

MiniModbus 2I2O

Expansion Module – 2 digital inputs, 2 digital outputs

version 1.4

User Manual



Manufactured for

CE

ASPAR

Thank you for choosing our product.

This manual will help you with proper support and proper operation of the device.

The information contained in this manual have been prepared with utmost care by our professionals and serve as a description of the product without incurring any liability for the purposes of commercial law.

This information does not release you from the obligation of own judgment and verification.

We reserve the right to change product specifications without notice.

Please read the instructions carefully and follow the recommendations contained therein.



WARNING!

Failure to follow instructions can result in equipment damage or impede the use of the hardware or software.

1. Safety rules

- Before first use, refer to this manual
- Before first use, make sure that all cables are connected properly
- Please ensure proper working conditions, according to the device specifications (eg: supply voltage, temperature, maximum power consumption)
- Before making any modifications to wiring connections, turn off the power supply

2. Module Features

2.1. Purpose and description of the module

2I2O Module is an innovative device that provides a simple and cost-effective extension of the number of lines of input and output in popular PLCs.

The module has 2 digital inputs with configurable timer/counter option, which allow to connect one encoder. All inputs are isolated from the logic by optocouplers. Each channel can be individually configured in one of several modes.

This module is connected to the RS485 bus with twisted-pair wire. Communication is via MODBUS RTU or MODBUS ASCII. The use of 32-bit ARM core processor provides fast processing and quick communication. The baud rate is configurable from 2400 to 115200.

The module is designed for mounting on a DIN rail in accordance with DIN EN 5002.

The module is equipped with a set of LEDs used to indicate the status of inputs and outputs useful for diagnostic purposes and helping to find errors.

Module configuration is done via USB by using a dedicated computer program. You can also change the parameters using the MODBUS protocol.

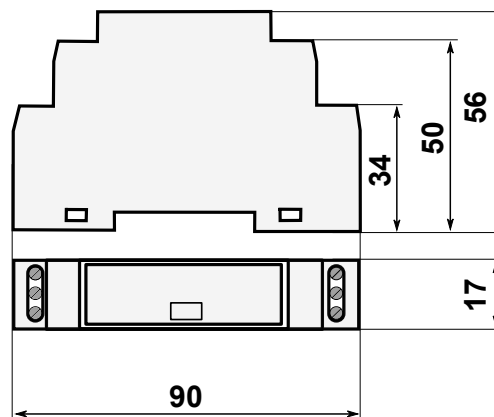
2.2. Technical Specifications

| | | |
|------------------------|-------------------------|---------------------------|
| Power Supply | Voltage | 10-38VDC; 20-28VAC |
| | Maximum Current* | 62 mA @ 12V / 35 mA @ 24V |
| Digital Inputs | No of inputs | 2 |
| | Voltage range | 0 – 36V |
| | Low State „0” | 0 – 3V |
| | High State „1” | 6 – 36V |
| | Input impedance | 4kΩ |
| | Isolation | 1500 Vrms |
| | Input Type | PNP or NPN |
| Digital Outputs | No of outputs | 2 |
| | Max current and voltage | 250mA / 55V |
| | Isolation | 1500 Vrms |
| | Output Type | PNP |
| Counters | No | 2 |
| | Resolution | 32 bits |
| | Frequency | 1kHz (max) |
| | Impulse Width | 500 μs (min) |
| Temperature | Work | -10 °C - +50°C |
| | Storage | -40 °C - +85°C |
| Connectors | Power Supply | 3 pin |
| | Communication | 3 pin |
| | inputs | 3 pin |
| | Outputs | 3 pin |
| | Configuration | Mini USB |
| Dimensions | Heigh | 90 mm |
| | Length | 56 mm |
| | Width | 17 mm |
| Interface | RS485 | Up to 128 devices |

* Maximum current with active Modbus transmission, all outputs on and high state on all inputs

2.3. Dimensions of the product

Look and dimensions of the module are shown below. The module is mounted directly to the rail in the DIN industry standard. Power connectors, communication and IOs are at the bottom and top of the module. USB connector configuration and indicators located on the front of the module.



3. Communication configuration

3.1. Grounding and shielding

In most cases, IO modules will be installed in an enclosure along with other devices which generate electromagnetic radiation. Examples of these devices are relays and contactors, transformers, motor controllers etc. This electromagnetic radiation can induce electrical noise into both power and signal lines, as well as direct radiation into the module causing negative effects on the system. Appropriate grounding, shielding and other protective steps should be taken at the installation stage to prevent these effects. These protective steps include control cabinet grounding, module grounding, cable shield grounding, protective elements for electromagnetic switching devices, correct wiring as well as consideration of cable types and their cross sections.

3.2. Network Termination

Transmission line effects often present a problem on data communication networks. These problems include reflections and signal attenuation.

To eliminate the presence of reflections from the end of the cable, the cable must be terminated at both ends with a resistor across the line equal to its characteristic impedance. Both ends must be terminated since the direction of propagation is bi-directional. In the case of an RS485 twisted pair cable this termination is typically 120 Ω .

3.3. