XF series PLC extension module

User manual

Wuxi XINJE Electric Co., Ltd.

Data No. PF 02 20241118EN 1.3

Basic description

- Thank you for purchasing the XINJE XF series programmable controller and extension module.
- This manual mainly introduces the hardware features of XF series extension module.
- Before using the product, please read this manual carefully and conduct wiring on the premise of fully understanding the contents of the manual.
- For software and programming, please refer to the relevant manuals.
- Please deliver this manual to the end user.

Notes to users

- Only operators with certain electrical knowledge can conduct wiring and other operations on the product. If there is any unknown place, please consult our technical department.
- The examples listed in the manual and other technical data are only for users' understanding and reference, and don't guarantee certain actions.
- When using this product in combination with other products, please confirm whether it conforms to relevant specifications and principles.
- When using this product, please confirm whether it meets the requirements and is safe.
- Please set up backup and safety functions by yourself to avoid possible machine failure or loss caused by the failure of this product.

Statement of responsibility

- Although the contents of the manual have been carefully checked, errors are inevitable, and we cannot guarantee complete consistency.
- We will often check the contents of the manual and make corrections in subsequent versions. We welcome your valuable comments.
- The contents described in the manual are subject to change without notice.

Contact us

If you have any questions about the use of this product, please contact the agent and office who purchased the product, or you can directly contact the company.

- Tel: 400-885-0136
- Fax: 0510-85111290
- Address: No.816, Jianzhu West Road, Binhu District, Wuxi City, Jiangsu Province, China
- Post code: 214072
- Website: www.xinje.com

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Safety precautions

The problems that may arise during the use of the product are basically included in the safety precautions, which are indicated in two levels of attention and danger. For other unfinished matters, please follow the basic electrical operation procedures.

Attension	When used incorrectly, it may cause danger, moderate injury or minor injury, and property damage.
Danger	When it is used incorrectly, it may cause danger, cause personal injury or serious injury, and may cause serious property damage.

- Confirmation upon receiving the product

Attention
Don't install damaged controllers, controllers with missing parts, or controllers with unqualified models. Danger of injury.

- Product system design

Danger
Please design a safety circuit outside the controller to ensure that the whole system can operate safely when the controller operates abnormally. There is a risk of misoperation and failure.

Attention
Don't tie the control wiring and power wiring together. In principle, they should be separated by 10cm. It may cause malfunction and product damage.

- Product installation

Danger
Before installing the controller, be sure to disconnect all external power supplies. Danger of electric shock.

Attention

1. Please install and use this product under the environmental conditions specified in the general specifications of the manual.
Don't use in damp, high temperature, places with dust, smoke, conductive dust, corrosive gas, flammable gas, vibration and impact.
It may cause electric shock, fire, misoperation, product damage, etc.
2. Don't directly touch the conductive part of the product.
It may cause malfunction and fault.
3. Please use DIN46277 guide rail, M3 screw or Xinje XG-EB to fix the product and install it on a flat surface.
Incorrect installation may cause malfunction and product damage.
4. When processing the screw hole, please don't let the cutting powder and wire debris fall into the product cover.
It may cause malfunction and fault.
5. When connecting the expansion module with the expansion cable, please confirm that the connection is tight and the contact is good.
It may lead to poor communication and misoperation.
6. When connecting peripheral devices, expansion devices, batteries and other devices, be sure to cut off power for operation.
It may cause malfunction and fault.

- Product wiring

Danger

1. Before wiring the controller, be sure to disconnect all external power supplies.
Danger of electric shock.
2. Please correctly connect the AC/DC power supply to the dedicated power terminal of the controller.
If the power supply is connected incorrectly, the controller may be burned.
3. Before the controller is powered on and operated, please cover the cover plate on the terminal block.
Danger of electric shock.

Attention

1. Don't use external 24V power supply to connect to 24V and 0V terminals of the controller or expansion module.
It may cause damage to the product.
2. Please use 2mm2 wire to carry out the third kind of grounding for the grounding terminal of the controller and expansion equipment, and Don't share the grounding with the strong current system.
It may cause failure, product damage, etc.
3. Don't make external wiring to the empty terminal.
It may cause malfunction and product damage.
4. When processing the screw hole, please don't let the cutting powder and wire debris fall into the product cover.
May cause malfunction, fault, etc.
5. When using wires to connect terminals, be sure to tighten them, and don't make conductive parts contact other wires or terminals.
It may cause malfunction and product damage.

- Operation and maintenance of products

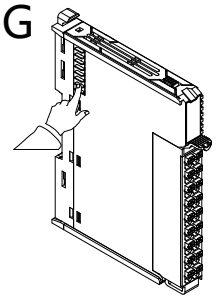
Danger

1. Don't touch the terminal after the controller is powered on.
Danger of electric shock.
2. Don't connect or remove the terminal with electricity.
Danger of electric shock.
3. Please stop the program in the controller before changing it.
It may cause malfunction.

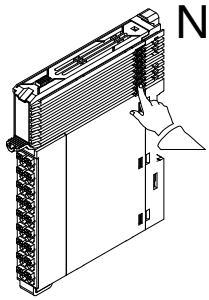
Attention

1. Don't disassemble or assemble this product without authorization.
It may cause damage to the product.
2. Please plug and unplug the connecting cable in case of power failure.
It may cause cable damage and malfunction.
3. Don't make external wiring to the empty terminal.
It may cause malfunction and product damage.
4. Please cut off the power before removing the expansion device, peripheral device and battery.
It may cause malfunction, fault, etc.
5. When the product is discarded, please treat it as industrial waste.
6. Before installing the device, be sure to turn off the power supply. If the power supply is not turned off, the device may malfunction or be damaged. Don't turn off the CPU unit or intermediate power supply when disassembling the XF-I/O unit.
It may cause malfunctions, product damage, etc.
7. Don't stick tape or labels on both sides of the device or at the golden finger. Tape or labels can affect the normal vertical sliding installation of the module unit. The residue of the label or tape, adhesive or debris, may adhere to the pins of the XF-I/O bus connector.
May cause malfunctions, malfunctions, etc.
8. Don't touch the XF-I/O bus connector on the device, as sweat and dust may adhere to the connector or golden fingers.
This may cause a malfunction.

NG



NG



9. Don't use ink to write on the device in the area shown in the picture.
This may cause a malfunction.

Preface

Sincerely thank you for purchasing the XINJE Programmable Controller XF-IO series products.

This manual is convenient for users to understand and use the necessary precautions, specifications, functions, and other contents of XF-IO units.

Before use, one should thoroughly read this manual and related manuals, and correctly use this product based on a thorough understanding of the functions/performance of the XF-IO series extension module.

Catalog

1. Document Guide

1-1. Related manual

(1) CPU unit

Manual name	Main content
XSF series hardware user manual	It mainly records the hardware specifications and hardware maintenance information of XSF series CPU units.
XS series PLCopen controller instruction manual (XS Studio)	It mainly records XS series instruction section.

(2) I/O unit

Manual name	Main content
XF Series expansion module user manual	It mainly records the product specifications and maintenance information of the XF series IO unit.

2. Terminology

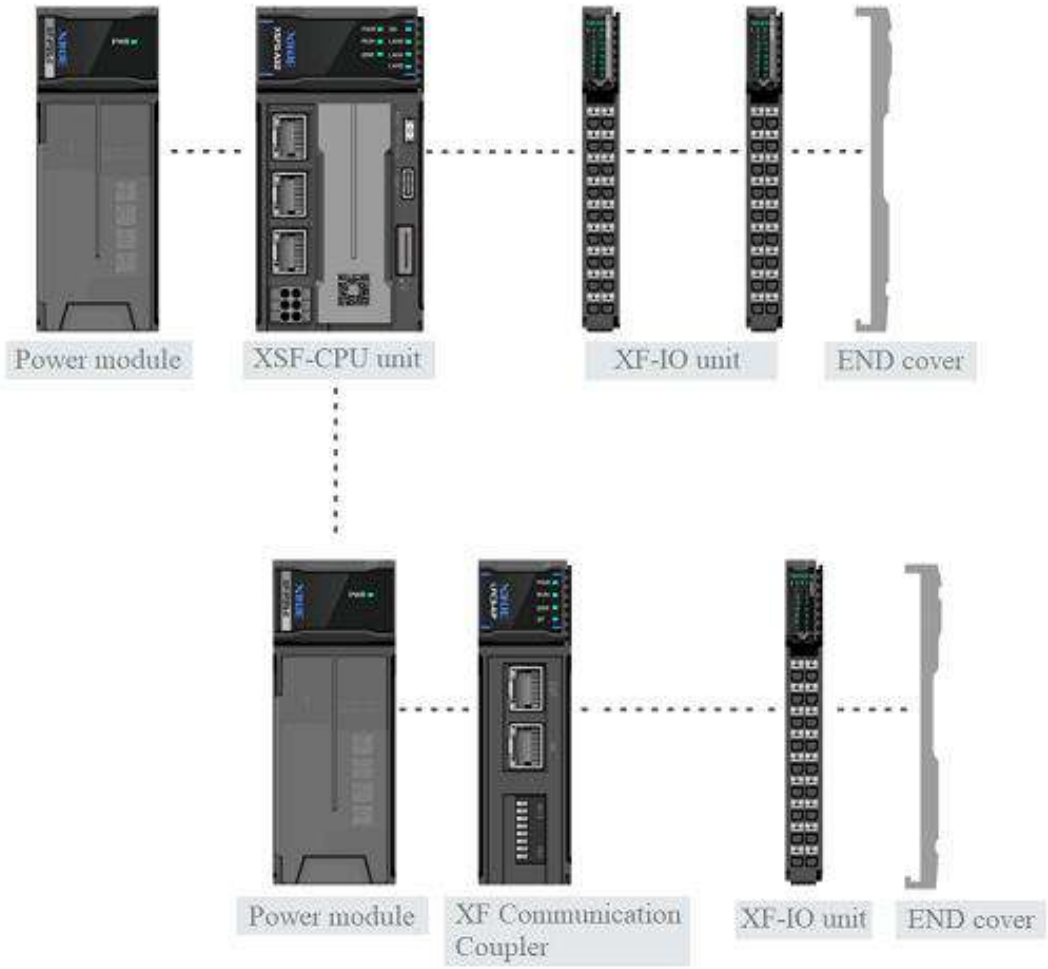
In this manual, unless otherwise specified, the following terms will be used for explanation.

Terminology	Instructions
CPU unit	General term for XF/XSF series CPU units
Power module unit	General term for XF series power modules
IP20	Protection level according to DIN 40050: protection against finger contact and intrusion of particles with a diameter greater than 12mm
Backplane bus	The backplane bus is a serial data bus used by various modules to communicate with each other. The backplane bus is also used to provide some necessary power supply for each module. Each module is connected through a bus connector.

3. Product System Configuration

In this chapter, the overall configuration, precautions during configuration, and peripheral device related content are explained.

3-1. Overall configuration



3-2. Major event

- Different CPU units are used, and the corresponding expandable IO units are also different.
- The I/O units that can be powered through the backplane bus vary according to the power supply units used.

The types and quantities of CPU units, power units, and expandable IO units are as follows:

Power unit model	CPU unit model	Scalable basic I/O unit
XF-P35-E	XSF5-A32	32
	XSF5-A64	

4. Power module unit XF-P35-E

4-1. Product overview

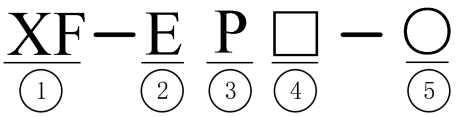
The XF-P35-E series CPU power module provides power for the CPU unit, coupler unit, and system unit for the expansion unit, suitable for XF and XSF series CPU unit products and XF series communication coupler unit.

- AC Input
- Double ground
- Overload protection

Module version:

Hardware version	Function
H2.0	Basic functions for the first official production

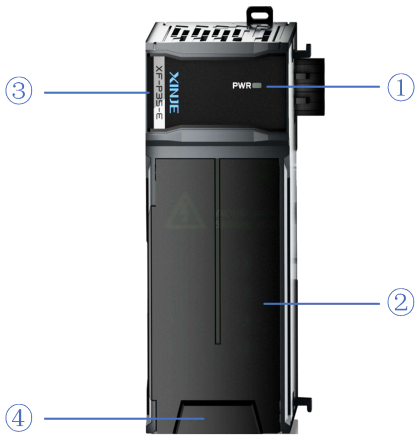
4-2. Naming rules



①	Series Name	XF:	XF series extension module
②	Extension module	E:	Right extension module
③	Module Type	P:	Power module
④	Output power	35:	Output power 35W
⑤	Input Type	E:	AC Input
		C:	DC Input

4-3. Module view

(1) Description of each section



Number	Name
①	System LED indicator light
②	Input terminal block
③	Signal indication
④	Protective cover plate

(2) System indicator light

System indicator light	Meaning	
PWR	Extinguish	No input power supply
	Normally ON (Green)	The input power of the power module is normal and provides power to the CPU unit normally
	Normally ON (Red)	The input power of the power module is normal, but the power supply to the CPU unit is abnormal

4-4. General specifications

General specifications		
Project		Content
Operating temperature	Max temperature	55℃
	Min temperature	-20℃
Transportation/storage temperature	Max temperature	70℃
	Min temperature	-40℃
Environmental humidity (Including operation/storage)	Upper limit	95%
	lower limit	10%
Protection grade		IP20
Anti vibration		Accord with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant acceleration 1.0g peak

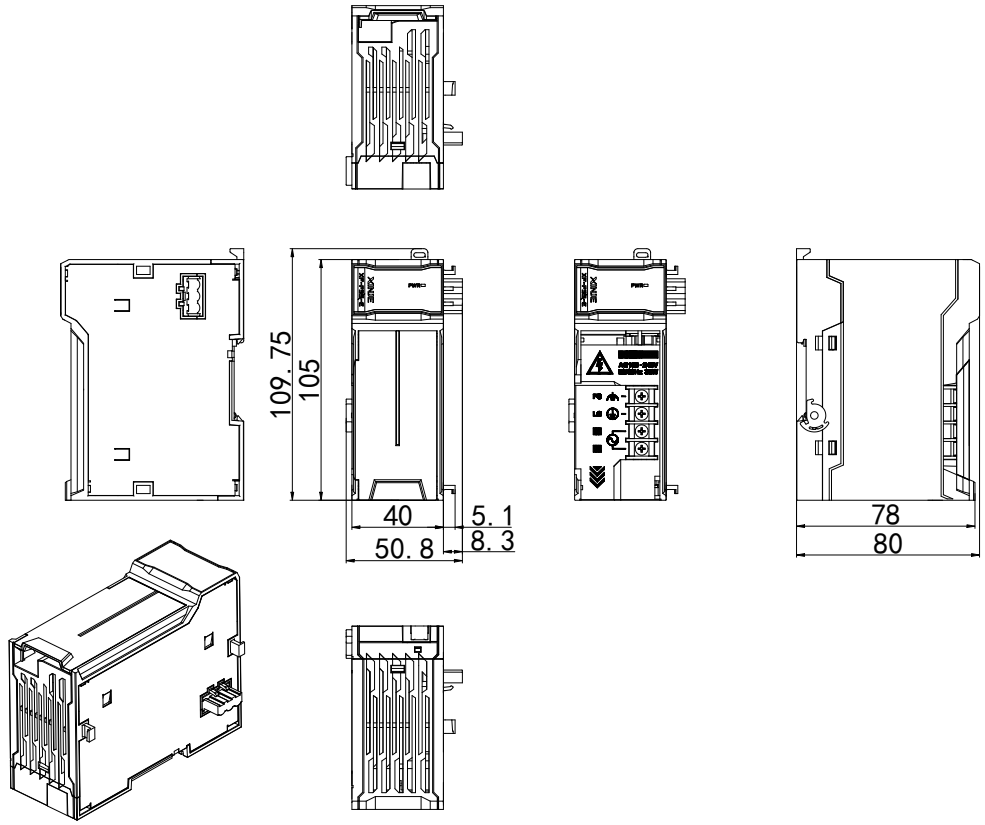
	acceleration) Under continuous vibration (frequency 5-9Hz, half amplitude 1.75mm displacement) and (frequency 9-150Hz, constant acceleration 0.5g, constant frame amplitude) Scan 10 times in X, Y, and Z directions
Impact resistance	Accord with IEC61131-2 Impact strength of 15G (peak) with a duration of 11ms is applied to three mutually perpendicular axes, with 3 impacts per axis (a total of 18 impacts)
Use environment	Non corrosive gas
Use altitude	0-2000 meters
Over voltage level	II: Accord with IEC61131-2
Pollution level	2: Accord with IEC61131-2
Anti interference EMC	Accord with IEC 61131-2 IEC61000-6-4 B type
Related certifications	CE

4-5. Technical specification

Project		Specification
Type		XF-P35-E
Power		35W
Input power	L	Input AC100~240V 50/60Hz
	N	
LG - Protective grounding		Protective grounding for equipment and operators (In accordance with the functional protection part of IEC 61131-2 and GB/T 15969.2 standards)
FG - Functional grounding		Functional grounding terminals, i.e. grounding functions used for non safety purposes, such as improving anti-interference. (In accordance with the functional grounding part of IEC 61131-2 and GB/T 15969.2 standards)
Allow instant power outage time		20ms and below
Dash current		20A 8ms and below
Module weight		199g

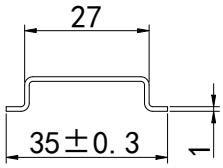
4-6. Installation&Wiring

4-6-1. Appearance dimension



4-6-2. Installation method

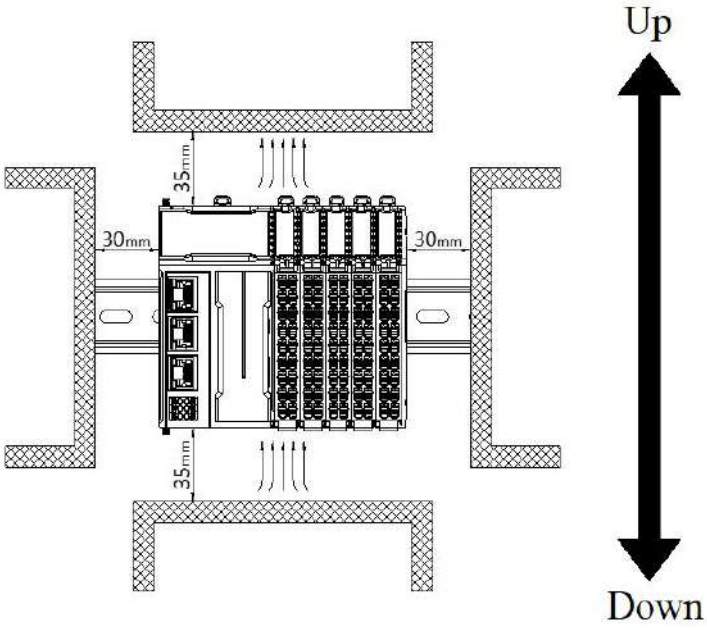
The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide and 1mm thick). The size information is shown in the following figure, in millimeters (mm).



⚠	Attention	When the module is installed on a non recommended DIN rail as mentioned above, the DIN rail latch may not lock properly.

4-6-3. Installation environment

This product can be installed in four positions (i.e. installation direction): horizontal direction, vertical direction, top of the cabinet, and bottom of the cabinet. It is recommended to install in the horizontal direction. The heat dissipation design is through natural convection, to ensure normal ventilation and heat dissipation, and to reserve sufficient wiring space, the minimum gap must be left around this product, as shown in the following figure:



If there are high-temperature heat source equipment (heaters, transformers, high resistors, etc.) around this product, a minimum gap of 100mm should be left between the equipment and the high-temperature heat source.

5. Digital quantity module unit

5-1. Naming convention

XF－E ○ □ X □ ○ Y □

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

①	Series Name	XF:	XF series extension module
②	Extension module	E:	Right extension module
③	Input channel	4:	4 channels
		8:	8 channels
		16:	16 channels
		32:	32 channels
		64:	64 channels
④	Input point type	Empty:	Digital input PNP and NPN type
		N:	Digital input NPN type
		P:	Digital input PNP type
⑤	Type	X:	Digital input
⑥	Output channel	4:	4 channels
		8:	8 channels
		16:	16 channels
		32:	32 channels
		64:	64 channels
⑦	Output type	Empty:	Digital output NPN type
		P:	Digital output PNP type
⑧	Type	Y:	Digital output
⑨	Output point type	T:	Digital output transistor type
		R:	Digital output relay type

5-2. Digital input unit XF-16X

5-2-1. Product overview

XF-E16X series digital input expansion module, which has 16 channels of digital input. Supports NPN and PNP inputs, and is compatible with XF, XSF series CPU unit products and XF series communication coupler units.

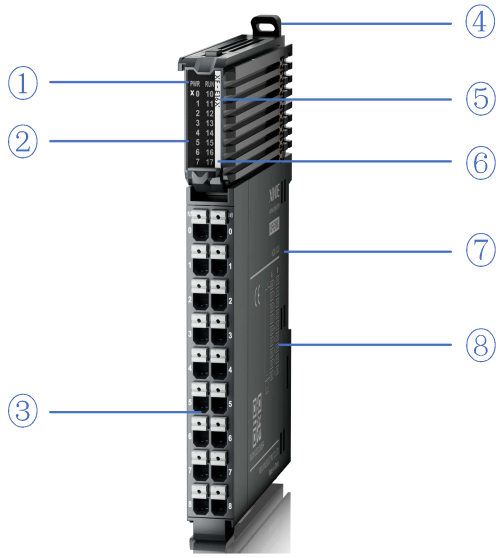
- 16 channels digital input.
- Accord with IEC61131-2 input standard type 3.
- NPN and PNP bipolar input.
- 12mm width design.

Module version:

Hardware version	Software version	Function
H2.0	V2.0	Basic functions for the first official production

5-2-2. Module view

(1) Description of each section



Number	Name
①	System LED indicator light
②	Channel LED indicator light
③	Detachable terminal block
④	Clasp
⑤	Signal indication
⑥	Color identification indicating module type
⑦	Module hardware and software versions
⑧	Wiring diagram

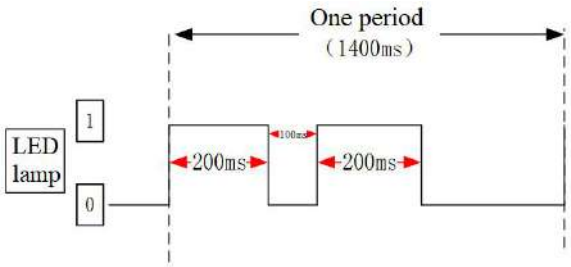
(2) System indicator light

System indicator light	Meaning	
PWR(Green)	Extinguish	Module not powered on
	Normally ON	All external power supplies of the module are normal (Backplane bus power supply&external input 24V)
RUN(Green)	Normally ON	The module is operating normally
	Flashing 1Hz*1	General errors in module logs
	Extinguish	Important errors in the module log
	Flashing 10Hz*2	Module establishing communication
	Double flashing*3	Module firmware update

*1: A square wave with a duty cycle of 50% and a frequency of 1Hz.

*2: A square wave with a duty cycle of 50% and a frequency of 10Hz.

*3: The following figure:



(3) Channel indicator light

Model	Channel indicator light		
XF-E16X	X0~X17	Normally ON(Green)	Corresponding input channel has input ON signal
		Extinguish	Corresponding input channel has no input ON signal

(4) Color identification

No.	Color		Module type
1		Grey White	Digital input
2		Gray	Digital output&digital mixed module
3		Light blue	Analog input
4		Dark blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

5-2-3. General specifications

General specifications		
Project		Content
Operating temperature	Max temperature	55℃
	Min temperature	-20℃
Transportation/storage temperature	Max temperature	70℃
	Min temperature	-40℃
Environmental humidity (Including operation/storage)	Upper limit	95%
	lower limit	10%
Protection grade		IP20
Anti vibration		Accord with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant acceleration 1.0g peak acceleration) Under continuous vibration (frequency 5-9Hz, half amplitude 1.75mm displacement) and (frequency 9-150Hz, constant acceleration 0.5g, constant frame amplitude) Scan 10 times in X, Y, and Z directions
Impact resistance		Accord with IEC61131-2 Impact strength of 15G (peak) with a duration of 11ms is applied to three mutually perpendicular axes, with 3 impacts per axis (a total of 18 impacts)
Use environment		Non corrosive gas
Use altitude		0-2000 meters
Over voltage level		II: Accord with IEC61131-2
Pollution level		2: Accord with IEC61131-2

Anti interference EMC	Accord with IEC 61131-2 IEC61000-6-4 B type
Related certifications	CE

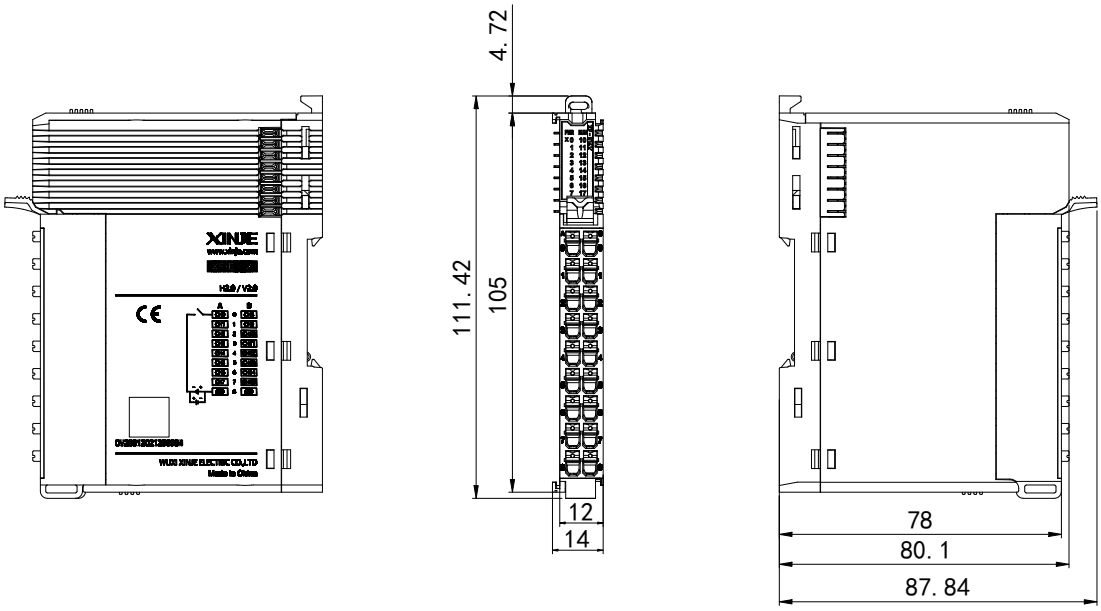
5-2-4. Technical specification

Project	Specification
Input points	16
Rated input voltage	DC24V
Rated input current	6mA
Input ON voltage	11V
Input ON current	2.5mA
Input OFF voltage	5V
Input OFF current	1mA
Input resistance ON → OFF response time (Hardware)	100us
Input resistance OFF → ON response time (Hardware)	100us
Input derating	Derate by 75% when operating at 60 ℃ (with no more than 12 ON input points), or by 10 ℃ when all input points are ON.
Public end method	1 common terminal of 8 points
Connection mode	For example, external terminal connection diagram
Module power consumption	0.5W (internal backplane)+1.4W (external input)
Module weight	80g

5-2-5. Installation&Wiring

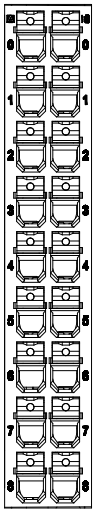
5-2-5-1 Appearance dimension

■ XF-E16X Unit: mm



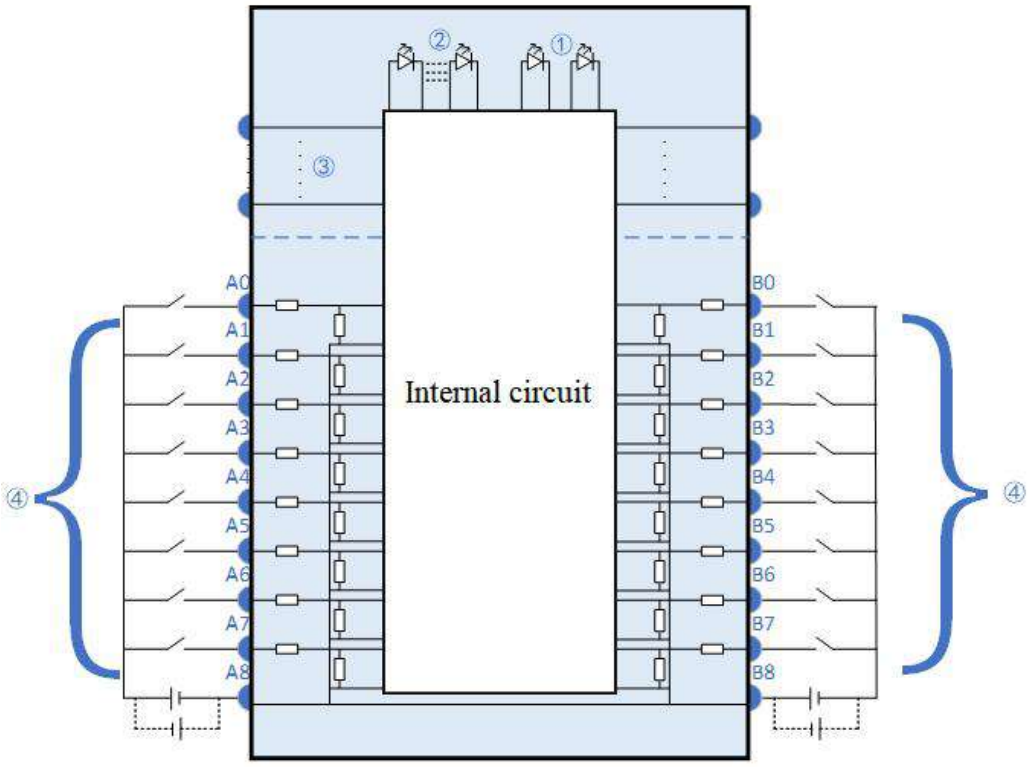
5-2-5-2 Terminal Definition&Wiring

■ Terminal Definition

XF-E16X				
Meaning	A-list terminal	Terminal layout	B-list terminal	Meaning
CH0	0		0	CH8
CH1	1		1	CH9
CH2	2		2	CH10
CH3	3		3	CH11
CH4	4		4	CH12
CH5	5		5	CH13
CH6	6		6	CH14
CH7	7		7	CH15
SS	8		8	SS

Two SS are internally short circuited, so all input points of a single module can only choose between NPN or PNP.

■ External wiring

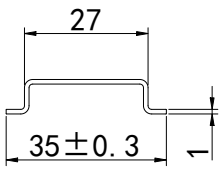


Number	Name
①	System indicator light
②	Channel indicator light
③	Backplane bus
④	Input Channel&Wiring

5-2-5-3 Installation method

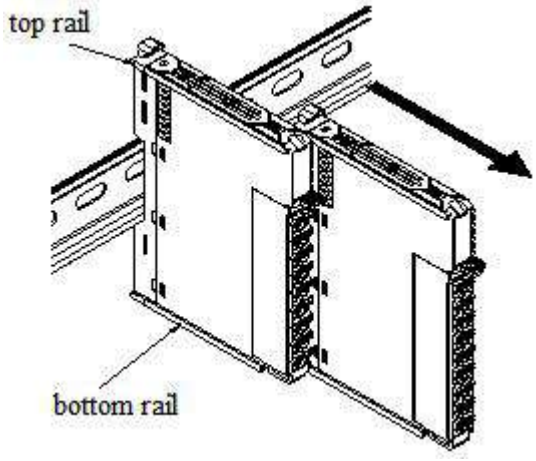
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

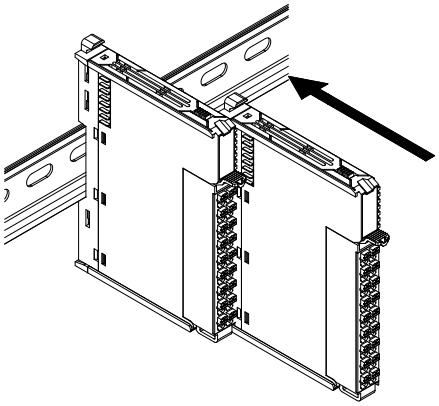


Attention When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

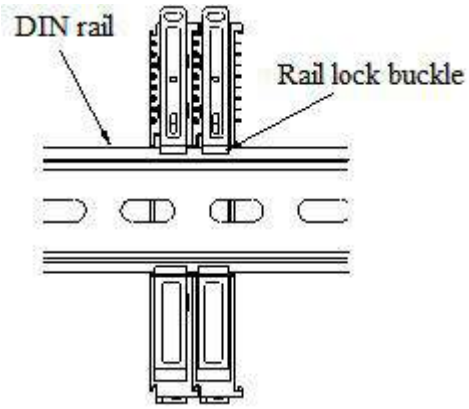
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

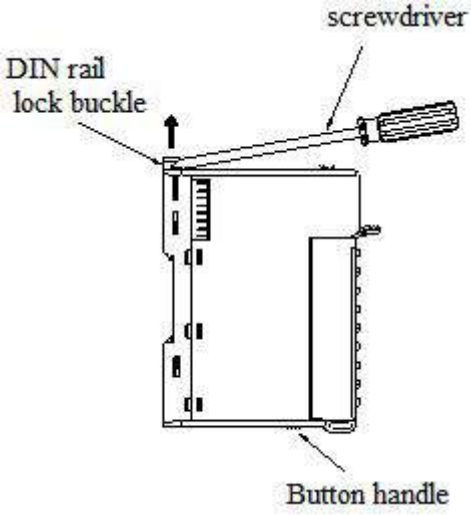


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

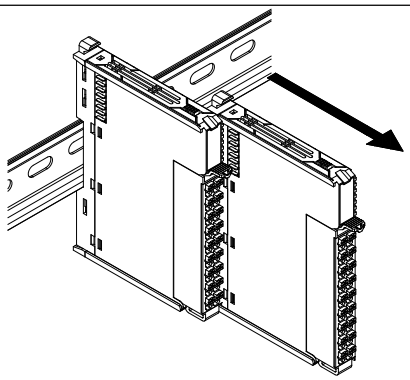


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



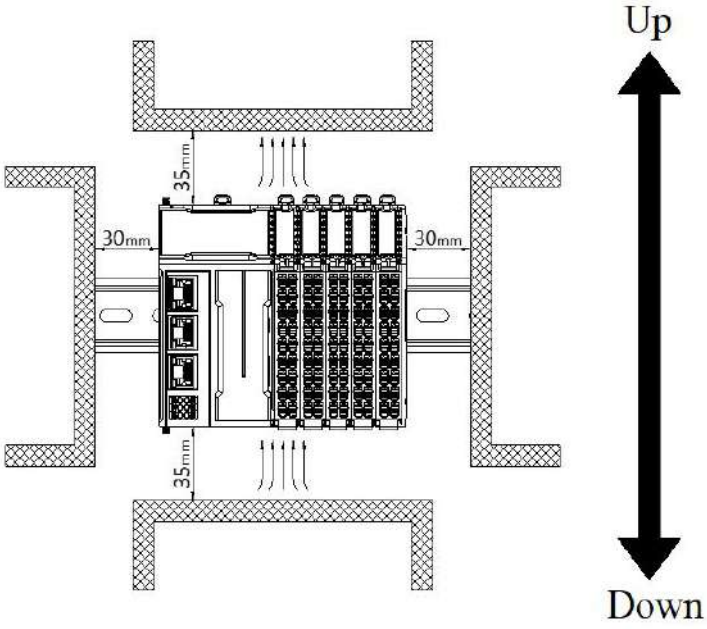
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

5-2-5-4 Installation environment

This product can be installed in four positions (installation direction): horizontal direction, vertical direction, top of the cabinet, and bottom of the cabinet. It is recommended to install in the horizontal direction. The heat dissipation design is through natural convection, to ensure normal ventilation and heat dissipation, and to reserve sufficient wiring space, the minimum gap must be left around this product, as shown in the following figure:



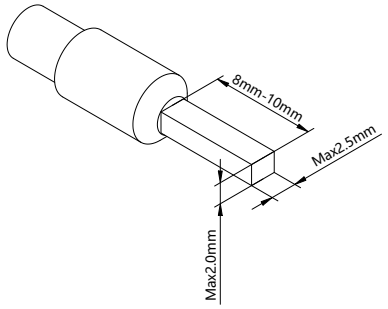
If there are high-temperature heat source equipment (heaters, transformers, high resistors, etc.) around this product, a minimum gap of 100mm should be left between the equipment and the high-temperature heat source.

5-2-5-5 Installation environment

When wiring a module, its terminal must meet the following requirements:

Suitable cable diameter	
Chinese standard/mm^2	American Standard/AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

If using other tube type wire lugs, please crimp them to the stranded wire, and the shape and size requirements are shown in the following figure:



5-2-6. Parameters and mapping addresses

Name	Type	Description
XF_E16X	Stuct	16 channels input module
CH0	BOOL	Channel 0 input value
CH1	BOOL	Channel 1 input value
CH2	BOOL	Channel 2 input value
CH3	BOOL	Channel 3 input value
CH4	BOOL	Channel 4 input value
CH5	BOOL	Channel 5 input value
CH6	BOOL	Channel 6 input value
CH7	BOOL	Channel 7 input value
CH8	BOOL	Channel 8 input value
CH9	BOOL	Channel 9 input value

Name	Type	Description
XF_E16X	Stuct	16 channels input module
CH10	BOOL	Channel 10 input value
CH11	BOOL	Channel 11 input value
CH12	BOOL	Channel 12 input value
CH13	BOOL	Channel 13 input value
CH14	BOOL	Channel 14 input value
CH15	BOOL	Channel 15 input value
ErrCode_module	WORD	Module level error codes
ErrCode_CH	DWORD	Channel level error codes

■ Error code parameters:

Module level error codes(ErrCode_module)		
Bit	Meaning	Error level
0	Not applicable	
2	Internal module error occurred and cannot be repaired by the user layer.	Important
3	Version mismatch	Important

Channel level error code reserved, currently undefined.

■ Configuration parameters

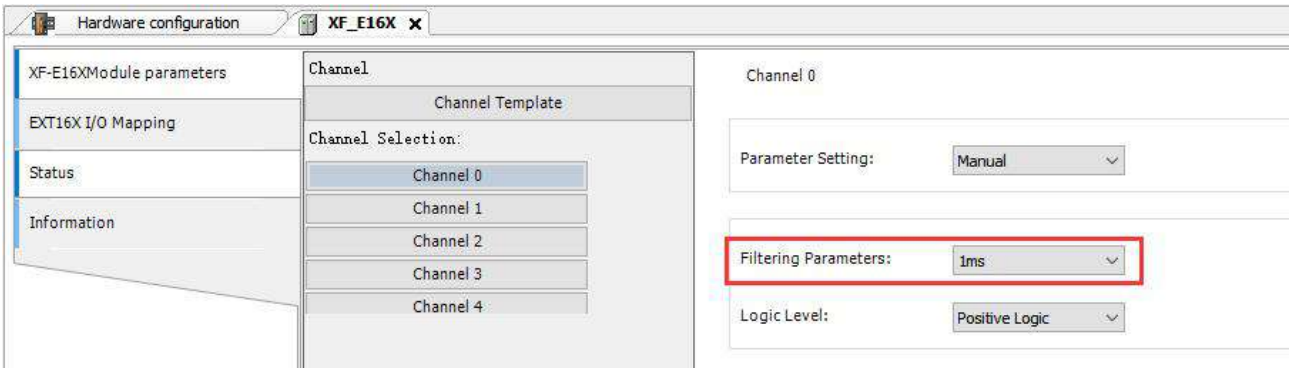
XF-E16X				
Variable name	Type	Meaning	Note	
CH0_FilterTime	BYTE	Channel 0 input filtering time	0: No filtering 1: 0.25ms 2: 0.5ms 3: 1ms 4: 2ms 5: 3ms 6: 4ms 7: 5ms 8: 6ms 9: 7ms 10: 8ms	11: 9ms 12: 10ms 13: 11ms 14: 12ms 15: 13ms 16: 14ms 17: 15ms 18: 20ms 19: 30ms 20: 64ms 21: 128ms
CH1_FilterTime	BYTE	Channel 1 input filtering time		
CH2_FilterTime	BYTE	Channel 2 input filtering time		
CH3_FilterTime	BYTE	Channel 3 input filtering time		
CH4_FilterTime	BYTE	Channel 4 input filtering time		
CH5_FilterTime	BYTE	Channel 5 input filtering time		

CH6_FilterTime	BYTE	Channel 6 input filtering time		
CH7_FilterTime	BYTE	Channel 7 input filtering time		
CH8_FilterTime	BYTE	Channel 8 input filtering time		
CH9_FilterTime	BYTE	Channel 9 input filtering time		
CH10_FilterTime	BYTE	Channel 10 input filtering time		
CH11_FilterTime	BYTE	Channel 11 input filtering time		
CH12_FilterTime	BYTE	Channel 12 input filtering time		
CH13_FilterTime	BYTE	Channel 13 input filtering time		
CH14_FilterTime	BYTE	Channel 14 input filtering time		
CH15_FilterTime	BYTE	Channel 15 input filtering time		
CH0-7_Input_Logiclevel	BYTE	Channel 0-7 logic level configuration	0: Positive logic 1: Negative logic Bit0~bit7 corresponds to channels 0~7 Bit8~bit15 correspond to channel 8-15	
CH8-15_Input_Logiclevel	BYTE	Channel 8-15 logic level configuration		

5-2-7. Functions and Settings

■ Channel input filtering time

Each channel of "filtering time" corresponds to a separate filtering parameter, and the setting method is to select the parameter from the drop-down menu.

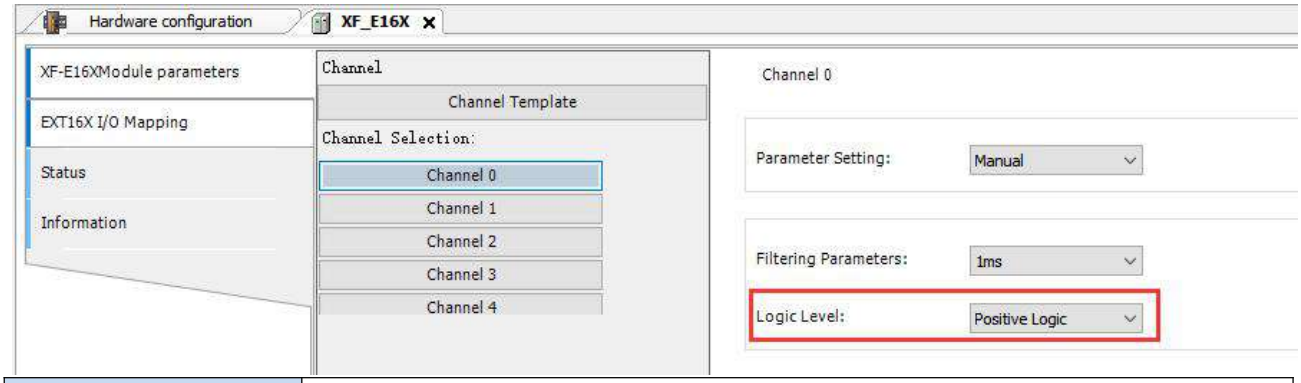


Parameter definition	When there is a signal at the input terminal and the signal duration exceeds the filtering time, it is considered a valid signal.

Settable parameters	0ms, 0.25ms, 0.5ms, 1ms, 2ms, 3ms, 4ms, 5ms, 6ms, 7ms, 8ms, 9ms, 10ms, 11ms, 12ms, 13ms, 14ms, 15ms, 20ms, 30ms, 64ms, 128ms
Default parameters	1ms

■ Channel logic level

The "Logic Level Configuration" corresponds to a separate logic level configuration for each channel. The setting method is to select parameters from the drop-down menu.



Parameter definition	The program execution logic after external signal input.

External input signal	Logic level configuration	Run program	Operation result
X0=1	Positive logic	LD X0. OUT Y0.	Y0=1
X0=1	Negative logic		Y0=0
X0=0	Positive logic		Y0=0
X0=0	Negative logic		Y0=1

Settable parameters	The following table pulling method reflects the parameters that can be set: positive logic, negative logic.

5-3. Digital output unit XF-E16(P)YT

5-3-1. Product overview

XF series digital output expansion module, which has 16 channels of digital output and is compatible with XF, XSF series CPU units and XF series communication coupler units.

- 16 channels digital output.
- NPN, PNP output.
- 12mm width design.

■ Model Description.

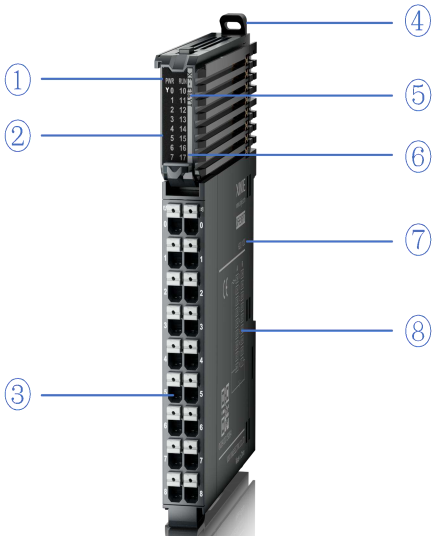
Model		Function
NPN output type	PNP output type	
XF-E16YT	XF-E16PYT	16 channels transistor output

■ Module version

Model	Hardware version	Software version	Function
XF-E16YT	H2.0	V2.0	Basic functions for the first official production
XF-E16PYT	H2.0	V2.0	Basic functions for the first official production

5-3-2. Module view

(1) Description of each section



Number	Name
①	System LED indicator light
②	Channel LED indicator light
③	Detachable terminal block
④	Clasp
⑤	Signal indication
⑥	Color identification indicating module type
⑦	Module hardware and software versions
⑧	Wiring diagram

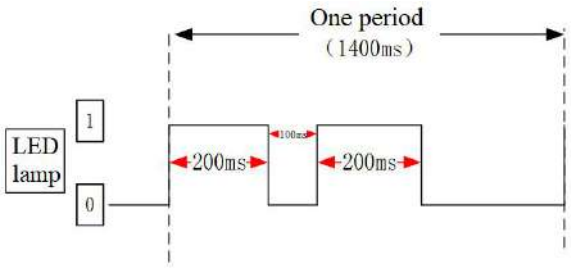
(2) System indicator light

System indicator light	Meaning	
PWR(Green)	Extinguish	Module not powered on
	Normally ON	All external power supplies of the module are normal (Backplane bus power supply&external input 24V)
	Flashing 1Hz*1	Module power supply is abnormal and cannot operate normally
RUN(Green)	Normally ON	The module is operating normally
	Flashing 1Hz*1	General errors in module logs
	Extinguish	Important errors in the module log
	Flashing 10Hz*2	Module establishing communication
	Double flashing*3	Module firmware update

*1: A square wave with a duty cycle of 50% and a frequency of 1Hz.

*2: A square wave with a duty cycle of 50% and a frequency of 10Hz.

*3: The following figure:



(3) Channel indicator light

Model	Channel indicator light		
XF-E16(P)YT	Y0~Y17	Normally ON(Green)	Corresponding input channel has input ON signal
		Extinguish	Corresponding input channel has no input ON signal

(4) Color identification

No.	Color		Module type
1		Grey White	Digital input
2		Gray	Digital output&digital mixed module
3		Light blue	Analog input
4		Dark blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

5-3-3. General specifications

General specifications		
Project		Content
Operating temperature	Max temperature	55℃
	Min temperature	-20℃
Transportation/storage temperature	Max temperature	70℃
	Min temperature	-40℃
Environmental humidity (including operation/storage)	Upper limit	95%
	lower limit	10%
Protection grade		IP20
Anti vibration		Accord with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant acceleration 1.0g peak acceleration) Under continuous vibration (frequency 5-9Hz, half amplitude 1.75mm displacement) and (frequency 9-150Hz, constant acceleration 0.5g, constant frame amplitude) Scan 10 times in X, Y, and Z directions
Impact resistance		Accord with IEC61131-2 Impact strength of 15G (peak) with a duration of 11ms is applied to three mutually perpendicular axes, with 3 impacts per axis (a total of 18 impacts)
Use environment		Non corrosive gas
Use altitude		0-2000 meters
Over voltage level		II: Accord with IEC61131-2
Pollution level		2: Accord with IEC61131-2
Anti interference EMC		Accord with IEC 61131-2 IEC61000-6-4 B type
Related certifications		CE

5-3-4. Technical specification

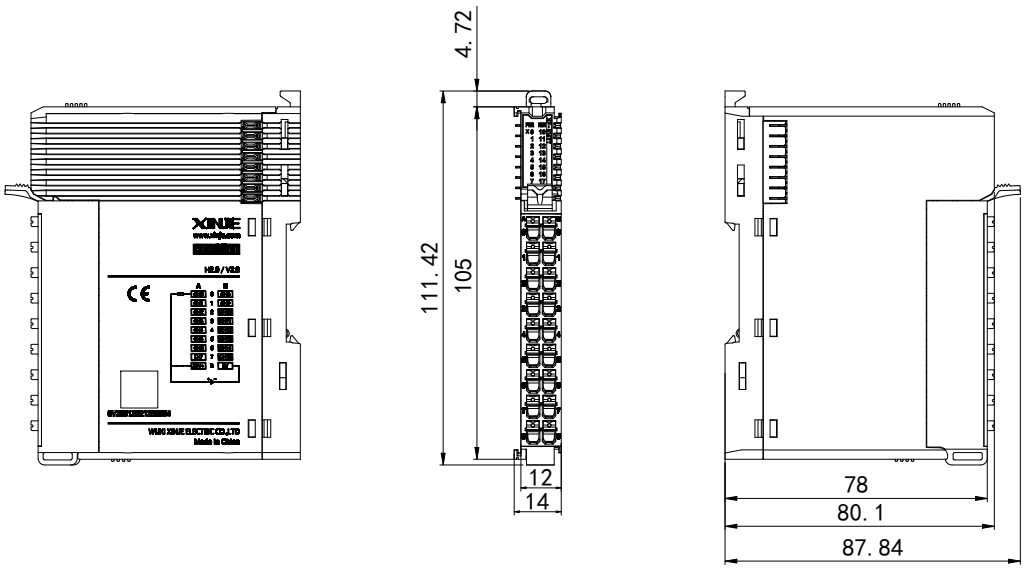
Project	Specification	
Model	XF-E16YT	XF-E16PYT
Output points	16	
Rated load voltage	DC24V(DC10.2V~28.8V)	
Maximum load current	0.5A/1 point, 4A/module	
Surge current protection	Support	
Leakage current at OFF	Below 0.1mA	
Maximum voltage drop at ON	0.5V~1V	
Output ON → OFF response time (Hardware)	0.1ms	
Output OFF → ON response time	0.1ms	

(Hardware)	
Output derating	Derate by 50% when operating at 55℃(While the output current of ON doesn't exceed 2A), or by 10℃ when the output point is fully ON
Public end method	1 common terminal of 16 points
Output Protection	Support short circuit and overload protection functions
Module power consumption	1.0W (Backplane bus)+0.8W(External input)
Module weight	80g
Insulation voltage	AC510V
Insulated resistance	1M

5-3-5. Installation&Wiring

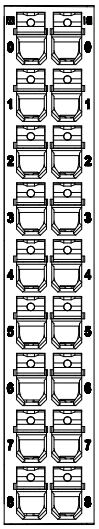
5-3-5-1 Appearance dimension

■ XF-E16(P)YT Unit: mm



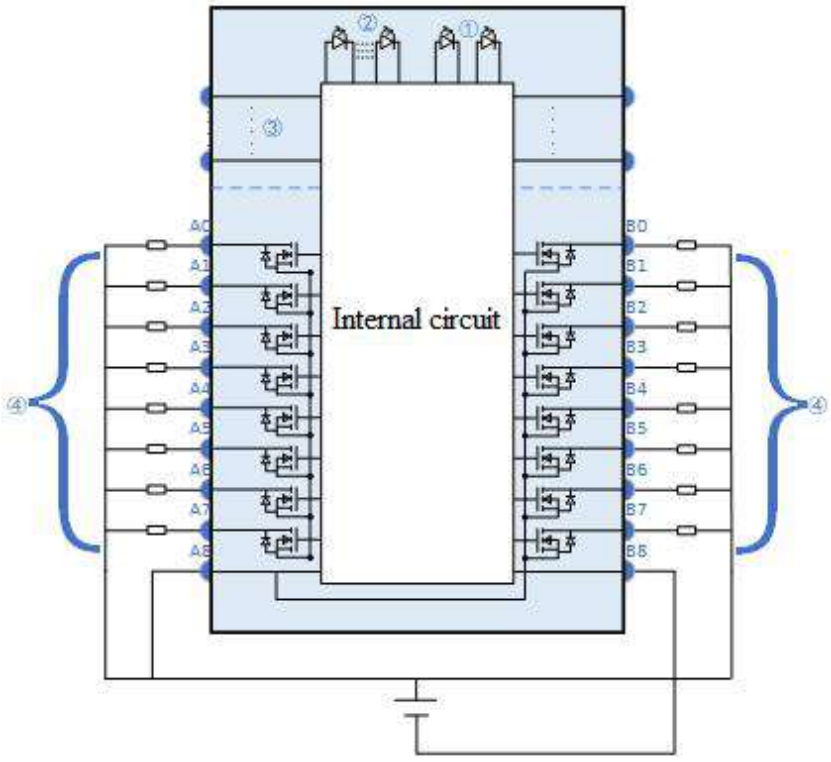
5-3-5-2 Terminal Definition&Wiring

(1) Terminal Definition

XF-E16YT				
Meaning	A-list terminal	Terminal layout	B-list terminal	Meaning
CH0	0		0	CH8
CH1	1		1	CH9
CH2	2		2	CH10
CH3	3		3	CH11
CH4	4		4	CH12
CH5	5		5	CH13
CH6	6		6	CH14
CH7	7		7	CH15
24V+	8		8	0V

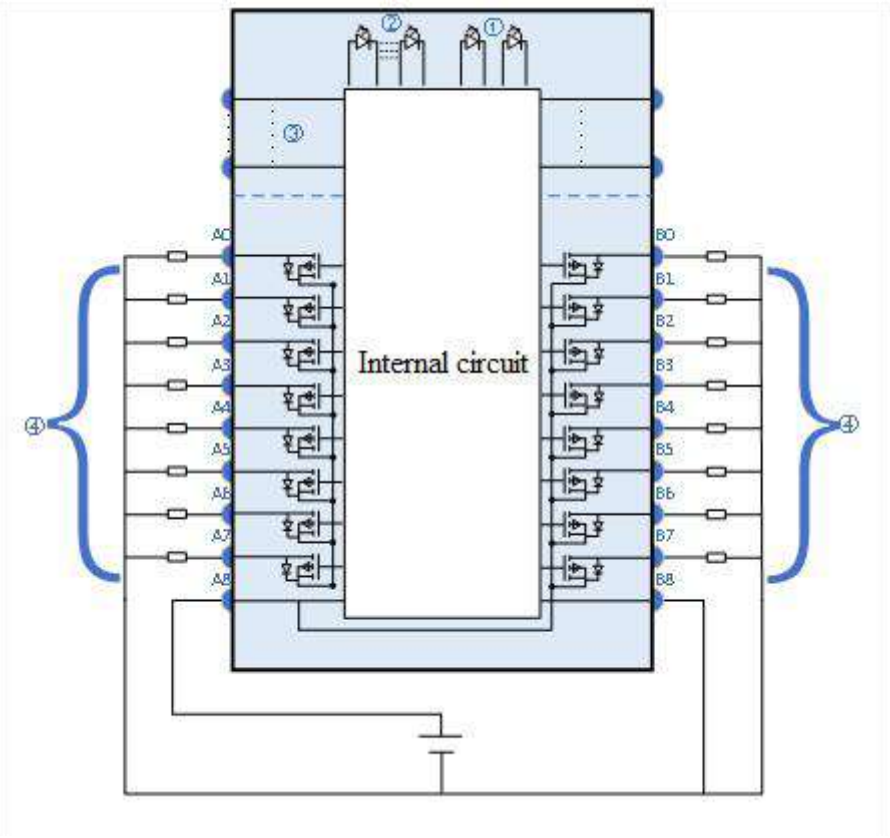
(2) External wiring

■ XF-E16YT



Number	Name
①	System indicator light
②	Channel indicator light
③	Backplane bus
④	Input Channel&Wiring

■ XF-E16PYT

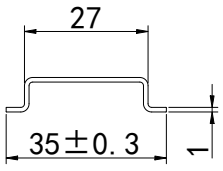


Number	Name
①	System indicator light
②	Channel indicator light
③	Backplane bus
④	Input Channel&Wiring

5-2-5-3 Installation method

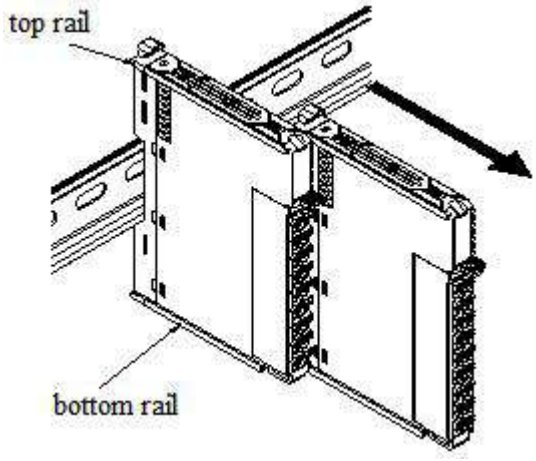
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

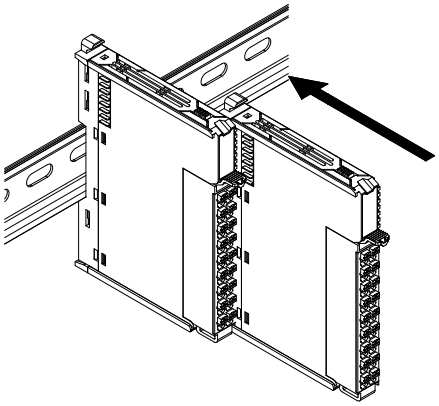


Attention When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

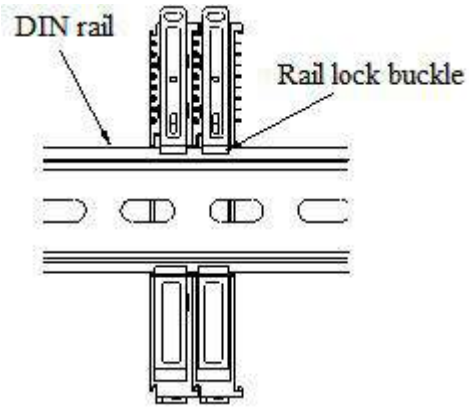
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

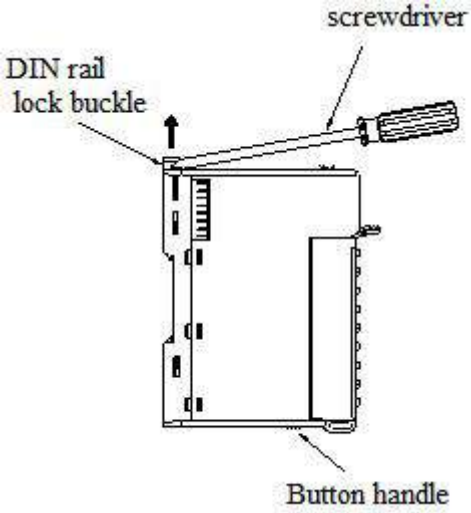


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

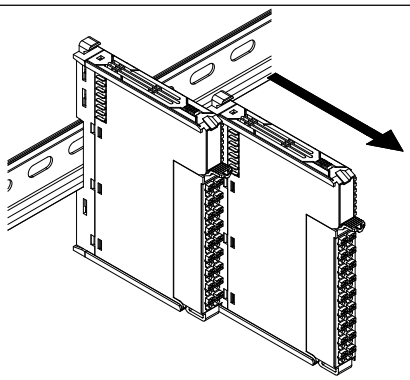


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



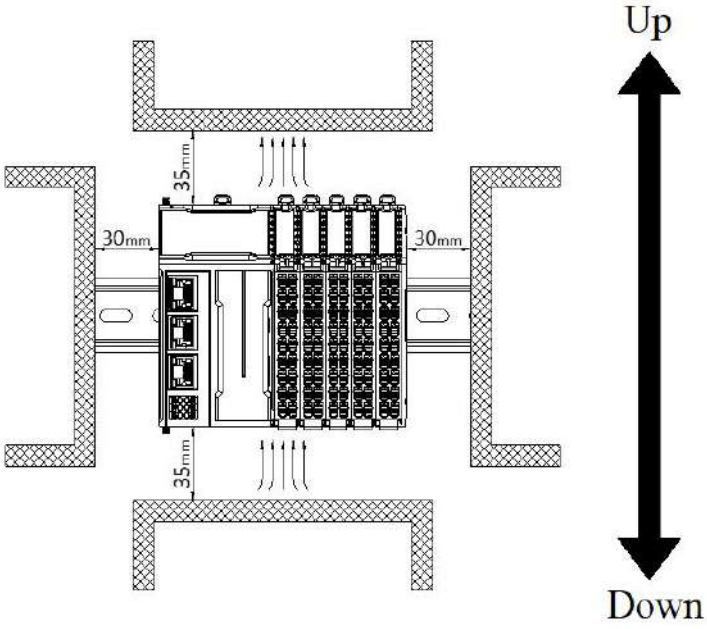
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

5-3-5-4 Installation environment

This product can be installed in four positions (installation direction): horizontal direction, vertical direction, top of the cabinet, and bottom of the cabinet. It is recommended to install in the horizontal direction. The heat dissipation design is through natural convection, to ensure normal ventilation and heat dissipation, and to reserve sufficient wiring space, the minimum gap must be left around this product, as shown in the following figure:



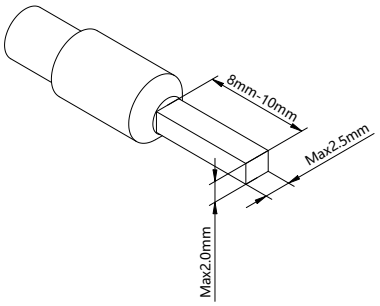
If there are high-temperature heat source equipment (heaters, transformers, high resistors, etc.) around this product, a minimum gap of 100mm should be left between the equipment and the high-temperature heat source.

