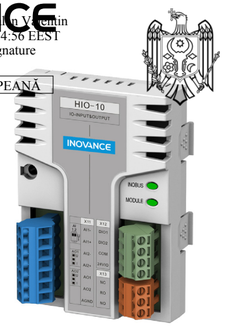


HIO-10 I/O Function Module

User Guide

19012609A00

1. Overview

Thank you for purchasing the HIO-10 input/output function module.

The HIO-10 I/O function module is used to expand the input/output interface of the HCU control module, including digital input/output, analog input/output, and relay output.

Before using this product, read through this user guide to fully understand features of the product and ensure safe use. This guide describes product information, installation, electrical connection, and module configuration for you reference.

■ Features

1) Supporting voltage/current type analog input detection: AI1, AI2
2) Supporting voltage/current type analog output: AO1, AO2
3) Supporting configurable digital input/output: DIO1, DIO2, and relay output
4) Providing power supply for DIO: 24 VDC±10%, 150 mA
5) Flexible filter time of AI and DI to improve the detection stability of the module
6) Powered by the HCU control module directly without the need for an external power supply

■ Access to documents

This user guide is delivered with the product.

2 Product Information

■ Nameplate and Model

HIO - 10

Code	Product Series
HIO	I/O function module

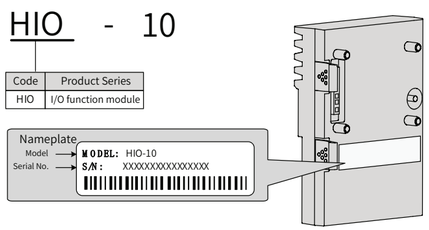


Figure 1 Nameplate and model

■ Specifications

Table 1 Specifications

Item	Description
Ambient temperature	-10° C to +55° C
Storage temperature	-40° C to +70° C
Ambient humidity	5% to 95% RH (without condensation)
Operating environment	No corrosive gases
Mounting method	Snap-fit joint+Screw
IP rating	IP20
Cooling method	Natural ventilation

■ Description

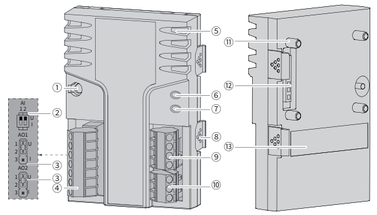


Figure 2 Components

Table 2 Description

No.	Name	Remarks
①	Fixing screw hole	Used to fix the HCU control module to keep the PE connected properly.
②	Analog input mode selection	2-bit DIP switch for switching between voltage and current input modes
③	Analog output mode selection	3-pin jumper for switching between voltage and current output modes
④	X11 - Analog input/output terminal	7-pin pluggable blue terminal for switching between analog input and output modes
⑤	Heat dissipation hole	Used for heat dissipation.
⑥	INOBUS indicator	Steady green: Communicating with the HCU control module normally
		Steady red: Failed to communicate with HCU control module
		Steady orange: In the process of establishing communication with HCU control module
⑦	MODULE indicator	Flashing red: Module operating properly
		Steady red/Off: Module error
⑧	Snap-fit joint	Two snap-fit joints that used to guide and fix the HIO-10 module during installation
⑨	X12 - DI/DO terminal	4-pin pluggable green terminal for switching between digital input and output modes
⑩	X13 - Relay output terminal	3-pin pluggable orange terminal for relay output
⑪	Guide post	Four guide posts that used to locate the HIO-10 module relative to HCU control module for easy installation
⑫	Slot terminal	Used for electrical connection between HIO-10 module and HCU control module.
⑬	Nameplate	Contains the model and serial number of the HIO-10 module.

