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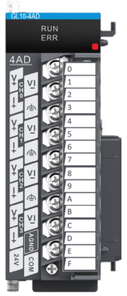

GL10-4AD

Analog Input Module User Guide

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Overview

This user guide provides information on the GL10-4AD analog input expansion module developed and manufactured independently by Inovance. It is a 4-channel analog input module that supports voltage and current input, with a resolution of up to 16 bits.

This user guide covers the specifications, functional characteristics, and operational guidelines of the product. Read the document before use to ensure safe operation. Visit Innovance' s official website (www.inovance.com) to download the latest version of the guide.

Safety Instructions

Safety precautions

1. Before installing, using, and maintaining this product, read the safety information and precautions thoroughly, and comply with them during operations.

2. To ensure personal and equipment safety, follow the safety instructions in this user guide.

3. The "CAUTION," "WARNING," and "DANGER" signs are only supplements to the safety instructions.

4. Use this equipment according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.

5. Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety levels and definition

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

CAUTION : Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage.

Keep this guide properly for future use and deliver this guide to the end user.

Control System Design

WARNING

- Provide a safety circuit outside the controller 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.

CAUTION

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

Installation

WARNING

- Installation must be carried out by qualified professionals.
- 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 controller in environments with dust, greasy smoke, conductive dust, corrosive or combustible gases, exposed to high temperature, condensation, wind & rain, or subject to vibration or impact. Electric shock, fire and malfunction may also damage the product.
- The controller is open-type equipment that must be installed in a control cabinet with lock (IP rating of the control cabinet enclosure > IP20). Only qualified professionals 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 unwanted 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. Incorrect installation may cause malfunctions, faults, or detachment.

During Wiring

WARNING

- Wiring must be carried out by qualified professionals.
- 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.

CAUTION

- Do not drop metal filings or wire ends into ventilation holes of the controller during wiring. Failure to comply may result in fire, fault and malfunction.
- The external wiring specifications and installation method must comply with local regulations. For details, see the wiring section in this guide.
- To ensure safety of equipment and operator, use cables with sufficient cross sectional area and connect the cables to ground.
- Ensure that all cables are connected to the correct interface. Failure to comply may result in module fault and external equipment fault.
- Tighten bolts on the terminal block with the specified tightening torque. If the terminal bolt is connected improperly, short circuit, fire or malfunction may occur. Tighten the bolts with improper tightening torque may damage the bolts and modules, leading to detachment, short circuit, fire, or malfunction.
- If a connector is used to connect to the external equipment, perform press-fitting, crimping, or welding with the tools specified by manufacturer. Improper connection may result in short-circuit, fire or malfunction.
- The module is attached with a label on the top to prevent unwanted matters from falling into the module during wiring. Do not remove the label during wiring. Remove this label before system operation to facilitate ventilation.
- Route control cables, communication cables, main circuit cables and power cables through different routes with a clearance of at least 100 mm among different types of cables. Failure to comply may result in malfunction caused by noise.
- Use shielded cables for high-frequency signal inputs or input cables in applications with significant interference.

Operation and Maintenance

WARNING

- Operation and maintenance must be carried out by qualified professionals.
- Do not touch the terminals with power 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 disassembling the module or connecting/disconnecting the communication cables. Failure to comply may result in electric shock or malfunction.

CAUTION

- Read through the user guide before operation, including online modification, forced output, RUN, and STOP operations.
- Disconnect the power supply before installing/removing the extension card.

Disposal

CAUTION

- Dispose retired batteries as hazardous industrial waste, following region-specific disposal regulations.

Product Information

■ Model and nameplate

GL10-4AD

Code	Description
G	General module

Code	Description
L	Local module

Code	Serial number
10	10 series

Code	Module type
AD	Analog input

Code	I/O point
4	4-channel

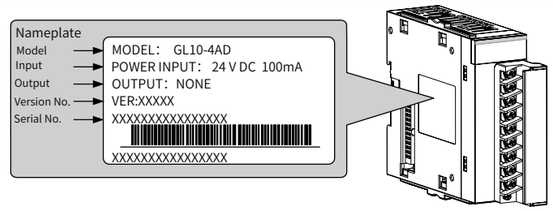

Figure 1 Description of model and nameplate

Model	Type	Description
GL10-4AD	Analog input	4-channel AD module, supporting analog voltage/current input