5-3-5-5 Installation environment

When wiring a module, its terminal must meet the following requirements:

Suitable cable diameter	
Chinese standard/mm^2	American Standard/AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

If using other tube type wire lugs, please crimp them to the stranded wire, and the shape and size requirements are shown in the following figure:



5-3-6. Parameters and mapping addresses

Name	Type	Description
XF_E16YT	Stuct	16 channels output module
CH0	BOOL	Channel 0 output value
CH1	BOOL	Channel 1 output value
CH2	BOOL	Channel 2 output value
CH3	BOOL	Channel 3 output value
CH4	BOOL	Channel 4output value

Name	Type	Description
XF_E16YT	Stuct	16 channels output module
CH5	BOOL	Channel 5 output value
CH6	BOOL	Channel 6 output value
CH7	BOOL	Channel 7 output value
CH8	BOOL	Channel 8 output value
CH9	BOOL	Channel 9 output value
CH10	BOOL	Channel 10 output value
CH11	BOOL	Channel 11 output value
CH12	BOOL	Channel 12 output value
CH13	BOOL	Channel 13 output value
CH14	BOOL	Channel 14 output value
CH15	BOOL	Channel 15 output value
ErrCode_module	WORD	Module level error codes
ErrCode_CH	DWORD	Channel level error codes

■ Error code parameters:

Module level error codes(ErrCode_module)		
Bit	Meaning	Error level
0	The 24V input power supply of the module is abnormal	Important
2	Internal module error occurred and cannot be repaired by the user layer.	Important
3	Version mismatch	Important

Channel level error code reserved, currently undefined.

■ Configuration parameters

XF-E16Y			
Variable name	Type	Meaning	Note
CH0_ExceptionOut	BYTE	Channel 0 output status in case of	0:Output replacement

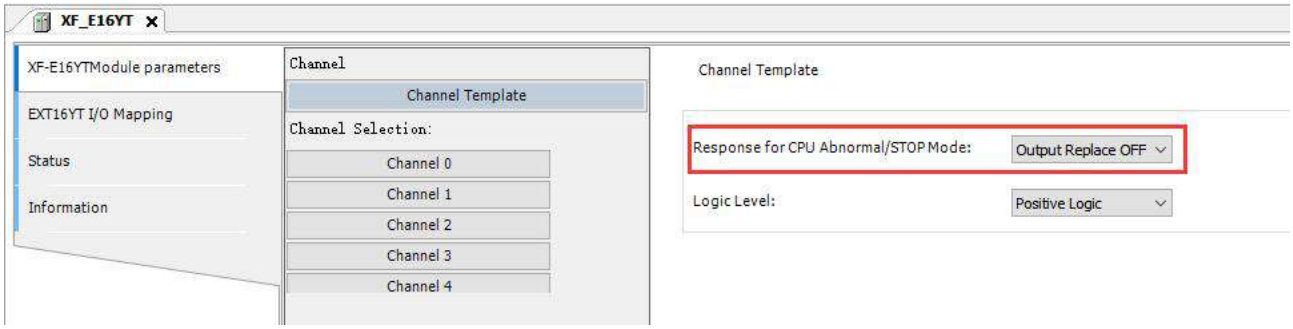
		abnormality	value OFF 1: Keep Previous Value 2:Output replacement value ON
CH1_ExceptionOut	BYTE	Channel 1 output status in case of abnormality	
CH2_ExceptionOut	BYTE	Channel 2 output status in case of abnormality	
CH3_ExceptionOut	BYTE	Channel 3 output status in case of abnormality	
CH4_ExceptionOut	BYTE	Channel 4 output status in case of abnormality	
CH5_ExceptionOut	BYTE	Channel 5 output status in case of abnormality	
CH6_ExceptionOut	BYTE	Channel 6 output status in case of abnormality	
CH7_ExceptionOut	BYTE	Channel 7 output status in case of abnormality	
CH8_ExceptionOut	BYTE	Channel 8 output status in case of abnormality	
CH9_ExceptionOut	BYTE	Channel 9 output status in case of abnormality	
CH10_ExceptionOut	BYTE	Channel 10 output status in case of abnormality	
CH11_ExceptionOut	BYTE	Channel 11 output status in case of abnormality	
CH12_ExceptionOut	BYTE	Channel 12 output status in case of abnormality	
CH13_ExceptionOut	BYTE	Channel 13 output status in case of abnormality	
CH14_ExceptionOut	BYTE	Channel 14 output status in case of abnormality	
CH15_ExceptionOut	BYTE	Channel 15 output status in case of abnormality	
CH0-7_Output_Logic LeveL	BYTE	Channel 0-7 logic level configuration	0: Positive logic 1: Negative logic Bit0~bit7 corresponds to channels 0~7, Bit8~bit15 correspond to channel 8-15.
CH8-15_Output_Logi cLeveL	BYTE	Channel 8-15 logic level configuration	

5-3-7. Functions and Settings

The upper computer does not differentiate between NPN and PNP, and the interfaces XF-E16YT and XF-E16PYT are uniformly displayed as XF-E16Y.

■ Abnormal/STOP output status

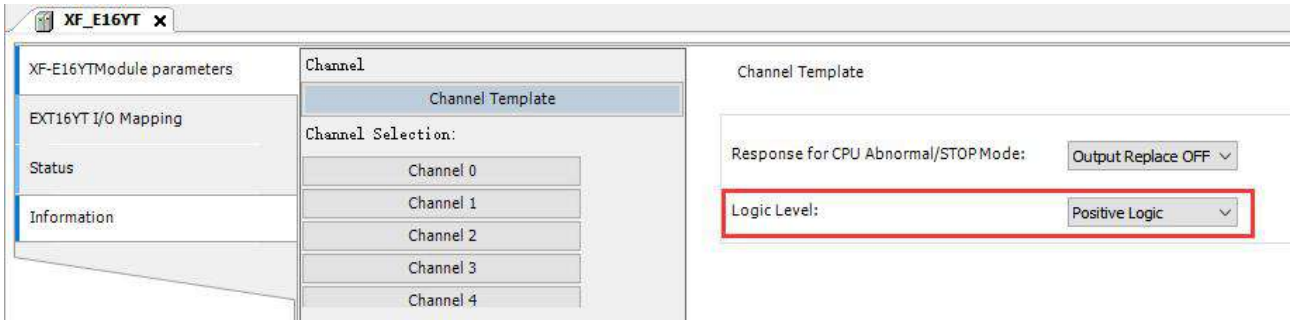
Each channel corresponds to a separate parameter for "Abnormal/STOP Output Status", which can be set by selecting a parameter from the drop-down menu.



Parameter definition	The following table pulling method reflects the parameters that can be set: "Output replacement value OFF", "Keep previous value", "Output replacement value ON".	
Parameter definition	Output replacement value OFF	When the PLC is in STOP mode, the output terminal is in a reset state (Physical terminal, regardless of channel logic level).
	Keep previous value	When the PLC is in abnormal/STOP mode, the output terminal outputs the last state of the PLC from RUN to STOP (Physical terminal, regardless of channel logic level).
	Output replacement value ON	When the PLC is in abnormal/STOP mode, the output terminal is in a set state (Physical terminal, regardless of channel logic level).
Default parameters	Output replacement value OFF.	

■ Channel logic level

The "Logic Level Configuration" corresponds to a separate logic level configuration for each channel. The setting method is to select parameters from the drop-down menu.



<table>
<tr><td>Settable parameters</td><td>The following table pulling method reflects the parameters that can be set: positive logic, negative logic.</td></tr>
<tr><td>Parameter definition</td><td>The program execution logic after external signal input.
<table>
<tr><td>Logic level configuration</td><td>Run program</td><td>Operation result</td></tr>
<tr><td>Positive logic</td><td rowspan="2">SET Y0.</td><td>Y0 set to ON</td></tr>
<tr><td>Negative logic</td><td>Y0 set to OFF</td></tr>
<tr><td>Positive logic</td><td rowspan="2">RST Y0.</td><td>Y0 set to OFF</td></tr>
<tr><td>Negative logic</td><td>Y0 set to ON</td></tr>
</table></td></tr>
</table>

5-4. Digital input output hybrid unit XF-E8NX8YT

5-4-1. Product overview

XF-E8NX8YT series digital input output hybrid expansion module, which has 8 channels of digital input, 8 channels of digital output and supports NPN input and output, and is suitable for XF, XSF series CPU unit products and XF series communication coupler units.

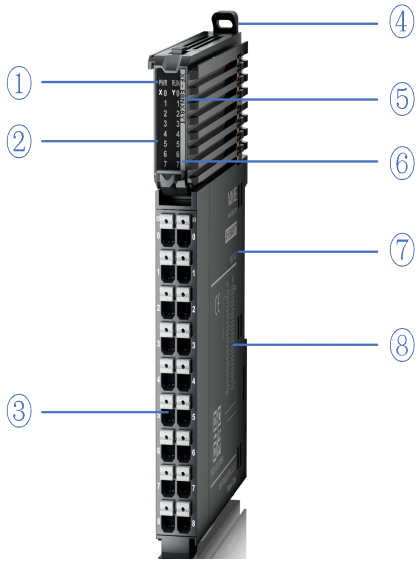
- 8 channels digital input.
- NPN input.
- 8 channels digital output.
- NPN output.
- 12mm width design.

Module version:

Hardware version	Software version	Function
H2.0	V2.0	Basic functions for the first official production

5-4-2. Module view

(1) Description of each section



Number	Name
①	System LED indicator light
②	Channel LED indicator light
③	Detachable terminal block
④	Clasp
⑤	Signal indication
⑥	Color identification indicating module type
⑦	Module hardware and software versions
⑧	Wiring diagram

(2) System indicator light

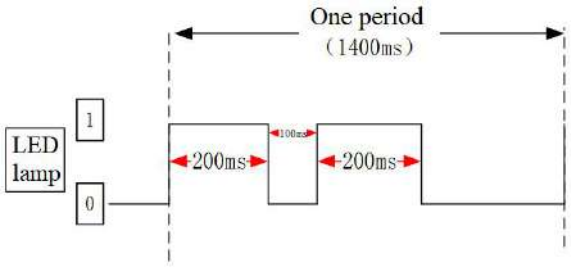
System indicator light	Meaning	
PWR(Green)	Extinguish	Module not powered on
	Normally ON	All external power supplies of the module are normal (Backplane bus power supply&external input 24V)
	Flashing 1Hz*1	Module power supply is abnormal and cannot operate normally

System indicator light	Meaning	
RUN(Green)	Normally ON	The module is operating normally
	Flashing 1Hz*1	General errors in module logs
	Extinguish	Important errors in the module log
	Flashing 10Hz*2	Module establishing communication
	Double flashing*3	Module firmware update

*1: A square wave with a duty cycle of 50% and a frequency of 1Hz.

*2: A square wave with a duty cycle of 50% and a frequency of 10Hz.

*3: The following figure:



(3) Channel indicator light

Model	Channel indicator light		
XF-E8NX8YT	X0-X7 Y0-Y7	Normally ON(Green)	Corresponding input channel has input ON signal
		Extinguish	Corresponding input channel has no input ON signal

(4) Color identification

No.	Color		Module type
1		Grey White	Digital input
2		Gray	Digital output&digital mixed module
3		Light blue	Analog input
4		Dark blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

5-4-3. General specifications

General specifications		
Project		Content
Operating temperature	Max temperature	55℃
	Min temperature	-20℃
Transportation/storage temperature	Max temperature	70℃
	Min temperature	-40℃
Environmental humidity (including operation/storage)	Upper limit	95%
	lower limit	10%
Protection grade		IP20
Anti vibration		Accord with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant acceleration 1.0g peak acceleration) Under continuous vibration (frequency 5-9Hz, half amplitude 1.75mm displacement) and (frequency 9-150Hz, constant acceleration 0.5g, constant frame amplitude) Scan 10 times in X, Y, and Z directions
Impact resistance		Accord with IEC61131-2 Impact strength of 15G (peak) with a duration of 11ms is applied to three mutually perpendicular axes, with 3 impacts per axis (a total of 18 impacts)
Use environment		Non corrosive gas
Use altitude		0-2000 meters
Over voltage level		II: Accord with IEC61131-2
Pollution level		2: Accord with IEC61131-2
Anti interference EMC		Accord with IEC 61131-2 IEC61000-6-4 B type
Related certifications		CE

5-4-4. Technical specification

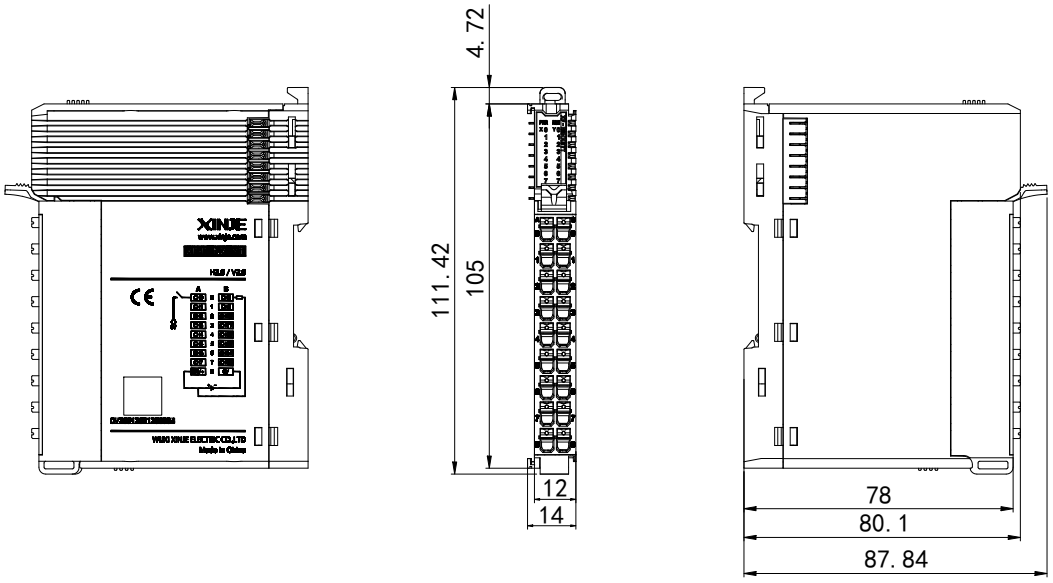
Project		Specification
Input specifications	Input channel	8
	Input type	NPN
	Rated input voltage	DC24V
	Rated input current	6mA
	Input ON voltage	15V
	Input ON current	3mA
	Input OFF voltage	5V
	Input OFF current	1mA
	Input derating	Derate by 50% when operating at 55℃ (with no more than 4 ON input points), or by 10℃ when all input points are ON.

	Input resistance ON → OFF response time (Hardware)	20us
	Input resistance OFF → ON response time (Hardware)	100us
Output specifications	Output channel	8
	Output type	Transistor (NPN)
	Rated load voltage	DC24V(DC21.6V~26.4V)
	Rated load current	0.5A/1 point
	Surge current protection	Support
	Leakage current at OFF	Below 0.1mA
	Maximum voltage drop at ON	0.5A, 2A/module
	Output derating	Derate by 50% when operating at 55℃(While the output current of ON doesn't exceed 2A), or by 10℃ when the output point is fully ON.
	Input resistance ON → OFF response time (Hardware)	100us
	Input resistance OFF → ON response time (Hardware)	100us
Module specifications	Module power consumption	1W (Backplane bus)+1.2W(External input)
	Module weight	80g

5-4-5. Installation&Wiring

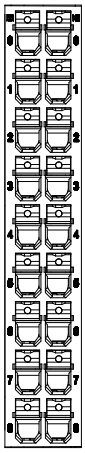
5-4-5-1 Appearance dimension

■ XF-E8NX8YT Unit: mm

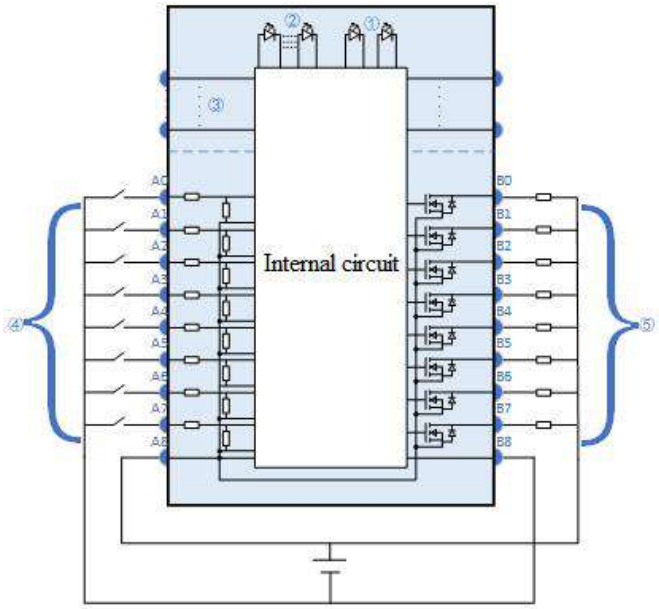


5-4-5-2 Terminal Definition&Wiring

■ Terminal Definition

XF-E8NX8YT				
Meaning	A-list terminal	Terminal layout	B-list terminal	Meaning
CH0	0		0	CH8
CH1	1		1	CH9
CH2	2		2	CH10
CH3	3		3	CH11
CH4	4		4	CH12
CH5	5		5	CH13
CH6	6		6	CH14
CH7	7		7	CH15
24V+	8		8	0V

■ External wiring

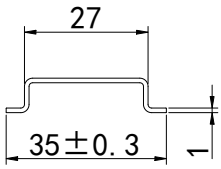


Number	Name
①	System indicator light
②	Channel indicator light
③	Backplane bus
④	Input Channel&Wiring
⑤	Output Channel&Wiring

5-4-5-3 Installation method

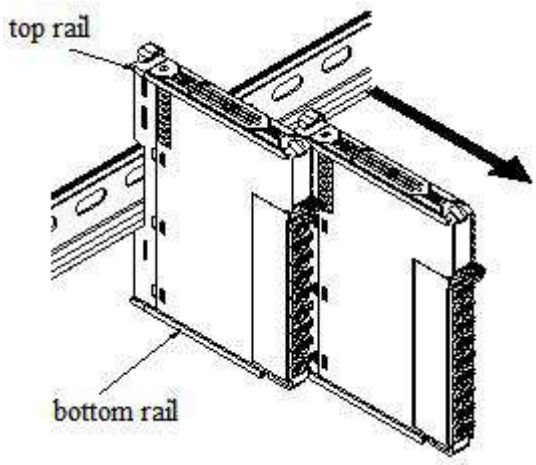
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

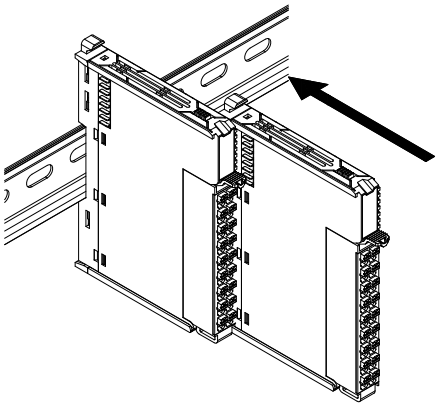


Attention When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

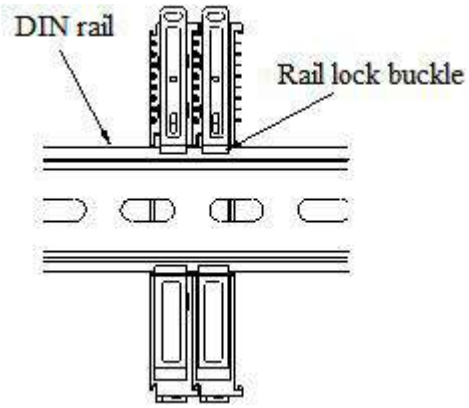
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

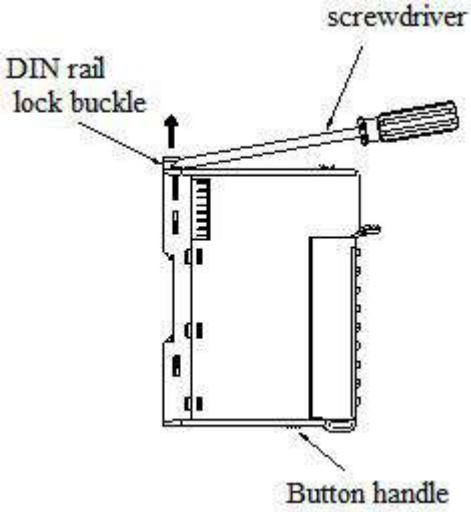


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

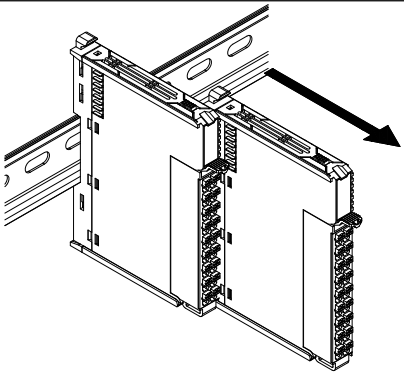


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



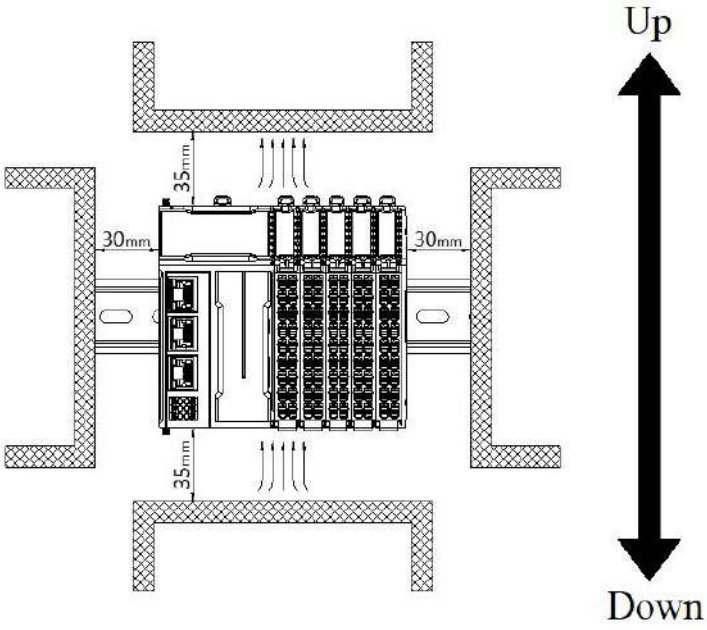
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

5-4-5-4 Installation environment

This product can be installed in four positions (installation direction): horizontal direction, vertical direction, top of the cabinet, and bottom of the cabinet. It is recommended to install in the horizontal direction. The heat dissipation design is through natural convection, to ensure normal ventilation and heat dissipation, and to reserve sufficient wiring space, the minimum gap must be left around this product, as shown in the following figure:



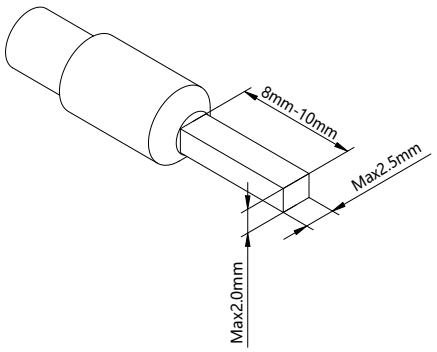
If there are high-temperature heat source equipment (heaters, transformers, high resistors, etc.) around this product, a minimum gap of 100mm should be left between the equipment and the high-temperature heat source.

5-4-5-5 Installation environment

When wiring a module, its terminal must meet the following requirements:

Suitable cable diameter	
Chinese standard/mm^2	American Standard/AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

If using other tube type wire lugs, please crimp them to the stranded wire, and the shape and size requirements are shown in the following figure:



5-4-6. Parameters and mapping addresses

Name	Type	Description
XF_E8X8Y	Stuct	8 channels input and 8 channels output module
CH0	BOOL	Channel 0 input value
CH1	BOOL	Channel 1 input value
CH2	BOOL	Channel 2 input value
CH3	BOOL	Channel 3 input value
CH4	BOOL	Channel 4 input value
CH5	BOOL	Channel 5 input value
CH6	BOOL	Channel 6 input value
CH7	BOOL	Channel 7 input value
CH8	BOOL	Channel 8 output value
CH9	BOOL	Channel 9 output value
CH10	BOOL	Channel 10 output value
CH11	BOOL	Channel 11 output value
CH12	BOOL	Channel 12 output value
CH13	BOOL	Channel 13 output value
CH14	BOOL	Channel 14 output value
CH15	BOOL	Channel 15 output value

Name	Type	Description
XF_E8X8Y	Stuct	8 channels input and 8 channels output module
ErrCode_module	WORD	Module level error codes
ErrCode_CH	DWORD	Channel level error codes

■ Error code parameters:

Module level error codes(ErrCode_module)		
Bit	Meaning	Error level
0	The 24V input power supply of the module is abnormal	Important
2	Internal module error occurred and cannot be repaired by the user layer.	Important
3	Version mismatch	Important

■ Configuration parameters

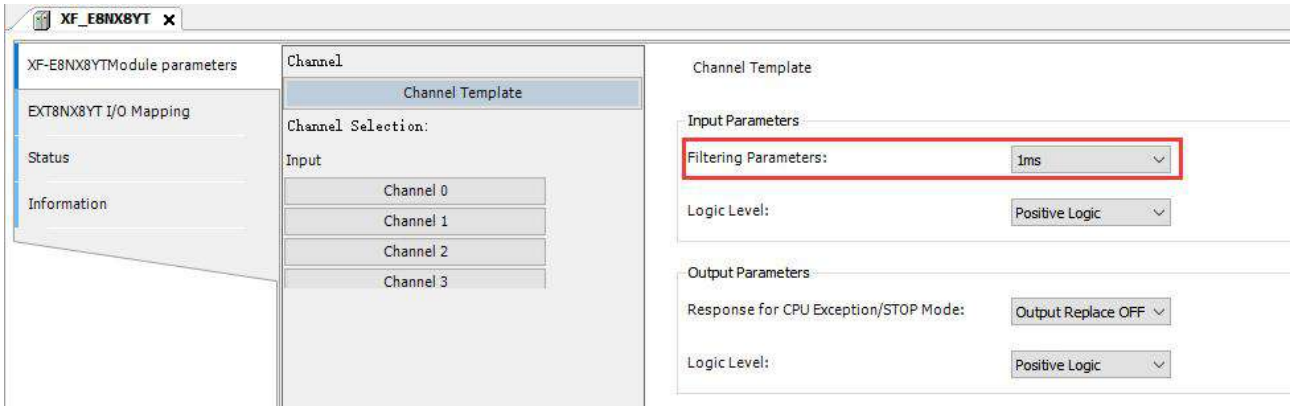
XF-E8NX8YT			
Byte sequence number	Type	Meaning	Note
CH0_FilterTime	BYTE	Channel 0 input filtering time	0:No filtering 1: 0.25ms 2: 0.5ms 3: 1ms 4: 2ms 5: 3ms 6: 4ms 7: 5ms 8: 6ms 9: 7ms 10: 8ms 11：9ms 12：10ms 13：11ms 14：12ms 15：13ms 16：14ms 17：15ms 18：20ms 19：30ms 20：64ms 21：128ms
CH1_FilterTime	BYTE	Channel 1 input filtering time	
CH2_FilterTime	BYTE	Channel 2 input filtering time	
CH3_FilterTime	BYTE	Channel 3 input filtering time	
CH4_FilterTime	BYTE	Channel 4 input filtering time	
CH5_FilterTime	BYTE	Channel 5 input filtering time	
CH6_FilterTime	BYTE	Channel 6 input filtering time	
CH7_FilterTime	BYTE	Channel 7 input filtering time	
CH8_ExceptionOut	BYTE	Channel 8 output status in case of abnormality	0: Output replacement value OFF 1: Keep Previous Value 2: Output replacement value ON
CH9_ExceptionOut	BYTE	Channel 9 output status in case of abnormality	
CH10_ExceptionOut	BYTE	Channel 10 output status in case of abnormality	
CH11_ExceptionOut	BYTE	Channel 11 output status in case of abnormality	
CH12_ExceptionOut	BYTE	Channel 12 output status in case of abnormality	
CH13_ExceptionOut	BYTE	Channel 13 output status in case of abnormality	
CH14_ExceptionOut	BYTE	Channel 14 output status in case of abnormality	

CH15_ExceptionOut	BYTE	Channel 15 output status in case of abnormality	
CH0-7_Input_Logiclevel	BYTE	Channel 0-7 logic level configuration	0: Positive logic 1: Negative logic Bit0~bit7 corresponds to channels 0~7, Bit8~bit15 correspond to channel 8-15.
CH8-15_Output_LogicLeveL	BYTE	Channel 8-15 logic level configuration	

5-4-7. Functions and Settings

■ Channel input filtering time

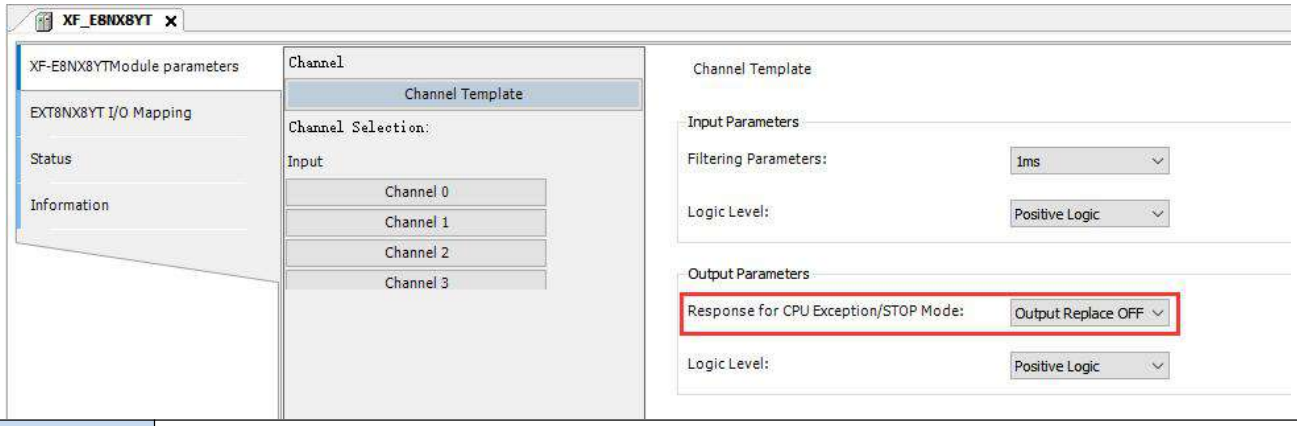
Each channel of "filtering time" corresponds to a separate filtering parameter, and the setting method is to select the parameter from the drop-down menu.



Parameter definition	When there is a signal at the input terminal and the signal duration exceeds the filtering time, it is considered a valid signal.
Settable parameters	0ms, 0.25ms, 0.5ms, 1ms, 2ms, 3ms, 4ms, 5ms, 6ms, 7ms, 8ms, 9ms, 10ms, 11ms, 12ms, 13ms, 14ms, 15ms, 20ms, 30ms, 64ms, 128ms
Default parameters	1ms

■ Abnormal/STOP output status

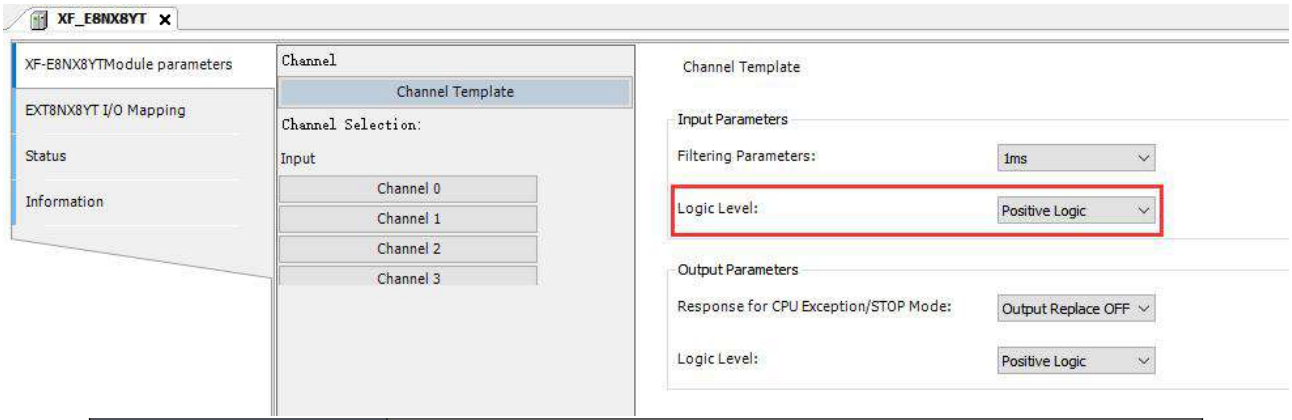
Each channel corresponds to a separate parameter for "Abnormal/STOP Output Status", which can be set by selecting a parameter from the drop-down menu.



Parameter definition	The following table pulling method reflects the parameters that can be set: "Output replacement value OFF", "Keep previous value", "Output replacement value ON".	
Parameter definition	Output replacement value OFF	When the PLC is in STOP mode, the output terminal is in a reset state (Physical terminal, regardless of channel logic level)
	Keep previous value	When the PLC is in abnormal/STOP mode, the output terminal outputs the last state of the PLC from RUN to STOP (Physical terminal, regardless of channel logic level).
	Output replacement value ON	When the PLC is in abnormal/STOP mode, the output terminal is in a set state (Physical terminal, regardless of channel logic level).
Default parameters	Output replacement value OFF	

■ Channel logic level

The "Logic Level Configuration" corresponds to a separate logic level configuration for each channel. The setting method is to select parameters from the drop-down menu.



<table>
<tr><td>Settable parameters</td><td>The following table pulling method reflects the parameters that can be set: positive logic, negative logic.</td></tr>
<tr><td>Parameter definition</td><td>The program execution logic after external signal input.
<table>
<tr><th>Logic level configuration</th><th>Run program</th><th>Operation result</th></tr>
<tr><td>Positive logic</td><td rowspan="2">SET Y0.</td><td>Y0 set to ON</td></tr>
<tr><td>Negative logic</td><td>Y0 set to OFF</td></tr>
<tr><td>Positive logic</td><td rowspan="2">RST Y0.</td><td>Y0 set to OFF</td></tr>
<tr><td>Negative logic</td><td>Y0 set to ON</td></tr>
</table></td></tr>
</table>

5.5 Digital input module XF-E32X

5.5.1 Product overview

The XF-E32X series digital input expansion module has 32 channels of digital input, supports NPN and PNP inputs, and is compatible with XF, XSF series CPU unit products and XF series communication coupler units.

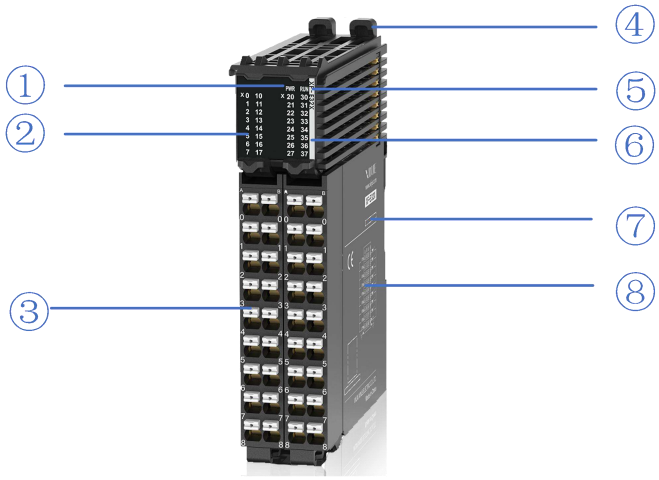
- 32 channels digital input;
- Compliant with IEC-61131 input standard type 1;
- NP&PNP bipolar input;
- Designed with a width of 24mm.

■ Module version

Hardware version	Firmware version	Function
H2.0	V2.0	First official production of basic functions

5.5.2 Module View

(1) Each part description



No.	Name	No.	Name
①	System LED indicator light	②	Channel LED indicator light
③	Detachable terminal block	④	Buckle
⑤	Model indication	⑥	Color identification indicating module type
⑦	Module hardware and firmware versions	⑧	Wiring diagram

(2) System indicator light

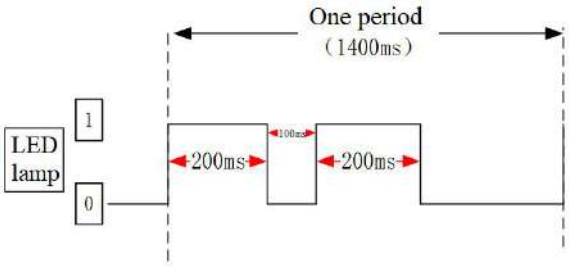
System indicator light	Meaning	
PWR (green)	OFF	Module not powered on
	Always ON	All external power supplies of the module are normal (backplane

System indicator light	Meaning	
		bus power supply&external input 24V)
	Flashing 1Hz*1	The module's power supply is abnormal and cannot operate normally
RUN (green)	Always ON	The module is running normally
	Flashing 1Hz*1	General errors in module logs
	OFF	Important errors in module logs
	Flashing 10Hz*2	Module establishment communication in progress
	Double flashing*3	Module firmware update

*1: A square wave with a duty cycle of 50% and a frequency of 1Hz.

*2: A square wave with a duty cycle of 50% and a frequency of 10Hz.

*3: The following figure:



(3) Channel indicator light

Model	Channel indicator light		
XF-E32X	X0-X37	Always ON (green)	Corresponding input channel has input ON signal
		OFF	Corresponding input channel has no input ON signal

(4) Color identification

No.	Color		Module type
1		Grey White	Digital input
2		Gray	Digital output&digital mixed module
3		Light blue	Analog input
4		Dark blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

5.5.3 General specification

Project		Content
Operating temperature	Max temperature	55℃
	Min temperature	-20℃
Transportation/storage temperature	Max temperature	70℃
	Min temperature	-40℃
Environmental humidity (Including operation/storage)	Upper limit	95%
	lower limit	10%
Protection grade		IP20
Anti vibration		Accord with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant acceleration 1.0g peak acceleration) Under continuous vibration (frequency 5-9Hz, half amplitude 1.75mm displacement) and (frequency 9-150Hz, constant acceleration 0.5g, constant frame amplitude) Scan 10 times in X, Y, and Z directions
Impact resistance		Accord with IEC61131-2 Impact strength of 15G (peak) with a duration of 11ms is applied to three mutually perpendicular axes, with 3 impacts per axis (a total of 18 impacts)
Use environment		Non corrosive gas
Use altitude		0-2000 meters
Over voltage level		II: Accord with IEC61131-2
Pollution level		2: Accord with IEC61131-2
Anti interference EMC		Accord with IEC 61131-2 IEC61000-6-4 B type
Related certifications		CE

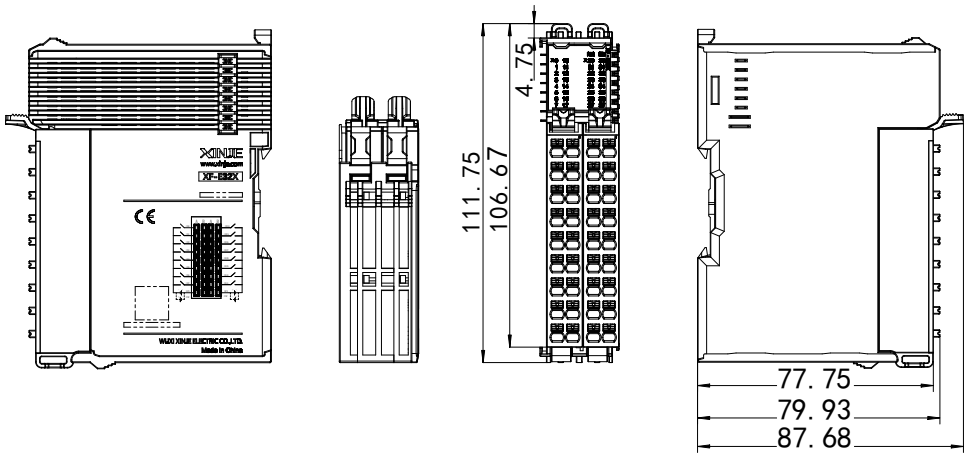
5.5.4 Technical specification

Project	Specification
Input points	32
Rated input voltage	DC24V
Rated input current	4mA
Input impedance	5.5KΩ
Input ON voltage	15V
Input ON current	2.5mA

Project	Specification
Input OFF voltage	5V
Input OFF current	1mA
Input resistance ON → OFF response time (Hardware)	100us
Input resistance OFF → ON response time (Hardware)	100us
Input derating	Derate by 50% when operating at 55℃ (with no more than 16 ON input points), or by 10℃ when all input points are ON.
Public end method	1 common terminal of 16 points
Connection mode	Refer to external terminal connection diagram
Module power consumption	0.8W (internal backplane)+3.2W (external input)
Module weight	128g

5.5.5 **Installation&Wiring**

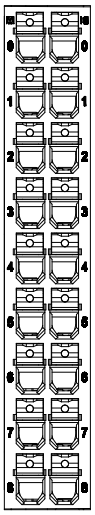
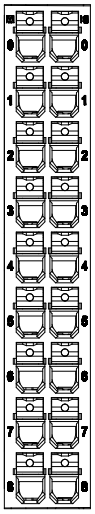
5.5.5.1 Appearance dimension diagram



(Unit: mm)

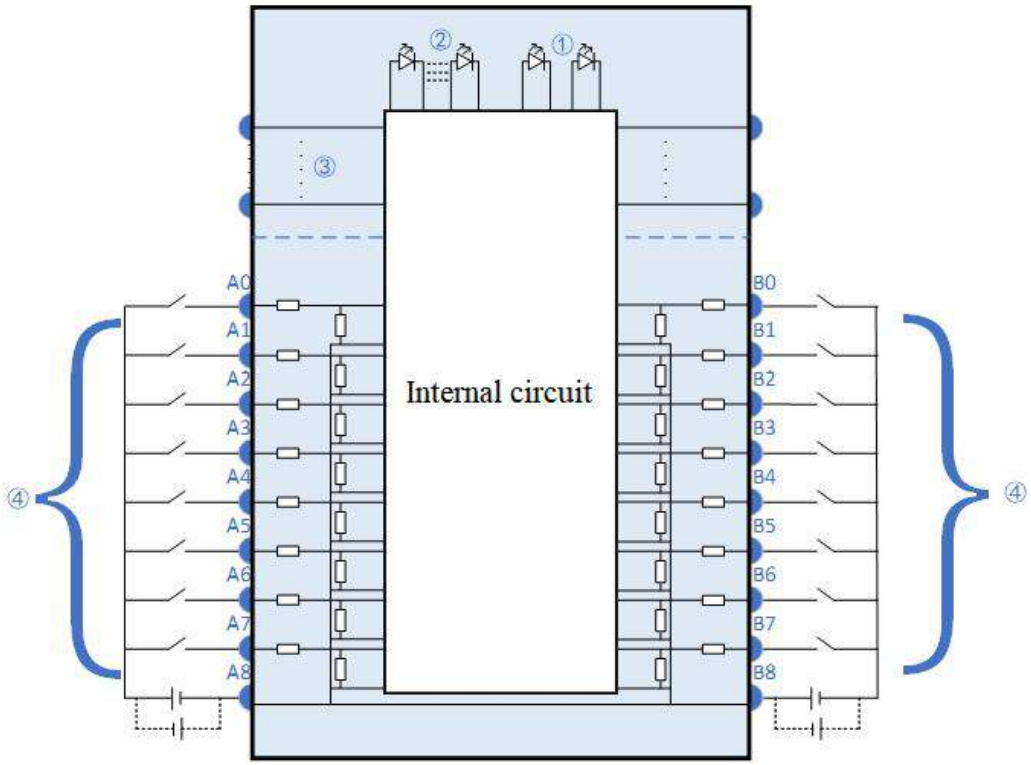
5.5.5.2 Terminal Definition&Wiring

■ Terminal Definition

XF-E32X								
Meaning	A-list terminal(left)	Meaning	B-list terminal(left)	Terminal layout	Meaning	A-list terminal(right)	Meaning	B-list terminal(right)
CH0	0	CH8	0		CH16	0	CH24	0
CH1	1	CH9	1		CH17	1	CH25	1
CH2	2	CH10	2		CH18	2	CH26	2
CH3	3	CH11	3		CH19	3	CH27	3
CH4	4	CH12	4		CH20	4	CH28	4
CH5	5	CH13	5		CH21	5	CH29	5
CH6	6	CH14	6		CH22	6	CH30	6
CH7	7	CH15	7		CH23	7	CH31	7
SS0	8	SS0	8		SS1	8	SS1	8

SS0 and SS1 are internally short circuited, so the left and right input points of a single module can be either NPN or PNP.

■ External wiring (Taking CH0-CH15 as an example, the same applies to CH16-CH31)

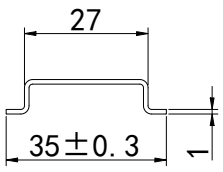


Number	Name
①	System indicator light
②	Channel indicator light
③	Backplane bus
④	Input Channel&Wiring

5.5.5.3 Installation method

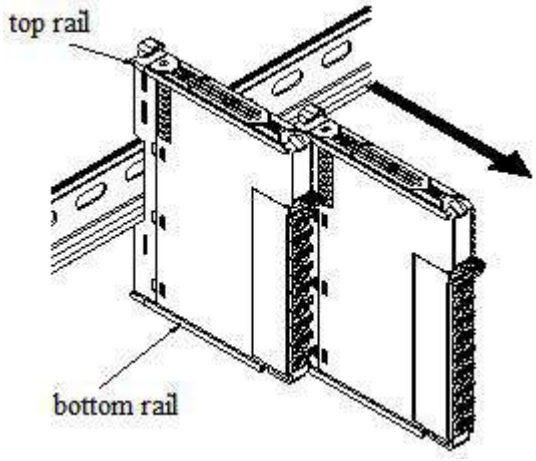
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

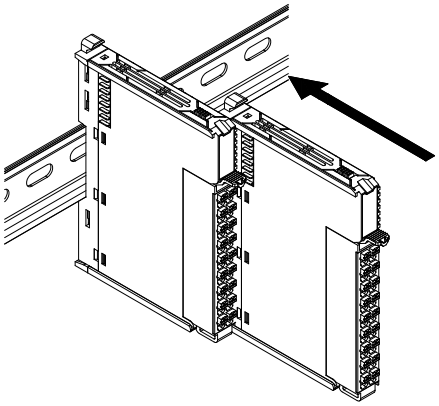


Attention When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

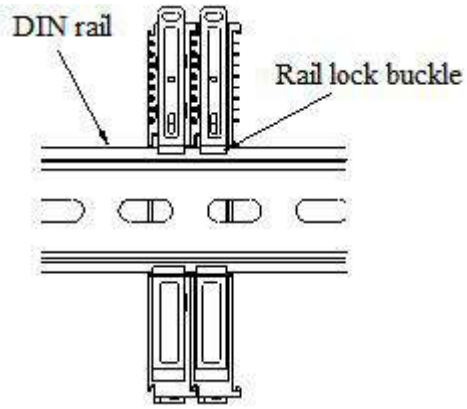
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

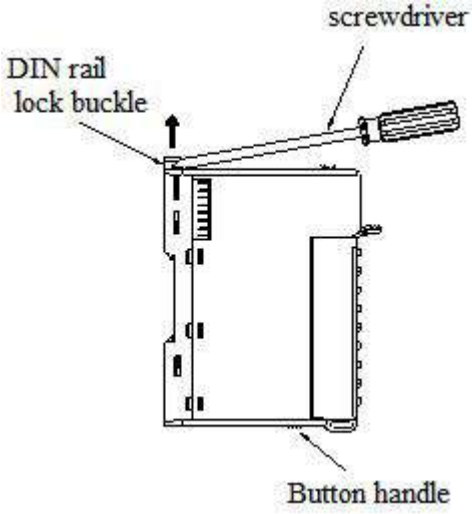


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

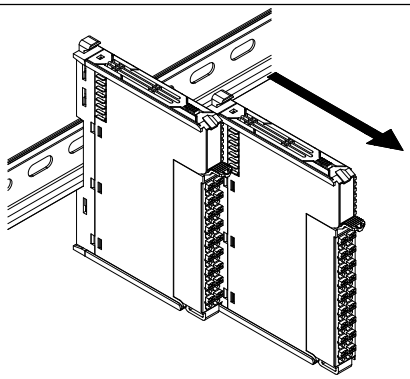


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



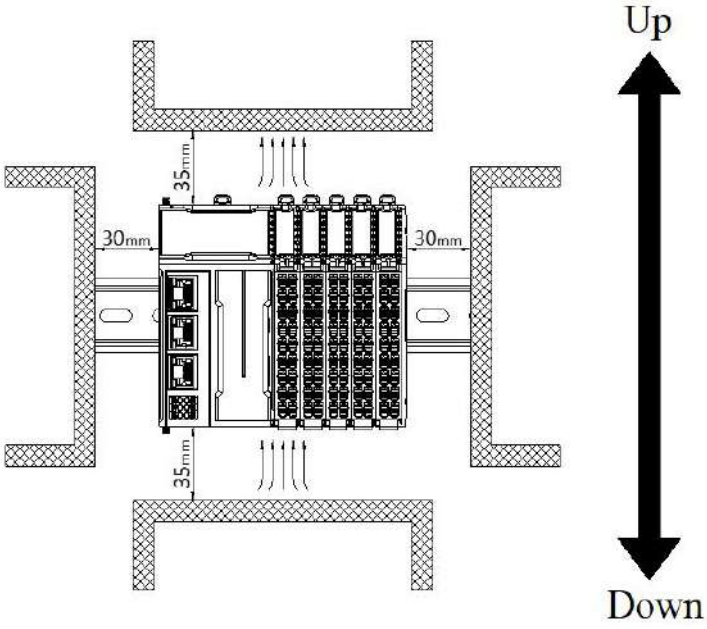
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

5.5.5.4 Installation environment

This product can be installed in four positions (installation direction): horizontal direction, vertical direction, top of the cabinet, and bottom of the cabinet. It is recommended to install in the horizontal direction. The heat dissipation design is through natural convection, to ensure normal ventilation and heat dissipation, and to reserve sufficient wiring space, the minimum gap must be left around this product, as shown in the following figure:



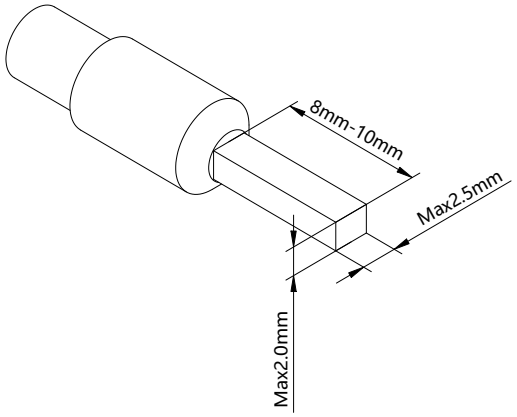
If there are high-temperature heat source equipment (heaters, transformers, high resistors, etc.) around this product, a minimum gap of 100mm should be left between the equipment and the high-temperature heat source.

5.5.5.5 Equipment wiring

When wiring a module, its terminal must meet the following requirements:

Suitable cable diameter	
Chinese standard/mm^2	American Standard/AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

If using other tube type wire lugs, please crimp them to the stranded wire, and the shape and size requirements are shown in the following figure:



5.5.6 Parameters and mapping addresses

Name	Type	Description
XF_E32X	Stuct	32 channels input module
CH0	BOOL	Channel 0 input value
CH1	BOOL	Channel 1 input value
CH2	BOOL	Channel 2 input value
CH3	BOOL	Channel 3 input value
CH4	BOOL	Channel 4 input value
CH5	BOOL	Channel 5 input value
CH6	BOOL	Channel 6 input value
CH7	BOOL	Channel 7 input value
CH8	BOOL	Channel 8 input value
CH9	BOOL	Channel 9 input value
CH10	BOOL	Channel 10 input value
CH11	BOOL	Channel 11 input value
CH12	BOOL	Channel 12 input value
CH13	BOOL	Channel 13 input value
CH14	BOOL	Channel 14 input value
CH15	BOOL	Channel 15 input value
CH16	BOOL	Channel 16 input value
CH17	BOOL	Channel 17 input value
CH18	BOOL	Channel 18 input value
CH19	BOOL	Channel 19 input value
CH20	BOOL	Channel 20 input value
CH21	BOOL	Channel 21 input value
CH22	BOOL	Channel 22 input value
CH23	BOOL	Channel 23 input value
CH24	BOOL	Channel 24 input value

Name	Type	Description
XF_E32X	Stuct	32 channels input module
CH25	BOOL	Channel 25 input value
CH26	BOOL	Channel 26 input value
CH27	BOOL	Channel 27 input value
CH28	BOOL	Channel 28 input value
CH29	BOOL	Channel 29 input value
CH30	BOOL	Channel 30 input value
CH31	BOOL	Channel 31 input value
ErrCode_module	WORD	Module level error codes
ErrCode_CH	DWORD	Channel level error codes

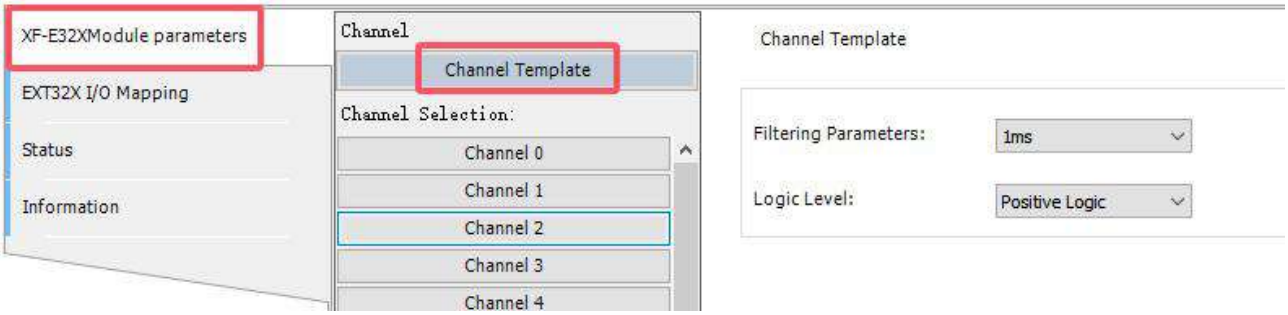
- Error code parameters

Module level error codes (ErrCode_module)		
Bit	Meaning	Error level
0	The 24V input power supply of the module is abnormal	General
1	Incorrect allocation of module parameters	Important
2	An internal module error has occurred and the user layer is unable to repair it	Important
3	Version mismatch	Important

Channel level error code reserved, currently undefined.

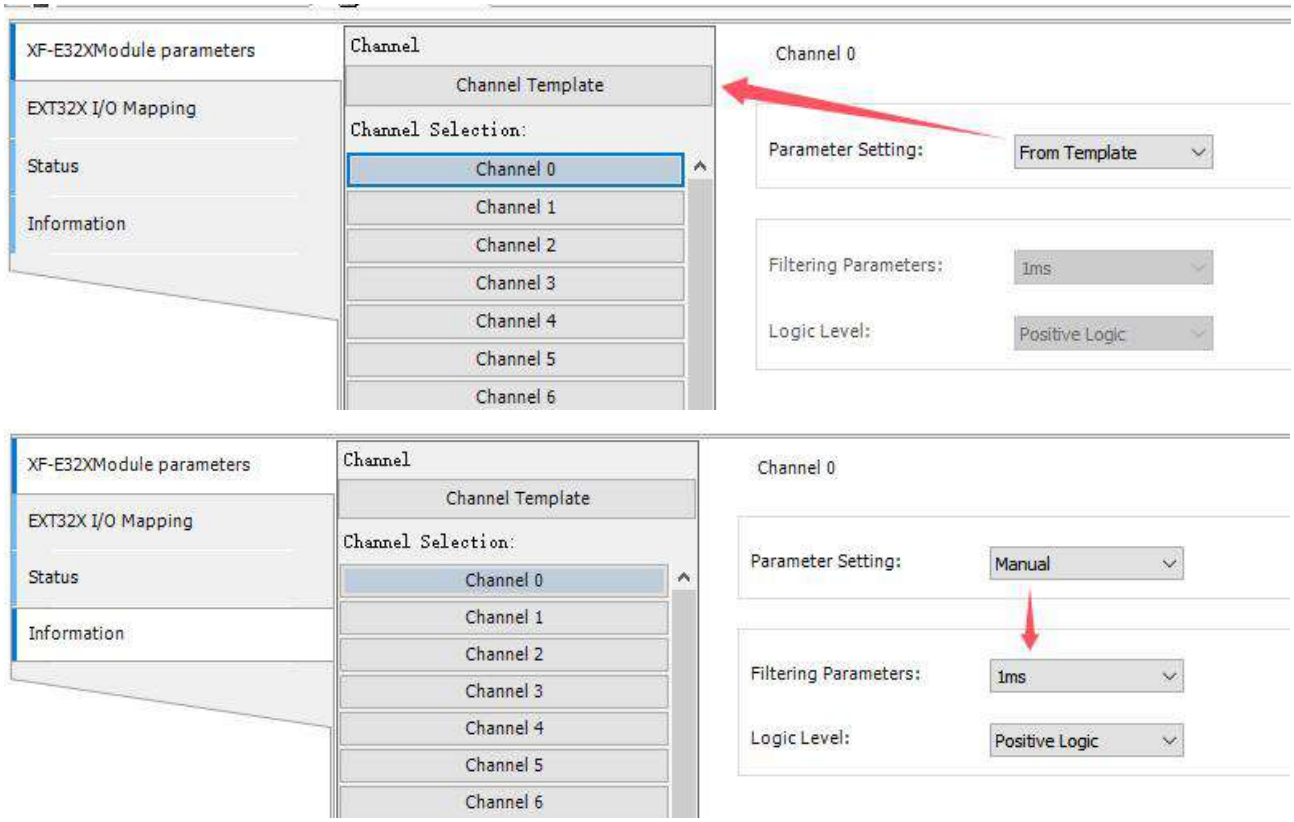
5.5.7 Function and settings

- Channel template



<table>
<tr><th>Parameter</th><th>Initial value</th><th>Parameter description</th></tr>
<tr><td>Filter parameters</td><td>1ms</td><td>When there is a signal at the input terminal and the signal duration exceeds the filtering time, it is considered a valid signal.
Parameters that can be set: The following reflects the parameters that can be set:
0ms, 0.25ms, 0.5ms, 1ms, 2ms, 3ms, 4ms, 5ms, 6ms, 7ms, 8ms, 9ms, 10ms, 11ms, 12ms, 13ms, 14ms, 15ms, 20ms, 30ms, 64ms, 128ms</td></tr>
<tr><td>Logic level</td><td>Positive Logic</td><td>The program execution logic after external signal input.
<table>
<tr><th>External input signal</th><th>Logic level configuration</th><th>Program</th><th>Result</th></tr>
<tr><td>X0=1</td><td>Positive logic</td><td rowspan="4">LD X0;
OUT Y0;</td><td>Y0=1</td></tr>
<tr><td>X0=1</td><td>Negative logic</td><td>Y0=0</td></tr>
<tr><td>X0=0</td><td>Positive logic</td><td>Y0=0</td></tr>
<tr><td>X0=0</td><td>Negative logic</td><td>Y0=1</td></tr>
</table></td></tr>
</table>

■ Channel selection



Filter parameters and logic levels can be set separately for each channel.

Channel setting	From Template: Configuring Parameters Using the "Channel Template" Interface Manual: Use the configuration parameters below this interface

5.6 Digital input module XF-E32YT

5.6.1 Product overview

The XF-E32YT series digital input expansion module has 32 channels of digital output, suitable for XF, XSF series CPU unit products and XF series communication coupler units.

