	0x0000000A (10)
2060:07	Filter Ch02	RW	0x0000000A (10)
2060:08	Filter Ch03	RW	0x0000000A (10)
2070:0	XBF4-A04 Config	RO	> 25 <
5F00:0	Bus Feature	RW	> 5 <
F030:0	Configured Module Ident List	RW	> 0 <

- f. The analog input voltage and current can be configured with 13 ranges, each channel can be configured independently. After configuration, click "OK", as shown in the figure below.



- g. The analog input filter can be configured from 1 to 200, and supports independent configuration of a single channel. After configuration, click "OK", as shown in the figure below.



- h. For example, to modify the configuration parameters of Module8 (XBF4-A04), click the "+" in front of Index 2070:0 to expand the configuration parameter menu. You can configure the analog voltage or current range and the analog output signal clear/hold parameters, as shown in the figure below.

Edit CANopen Startup Entry ✕

Transition

☐ I → P

☒ P → S ☐ S → P

☐ S → O ☐ O → S

Index (hex):

Sub-Index (dec):

☐ Validate ☐ Complete Access

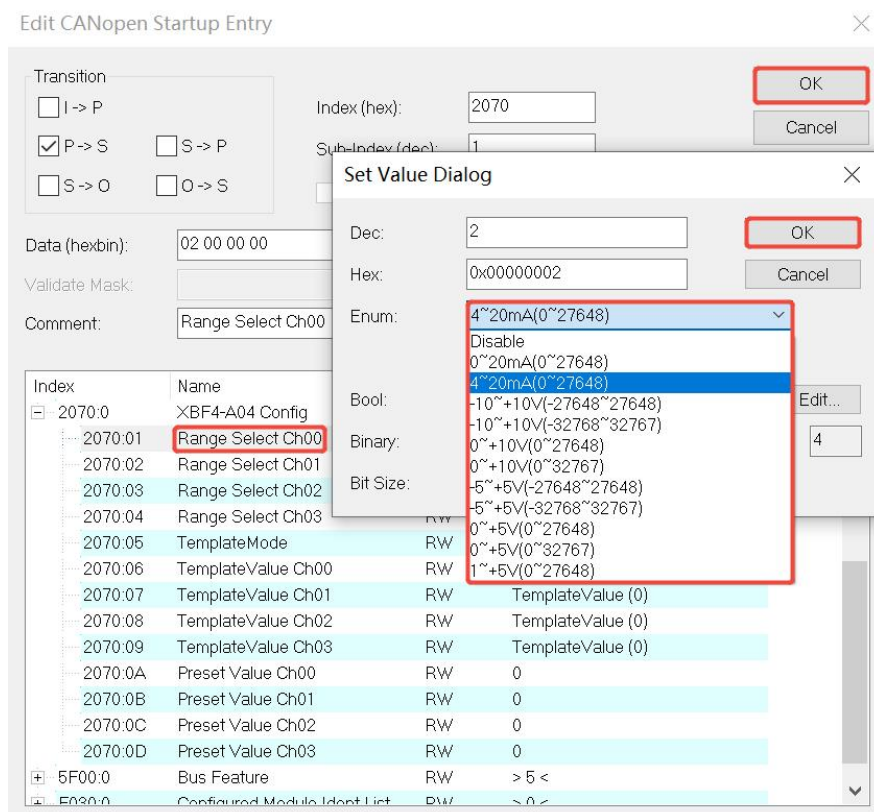
Data (hexbin):

Validate Mask:

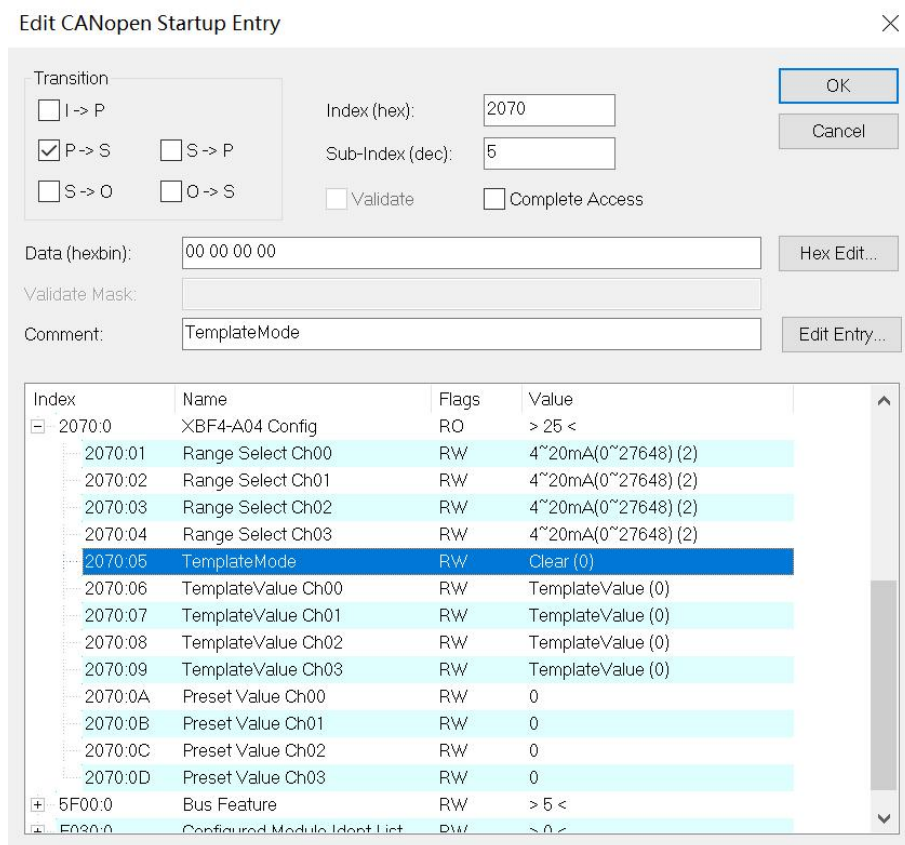
Comment:

Index	Name	Flags	Value
[-] 2070:0	XBF4-A04 Config	RO	> 25 <
2070:01	Range Select Ch00	RW	4~20mA(0~27648) (2)
2070:02	Range Select Ch01	RW	4~20mA(0~27648) (2)
2070:03	Range Select Ch02	RW	4~20mA(0~27648) (2)
2070:04	Range Select Ch03	RW	4~20mA(0~27648) (2)
2070:05	TemplateMode	RW	Clear (0)
2070:06	TemplateValue Ch00	RW	TemplateValue (0)
2070:07	TemplateValue Ch01	RW	TemplateValue (0)
2070:08	TemplateValue Ch02	RW	TemplateValue (0)
2070:09	TemplateValue Ch03	RW	TemplateValue (0)
2070:0A	Preset Value Ch00	RW	0
2070:0B	Preset Value Ch01	RW	0
2070:0C	Preset Value Ch02	RW	0
2070:0D	Preset Value Ch03	RW	0
[+] 5F00:0	Bus Feature	RW	> 5 <
[+] 5030:0	Configured Module Ident List	RW	< 0 <

- i. The analog output voltage and current can be configured with 12 ranges, each channel can be configured independently. After configuration, click "OK", as shown in the figure below.



- j. Analog output signal clear/hold function. By default, all channels are in output clear mode. Module channels can be configured individually; see the corresponding relationship [6.1.5 Clear/Hold Analog Output Signal](#). After configuration, click "OK", as shown in the image below.



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

Transition:

☐ I → P ☒ P → S ☐ S → P

☐ S → O ☐ O → S

Index (hex): 5f00 Sub-Index (dec): 0

☐ Validate ☐ Complete Access

Data (hexbin): 05 Hex Edit...

Validate Mask:

Comment: SubIndex 000 Edit Entry...

Index	Name	Flags	Value	U
2010:0	XBF4-0032A Config	RO	> 33 <	
2020:0	XBF4-0032B Config	RO	> 33 <	
2030:0	XBF4-1616B Config	RO	> 18 <	
2040:0	XBF4-1616B Config	RO	> 18 <	
2050:0	XBF4-3200 Config	RO	> 1 <	
2060:0	XBF4-3200 Config	RO	> 1 <	
2070:0	XBF4-1616B Config	RO	> 18 <	
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 <	

- l. 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.

Transition:

☐ I → P ☒ P → S ☐ S → P

☐ S → O ☐ O → S

Index (hex): 5f00 Sub-Index (dec): 5

Data (hexbin): 80 8D 5B 00 Hex Edit...

Validate Mask:

Comment: Bus Baud Rate Edit Entry...

Index	Name	Flags	Value	U
2010:0	XBF4-0032A Config	RO	> 33 <	
2020:0	XBF4-0032B Config	RO	> 33 <	
2030:0	XBF4-1616B Config	RO	> 18 <	
2040:0	XBF4-1616B Config	RO	> 18 <	
2050:0	XBF4-3200 Config	RO	> 1 <	
2060:0	XBF4-3200 Config	RO	> 1 <	
2070:0	XBF4-1616B Config	RO	> 18 <	
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 <	

Set Value Dialog:

Dec: 6000000 OK Cancel

Hex: 0x005B8D80

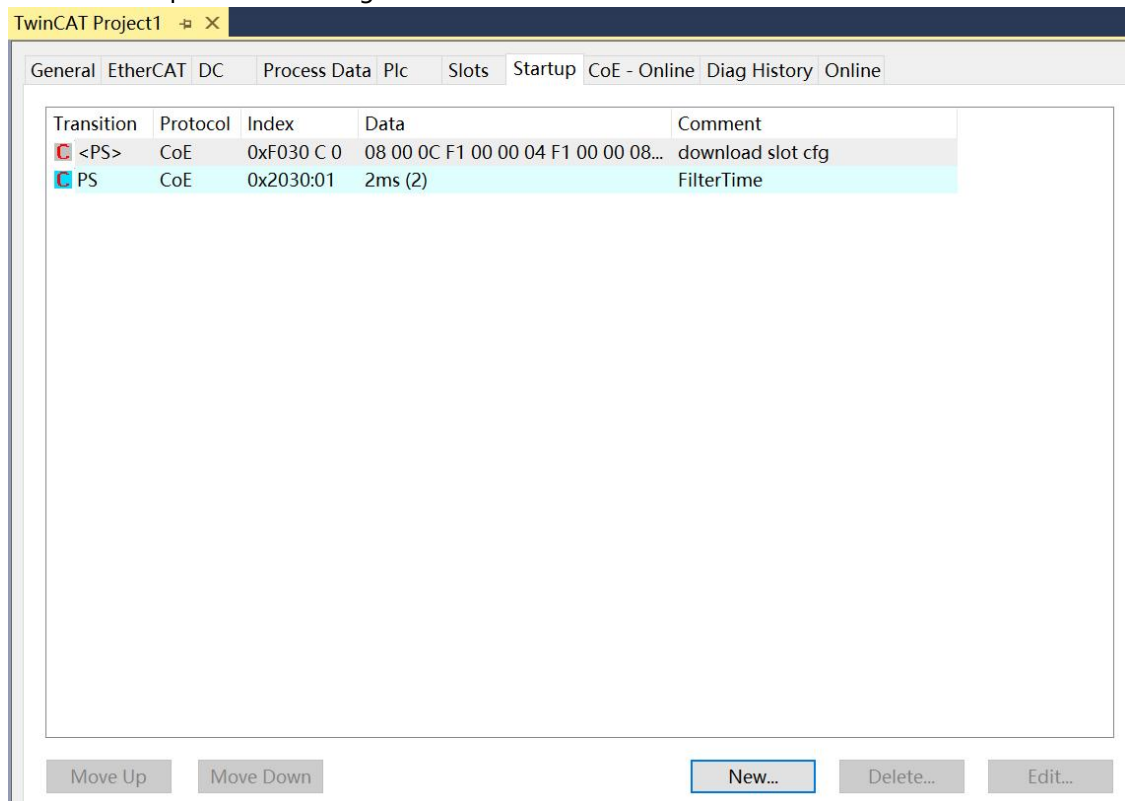
Enum: 6MHz (selected) Edit...

Bool:

Binary: 80 8D 5B 00 4

Bit Size: ☐ 1 ☐ 8 ☐ 16 ☒ 32 ☐ 64 ☐ ?

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



6. Verify basic functions

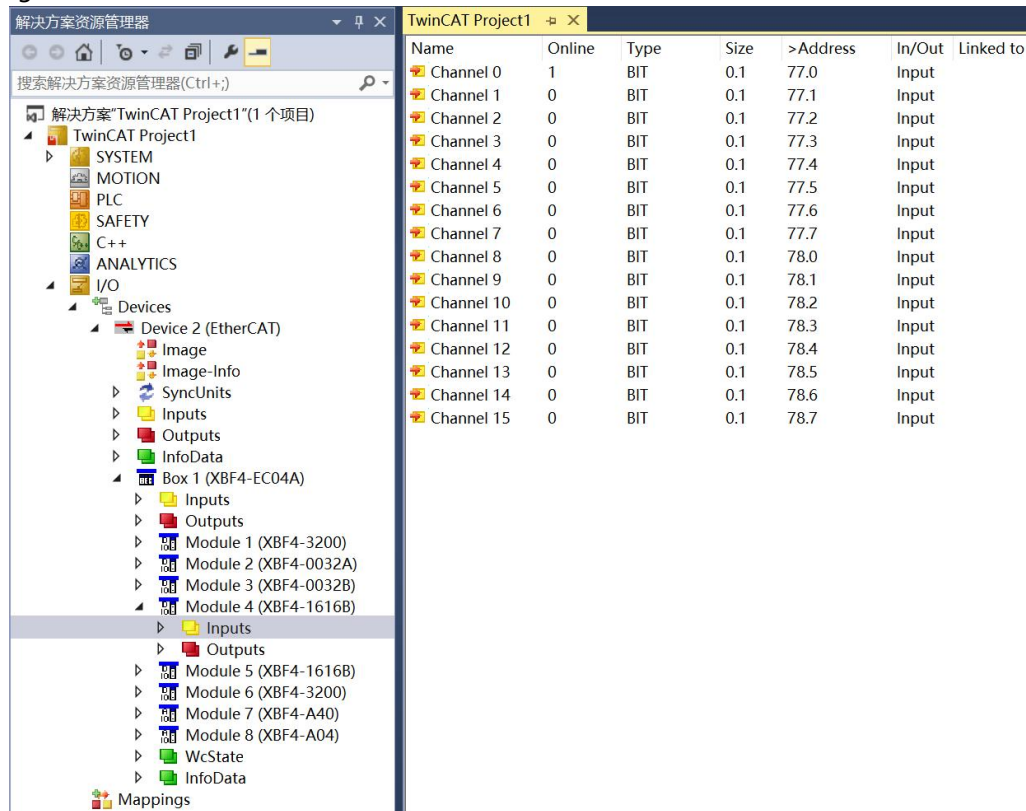
- a. The left-hand navigation tree "Module 1 -> Inputs" displays the upstream data of the module, used to monitor the module's input, as shown in the figure below.

Name	Online	Type	Size	>Address	In/Out	Linked to
Channel 0	0	BIT	0.1	73.0	Input	
Channel 1	0	BIT	0.1	73.1	Input	
Channel 2	0	BIT	0.1	73.2	Input	
Channel 3	0	BIT	0.1	73.3	Input	
Channel 4	0	BIT	0.1	73.4	Input	
Channel 5	0	BIT	0.1	73.5	Input	
Channel 6	0	BIT	0.1	73.6	Input	
Channel 7	0	BIT	0.1	73.7	Input	
Channel 8	0	BIT	0.1	74.0	Input	
Channel 9	0	BIT	0.1	74.1	Input	
Channel 10	0	BIT	0.1	74.2	Input	
Channel 11	0	BIT	0.1	74.3	Input	
Channel 12	0	BIT	0.1	74.4	Input	
Channel 13	0	BIT	0.1	74.5	Input	
Channel 14	0	BIT	0.1	74.6	Input	
Channel 15	0	BIT	0.1	74.7	Input	
Channel 16	0	BIT	0.1	75.0	Input	
Channel 17	0	BIT	0.1	75.1	Input	
Channel 18	0	BIT	0.1	75.2	Input	
Channel 19	0	BIT	0.1	75.3	Input	
Channel 20	0	BIT	0.1	75.4	Input	
Channel 21	0	BIT	0.1	75.5	Input	
Channel 22	0	BIT	0.1	75.6	Input	
Channel 23	0	BIT	0.1	75.7	Input	
Channel 24	0	BIT	0.1	76.0	Input	
Channel 25	0	BIT	0.1	76.1	Input	
Channel 26	0	BIT	0.1	76.2	Input	
Channel 27	0	BIT	0.1	76.3	Input	
Channel 28	0	BIT	0.1	76.4	Input	
Channel 29	0	BIT	0.1	76.5	Input	
Channel 30	0	BIT	0.1	76.6	Input	
Channel 31	0	BIT	0.1	76.7	Input	

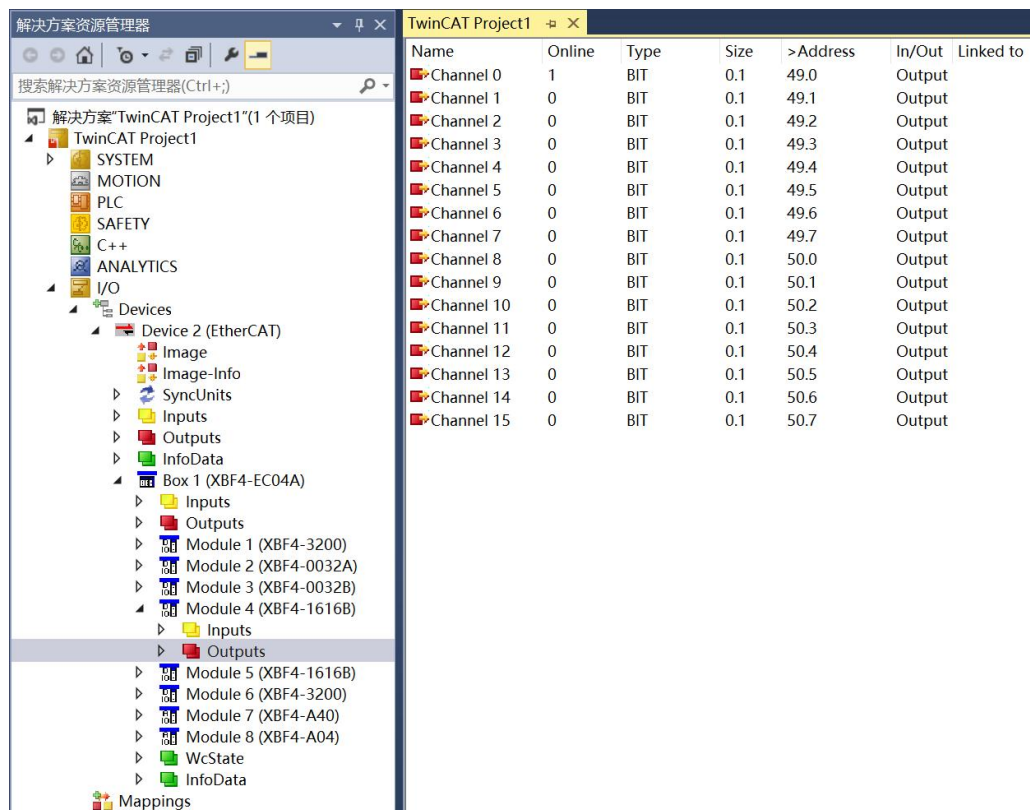
- b. The left-hand navigation tree "Module 2 -> Outputs" displays the module's downstream data, which is used to control the module's output, as shown in the figure below.

