

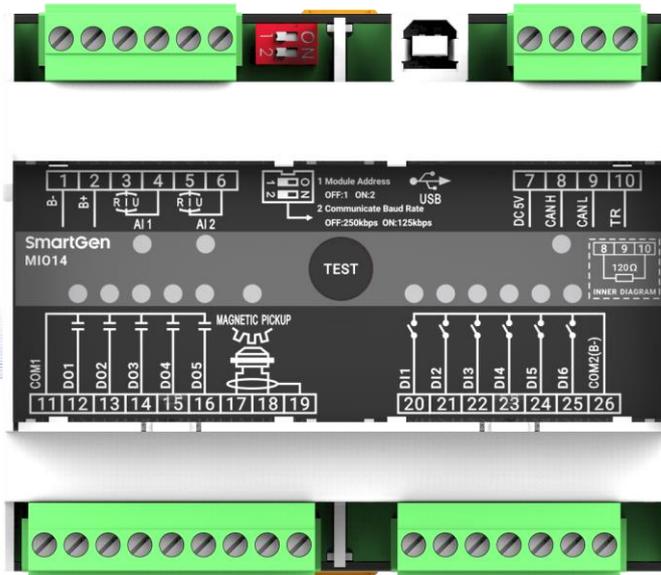
SmartGen

MAKING CONTROL SMARTER

MI014

INTEGRATED EXPANSION MODULE

USER MANUAL



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Table 1 – Software Version

Date	Version	Notes
2024-02-28	1.0	Original release.

Table 2 – Notation Clarification

Symbol	Instruction
 NOTE	Highlights an essential element of a procedure to ensure correctness.
 CAUTION	Indicates a procedure or practice, which, if not strictly observed, could result in damage or destruction of equipment.
 WARNING	Indicates a procedure or practice, which could result in injury to personnel or loss of life if not followed correctly.

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1 OVERVIEW

MI014 Integrated Expansion Module is an integrated input/output module, which can connect with master controller HMC9100A/HMC9100S via CANBUS and all the parameters and data can be viewed through master controller. It applies to marine main propulsion units, main generator units, emergency units or pumping units.

2 PERFORMANCE AND CHARACTERISTICS

Its main characteristics are as follows:

- 1 speed sensor can accurately collect speed;
- 6 digital inputs, the specific functions can be set by mater control;
- 5 relay outputs, Aux. output 1~5, the specific functions can be set by mater control;
- 2 analog sensor inputs, the input signals of resistance-type, voltage-type and current-type are optional;
- Modular design, compact structure, small volume and easy to use.

Table 3 – Performance Parameters

Item	Content
Working Voltage	DC18.0V~DC 35.0V
Overall Consumption	≤2.5W
Speed Sensor	Voltage Range: 1.0V ~ 24V (RMS)
	Frequency Range: 5Hz ~ 10000Hz
Analog Sensor 1~2	Resistance Input Range: 0Ω ~ 6000Ω Resolution: 0.1Ω Accuracy: 1Ω (below 300Ω)
	Voltage Input Range: 0V ~ 5V Resolution: 0.01V Accuracy: 1%
	Current Input Range: 0mA ~ 20mA Resolution: 0.01mA Accuracy: 1%
Aux. Relay Output 1	7A Volts free, connect to COM
Aux. Relay Output 2	16A Volts free, connect to COM
Aux. Relay Output 3	7A Volts free, connect to COM
Aux. Relay Output 4	7A Volts free, connect to COM
Aux. Relay Output 5	7A Volts free, connect to COM
CAN Interface	Isolation, max communication distance 250m, using Belden 9841 cable or equivalent
Vibration	5Hz~8Hz: ±7.5mm
	8Hz~500Hz: a ±2g
	IEC 60068-2-6
Shock	50g, 11ms, half-sine, complete shock test from three mutually perpendicular directions, totally 18 times IEC 60068-2-27
Bump	20g, 16ms, half-sine IEC 60255-21-2
Case Dimension	107.6mm x 93.0mm x 60.7mm
Working Temp.	(-25~+70)°C
Working Humidity	(20~93)%RH
Storage Temp.	(-30~+80)°C
Insulation Strength	Apply AC2.2kV voltage between high voltage terminal and low voltage terminal and the leakage current is not more than 3mA within 1min.
Weight	0.27kg

4 WORKING PROCESS

MIO14 integrated expansion module communicates with master controller via CANBUS, the master controller issues the control command to MIO14 module through CANBUS, MIO14 module controls relay output, input type selection of analog input port when it receives the command. MIO14 module uploads the status and data of digital input port, analog input port and speed to the master controller.

