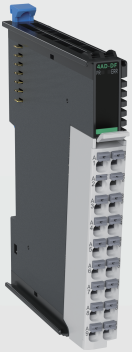
INOVANCE

FORWARD, ALWAYS PROGRESSING



PS00008815A01

GL20-4AD-DF
Analog Input Module
User Guide

Suzhou Inovance Technology Co., Ltd.

Add.: No. 16 Youxiang Road, Yuexi Town,
Wuzhong District, Suzhou 215104, P.R. China
Tel:(0512) 6637 6666 Fax: (0512) 6285 6720
www.inovance.com

Preface

■ Introduction

GL20-4AD-DF series 4-channel analog input module (differential input type) supports voltage and current input with a 16-bit resolution, and can be used together with a PLC master such as Easy series and AC800 series.

This guide describes the product information, mechanical installation, electrical installation, fault diagnosis, programming examples, and version information 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 **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 CAN/CSA-C22.2 No. 61010-1 CSA C22.2 NO. 61010-2-201
KCC Certification	-		-

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

■ More documents

Name	Data Code	Description
GL20-RTU-ECT Coupler Module User Guide	PS00004985	This guide describes the installation, wiring and more of the product.

■ Revision History

Date	Version	Description
August 2023	A01	Added "Fault Diagnosis" and "Version Information" chapters.
December 2022	A00	First release

■ Access to the Guide

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

- Visit *http://www.inovance.com*, go to Support > Download, search by keyword, and then download the PDF file.
- Scan the QR code on the product with your smart phone.

- Scan the QR code below to install the app, where you can search for and download manuals.

■ Warranty

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 abnormal 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 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 the 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 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 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 injury or property damage caused by improper use.

■ Safety Levels and Definitions

Indicates that failure to comply with the notice will result in severe personal injuries or even death.

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

Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage. Please keep this guide well so that it can be read when necessary and forward this guide 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 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.

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.

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 supply of the HMI should be 24 VDC. Power supplies outside ±20% of 24 VDC will 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

- 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

- 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, manually-operated devices or similar must be installed independently of the PLC to start or stop the automatic operation of the system.
- 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

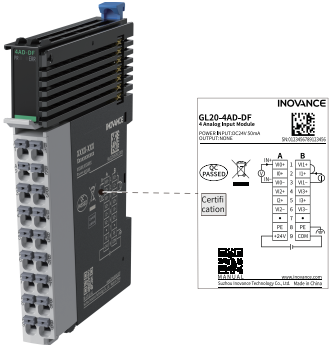
- Treat the scrapped product as industrial waste. Dispose of the battery according to local laws and regulations.
- Recycle retired equipment by observing industry waste disposal standards to avoid environmental pollution.

1 Product Information

1.1 Model and Nameplate

GL 20 - 4 AD - DF
① ② ③ ④ ⑤

① **Product Information** GL: General local module	③ **I/O Points** 4: 4 channels 8: 8 channels
② **Serial Number** 20: 20 series module	④ **Module Type** AD: Analog input DA: Analog output AM: Hybrid module PT: Heating resistor temperature detection TC: Thermocouple temperature detection
⑤ **Custom Solution** DF: Differential input	-

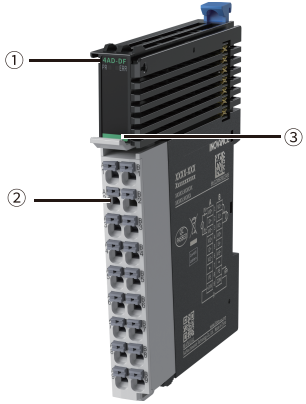


Based on the above description of model number and nameplate, the relevant ordering data of this product is described in the following table.

Model	Description	Product Code	Applicable Model
GL20-4AD-DF	GL20-4AD-DF series 4-channel analog input module (differential input type) supports voltage/current input.	01440479	AC800 series, Easy series

1.2 Components

The following describes the terminals of the module.



