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PS00007594 A00

GL20-RTU-PN
Communication Interface Module

User Guide

Shenzhen Inovance Technology Co., Ltd.

Add.: Inovance Headquarters Tower, High-tech Industrial Park,
Guanlan Street, Longhua New District, Shenzhen
Tel:(0755) 2979 9595 Fax: (0755) 2961 9897
www.inovance.com

Preface

■ About this Guide

GL20-RTU-PN series PROFINET communication interface module features support for PROFINET communication and is applicable to PROFINET master devices such as S7-1500 and S7-1200. One PROFINET module can connect up to 16 GL20 I/O modules. When the number of connected I/O modules exceeds 16, an expansion power supply module is required (one power supply module for every 16 additional I/O modules).

This guide describes the mechanical installation, electrical installation and programming examples of the product.

■ Standard 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 Name		Standard
CE certification	EMC directive	2014/30/EU	**24 VDC products** EN 61131-2 **24 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 UL 61010-2-030 CAN/CSA-C22.2 No. 61010-1 CSA C22.2 NO. 61010-2-201 CSA C22.2 NO. 61010-2-030

Certification	Directive Name	Standard
KCC certification	-	-
EAC certification	-	-

■ Revision History

Date	Version	Description
September 2022	A00	First release.

■ How to Obtain

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

- Log in to Inovance's website (*www.inovance.com*), choose **Support** > **Download**, search by keyword, and then download the PDF file.
- Scan the QR code on the product with your mobile phone.

■ Product Warranty Instructions

The warranty period of the product is 18 months as of the date of manufacture (refer to the barcode on the equipment). If otherwise agreed upon, the agreed terms and conditions shall prevail. After the warranty period expires, maintenance will be charged.

Within the warranty period, maintenance will be charged for damages caused by the following:

- Operations not following the user instructions
- Fire, flood, or abnormal voltage
- Use of the product for non-recommended functions
- Use of the product outside the scope of intended use
- Force majeure such as natural disasters, earthquake, lightning strike

The maintenance fee 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 Instructions

■ Safety Precautions

1. Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations.
2. To ensure the safety of humans and equipment, follow the signs on the equipment and all the safety instructions in this user guide.
3. "CAUTION", "WARNING", and "DANGER" items in the user guide only indicate some of the precautions that need to be followed; they just supplement the safety precautions.
4. Use this equipment according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
5. Inovance shall take no responsibility for any personal injuries 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 injuries or damage to the equipment. Please keep this guide well so that it can be read when necessary and forward this guide to the end user.

During 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 PLC 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 a 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, please design external protection circuit 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 indoor electrical environment (overvoltage category II). The power supply must have a system-level lightning protection device, assuring that overvoltage due to lightning shock cannot be applied to the PLC power supply input terminals, signal input terminals and output terminals and so forth, so as to avoid damage to the equipment.

Installation

Warning

- Installation must be carried out by the specialists who have received the necessary electrical training and understood enough electrical knowledge.
- 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 where there are dust, oil smoke, conductive dust, corrosive or combustible gases, or exposed to high temperature, condensation, wind & rain, or subject to vibration and impact. 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 personnel who have received the necessary electrical training and understood enough electrical knowledge 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.

Wiring

- Wiring must be carried out by personnel who have received the necessary electrical training and understood enough electrical knowledge.
- 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 completed. Failure to comply may result in electric shock.
- Perform good insulation on terminals so that insulation distance between cables will not reduce after cables are connected to terminals. 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 product to the power supply.
- The input power of the product must meet the specifications listed in this guide. If the power input does not meet the specifications, the equipment may be damaged. Thus, check regularly that the DC power provided by the switching-mode power supply unit is stable.

During Operation and Maintenance

- Maintenance & inspection must be carried out by personnel who have the necessary electrical training and experience.
- 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 removing the module or connecting/removing the communication wirings. Failure to comply may result in electric shock or malfunction.

Safety Recommendations

- On-site manual devices or other backup means must be equipped in the position where the operator directly touches the mechanical parts, such as loading and unloading mechanical tools, or the position where the machine runs automatically. The manual devices and backup means, which can start or interrupt automatic operations of the system, must be independent of the programmable controller.
- If you need to modify the program while the system is running, 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.

