INOVANCE

FORWARD, ALWAYS PROGRESSING

PS00007594A04

GL20-RTU-PN
Communication Interface Module

User Guide

Suzhou Inovance Technology Co., Ltd.

Add.: No.52, Tian E Dang Road, Wuzhong District,
Suzhou 215104, P.R. China
Tel: (0512) 6637 6666 Fax: (0512) 6285 6720
www.inovance.com

Preface

■ Introduction

This guide describes the product information, mechanical installation, electrical installation, programming, commissioning, and troubleshooting of the product.

■ Standard

The following table lists the certifications, directives, and standards that the product may comply with. For details about the acquired certificates, see the certification marks on the product nameplate.

Certification	Directive		Standard
CE Certification	EMC Directive	2014/30/EU	**24 VDC products:** EN 61131-2 **220 VAC products:** EN 61131-2 EN 61000-3-2 EN 61000-3-3
	LVD Directive	2014/35/EU	EN 61010-1 EN 61010-2-201
	RoHS Directive	2011/65/EU amended by (EU) 2015/863	EN IEC 63000
UL/cUL Certification	-		UL 61010-1 UL 61010-2-201 CAN/CSA-C22.2 No. 61010-1 CSA C22.2 NO. 61010-2-201
KCC Certification	-		-
EAC Certification	-		-

Certification	Directive		Standard
UKCA Certification	Safety Regulations	Electrical Equipment (Safety) Regulations 2016	EN 61010-1 EN 61010-2-201
	EMC Regulations	Electromagnetic Compatibility Regulations 2016	**24 VDC products:** EN 61131-2 **220 VAC products:** EN 61131-2 EN 61000-3-2 EN 61000-3-3
	RoHS Regulations	Directive (RoHS) Regulations 2012	EN IEC 63000

■ Revision History

Revision date	Version	Description
February 2025	A04	• Modified the "Software specifications" in *"1.4 Technical Specifications" on page 16*. • Modified the "Fifth release: 2.4.1.0 firmware (MCU)" in *"1.6 Release Notes" on page 21*. • Modified the "Notes on GSD File Updates" in *"4.5* **Notes***" on page 66*. • Modified the "Import the GSD file" part in *"4.2 Applicable for TIA Portal" on page 40*. • Modified the step 1 of the "Operation Example" in *"6.2 Share IN and Share OUT Mapping Modules" on page 76*.
August 2024	A03	Made minor corrections.
June 2024	A02	**Added the following content:** Added *"2.1 Installation Precautions" on page 27*.
		Updated the following content: • Modified the "Input PDO data volume" and "Output PDO data volume" in *"1.4 Technical Specifications" on page 16*. • Modified the "Fourth release: 2.4.0.0 firmware (MCU)" in *"1.6 Release Notes" on page 21*.

Revision date	Version	Description
September 2023	A01	**Added the following content**: • Added *"1.1 Product Introduction" on page 10*. • Added *"1.6 Release Notes" on page 21*. • Added *" Program Commissioning" on page 35*. • Added *"6.1 Configuring the MRP" on page 73*. • Added *"6.3 Expansion Module Parameter Description" on page 81*. • Added *"6.4 DeviceStates Command" on page 89*. • Added *"6.5 Firmware 2.0.0.5 and GSD 20230323 Compatibility" on page 95*.
		Modified the following content: • Added "General Specifications" and updated expansion capabilities in *"1.4 Technical Specifications" on page 16*. • Optimized the content in *"6.2 Share IN and Share OUT Mapping Modules" on page 76*.
		Deleted the following content: Deleted the "Supported Module" and "Analog Channel & Matching Values" sections.
September 2022	A00	Initial release.

■ Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version by the following methods:

- Do keyword search under Service and Support at *www.inovance.com*.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install My Inovance app, where you can search for and download user guides.

■ Warranty Disclaimer

Inovance provides warranty service within the warranty period (as specified in your order) for any fault or damage that is not caused by improper operation of the user. Maintenance will be charged after the warranty expires.

Within the warranty period, maintenance will be charged for the following damage:

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or unusual voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see the Product Warranty Card.

Safety Precautions

■ Safety Disclaimer

1. Read through the safety instructions before installing, operating, and servicing the equipment, and comply with these instructions.
2. To ensure personal and equipment safety, observe the notes indicated on the product labels and all the safety instructions in the user guide.
3. “CAUTION”, “WARNING”, and “DANGER” in this guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.
4. Use this product in environments meeting the design and specification requirements; otherwise, a fault may occur. Noncompliance-caused malfunction or damage to parts are not covered in product quality warranty.
5. Inovance shall take no responsibility for any personal injury or property damage caused by improper use.

■ Safety Levels and Definitions

"DANGER" indicates that failure to comply with the notice will result in death or severe personal injuries.

"WARNING" indicates that failure to comply with the notice may result in death or severe personal injuries.

"CAUTION" indicates that failure to comply with the notice may result in minor or moderate personal injury or equipment damage. Keep this user guide properly for future use and deliver it to the end user.

Control System Design

DANGER

- Provide a safety circuit outside the PLC so that the control system can still work safely once external power failure or controller fault occurs.
- Add a fuse or circuit breaker because the module may smoke or catch fire due to long-time overcurrent caused by operation above rated current or load short-circuit.

WARNING

- An emergency stop circuit, a protection circuit, a forward/reverse operation interlocked circuit, and an upper position limit and lower position limit interlocked circuit must be set in the external circuits of PLC to prevent damage to the machine.
- To ensure safe operation, for the output signals that may cause critical accidents, use external protection circuits and safety mechanism.
- Once PLC CPU detects abnormality in the system , all outputs may be closed; however, when a fault occurs in the controller circuit, the output may not be under control. Therefore, it is necessary to design an appropriate external control circuit to ensure normal operation.
- If the PLC output units such as relays or transistors are damaged, the output may fail to switch between ON and OFF states according to the commands.
- The PLC is designed to be used in an indoor electrical environment (overvoltage category II). The power supply must have a system-level surge protector, assuring that overvoltage due to lightning shock can't be applied to the PLC's power supply input terminals, signal input terminals and output terminals, to prevent damage to the equipment.

Installation

WARNING

- Installation must be carried out by skilled personnel who have undergone specialized electrical training and possess comprehensive electrical expertise.
- Disconnect all external power supplies of the system before removing/installing the module. Failure to do so may result in electric shock, module fault or malfunction.
- Do not use the PLC in environments with dust, greasy smoke, conductive dust, corrosive or combustible gases, exposed to high temperature, condensation, wind & rain, or subject to vibration and shock. Electric shock, fire and malfunction may also result in damage or deterioration to the product.
- The PLC is open-type equipment that must be installed in a control cabinet with lock (cabinet housing protection > IP20). Only the skilled personnel who have undergone specialized electrical training and possess comprehensive electrical expertise can open the cabinet.

CAUTION

- Prevent metal filings and wire ends from dropping into ventilation holes of the PLC during installation. Failure to comply may result in fire, fault and malfunction.
- Ensure there are no foreign matters on ventilation surface. Failure to comply may result in poor ventilation, which may cause fire, fault and malfunction.
- Ensure the module is connected to the respective connector securely and hook the module firmly. Improper installation may result in malfunction, fault or fall-off.
- Ensure natural ventilation for the equipment.

Wiring

DANGER

- Wiring must be carried out by skilled personnel who have undergone specialized electrical training and possess comprehensive electrical expertise.
- Disconnect all external power supplies of the system before wiring. Failure to comply may result in electric shock, module fault or malfunction.
- Install the terminal cover attached to the product before power-on or operation after wiring is done. Failure to comply may result in electric shock.
- Insulate the cable terminals properly to ensure the insulation distance between cables will not be shortened after cables are connected to the terminal block. Failure to comply may result in electric shock or damage to the equipment.

Wiring

- To avoid electric shock, cut off the power supply before connecting the equipment to the power supply.
- The input power supply of this product must be 24 VDC. Power supplies outside ±20% of 24 VDC can cause severe damage to the product. Therefore, check whether the DC power supply provided by the switching-mode power supply is stable at a regular interval.

Operation and Maintenance

- Operation and maintenance must be carried out by skilled personnel who have undergone specialized electrical training and possess comprehensive electrical expertise.
- Do not touch the terminals while the power is on. Failure to comply may result in electric shock or malfunction.
- Disconnect all external power supplies of the system before cleaning the module or re-tightening screws on the terminal block or screws of the connector. Failure to comply may result in electric shock.
- Disconnect all external power supplies of the system before assembling/disassembling the module or connecting/removing the communication cables. Failure to comply may result in electric shock or malfunction.

Safety Recommendations

- In the position where the operator directly touches the machinery part, for example, where a machinery tool is loaded/unloaded, or where a machine runs automatically, the on-site manual operating devices and any other alternative means must be carefully arranged and designed so that they are independent of the programmable controller and can start or terminate the automatic running of the system.
- If modification on the program is needed during system operation, use the lock function or other protective measures. Ensure that only authorized personnel can make the necessary modifications.

Disposal

- Treat the scrapped product as industrial waste. Dispose of the battery according to local laws and regulations.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

1 Product Information

1.1 Product Introduction

■ Overview

GL20-RTU-PN communication interface module connects to the PROFINET network as a PROFINET slave. With this module, you can expand the system with Inovance local modules such as GL20 series digital modules, analog modules, and temperature detection modules (*"1.6 Release Notes" on page 21*). It can be used together with the PROFINET master devices, such as S7-200 Smart, S7-300, S7-400, S7-1200, and S7-1500 series. The topology is shown in the figure below.

■ Bus current consumption

Modules with firmware version 2.2.0.0 or later support up to 32 GL20 series local expansion modules. Modules with firmware versions earlier than 2.2.0.0 support up to 16 expansion modules. If the GL20-PS2 relay power module (hereinafter referred to as expansion modules) is present, the maximum number of supported expansion modules must include the count of GL20-PS2 modules. The actual number of supported expansion modules needs to be calculated based on the total bus current consumption.

When the number of expansion modules exceeds 16 or when the total bus current consumption of the expansion modules (*"1.6 Release Notes" on page 21*) exceeds the bus supply current of this module, that is, 2 A, it is necessary to add a GL20-PS2 module to supply power to the expansion modules.

The formula for calculating the total bus current consumed by the expansion modules is as follows:

Total bus current consumption of expansion modules = Bus consumption current of expansion module #1 + Bus consumption current of expansion module #2 + ... + Bus consumption current of expansion module #n

- When a GL20-PS2 module is not provided, the total bus current consumption of the expansion modules cannot exceed 2 A, and the number of expansion modules cannot exceed 16.

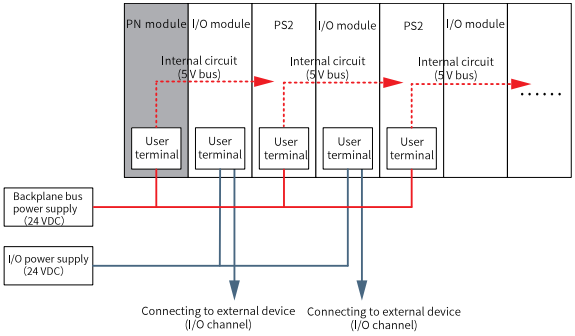
  For example, this module can support up to 8 GL20-3232ETN-M modules each with a bus current consumption of 250 mA (2 A/250 mA = 8), or up to 16 GL20-0008ETP modules each with a bus current consumption of 80 mA (16 x 80 mA = 1280 mA ⩽ 2 A).

- When a GL20-PS2 module is provided, it supplies power to the surplus expansion modules. The number of expansion modules supported by the GL20-PS2 module is determined by the total bus current consumption of the expansion modules, similar to the above calculation method of this module. Note that if one GL20-PS2 module is provided, then its bus current consumption must be included in the total supply current of this module. If multiple GL20-PS2 modules are provided, the bus current consumption of a certain GL20-PS2 module must be included in the total supply current of the immediately previous GL20-PS2 module.

  For example, given that 8 GL20-3232ETN-M modules or 16 GL20-0008ETP modules are already added to this module. If you want to add more expansion modules, a GL20-PS2 module is required for additional power supply. In this case, remove at least one GL20-3232ETN-M module or at least one GL20-0008ETP module to reserve the bus supply current margin of this module to supply power to the GL20-PS2 module. The GL20-PS2 module consumes a bus current consumption of 55 mA and provides a bus current of 2 A.

  For example, a GL20-RTU-ECT32 module equipped with a GL20-PS2 module can support up to 15 GL20-3232ETN-M modules (7 by this module and 8 by the GL20-PS2 module, with a total current consumption of 15 x 250 mA = 3750 mA) or 31 GL20-0008ETP modules (15 by this module and 16 by the GL20-PS2 module, with a total current consumption of 31 x 80 mA = 2480 mA).

The following figure shows the power supply diagram of this module.



Caution

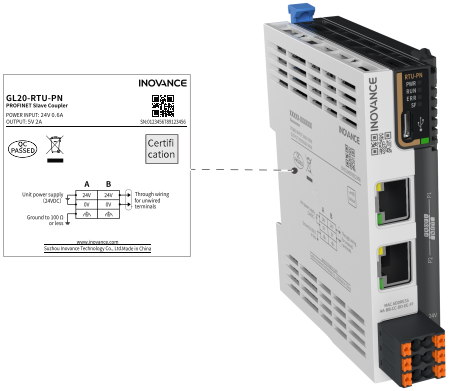
- The GL20-PS2 module and the GL20-RTU-ECT module must be powered on simultaneously (the GL20-PS2 module is allowed to be powered on at most two seconds later than the GL20-RTU-ECT module), otherwise addressing may fail.
- Do not place the GL20-PS2 module in the last slot of the configuration.

1.2 Naming Rules and Nameplate

GL 20 - RTU - PN

① ② ③ ④

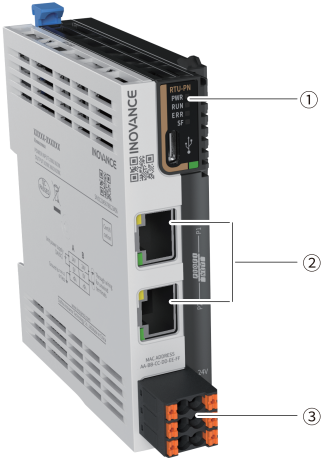
① **Product information** GL: Inovance general local module	③ **I/O type** RTU: Remote interface module
② **Series number** 20: 20 series module	④ **Communication protocol** PN: PROFINET ECT: EtherCAT



The data for ordering the product is shown below.

Model	Description	Material Code	Applicable Model
GL20-RTU-PN	GL20 series PROFINET communication interface module	01440289	Siemens PROFINIT master devices such as S7-1200 and S7-1500.

1.3 Components



No.	Interface Name	Description			
①	Signal indicator	PWR	Power indicator	Solid on (green)	ON when power supply is switched on.
		RUN	RUN indicator	OFF	The module is initializing.
				Flashing (green)	The module is in parameter configuration mode or waiting to connect to the master device.
				Single flash (green)	The module is in safe operational mode (can read inputs, cannot update outputs).
				Solid on (green)	The module communication is normal.
		ERR	Communica-tion fault indicator	OFF	No communication error
				Solid on (red)	No expansion module presents. For details, see *" Fault Diagnosis" on page 70*
				Flashing (red)	The configuration for expansion modules is inconsistent. For details, see *" Fault Diagnosis" on page 70*
				Single flash (red)	The module is offline or the expansion module synchronization error occurs.
		SF	Module fault indicator	OFF	The expansion module is normal.
				Solid ON	Local bus error occurs. For details, see *" Fault Diagnosis" on page 70*
				Flashing (red)	The expansion module is faulty. For details, see *" Fault Diagnosis" on page 70*
②	PROFINET interface	P1: PROFINET interface 1			
		P2: PROFINET interface 2			

No.	Interface Name	Description	
③	Power supply terminal	+24 V	Power supply +
		0 V	Power supply -
		⏚	Function grounding

Note

- Flashing: Flashes at an interval of 200 ms.
- Single flash: Flashes at an interval of 1s.
- Double flash: Flashes twice at an interval of 1s.