■ External interface

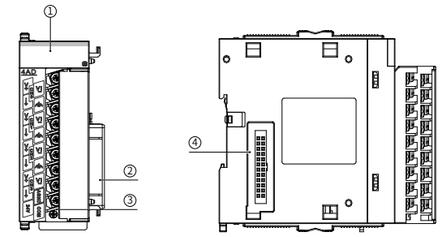

Figure 2 Module interface

No.	Interface	Definition
①	Signal indicator	RUN Status Indicator: Lights on when the local bus and module are operational; lights off when the local bus and module are stopped. ERR: error state indicator, which is turned on when a fault occurs.
②	Local expansion module downstream interface	Connect downstream module, not supporting hot plugging.
③	User input terminal	4-channel input (supporting voltage or current input)
④	Local expansion module upstream interface	Connect upstream module, not supporting hot plugging.

■ General specifications

Item	Specification
Input channel	4
Power supply voltage	24 VDC (20.4 VDC to 28.8 VDC) (-15%~+20%)
Internal 5 V power consumption	85 mA (typical value)
Voltage input impedance	> 1 MΩ
Current sampling impedance	250 Ω
Voltage input range	Bipolar: ±5 V, ±10 V; Unipolar: +5 V, +10 V
Current input range	0 mA to 20 mA, 4 mA to 20 mA, ±20 mA
Resolution	16 bits
Sampling time	1 ms
Accuracy (normal temperature: 25° C)	Voltage: ±0.1%, current: ±0.1% (full ranges)
Accuracy (ambient temperature: 0°C to 55°C)	Voltage: ±0.3%, current: ±0.8%
Voltage limits	±15 V
Current limits	±30 mA (transient), ±24 mA (average)
Maximum common mode voltage between channels	30 VDC
Isolation mode	I/O terminals isolated from power supply; Non-isolation between channels.
System program upgrade method	USB interface

Note: For environmental parameter details, refer to the "Product Information > Environmental Parameters" section in the GL10-RTU-ECTA EtherCAT Communication Module User Guide.

■ Analog-to-digital signal correspondence

	Rated input range	Corresponding digital value	Input limit range	Limit digital value
Analog voltage input	-10 V to +10 V	+20000 to +20,000	-11 V to +11 V	-22000 to +22000
	0 V to 10 V	0 to 20000	-0.5 V to +10.5 V	-1000 to +21000
	-5 V to +5 V	-20000 to +20000	-5.5 V to +5.5 V	-22000 to +22000
	0 V to 5 V	0 to 20000	-0.25 V to +5.25 V	-1000 to +21000
	1 V to 5 V	0 to 20000	0.8 V to 5.2 V	-1000 to +21000
Analog current input	-20 mA to +20 mA	+20000 to +20,000	-22 mA to +22 mA	-22000 to +22000
	0 mA to 20 mA	0 to 20000	-1 mA to +21 mA	-1000 to +21000
	4 mA to 20 mA	0 to 20000	3.2 mA to 20.8 mA	-1000 to +21000

Mechanical Design Reference

■ Mounting dimensions

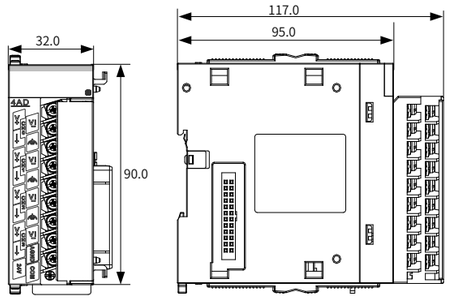

Figure 3 Mounting dimensions (in mm)

Electrical Design Reference

■ Cable selection

Material name	Model	Applicable cross sectional area of the cable		Manufacturer	Crimping pliers
		mm^2	AWG		
Y-type cable lug	TNS1.25-3	0.5–0.75	22–18	Suzhou Yuanli	RYO-8 YYT-8

Those cable lugs are applicable to digital/analog modules, and the cable rated temperature is required to be above 75 °C.

■ Cable preparation

Cable preparation:

- Strip the cable insulation by 6 mm.
- Pass the cable through the cable sleeve.
- Insert the exposed conductor into the hole of the cable lug, and then crimp it with recommended tool.
- Use a heat-shrinkable tube (Φ3) of 20 mm long to wrap the copper tube of a cable lug and then perform thermal shrinkage.