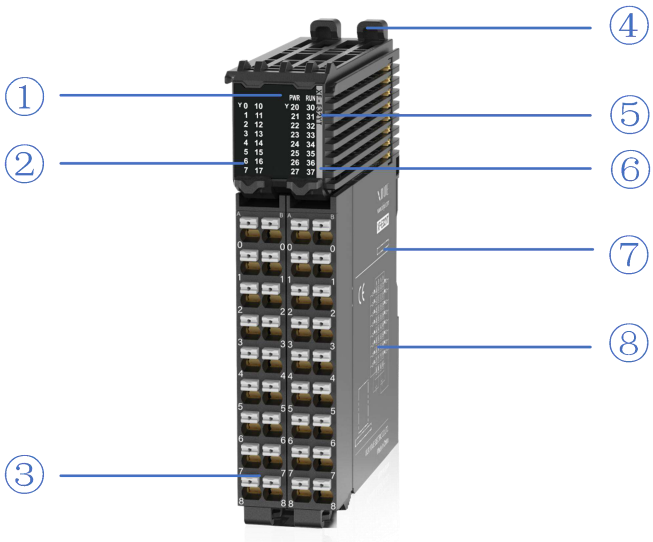
- 32 channel digital output
- NPN output
- Designed with a width of 24mm

■ Module version

Hardware version	Firmware version	Function
H2.0	V2.0	Basic functions for the first official production

5.6.2 Module view

(1) Description of each section



No.	Name	No.	Name
①	System LED indicator light	②	Channel LED indicator light
③	Detachable terminal block	④	Clasp
⑤	Model indicator	⑥	Color identification indicating module type
⑦	Module hardware and firmware version	⑧	Wiring diagram

(2) System indicator light

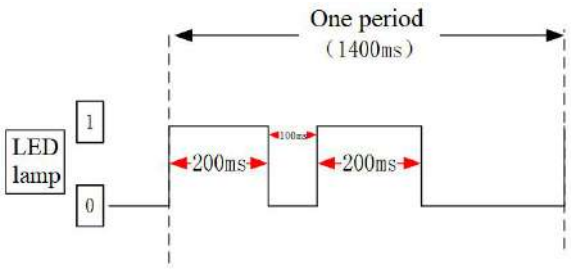
System indicator light	Meaning	
PWR(Green)	Extinguish	Module not powered on
	Normally ON	All external power supplies of the module are normal

System indicator light	Meaning	
		(Backplane bus power supply&external input 24V)
	Flashing 1Hz*1	Module power supply is abnormal and cannot operate normally
RUN(Green)	Normally ON	The module is operating normally
	Flashing 1Hz*1	General errors in module logs
	Extinguish	Important errors in the module log
	Flashing 10Hz*2	Module establishing communication
	Double flashing*3	Module firmware update

*1: A square wave with a duty cycle of 50% and a frequency of 1Hz.

*2: A square wave with a duty cycle of 50% and a frequency of 10Hz.

*3: The following figure:



(3) Channel indicator light

Model	Channel indicator light		
XF-E32YT	Y0-Y37	Normally ON(Green)	The corresponding output channel has an ON signal output
		Extinguish	Corresponding output channel has no output ON signal

(4) Color identification

No.	Color		Module type
1		Grey White	Digital input
2		Gray	Digital output&digital mixed module
3		Light blue	Analog input
4		Dark blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

5.6.3 General specifications

Item		Specification
Operating temperature	Max temperature	55℃
	Min temperature	-20℃
Transportation/storage	Max	70℃

Item		Specification
temperature	temperature	
	Min temperature	-40℃
Environmental humidity (including operation/storage)	Upper limit	95%
	lower limit	10%
Protection grade		IP20
Anti vibration		Accord with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant acceleration 1.0g peak acceleration) Under continuous vibration (frequency 5-9Hz, half amplitude 1.75mm displacement) and (frequency 9-150Hz, constant acceleration 0.5g, constant frame amplitude) Scan 10 times in X, Y, and Z directions
Impact resistance		Accord with IEC61131-2 Impact strength of 15G (peak) with a duration of 11ms is applied to three mutually perpendicular axes, with 3 impacts per axis (a total of 18 impacts)
Use environment		Non corrosive gas
Use altitude		0-2000 meters
Over voltage level		II: Accord with IEC61131-2
Pollution level		2: Accord with IEC61131-2
Anti interference EMC		Accord with IEC 61131-2 IEC61000-6-4 B type
Related certifications		UL, CE

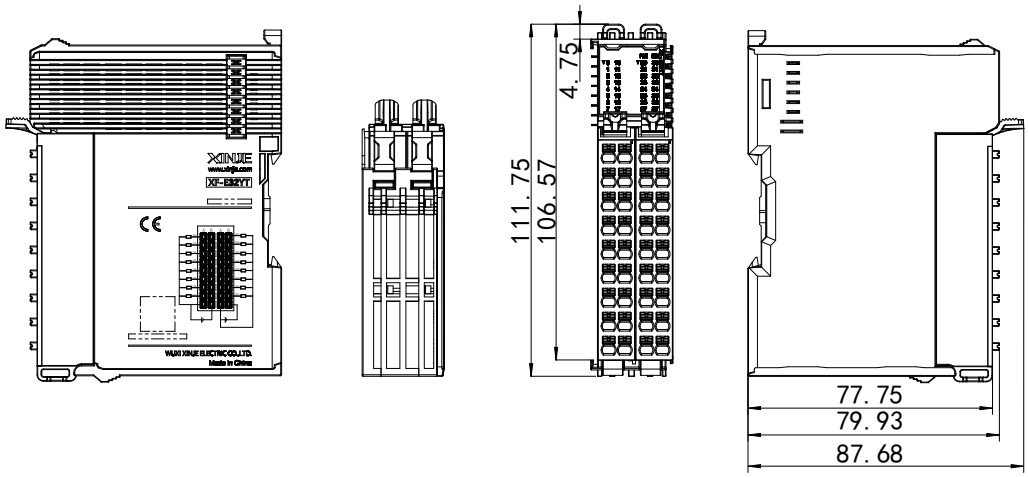
5.6.4 Technical specification

Item	Specification
Model	XF-E32YT
Output points	32
Rated load voltage	DC24V (DC21.6V~26.4V)
Maximum load current	0.5A/1 point, 8A/module
Surge current protection	Support
Leakage current at OFF	Below 0.1mA
Maximum voltage drop at ON	0.5V
Output ON → OFF response time (Hardware)	0.1ms
Output OFF → ON response time (Hardware)	0.1ms
Output derating	Derate by 50% when operating at 55℃(While the output current of ON doesn't exceed 2A), or by 10℃ when the output point is fully ON

Item	Specification
Public end method	1 common terminal of 16 points
Output Protection	Support short circuit and overload protection functions
Module power consumption	1.2W (Backplane bus)+0.6W(External input)
Module weight	137g
Insulation voltage	AC510V
Insulated resistance	10M

5.6.5 Installation&Wiring

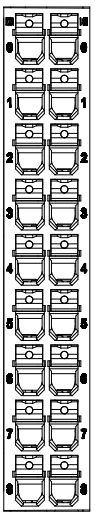
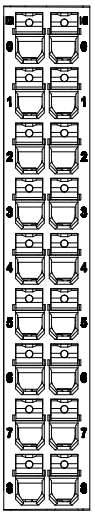
5.6.5.1 Appearance dimension



(Unit: mm)

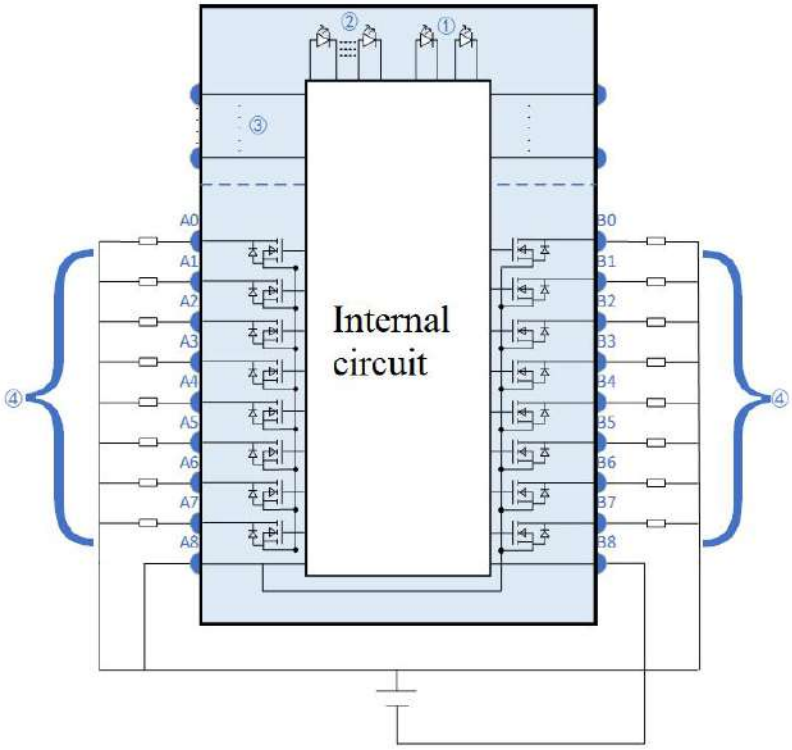
5.6.5.2 Terminal Definition&Wiring

(1) Terminal Definition

XF-E32Y								
Meaning	A-list terminal(left)	Meaning	B-list terminal(left)	Terminal layout	Meaning	A-list terminal(right)	Meaning	B-list terminal(right)
CH0	0	CH8	0		CH16	0	CH24	0
CH1	1	CH9	1		CH17	1	CH25	1
CH2	2	CH10	2		CH18	2	CH26	2
CH3	3	CH11	3		CH19	3	CH27	3
CH4	4	CH12	4		CH20	4	CH28	4
CH5	5	CH13	5		CH21	5	CH29	5
CH6	6	CH14	6		CH22	6	CH30	6
CH7	7	CH15	7		CH23	7	CH31	7
24V+	8	0V	8		24V+	8	0V	8

Two 0V internal short circuits and two 24V internal isolation.

(2) External wiring (taking CH0-CH15 as an example, CH16-CH31 is the same)

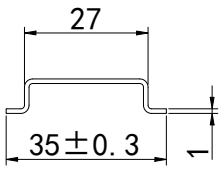


Number	Name
①	System indicator light
②	Channel indicator light
③	Backplane bus
④	Input Channel&Wiring

5.6.5.3 Installation method

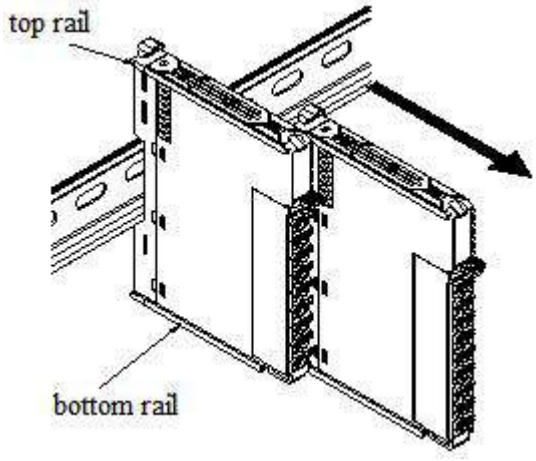
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

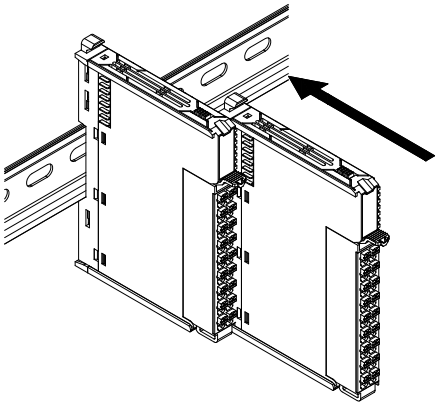


Attention When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

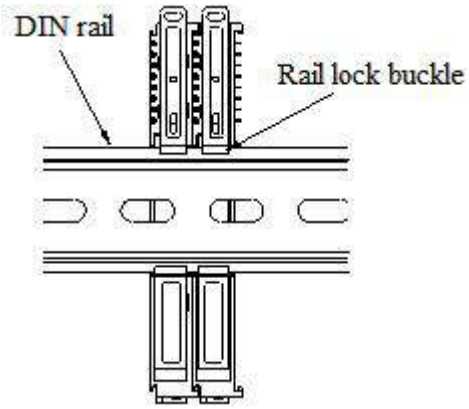
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

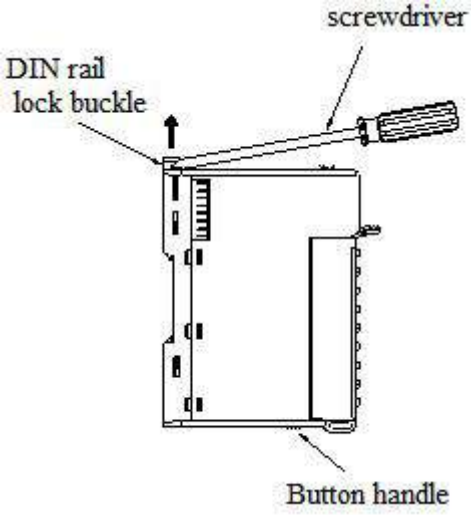


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

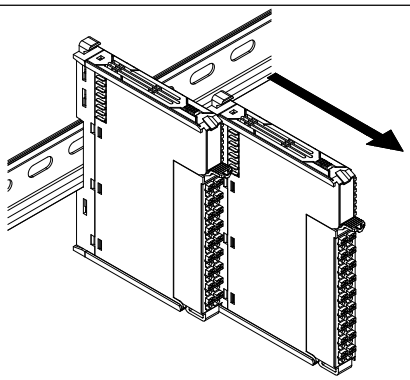


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



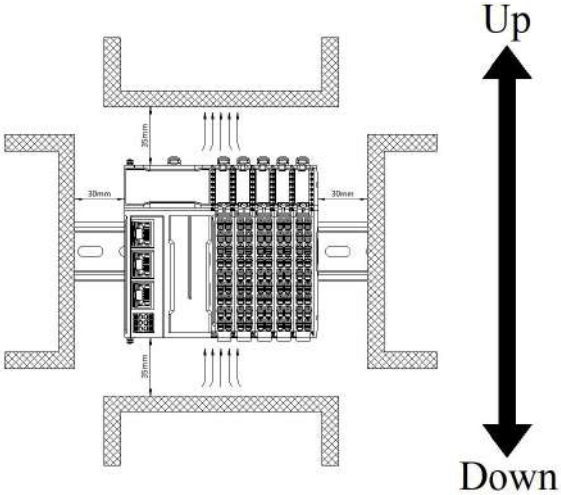
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

5.6.5.4 Installation environment

This product can be installed in four positions (installation direction): horizontal direction, vertical direction, top of the cabinet, and bottom of the cabinet. It is recommended to install in the horizontal direction. The heat dissipation design is through natural convection, to ensure normal ventilation and heat dissipation, and to reserve sufficient wiring space, the minimum gap must be left around this product, as shown in the following figure:



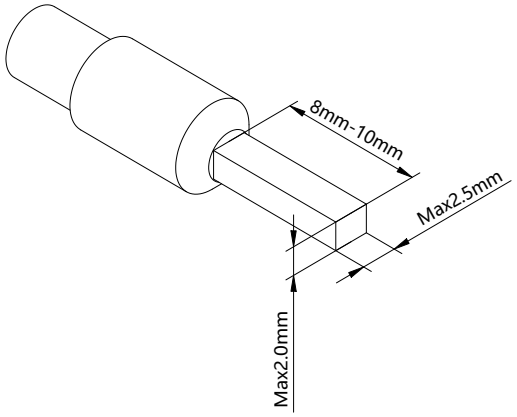
If there are high-temperature heat source equipment (heaters, transformers, high resistors, etc.) around this product, a minimum gap of 100mm should be left between the equipment and the high-temperature heat source.

5.6.5.5 Equipment wiring

When wiring a module, its terminal must meet the following requirements:

Suitable cable diameter	
Chinese standard/mm^2	American Standard/AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

If using other tube type wire lugs, please crimp them to the stranded wire, and the shape and size requirements are shown in the following figure:



5.6.6 Parameters and mapping addresses

Name	Type	Description
XF_E32YT	Stuct	32 channels output module
CH0	BOOL	Channel 0 output value
CH1	BOOL	Channel 1 output value
CH2	BOOL	Channel 2 output value
CH3	BOOL	Channel 3 output value
CH4	BOOL	Channel 4output value
CH5	BOOL	Channel 5 output value
CH6	BOOL	Channel 6 output value
CH7	BOOL	Channel 7 output value
CH8	BOOL	Channel 8 output value

Name	Type	Description
XF_E32YT	Stuct	32 channels output module
CH9	BOOL	Channel 9 output value
CH10	BOOL	Channel 10 output value
CH11	BOOL	Channel 11 output value
CH12	BOOL	Channel 12 output value
CH13	BOOL	Channel 13 output value
CH14	BOOL	Channel 14 output value
CH15	BOOL	Channel 15 output value
CH16	BOOL	Channel 16 output value
CH17	BOOL	Channel 17 output value
CH18	BOOL	Channel 18 output value
CH19	BOOL	Channel 19 output value
CH20	BOOL	Channel 20 output value
CH21	BOOL	Channel 21 output value
CH22	BOOL	Channel 22 output value
CH23	BOOL	Channel 23 output value
CH24	BOOL	Channel 24 output value
CH25	BOOL	Channel 25 output value
CH26	BOOL	Channel 26 output value
CH27	BOOL	Channel 27 output value
CH28	BOOL	Channel 28 output value
CH29	BOOL	Channel 29 output value
CH30	BOOL	Channel 30 output value
CH31	BOOL	Channel 31 output value
ErrCode_module	WORD	Module level error code
ErrCode_CH	DWORD	Channel level error code

- Error code parameters:

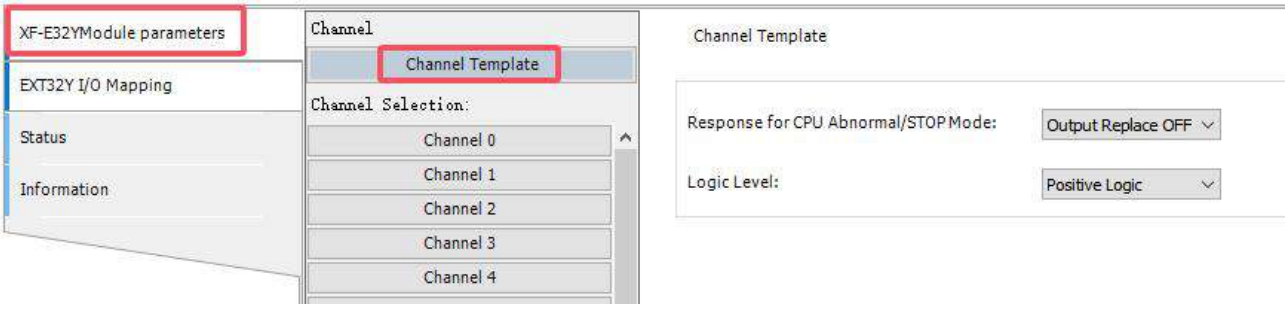
Module level error codes(ErrCode_module)

Bit	Meaning	Error level
0	The 24V input power supply of the module is abnormal	General
1	Incorrect allocation of module parameters	Important
2	An internal module error has occurred and the user layer is unable to repair it	Important
3	Version mismatch	Important

Channel level error code reserved, currently undefined.

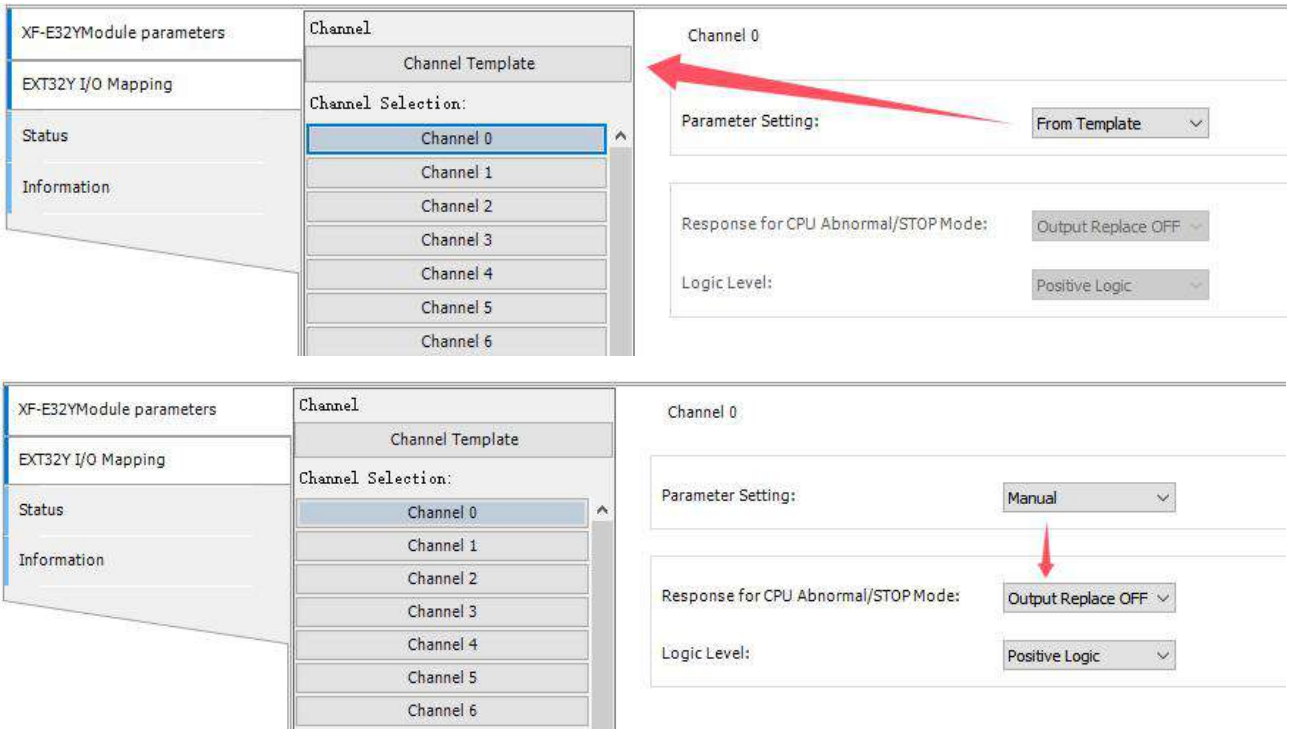
5.6.7 Function and setting

- Channel template



Parameter	Initial value	Description
Response for CPU abnormal/STOP mode	Output replace OFF	Output replace OFF: When the PLC is in STOP mode, the output terminal is in a reset state (physical terminal, regardless of channel logic level). Keep previous value: When the PLC is in abnormal/STOP mode, the output terminal outputs the last state of the PLC from RUN to STOP (physical terminal, regardless of channel logic level). Output replace ON: When the PLC is in abnormal/STOP mode, the output terminal is in the set state (physical terminal, not considering channel logic level)
Logic level	Positive logic	Positive logic: When the terminal in the program is set to ON, the external terminal outputs Negative logic: When the terminal in the program is set to OFF, the external terminal outputs

- Channel setting



The response and logic level for CPU exception/STOP mode can be set separately for each channel.

Channel setting	From Template: Configuring Parameters Using the "Channel Template" Interface Manual: Use the configuration parameters below this interface

5.7 Digital IO module XF-E16X16YT

5.7.1 Product overview

The XF-E16X16YT series digital input output expansion module has 16 channels of digital input, supports NPN and PNP inputs, and 16 channels of digital output. It is compatible with XF and XSF series CPU unit products and XF series communication coupler units.

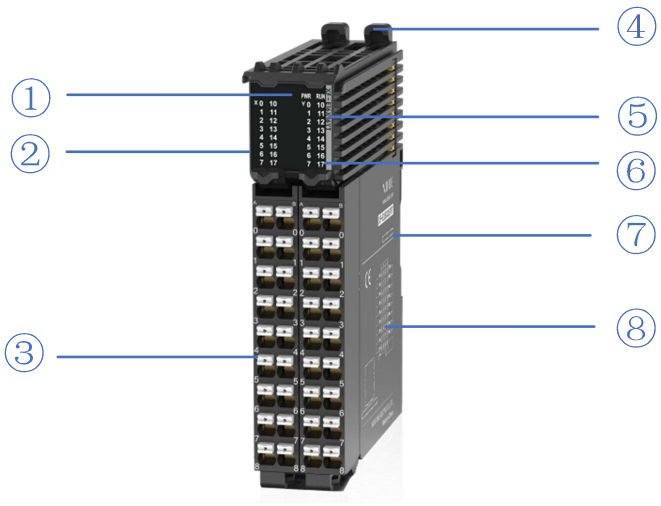
- 16 channel digital input.
- NPN&PNP bipolar input.
- 16 channels digital output.
- NPN output.
- 24mm width design.

Module version:

Hardware version	Software version	Function
H2.0	V2.0	Basic functions for the first official production

5.7.2 Module view

(1) Description of each section

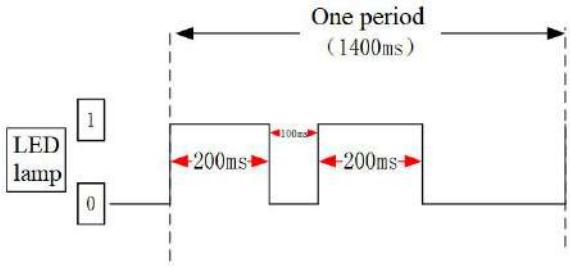


No.	Name	No.	Name
①	System LED indicator light	②	Channel LED indicator light
③	Detachable terminal block	④	Clasp
⑤	Signal indication	⑥	Color identification indicating module type
⑦	Module hardware and firmware version	⑧	Wiring diagram

(2) System indicator light

System indicator light	Meaning	
PWR(Green)	Extinguish	Module not powered on
	Normally ON	All external power supplies of the module are normal (Backplane bus power supply&external input 24V)
	Flashing 1Hz*1	Module power supply is abnormal and cannot operate normally
RUN(Green)	Normally ON	The module is operating normally
	Flashing 1Hz*1	General errors in module logs
	Extinguish	Important errors in the module log
	Flashing 10Hz*2	Module establishing communication
	Double flashing*3	Module firmware update

*1: A square wave with a duty cycle of 50% and a frequency of 1Hz.
*2: A square wave with a duty cycle of 50% and a frequency of 10Hz.
*3: The following figure:



(3) Channel indicator light

Channel	Channel indicator light		
XF-E16X16YT	X0-X17	Normally ON(Green)	Corresponding input channel has input ON signal
		Extinguish	Corresponding input channel has no input ON signal
	Y0-Y17	Normally ON(Green)	Corresponding output channel has output ON signal
		Extinguish	Corresponding output channel has no output ON signal

(4) Color identification

No.	Color		Module type
1		Grey White	Digital input
2		Gray	Digital output&digital mixed module
3		Light blue	Analog input
4		Dark blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

5.7.3 General specifications

Item		Specification
Operating temperature	Max temperature	55℃
	Min temperature	-20℃
Transportation/storage temperature	Max temperature	70℃
	Min temperature	-40℃
Environmental humidity (including operation/storage)	Upper limit	95%
	lower limit	10%
Protection grade		IP20

Item	Specification
Anti vibration	Accord with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant acceleration 1.0g peak acceleration) Under continuous vibration (frequency 5-9Hz, half amplitude 1.75mm displacement) and (frequency 9-150Hz, constant acceleration 0.5g, constant frame amplitude) Scan 10 times in X, Y, and Z directions
Impact resistance	Accord with IEC61131-2 Impact strength of 15G (peak) with a duration of 11ms is applied to three mutually perpendicular axes, with 3 impacts per axis (a total of 18 impacts)
Use environment	Non corrosive gas
Use altitude	0-2000 meters
Over voltage level	II: Accord with IEC61131-2
Pollution level	2: Accord with IEC61131-2
Anti interference EMC	Accord with IEC 61131-2 IEC61000-6-4 B type
Related certifications	UL, CE

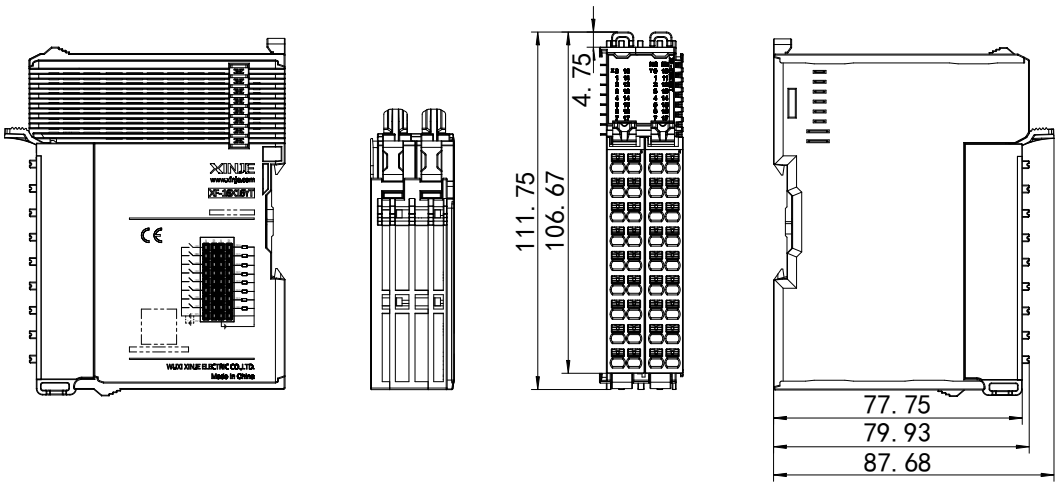
5.7.4 Technical specification

Item		Specification
Input specifications	Input channel	16
	Input type	NPN&PNP compatible
	Rated input voltage	DC24V
	Rated input current	6mA
	Input impedance	5KΩ
	Input ON voltage	11V
	Input ON current	2.5mA
	Input OFF voltage	5V
	Input OFF current	1mA
	Input derating	Derate by 50% when operating at 55℃ (with no more than 4 ON input points), or by 10℃ when all input points are ON.
	Input resistance ON → OFF response time (Hardware)	100us
	Input resistance OFF → ON response time (Hardware)	100us
Output specifications	Output channel	16
	Output type	Transistor (NPN)
	Rated load voltage	DC24V(DC21.6V~26.4V)
	Rated load current	0.5A/1 point, 4A/module
	Surge current protection	Support
	Leakage current at OFF	Below 0.1mA
	Maximum voltage drop at ON	0.5V~1V

Item		Specification
	Output derating	Derate by 50% when operating at 55℃(While the output current of ON doesn't exceed 2A), or by 10℃ when the output point is fully ON.
	Input resistance ON → OFF response time (Hardware)	0.1ms
	Input resistance OFF → ON response time (Hardware)	0.1ms
Module specifications	Module power consumption	1W (Backplane bus)+2W(External input)
	Module weight	132g

5.7.5 Installation&Wiring

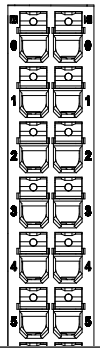
5.7.5.1 Appearance dimension

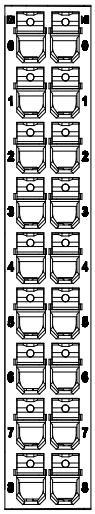


(Unit: mm)

5.7.5.2 Terminal Definition&Wiring

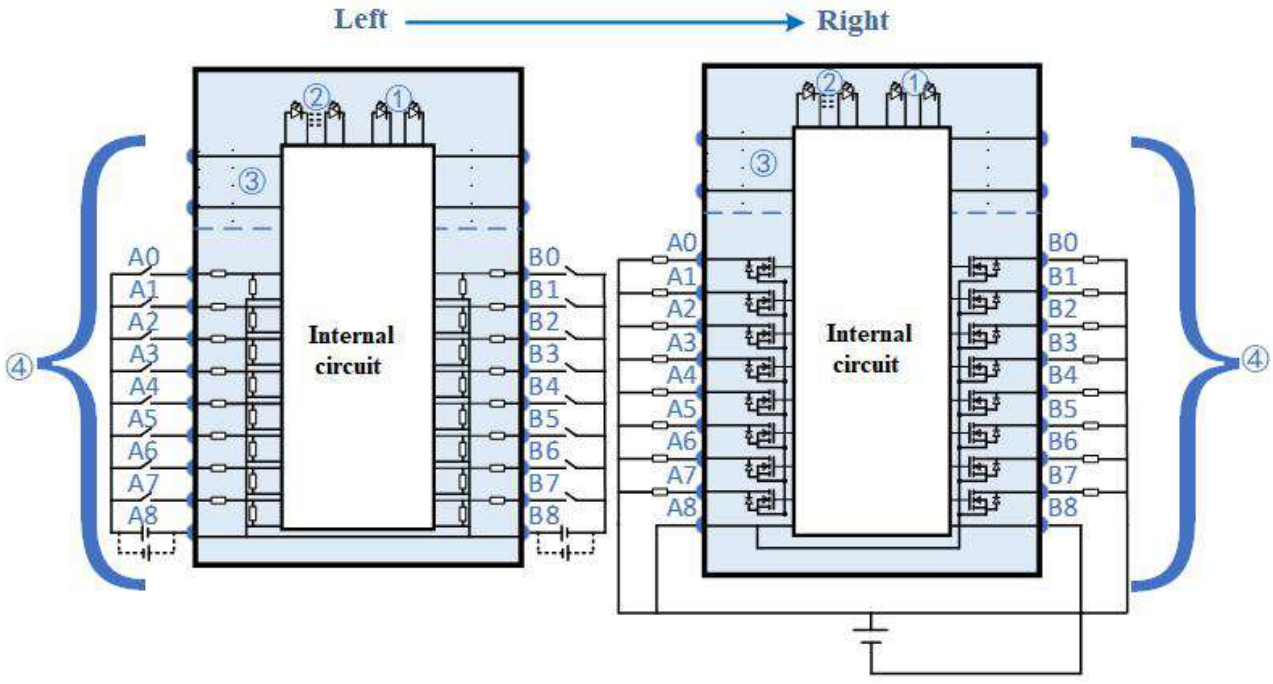
(1) Terminal definition

XF-E16X16YT								
Meaning	A-list terminal(left)	Meaning	B-list terminal(left)	Terminal layout	Meaning	A-list terminal(right)	Meaning	B-list terminal(right)
CH0	0	CH8	0		CH16	0	CH24	0
CH1	1	CH9	1		CH17	1	CH25	1
CH2	2	CH10	2		CH18	2	CH26	2
CH3	3	CH11	3		CH19	3	CH27	3
CH4	4	CH12	4		CH20	4	CH28	4
CH5	5	CH13	5		CH21	5	CH29	5

XF-E16X16YT								
Meaning	A-list terminal(left)	Meaning	B-list terminal(left)	Terminal layout	Meaning	A-list terminal(right)	Meaning	B-list terminal(right)
CH6	6	CH14	6		CH22	6	CH30	6
CH7	7	CH15	7		CH23	7	CH31	7
SS0	8	SS0	8		24V+	8	0	8

SS0 has an internal short circuit, so all input points of a single module can only choose between NPN or PNP.

(2) External wiring

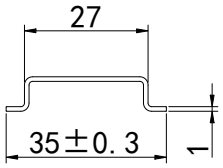


Number	Name
①	System indicator light
②	Channel indicator light
③	Backplane bus
④	Input/Output Channel&Wiring

5.7.5.3 Installation method

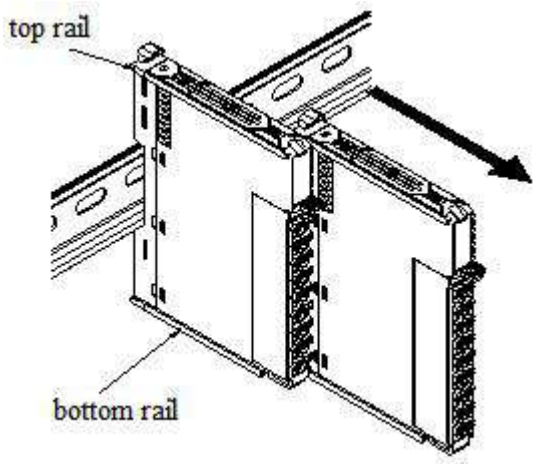
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

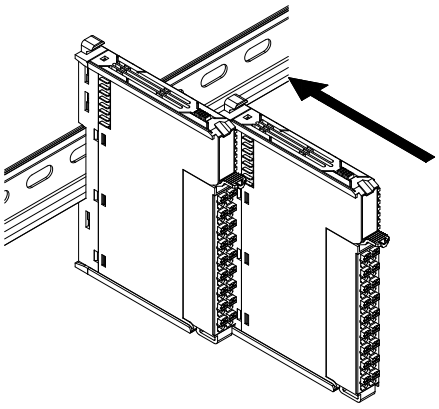


Attention When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

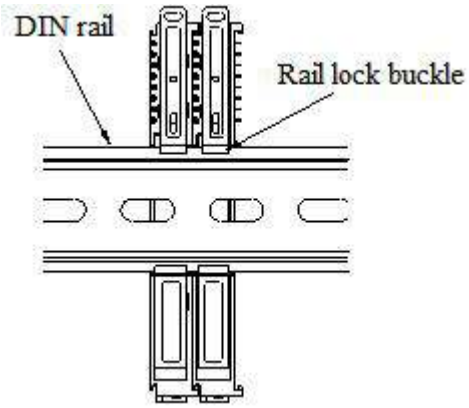
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

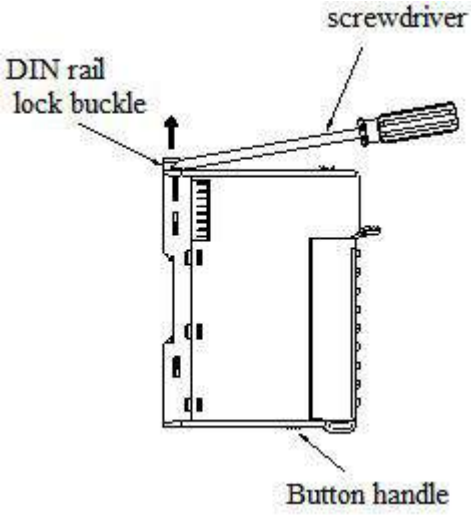


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

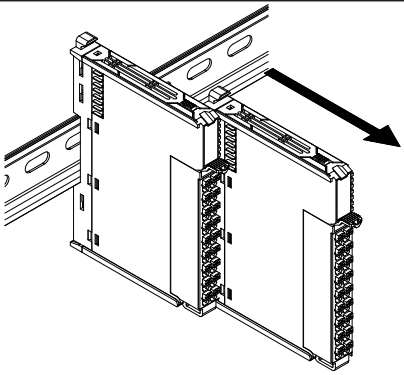


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



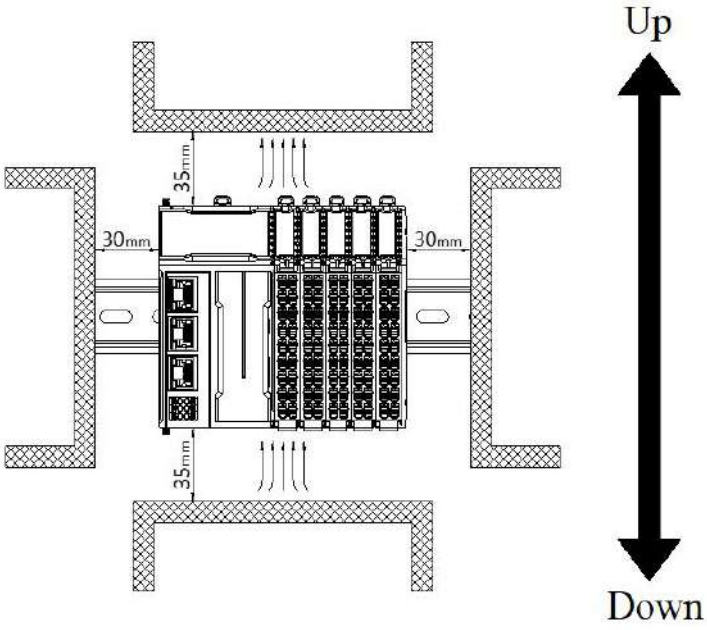
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

5.7.5.4 Installation environment

This product can be installed in four positions (installation direction): horizontal direction, vertical direction, top of the cabinet, and bottom of the cabinet. It is recommended to install in the horizontal direction. The heat dissipation design is through natural convection, to ensure normal ventilation and heat dissipation, and to reserve sufficient wiring space, the minimum gap must be left around this product, as shown in the following figure:



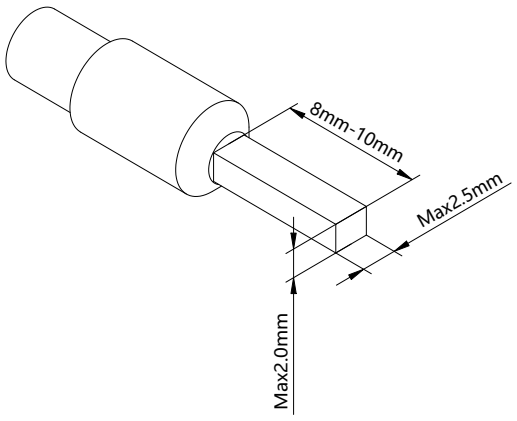
If there are high-temperature heat source equipment (heaters, transformers, high resistors, etc.) around this product, a minimum gap of 100mm should be left between the equipment and the high-temperature heat source.

5.7.5.5 Equipment wiring

When wiring a module, its terminal must meet the following requirements:

Suitable cable diameter	
Chinese standard/mm^2	American Standard/AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

If using other tube type wire lugs, please crimp them to the stranded wire, and the shape and size requirements are shown in the following figure:



5.7.6 Parameters and mapping addresses

Name	Type	Description
XF_E16X16YT	Stuct	16 channel input, 16 channel output module
CH0	BOOL	Channel 0 input value
CH1	BOOL	Channel 1 input value
CH2	BOOL	Channel 2 input value
CH3	BOOL	Channel 3 input value
CH4	BOOL	Channel 4 input value
CH5	BOOL	Channel 5 input value
CH6	BOOL	Channel 6 input value
CH7	BOOL	Channel 7 input value
CH8	BOOL	Channel 8 input value
CH9	BOOL	Channel 9 input value
CH10	BOOL	Channel 10 input value
CH11	BOOL	Channel 11 input value
CH12	BOOL	Channel 12 input value
CH13	BOOL	Channel 13 input value
CH14	BOOL	Channel 14 input value
CH15	BOOL	Channel 15 input value
CH16	BOOL	Channel 16 input value
CH17	BOOL	Channel 17 input value
CH18	BOOL	Channel 18 input value
CH19	BOOL	Channel 19 input value
CH20	BOOL	Channel 20 input value
CH21	BOOL	Channel 21 input value
CH22	BOOL	Channel 22 input value
CH23	BOOL	Channel 23 input value
CH24	BOOL	Channel 24 input value

Name	Type	Description
XF_E16X16YT	Stuct	16 channel input, 16 channel output module
CH25	BOOL	Channel 25 input value
CH26	BOOL	Channel 26 input value
CH27	BOOL	Channel 27 input value
CH28	BOOL	Channel 28 input value
CH29	BOOL	Channel 29 input value
CH30	BOOL	Channel 30 input value
CH31	BOOL	Channel 31 input value
ErrCode_module	WORD	Module level error codes
ErrCode_CH	DWORD	Channel level error codes

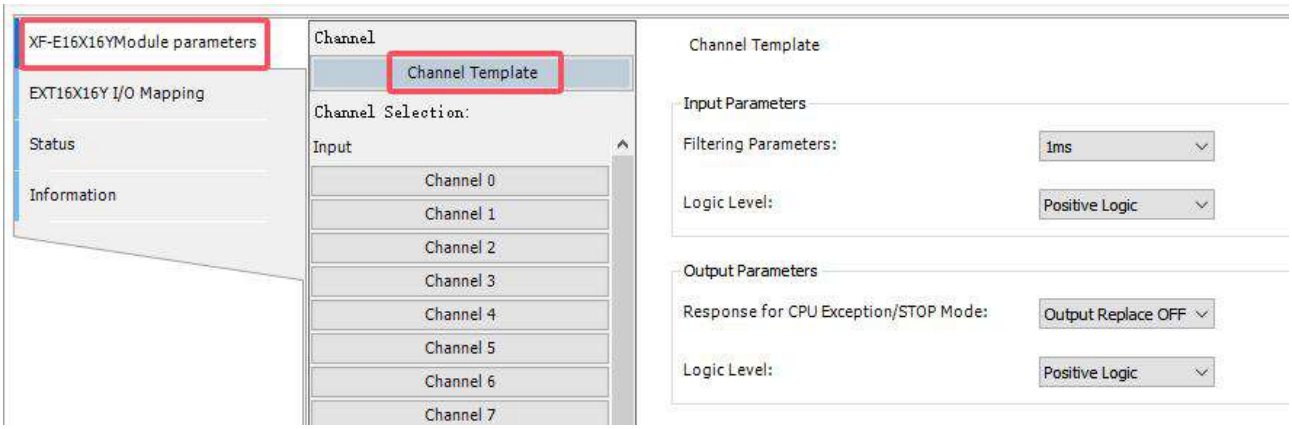
■ Error code parameters

Module level error codes(ErrCode_module)		
Bit	Meaning	Error level
0	The 24V input power supply of the module is abnormal	General
1	Incorrect allocation of module parameters	Important
2	Internal module error occurred and cannot be repaired by the user layer.	Important
3	Version mismatch	Important

Channel level error code reserved, currently undefined.

5.7.7 Function and setting

■ Channel template



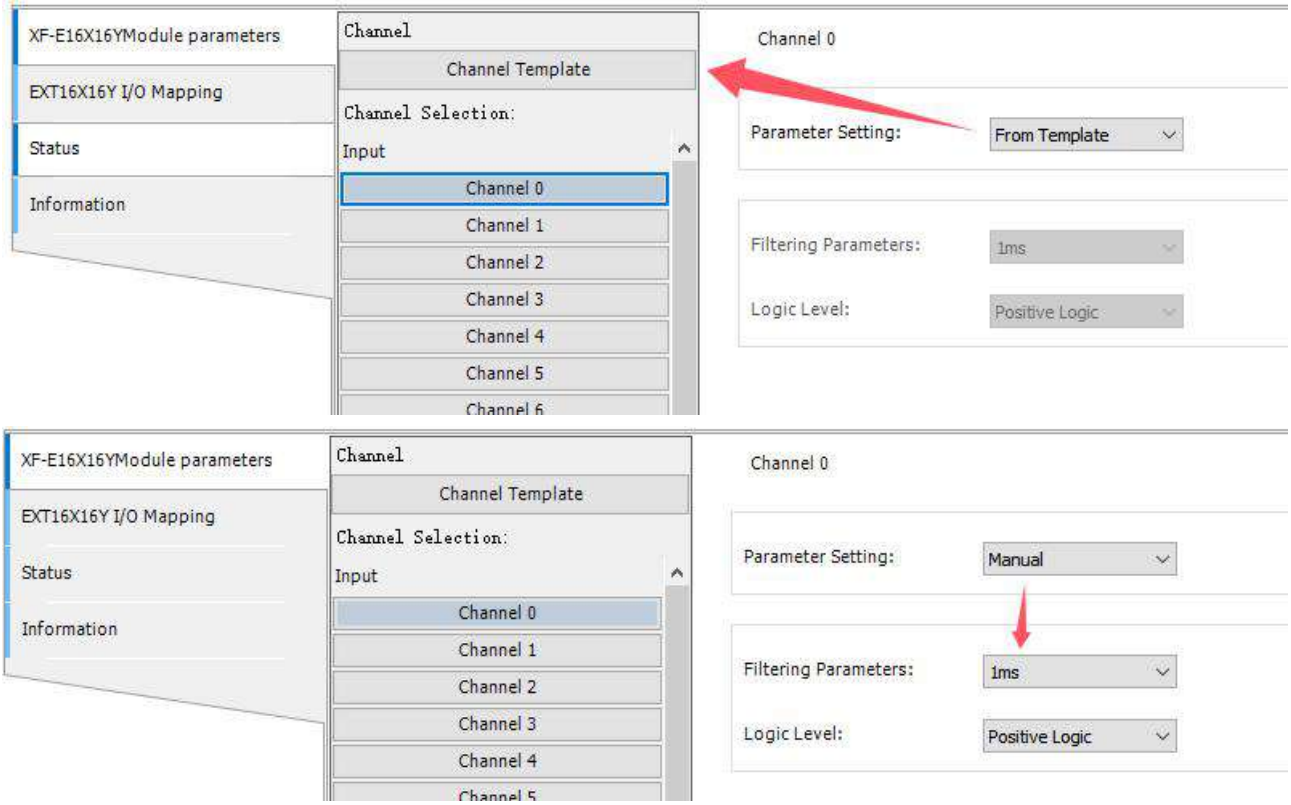
Input parameter	Initial value	Parameter explanation
Filtering parameter	1ms	When there is a signal at the input terminal and the signal duration exceeds the filtering time, it is considered a valid signal. The parameters can be set are shown in the dropdown list: 0ms, 0.25ms, 0.5ms, 1ms, 2ms, 3ms, 4ms, 5ms, 6ms, 7ms, 8ms, 9ms, 10ms, 11ms, 12ms, 13ms, 14ms, 15ms, 20ms, 30ms, 64ms, 128ms
Logic level	Positive logic	The program execution logic after external signal input.

External input signal	Logic level configuration	Run program	Operation result
X0=1	Positive logic	LD X0. OUT Y0.	Y0=1
X0=1	Negative logic		Y0=0
X0=0	Positive logic		Y0=0
X0=0	Negative logic		Y0=1

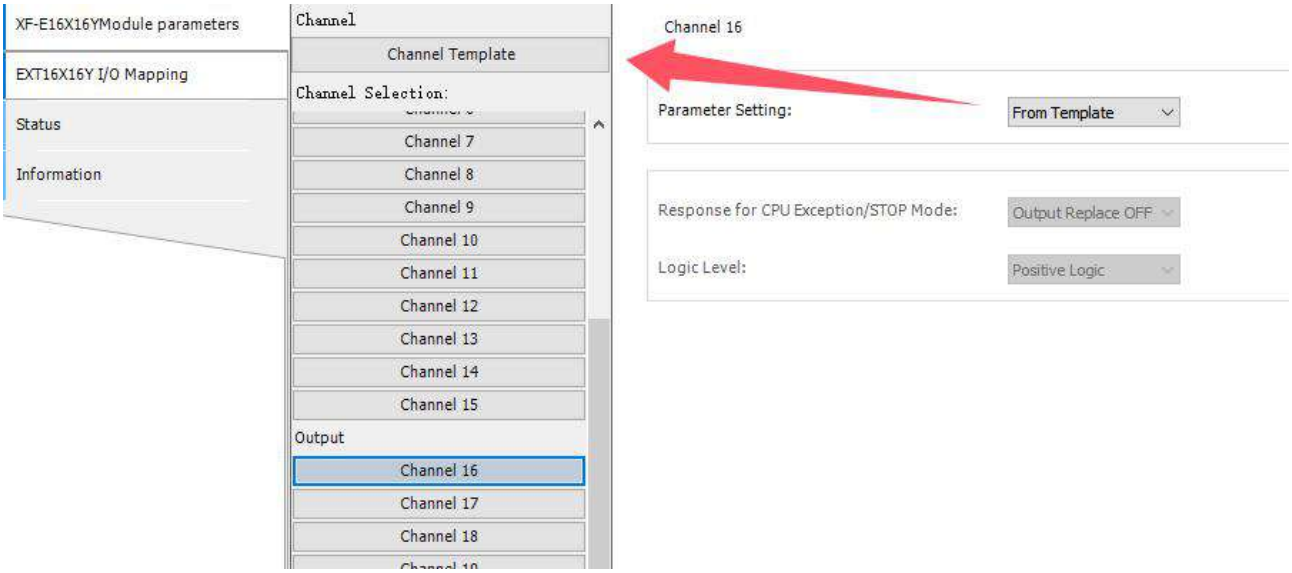
Output parameter	Initial value	Parameter explanation
Response for CPU exception/STOP mode	Output replace OFF	Output replace OFF: When the PLC is in STOP mode, the output terminal is in a reset state (Physical terminal, regardless of channel logic level). Keep previous value: When the PLC is in abnormal/STOP mode, the output terminal outputs the last state of the PLC from RUN to STOP (Physical terminal, regardless of channel logic level). Output replace ON: When the PLC is in abnormal/STOP mode, the output terminal is in a set state (Physical terminal, regardless of channel logic level).
Logic level	Positive logic	Positive logic: When the terminal in the program is set to ON, the external terminal outputs Negative logic: When the terminal in the program is set to OFF, the external terminal outputs

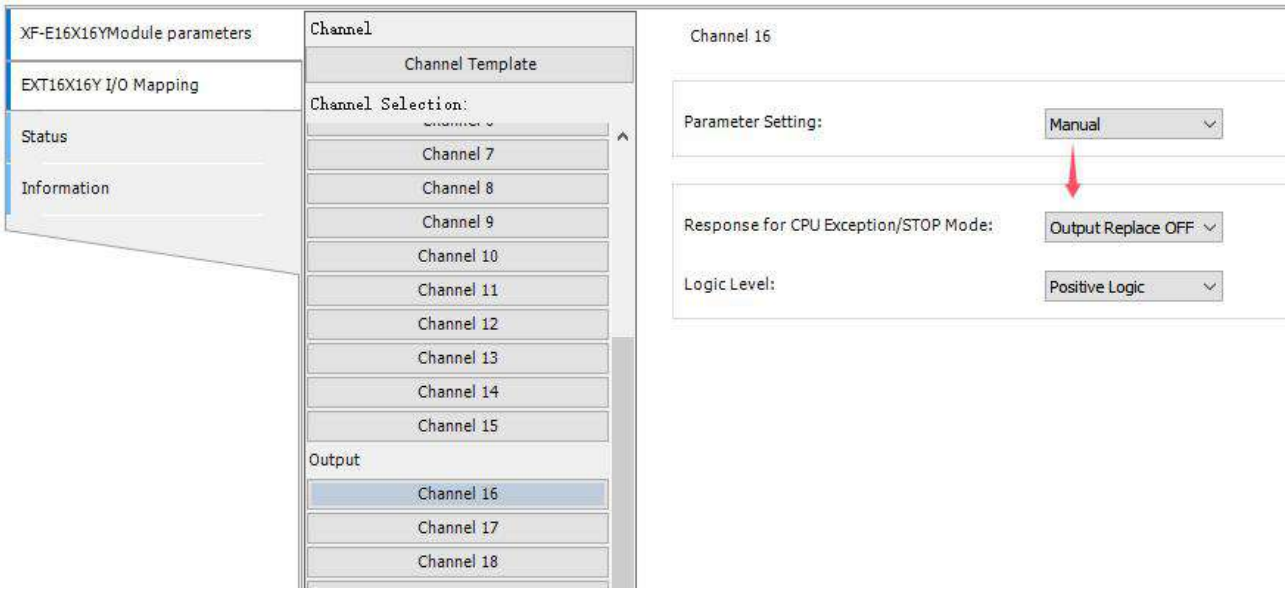
- Channel selection

- Input



- Output





Filter parameters, response for CPU exception/STOP mode, logic level can be set separately for each channel.

Channel setting	From Template: Use the "Channel Template" interface to configure parameters; Manual: Use the configuration parameters at the bottom of this interface.

6. Analog module unit

6-1. Naming rules

XF－E ○ AD □ DA－○－□

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

①	Series Name	XF:	XF series extension module
②	Extension module	E:	Right extension module
③	Input channel	1:	1 channel
		2:	2 channels
		4:	4 channels
		6:	6 channels
		8:	8 channels
④	Type	AD:	Analog voltage and current input
⑤	Output channel	1:	1 channel
		2:	2 channels
		4:	4 channels
		6:	6 channels
		8:	8 channels
⑥	Type	DA:	Analog voltage and current input

⑦	Analog type	Empty:	Current&voltage type
		A:	Current type
		V:	Voltage type
⑧	Module type	Empty:	Current&voltage type
		H:	Channel to channel isolation
		S:	High precision
		U:	High speed

6-2. Analog input unit XF-E4AD

6-2-1. Product overview

XF-E4AD series analog input expansion module, which has 4 channels of analog input and supports current and voltage input, and is suitable for XF, XSF series CPU unit products and XF series communication coupler units.

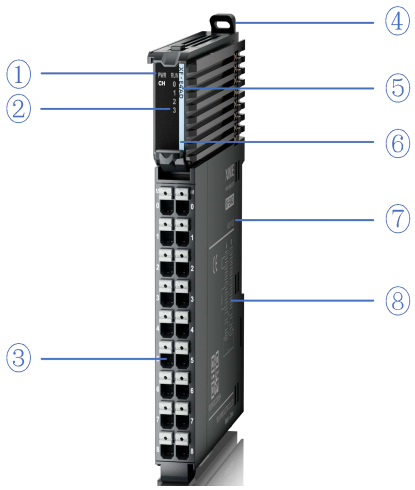
- 4 channel analog input.
- Channel conversion speed 60us/channel.
- Maximum error of 0.2%.
- Voltage and current bipolar input.
- 12mm width design

Module version:

Hardware version	Software version	Function
H2.0	V2.0	Basic functions for the first official production

6-2-2. Module view

(1) Description of each section



Number	Name
①	System LED indicator light
②	Channel LED indicator light
③	Detachable terminal block
④	Clasp
⑤	Signal indication
⑥	Color identification indicating module type
⑦	Module hardware and software versions
⑧	Wiring diagram

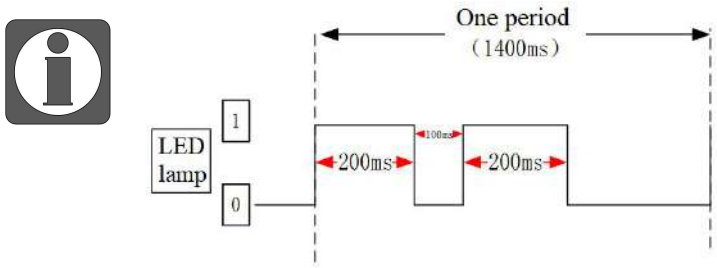
(2) System indicator light

System indicator light	Meaning	
PWR(Green)	Extinguish	Module not powered on
	Normally ON	All external power supplies of the module are normal (Backplane bus power supply&external input 24V)
	Flashing 1Hz*1	Module power supply is abnormal and cannot operate normally
RUN(Green)	Normally ON	The module is operating normally
	Flashing 1Hz*1	General errors in module logs
	Extinguish	Important errors in the module log
	Flashing 10Hz*2	Module establishing communication
	Double flashing*3	Module firmware update

*1: A square wave with a duty cycle of 50% and a frequency of 1Hz.

*2: A square wave with a duty cycle of 50% and a frequency of 10Hz.

