

FP30-PN-8A-M12-S0 Master

User Manual



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1 Product overview

1.1 Product introduction

The FP30-PN-8A-M12-S0 is an IP67 master module in the FP30 series, an IO-Link master device with a standard IO architecture. The device supports the PROFINET industrial Ethernet bus interface on the bus side and the IO-Link protocol on the user side, serving as a gateway device for both bus slaves and IO-Link masters. Both the bus and IO-Link interfaces are compatible with devices from multiple manufacturers, offering high compatibility and providing various options for user data acquisition, system configuration optimization, simplified field wiring, and improved system reliability.

1.2 Product features

- Up to IP67 protection rating

Suitable for harsh industrial environments

- Standardization

Based on the IO-Link standard V1.1.3, it can remotely control IO-Link slave devices and is easy to operate.

- IO-Link communication

It has 8 IO-Link ports, allowing connection of up to 8 IO-Link devices. Class-A type)

- Parameter settings

Device parameter backup: automatically restores the parameters of connected IO-Link devices.

Port parameter backup: when enabled, the system automatically backs up the configuration parameters of the slave device when it first connects to the port. Subsequent slave devices connected to this port will run according to these backed-up parameters.

- Short circuit overcurrent protection

Pin2 (DO mode) and Pin4 (DO mode) have short-circuit overcurrent protection.

- Pin2 supports overcurrent recovery

Supports automatic and manual recovery

- High compatibility

Support for slave devices with special process data lengths

- Small size

Suitable for applications with limited space

- Easy to diagnose

The innovative channel indicator light design, positioned close to the channel, clearly displays the communication status of Pin2 and Pin4, facilitating inspection and maintenance.

- Easy configuration

Simple configuration and supports all major mainstream PLCs

- Simple and quick wiring

Using standard cables simplifies wiring

2 Module model

2.1 Model list

Model	Product description
FP30-PN-8A-M12-S0	PROFINET bus protocol 8 x Class-A port IO-Link master

3 Product parameters

3.1 General parameters

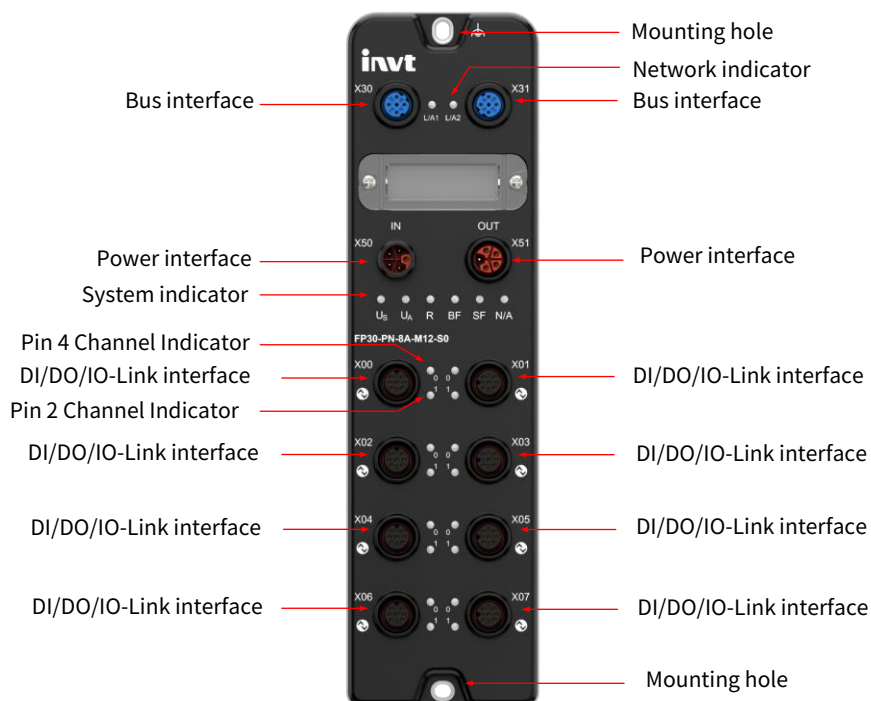
Interface parameters	
Bus protocol	PROFINET
Bus interface	2 x M12-D, 4-pin, female connector
Electrical isolation	500 VAC
Number of I/O stations	According to the master
Data transmission medium	UTP or STP of category 5 or higher (STP recommended)
Transmission distance	≤100 m (station-to-station distance)
Transmission rate	100 Mbps
Technical parameters	
Configuration method	Via the master
Power interface	2 x M12-L, 5-pin, male and female connectors
Power supply	24 VDC (18 V to 30 V)
US total current	Max: 9A
US consumes current	≤100 mA
UA total current	Max: 9A
UA consumes current	0 mA
Power supply reverse polarity protection	Support
Weight	660g
Size	225.5×62.5×32.6mm
Operating temperature	-25°C to +70°C
Storage temperature	-40°C~+85°C
Relative humidity	95%, no condensation
Protection level	IP67

3.2 Digital parameters

Product model	FP30-PN-8A-M12-S0
Bus protocol	PROFINET
Rated voltage	24 VDC (18 V to 30 V)
DI/DO/IO-Link interface	8 x M12-A, 5-pin, female connector
IO-Link channel count	8
IO-Link version	V1.1.3
IO-Link transmission rate	COM1 (4.8kbps), COM2 (38.4kbps), COM3 (230.4kbps)
Number of input channels	Maximum 16
Input signal type	PNP
Input filtering	Supported, fixed configuration is 3ms
Input current	200 mA
Output maximum number of channels	Maximum 16
Maximum output current of single channel	Pin4: 0.5A
	Pin2: 2A
Output signal type	PNP
Load type	Resistive load, inductive load
Total output current	US, UA maximum 9 A
Port protection	Overcurrent protection
Isolation methods	US and UA are not isolated.
Channel indicator lights	Support

4 Panel

4.1 Product structure

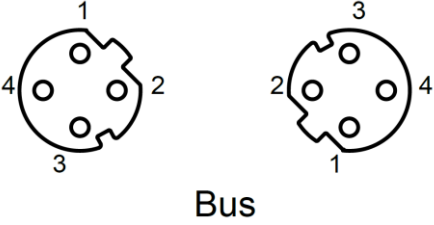


4.2 Indicator light function

Name	Logo	Color	State	Status description
Network indicator IN	L/A1	Green	ON	Establish network connection
			Flash	Network connection and data exchange
			OFF	No data interaction or anomaly
Network indicator OUT	L/A2	Green	ON	Establish network connection
			Flash	Network connection and data exchange
			OFF	No data interaction or anomaly
System power indicator	U_s	Green/Red	Green always on	Power supply is normal
			Red flashing	The system power supply is higher than 9 V and lower than 18 V.
			OFF	The product is not powered on or the power supply is abnormal.
Auxiliary power indicator light	U_A	Green/Red	Green always on	Power supply is normal
			Red flashing	Auxiliary power supply is higher than 11 V and lower than 18 V
			Red always on	Auxiliary power supply is not powered on or the voltage is lower than 11 V
			OFF	The product is not powered on or the power supply is abnormal.

Name	Logo	Color	State	Status description
Operating indicator	R	Green	ON	The system is running normally.
			OFF	Work abnormality
System error indicator	SF	Red	ON	The PROFINET master system is malfunctioning.
			OFF	PROFINET master system is running normally or not powered on
Bus fault indicator	BF	Red	ON	No network connection
			Flash	No PROFINET connection established with the controller
			OFF	Establish PROFINET connection with controller
Pin4 channel indicator	0	Yellow/Red/Green	Yellow always on	Pin4 is in a state of input or output of 1.
			Red always on	Pin4 overcurrent
			Red flashing	IO-Link error
			Green always on	IO-Link communication connection successful
		-	Green flashing	IO-Link communication not connected
			OFF	The state of Pin4 input or output is 0.
Pin2 channel indicator	1	Yellow/Red	Yellow always on	Pin2 input or output state is 1.
			Red always on	Pin2 overcurrent
			Red flashing	Pin1 overcurrent (LED1 and LED0 flash simultaneously)
			OFF	The state of Pin2 input or output is 0.

4.3 Bus interface definition

Bus interface connection view (M12-D, female connector)	Definitions	
	Pin	Function
	1	TX+, send data+
	2	RX+, receiving data+
	3	TX - send data -
	4	RX-, receiving data-

4.4 Power interface definition

Power interface connection view (M12-L, male and female connectors)	Definitions		
	Pin	Function	Wire core color
	1	+24V U _S	Brown
	2	0V GND _A	White
	3	0V GND _S	Blue
	4	+24V U _A	Black
	5	PE	Gray

4.5 I/O interface definition

I/O interface connection view (M12-A, female connector)	Definitions		
	Pin	Function	Wire core color
	1	+24V U _S	Brown
	2	DI/DO	White
	3	0V GND _S	Blue
	4	DI/DO/IO-Link	Black
	5	PE	Gray

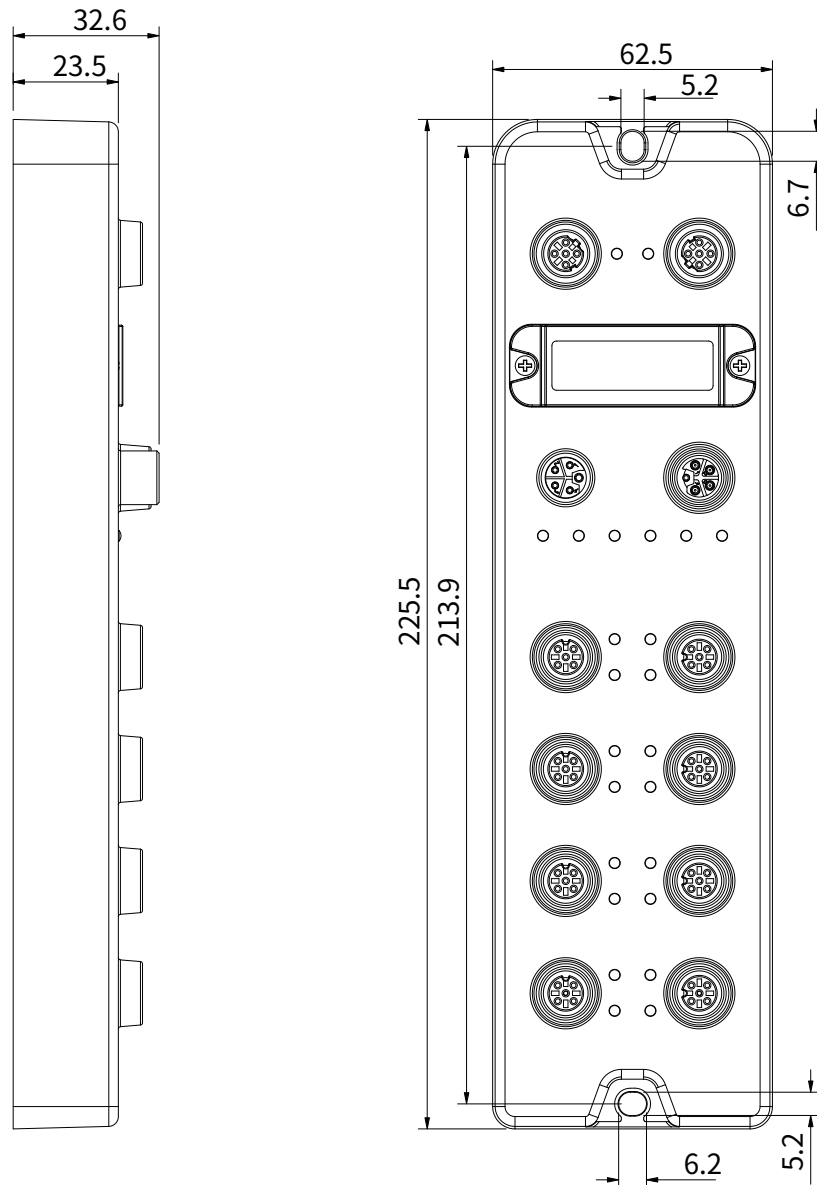
Note:

- Pin1 and Pin3 are powered by the system power supply U_S, and Pin4 signal output is also powered by U_S.
- Pin2 power comes from U_A. If the Pin2 output function is not used, U_A can be left unconnected.

5 Installation and wiring

5.1 Outline dimensions

Figure 5-1 external dimensions (unit: mm)



5.2 Installation environment requirements

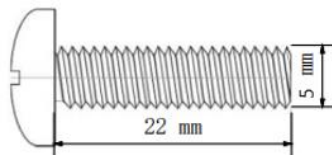
To fully utilize the module's performance and improve its reliability, please avoid installing it in the following locations:

- Places with direct sunlight
- Locations where ambient temperature or relative humidity exceeds module specifications
- Places containing corrosive or flammable gases
- Places where there are droplets of acid, oil, or chemicals
- Places with dust, iron filings, and flying sparks

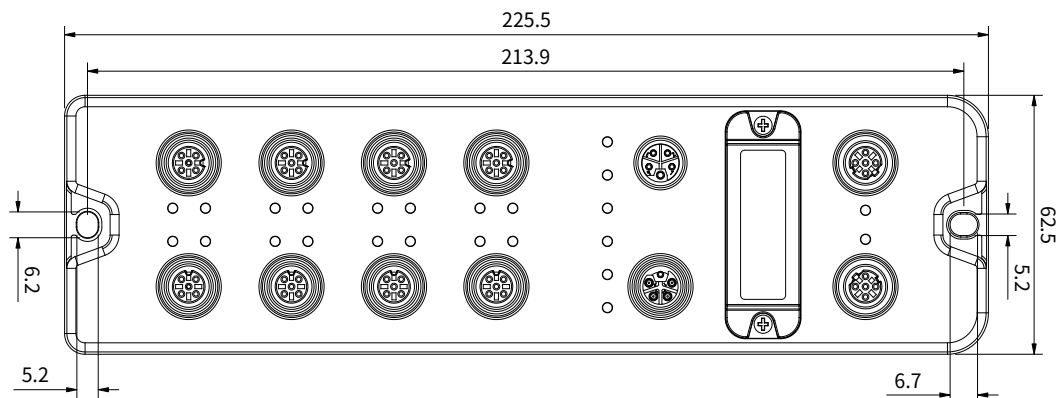
- Locations where the module body is directly subjected to impact or vibration
- Places with strong electric fields, magnetic fields, radiation, and electrostatic interference.
- There are power lines and AC high-voltage power lines nearby.