5 PANEL INSTURCTIONS

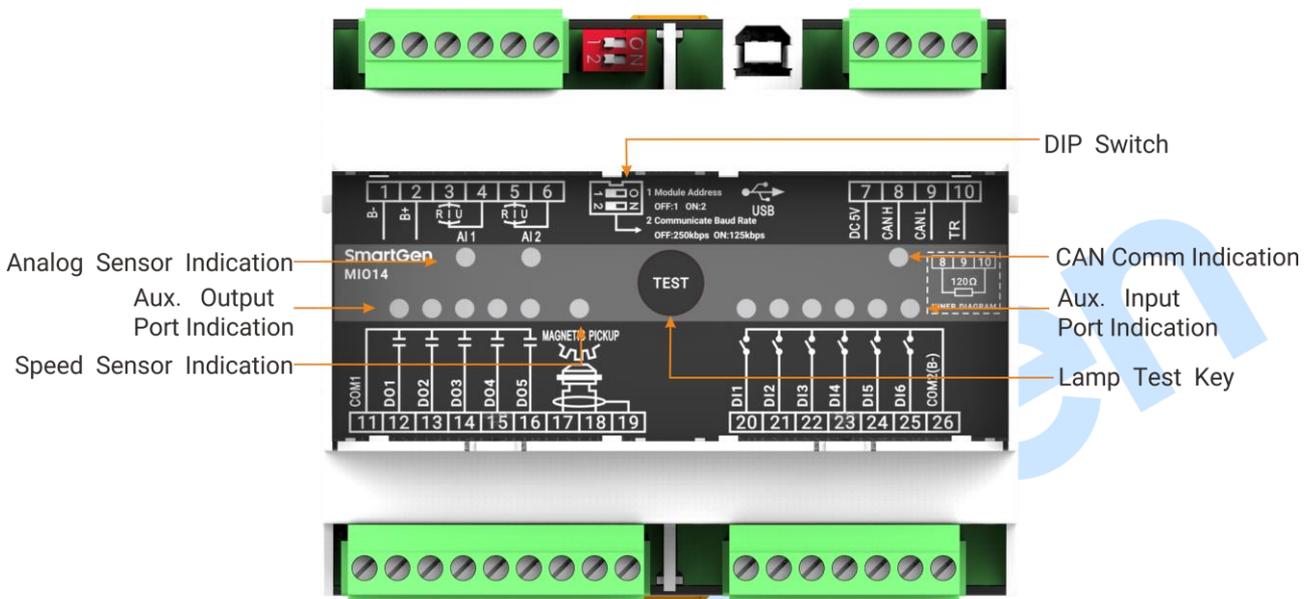


Fig.1 – MIO14 Panel Indication

NOTE: Indicators descriptions.

NOTE1: Analog sensor indicator: always illuminated when sensor connection is normal, flashes when it is abnormal;

NOTE2: Aux. output port indicator: always illuminated when there is output, extinguished when there is no output;

NOTE3: Speed sensor indicator: always illuminated when speed sensor connection is normal, flashes when it is abnormal;

NOTE4: CAN communication indicator: flashes during data interaction, otherwise, it is extinguished;

NOTE5: Aux. input indicator: always illuminated when there is input, otherwise, it is extinguished;

6 WARNING

When the module detects the warning signal, it will send a warning alarm and the corresponding LED flashes.

Table 4 – Warnings

No.	Type	Range	Description
1	Sensor 1 Open	Always be Active	When there is sensor alarm, the corresponding LED flashes.
2	Sensor 2 Open		
3	Speed Sensor Broken Wire		When MIO14 module detects the fault of speed sensor broken wire, the corresponding indicator flashes.

7 TESTING MODE

Hold and press  for 3s to enter the testing mode, which is used to test whether the relay output and indicator are normal. Hold and press  for 3s to enter the testing mode, at the same time , other indicators unrelated to the relay output are illuminated, DO1 relay outputs and its indicator is illuminated. In the testing mode, when pressing  for each time, there is a relay output and its indicator is illuminated, when relay output is finished (only one relay output and its indicator is illuminated), the module exits the testing mode. When the module is in testing mode and without pressing the key for about 20s, the module will exit the testing mode automatically.

▲NOTE: No permission to make the module enter the testing mode when it is in normal operating, i.e. when closing input is active.