Name	Online	Type	Size	>Address	In/Out	Linked to
Channel 0	0	BIT	0.1	41.0	Output	
Channel 1	0	BIT	0.1	41.1	Output	
Channel 2	0	BIT	0.1	41.2	Output	
Channel 3	0	BIT	0.1	41.3	Output	
Channel 4	0	BIT	0.1	41.4	Output	
Channel 5	0	BIT	0.1	41.5	Output	
Channel 6	0	BIT	0.1	41.6	Output	
Channel 7	0	BIT	0.1	41.7	Output	
Channel 8	0	BIT	0.1	42.0	Output	
Channel 9	0	BIT	0.1	42.1	Output	
Channel 10	0	BIT	0.1	42.2	Output	
Channel 11	0	BIT	0.1	42.3	Output	
Channel 12	0	BIT	0.1	42.4	Output	
Channel 13	0	BIT	0.1	42.5	Output	
Channel 14	0	BIT	0.1	42.6	Output	
Channel 15	0	BIT	0.1	42.7	Output	
Channel 16	0	BIT	0.1	43.0	Output	
Channel 17	0	BIT	0.1	43.1	Output	
Channel 18	0	BIT	0.1	43.2	Output	
Channel 19	0	BIT	0.1	43.3	Output	
Channel 20	0	BIT	0.1	43.4	Output	
Channel 21	0	BIT	0.1	43.5	Output	
Channel 22	0	BIT	0.1	43.6	Output	
Channel 23	0	BIT	0.1	43.7	Output	
Channel 24	0	BIT	0.1	44.0	Output	
Channel 25	0	BIT	0.1	44.1	Output	
Channel 26	0	BIT	0.1	44.2	Output	
Channel 27	0	BIT	0.1	44.3	Output	
Channel 28	0	BIT	0.1	44.4	Output	
Channel 29	0	BIT	0.1	44.5	Output	
Channel 30	0	BIT	0.1	44.6	Output	
Channel 31	0	BIT	0.1	44.7	Output	

- c. Taking channel 0 of Module 4 (XBF4-1616B) as an example, if there is a valid voltage input to input channel 0 of this module, it can be observed in "Module 4 -> Inputs", as shown in the figure below.

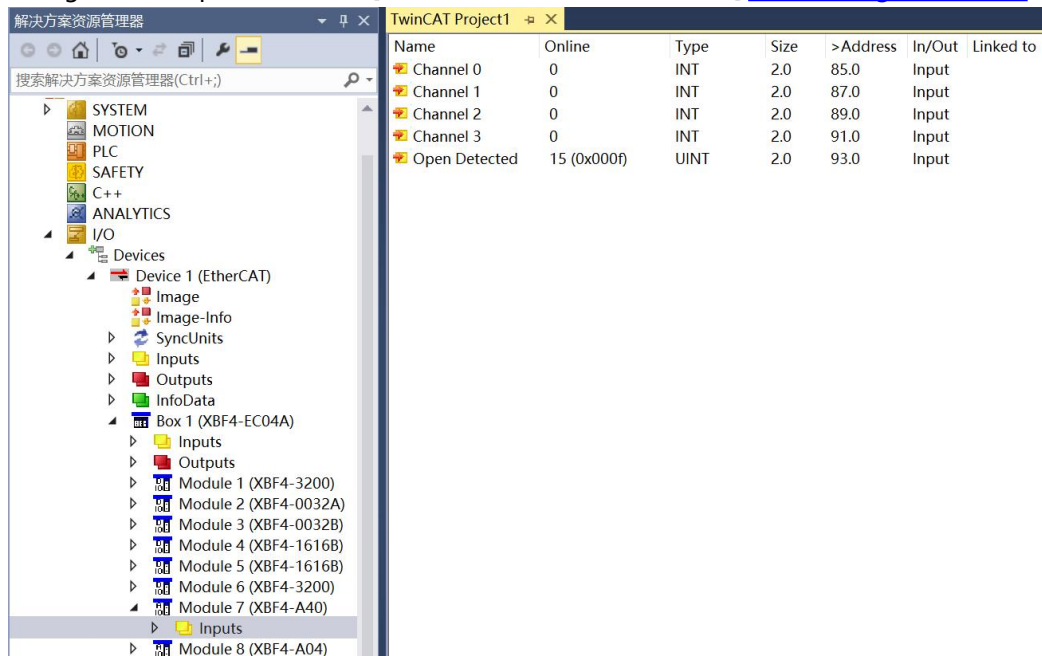


- d. Taking channel 0 of Module 4 (XBF4-1616B) as an example, if you want the digital output channel 0 of this module to output, you can click on Channel 0 in "Module 4 -> Outputs", right-click and enter 1. You can see the corresponding channel light on the module, as shown in the figure below.



Name	Online	Type	Size	>Address	In/Out	Linked to
Channel 0	1	BIT	0.1	49.0	Output	
Channel 1	0	BIT	0.1	49.1	Output	
Channel 2	0	BIT	0.1	49.2	Output	
Channel 3	0	BIT	0.1	49.3	Output	
Channel 4	0	BIT	0.1	49.4	Output	
Channel 5	0	BIT	0.1	49.5	Output	
Channel 6	0	BIT	0.1	49.6	Output	
Channel 7	0	BIT	0.1	49.7	Output	
Channel 8	0	BIT	0.1	50.0	Output	
Channel 9	0	BIT	0.1	50.1	Output	
Channel 10	0	BIT	0.1	50.2	Output	
Channel 11	0	BIT	0.1	50.3	Output	
Channel 12	0	BIT	0.1	50.4	Output	
Channel 13	0	BIT	0.1	50.5	Output	
Channel 14	0	BIT	0.1	50.6	Output	
Channel 15	0	BIT	0.1	50.7	Output	

- e. In the Inputs datasheet of Module 7 (XBF4-A40), you can monitor the input voltage or current code value for each channel and the open circuit detection for each input channel, as shown in the figure below. For details on the correspondence between code values and voltage/current, please refer to [\[link to relevant documentation\]](#). [3.3.5 Analog Parameters](#).



Name	Online	Type	Size	>Address	In/Out	Linked to
Channel 0	0	INT	2.0	85.0	Input	
Channel 1	0	INT	2.0	87.0	Input	
Channel 2	0	INT	2.0	89.0	Input	
Channel 3	0	INT	2.0	91.0	Input	
Open Detected	15 (0x000f)	UINT	2.0	93.0	Input	

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

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

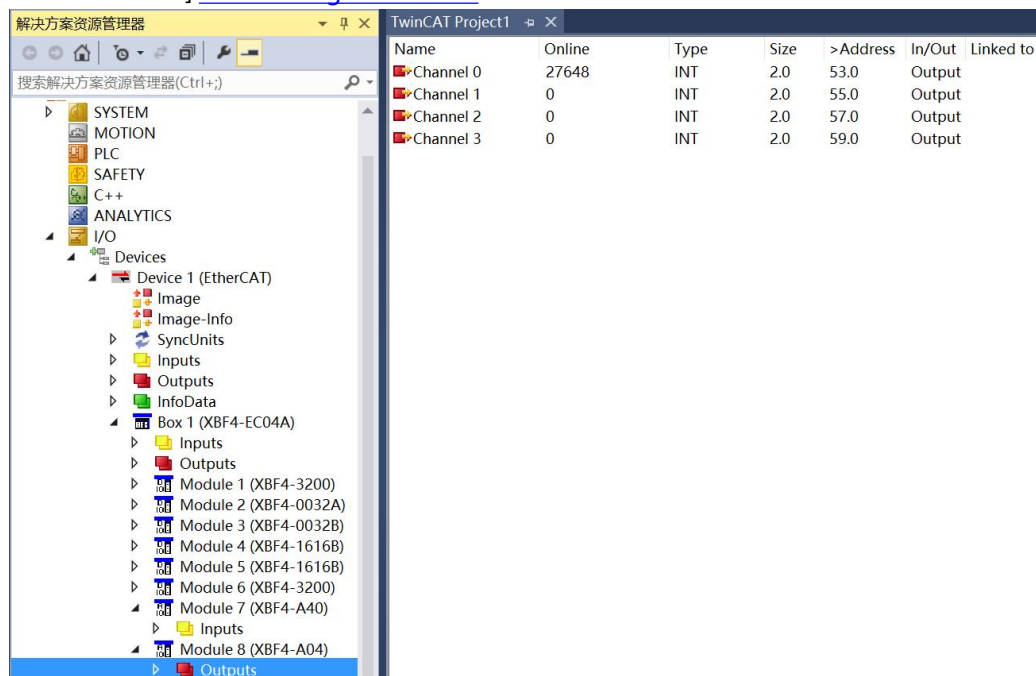
If Open Detected is 4 (2#0100), it means that a disconnection was detected in Channel 2 voltage/current mode.

If Open Detected is 8 (2#1000), it means that a disconnection was 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.

- f. In the Outputs datasheet of Module 7 (XBF4-A04), writing voltage or current code values will force output for each channel, as shown in the figure below. For details on the correspondence between code values and voltage/current, please refer to [link to relevant documentation]. [3.3.5 Analog Parameters.](#)



- g. In the left navigation tree "Box 1 -> Inputs", you can view the extended interface number of the slave module connected to the coupler and the DIP switch station number of the slave module in "Module 1 ~ Module32", as shown in the figure below.

Name	Online	Type	Size	>Address	In/Out	Linked to
CouplerState	0x0000	UINT	2.0	39.0	Input	
Module1	0x00	USINT	1.0	41.0	Input	
Module2	0x01	USINT	1.0	42.0	Input	
Module3	0x10	USINT	1.0	43.0	Input	
Module4	0x11	USINT	1.0	44.0	Input	
Module5	0x20	USINT	1.0	45.0	Input	
Module6	0x21	USINT	1.0	46.0	Input	
Module7	0x30	USINT	1.0	47.0	Input	
Module8	0x31	USINT	1.0	48.0	Input	
Module9	0x00	USINT	1.0	49.0	Input	
Module10	0x00	USINT	1.0	50.0	Input	
Module11	0x00	USINT	1.0	51.0	Input	
Module12	0x00	USINT	1.0	52.0	Input	
Module13	0x00	USINT	1.0	53.0	Input	
Module14	0x00	USINT	1.0	54.0	Input	
Module15	0x00	USINT	1.0	55.0	Input	
Module16	0x00	USINT	1.0	56.0	Input	
Module17	0x00	USINT	1.0	57.0	Input	
Module18	0x00	USINT	1.0	58.0	Input	
Module19	0x00	USINT	1.0	59.0	Input	
Module20	0x00	USINT	1.0	60.0	Input	
Module21	0x00	USINT	1.0	61.0	Input	
Module22	0x00	USINT	1.0	62.0	Input	
Module23	0x00	USINT	1.0	63.0	Input	
Module24	0x00	USINT	1.0	64.0	Input	
Module25	0x00	USINT	1.0	65.0	Input	
Module26	0x00	USINT	1.0	66.0	Input	
Module27	0x00	USINT	1.0	67.0	Input	
Module28	0x00	USINT	1.0	68.0	Input	
Module29	0x00	USINT	1.0	69.0	Input	
Module30	0x00	USINT	1.0	70.0	Input	
Module31	0x00	USINT	1.0	71.0	Input	
Module32	0x00	USINT	1.0	72.0	Input	

Note: Module 1 (XBF4-3200): 0x00 -- The extension interface number corresponding to the access coupler is 0, and the module station number is 0;

Module 2 (XBF4-0032A): 0x01 -- The extension interface number corresponding to the access coupler is 0, and the module station number is 1;

Module 3 (XBF4-0032B): 0x10 -- The extension interface number corresponding to the access coupler is 1, and the module station number is 0;

Module 4 (XBF4-1616B): 0x11 -- The extension interface number corresponding to the access coupler is 1, and the module station number is 1.

6.4.2 Application in CODESYS V3.5 software environment

1、Preparation

- **Hardware environment**

- **Module preparation:** This instruction uses the XBF4-EC04A+{Coupler Interface 0: XBF4-3200+XBF4-0032A}+{Coupler Interface 1: XBF4-0032B+XBF4-1616B}+{Coupler Interface 2: XBF4-1616B+XBF4-3200}+{Coupler Interface 3: XBF4-3200+XBF4-1616B} topology as an example.
- **One computer, pre-installed with CODESYS V3.5 and CODESYS Control Win V3 - x64 SysTray software.**
- **EtherCAT dedicated shielded cable**
- **One switching power supply**
- **Device configuration file**

Configuration file retrieval

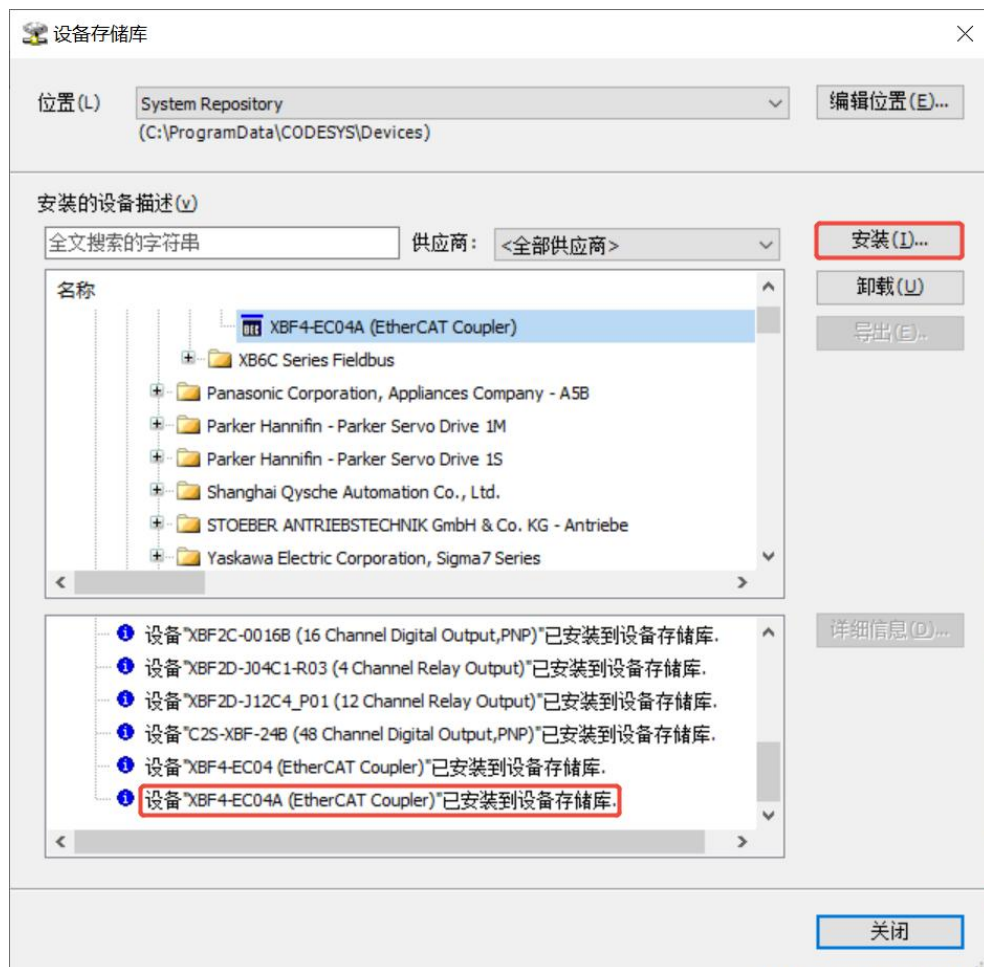
address:<https://www.solidotech.com/cn/resources/configuration-files>