1.4 Technical Specifications

■ General specifications

Item	Specification
IP rating	IP20
Dimensions (W x H x D)	24 mm x 100 mm x 100.5 mm
Weight (g)	Approx. 100 g

■ Power supply specifications

Item	Specification
Rated voltage of terminal input power supply	24 VDC (20.4 VDC to 28.8 VDC)
Rated current of terminal input power supply	0.6 A (typical@24 V)
Rated voltage of bus output power supply	5 VDC (4.75 VDC to 5.25 VDC)

Item	Specification
Rated current of bus output power supply	2 A (typical@5 V)
Power supply protection	Anti-reverse connection protection, and surge absorption

■ Software specifications

Item		Specification
Basic specifications	Input PDO data volume	Max. 1,440 bytes
	Output PDO data volume	Max. 1,440 bytes
	Communication mode	RT mode
	Minimum communication cycle	1 ms
	I&M data	I&M0 to I&M3
	PROFINET version	V2.3
	Expansion capability	• Versions earlier than 2.2.0.0: Support up to 16 expansion modules • Version 2.2.0.0 and later: Support up to 32 expansion modules
	Number of PROFINET interfaces	2
	PROFINET switch capability	Networking
	Open IE	Support standard Ethernet protocols, such as TCP/IP, SNMP, and LLDP
	Alarm/ diagnosis/ status information	Supported, allowing uploading of error code from local to PLC

Item		Specification
I/O Service	Physical layer	100BASE-TX
	Communication rate	10 Mbps (standard Ethernet), 100 Mbps (PROFINET)
	Communication mode	Full duplex
	Topology	Linear, star, tree
	Transmission medium	Cat5e and above
	Transmission distance	Less than 100 m between two nodes
	Priority boost	Supported
	MRP	Supported. For details, see *"6.1 Configuring the MRP" on page 73*.
	Port disable	Supported
	Zero configuration for module replacement	Supported (For replacement of PN module of the same type)
	Factory reset of GL20-RTU-PN	Supported
	Factory reset of module	Not supported
	Firmware update of GL20-RTU-PN	Supported

Note

Each GL20-RTU-PN communication interface module can be configured with a maximum of 120 modules (the sum of actual expansion modules and sub-modules). Exceeding this limit will cause the GL20-RTU-PN communication interface module to go offline and cease operation. For example, if the configuration includes one GL20-2SCOM-MDB expansion module and one GL20-1600END expansion module, where the GL20-2SCOM-MDB expansion module contains multiple "Master Read Holding Register Modules (referred to as sub-modules)", the total current module count is the sum of GL20-2SCOM-MDB expansion module, GL20-1600END expansion module, and sub-modules. Given that the total number of expansion modules is 2, the number of sub-modules cannot exceed 118.

1.5 Environmental Specifications

Item	Specification
Installation/ application environment	Free from conductive dust, conductive fibers, explosive dust, flammable gases, water mist/greasy dirt, corrosive dusts/gases, strong vibration, and repetitive shock
Altitude	⩽ 2,000 m
Pollution degree	2
Immunity	2 kV on power supply cable (compliant with IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC61131-2
Anti-static rating	Contact discharge +/-6 kV and air discharge +/-8 kV
Vibration resistance	• Application scenario: Tested according to IEC60068-2-6, 3.5 mm amplitude from 5 Hz to 8.4 Hz; 1 g acceleration from 8.4 Hz to 200 Hz; 10 cycles per axial direction • Transportation scenario: Tested according to IEC60068-2-64, 0.01 g^2/Hz power spectral density from 5 Hz to 100 Hz; 0.001 g^2/Hz power spectral density at 200 Hz; 1.14 g Grms

Item	Specification
Shock resistance	Application/Transportation scenario: Tested according to IEC60068-2-27; 15 g peak acceleration, 11 ms pulse width, 18 cycles in total in X, Y and Z axial directions
Operating temperature/humidity	• Temperature: -20°C to +55°C • Humidity: < 95% RH (30°C), without condensation
Storage temperature/ humidity	• Temperature: -20°C to +60°C • Humidity: < 95% RH (30°C), without condensation
Transportation temperature/humidity	• Temperature: -40°C to +70°C • Humidity: < 95% RH (40°C), without condensation

1.6 Release Notes

This section describes the expansion modules, functions, and GSD file versions compatible with the released firmware versions.

■ Fifth release: 2.4.1.0 firmware (MCU)

- **New compatible expansion modules**

Product No.	Product Model	Product Description	Firmware Version	Bus Current Consumption
01440623	GL20-8DAV	GL20 series 8-channel analog output module - voltage type	Logic software: 0.2.2.0 and later Board software: 1.0.3.0 and later	100 mA
01440622	GL20-8DAI	GL20 series 8-channel analog output module - current type	Logic software: 0.2.2.0 and later Board software: 1.0.3.0 and later	100 mA

Product No.	Product Model	Product Description	Firmware Version	Bus Current Consumption
01440835	GL20-2S485-MDB	GL20 series 2-channel RS485 module (Modbus)	Logic software: 0.2.2.0 and later Board software: 1.0.2.0 and later	155 mA
01440823	GL20-1600END-5V	GL20 series 16-channel digital input module	Logic software: 0.2.1.1 and later	120 mA

- **New and optimized functions**
  - Compatible with GL20-8DAV, 8DAI, and GL20-1600END-5V modules.
  - Resolved the issue of the GL20-RTU-PN module going offline due to external TCP connections.
- **Compatible GSD file version**: 20240401

■ Fourth release: 2.4.0.0 firmware (MCU)

- **New compatible expansion modules**

Product No.	Product model	Product description	Firmware Version	Bus Current Consumption
01440519	GL20-2HC	GL20 series 2-channel high-speed counting module	Logic software: 0.1.7.0 and later Board software: 1.2.3.0 and later	95 mA
01440506	GL20-0404ETP-5V	GL20 series 4-channel digital input and 4-channel digital output 5V module	Logic software: 0.1.12.0 and later	90 mA

Product No.	Product model	Product description	Firmware Version	Bus Current Consumption
01440512	GL20-0004ETP-2A	GL20 series 4-channel large current digital PNP output module	Logic software: 0.1.14.0 and later	80 mA
01440673	GL20-2SCOM-MDB	GL20 series serial port communication module	Logic software: 0.2.2.0 and later Board software: 1.0.2.2 and later	170 mA

- **New and optimized functions**
  - Compatible with the GL20-2SCOM-MDB serial communication module, supporting both Modbus protocol and free protocol.
  - Supports power overload fault alarm for the GL20-PS2 relay power module.
  - Optimized the fault diagnosis function.
- **Compatible GSD file version**: 20240401

■ Third release: 2.2.0.0 firmware (MCU)

- **New compatible expansion modules**

Product No.	Product model	Product description	Firmware Version	Bus Current Consumption
01440351	GL20-PS2	GL20 series programmable logic controller power supply module	Logic software: 0.1.A.0 and later	55 mA
01440445	GL20-2SSI	GL20 series programmable logic controller SSI communication module	Board software: 1.1.6.0 and later	115 mA
01440467	GL20-0032ETN	GL20 series 32-channel NPN transistor output module	Logic software: 0.1.2.0 and later	80 mA

Product No.	Product model	Product description	Firmware Version	Bus Current Consump-tion
01440466	GL20-3200END	GL20 series 32-channel digital input module	Logic software: 0.1.2.0 and later	85 mA
01440489	GL20-8ADI	GL20 series 8-channel analog input module - current type	Board software: 1.1.0.3 and later	65 mA
01440482	GL20-8ADV	GL20 series 8-channel analog input module - voltage type	Board software: 1.1.0.3 and later	65 mA
01440479	GL20-4AD-DF	GL20 series 4-channel analog input module (differential input)	Board software: 1.1.5.0 and later	95 mA
01440485	GL20-0004ER	GL20 series 4-channel relay output general-purpose module	Logic software: 0.1.4.0 and later	90 mA

- **New functions**

  Supports TIA Portal online scanning and automatic configuration for GL20-RTU-PN module and expansion modules.

- **Compatible GSD file version**: 20230523

■ Second release: 2.1.1.0 firmware (MCU)

- **New compatible expansion modules**

Product No.	Product model	Product description	Firmware Version	Bus Current Consump-tion
01440334	GL20-0008ER	GL20 series 8-channel relay output general-purpose module	Logic software: 0.1.2.0 and later	110 mA
01440381	GL20-0800END	GL20 series 8-channel digital input module	Logic software: 0.1.2.0 and later	105 mA

Product No.	Product model	Product description	Firmware Version	Bus Current Consumption
01440379	GL20-0008ETN	GL20 series 8-channel digital NPN transistor output module	Logic software: 0.1.2.0 and later	115 mA
01440380	GL20-0008ETP	GL20 series 8-channel digital PNP transistor output module	Logic software: 0.1.2.0 and later	80 mA
01440339	GL20-0808ETN	GL20 series module with 8-channel digital inputs and 8-channel NPN transistor outputs	Logic software: 0.1.2.0 and later	130 mA
01440290	GL20-3232ETN-M	GL20 series module with 32-channel digital inputs and 32-channel NPN transistor outputs (external terminal block)	Logic software: 0.1.2.0 and later	250 mA
01440377	GL20-0032ETN-M	GL20 series module with 32-channel NPN transistor outputs (external terminal block)	Logic software: 0.1.2.0 and later	85 mA
01440378	GL20-3200END-M	GL20 series 32-channel digital input module (external terminal block)	Logic software: 0.1.2.0 and later	95 mA
01440337	GL20-4PT	GL20 series 4-channel input thermal resistor temperature detection module	Board software: 2.0.5.0 and later	95 mA
01440338	GL20-4TC	GL20 series 4-channel thermocouple temperature detection module	Board software: 2.0.5.0 and later	95 mA

- **New functions**
  - Supports the range of -27,648 to +27,648 for GL20-4AD and GL20-4DA modules.
  - Supports overflow detection enable function for GL20-4AD, GL20-4TC, and GL20-4PT modules.

- Supports MRP function. For details, see *"6.1 Configuring the MRP" on page 73*

- **Compatible GSD file version**: 20230323

■ First release: 2.0.0.5 firmware (MCU)

- **Compatible expansion modules**

Product No.	Product model	Product description	Firmware Version	Bus Current Consump-tion
01440291	GL20-1600END	GL20 series 16-channel digital input module	Logic software: 0.1.2.0 and later	120 mA
01440292	GL20-0016ETP	GL20 series 16-channel digital PNP transistor output module	Logic software: 0.1.2.0 and later	100 mA
01440293	GL20-0016ETN	GL20 series 16-channel digital NPN transistor output module	Logic software: 0.1.2.0 and later	145 mA
01440288	GL20-4AD	GL20 series 4-channel analog input module	Board software: 1.1.5.0 and later	95 mA
01440287	GL20-4DA	GL20 series 4-channel analog output module	Board software: 1.1.5.0 and later	70 mA

- **Compatible GSD file version**: 20220930

2 Mechanical Installation

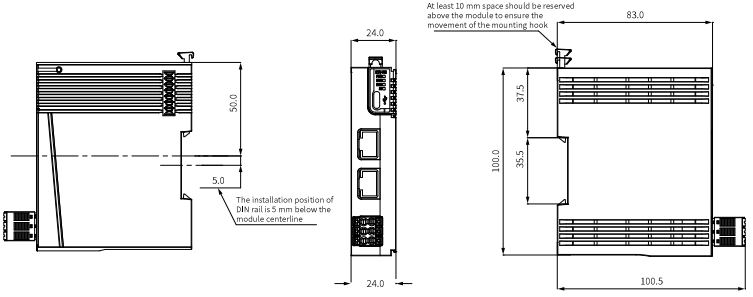
2.1 Installation Precautions

- Make sure the module is powered off before installing or removing.
- Do not hot swap the modules. Otherwise, the modules may be damaged by overcurrent or overvoltage, and the communication interface module or PLC may be subject to restart, user data loss or corruption.
- Do not drop or shock the housing or terminals of the module to avoid damage.

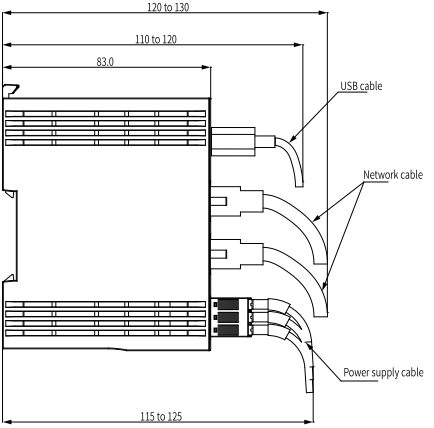
2.2 Installation Dimensions

■ Module

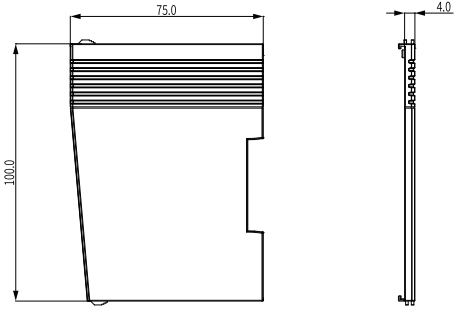
The installation dimensions (in mm) are shown in the figure below.



■ Cable connection



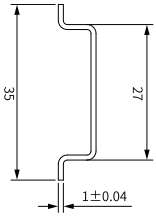
■ End Cover



2.3 Installation Method

■ Installing the modules to each other

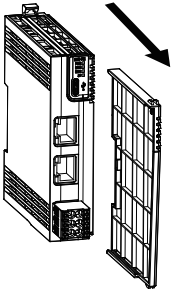
The module is mounted onto a DIN rail according to IEC 60715 (width: 35 mm, thickness: 1 mm). The dimensions (unit: mm) are shown below.



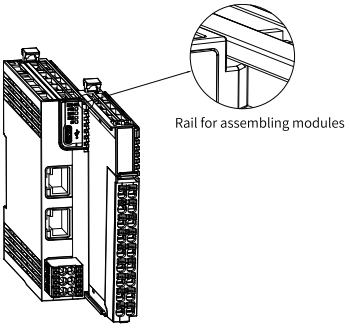
Caution

If the module is not installed on the recommended DIN rail (especially when the DIN rail thickness is not 1.0 mm), DIN rail buckles may not be locked. In this case, the module cannot be installed in place and will fail to work properly.

1. Remove the end cover in the direction indicated by the arrow, as shown below.

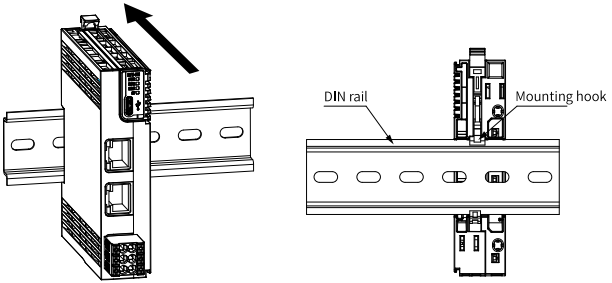


2. Install the modules to each other through top and bottom guide rails, as shown below.

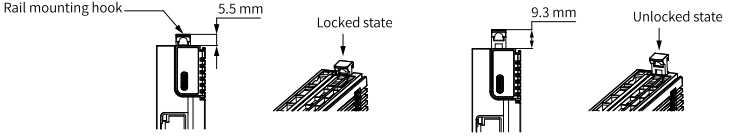


■ Installing the module onto DIN rail

1. Align the module with the DIN rail and push the module in the direction indicated by the arrow until you hear a click, as shown below.



2. Make sure the DIN rail mounting hook of the module is locked. The locked and unlocked states of the mounting hook are shown below.



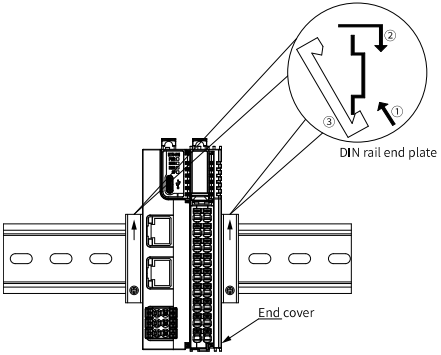
- If the mounting hook is pressed down, it is locked.
- If the mounting hook is lifted up, it is unlocked.

To lock the module to the DIN rail, press down the mounting hook.

Caution

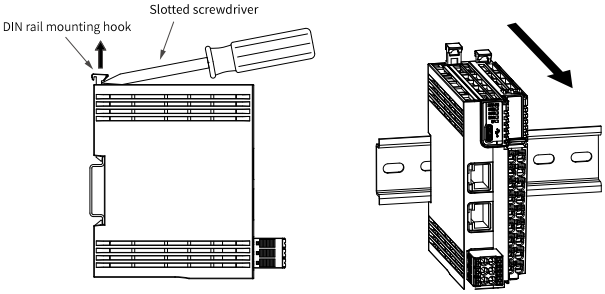
When the module is not installed on the DIN rail, keep the rail buckles in locked state. If the rail buckles remain in unlocked state for a long period of time, they will be invalidated.