8 WIRING CONNECTION

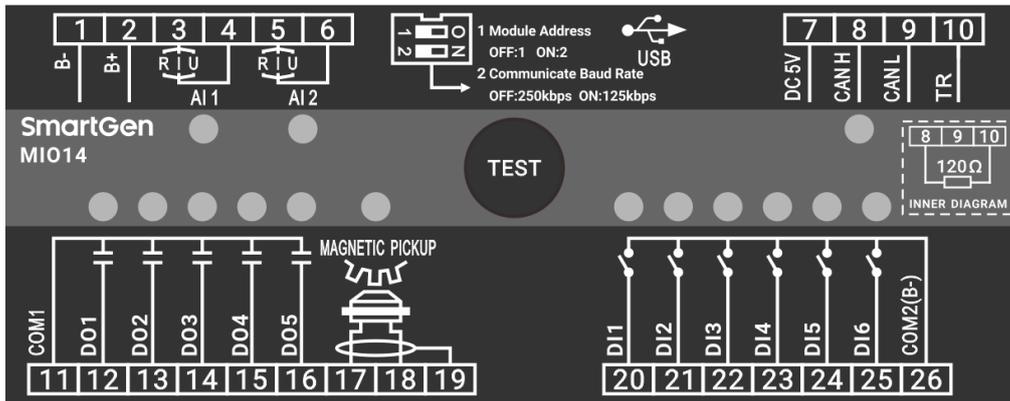


Fig.2 – Terminal Description Drawing

Table 5 – Terminal Connection

No.	Function	Cable Size	Description
1	B-	2.5mm ²	DC power supply negative input.
2	B+	2.5mm ²	DC power supply positive input.
3	AI 1 Input	1.0mm ²	Sensor 1 input, the resistance type, voltage type and current type are optional.
4	AI 1 COM	1.0mm ²	It is sensor GND port, when sensor 1 is resistance type or voltage type, it is sensor common port input. When sensor 1 is current type, it is not used.
5	AI 2 Input	1.0mm ²	Sensor 2 input, the resistance type, voltage type and current type are optional.
6	AI 2 COM	1.0mm ²	It is sensor GND port, when sensor 2 is resistance type or voltage type, it is sensor common port input. When sensor 1 is current type, it is not used.
7	DC 5V	1.0mm ²	The power supply port of voltage type sensor and outputs 5V.
8	CAN(H)	0.5mm ²	Connect to the expansion CANBUS interface of master controller. Impedance-120Ω shielded wire is recommended. CANH' internal connects to 120Ω, and after external CANL and TR are short connected, 120Ω resistance can be added between CANH and CANHL.
9	CAN(L)	0.5mm ²	
10	TR	0.5mm ²	
11	COM1	2.5mm ²	Common port of output.
12	DO1	1.5mm ²	It can be configured by users; output after it is energized.
13	DO2	2.5mm ²	It can be configured by users; output after it is energized.
14	DO3	1.5mm ²	It can be configured by users; output after it is energized.
15	DO4	1.5mm ²	It can be configured by users; output after it is energized.
16	DO5	1.5mm ²	It can be configured by users; output after it is energized.
17	MAGNETIC	1.0mm ²	Speed sensor input with break wire detection function.
18	PICKUP	1.0mm ²	
19	Speed Sensor GND Shielded	1.0mm ²	

No.	Function	Cable Size	Description
20	DI1	1.0mm ²	Input port, active when connected to common port of input port (COM2(-)).
21	DI2	1.0mm ²	Input port, active when connected to common port of input port (COM2(-)).
22	DI3	1.0mm ²	Input port, active when connected to common port of input port (COM2(-)).
23	DI4	1.0mm ²	Input port, active when connected to common port of input port (COM2(-)).
24	DI5	1.0mm ²	Input port, active when connected to common port of input port (COM2(-)).
25	DI6	1.0mm ²	Input port, active when connected to common port of input port (COM2(-)).
26	COM2(-)	1.0mm ²	Common port of input port.
	TEST		Lamp test.
	SWITCH		Module Address: It is Address 1 when the switch 1 is connected to 12, while Address 2 when connected to ON position. Baud rate selection: It is 250kbps when the switch 2 is connected to 12, while 125kbps when connected to ON position.
<p>NOTE: When the communication between CAN and master controller, the CAN communication indicator flashes, otherwise, the indicator is extinguished.</p>			

Cable Size Requirements: Power supply B+, B-, 2.5mm²;

Digital Input, analog input, 1.0mm²;

The current of output port according to the relay output: 10-16A (2.5mm²), 5-10A (1.5mm²) , below 5A (1.0mm²);

CAN communication wire: 0.5 mm².

