DIO-M-R2

DIN RAIL MOUNTED DIGITAL I/O MODULE

Mounting and operating instructions

Table of contents

SAFETY AND PRECAUTIONS

Read all the information, the datasheet, Modbus register map, mounting and operating instructions and study the wiring and connection diagram before working with the product. For personal and equipment safety, and for optimum product performance, make sure you entirely understand the contents before installing, using, or maintaining this product.

For safety and licensing (CE) reasons, unauthorised conversion and / or modifications of the product are inadmissible.

The product should not be exposed to abnormal conditions, such as: extreme temperatures, direct sunlight or vibrations. Long-term exposure to chemical vapours in high concentration can affect the product performance. Make sure the work environment is as dry as possible; avoid condensation.

All installations shall comply with local health and safety regulations and local electrical standards and approved codes. This product can only be installed by an engineer or a technician who has expert knowledge of the product and safety precautions.

Avoid contacts with energised electrical parts. Always disconnect the power supply before connecting, servicing or repairing the product.

Always verify that you apply appropriate power supply to the product and use appropriate wire size and characteristics. Make sure that all the screws and nuts are well tightened and fuses (if any) are fitted well.

Recycling of equipment and packaging should be taken into consideration and these should be disposed of in accordance with local and national legislation / regulations.

In case there are any questions that are not answered, please contact your technical support or consult a professional.

PRODUCT DESCRIPTION

DIO-M-R2 is an input/output module for Modbus RTU networks featuring 4 digital inputs, 2 relay outputs and Modbus RTU communication. This module makes it possible to control or connect devices without Modbus RTU communication to the Modbus RTU network.

ARTICLE CODES

Code	Number of digital inputs	Number of relay outputs
DIO-M-R2	4	2

INTENDED AREA OF USE

- Convert Modbus RTU registers into relay outputs or digital inputs into Modbus RTU registers
- Create a gateway between Sentera Modbus RTU network and external devices

TECHNICAL DATA

- 5 VDC output (to be used in combination with dry contacts for the digital inputs)
- Modbus RTU communication and 24 VDC power supply via RJ45 connector (PoM connection)
- The digital inputs feature tacho functionality to detect fan speed
- LED indicator integrated in the RJ45 socket
- DIN rail mounted
- 2 C/O relay outputs
- In stand-alone mode the relays will follow the digital inputs
- Enclosure: plastic ABS, UL94-V0, grey RAL 7035
- Operating ambient conditions:
  - Temperature: -10—60 ºC
  - Rel. humidity: 5—85 % rH (non-condensing)
- Storage temperature: -40—50ºC

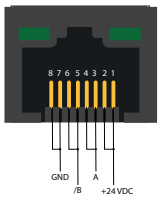
STANDARDS

- Low Voltage Directive 2014/35/EU CE
  - EN 60529:1991 Degrees of protection provided by enclosures (IP Code). Amendment AC:1993 to EN 60529
- EMC directive 2014/30/EU:
  - EN 61000-6-1:2007 Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments
  - EN 61000-6-3:2007 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments. Amendments A1:2011 and AC:2012 to EN 61000-6-3
  - EN 61000-6-2:2005 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments. Amendment AC:2005 to EN 61000-6-2
- WEEE Directive 2012/19/EC
- RoHs Directive 2011/65/EC

WIRING AND CONNECTIONS

	RJ45 socket - 24 VDC PoM – 60 mA max
Pin 1	Supply voltage, 24 VDC
Pin 2	Supply voltage, 24 VDC
Pin 3	Modbus RTU communication, signal A
Pin 4	Modbus RTU communication, signal A
Pin 5	Modbus RTU communication, signal /B
Pin 6	Modbus RTU communication, signal /B
Pin 7	Ground, supply voltage
Pin 8	Ground, supply voltage

RJ45 socket



	Digital inputs
DI1	Digital input 1, 0—45 VDC
GND	Digital input, ground
DI2	Digital input 2, 0—45 VDC
5VDC	5 VDC supply (max. 100 mA) to be used in combination with dry contacts for the digital inputs (enable the digital input by connecting the 5 VDC to it)
DI3	Digital input 3, 0—45 VDC
GND	Digital input, ground
DI4	Digital input 4, 0—45 VDC
	Relay outputs
NO1	Normally open contact 1
COM1	Common contact 1
NC1	Normally closed contact 1
NO2	Normally open contact 2
COM2	Common contact 2
NC2	Normally closed contact 2