5.3 Module installation

Please use screws of M5*22mm or larger to secure the module body.



The dimensions of the mounting holes for the module are shown in the figure below.

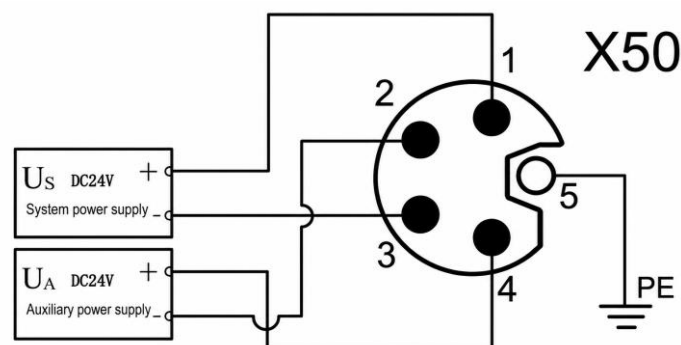


 Note:

- The transparent cover on the module is a pre-installed cover for the rotary switch. The cover is already secured at the factory. Please do not disassemble it at will to avoid damaging the IP67 protection rating.
- Please secure the module properly. If it is not securely fixed, vibration may cause a malfunction.

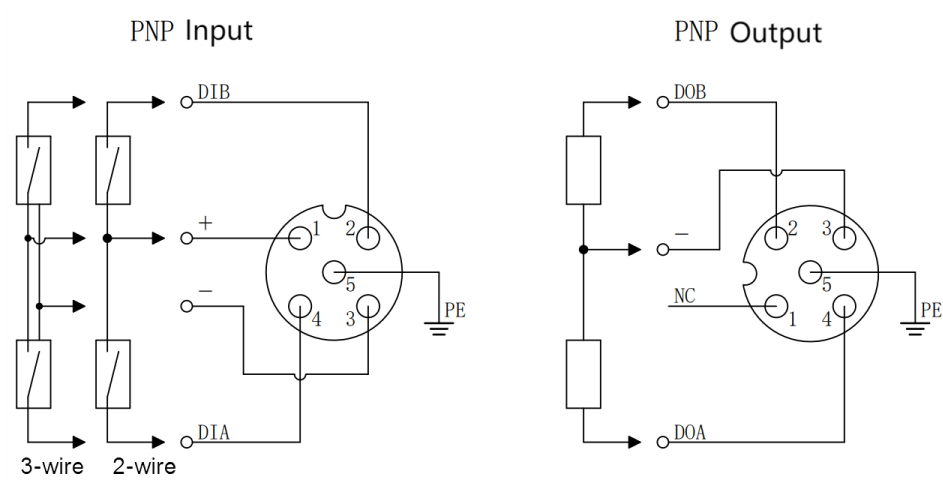
5.4 Wiring instructions

5.4.1 Power interface wiring diagram



Note:

- It is recommended that the system power supply and auxiliary power supply use different switching power supplies to ensure operational stability.
- Please refer to the *Power supply rules* chapter.

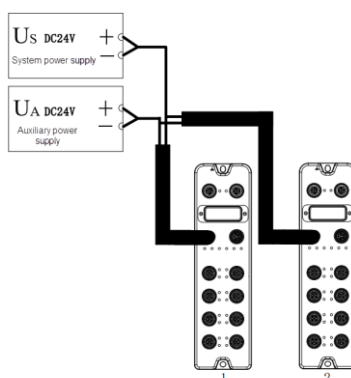
5.4.2 I/O interface wiring diagram

Note: install the module's waterproof cap on unused connector interfaces and tighten it to avoid compromising the IP67 protection rating.

6 Power supply rules

6.1 Direct power supply rules

Each module is powered directly from the switching power supply, without using the OUT interface. The total current consumed by each module's US pin should be $\leq 9A$, and the total current consumed by each module's UA pin should be $\leq 9A$.



The voltage drop in the power cable varies depending on the total current consumed by the module power supply and the cable material. The table below shows the voltage drop when using our standard cable.

Total current consumed by the power supply (A)	Voltage drop (V) at different cable lengths			
	1m	3m	5m	10m
8	0.64	1.12	1.60	2.72
7	0.56	0.98	1.40	2.38
6	0.48	0.84	1.20	2.04
5	0.40	0.70	1.00	1.70
4	0.32	0.56	0.80	1.36
3	0.24	0.42	0.60	1.02
2	0.16	0.28	0.40	0.68
1	0.08	0.14	0.20	0.34

Example of calculating the total current consumption of the module when directly powered

For example, if both modules are FP30-PN-8A-M12-S0, the usage of each module is shown in the table below:

Module name	I/O ports			External connection devices	
	Port name	Pin name	I/O mode	Product name	Specification
Module 1	Ports 1-8	Pin4	DI (input current 4mA)	3-wire sensor	Current consumption: 30mA
		Pin2	DI (input current 4mA)		Current consumption: 30mA
Module 2	Ports 1-8	Pin4	DO	Solenoid valve	Load current: 500mA
		Pin2	DO	Solenoid valve	Load current: 2A

The total current consumption is calculated, and the current consumption of a single module is calculated as shown in the table below:

Module name	Power type	Total current consumption calculation items	Calculation results
Module 1	System power US	System current consumption	Module system-side power consumption 35mA
	System power US	Module input current and sensor current consumption	For all ports (Sensor current consumption) + (channel input current * number of input points) = (30mA * 16) + (4mA * 16) = 544 mA
Module 2	System power US	System current consumption	Module system-side power consumption 35mA
	System power US	Pin4 load output current	For ports 1–8 Pin4 Channel output current * number of output points = 500mA * 8 = 4A
	Auxiliary power supply UA	Pin2 load output current	For ports 1–8 Pin2 Channel output current * number of output points = 500mA * 8 = 4A

In summary, the current consumption of each module is as follows:

For the system power supply U_s , each module consumes 35mA of current.

The system power supply U_s of module 1 (FP30-PN-8A-M12-S0) consumes a current of 35mA + 544mA = 579mA, which is less than the maximum current of the module's system power supply U_s of 9A.

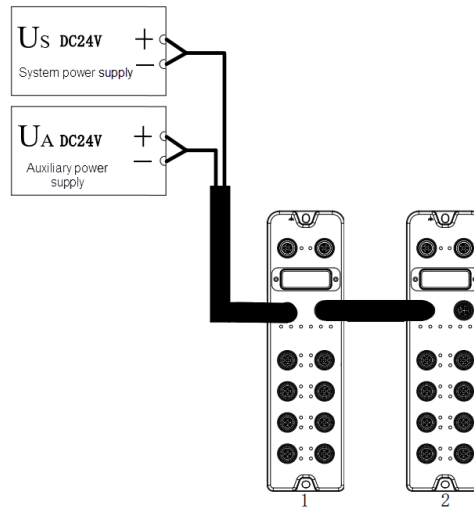
The system power supply U_s of module 2 (FP30-PN-8A-M12-S0) consumes a current of 35mA + 4A = 4.035A, which is less than the maximum current of the module's system power supply U_s of 9A.

The auxiliary power supply U_A of module 2 (FP30-PN-8A-M12-S0) consumes 4A of current, which is less than the maximum current of 9A of the module's auxiliary power supply U_A .

In this example, the requirement is met because the total current consumed by each module (U_s) is $\leq 9A$ and the total current consumed by each module (U_A) is $\leq 9A$.

6.2 Series power supply rules

The modules are connected in series via the OUT interface. The total current consumed by the U_s of each module should be $\leq 9A$, the total current consumed by the U_A should be $\leq 9A$, and the total current consumed by the U_s and U_A of all modules should be $\leq 9A$.



When powered in series, the current consumed by the modules connected in series flows through the module, resulting in a voltage drop in the internal circuit of the module. The voltage drop in the power cable varies depending on the total current consumed by the module power supply and the cable material. The table below shows the voltage drop when using our standard cables.

Total current consumed by the power supply (A)	Voltage drop (V) in the internal circuit of the module	Voltage drop (V) at different cable lengths			
		1m	3m	5m	10m
9	0.36	0.72	1.26	1.80	3.06
8	0.32	0.64	1.12	1.60	2.72
7	0.28	0.56	0.98	1.40	2.38
6	0.24	0.48	0.84	1.20	2.04
5	0.20	0.40	0.70	1.00	1.70
4	0.16	0.32	0.56	0.80	1.36
3	0.12	0.24	0.42	0.60	1.02
2	0.08	0.16	0.28	0.40	0.68
1	0.04	0.08	0.14	0.20	0.34

Note:

- The total current consumed by each module's U_S should be $\leq 9A$, and the total current consumed by each module's U_A should be $\leq 9A$.
- As shown in the figure above, when powered in series, the total current consumed by U_S and U_A of all modules should meet the rule that "module 1 + module 2" $\leq 9A$.

Example of calculating the total current consumption of the module when powered in series

For example, both modules are FP30-PN-8A-M12-S0, and the usage of each module is similar to "example of calculating the total current consumption of the module when directly powered" same.

Calculate the total current consumption: $U_S = 579mA + 4.035A = 4.614A$, $U_A = 4A$.

In this example, the requirement is met because the total current consumed by U_S and U_A of all modules satisfies the rule "module 1 + module 2" $\leq 9A$.

7 Operation

7.1 Parameter and process data description

7.1.1 Output clear/hold function

The Clear/Hold function applies to the output signal of each port. This function configures the module output action when a bus fault occurs. The following three output actions are supported:

Low-level output (Clear 0): when communication is disconnected, the module output channel outputs a low level.

High-level output (Clear 1): when communication is disconnected, the module output channel outputs a high level.

Hold last value: when communication is disconnected, the module output channel holds the last output level.

7.1.2 Pin2 circuit overcurrent recovery mode function

When an overcurrent fault occurs on Pin2, Automatic Recovery and Manual Recovery are supported. This setting can be configured in the master module parameters. The default mode is Automatic Recovery.

The PROFINET master parameter function is described using TIA Portal V17 as an example. For the procedure, see "Master Parameter Configuration" in section 7.2.1 Application in TIA Portal V17 Software Environment.

7.1.3 ISDU remote configuration function

The PROFINET master supports only ISDU write operations before configuration. Before performing the operation, obtain the ISDU information of the slave device. For details, refer to Chapter 6 of the "FP30 Series Hub User Manual_Vx.xx.pdf".

The FP30-16CP-A-M12-S0 slave device supports port direction configuration, input filtering, and factory reset. The following example describes how to configure these three functions when Port 1 is connected to the FP30-16CP-A-M12-S0 and the Port 1 status is displayed as 3 (IO-Link OP status).

PROFINET Master ISDU Parameter Configuration

Due to protocol limitations, the PROFINET master does not support ISDU read operations; it supports only ISDU write operations before configuration. For multiple write operations, the configuration can be downloaded multiple times. Slave devices usually support configuration saving, and the configuration is retained after power-off. The Index, Subindex, and Length fields of the PROFINET master accept decimal (DEC) values only, and the Control field is not required.

Example 1: Configure the FP30-16CP-A-M12-S0 with the first 8 channels as inputs and the last 8 channels as outputs. Refer to section 6.5.2 of the "FP30 Series Hub User Manual_Vx.xx.pdf". Set Index to 66 (0x0042), Subindex to 0 (0x00), Length to 2 (0x02), and Data to 00FF.

Example 2: Configure the FP30-16CP-A-M12-S0 with 2 ms input filtering for the first 8 channels and input filtering disabled for the last 8 channels. Refer to section 6.5.5 of the "FP30 Series Hub User Manual_Vx.xx.pdf". Set Index to 73 (0x0049), Subindex to 0 (0x00), Length to 16 (0x10), and Data to 01010101010101010000000000000000.

Example 3: Restore the FP30-16CP-A-M12-S0 to factory settings. Refer to section 6.3 of the "FP30 Series Hub User Manual_Vx.xx.pdf". Set Index to 2 (0x0002), Subindex to 0 (0x00), Length to 1 (0x01), and Data to 82.

The PROFINET master ISDU configuration function is described using TIA Portal V17 as an example. For the procedure, see "Slave ISDU Parameter Configuration" in section 7.2.1 Application in TIA Portal V17 Software Environment.

7.1.4 DI/DO/IO-Link mode function

1. Port DI/DO Mode

The 01 series PROFINET master supports standard DI/DO mode on Pin2 and Pin4 of each port. Select the corresponding Standard Input or Standard Output module as needed. The default mode is Standard Input.

2. Port IO-Link Mode

- The 01 series PROFINET master supports IO-Link mode on Pin4 of each port.
- Normally, the slave process data length should be consistent with the configured module data length, but a longer configured length is compatible. For example, if the slave input process data length is 2 bytes, a module input length greater than 2 bytes, such as 4 bytes, can be selected. However, a length less than 2 bytes cannot be selected; otherwise, the device status indicates an input length mismatch.