■ Terminal specifications

Table 3 Terminal specifications

Terminal	Remarks
AI/AO terminal (X11)	
AI1-, AI1+, AI2-, AI2+	Input voltage signal: -10 V to +10 V, 0 to 10 V
	Input current signal: -20 mA to +20 mA, 0 mA to 20 mA, and 4 mA to 20 mA
	Common mode voltage range: ±20 V
	Analog-to-Digital conversion resolution: 12 bits
	Accuracy: 1% (full range)
AO1, AO2	Current output: 0–20 mA, R_{load} < 500 Ω
	Voltage output: 0–10 V, R_{load} > 500 Ω
	Digital-to-Analog conversion resolution: 12 bits
	Accuracy: 1% (full range)

Terminal	Remarks	
AGND	Analog reference ground	
DI/DO terminals (X12)		
DIO1, DIO2	DI	Voltage range: 0–30 V
		"0" < 5 V, "1" > 15 V, compliant with IEC 61131-2
		Input direction: Unidirectional input
		DI input impedance: 3 kΩ
	DO	Voltage range: 0–30 V (external power supply required when greater than 24 V)
		Output mode: OD (open-drain)
		Load current: 0–50 mA
24VIO	Power supply, 24 VDC±10% 150 mA (max.)	
COM	Digital reference ground	
Relay output terminal (X13)		
NC,RO,NO	24 VDC power supply, single pole double throw (SPDT)	
	Contact parameters: 250 VAC, 3 A resistive load 30 VDC, 3 A resistive load	

3 Installation Instructions

■ Installation precautions

CAUTION

- Ensure that HIO-10 module is de-energized during installation or disassembly to prevent damage to the HIO-10 module or HCU control module caused by live plugging.
- Protect the HIO-10 module from falling or shock to avoid damage to the module.
- Do not disassemble the HIO-10 module. Otherwise, the module may be damaged.
- Tighten the screws according to the required tightening torque to avoid damage or loose connection.

■ Tightening torque for screws and screw fasteners

Tighten the screws with the following tightening torque.

Table 4 Mechanical connection

Screw	Tightening torque
M3	1.2 N·m

Table 5 Electrical connection

Screw	Tightening torque
M3	0.55 N·m

■ Dimensions

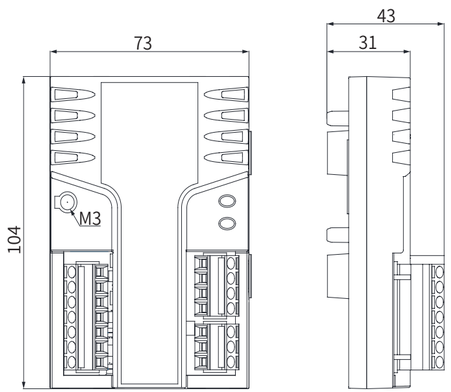
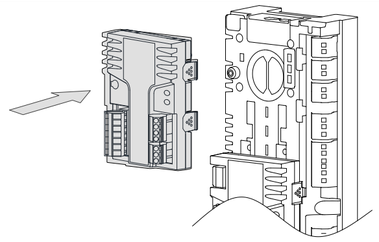


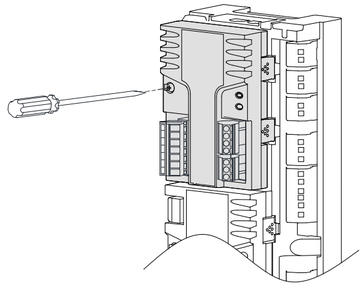
Figure 3 Product dimensions (mm)

■ Installation procedure

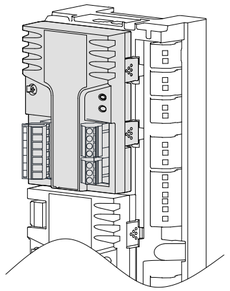
Step 1: Place the HIO-10 module in any of the three slots of the HCU control module.



Step 2: First locate the HIO-10 module through the four guide posts, and then press the two snap-fit joints into the card slot, and tighten the grounding screw of the electronic device of the function module with a screwdriver.



Step 3: The installation is done.



NOTE

- To meet EMC requirements and guarantee reliable operation of the module, tighten the screws to ensure reliable grounding.
- The HIO-10 module and the HCU control module are electrically connected through slots. Ensure that they are installed in place and electrically connected effectively.

■ Disassembly procedure

Observe the preceding procedure, but in the reverse order.

Step 1: Remove the grounding screw of the HIO-10 module with a screwdriver.

Step 2: Press the two snap-fit joints on the right side of HIO-10 module and then pull it out.

Step 3: Keep the module removed in a proper place.

4 Electrical Connection

■ Preparation

Before installing the HIO-10 module and connecting cables, power off the cabinet equipment, including the auxiliary power supply.