3. Install the end cover on the last module to prevent the metal pin from being exposed. Install an end plate on each side of the main unit or the module to prevent the module from sliding, as shown below.
   To install the end plate, hook the bottom of it to the bottom of the DIN rail, rotate the end plate to hook the top of it to the top of the DIN rail, and then tighten the screw to lock the end plate in place.



■ Removal

Pry the DIN rail mounting hook upwards with a tool such as a slotted screwdriver, and pull the module away from the DIN rail to remove it. Then, press down the top of the mounting hook, as shown below.


Slotted screwdriver
DIN rail mounting hook

3 Electrical Installation

3.1 Cable Selection

■ Communication cable

PROFINET bus communication utilizes shielded cables for network data transmission, ensuring no short circuits, misalignments, or poor contact issues. The cable length between devices must not exceed 100 m, as exceeding this limit may cause signal attenuation and disrupt normal communication. It is recommended to use cables specified as follows.

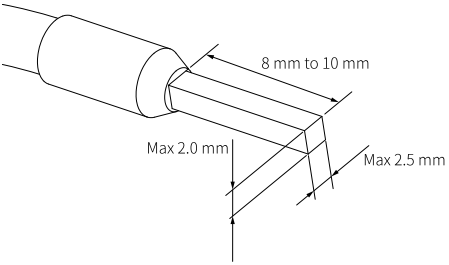
Item	Specification
Cable type	Flexible crossover cable, S-FTP, Cat 5e
Standard	EIA/TIA568A, EN50173, ISO/IEC11801 EIA/TI Abulletin TSB, EIA/TIA SB40-A&TSB36
Cross sectional area	AWG26
Conductor type	Twisted pair
Number of pairs	4

■ Power supply cable

The cable lug and cable diameter included in the following table are only for reference.

Material Name	Applicable Cable Diameter		Applicable Cable Diameter		Suzhou Yuanli	
	mm^2	AWG	Model	Crimping Tool	Model	Crimping Tool
Tubular lug	0.5	20	E0508	KST2000L	0508	YAC-5
	0.75	18	E7508		7508	
	1.0	18	E1008		1008	
	1.5	16	E1508		1508	

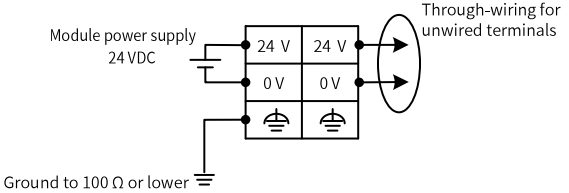
The shape and dimension requirements of the crimped terminals are as shown in the figure below.



■ External interface specifications

Type	Interface Name	Cable Type/ Max Length	Description	User Terminal	Performance Metrics
PROFINET interface	PROFINET	Shielded network cable, 100 m	PROFINET communica-tion interface	RJ45 x 2	100 Mbps (100Base-TX)
Power supply	24 V input	3-core unshielded cable, 20 m	24 V power supply input	6-pin pluggable terminal block	24 V/1 A

3.2 Terminal Wiring



4 Programming Commissioning

4.1 Applicable for STEP7 MicroWIN

Prerequisite

- The relationship between the firmware version compatibility of the GL20-RTU-PN module, the expansion modules, their firmware versions, functionalities, and GSD file versions has been understood. For details, see *"1.6 Release Notes" on page 21*.

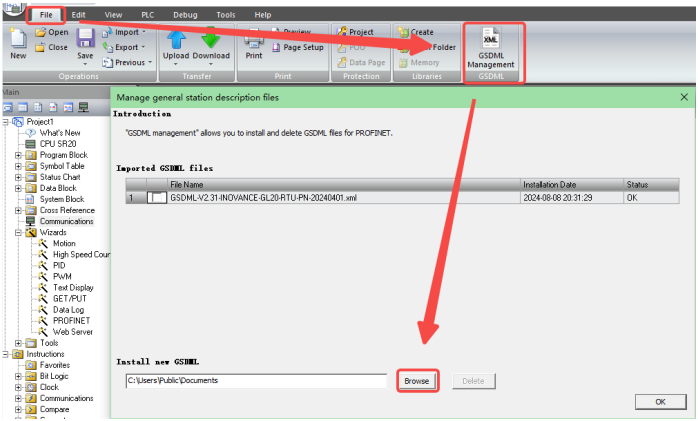
Note

To check the firmware version and related module versions of the GL20-RTU-PN module, See *"6.2 Share IN and Share OUT Mapping Modules" on page 76*.

- The GSD file is ready. You can get the GSD file from *https://www.inovance.com*.

Operating procedure

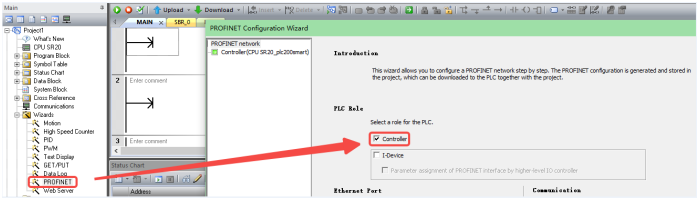
1. Complete the cable connections, then power on and initiate the operation of this product.
2. Import the GSD file.
   a. In the STEP7 main interface, select **File** > **GSDML Management** to open the "Manage general station description file" dialog box, as shown in the figure below.



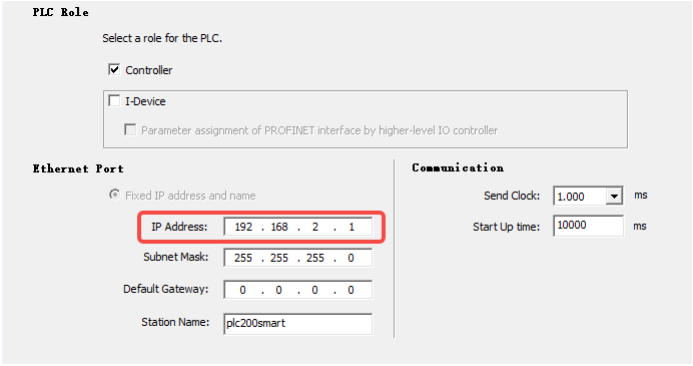
b. Click **Browse** to select the path where the GSD file is located, then click **OK**.

3. Configure the PLC IP address.

a. Expand **Wizards** in the left project tree, double-click **PROFINET**, and check the **PLC Role** as **Controller**, as shown in the figure below.



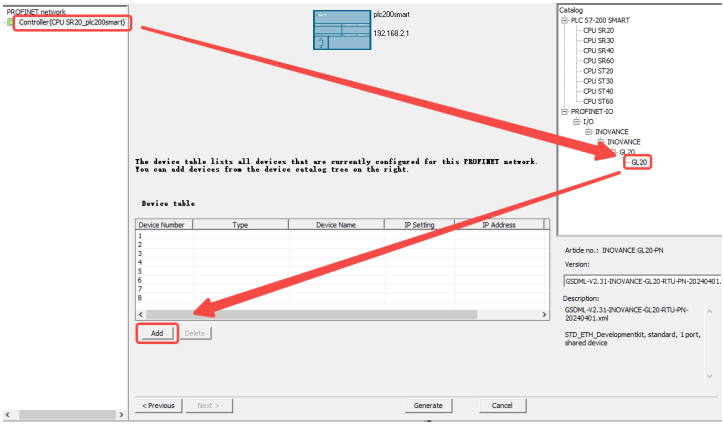
b. Configure the **IP Address** according to the actual PLC IP address, as shown in the figure below.



4. Configure the GL20-RTU-PN module.

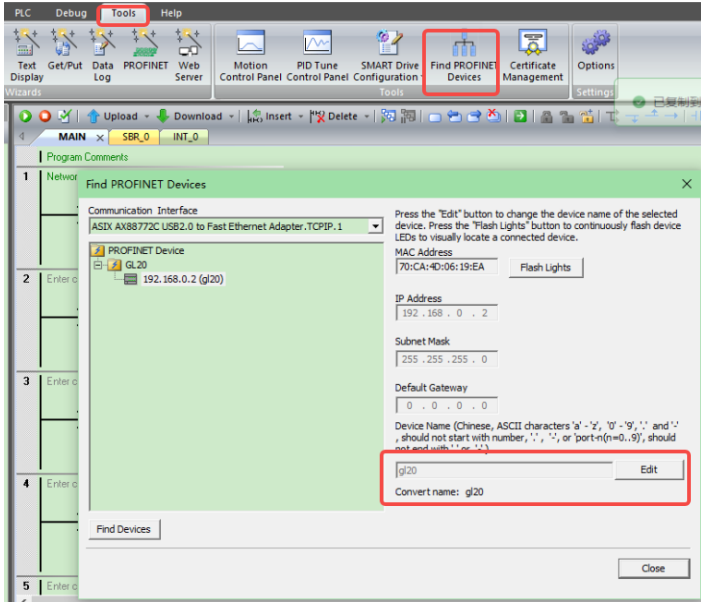
   a. Double-click the **Controller** to enter the configuration interface.

   b. In the configuration interface, expand the directory tree on the right to **PROFINET-IO** > **I/O** > **INOVANCE** > **INOVANCE** > **GL20**, select **GL20**, and click **Add**.

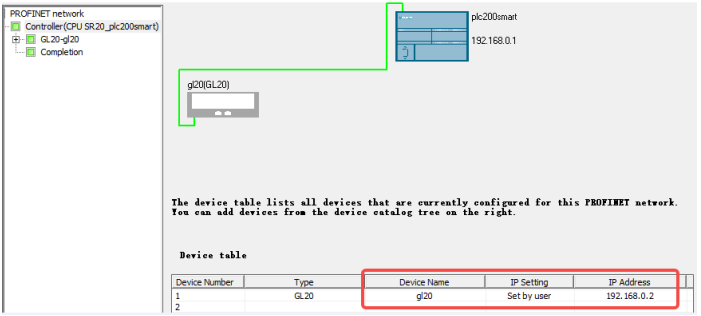


5. Modify the device name and IP address of the GL20-RTU-PN module.

a. In the STEP7 main interface, select **Tools** > **Find PROFINET Devices** to display the device name, as shown in the figure below.



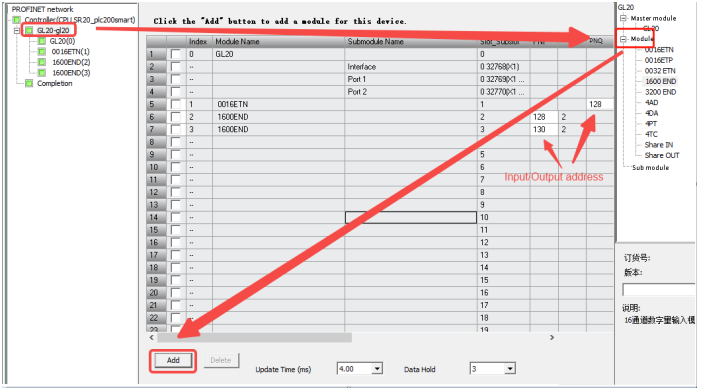
b. In the "Device Name" and "IP Address" lists, modify the device name and IP address of the GL20-RTU-PN module to match the actual device name and IP address, as shown in the figure below.



6. Configure the expansion module.

a. Double-click the configured GL20-RTU-PN module in the left project tree to access the expansion module configuration interface, as shown in the figure below.

b. Click the expansion modules in the right directory tree according to the actual installation sequence, then click **Add** to add the expansion modules and automatically assign input/output addresses (I area and Q area).



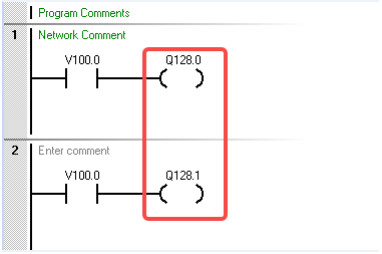
7. After configuration, click **Generate** to complete the configuration wizard setup.

Programming Examples

Taking the first GL20-0016ETN module in the figure above as an example, the address ranges are configured as follows:

- First 8 points: Q128.0 to Q128.7
- Post 8 points: Q129.0 to Q129.7

Program directly using the default assigned addresses, as shown in the figure below.



4.2 Applicable for TIA Portal

Prerequisite

- The relationship between the firmware version compatibility of the GL20-RTU-PN module, the expansion modules, their firmware versions, functionalities, and GSD file versions has been understood. For details, see *"1.6 Release Notes" on page 21*.

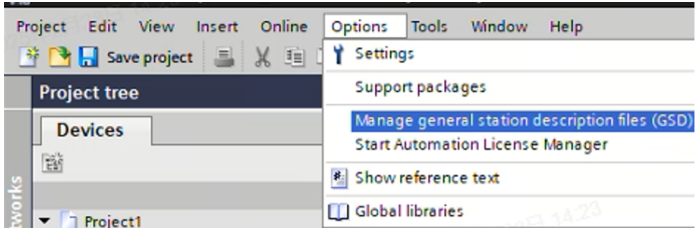
Note

To check the firmware version and related module versions of the GL20-RTU-PN module, See *"6.2 Share IN and Share OUT Mapping Modules" on page 76*.

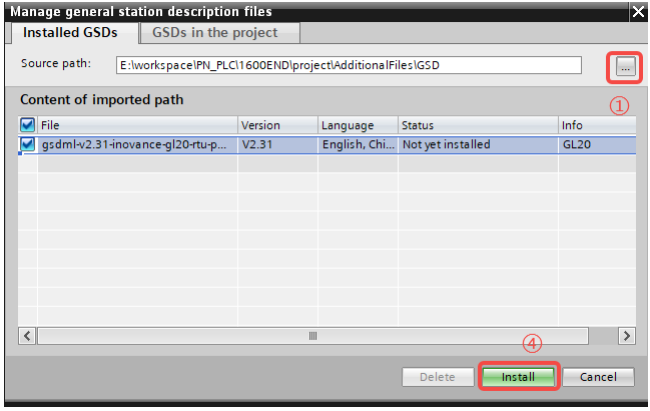
- The GSD file is ready. You can get the GSD file from *https://www.inovance.com*.

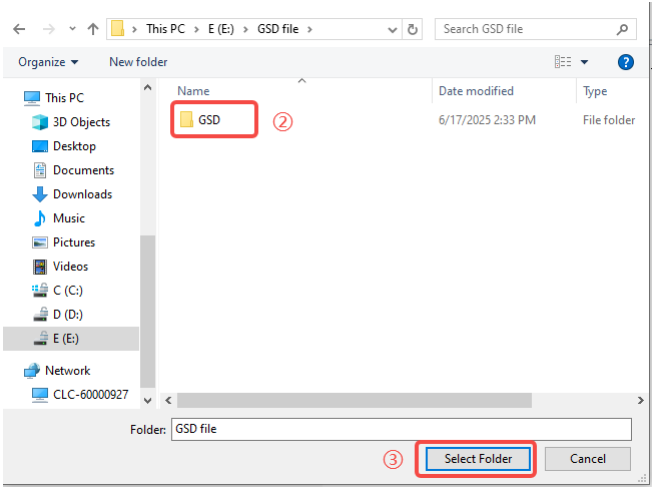
Operating procedure

1. Complete the cable connections, then power on and initiate the operation of this product.
2. Import the GSD file.
   a. In the TIA Portal menu bar, select **Options** > **Manage general station description files (GSD)**, as shown in the figure below.

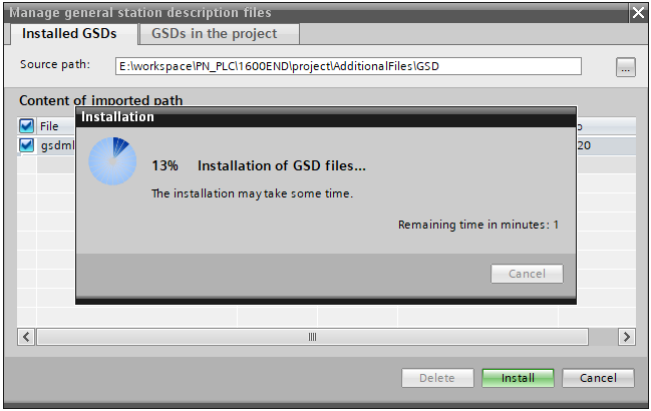


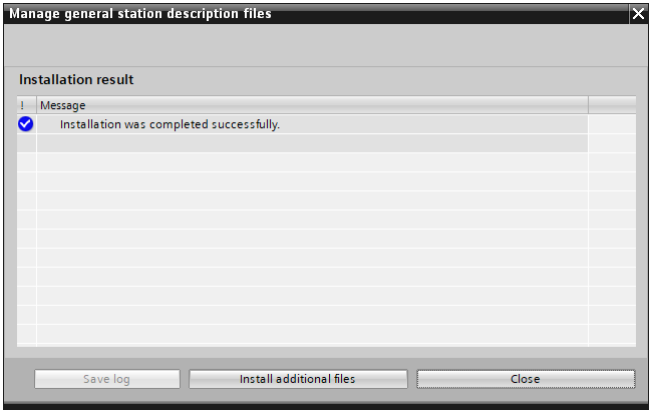
b. In the opened dialog box, click ... ①, select the source path where the GSD file is located (the software will automatically index the file) ②, check the GSD file ③, and click **Install** ④ to install the GSD file, as shown in the figure below.