- **Hardware configuration and wiring**

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

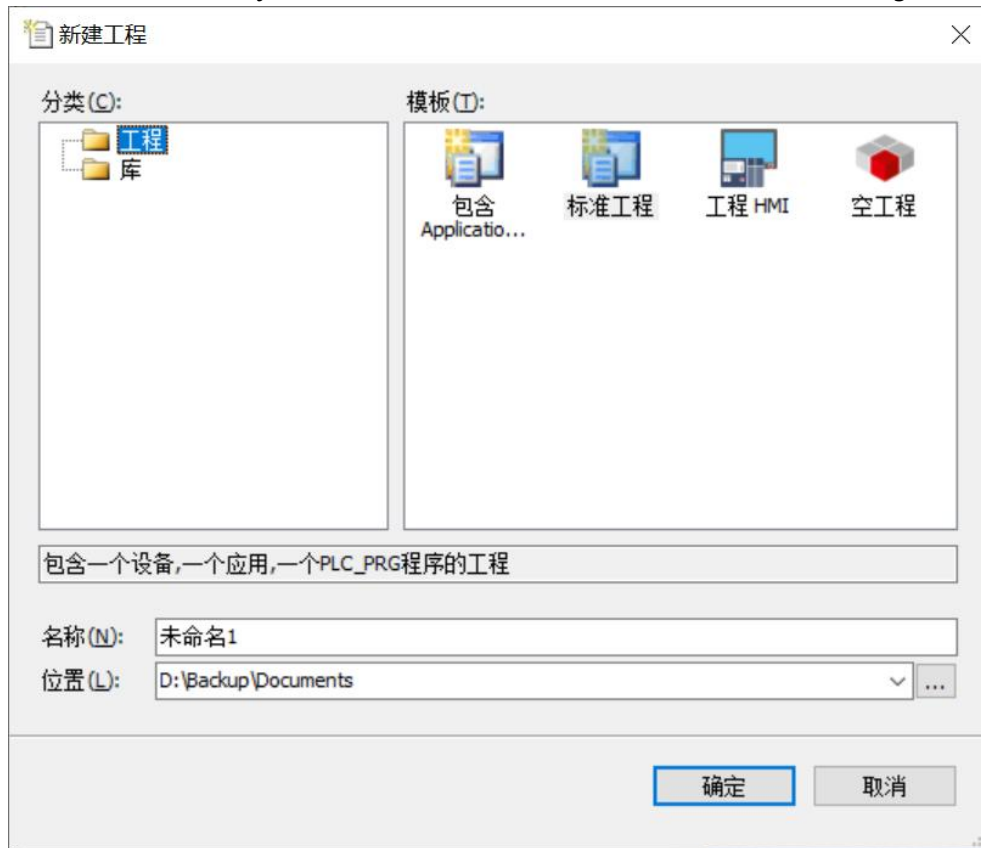
2、Installation configuration file

- a. Open the CODESYS software, select "Tools -> Device Repository", and install the EtherCAT XML device description file.
- b. A device repository window will pop up. Click "Install" and select the relevant XML file to install. Successful installation will display that device "xxxx" has been installed in the device repository, as shown in the image below.



3、New construction projects

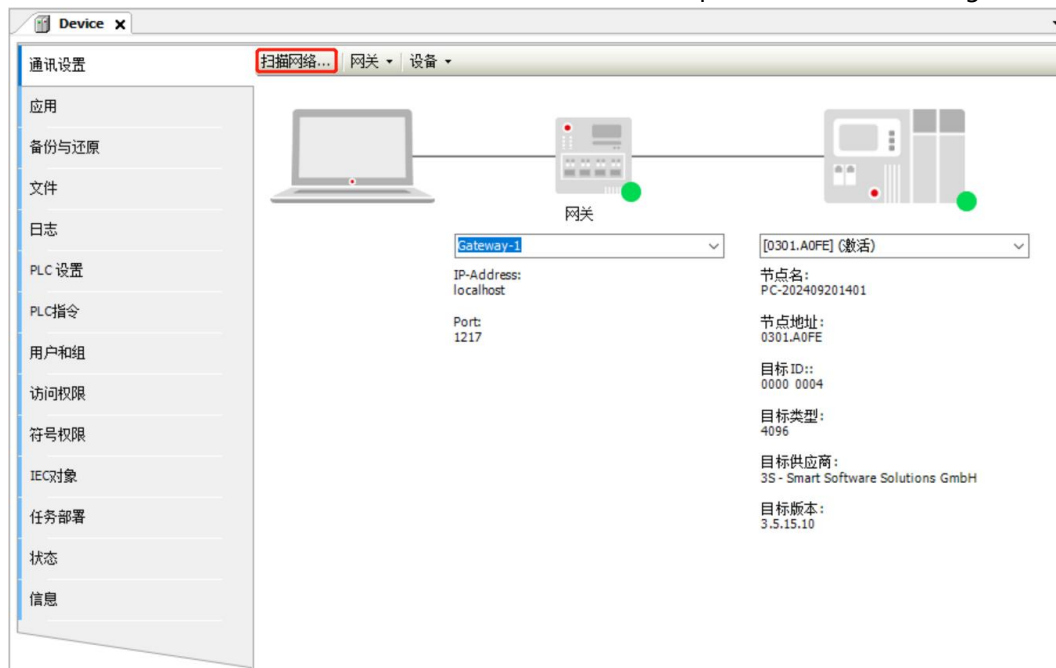
- a. Click "File -> New Project", enter a name, and click "OK", as shown in the image below.



4、Scanning Network

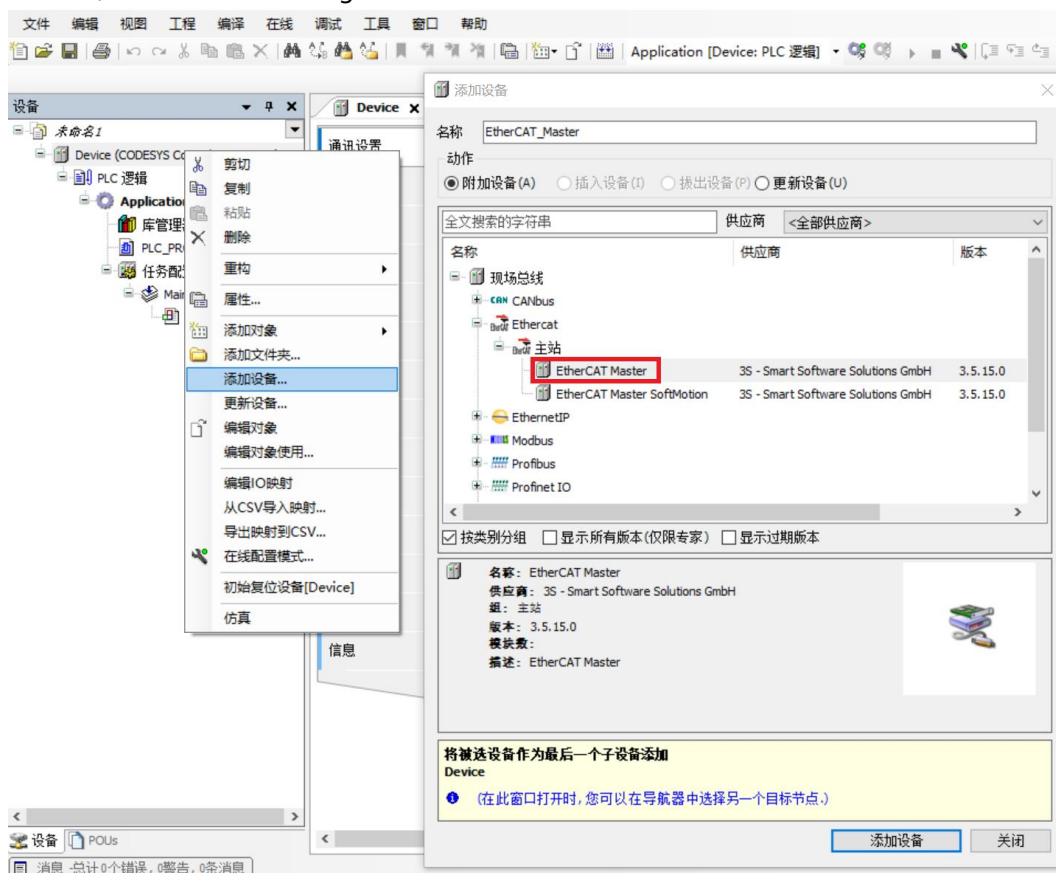
- a. To start the PLC, use "CODESYS Control Win V3 - x64 SysTray". Locate "CODESYS Control Win V3 - x64 SysTray" in the lower right corner of your computer, right-click and select "Start PLC".
- b. Double-click "Device (CODESYS Control Win V3 X64)" in the left navigation tree of CODESYS, and then click "Scan Network".

- c. Select the device and choose the correct controller network path, as shown in the figure below.



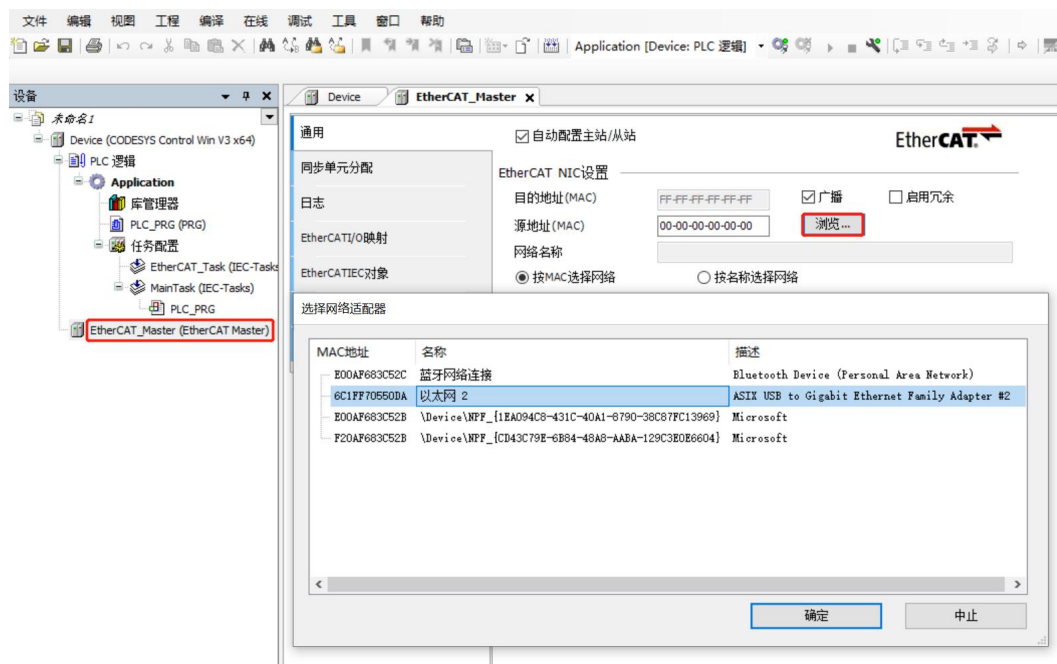
5、 Add EtherCAT Master

- a. Right-click "Device (CODESYS Control Win V3 X64)" in the left navigation tree of CODESYS, click "Add Device", and select...Add the following settings: "EtherCAT -> Main Site -> EtherCAT Master", as shown in the image below.



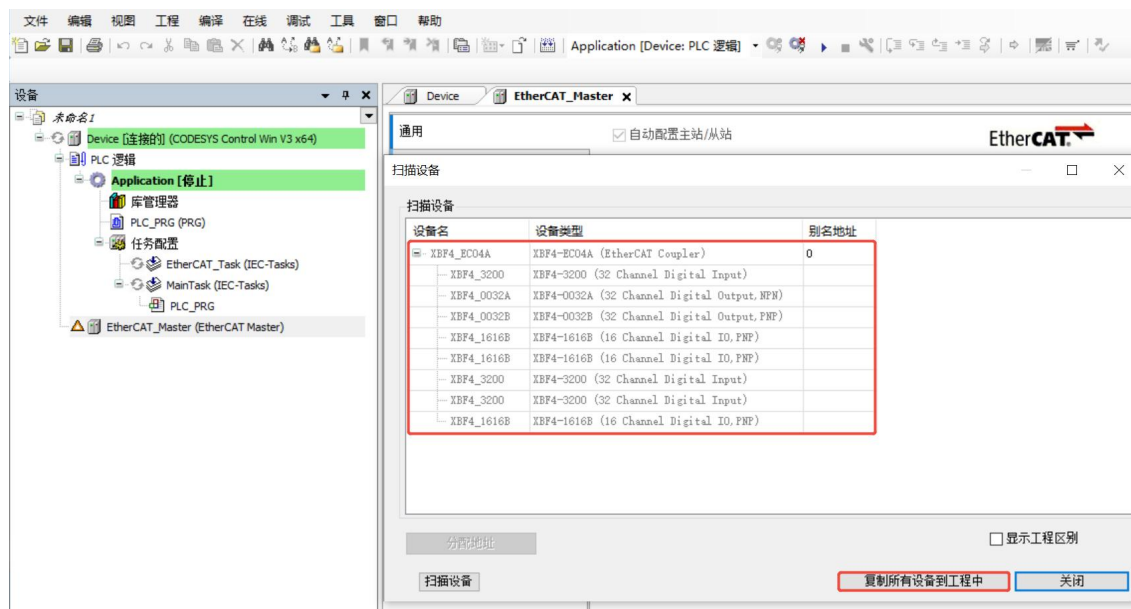
6、 Configure EtherCAT Master

- a. Double-click "EtherCAT_Master (EtherCAT Master)" in the left navigation tree to open the main menu on the right, then click...Open the Network Adapters window with "Browse" and select Ethernet.

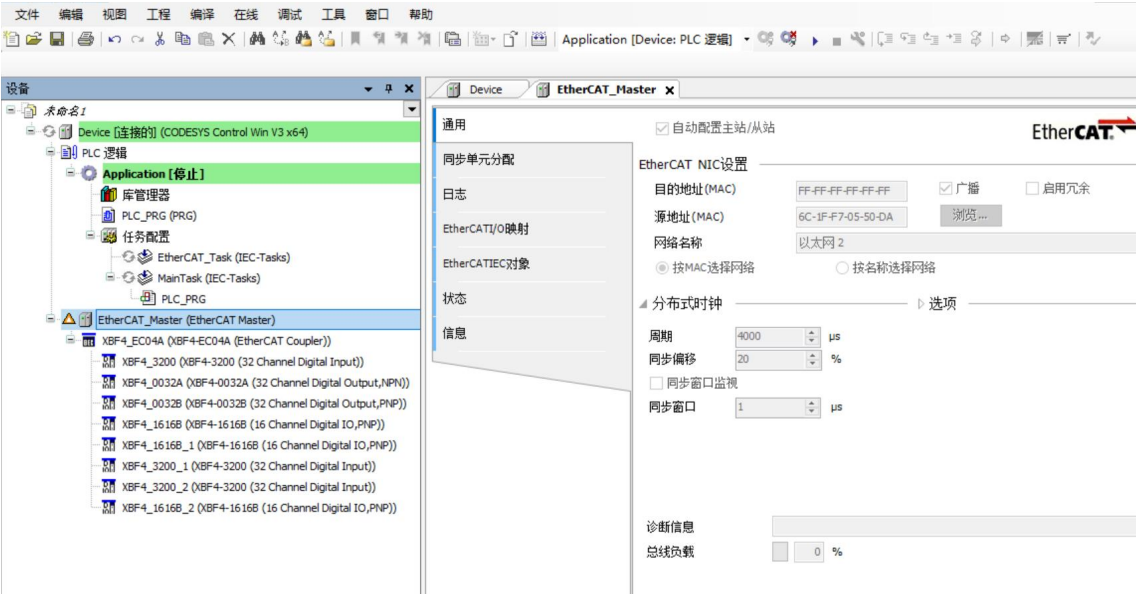


7、Scanning equipment

- a. Before the first scan, you must log in to the PLC program, right-click "EtherCAT_Master (EtherCAT Master)" in the left navigation tree, select the scanning device, scan the corresponding device, select the module, and click "Copy to Project", as shown in the figure below.

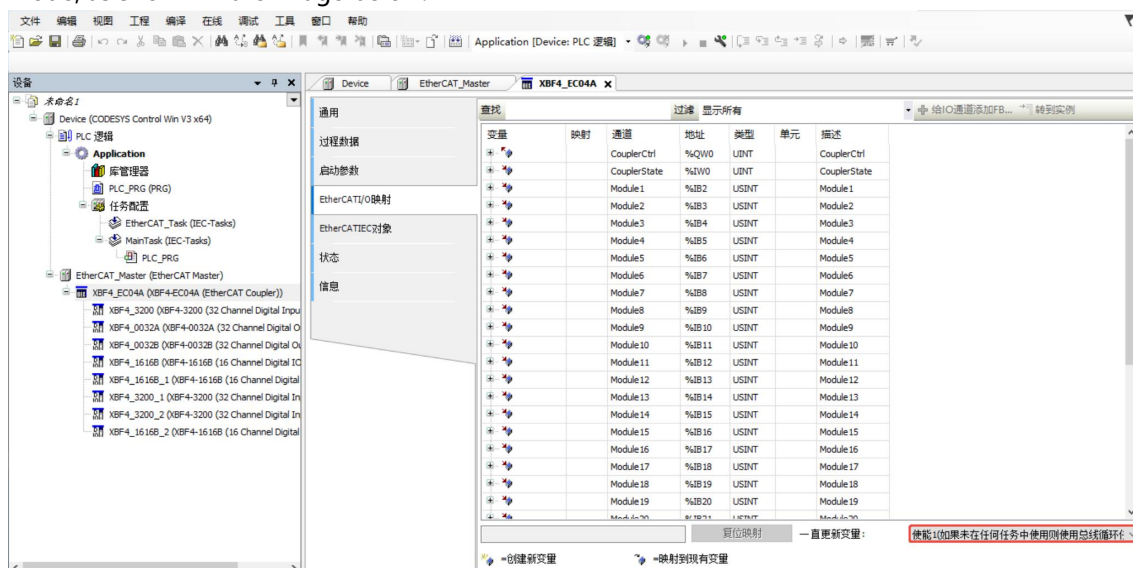


- b. After successful copying, it will look like the image below.