MOUNTING INSTRUCTIONS IN STEPS

Before you start mounting the unit, read carefully *"***Safety and Precautions"** and follow these steps:

1. Switch off the power supply.
2. Slide the unit along the guides of a standard 35 mm DIN rail and fix it to the rail by means of the black locking clip on the enclosure. Mind the correct position and mounting dimensions shown in **Fig. 1** *Mounting dimensions* and **Fig. 2** *Mounting position.*

Fig. 1 Mounting dimensions

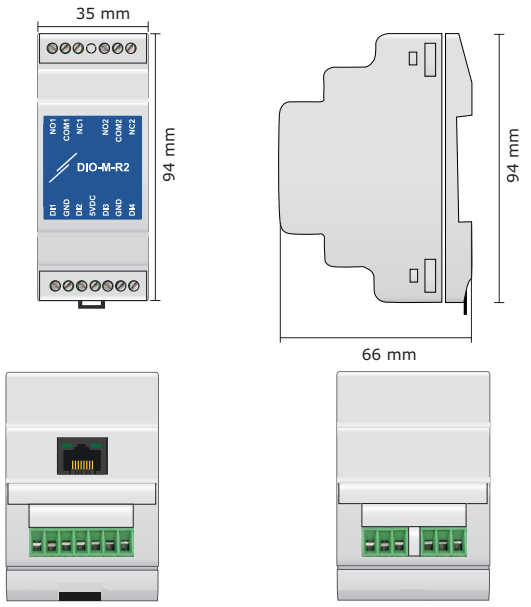
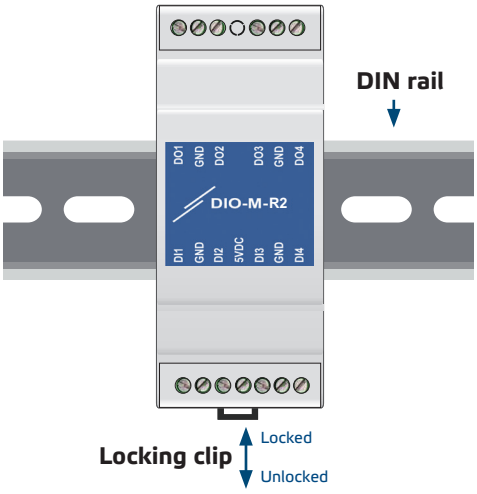


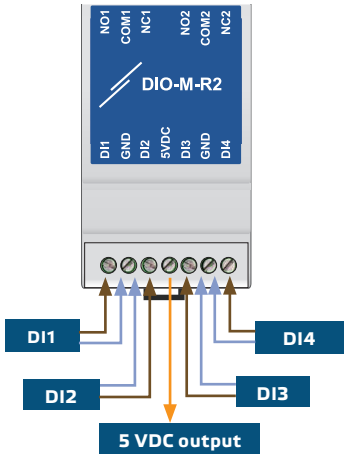
Fig. 2 Mounting position



3. Connect the digital input and output cables to the terminal blocks as shown in **Fig. 3a** and **3b** adhering to the information in section "**Wiring and connections**".

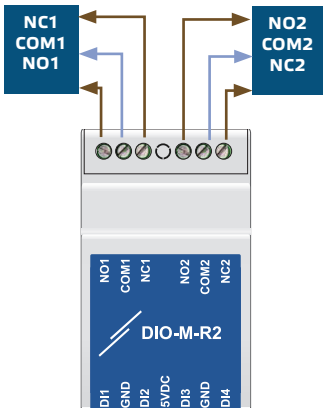
Fig. 3 Wiring diagram

a. Digital inputs*

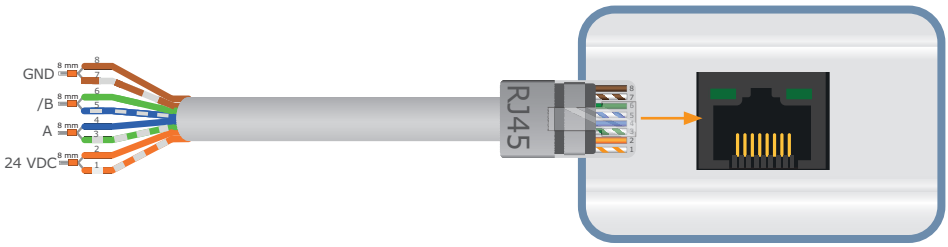


*See also "Typical wiring examples" below.

b. Relay outputs



c. RJ45 connector



4. Crimp the RJ45 cable (for 24 VDC power supply and Modbus RTU communication) and plug it into the socket (see **Fig. 3c**).
5. Switch on the power supply.

