

## MIO12 Intelligent Modbus Input/Output Modules

MIO12 are Modbus Input/Output modules designed for a generic use with most of the Modbus masters and with a large number of BMS systems.

The Modbus RTU communication designed as a part of the module conforms to standard messaging and is easy to set up. No complicated calculations are required in the Modbus masters.

The inputs are configurable via built-in LCD menu to operate as digital or analogue inputs (PT1000 or 0..10Vdc depending on the model).

The triac outputs can be configured to operate as on/off outputs or the outputs can operate as thermic actuator or 3-point actuator control mode making the integration of any type of actuator easy to the BMS system. The MIO provides settings for the actuator running time and the type. The Modbus master can send a 0..100% control message to drive the 3-point and/or thermic actuators automatically to the required position.

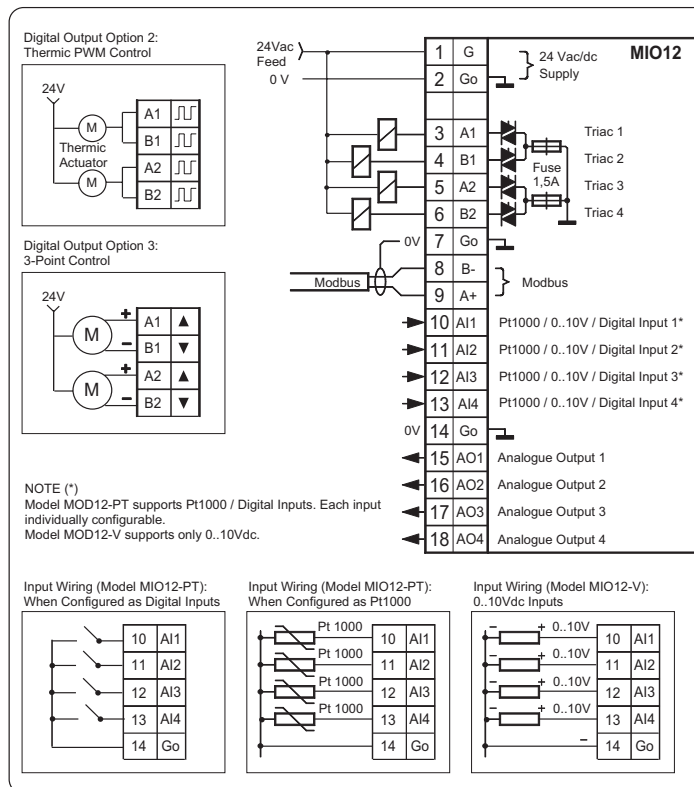
The unit is DIN-rail mounted and has compact dimensions.



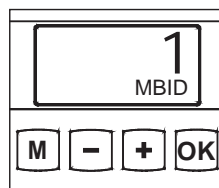
Model Types	Model	Description
	<b>MIO12-PT</b>	Modbus IO-Module with 4UI/4AO/4DO (4 x PT1000/DI, 4 x 0..10Vdc, 4 24Vac Triacs)
	<b>MIO12-V</b>	Modbus IO-Module with 4AI/4AO/4DO (4 x 0..10Vdc, 4 x 0..10Vdc, 4 24Vac Triacs)
<b>Technical Data</b>	Power supply	24Vac/dc (20...26V),
	Inputs	MIO12-PT            4 x Pt1000 Temperature or Volt-Free (individually configurable) MIO12-V            4 x AI 0..10Vdc
	Outputs	4 x 0..10Vdc 4 x 24Vac Triacs, 1A maximum Triacs configurable as on/off output, 3-point control or thermic actuator control modes
	Communications	RS-485 Modbus RTU, 9600/19200/38400 bps, 8 data bits, Parity None, 1 Stop Bit (Up to 128 devices per segment)
	Display	LCD Display, Automatically Rotating Display for the User Access to all configuration parameters
	Buttons	4 Touch Buttons for the Programming and User Configuration
	Wiring Terminals	1.5 mm <sup>2</sup>
	Operating Humidity	0..95% rH
	Protection Class	IP20
	CE Approval	Directive 2004/108/EY EN61000-6-3: 2001 (Emissions) EN61000-6-2: 2001 (Immunity)
	Mounting	DIN-rail Mounting
	Overall size	53W x 90H x 58D mm

**CONNECTION DIAGRAM**

**WARNING:**The electrical installation, device connection and commissioning can only be carried out by qualified professionals and according to the local wiring regulations!



