



GS20-PN-8L Series High Protection IO-Link Master Module User Guide



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code PS00018181A01

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Waste Disposal

The storage, use, and disposal of this product (including optional accessories) must comply with local laws and regulations.

Qualified Personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel can identify the risks of the product/system and prevent possible dangers.

Proper Use of the Product

Proper transportation, storage, assembly, installation, commissioning, operation, and maintenance are required to ensure the safe operation of the product without any problems. The required ambient conditions must be met. All operations must follow the guidelines provided in this documentation.

Preface

Introduction

GS20-PN-8L is an IP67 IO-Link master module that transfers PROFINET communication to IO-Link communication. The module is equipped with eight IO-Link ports and can connect up to eight IO-Link devices (Class A type).

This guide introduces the product information, mechanical installation, electrical installation, program commissioning, and troubleshooting of the product.

Standards Compliance

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	-		-
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

More Data

Name	Code	Description
GR20-16EMNL Digital Input and Output Module User Guide	PS00007355	Introduces the product information, mechanical installation, and electrical installation of the product.
GR20-16EMPL Digital Input and Output Module User Guide	PS00007356	Introduces the product information, mechanical installation, and electrical installation of the product.
GS20-16EMNL Digital Input and Output Module User Guide	PS00009314	Introduces the product information, mechanical installation, and electrical installation of the product.
GS20-16EMPL Digital Input and Output Module User Guide	PS00009714	Introduces the product information, mechanical installation, and electrical installation of the product.
GS20-16EMNL-S Digital Input and Output Module User Guide	PS00018165	Introduces the product information, mechanical installation, and electrical installation of the product.
GS20-16EMPL-S Digital Input and Output Module User Guide	PS00018166	Introduces the product information, mechanical installation, and electrical installation of the product.
GS20-PN-8L High Protection IO-Link Master Module User Guide	PS00018181	Introduces the product information, mechanical installation, electrical installation, programming commissioning, and troubleshooting of the product.

Revision History

Date	Version	Revision
July 2025	A01	- Modified the plug and connector assemblies in <i>“3.2 Cable Selection” on page 17.</i> - Modified <i>“3.2 Cable Selection” on page 17.</i> - Made minor corrections.
January 2025	A00	Initial release.

Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version in the following ways

- 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. You will be charged for any repair work after the warranty period expires.

Within the warranty period, maintenance fee 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 Product Warranty Card.

Safety Precautions

Safety Disclaimer

1. Read and follow the safety instructions when installing, operating, and maintaining the equipment.
2. To ensure your safety and prevent damage to the equipment, follow the marks on the equipment and all the safety instructions in this guide.
3. "CAUTION", "WARNING", and "DANGER" items in this guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
4. Use this equipment according to the designated environment requirements; otherwise, a fault may occur. Malfunction or damage caused by improper use is not covered by 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	
	• 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.
	• 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 equipment. • To ensure safe operation, for the output signals that may cause critical accidents, use external protection circuit and safety mechanism. • Once the CPU of the controller detects an exception in the system, all outputs may be closed. When a fault occurs in the controller circuit, the output may not be under control. Therefore, it is necessary to set up an external control circuit to ensure normal operation. • If the 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 cannot be applied to the PLC's power supply input terminals, signal input terminals, and output terminals, to prevent damage to the equipment.

Installation



- Installation must be carried out by skilled personal who have undergone specialized electrical training and possess comprehensive electrical expertise.
- Disconnect all external power supplies of the system before disassembling 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.



- 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



- 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.



- 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 $\pm 20\%$ 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 PLC 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 Functions

Basic functions

- IO-Link communication
 - IO-Link master that can communicate with the IO-Link V1.0 and V1.1 devices
 - Equipped with eight IO-Link ports to connect up to eight IO-Link devices (Class A type)
- PROFINET communication

Equipped with two PROFINET network ports (M12-D type) to transfer data between IO-Link devices and PROFINET devices
- Parameter configuration
 - Device parameter modification: The system supports modifying the operation parameters of the slave devices through ISDU.
 - Port parameter backup: When this function is enabled, the system automatically backs up the configuration parameters of the slave connected to the port for the first time, and the slave connected to the port will run according to this backup parameter.
- Port mode configuration
 - Standard IO-Link master mode
 - Standard digital input mode
 - Standard digital output mode
- Visualized diagnosis
 - Network connection indicator
 - PROFINET communication state indicator
 - US/UA power supply voltage state indicator
 - I/O-LINK port communication state indicator (indicating faults, short circuit, and overcurrent)

Digital input and output function

- Equipped with 16 configurable DI/DOs
- Pin2 and Pin4 of each port can be configured as DI/DO mode.
- The reference potential of all inputs and outputs is Pin3 voltage.

IO-Link port function

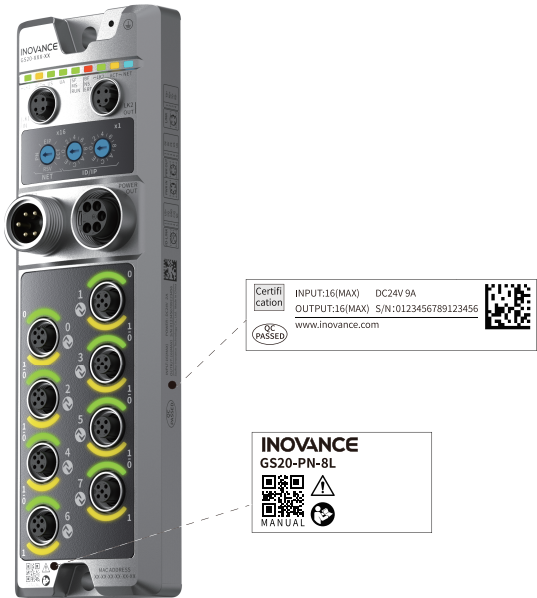
- Equipped with eight IO-Link device power supplies
- Class-A IO-Link ports
- Short circuit detection for the power supply of each port
- Short circuit/overcurrent protection for Pin1, Pin2 (DO mode), and Pin4 (DO mode)

1.2 Naming Rules and Nameplate

G S 20 - PN - 8 L

① ② ③ ④ ⑤ ⑥

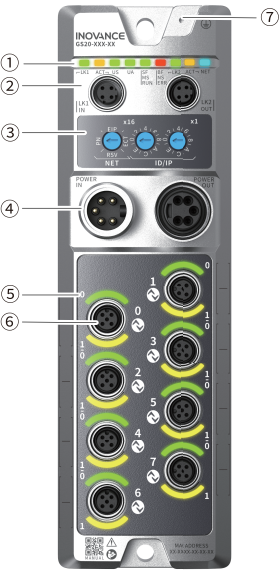
① Product Family G: Inovance controller general-purpose module	④ Communication Protocol ECT: EtherCAT bus communication EIP: EtherNet/IP communication PN: PROFINET communication
② Product Type S: High protection	⑤ Number of Converter Channels 8: Eight channels
③ Series 20: 20 series	⑥ Module Type L: IO-Link



The data for ordering the product is shown in the following table.

Model	Description	Material Code	Applicable Model
GS20-PN-8L	GS20 series high protection IO-Link master module that transfers PROFINET communication to eight channels of IO-Link communication	01440655	Class A IO-Link master

1.3 Components



No.	Name	Description		
①	State indicator	Link	Network connection indicator	- Steady green: The module is connected to the peer device. - OFF: The module is not connected to the peer device, or the module or the peer device is not powered on.
		ACT	Data transmission indicator	- Flashing in yellow: Data transmission in progress - OFF: No data transmission
		US	System power supply indicator	- Steady green: The US power supply voltage is normal ($18\text{ VDC} \leq \text{US power supply voltage} \leq 30.2\text{ VDC}$). - Steady red: The US power supply voltage is abnormal ($\text{US power supply voltage} > 30.2\text{ VDC}$). - Flashing in red^[2]: The US power supply voltage is abnormal ($11\text{ VDC} \leq \text{US power supply voltage} \leq 18\text{ VDC}$). - Flashing in red^[1]: The US power supply voltage is abnormal ($\text{US power supply voltage} < 11\text{ VDC}$). - OFF: No power supply
		UA	Actuator power supply indicator	- Steady green: The UA power supply voltage is normal ($18\text{ VDC} \leq \text{UA power supply voltage} \leq 30.2\text{ VDC}$). - Steady red: The UA power supply voltage is abnormal ($\text{UA power supply voltage} > 30.2\text{ VDC}$). - Flashing in red^[2]: The UA power supply voltage is abnormal ($11\text{ VDC} \leq \text{UA power supply voltage} \leq 18\text{ VDC}$). - OFF: The UA power supply voltage is abnormal ($\text{UA power supply voltage} < 11\text{ VDC}$).
		SF	Module state	- OFF: The module is not powered on. - Steady ON: The module is operating normally. - Flashing in red: The module hardware is faulty (abnormal US/UA/temperature).
		BF	Network state	- OFF: The communication is not established. - Steady green: The communication is normal and the PLC operates normally. - Flashing in green: The communication is normal and the PLC stops. - Flashing in red and green alternatively: The communication is abnormal and the PLC operates normally. - Flashing in red: The communication is abnormal and the PLC stops.
		NET	Communication indicator	Steady green: PROFINET communication mode
②	PROFINET communication interface	LK1	Used for PROFINET communication input and output. For pin assignment, see “3.3 Terminal Definition” on page 20	
		OUT		
③	DIP switch	ID/IP	Reserved	
④	Power supply port	POWER IN	Used for power supply input/output. For pin assignment, see “3.3 Terminal Definition” on page 20	
		POWER OUT		

No.	Name	Description	
⑤	IO-Link indicator	0	Indicator 0 • Steady yellow: The output state of Pin4 is 1. • Steady green: The IO-Link communication is connected and the output state of Pin4 is 1. • Flashing in green^[2]: The IO-Link communication is not connected. • Steady red: Pin4 encounters overcurrent. • Flashing in red and green alternatively^[2]: The IO-Link communication is not connected due to invalid verification. • Flashing in red^[2] (together with indicator 1): Pin1 encounters overcurrent. • OFF: The input/output state of Pin4 is 0.
		1	Indicator 1 • Steady yellow: The output state of Pin2 is 1. • Steady green: The input state of Pin2 is 1. • Steady red: Pin2 encounters overcurrent. • Flashing in red^[2] (together with indicator 0): Pin1 encounters overcurrent. • OFF: The input/output state of Pin2 is 0.
⑥	IO-Link port	0/1/2/3/4/5/6/7	Used for I/O-Link data transmission. For pin assignment, see “3.3 Terminal Definition” on page 20
⑦	Grounding terminal		During installation, ensure that the protective grounding terminal of the module is grounded properly, with a recommended grounding impedance of less than 1 Ω.