No.	Name	Description			
①	Signal Indicator	PR (POWER +RUN)	Power / running indicator	Yellow green	ON when the module is in normal operation
		ERR	State machine error indicator	Red	Is ON when an error occurs in the state machine
②	Terminals	For details, see *"3.2 Terminal assignment" on page 20*			

No.	Name	Description	
③	Color identification	Red: Digital output	Orange: Analog output
		Gray: Digital input	Green: Analog input
		White: Communication	Blue: Other module

1.3 Specifications

■ General Specifications

Item	Specification
IP rating	IP20
Dimensions (W x H x D)	12 mm × 100 mm × 75 mm
Weight	Approx. 60 g

■ Power Supply Specifications

Item	Specification
Rated bus input voltage	5 VDC (4.75 VDC to 5.25 VDC)
Rated bus input current	120mA (typical@5 V)
Rated terminal input voltage	24 VDC (20.4 VDC to 28.8 VDC)
Rated terminal input current	50 mA (typical@24 V)
Rated terminal output voltage	None
Rated terminal output current	None
Hot swap	Not supported

■ Input Specifications

Item	Description
Input type	Analog input
Input mode	Voltage/Current, differential input*
Number of input channels	4

Item	Description
Resolution	16-bit
Conversion time	250 us/channel
Voltage input range	±10 V, 0 V to 10 V, ±5 V, 0 V to 5 V, 1 V to 5 V
Voltage input impedance	1 MΩ
Voltage input accuracy (25°C)	±0.1% (full scale)
Voltage input accuracy (full temperature range)	±0.2% (full scale)
Voltage input limit	±15 V
Voltage input diagnosis	Wire break detection supported only when set to 1 V to 5 V
Current input range	±20 mA, 0 mA to 20 mA, 4 mA to 20 mA
Current sampling impedance	250 Ω
Current input accuracy (25°C)	±0.1% (full scale)
Current input accuracy (full temperature range)	±0.2% (full scale)
Current input limit	±30 mA (transient), ±24 mA (average)
Current input diagnosis	Wire break detection supported only when set to 4 mA to 20 mA
Isolation	No isolation between the channels; isolation between the channels and the power supply; isolation between the channels and the bus
Input action display	None
Input derating	None
Support for sink wiring	Yes

Note

*Differential input can ensure that sampling signals between channels are not affected by each other.

■ Software specifications

Item	Description
Independent channel enable configuration	Supported
Diagnostic report configuration	Supported
Diagnostic detection configuration	Short circuit detection and wire break detection, not supported by output range containing 0
Conversion mode configuration	±10 V, 0 V to 10 V, ±5 V, 0 V to 5 V, 1 V to 5 V, ±20 mA, 0 mA to 20 mA, 4 mA to 20 mA
Filter parameter configuration	The software filtering time can be configured through the host controller, the setting range is 0 to 255
Overlimit detection configuration	Supported
Peak hold configuration	Supported
Digital output range configuration	-20000 to 20000, ±32000 supported
Sampling time	1 ms/4 channels
Sampling refresh	Refresh asynchronously according to the sampling time, not required to refresh synchronously according to the bus cycle
Stop mode	Output last value, no refresh

1.4 Environmental Specifications

Item	Specification
Ambient operating temperature	-20°C to 55°C
Ambient operating humidity	10% to 90% RH (non-condensing)
Working environment	No corrosive and flammable gas and no excessive conductive dust
Ambient storage temperature	-40°C to 70°C (<90% RH, non-condensing)