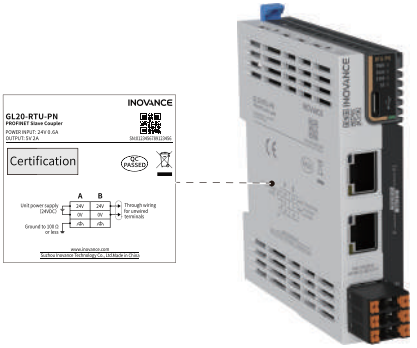
1 Product Information

1.1 Model Number and Nameplate

GL 20 - RTU - PN

① ② ③ ④

① **Product Information** GL: General local module	③ **I/O Type** RTU: Remote terminal unit
② **Serial Number** 20: 20 series module	④ **Module Type** PN: PROFINET

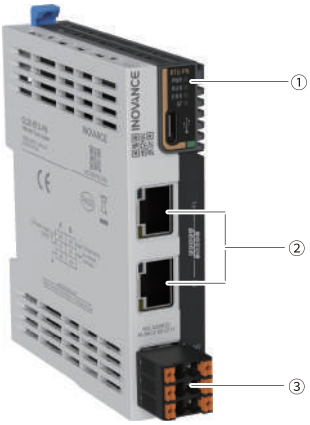


Based on the above description of model number and nameplate, the relevant ordering data of this product is described in the following table.

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

1.2 Components

The following figure shows the terminals and interfaces of the module.


①
②
③

No.	Interface Name	Function			
①	Signal indicators	PWR	Power indicator	Solid on (green)	ON when power supply is switched on.
		RUN	Running 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 error indicator	Off	No communication error
				Solid on (red)	No expansion module present. For details, see *" Fault Diagnosis" on page 23*
				Flashing (red)	Inconsistent configuration of expansion modules. For details, see *" Fault Diagnosis" on page 23*
				Single flash (red)	GL20-RTU-PN module offline or expansion module synchronization error
		SF	Fault indicator	Off	Expansion module is normal
				Solid on	Local bus error. For details, see *" Fault Diagnosis" on page 23*
				Flashing (red)	Expansion module fault. For details, see *" Fault Diagnosis" on page 23*
②	PROFINET interface	P1: PROFINET interface 1			
		P2: PROFINET interface 2			

No.	Interface Name	Function
③	24 V power	Power input terminals

Note

- Flashing: Flashes at an interval of 200 ms
- Single flash: Flashes at an interval of 1000 ms
- Double flash: Flashes twice at an interval of 1000 ms

1.3 Specifications

■ Power supply specifications

Item	Specification
Rated terminal input voltage	24 VDC (20.4 VDC to 28.8 VDC)
Rated terminal input current	0.6 A (typical@24 V)
Rated bus output voltage	5 VDC (4.75 VDC to 5.25 VDC)
Rated bus output current	2 A (typical@5 V)
Power output derating	80% derating at 55°C (the output current does not exceed 1.6 A), or 10°C derating when output curent is 2 A
Power supply protection	Anti-reverse connection, surge absorption

■ Software specifications

Item	Specification
Communication mode	RT mode
Minimum communication cycle	1 ms
I&M data	I&M0 to I&M3
PROFINET version	V2.3
Expansion capability	16 modules
Number of PROFINET interfaces	2
PROFINET switch capability	Networking
Open IE	Support for TCP/IP, SNMP, LLDP
Alarm/diagnosis/ status information	Support for uploading of error code from local to PLC
Physical layer	100BASE-TX
Communication speed	10 Mbit/s (standard Ethernet), 100 Mbit/s (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
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

Item	Specification
Factory reset of expansion module	Not supported
Firmware update	Supported

1.4 Environmental Specifications

Item	Specification
Ambient operating temperature	–20°C to 55°C
Ambient operating humidity	<95% RH, non-condensing
Atmosphere	Must be free from corrosive gases
Ambient storage temperature	–20°C to 60°C (<90% RH, non-condensing)
Altitude	2,000 m max. (80 kPa)
Pollution degree	2 or less
Noise immunity	2 kV on power supply line (Conforms to IEC 61000-4-4)
Overvoltage category	II
EMC immunity level	Zone B, IEC61131-2
Vibration resistance	IEC 60068-2-6 5 to 8.4 Hz with 3.5 mm amplitude, 8.4 to 150 Hz, acceleration of 9.8 m/s^2, X, Y, and Z directions (10 sweeps of 10 min each = 100 min in total)
Shock resistance	IEC 60068-2-27, 9.8 m/s^2, 11 ms, X, Y, Z, 6 directions, 3 times/direction

1.5 Supported Modules

Currently, the following modules are supported.