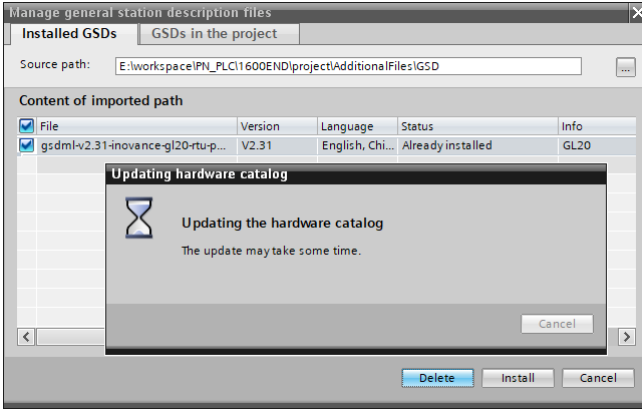


c. The progress of installing the GSD file will display, and a "Manage general station description files" dialog will pop up upon completion, showing "Installation completed successfully" as the "Installation Result" message, as shown in the figure below.

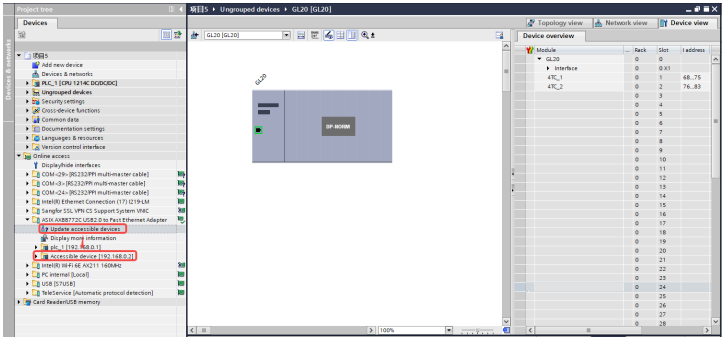




d. A GSD installation update information will display, and then the GSD installation interface will automatically exit when the update is completed.



3. On the main interface, select **Project tree** > **Devices** > **Online access**, then double-click **Update accessible devices** under the corresponding network card of the PLC to scan for online GL20-RTU-PN module, as shown in the figure below.
   The scan result will be displayed below, such as "gl20" shown in the figure below.

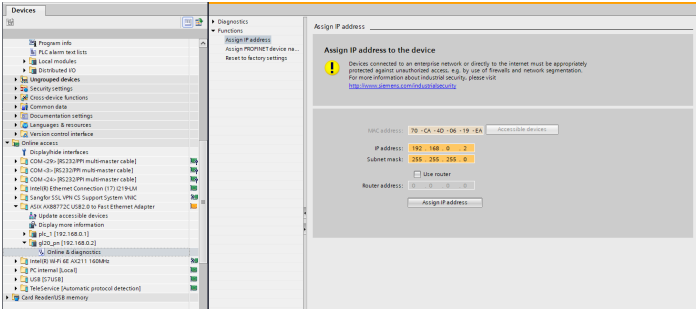


4. Assign an IP address and PROFINET device name for the GL20-RTU-PN module.
   a. Double-click **Online & diagnostics** under the scanned GL20-RTU-PN module. In the right-hand interface, select **Functions** > **Assign IP address**, configure the IP

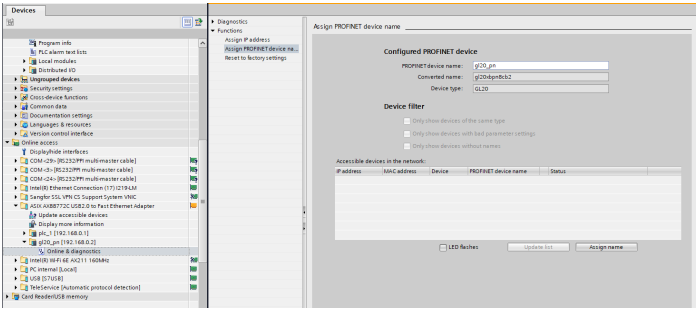
address and subnet mask for the GL20-RTU-PN module, then click **Assign IP address**, as shown in the figure below.

Caution

The IP address of the GL20-RTU-PN module must be in the same subnet as the PLC.

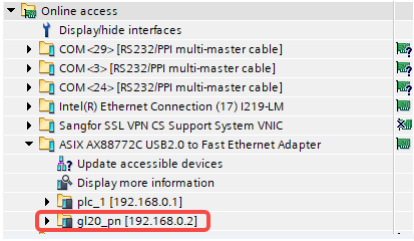


b. Select **Functions** > **Assign PROFINET device name**, configure the PROFINET device name and click **Assign name** to complete the configuration, as shown in the figure below.



c. Check the configuration result.

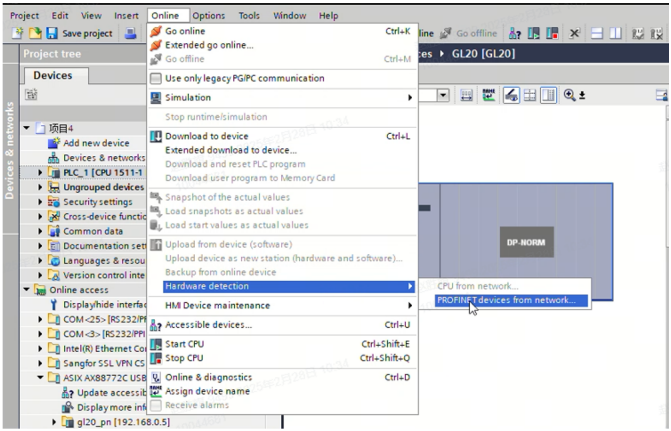
Upon successful configuration, the PROFINET device name and IP address will be displayed under the corresponding network card of the PLC in the left project tree, as shown in the figure below.



5. Configure the GL20-RTU-PN and expansion modules. Automatic and manual configuration methods are supported.

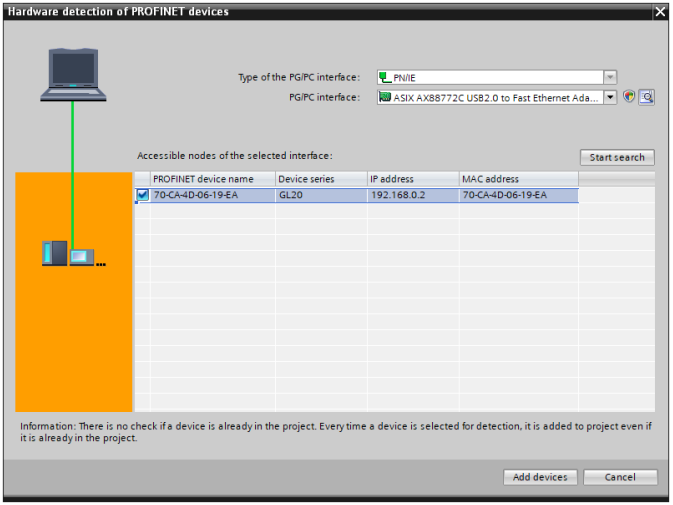
- **Automatic configuration**

a. In the menu bar, select **Online** > **Hardware detection** > **PROFINET devices from network**, as shown in the figure below.



b. Select the corresponding network card, click **Start search**, check the GL20-RTU-PN communication interface module to be configured, and click **Add devices**.

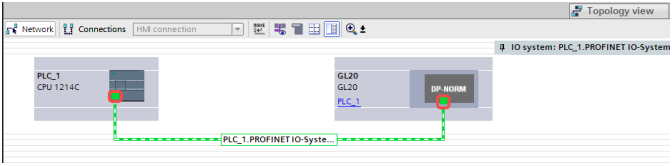
After the GL20-RTU-PN communication interface module is successfully added, a pop-up message displays indicating the hardware detection of the device has been successfully completed.



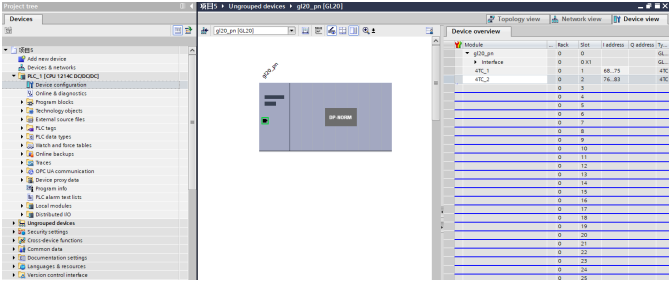
Note

If the addition fails, disconnect the network cable connection between the PLC and the GL20-RTU-PN module, then reconnect it, and repeat steps a to b.

c. Hold down the left mouse button and drag the green frame of the PLC to the green frame of the GL20-RTU-PN module to connect the PLC and the GL20-RTU-PN module, as shown in the figure below.



d. Double-click the GL20-RTU-PN module in the network view to open the device view, as shown in the figure below.



e. (Optional) Assign I address or Q address for the module.

Note

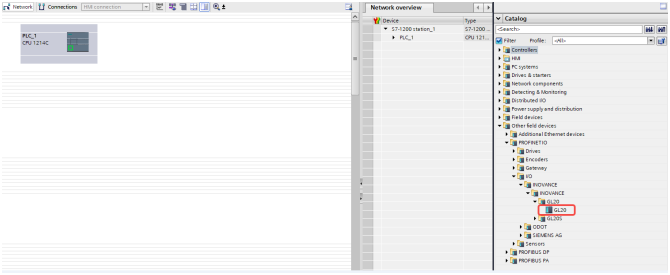
If this product interfaces with the S7-300 series master and the CP343-1 Ethernet communication module, and only Inovance expansion modules are used, it is recommended to modify the I or Q address of the first module to start from "0" to facilitate parameter configuration when using the PNIO_SEND(FC11) and PNIO_RECV (FC12) program blocks later. Otherwise, attention must be paid to the relevant parameter configurations. For details, see *"4.5* **Notes***" on page 66*.

---

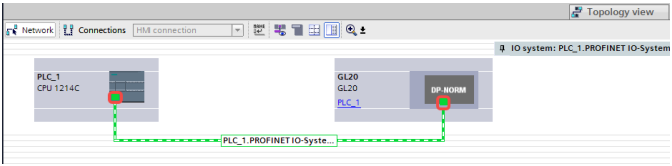
f. Click on the expansion module to be configured in the network view, then configure the corresponding module parameters under **Properties** > **General** > **Module parameters**. For detailed descriptions of the module parameters, see *"6.3 Expansion Module Parameter Description" on page 81*.

- **Manual configuration**

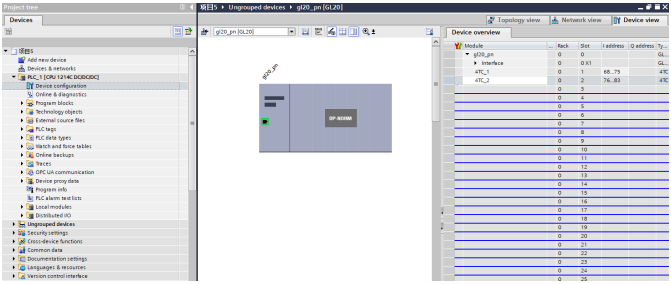
a. Double-click **GL20** or drag **GL20** to the network view in the hardware catalog, as shown in the figure below.



b. Hold down the left mouse button and drag the green frame of the PLC to the green frame of the GL20-RTU-PN module to connect the PLC and the GL20-RTU-PN module, as shown in the figure below.



c. Double-click the GL20-RTU-PN module in the network view to open the hardware catalog, as shown in the figure below.



d. According to the actual module installation sequence, double-click the expansion modules in the hardware catalog on the right side to add them and automatically assign addresses.

Note

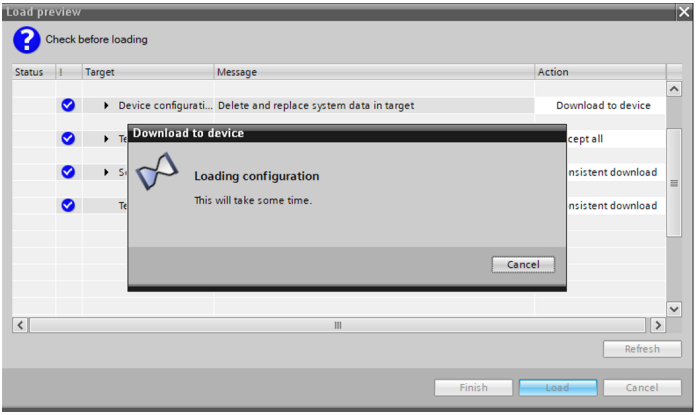
If this product interfaces with the S7-300 series master and the CP343-1 Ethernet communication module, and only Inovance expansion modules are used, it is recommended to modify the I or Q address of the first module to start from "0" to facilitate parameter configuration when using the PNIO_SEND(FC11) and PNIO_RECV (FC12) program blocks later. Otherwise, attention must be paid to the relevant parameter configurations. For details, see *"4.5* **Notes***" on page 66*.

---

e. Click on the expansion module to be configured in the network view, then configure the corresponding module parameters under **Properties** > **General** > **Module parameters**. For detailed descriptions of the module parameters, see *"6.3 Expansion Module Parameter Description" on page 81*.

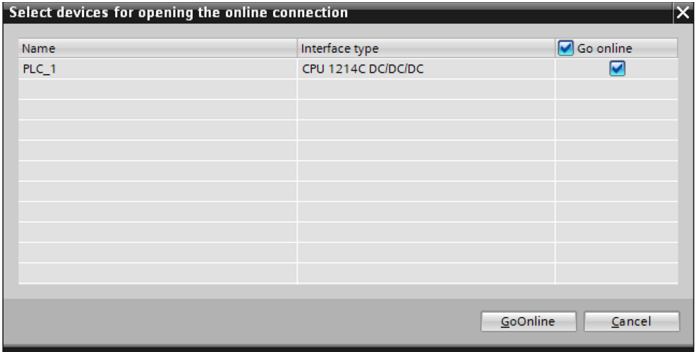
6. Download the program to the device and switch to online.

a. Click in the toolbar to open the "Load preview" dialog box, as shown in the figure below.



b. Click **Load** to download the program to the device.

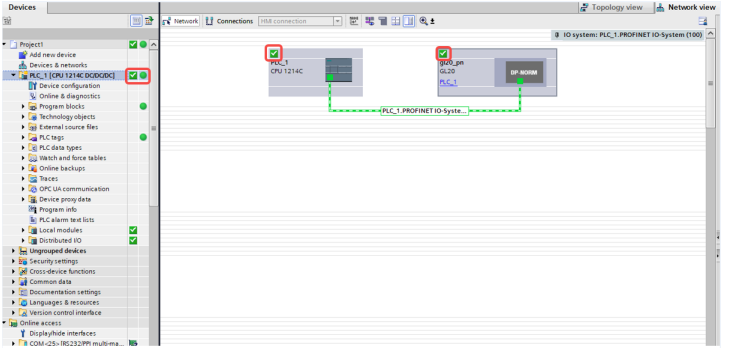
c. Click Go online in the toolbar to open the dialog box, as shown in the figure below.



d. Check the PLC and click **GoOnline**.

7. Check that the GL20-RTU-PN module is successfully configured.

If green icons are displayed in both the project tree and network view, it indicates that the GL20-RTU-PN module is successfully configured; otherwise, the configuration is unsuccessful, as shown in the figure below.



If the configuration is unsuccessful, contact Inovance for technical support.

4.3 Applicable for STEP7

Prerequisite

- The relationship between the firmware version compatibility of the GL20-RTU-PN module, the expansion modules, their firmware versions, functionalities, and GSD file versions has been understood. For details, see *"1.6 Release Notes" on page 21*.