For slave data length values, refer to Appendix C. If no module with the corresponding slave data length is available, select a module with a length greater than the slave data length, or select a slave data length module according to section 7.3 Custom Data Length Module.

The DI/DO/IO-Link mode configuration method for the PROFINET master is described using TIA Portal V17 as an example. For the procedure, see "DI/DO/IO-Link Settings" in section 7.2.1 Application in TIA Portal V17 Software Environment.

7.1.5 Uplink and downlink process data

Slot0 data definition table for the PROFINET master model FP30-PN-8A-M12-S0:

Type	Byte offset	Length	Description
Input Process Data (12 bytes)	0	1 byte	Pin2 standard input mode input value
	1	1 byte	Pin4 standard input mode input value
	2	1 byte	Port 0 device status
	3	1 byte	Port 1 device status
	4	1 byte	Port 2 device status
	5	1 byte	Port 3 device status
	6	1 byte	Port 4 device status
	7	1 byte	Port 5 device status
	8	1 byte	Port 6 device status
	9	1 byte	Port 7 device status
	10	1 byte	Master status
	11	1 byte	Input data validity, default 0xFF, reserved
Output Process Data (2 bytes)	0	1 byte	Port Pin2 standard output mode output value
	1	1 byte	Port Pin4 standard output mode output value

Note: For port status details, refer to Appendix B.

7.2 PROFINET master configuration application

7.2.1 Application in TIA Portal V17 software environment

1. Preparation

Hardware environment

- This section uses the FP30-PN-8A-M12-S0 module as an example.

Connect slave module FP30-16CP-A-M12-S0 to port X01.

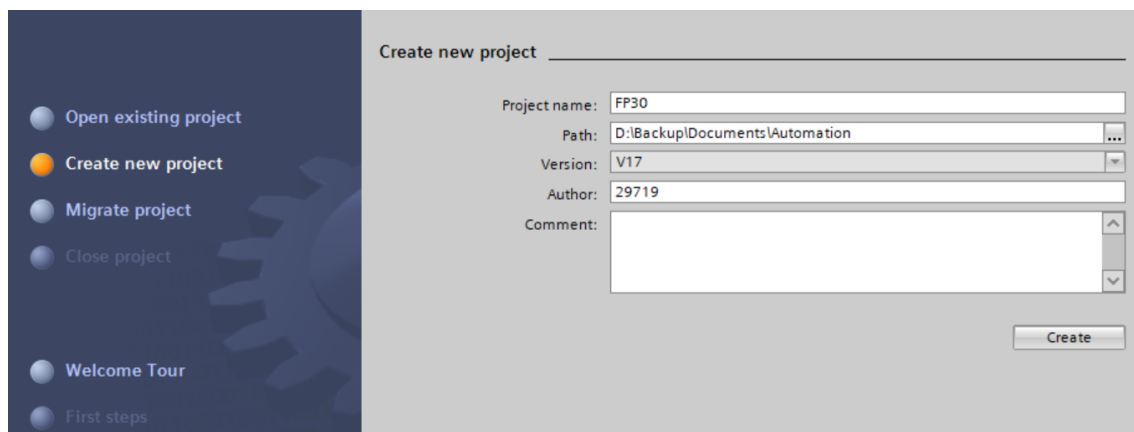
- One computer pre-installed with TIA Portal V17 software
- **PROFINET dedicated shielded cable**
- One Siemens PLC. This manual uses Siemens S7-1500 CPU 1511-1 PN as an example.
- **One switching power supply**
- **Device configuration file**

Hardware Configuration and Wiring

Please follow the requirements in Chapter 5 "Installation and Wiring".

2. Create a New Project

Open TIA Portal V17, click "Create new project", enter the required information, and click "Create", as shown in the figure below.



Project name: Custom; the default setting can be retained.

Path: Project save path; the default setting can be retained.

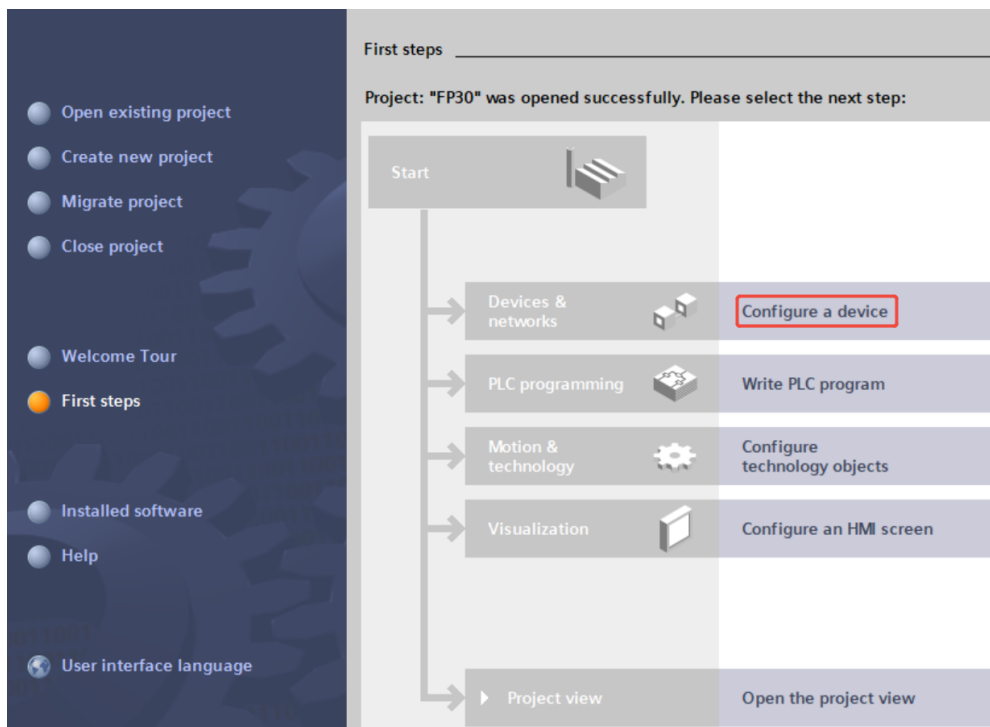
Version: The default setting can be retained.

Author: The default setting can be retained.

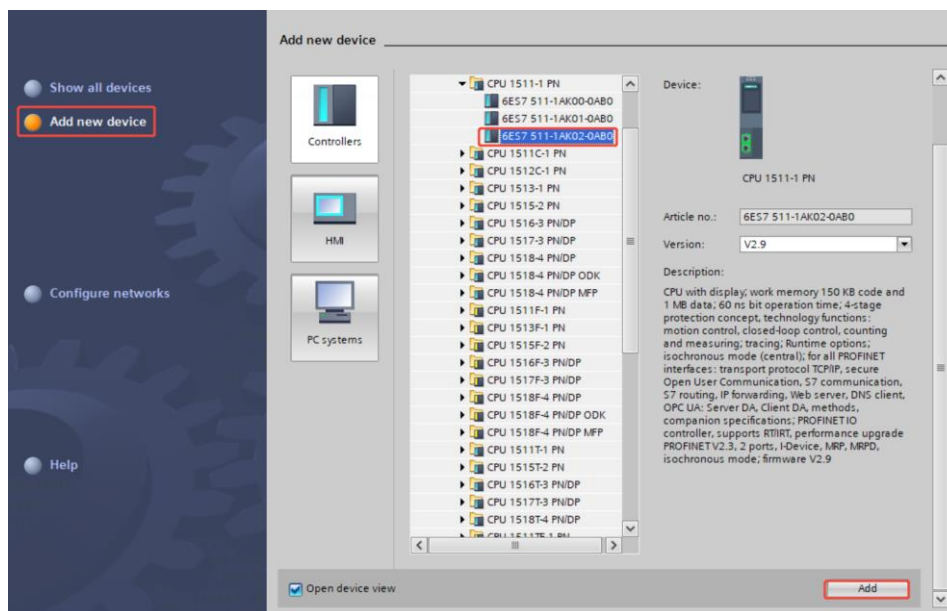
Comment: Custom; this field can be left blank.

3. Add PLC Controller

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

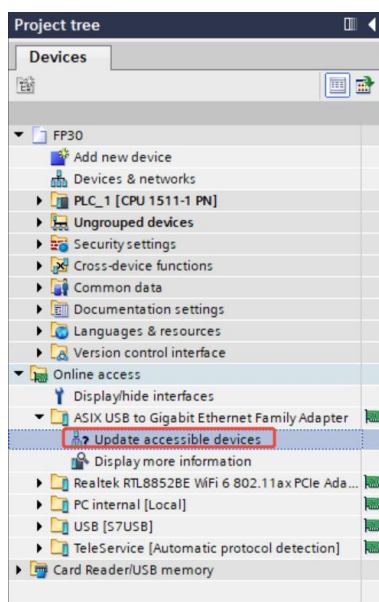


- b) Click "Add new device", select the PLC model you are currently using, and click "Add", as shown in the figure below. After adding, you can see that the PLC has been added to the device navigation tree.

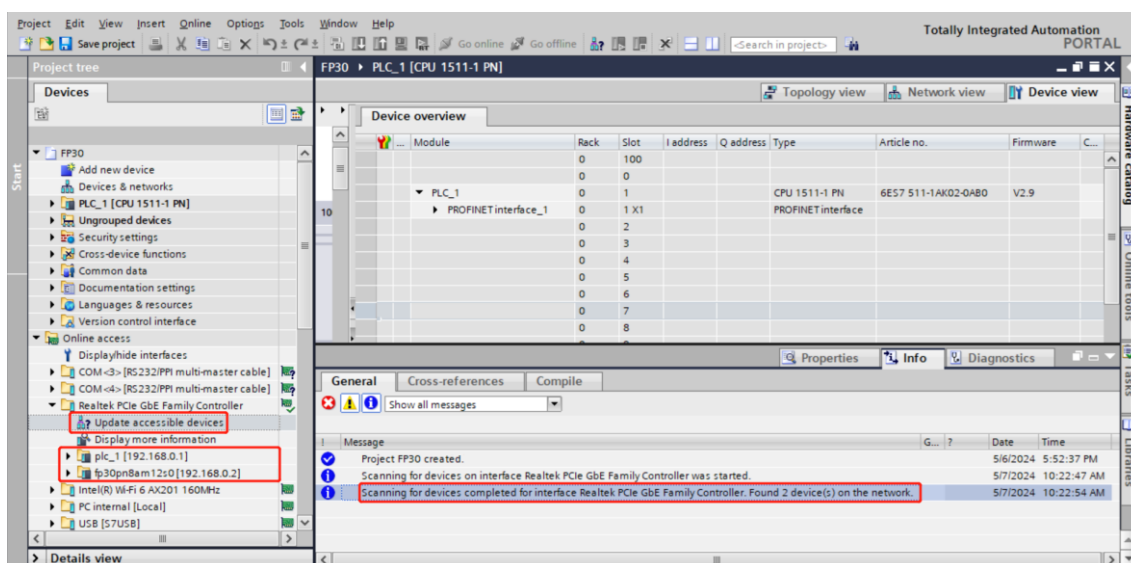


4. Scan Connected Devices

- a) Click "Online access -> Update accessible devices" in the left navigation tree, as shown in the figure below.



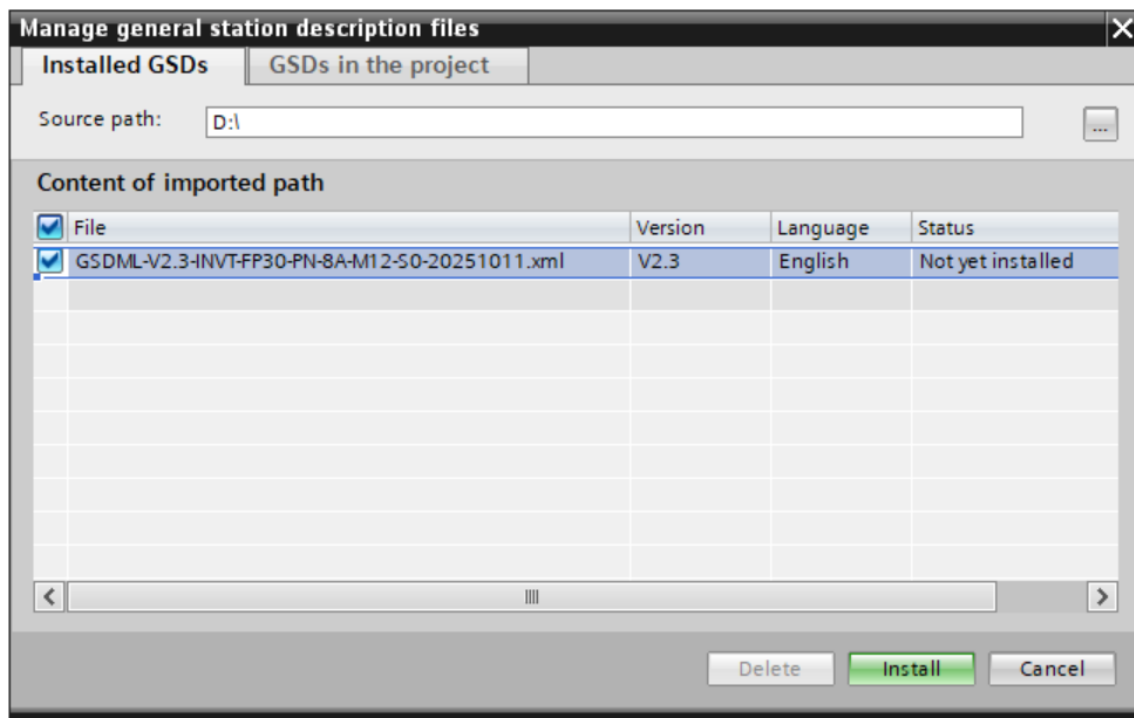
- b) After the update is complete, the connected slave devices are displayed, as shown in the figure below.