Product code	Module Name	Description
01440291	GL20-1600END	GL20 series 16-channel digital input module
01440292	GL20-0016ETP	GL20 series 16-channel digital PNP transistor output module
01440293	GL20-0016ETN	GL20 series 16-channel digital NPN transistor output module
01440288	GL20-4AD	GL20 series 4-channel analog input module
01440287	GL20-4DA	GL20 series 4-channel analog output module

1.6 Analog-to-Digital Conversion

The rule for conversion between analog and digital is described in the following tables.

■ Analog Output

Rated Output Range	Rated Digital Value –20000 to 20000	Rated Digital Value –32000 to 32000
–10 V to 10 V	–20000 to 20000	–32000 to 32000
0 V to 10 V	0 to 20000	0 to 32000
–5 V to 5 V	–20000 to 20000	–32000 to 32000
0 V to 5 V	0 to 20000	0 to 32000
1 V to 5 V	0 to 20000	0 to 32000
0 mA to 20 mA	0 to 20000	0 to 32000
4 mA to 20 mA	0 to 20000	0 to 32000

■ Analog Input

Rated Input Range	Rated Digital Value –20000 to 20000	Rated Digital Value –32000 to 32000
–10 V to 10 V	–20000 to 20000	–32000 to 32000
0 V to 10 V	0 to 20000	0 to 32000
–5 V to 5 V	–20000 to 20000	–32000 to 32000

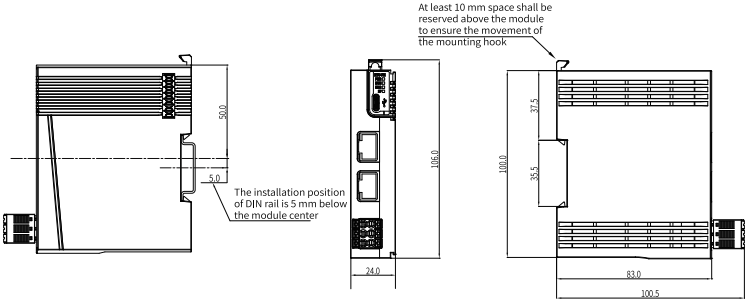
Rated Input Range	Rated Digital Value –20000 to 20000	Rated Digital Value –32000 to 32000
0 V to 5 V	0 to 20000	0 to 32000
1 V to 5 V	0 to 20000	0 to 32000
0 mA to 20 mA	0 to 20000	0 to 32000
–20 mA to 20 mA	–20000 to 20000	–32000 to 32000
4 mA to 20 mA	0 to 20000	0 to 32000

2 Mechanical Installation

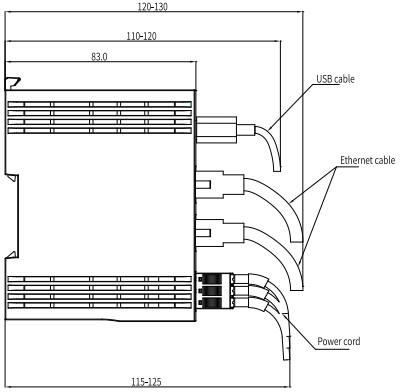
2.1 Mounting Dimensions

■ Module

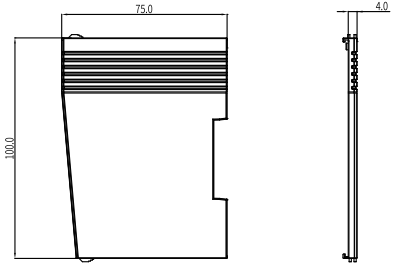
The mounting dimensions (in mm) are shown in the figure below.



■ Cable Connection



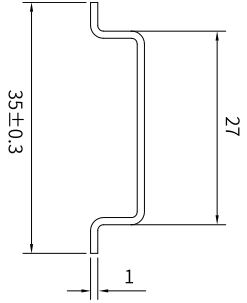
■ End Cover



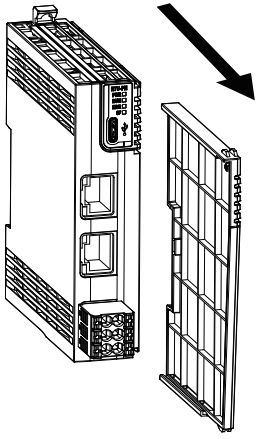
2.2 Installation Method

■ Installing Modules Side-by-Side

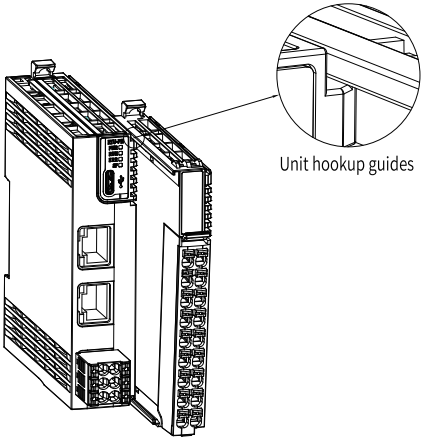
The module is mounted onto a DIN rail in conformity with IEC 60715 (width: 35 mm, thickness: 1 mm). The dimensions (unit: mm) are shown below.