Note

- Flashing: The indicator is on for 200 ms and off for 200 ms, repeating this cycle.
- [1]: US/UA indicator is on for 250 ms and off for 250 ms, repeating this cycle.
- [2]: The IO-Link indicator and US/UA indicator is on for 500 ms and off for 500 ms, repeating this cycle.



: High temperature caution for the module.

1.4 Technical Specifications

General specifications

Item	Specification
Dimensions (W x H x D)	69.8 mm x 224.8 mm x 20.5 mm
Weight	About 550 g

Power supply specifications

Item	Specification
Rated voltage of US power supply	24 VDC (18 VDC to 30.2 VDC)
Maximum current of US power supply	The maximum input/output current is 9 A (with the external +24 V power supply disabled for IO-Link port).
US reverse polarity protection	Supported
Rated voltage of UA power supply	24 VDC (18 VDC to 30.2 VDC)
Maximum current of UA power supply	The maximum input/output current is 9 A (with the DO disabled).
UA reverse polarity protection	Supported
US undervoltage detection	The module uses software to perform undervoltage detection (< 18 VDC), voltage-loss detection (< 11 VDC), and overvoltage detection (≥ 30.2 VDC).
UA undervoltage detection	The module uses software to perform undervoltage detection (< 18 VDC), voltage-loss detection (< 11 VDC), and overvoltage detection (≥ 30.2 VDC).

Input specifications

Item	Specification
Input type	Digital input
Input mode	PNP
Maximum number of input channels	16
Input voltage class	24 VDC (18 VDC to 30.2 VDC)
Input current (typical value)	2.4 mA (typical @24 V)
ON voltage	> 11 VDC
OFF voltage	< 5 VDC
Hardware response time upon ON/OFF	100 μ s (Max.)/100 μ s (Max.)
Supported type	Type1/Type3
Isolation	Not supported

Output specifications

Item	Specification
Output type	Digital output/transistor output
Output mode	PNP
Maximum number of output channels	16
Output voltage class	24 VDC (18 VDC to 30.2 VDC)
Resistive output load	2 A/channel; 9 A/module
Inductive output load	24 W/point
Lamp output load	18 W/point
Hardware response time upon ON/OFF	100 μ s (Max.)/1.4ms (Max.)
Leakage current upon signal OFF	10 μ A (with 24 VDC)
Isolation	Not supported

Item	Specification
Protective functions	Short circuit protection
Output derating	• Outside the cabinet: The module works at full load at 70°C. For example, the output current of the 16-channel resistive output load does not exceed 9 A. • Inside the cabinet: The module works at 75% of full load at 70°C. For example, the output current of the 16-channel resistive output load does not exceed 7 A.

IO-Link specifications

Item	Specification
Number of ports	8
IO-Link version	1.1.3
IO-Link port type	Class A
Communication rate	COM1 (4.8 kbps) COM2 (38.4 kbps) COM3 (230.4 kbps)
Process data volume	Max. 32 bytes of input data of each port. Max. 32 bytes of output data of each port.
Capacity of the memory for device parameters	2 kbyte (applicable to each port)
External +24 V "L+" supply current of IO-Link port (Pin1)	Rated current: 1.6 A Overcurrent protection value: 2 A
Isolation method	Not supported
Unshielded cable length	Max. 20 m
Cable requirements	5-core unshielded cable
Protective functions	Overcurrent protection

PROFINET specifications

Item	Specification
Communication interface	2
Communication mode	RT mode
Communication period	Min. 1ms
Communication protocol	PROFINET
Network mode	Bus, linear, star, and tree types
Network interface	M12 D-code x 2
Network version	V2.4
Diagnostic function	Supports uploading faults, alarms, and notifications to the PLC.
Open IE	Supports TCP/IP, SNMP, and LLDP
Restore factory settings	Supported
Zero configuration for module replacement	Supported (for replacement of PN module of the same type)

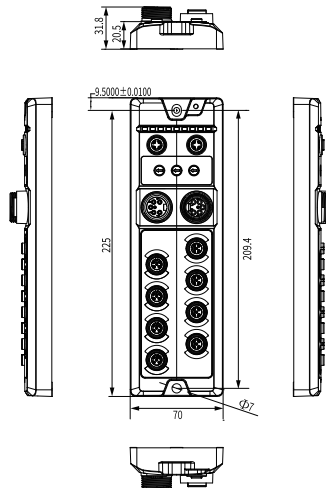
1.5 Environmental Specifications

Item		Operating Specification	Transportation Specification	Storage Specification
IP rating		IP67 (with screws tightened)		
Pollution degree		2		
Immunity		2 kV on power supply line (IEC61000-4-4)		
Overvoltage class		I		
EMC immunity level		Zone B, IEC61131-2		
ESD protection level		Contact discharge +/-6 kV, air discharge +/-8 kV		
Temperature		-30°C to +70°C	-40°C to +85°C	-40°C to +85°C
Humidity		10% RH to 99% RH, without condensation 100% (when all connectors are installed)		
Vi- bra- tion	Frequency	5 Hz to 500 Hz	2M2	1M12
	Displace- ment	1 mm (direct installation) (5 Hz to 61 Hz)		
	Acceleration rate	15 g (direct installation) (61 Hz to 500 Hz)		
	Direction	X/Y/Z directions		
Shock resistance		Application/Transportation scenario: Tested according to IEC60068-2-27; 15 g peak gravitational acceleration, 11 ms pulse width, total 18 times in X/Y/Z directions		
Altitude/Air pressure		0 m to 2000 m (> 79.5 kPa)	0 m to 2000 m (> 79.5 kPa)	

2 Mechanical Installation

2.1 Installation Dimensions

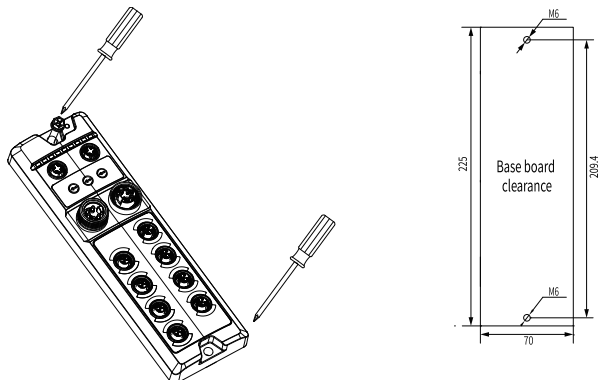
The installation dimensions (in mm) are shown in the figure below.



2.2 Installation Method

Installation

Install the module with two cross recessed hexagon SEMS screws (M6 x 25) with the washer diameter of 11 mm. The clearance between the two screws is 209.4 mm. The following figure describes the installation and clearance (in mm).



Uninstallation

Remove the M6 screws using a Phillips screwdriver, and then detach the module.

I/O-Link is a serial digital communication protocol that integrates intelligent sensors and actuators into automation systems. It is the first standardized I/O technology (IEC 61131-9) used for communication of sensors and actuators. It is used for periodic data exchange between the sensor/ actuator and the PLC. IO-Link is not a fieldbus, but an open point-to-point communication. This protocol is easy to use, stable, and reliable. With the advancement of Industry 4.0, it is gaining wider adoption.

The diagram illustrates a distributed I/O system architecture. At the top left, a PLC is connected to two 24 VDC power supplies via dashed lines representing PROFINET. These power supplies are connected to two IO-Link masters (IP67). The first IO-Link master is connected to an SIO module, which in turn connects to two general sensors and an IO-Link slave (IP67). The second IO-Link master is connected to two IO-Link sensors and two IO-Link slaves (IP67). The IO-Link slaves are connected to general sensors and an IO-Link slave (IP67). The IO-Link slave (IP67) is connected to an IO-Link slave (IP20-no dust cover/IP5X-with a dust cover), which is then connected to two general sensors. A legend at the bottom right defines the symbols: dashed line for PROFINET, dotted line for 24 V power supply, solid line for IO-Link, and a circle with a dot for IO-Link mode. The SIO module is also labeled as SIO mode.

The IO-Link port supports two operating modes: IO-Link mode and SIO mode (Standard I/O mode), which can be separately configured on any port.

The data for ordering the PROFINET communication cable is as follows.

Model	Description	Length	Material Code
CAB-M12DMS4-M12DMS4-3	Cable assembly - PROFINET cable - Male (straight) - 22 AWG - Green - Male (straight) - 80°C (used for cascading multiple IO-Link masters (PROFINET cascaded))	3 m	15310153
CAB-M12DMS4-M12DMS4-5		5 m	15310178
CAB-M12DMS4-M12DMS4-8		8 m	15310221
CAB-M12DMS4-M12DMS4-10		10 m	15310177
CAB-M12DMS4-M12DMS4-15		15 m	15310176
CAB-RJ45-M12DMS4-3	Cable assembly - PROFINET cable - Male (straight) - 26 AWG - Black - RJ45 - 80°C (used for connecting PLC network ports and IO-Link masters)	3 m	15310154
CAB-RJ45-M12DMS4-5		5 m	15310187
CAB-RJ45-M12DMS4-8		8 m	15310215
CAB-RJ45-M12DMS4-10		10 m	15310186
CAB-RJ45-M12DMS4-15		15 m	15310185

Power supply input cable

The data for ordering the power supply input cable is as follows.

Model	Description	Length	Material Code
CAB-7/8FL5-3	Cable assembly - 7/8 power supply cable - Female (angled) - 16 AWG - Black - NA - 80°C (used for powering IO-Link masters)	3 m	15310155
CAB-7/8FL5-5		5 m	15310175
CAB-7/8FL5-8		8 m	15310216
CAB-7/8FL5-10		10 m	15310174
CAB-7/8FL5-15		15 m	15310173

The following table introduces the functions of power supply cables in different colors.