*3: The following figure:



(3) Channel indicator light

Model	Channel indicator light		
XF-E4AD	CH0~CH3	Normally ON(Green)	The channel is enabled and configured correctly
		Flashing 10Hz	This channel has error messages
		Extinguish	Disable the channel

(4) Color identification

No.	Color		Module type
1		Grey White	Digital input
2		Gray	Digital output&digital mixed module
3		Light blue	Analog input
4		Dark blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

6-2-3. General specifications

General specifications		
Project		Content
Operating temperature	Max temperature	55℃
	Min temperature	-20℃
Transportation/storage temperature	Max temperature	70℃
	Min temperature	-40℃
Environmental humidity (including operation/storage)	Upper limit	95%
	lower limit	10%
Protection grade		IP20
Anti vibration		Accord with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant acceleration 1.0g peak acceleration) Under continuous vibration (frequency 5-9Hz, half amplitude 1.75mm displacement) and (frequency 9-150Hz, constant acceleration 0.5g, constant frame amplitude) Scan 10 times in X, Y, and Z directions
Impact resistance		Accord with IEC61131-2 Impact strength of 15G (peak) with a duration of 11ms is applied to three mutually perpendicular axes, with 3 impacts per axis (a total of 18 impacts)
Use environment		Non corrosive gas
Use altitude		0-2000 meters
Over voltage level		II: Accord with IEC61131-2
Pollution level		2: Accord with IEC61131-2
Anti interference EMC		Accord with IEC 61131-2 IEC61000-6-4 B type
Related certifications		CE

6-2-4. Technical specification

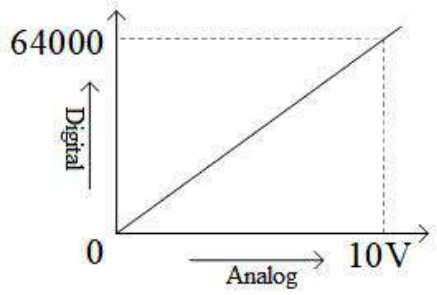
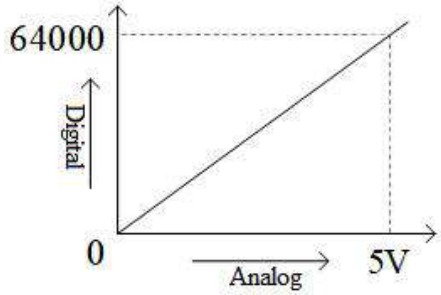
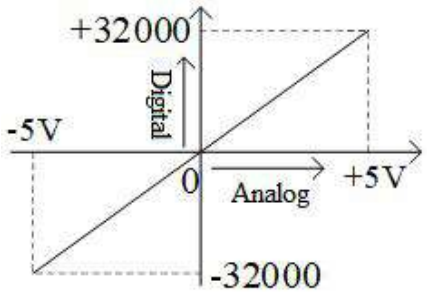
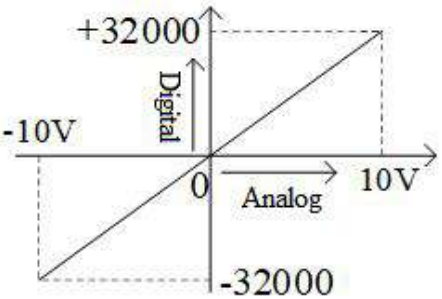
6-2-4-1. Module performance

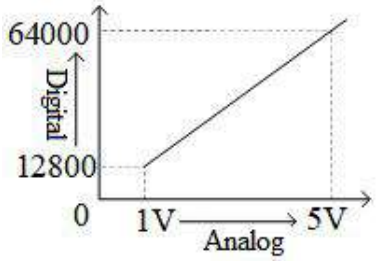
Project			Specification
Input channel			4
Analog input range (rated)	Voltage	Input range	0V~5V (0~64000) 0V~10V (0~64000) -5V~5V (-32000~32000) -10V~10V (-32000~32000)

			1V~5V (12800~64000) Impedance greater than 1M
	Current	Input range	0mA~20mA (0~64000) 4mA~20mA (12800~64000) -20mA~20mA (-32000~32000) Impedance is approximately 120 Ω
Maximum input range	Voltage input		DC±15V
	Current input		-40~40mA
Conversion speed			12us/CH
Response speed			60us
Resolution ratio			1/64000 (16Bit)
Module power supply	Rated input		DC24V±10%, 150mA
	Protect		Reverse protection
Error	Normal temperature 25 ℃± 5 ℃		±0.1% (25±5 ℃)
	Full temperature end -20~55 ℃		±0.2%
Isolate			Channel non isolated, power isolated
Module power consumption			0.7W (Backplane bus)+0.5W(External input)
Module weight			80g

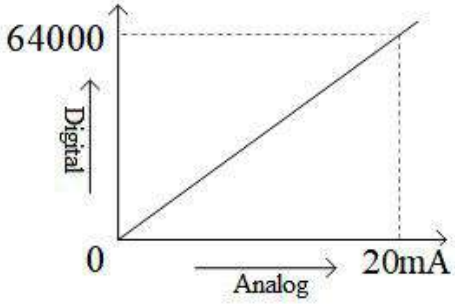
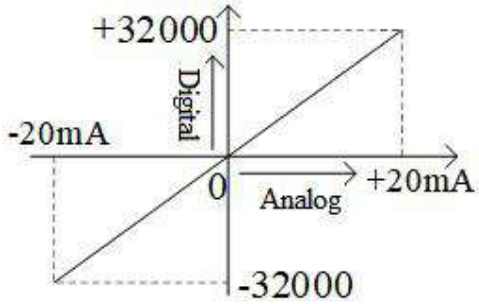
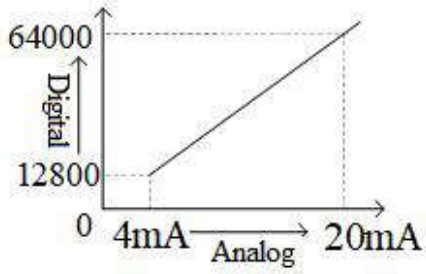
6-2-4-2. Module conversion diagram

■ Voltage

0V~10V analog input	0V~5V analog input
	
-5V~5V analog input	-10V~10V analog input
	
1V~5V analog input	

■ Current

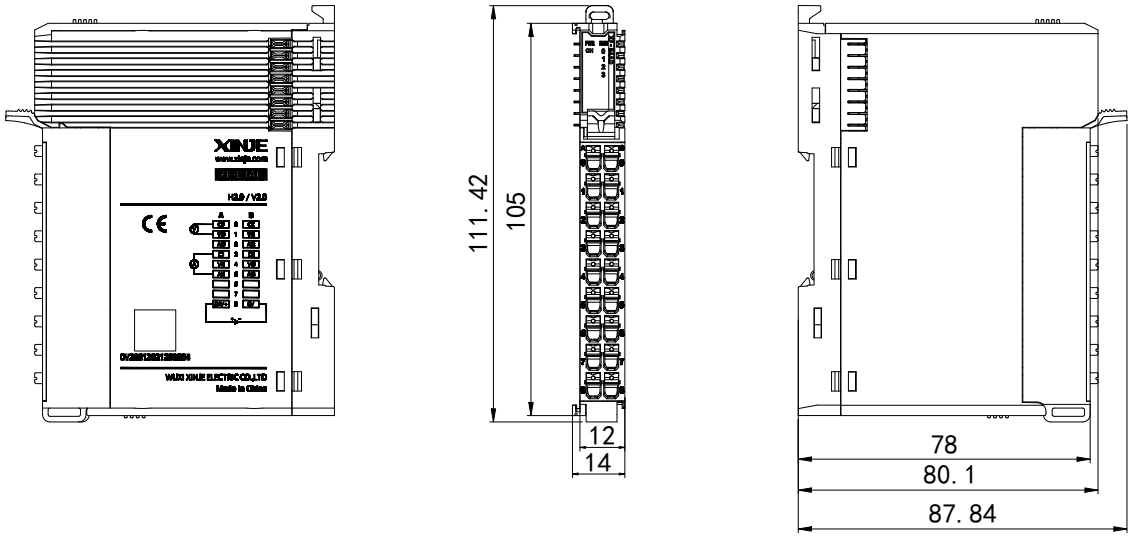
0mA~20mA analog input	-20mA~20mA analog input
	
4mA~20mA analog input	
	

6-2-5. Installation&Wiring

6-2-5-1 Appearance dimension

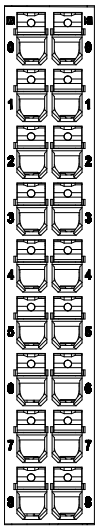
■ XF-E4AD

Unit: mm



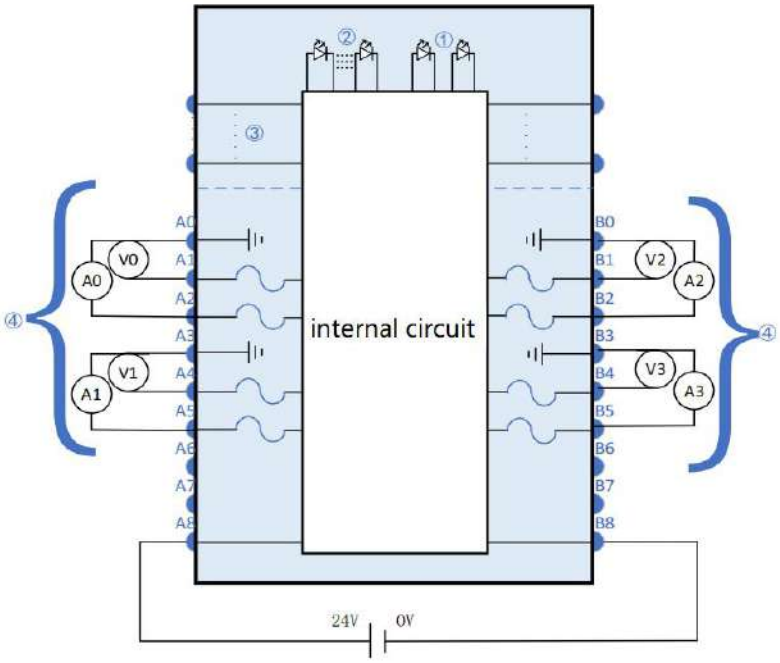
6-2-5-2 Terminal definition&Wiring

■ Terminal Definition

XF-E4AD						
Meaning		A-list terminal	Terminal layout	B-list terminal	Meaning	
CH0	Input grounding	0		0	CH2	Input grounding
VI0	Analog voltage input terminal	1		1	VI2	Analog voltage input terminal
AI0	Analog current input terminal	2		2	AI2	Analog current input terminal
CH1	Input grounding	3		3	CH3	Input grounding
VI1	Analog voltage input terminal	4		4	VI3	Analog voltage input terminal
AI1	Analog current input terminal	5		5	AI3	Analog current input terminal
Empty		6		6	Empty	
Empty		7		7	Empty	

24V+	External power supply terminal	8		8	0V	External power supply terminal

■ External wiring

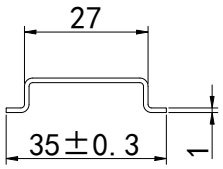


Number	Name
①	System indicator light
②	Channel indicator light
③	Backplane bus
④	Input Channel&Wiring

6-2-5-3 Installation method

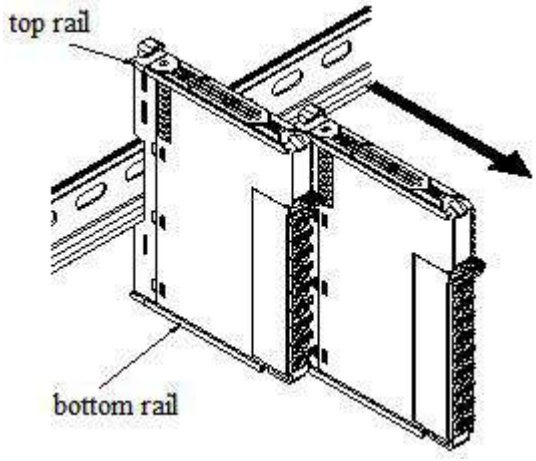
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

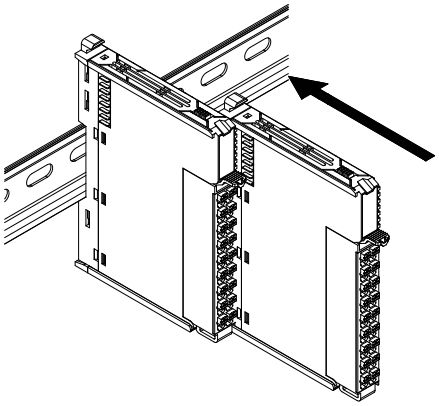


Attention When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

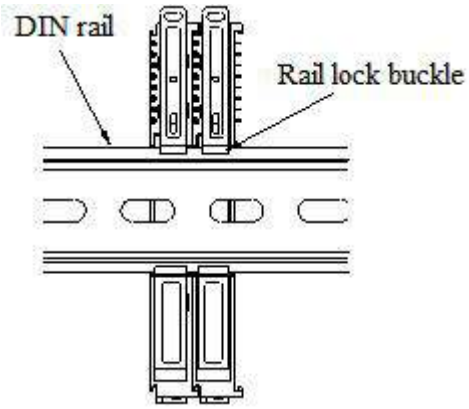
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

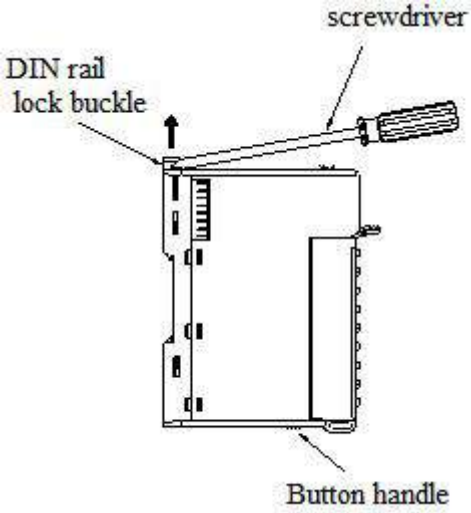


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

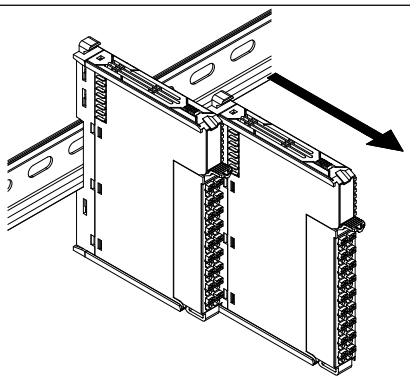


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



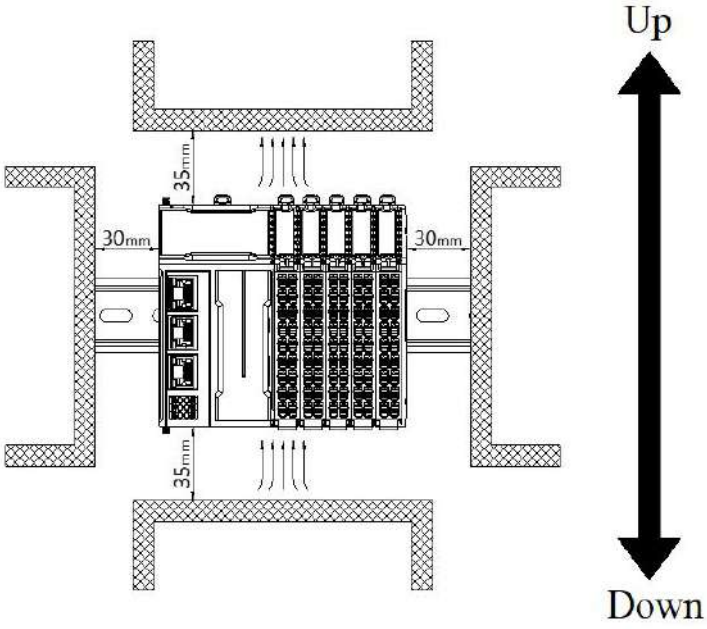
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

6-2-5-4 Installation environment

This product can be installed in four positions (installation direction): horizontal direction, vertical direction, top of the cabinet, and bottom of the cabinet. It is recommended to install in the horizontal direction. The heat dissipation design is through natural convection, to ensure normal ventilation and heat dissipation, and to reserve sufficient wiring space, the minimum gap must be left around this product, as shown in the following figure:



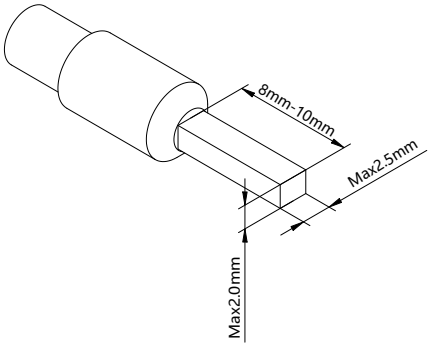
If there are high-temperature heat source equipment (heaters, transformers, high resistors, etc.) around this product, a minimum gap of 100mm should be left between the equipment and the high-temperature heat source.

6-2-5-5 Equipment wiring

When wiring a module, its terminal must meet the following requirements:

Suitable cable diameter	
Chinese standard/mm^2	American Standard/AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

If using other tube type wire lugs, please crimp them to the stranded wire, and the shape and size requirements are shown in the following figure:



6-2-6. Parameters and mapping addresses

Name	Type	Description
XF_E4AD	Stuct	4 channels input module
CH0	DINT	Channel 0 input value
CH1	DINT	Channel 1 input value
CH2	DINT	Channel 2 input value
CH3	DINT	Channel 3 input value
ErrCode_module	WORD	Module level error codes
ErrCode_CH	DWORD	Channel level error codes

■ Error code parameters:

Module level error codes(ErrCode_module)		
Bit	Meaning	Error level
0	The 24V input power supply of the module is abnormal.	Important
2	An internal module error occurred and cannot be fixed by the user layer.	Important
3	Version mismatch.	Important
4	ADC/DAC read/write failure.	Important

Module level error codes(ErrCode_module)		
Bit	Meaning	Error level
0	Channel 1 upper limit overflow.	Normal
1	Channel 1 low limit overflow.	Normal
2	Channel 1 disconnected.	Important
3	Reserve	-
4	Channel 2 upper limit overflow.	Normal
5	Channel 2 low limit overflow.	Normal
6	Channel 2 disconnected.	Important
7	Reserve	-
8	Channel 3 upper limit overflow.	Normal
9	Channel 3 low limit overflow.	Normal
10	Channel 3 disconnected.	Important
11	Reserve	-
12	Channel 4 upper limit overflow.	Normal
13	Channel 4 low limit overflow.	Normal
14	Channel 4 disconnected.	Important

■ Configuration parameters

Parameter	Type	Channel	Meaning	Note
Power_Detection	Enumeration of BYTE	-	Power detection	0: Close 1: Open
CH0_enable_disable		Channe 0	Channel enable/disable	0: Close 1: Open
CH0_broken_line_detection_enable_disable	Enumeration_of BYTE		Enable/disable wire breakage detection	0: Close 1: Open
CH0_range selection	BYTE		Range select	0：0~10V 5：0~20mA 1：0~5V 6：4~20mA 2：-10~10V 7：-20~20mA 3：-5~5V 4：1~5V
CH0_filtering_mode			Filtering method	0: First order filtering 1: Time average 2: Average number of times 3: Moving average
CH0_FilterPar	INT		Filtering	Time average (2-100ms)

Parameter	Type	Channel	Meaning	Note
			parameter	default value 2 Average frequency (4-500) default value 4 Moving average (2-500) default value 2 First order delay filtering (0-254) defaults to 0 (no filtering)
CH0_Calibrate_enable_disable	Enumeration of BYIE		Calibration enable/disable	0: Close 1: Open
CH0_Calibration1_Analog	INT		Calibration 1 analog quantity	**Voltage input** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V： Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000 -5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 1000mV~5000mV Digital range: 12800~64000 **Current input** 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 4000~20000uA Digital range: 12800~64000 -20~20mA： Analog range: -20000~20000uA Digital range: -32000~32000
CH0_Calibration1_Numerical	DINT		Calibration 1 digital quantity	
CH0_Calibration2_Analog	INT		Calibration 2 analog quantity	
CH0_Calibration2_Numerical	DINT		Calibration 2 digital quantity	
CH0_unit_display_conversion_enabled_disable	Enumeration of BYTE		Enable/disable unit display conversion	0: Close 1: Open
CH0_UpperLimit	DINT		Unit display conversion limit	Range: -100000000~100000000

Parameter	Type	Channel	Meaning	Note
CH0_LowerLimit			Unit display conversion lower limit	And after enabling unit conversion, (upper lower limit)>0
CH0_Upper_and_lower_limit_overflow_set_enabled_disable	Enumeration of BYTE		Enable/disable upper and lower limit overflow settings	0: Close 1: Open
CH0_UpperAnalog	INT		Upper limit overflow analog quantity	Analog range: In mV, uA units, for example: 0-10V: 0-10000mV
CH0_UpperNumerical	DINT		Upper limit overflow output digital quantity	**Voltage input** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V： Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000 -5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 1000mV~5000mV Digital range: 12800~64000 **Current input** 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 4000~20000uA Digital range: 12800~64000 -20~20mA： Analog range: -20000~20000uA Digital range: -32000~32000
CH0_LowerAnalog	INT		Lower limit overflow analog quantity	
CH0_LowerNumerical	DINT		Lower limit overflow output digital quantity	
CH1_enable_disable	Enumeration of BYTE	Channe 1	Channel enable/disable	0: Close 1: Open
CH1_broken_line_detection_enable_disable	Enumeration_of BYTE		Enable/disable wire breakage detection	0: Close 1: Open
CH1_range selection	BYTE		Range select	0：0~10V 5：0~20mA

Parameter	Type	Channel	Meaning	Note
				1：0~5V　　6：4~20mA 2：-10~10V　7：-20~20mA 3：-5~5V 4：1~5V
CH1_filtering_mode			Filtering method	0: First order filtering 1: Time average 2: Average number of times 3: Moving average
CH1_FilterPar	INT		Filtering parameter	Time average (2-100ms) default value 2 Average frequency (4-500) default value 4 Moving average (2-500) default value 2 First order delay filtering (0-254) defaults to 0 (no filtering)
CH1_Calibrate_enable_disable	Enumeration of BYIE		Calibration enable/disable	0: Close　　1: Open
CH1_Calibration1_Analog	INT		Calibration 1 analog quantity	**Voltage input** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V： Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000 -5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 1000mV~5000mV Digital range: 12800~64000 **Current input** 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 4000~20000uA Digital range: 12800~64000 -20~20mA：
CH1_Calibration1_Numerical	DINT		Calibration 1 digital quantity	
CH1_Calibration2_Analog	INT		Calibration 2 analog quantity	
CH1_Calibration2_Numerical	DINT		Calibration 2 digital quantity	

Parameter	Type	Channel	Meaning	Note
				Analog range: -20000~20000uA Digital range: -32000~32000
CH1_unit_display_conversion_enabled_disable	Enumeration of BYTE		Enable/disable unit display conversion	0: Close 1: Open
CH1_UpperLimit	DINT		Unit display conversion limit	Range: -100000000~100000000 And after enabling unit conversion, (upper lower limit)>0
CH1_LowerLimit			Unit display conversion lower limit	
CH1_Upper_and_lower_limit_overflow_set_enabled_disable	Enumeration of BYTE		Enable/disable upper and lower limit overflow settings	0: Close 1: Open
CH1_UpperAnalog	INT		Upper limit overflow analog quantity	Analog range: In units of mV and uA, for example: 0-10V: 0-10000mV
CH1_UpperNumerical	DINT		Upper limit overflow output digital quantity	**Voltage input** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V： Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000 -5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 1000mV~5000mV Digital range: 12800~64000 **Current input** 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 4000~20000uA Digital range: 12800~64000 -20~20mA： Analog range:
CH1_LowerAnalog	INT		Lower limit overflow analog quantity	
CH0_LowerNumerical	DINT		Lower limit overflow output digital quantity	

Parameter	Type	Channel	Meaning	Note
				-20000~20000uA Digital range: -32000~32000
CH2_enable_disable	Enumeration of BYTE	Channe 2	Channel enable/disable	0: Close 1: Open
CH2_broken_line_detection_enable_disable	Enumeration_of BYTE		Enable/disable wire breakage detection	0: Close 1: Open
CH2_range selection	BYTE		Range select	0：0~10V 5：0~20mA 1：0~5V 6：4~20mA 2：-10~10V 7：-20~20mA 3：-5~5V 4：1~5V
CH2_filtering_mode			Filtering method	0: First order filtering 1: Time average 2: Average number of times 3: Moving average
CH2_FilterPar	INT		Filtering parameter	Time average (2-100ms) default value 2 Average frequency (4-500) default value 4 Moving average (2-500) default value 2 First order delay filtering (0-254) defaults to 0 (no filtering)
CH2_Calibrate_enable_disable	Enumeration of BYIE		Calibration enable/disable	0: Close 1: Open
CH2_Calibration1_Analog	INT		Calibration 1 analog quantity	**Voltage input** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V： Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000 -5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 1000mV~5000mV Digital range: 12800~64000
CH2_Calibration1_Numerical	DINT		Calibration 1 digital quantity	
CH2_Calibration2_Analog	INT		Calibration 2 analog quantity	
CH2_Calibration2_Numerical	DINT		Calibration 2 digital quantity	

Parameter	Type	Channel	Meaning	Note
				Current input 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 4000~20000uA Digital range: 12800~64000 -20~20mA： Analog range: -20000~20000uA Digital range: -32000~32000
CH2_unit_display_conversion_enabled_disable	Enumeration of BYTE		Enable/disable unit display conversion	0: Close 1: Open
CH2_UpperLimit	DINT		Unit display conversion limit	Range: -100000000~100000000 And after enabling unit conversion, (upper lower limit)>0
CH2_LowerLimit			Unit display conversion lower limit	
CH2_Upper_and_lower_limit_overflow_set_enabled_disable	Enumeration of BYTE		Enable/disable upper and lower limit overflow settings	0: Close 1: Open
CH2_UpperAnalog	INT		Upper limit overflow analog quantity	Analog range: In units of mV and uA, for example: 0-10V: 0-10000mV
CH2_UpperNumerical	DINT		Upper limit overflow output digital quantity	**Voltage input** 0~10V： Analog range: 0~10000mV
CH2_LowerAnalog	INT		Lower limit overflow analog quantity	Digital range: 0~64000 0~5V： Analog range: 0~5000mV
CH2_LowerNumerical	DINT		Lower limit overflow output digital quantity	Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000 -5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 1000mV~5000mV Digital range: 12800~64000 **Current input**

Parameter	Type	Channel	Meaning	Note
				0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 4000~20000uA Digital range: 12800~64000 -20~20mA： Analog range: -20000~20000uA Digital range: -32000~32000
CH3_enable_disable	Enumeration of BYTE	Channe 3	Channel enable/disable	0: Close 1: Open
CH3_broken_line_detection_enable_disable	Enumeration_of BYTE		Enable/disable wire breakage detection	0: Close 1: Open
CH3_range selection	BYTE		Range select	0：0~10V 5：0~20mA 1：0~5V 6：4~20mA 2：-10~10V 7：-20~20mA 3：-5~5V 4：1~5V
CH3_filtering_mode			Filtering method	0: First order filtering 1: Time average 2: Average number of times 3: Moving average
CH3_FilterPar	INT		Filtering parameter	Time average (2-100ms) default value 2 Average frequency (4-500) default value 4 Moving average (2-500) default value 2 First order delay filtering (0-254) defaults to 0 (no filtering)
CH3_Calibrate_enable_disable	Enumeration of BYIE		Calibration enable/disable	0: Close 1: Open
CH3_Calibration1_Analog	INT		Calibration 1 analog quantity	**Voltage input** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V： Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV
CH3_Calibration1_Numerical	DINT		Calibration 1 digital quantity	
CH3_Calibration2_Analog	INT		Calibration 2 analog quantity	
CH3_Calibration2_Numerical	DINT		Calibration 2 digital quantity	

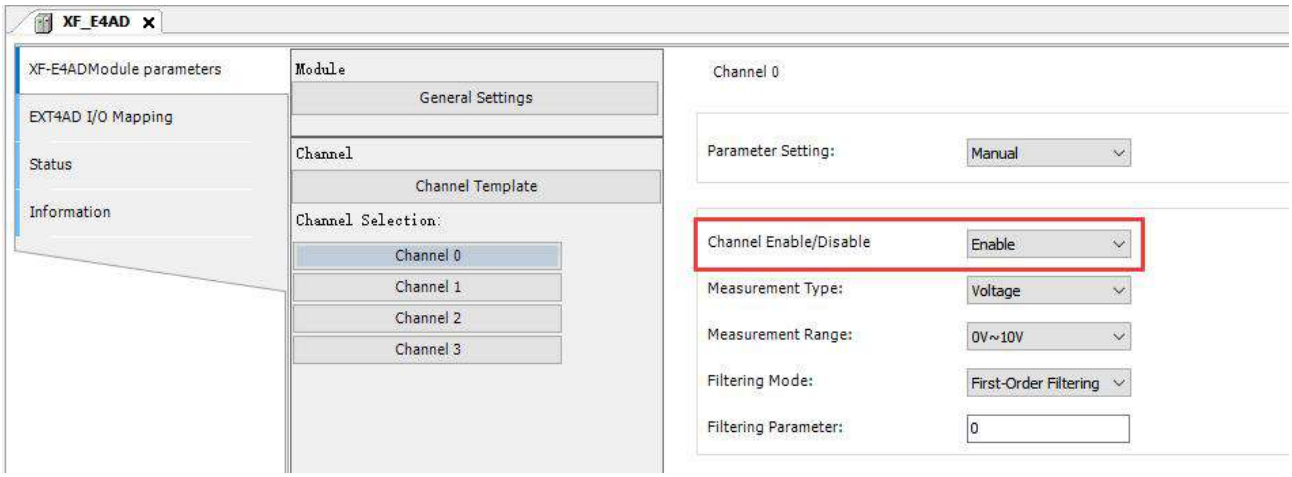
Parameter	Type	Channel	Meaning	Note
				Digital range: -32000~32000 -5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 1000mV~5000mV Digital range: 12800~64000 **Current input** 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 4000~20000uA Digital range: 12800~64000 -20~20mA： Analog range: -20000~20000uA Digital range: -32000~32000
CH3_unit_display_conversion_enabled_disable	Enumeration of BYTE		Enable/disable unit display conversion	0: Close 1: Open
CH3_UpperLimit	DINT		Unit display conversion limit	Range: -100000000~100000000 And after enabling unit conversion, (upper lower limit)>0
CH3_LowerLimit			Unit display conversion lower limit	
CH3_Upper_and_lower_limit_overflow_set_enabled_disable	Enumeration of BYTE		Enable/disable upper and lower limit overflow settings	0: Close 1: Open
CH3_UpperAnalog	INT		Upper limit overflow analog quantity	Analog range: In units of mV and uA, for example: 0-10V: 0-10000mV **Voltage input** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V： Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000
CH3_UpperNumerical	DINT		Upper limit overflow output digital quantity	
CH3_LowerAnalog	INT		Lower limit overflow analog quantity	
CH3_LowerNumerical	DINT		Lower limit overflow output digital quantity	

Parameter	Type	Channel	Meaning	Note
				-5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 1000mV~5000mV Digital range: 12800~64000 **Current input** 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 4000~20000uA Digital range: 12800~64000 -20~20mA： Analog range: -20000~20000uA Digital range: -32000~32000

6-2-7. Functions and Settings

- Channel enable/disable

Enable or disable AD sampling channels to save module sampling time.

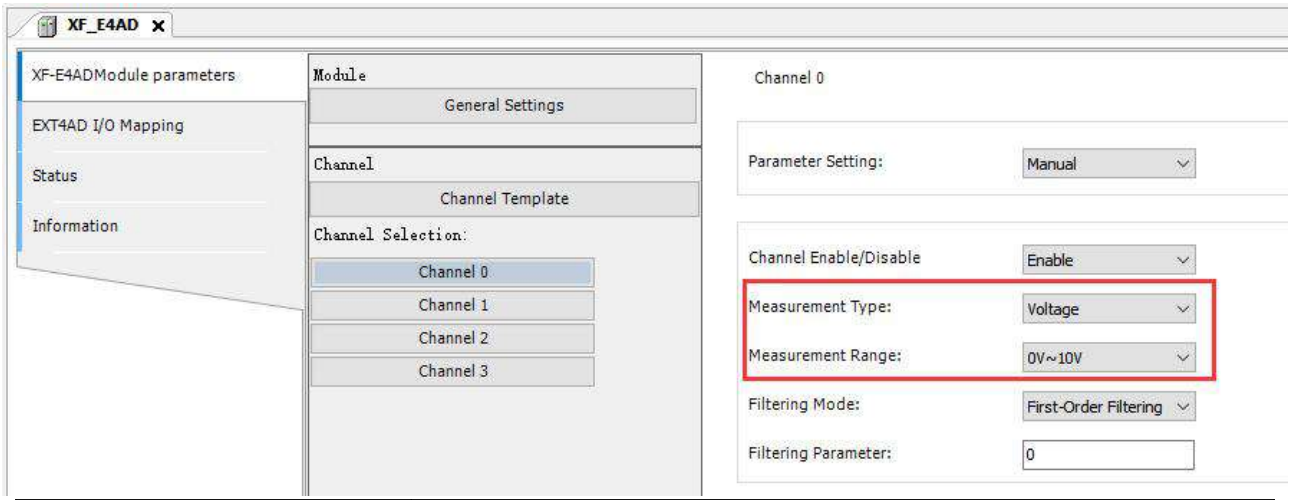


Settable parameters	Enable or disable (In disable mode, subsequent software functions of the corresponding channel cannot be set)
Default parameters	Enable
Note	The conversion time of each channel is 60us, with a total time of on/off conversion speed * the number of enabled channels. If this channel is not used, it can be set to

	"disable" to reduce the total conversion time of the module.

■ Input type/range

Users can choose different input types and ranges.



Settable parameters	The following table pulling method reflects the parameters that can be set: voltage, current
Default parameters	Voltage
Voltage measurement range	0V~5V, 0V~10V, -5V~5V, -10V~10V, 1V~5V Default: 0V~10V
Current measurement range	0mA~20mA, 4mA~20mA, -20mA~20mA

■ Module power detection

- Check whether the external power supply 24V of the module is normal:

◆ Normal: The module is operating normally.

◆ Abnormal: The module channel cannot be used but can be configured, configured, and scanned normally.

- Settable parameters: Enable/disable (default to disabled).

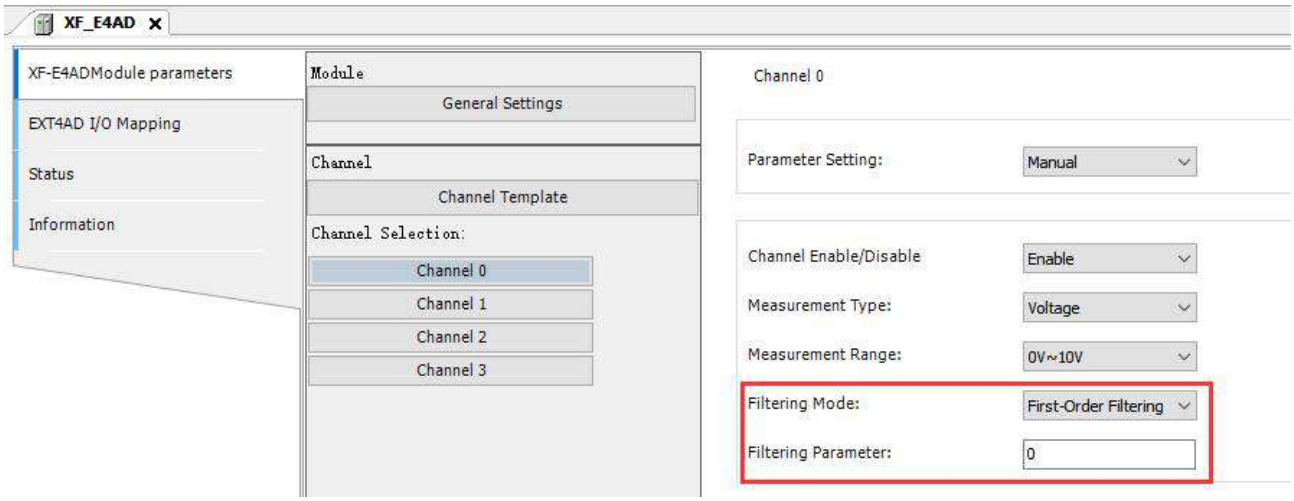
■ Wire breakage detection

- Detect abnormal disconnection of AD input channel and configure alarm logs. If there is no current flowing through the module or the current flowing is too low (the measurement range is 4-20 mA or 1-5V), the corresponding alarm log will be triggered, which can activate both circuit breaker detection and underflow simultaneously.

This function is only supported when the "measurement range" is set to "4mA~20mA" and "1V~5V".

- Parameters can be set: enable or disable (default is disabled).

■ Channel filtering parameters



- First order filtering

The first-order low-pass filtering method uses the weighting of the current sampling value and the output value of the previous filtering to obtain the effective filtering value. The filtering coefficient is set by the user to 0~254. The smaller the value, the more stable the data will be, but it may cause data lag. Therefore, when set to 1, the filtering effect is strongest and the data is most stable. When set to 254, the filtering effect is weakest. The default is 0 (not filtered).

- Average filtering

Time average	Functional actions	Perform A/D conversion according to the set time, and average the total value after removing the maximum and minimum values. The average processed value is stored in the corresponding output buffer memory. The number of processing times within the set time varies depending on the number of channels allowed for A/D conversion
	Set range	2-100ms (default value 2)
Count average	Functional actions	Perform A/D conversion according to the set number of times, and average the total value after removing the maximum and minimum values. The average processed value is stored in the corresponding channel variable. The time it takes for the average of the number of times to be stored in the corresponding channel variable varies depending on the number of channels allowed for A/D conversion.
	Set range	4-500 (default value 4)
Moving average	Functional actions	After averaging the specified number of digital output values obtained in each sampling cycle, store them in the corresponding output register/variable. Due to moving average processing in each sampling process, the latest digital output values can be obtained.
	Set range	2-500 (default value 2)

- Settable parameters

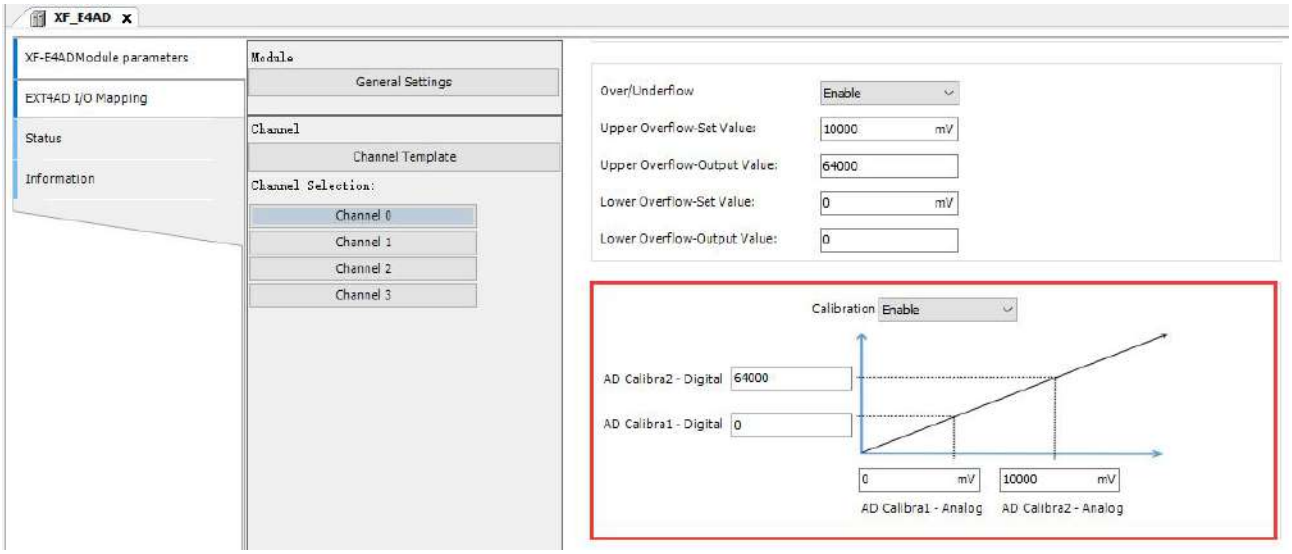
◆ Filtering mode (selected from the dropdown menu): “First order filtering”, “Time average filtering”, “Frequency average filtering”, “Moving average filtering” (default: First order filtering).

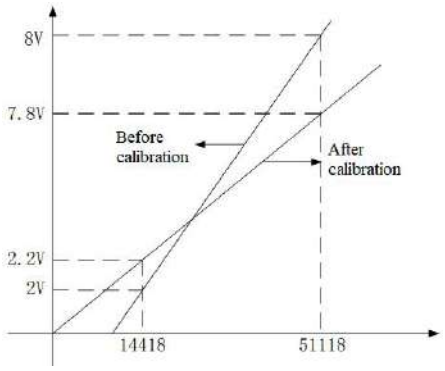
◆ Filtering parameters (selected using the input box): Can be set in “first-order filtering” mode: 0-254 (default value: 0), can be set in “time average filtering” mode: 2ms~100ms (default value: 2), can be set in “number

average filtering" mode: 4-500 (default value: 4), can be set in "moving average filtering" mode: 2-500 (default value: 2).

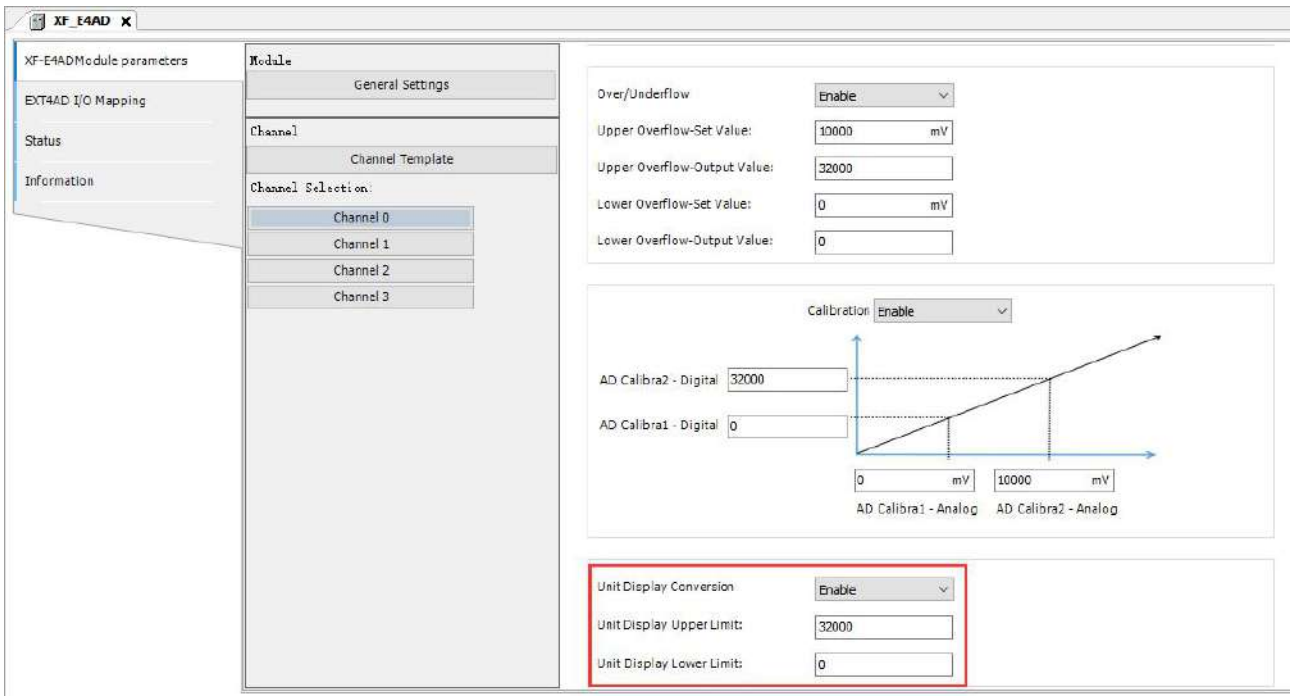
- Up and down overflow settings
  When the AD channel sampling exceeds the upper/lower limit set value, an alarm log is triggered and the set value is output.

- Calibration function



	Due to the possibility of drift between the analog output converted from DA and the set digital output after the product leaves the factory or has been in use for a period of time, customers can immediately reflect it to the proportional scaling value (digital operation value) by setting the DA offset calibration function, and can easily complete the calibration at system startup on their own.

- Unit display conversion



This function can directly display the output analog data as the actual output unit required by the customer.

Due to the customer's use of analog expansion module DA, the basic output is to provide analog quantities corresponding to the outputs of some instruments or sensors. For example, controlling a frequency output range of 0~50Hz for a frequency converter and controlling an analog signal of 4~20mA for frequency control. The existing DA module will output an analog signal of 4~20mA to the analog acquisition terminal of the frequency converter, and the customer needs to convert the digital signal of 0~65535 to 0~50Hz for the actual output frequency of the frequency converter. You can automatically convert the analog output of module DA into the actual output frequency value of the frequency converter by setting the conversion value range.

6-3 Analog output unit XF-E4DA

6-3-1 Product overview

XF-E4DA series analog output expansion module, this product has 4 channels of analog input, supports current and voltage input, and is compatible with XF, XSF series CPU unit products and XF series communication coupler units.

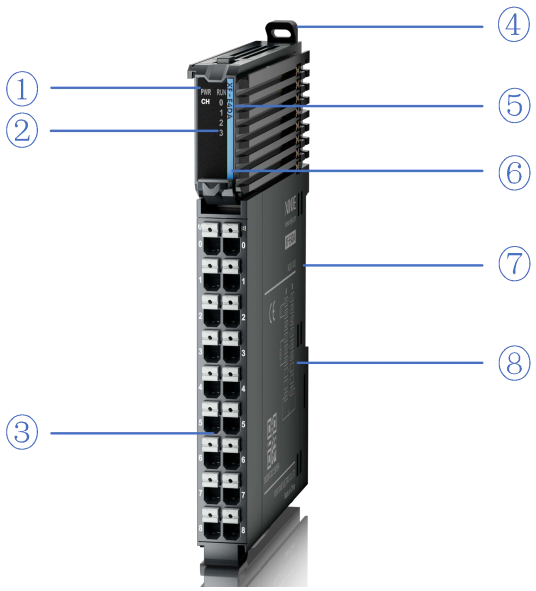
- 4-channel analog output.
- The channel conversion speed is 60us/channel.
- Maximum error of 0.2%.
- Voltage and current bipolar input.
- Designed with a width of 12mm.

Module version:

Hardware version	Firmware version	Function
H2.0	V2.0	Basic functions for the first official production

6-3-2 Module view

(1) Description of each section



Number	Name	Number	Name
①	System LED indicator lights	②	Channel LED indicator light
③	Detachable terminal block	④	Clasp
⑤	Model indication	⑥	Color identification indicating module type
⑦	Module hardware and firmware versions	⑧	Wiring diagram

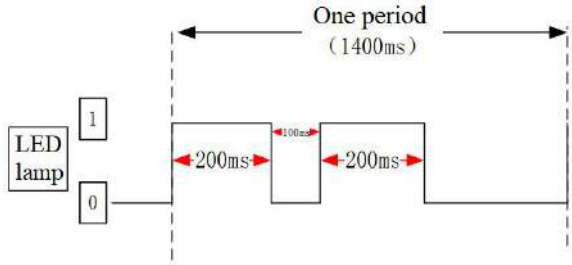
(2) System indicator light

System indicator light	Meaning	
PWR(Green)	Extinguish	Module not powered on
	Normally ON	All external power supplies of the module are normal (Backplane bus power supply&external input 24V)
	Flashing 1Hz*1	Abnormal power supply in the module and inability to operate normally
RUN(Green)	Normally ON	The module is running normally
	Flashing 1Hz*1	General errors in module logs
	Extinguish	Important errors in module logs
	Flashing 10Hz*2	Module establishing communication
	Double flashing *3	Module firmware update

*1: A square wave with a duty cycle of 50% and a frequency of 1Hz.

*2: A square wave with a duty cycle of 50% and a frequency of 10Hz.

*3: The following figure:



(3) Channel indicator light

Model	Channel indicator light		
XF-E4DA	CH0~CH3	Normally ON (Green)	Channel enabled and configured correctly
		Extinguish	Disable channel

(4) Color identification

No.	Color		Module type
1		Grey White	Digital input
2		Gray	Digital output&digital mixed module
3		Light blue	Analog input
4		Dark blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

6-3-3 General specifications

General specifications		
Project		Content
Operating temperature	Max temperature	55℃
	Min temperature	-20℃
Transportation/storage temperature	Max temperature	70℃
	Min temperature	-40℃
Environmental humidity (including operation/storage)	Upper limit	95%
	lower limit	10%
Protection grade		IP20
Anti vibration		Compliant with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant acceleration 1.0g peak acceleration) Under continuous intermittent vibration (frequency 5-9Hz half amplitude 1.75mm displacement) and (frequency 9-150Hz constant acceleration 0.5g constant frame amplitude) Scan 10 times in X, Y, and Z directions
Impact resistance		Complies with IEC61131-2 standard The impact strength is 15G (peak) and the duration is 11ms. It is applied to three mutually perpendicular axes, and each axis is impacted 3 times (a total of 18 impacts)
Use environment		Non corrosive gas
Use altitude		0-2000m
Over voltage level		II: Compliant with IEC61131-2
Pollution level		2: Compliant with IEC61131-2
Anti interference EMC		Accord with IEC 61131-2 IEC61000-6-4 B type
Related certifications		CE

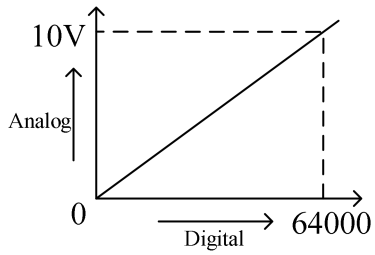
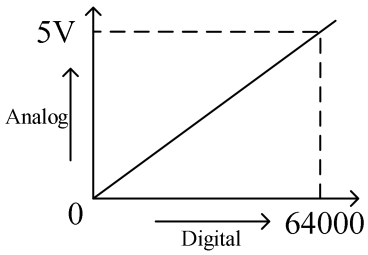
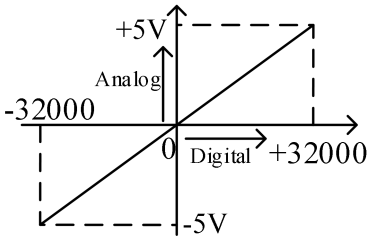
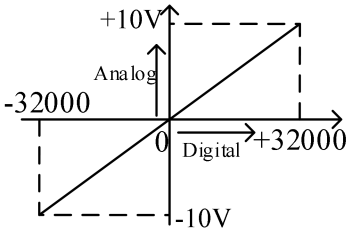
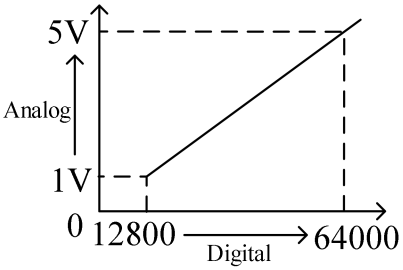
6-3-4 Technical specification

6-3-4-1 Module performance

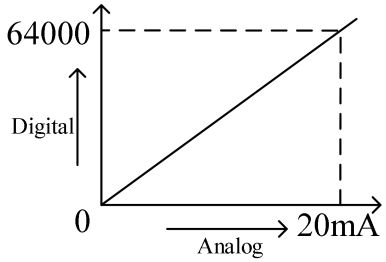
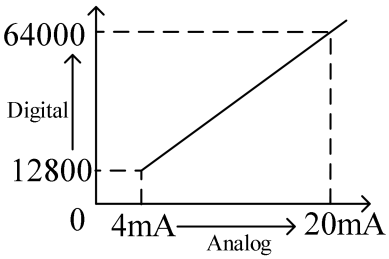
Project		Specification
Output channel		4
Analog output range (rated)	Voltage output range	0V~5V (0~64000) 0V~10V (0~64000) -5V~5V (-32000~32000) -10V~10V (-32000~32000) 1V~5V (12800~64000) External load resistance 2K Ω~1M Ω
	Current output range	0mA~20mA (0~64000) 4mA~20mA (12800~64000) External load resistance less than 500 Ω
Maximum output range	Voltage output	DC±15V
	Current output	-40~40mA
Conversion speed		45us/CH
Response speed		60us
Resolution ratio		1/64000 (16Bit)
Module power supply	Rated input	DC24V±10%, 150mA
	Protect	Reverse polarity protection
Error	Normal temperature 25 ℃± 5℃	±0.1%(25±5℃)
	Full temperature end -20~55℃	±0.2%
Isolate		Channel non isolated, power isolated
Module power consumption		0.8W (Backplane bus)+1.2W (External input)
Module weight		80g

6-3-4-2 Module conversion diagram

- Voltage

0V~10V analog output	0V~5V analog output
	
-5V~5V analog output	**-10V~10V analog output**
	
1V~5V analog output	
	

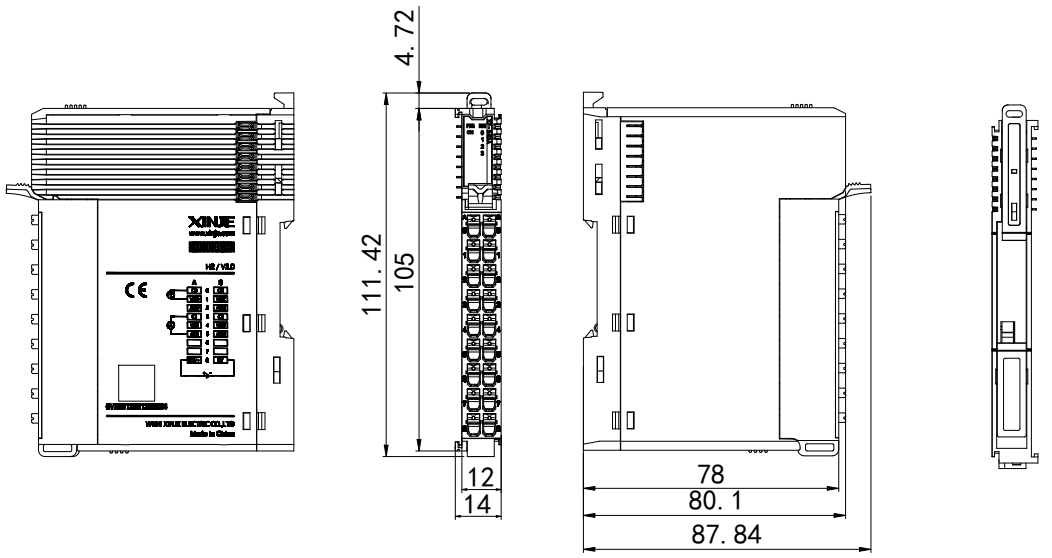
- Current

0mA~20mA analog output	4mA~20mA analog output
	

6-3-5 Installation&Wiring

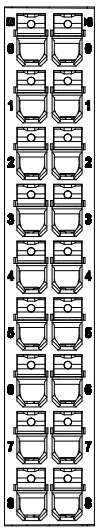
6-3-5-1 Appearance dimension

■ XF-E4DA Unit：mm

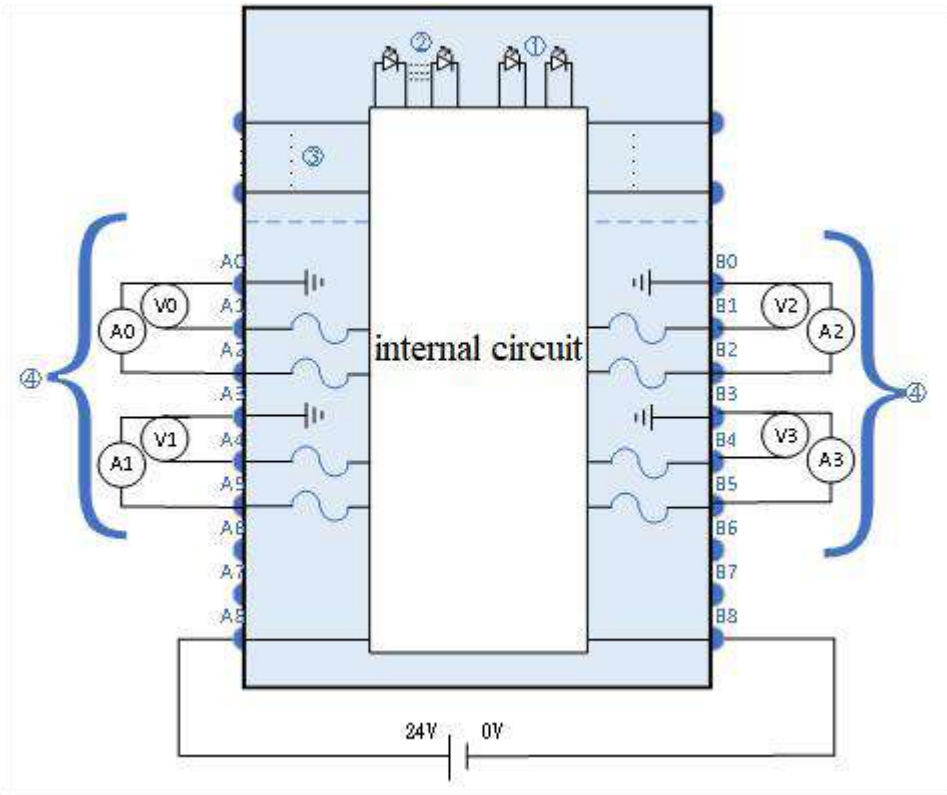


6-3-5-2 Terminal definition&Wiring

■ Terminal Definition

XF-E4DA				
Meaning	A-list terminal	Terminal layout	B-list terminal	Meaning
CH0- output ground	0		0	CH2- output ground
CH0-DA analog voltage output terminal	1		1	CH2-DA analog voltage output terminal
CH0-DA analog current output terminal	2		2	CH2-DA analog current output terminal
CH1- Output ground	3		3	CH3- output ground
CH1-DA analog voltage output terminal	4		4	CH3-DA analog voltage output terminal
CH1-DA analog current output terminal	5		5	CH3-DA analog current output terminal
Empty	6		6	Empty
Empty	7		7	Empty
External 24V power supply for module positive	8		8	External power supply to the module 24V power supply negative

■ External wiring

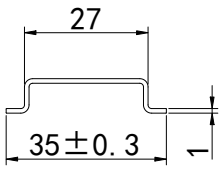


①System indicator light ②Channel indicator light ③ Backplane bus ④ Output Channel&Wiring

6-3-5-3 Installation method

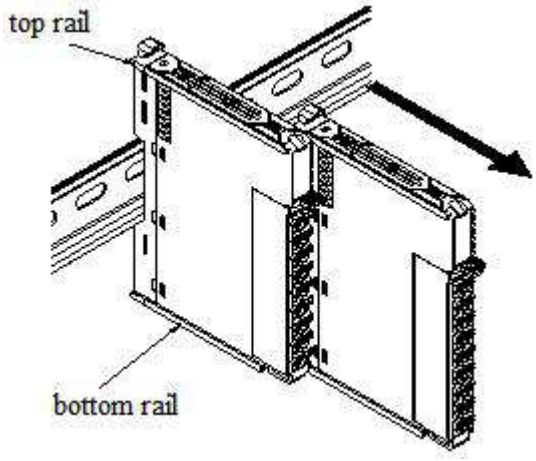
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

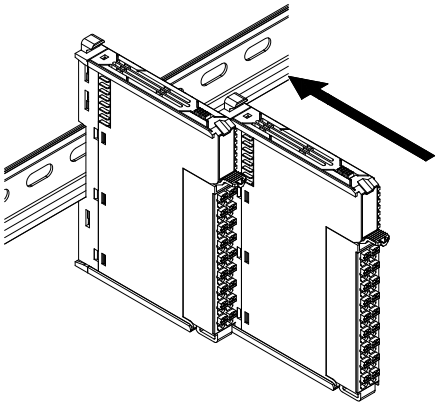


Attention When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

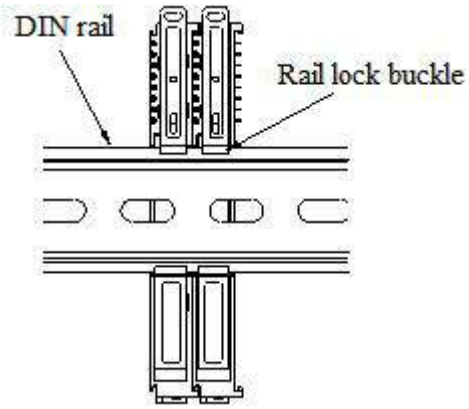
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

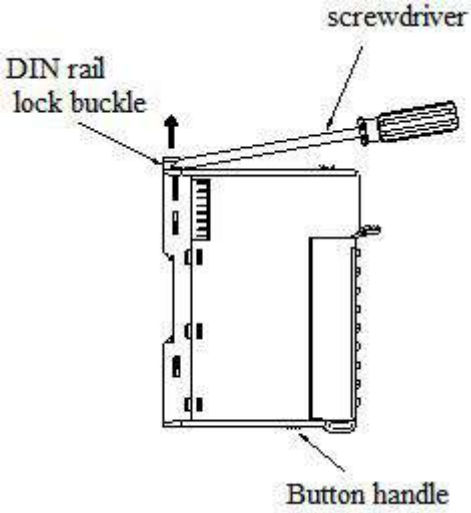


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

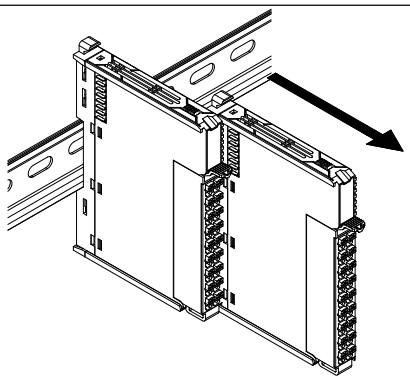


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



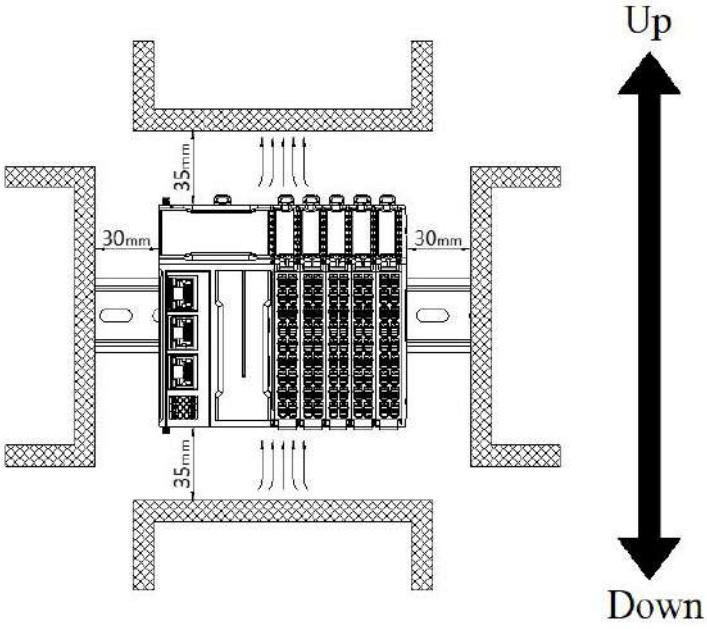
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

6-3-5-4 Installation environment

This product can be installed in four positions (installation direction): horizontal direction, vertical direction, top of the cabinet, and bottom of the cabinet. It is recommended to install in the horizontal direction. The heat dissipation design is through natural convection, to ensure normal ventilation and heat dissipation, and to reserve sufficient wiring space, the minimum gap must be left around this product, as shown in the following figure:



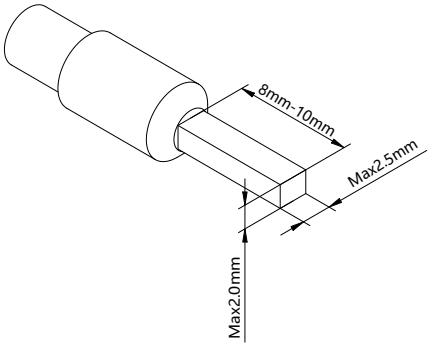
If there are high-temperature heat source equipment (heaters, transformers, high resistors, etc.) around this product, a minimum gap of 100mm should be left between the equipment and the high-temperature heat source.