Before installing the module, remove the end cover in the direction indicated by the arrow, as shown below.

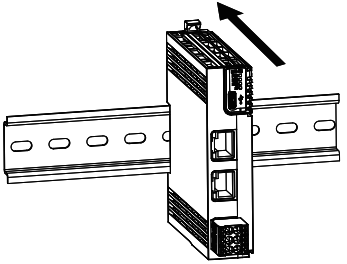


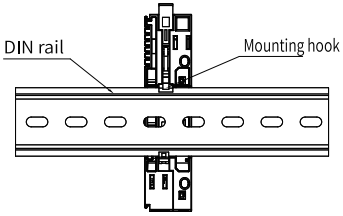
You can install multiple modules side by side with the help of top and bottom guides on the modules, as shown below.



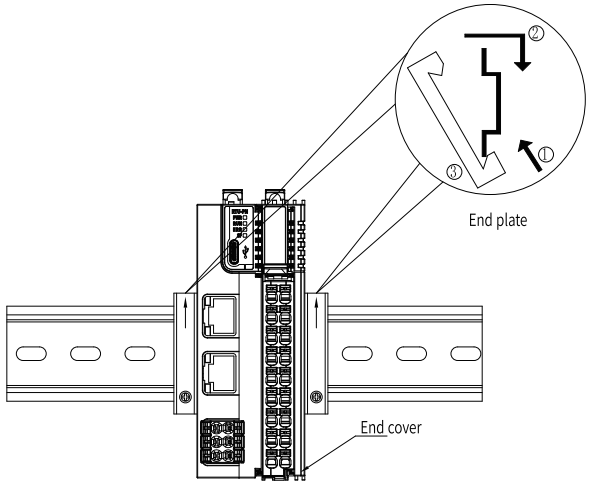
■ Installing Module onto DIN Rail

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.





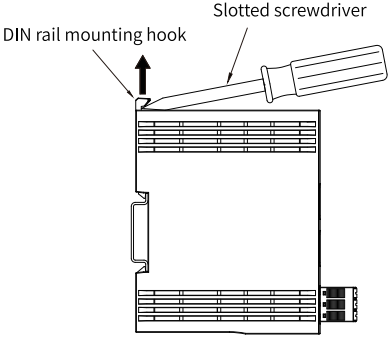
Note: After the module is installed, the DIN rail mounting hook will automatically move downward to lock the module to the rail. If the DIN rail mounting hook does not move downward, press down the top of it to ensure that the module is installed in place.

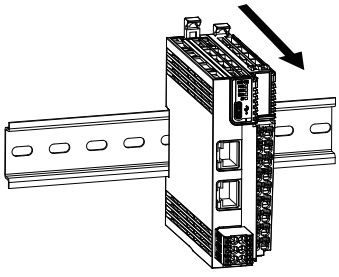


Install the end cover to the last module to prevent exposure of the metal pins. After installing the end cover, mount an end plate on either side of the module assembly to prevent sliding of the module.

■ Removing Module

Pry the DIN rail mounting hook upwards with a tool such as slotted screwdriver, and then pull the module away from the DIN rail to remove it.





3 Electrical Installation

3.1 Cable Selection

■ Communication Cable

EtherCAT bus communication adopts shielded Ethernet cables for data transmission, without short circuit, misalignment and poor contact. The length of cables between devices cannot exceed 100m; otherwise, signal attenuation will occur and affect normal communication. It is recommended to use cables specified as follows.

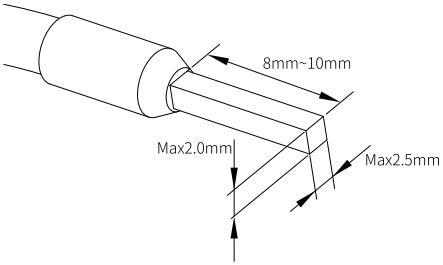
Item	Specification
Cable type	Elastic crossover cable, S-FTP, Cat5
Standard	EIA/TIA568A, EN50173, ISO/IEC11801 EIA/TI Abulletin TSB, EIA/TIA SB40-A&TSB36
Cross sectional area	AWG26
Conductor type	Twisted pair
Pair	4

■ 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	

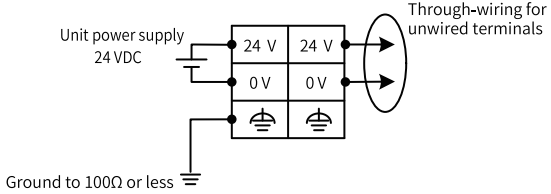
The shape and dimension requirements of the crimped terminals are shown below.