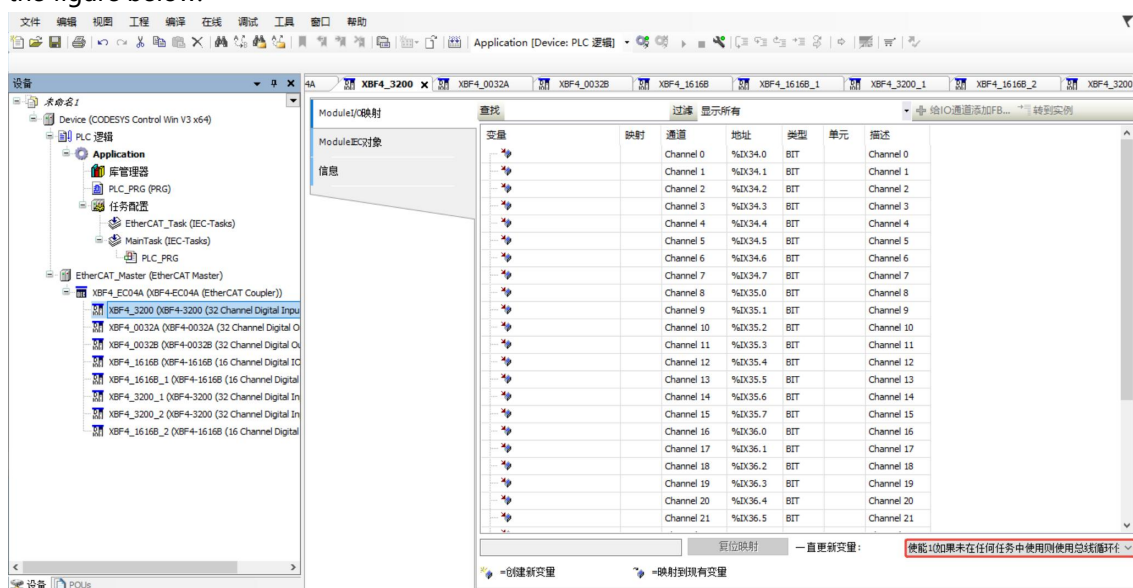


8、Test I/O module

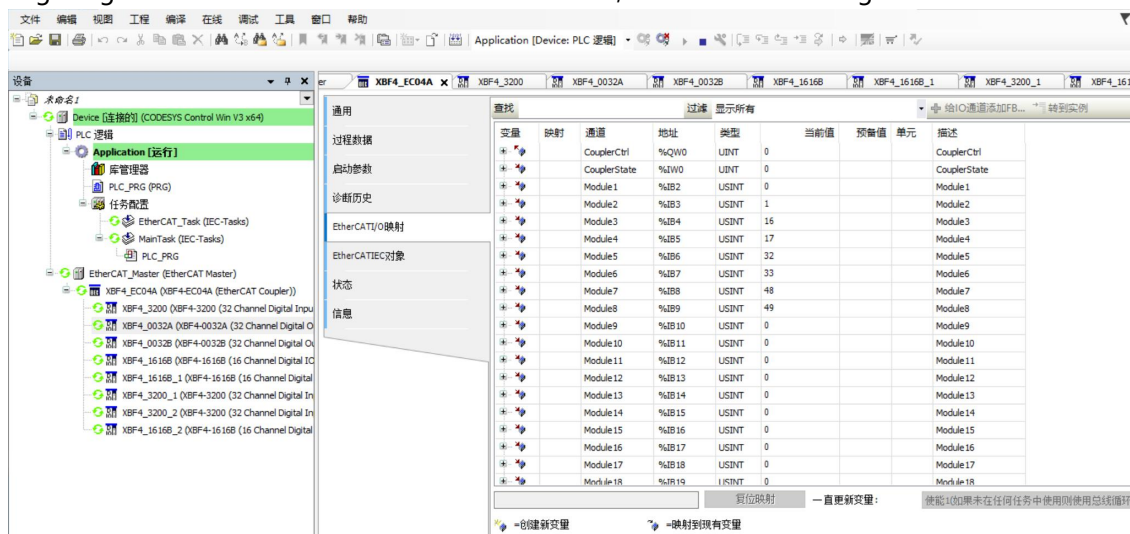
- Select the module coupler, then select "EtherCAT I/O Mapping" from the menu.
- In the "Continuously Update Variables" menu at the bottom right of the page, select "Enable 1" mode, as shown in the image below.



- Select the I/O module, then select "Module I/O Mapping" from the menu, and in the "Always Update Variables" menu at the bottom right of the page, select "Enable 1" mode, as shown in the figure below.

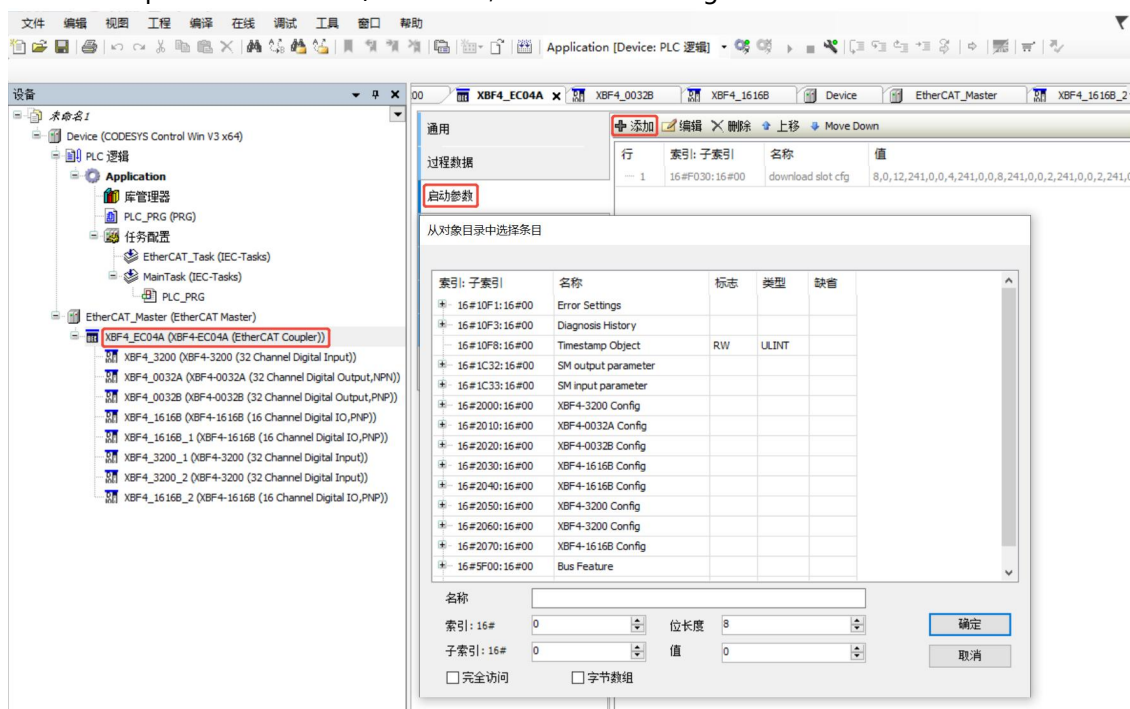


- d. Click "Online -> Multiple Downloads" in the menu bar. In the Multiple Downloads window, select "Always perform full download" and click "OK".
- e. Log in again and run the software to test the module, as shown in the image below.



9、Parameter settings

- a. Log out, double-click the coupler XBF4-EC04A in the left navigation tree, select the "Startup Parameters" page in its properties tab, and click "Add". On the parameter settings page, you can see the parameters of the I/O module, as shown in the figure below.



- b. If you modify the XBF4-1616B parameter settings, expand the configuration parameter menu to configure the digital input filtering and output signal clear/hold functions, as shown in the figure below.

从对象目录中选择条目

索引: 子索引	名称	标志	类型	缺省
16#2030:16#00	XBF4-1616B Config			
:16#01	FilterTime	RW	UDINT	16#00000003
:16#02	TemplateMode	RW	UDINT	16#00000001
:16#03	Channel 00	RW	UDINT	16#00000000
:16#04	Channel 01	RW	UDINT	16#00000000
:16#05	Channel 02	RW	UDINT	16#00000000
:16#06	Channel 03	RW	UDINT	16#00000000
:16#07	Channel 04	RW	UDINT	16#00000000
:16#08	Channel 05	RW	UDINT	16#00000000
:16#09	Channel 06	RW	UDINT	16#00000000
:16#0A	Channel 07	RW	UDINT	16#00000000
:16#0B	Channel 08	RW	UDINT	16#00000000
:16#0C	Channel 09	RW	UDINT	16#00000000
:16#0D	Channel 10	RW	UDINT	16#00000000

名称:

索引: 16# 位长度:

子索引: 16# 值:

☐ 完全访问 ☐ 字节数组

- c. The digital input filtering time FilterTime can be set from 0 to 20ms. After configuration, click "OK", as shown in the figure below.

从对象目录中选择条目

索引: 子索引	名称	标志	类型	缺省
16#2030:16#00	XBF4-16 16B Config			
:16#01	FilterTime	RW	UDINT	16#00000003
:16#02	TemplateMode			1
:16#03	Channel 00			00
:16#04	Channel 01			00
:16#05	Channel 02			00
:16#06	Channel 03			00
:16#07	Channel 04			00
:16#08	Channel 05			00
:16#09	Channel 06			00
:16#0A	Channel 07			00
:16#0B	Channel 08			00
:16#0C	Channel 09			00
:16#0D	Channel 10			00

名称

FilterTime

索引: 16#

2030

位长度

子索引: 16#

1

值

☐ 完全访问

☐ 字节数组

1ms

2ms

3ms

4ms

5ms

6ms

7ms

8ms

9ms

10ms

11ms

12ms

13ms

14ms

15ms

16ms

17ms

18ms

19ms

20ms

0.1ms

0.2ms

0.5ms

3ms

确定

取消

- 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.

从对象目录中选择条目

索引: 子索引	名称	标志	类型	缺省
16#2030:16#00	XBF4-16 16B Config			
:16#01	FilterTime	RW	UDINT	16#00000003
:16#02	TemplateMode	RW	UDINT	16#00000001
:16#03	Channel 00	RW	UDINT	16#00000000
:16#04	Channel 01	RW	UDINT	16#00000000
:16#05	Channel 02	RW	UDINT	16#00000000
:16#06	Channel 03	RW	UDINT	16#00000000
:16#07	Channel 04	RW	UDINT	16#00000000
:16#08	Channel 05	RW	UDINT	16#00000000
:16#09	Channel 06	RW	UDINT	16#00000000
:16#0A	Channel 07	RW	UDINT	16#00000000
:16#0B	Channel 08	RW	UDINT	16#00000000
:16#0C	Channel 09	RW	UDINT	16#00000000
:16#0D	Channel 10	RW	UDINT	16#00000000

名称

TemplateMode

索引: 16#

2030

位长度

32

子索引: 16#

2

值

PresetLow

☐ 完全访问

☐ 字节数组

确定

取消

- e. For example, to modify the baud rate configuration parameter, expand the configuration parameter menu, as shown in the figure below.

从对象目录中选择条目

The screenshot shows a configuration window with a table of parameters. The 'Bus Baud Rate' parameter is highlighted. Below the table, the configuration details for 'Bus Baud Rate' are shown, including the name, index, sub-index, bit length, and value.

索引: 子索引	名称	标志	类型	缺省
* 16#1C32:16#00	SM output parameter			
* 16#1C33:16#00	SM input parameter			
* 16#2000:16#00	XBF4-3200 Config			
* 16#2010:16#00	XBF4-0032A Config			
* 16#2020:16#00	XBF4-0032B Config			
* 16#2030:16#00	XBF4-16 16B Config			
* 16#2040:16#00	XBF4-16 16B Config			
* 16#2050:16#00	XBF4-3200 Config			
* 16#2060:16#00	XBF4-3200 Config			
* 16#2070:16#00	XBF4-16 16B Config			
16#5F00:16#00	Bus Feature			
:16#01	BusFault Communication Configuration	RW	UDINT	16#00000000
:16#05	Bus Baud Rate	RW	UDINT	16#005b8d80
* 16#F030:16#00	Configured Module Ident List			

名称: Bus Baud Rate

索引: 16# 5F00 位长度: 32

子索引: 16# 5 值: 6MHz

☐ 完全访问 ☐ 字节数组

确定 取消

- f. The bus baud rate can be set to 6MHz, 3MHz, 1MHz, or 115200Hz. After configuration, click "OK", as shown in the figure below.

从对象目录中选择条目

索引: 子索引	名称	标志	类型	缺省
16#1C32:16#00	SM output parameter			
16#1C33:16#00	SM input parameter			
16#2000:16#00	XBF4-3200 Config			
16#2010:16#00	XBF4-0032A Config			
16#2020:16#00	XBF4-0032B Config			
16#2030:16#00	XBF4-1616B Config			
16#2040:16#00	XBF4-1616B Config			
16#2050:16#00	XBF4-3200 Config			
16#2060:16#00	XBF4-3200 Config			
16#2070:16#00	XBF4-1616B Config			
16#5F00:16#00	Bus Feature			
:16#01	BusFault Communication Configuration	RW	UDINT	16#00000000
:16#05	Bus Baud Rate	RW	UDINT	16#005b8d80
16#F030:16#00	Configured Module Ident List			

名称:

索引: 16# 位长度:

子索引: 16# 值:

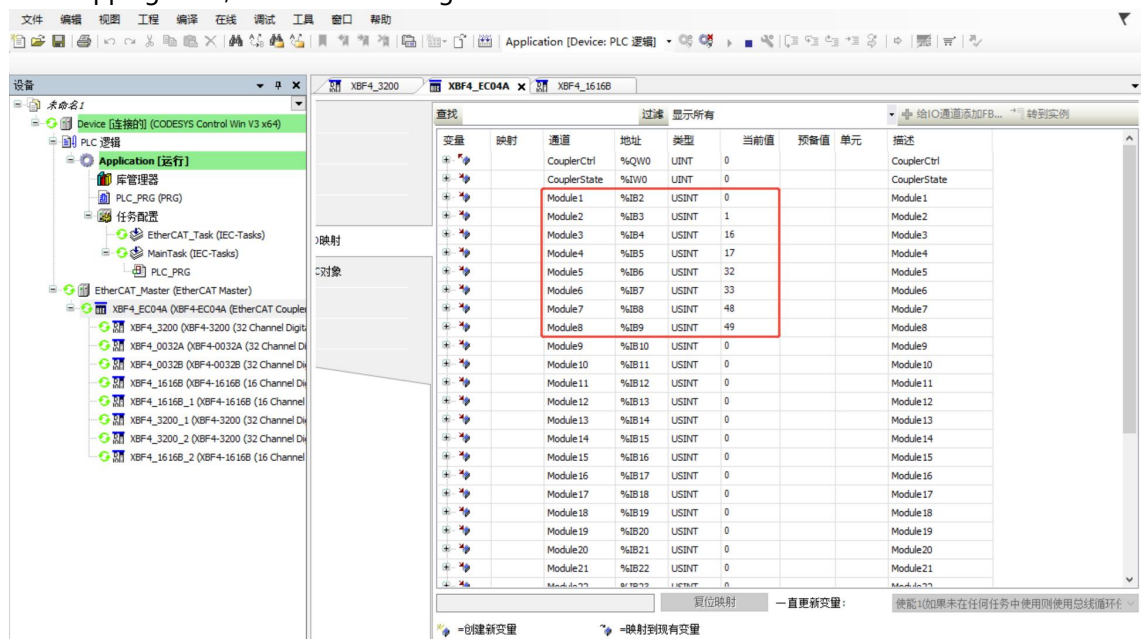
☐ 完全访问 ☐ 字节数组

10、Verify basic functions

- Click "Online -> Multiple Downloads" in the menu bar. In the Multiple Downloads window, select "Always Perform Full Download" and click "OK", as shown in the image below.
- Click the "Login" button to log in again. Double-click XBF4-1616B in the left navigation bar to expand the mapping table of the XBF4-1616B module. When an effective voltage is input to the input channel, the input value can be monitored in the mapping table. The output channel can be forced to output by clicking the cell to modify the pre-set value and clicking "Debug -> Write Value" in the menu bar, as shown in the figure below.