Tool preparation: Straight screwdriver, wire stripper, and wire cutter

Material preparation: Proper shielded cables and crimping pins

■ AI signal

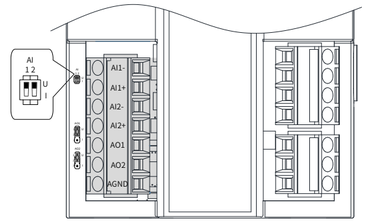


Figure 4 Position of the analog input DIP switch

1) Assignment

Table 5 Description of X11 analog input

X11	Assignment	Remarks
X11-7	AI1-	AI1 differential input (-)
X11-6	AI1+	AI1 differential input (+)
X11-5	AI2-	AI2 differential input (-)
X11-4	AI2+	AI2 differential input (+)

2) DIP switch selection

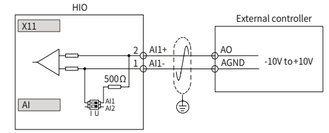
Table 6 Instructions for use of the DIP switch

DIP switch	Description	Channel	Remarks
AI 1 2 U I	AI1/AI2 current or voltage signal input selection	1	U: AI1 voltage signal input (default state)
			I: AI1 current signal input
		2	U: AI2 voltage signal input (default state)
			I: AI2 current signal input

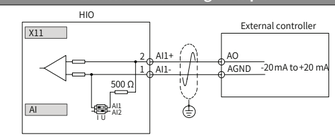
3) Wiring description

Table 7 Analog input wiring

External voltage signal input



External current signal input



4) Wiring requirements and precautions

Table 8 AI terminal cable requirements

Terminal	Name	Terminal specifications	Cable specifications
1	AI1-	7-pin blue pluggable terminal with 5.0 mm clearance	Cross-sectional area: 0.5 mm^2 to 2.5 mm^2 Use two dual-conductor shielded twisted pairs when using two AIs.
2	AI1+		
3	AI2-		
4	AI2+		

CAUTION

- The DIP switch must be consistent with the external analog input signal type (current or voltage).
- The input range cannot be exceeded (voltage range: -10 V to +10 V; current range: -20 mA to +20 mA).
- Note that the colors of the terminal connector and terminal block are consistent.

■ Connection of analog output signals

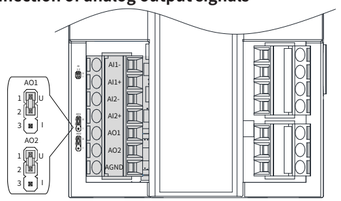


Figure 5 Position of the analog output jumper

1) Assignment

Table 9 Description of X11 analog output

X11	Assignment	Remarks
X11-3	AO1	Analog output 1
X11-2	AO2	Analog output 2
X11-1	AGND	Analog reference ground

2) Jumper selection

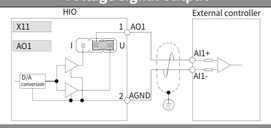
Table 10 Instructions for use of jumpers

Jumper switch	Function	Position
AO1	AO1 current/ voltage signal output selection	AO1 1 2 3 U I — Voltage signal output applies when 1 and 2 are shorted (default).
		AO1 1 2 3 U I — Current signal output applies when 2 and 3 shorted.
AO2	AO2 current/ voltage signal output selection	AO2 1 2 3 U I — Voltage signal output applies when 1 and 2 are shorted (default).
		AO1 1 2 3 U I — Current signal output applies when 2 and 3 shorted.

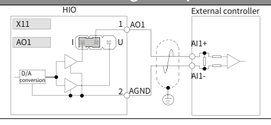
3) Wiring description

Table 11 Description of analog output wiring

Voltage signal output



Current signal output



4) Wiring requirements and precautions

Table 12 AO terminal cable requirements

Terminal	Name	Terminal specifications	Cable specifications
1	AO1	7-pin blue pluggable terminal with 5.0 mm clearance	Cross-sectional area: 0.5 mm² to 2.5 mm² Use two dual-conductor shielded twisted pairs when using two AOs.
2	AGND		
3	AO2		
4	AGND		

CAUTION

- Ensure that the shield is grounded at the nearest single end on the HCU side.
- The jumper selection output signal (current or voltage) must be consistent with the input mode of the user interface.
- Note that the colors of the terminal connector and terminal block are consistent.