Note

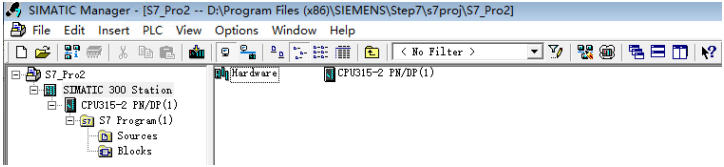
To check the firmware version and related module versions of the GL20-RTU-PN module, See *"6.2 Share IN and Share OUT Mapping Modules" on page 76*.

- The GSD file is ready. You can get the GSD file from *https://www.inovance.com*.

Operating procedure

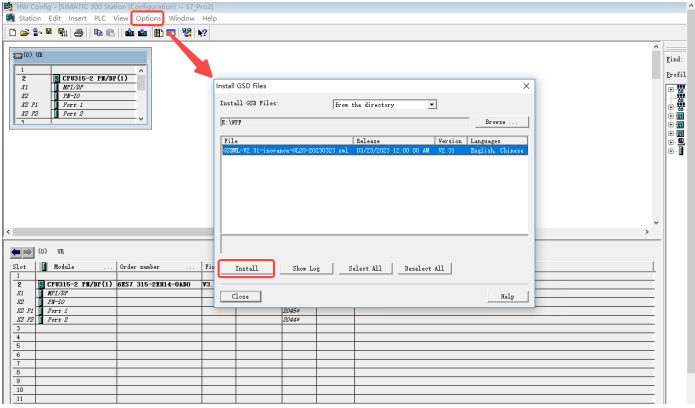
1. Complete the cable connections, then power on and initiate the operation of this product.

2. Create a new project, taking the S7-300 CPU315-2 PN/DP as an example, as shown in the figure below.



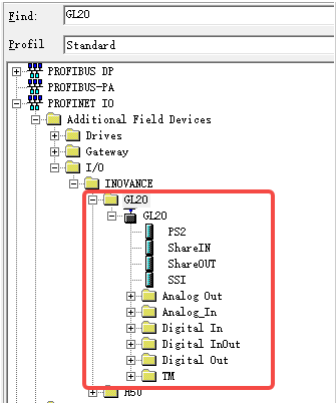
3. Import the GSD file.

a. Double-click the **Hardware** in the STEP7 main interface, then select **Options** > **Install GSD Files** from the menu bar to open the "Install GSD Files" dialog box, as shown in the figure below.



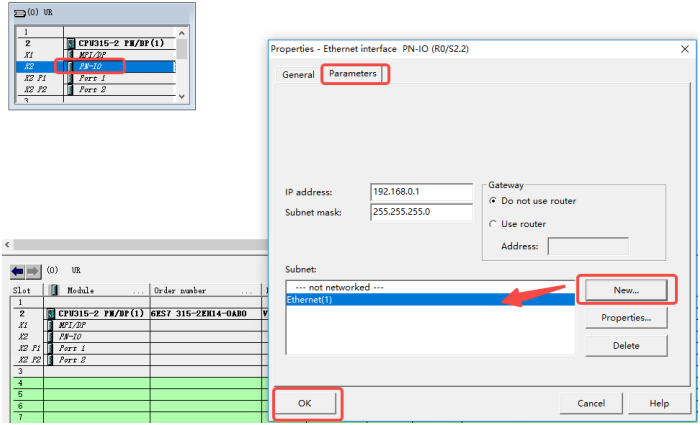
b. Click **Browse...** to select the path where the GSD file is located, then click **OK**.

c. Click **Install** to start the installation. Once the installation is complete, the GL20 series module can be found in the device list on the right, as shown in the figure below.



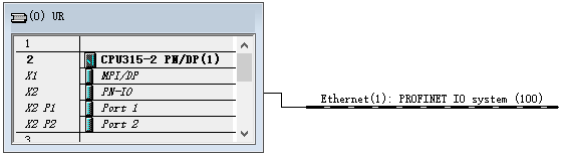
4. Configure the GL20-RTU-PN module.

   a. Right-click on **PN-IO** in the **Hardware** configuration interface, select **Insert PROFINET IO System** from the context menu, and open the "Properties - Ethernet interface PN-IO" dialog box, as shown in the figure below.

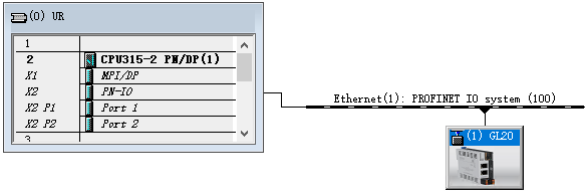


b. Click the **Parameters** tab, click **New**, then click **OK** to create the PROFINET subnet.

Upon successful creation of the PROFINET subnet, the display appears as shown in the figure below.

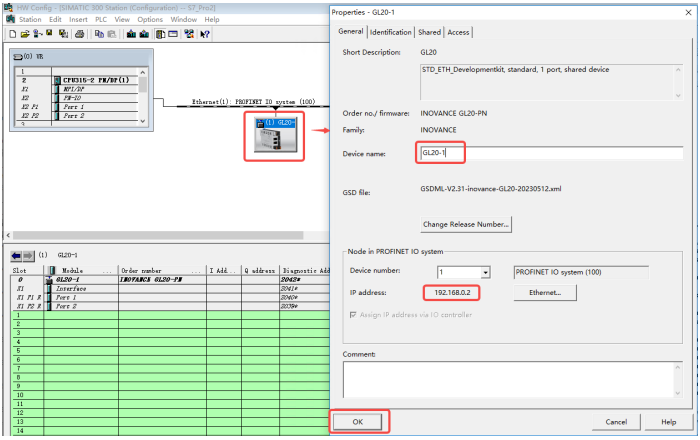


c. Double-click the GL20 series module in the right device list, or drag the GL20 series module to the "Ethernet (1): PROFINET IO system (100)" subnet to complete the configuration of the GL20-RTU-PN module.

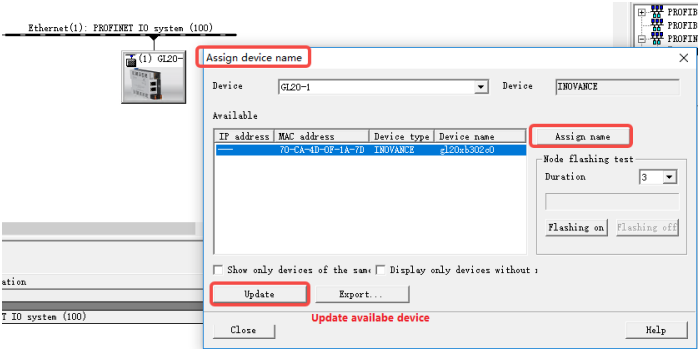


5. Modify the IP address and device name of the GL20-RTU-PN module, and assign the device name to the GL20-RTU-PN module.

a. Double-click the configured GL20-RTU-PN module, modify the device name and IP address, then click **OK**, as shown in the figure below.



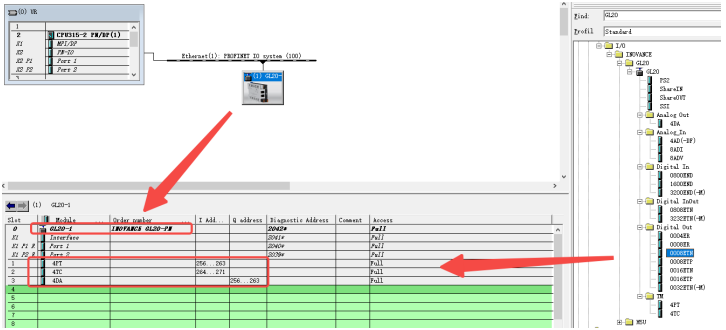
b. In the "Hardware" configuration interface, navigate to the menu bar and select **PLC** > **EtherNet** > **Assign Device Name**. In the opened window, click **Update**, then select the device from the available device list and click **Assign name** to assign the device name, as shown in the figure below.



6. Configure the expansion module.

In the "Hardware" configuration interface, click on the GL20-RTU-PN module, then sequentially double-click the expansion modules in the right device list according

to the actual installation sequence to add them and automatically assign addresses, as shown in the figure below.

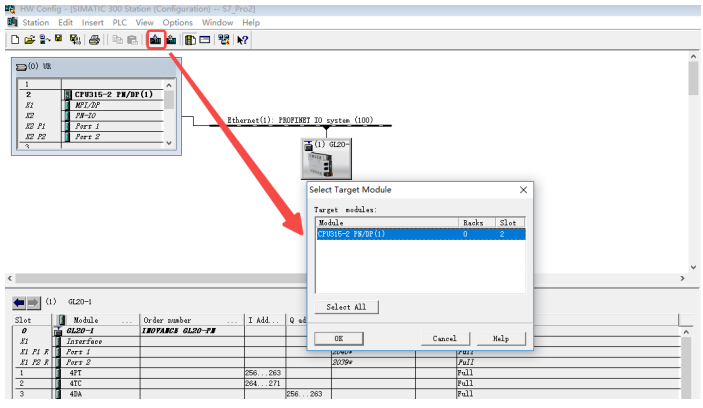


Note

If this product interfaces with the S7-300 series master and the CP343-1 Ethernet communication module, and only Inovance expansion modules are used, it is recommended to modify the I or Q address of the first module to start from "0" to facilitate parameter configuration when using the PNIO_SEND(FC11) and PNIO_RECV (FC12) program blocks later. Otherwise, attention must be paid to the relevant parameter configurations. For details, see *"4.5* **Notes***" on page 66*.

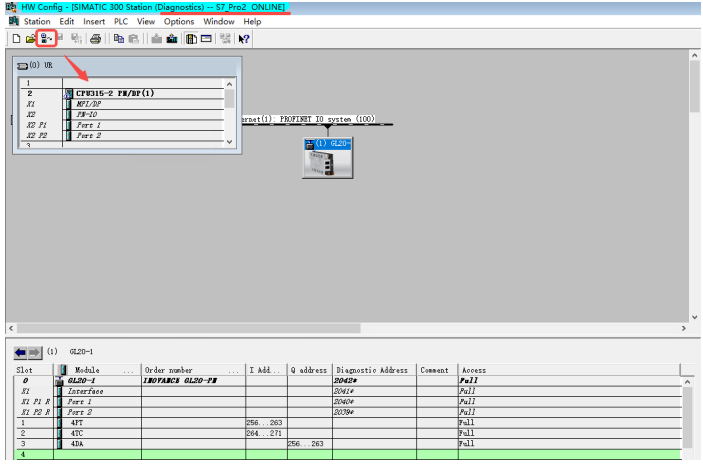
7. Download the configuration settings and perform online monitoring to verify the correctness of the configuration.

   a. Click  on the toolbar, select the corresponding PLC device in the opened dialog box, and click **OK** to download the configuration settings to the PLC, as shown in the figure below.



b. Click  to access the online monitoring configuration, as shown in the figure below.

If the configuration shows no errors, it indicates that the GL20-RTU-PN module configuration is successful; otherwise, the configuration has failed. If the configuration fails, contact Inovance for technical support.



4.4 Applicable for SIMOTION SCOUT

Prerequisite

- The relationship between the firmware version compatibility of the GL20-RTU-PN module, the expansion modules, their firmware versions, functionalities, and GSD file versions has been understood. For details, see *"1.6 Release Notes" on page 21*.

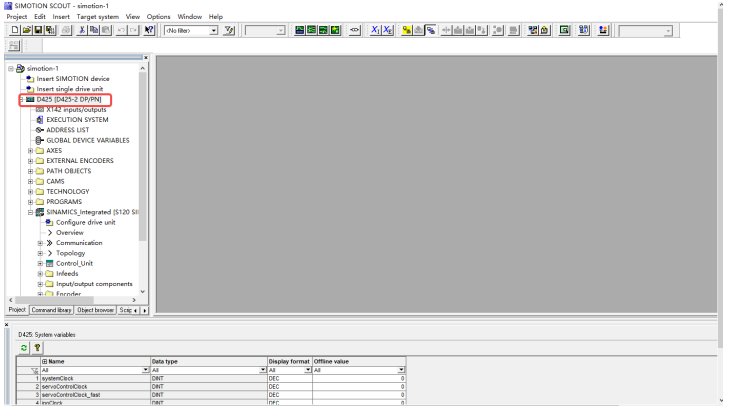
Note

To check the firmware version and related module versions of the GL20-RTU-PN module, See *"6.2 Share IN and Share OUT Mapping Modules" on page 76*.

- The GSD file is ready. You can get the GSD file from *https://www.inovance.com*.

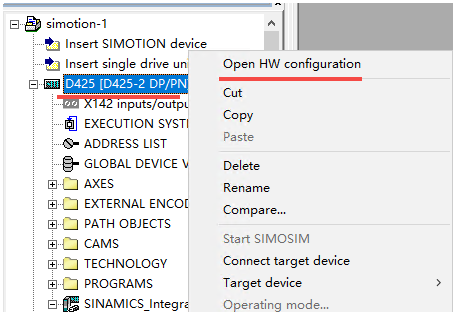
Operating procedure

1. Complete the cable connections, then power on and initiate the operation of this product.
2. Create a new project, taking the SIMOTION D425-2 DP/PN as an example, as shown in the figure below.

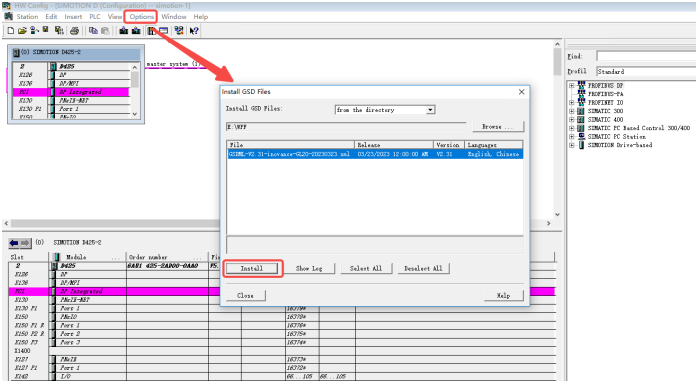


3. Import the GSD file.

a. In the navigation tree of SIMOTION SCOUT on the left, right-click **D425 [D425-2 DP/PN]**, and select **Open HW configuration** from the context menu, or double-click **D425 [D425-2 DP/PN]** to enter the hardware configuration interface, as shown in the figure below.

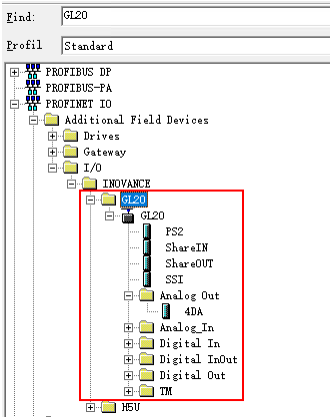


b. In the hardware configuration interface, select **Options** > **Install GSD Files** from the menu bar to open the "Install GSD Files" dialog box, as shown in the figure below.



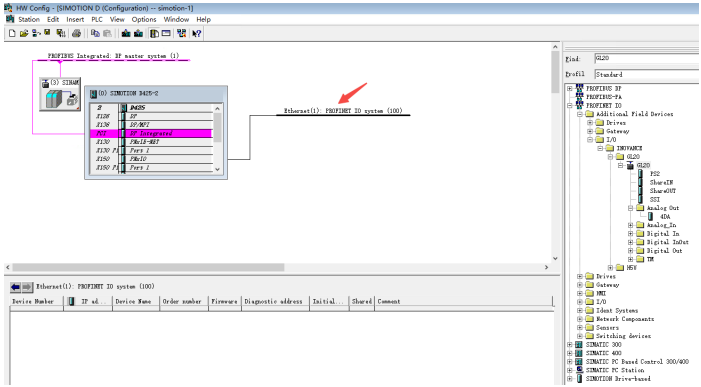
c. Click **Browse...** to select the path where the GSD file is located, then click **OK**.

d. Click **Install** to start the installation. Once the installation is complete, the GL20 series module can be found in the device list on the right, as shown in the figure below.