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

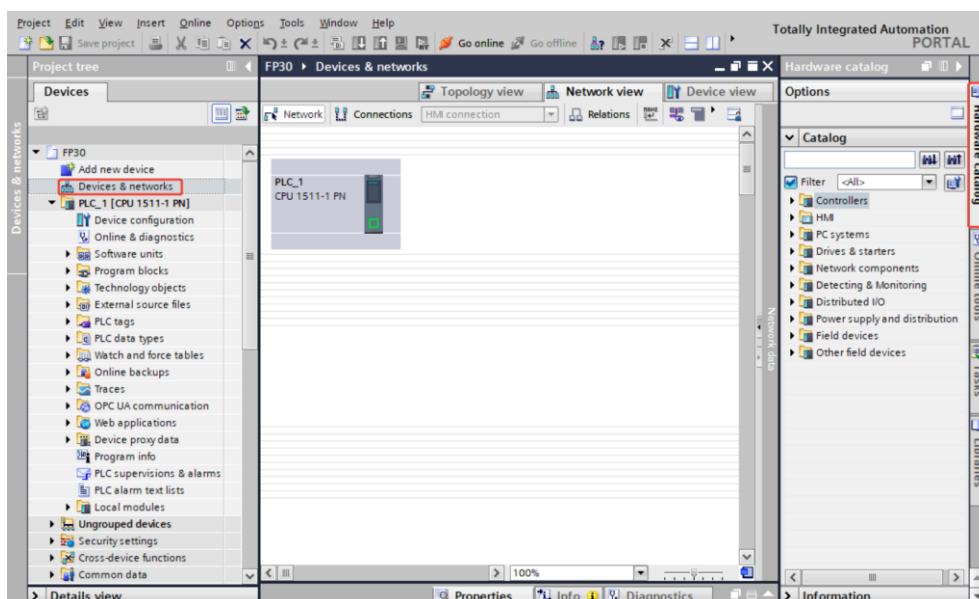
5. Add GSD Configuration File

- In the menu bar, select "Options -> Manage general station description files (GSDML)(D)".
- Click "Source path" and select the folder where the GSD files are stored.
- Check whether the status of the GSD file to be added is "Not installed". If it is not installed, click "Install". If it is already installed, click "Cancel" to skip installation.

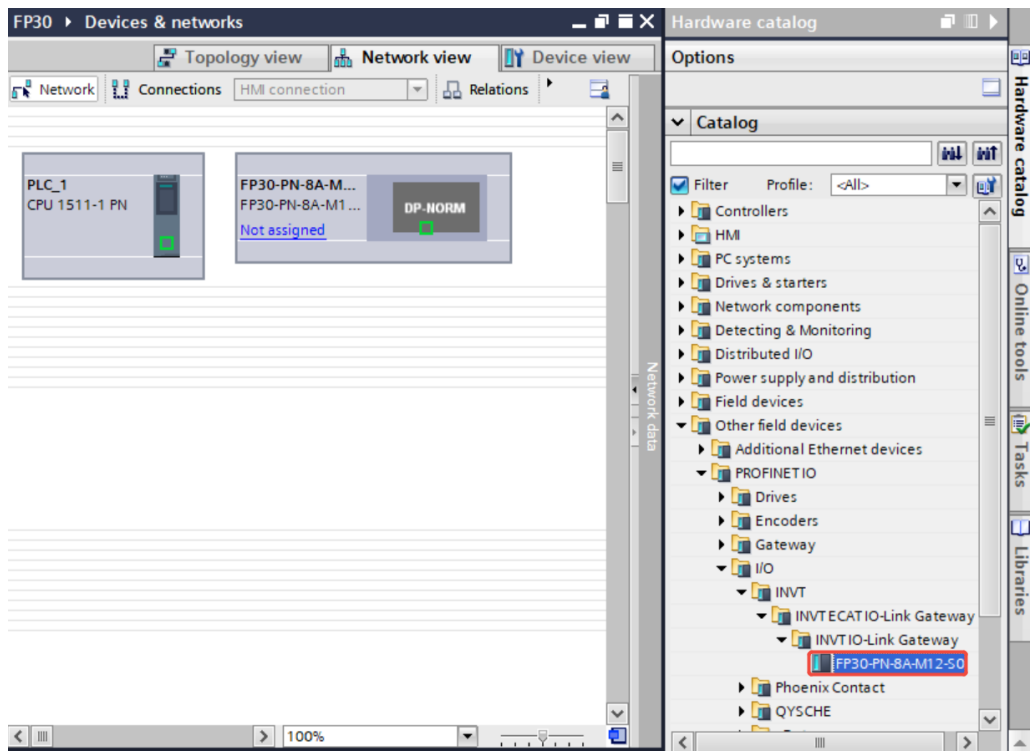


6. Add Slave Device

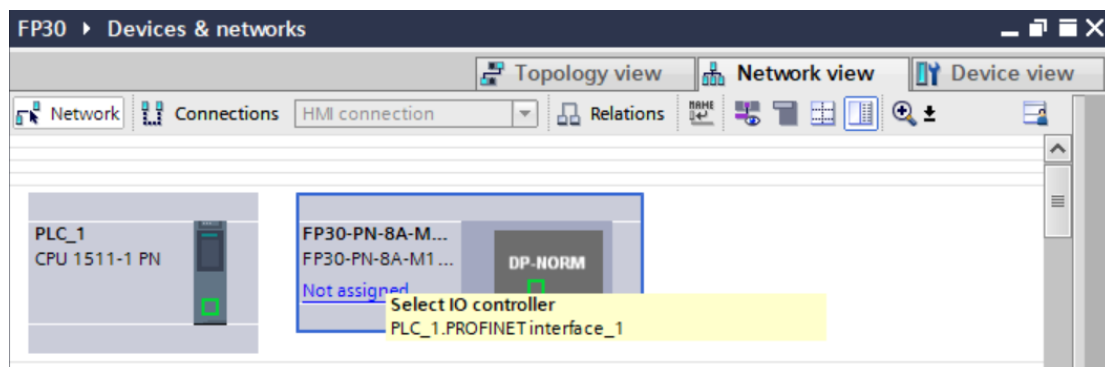
- Double-click "Devices and networks" in the left navigation tree.
- Click the vertical "Hardware catalog" button on the right. The catalog is displayed as shown in the figure below.



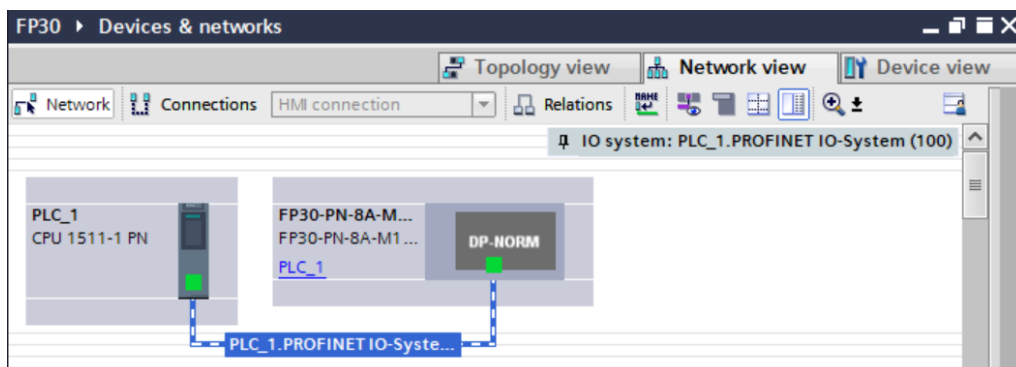
- c) Find the "FP30-PN-8A-M12-S0" module in the Hardware catalog and drag or double-click it to "Network view", as shown in the figure below. If multiple modules are connected, add them in sequence according to the actual topology in the Hardware catalog on the right.



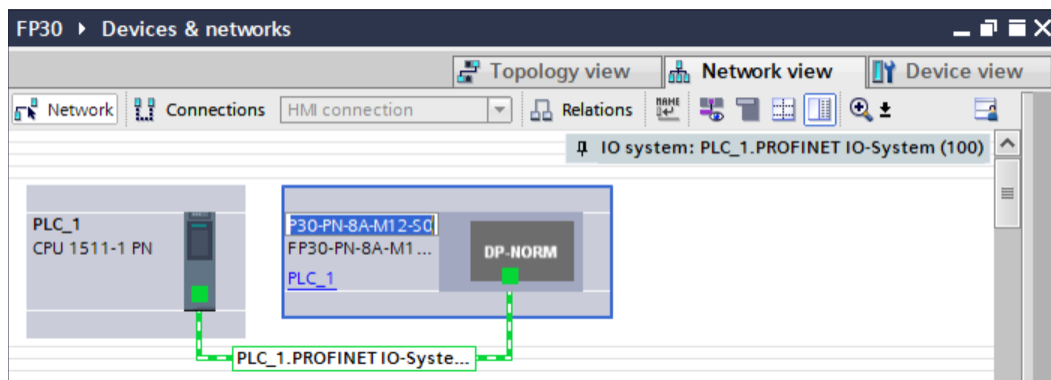
- d) Click "Unassigned" (blue text) on the slave device and select "PLC_1.PROFINET interface_1", as shown in the figure below.



- e) After the connection is complete, the result is shown in the figure below.



- f) Click the device name to rename the device, as shown in the figure below.



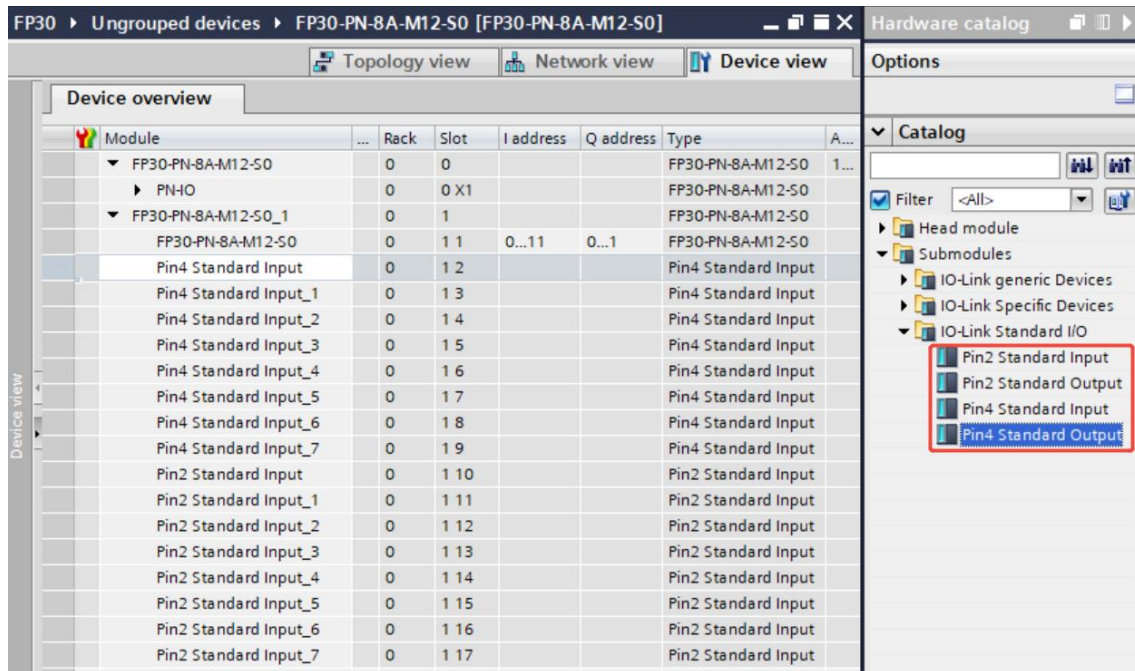
7. DI/DO/IO-Link Settings

- a) Click "Device view" to enter the device overview. The topology configuration information, including the I/O addresses automatically assigned by the system, is displayed. The I/O addresses can be modified manually, as shown in the figure below. Pin4 Standard Input to Pin4 Standard Input 7 can be configured as DI, DO, or IO-Link. Pin2 Standard Input to Pin2 Standard Input 7 can be configured as DI or DO.