变量	映射	通道	地址	类型	当前值	预置值	单元	描述
		Channel 0	%QX10.0	BIT	TRUE			Channel 0
		Channel 1	%QX10.1	BIT	FALSE			Channel 1
		Channel 2	%QX10.2	BIT	FALSE			Channel 2
		Channel 3	%QX10.3	BIT	FALSE			Channel 3
		Channel 4	%QX10.4	BIT	FALSE			Channel 4
		Channel 5	%QX10.5	BIT	FALSE			Channel 5
		Channel 6	%QX10.6	BIT	FALSE			Channel 6
		Channel 7	%QX10.7	BIT	FALSE			Channel 7
		Channel 8	%QX11.0	BIT	FALSE			Channel 8
		Channel 9	%QX11.1	BIT	FALSE			Channel 9
		Channel 10	%QX11.2	BIT	FALSE			Channel 10
		Channel 11	%QX11.3	BIT	FALSE			Channel 11
		Channel 12	%QX11.4	BIT	FALSE			Channel 12
		Channel 13	%QX11.5	BIT	FALSE			Channel 13
		Channel 14	%QX11.6	BIT	FALSE			Channel 14
		Channel 15	%QX11.7	BIT	FALSE			Channel 15
		Channel 0	%DX38.0	BIT	FALSE			Channel 0
		Channel 1	%DX38.1	BIT	FALSE			Channel 1
		Channel 2	%DX38.2	BIT	FALSE			Channel 2
		Channel 3	%DX38.3	BIT	FALSE			Channel 3
		Channel 4	%DX38.4	BIT	FALSE			Channel 4
		Channel 5	%DX38.5	BIT	FALSE			Channel 5
		Channel 6	%DX38.6	BIT	FALSE			Channel 6
		Channel 7	%DX38.7	BIT	FALSE			Channel 7

- c. existDouble-click XBF4-EC04A in the left navigation bar to expand the mapping table of XBF4-EC04A. You can view the extended interface number of the slave module connected to the coupler and the DIP switch station number of the slave module in "Module 1 ~ Module32" of the mapping table, as shown in the figure below.



Note: Module 1 (XBF4-3200): 0 (16#00) -- The extension interface number corresponding to the access coupler is 0, and the module station number is 0;

Module 2 (XBF4-0032A): 1 (16#01) -- The extension interface number corresponding to the access coupler is 0, and the module station number is 1;

Module 3 (XBF4-0032B): 16 (16#10) -- The extension interface number corresponding to the access coupler is 1, and the module station number is 0.

6.4.3 Application in the AutoShop software environment

1、Preparation

● Hardware environment

- **Module preparation:** This instruction uses the XBF4-EC04A+{Coupler Interface 0: XBF4-3200+XBF4-0032A}+{Coupler Interface 1: XBF4-0032B+XBF4-1616B}+{Coupler Interface 2: XBF4-1616B+XBF4-3200}+{Coupler Interface 3: XBF4-3200+XBF4-1616B} topology as an example.
- **One computer, pre-installed with AutoShop software.**
- **One Huichuan PLC**
This instruction uses model H5U-1614MTD-A8 as an example.
- **EtherCAT dedicated shielded cable**
- **One switching power supply**
- **Device configuration file**
Configuration file retrieval

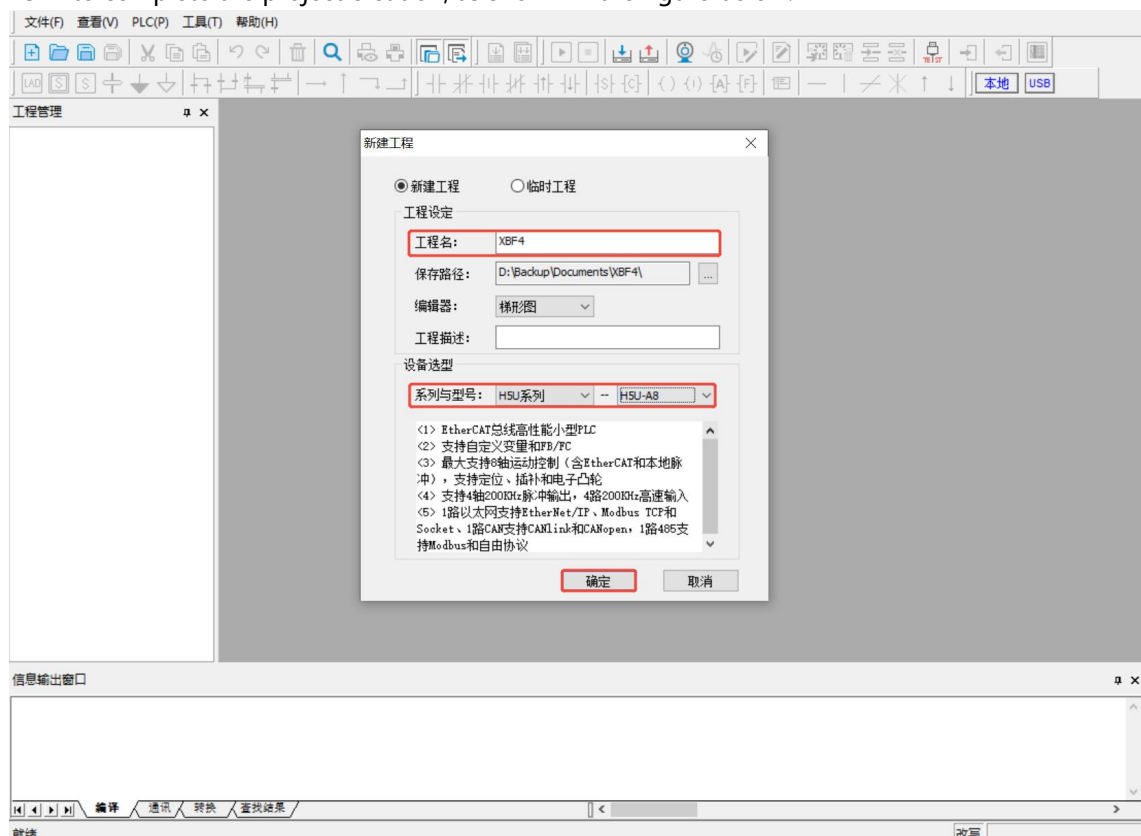
address: <https://www.solidotech.com/cn/resources/configuration-files>

● Hardware configuration and wiring

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

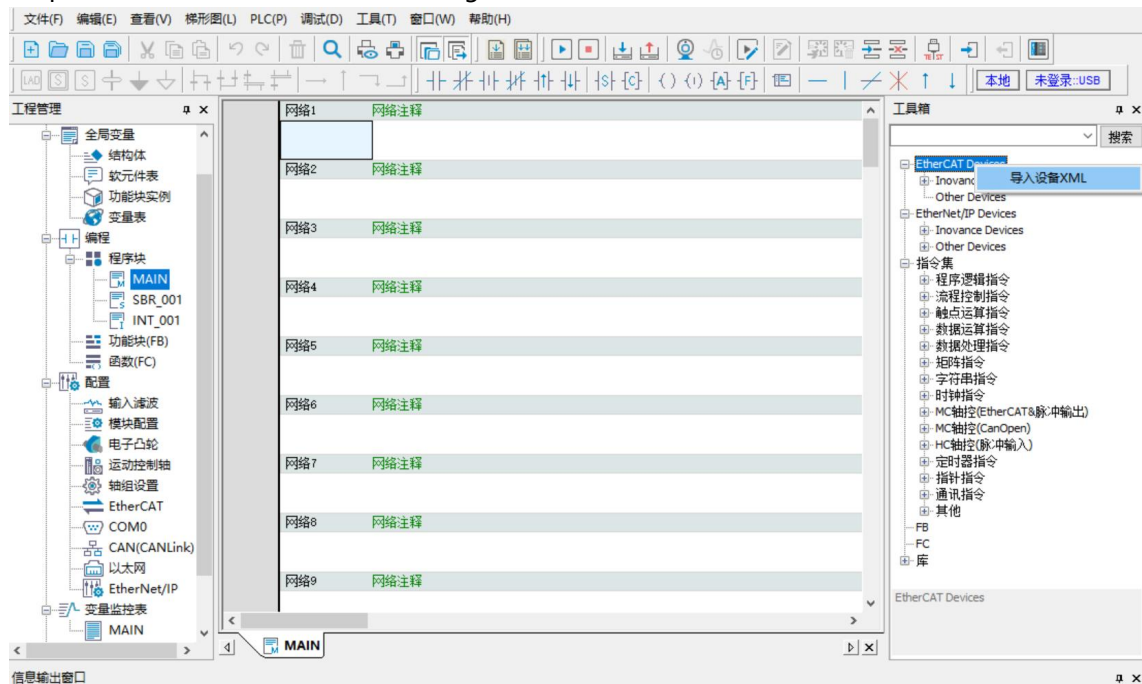
2、New construction projects

- a. Open the AutoShop software, click "File -> New Project" in the menu bar, and the New Project window will pop up. Enter a custom project name, select the PLC model and series, and click "OK" to complete the project creation, as shown in the figure below.

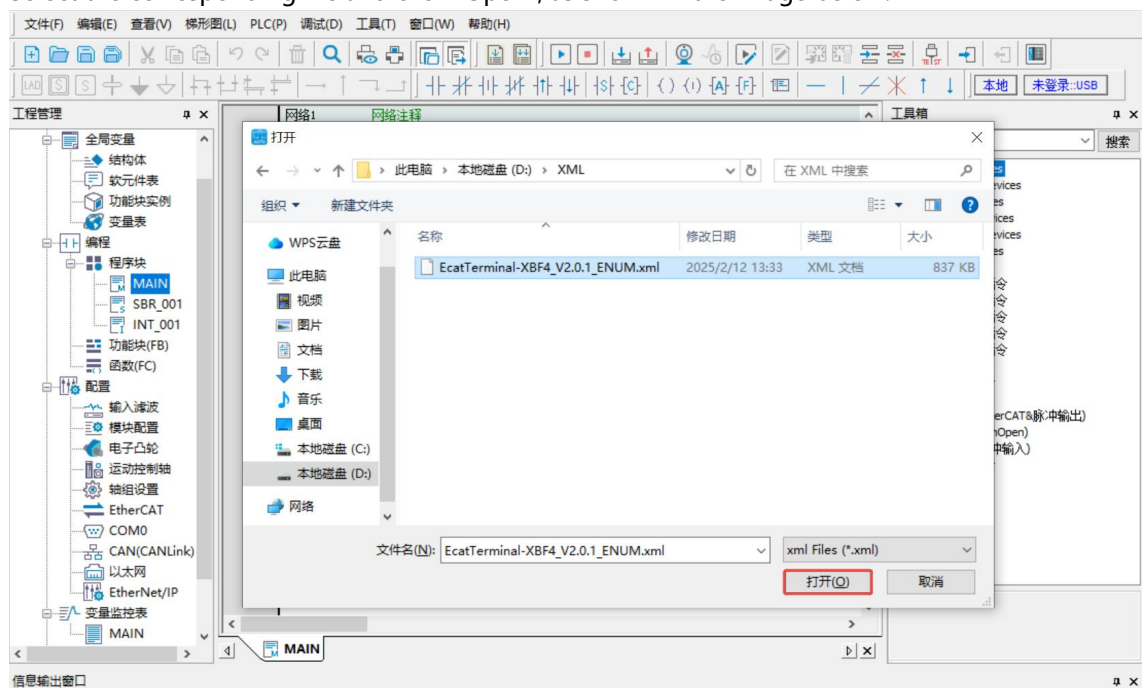


3. Import XML file

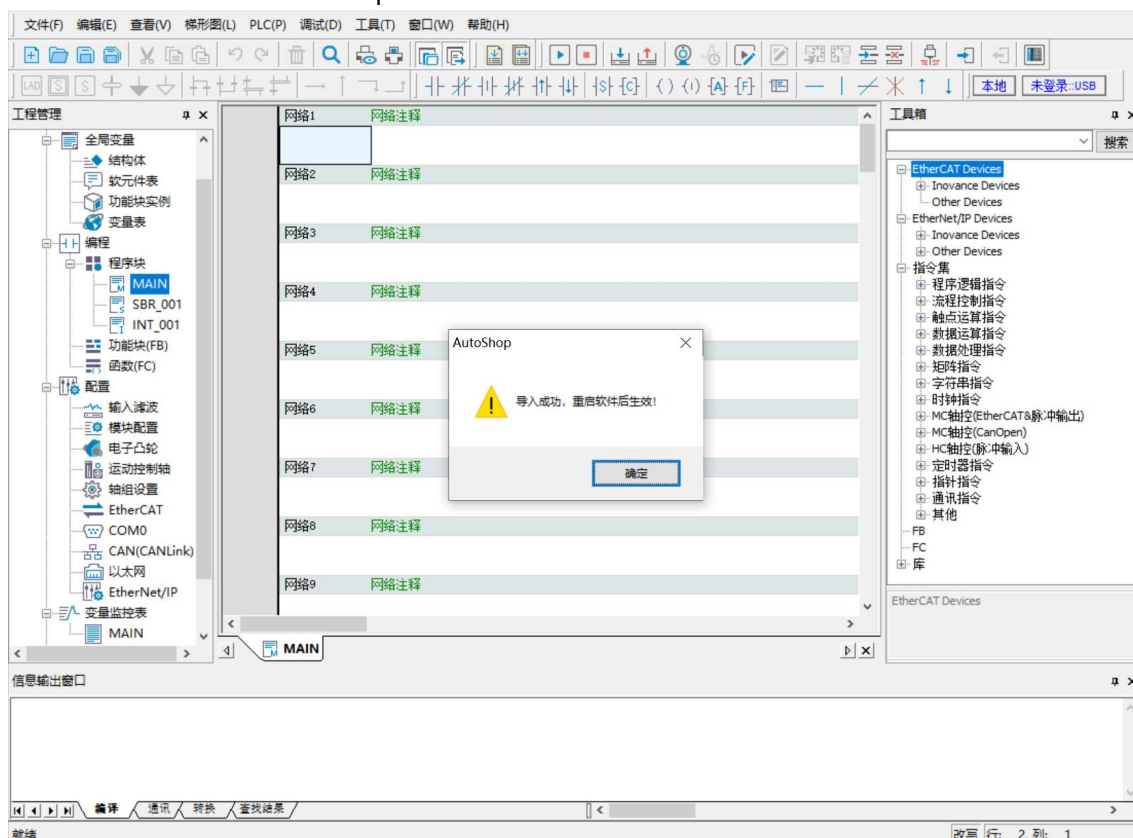
- a. Right-click "EtherCAT Devices" in the toolbox on the right side of the interface and select "Import Device XML", as shown in the figure below.



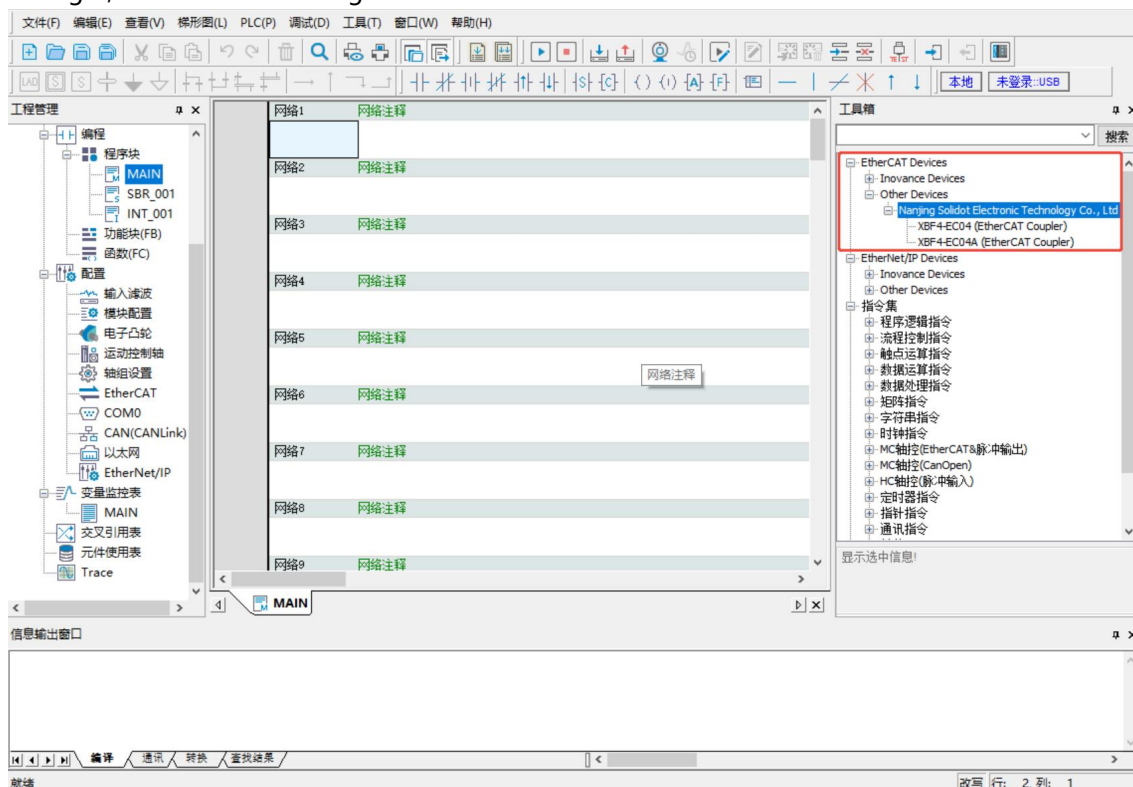
- b. Select the corresponding file and click "Open", as shown in the image below.



- c. After importing, a prompt to restart the software will appear, as shown in the image below. Close the software and then reopen it.