**USER DISPLAY**



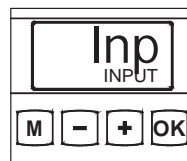
- M 'PROGRAM' Key
- '+' and '-' Keys
- OK 'OK' Key

MIO12 IO-module auto-rotates on its display the Modbus baudrate and the Modbus address.

The IO-module has four (4) touchsensitive buttons for the user interaction (see figure).

**PROGRAMMING MODE**

To enter programming mode, press the following



The 'INPUT' menu selection is displayed on the screen.

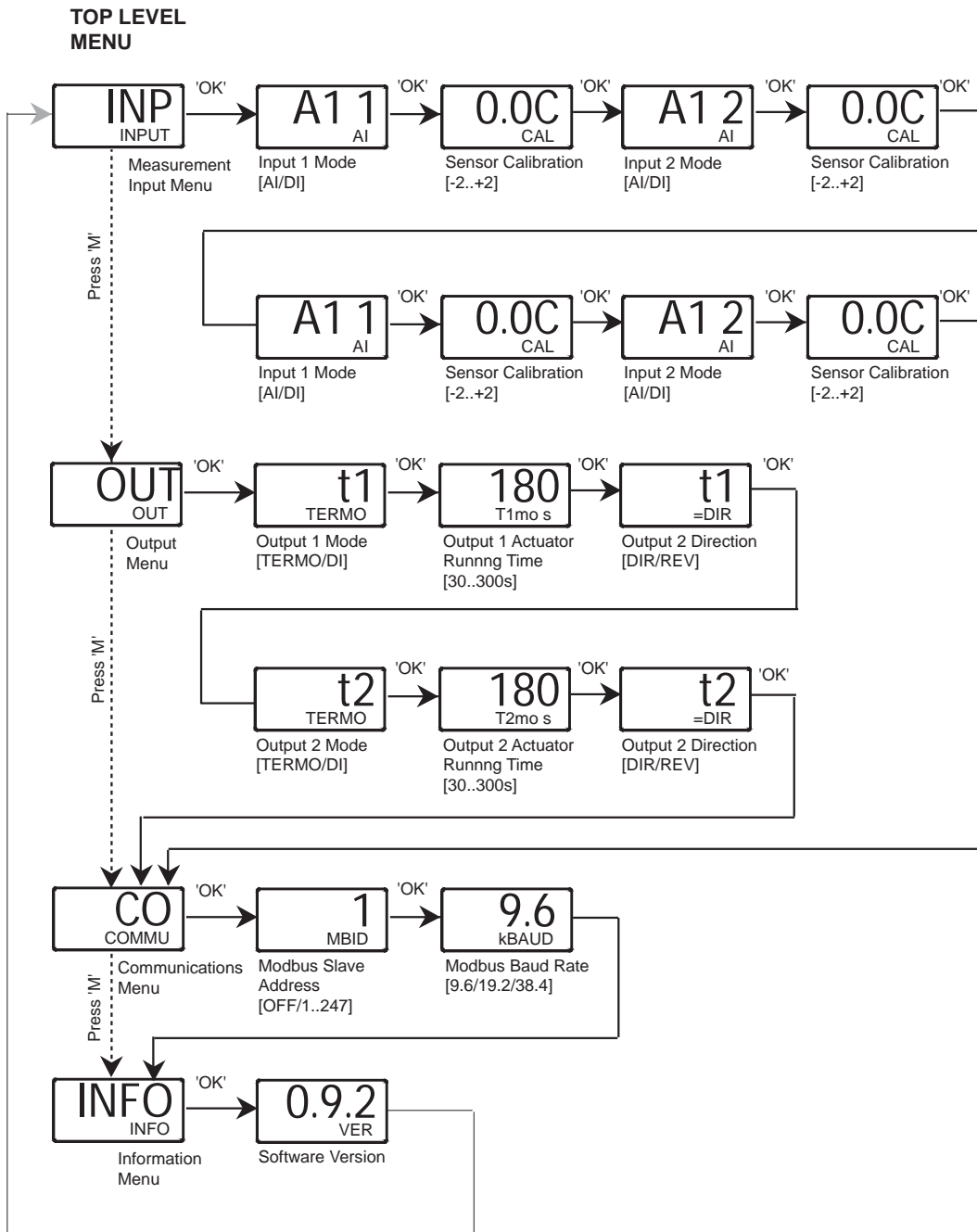
Press 'OK' to enter to 'INPUT' (Measurement Input) menu.

The Modbus settings, input type configuration and the digital output configuration is done in the Programming mode.