No.	Color	Function
1	Black	0 V
2	Blue	0 V
PE	Green/Yellow	Function grounding
4	Brown	Sensor and power supply system (US)
5	White	Power supply of the actuator (UA)

Power supply output cable

The data for ordering the power supply output cable is as follows.

Model	Description	Length	Material Code
CAB-7/8FL5-7/8ML5-3	Cable assembly - 7/8 power supply cable - Female (angled) - 16 AWG - Black - Female (angled) - 80°C (used for cascading multiple IO-Link master power supplies)	3 m	15310156
CAB-7/8FL5-7/8ML5-5		5 m	15310181
CAB-7/8FL5-7/8ML5-8		8 m	15310219
CAB-7/8FL5-7/8ML5-10		10 m	15310180
CAB-7/8FL5-7/8ML5-15		15 m	15310179

IO-Link communication cable

The data for ordering IO-Link communication cable is as follows:

Model	Description	Length	Material Code
CAB-M12AMS4-M12AFL4-3	Cable assembly - IO-Link cable - Male (straight) - 22AWG - Black - Female (angled) - 85°C (used for connecting the IO-Link master to IO-Link slaves)	3 m	15310142
CAB-M12AMS4-M12AFL4-5		5 m	15310184
CAB-M12AMS4-M12AFL4-8		8 m	15310230
CAB-M12AMS4-M12AFL4-10		10 m	15310183
CAB-M12AMS4-M12AFL4-15		15 m	15310182
CAB-M12AMS4-M12AFL4-3-T-taiyo	Cable assembly - IO-Link cable - Male (straight) - 22AWG - Black - Female (angled) - 85°C - Highly flexible cables fit for drag chains, surviving 3 to 5 million continuous tests (used for connecting the IO-Link master to IO-Link slaves)	3 m	15310232
CAB-M12AMS4-M12AFL4-5-T-taiyo		5 m	15310231
CAB-M12AMS4-M12AFL4-8-T-taiyo		8 m	15310229
CAB-M12AMS4-M12AFL4-10-T-taiyo		10 m	15310228
CAB-M12AMS4-M12AFL4-15-T0-taiyo		15 m	15310227

Plug and connector assembly

The data for ordering the plug and connector assembly is as follows:

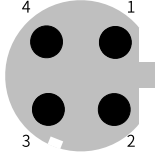
Model	Description	Material Code
CON-M12AFS4	4-pin female (straight) field-wirable plug	15051155
CON-M12AFL4	4-pin female (angled) field-wirable plug	15051157
CON-M12AMS5	5-pin male (straight) field-wirable plug	15051156
CON-M12AML5	5-pin male (angled) field-wirable plug	15051158
CON-M12AMS5-YF5	Y splitter that converts one 5-pin male M12 connector to two 5-pin female M12 DIO connectors	15051159
CON-M12AFL4-L	4-pin female (angled) field-wirable plug (applicable to GR20-16EMNL/GR20-16EMPL)	15051269
CON-M12AMS4-YM8F3	Y splitter that converts one M12 5-pin A-code male straight connector to two M8 3-pin female connectors	15051420
CON-M12AMS4-YM8F4	Y splitter used for converting one M12 5-pin A-code male straight connector to two M8 4-pin female connectors	15051419
CON-M8AMS3	M8 3-pin assembled connector	15051445
CON-M8AMS4	M8 4-pin assembled connector	15051448
CON-M12AFS5-YM5	Y splitter that converts one 5-pin female connector to two 5-pin male straight connectors. It can be used to connect the class A master to class B valve terminal slave.	15051334
IPT210-A-CAB-M12AMS5-M12AFS5-1.5	Connector that converts 5-pin male straight connector to 5-pin female straight connector. It can be used to connect the IO-Link master to valve terminal.	72235829
IPT210-A-CAB-M12AFS5-1.5	Connector that converts 5-pin female straight connector to discrete cable. It can be used to power the valve terminal.	72235870

Note

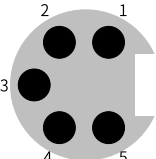
If you have additional requirements for cable selection, contact Inovance for customization.

3.3 Terminal Definition

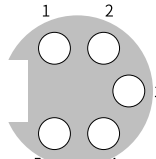
Assignment of PROFINET pins

Diagram	Pin	Description
	1	TD+
	2	RD+
	3	TD-
	4	RD-

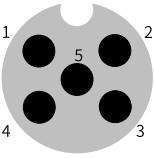
Assignment of power supply input pins

Diagram	Pin	Description
	1	0V
	2	0V
	3	Function grounding (PE)
	4	Sensor and system power supply (US)
	5	Actuator power supply (UA)

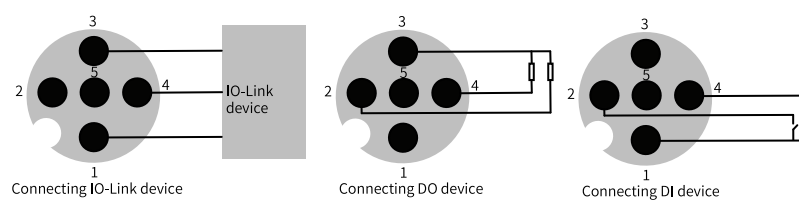
Assignment of power supply output pins

Diagram	Pin	Description
	1	0V
	2	0V
	3	Function grounding (PE)
	4	Sensor and bus power supply (US)
	5	Actuator power supply (UA)

Assignment of IO-Link pins

Diagram	Pin	Function	Description	Color
	1	L+	+24 V power supply (US+)	Brown
	2	I/Q	- Not connected (Class A) - DI: Digital input (Class A) - DO: Digital output (Class A)	White
		2L+	+24 V power supply (UA+)	
	3	L-	+24 V power supply (US-)	Blue
	4	C/Q	- SIO: Standard input/output mode - IO-Link communication mode	Black
	5	NC	Not connected (Class A)	Undefined
		2L-	+24 V power supply (UA-)	

3.4 Terminal Wiring



4 Program Commissioning

4.1 Module Function Configuration

Name	Input Process Data Length (Byte)	Output Process Data Length (Byte)	Function	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IOL n-byte input/output	x	n	Port in IOLM mode	-	-	-	-	-	-	-	-
Standard I/O	0	0	Port in standard I/O mode	-	-	-	-	-	-	-	-
IO-Link communication state	1	-	Communication state machine of IO-Link slave	Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0
				• 1: IO-Link communication normal • 0: IO-Link communication abnormal							
Valid flag for IO-Link process data	1	-	Valid flag bit for IO-Link input process data	Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0
				• 1: Valid IO-Link process data • 0: Invalid IO-Link process data							
Pin2 output short circuit	1	-	Short circuit flag bit of IQ pin (Pin2) in DO mode	Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0
				• 1: Pin2 output short circuit • 0: Pin2 output normal							
Pin4 output short circuit	1	-	Short circuit flag bit of CQ pin (Pin4) in DO or IOL mode	Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0
				• 1: Pin4 output short circuit • 0: Pin4 output normal							
Short circuit of sensor power supply	1	-	Short circuit/overcurrent flag bits of system power (Pin1)	Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0
				• 1: Sensor power supply short circuit • 0: Sensor power supply normal							
Pin4 input	1	-	CQ pin receives signals in DI mode	Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0
				• 1: Valid Pin4 input • 0: Invalid Pin4 input							
Pin2 input	1	-	IQ pin receives signals in DI mode	Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0
				• 1: Valid Pin2 input • 0: Invalid Pin2 input							

Name	Input Process Data Length (Byte)	Output Process Data Length (Byte)	Function	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Pin4 output	-	1	CQ pin outputs enable signals in DO mode	Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0
				• 1: Valid Pin4 output • 0: Invalid Pin4 output							
Pin2 output	-	1	IQ pin outputs enable signals in DO mode	Port 7	Port 6	Port 5	Port 4	Port 3	Port 2	Port 1	Port 0
				• 1: Valid Pin2 output • 0: Invalid Pin2 output							
Module monitoring state	1	-	Flag bits for monitoring the temperature and power supply voltage of the module	-	-	tem- pera- ture	-	US	-	UA	-
				Module temperature: • 1: Module temperature exceeding the operating range (-30°C to +70° C) • 0: Module temperature within the operating range US (system power)/UA (actuator power) • 1: Voltage exceeding the operating range (18 VDC to 30.2 VDC) • 0: Voltage within the operating range							

4.2 Master Port Parameter Configuration

Parameter	Description
Cycle time ^[1]	Communication cycle between the master and the slave, which is longer than or equal to the minimum cycle time specified by the slave Automatic: Adaptive cycle defined by the slave
Validation	Validation mode • No validation • Compatible V1.0: Enable IO-Link V1.0 verification • Compatible V1.1: Enable IO-Link V1.1 verification
Parameter server	Parameter server configuration • Disable • Clear: Clear the backed up parameters • Restore^[2]: Restore the backed up parameters • Backup/Restore^[2]: Back up parameters and restore parameters of the new device
Parameter reset	This function is currently not supported.

Parameter	Description
Block parametrization	This function is currently not supported. • Start block parameterization: Enable block parameterization function • End block parameterization: Disable block parameterization function
Index service unit	Parameter configuration function for index service unit • ISDU index: The index number of the slave to be configured • ISDU subindex: The subindex number of the slave to be configured • ISDU length: The data length of the index to be configured • ISDU data: The index data of the slave to be configured

Note

[1]: The values of cycle time are shown in the following table.

[2]: Enable V1.1 validation before using the Restore or Backup/Restore function.