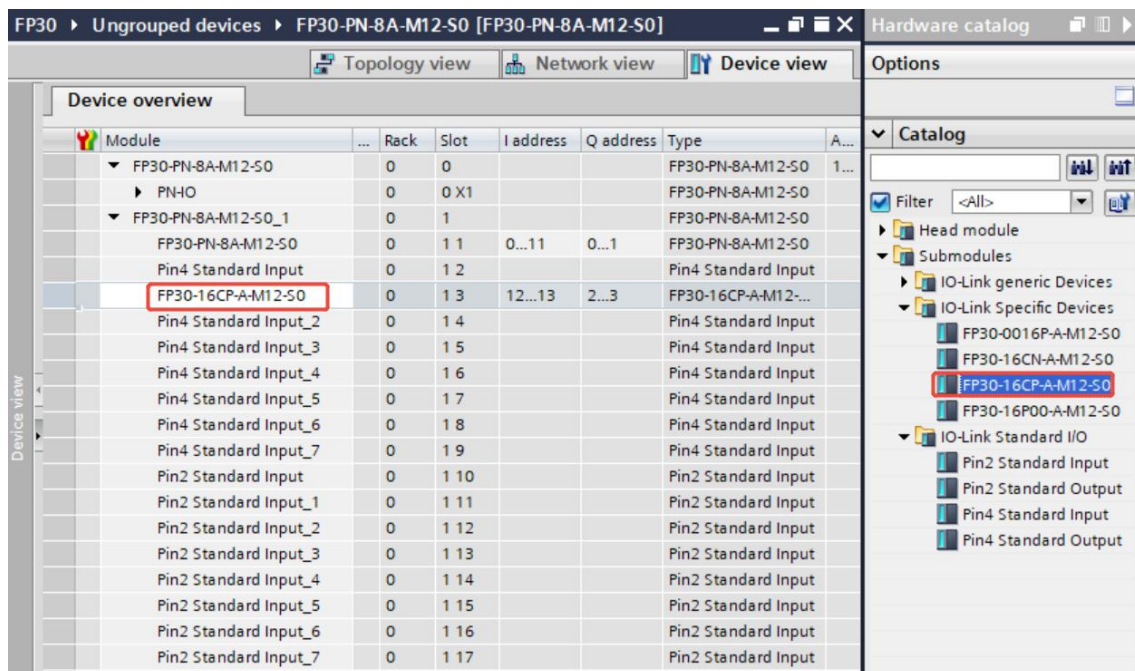
Module	Rack	Slot	I address	Q address	Type	Article number
FP30-PN-8A-M12-S0	0	0			FP30-PN-8A-M12-S0	1234567
PN-IO	0	0 X1			FP30-PN-8A-M12-S0	
FP30-PN-8A-M12-S0_1	0	1			FP30-PN-8A-M12-S0	
FP30-PN-8A-M12-S0	0	1.1	0...11	0...1	FP30-PN-8A-M12-S0	
Pin4 Standard Input	0	1.2			Pin4 Standard Input	
Pin4 Standard Input_1	0	1.3			Pin4 Standard Input	
Pin4 Standard Input_2	0	1.4			Pin4 Standard Input	
Pin4 Standard Input_3	0	1.5			Pin4 Standard Input	
Pin4 Standard Input_4	0	1.6			Pin4 Standard Input	
Pin4 Standard Input_5	0	1.7			Pin4 Standard Input	
Pin4 Standard Input_6	0	1.8			Pin4 Standard Input	
Pin4 Standard Input_7	0	1.9			Pin4 Standard Input	
Pin2 Standard Input	0	1.10			Pin2 Standard Input	
Pin2 Standard Input_1	0	1.11			Pin2 Standard Input	
Pin2 Standard Input_2	0	1.12			Pin2 Standard Input	
Pin2 Standard Input_3	0	1.13			Pin2 Standard Input	
Pin2 Standard Input_4	0	1.14			Pin2 Standard Input	
Pin2 Standard Input_5	0	1.15			Pin2 Standard Input	
Pin2 Standard Input_6	0	1.16			Pin2 Standard Input	
Pin2 Standard Input_7	0	1.17			Pin2 Standard Input	

- b) When configuring DI/DO on the FP30-PN-8A-M12-S0 master module, select the corresponding Pin4/Pin2 Standard Input to Pin4/Pin2 Standard Input 7 for ports X00–X07, right-click and delete it,

and then double-click Pin4/Pin2 Standard Input or Standard Output in the Hardware catalog on the right to add it, as shown in the figure below.

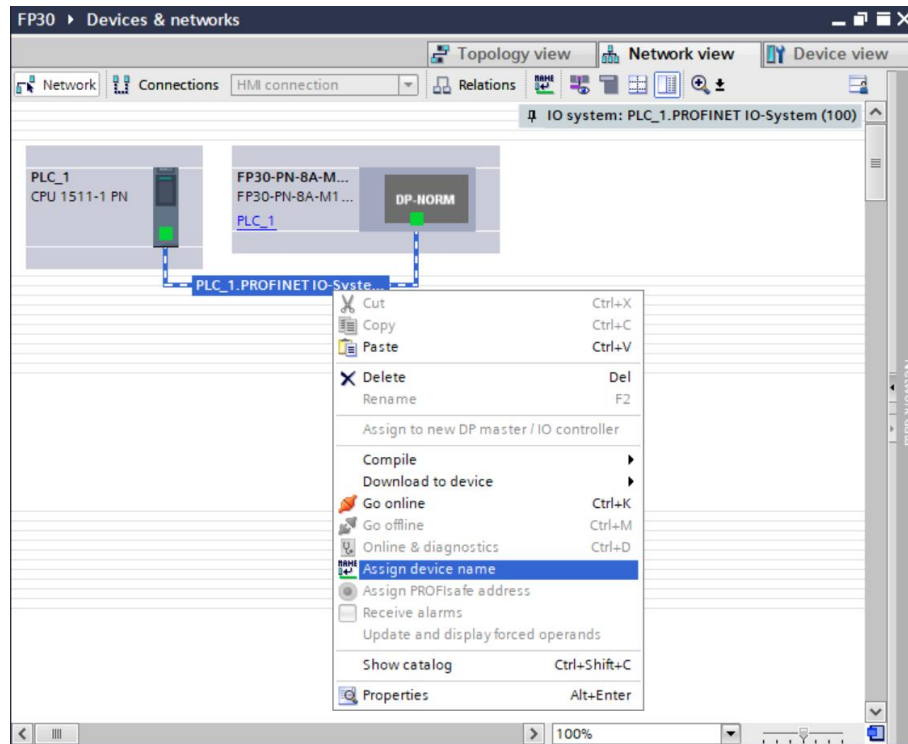


- c) The X01 port Pin4 of the FP30-PN-8A-M12-S0 master module is connected to the FP30-16CP-A-M12-S0 module. In the Hardware catalog on the right, find the module, right-click "Pin4 Standard Input 1" and select "Delete". Then double-click "FP30-16CP-A-M12-S0" to add the slave device to the configuration, as shown in the figure below.

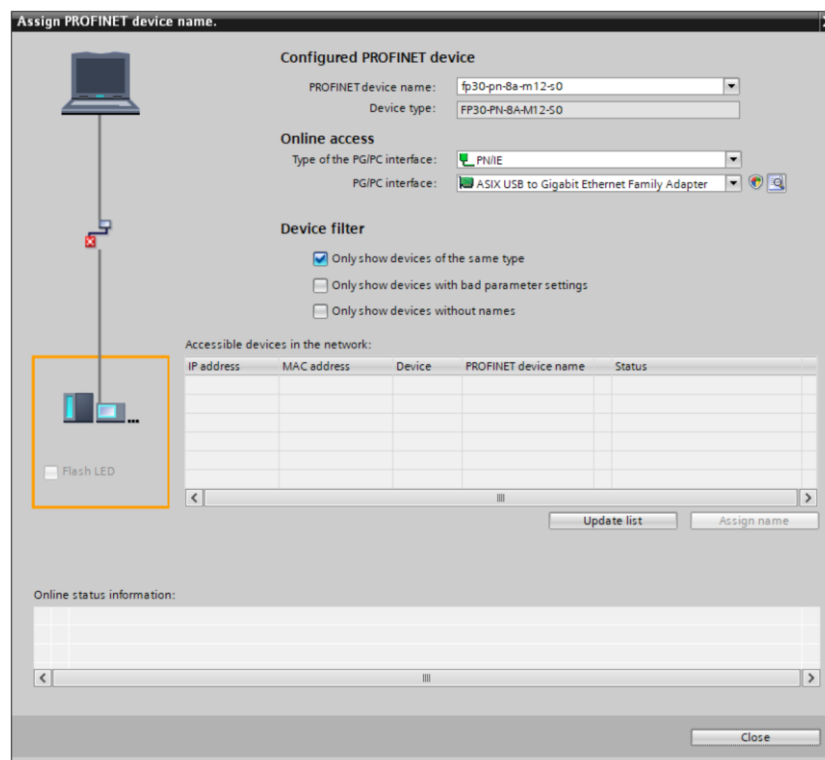


8. Assign Device Name

- a) Switch to "Network view", right-click the connection cable between the PLC and module FP30-PN-8A-M12-S0, and select "Assign device name", as shown in the figure below.

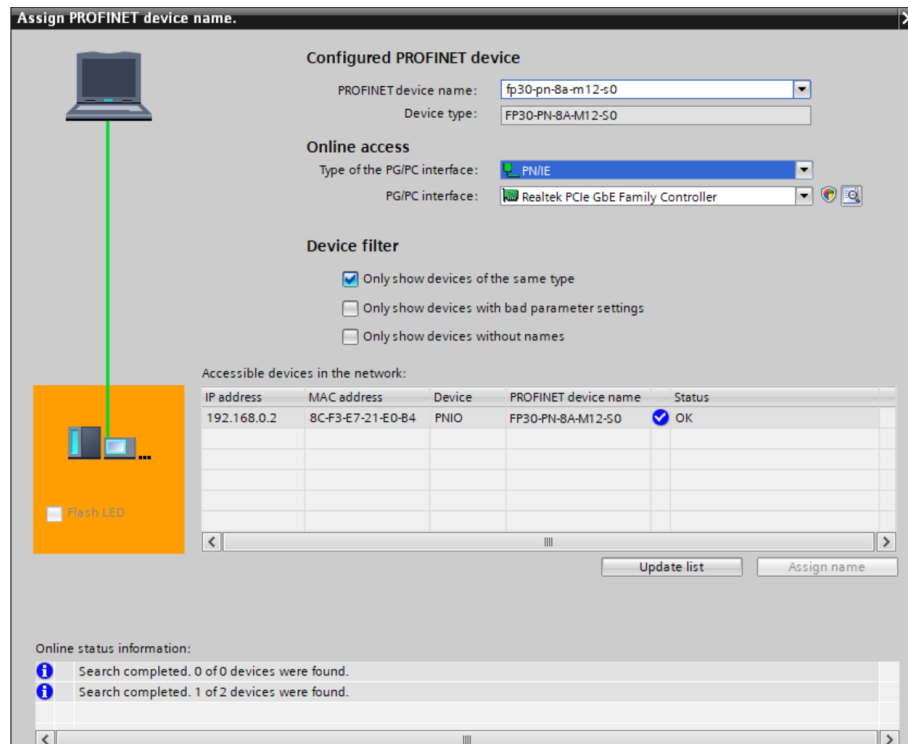


- b) The "Assign PROFINET device name" window will pop up, as shown in the figure below.



Check whether the MAC address on the module silkscreen is the same as the MAC address of the assigned device name.

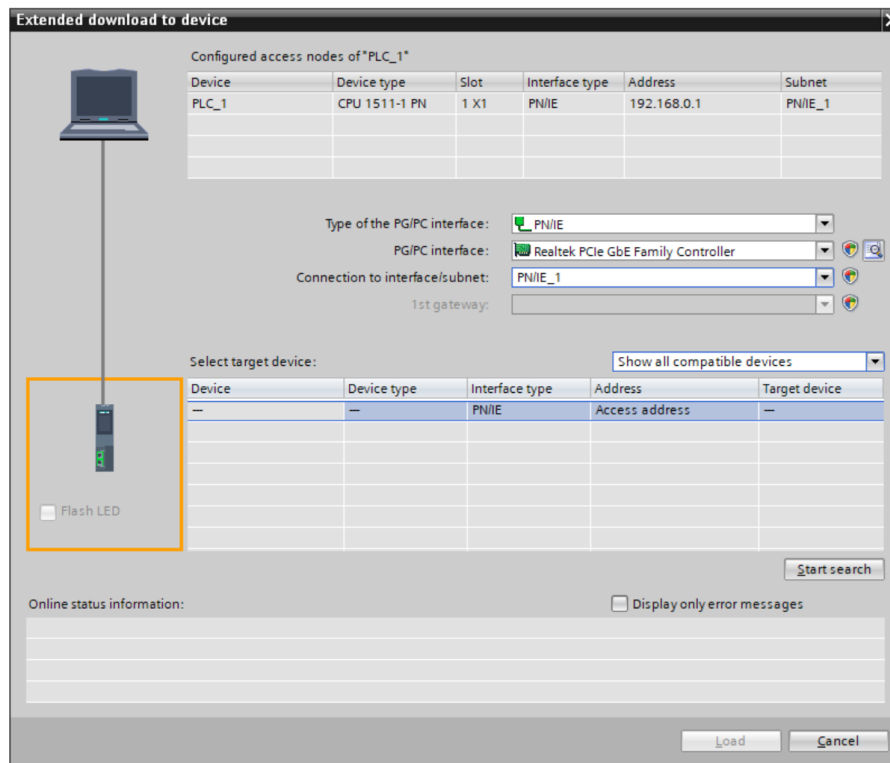
- PROFINET device name: the name set in "Assign PROFINET device name".
 - PG/PC interface type: PN/IE.
 - PG/PC interface: the actual network adapter used.
- c) Select the slave devices in sequence, click "Update list", and then click "Assign name". Check whether the status of the node in "Accessible nodes in the network" is "OK", as shown in the figure below.