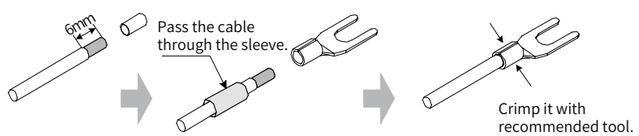

Figure 4 Cable preparation

- Put the cable lug onto the terminal and tighten the screw with a screwdriver. The maximum tightening torque is 0.8 N·m.

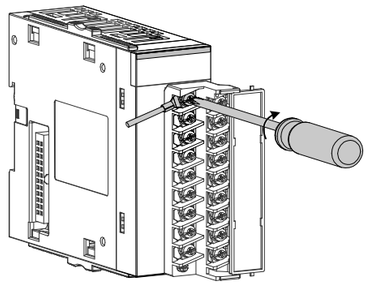

Figure 5 Connecting cable to terminal block

■ Terminal arrangement

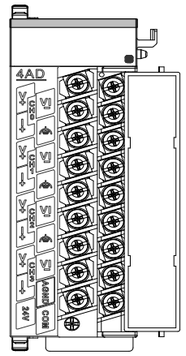

Figure 6 Terminal arrangement of the module

■ Terminal assignment

No.	Network name	Type	Function	Description
1	V+	Input	V+ of channel 0	Voltage input
2	VI-	Input	V-/I- of channel 0	Voltage/current input
3	I+	Input	I+ of channel 0	Current input
4	⏚ [1]	-	Shield ground	Internally connected to housing ground.
5	V+	Input	V+ of channel 1	Voltage input
6	VI-	Input	V-/I- of channel 1	Voltage/current input
7	I+	Input	I+ of channel 1	Current input
8	⏚ [1]	-	Shield ground	Internally connected to housing ground.
9	V+	Input	V+ of channel 2	Voltage input
10	VI-	Input	V-/I- of channel 2	Voltage/current input
11	I+	Input	I+ of channel 2	Current input
12	⏚ [1]	-	Shield ground	Internally connected to housing ground.
13	V+	Input	V+ of channel 3	Voltage input
14	VI-	Input	V-/I- of channel 3	Voltage/current input
15	I+	Input	I+ of channel 3	Current input
16	$AGND_{[2]}$	Analog ground	Analog ground	-
17	24V	Power supply	24 V power supply	-
18	COM	Power supply GND	Power supply GND	-

NOTE

- [1]: Shield ground terminals 4, 8, and 12 are internally connected.
- [2]: Terminal 16 (AGND) is internally connected to the AGND terminals of other channels.

■ External wiring

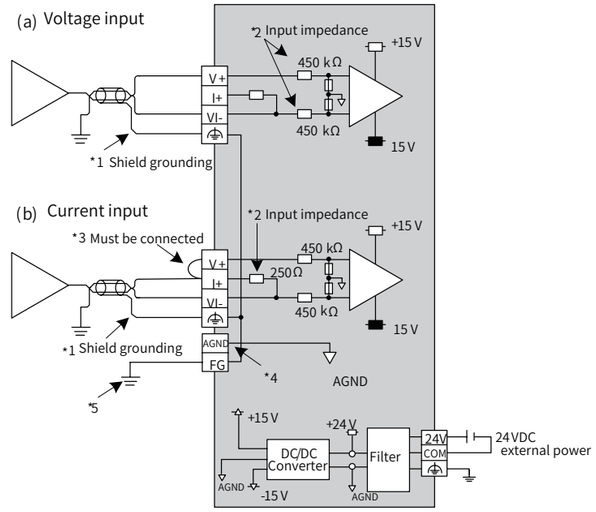

Figure 7 Module output wiring

*1 Use 2- core twisted pair shielded cable for analog signal.

*2 Indicates input impedance of 4AD.

*3 For current input, terminal (V+) must be connected to terminal (I+).

*4 When the input signal is a differential signal, "AGND" can be connected to analog ground of compatible devices to eliminate the difference of common mode voltage between devices and ensure the accuracy of module sampling.

*5 Mount the module on a grounded metal bracket, ensuring the bottom metal spring maintains firm contact.

■ Wiring precautions

1) Do not bundle the cable together with AC cable, main lines, or high voltage cables, otherwise it may increase noise, power surges and inductive interference.
2) Implement single-point grounding for shielded cables and the shielding layers of soldered connections.

Non-welded crimp terminals with sleeves are prohibited for terminal blocks. Use marking sleeve or insulation sleeve to cover the crimped terminal ends of cables.