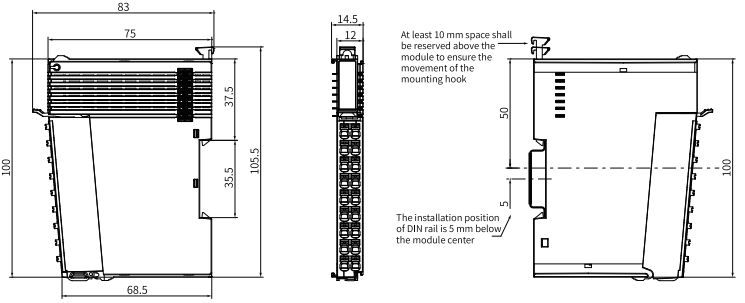
Item	Specification
Altitude	⩽2000 m
Pollution degree	2 or less
Noise immunity	2 kV on power supply line (Conforms to IEC 61000-4-4)
Overvoltage category	I
EMC immunity level	Zone B, IEC61131-2
Vibration resistance	IEC 60068-2-6 5 Hz to 8.4 Hz, 3.5 mm $_{p}$, 8.4 Hz to 150 Hz, 1g, 10 times each in X, Y and Z directions
Shock resistance	IEC 60068-2-27 150 m/s^2, 11 ms, 3 times each in ±X, ±Y and ±Z directions, 18 times in total

2 Mechanical Installation

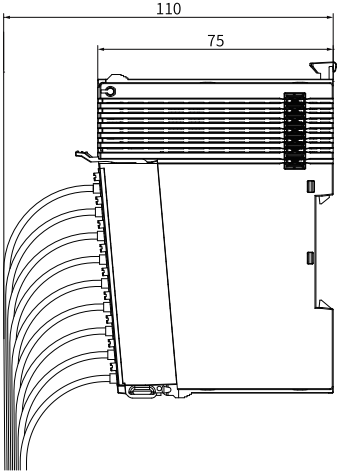
2.1 Mounting Dimensions

■ Module

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

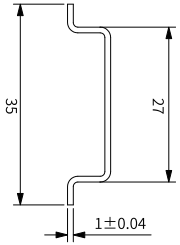


■ Cable Connection



2.2 Installation Method

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.

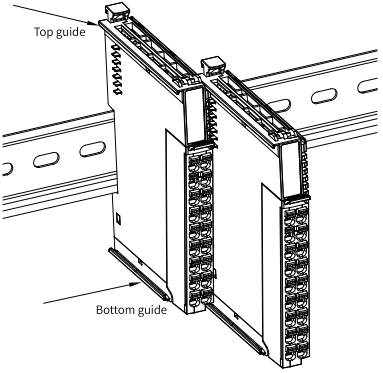


Caution

When installed on a DIN rail other than the recommended one (especially the one whose thickness is not 1.0 mm), the product will not fit in place as the mounting hook does not work.

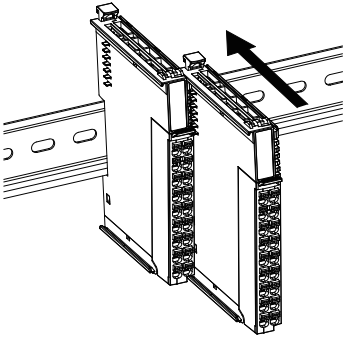
■ Installing Modules Side-by-Side

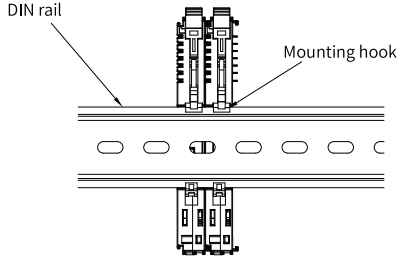
You can install multiple modules side by side with the help of top and bottom guides on the modules, as shown below.