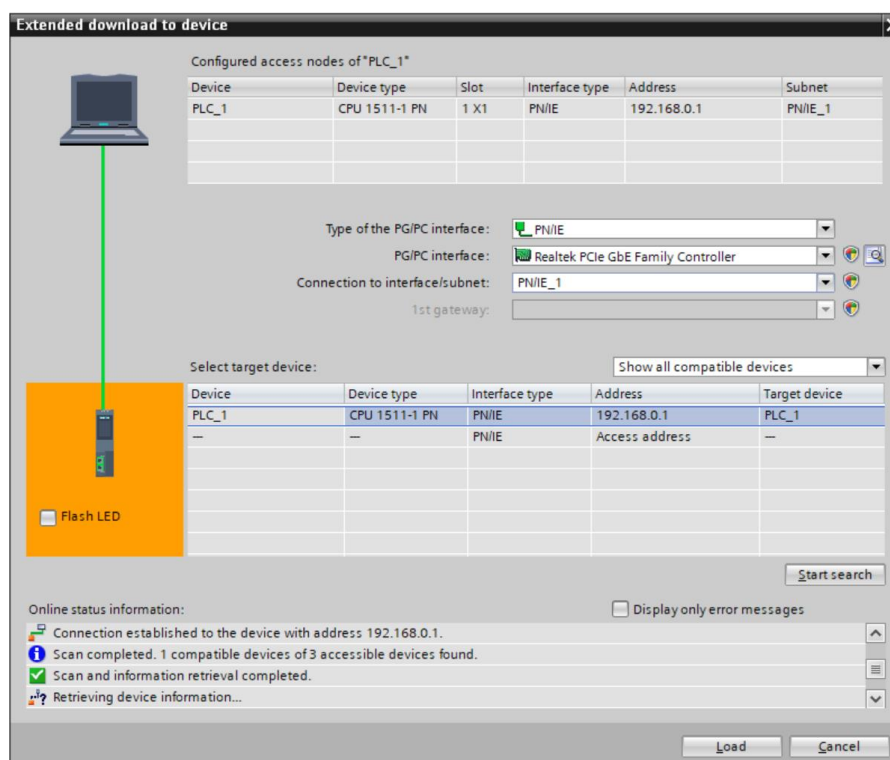
- d) Click "Close".

9. Download Configuration

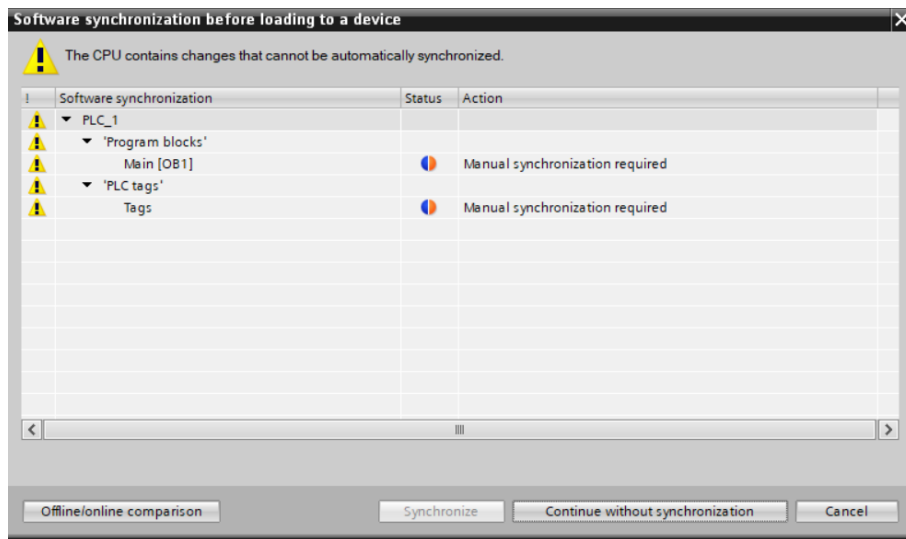
- In the "Network view", select PLC.
- Click  on the menu bar to download the current configuration to the PLC.
- In the "Extended download to device" window, configure the settings as shown in the figure below.



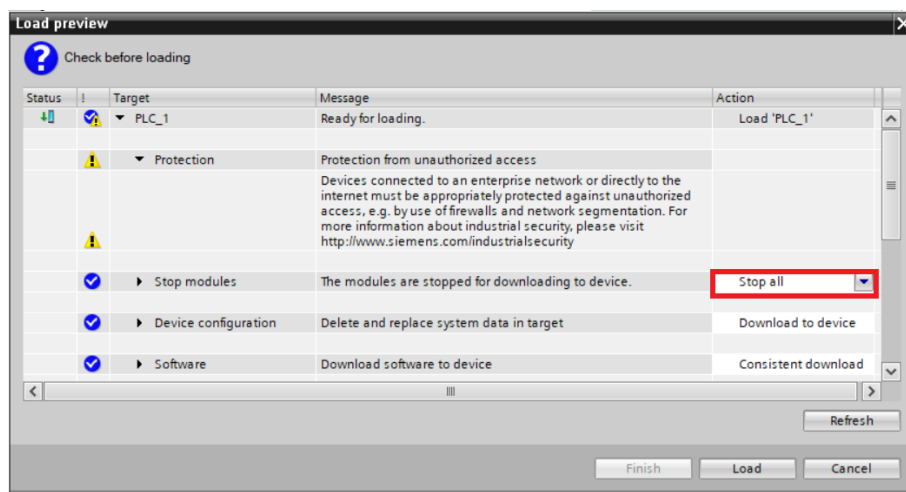
- Click "Start search", as shown in the figure below.



- e) Click "Download".
- f) Select "Continue without synchronization", as shown in the figure below.



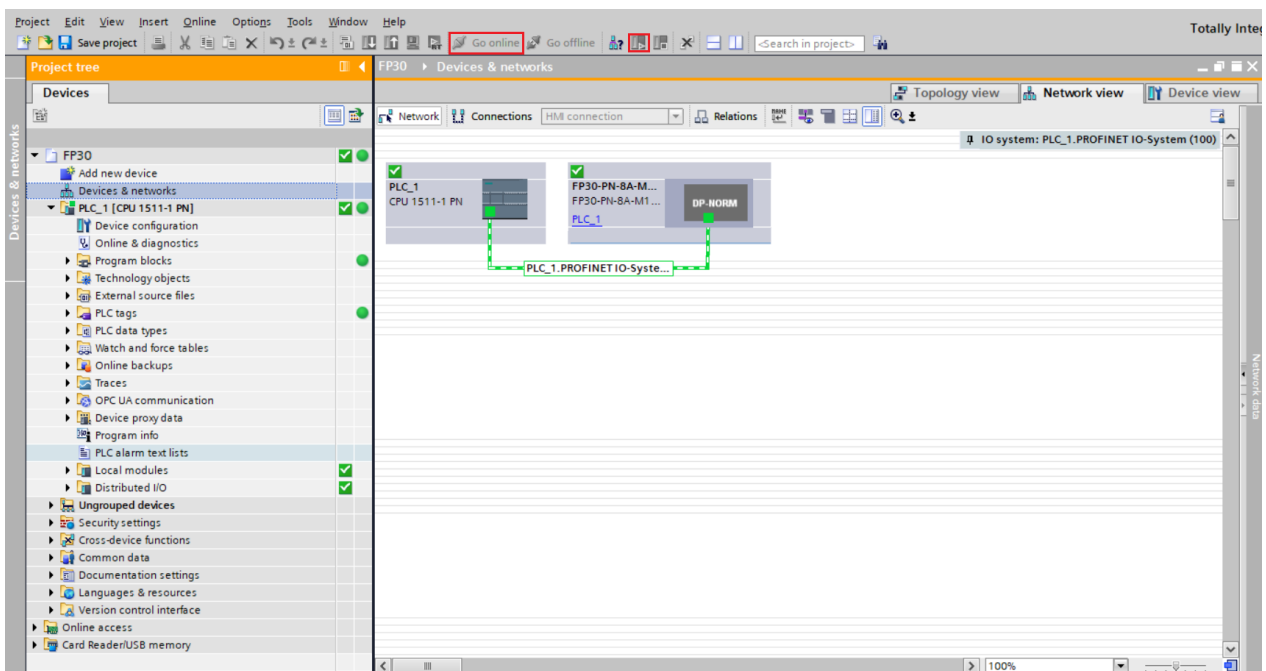
- g) Select "Stop all".



- h) Click "Load".
- i) Click "Finish".
- j) Power cycle the device.

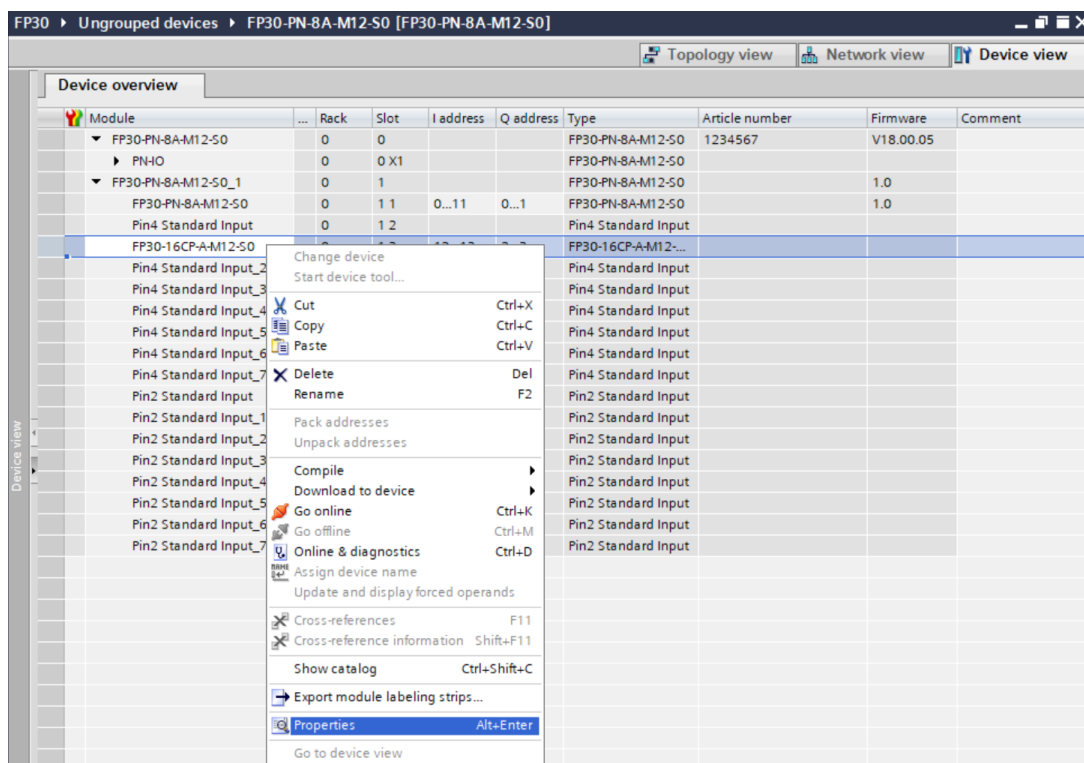
10. Communication Connection

- a) Click , then click "Go online". When all icons are green, the connection is successful, as shown in the figure below.

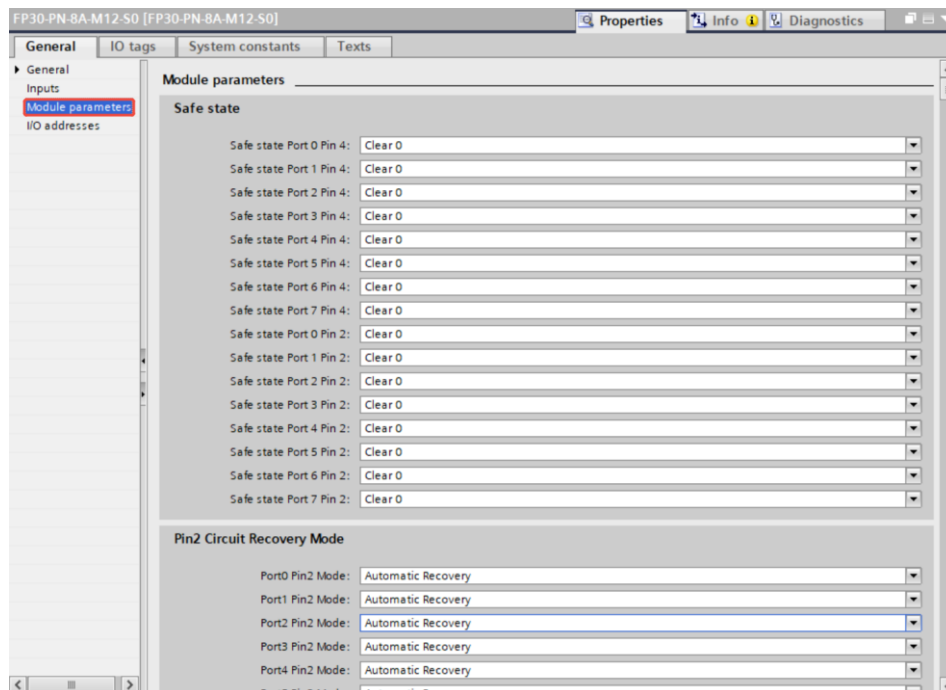


11. Master Parameter Configuration

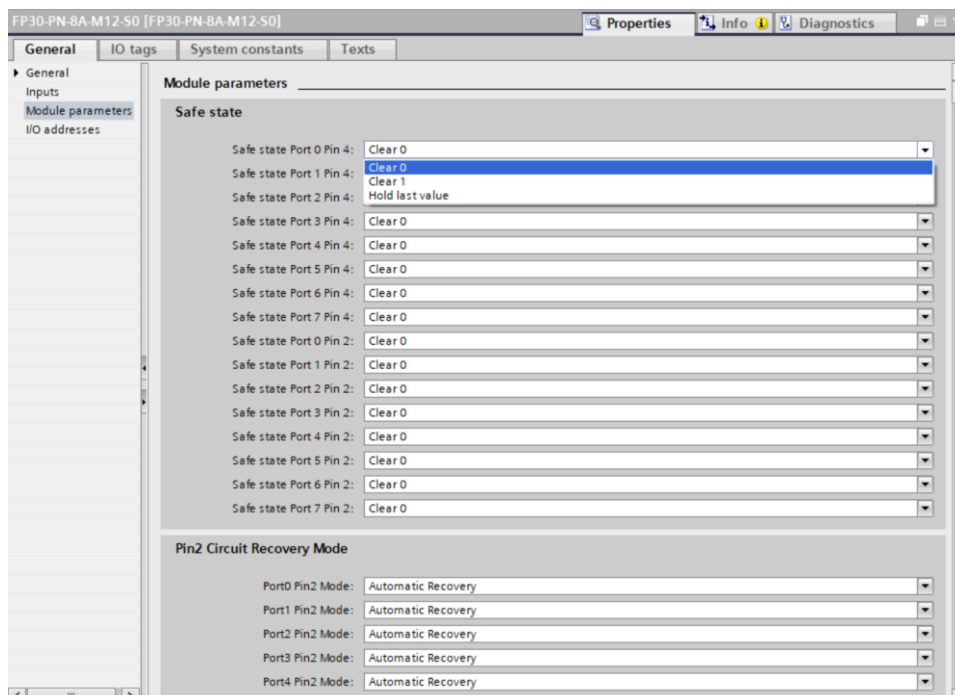
- a) Open "Device view". In offline mode, right-click the module name "FP30-PN-8A-M12-S0" and click "Properties", as shown in the figure below.