6-3-5-5 Equipment wiring

When wiring a module, its terminal must meet the following requirements:

Suitable cable diameter	
Chinese standard/mm^2	American Standard/AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

If using other tube type wire lugs, please crimp them to the stranded wire, and the shape and size requirements are shown in the following figure:



6-3-6 Parameters and mapping addresses

Name	Type	Description
XF_E4DA	Stuct	4-channel output module
CH0	DINT	Channel 0 output value
CH1	DINT	Channel 1 output value
CH2	DINT	Channel 2 output value
CH3	DINT	Channel 3 output value
ErrCode_module	WORD	Module level error codes
ErrCode_CH	DWORD	Channel level error code

- Error code parameters

Module level error code (ErrCode_module)		
Bit	Meaning	Error level
0	The 24V input power supply of the module is abnormal	Important
2	Internal module error occurred and cannot be fixed by the user layer	Important
3	Version mismatch	Important
4	ADC/DAC read/write failure	Important

■ Configuration parameters

Parameter	Type	Channel	Meaning	Note
Power_Detection	Enumeration ofBYTE	--	Power detection	0: Close 1: Open
CH0 enable disable	BYTE	Channel 0	Channel enable/disable	0: Close 1: Open
CH0 Output Range select	BYTE		Output type and range	0：0~10V 5：0~20mA 1：0~5V 6：4~20mA 2：-10~10V 3：-5~5V 4：1~5V
output hold the previous value or preset value in the stopped state	Enumeration ofBYTE		In the STOP state, the output remains at the previous value/preset value	0: Keep the previous value 1: Set value
CH0 default value	DINT		Presets	-32000~64000
Calibrate enable disable	Enumeration ofBYTE		Calibration enable/disable	0: Close 1: Open
CH0 Calibration1 Analoc	INT		Calibration 1 analog quantity	**Voltage output** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V： Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000 -5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 0mV~5000mV Digital range: 12800~64000
CH0 Calibration1 Numerical	DINT		Calibration 1 digital quantity	
CH0 Calibration2 Analog	INT		Calibration 2 analog quantity	
CH0 Calibration2 Numerical	DINT		Calibration 2 digital quantity	

Parameter	Type	Channel	Meaning	Note	
				Current output 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 0-20000uA Digital range: 12800-64000	
Unit display conversion enable disable	Enumeration ofBYTE		Enable/disable unit display conversion	0: Close	1: Open
CH0 UpperLimit	DINT		Unit display conversion limit	Range: -100000000~100000000 And after enabling unit conversion, (upper lower limit)>0	
CH0 LowerLimit			Unit Display Conversion Lower Limit		
CH1 enable disable	Enumeration of BYTE	Channel 1	Channel enable/disable	0: Close	1: Open
CH1 Output Range select	BYTE		Output type and range	0：0~10V 1：0~5V 2：-10~10V 3：-5~5V 4：1~5V 5：0~20mA 6：4~20mA	
output hold the previous value or preset value in the stopped state	Enumeration ofBYTE		In the STOP state, the output remains at the previous value/preset value	0: Keep the previous value	1: Set value
CH1 default value	DINT		Presets	-32000~64000	
calibrate enable disable	Enumeration ofBYTE		Calibration enable/disable	0: Close	1: Open
CH1 Calibration1 Analoc	INT		Calibration 1 analog quantity	**Voltage output** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V： Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000	
CH1 Calibration1 Numerical	DINT		Calibration 1 digital quantity		
CH1 Calibration2 Analog	INT		Calibration 2 analog quantity		
CH1 Calibration2 Numerical	DINT		Calibration 2 digital quantity		

Parameter	Type	Channel	Meaning	Note
				-5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 0mV~5000mV Digital range: 12800~64000 **Current output** 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 0-20000uA Digital range: 12800-64000
unit display conversion enable disable	Enumeration ofBYTE		Enable/disable unit display conversion	0: Close 1: Open
CH1 UpperLimit	DINT		Unit display conversion limit	Range: -100000000~100000000 And after enabling unit conversion, (upper lower limit)>0
CH1 LowerLimit			Unit display conversion lower limit	
CH2 enable disable	Enumeration of BYTE	Channel 2	Channel enable/disable	0: Close 1: Open
CH2 Output Range select	BYTE		Output type and range	0：0~10V 1：0~5V 2：-10~10V 3：-5~5V 4：1~5V 5：0~20mA 6：4~20mA
output hold the previous value or preset value in the stopped state	Enumeration ofBYTE		In the STOP state, the output remains at the previous value/preset value	0: Keep the previous value 1: Set value
CH2 default value	DINT		Presets	-32000~64000
calibrate enable disable	Enumeration ofBYTE		Calibration enable/disable	0: Close 1: Open
CH2 Calibration1 Analoc	INT		Calibration 1 analog quantity	**Voltage output** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V：
CH2 Calibration1 Numerical	DINT		Calibration 1 digital quantity	
CH2 Calibration2 Analog	INT		Calibration 2	

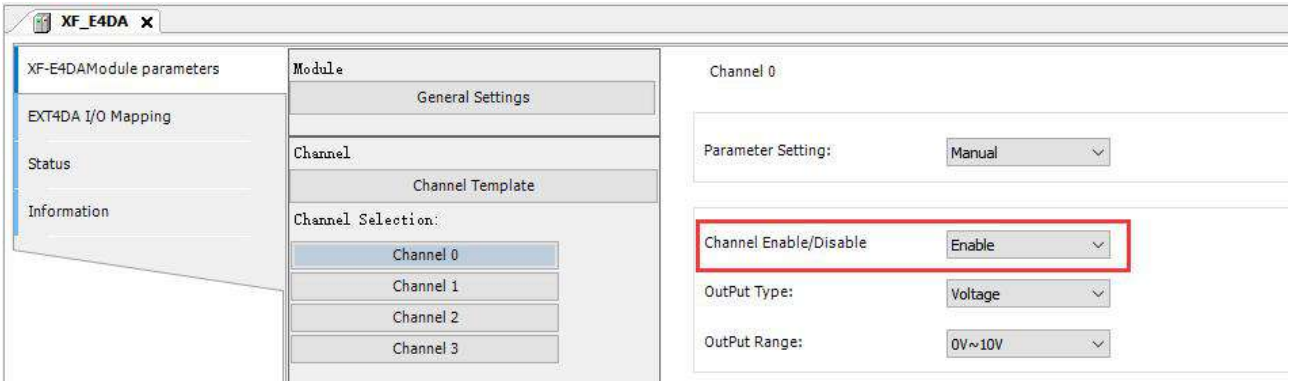
Parameter	Type	Channel	Meaning	Note
			analog quantity	Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000 -5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 0mV~5000mV Digital range: 12800~64000 **Current output** 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 0-20000uA Digital range: 12800-64000
CH2 Calibration2 Numerical	DINT		Calibration 2 digital quantity	
unit display conversion enable disable	Enumeration ofBYTE		Enable/disable unit display conversion	0: Close 1: Open
CH2 UpperLimit	DINT		Unit display conversion limit	Range: -100000000~100000000 And after enabling unit conversion, (upper lower limit)>0
CH2 LowerLimit			Unit display conversion lower limit	
CH3 enable disable	Enumeration of BYTE	Channel 3	Channel enable/disable	0: Close 1: Open
CH3 Output Range select	BYTE		Output type and range	0：0~10V 1：0~5V 2：-10~10V 3：-5~5V 4：1~5V 5：0~20mA 6：4~20mA
output hold the previous value or preset value in the stopped state	Enumeration ofBYTE		In the STOP state, the output remains at the previous value/preset value	0: Keep the previous value 1: Set value
CH3 default value	DINT		Presets	-32000~64000
calibrate enable disable	Enumeration		Calibration	0: Close 1: Open

Parameter	Type	Channel	Meaning	Note
	ofBYTE		enable/disable	
CH3 Calibration1 Analoc	INT		Calibration 1 analog quantity	**Voltage output** 0~10V： Analog range: 0~10000mV Digital range: 0~64000 0~5V： Analog range: 0~5000mV Digital range: 0~64000 -10~10V： Analog range: -10000~10000mV Digital range: -32000~32000 -5~5V： Analog range: -5000~5000mV Digital range: -32000~32000 1~5V： Analog range: 0mV~5000mV Digital range: 12800~64000 **Current output** 0~20mA： Analog range: 0~20000uA Digital range: 0~64000 4~20mA： Analog range: 0-20000uA Digital range: 12800-64000
CH3 Calibration1 Numerical	DINT		Calibration 1 digital quantity	
CH3 Calibration2 Analog	INT		Calibration 2 analog quantity	
CH3 Calibration2 Numerical	DINT		Calibration 2 digital quantity	
unit display conversion enable disable	Enumeration ofBYTE		Enable/disable unit display conversion	0: Close 1: Open
CH3 UpperLimit	DINT		Unit display conversion limit	Range: -100000000~100000000 And after enabling unit conversion, (upper lower limit)>0
CH3 LowerLimit			Unit display conversion lower limit	

6-3-7 Functions and Settings

- Channel enable/disable

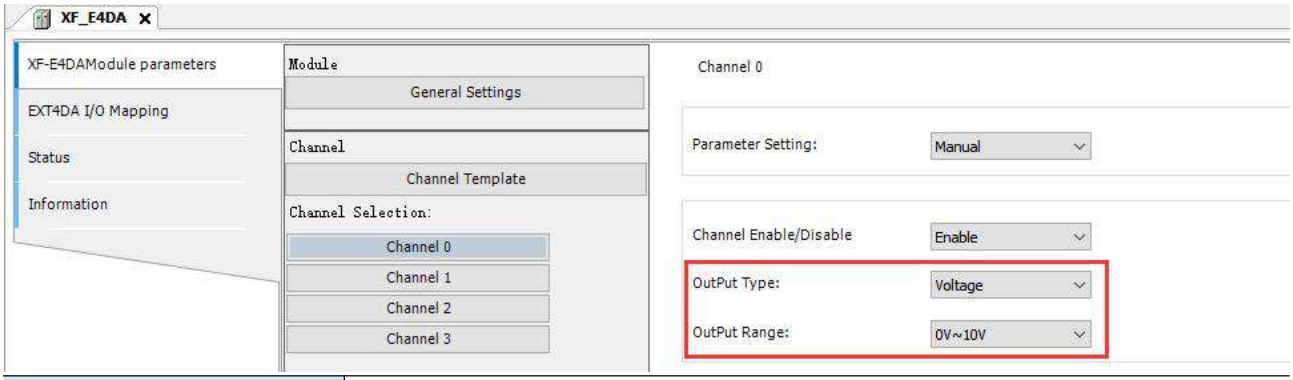
Enable or disable AD sampling channels to save module sampling time.



Settable parameters	Enable/disable (in disable mode, subsequent software functions for the corresponding channel cannot be set)
Default parameters	Enable
Note	The conversion time for each channel is 60us, and the total time is equal to the on/off conversion speed multiplied by the number of enabled channels, if this channel is not used, it can be set to "disable" to reduce the total conversion time of the module.

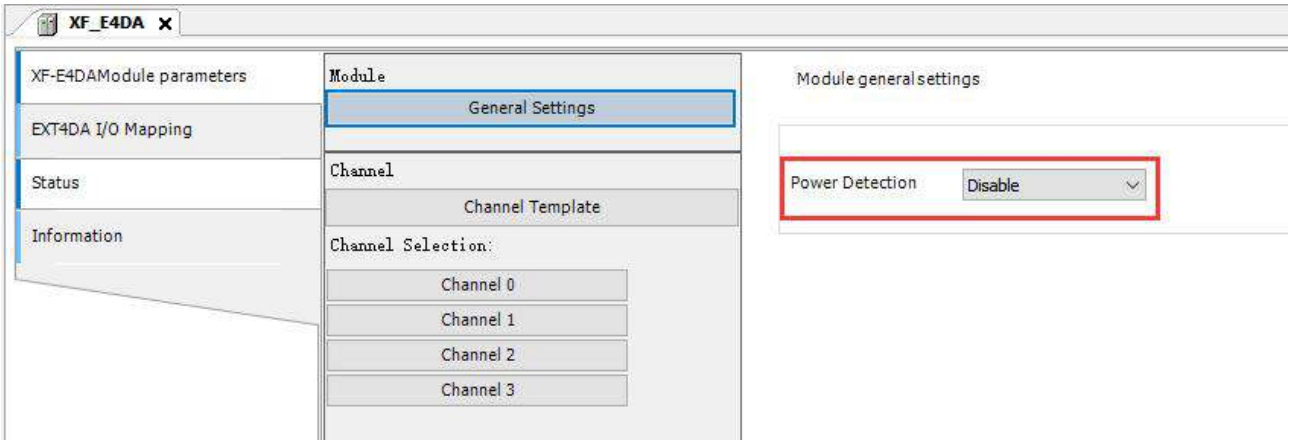
- Output type/range

Users can choose different output types and output ranges.



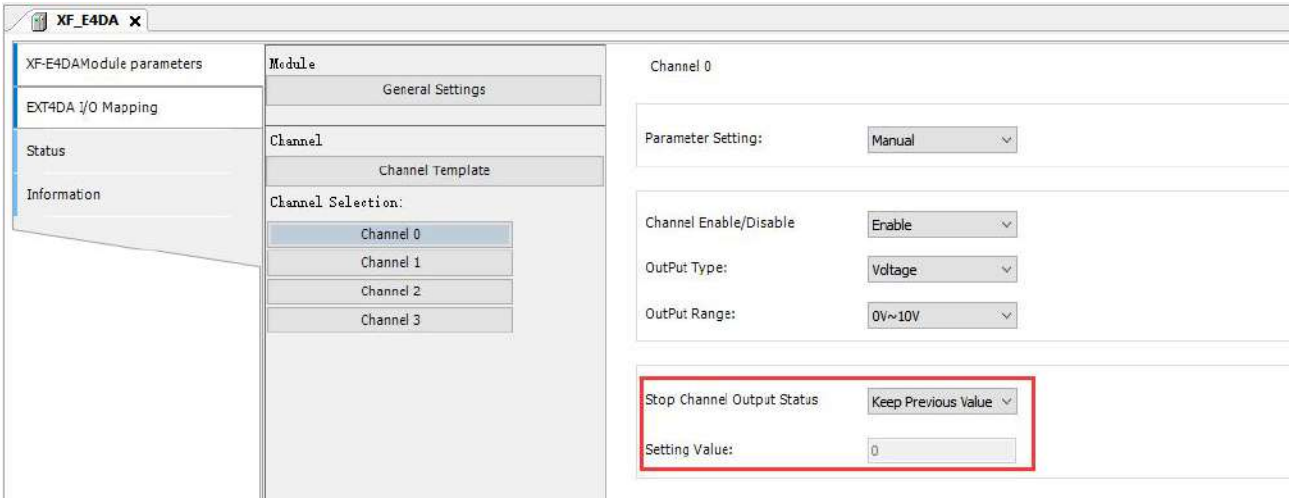
Settable parameters	The following table pulling method reflects the adjustable parameters: voltage, current
Default parameter	Voltage
Voltage measurement range	0V~5V, 0V~10V, -5V~5V, -10V~10V, 1V~5V Default: 0V~10V
Current measuring range	0mA~20mA, 4mA~20mA

- Module power supply detection



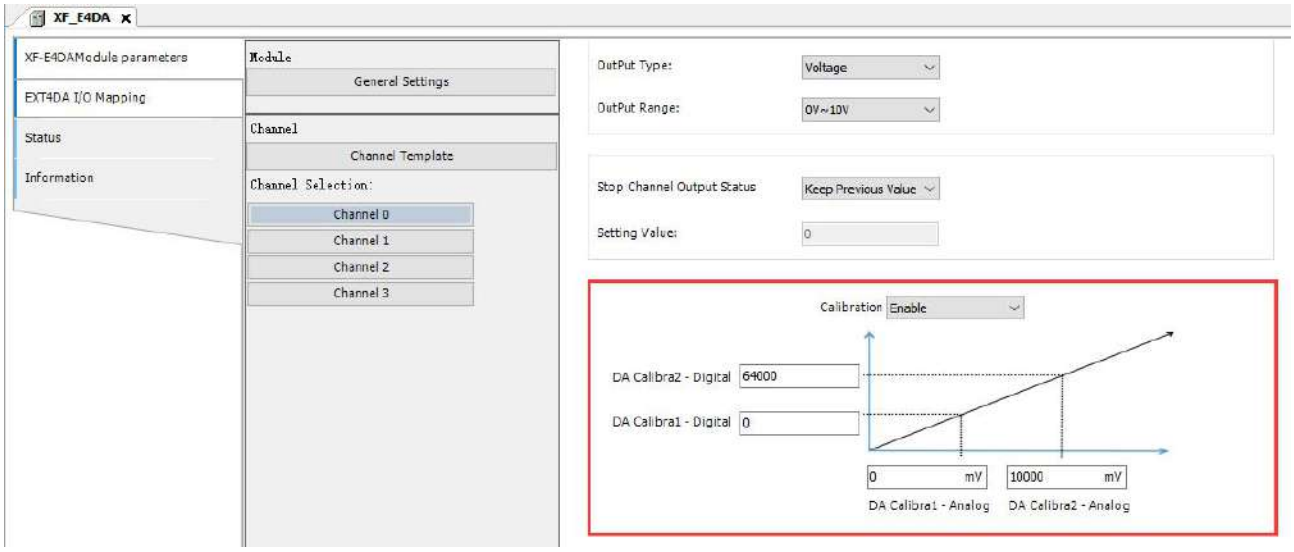
- Check if the external 24V power supply of the module is normal:
  - Normal: The module is running normally.
  - Exception: The module channel cannot be used but can be configured, configured, and scanned normally.
- Parameters can be set: enable, disable (default is disabled).

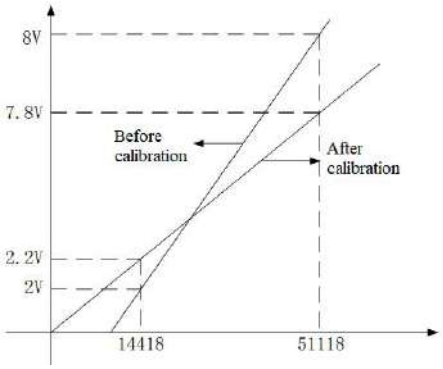
  - STOP output



- When the CPU unit is in STOP mode or abnormal error mode, the corresponding DA channel of the module outputs according to the set parameters.
- Parameters can be set: Keep the previous value, set the value (default to keep the previous value)

  - Calibration function

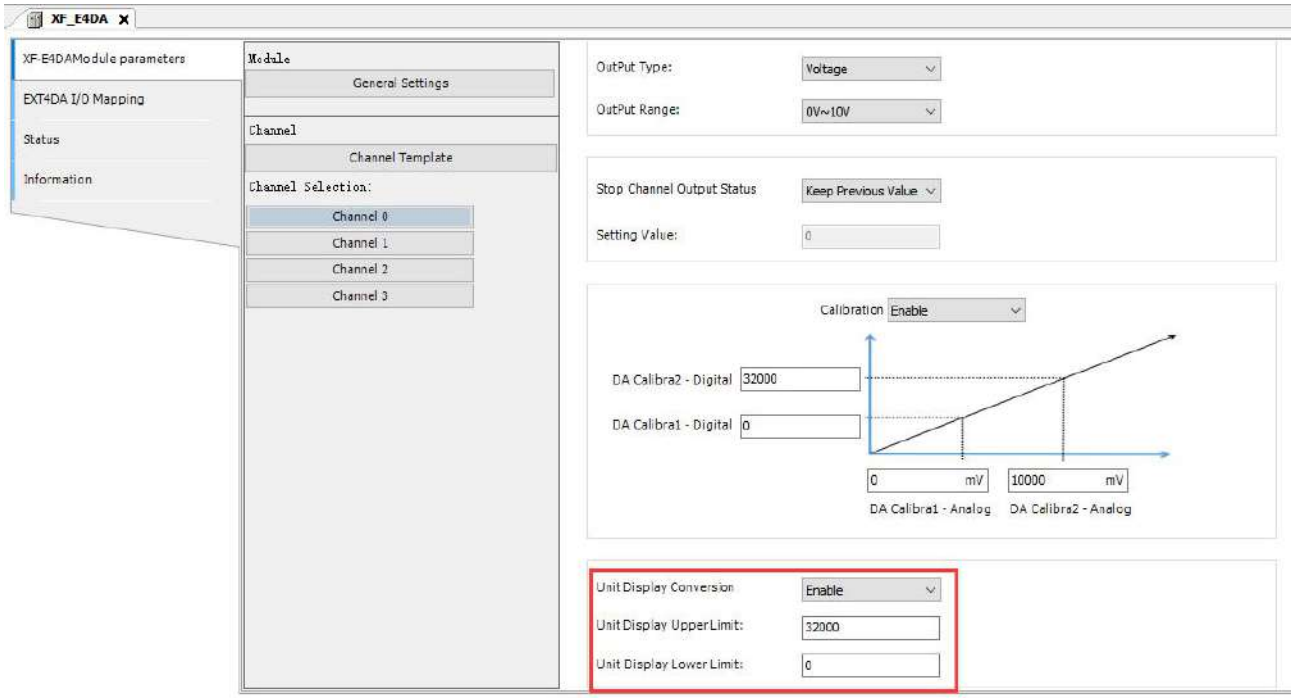




Due to the possibility of drift between the analog output converted from DA and the set digital output after the product leaves the factory or has been used for a period of time, customers can set the DA offset calibration function to immediately reflect it to the proportional scaling value (digital operation value), and can easily complete the calibration at system startup on their own.

For example, when the DA1 analog output is set to 0-10V output, and a value of 51118 is assigned to the output channel, the output voltage is 8V. When a value of 14418 is assigned to the output channel, the output voltage is 2V. At this point, set 8000mV in the analog setting of DA1 calibration 1, 51118 in the digital setting of DA1 calibration 1, 2000mV in the analog setting of DA1 calibration 2, and 14418 in the digital setting of DA1 calibration 2 to achieve the calibration function.

- Unit display conversion

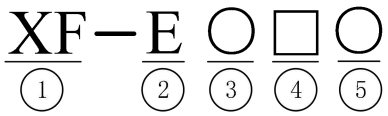


This function can directly display the output analog data as the actual output unit required by the customer.

Due to the fact that customers use analog expansion module DA to output analog signals that correspond to the outputs of some instruments or sensors. For example, controlling the frequency output range of a frequency converter to be 0~50Hz, the frequency control analog signal of the frequency converter is 4~20mA. The existing DA module will output the 4~20mA analog signal to the analog acquisition terminal of the frequency converter, and the customer needs to convert the digital signal from 0~65535 to 0~50Hz for the actual output frequency of the frequency converter. It is possible to automatically convert the analog output of module DA into the actual output frequency value of the frequency converter by setting the conversion value range.

7. Serial port communication module

7.1 Naming rule



①	Series name	XF：	XF series expansion module
②	Expansion module	E：	Right expansion module
③	Channel number	1：	1 channel
		2：	2 channels
		4：	4 channels
④	Communication type	COM：	Serial port communication
		CAN：	CAN communication
⑤	Physical interface type	24：	232&485
		2：	232
		4：	485

7.2 Serial Communication Unit XF-E2COM24

7.2.1 Product overview

XF-E2COM24 serial communication expansion module has 2 serial channels and supports RS232 and RS485 communication (each channel can only select one of RS232 and RS485 for communication). It is compatible with XF, XSF series CPU unit products and XF series communication coupler units.

- Two independent RS232/RS485 serial communication channels.
- Supports Modbus master, slave, and free format communication.
- Channel and internal isolation to enhance anti-interference capability.
- 12mm width design.

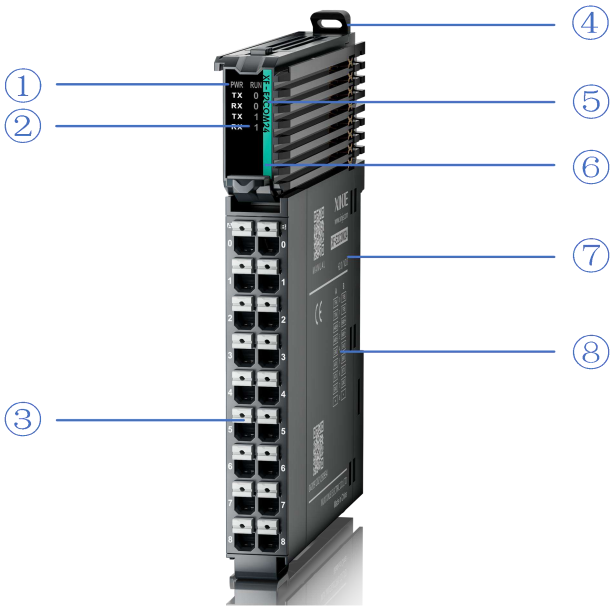
■ Module version

Hardware version	Firmware version	Function
H2.0	V2.0	Basic functions for the first official production

A PLC main unit can have up to 8 XF-E2COM24 serial port modules on the right expansion. Each remote I/O adapter, LFC3-AP or LFP3-AP, can also support up to 8 XF-E2COM24 serial port modules.

7.2.2 Module view

(1) Description of each section



No.	Name	No.	Name
①	System LED indicator light	②	Channel LED indicator light
③	Detachable terminal block	④	Buckle
⑤	Model indication	⑥	Color identification indicating module type
⑦	Module hardware and firmware versions	⑧	Wiring diagram

(2) System indicator light

System indicator light	Meaning	
PWR (green)	OFF	Module not powered on
	Always ON	All power supplies for the module are normal
RUN (green)	Always ON	The module is running normally
	Flashing 1Hz*1	General errors in module logs *3
	OFF	Important errors in module logs *4
	Flashing 10Hz*2	Module establishment communication in progress

- *1: A square wave with a 50% duty cycle and a frequency of 1Hz.
- *2: A square wave with a 50% duty cycle and a frequency of 10Hz.
- *3: General error, does not affect the operation of the equipment.
- *4: Critical error, prevents the equipment from operating normally. Currently, only configuration parameter errors.

(3) Channel indicator light

Model	Channel indicator light		
XF-E2COM24	RX0 RX1	Always ON (green)	Receiving data
		OFF	Received completed or no communication
	TX0 TX1	Always ON (green)	Sending data
		OFF	Sending completed or no communication

During normal communication, RX/TX alternately flashes, and the speed of flashing can indicate the communication rate.

(4) Color identification

No.	Color		Module type
1		Gray White	Digital input
2		Gray	Digital output & digital mixed module
3		Light blue	Analog input
4		Dark blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

7.2.3 General specifications

General specifications		
Item		Specification
Operating temperature	Max temperature	55℃
	Min temperature	-20℃
Storage temperature	Max temperature	70℃
	Min temperature	-40℃
Environmental humidity (including operation/storage)	Upper limit	95%
	Lower limit	10%
Protection level		IP20
Anti vibration		Compliant with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant

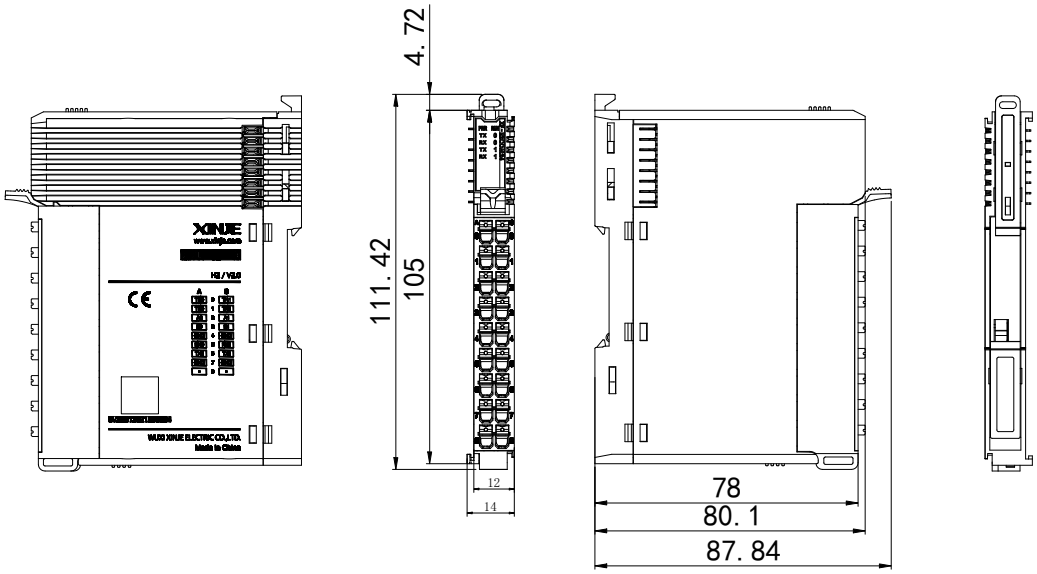
General specifications	
Item	Specification
	acceleration 1.0g peak acceleration) Under continuous intermittent vibration (frequency 5-9Hz half amplitude 1.75mm displacement) and (frequency 9-150Hz constant acceleration 0.5g constant frame amplitude) Scan 10 times in each direction of X, Y, and Z
Impact resistance	Compliant with IEC61131-2 standard Impact strength of 15G (peak) with a duration of 11ms is applied to three mutually perpendicular axes, with 3 impacts per axis (a total of 18 impacts)
Use environment	Non corrosive gas
Use altitude	0-2000m
Overvoltage level	II: Compliant with IEC61131-2
Pollution level	2; Compliant with IEC61131-2
Anti interference EMC	Compliant with IEC 61131-2 IEC61000-6-4 Type B
Related certifications	CE

7.2.4 Technical specification

Item		Specification
Number of ports		2
Communication port		RS-232 and RS-485 (choose one of RS232 and RS485 for single COM)
Communication protocol		Modbus-RTU/ASCII Master/Slave/Free Format
Communication specifications	communication mode	Half-duplex
	Channel isolation	Yes
	Baud rate	2400bps, 4800bps, 9600bps, 19200bps (Default), 38400bps, 57600bps, 115200bps
	Data bits	7 or 8 (Default)
	Stop bit	1(Default) or 2
	Check bit	Odd, even (Default), none
Communication distance		RS-232 15m (19200bps) RS-485 1200m (9600bps)
Max number of modules		8 pcs (The right extension of the main body and the remote IO adapter each support max 8 modules)
Max number of bytes		256 bytes(Modbus) 1024 bytes(Free Format)
Module power consumption		0.8W

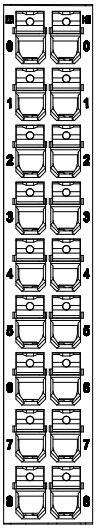
7.2.5 Installation&Wiring

7.2.5.1 Dimension diagram



Unit: mm

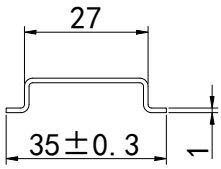
7.2.5.2 Terminal definition

XF-E2COM24				
Meaning	A column terminal	Terminal layout	B column terminal	Meaning
TR0—A channel terminal resistor	0		0	TR1—B channel terminal resistor
TR0—A channel terminal resistor	1		1	TR1—B channel terminal resistor
A0—RS485+ terminal	2		2	A1— RS485+ terminal
B0—RS485- terminal	3		3	B1— RS485- terminal
GND—grounding terminal	4		4	GND— grounding terminal
RX0—RS232 receive data terminal	5		5	RX1— RS232 receive data terminal
TX0—RS232 send data terminal	6		6	TX1— RS232 send data terminal
GND—grounding terminal	7		7	GND— grounding terminal
·	8		8	·

7.2.5.3 Installation method

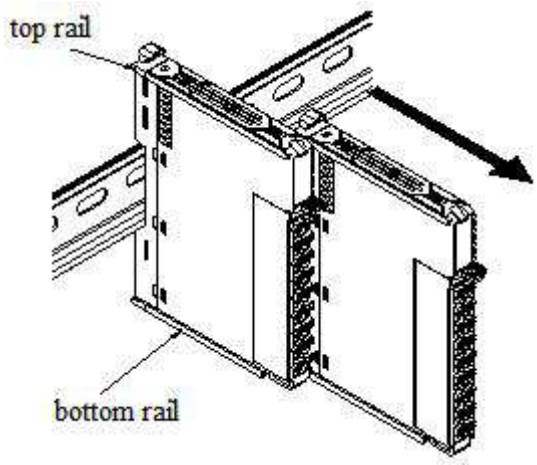
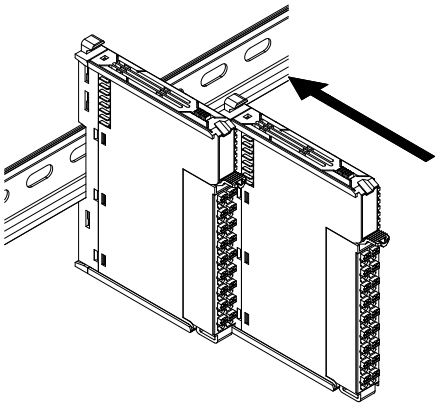
(1) Installation requirements

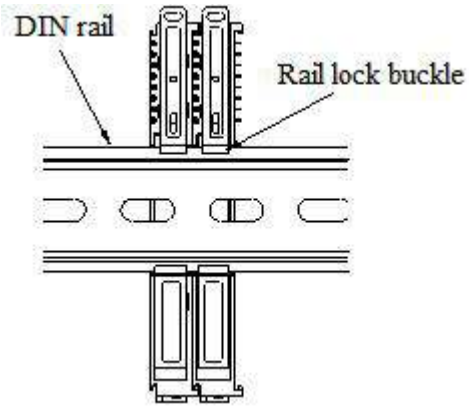
The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.



Attention	When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

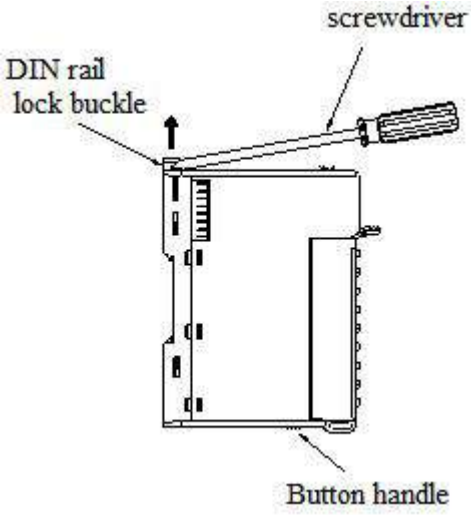
(2) Installation steps

	The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:
	The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

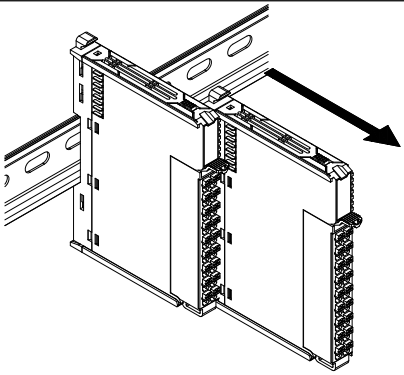


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



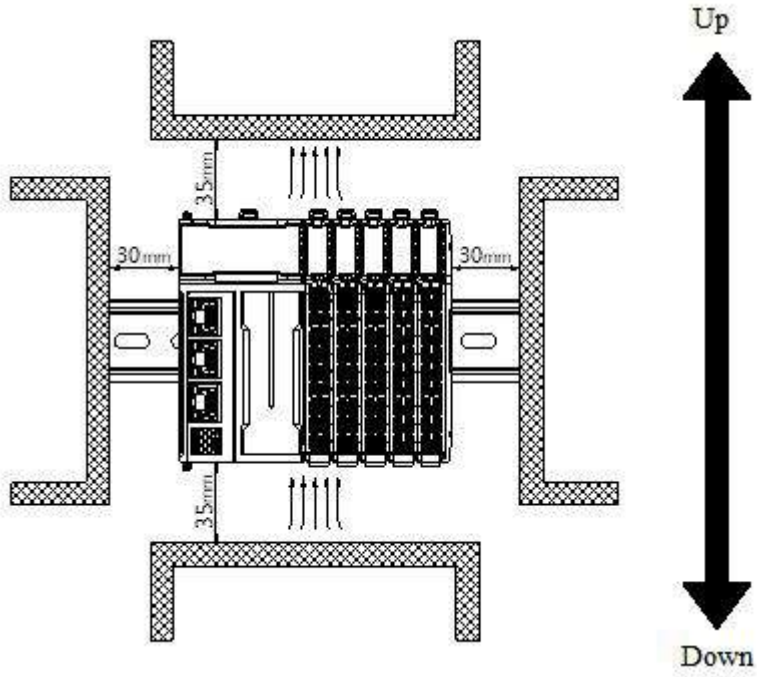
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

7.2.5.4 Installation environment

This product can be installed in four positions (i.e. installation direction): horizontal direction, vertical direction, top of the electrical cabinet, and bottom of the electrical cabinet. It is recommended to install it in the horizontal direction, and the heat dissipation design is through natural convection. To ensure normal ventilation and heat dissipation and reserve sufficient wiring space, the minimum gap must be retained around this product, as shown in the following figure:



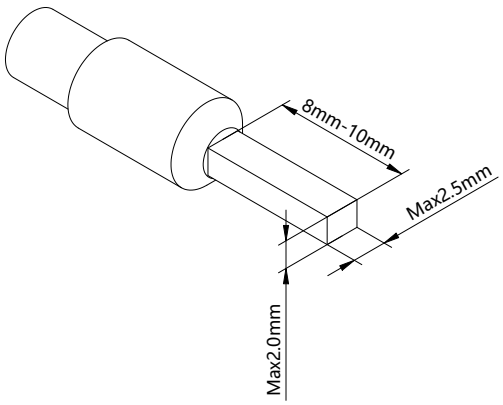
If there are high-temperature heat source equipment (heaters, transformers, large resistors, etc.) around this product, a gap of at least 100mm should be left between them.

7.2.5.5 Equipment wiring

When wiring modules, their connectors must meet the following requirements:

Adaptive wire diameter	
National standard /mm^2	American Standard /AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

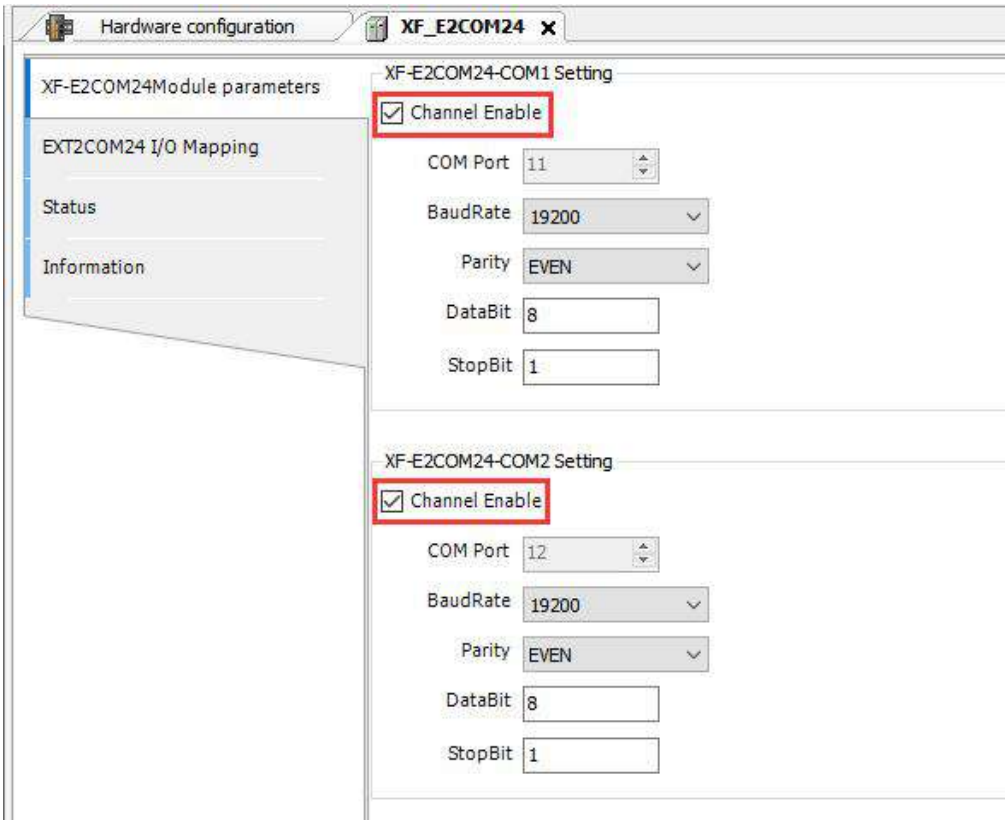
If using other types of terminal lugs, crimp them onto the stranded wire. The shape and dimensions should conform to the diagram shown below.



7.2.6 Function and settings

■ Channel enable

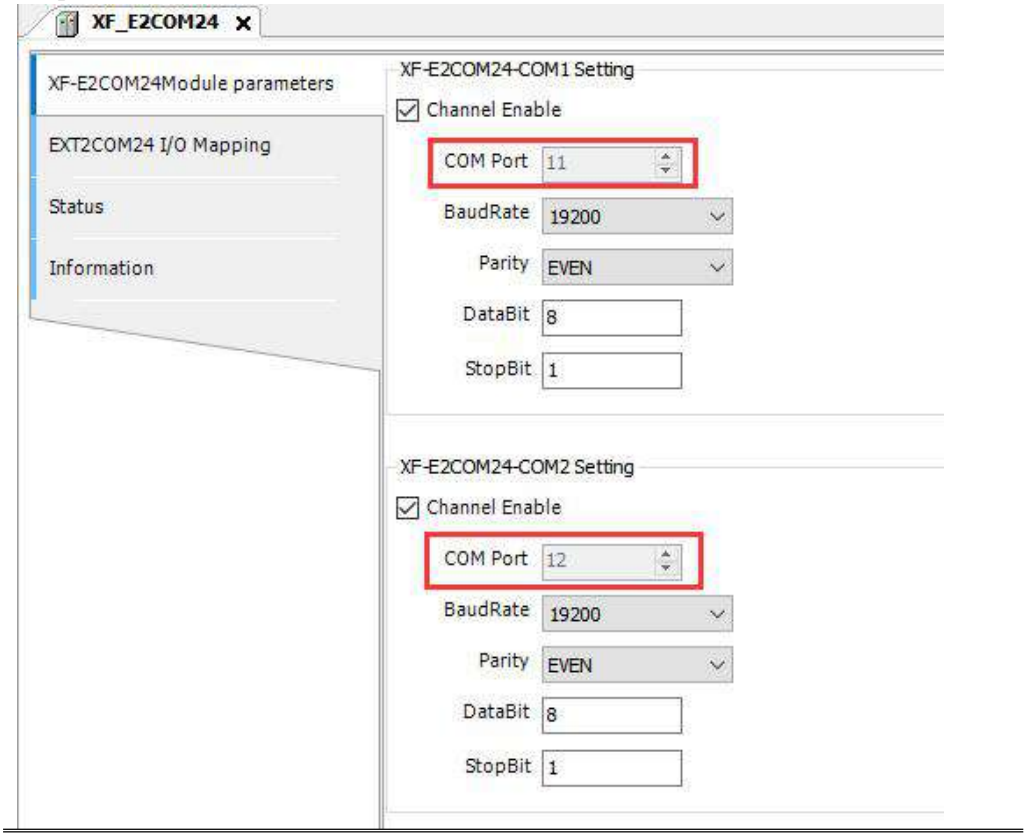
When the corresponding "channel enable" is checked, configuration is allowed. When not checked, the parameter background displays gray and configuration is not allowed. When a certain serial port channel allows configuration, the configuration data of the serial port channel are linked to each other and automatically configure the same parameters.



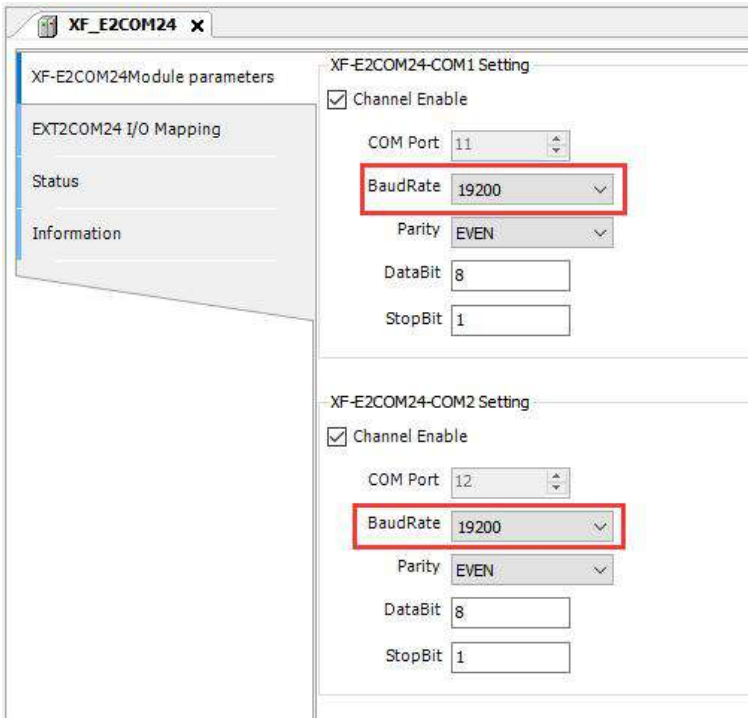
■ COM port

The controller body is sorted using port numbers 1-10, and the right extension port numbers are sorted starting from 11. Dragging and deleting modules with assigned port numbers will not rearrange them.

Using native codesys, corresponding addressing sorting can be performed according to the port numbers mentioned above.

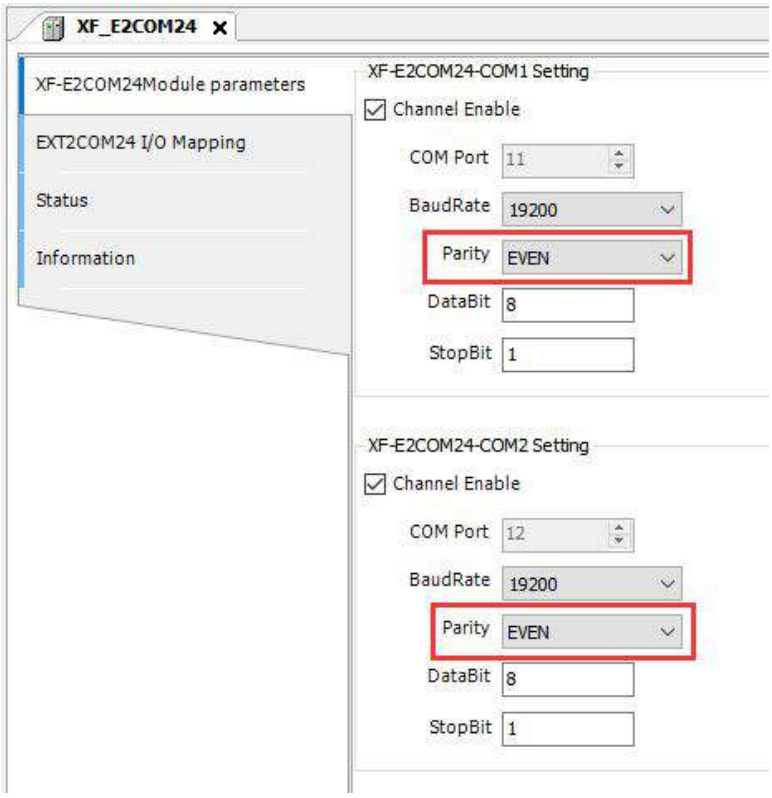


- Baud rate



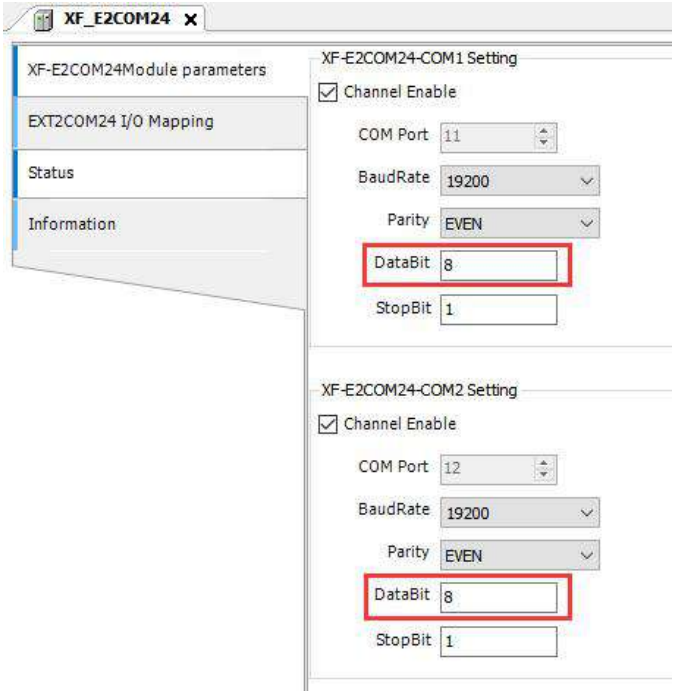
Setting range	2400bps, 4800bps, 9600bps, 19200bps, 38400bps, 57600bps, 115200bps
Default parameter	19200bps

■ Parity



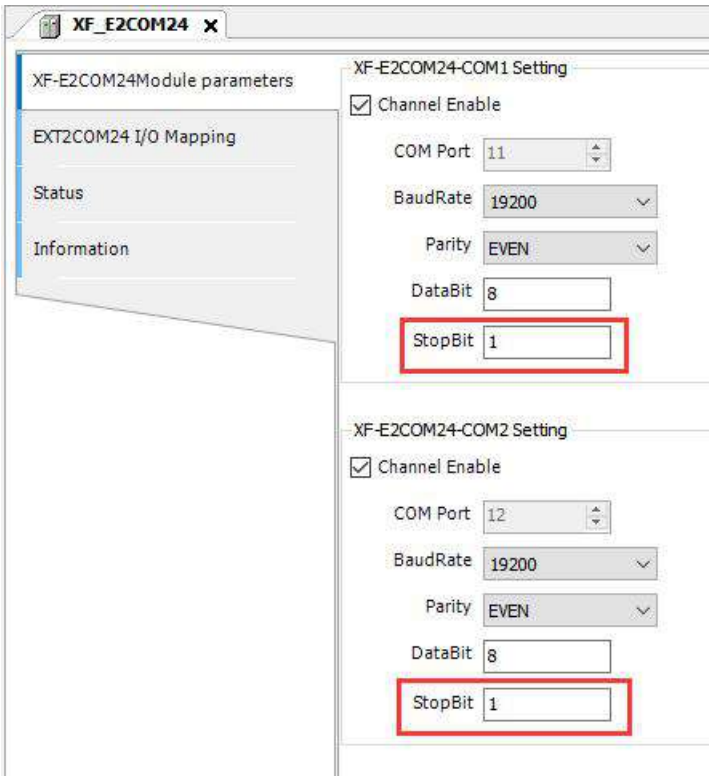
Setting range	EVEN, ODD, NONE
Default parameter	EVEN

■ Data bit



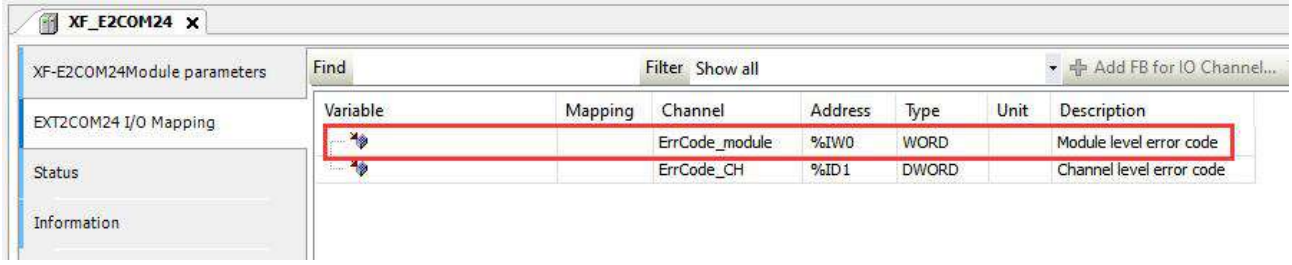
Setting range	7 or 8
Default parameter	8

■ Stop bit



Setting range	1 or 2
Default parameter	1

■ Module level error code



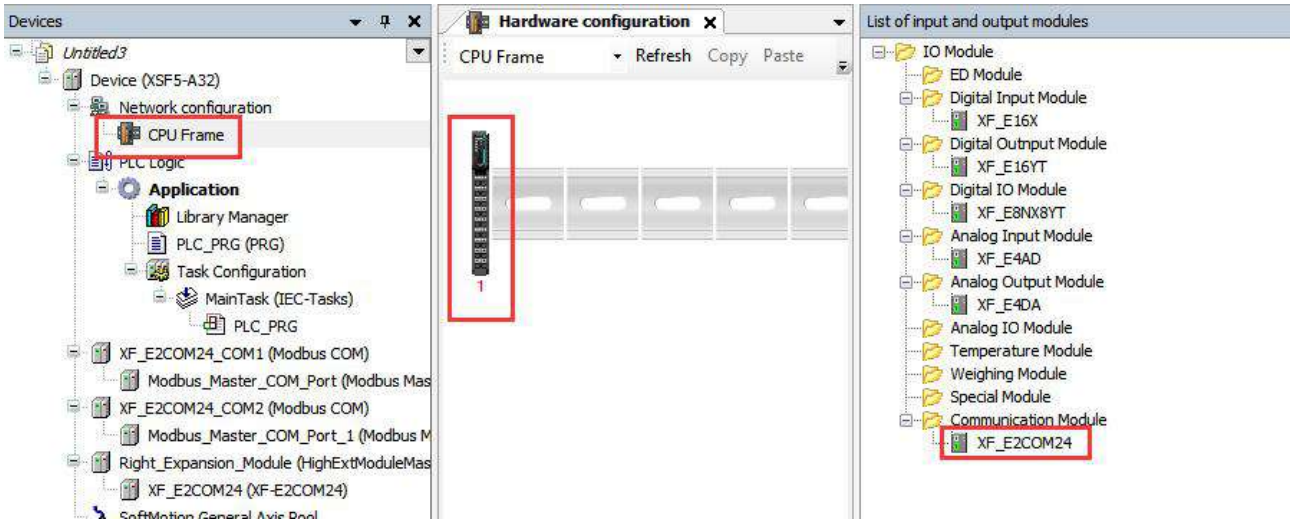
Module level error code (ErrCode_module)		
Bit	Meaning	Error level
0	Version error	Important
1	Hardware error	Important
2	Operation fault	Important
3	Parameter error	Important

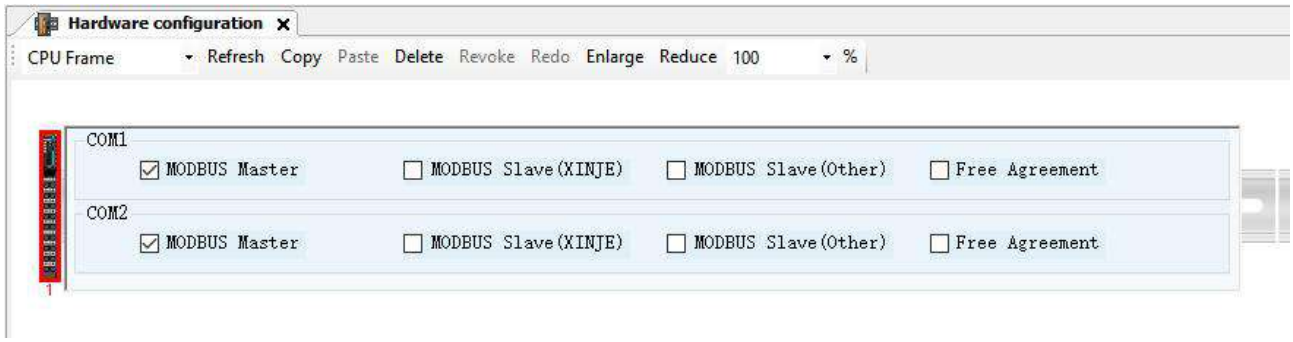
■ Channel level error code

This function is reserved.

7.2.7 Configure the module

Right Extension Module: Double click the space for the extension module in "CPU Frame", and then double click "XF-E2COM24" in “List of input and output modules” to add the module, as shown in the following figure.
Configure LF Series Remote IO: For specific configuration examples, please refer to the LF Series Remote IO User Manual.





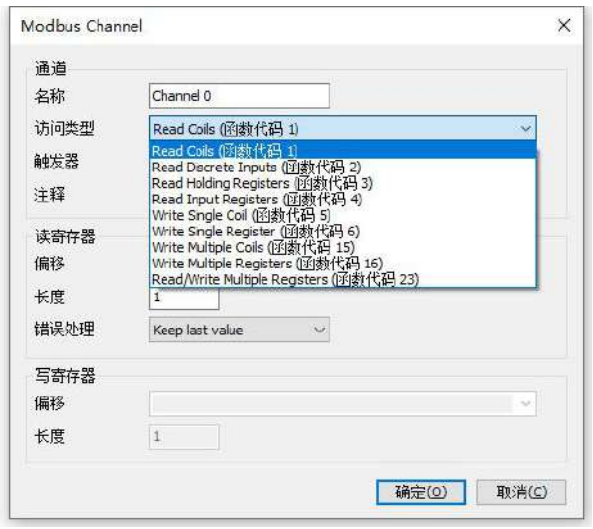
7.2.7.1 MODBUS master station

Explanation:

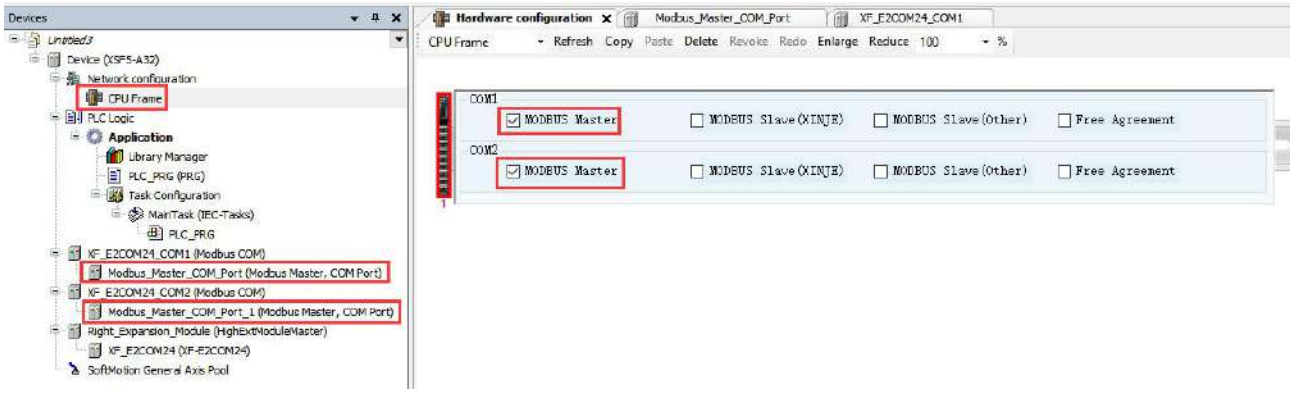
As the master station, a single channel can support up to 32 slave stations for communication.

The length of data that can be communicated through an instruction channel:

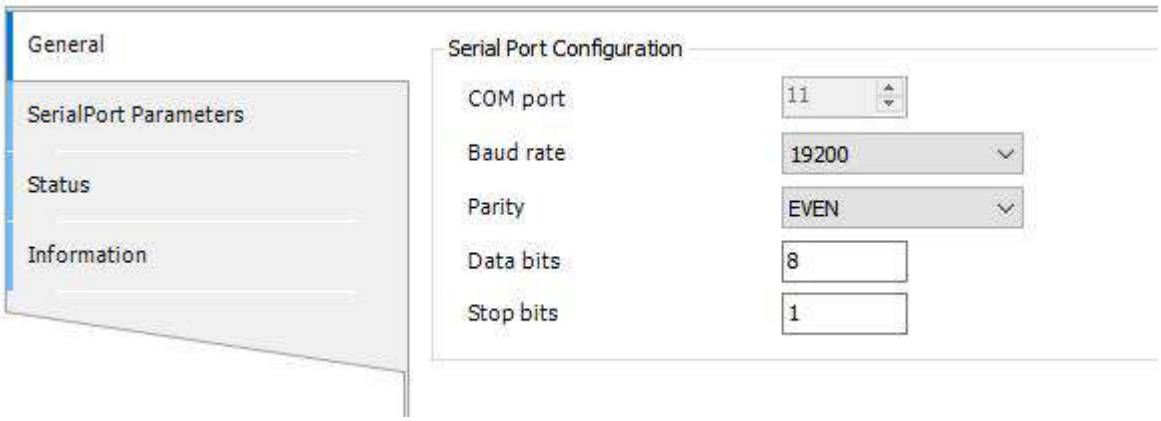
Function code	Length
Read coil (01)	2000
Read input coil (02)	2000
Read register (03)	125
Read input register (04)	125
Write single coil (05)	1
Write single coil (06)	1
Write multiple coils (0F)	1968
Write multiple registers (10)	123
Read write multiple registers (17)	Read: 125 Write: 121



Double click on "CPU Frame" to enter the hardware configuration interface. You can click the checkbox button in the window to configure the protocol of the module's two serial port channels. Select "MODBUS Master" here.