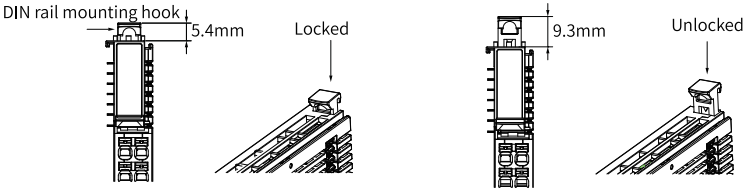
■ Installing Module onto DIN Rail

Align the module with the DIN rail and push it in the direction indicated by the arrow until you hear a click,





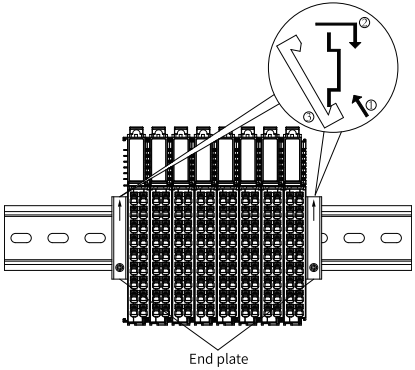
Note: After the module is installed, the DIN rail mounting hook will automatically move downward to lock the module to the rail. If the hook does not move downward, press down the top of the hook to ensure that the module is installed in place.



Caution

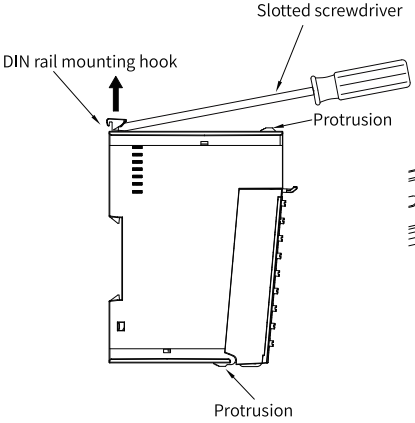
When the module is not installed on the rail, keep the mounting hook in the locked state. Keeping the mounting hook unlocked for a prolonged time may cause the hook to fail.

Mount an end plate on a side of the PLC or expansion module. To mount 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, as shown below.



■ Removing the Module

Pry the DIN rail mounting hook upwards with a tool such as slotted screwdriver, hold the protrusions and pull the module out straight forward, and then press down the top of the DIN rail mounting hook.



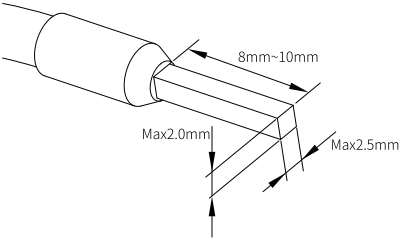
3 Electrical Installation

3.1 Cable Selection

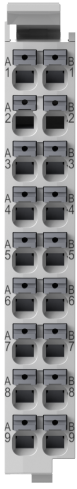
The cable lug and cable diameter included in the following table are only for reference.

Material Name	Applicable Cross Sectional Area of the Cable		KST		Suzhou Yuanli	
	mm^2	AWG	Model	Crimping Tool	Model	Crimping Tool
Tubular lug	0.3	22	E0308	KST2000L	0308	YAC-5
	0.5	20	E0508		0508	
	0.75	18	E7508		7508	
	1.0	18	E1008		1008	
	1.5	16	E1508		1508	

If you use other types of tubular lug, crimp the lug to the cables according to the shape and dimension requirements shown in the figure below.