To enter programming mode press the following keys '+', 'OK', 'OK' and 'M'.

After programming it is possible to exit the programming mode by pressing 'M' for 10 seconds. If no keys are pressed the device returns to normal display after 60 seconds.

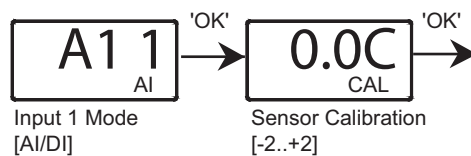
**MENU STRUCTURE**



**INPUT MODE SELECTION (MIO12-PT)**

Each analogue input on the MIO12-PT can be configured to operate as a temperature input (PT1000) or as a digital volt-free input.

MIO12-PT: Set analogue input mode to AI to measure Pt1000 Sensors



NOTE: MIO12-V model operates only as 0..10V input mode.

**OUTPUT MODE SELECTION**

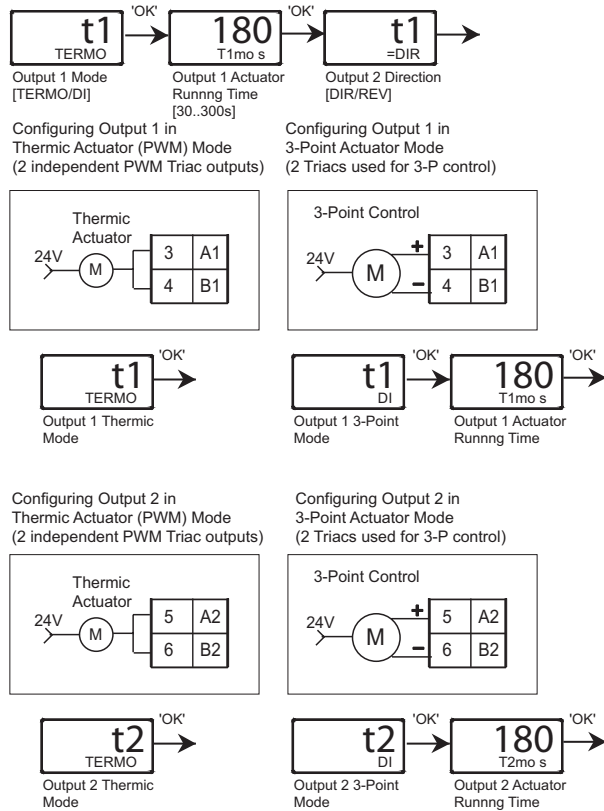
MIO12 has 4 triac outputs can can be configured as:-

- 4 x digital on/off outputs
- 2 x 3-point actuator control points (individually configurable)
- 4 x Thermic (PWM) actuator control points (individually configurable)

If configured as 3-point or Thermic actuator control mode, this uses 2 of the triacs. E.g. if 3-P/THERMIC actuator output 1 is used in this way both triacs 1 and 2 (terminals 3 and 4) are used to drive the actuator(s).

The second output for the 3-point/Thermic actuators uses triacs 3 and 4 (terminals 5 and 6).

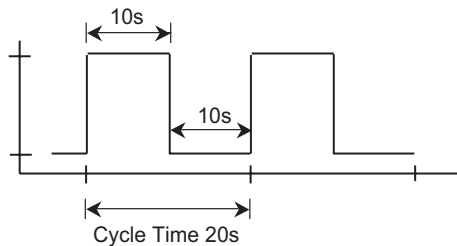
When in thermic mode each triac can be individually driven to the required position via Modbus registers.



**THERMIC ACTUATOR**

Thermic output operates with 20s cycle time. If the demand is 100%, then the output is permanently ON. If the demand is 50% the output is ON 10 seconds and OFF 10 seconds and so on.