Time Base Code	Time Base Value	Calculation Method	Cycle Time
00	0.1ms	Multiplier x Time base	0.4ms to 6.3ms
01	0.4ms	6.4ms + Multiplier x Time base	6.4ms to 31.6ms
10	1.6ms	32.0ms + Multiplier x Time base	32.0ms to 132.8ms
11	Reserved	Reserved	Reserved

4.3 Master Module Parameter Configuration

Parameter	Description
Global diagnosis	When the global diagnosis function is disabled, the module faults will only be displayed through the indicators, but not be uploaded. • Undervoltage detection for system power supply: Low voltage detection switch. When this function is disabled, low voltage signals are not uploaded and module functions are not limited by voltage. • Undervoltage detection for actuator power supply: Low voltage detection switch. When this function is disabled, low voltage signals are not uploaded and module functions are not limited by voltage. • Short circuit detection for sensor power supply: Pin1 short circuit detection switch. When this function is disabled, short circuit signals of Pin1 are not uploaded.
Port function	Function Port x Pin4 • NO input • NC input • Output Function Port x Pin2 • NO input • NC input • Output • Output enable: This function is not limited by process data and can be directly enabled after configuration.
Safe state	Safe state Port 0 x Pin4 • 0: Outputs 0 V upon network disconnection • 1: Outputs 24 V upon network disconnection • Last value: Outputs last cycle value upon network disconnection Safe state Port 0 x Pin2 • 0: Outputs 0 V upon network disconnection • 1: Outputs 24 V upon network disconnection • Last value: Outputs last cycle value upon network disconnection

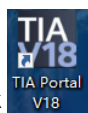
4.4 Programming Examples

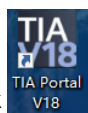
Prerequisites

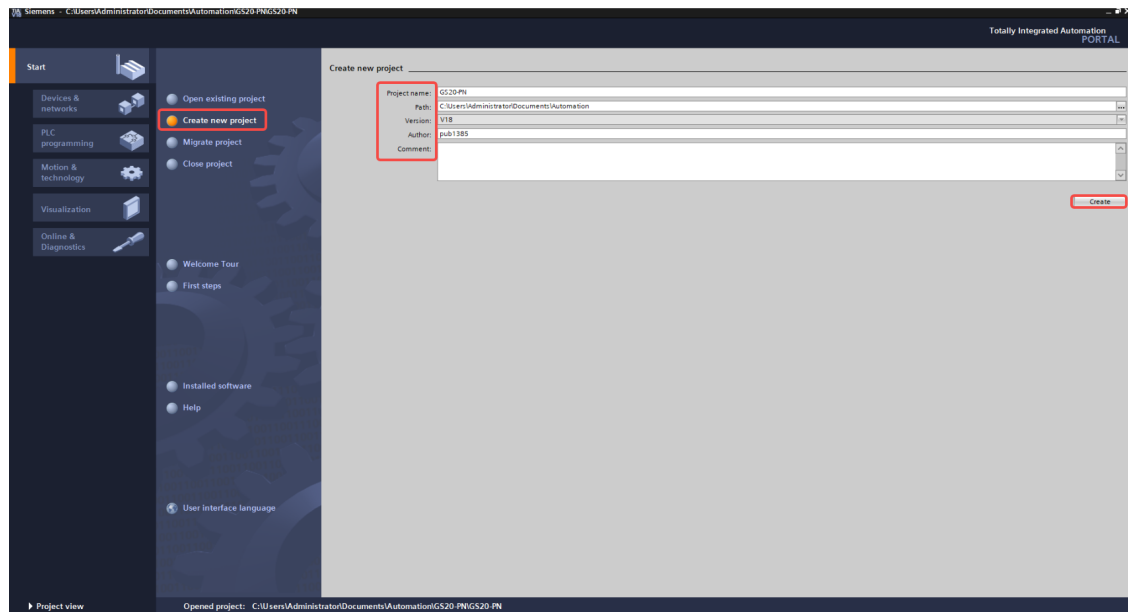
- The cables are connected correctly.
- TIA Portal V16 and above is installed.
- The PLC supports PROFINET master devices such as Siemens PLCs with version S7-1200 and above.
- The GSD file of the GS20-PN-8L module is imported into the TIA Portal V16 software. The GSD file can be obtained under Software and Commissioning Tools on the GS20 series product page at www.inovance.com.

Procedure

1. Create a project.

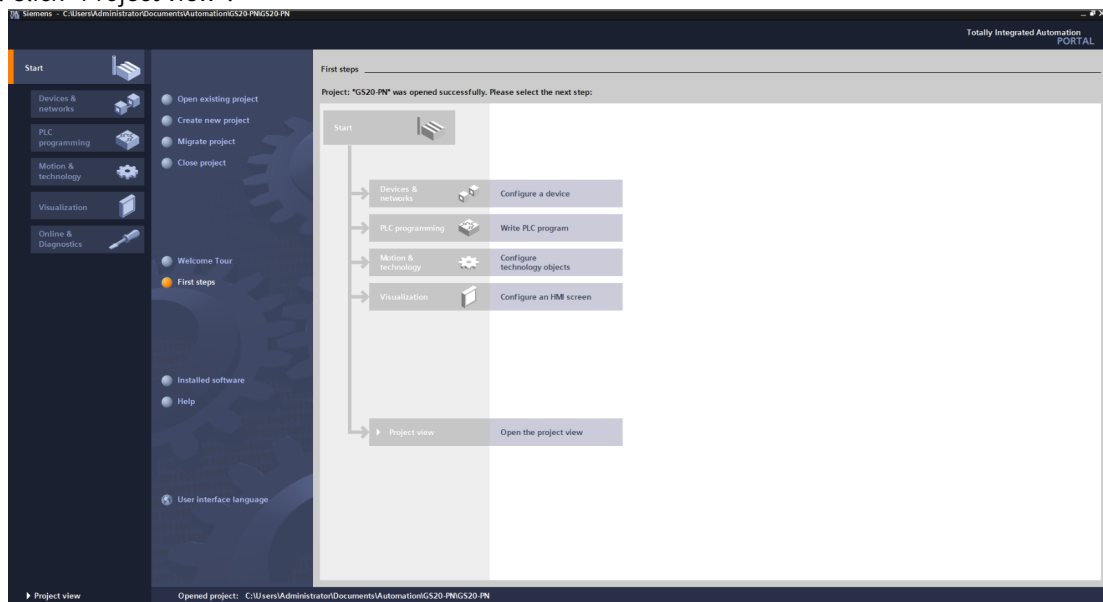


Double-click  on the desktop to open the TIA Portal software and click "Create new project". Enter the project information and click "Create".

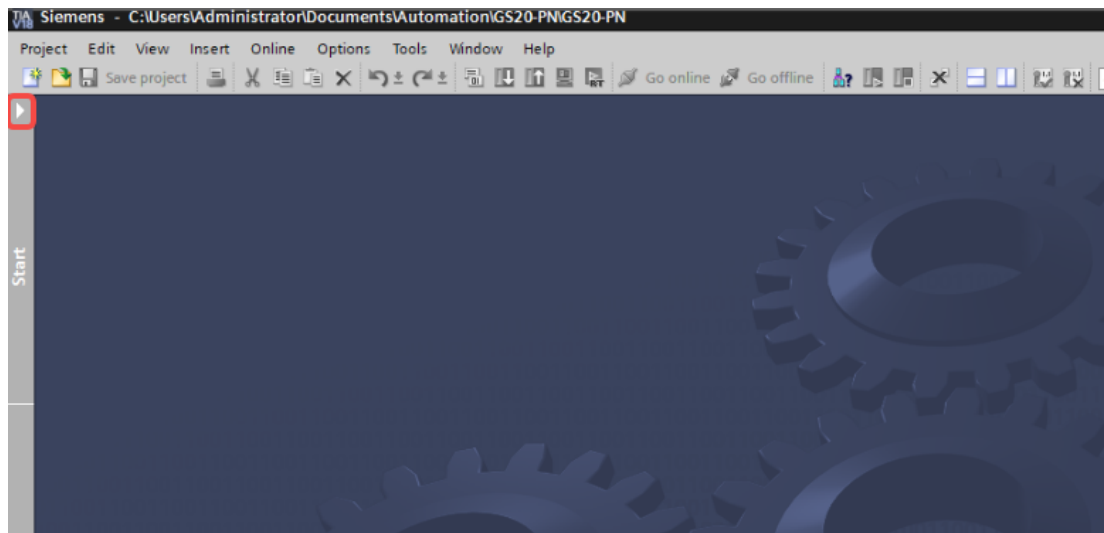


2. Add a device.

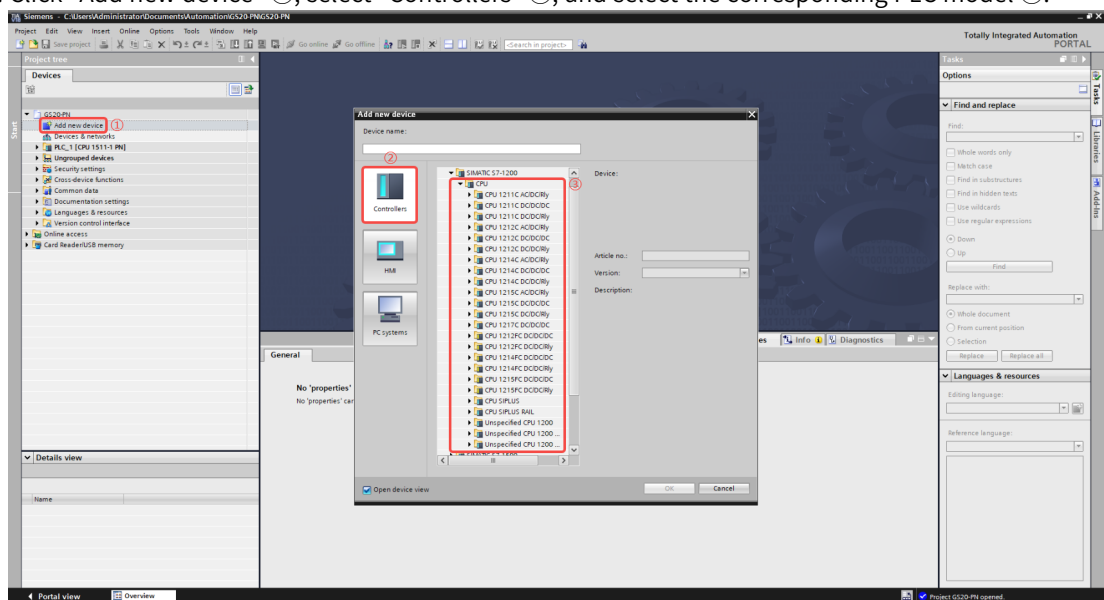
a. Click "Project view".



b. Click  to expand the menu.