3.2 Terminal assignment



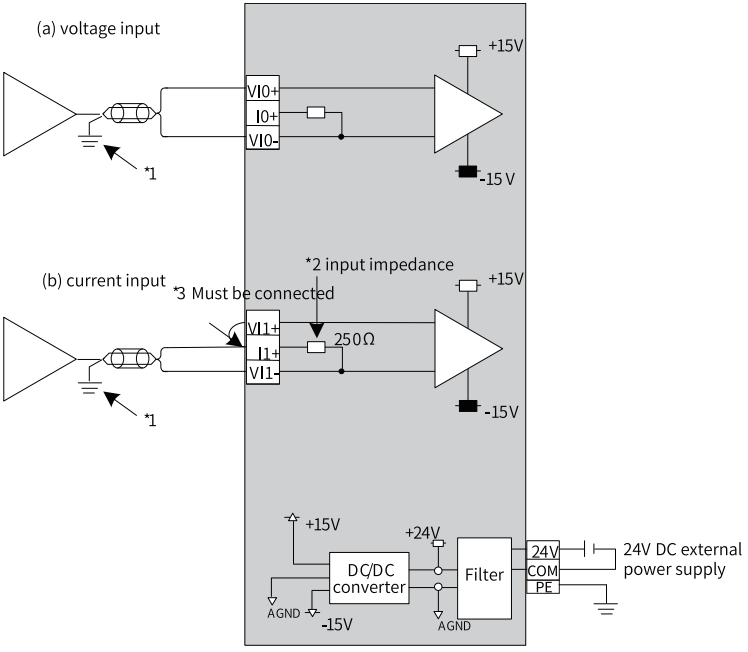
Left Signal	Left Terminal	Right Terminal	Right Signal
VI0+	A1	B1	VI1+
I0+	A2	B2	I1+
VI0-	A3	B3	VI1-
VI2+	A4	B4	VI3+
I2+	A5	B5	I3+
VI2-	A6	B6	VI3-
-	A7	B7	-
PE	A8	B8	PE
24V	A9	B9	COM

3.3 Terminal Wiring

■ Wiring Precautions

- Do not bundle the extension cable together with power cables (high voltage, large current) which produce strong interference signals; otherwise, it may be influenced by noise, surge and induction. Separate it from other cables and avoid cabling in parallel.
- Select recommended cables and pinboards for connection. It is recommended that shielded cables be used as extension cables to enhance capacity of resisting interference.
- Apply single-point grounding for the shielding of shielded cable and solder sealed cable.

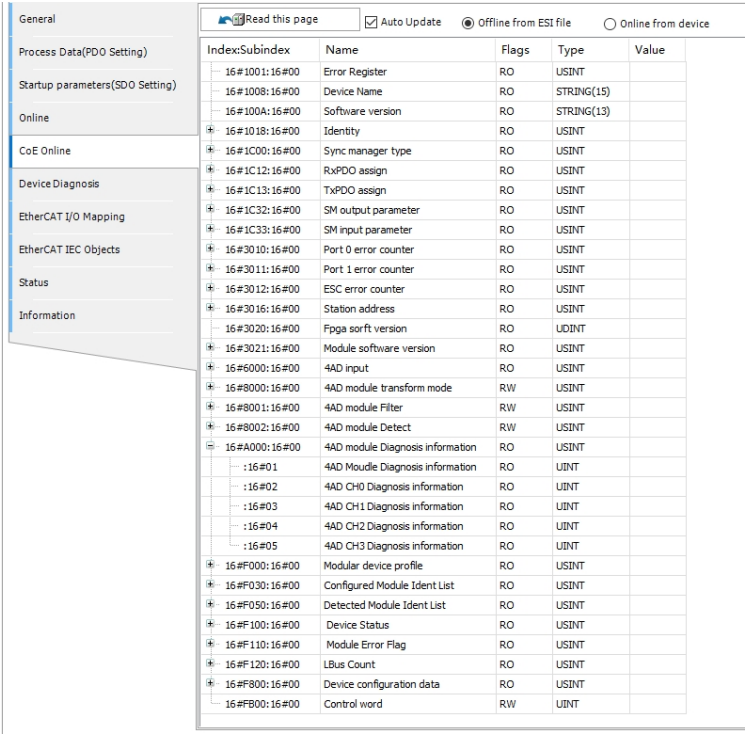
■ External Wiring



- *1 Use 2-core shielded twisted pair cable for analog signal.
- *2 Indicates input impedance of GL20-4AD-DF.
- *3 For current input, terminal (V+) must be connected to terminal (I+).

4 Fault Diagnosis

When the ERR indicator of the module is ON, it indicates that the module encounters a fault. The module reports a fault code. You can get the fault code through the diagnostic data object dictionary value displayed on the "CoE Online" interface, as shown below.