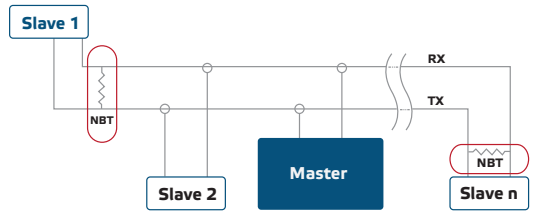
NOTE

For the complete Modbus register data, refer to the product Modbus Register Map, which is a separate document attached to the article code on the website and contains the registers list. Products with earlier firmware versions may not be compatible with this list.

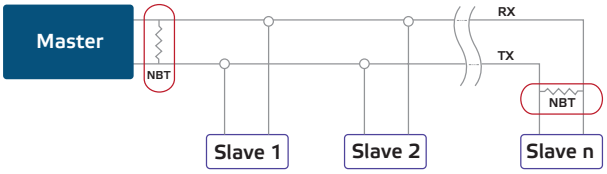
Optional settings

To assure correct communication, the NBT needs to be activated in only two devices on the Modbus RTU network. If necessary, enable the NBT resistor via 3SModbus or Sensistant (*Holding register 9*).

Example 1



Example 2



NOTE

On a Modbus RTU network, two bus terminators (NBTs) need to be activated.

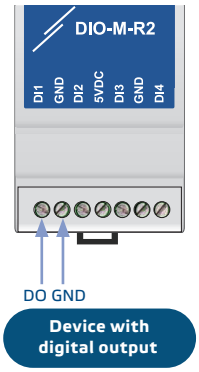
Typical connection examples

Digital inputs:
There are multiple ways to connect the digital inputs of DIO-M-R2. The I/O module also features motor tacho signal detection and reading. Please refer to **Fig. 4** below for connection examples.

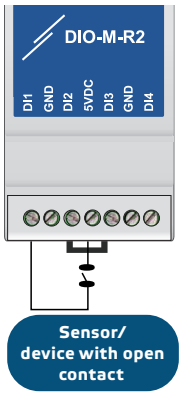
Relay outputs:
The relay outputs of DIO-M-R2 should be connected to the circuit wires to the common and normally open (or closed) contacts. Please refer to **Fig. 5** below for a connection example. In this example, the normally open contact is used to turn ON/OFF the coil of a contactor.

Fig. 4 Typical wiring examples - digital inputs

a. Connecting a device with a digital output

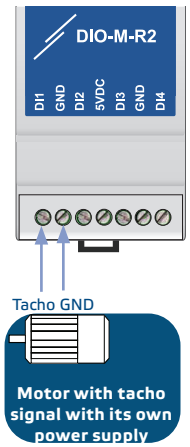


b. Connecting a device with normally open / normally closed contact

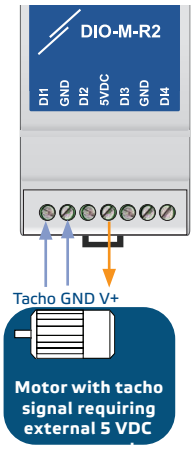


* If the wires are long, consider connecting a 500 Ω—10 kΩ pull down resistor between the Digital Input and GND. (The resistor size is limited to 5 VDC /100 mA)

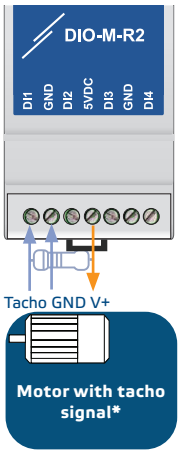
c. Connecting a motor with tacho[1] signal



d. Connecting a motor with tacho signal requiring external power supply



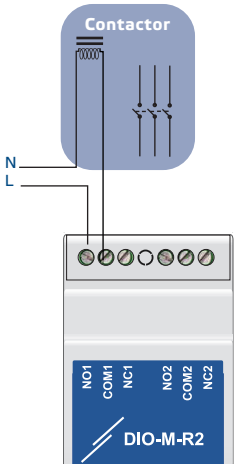
e. Connecting a motor with open collector tacho signal



* If the tacho signal is open collector, a resistor must be installed between DI and 5 VDC. Check the motor information for resistor size.