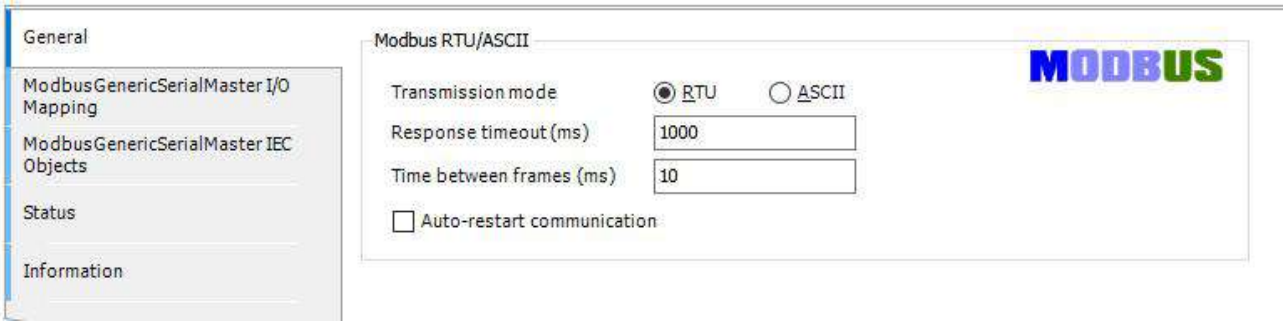


When using an extended serial port as the master station, double-click on "XF_E2COM24_COM" to open the Modbus communication configuration interface. The relevant configuration interface is as follows:



COM port	The serial port selected for the physical connection of the master station
Baud rate	Speed during communication
Parity	Verification method for communication frames
Data bits	The actual data bits contained in the communication frame
Stop bits	Representing the last bit of a single packet during communication

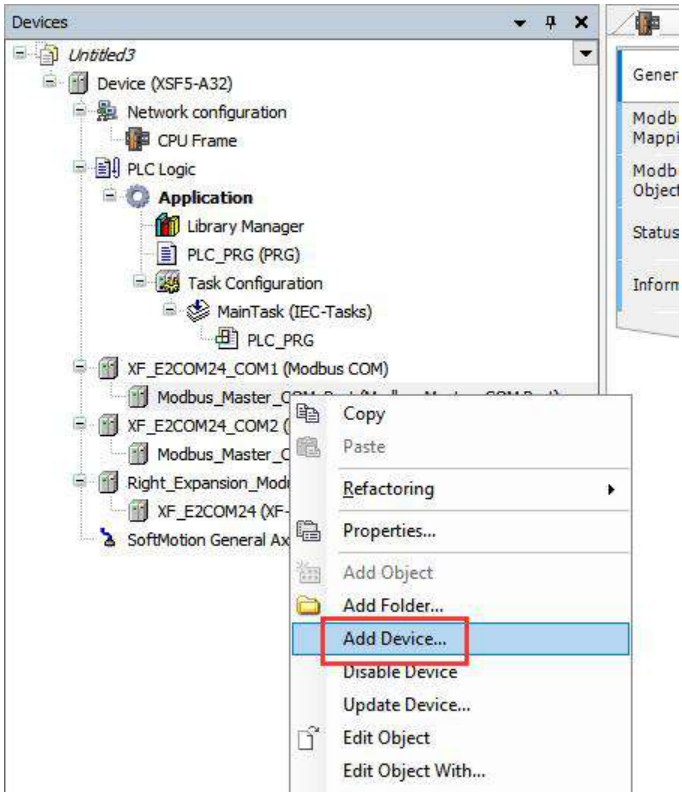
Double click on the master device "Modbus_Master_COM_Port" in the device tree to open the Modbus master communication parameter configuration window. The configuration interface is shown in the figure:

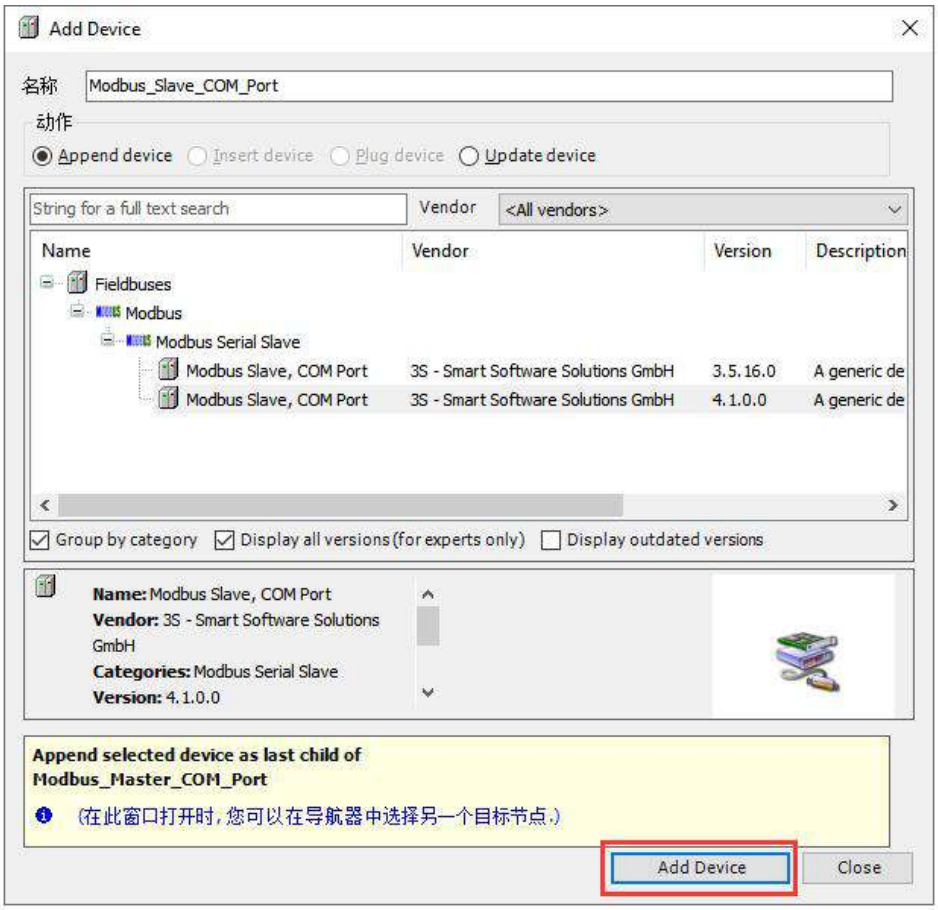


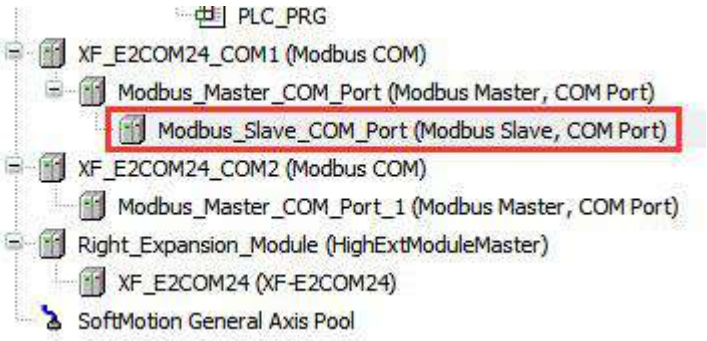
Transmission mode	Choose RTU or ASCII code
Response timeout (ms)	The time interval during which the master station waits for a response from the slave station. If no response is sent from the slave station during this period, the master station will request the next slave station. The value entered at this point will be considered as the default value for each slave station. On the slave configuration page, each slave can individually set an appropriate time interval
Time between frames (ms)	The time interval between the master station receiving the previous response data frame and the next request data frame. This parameter can be used to adjust the data exchange rate

After the configuration of the master station is completed, corresponding configurations need to be made for the slave stations connected to the master station.

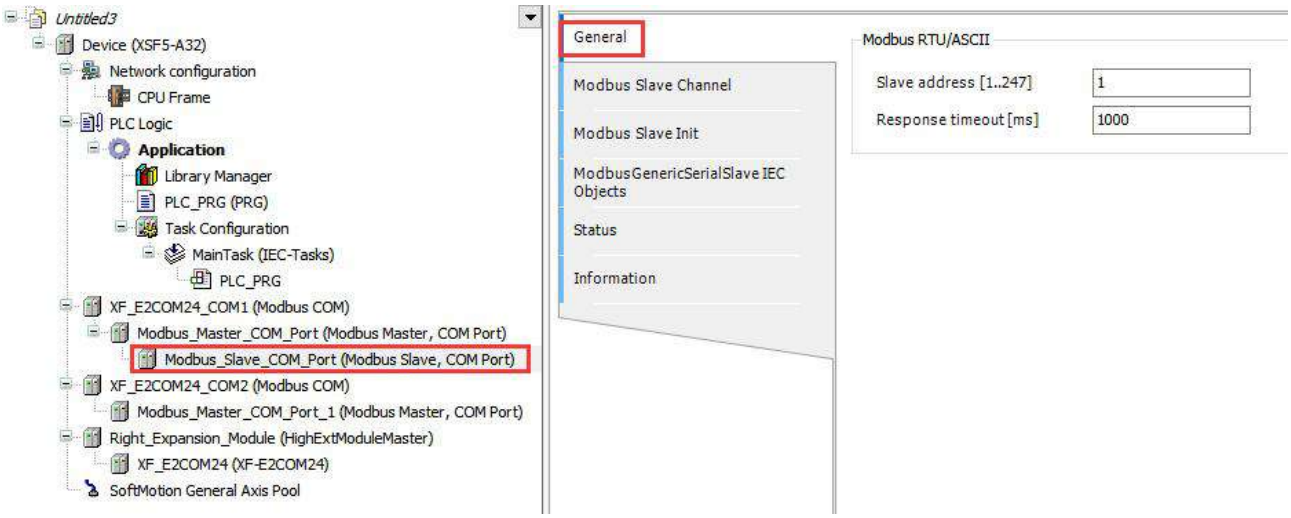
Click on the master station device "Modbus_Saster_COM_Port" and right-click, select "Add Device...", then select the slave station device and click "Add Device". At this point, the slave station device has been added, as shown in the figure:





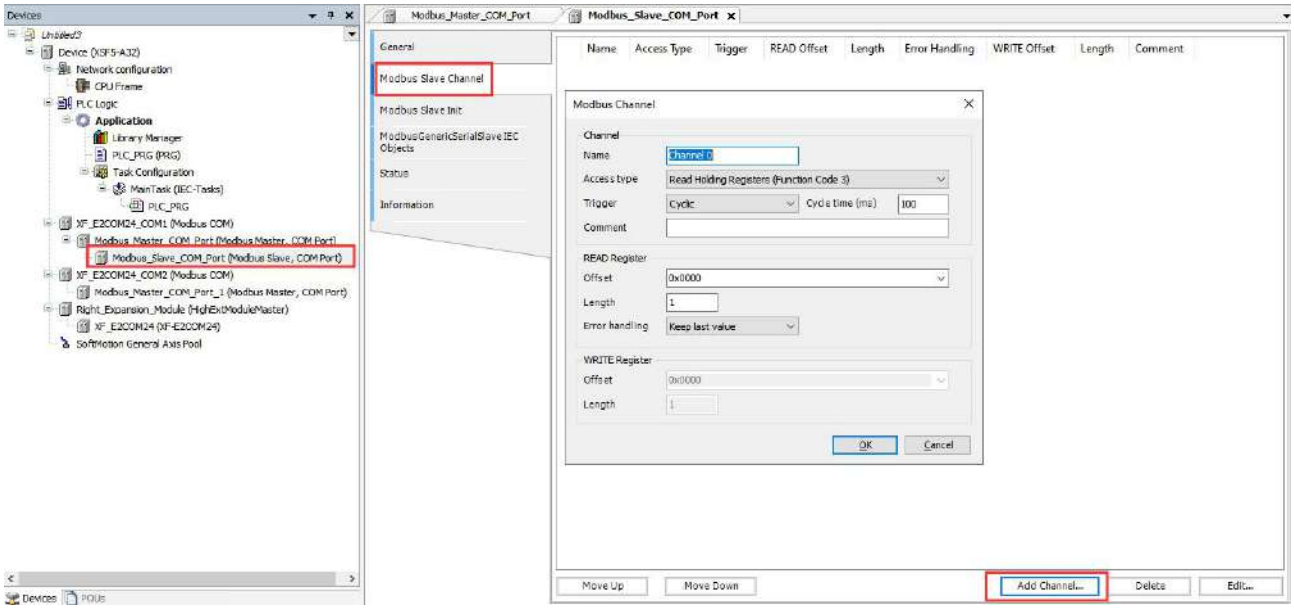


Double click on the Modbus_Slave_COM_Port node to open the slave configuration interface, as shown in the figure:

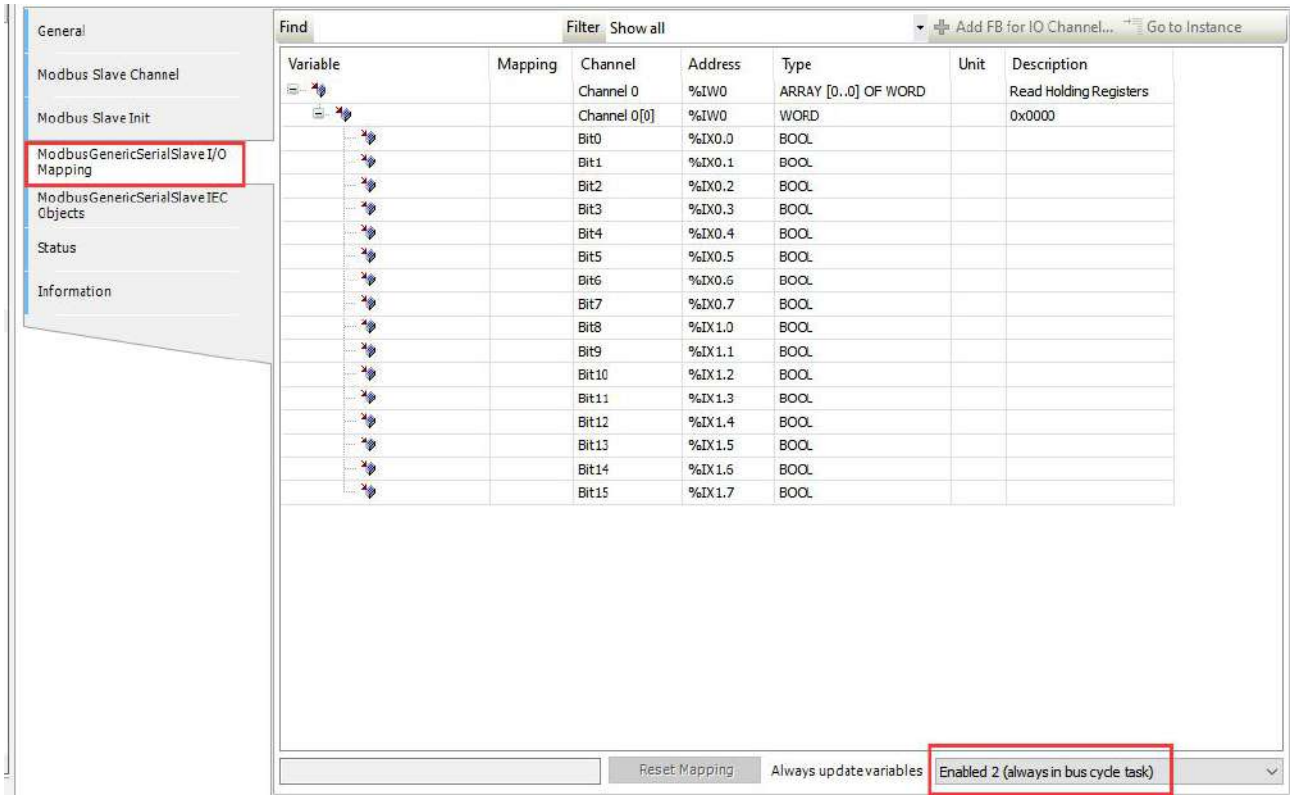


Slave address	Set the station address of the slave station, valid from 1 to 247
Response timeout (ms)	Set the response timeout for the slave station. If the slave station does not respond to the master station after this time, the master station considers that the slave station has a communication failure.

Users can customize the Modbus communication channel of the slave station, but it must match the actual slave station hardware. After clicking "Add Channel", the system will automatically pop up the "Modbus Channel" dialog box, and users can directly select the access type, address offset, data length, and communication cycle time, as shown in the following figure:

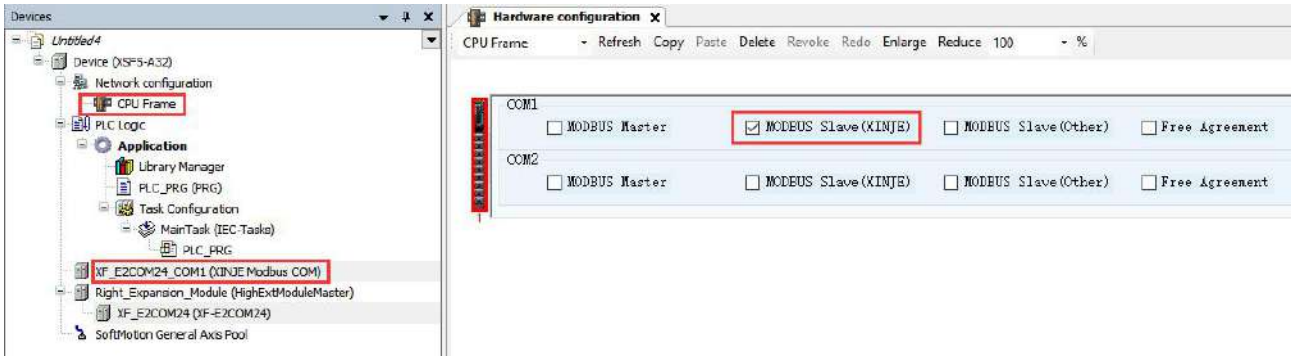


After completing the configuration of "Add Channel", the corresponding "IO Mapping" interface will automatically appear, which contains the data involved in communication. The default setting for 'always update variables' is' use parent device settings'. Users need to set' always update variables' according to their actual needs, and can select Enable 1 or Enable 2 from the dropdown menu. As shown in the following figure:

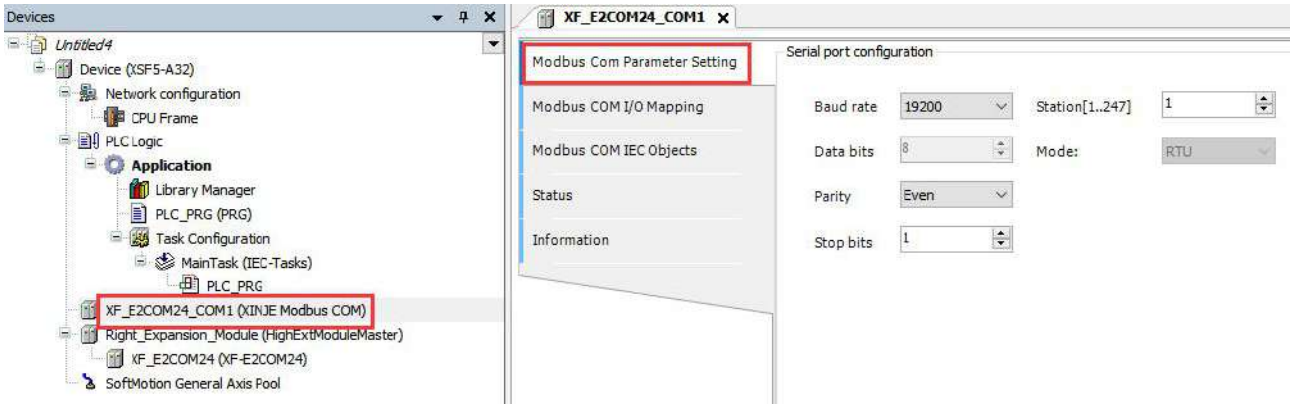


7.2.7.2 MODBUS slave station (XINJE)

Double click on "CPU Frame" to enter the hardware configuration interface. You can click the checkbox button in the window to configure the protocol of the module's two channel serial ports. Use the first channel of the module for serial communication here, and select "MODBUS Slave (XINJE)".



After adding a slave device, double-click on the "XF_E2COM24_COM1 (XINJE Modbus COM)" node to open the configuration interface, which can switch to the Modbus Slave Communication Configuration interface. As shown in the following figure:



Baud rate	Speed during communication
Data bit	The actual data bits contained in the communication frame
Parity	Verification method for communication frames
Stop bit	Representing the last bit of a single packet during communication
Station	The station number of this device ranges from 1 to 247
Mode	MODBUS RTU

When making Modbus RTU (XINJE) slave devices, the address range that can be accessed by the master device is defined as follows:

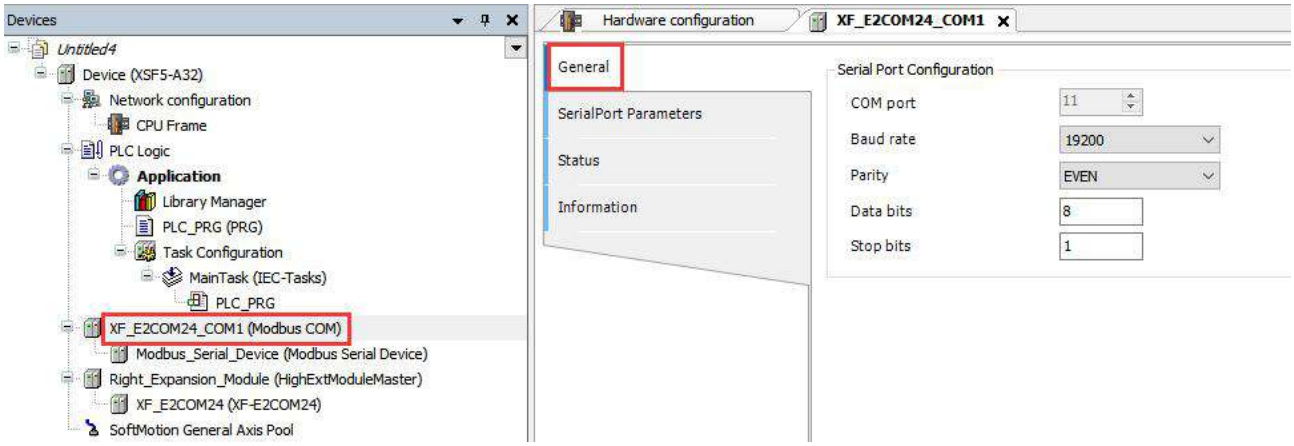
All coil operations (function codes 0x01, 0x02, 0x05, 0x0F) can be read and written to addresses %MB0-%MB65534;

All register operations (function codes 0x03, 0x04, 0x06, 0x10) have read-write addresses of %MW40000-%MW105534.

7.2.7.3 MODBUS slave (Other)

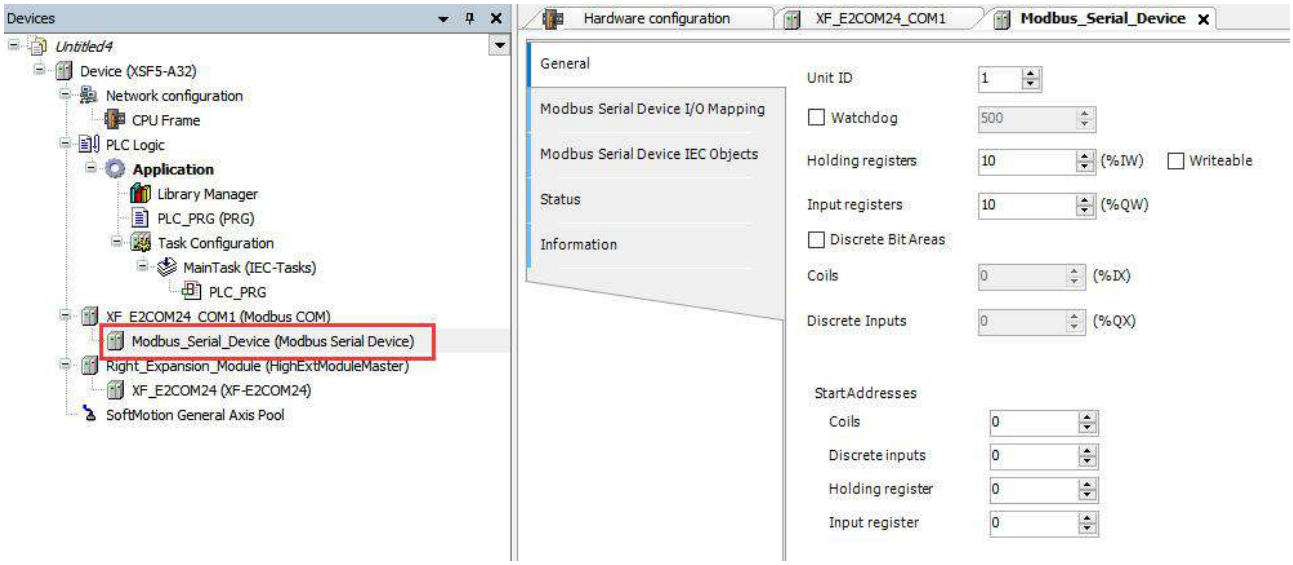
Double click on "CPU Frame" to enter the hardware configuration interface. You can click the checkbox button in the window to configure the protocol of the module's two channel serial ports. Use the first channel serial communication of the module here, and check "MODBUS Slave (Other)".

Double click the XF_E2COM24_COM1 (Modbus COM) node to open the configuration interface, which can switch to the Modbus slave communication configuration interface. As shown in the following figure:

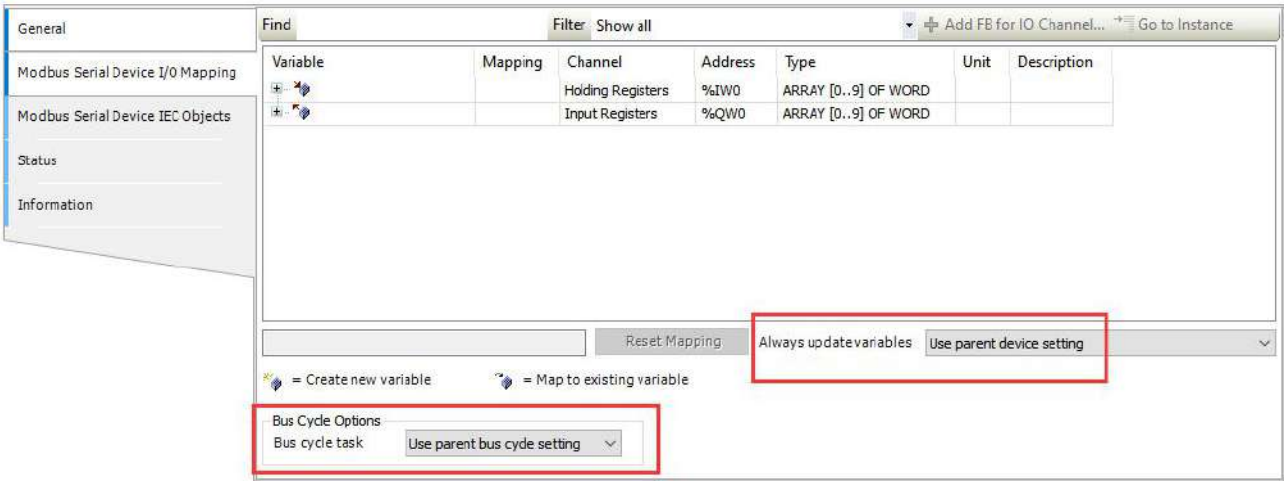


COM port	The right expansion port number is sorted from 11 and cannot be modified. (Serial port numbers are arranged according to the order of addition, and copying and pasting modules are also arranged in order. Dragging and deleting modules with assigned port numbers will not rearrange them.)
Baud rate	The actual data bits contained in the communication frame
Parity	Verification method for communication frames
Data bits	Representing the last bit of a single packet during communication
Stop bits	The station number of this device ranges from 1 to 247

Click on the "Modbus_Serial_Device(Modbus Serial Device)" node in the left device tree to open the Modbus slave communication data configuration interface. As shown in the following figure:



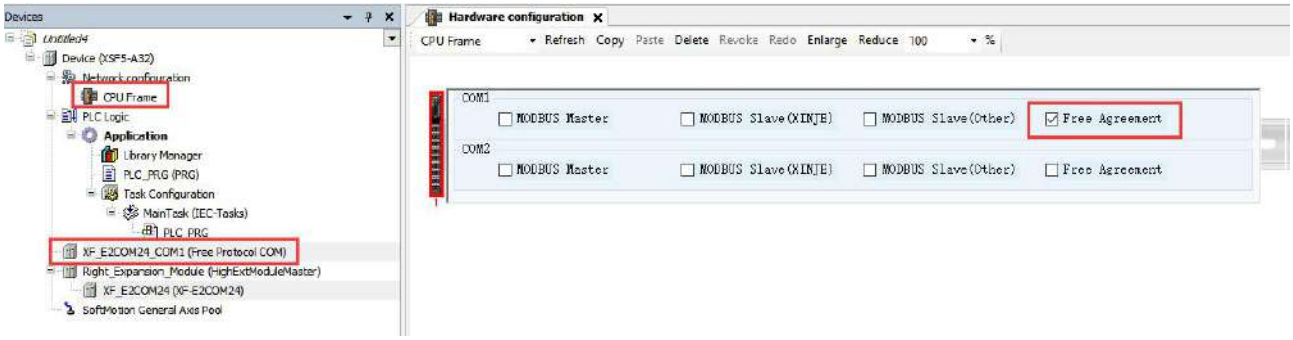
Switch to "Modbus Serial Device I/O Mapping" in this window, and users need to set the "Bus Cycle Options" and "Always Update Variables" according to their actual needs, as shown in the following figure:



7.2.7.4 Free protocol

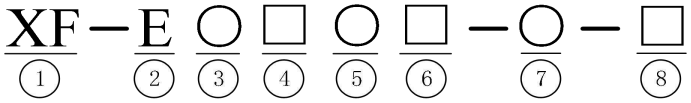
There are two configuration methods: configuration interface configuration and XJ_COMFree instruction library, and there are some differences in data processing between the two.

Double click on "CPU Frame" to enter the hardware configuration interface. You can click the checkbox button in the window to configure the protocol of the module's two channel serial ports. Use the first channel of the module for serial communication here, and select 'Free Agreement'.



8. Temperature module

8.1 Naming rule



①	Series name	XF：	XF series expansion module
②	Expansion module	E：	Right expansion module
③	Input channel	4：	4 channels
		8：	8 channels
④	Input type	RTD：	Thermal resistance
		TC：	Thermocouple
⑤	Output channel	Vacant：	No output
		4：	4 channels
		8：	8 channels
⑥	Output type	Vacant：	No output
		Y：	Digital output
		DA：	Analog output
⑦	PID control function	Vacant：	Not support PID control
		P：	Support PID control
⑧	Module type	Vacant：	Normal type
		H：	Isolated between channels

8.2 Ordinary thermistor temperature acquisition unit XF-E4RTD

8.2.1 Product Overview

XF-E4RTD series ordinary thermistor temperature acquisition expansion module, 4-channel thermistor temperature acquisition, power supply DC24V, compatible with XF, XSF series CPU unit products and XF series communication coupler units.

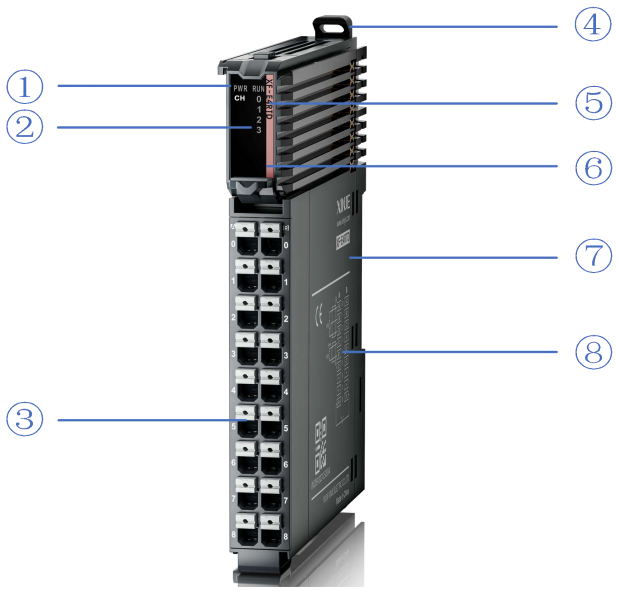
- 4-channel thermal resistance temperature acquisition.
- Compatible with three wire and two-wire thermal resistance sensors.
- Supports PT100, PT1000, CU50, CU100, NTC-5K, NTC-10K sensor types.
- 0.1℃, 1℃ resolution (optional).
- Conversion speed of 250ms/4CH, 500ms/4CH, 1000ms/4CH (optional).
- 12mm width design.

■ Module version

Hardware version	Firmware version	Function
H2.0	V2.0	Basic functions for the first official production

8.2.2 Module view

(1) Description of each section

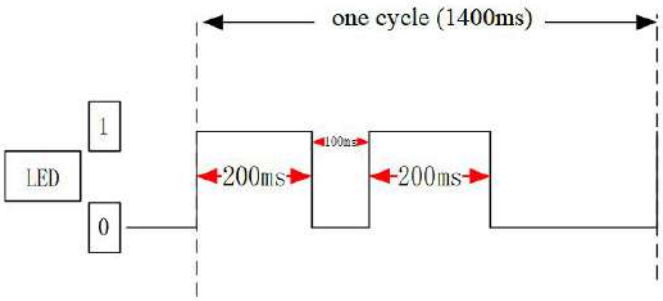


No.	Name	No.	Name
①	System LED indicator light	②	Channel LED indicator light
③	Detachable terminal block	④	Buckle
⑤	Model indication	⑥	Color identification indicating module type
⑦	Module hardware and firmware versions	⑧	Wiring diagram

(2) System indicator light

System indicator light	Meaning	
PWR (green)	OFF	Module not powered on (backplane bus)
	Always ON	All power supplies for the module are normal (backplane bus power supply&external input 24V)
	Flashing 1Hz*1	Module power supply abnormal and unable to operate normally (external)
RUN (green)	Always ON	The module is running normally
	Flashing 1Hz*1	General errors in module logs
	OFF	Important errors in module logs
	Flashing 10Hz*2	Module establishment communication in progress
	Double flashing*3	Module firmware update

- * 1: A square wave with a duty cycle of 50% and a frequency of 1Hz.
- * 2: A square wave with a duty cycle of 50% and a frequency of 10Hz.
- * 3: Double flashing as shown in the following figure:



(3) Channel indicator light

Model	Channel indicator		
XF-E4RTD	CH0~CH3	Always ON (green)	The channel is enabled and configured correctly
		Flashing 1Hz	Sensor disconnection/channel level error
		OFF	Disable channel

(5) Color identification

No.	Color		Module type
1		Grey White	Digital input
2		Gray	Digital output&digital mixed module
3		Light blue	Analog input
4		Dark blue	Analog output

No.	Color		Module type
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

8.2.3 General specifications

General specifications	
Item	Specification
Protection level	IP20
Anti vibration	Compliant with IEC61131-2 Under intermittent vibration (frequency 5-9Hz, constant amplitude 3.5mm peak displacement) and (frequency 9-150Hz, constant acceleration 1.0g peak acceleration) Under continuous intermittent vibration (frequency 5-9Hz half amplitude 1.75mm displacement) and (frequency 9-150Hz constant acceleration 0.5g constant frame amplitude) Scan 10 times in each direction of X, Y, and Z
Impact resistance	Compliant with IEC61131-2 standard Impact strength of 15G (peak) with a duration of 11ms is applied to three mutually perpendicular axes, with 3 impacts per axis (a total of 18 impacts)
Use altitude	0-2000m
Overvoltage level	II: Compliant with IEC61131-2
Pollution level	2, Compliant with IEC61131-2
Anti interference EMC	Compliant with IEC 61131-2 IEC61000-6-4 Type B
Related certifications	CE

8.2.4 Technical specification

Item		Specification
Number of input channels		4CH
Sensor type		PT100, PT1000, CU50, CU100, NTC-5K, NTC-10K
Temperature input range		Pls refer to the sensor accuracy table for details
Conversion speed		250ms, 500ms,1000ms optional (Default 500ms)
Resolution		1℃, 0.1℃ optional (Default0.1℃)
Module power supply	Rated input	DC24V±10%, 6mA
	Protection	Reverse polarity protection
Accuracy	Normal temperature 25℃±5℃	Please refer to the sensor accuracy table for details
	Full temperature	Please refer to the sensor accuracy table for details

	range -20~55℃	
Isolation		Channel not isolated, Power isolated
Module power consumption		0.7W (Backplane bus)+0.3W(External input)
Weight		82g
Maximum cable length		200m(Only three-wire PT100, PT1000, CU50, CU100; two-wire sensors cannot measure wire resistance, while NTC sensors have low sensor accuracy and cannot guarantee sampling accuracy over long distances

Example of channel conversion speed calculation:

If the sampling time is set to 250ms, then each channel=250ms/4 channels=62.5ms.
When channels are not disabled, sampling time=number of channels 4*62.5ms=250ms for each 4 channels.
When disabling a channel and enabling three channels, the sampling time is 3*62.5ms=187.5ms.
When disabling two channels and enabling two channels, the sampling time is 2*62.5ms=125ms.

8.2.5 Sensor Accuracy Table

Type		Temperature lower limit	temperature upper limit	Normal temperature accuracy (25℃±5℃)	Full temperature accuracy (-20~55℃)
PT100		-200.0	850.0	±1℃	±2℃
PT1000		-200.0	850.0	±1℃	±2℃
CU50		-50.0	150.0	±1℃	±2℃
CU100		-50.0	150.0	±1℃	±2℃
NTC-5K	B value:2000~6000	Resistance value: 40000Ω Calculate the temperature	Resistance value: 400Ω Calculate the temperature	±1.5℃	±3℃
NTC-10K	B value: 2000~6000	Resistance value: 40000Ω Calculate the temperature	Resistance value: 400Ω Calculate the temperature	±1.5℃	±3℃

The above accuracy indicators are all technical indicators in ℃ units.

The resistance measurement range of NTC sensor is 400 Ω~40000 Ω, the setting range of B value is 2000~6000, and the sensor label supports 5K and 10K. The temperature measurement range of NTC sensor is calculated based on the B value and sensor label setting. The temperature calculation formula is as follows:

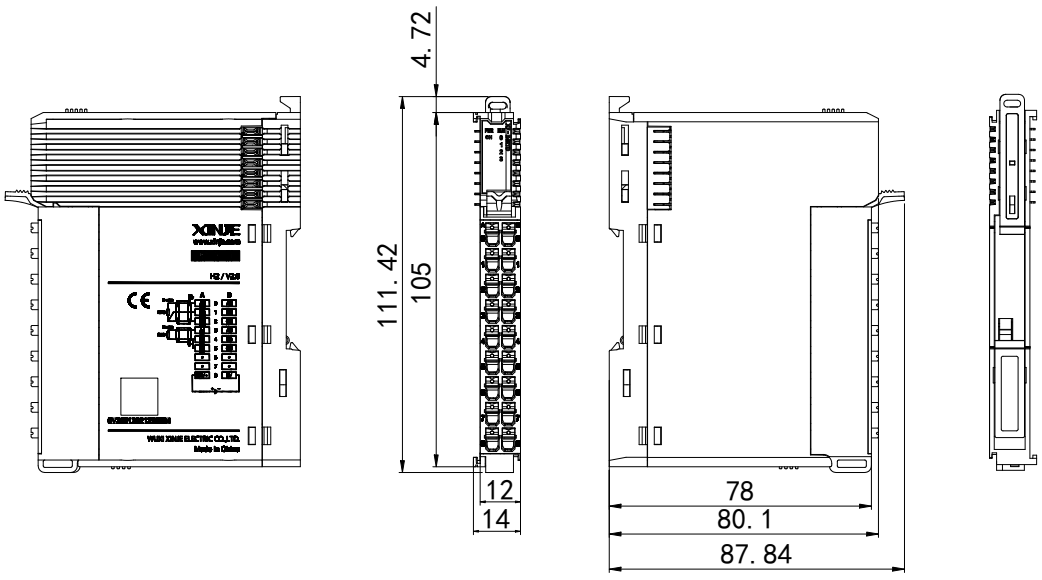
$$T=\frac{298.15*B}{298.15*\ln\left(\frac{R_T}{R_{25}}\right)+B}-273.15$$

(Refer to the method specified in 4.9 of the Chinese national standard GB/T6663.1-2007)
The resistance value measured by R_L has a maximum value of 40000Ω and a minimum value of 400Ω.
B is the B value, with a mini value of 2000 and a max value of 6000.
R_{25} is the sensor label, currently supporting 5K and 10K.

For example:
The NTC sensor is NTC-5K, with a B value set to 3000, a maximum R_L value of 40000 Ω, and a minimum R_L value of 400Ω. The lower temperature limit is calculated to be -26 ℃ (rounded to the nearest integer), and the upper temperature limit is calculated to be 125 ℃ (rounded to the nearest integer).

8.2.6 Installation&Wiring

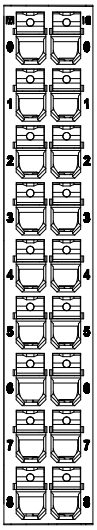
8.2.6.1 Dimension



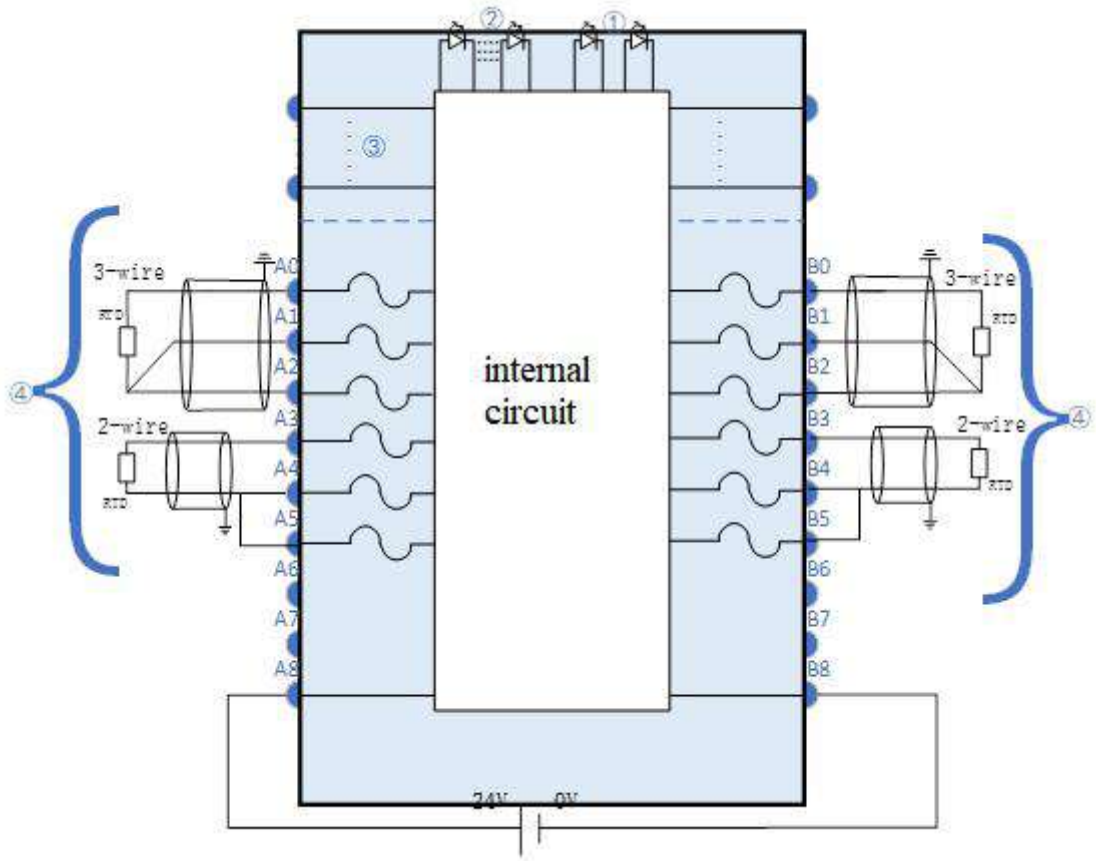
(Unit: mm)

8.2.6.2 Terminal definition and wiring

(1) Terminal definition

XF-E4RTD						
Meaning	Terminal	A-column terminal	Terminal layout	B-column terminal	Terminal	Meaning
CH0—input terminal	A0	0		0	A2	CH2— input terminal
CH0—common terminal	B0	1		1	B2	CH2— common terminal
CH0— common terminal	C0	2		2	C2	CH2— common terminal
CH1—input terminal	A1	3		3	A3	CH3— input terminal
CH1— common terminal	B1	4		4	B3	CH3— common terminal
CH1— common terminal	C1	5		5	C3	CH3— common terminal
Empty	NC	6		6	NC	Empty
Empty	NC	7		7	NC	Empty
External power supply to the module 24V power supply positive	24V	8		8	0V	External power supply to the module 24V power supply negative

(2) External wiring

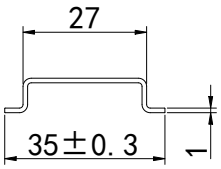


① System LED ② Channel LED ③ backplane bus ④ output channel&wiring

8.2.6.3 Installation method

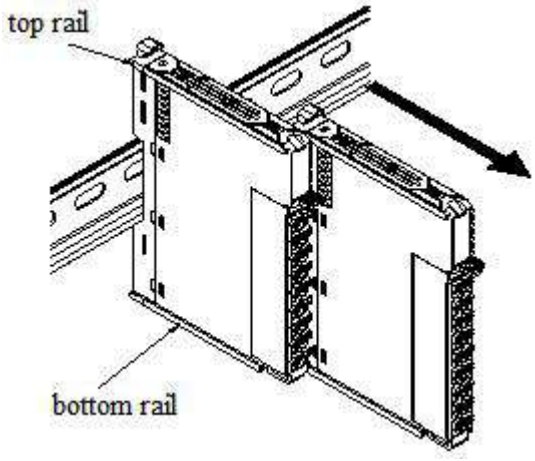
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

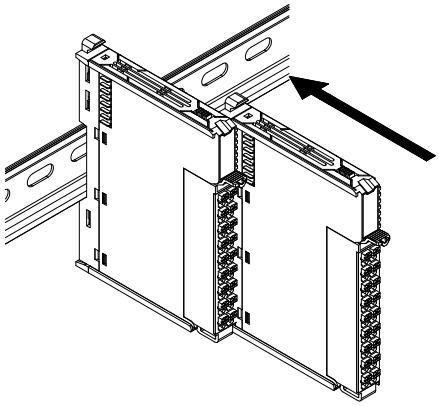


⚠	**Attention**	When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

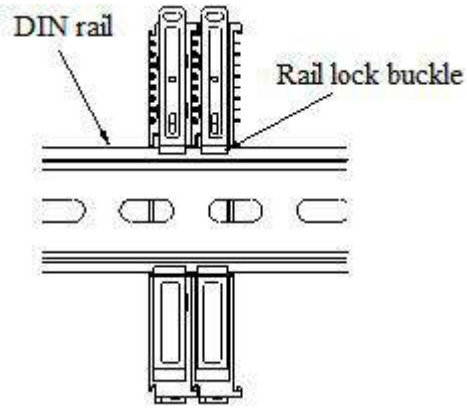
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

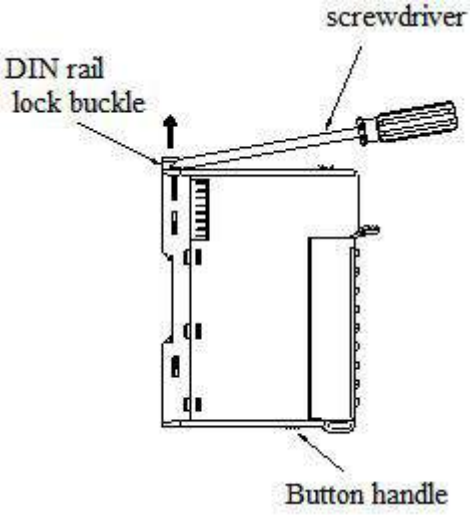


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

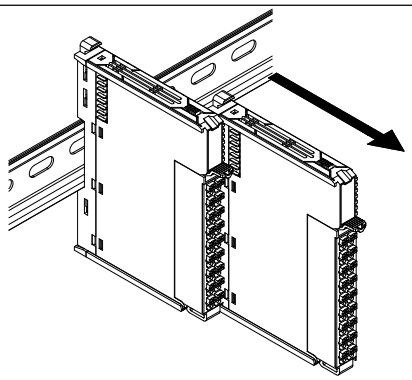


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



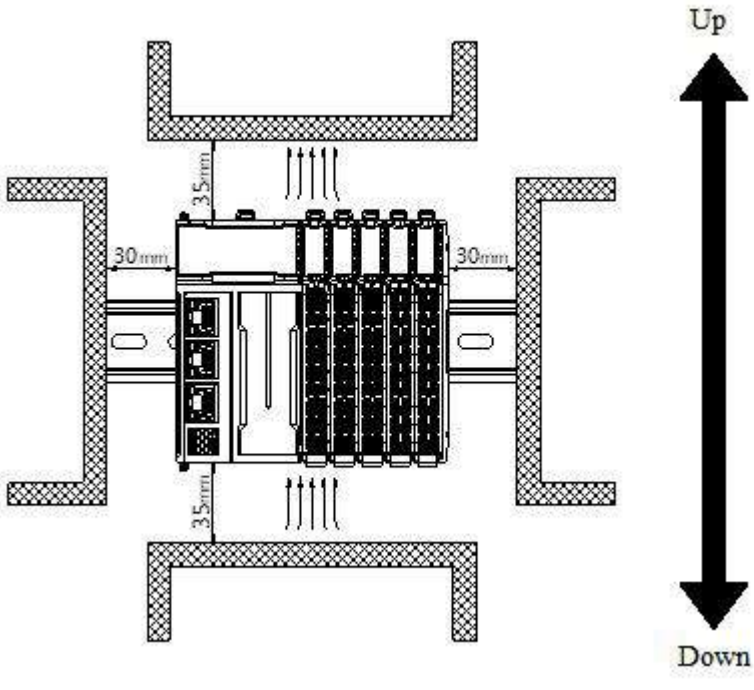
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



ull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

8.2.6.4 Installation environment

This product can be installed in four positions (i.e. installation direction): horizontal direction, vertical direction, top of the electrical cabinet, and bottom of the electrical cabinet. It is recommended to install it in the horizontal direction, and the heat dissipation design is through natural convection. To ensure normal ventilation and heat dissipation and reserve sufficient wiring space, the minimum gap must be retained around this product, as shown in the following figure:



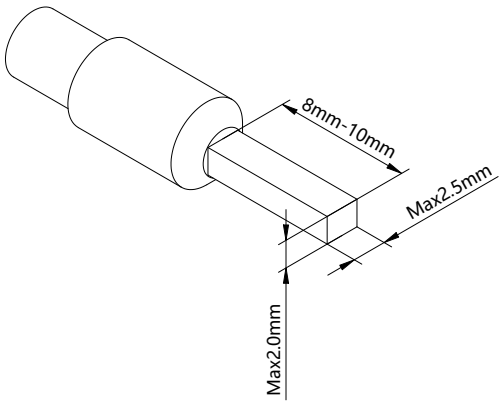
If there are high-temperature heat source equipment (heaters, transformers, large resistors, etc.) around this product, a gap of at least 100mm should be left between them.

8.2.6.5 Equipment wiring

When wiring modules, their connectors must meet the following requirements:

Adaptive wire diameter	
National standard /mm^2	American Standard /AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

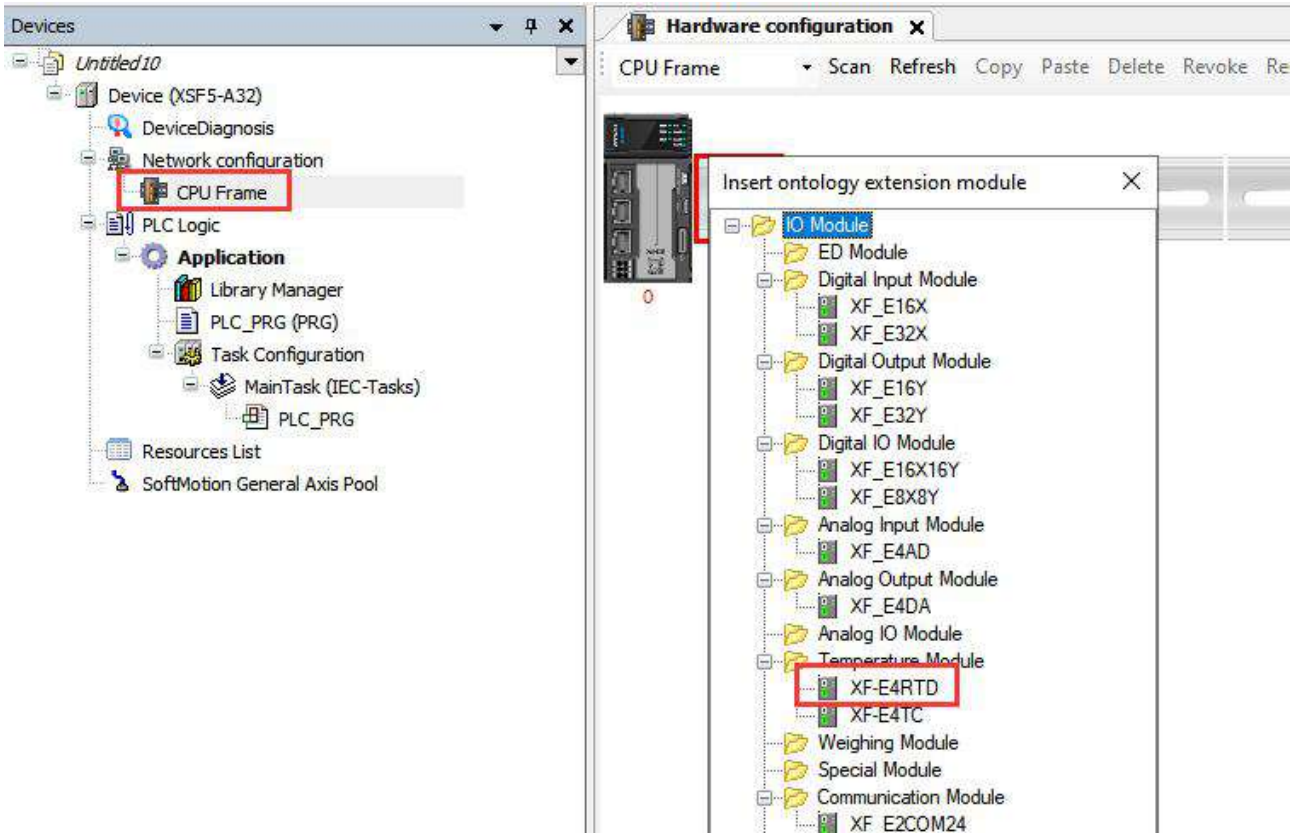
If using other types of terminal lugs, crimp them onto the stranded wire. The shape and dimensions should conform to the diagram shown below.

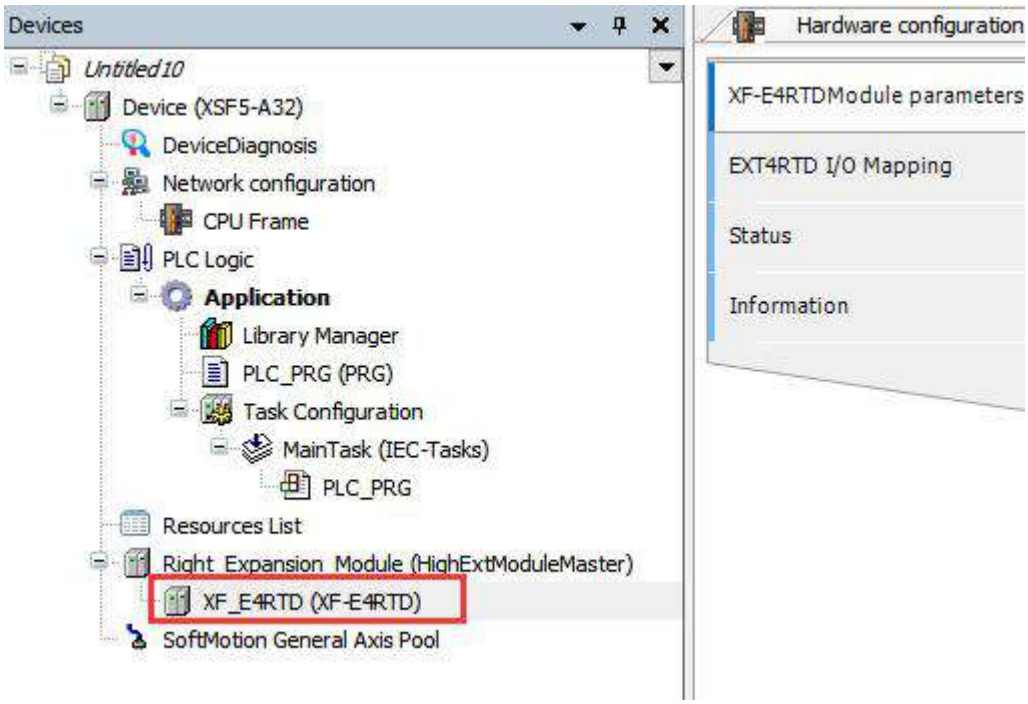


8.2.7 Configure the module

Right Extension Module: Double click the space for the extension module in "CPU Frame", and then click "XF-E4RTD" in the pop-up "Insert ontology extension module" dialog box to add the module, as shown in the following figure.

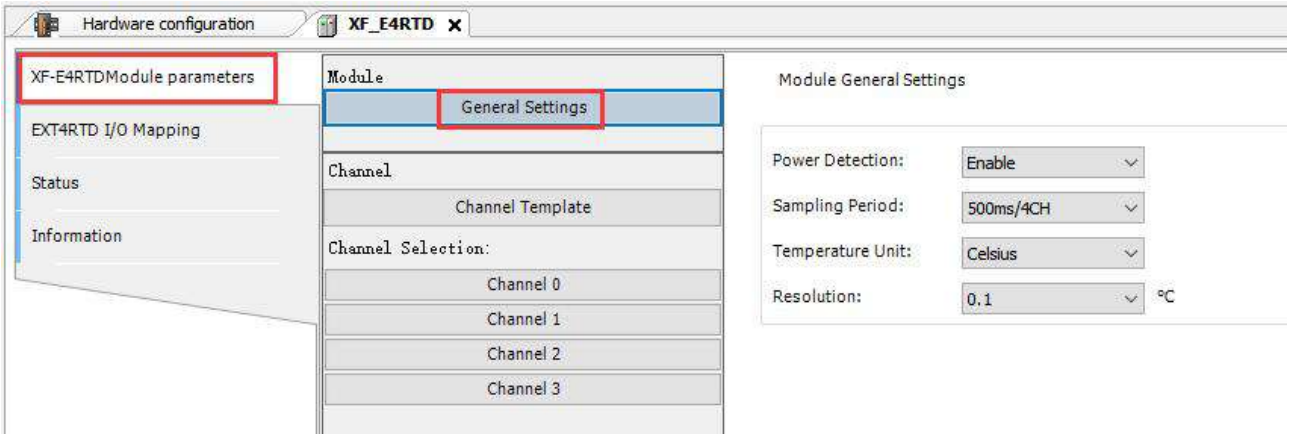
Configure LF Series Remote IO: For specific configuration examples, please refer to the LF Series Remote IO User Manual.