9 TYPICAL APPLICATION DIAGRAM

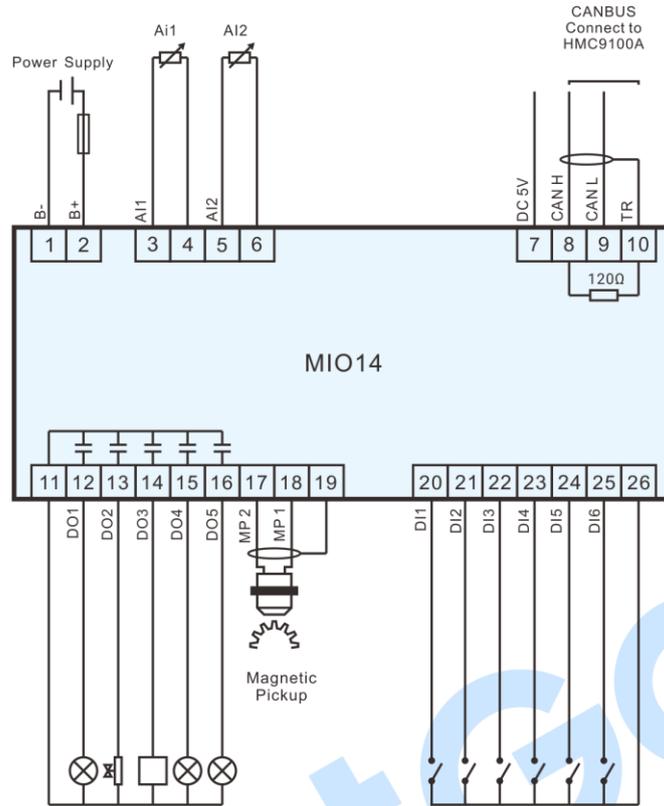


Fig.3 – Resistance-type Sensor

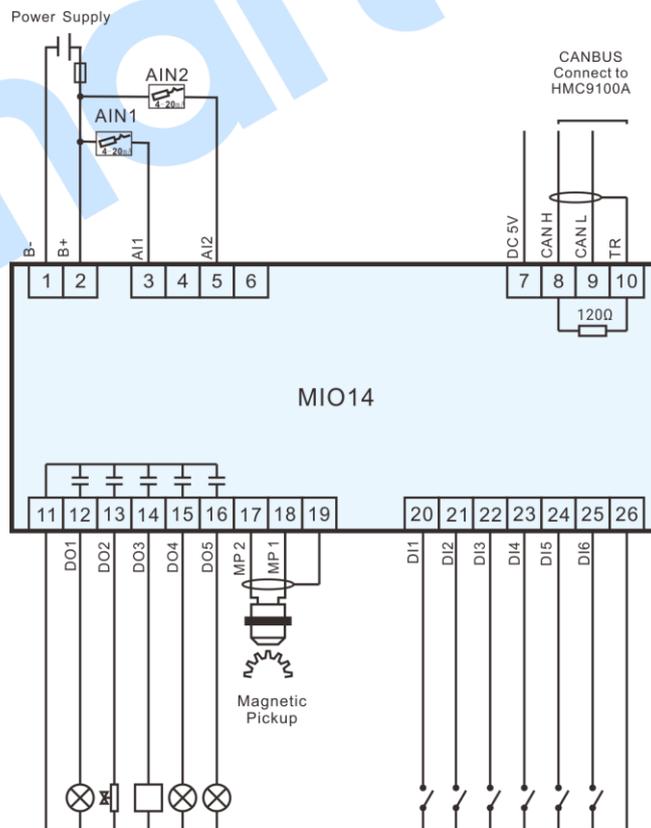


Fig.4 – Current-type Sensor

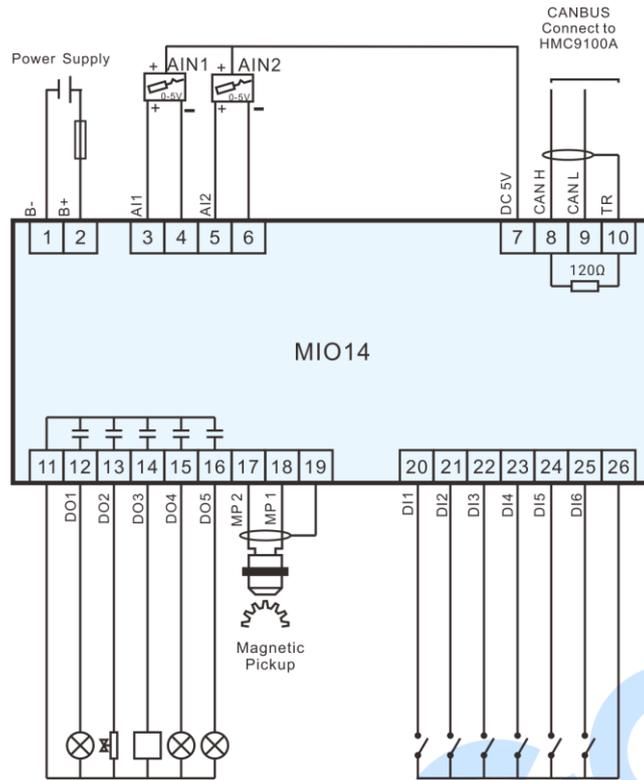


Fig.5 – Voltage-type Sensor

10 CASE DIMENSIONS

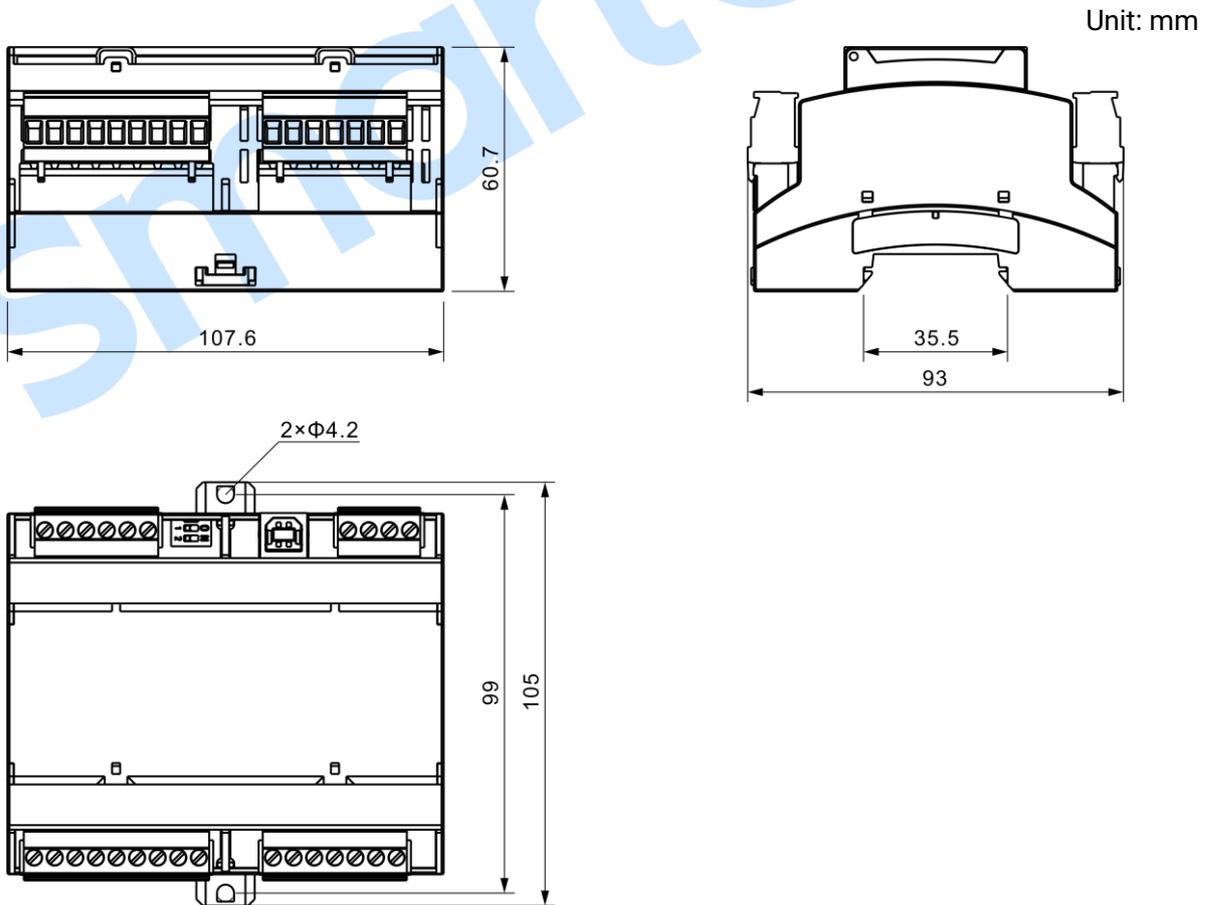


Fig.6 – Overall Dimensions

Table 6 – Troubleshooting

Fault Symptoms	Possible Solutions
Controller no response when power on	Check starting battery; Check controller wirings.
Sensor data incorrect	Check if sensor wirings are correct and the input sensor type is consistent with selected;
CANBUS communication failure	Check if CANBUS wirings are connected correctly; Check if 120Ω resistor is connected; Check if the baud rate of the DIP switch is correct.

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