- b) On the Properties page, click "Module parameters", as shown in the figure below. The parameters can be configured according to actual usage needs. After configuration, download the program to the PLC again, and then power cycle the PLC and the module.

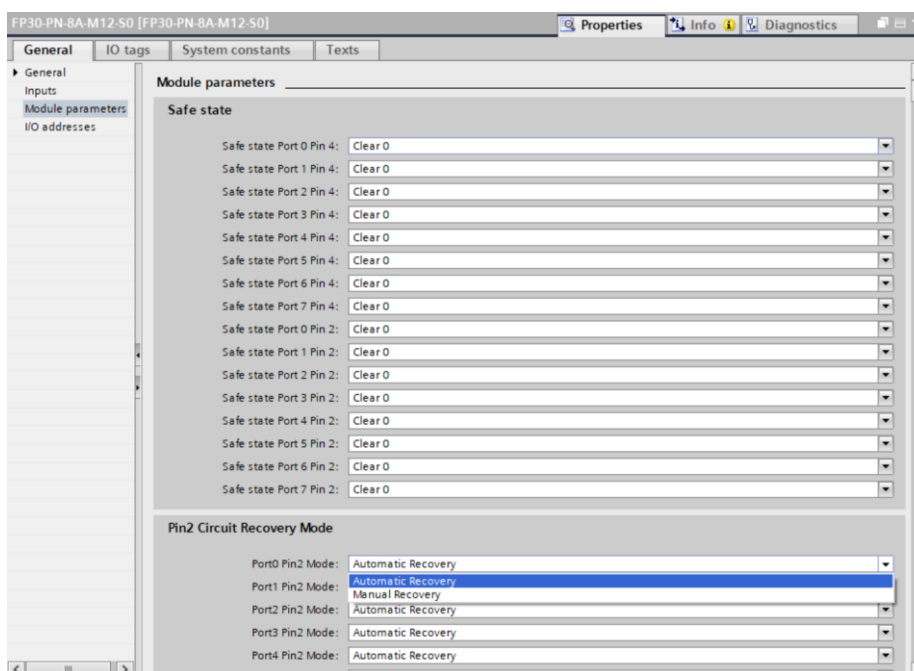


- c) Clear/Hold function setting method: Take Port 0 Pin4 as an example. On the parameter page of module FP30-PN-8A-M12-S0, click the radio button to the right of "Safe state Port 0 Pin4" to select the setting, as shown in the figure below. After configuration, download the program to the PLC again, and then power cycle the PLC and the module.



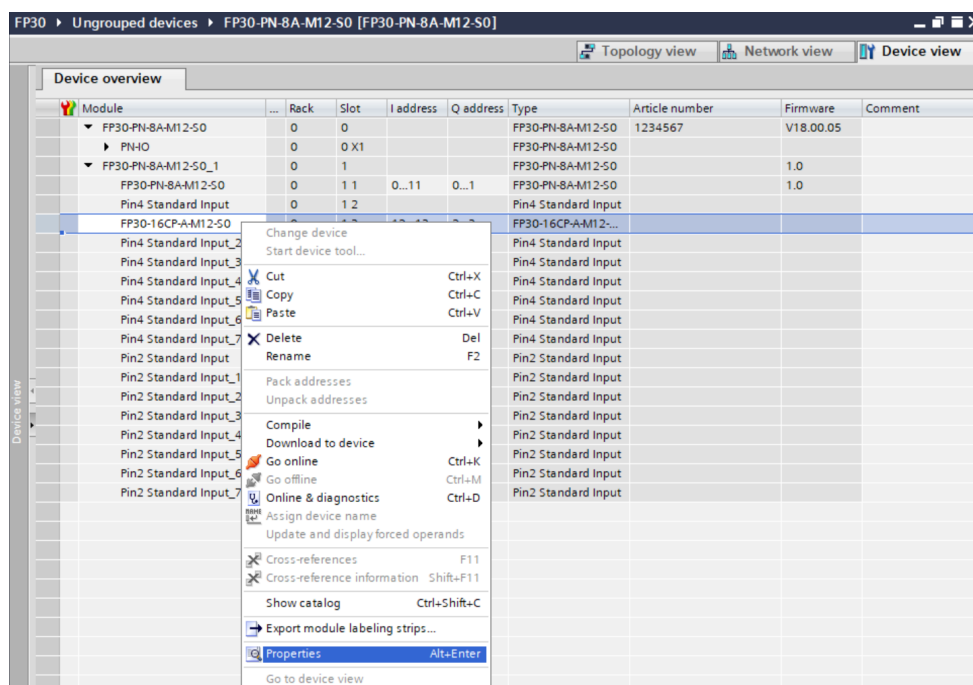
- d) Pin2 overcurrent recovery function setting method: Take Port 0 Pin2 as an example. On the parameter page of module FP30-PN-8A-M12-S0, click the radio button to the right of "Port0 Pin2 Mode" under Pin2 Circuit Recovery Mode to select the setting, as shown in the figure below. After

configuration, download the program to the PLC again, and then power cycle the PLC and the module.



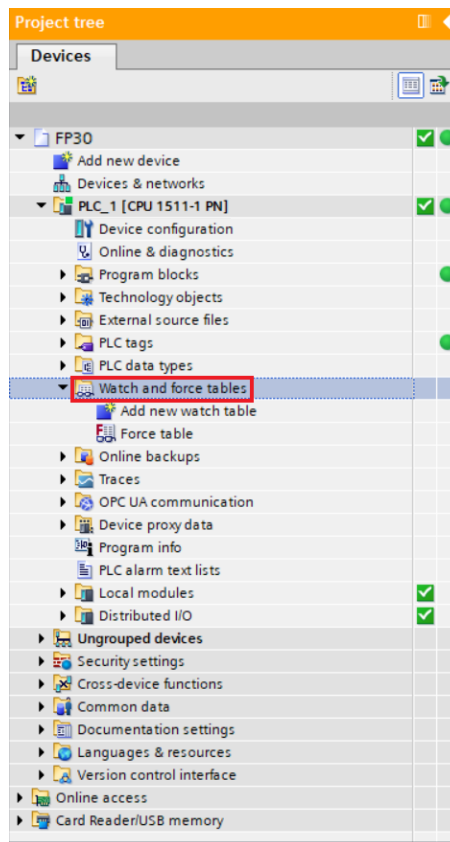
12. Slave ISDU Parameter Configuration

- a) On the "Device view" page, in offline mode, right-click the slave module name "FP30-16CP-A-M12-S0" and click "Properties", as shown in the figure below.

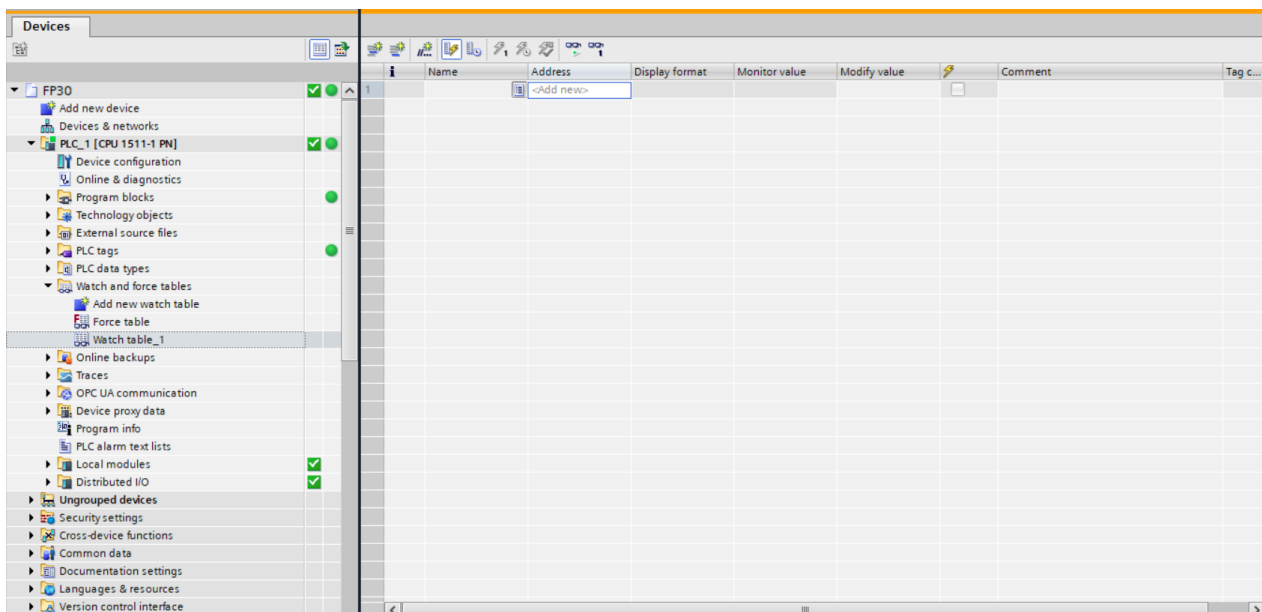


13. Functional Verification

- a) Expand the project navigation on the left and select "Watch and force tables", as shown in the figure below.



- b) Double-click "Add new watch table". The system adds a new watch table, as shown in the figure below.



- c) Open "Device view" and view the Q address (output signal channel address) and I address (input signal channel address) of the FP30-PN-8A-M12-S0 master module and the FP30-16CP-A-M12-S0 slave module in the device overview.

For example, the "Q address" of the FP30-PN-8A-M12-S0 module is 0–1 and the "I address" is 0–11; the "Q address" of the FP30-16CP-A-M12-S0 slave module is 2–3 and the "I address" is 12–13, as shown in the figure below.

Module	Rack	Slot	I address	Q address	Type	Article number
FP30-PN-8A-M12-S0	0	0			FP30-PN-8A-M12-S0	1234567
PN-IO	0	0 X1			FP30-PN-8A-M12-S0	
FP30-PN-8A-M12-S0_1	0	1			FP30-PN-8A-M12-S0	
FP30-PN-8A-M12-S0	0	1 1	0...11	0...1	FP30-PN-8A-M12-S0	
Pin4 Standard Input	0	1 2			Pin4 Standard Input	
FP30-16CP-A-M12-S0	0	1 3	12...13	2...3	FP30-16CP-A-M12-...	
Pin4 Standard Input_2	0	1 4			Pin4 Standard Input	
Pin4 Standard Input_3	0	1 5			Pin4 Standard Input	
Pin4 Standard Output	0	1 6			Pin4 Standard Outp...	
Pin4 Standard Output_1	0	1 7			Pin4 Standard Outp...	
Pin4 Standard Output_2	0	1 8			Pin4 Standard Outp...	
Pin4 Standard Output_3	0	1 9			Pin4 Standard Outp...	
Pin2 Standard Output	0	1 10			Pin2 Standard Outp...	
Pin2 Standard Output_1	0	1 11			Pin2 Standard Outp...	
Pin2 Standard Output_2	0	1 12			Pin2 Standard Outp...	
Pin2 Standard Output_3	0	1 13			Pin2 Standard Outp...	
Pin2 Standard Input_4	0	1 14			Pin2 Standard Input	
Pin2 Standard Input_5	0	1 15			Pin2 Standard Input	
Pin2 Standard Input_6	0	1 16			Pin2 Standard Input	
Pin2 Standard Input_7	0	1 17			Pin2 Standard Input	

In the FP30-PN-8A-M12-S0 master module, IB0 represents the monitored value of the Pin2 input signal of X00–X07, IB1 represents the monitored value of the Pin4 input signal of X00–X07, and IB2–IB11 represent the module status information. By default, all I/O interfaces of the master module are input channels. When an I/O interface of the master module is configured as an output channel, QB0 represents the Pin2 output signal of X00–X07, and QB1 represents the Pin4 output signal of X00–X07.

- d) Enter the input/output channel addresses in the address cells of the watch table and press "Enter". After all addresses are entered, click  to monitor the data, as shown in the figure below.