Devices
Untitled10
Device (XSF5-A32)
DeviceDiagnosis
Network configuration
CPU Frame
PLC Logic
Application
Library Manager
PLC_PRG (PRG)
Task Configuration
MainTask (IEC-Tasks)
PLC_PRG
Resources List
SoftMotion General Axis Pool
Hardware configuration
CPU Frame
Scan
Refresh
Copy
Paste
Delete
Revoke
0
Insert ontology extension module
IO Module
ED Module
Digital Input Module
XF_E16X
XF_E32X
Digital Output Module
XF_E16Y
XF_E32Y
Digital IO Module
XF_E16X16Y
XF_E8X8Y
Analog Input Module
XF_E4AD
Analog Output Module
XF_E4DA
Analog IO Module
XF-E4RTD
XF-E4TC
Weighing Module
Special Module
Communication Module
XF_E2COM24


Devices
Untitled10
Device (XSF5-A32)
DeviceDiagnosis
Network configuration
CPU Frame
PLC Logic
Application
Library Manager
PLC_PRG (PRG)
Task Configuration
MainTask (IEC-Tasks)
PLC_PRG
Resources List
Right_Expansion_Module (HighExtModuleMaster)
XF_E4RTD (XF-E4RTD)
SoftMotion General Axis Pool
Hardware configuration
XF-E4RTDModule parameters
EXT4RTD I/O Mapping
Status
Information

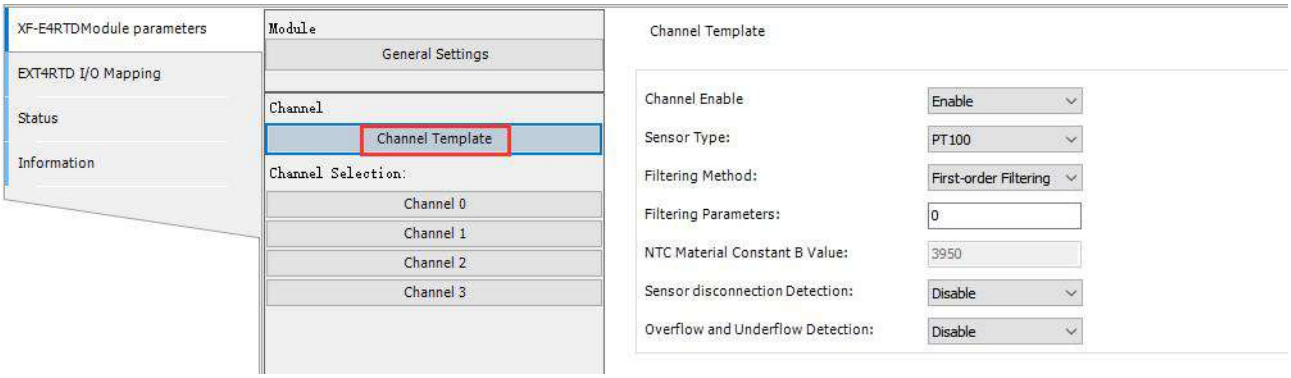
8.2.8 Module parameter

8.2.8.1 General setting



Parameter	Initial value	Explanation
Power detection	Enable	Disable /enable
Sampling period	500ms/4CH	250ms/4CH 500ms/4CH 1000ms/4CH
Temperature unit	℃	℃/℉
Resolution	0.1℃	1℃/1℉ 0.1℃/0.1℉

8.2.8.2 Channel template



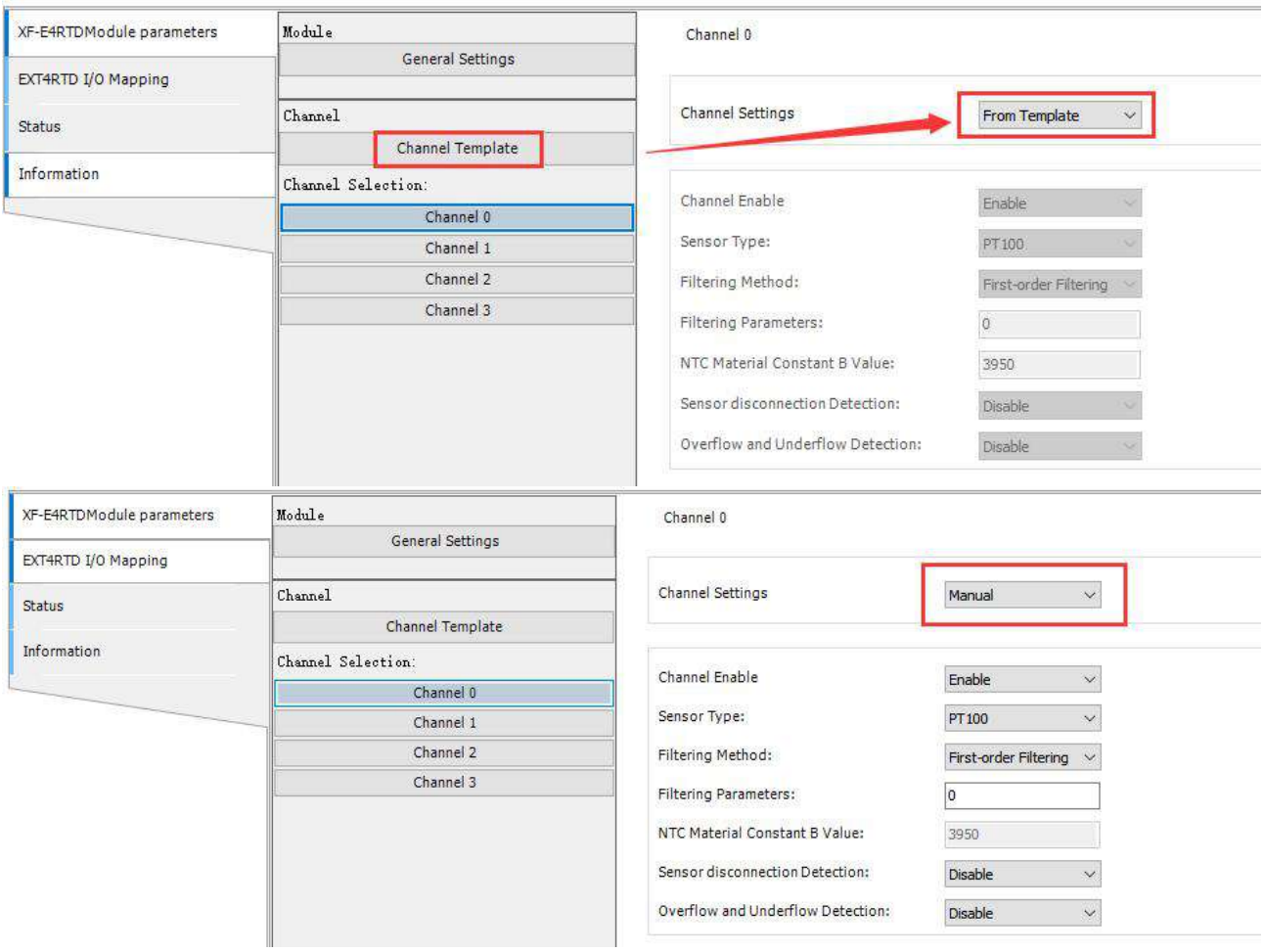
Parameter	Initial value	Explanation
Channel enable	Enable	Disable /enable
Sensor type	PT100	PT100/PT1000/CU50/CU100/NTC-5K/NTC-10K
Filtering method	First order filtering	First order filtering/time averaging/frequency averaging/moving average
Filtering parameter	0	First order filtering (0~254) defaults to 0 Time average (250~60000ms) default value 1000 Average frequency (4~500) default 4

Parameter	Initial value	Explanation
		Moving average (2~500) default 2
NTC material constant B value	3950	2000~6000 When the "Sensor Type" is "NTC-5K" or "NTC-10K", it can be inputted
Sensor disconnection detection	Disable	Disable/Enable
Overflow and underflow detection	Disable	Disable/Enable

Channel filtering parameters		
First order filtering	Functional action	The first-order low-pass filtering method weights the current sampling value with the previous filtering output value to obtain the effective filtering value; The filtering coefficient is set by the user to 0~254. The smaller the value, the more stable the data is, but it may cause data lag; Therefore, when set to 1, the filtering effect is the strongest and the data is the most stable; When set to 254, the filtering effect is the weakest; 0 is unfiltered.
	Setting range	0~254 (default value 0)
Time average	Functional action	Perform A/D conversion according to the set time, and average the total value after removing the maximum and minimum values. The average processed value is stored in the corresponding output to the buffer memory. The number of processing times within the set time varies according to the number of channels allowed for A/D conversion. The larger the value, the stronger the filtering effect.
	Setting range	250~60000ms (default 1000)
Count average	Functional action	Perform A/D conversion according to the set number of times, and average the total value after removing the maximum and minimum values. The average processed value is stored in the corresponding channel variable. The average value of the number of times stored in the corresponding channel variable varies depending on the number of channels allowed for A/D conversion. The larger the value, the stronger the filtering effect.
	Setting range	4~500 (default value 4)
Moving average	Functional action	After averaging the specified number of digital output values obtained in each sampling period, store them in the corresponding output register/variable. Due to the use of moving average processing in each sampling process, the latest digital output value can be obtained. The larger the value, the stronger the filtering effect.
	Setting range	2~500 (default value 2)

Calculate the number of measurement input values to be averaged when using 'time averaging' according to the following formula.
The average number of measured input values processed=average time ÷ sampling period
Discard the numerical value after the decimal point in the calculation result. When the calculated quantity is less than or equal to 1, it is not filtered.

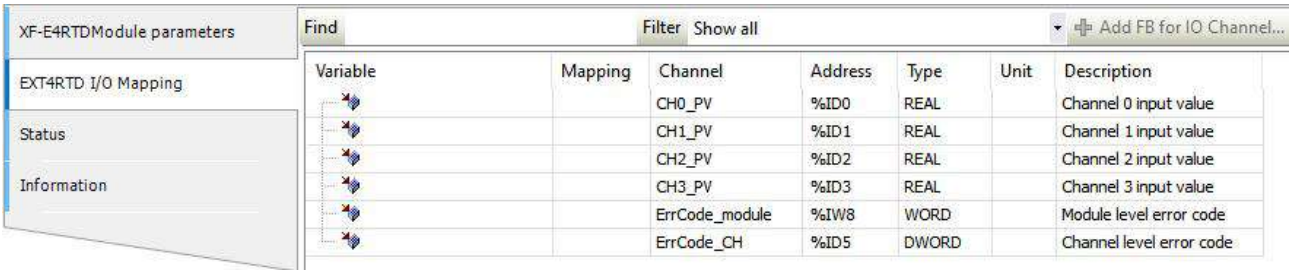
8.2.8.3 Channel selection



Parameters such as whether to enable, sensor type, filtering method, etc. can be set separately for each channel.

Channel setting	From Template: Use the parameters from "Channel Template" Interface Manual: Use the configuration parameters below this interface

8.2.9 I/O mapping



Channel input value	Display the temperature values of each of the four channels, with units and resolutions specified in the "Module Parameters" - "General Settings" section for temperature units and resolutions
Module level error code	See the table below
Channel level error code	See the table below

Module level error code (ErrCode_module)		
Bit location	Meaning	Error level
0	The 24V input power supply of the module is abnormal	Important
2	An internal module error has occurred and the user layer is unable to repair it	Important
3	Version mismatch	Important
4	ADC read/write failure	Important

Channel level error code (EErrCode_CH)		
Bit location	Meaning	Error level
0	Channel 0 upper limit overflow	General
1	Channel 0 lower limit overflow	General
2	Channel 0 disconnected	General
3	Reserved	-
4	Channel 1 upper limit overflow	General
5	Channel 1 lower limit overflow	General
6	Channel 1 disconnected	General
7	Reserved	-
8	Channel 2 upper limit overflow	General
9	Channel 2 lower limit overflow	General
10	Channel 2 disconnected	General
11	Reserved	-
12	Channel 3 upper limit overflow	General
13	Channel 3 lower limit overflow	General
14	Channel 3 disconnected	General
15	Reserved	-

8.3 Thermocouple temperature acquisition module

XF-E4TC

8.3.1 Product overview

XF-E4TC series thermocouple temperature acquisition expansion module, 4-channel thermocouple temperature acquisition, suitable for pure acquisition scenarios, no output channel, power supply DC24V, compatible with XSF series CPU unit and XF series communication coupler units.

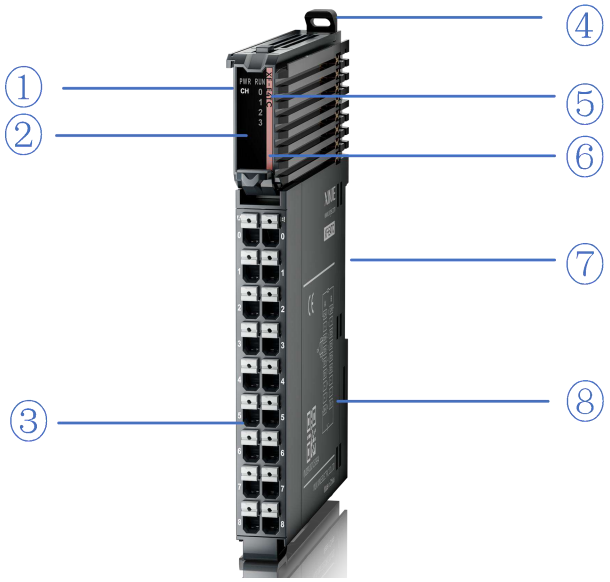
- 4-channel thermocouple temperature acquisition.
- Supports K, S, E, N, B, T, J, and R sensor types.
- Support -100mV~100mV voltage acquisition.
- 0.1℃, 1℃ resolution (optional).
- Conversion speed of 250ms/4CH, 500ms/4CH, 1000ms/4CH (optional).
- Designed with a width of 12mm.

■ Module version

Hardware	Firmware	Function
H2.0	V2.0	First official production of basic functions

8.3.2 Module view

(1) Explanation of each section



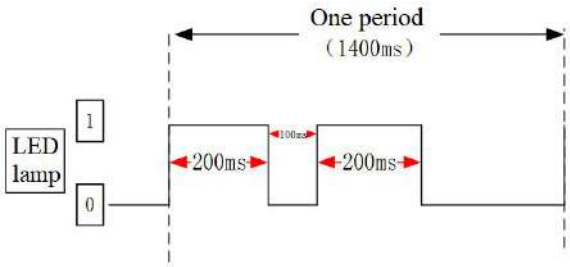
No.	Name	No.	Name
①	System LED indicator light	②	Channel LED indicator light
③	Detachable terminal block	④	Buckle

No.	Name	No.	Name
⑤	Model indication	⑥	Color identification indicating module type
⑦	Module hardware and firmware versions	⑧	Wiring diagram

(2) System indicator light

System indicator light	Meaning	
PWR (green)	OFF	Module not powered on (backplane bus)
	Awlays ON	All power supplies for the module are normal (backplane bus power supply&external input 24V)
	Flashing 1Hz*1	Module power supply abnormal and unable to operate normally (external)
RUN (green)	Always ON	The module is running normally
	Flashing 1Hz*1	General errors in module logs
	OFF	Important errors in module logs
	Flashing 10Hz*2	Module establishment communication in progress
	Double flashing*3	Module firmware update

- * 1: A square wave with a duty cycle of 50% and a frequency of 1Hz.
- * 2: A square wave with a duty cycle of 50% and a frequency of 10Hz.
- * 3: Double flashing as shown in the following figure:



(3) Channel indicator light

Model	Channel indicator light		
XF-E4TC	CH0~CH3	Awlays ON (green)	The channel is enabled and configured correctly
		Flashing 1Hz	Sensor disconnection/channel level error

Model	Channel indicator light		
		OFF	Disable channel

(4) Color identification

No.	Color		Module type
1		Grey white	Digital input
2		Gray	Digital output&digital mixing module
3		Light blue	Analog input
4		Deep blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

8.3.3 General specification

General specification	
Item	Specification
Protection level	IP20
Anti-vibration	Under the requirements of IEC 61131-2. For intermittent vibration: - Frequency from 5-9 Hz with a constant amplitude of 3.5 mm peak displacement - Frequency from 9-150 Hz with a constant acceleration of 1.0g peak acceleration For continuous vibration: - Frequency from 5-9 Hz with a half amplitude of 1.75 mm displacement - Frequency from 9-150 Hz with a constant acceleration of 0.5g constant frame amplitude Scanning is performed 10 times in each direction: X, Y, and Z.
Impact resistance	Compliant with IEC 61131-2 standards; Shock intensity of 15g (peak) with a duration of 11ms is applied to each of the three mutually perpendicular axes. Each axis is subjected to 3 shocks, totaling 18 shocks.
Using altitude	0-2000m
Usage environment	Non corrosive gas
Overvoltage level	II: Compliant with IEC61131-2
Pollution level	2; Compliant with IEC61131-2
EMC	Compliant with IEC 61131-2 IEC61000-6-4 B type
Certificate	CE

8.3.4 Technical specification

Item		Specification	
Input channels		4CH	
Sensor type		Thermocouple: K, S, E, N, B, T, J, R Voltage: -100mV~100mV	
Analog input range (rated)	Thermocouple	K	-200.0℃~1300.0℃
		S	-50.0℃~1768.0℃
		E	-200.0℃~1000.0℃
		N	-200.0℃~1300.0℃
		B	250.0℃~1820.0℃
		T	-200.0℃~400.0℃
		J	-210.0℃~1200.0℃
		R	-50.0℃~1768.0℃
	Voltage	-100mV~100mV (-32000~32000)	
Conversion speed		250ms, 500ms, 1000ms optional (default 500ms)	
Resolution	Thermocouple	1℃, 0.1℃ optional (default 0.1℃)	
	Voltage	1/64000	
Module power supply	Rated input	DC24V±10%, 6 mA	
	Protection	Reverse connection protection	
Accuracy	normal atmospheric temperature 25℃±5℃	Please refer to the sensor accuracy table for details.	
	Full temperature range -20~55℃	Please refer to the sensor accuracy table for details.	
Repeatability		±0.05%	
Cold end compensation method		Built in cold end sensor, external cold end compensation, fixed value compensation	
Cold end compensation accuracy		Please refer to the cold end accuracy table for details	
Isolation		Channel non isolated, power isolated	
Module power consumption		0.7W (backplane bus) +0.3W (external input)	
Module weight		82g	
Maximum cable length		50m	

Example of channel conversion speed calculation:

If the sampling time is set to 250ms, then each channel=250ms/4 channels = 62.5ms.

When channels are not disabled, sampling time=number of channels 4 * 62.5ms=250ms/4 channels.

When disabling a channel, such as disabling one channel and enabling three channels, the sampling time is 3 * 62.5ms=187.5ms; Disable 2 channels, and enable 2 channels with a sampling time of 2 * 62.5ms=125ms.

If the "external compensation channel" method is selected for the "cold end compensation method", the sampling time of the module will be increased by one channel.
If the sampling time is set to 250ms, the channel is not disabled, and the "external compensation channel" method is selected for the "cold end compensation method", then the actual sampling time of the module is 250+250/4=312.5ms.

8.3.5 Sensor accuracy table

Accuracy standards

Type	Lower limit temperature	Upper limit temperature	Room temperature accuracy (25℃±5℃)	Full temperature range accuracy (-20~55℃)
K	-200.0℃	1300.0℃	±1.5℃	±3℃
S	-50.0℃	1768.0℃	±2℃	±4℃
E	-200.0℃	1000.0℃	±1℃	±2℃
N	-200.0℃	1300.0℃	±1.5℃	±3℃
B	250.0℃ 800.0℃	799.9℃ 1820.0℃	±4℃ ±2℃	±5℃ ±4℃
T	-200.0℃	400.0℃	±1℃	±2℃
J	-210.0℃	1200.0℃	±1℃	±2℃
R	-50.0℃	1768.0℃	±2℃	±4℃
-100mv /+100mv	-32000 (Numbers are only integers, decimals are 0)	32000 (Numbers are only integers, decimals are 0)	±0.1%	±0.2%

Built in cold end compensation accuracy

Installation direction	Adjacent module types	Built in sensor cold end compensation accuracy	
		T-type above 90℃ J, E, K, N above -100℃ R, S above 200℃ Above 400℃ for B type	T-type below -90℃ J, E, K, N below -100℃ R, S below 200℃ B-type does not guarantee accuracy below 400℃
Horizontal upright installation	Temperature module	±1.5	±3.0
	Non temperature module	±4.0	±7.0
Non horizontal upright installation	Temperature module	±4.0	±7.0
	Non temperature module	±4.0	±7.0

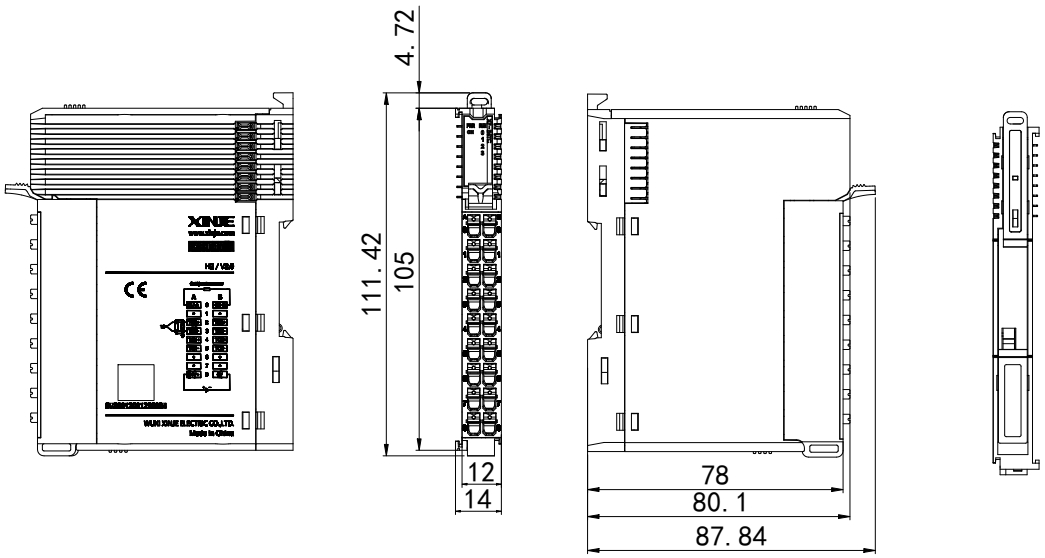
External cold end channel compensation accuracy: ±1.5℃.

Comprehensive accuracy=channel conversion accuracy+cold end compensation accuracy

Explanation: The above accuracy indicators are all technical indicators in ℃ units.

8.3.6 Installation and wiring

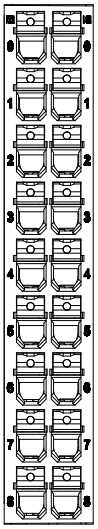
8.3.6.1 Appearance dimension diagram



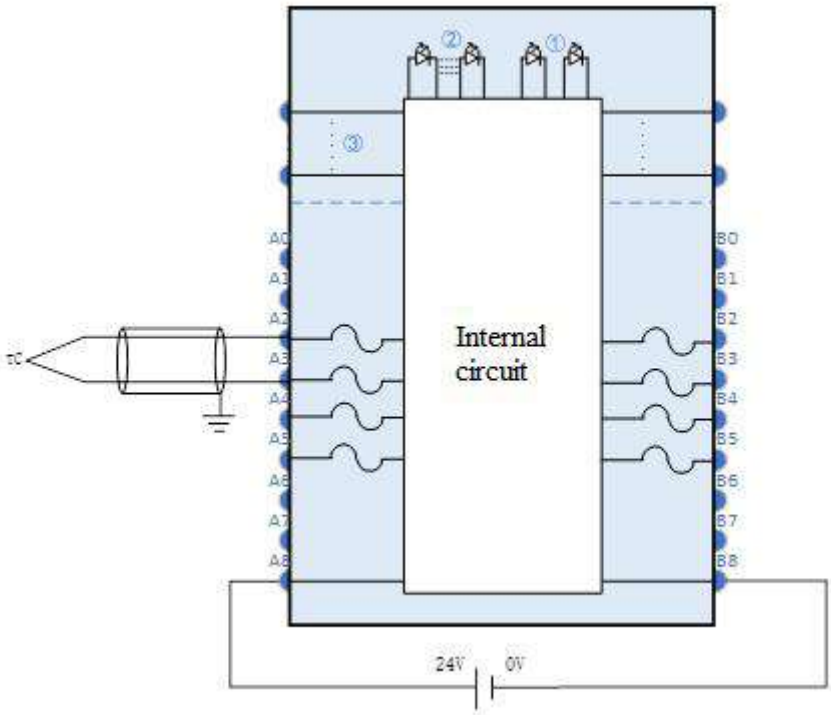
(Unit: mm)

8.3.6.2 Terminal definition and wiring

(1) Terminal definition

XF-E4TC						
Meaning	Terminal	A-column terminal	Terminal layout	B-column terminal	Terminal	Meaning
Cold end compensation -A	CJ-A	0		0	CJ-B	Cold end compensation -B
Vacant	NC	1		1	NC	Vacant
CH0-input terminal	TC0+	2		2	TC2+	CH2- input terminal
CH0-common terminal	TC0-	3		3	TC2-	CH2- common terminal
CH1- input terminal	TC1+	4		4	TC3+	CH3- input terminal
CH1- common terminal	TC1-	5		5	TC3-	CH3- common terminal
Vacant	NC	6		6	NC	Vacant
Vacant	NC	7		7	NC	Vacant
External power supply to the module 24V+	24V	8		8	0V	External power supply to the module 24V-

(2) External wiring

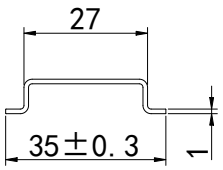


① System LED ② Channel LED ③ Backplane bus ④ Output channel&wiring

8.3.6.3 Installation method

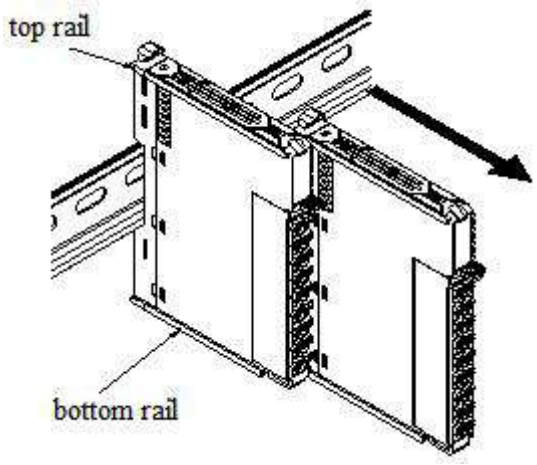
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

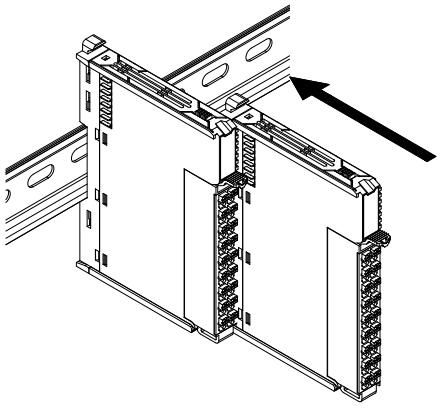


When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

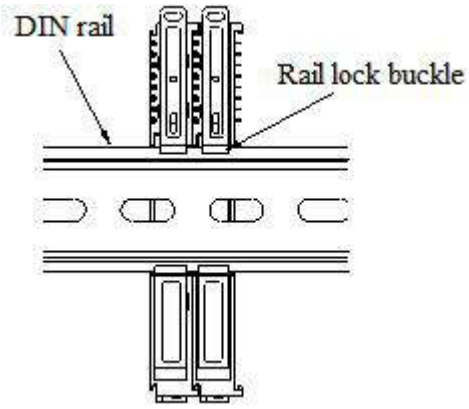
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

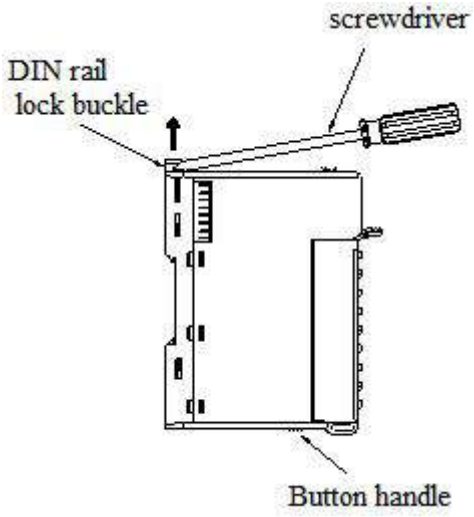


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

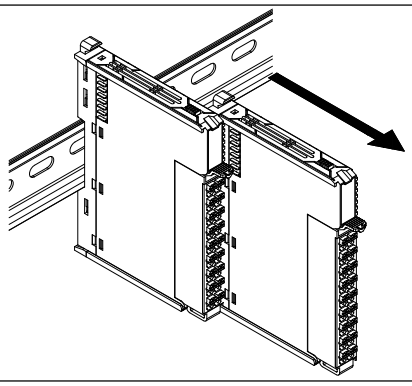


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



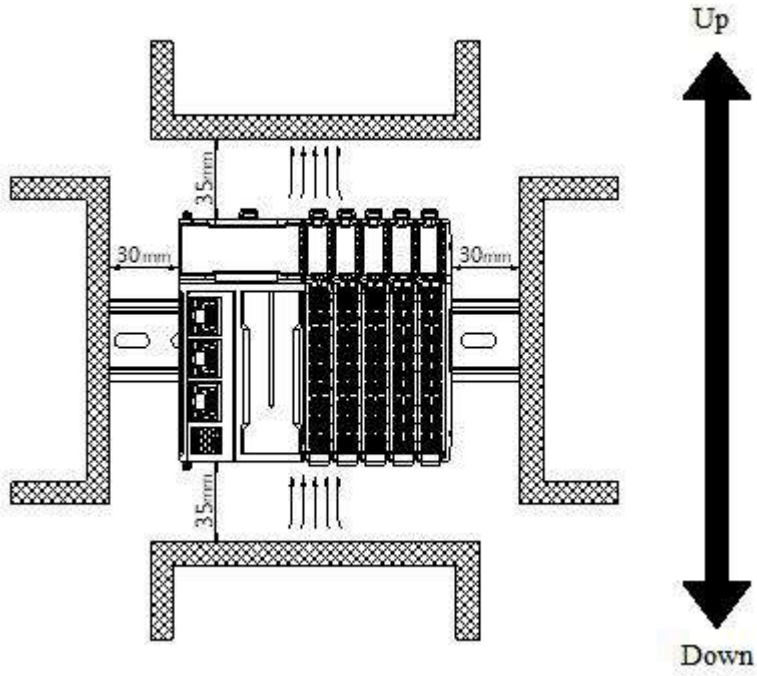
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

8.3.6.4 Installation environment

This product can be installed in four positions (i.e. installation direction): horizontal direction, vertical direction, top of the electrical cabinet, and bottom of the electrical cabinet. It is recommended to install it in the horizontal direction, and the heat dissipation design is through natural convection. To ensure normal ventilation and heat dissipation and reserve sufficient wiring space, the minimum gap must be retained around this product, as shown in the following figure:



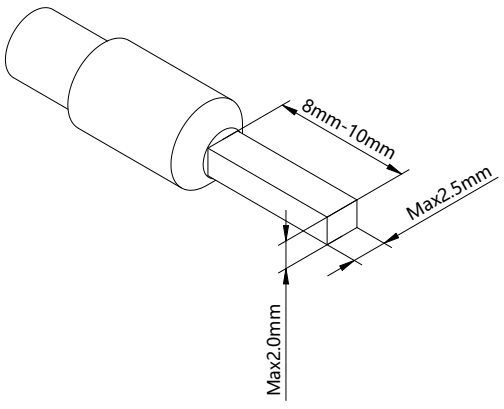
If there are high-temperature heat source equipment (heaters, transformers, large resistors, etc.) around this product, a gap of at least 100mm should be left between them.

8.3.6.5 Equipment wiring

When wiring modules, their connectors must meet the following requirements:

Adaptive wire diameter	
National standard /mm^2	American Standard /AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

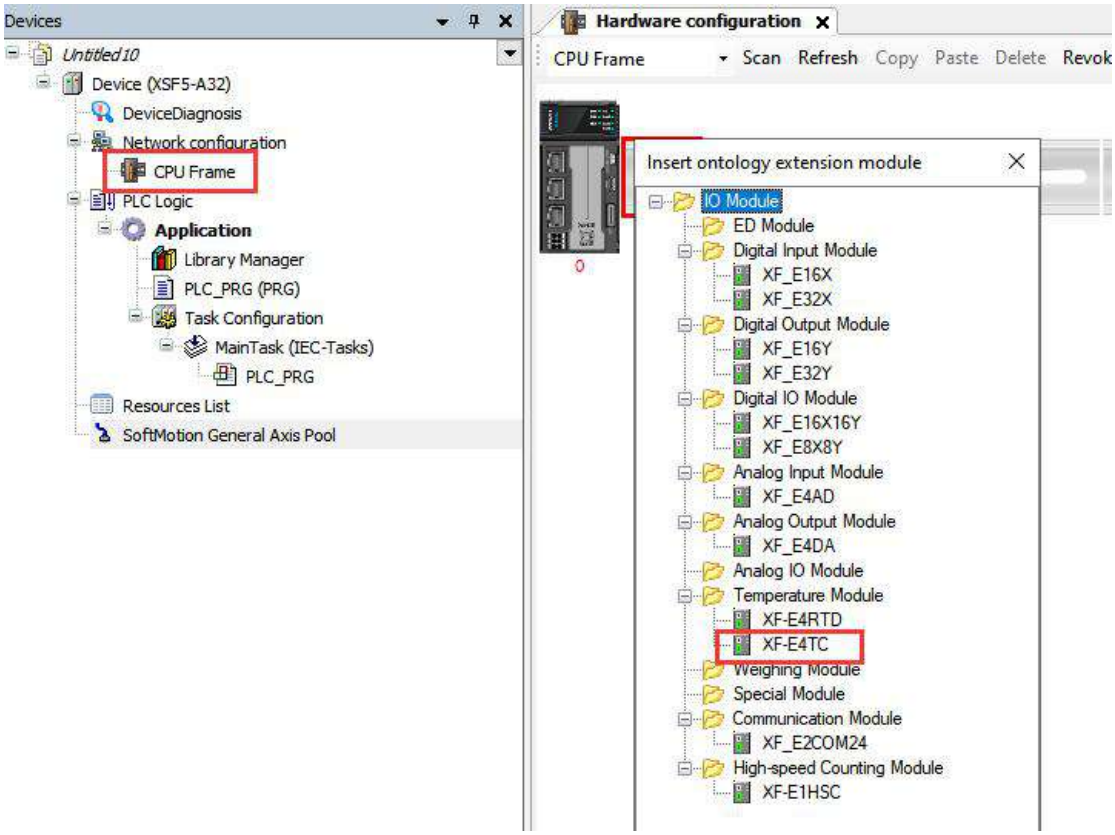
If using other types of terminal lugs, crimp them onto the stranded wire. The shape and dimensions should conform to the diagram shown below.

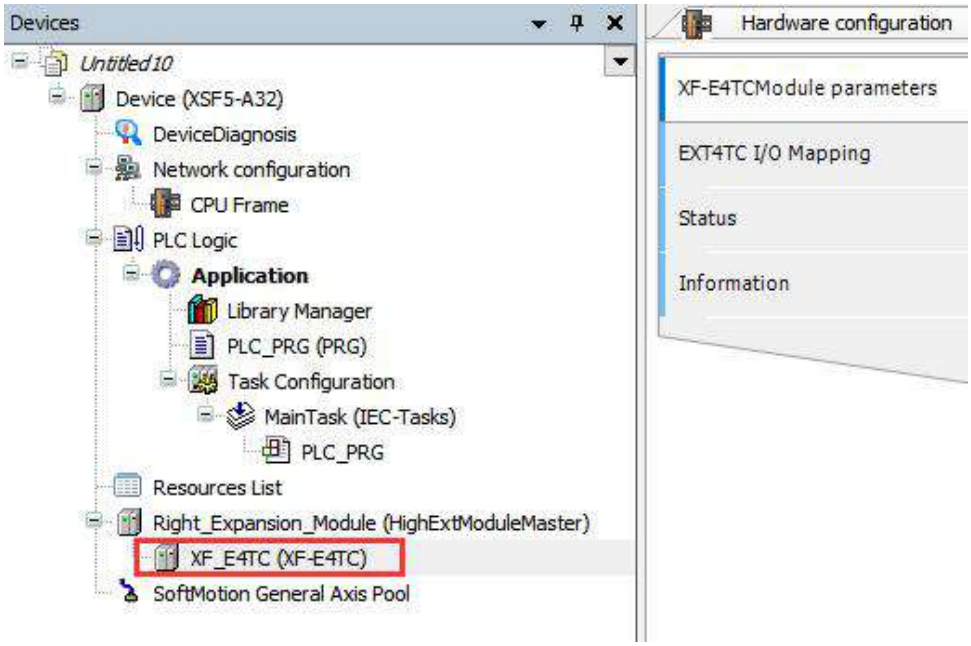


8.3.7 Module configuration

Right Extension Module: Double click the space for the extension module in "CPU Frame", and then click "XF-E4TC" in the pop-up "Insert ontology extension module" dialog box to add the module, as shown in the following figure.

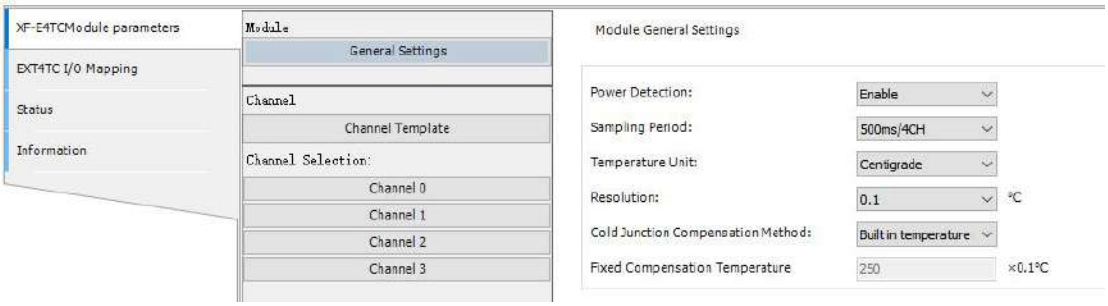
Configure LF Series Remote IO: For specific configuration examples, please refer to the LF Series Remote IO User Manual.





8.3.8 Module parameters

8.3.8.1 General setting

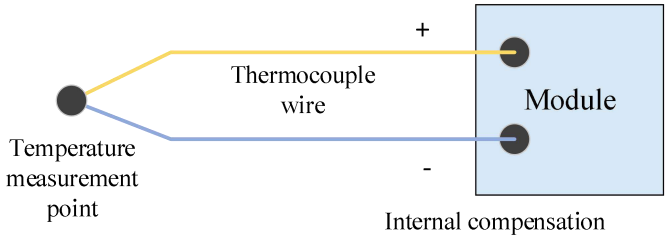


Parameter	Initial value	Explanation
Power detection	Enable	Disable/Enable
Sampling period	500ms/4CH	250ms/4CH 500ms/4CH 1000ms/4CH
Temperature unit	℃	℃ ℉
Resolution	0.1℃	1℃/1℉ 0.1℃/0.1℉
Cold junction compensation method	Built in temperature sensor	Built in temperature sensor External compensation channel Fixed value compensation
Fixed compensation temperature	250 (25.0℃)	Fixed value compensation temperature Unit: 0.1℃ Range: -145.0℃~155.0℃

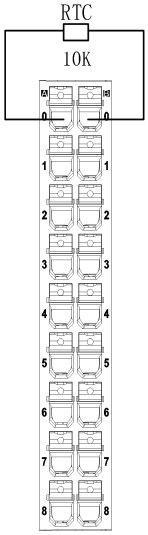
■ Cold end compensation method&fixed value compensation temperature

Thermocouples consist of two wires made from different metals or metal alloys, with the ends of the wires welded together at one end, known as the measuring junction, and the other ends are open, referred to as the reference junction (or cold junction). A thermoelectric voltage appears at the measuring junction, which is dependent on the temperature there. By measuring this thermoelectric voltage, the temperature at the measuring junction can be determined. When measuring temperature with a thermocouple, it is important to keep the temperature of the cold junction constant so that the resulting thermoelectric voltage maintains a proportional relationship with the measured temperature. If the ambient temperature of the cold junction changes during measurement, it will significantly affect the accuracy. Therefore, when using a thermocouple for temperature measurement, cold junction compensation is typically required.
The module provides three methods for cold junction compensation: "built-in temperature sensor," "external compensation channel," and "fixed value compensation."

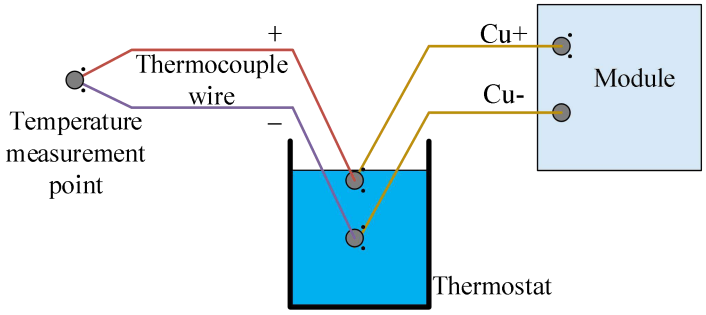
- "Built-in temperature sensor" cold junction compensation uses the temperature collected by the module's built-in cold junction sensor. This requires directly connecting the thermocouple to the module or connecting it through compensation wires.

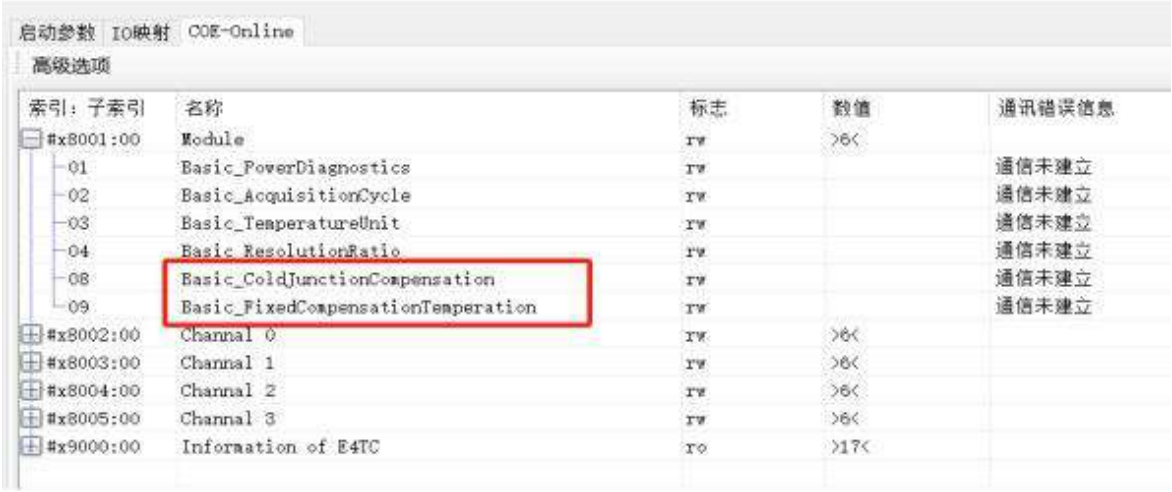


- "External compensation channel" requires using an additional thermistor (NTC10K, B3950) connected to the module's A0 and B0 terminals to detect the cold junction temperature for compensation.

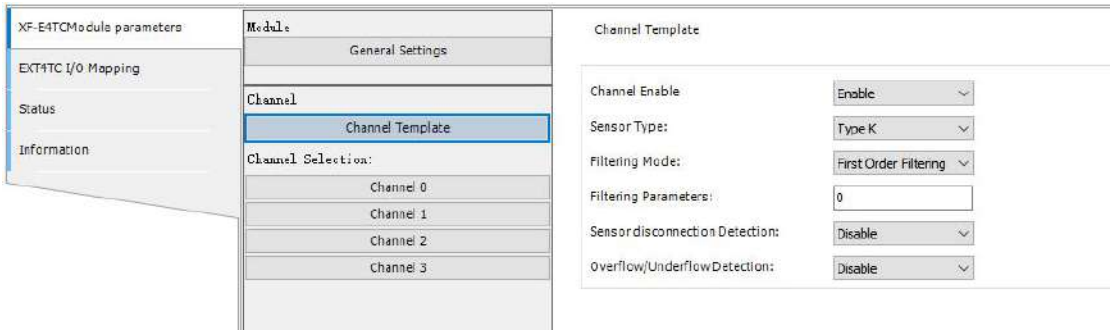


- "Fixed value compensation" uses a preset "fixed compensation temperature" for the cold junction, with a default of 250 (25.0°C). The setting range is -1450 to 1550 (in 0.1°C units). It's important to ensure that the "fixed compensation temperature" matches the actual temperature at the cold junction location. To further improve accuracy, you can use a thermostat as shown in the diagram and set the "fixed compensation temperature" to match the thermostat's temperature.





8.3.8.2 Channel template



Parameter	Initial value	Explanation
Channel enable	Enable	Enable/disable
Sensor type	Type K	Thermocouples: K-type, S-type, E-type, N-type, B-type, T-type, J-type, R-type Voltage: -100mv/+100mv
Filtering mode	First order filtering	First order filtering/time averaging/frequency averaging/moving average
Filtering parameters	0	First order filtering (0~254) defaults to 0 Time average (250~60000ms) default value 1000 Average frequency (4~500) default 4 Moving average (2~500) default 2
Sensor disconnection detection	Disable	Enable/disable
Overflow/underflow detection	Disable	Enable/disable

■ Channel filtering parameters

- First order filtering

The first-order low-pass filter method uses a weighted combination of the current sample value and the previous filtered output value to obtain an effective filtered value. The filter coefficient is user-defined, ranging from 0 to 254. A smaller value results in more stable data but may cause data lag. Therefore, setting it to 1 provides the strongest filtering effect and most stable data, while setting it to 254 gives the weakest filtering effect. A setting of 0 means no filtering.

- Average filtering

Paramter		Explanation
Time average	Functional action	Perform A/D conversion according to the set time, and average the total value after removing the maximum and minimum values. The average processed value is stored in the corresponding output to the buffer memory. The number of processing times within the set time varies according to the number of channels allowed for A/D conversion. The larger the value, the stronger the filtering effect.
	Setting range	250~60000ms (default 1000)
Count average	Functional action	Perform A/D conversion according to the set number of times, and average the total value after removing the maximum and minimum values. The average processed value is stored in the corresponding channel variable. The average value of the number of times stored in the corresponding channel variable varies depending on the number of channels allowed for A/D conversion. The larger the value, the stronger the filtering effect.
	Setting range	4~500 (default value 4)
Moving average	Functional action	After averaging the specified number of digital output values obtained in each sampling period, store them in the corresponding output register/variable. Due to the use of moving average processing in each sampling process, the latest digital output value can be obtained. The larger the value, the stronger the filtering effect.
	Setting range	2~500 (default value 2)

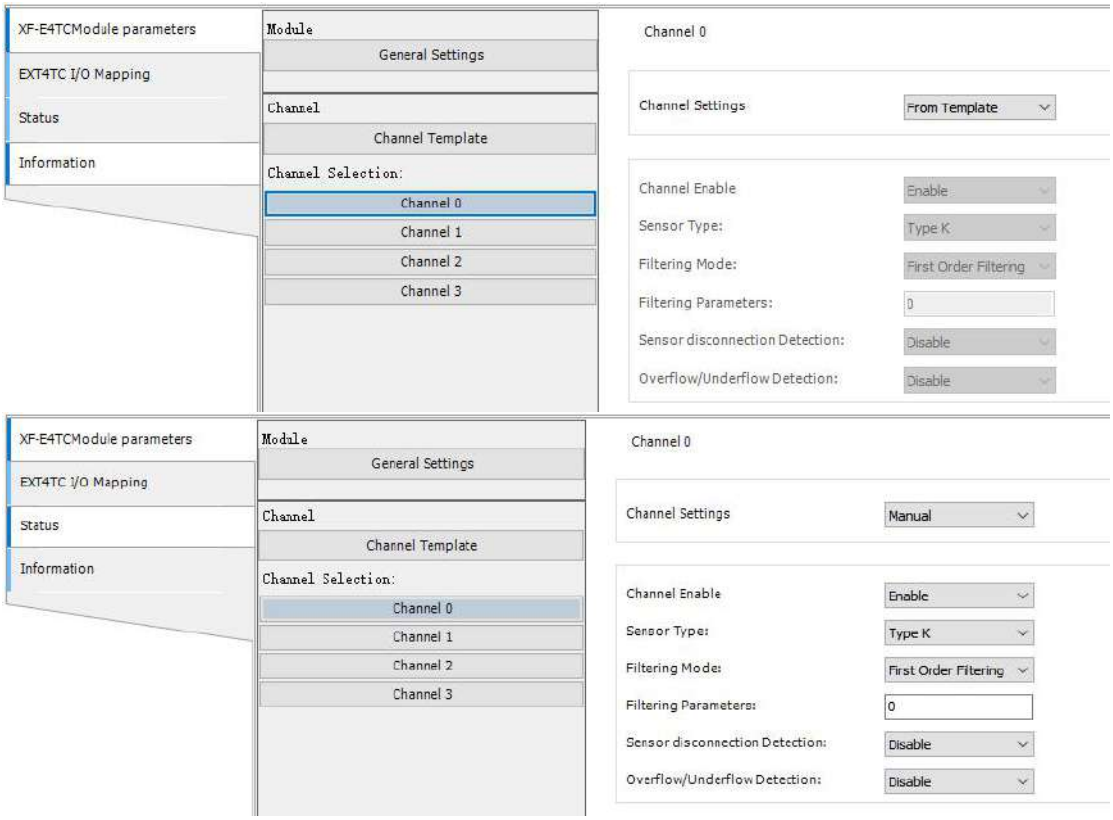
Calculate the number of measurement input values to be averaged when using 'time averaging' according to the following formula.
The average number of measured input values processed=average time ÷ sampling period
Discard the numerical value after the decimal point in the calculation result. When

the calculated quantity is less than or equal to 1, it is not filtered.

■ Overflow/underflow setting

When the channel sampling exceeds the sensor's upper limit or falls below the sensor's lower limit, it triggers an alarm log and outputs a preset value. If it exceeds the upper limit, the upper limit value is displayed; if it falls below the lower limit, the lower limit value is displayed.

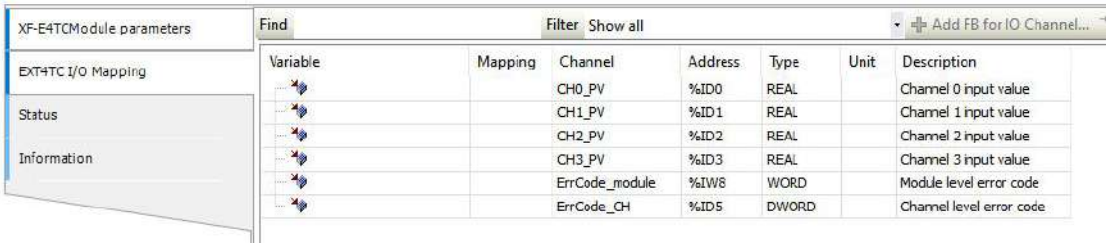
8.3.8.3 Channel selection



Parameters such as whether to enable, sensor type, filtering method, etc. can be set separately for each channel.

Channel setting	From Template: Configuring Parameters Using the "Channel Template" Interface Manual: Use the configuration parameters below this interface

8.3.9 I/O mapping



Channel input value	Display the temperature values of each of the four channels, with units and resolutions specified in the "Module Parameters" - "General Settings"
Module level error code	See the table below
Channel level error code	See the table below

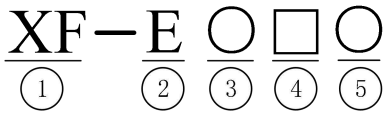
Module level error code (ErrCode_module)		
Bit	Meaning	Error level
0	The 24V input power supply of the module is abnormal	Important
2	An internal module error has occurred and the user layer is unable to repair it	Important
3	Version mismatch	Important
4	ADC read/write failure	Important
5	Cold end sensor disconnected	Important

Channel level error code (EErrCode_CH)		
Bit	Meaning	Error level
0	Channel 0 upper limit overflow	General
1	Channel 0 lower limit overflow	General
2	Channel 0 disconnected	General
3	Reserved	-
4	Channel 1 upper limit overflow	General
5	Channel 1 lower limit overflow	General
6	Channel 1 disconnected	General
7	Reserved	-
8	Channel 2 upper limit overflow	General
9	Channel 2 lower limit overflow	General
10	Channel 2 disconnected	General
11	Reserved	-
12	Channel 3 upper limit overflow	General
13	Channel 3 lower limit overflow	General
14	Channel 3 disconnected	General

Channel level error code (EErrCode_CH)		
Bit	Meaning	Error level
15	Reserved	-

9. High speed counting module

9.1 Naming rule



①	Series	XF：	XF series expansion module
②	Expansion module	E：	Right expansion module
③	Input channel	1：	1 channel
		2：	2 channels
		4：	4 channels
④	Output type	HSC：	High speed counting
		HSP：	High speed pulse output

9.2 High speed counting module XF-E1HSC

9.2.1 Product overview

XF-E1HSC high-speed counting expansion module, power supply DC24V, compatible with XSF series CPU unit products and LF series communication coupler units.

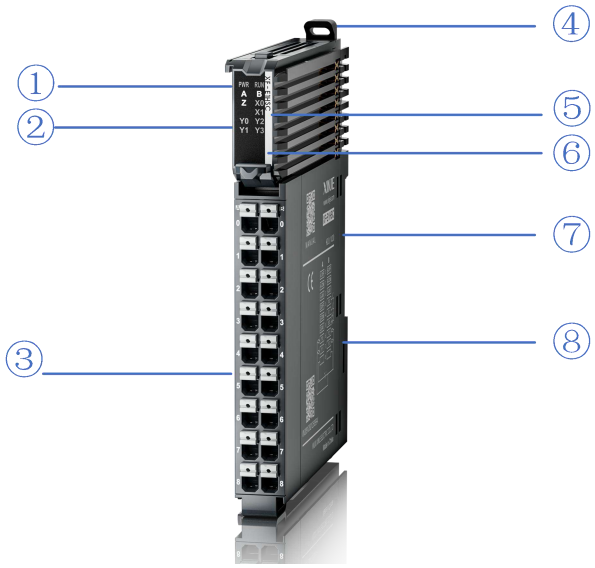
- The module supports encoder single ended input (bipolar) or differential input (A\B\Z) for one channel.
- Differential input supports up to 2MHz (1×frequency), single ended input supports up to 200KHz (1×frequency).
- Channel mode supports single-phase, pulse+direction, A/B/Z phase, CW/CCW mode.
- A/B phase supports 1/2/4 frequency doubling.
- The module supports frequency measurement function.
- Support pulse width measurement function.
- Supports two channels of high-speed (high response) inputs X0 and X1, and supports probe function.
- Support 4-channel high-speed (high response) output Y0, Y1, Y2, Y3, and support comparison output (snapshot) function.
- Designed with a width of 12mm.

■ Module version

Hardware version	Firmware version	Function
H2.0	V2.0	First official production of basic functions

9.2.2 Module View

(1) Each part description

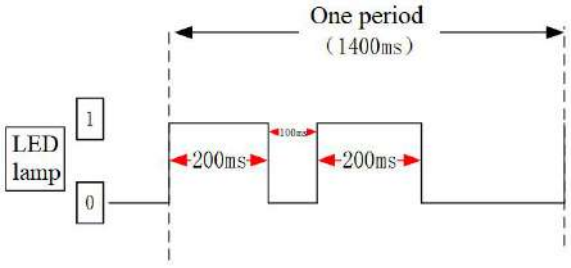


No.	Name	No.	Name
①	System LED indicator light	②	Channel LED indicator light
③	Detachable terminal block	④	Buckle
⑤	Model indication	⑥	Color identification indicating module type
⑦	Module hardware and firmware versions	⑧	Wiring diagram

(2) System indicator light

System indicator light	Meaning	
PWR (green)	OFF	Module not powered on (backplane bus)
	Always ON	All power supplies for the module are normal (backplane bus power supply&external input 24V)
	Flashing 1Hz*1	Module power supply abnormal and unable to operate normally (external)
RUN (green)	Always ON	The module is running normally
	Flashing 1Hz*1	General errors in module logs
	OFF	Important errors in module logs
	Flashing 10Hz*2	Module establishment communication in progress
	Flashing *3	Module heartbeat detection in progress
	Double flashing*4	Module firmware update

- * 1: A square wave with a duty cycle of 50% and a frequency of 1Hz.
- * 2: A square wave with a duty cycle of 50% and a frequency of 10Hz.
- * 3: Indicator light flashing specification: ON: 0.2s OFF: 1.8s
- * 4: Double flashing as shown in the following figure:



(3) Channel indicator light

Model	Channel indicator light		
XF-E1HSC	A, B, Z	Always ON (green)	The corresponding input channel has an input ON signal
		OFF	Corresponding input channel has no input ON signal
	X0, X1	Always ON (green)	The corresponding input channel has an input ON signal
		OFF	Corresponding input channel has no input ON signal
	Y0, Y1, Y2, Y3	Always ON (green)	The corresponding output channel has an ON signal output
		OFF	The corresponding output channel has no output ON signal

(4) Color identification

No.	Color		Module type
1		Grey white	Digital input
2		Grey	Digital output&digital mixing module
3		Light blue	Analog input
4		Deep blue	Analog output
5		Green	RS232&485 serial port communication
6		Pink	Temperature signal input
7		White	High speed counting

9.2.3 General specification

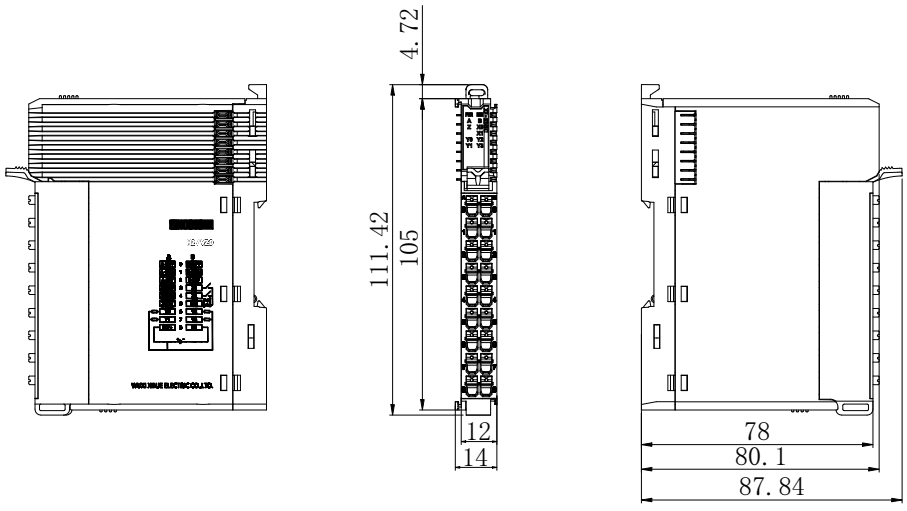
General specification		
Item		Specification
Operation temperature	maximum temperature	55℃
	Minimum temperature	-20℃
Transportation/storage temperature	maximum temperature	70℃
	Minimum temperature	-40℃
Environmental humidity (including operation/storage)	Upper limit	95%
	Lower limit	10%
Protection level		IP20
Anti-vibration		Conforming to IEC 61131-2: Under intermittent vibration: - Frequency 5-9 Hz with a constant amplitude of 3.5mm peak displacement - Frequency 9-150 Hz with a constant acceleration of 1.0g peak acceleration Under continuous vibration: - Frequency 5-9 Hz with a half amplitude of 1.75mm displacement - Frequency 9-150 Hz with a constant acceleration of 0.5g constant frame amplitude Each direction (X, Y, Z) is scanned 10 times.
Impact resistance		Conforming to IEC 61131-2: Shock intensity of 15G (peak) with a duration of 11ms is applied to each of the three mutually perpendicular axes. Each axis is subjected to 3 shocks, making a total of 18 shocks.
Usage environment		Non corrosive gas
Using altitude		0-2000m
Overvoltage level		II: conforming to IEC61131-2
Pollution level		2; conforming to IEC61131-2
EMC		Conforming to IEC 61131-2 IEC61000-6-4 B type
Certificate		CE

9.2.4 Technical specification

Item		Specification
Input specification	Counter	A, B, Z
	Type	Support single ended input or differential input
	High speed counting channel	2 channels (X0 X1)
	Input type	NPN&PNP
	Rated input voltage	24VDC
	Rated input current	6mA
	Input ON current	Above 2.5mA
	Input OFF current	Below 1mA
Output specification	Output type	NPN
	Control circuit voltage	DC24V(DC21.6V~26.4V)
	Rated load current	0.5A/1 point 1A/module
	ON response time	1us
	OFF response time	1us
	Output protection	Support short circuit and overload protection functions
Module power consumption		0.8W (internal backplane)+1.2W (external input)

9.2.5 Installation and wiring

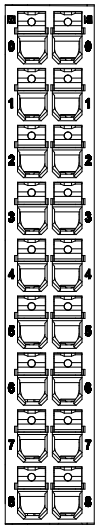
9.2.5.1 Appearance drawing



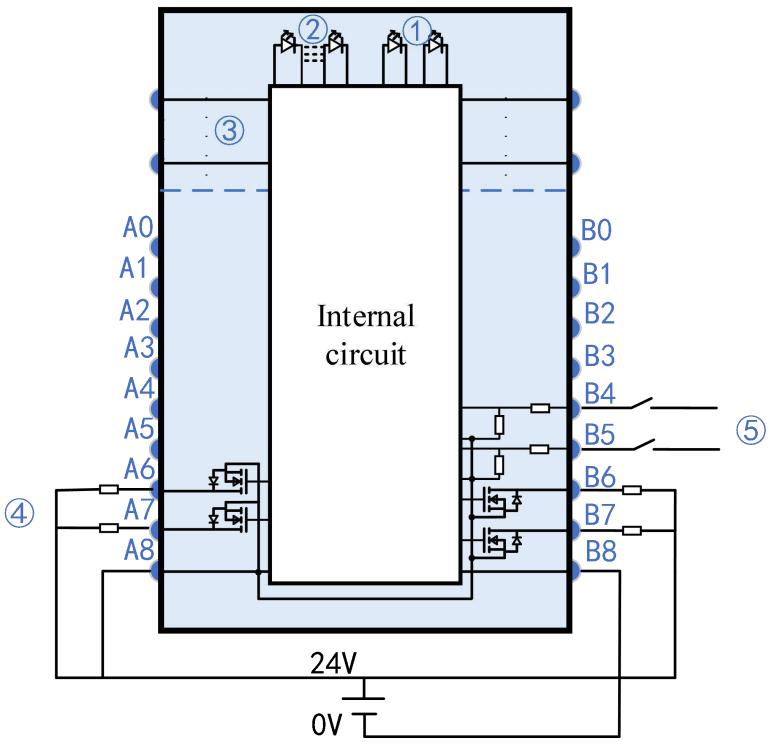
(unit: mm)

9.2.5.2 Terminal definition and wiring

(1) Terminal definition

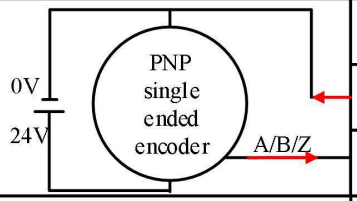
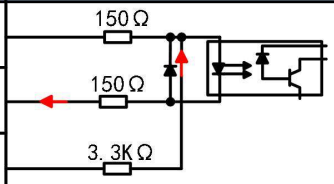
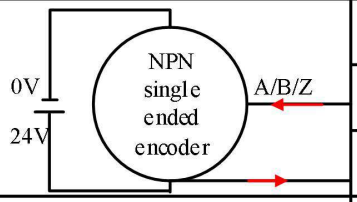
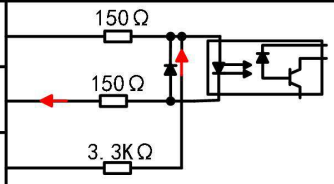
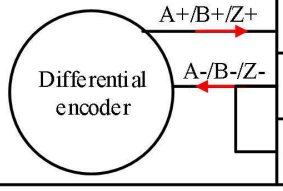
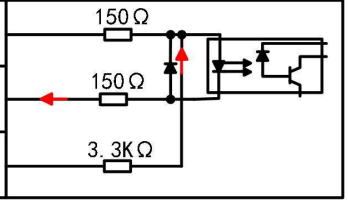
XF-E1HSC				
Meaning	A-column terminal	Terminal layout	B-column terminal	Meaning
A-DIFF	0		0	B-DIFF
A-COM	1		1	B-COM
A-24V	2		2	B-24V
Z-DIFF	3		3	X0
Z-COM	4		4	X1
Z-24V	5		5	S/S
Y0	6		6	Y2
Y1	7		7	Y3
24V+	8		8	24V-

(2) External wiring



① System LED ② Channel LED ③ Backplane bus ④ Output channel and wiring
⑤ Input channel and wiring

The module supports a set of A, B, Z high-speed single-ended and differential signal inputs. When in use, ensure correct wiring. Using A0 as an example, the application is illustrated in the table below:

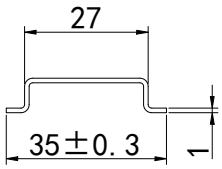
Input type	External wiring	No.	Signal name	Internal circuit
PNP collector type (24V level)		0	Differential input (A-DIFF)	
		1	Input common terminal (A-COM)	
		2	24V single end input (A-24V)	
NPC collector type (24V level)		0	Differential input (A-DIFF)	
		1	Input common terminal (A-COM)	
		2	24V single end input (A-24V)	
Differential signal		0	Differential input (A-DIFF)	
		1	Input common terminal (A-COM)	
		2	24V single end input (A-24V)	

Explanation: If it is a PNP type AB phase encoder, A-COM and B-COM need to be short circuited, and if it is an NPN type AB phase encoder, A-24V and B-24V need to be short circuited.