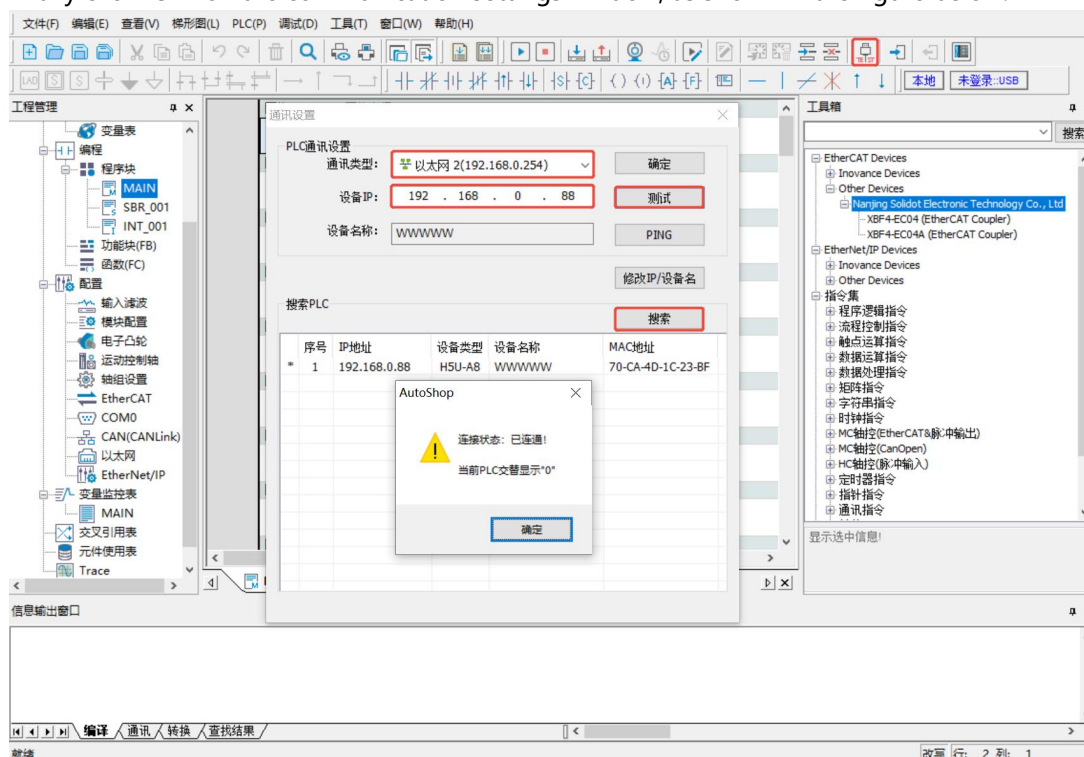


- d. Importing a previously created project allows you to view the imported files in the toolbox on the right, as shown in the image below.



4. Communication testing

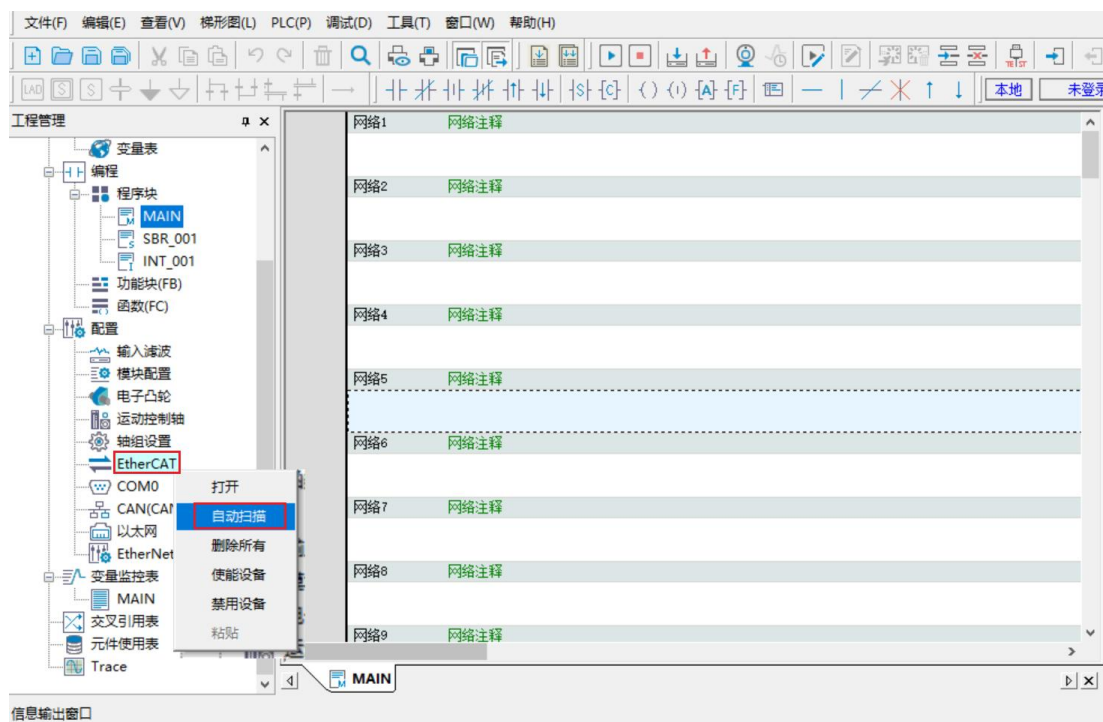
- a. Click the "Test Communication Status" button on the toolbar to bring up the communication settings window. Select the current connection communication type and click "Search" to search for the PLC. After the search is complete, modify the device IP address to match the IP address of the found PLC device. Click "Test," and the test result will show that the connection is established, meaning the PLC and computer have successfully communicated. Click "OK," and finally click "OK" on the communication settings window, as shown in the figure below.



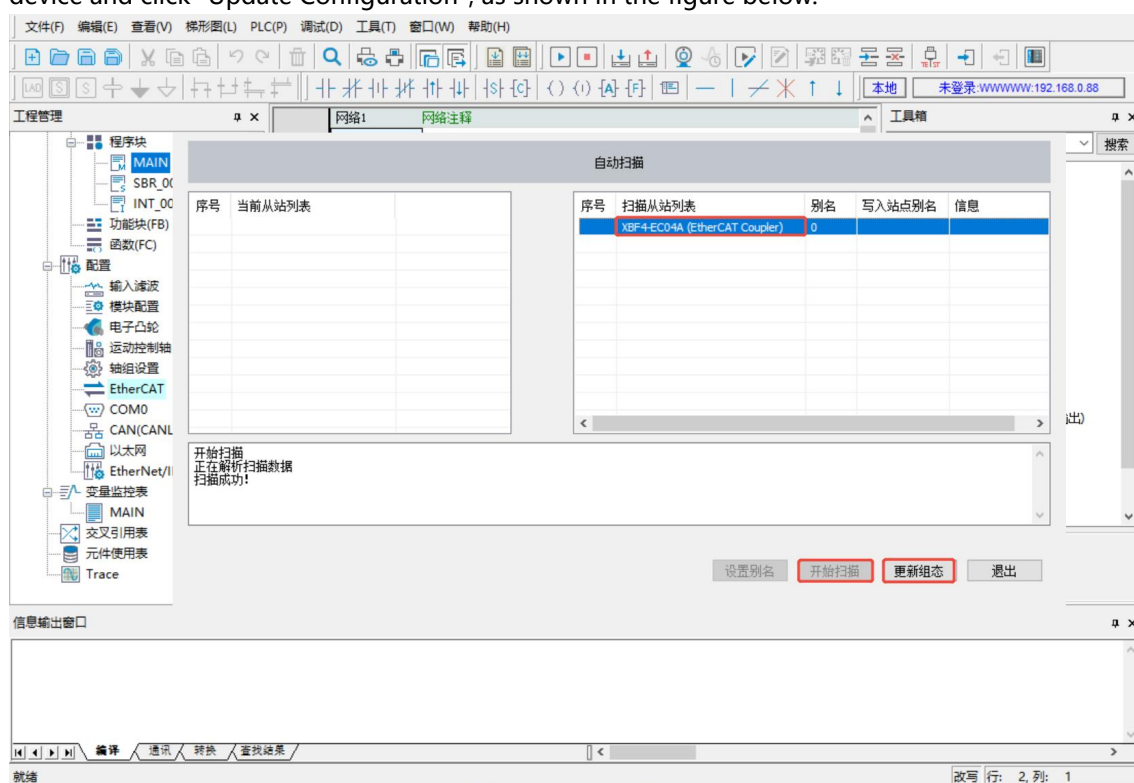
- b. If the communication test fails, check the computer's IP address. It must be on the same network segment as the PLC device's IP address. After making the necessary changes, test again.

5. Scanning equipment

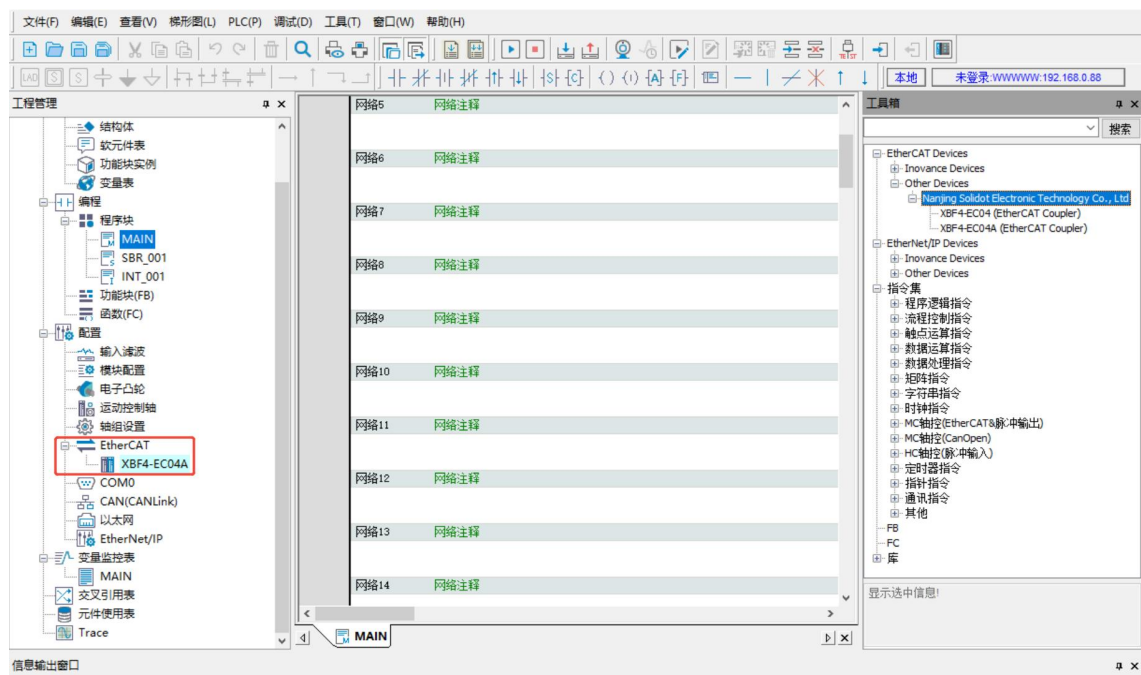
- a. Right-click "EtherCAT" in the left navigation tree and select "Auto Scan", as shown in the image below.



- b. An automatic scan window will pop up. Click "Start Scan". After the device is scanned, select the device and click "Update Configuration", as shown in the figure below.

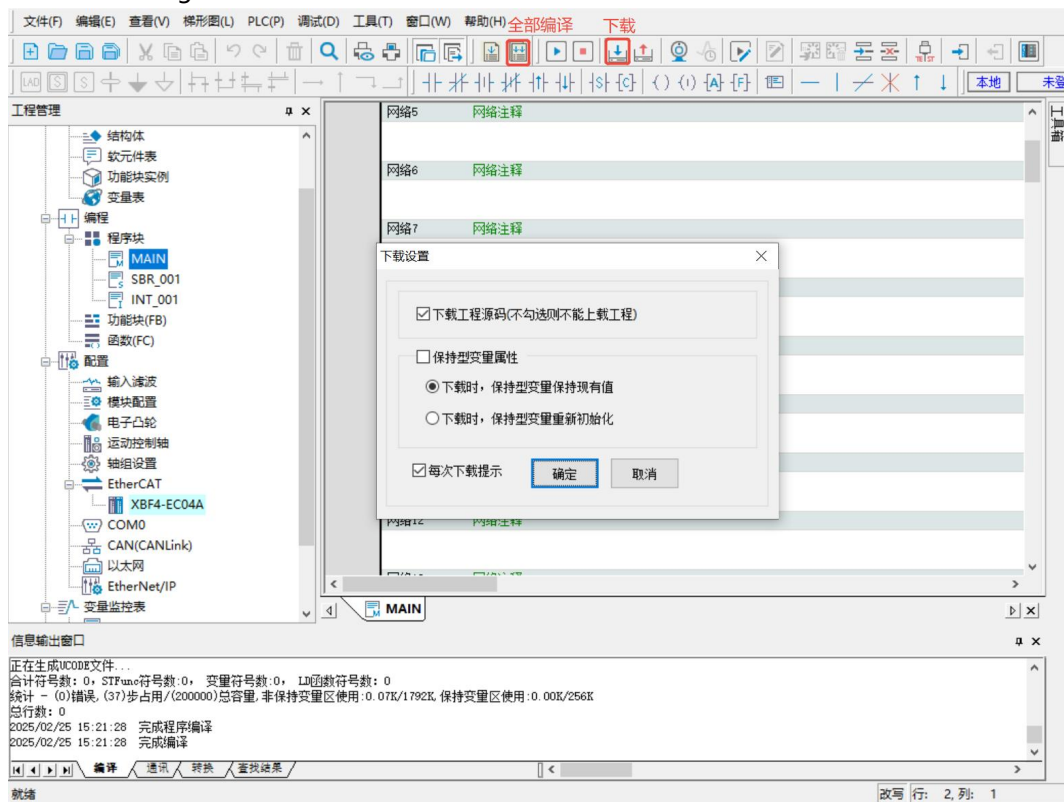


- c. After the configuration update is complete, the added device can be seen in the left navigation tree, as shown in the figure below.

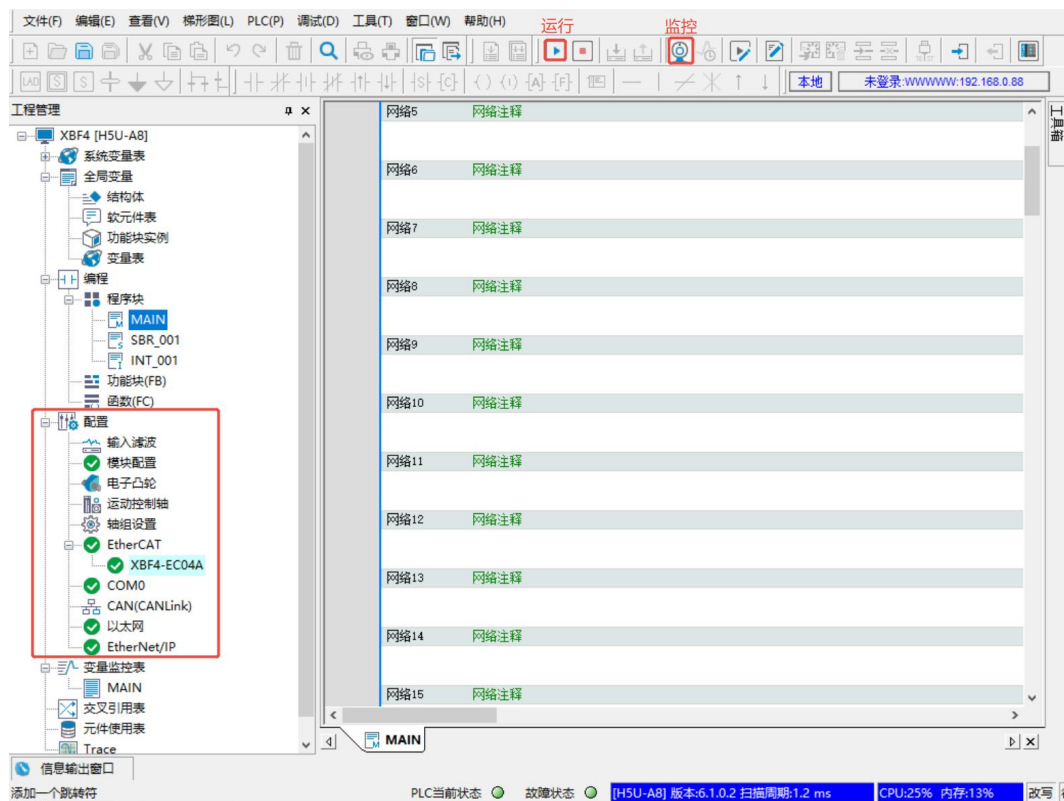


6. Configuration download

- a. Click the "Compile All" button on the toolbar. After compilation is complete, click the "Download" button on the toolbar. A download settings window will pop up. Click "OK", as shown in the figure below.