Index:Subindex	Name	Flags	Type	Value
16#1001:16#00	Error Register	RO	USINT	
16#1008:16#00	Device Name	RO	STRING(15)	
16#100A:16#00	Software version	RO	STRING(13)	
16#1018:16#00	Identity	RO	USINT	
16#1C00:16#00	Sync manager type	RO	USINT	
16#1C12:16#00	RxPDO assign	RO	USINT	
16#1C13:16#00	TxPDO assign	RO	USINT	
16#1C32:16#00	SM output parameter	RO	USINT	
16#1C33:16#00	SM input parameter	RO	USINT	
16#3010:16#00	Port 0 error counter	RO	USINT	
16#3011:16#00	Port 1 error counter	RO	USINT	
16#3012:16#00	ESC error counter	RO	USINT	
16#3016:16#00	Station address	RO	USINT	
16#3020:16#00	Fpga sorft version	RO	UDINT	
16#3021:16#00	Module software version	RO	USINT	
16#6000:16#00	4AD input	RO	USINT	
16#8000:16#00	4AD module transform mode	RW	USINT	
16#8001:16#00	4AD module Filter	RW	USINT	
16#8002:16#00	4AD module Detect	RW	USINT	
16#A000:16#00	4AD module Diagnosis information	RO	USINT	
:16#01	4AD Moudle Diagnosis information	RO	UINT	
:16#02	4AD CH0 Diagnosis information	RO	UINT	
:16#03	4AD CH1 Diagnosis information	RO	UINT	
:16#04	4AD CH2 Diagnosis information	RO	UINT	
:16#05	4AD CH3 Diagnosis information	RO	UINT	
16#F000:16#00	Modular device profile	RO	USINT	
16#F030:16#00	Configured Module Ident List	RO	USINT	
16#F050:16#00	Detected Module Ident List	RO	USINT	
16#F100:16#00	Device Status	RO	USINT	
16#F110:16#00	Module Error Flag	RO	USINT	
16#F120:16#00	LBus Count	RO	USINT	
16#F800:16#00	Device configuration data	RO	USINT	
16#FB00:16#00	Control word	RW	UINT	

- Diagnostic data

  For the module installed in slot n (n=1-32), the object dictionary definition for index 0xA000+0x40*n is shown in the table below.

Index	0xA000+0x40*n: 4AD fault code				
Sub-index	Name	Data type	Access mode	Mapping	Default
0	4AD fault code count	USINT	RO	NO	5
1	4AD Module fault code	UINT	RO	NO	0
2	4AD channel 0 fault code	UINT	RO	NO	0
3	4AD channel 1 fault code	UINT	RO	NO	0
4	4AD channel 2 fault code	UINT	RO	NO	0
5	4AD channel 3 fault code	UINT	RO	NO	0

- Module Fault Code

Fault Code	Fault Description	Solution
0x5003	External 24 V power failure	Check the isolated power supply of the module

- Module Channel Fault Code

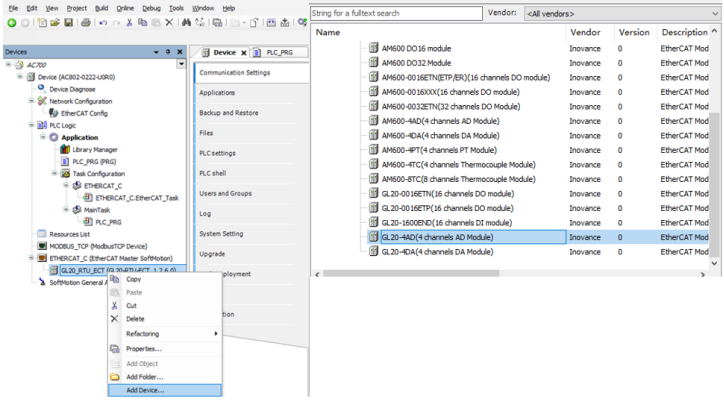
Fault Code	Fault Description	Solution
0x6001	Channel disconnected	Check that the input current or voltage is not greater than the minimum value in the current (4 mA to 20 mA) or voltage (1 V to 5 V) mode when the wire break is enabled.
0x6002	Channel shorted	None
0x6003	Channel data exceeds upper limit	Check that the input voltage or current is not greater than the rated value when overlimit is enabled
0x6004	Channel data exceeds lower limit	Check that the input voltage or current is not smaller than the rated value when overlimit is enabled