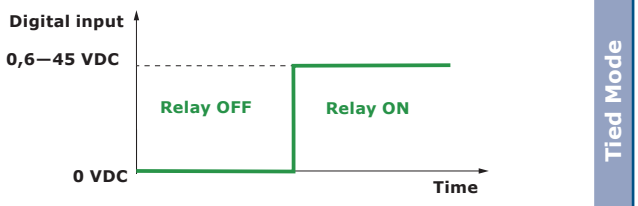
[1] A tachometer is an electromagnetic device that produces an analogue signal (modulating PWM output) that is proportional to motor speed. The DIO-M digital inputs can read tacho signals with a measurement range of 0—60.000 rpm (0—1.000 Hz).

Fig. 5 Typical wiring example - relay outputs

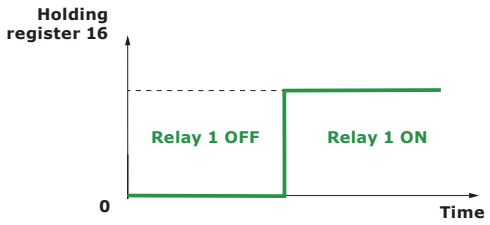


OPERATIONAL DIAGRAMS

Operational diagrams



Tied Mode



Modbus Mode

OPERATING INSTRUCTIONS

- Modbus input registers 1 to 4 indicate if the digital input signal is low or high
- Modbus input registers 16 to 19 indicate if the motor is running or stopped *
- Modbus input registers 21 to 24 indicates the motor speed in rpm *
- Modbus input registers 26 to 29 indicates the motor speed in Hz *

** connect with the tacho outputs from the motor (see **Fig. 4c, 4d** and **4e**)*

Although the 4 digital inputs and the 2 relay outputs can operate completely independently (Normal Modbus mode), it is also possible to make the outputs interact with the inputs (Tied mode).

Normal Modbus mode:
For the relay outputs to work in Modbus mode (without interaction with the inputs), Modbus holding registers 26 to 27 should be set to '0' (Normal Modbus mode). Holding registers 16 to 17 can then be used to open or close the C/O relays.

Tied mode:
To make the C/O relays interact with the digital inputs, it is possible to tie (some of the) outputs to the inputs, using one of these algorithms:
- Tied to DI1 to DI4
- Tied to DI1 to DI4 inversed
- Tied to Tacho Status DI1 to DI4 (input registers 16 to 19)
- Tied to Tacho Status DI1 to DI4 (input registers 16 to 19) inversed

Bootloader

Thanks to the bootloader functionality, the unit firmware can be updated via Modbus RTU communication. With 3SM boot Application (part of 3SM center software suite), 'boot mode' is automatically activated and the firmware can be updated.

NOTE

Make sure the power supply does not get interrupted during "bootload" procedure, otherwise you risk losing unsaved data.

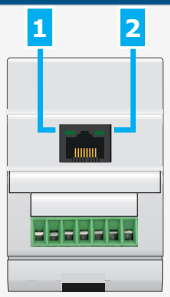
VERIFICATION OF THE INSTALLATION INSTRUCTIONS

After powering the unit, the LED on the left of the RJ45 socket (**Fig. 6 - 1**) should light up to indicate that the unit is supplied.

The LED on the right of the RJ45 socket (**Fig. 6 - 2**) indicates that there is active Modbus communication.

If your unit does not function as expected, please check the connections.

Fig. 6 Indications



ATTENTION

The status of the LEDs can be checked only when the unit is energised. Take the relevant safety measures!

TRANSPORT AND STORAGE

Avoid shocks and extreme conditions; stock in original packing.

WARRANTY AND RESTRICTIONS

Two years from the delivery date against defects in manufacturing. Any modifications or alterations to the product after the date of publication relieve the manufacturer of any responsibilities. The manufacturer bears no responsibility for any misprints or mistakes in this data.

MAINTENANCE

In normal conditions this product is maintenance-free. If soiled, clean with a dry or damp cloth. In case of heavy pollution, clean with a non-aggressive product. In these circumstances the unit should be disconnected from the supply. Pay attention that no fluids enter the unit. Only reconnect it to the supply when it is completely dry.