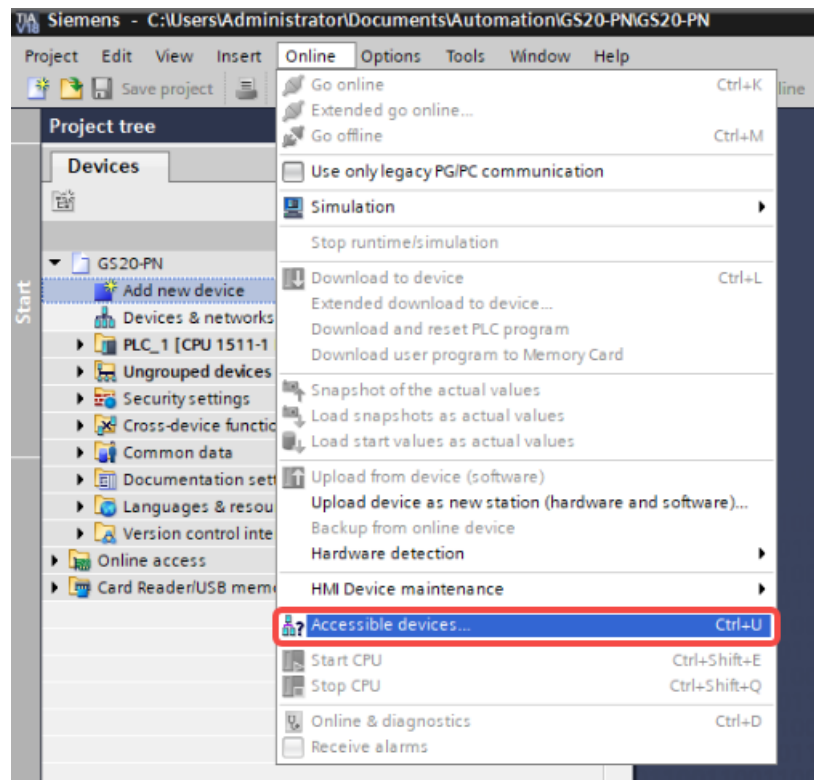


c. Click "Add new device" ①, select "Controllers" ②, and select the corresponding PLC model ③.

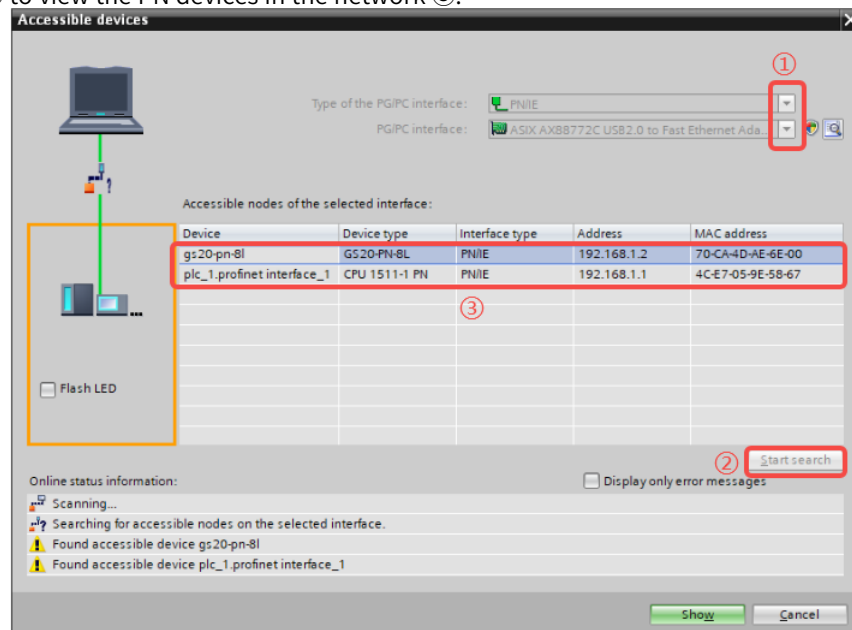


3. Search for the GS20-PN-8L module.

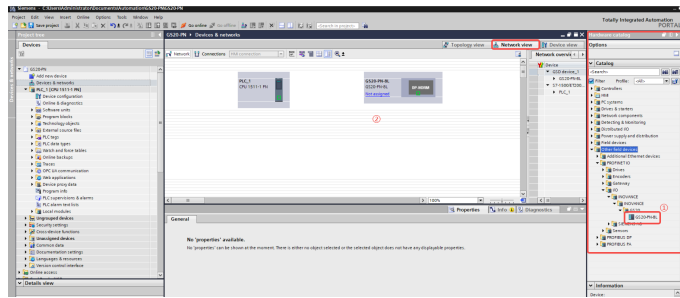
a. Select "Online" > "Accessible devices" in the menu bar.



- b. In the pop-up window, select the corresponding PC interface type and interface ①. Click "Start search" ② to view the PN devices in the network ③.

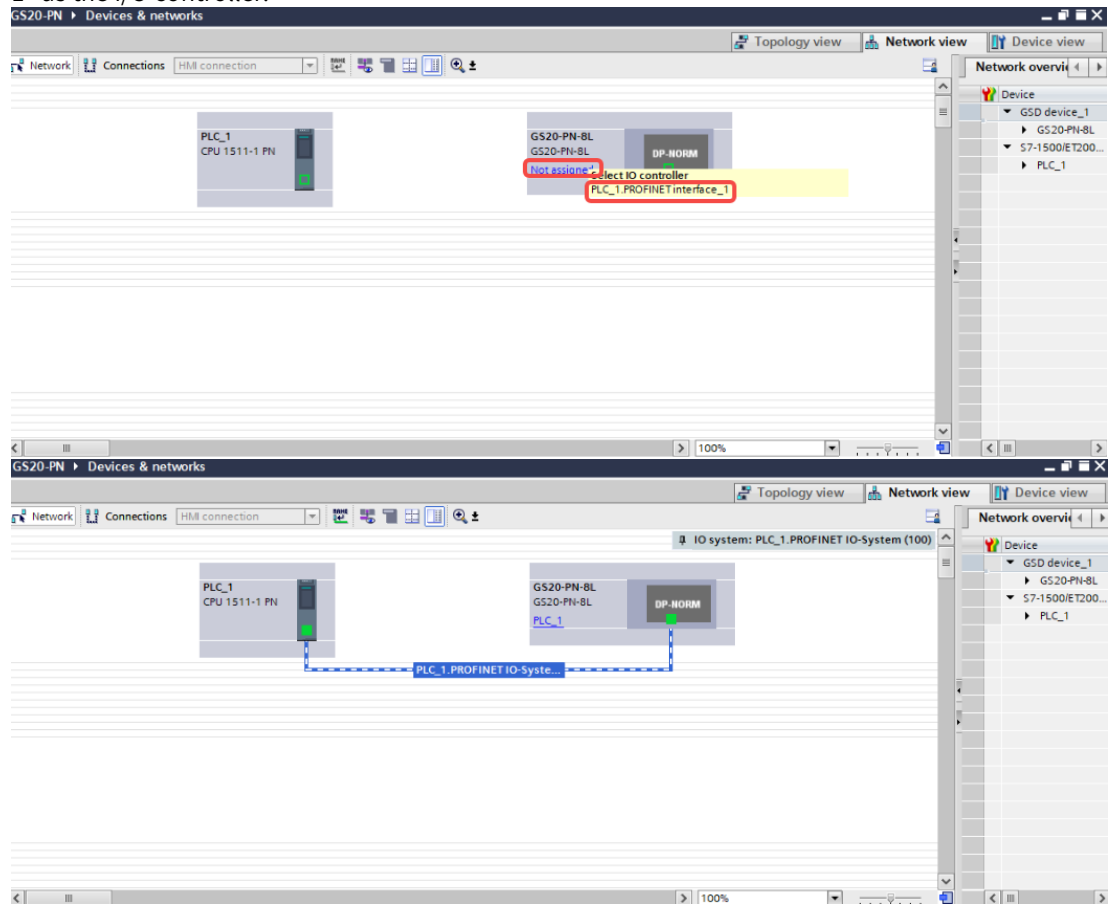


- c. In the main interface, click "Network view". In the "Hardware catalog" on the right, select "Other field devices" > "PROFINET IO" > "I/O" > the corresponding master device ①. Drag the device to the space in the middle to add the device ②.