Fault Code	Fault Description	Solution
0x6005	Channel data overflow	Check that the input voltage or current is not greater than the limit value when overflow is enabled
0x6006	Channel data underflow	Check that the input voltage or current is not smaller than the limit value when overflow is enabled

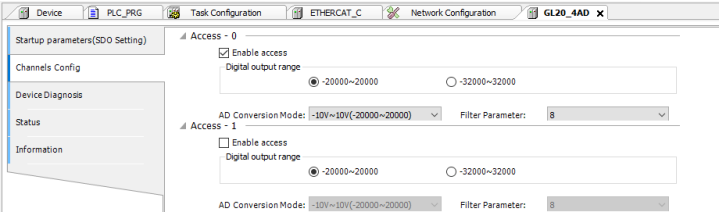
5 Programming Examples

The following takes the combination of AC802 series controller, AGL20-RTU-ECT communication module, and GL20-4AD module as an example, where the input voltage of channel 0 of the GL20-4AD module is assigned to the corresponding variable.

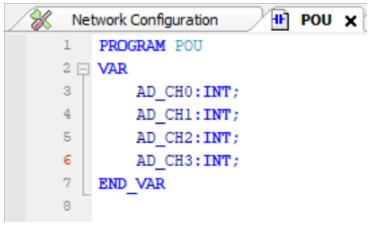
1. Add a GL20-4AD module.



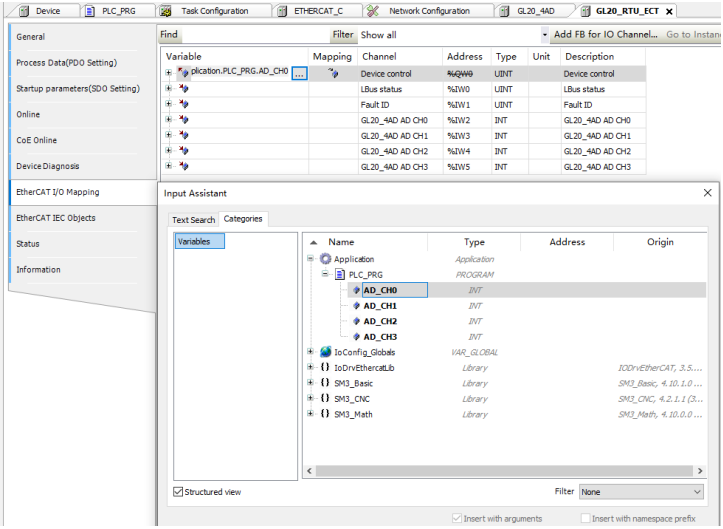
2. In the **Channels Config** interface, check **Enable access** for Access-0, and set the parameters as per needs.



3. Define variables AD_CH0, AD_CH1, AD_CH2, and AD_CH3 with the ST programming language as shown in the figure below.



4. Map AD_CH0 to channel 0 of the configured Gl20-4AD module..



5. After successful compiling, download the project and run it.

6 Appendix: Version Information

You can get the firmware of the module and the firmware of communication interface module from Inovance technical support, and get XML file and InoProShop from *https://www.inovance.com*. The following table describes the version matching information.

Module Firmware Version	Communication Interface Module Firmware Version	XML/GSD File Version	AutoShop/InoProShop version
Board software: 1.1.8.4 and later	GL20-RTU-ECT: board software 2.4.3.0 and later	GL20-RTU-ECT: 1.3.9.0 and later	• AutoShop V4.6.0.0 and later • InoProShop: V1.7.3 SP2 and later