9.2.5.3 Installation method

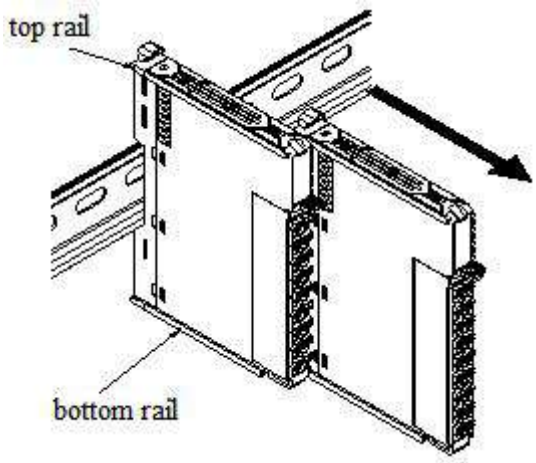
(1) Installation requirements

The module is installed using DIN rails, which must comply with the IEC 60715 standard (35mm wide, 1mm thick). The size information is shown in the following figure, in millimeters.

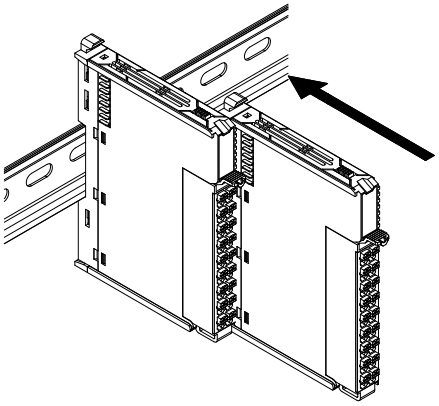


	**Attention**	When the module is installed on a non recommended DIN rail, the DIN rail latch may not lock properly.

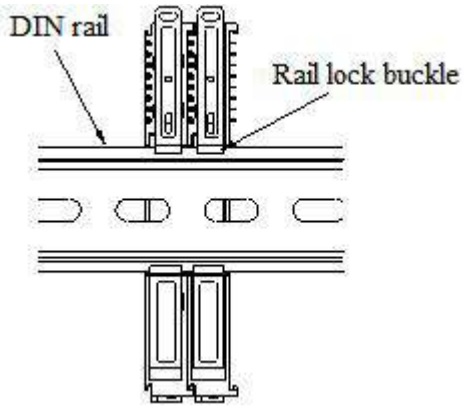
(2) Installation steps



The assembly between IO modules is carried out by sliding installation through the top and bottom rails of the modules, as shown in the left figure:

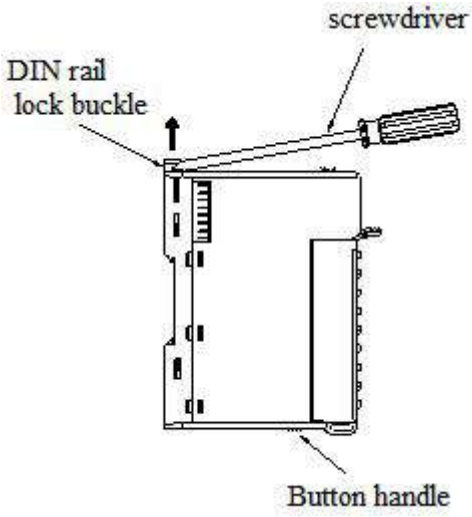


The module is installed on the guide rail. When installing, align the module with the DIN rail and press the module in the direction indicated by the arrow. After installation, there is a noticeable sound of the module engaging, as shown in the left figure:

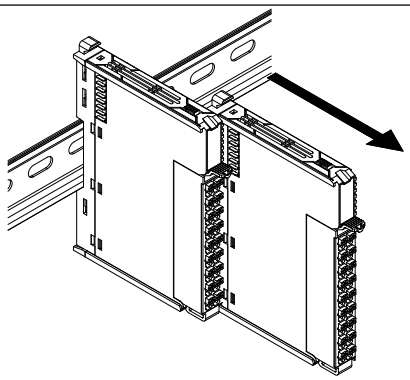


After the module installation is completed, the lock buckle will automatically move downwards for locking. If the lock buckle does not move downwards, the top of the lock buckle needs to be pressed downwards to ensure proper installation.

(3) Unstallation steps



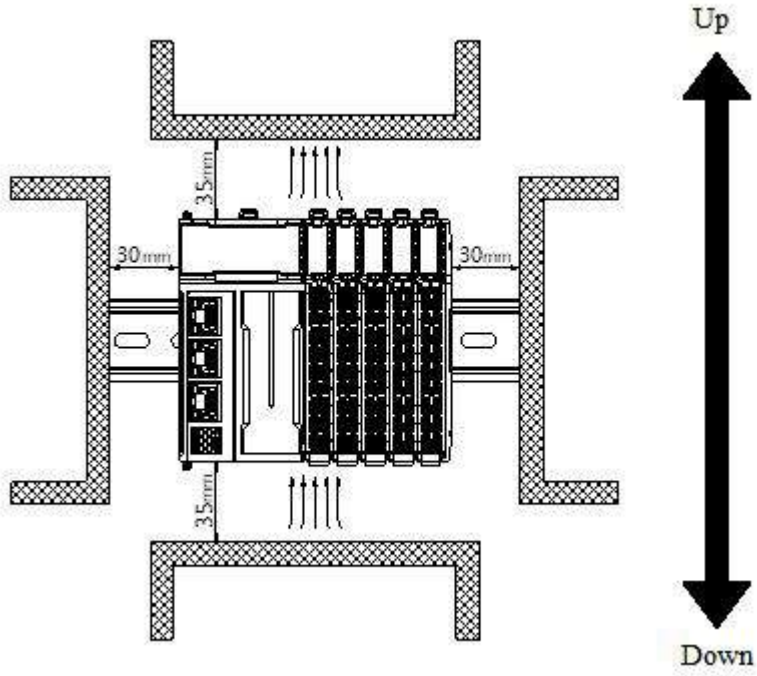
Use a Phillips screwdriver or similar tool to pry up the rail lock, as shown in the left figure:



Pull the module straight forward at the buckle position (protruding part), and then press down on the top of the lock buckle, as shown in the left figure:

9.2.5.4 Installation environment

This product can be installed in four positions (i.e. installation direction): horizontal direction, vertical direction, top of the electrical cabinet, and bottom of the electrical cabinet. It is recommended to install it in the horizontal direction, and the heat dissipation design is through natural convection. To ensure normal ventilation and heat dissipation and reserve sufficient wiring space, the minimum gap must be retained around this product, as shown in the following figure:



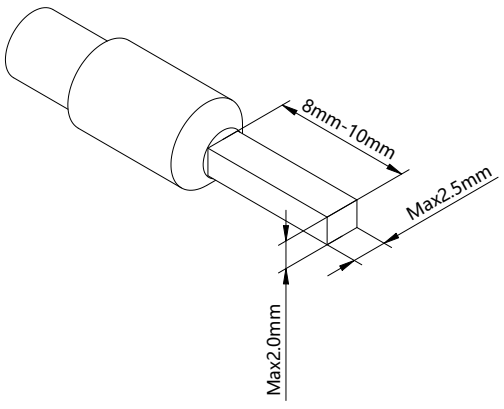
If there are high-temperature heat source equipment (heaters, transformers, large resistors, etc.) around this product, a gap of at least 100mm should be left between them.

9.2.5.5 Equipment wiring

When wiring modules, their connectors must meet the following requirements:

Adaptive wire diameter	
National standard /mm^2	American Standard /AWG
0.3	22
0.5	20
0.75	18
1.0	18
1.5	16

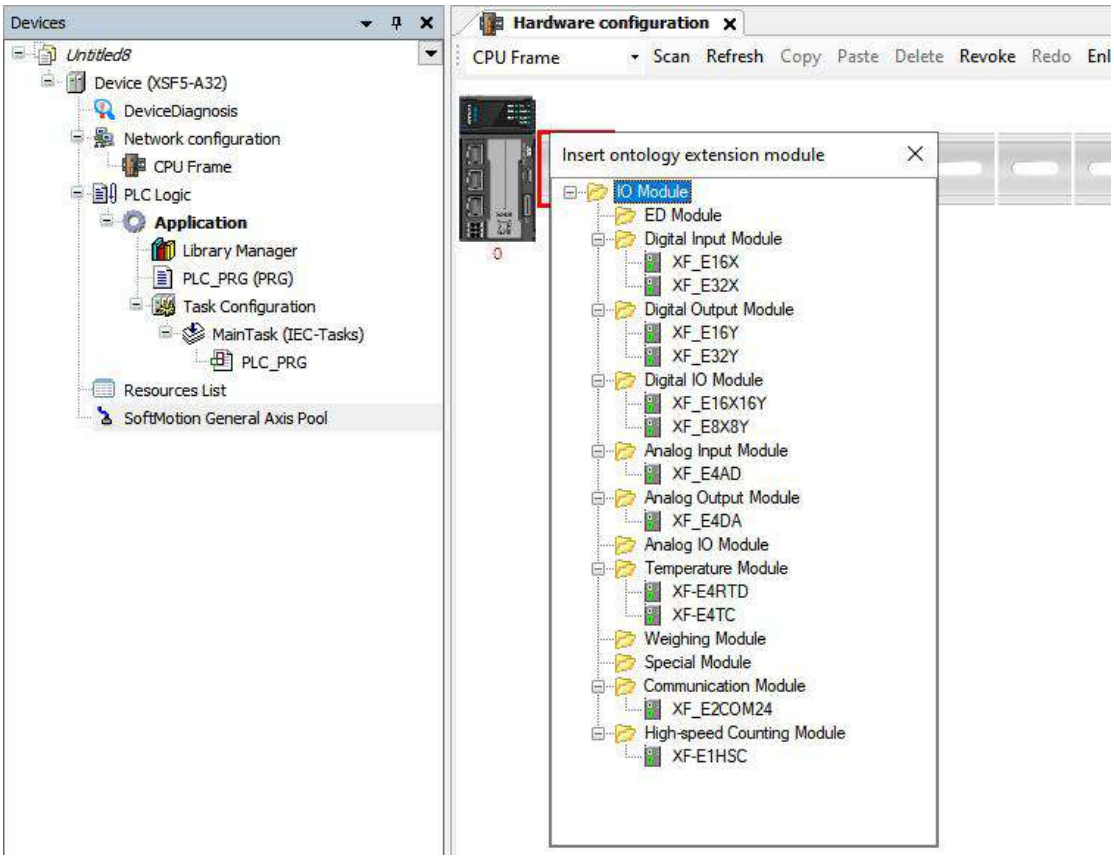
If using other types of terminal lugs, crimp them onto the stranded wire. The shape and dimensions should conform to the diagram shown below.

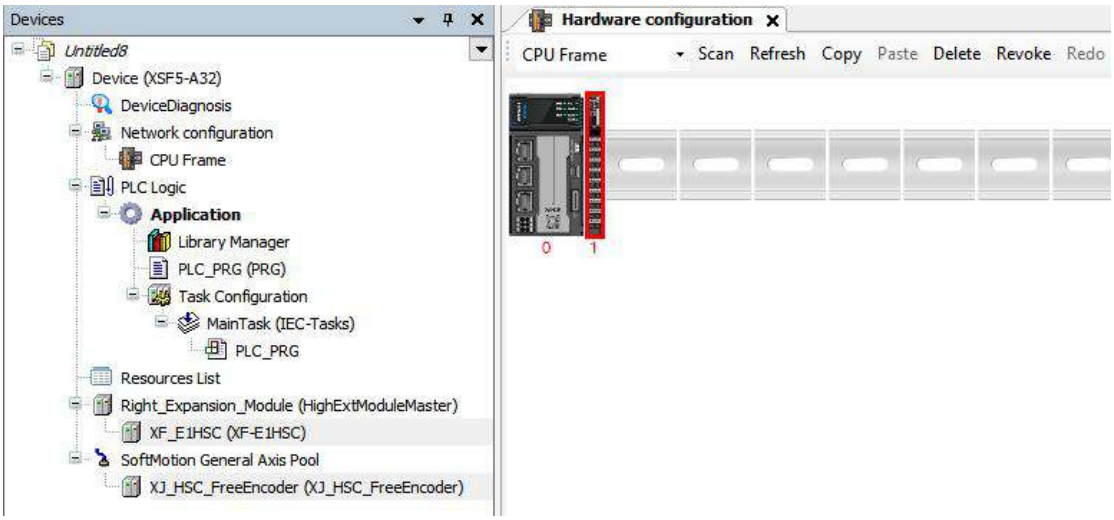


9.2.6 Module configuration

Right Extension Module: Double click the space for the extension module in "CPU Frame", and then click "XF-E1HSC" in the pop-up "Insert ontology extension module" dialog box to add the module. After adding the module, the axis variable instance of "XJ_HSC_FreeEncoder" will be automatically created in the "SoftMotion General Axis Pool".

Configure LF Series Remote IO: For specific configuration examples, please refer to the LF Series Remote IO User Manual.





After adding XF-E1HSC, XJ_HSC_FreeEncoder is automatically instantiated and bound to the module.

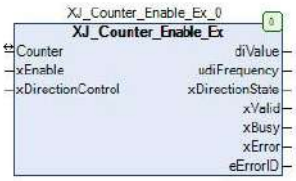
9.2.7 Instructions

When XS Studio adapts XF-E1HSC, including XSF5 body mounted XF-E1HSC and LFC3-AP mounted XF-E1HSC, the following FB function blocks need to be compatible.

Function block	Explanation
XJ_Counter_Enable_Ex	Counter enable, counting, measure frequency
XJ_Counter_Compare_Ex	Counter comparison consistent output
XJ_Counter_PresetValue_Ex	Counter preset value writing, including internal preset, external preset, and Z-phase preset
XJ_TouchProbe_Ex	Counter reading lock position or lock time function
XJ_MeasurePulseWidth_Ex	Read the pulse width measurement value of the counter
XJ_Counter_Reset_Ex	Counter error reset

9.2.7.1 Counter enable XJ_Counter_Enable_Ex

High speed counter enable [XJ_Counter_Enable_Ex]			
Execution condition	Normally open/ close triggering	Suitable model	XF-E1HSC module
Firmware	V2.0.0 and up	Software	XS Studio V2.3.1 and up
Library	XJ_HSC		

Command	Name	Graphic	ST
XJ_Counter_Enable	High speed counter enable		XJ_Counter_Enable_Ex_0(Counter:=, xEnable:= , xDirectionControl:= , diValue=> , udiFrequency=> , xDirectionState=> , xValid=> , xBusy=> , xError=> , eErrorID=>);

(1) Input variables

Input variables	Name	Data type	Effective range	Initial value	Description
Counter	High speed counter input	XJ_COUNTER_REF	-	-	Add XF-E1HSC automatic instantiation and select the corresponding

					instantiation name for the high-speed counter
xEnable	Enable	BOOL	TRUE, FALSE	FALSE	Normally open to enable counting
xDirectionControl	Direction	BOOL	TRUE, FALSE	FALSE	0: A-phase priority (default) 1: B-phase priority

(2) Output variables

Output variables	Name	Data type	Effective range	Initial value	Description
diValue	High speed count value	DINT	Data range	0	High speed count value
udiFrequency	Pulse frequency measurement value	UDINT		0	Unit: Hz. If it is a low frequency, it can be used in conjunction with measuring the period through the interface
xDirectionState	Direction	BOOL	TRUE, FALSE	FALSE	0: count up 1: count down
xValid	Counter counting status	BOOL	TRUE, FALSE	FALSE	0: Counter stops counting 1: The counter is counting normally
xBUSY	Busy	BOOL	TRUE, FALSE	FALSE	
xError	Error flag	BOOL	TRUE, FALSE	FALSE	
eErrorID	Error type	HSIO_ERROR	-	0	

9.2.7.2 Counter comparison output XJ_Counter_Compare_Ex

Counter comparison output [XJ_Counter_Compare_Ex]			
Execution condition	Edge triggering	Suitable model	XF-E1HSC module
Firmware	V2.0.0 and up	Software	XS Studio V2.3.1 and up
Library	XJ_HSC		

Command	Name	Graphic	ST
XJ_Counter_Compare	Comparison consistent output		XJ_Counter_Compare_Ex_0(Counter:= , xExecute:= , xAbort:= , diCompareValue:= , byChannel:= , uiImRefreshCycle:= , xDone=> , xBusy=> , xCommandAborted=> , xError=> , eErrorID=>);

(1) Input variables

Input variables	Name	Data type	Effective range	Initial value	Description
Counter	High speed counter input	XJ_COUNTER_REF	-	-	
xExecute	Triggering	BOOL	TRUE, FALSE	FALSE	Triggering
xAbort	Terminate comparison	BOOL	TRUE, FALSE	FALSE	Rising edge effective
diCompareValue	Specify comparison value	DINT	-	0	
byChannel	Channel selection	Byte	1-4	1	1-4 correspond to Y0-Y3
uiImRefreshCycle	Hardware direct output time	UINT	-	0	Unit: 100us, maximum output time is 3000ms

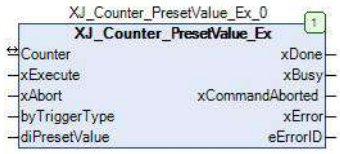
(2) Output variables

Output variables	Name	Data type	Effective range	Initial value	Description
xDone	Completion flag	BOOL	TRUE, FALSE	FALSE	After the instruction is executed, the flag is set to 'TRUE'
xBusy	Running	BOOL	TRUE, FALSE	FALSE	
xCommandAborted	Function block termination execution	BOOL	TRUE, FALSE	FALSE	

xError	Error flag	BOOL	TRUE, FALSE	FALSE	
eErr1orID	Error type	HSIO_ERROR	-	0	

9.2.7.3 Preset value write in XJ_Counter_PresetValue_Ex

Preset value write in [XJ_Counter_PresetValue_Ex]			
Execution condition	Edge triggering	Suitable model	XF-E1HSC module
Firmware	V2.0.0 and up	Software	XS Studio V2.3.1 and up
Library	XJ_HSC		

Command	Name	Graphic	ST
XJ_Counter_PresetValue	Preset value input		XJ_Counter_PresetValue_Ex_0(Counter:= , xExecute:= , xAbort:= , byTriggerType:= , diPresetValue:= , xDone=> , xBusy=> , xCommandAborted=> , xError=> , eErrorID=>);

(1) Input variables

Input variables	Name	Data type	Effective range	Initial value	Description
Counter	High speed counter input	XJ_COUNTER_REF	-	-	High speed counter, high-speed counting input terminal needs to be defined (see functional description)
xExecute	Triggering	BOOL	TRUE, FALSE	FALSE	Triggering
xAbort	Terminate preset	BOOL	TRUE, FALSE	FALSE	Rising edge effective
byTriggerType	Trigger Type	Byte	-	0	Internal trigger: 1 DI trigger: 2 Z-phase trigger: 3 Internal+DI trigger: 4 Internal+Z-phase trigger: 5 DI+Z phase trigger: 6

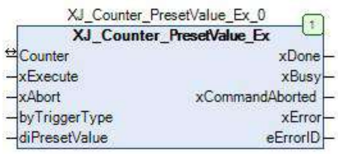
Input variables	Name	Data type	Effective range	Initial value	Description
					Internal+DI+Z-phase trigger: 7
diPresetValue	Preset value	DINT	Data range	0	Write the preset value for high-speed counting

(2) Output variables

Output variables	Name	Data type	Effective range	Initial value	Description
xDone	Completion flag	BOOL	TRUE,FALSE	FALSE	After completing the writing, the flag bit is set to TRUE
xBusy	Running	BOOL	TRUE,FALSE	FALSE	
xCommandAborted	Function block termination execution	BOOL	TRUE,FALSE	FALSE	
xError	Error flag	BOOL	TRUE,FALSE	FALSE	
eErrorID	Error type	HSIO_ERROR	-	0	

9.2.7.4 Counter probe XJ_TouchProbe_Ex

Counter probe [XJ_TouchProbe_Ex]			
Execution condition	Edge triggering	Suitable model	XF-E1HSC module
Firmware	V2.0.0 and up	Software	XS Studio V2.3.1 and up
Library	XJ_HSC		

Command	Name	Graphic	ST
XJ_TouchProbe	Probe		XJ_Counter_PresetValue_Ex_0(Counter:= , xExecute:= , xAbort:= , byTriggerType:= , diPresetValue:= , xDone=> , xBusy=> , xCommandAborted=> , xError=> , eErrorID=>);

(1) Input variables

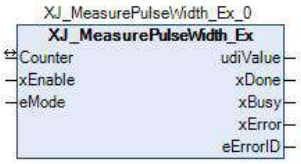
Input variables	Name	Data type	Effective range	Initial value	Description
Counter	High speed counting input	XJ_COUNTER_REF	-	-	High speed counter, high-speed counting input terminal needs to be defined (see functional description)
xExcute	Triggering	BOOL	TRUE,FALSE	FALSE	Triggering
xAbort	Terminate probe	BOOL	TRUE,FALSE	FALSE	Rising edge effective
byProbeId	Specify input point	Byte	1-2	0	1: Channel 1 probe 2: Channel 2 probe
byEdgeType	Edge type	Byte	0-2	0	0: Rising edge 1: Falling edge 2: Rising edge+falling edge
byInputType	External trigger selection	Byte	0-1	0	0: DI 1: Z phase

(2) Output variables

Output variables	Name	Data type	Effective range	Initial value	Description
diTouchVaulePos	Rising edge latch value	DINT		0	
diTouchVauleNeg	Falling edge latch value	DINT		0	
diTouchTimePos	Rising edge latch time	LINT			
diTouchTimeNeg	Falling edge latch time	LINT			
xDone	Completion flag	BOOL	TRUE, FALSE	FALSE	After completing the writing, the flag bit is set to TRUE
xBusy	Running	BOOL	TRUE, FALSE	FALSE	
xCommandAborted	Function block termination execution	BOOL	TRUE, FALSE	FALSE	
xError	Error flag	BOOL	TRUE, FALSE	FALSE	
eErrorID	Error type	HSIO_ERROR	-	0	

9.2.7.5 Measure pulse width XJ_MeasurePulseWidth_Ex

Measure pulse width [XJ_MeasurePulseWidth_Ex]			
Execution condition	Normally open/close triggering	Suitable model	XF-E1HSC module
Firmware	V2.0.0 and up	Software	XS Studio V2.3.1 and up
Library	XJ_HSC		

Command	Name	Graphic	ST
XJ_MeasurePulseWidth	Read the pulse width measurement value of the counter		XJ_MeasurePulseWidth_Ex_0(Counter:= , xEnable:= , eMode:= , udiValue=> , xDone=> , xBusy=> , xError=> , eErrorID=>);

(1) Input variables

Input variables	Name	Data type	Effective range	Initial value	Description
Counter	High speed counter input	XJ_COUNTER_REF	-	-	High speed counter, high-speed counting input terminal needs to be defined (see functional description)
xEnable	Normally open/close	BOOL	TRUE,FALSE	FALSE	Normally open enable
eMode	Measure high/low level pulse width	HSC_PULSEWIDTH_TYPE	0,1	0	0: External signal high level (measuring high-level pulse width); 1: External signal low level (measuring low level pulse width)

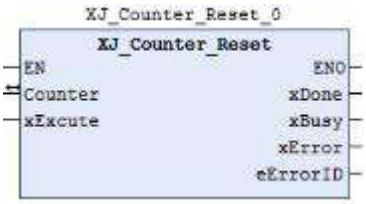
(2) Output variables

Output variables	Name	Data type	Effective range	Initial value	Description
udiValue	Measurement value	UDINT		0	
xDone	Completion flag	BOOL	TRUE,FALSE	FALSE	After completing the writing, the flag bit is

					set to TRUE
xBusy	Running	BOOL	TRUE,FALSE	FALSE	
xError	Error flag	BOOL	TRUE,FALSE	FALSE	
eErrorID	Error type	HSIO_ERROR	-	0	

9.2.7.6 Counter reset XJ_Counter_Reset_Ex

Counter reset [XJ_Counter_Reset _Ex]			
Execution condition	Edge triggering	Suitable model	XF-E1HSC module
Firmware	V2.0.0 and up	Software	XS Studio V2.3.1 and up
Library	XJ_HSC		

Command	Name	Graphic	ST
XJ_Counter_Reset	Counter reset		XJ_Counter_Reset_0(Counter:= , xExcute:= , xDone=> , xBusy=> , xError=> , eErrorID=>);

(1) Input variables

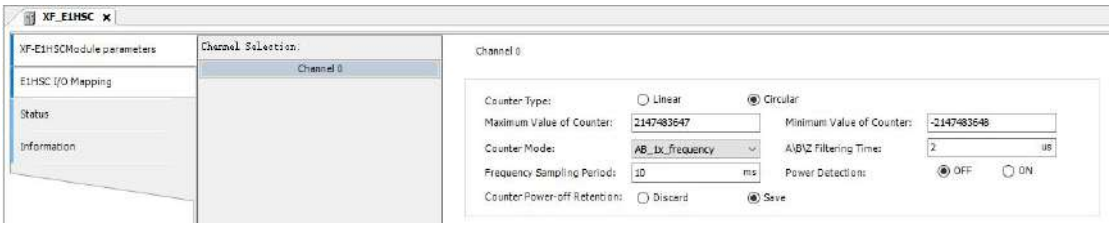
Input variables	Name	Data type	Effective range	Initial value	Description
Counter	High speed counter input	XJ_COUNTER_REF	-	-	High speed counter, high-speed counting input terminal needs to be defined (see functional description)
xExcute	Triggering	BOOL	TRUE,FALSE	FALSE	Triggering

(2) Output variables

Output variables	Name	Data type	Effective range	Initial value	Description
xDone	Completion flag	BOOL	TRUE,FALSE	FALSE	After completing the writing, the flag bit is set to TRUE
xBusy	Running	BOOL	TRUE,FALSE	FALSE	
xError	Error flag	BOOL	TRUE,FALSE	FALSE	
eErrorID	Error type	HSIO_ERROR	-	0	

9.2.8 Functions and setting

9.2.8.1 General functions

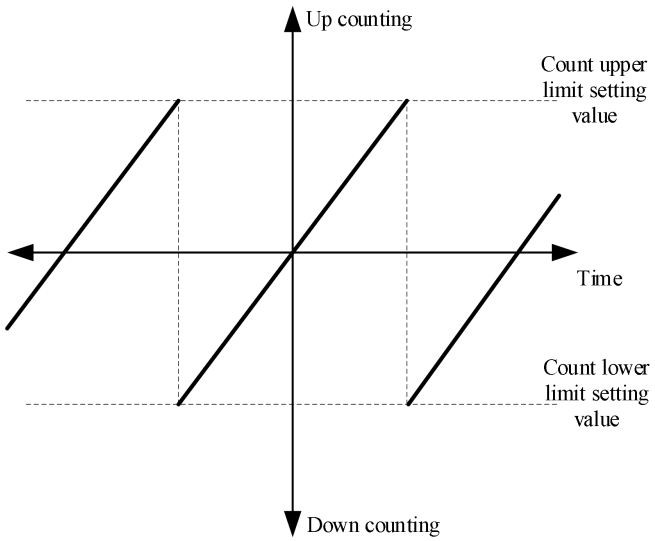


- Counter type

The data type of the counter is a 32-bit signed number (-2147483648~2147483647).
Counter counting types can be divided into ring counters and linear counters.

- Ring counters

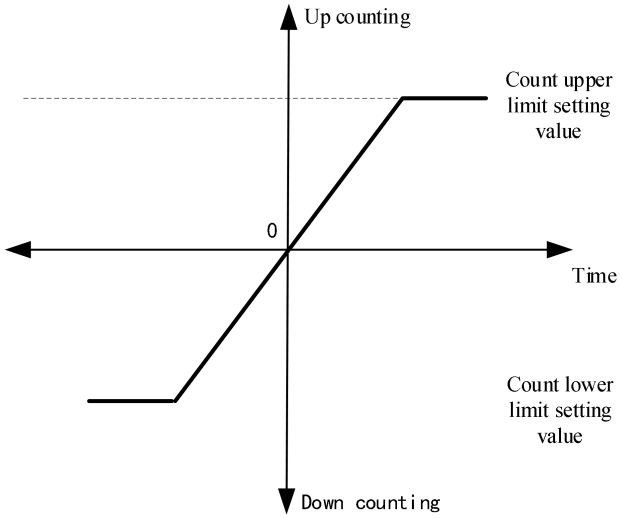
Ring counter counts between the maximum and the minimum value.
When forward counting exceed the maximum value, it jumps to the minimum value.
When backward counting is less than the minimum, it jumps to the maximum value.



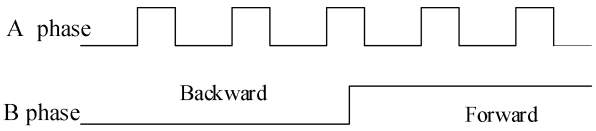
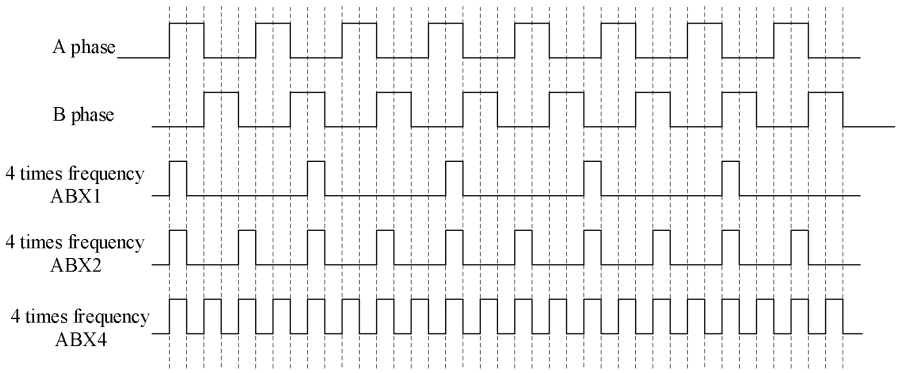
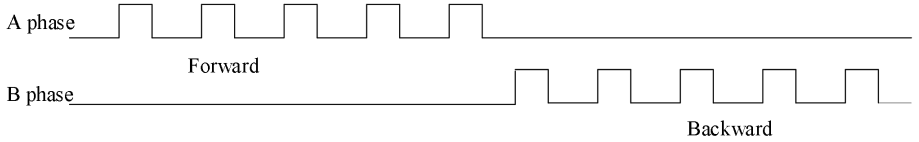
- Linear counter

Linear counter counts between the maximum and the minimum value.
When the forward counting reaches the maximum value or the backward counting reaches the minimum value, it will stop counting.

When the current counting value reaches the set limit, up and down overflow alarm will be triggered.



■ Counter mode

Mode	Waveform
Single phase（P）	
Pulse + direction	
A/B phase 1/2/4 times frequency	
CW/CCW input	

■ Counter direction control

The counting direction of the counter can be changed through PDO, and A-phase priority or B-phase priority can be set.

- AB phase

When set to prioritize A phase , the counter increases when A phase leads B phase .
When set to prioritize B phase , the counter decreases when A phase lags behind B phase .

- Single phase

Only for A phase , without directional control.

- Pulse + direction

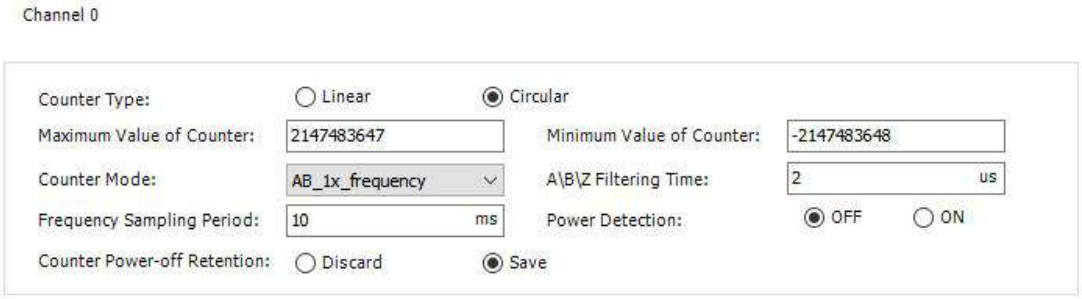
When set to prioritize A-phase , the counter increases when B-phase input is at high level.
When set to prioritize B-phase , the counter increases when B-phase input is at low level.

- CW/CCW

When set to prioritize A-phase, the counter increase when A-phase has a count.
When set to prioritize B-phase, the counter increase when B-phase has a count.

■ Counter application example

For example, if the power detection is not turned on, the counter type is set to circular, the counter mode is AB phase 1x frequency, the count value is power down hold, and the maximum and minimum values of the counter are default



The result of rotating the external encoder is as follows:

- Encoder rotates forward (counting up)

Use the XJ_Counts_Enabled_Ex counter enable command to rotate the encoder after enabling. The current count value is displayed in the high-speed count value of the output parameter, and the output pin "xDirectionState" is set to False.

- Encoder rotates reverse (countdown)

Use the XJ_Counts_Enabled_Ex counter enable command to rotate the encoder after enabling it. The current count value is displayed in the high-speed count value of the output parameter, and the output pin "xDirectionState" is set to TRUE.

- Module level error code

Module level error code (ErrCode_module)		
Bit	Meaning	Error level
0	The 24V input power supply of the module is abnormal	General
1	Incorrect allocation of module parameters	Important
2	An internal module error has occurred and the user layer is unable to repair it	Important
3	Version mismatch	Important

■ Channel level error code

Channel level error code (ErrCode_CH)		
Bit	Meaning	Error level
0	Input frequency overload	General

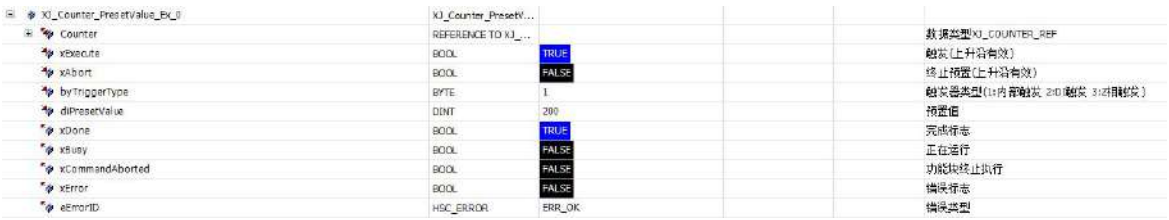
9.2.8.2 Preset function

There are three preset methods for counters, namely internal command, external digital input terminal, and Z signal.

■ Preset function application example

Example: Change the current high speed count value to 200.
(1) Internal preset writing
Set the preset value of the counter to 200.
First, execute the counter enable command, then use the preset value write command to write the preset value using the internal preset function. The preset value set upon successful execution of the command will be written into the current count value.

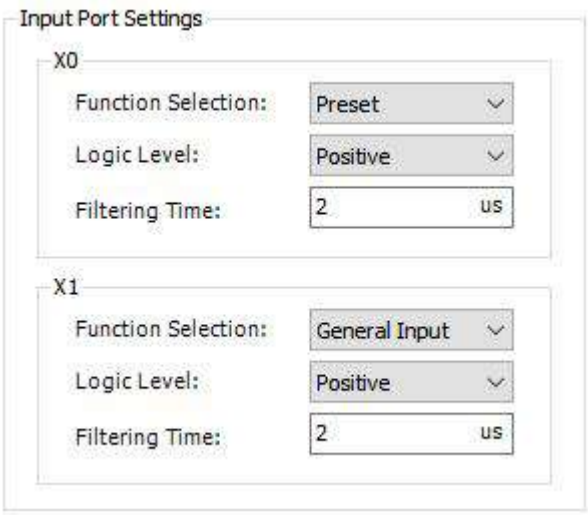
The instruction parameter configuration is as follows:



The execution effect is shown in the figure:

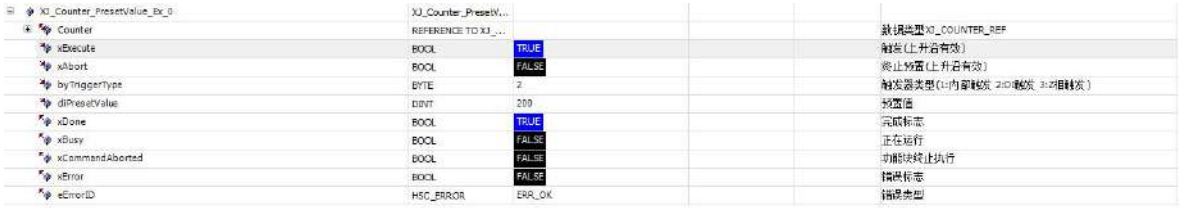
(2) External digital preset

Taking X0 as an example, set the X0 terminal function to "preset":



Set the preset value of the counter to 200.

First, execute the counter enable command, then use the preset value write command to use the internal preset function. At the rising edge of external X signal, the preset value is written, and after successful command execution, the preset value will be written into the current count value. The instruction parameter configuration is as follows:



XJ_Counter_PresetValue_Ex_0	XJ_Counter_PresetV...				
Counter	REFERENCE TO XJ_...				数据类型XJ_COUNTER_REF
xExecute	BOOL	TRUE			触发(上升沿有效)
xAbort	BOOL	FALSE			终止预置(上升沿有效)
byTriggerType	BYTE	2			触发器类型(1:内部触发 2:DI触发 3:ZI触发)
diPresetValue	DINT	200			预置值
xDone	BOOL	TRUE			完成标志
xBusy	BOOL	FALSE			正在运行
xCommandAborted	BOOL	FALSE			功能块终止执行
xError	BOOL	FALSE			错误标志
eErrorID	HSC_ERROR	ERR_OK			错误类型

The execution effect is as follows:

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表达式	类型	值	准备值	地址	注释
XJ_Counter_Enable_Ex_0	XJ_Counter_Enable...				
Counter	REFERENCE TO XJ_...				数据类型XJ_COUNTER_REF
xEnable	BOOL	TRUE			常开使能进行计数
xDirectionControl	BOOL	FALSE			FALSE:A 相优先（默认） TRUE:B 相优先
diValue	DINT	200			高速计数值
udiFrequency	UDINT	0			脉冲频率测量值(单位:hz)，填可通过界面测量间隔指令...
xDirectionState	BOOL	FALSE			FALSE:加计数 TRUE:减计数
xValid	BOOL	TRUE			FALSE:计数器停止计数 TRUE:计数器正常计数
xBusy	BOOL	TRUE			忙碌中
xError	BOOL	FALSE			错误标志
eErrorID	HSC_ERROR	ERR_OK			错误类型
XJ_Counter_PresetValue_Ex_0	XJ_Counter_PresetV...				
Counter	REFERENCE TO XJ_...				数据类型XJ_COUNTER_REF
xExecute	BOOL	TRUE			触发(上升沿有效)
xAbort	BOOL	FALSE			终止预置(上升沿有效)
byTriggerType	BYTE	2			触发器类型(1:内部触发 2:DI触发 3:ZI触发)
diPresetValue	DINT	200			预置值
xDone	BOOL	TRUE			完成标志
xBusy	BOOL	FALSE			正在运行
xCommandAborted	BOOL	FALSE			功能块终止执行
xError	BOOL	FALSE			错误标志
eErrorID	HSC_ERROR	ERR_OK			错误类型

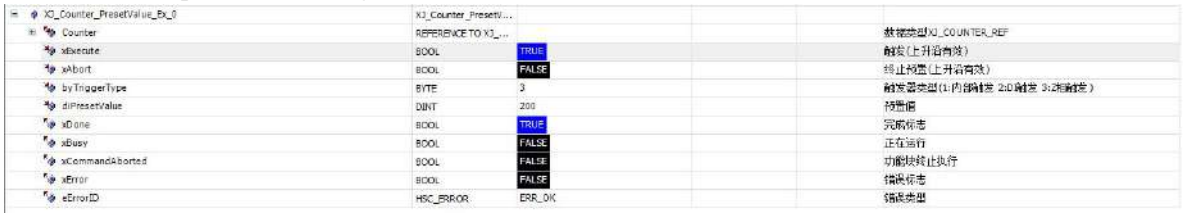
```
1  XJ_Counter_Enable_Ex_0(
2      Counter:=XJ_HSC_FreeEncoder ,
3      xEnable:= ,
4      xDirectionControl:= ,
5      diValue=> ,
6      udiFrequency=> ,
7      xDirectionState=> ,
8      xValid=> ,
9      xBusy=> ,
10     xError=> ,
11     eErrorID=> );
12 XJ_Counter_PresetValue_Ex_0(
13     Counter:=XJ_HSC_FreeEncoder ,
14     xExecute:= ,
15     xAbort:= ,
16     byTriggerType:= ,
17     diPresetValue:= ,
18     xDone=> ,
19     xBusy=> ,
20     xCommandAborted=> ,
21     xError=> ,
22     eErrorID=> );
```

(3) Z signal preset

Set the preset value of the counter to 200.

First, execute the counter enable command, then use the preset value write command to use the internal preset function. When the rising edge of the external Z signal arrives, write the preset value, after the successful execution of the command, the preset value will be written into the current count value.

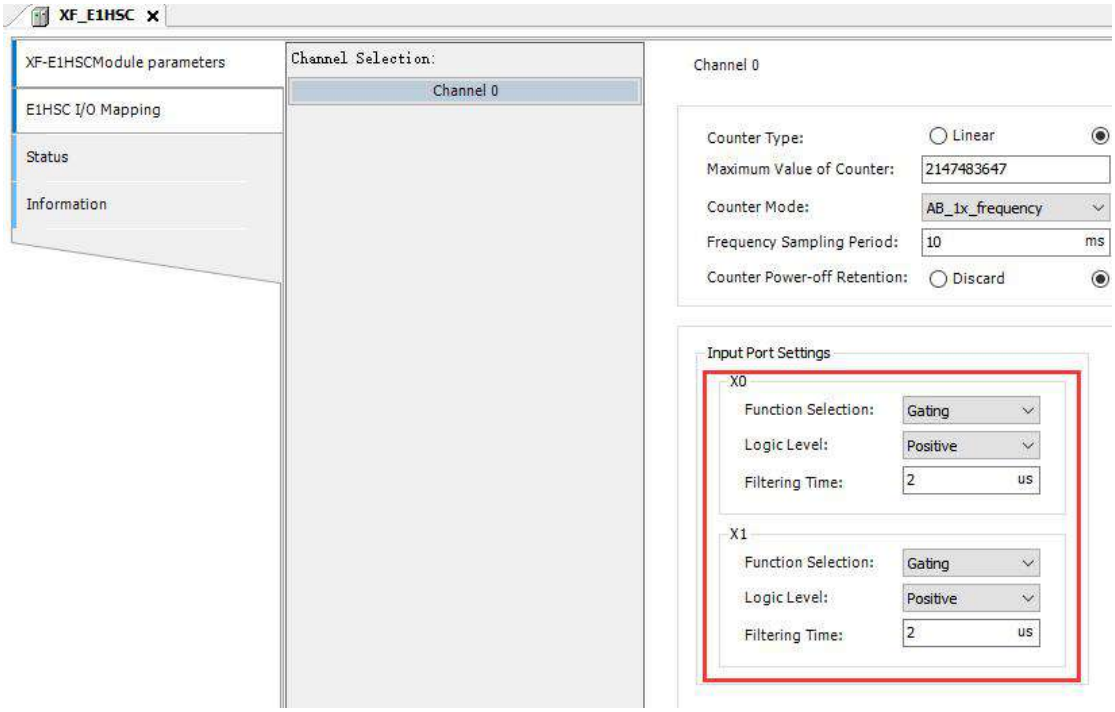
The instruction parameter configuration is as follows:



XJ_Counter_PresetValue_Ex_0	XJ_Counter_PresetV...				
Counter	REFERENCE TO XJ_...				数据类型XJ_COUNTER_REF
xExecute	BOOL	TRUE			触发(上升沿有效)
xAbort	BOOL	FALSE			终止预置(上升沿有效)
byTriggerType	BYTE	3			触发器类型(1:内部触发 2:DI触发 3:ZI触发)
diPresetValue	DINT	200			预置值
xDone	BOOL	TRUE			完成标志
xBusy	BOOL	FALSE			正在运行
xCommandAborted	BOOL	FALSE			功能块终止执行
xError	BOOL	FALSE			错误标志
eErrorID	HSC_ERROR	ERR_OK			错误类型

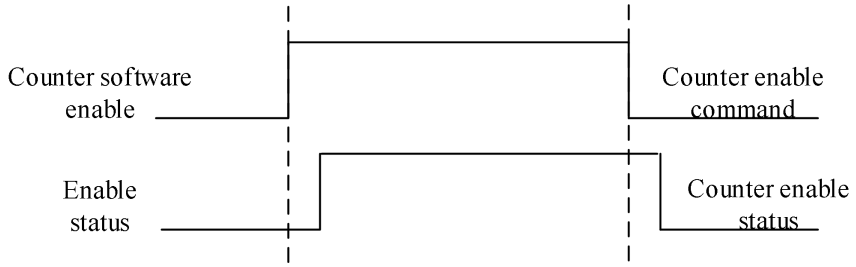
The execution effect is as follows:

9.2.8.3 Gate control function

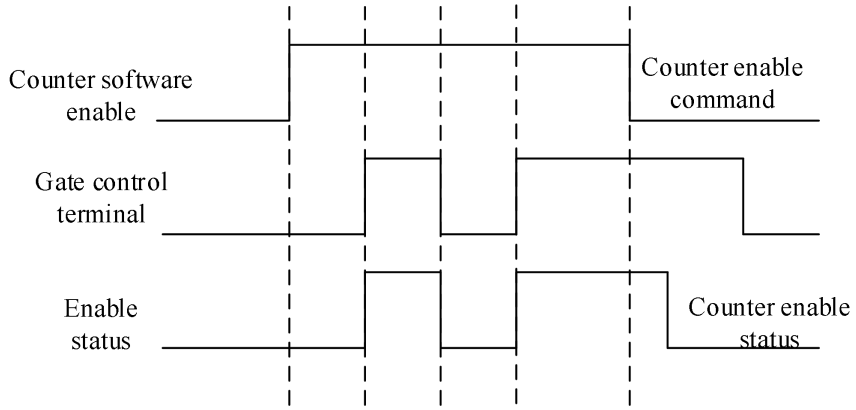


The gate control function refers to hardware enabled control, and users can set X0 or X1 as the gate control function to use. When the gate control function is invalid, the counter is only enabled by the control command. When the gate control function is valid, the counter is enabled to count when both the control command and the gate control input signal are valid. After the counter starts counting, the status word related flag bits will be valid. The control logic is shown in the following figure:

- Not use gate control function



- Use gate control function

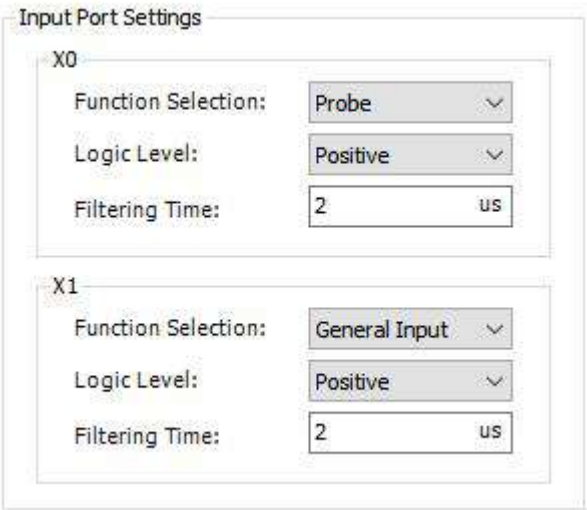


9.2.8.4 Probe function

The probe function is used to latch the DC time and counter value when a specific signal occurs. Each channel can be equipped with up to two probe terminals, and each probe can achieve rising edge latching and falling edge latching.

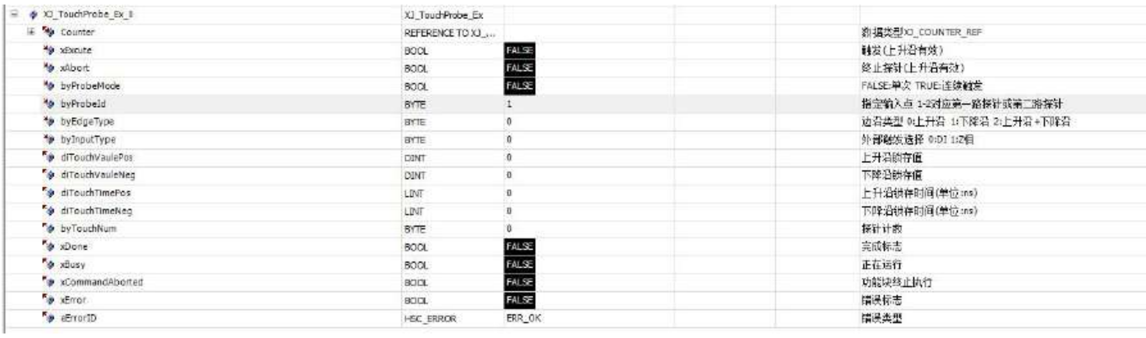
For example, using the X0 terminal as a probe trigger signal, the rising edge condition locks the probe position.

Set the X0 terminal function to 1 "probe":



First, execute the counter enable instruction, then use the counter probe instruction to trigger an external probe signal. After the instruction is successfully executed, latch the current position and current DC time value in the instruction output parameters.

The instruction parameter configuration is as follows:



XJ_TouchProbe_Ex_0	XJ_TouchProbe_Ex				
Counter	REFERENCE TO XJ_...				数据类型XJ_COUNTER_REF
xExcute	BOOL	FALSE			触发(上升沿有效)
xAbort	BOOL	FALSE			终止探针(上升沿有效)
byProbeMode	BOOL	FALSE			FALSE:单次 TRUE:连续触发
byProbeId	BYTE	1			指定输入点 1-2对应第一路探针或第二路探针
byEdgeType	BYTE	0			边沿类型 0:上升沿 1:下降沿 2:上升沿+下降沿
byInputType	BYTE	0			外部触发选择 0:DI 1:Z相
diTouchVaulePos	DINT	0			上升沿锁存值
diTouchVauleNeg	DINT	0			下降沿锁存值
diTouchTimePos	LINT	0			上升沿锁存时间(单位:ns)
diTouchTimeNeg	LINT	0			下降沿锁存时间(单位:ns)
byTouchNum	BYTE	0			探针计数
xDone	BOOL	FALSE			完成标志
xBusy	BOOL	FALSE			正在运行
xCommandAborted	BOOL	FALSE			功能块终止执行
xError	BOOL	FALSE			错误标志
eErrorID	HSC_ERROR	ERR_OK			错误类型

The execution effect is as follows:

Device.Application.PLC_PRG

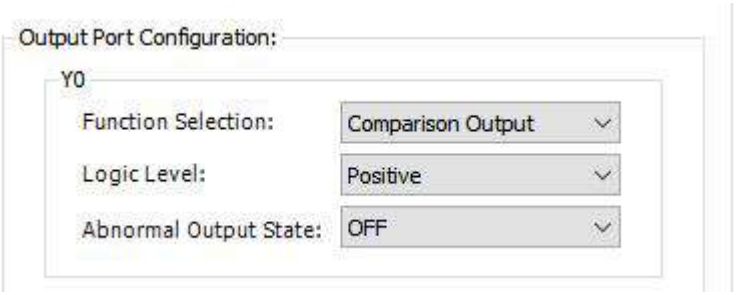
表达式	类型	值	准备值	地址	注释
XJ_Counter_Enable_Ex_0	XJ_Counter_Enable...				
Counter	REFERENCE TO XJ_...				数据类型XJ_COUNTER_REF
xEnable	BOOL	TRUE			常开使能进行计数
xDirectionControl	BOOL	FALSE			FALSE:A 相优先（默认） TRUE:B 相优先
diValue	DINT	5084			高速计数值
udiFrequency	UDINT	0			脉冲频率测量值(单位:hz)...
xDirectionState	BOOL	TRUE			FALSE:增计数 TRUE:减计数
xValid	BOOL	TRUE			FALSE:计数器停止计数 TRUE:计数器正常计数
xBusy	BOOL	TRUE			执行中
xError	BOOL	FALSE			错误标志
eErrorID	HSC_ERROR	ERR_OK			错误类型
XJ_TouchProbe_Ex_0	XJ_TouchProbe_Ex				
Counter	REFERENCE TO XJ_...				数据类型XJ_COUNTER_REF
xExcute	BOOL	TRUE			触发(上升沿有效)
xAbort	BOOL	FALSE			终止探针(上升沿有效)
byProbeMode	BOOL	FALSE			FALSE:单次 TRUE:连续触发
byProbeId	BYTE	1			指定输入点 1-2对应第一路探针或第二路探针
byEdgeType	BYTE	0			边沿类型 0:上升沿 1:下降沿 2:上升沿+下降沿
byInputType	BYTE	0			外部触发选择 0:DI 1:Z相
diTouchVaulePos	DINT	5084			上升沿锁存值
diTouchVauleNeg	DINT	0			下降沿锁存值
diTouchTimePos	LINT	914913636120			上升沿锁存时间(单位:ns)
diTouchTimeNeg	LINT	0			下降沿锁存时间(单位:ns)
byTouchNum	BYTE	0			探针计数
xDone	BOOL	TRUE			完成标志
xBusy	BOOL	FALSE			正在运行
xCommandAborted	BOOL	FALSE			功能块终止执行
xError	BOOL	FALSE			错误标志
eErrorID	HSC_ERROR	ERR_OK			错误类型

```
    xEnable:= ,
    xDirectionControl:= ,
    diValue=> ,
    udiFrequency=> ,
    xDirectionState=> ,
    xValid=> ,
    xBusy=> ,
    xError=> ,
    eErrorID=> );
XJ_TouchProbe_Ex_0(
    Counter:=XJ_HSC_FreeEncoder ,
    xExcute:= ,
```

9.2.8.5 Comparison output

Example: Take Y0 as a comparison output signal.

Set the Y terminal function to "Compare Output":



First, execute the counter enable instruction, then use the counter comparison output instruction, set the comparison output value and comparison output time. After the instruction is successfully executed, the corresponding Y will output the status of the corresponding time.

The instruction parameter configuration is as follows:

XJ_Counter_Compare_Ex_0	XJ_Counter_Compar...				
Counter	REFERENCE TO XJ_...				数据类型XJ_COUNTER_REF
xExecute	BOOL	TRUE			触发
xAbort	BOOL	FALSE			终止比较
diCompareValue	DINT	7000			指定比较值
byChannel	BYTE	1			通道选择(1-4对应Y0-Y3)
uiImRefreshCycle	UINT	30000			单位：0.1ms，最大输出时间是3000ms
xDone	BOOL	FALSE			完成标志
xBusy	BOOL	TRUE			正在运行
xCommandAborted	BOOL	FALSE			功能块终止运行
xError	BOOL	FALSE			错误标志
eErrorID	HSC_ERROR	ERR_OK			错误类型

The execution effect is as follows:

Device.Application.PLC_PRG

表达式	类型	值	准备值	地址	注释
XJ_Counter_Enable_Ex_0	XJ_Counter_Enable...				
Counter	REFERENCE TO XJ_...				数据类型XJ_COUNTER_REF
xEnable	BOOL	TRUE			常开使能进行计数
xDirectionControl	BOOL	FALSE			FALSE:A相优先（默认） TRUE:B相优先
diValue	DINT	9905			高速计数值
udiFrequency	UDINT	0			脉冲频率测量值(单位:hz)...暂可通过界面联调调试合...
xDirectionState	BOOL	TRUE			FALSE:减计数 TRUE:增计数
xValid	BOOL	TRUE			FALSE:计数器停止计数 TRUE:计数器正常计数
xBusy	BOOL	TRUE			忙碌中
xError	BOOL	FALSE			错误标志
eErrorID	HSC_ERROR	ERR_OK			错误类型
XJ_Counter_Compare_Ex_0	XJ_Counter_Compar...				
Counter	REFERENCE TO XJ_...				数据类型XJ_COUNTER_REF
xExecute	BOOL	TRUE			触发
xAbort	BOOL	FALSE			终止比较
diCompareValue	DINT	7000			指定比较值
byChannel	BYTE	1			通道选择(1-4对应Y0-Y3)
uiImRefreshCycle	UINT	30000			单位：0.1ms，最大输出时间是3000ms
xDone	BOOL	TRUE			完成标志
xBusy	BOOL	FALSE			正在运行
xCommandAborted	BOOL	FALSE			功能块终止运行
xError	BOOL	FALSE			错误标志
eErrorID	HSC_ERROR	ERR_OK			错误类型

```
1  XJ_Counter_Enable_Ex_0(
2      Counter:=XJ_HSC_FreeEncoder ,
3      xEnable:= ,
4      xDirectionControl:= ,
5      diValue=> ,
6      udiFrequency=> ,
7      xDirectionState=> ,
8      xValid=> ,
9      xBusy=> ,
10     xError=> ,
11     eErrorID=> );
12 XJ_Counter_Compare_Ex_0(
13     Counter:=XJ_HSC_FreeEncoder ,
14     xExecute:= ,
15     xAbort:= ,
16     diCompareValue:= ,
17     byChannel:= ,
18     uiImRefreshCycle:= ,
19     xDone=> ,
20     xBusy=> ,
```

10. Common problem

Q1: After power on, the PWR light of the module flashes at a frequency of 1Hz.

A1: Please check if the current module is powered by DC24V normally.

WUXI XINJE ELECTRIC CO., LTD.

No.816, Jianzhu West Road, Binhu District, Wuxi City, Jiangsu Province, China

214072

Tel: 400-885-0136

Fax: (510) 85111290

www.xinje.com