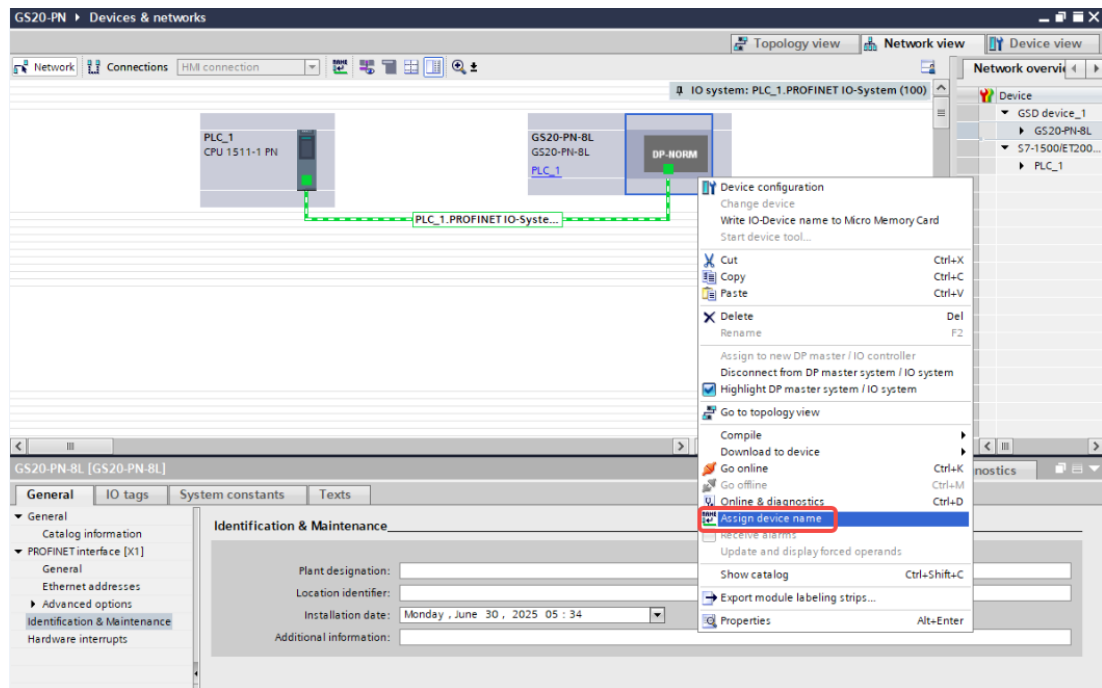


4. Assign the name of the GS20-PN-8L module.

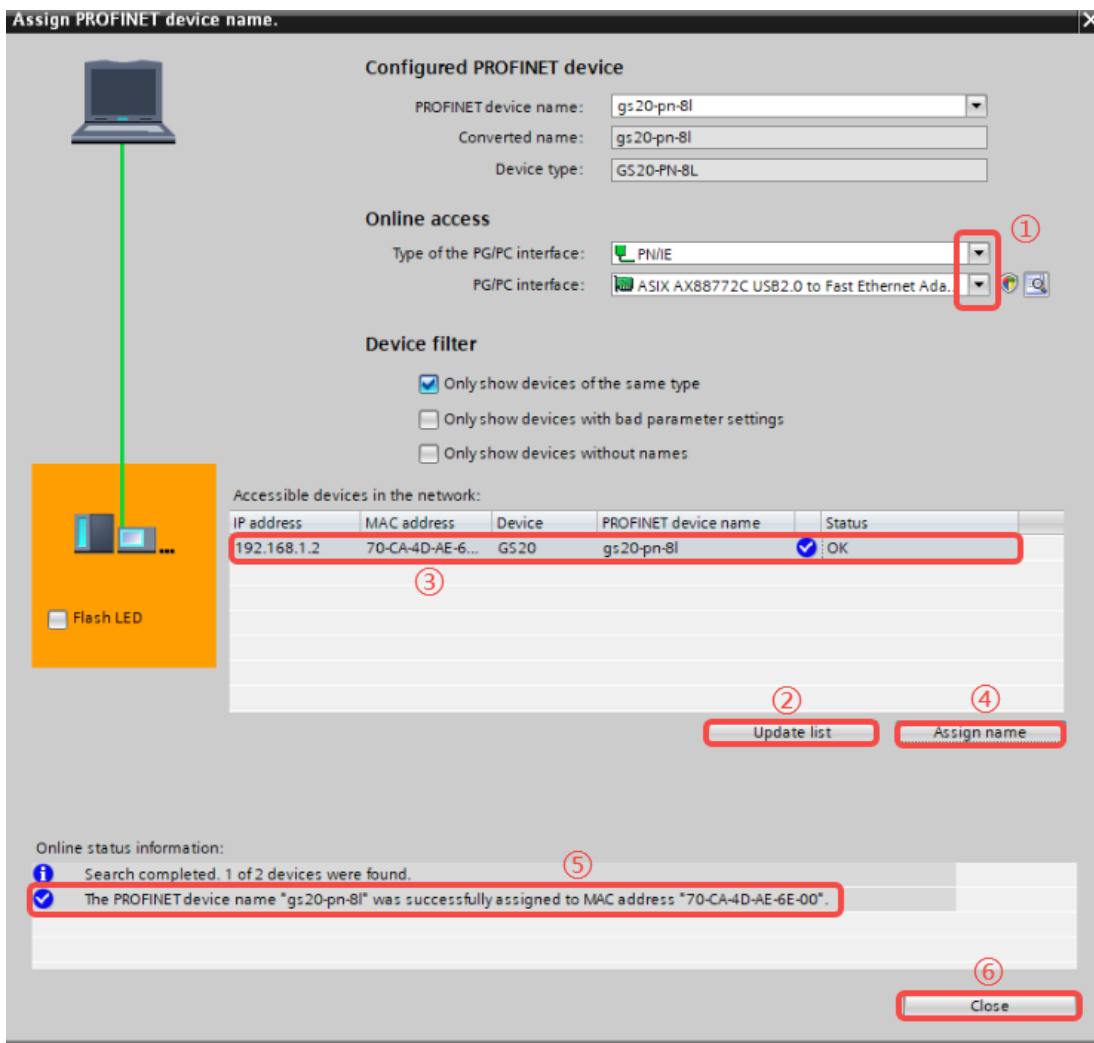
a. Click "Not assigned" on the icon of the GS20-PN-8L module. Select "PLC_1.PROFINET IO-System_1" as the I/O controller.



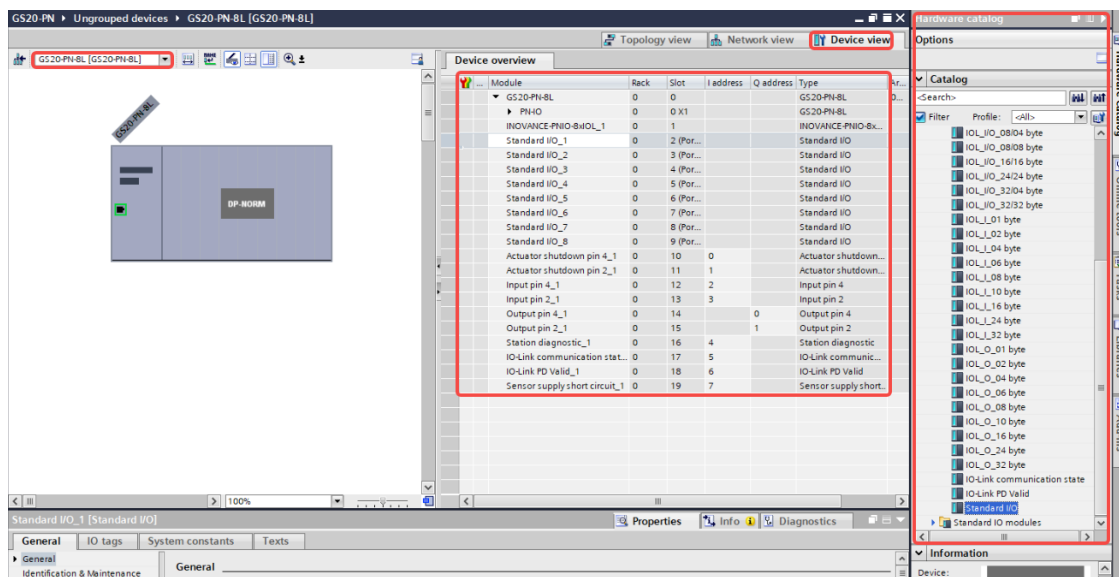
b. Right-click the GS20-PN-8L module and click "Assign device name".



- c. In the pop-up window, select the corresponding "Type of the PG/PC interface" and "PG/PC interface" ①. Click "Update list" ②, select the GS20-PN-8L module ③, and click "Assign name" ④. After the successful name assignment notification is displayed at the bottom of the window ⑤, click "Close" ⑥.



Click "Device view" and select the GS20-PN-8L module. In the "Device overview" window, you can view the slot position and current function of the module. The "Hardware catalog" on the right displays the components to be configured.

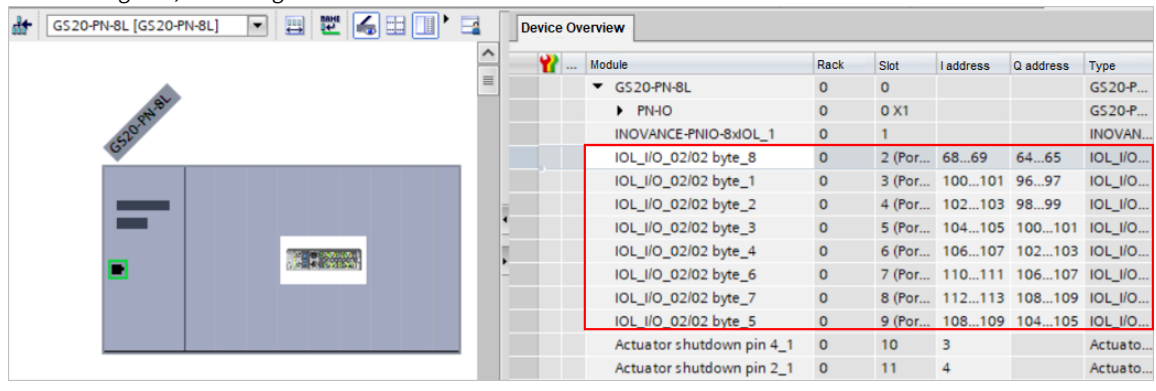


6. Configure the IO-Link slave module of the GS20-PN-8L module.

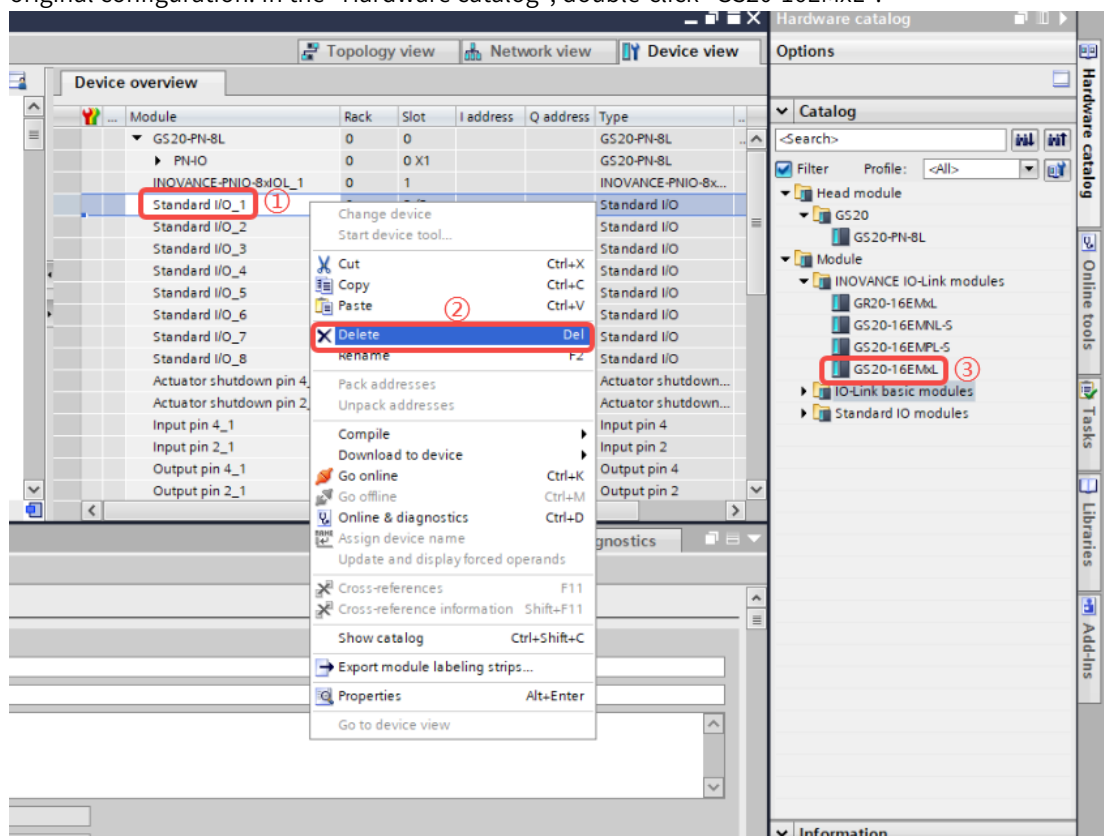
Take the GS20-16EMxL module as an example, the following introduces how to configure the GS20-16EMxL module as a slave with 8 DO ports and 8 DI ports.