	Name	Address	Display format	Monitor value	Modify value		Comment
1		%IB0	Hex	16#00		☐	
2		%IB1	Hex	16#00		☐	
3		%IB2	Hex	16#03		☐	
4		%IB3	Hex	16#01		☐	
5		%IB4	Hex	16#01		☐	
6		%IB5	Hex	16#01		☐	
7		%IB6	Hex	16#02		☐	
8		%IB7	Hex	16#02		☐	
9		%IB8	Hex	16#02		☐	
10		%IB9	Hex	16#02		☐	
11		%IB10	Hex	16#00		☐	
12		%IB11	Hex	16#FF		☐	
13		%QB0	Hex	16#00		☐	
14		%QB1	Hex	16#00		☐	
15		%IB12	Hex	16#00		☐	
16		%IB13	Hex	16#00		☐	
17		%QB2	Hex	16#00		☐	
18		%QB3	Hex	16#00		☐	
19		新增				☐	

- e) Taking the configuration of FP30-16CP-A-M12-S0 with the first 8 channels as inputs and the last 8 channels as outputs as an example, IB12 indicates the input signal values of slave module X00–X03, and QB3 indicates the output signal values of slave module X04–X07. Enter "FF" in the "Modify value" cell of QB3, and click  to write. The 8 channel indicators of slave module X04–X07 will light up, as shown in the figure below.

	Name	Address	Display format	Monitor value	Modify value		Comment
1		%IB0	Hex	16#00		☐	
2		%IB1	Hex	16#00		☐	
3		%IB2	Hex	16#03		☐	
4		%IB3	Hex	16#01		☐	
5		%IB4	Hex	16#01		☐	
6		%IB5	Hex	16#01		☐	
7		%IB6	Hex	16#02		☐	
8		%IB7	Hex	16#02		☐	
9		%IB8	Hex	16#02		☐	
10		%IB9	Hex	16#02		☐	
11		%IB10	Hex	16#00		☐	
12		%IB11	Hex	16#FF		☐	
13		%QB0	Hex	16#00		☐	
14		%QB1	Hex	16#00		☐	
15		%IB12	Hex	16#00		☐	
16		%IB13	Hex	16#00		☐	
17		%QB2	Hex	16#00		☐	
18		%QB3	Hex	16#FF	16#FF	☐	
19		新增				☐	

- f) When slave module X00 receives a valid voltage, the input value "16#C0" can be monitored in IB12, which is "2#11000000", as shown in the figure below.

	Name	Address	Display format	Monitor value	Modify value		Comment
1		%IB0	Hex	16#00		☐	
2		%IB1	Hex	16#00		☐	
3		%IB2	Hex	16#03		☐	
4		%IB3	Hex	16#01		☐	
5		%IB4	Hex	16#01		☐	
6		%IB5	Hex	16#01		☐	
7		%IB6	Hex	16#02		☐	
8		%IB7	Hex	16#02		☐	
9		%IB8	Hex	16#02		☐	
10		%IB9	Hex	16#02		☐	
11		%IB10	Hex	16#00		☐	
12		%IB11	Hex	16#FF		☐	
13		%QB0	Hex	16#00		☐	
14		%QB1	Hex	16#00		☐	
15		%IB12	Hex	16#00		☐	
16		%IB13	Hex	16#00		☐	
17		%QB2	Hex	16#00		☐	
18		%QB3	Hex	16#FF	16#FF	☐	
19		<新增>				☐	

- g) Set the Pin2 output signals of X00–X03 and the Pin4 output signals of X04–X07 on the FP30-PN-8A-M12-S0 to 1. That is, enter "0F" for QB0 and "F0" for QB1, then click  to write. The corresponding 8 channel indicators on the module will light up, as shown in the figure below.

	Name	Address	Display format	Monitor value	Modify value		Comment
1		%IB0	Hex	16#00		☐	
2		%IB1	Hex	16#00		☐	
3		%IB2	Hex	16#03		☐	
4		%IB3	Hex	16#01		☐	
5		%IB4	Hex	16#01		☐	
6		%IB5	Hex	16#01		☐	
7		%IB6	Hex	16#02		☐	
8		%IB7	Hex	16#02		☐	
9		%IB8	Hex	16#02		☐	
10		%IB9	Hex	16#02		☐	
11		%IB10	Hex	16#00		☐	
12		%IB11	Hex	16#FF		☐	
13		%QB0	Hex	16#0F	16#0F	☐	
14		%QB1	Hex	16#F0	16#F0	☐	
15		%IB12	Hex	16#00		☐	
16		%IB13	Hex	16#00		☐	
17		%QB2	Hex	16#00		☐	
18		%QB3	Hex	16#FF	16#FF	☐	
19		<新增>				☐	

- h) When valid signals are input to Pin2 of X04–X07 and Pin4 of X01–X03 on the FP30-PN-8A-M12-S0, the input value "16#F0" (i.e., "2#11110000") can be monitored in IB0, and the input value "16#0E" (i.e., "2#00001110") can be monitored in IB1, as shown in the figure below.

	Name	Address	Display format	Monitor value	Modify value		Comment
1		%IB0	Hex	16#00		☐	
2		%IB1	Hex	16#00		☐	
3		%IB2	Hex	16#03		☐	
4		%IB3	Hex	16#01		☐	
5		%IB4	Hex	16#01		☐	
6		%IB5	Hex	16#01		☐	
7		%IB6	Hex	16#02		☐	
8		%IB7	Hex	16#02		☐	
9		%IB8	Hex	16#02		☐	
10		%IB9	Hex	16#02		☐	
11		%IB10	Hex	16#00		☐	
12		%IB11	Hex	16#FF		☐	
13		%QB0	Hex	16#0F	16#0F	☐	
14		%QB1	Hex	16#F0	16#F0	☐	
15		%IB12	Hex	16#00		☐	
16		%IB13	Hex	16#00		☐	
17		%QB2	Hex	16#00		☐	
18		%QB3	Hex	16#FF	16#FF	☐	
19		新增				☐	

7.3 Custom data length module

Appendix A defines process data modules with different byte lengths for different protocol masters. These modules generally meet the interfacing requirements of mainstream slave devices in the market. However, in actual applications, the process data length of some slave devices may not match the available modules. For example, a slave device may have an input process data length of 16 bytes and an output process data length of 32 bytes. In this case, a module with an input process data length of 32 bytes and an output process data length of 32 bytes can be used for compatibility, or the process data length can be customized. This section describes how to customize the process data length.

7.3.1 PROFINET master custom module

In the PROFINET master device configuration file, a "module" is called a submodule. To add a custom submodule, obtain the Submodule ID and process data length from the submodule product manual, modify the configuration file, and update the GSD file in the engineering software.

Note: If you are unsure how to implement a custom data length module or modify the configuration file, please consult technical support first and do not attempt any actions without authorization.

8 FAQ

8.1 When updating accessible devices, no device can be found.

1. Confirm that the TIA Portal software is installed correctly.
2. Confirm that no other software is using the network adapter used by the TIA Portal software.
3. Confirm that the network cable, network card, and network port are working properly.
4. Check for IP address or MAC address conflicts.

8.2 The load button is grayed out when downloading configuration.

1. Confirm that there are no forced values in the PLC.
2. Confirm that the PLC is in a stopped state.

Appendix

Appendix A

The PROFINET master configuration file defines modules for different byte input process data lengths, output process data lengths, and input/output combined process data lengths, as listed in the table below:

Name	Description
Std input	Standard input
Std output	Standard output
IOL_I_01 byte	Input process data length 1 byte
IOL_I_02 byte	Input process data length 2 bytes
IOL_I_04 byte	Input process data length 4 bytes
IOL_I_06 byte	Input process data length 6 bytes
IOL_I_08 byte	Input process data length 8 bytes
IOL_I_10 byte	Input process data length 10 bytes
IOL_I_16 byte	Input process data length 16 bytes
IOL_I_24 byte	Input process data length 24 bytes
IOL_I_32 byte	Input process data length 32 bytes
IOL_O_01 byte	Output process data length 1 byte
IOL_O_02 byte	Output process data length 2 bytes
IOL_O_04 byte	Output process data length 4 bytes
IOL_O_06 byte	Output process data length 6 bytes
IOL_O_08 byte	Output process data length 8 bytes
IOL_O_10 byte	Output process data length 10 bytes
IOL_O_16 byte	Output process data length 16 bytes
IOL_O_24 byte	Output process data length 24 bytes
IOL_O_32 byte	Output process data length 32 bytes
IOL_I/O_01/01 byte	Input process data length 1 byte, output process data length 1 byte
IOL_I/O_02/02 byte	Input process data length 2 bytes, output process data length 2 bytes
IOL_I/O_02/04 byte	Input process data length 2 bytes, output process data length 4 bytes
IOL_I/O_02/08 byte	Input process data length 2 bytes, output process data length 8 bytes
IOL_I/O_04/02 byte	Input process data length 4 bytes, output process data length 2 bytes
IOL_I/O_04/04 byte	Input process data length 4 bytes, output process data length 4 bytes
IOL_I/O_04/08 byte	Input process data length 4 bytes, output process data length 8 bytes
IOL_I/O_04/16 byte	Input process data length is 4 bytes, and the output process data length is 16 bytes.
IOL_I/O_04/32 byte	Input process data length is 4 bytes, and the output process data length is 32 bytes.
IOL_I/O_08/02 byte	Input process data length 8 bytes, output process data length 2 bytes
IOL_I/O_08/04 byte	Input process data length 8 bytes, output process data length 4 bytes
IOL_I/O_08/08 byte	Input process data length 8 bytes, output process data length 8 bytes
IOL_I/O_10/10 byte	Input process data length 10 bytes, output process data length 10 bytes
IOL_I/O_16/04 byte	Input process data length is 16 bytes, and the output process data length is 4 bytes.
IOL_I/O_16/16 byte	Input process data length 16 bytes, output process data length 16 bytes
IOL_I/O_24/24 byte	Input process data length 24 bytes, output process data length 24 bytes

Name	Description
IOL_I/O_32/04 byte	Input process data length is 32 bytes, and the output process data length is 4 bytes.
IOL_I/O_32/32 byte	Input process data length 32 bytes, output process data length 32 bytes

Appendix B

The IO-Link port status is represented by 1 byte. Bits 0–3 indicate the IO-Link port status, and bits 4–7 indicate IO-Link port error messages.

Bits 0–3 are defined as follows:

Value (DEC)	Description
0	Port Not Activated
1	Port in Input Mode
2	Port in Output Mode
3	Port in IO-Link Mode and Communication Normal
4	Port in IO-Link Mode and Communication Abnormal

Bits 4–7 are defined as follows:

Value (DEC)	Description
0	No errors
1	Watchdog Error
2	Cache Overflow
3	Invalid Device ID
4	Invalid Vendor ID
5	Invalid IO-Link Version
6	Invalid Frame Capability
7	Invalid cycle time
8	Invalid Input Process Data Length
9	Invalid Output Process Data Length
10	No Device Detected
11	PREOPERATE status error

For example: if a port is configured in IO-Link mode but no slave device is actually connected, the status will be 0xA4. If a port is configured in IO-Link mode but the input data length does not match, the status will be 0x84.

The IO-Link master status is represented by 1 byte, as defined below:

Value (DEC)	Description
0	No errors
1	Undervoltage
2	Overvoltage
3	Overcurrent, overload
4–255	Reserved

Appendix C

The 1-byte process data length defined in the IO-Link standard is represented by different bits. See Appendix B.1.6 of "IOL-Interface-Spec_10002_v113_Jun19.pdf".

Bit	Description
0–4	Length
5	Reserved
6	Supports standard input or standard output mode
7	Byte flag bit. When set, length values 0...4 indicate the byte length plus 1; when not set, length values 0–4 indicate the bit length.

Ignoring bit 6, the simple correspondence between its value and the process data length is as follows:

Byte	Description
0x01	The process data length is 1 bit, typically used for standard input or standard output.
0x08	Process data length 1 byte
0x10	Process data length 2 bytes
0x18	Process data length 3 bytes
0x83	Process data length 4 bytes
0x84	Process data length 5 bytes
0x85	Process data length 6 bytes
0x86	Process data length 7 bytes
0x87	Process data length 8 bytes
0x88	Process data length 9 bytes
0x89	Process data length 10 bytes
0x8A	Process data length 11 bytes
0x8B	Process data length 12 bytes
0x8C	Process data length 13 bytes
0x8D	Process data length 14 bytes
0x8E	Process data length 15 bytes
0x8F	Process data length 16 bytes
0x90	Process data length 17 bytes
0x91	Process data length 18 bytes
0x92	Process data length 19 bytes
0x93	Process data length 20 bytes
0x94	Process data length 21 bytes
0x95	Process data length 22 bytes
0x96	Process data length 23 bytes
0x97	Process data length 24 bytes
0x98	Process data length 25 bytes
0x99	Process data length 26 bytes
0x9A	Process data length 27 bytes
0x9B	Process data length 28 bytes
0x9C	Process data length 29 bytes
0x9D	Process data length 30 bytes
0x9E	Process data length 31 bytes
0x9F	Process data length 32 bytes

Appendix D

The slave ISDU may return an error. The error codes are defined as follows. For details, refer to Appendix C, ErrorTypes, of "IOL-Interface-Spec_10002_v113_Jun19.pdf".

Error code	Description
0x8000	Device Application Layer Error
0x8011	Unreachable Index
0x8012	Unreachable Sub-index
0x8020	Service temporarily unavailable
0x8021	Local Control Services Temporarily Unavailable
0x8022	Device Control Services Temporarily Unavailable
0x8023	Permission Error
0x8030	Parameter Out of Range
0x8031	Parameter Exceeds Limit Value
0x8032	Parameter Below Limit Value
0x8033	Parameter Length Too Long
0x8034	Insufficient Parameter Length
0x8035	Function Unavailable
0x8036	Function Temporarily Unavailable
0x8040	Invalid Parameter Set
0x8041	Inconsistent Parameter Set
0x8082	Application Not Ready
0x81xx	Manufacturer-specific Error

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