■ Connection of DI/DO signals

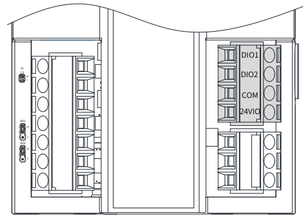


Figure 6 Position of digital input/output signals

1) Assignment

Table 13 Description of X12 digital input/output

X12	Assignment	Remarks
X12-1	DIO1	Digital input/output 1
X12-2	DIO2	Digital input/output 2
X12-3	COM	Digital reference ground
X12-4	24VIO	24 V power supply

NOTE

◆ The digital output and input share a common terminal. You need to configure corresponding parameters during use.

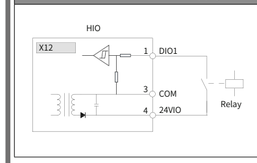
2) Wiring description

When used as DI:

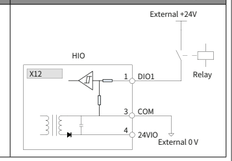
① Relay passive contact interface mode

Table 14 Principle of DI relay passive contact interface

Use the internal 24 VIO power supply of HIO



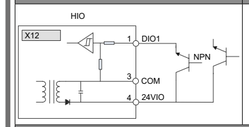
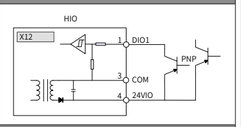
Use an external power supply



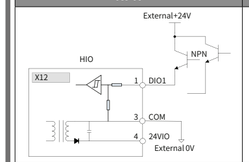
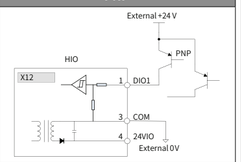
② Common emitter and common collector interface mode

Table 15 Principle of digital input common emitter and common collector interface

Use the internal 24 VIO power supply of HIO

NPN	PNP
	

Use an external power supply

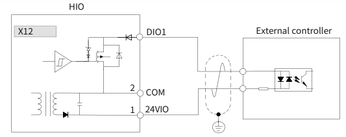
NPN	PNP
	

When used as DO:

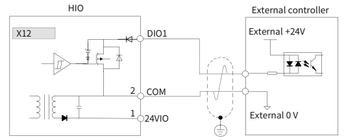
The DO is used to transmit digital signals. It is generally used to provide input signals to DI terminals of other devices. The DO output is MOSFET open drain output, with the source connected to COM. You can use 24 VIO to power the DI of the external controller. If you use an external power supply, the external power supply ground must be connected to COM.

Table 16 Principle of digital output interface

Use the internal 24 VIO power supply of HIO



Use an external power supply



3) Wiring requirements and precautions

Table 17 DIO cable requirements

No.	Name	Terminal specifications	Cable specifications
1	DIO1	4-pin green pluggable terminal with 5.0 mm clearance	Cross-sectional area: 0.5 mm² to 2.5 mm² Use two dual-conductor shielded twisted pairs when using two DIOs.
2	DIO2		

CAUTION

- When used as a DO, the DO is MOSFET open drain output, with the source connected to COM. If an external power supply is used, note that the external power ground must be shorted to COM.
- It is recommended to use shielded twisted pair cables for DIOs. However, if the cable is shorter than 3 m without strong electromagnetic interference, you can also select a regular shielded cable.
- When using the internal 24 VD power supply, pay attention to its maximum load carrying capacity (150 mA).
- The DOs and DIs share the same terminal. You need to configure corresponding parameters when using this terminal.

■ Connection of relay output signals

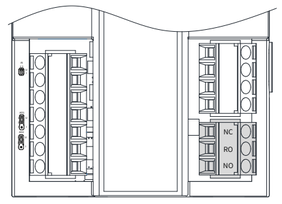


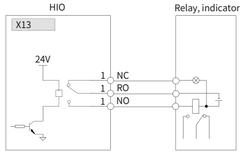
Figure 7 Relay output signal position

1) Assignment

Table 18 Description of relay terminal X13

X13	Assignment	Remarks
X13-1	NC	NC contact
X13-2	RO	Common point
X13-3	NO	NO contact

2) Wiring description



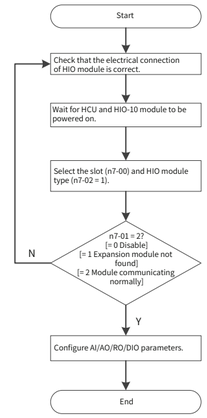
3) Wiring requirements

Table 19 Relay terminal cable requirements

Terminal	Name	Terminal specifications	Technical data
1	NC	3-pin orange pluggable terminal with 5.0 mm clearance	Single-conductor cable Cross-sectional area: 0.5 mm² to 2.5 mm²
2	RO		
3	NO		

5 Parameter setting

The following figure shows the configuration flow of I/O module 1.