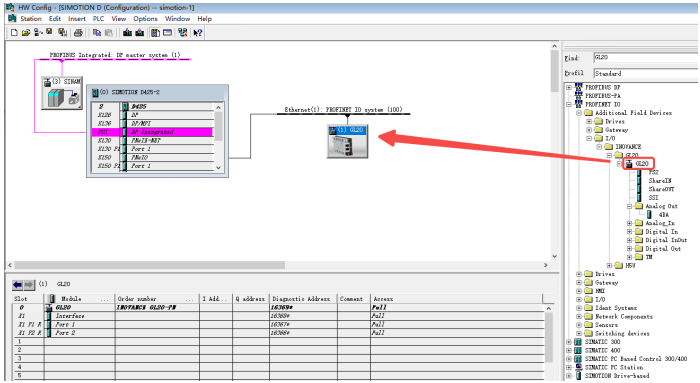


4. Configure the GL20-RTU-PN module.

a. In the hardware configuration interface, drag the "SIMOTION D425-2" configuration window and the "Ethernet(1): PROFINET IO system (100)" line segment to appropriate positions to reserve space for configuring the GL20-RTU-PN module, as shown in the figure below.

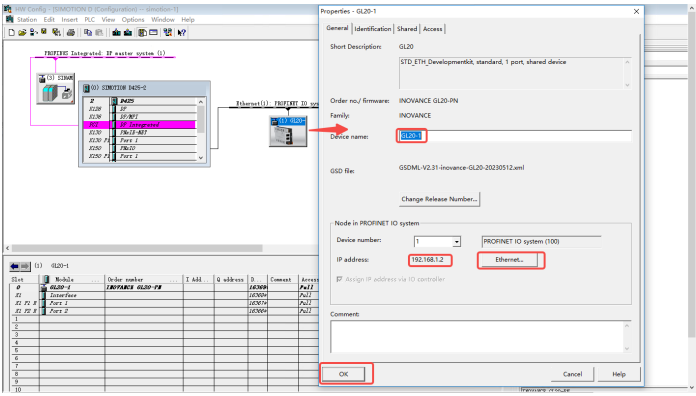


b. Double-click the GL20 series module in the right device list, or drag the GL20 series module to the "Ethernet (1): PROFINET IO system (100)" subnet to complete the configuration of the GL20-RTU-PN module.

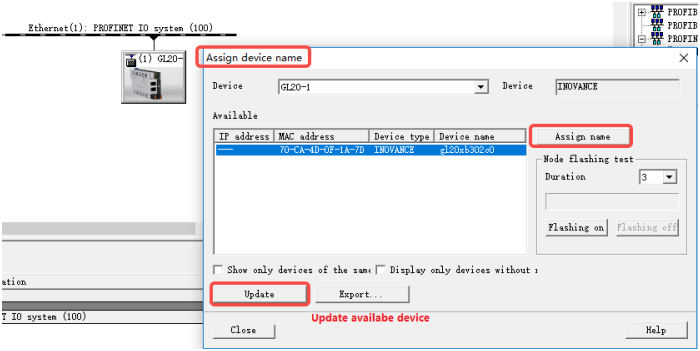


5. Modify the IP address and device name of the GL20-RTU-PN module, and assign the device name to the GL20-RTU-PN module.

a. Double-click the configured GL20-RTU-PN module, modify the device name and IP address, then click **OK**, as shown in the figure below.

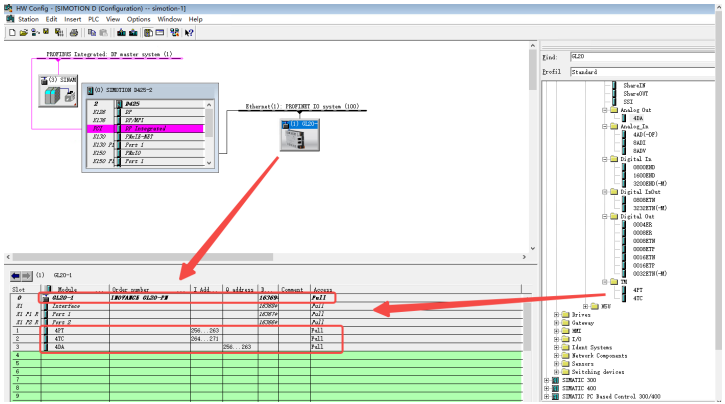


b. In the "Hardware" configuration interface, navigate to the menu bar and select **PLC** > **EtherNet** > **Assign Device Name**. In the opened window, click **Update**, then select the device from the available device list and click **Assign name** to assign the device name, as shown in the figure below.



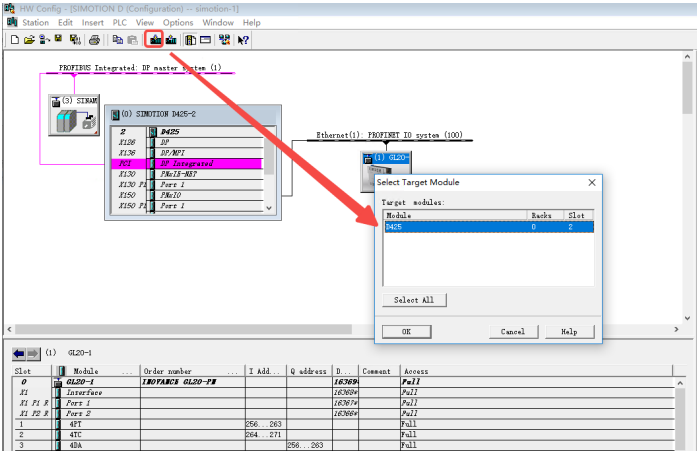
6. Configure the expansion module.

In the "Hardware" configuration interface, click on the GL20-RTU-PN module, then sequentially double-click the expansion modules in the right device list according to the actual installation sequence to add them and automatically assign addresses, as shown in the figure below.



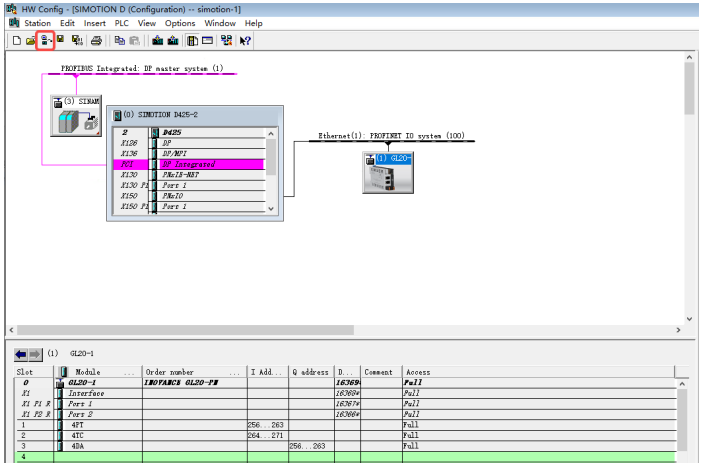
7. Download the configuration settings and perform online monitoring to verify the correctness of the configuration.

   a. Click  on the toolbar, select the corresponding PLC device in the opened dialog box, and click **OK** to download the configuration settings to the PLC, as shown in the figure below.



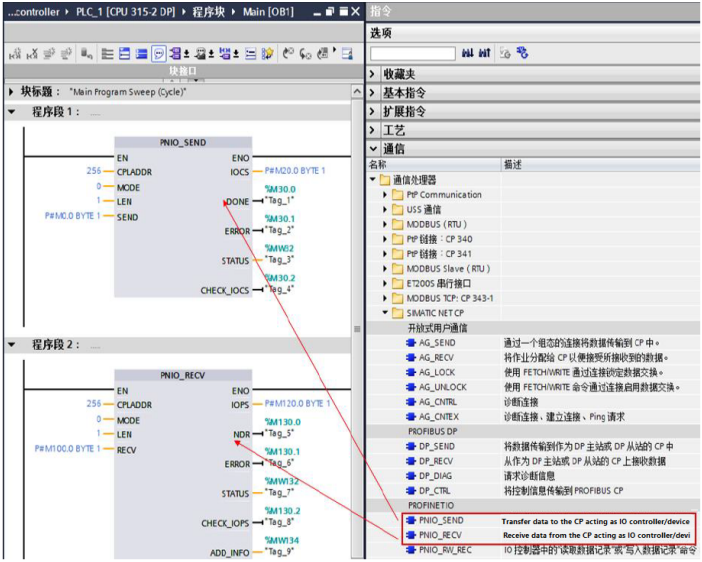
b. Click  to access the online monitoring configuration, as shown in the figure below.

If the configuration shows no errors, it indicates that the GL20-RTU-PN module configuration is successful; otherwise, the configuration has failed. If the configuration fails, contact Inovance for technical support.



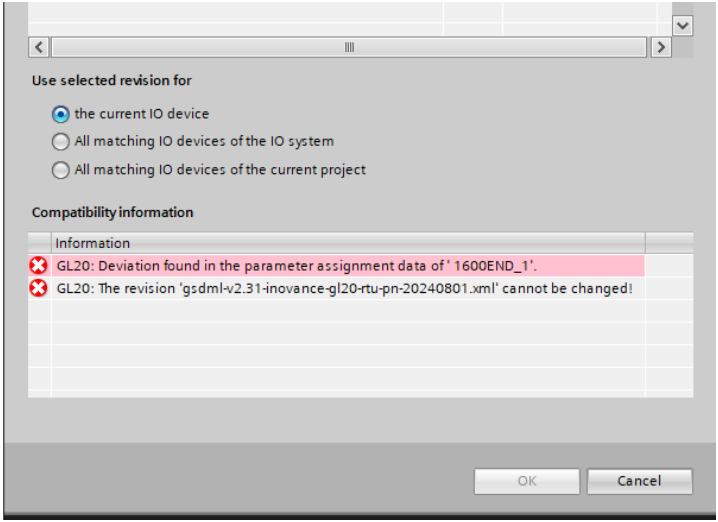
4.5 Notes

- When this product interfaces with the S7-300 series master and the CP343-1 Ethernet communication module, the PNIO_SEND(FC11) and PNIO_RECV(FC12) program blocks are required, as shown in the figure below. The parameter configuration instructions are detailed in the following table.


...controller ▸ PLC_1 [CPU 315-2 DP] ▸ 程序块 ▸ Main [OB1]
块接口
块标题： "Main Program Sweep (Cycle)"
程序段 1：
PNIO_SEND
EN
ENO
256 CPLADDR
IOCS P#M20.0 BYTE 1
0 MODE
1 LEN
P#M0.0 BYTE 1 SEND
DONE %M30.0 "Tag_1"
ERROR %M30.1 "Tag_2"
STATUS %MW32 "Tag_3"
CHECK_IOCS %M30.2 "Tag_4"
程序段 2：
PNIO_RECV
EN
ENO
256 CPLADDR
IOPS P#M120.0 BYTE 1
0 MODE
1 LEN
P#M100.0 BYTE 1 RECV
NDR %M130.0 "Tag_5"
ERROR %M130.1 "Tag_6"
STATUS %MW132 "Tag_7"
CHECK_IOPS %M130.2 "Tag_8"
ADD_INFO %MW134 "Tag_9"
指令
选项
收藏夹
基本指令
扩展指令
工艺
通信
名称
描述
通信处理器
PtP Communication
USS 通信
MODBUS (RTU)
PtP 链接：CP 340
PtP 链接：CP 341
MODBUS Slave (RTU)
ET200S 串行接口
MODBUS TCP: CP 343-1
SIMATIC NET CP
开放式用户通信
AG_SEND 通过一个组态的连接将数据传输到 CP 中。
AG_RECV 将作业分配给 CP 以便接受所接收到的数据。
AG_LOCK 使用 FETCH/WRITE 通过连接锁定数据交换。
AG_UNLOCK 使用 FETCH/WRITE 命令通过连接启用数据交换。
AG_CNTRL 诊断连接
AG_CNTEX 诊断连接、建立连接、Ping 请求
PROFIBUS DP
DP_SEND 将数据传输到作为 DP 主站或 DP 从站的 CP 中
DP_RECV 从作为 DP 主站或 DP 从站的 CP 上接收数据
DP_DIAG 请求诊断信息
DP_CTRL 将控制信息传输到 PROFIBUS CP
PROFINET IO
PNIO_SEND Transfer data to the CP acting as IO controller/device
PNIO_RECV Receive data from the CP acting as IO controller/devi
PNIO_RW_REC IO 控制器中的"读取数据记录"或"写入数据记录"命令

Parameter	Variables Declaration	Data Type	Description
LEN	INPUT	INT	Indicates the length of the data area to be sent or received, which is measured in bytes, and always calculated starting from address 0 of the data area. • When the I or Q address of the first expansion module applicable to this product starts from 0, this parameter should be set according to the actual length of the last expansion module. For example, if the I address ranges from 0 to 9, then LEN should be set to 10. The same applies to the Q address. • When the I or Q address of the first expansion module applicable to this product does not start from 0, this parameter should be set according to the length calculated from the last expansion module's I or Q address starting at 0. For example, if the I address ranges from 68 to 83, then LEN should be set to 84. The same applies to the Q address.
SEND	IN_OUT	ANY	Indicates the data sending area, which is a peer data area with the expansion module, and used for data exchange between the S7-300 series master and the expansion modules. The format is: **P#Mx.0 BYTE y**, where x represents the starting address of the S7-300 series master data area, and y represents the length of the S7-300 series master data area, with the value of y being equal to the LEN value.
RECV	IN_OUT	ANY	Indicates the data receiving area, which is a peer data area with the expansion module, and used for data exchange between the S7-300 series master and the expansion modules. The format is: **P#Mx.0 BYTE y**, where x represents the starting address of the S7-300 series master data area, and y represents the length of the S7-300 series master data area, with the value of y being equal to the LEN value.

- For GSD file versions updated after 20240401, if encountering the issue shown in the figure below, it is necessary to delete the 1600END module from the corresponding configuration settings, update the GSD file, and then re-add the 1600END module.



5 Fault Diagnosis

LED Indicator Status		Description	Cause	Solution
ERR	Solid on (red)	Protocol stack failed to scan for modules	The expansion module does not exist.	Check that the module is installed properly and supplied with power.
			No expansion module was scanned due to local bus communication failure.	Check the contact of the communication interface of the expansion module or restart the whole system
	Flashing (red)	• Number of configured I/O modules greater than the number of actual scanned I/O modules • Number of configured I/O modules less than the number of actual scanned I/O modules • Type of configured I/O modules inconsistent with that of actual scanned I/O modules	The actual slot of the expansion module is inconsistent with the configuration.	Check the number and installation sequence of expansion modules.
			The local bus communication failure causes that the module scanned is inconsistent with the configuration.	Check the contact of the communication interface of the expansion module or restart the whole system
		Share IN/Share OUT module position or number error	The Share IN or Share OUT module should be placed at the end of the module list. Only one Share IN module and one Share OUT module are allowed.	Check the slot or number of Share IN or Share OUT modules.

LED Indicator Status		Description	Cause	Solution
SF	Solid on (red)	• I/O module configuration failed • I/O module status switch failed	The local bus communication failure causes an error when the master module interacts with the expansion module.	Check the contact of the communication interface of the expansion module or restart the whole system
		I/O module offline	The I/O module was powered off or removed.	Check whether the module in the corresponding slot is powered off or removed.
			The error occurs due to high frame loss rate of local bus communica-tion.	Check the contact of the communication interface of the expansion module or restart the whole system
SF	Flashing (red)	Power supply overvoltage	Unstable module power supply or power failure	Check the power supply of the module.
		Power supply undervoltage		
		External 24 V power supply failure		

LED Indicator Status		Description	Cause	Solution
SF	Flashing (red)	Chip overtemperature	The DAC device temperature is too high.	1. Check whether the module hardware is faulty. 2. Replace the module.
		ADC device fault	The ADC device is faulty.	
		DAC device fault	The DAC device is faulty.	
		Reference channel fault	The TC module cold end sampling channel is faulty.	1. Check the TC module cold end channel hardware. 2. Replace the module.
		Channel x open-circuited	The analog channel wiring is disconnected.	1. Check the external wiring of the module channel. 2. If the external wiring is correct, it is recommended to check the internal hardware of the module or replace the module.
		Channel x short-circuited	The analog channel wiring is short-circuited.	
		Channel x data exceeds upper limit	The channel data is abnormal and out of normal range.	Check whether the external input signal of module is abnormal.
		Channel x data exceeds lower limit		
		Channel x data overflow		
		Channel x data underflow		

6 Appendix

6.1 Configuring the MRP

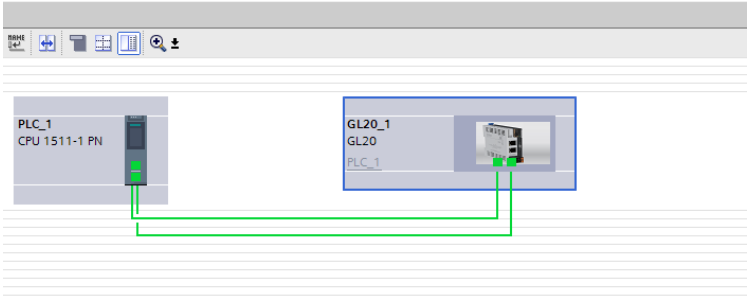
■ MRP overview

The standard Media Redundancy Protocol (MRP) is used, which meets the IEC 62439-2 standard. The typical reconstruction time is 200 ms and each ring network supports up to 50 devices.