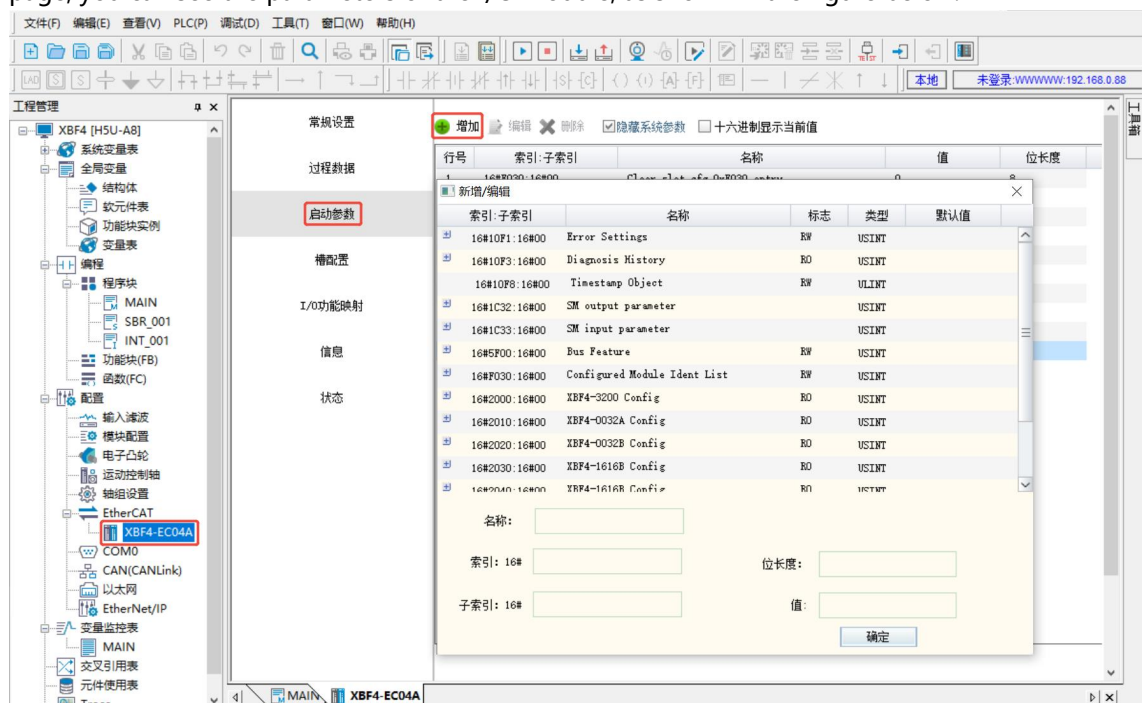


- b. After the download is complete, click the "Run" button in the toolbar, and then click the "Monitor" button in the toolbar. You can see that the configuration was successful in the left navigation tree, as shown in the figure below.



7. Parameter settings

- Exit monitoring mode, double-click the coupler XBF4-EC04A in the left navigation tree, select the "Startup Parameters" page in its properties tab, and click "Add". On the parameter settings page, you can see the parameters of the I/O module, as shown in the figure below.



- To modify the XBF4-1616B parameter settings, expand the configuration parameter menu to configure the digital input filtering and output signal clear/hold functions. After configuration, click "OK", as shown in the figure below.

新增/编辑

索引:子索引	名称	标志	类型	默认值
16#2030:16#00	XBF4-1616B Config	RO	USINT	
16:1	FilterTime	RW	DT080...	
16:2	TemplateMode	RW	DT080...	
16:3	Channel 00	RW	DT080...	
16:4	Channel 01	RW	DT080...	
16:5	Channel 02	RW	DT080...	
16:6	Channel 03	RW	DT080...	
16:7	Channel 04	RW	DT080...	
16:8	Channel 05	RW	DT080...	
16:9	Channel 06	RW	DT080...	
16:A	Channel 07	RW	DT080...	
16:B	Channel 08	RW	DT080...	

名称:

索引: 16# 位长度:

子索引: 16# 值:

- c. For example, to modify the baud rate configuration parameters, expand the configuration parameters menu, and after configuration, click "OK", as shown in the figure below.

新增/编辑

索引:子索引	名称	标志	类型	默认值
16#10F8:16#00	Timestamp Object	RW	ULINT	
16#1C32:16#00	SM output parameter		USINT	
16#1C33:16#00	SM input parameter		USINT	
16#5F00:16#00	Bus Feature	RW	USINT	
16:1	BusFault Communication Configuration	RW	UDINT	
16:5	Bus Baud Rate	RW	DT08F...	
16#F030:16#00	Configured Module Ident List	RW	USINT	
16#2000:16#00	XBF4-3200 Config	RO	USINT	
16#2010:16#00	XBF4-0032A Config	RO	USINT	
16#2020:16#00	XBF4-0032B Config	RO	USINT	
16#2030:16#00	XBF4-1616B Config	RO	USINT	

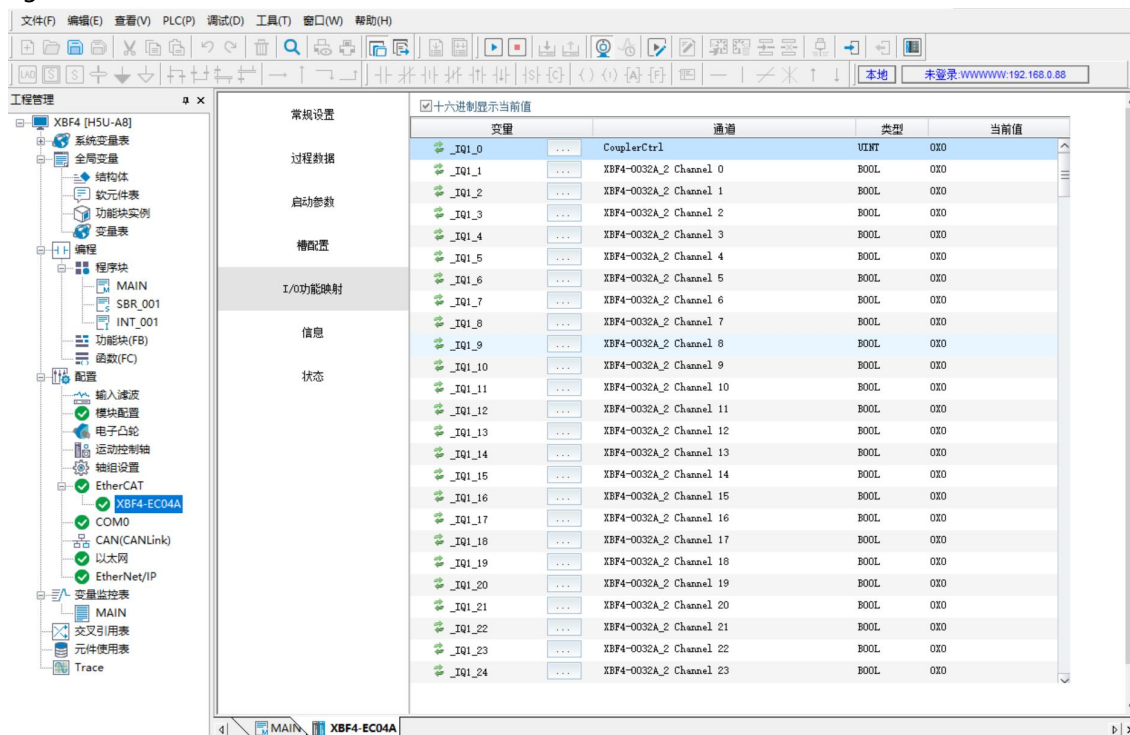
名称:

索引: 16# 位长度:

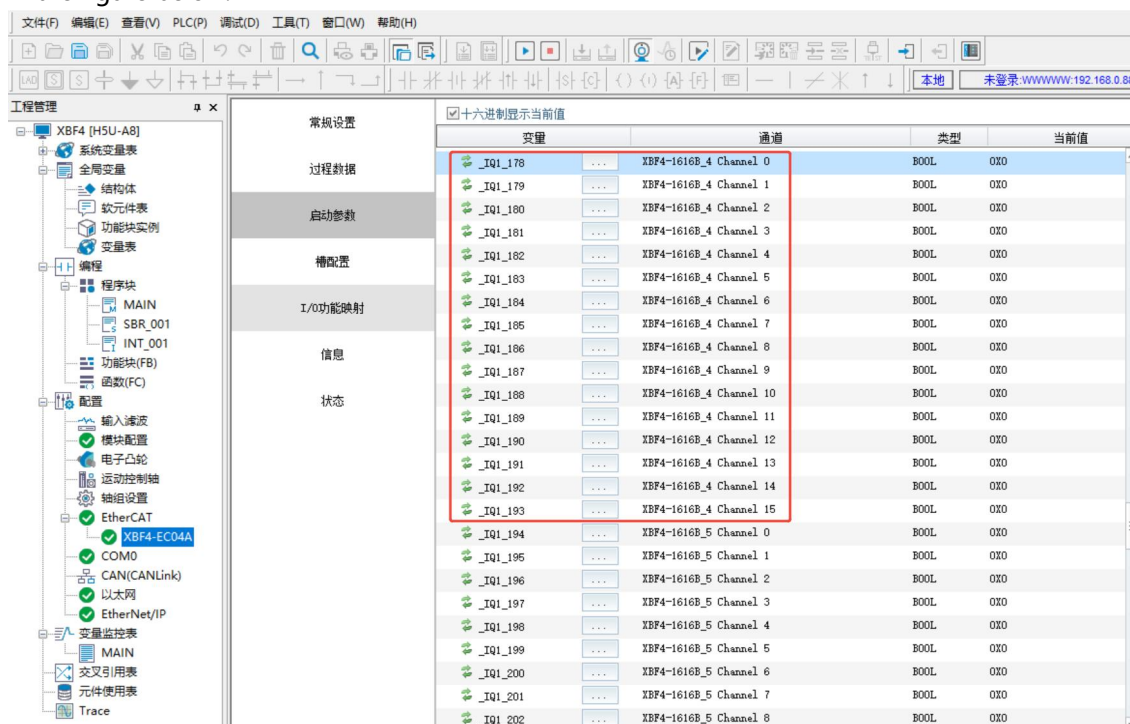
子索引: 16# 值:

8. Verify basic functions

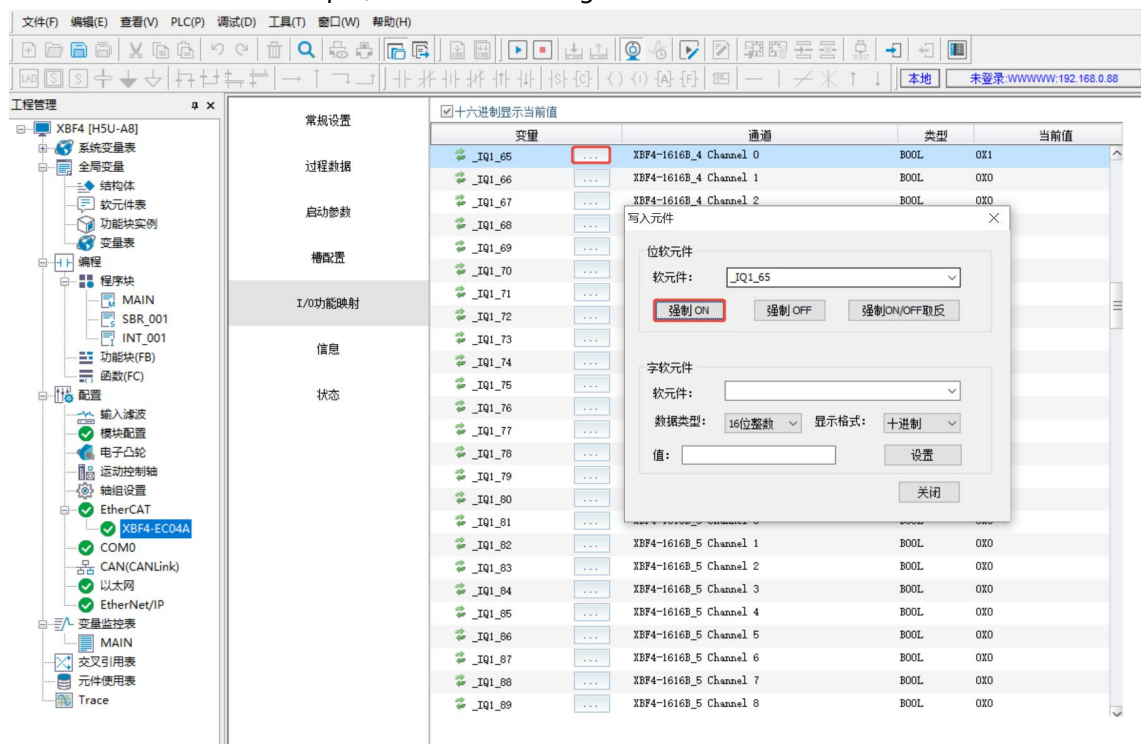
- Click the "Monitor" button to re-enter the monitoring state, double-click the XBF4-EC04A coupler in the left navigation tree, select the "I/O Function Mapping" page in its properties tab, and monitor the input and output values of each channel of each module, as shown in the figure below.



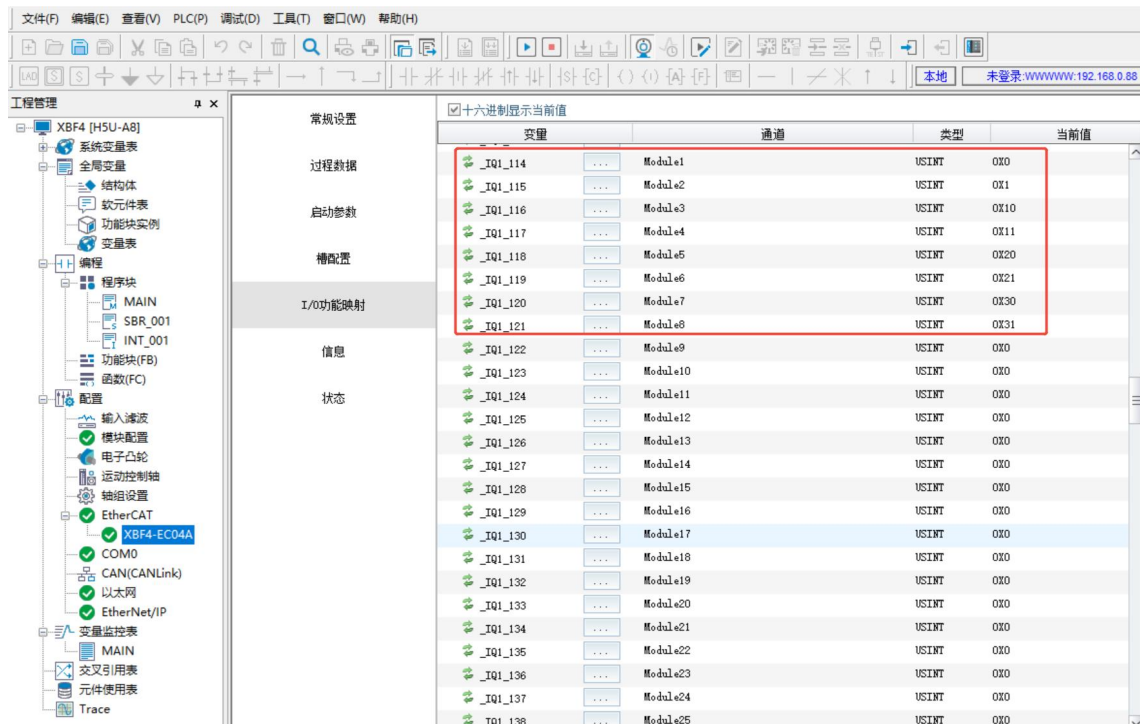
- Taking the XBF4-1616B module as an example, when an effective voltage is input to the input channel, the input value can be monitored in the mapping table "IQ1_178~IQ1_193", as shown in the figure below.



- c. The output channels of the XBF4-1616B can be controlled by clicking or double-clicking the button to the right of IQ1_65~IQ1_80, which will bring up the Write Component window. Click "Force ON" to force the output, as shown in the figure below.



- d. In the mapping table “IQ1_114~IQ1_145”, view the interface number of the slave module connected to the coupler and the station number of the slave module, as shown in the figure below.



Note: Module 1 (XBF4-3200): 0x0 -- The extension interface number corresponding to the access coupler is 0, and the module station number is 0;

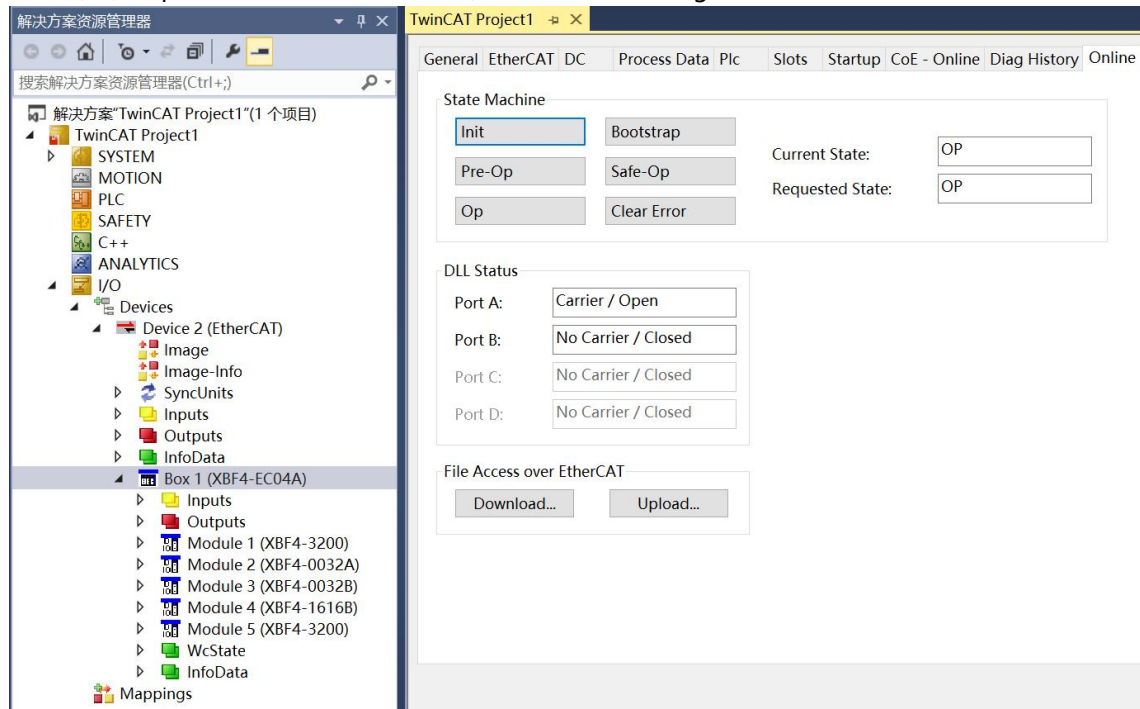
Module 2 (XBF4-0032A): 0x1 -- The extension interface number corresponding to the access coupler is 0, and the module station number is 1;

Module 3 (XBF4-0032B): 0x10 -- The extension interface number corresponding to the access coupler is 1, and the module station number is 0.