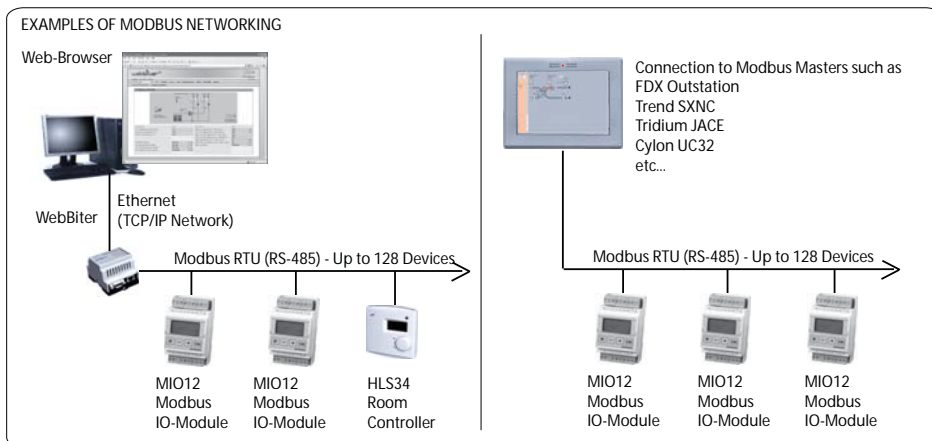
Example: Demand 50%



**NETWORKING INFORMATION**

Up to 128 MIO12 Input/Output Modules can be connected to a single Modbus network segment.

It possible to connect the controllers to an existing BMS (e.g. to TREND BMS) via a Modbus gateway. Please contact SyxthSense for more information. Or the controllers can be connected to the WebBiter embedded web-server that provides BMS front-end capability and access via a standard web-browser.



WebBiter RS-485 Modbus Wiring Details using pre-fabricated NET-CAB485 cable.

NET-CAB485 Cable Colour	Pulse 8 Wiring Terminal	Function
Orange/White	9 (A+)	RS485+
Orange	8 (B-)	RS485-

**MODBUS REGISTERS (MIO Version 0.9.2)**

The MIO12 supports the following Modbus registers and function codes. The default communication speed is 9600 bps, 8 data bits, Parity None and 1 Stop Bit.

Please note that Modbus register space is specified from the Modbus master perspective as in the Modbus Application Protocol specification. The Modbus registers for Function Codes 02, 03, 06 and 16 have presentation for both Modbus "address blocks" and for actual Modbus register offsets. For example, the Pt1000 Temperature 1 (for MIO12-PT) is read from Modbus register 1 using Function Code 04. Some Modbus masters will require Function Code 04, register 1 to be entered, whereas the others will require register 30001 and Function Code 04. The actual message string will always be sent as a stripped register value of 1 but the data entered to the Modbus master depends on the implementation of the master.

Register	Parameter Description	Data Type	Raw Data	Range
<b>COILS READ/WRITE - FUNCTION CODES 01 / 05 / 15</b>				
1	DO1 - manual mode	Bit 0		On - Off
2	DO2 - manual mode	Bit 1		On - Off
3	DO3 - manual mode	Bit 2		On - Off
4	DO4 - manual mode	Bit 3		On - Off
<b>DISCRETE INPUTS READ- FUNCTION CODE 02</b>				
10001	A11 Digital Input (MIO12-PT only)	Bit 0		On - Off
10002	A12 Digital Input (MIO12-PT only)	Bit 1		On - Off
10003	A13 Digital Input (MIO12-PT only)	Bit 2		On - Off
10004	A14 Digital Input (MIO12-PT only)	Bit 3		On - Off
<b>INPUT REGISTERS READ - FUNCTION CODE 04</b>				
30001	A11 Input Value	Signed 16	MIO12-PT: -500..1500 MIO12-AI: 0..1000	MIO12-PT: -50.0..150.0 MIO12-V: 0.0..100
30002	A12 Input Value	Signed 16	MIO12-PT: -500..1500 MIO12-AI: 0..1000	MIO12-PT: -50.0..150.0 MIO12-V: 0.0..100
30003	A13 Input Value	Signed 16	MIO12-PT: -500..1500 MIO12-AI: 0..1000	MIO12-PT: -50.0..150.0 MIO12-V: 0.0..100
30004	A14 Input Value	Signed 16	MIO12-PT: -500..1500 MIO12-AI: 0..1000	MIO12-PT: -50.0..150.0 MIO12-V: 0.0..100

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Register	Parameter Description	Data Type	Raw Data	Range
HOLDING REGISTERS - FUNCTION CODES 03 / 06 / 16				
40001	AO1 Value	Signed 16	0..1000	0..100.0%
40002	AO2 Value	Signed 16	0..1000	0..100.0%
40003	AO3 Value	Signed 16	0..1000	0..100.0%
40004	AO4 Value	Signed 16	0..1000	0..100.0%
40005	3P MOTOR1 VALUE or THERM1 out	Signed 16	0..1000	0..100.0%
40006	THERM2 out	Signed 16	0..1000	0..100.0%
40007	3P MOTOR1 VALUE or THERM3 out	Signed 16	0..1000	0..100.0%
40008	THERM3 out	Signed 16	0..1000	0..100.0%

Note 1. MOD12-PT value outside the limits indicates fault in measurement circuit.