MRP basic rules:

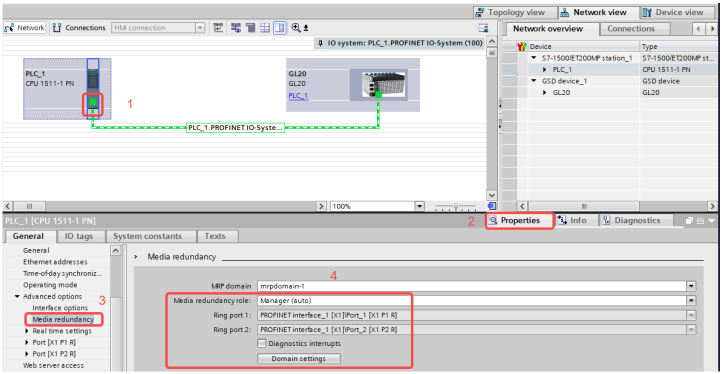
- All nodes on the ring network must support the MRP and have the MRP enabled.
- All devices must be interconnected through ports on the ring network.
- All devices in the ring network are in the same redundancy domain.
- A maximum of 50 devices can be connected in a ring network. More devices will prolong the reconstruction time of 200 ms.
- Only one device in the ring network can serve as the ring network manager, and other devices are all ring network clients.

The MRP topology diagram is shown in the figure below.

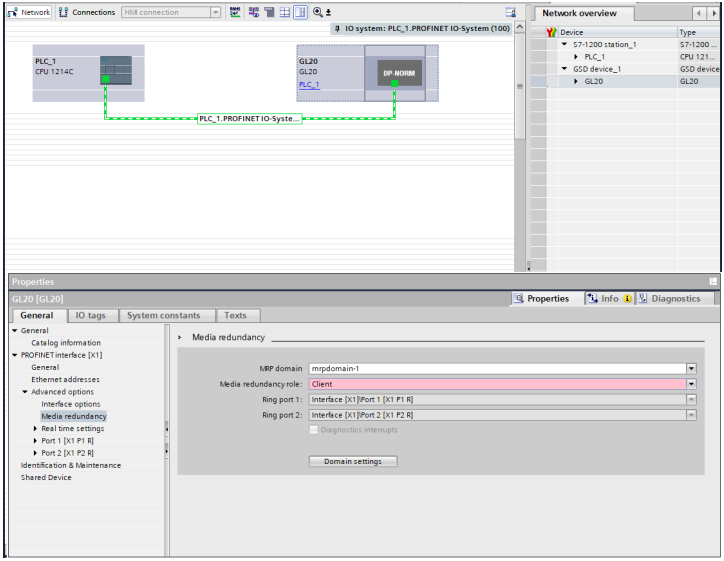


■ MRP setting

1. Select the PLC port, navigate to **Properties** > **Media redundancy**, set the "Media redundancy role" to "Admin", and check the parameters of "Ring port 1" and "Ring port 2".



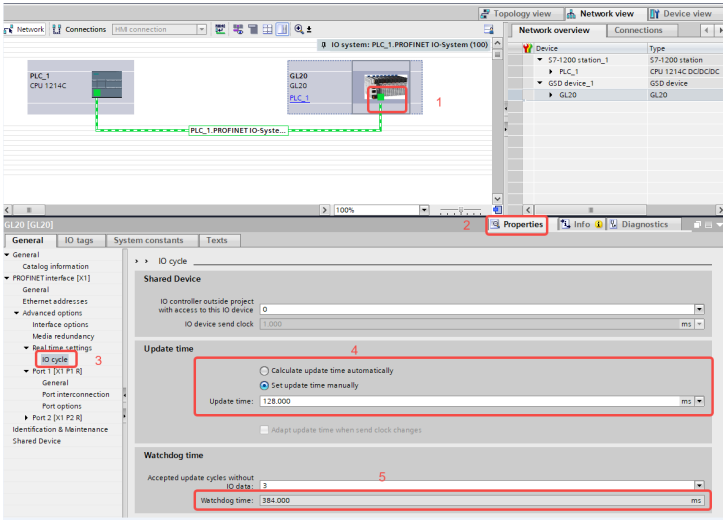
2. Select an I/O device port, navigate to **Properties** > **Media redundancy**, set the "Media redundancy role" to "Client", and check the parameters of "Ring port 1" and "Ring port 2".



3. Select an I/O device port, navigate to **Properties** > **IO cycle**, and adjust the "Update time" to an appropriate value so that the "Watchdog time" is greater than 200 ms.

Note

MRP provides a typical reconstruction time of 200 ms and supports up to 50 devices in each ring network. To avoid interference to PROFINET communication during ring network reconstruction, set the PROFINET watchdog time of the I/O device to be greater than 200 ms.



6.2 Share IN and Share OUT Mapping Modules

Caution

The Share IN and Share OUT are mapping modules, and must be added at the end of all modules; otherwise, the modules will fail to operate.

■ Byte description

The first two bytes of Share IN will be refreshed in real time, respectively corresponding to the local bus status and PROFINET communication status. The values under normal status, 0x08 (local bus) and 0x02 (PROFINET communication) can be used for program judgment.

Address	Description	Value
First byte of Share IN	Local bus status	• 0x01: init • 0x02: preop • 0x04: safeop • 0x08: op • 0x10: safeop2op • 0x20: op2safeop • 0x80: error
Second byte of Share IN	PROFINET communication status	• 0x01: disconnected • 0x02: connected

Share IN will be displayed according to the value of Share OUT from the 4th byte. This function can only be used when both Share IN and Share OUT modules exist, and corresponding values need to be entered in Share OUT.

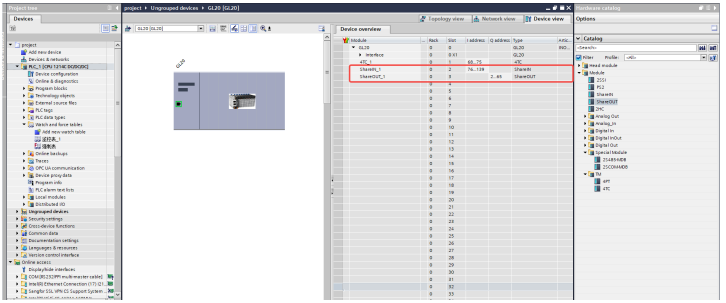
Share OUT input value	Share IN feedback value meaning	Length
0x01	App version	4 consecutive bytes
0x02	FPGA version	4 consecutive bytes
0x03	PN version	4 consecutive bytes
0x04	GSD version	4 consecutive bytes
0x10	Slot 1 module version information	8 consecutive bytes
0x11	Slot 2 module version information	8 consecutive bytes
0x12	Slot 3 module version information	8 consecutive bytes
0x13	Slot 4 module version information	8 consecutive bytes
0x14	Slot 5 module version information	8 consecutive bytes
0x15	Slot 6 module version information	8 consecutive bytes
0x16	Slot 7 module version information	8 consecutive bytes

Share OUT input value	Share IN feedback value meaning	Length
0x17	Slot 8 module version information	8 consecutive bytes
0x18	Slot 9 module version information	8 consecutive bytes
0x19	Slot 10 module version information	8 consecutive bytes
0x1A	Slot 11 module version information	8 consecutive bytes
0x1B	Slot 12 module version information	8 consecutive bytes
0x1C	Slot 13 module version information	8 consecutive bytes
0x1D	Slot 14 module version information	8 consecutive bytes
0x1E	Slot 15 module version information	8 consecutive bytes
0x1F	Slot 16 module version information	8 consecutive bytes
0x20	Slot 17 module version information	8 consecutive bytes
0x21	Slot 18 module version information	8 consecutive bytes
0x22	Slot 19 module version information	8 consecutive bytes
0x23	Slot 20 module version information	8 consecutive bytes
0x24	Slot 21 module version information	8 consecutive bytes
0x25	Slot 22 module version information	8 consecutive bytes
0x26	Slot 23 module version information	8 consecutive bytes
0x27	Slot 24 module version information	8 consecutive bytes

Share OUT input value	Share IN feedback value meaning	Length
0x28	Slot 25 module version information	8 consecutive bytes
0x29	Slot 26 module version information	8 consecutive bytes
0x2A	Slot 27 module version information	8 consecutive bytes
0x2B	Slot 28 module version information	8 consecutive bytes
0x2C	Slot 29 module version information	8 consecutive bytes
0x2D	Slot 30 module version information	8 consecutive bytes
0x2E	Slot 31 module version information	8 consecutive bytes
0x2F	Slot 32 module version information	8 consecutive bytes

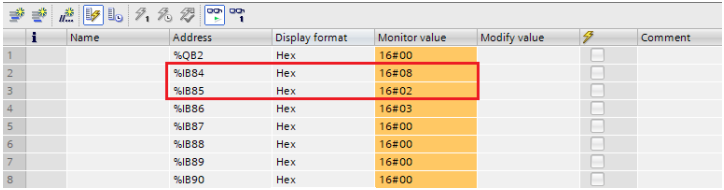
■ Operation example

1. In the hardware directory tree, double-click **Share IN** and **Share OUT** respectively to add them to the end of the module, as shown in the figure below.



2. Monitor the addresses "%IB84" and "%IB85" on the monitoring table to check the local bus status and PROFINET communication status.

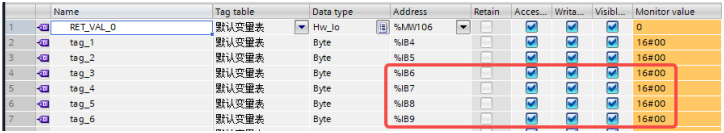
- "16#08" indicates normal local bus operation.
- "16#02" indicates normal PROFINET communication operation.



	Name	Address	Display format	Monitor value	Modify value	Comment
1		%QB2	Hex	16#00		
2		%IB84	Hex	16#08		
3		%IB85	Hex	16#02		
4		%IB86	Hex	16#03		
5		%IB87	Hex	16#00		
6		%IB88	Hex	16#00		
7		%IB89	Hex	16#00		
8		%IB90	Hex	16#00		

3. View the APP version information.

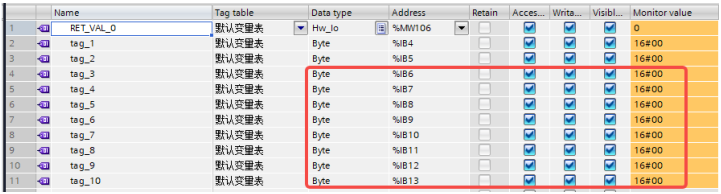
   Assign "0x01" to the first byte of the Share OUT mapping module. The Share IN module obtains the feedback values as shown in the following figure, indicating that the APP version is "1.0.1.7".



	Name	Tag table	Data type	Address	Retain	Acces...	Writa...	Visibl...	Monitor value
1	RET_VAL_0	默认变量表	Hw_Io	%MW106		✓	✓	✓	0
2	tag_1	默认变量表	Byte	%IB4		✓	✓	✓	16#00
3	tag_2	默认变量表	Byte	%IB5		✓	✓	✓	16#00
4	tag_3	默认变量表	Byte	%IB6		✓	✓	✓	16#00
5	tag_4	默认变量表	Byte	%IB7		✓	✓	✓	16#00
6	tag_5	默认变量表	Byte	%IB8		✓	✓	✓	16#00
7	tag_6	默认变量表	Byte	%IB9		✓	✓	✓	16#00

4. View the module version information.

   Assign "0x14" to the first byte of the Share OUT mapping module. The Share IN module obtains the feedback values as shown in the following figure, indicating that the logic version of the fifth module is "0.1.2.0" and the CPU version is "1.1.0.0".



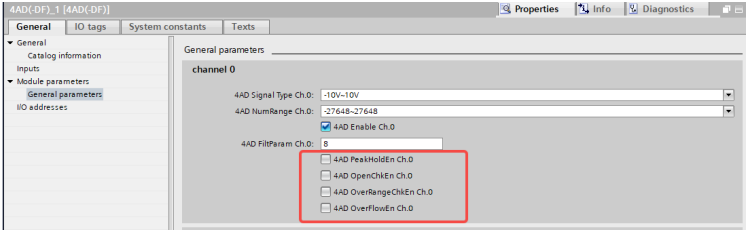
	Name	Tag table	Data type	Address	Retain	Acces...	Writa...	Visibl...	Monitor value
1	RET_VAL_0	默认变量表	Hw_Io	%MW106		✓	✓	✓	0
2	tag_1	默认变量表	Byte	%IB4		✓	✓	✓	16#00
3	tag_2	默认变量表	Byte	%IB5		✓	✓	✓	16#00
4	tag_3	默认变量表	Byte	%IB6		✓	✓	✓	16#00
5	tag_4	默认变量表	Byte	%IB7		✓	✓	✓	16#00
6	tag_5	默认变量表	Byte	%IB8		✓	✓	✓	16#00
7	tag_6	默认变量表	Byte	%IB9		✓	✓	✓	16#00
8	tag_7	默认变量表	Byte	%IB10		✓	✓	✓	16#00
9	tag_8	默认变量表	Byte	%IB11		✓	✓	✓	16#00
10	tag_9	默认变量表	Byte	%IB12		✓	✓	✓	16#00
11	tag_10	默认变量表	Byte	%IB13		✓	✓	✓	16#00

Note

The modules supporting CPU version number queries are: GL20-4AD, GL20-4AD-DF, GL20-4DA, GL20-4PT, GL20-4TC, GL20-3232ETN, GL20-0032ETN, GL20-3200END, and GL20-3200END-M.

6.3 Expansion Module Parameter Description

■ GL20-4AD/GL20-4AD-DF/GL20-8ADI/GL20-8ADV expansion module



-	Input Rated Range	Rated Range	Input Limit Range	Limit Range	GSD Interface Range
Analog voltage input	-10 V to +10 V	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648	-10.20 V to +10.20 V	-20,400 to +20,400 -32,640 to +32,640 -28,200 to +28,200	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648
	0 V to 10 V	0 to 20,000 0 to 32,000 0 to 27,648	-0.5 V to +10.24 V	-1,000 to +20,400 -1,600 to +32,640 -1,382 to +28,200	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648
	-5 V to +5 V	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648	-5.10 V to +5.10 V	-20,400 to +20,400 -32,640 to +32,640 -28,200 to +28,200	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648
	0 V to 5 V	0 to 20,000 0 to 32,000 0 to 27,648	-0.25 V to +5.10 V	-1,000 to +20,400 -1,600 to +32,640 -1,382 to +28,200	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648
	1 V to 5 V	0 to 20,000 0 to 32,000 0 to 27,648	0.8 V to 5.10 V	-1,000 to +20,400 -1,600 to +32,640 -1,382 to +28,200	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648

-	Input Rated Range	Rated Range	Input Limit Range	Limit Range	GSD Interface Range
Analog current output	-20 mA to +20 mA	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648	-20.50 mA to +20.50 mA	-20,400 to +20,400 -32,640 to +32,640 -28,200 to +28,200	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648
	0 mA to 20 mA	0 to 20,000 0 to 32,000 0 to 27,648	-1 mA to +20.50 mA	-1,000 to +20,400 -1,600 to +32,640 -1,382 to +28,200	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648
	4 mA to 20 mA	0 to 20,000 0 to 32,000 0 to 27,648	3.2 mA to 20.50 mA	-1,000 to +20,400 -1,600 to +32,640 -1,382 to +28,200	-20,000 to +20,000 -32,000 to +32,000 -27,648 to +27,648

Note

Due to GSD file restrictions, although the interface currently only displays three ranges (-20,000 to +20,000, -32,000 to +32,000, and -27,648 to +27,648), it actually supports the other ranges listed in the table above. For example, if a range of 0 V to 10 V is selected, the corresponding ranges would be 0 to 20,000, 0 to 32,000, or 0 to 27,648. Since the -20,000 to +20,000 range includes the 0 to 20,000 range, you can directly select -20,000 to +20,000 option on the interface. The same logic applies to other ranges.