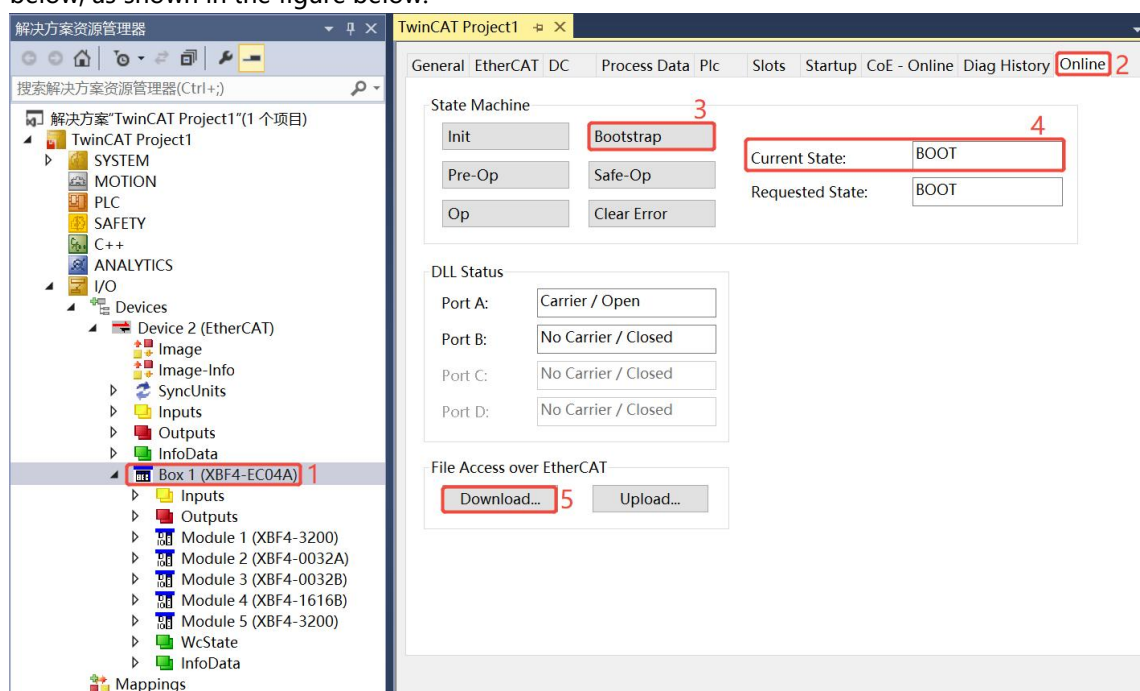
6.5 Firmware online upgrade

➤ **Using TwinCAT3 software as an example, this article introduces online firmware upgrades.**

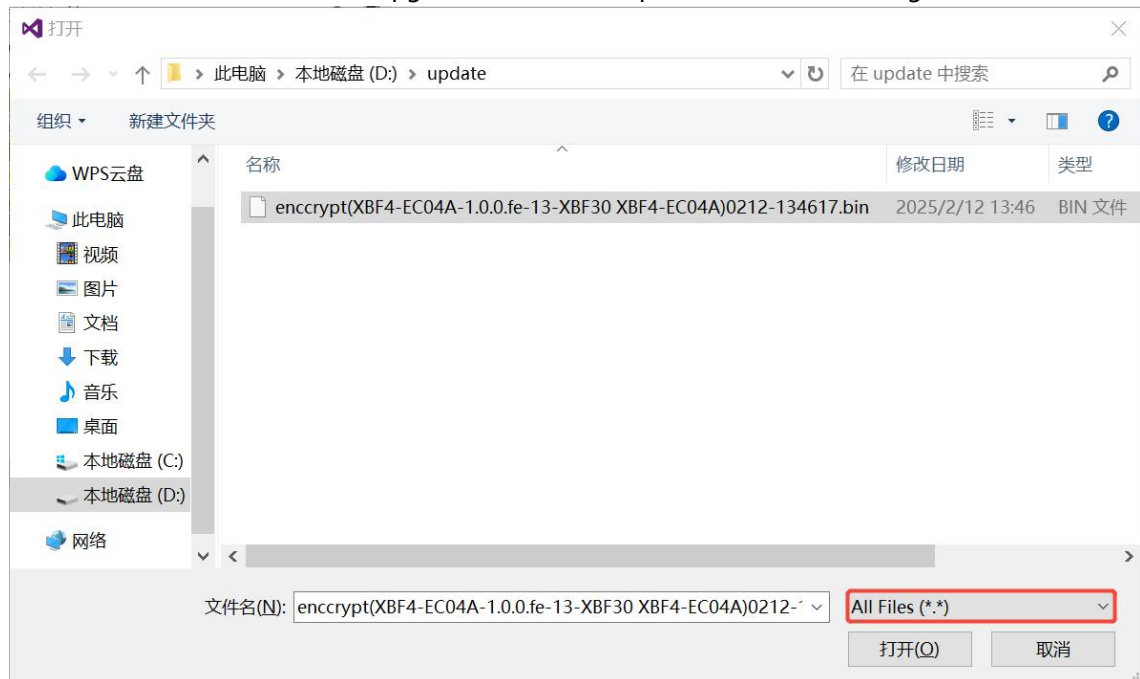
- 1、Taking TwinCAT3 software as an example, the topology is XBF4-EC04A+{Coupler Interface 0: XBF4-3200+XBF4-0032A}+{Coupler Interface 1: XBF4-0032B}+{Coupler Interface 2: XBF4-1616B}+{Coupler Interface 3: XBF4-3200}, as shown in the figure below.



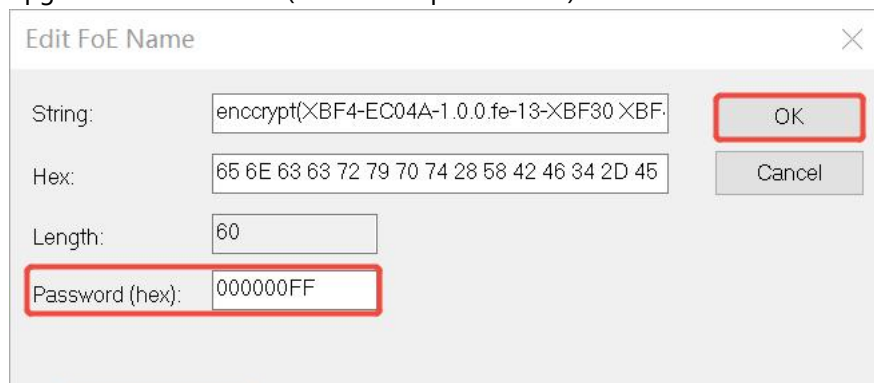
- 2、Click the coupler “XBF4-EC04A” in the left navigation tree, click the “Online” option in the right menu, click the “Bootstrap” option in State Machine, wait for the Current State to display the “BOOT” status, and then click the “Download” option in File Access over EtherCAT below, as shown in the 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) The password for coupler upgrade is 0xFF.

2) **Password rule for station module upgrade: 0xXYZ (X is the extension number of the slave module access coupler, Y is the reserved field 0, and Z is the slave module DIP switch station number)**

Password of Module 1 (XBF4-3200): 0x000;

Password of Module 2 (XBF4-0032A): 0x001;

Password of Module 3 (XBF4-0032B): 0x100;

Password of Module 4 (XBF4-1616B): 0x200;

Password for Module 5 (XBF4-3200): 0x300.

5、Successful upgrade process for different modules

EtherCAT coupler online upgrade:

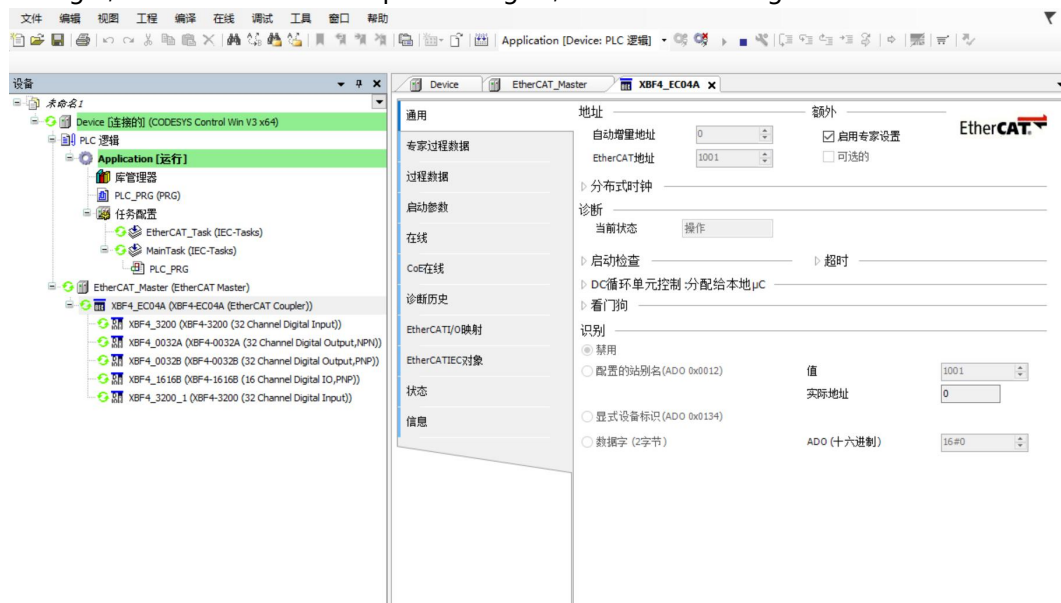
- 1) Once the progress bar is full, the RUN and ERR indicators on the coupler will flash briefly and then turn off, indicating a successful upgrade.
- 2) After a successful online upgrade, you need to manually switch to OP mode before you can re-establish the connection.
- 3) If you need to upgrade again,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

Online upgrade of I/O modules:

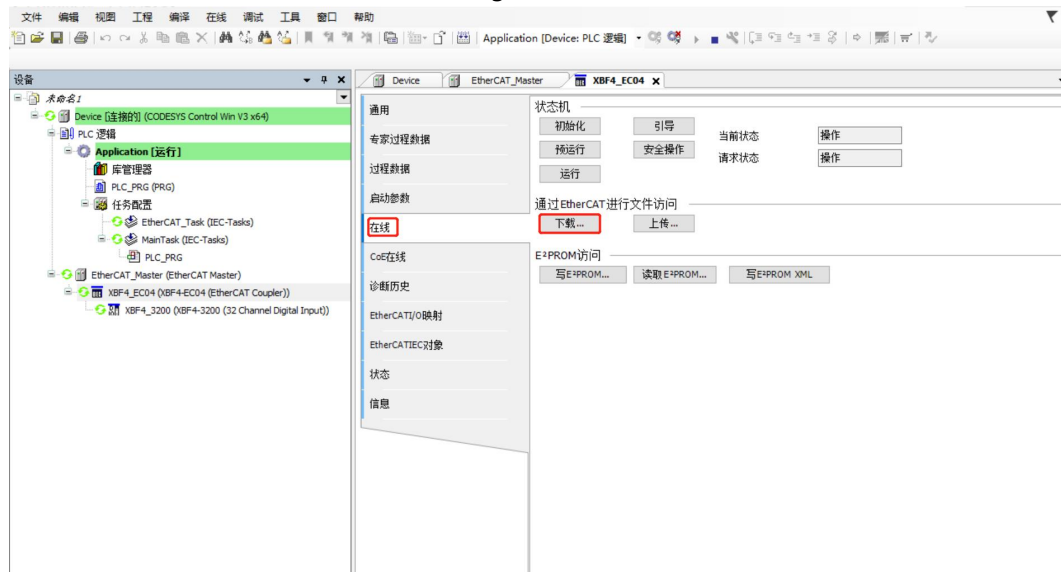
- 1) The discrete I/O module interface operation indicator Pn (n: 0~3, green light) and ERR light (red light) will flash sequentially. After the flashing ends, the upgrade is successful (after the upgrade is completed, you need to power it on and off to connect normally).
- 2) Other modules can be upgraded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

➤ Using CODESYS V3.5 software as an example, this article introduces online firmware upgrades.

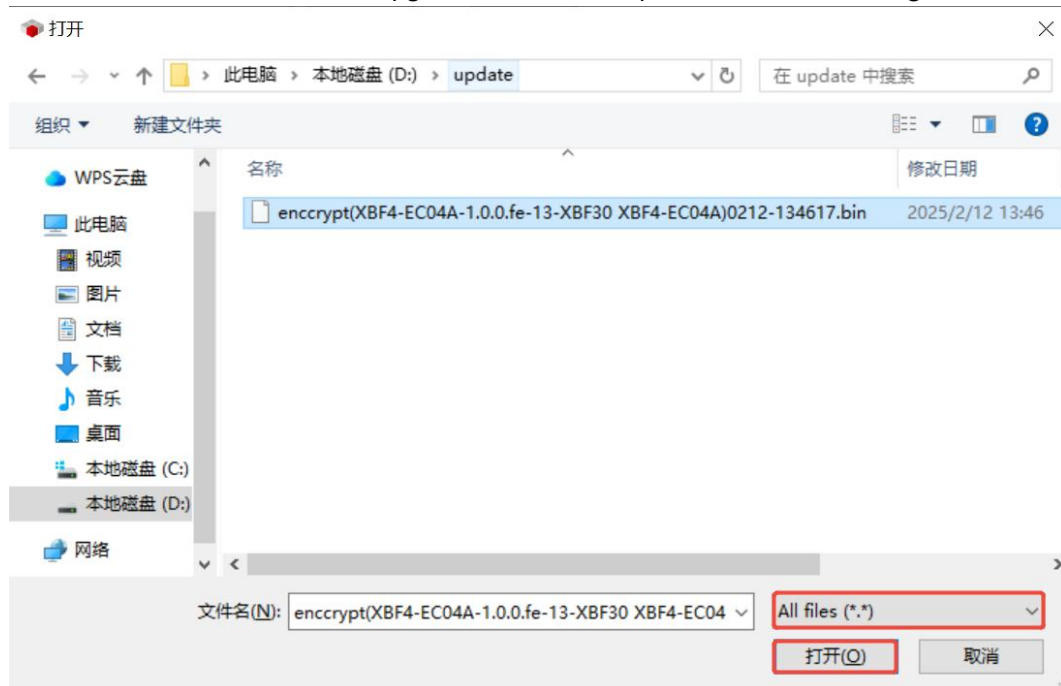
- 1、Taking CODESYS V3.5 software as an example, the topology is XBF4-EC04A+{Coupler Interface 0: XBF4-3200+XBF4-0032A}+{Coupler Interface 1: XBF4-0032B}+{Coupler Interface 2: XBF4-1616B}+{Coupler Interface 3: XBF4-3200}. Click the "Login" button to log in, and upgrade online if communication is normal.
- 2、Double-click the coupler "XBF4-EC04A" in the left navigation tree to open the main menu on the right, and check "Enable Expert Settings", as shown in the figure below.



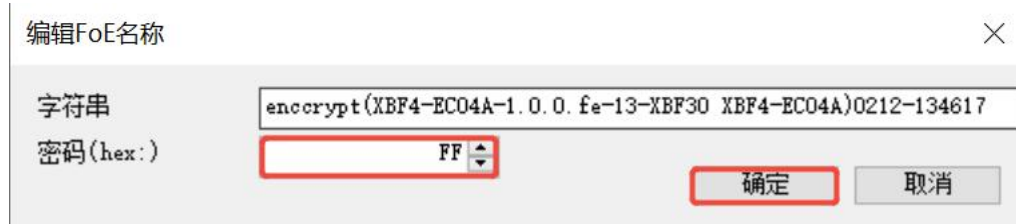
- 3、Click the "Online" option in the right-hand menu, then click the "Download" option under "File Access via EtherCAT," as shown in the image below.



- 4、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.



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



Note: 1) The password for coupler upgrade is 0xFF.

2) Password rule for slave module upgrade: 0xXYZ (X is the extension number of the slave module access coupler, Y is the reserved field 0, and Z is the slave module DIP switch station number)

Password of Module 1 (XBF4-3200): 0x000;
Password of Module 2 (XBF4-0032A): 0x001;
Password of Module 3 (XBF4-0032B): 0x100;
Password of Module 4 (XBF4-1616B): 0x200;
Password for Module 5 (XBF4-1616B): 0x300.

- 6、 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.

Online upgrade of I/O modules:

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

7 FAQ

7.1 Does the EtherCAT slave support ring network redundancy?

1. In EtherCAT, ring network redundancy is a function of the PLC and is unrelated to the I/O slave station.