Parameter configuration of HIO-10 module:

1) Groups n7 (n8, n9) are used to enable the HIO-10 module and display status.
2) Groups n23 (n26, n29) are used to configure AI, AO, DIO, and RO.

Table 20 Parameters of the HIO-10 module

No.	Parameter	Description
1	n7-00 (n8-00 and n9-00)	Used to set the HIO module slot position.
2	n7-02 (n8-02 and n9-02)	Set HIO module type to 1 (HIO-10 module).
3	n7-01 (n8-01 and n9-01)	Displays the HIO module online state.
4	n7-10 (n8-10 and n9-10)	Displays DIO module configuration state.
5	n7-11 to n7-14 (n8-11 to n8-14, and n9-11 to n9-14)	Displays the input and output states of DI, DIO, and RO.
6	n7-15 (n8-15 and n9-15)	Displays the AI input state, including AI disconnection and AI out-of-range.
7	n7-20 to n7-25 (n8-20 to n8-25, and n9-20 to n9-25)	Displays the AI input value and AI input proportion.
8	n7-30 to n7-35 (n8-30 to n8-35, and n9-30 to n9-35)	Displays the AO output ratio and the actual AO output value.
9	n23-00 (n26-00 and n29-00)	Used to set the DI/DIO input filter time.
10	n23-09 to n23-15 (n26-09 to n26-15, n29-09 to 29-15)	Used to set the DIO positive/negative logic, ON time, OFF time, and signal source.
11	n23-20 to n23-23 (n26-20 to n26-23, n29-20 to 29-23)	Used to set the RO positive/negative logic, ON time, OFF time, and signal source.
12	n23-35 to n23-37 (n26-35 to n26-37, n29-35 to 29-37)	Used to set the action when AI is lower than the minimum input value, enable AI open circuit monitoring, and set zero-crossing threshold of AI.
13	n23-40 to n23-59 (n26-40 to n26-59, n29-40 to 29-59)	Used to enable AI, set the AI type[Note], AI curve parameters, AI filter time, AI denoising threshold, and AI open circuit monitoring threshold, AI open circuit monitoring delay.
14	n23-70 to n23-85 (n26-70 to n26-85, n29-70 to 29-85)	Used to set the AO signal source, AO type[Note], and AO curve parameters.

NOTE

- Note: The parameter selection of AI type (AO type) must match the hardware DIP (jumper).
- For other parameter setting of the HIO-10 module, see the MD880-50 Series Inverter Software Guide.

INOVANCE Warranty Agreement

1) Inovance provides an 18-month free warranty (subject to information indicated by the barcode on the equipment) to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.
2) Within the warranty period, maintenance will be charged for the following damage:
   A. Equipment damage caused by improper use or unauthorized repair or retrofit
   B. Equipment damage caused by fire, flood, abnormal voltage, other disasters and secondary disasters
   C. Hardware damage caused by falling or transportation
   D. Equipment damage caused by operations not following the user guide
   E. Faults and damage caused by external factors other than the equipment itself
3) If the equipment is faulty or damaged, fill in the Warranty Card correctly.
4) Maintenance is charged according to the latest Maintenance Price List of Inovance.
5) The Product Warranty Card is not re-issued. Keep the card and present it to the maintenance personnel during maintenance.
6) For any question during service, contact Inovance agent or Inovance.
7) This agreement shall be interpreted by Inovance.

INOVANCE Product Warranty Card

Customer Information	Company address:	
	Company name:	Contact:
	P.C.:	Tel.:
Product information	Product model:	
	Product barcode (attached here):	
	Agent name:	
Description	Fault details Recorded by:	

Suzhou Inovance Technology Co., Ltd.
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Tel: (0512) 6637 6666 Fax: (0512) 6285 6720
Website: http://www.inovance.com

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