Note

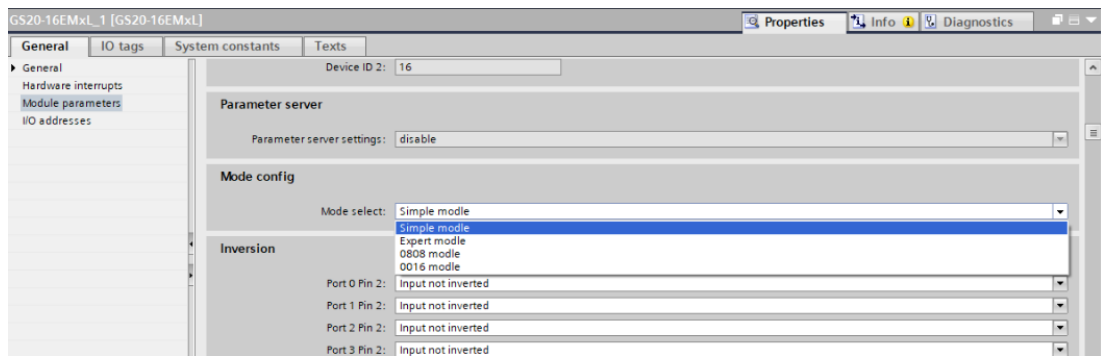
To reduce configuration costs, the module configuration file sets the default slot mode to IO-Link general mode (2-byte input/2-byte output of process data). If no IO-Link device is connected to the corresponding port, the port indicator on the master will flash in green, which is normal. Once the correct IO-Link device is connected, the indicator turns solid green, indicating normal communication.



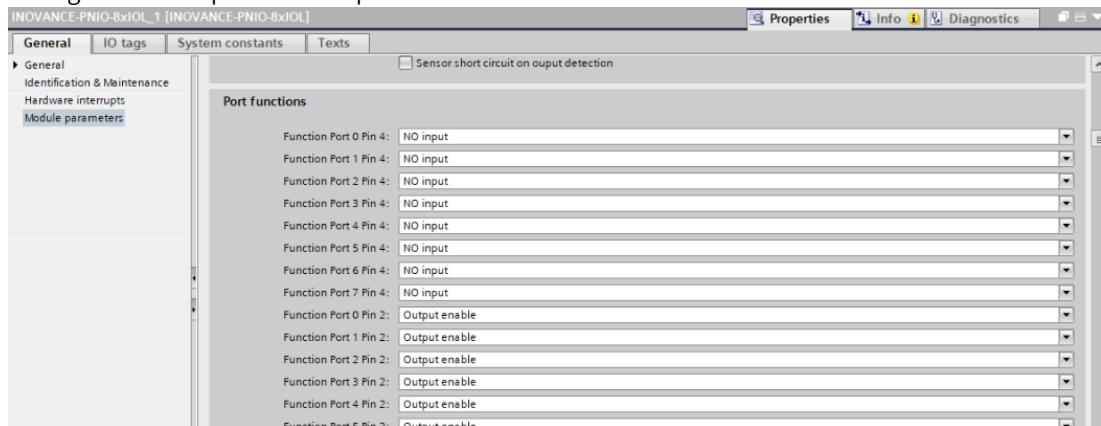
- a. Configure the slot position. Right-click the corresponding slot ① and select "Delete" to delete the original configuration. In the "Hardware catalog", double-click "GS20-16EMxL".



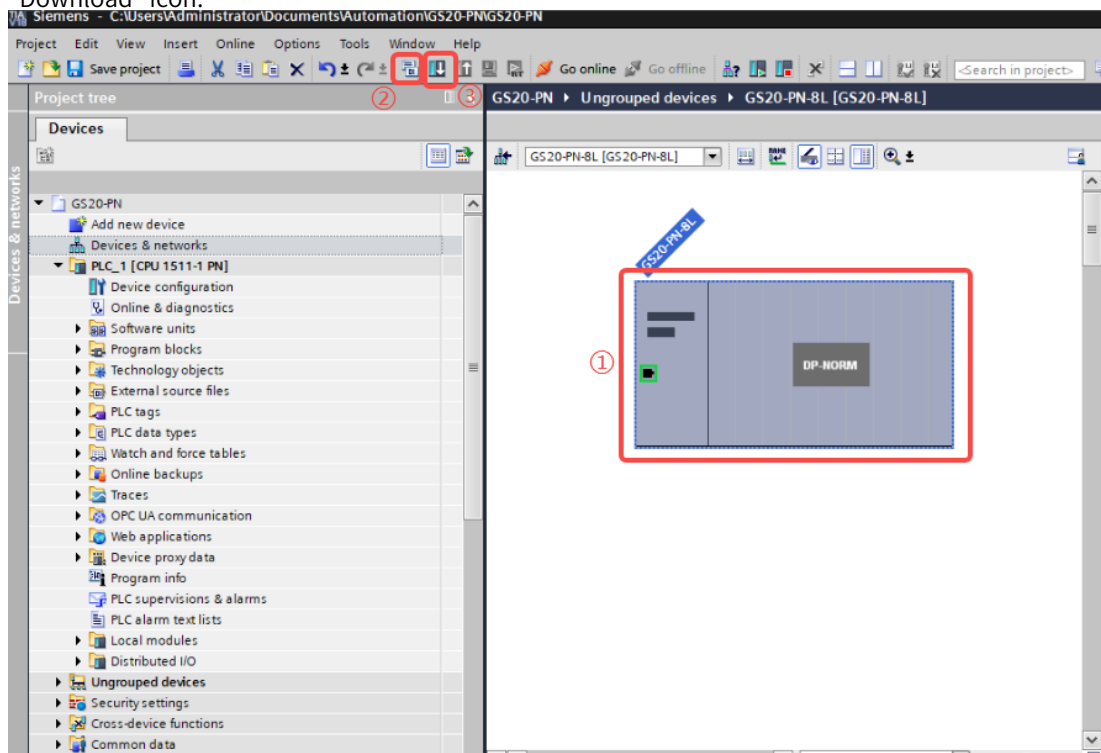
- b. In the pop-up interface at the bottom, select "Properties" > "Module parameters" to configure the parameters related to the module.



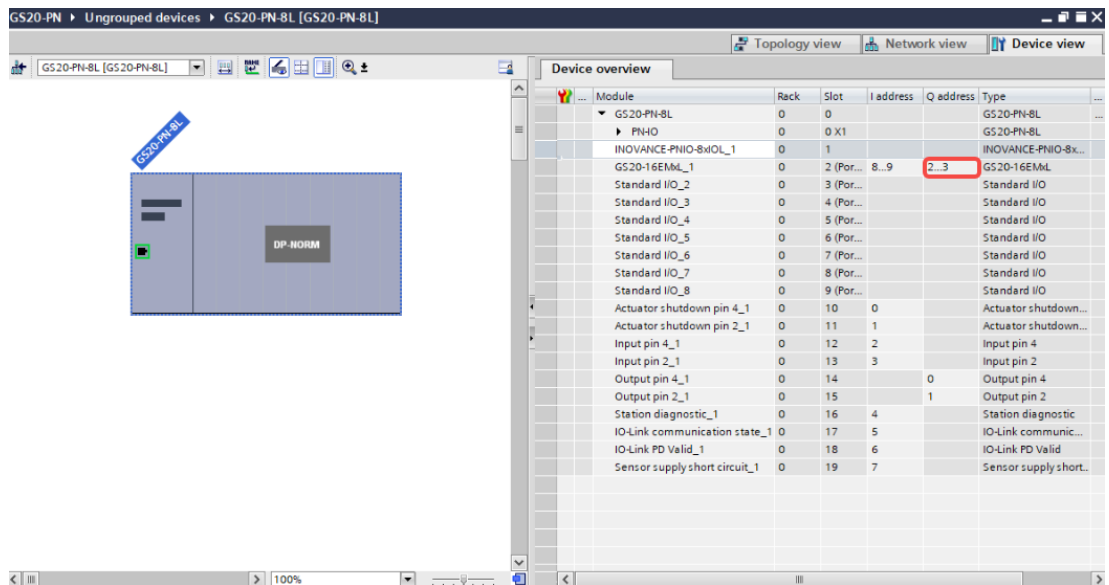
c. Configure all Pin2 ports to "Output enable" mode.



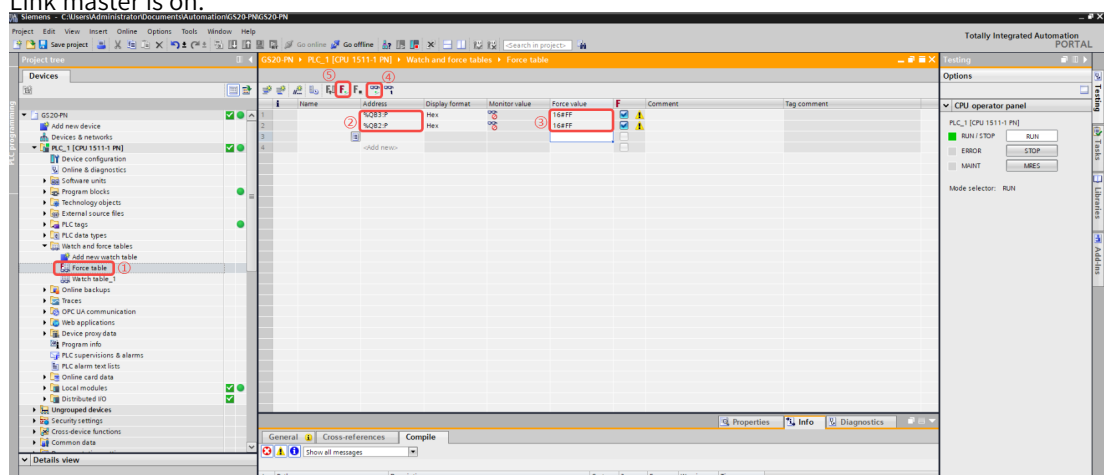
d. Select the GS20-PN-8L module ①. Click the "Compile" icon ② in the menu bar and click the "Download" icon ③.