■ External Interface Specifications

Interface Type	Interface Name	Cable Type/ Maximum Length	Description	Terminals	Specification
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 input	6-pin pluggable terminal block	24 V/1 A

3.2 Terminal Wiring



4 Fault Diagnosis

LED Indicator Status (see *"1.2 Components" on page 8*)		Fault Description	Cause	Solution
ERR	Solid on (red)	Protocol stack failed to scan for modules	Expansion module does not exist	Check that the module is installed properly and supplied with power
			Local bus communication failure	Check the contact of the communication interface of the expansion module or restart the whole system
	Flash-ing (red)	• The number of I/O modules configured is more than the number of I/O modules actually scanned • The number of I/O modules configured is less than the number of I/O modules actually scanned • The type of I/O modules configured is inconsistent with that of the I/O modules actually scanned	The actual slot of the expansion module is inconsistent with the configuration	Check the number and installation sequence of expansion modules
			Local bus communication failure	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	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 (see *"1.2 Components" on page 8*)		Fault 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	I/O module is powered off or unplugged	Check whether the module in the corresponding slot is powered off or unplugged
			Error caused by high frame loss rate of local bus communication	Check the contact of the communication interface of the expansion module or restart the whole system

LED Indicator Status (see *"1.2 Components" on page 8*)		Fault Description	Cause	Solution
SF	Flashing (red)	Power supply overvoltage	Unstable power supply to the module or power failure	Check the power supply of the module
		Power supply undervoltage		
		External 24 V power supply power failure		
		Chip overheating	DAC device temperature is too high	1. Check whether the module hardware is faulty 2. Replace the module
		ADC device failure	ADC device failure	
		DAC device failure	DAC device failure	
		Reference channel failure	TC module cold end sampling channel failure	1. Check TC module cold end channel hardware 2. Replace the module
		Channel x disconnected	Analog channel wiring disconnected	1. Check the external wiring of the module channel 2. If external wiring is correct, it is recommended to check the internal hardware of the module or replace the module
		Channel x shorted	Analog channel wiring shorted	
		Channel x data exceeds upper limit	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		

5 Appendix: Use Instruction of Share_in and Share_out

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

Address	Meaning	Value
First byte of Share_in	Status of local bus	• 0x01: init • 0x02: preop • 0x04: safeop • 0x08: op • 0x10: safeop2op • 0x20: op2safeop • 0x80: error
Second byte of Share_in	Status of PROFINET communication	• 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 Share_in and Share_out modules exist at the same time. It is necessary to enter the corresponding value in Share_out.

Share_out input value	Share_in feedback value	Length
0x01	APP version	Occupies 4 consecutive bytes
0x02	FPGA version	Occupies 4 consecutive bytes
0x03	PN version	Occupies 4 consecutive bytes
0x04	GSD version	Occupies 4 consecutive bytes
0x10	Slot 1 module version	Occupies 8 consecutive bytes
0x11	Slot 2 version	Occupies 8 consecutive bytes
0x12	Slot 3 version	Occupies 8 consecutive bytes
0x13	Slot 4 version	Occupies 8 consecutive bytes
0x14	Slot 5 version	Occupies 8 consecutive bytes

Share_out input value	Share_in feedback value	Length
0x15	Slot 6 version	Occupies 8 consecutive bytes
0x16	Slot 7 version	Occupies 8 consecutive bytes
0x17	Slot 8 version	Occupies 8 consecutive bytes
0x18	Slot 9 version	Occupies 8 consecutive bytes
0x19	Slot 10 version	Occupies 8 consecutive bytes
0x1A	Slot 11 version	Occupies 8 consecutive bytes
0x1B	Slot 12 version	Occupies 8 consecutive bytes
0x1C	Slot 13 version	Occupies 8 consecutive bytes
0x1D	Slot 14 version	Occupies 8 consecutive bytes
0x1E	Slot 15 version	Occupies 8 consecutive bytes
0x1F	Slot 16 version	Occupies 8 consecutive bytes

Share_in and Share_out must be added to the end of the list of all modules.