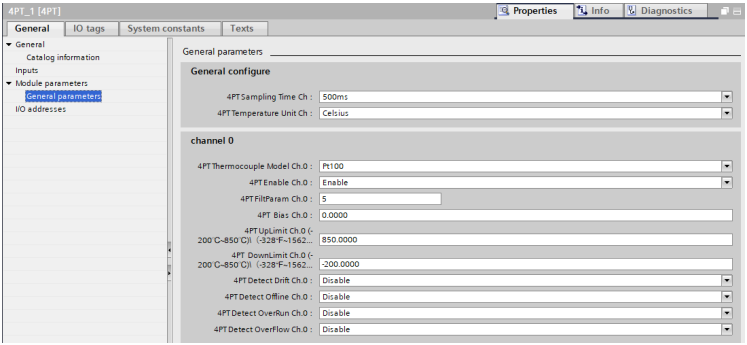
The parameters within the red box in the interface are described in the following table.

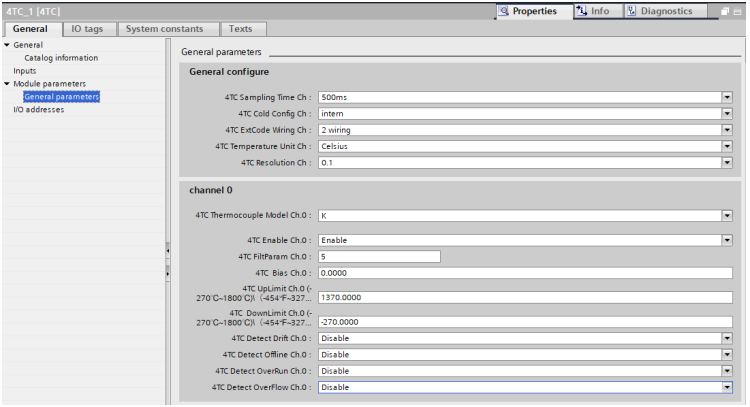
Parameter	Description
PeakHoldEn	Keep the maximum collected value if subsequent values do not exceed the current value. Check to enable.
OpenChkEn	Trigger the alarm when no wiring input is detected, supporting the ranges of 1 V to 5 V and 4 mA to 20 mA. Check to enable.
OverRan-geChkEn	Trigger the alarm when the exceeding the rated range is detected. Check to enable (excluding 0 V to 10V, 0 V to 5V, 1 V to 5 V, 0 mA to 20 mA, and 4 mA to 20 mA; values below -200 are considered below the lower limit, while those above 20,000 are considered above the upper limit).
OverFlowEn	Trigger the alarm when exceeding the limit range is detected. Check to enable.

If 4 mA to 20 mA and 0 to 27648 mode are selected, the sampled value will be displayed without wiring:

- If the parameter within the red box is not checked, it displays -1382 (corresponding to -1000 out of ±20000).
- If the "OpenChkEn" option is checked, it displays -1382 (corresponding to -1000 out of ±20000).
- If the "OverFlowEn" option is checked, it displays -1382 (corresponding to -1000 out of ±20000).

■ GL20-4PT/GL20-4TC expansion module



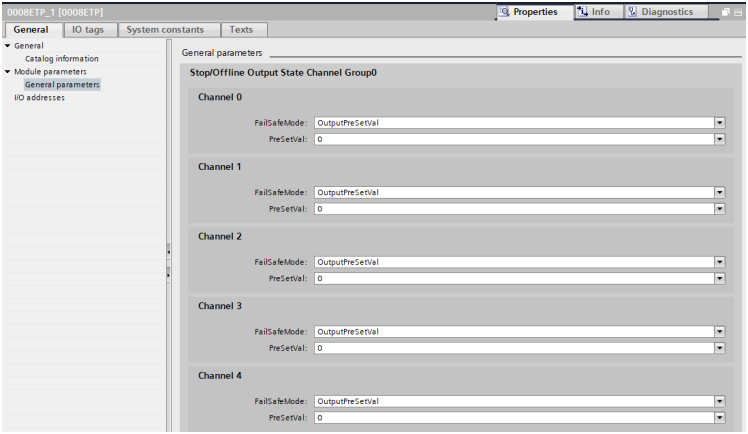


Parameter	Description
Temperature Unit	Celsius and Fahrenheit are optional. Choose based on actual conditions.
Bias	Set the temperature offset value. This parameter takes effect when "Detect Drift" is configured as "Enabled". Set the offset value as needed.
UpLimit	Set the upper temperature limit. Set this parameter based on the range values of the corresponding temperature unit, with precision to one decimal place.
DownLimit	Set the lower temperature limit. Set this parameter based on the range values of the corresponding temperature unit, with precision to one decimal place.
Detect Drift	Set whether to enable temperature offset detection. This parameter is used in combination with the "Bias" parameter. This function takes effect when set to "Enable".

For the technical specifications of GL20-4PT/GL20-4TC, see "Technical Specifications" section in the corresponding *User Guide*.

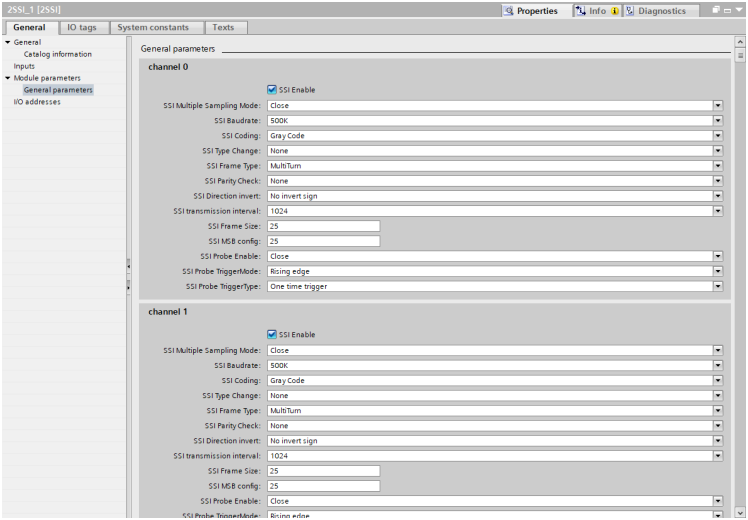
■ GL20-0004ER/GL20-0008ER/GL20-0800END/GL20-0008ETN/GL20-0008ETP/GL20-0808ETN/GL20-1600END/GL20-0016ETP/GL20-

0016ETN/GL20-3232ETN-M/GL20-0032ETN-M/GL20-3200END-M/GL20-0032ETN/GL20-3200END expansion module



Parameter	Description
FailSafeMode	Set the output mode upon stop/disconnection. "OutputHold" and "OutputPreSetVal" are optional, with the following meanings: • OutputHold: Keep present output status • OutputPreSetVal: Output according to preset value, used in combination with the "PreSetVal" parameter.
PreSetVal	Set the preset value upon stop/disconnection. Set to "0" or "1" as needed.

■ GL20-2SSI expansion module



Parameter	Description
SSI Enable	Check to enable the channel. Drop-down options: • Checked • Unchecked Default: Checked
SSI Multiple Sampling Mode	Turn the mode on to check the validity of the encoder position value. A fault code will be sent to the host if the value is invalid. Drop-down options: • OFF • ON Default: OFF

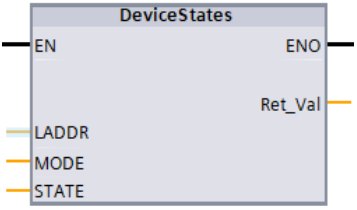
Parameter	Description
SSI Baudrate	The baud rate affects the accuracy of the encoder as well as the rate of position updates. You can adjust it according to the actual transmission rate and performance of the encoder. (Unit: bps) This parameter is strongly related to the encoder performance. Drop-down options: 100k/200k/300k/400k/500k/1000k/1250k/1500k/2000k Default: 500k
SSI Coding	Select the coding mode according to the encoder type. Drop-down options: • Gray Code • Binary Code Default: Gray Code
SSI Type Change	• When **SSI Type Change** is set to "gray", configure this parameter if you need to upload data as binary code. • When **SSI Type Change** is set to "binary", use the default value. Drop-down options: • None • Gray->Bin Default: None
SSI Frame Type	It is recommended to select "Variable" when there are status bits in the encoder bits. This parameter should be used in combination with "DataBit Size" and "Frame Size". Drop-down options: • SingleTurn-13Bit • MultiTurn-25Bit • Variable Default: MultiTurn-25Bit

Parameter	Description
SSI Parity Check	If the assigned parity check is for a 25-bit encoder, 26 bits can be read from the encoder. The bit after the least significant bit will be judged as the parity bit, and parity errors will be sent to the host in the form of a fault code. Drop-down options: • None • Odd check • Even check Default: None
SSI Direction invert	The inversion function can adjust the motion direction of the absolute encoder to the direction of the motion axis. Drop-down options: • No invert sign • Invert sign Default: No invert sign
SSI transmission interval	Set the interval according to the encoder specifications. If you need to increase the response speed of the encoder, you can adjust this parameter according to the performance of the encoder. This parameter is strongly related to the encoder performance. Drop-down options: 16/32/48/64/512/1024 Default: 1024
SSI Frame Size	When switching frame types, manually adjust this value according to the actual bit length of the frame type. Value range: 0 to 32. Default: 25
SSI MSB config	When switching frame types, manually adjust this value according to the actual bit length of the frame type. Value range: 0 to 32. Default: 25

6.4 DeviceStates Command

DeviceStates: Read module state information of the I/O system.

■ Graphic block



See the following table for the command pins and their definitions.

Parameter	Declaration Type	Data Type	Storage Area	Description
LADDR	Input	HW_IOSYSTEM	I, Q, M, L, or constants	PROFINET I/O hardware identifier
MODE	Input	UINT	I, Q, M, D, L, or constants	1: I/O device/DP slave configured 2: I/O device/DP slave fault 3: I/O device/DP slave disabled 4: I/O device/DP slave present 5: faulty I/O device/DP slave

Parameter	Declaration Type	Data Type	Storage Area	Description
STATE	InOut	VARIANT	I, Q, M, D, L	I/O device state buffer
RET_VAL	Return	INT	I, Q, M, D, L	Error code [1] format: W#16#... 0: No error 8091: The hardware identifier for the LADDR parameter does not exist. Check if the LADDR value is present in the project (e.g., within the system constants). 8092: LADDR does not address PROFINET I/O or DP master systems. 8093: The data type in the STATE parameter is invalid. 80B1: The CPU does not support the DeviceStates command. 80B2: The CPU in the I/O system specified by the LADDR parameter does not support the selected MODE parameter. 8452: Complete state information, not applicable to variables configured in the STATE parameter. [2]

Note

- [1]: In the program editor, error codes will be displayed as integers or hexadecimal values.
- [2]: To check the field length of variables configured in STATE, the CountOfElements instruction can be invoked. When the data type VARIANT points to an Array of BOOL, this instruction counts the number of padding elements; for example, when using Array [0...120] of BOOL, the field length is 128. Therefore, when the sum of the set field elements and the padding elements created by the CPU is less than the value 1024 or 128, the DeviceStates will only return the error code W#16#8452.

■ Command description

The STATE parameter indicates the states of the I/O device/DP slave selected by the MODE parameter.

If the state selected by MODE is applicable to the I/O device/DP slave, set the following bits to "1" in the STATE parameter:

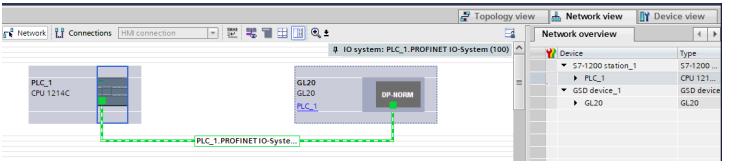
- Bit 0 = 1: Group display, where at least one I/O device/DP slave has the nth bit set to "1".
- Bit n = 1: The state selected by MODE will be applied to the I/O device/DP slave.
  - For the PROFINET I/O system, the nth bit corresponds to the device number of the I/O device (refer to the DP slave properties in the device view and network view).
  - For the PROFINET DP system, the nth bit corresponds to the PROFIBUS address of the DP slave (refer to the DP slave properties in the device view and network view).

Use "BOOL" or "Array of BOOL" as the data type:

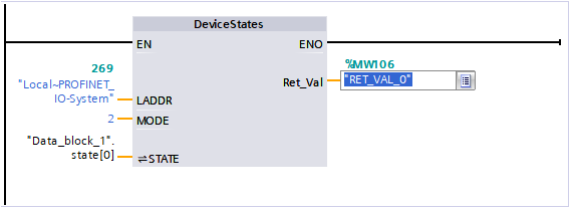
- To display only state information for group bits, use the BOOL data type in the STATE parameter.
- To output the state information of all I/O devices/DP slaves, use an Array of BOOL with the following length:
  - For PROFINET I/O system: 1,024 bits
  - For DP master system: 128 bits

■ Command examples

1. Add one GL20-RTU-PN and the expansion modules.

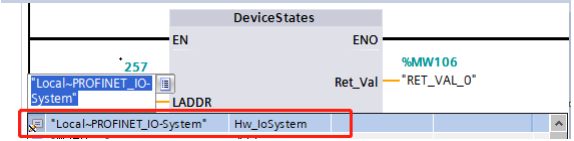


2. Invoke diagnostic command.

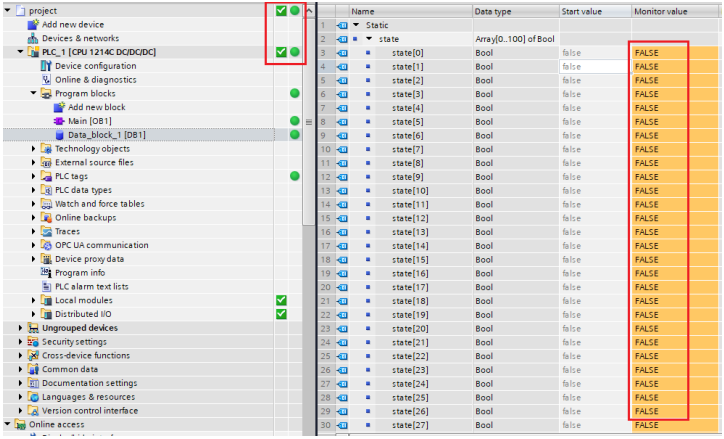


3. Configure command-related parameters.

Parameter	Description
LADDR	Double-click the input assistant, then select the module added by default in the system.
MODE	Assign a value of 2, where 2 indicates a slave fault.
STATE	Create a BOOL array to store the data.
Ret_VAL	Used for viewing command error codes.

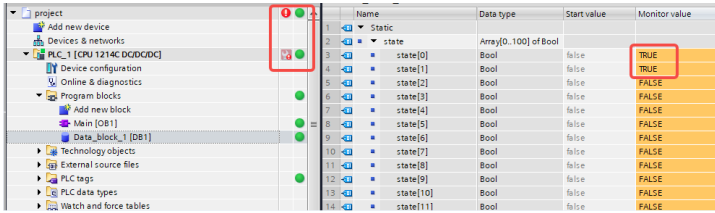


4. Download the program and check the I/O system states and fault buffer. All states are normal if all entries in the fault buffer display "FALSE".



5. Disconnect the I/O system communication line. The interface displays the fault icon, and the first two BOOLs in the fault buffer are set to "TRUE".

- Bit 0=1: At least one I/O device has failed.
- Bit 1=0: I/O device with device number 1 is not faulty.



6.5 Firmware 2.0.0.5 and GSD 20230323 Compatibility

Module/Function	Description
GL20-0008ER/GL20-0800END/GL20-0008ETN/GL20-0008ETP/GL20-0808ETN/GL20-3232ETN-M/GL20-0032ETN-M/GL20-3200END-M/GL20-4PT/GL20-4TC	• For GL20-0008ER/GL20-0800END/GL20-0008ETN/GL20-0008ETP/GL20-0032ETN-M/GL20-3200END-M: function properly. • For GL20-0808ETN/GL20-3232ETN-M/GL20-4PT/GL20-4TC: Unable to function properly, displaying abnormal error messages.
Digital range of GL20-4AD/GL20-4DA	The GL20-4AD/GL20-4DA expansion module uses the new range "27648". When a 10 V voltage is applied to channel 0, if effective, the acquired value should be "27648". Otherwise, the acquired value will be 19999 (20000) as the default range is "20000".
Set overflow flag	GL20-1600END/GL20-0016ETP/GL20-0016ETN/GL20-4AD/GL20-4DA expansion modules use overflow detection enable. The overflow will still be alerted even when the overflow flag is unchecked, as legacy versions of the modules have always included overflow alert function.
Individual bitwise settings	Function properly.
MRP	Unable to function properly, displaying abnormal error messages.