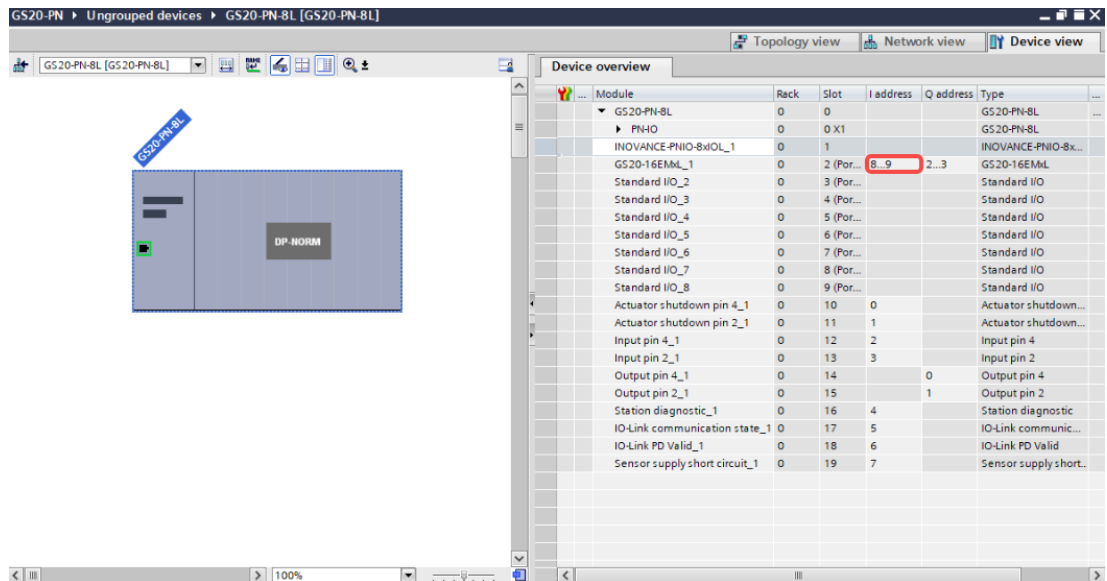
e. To assign the output ports of the IO-Link slave, it is necessary to view the corresponding address in the "Device overview" window.



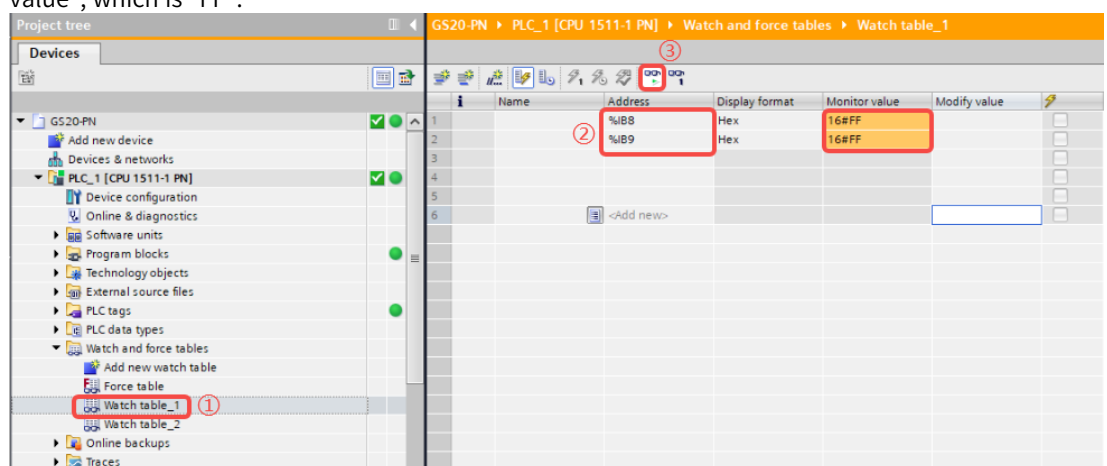
- f. In the "Devices" list on the left, double-click "Force table" ①. Enter the output address corresponding to the IO-Link slave in the "Address" column ② and enter "FF" in the "Force value" column ③. Click  ④ and select "Yes" in the pop-up window. Click  ⑤ and select "Yes" in the pop-up window to complete data enforcement. After completion, the Pin2 indicator of the IO-Link master is on.



- g. Short Pin2 and Pin4 of the IO-Link slave to view the input through the host controller. After shorting, view the input address of the IO-Link slave in the "Device overview" interface.

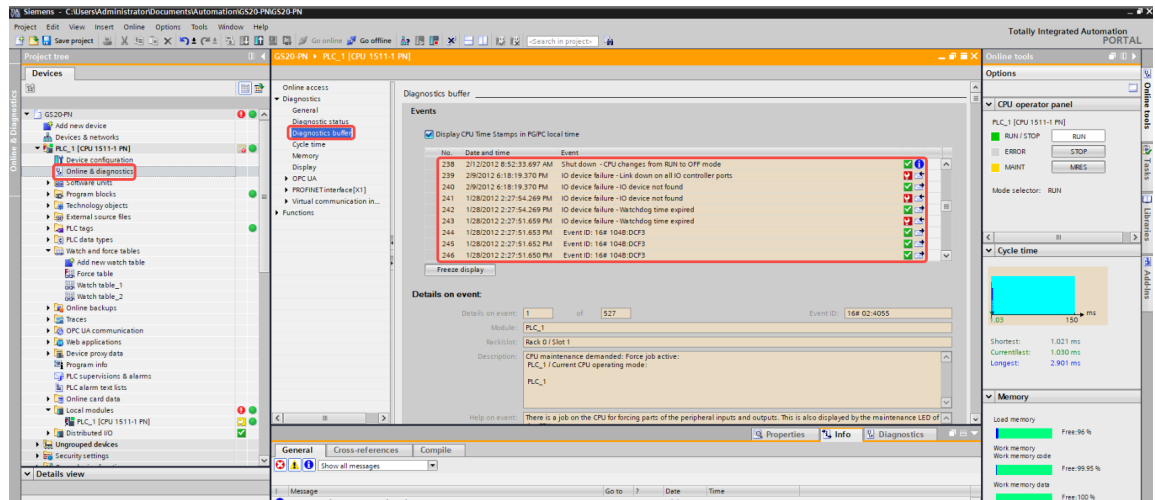


h. In the "Devices" list on the left, double-click "Watch table". Enter the input address corresponding to the IO-Link slave in the "Address" column. Click  to monitor the data and view the "Monitor value", which is "FF".



5 Troubleshooting

In the "Devices" list on the left, select "Online & diagnostics" > "Diagnostics buffer". Fault information is displayed in "Events".



Source	Fault Code	Description	Solution
IO-Link master	0x1800	Device not detected by the port	Check whether the port device configured as IO-Link is connected.
	0x1802	Invalid vendor ID	Check whether the configured Vendor ID is consistent with the connected port device when I/O-Link validation mode is enabled.
	0x1803	Invalid Device ID	Check whether the configured device ID is consistent with the connected port device when I/O-Link validation mode is enabled.
	0x6000	Invalid cycle time	Check whether the configured cycle time meets the communication requirements of the connected port when I/O-Link validation mode is enabled.
	0x6001	Incorrect slave version	Check whether the version of the IO-Link slave device connected to the port meets the requirements when I/O-Link validation mode is enabled.
	0x1806	Pin1 short-circuited	Check whether Pin1 encounters a short circuit.
	0x1807	Pin1 overcurrent	Check whether Pin1 encounters an overcurrent.

Source	Fault Code	Description	Solution
IO-Link slave	0x4210	Overtemperature	The ambient temperature is too high. Decrease the temperature before using the module.
	0x4220	Undertemperature	The ambient environment is too low. Increase the temperature before using the module.
	0x5011	Loss of retentive data upon power failure	Retention of configuration parameters fails. Re-configure the parameters.
	0x5100	Power supply fault	The UA power supply of the module fails. Enable the power supply to pin 2 on the master or use the external UA power supply.
	0x5110	System power supply overvoltage	The US power supply voltage of the module is higher than the normal operating voltage. Decrease the US power supply voltage.
	0x5111	System power supply undervoltage	The US power supply voltage of the module is lower than the normal operating voltage. Increase the US power supply voltage.
	0x7710	Short circuit	The module encounters a short circuit. Check the external wiring.
	0x6320	Parameter fault	The module parameters are configured incorrectly. Configure the parameters correctly according to the product data.
	0x6321	Parameter loss	In expert mode, an input signal is detected for a channel configured as output. Modify the input/output configuration parameter 0x41 according to actual usage.

6 Appendix: Version Matching Information

You can get the module firmware from Inovance technical support engineers. The InoProShop software can be downloaded from the software and commissioning tool interface of any medium-sized PLC series at <https://www.inovance.com>. The following table describes the version matching information.

Module Firmware Version	InoProShop version
2.0.0.0 and later	V1.7.3 SP2 and later

Service and Support

Should you encounter a safety accident during the use or operation of the product, or face challenges in operating and maintaining the equipment, which remain unresolved after the relevant documentation is consulted, we provide multiple channels to ensure prompt resolution:

- Channel #1: Contact service@inovance.com.
- Channel #2: Visit <https://www.inovance.com/global> to access document downloads, after-sales support, spare parts ordering, repair applications, and authenticity verification services.
- Channel #3: Download My Inovance app (<https://zshc-eu.inovance.com/download-pc/>) where you can access products info and documentation, and query product parameters.

We are committed to providing you with quick and professional technical support, and we look forward to your satisfaction and trust.



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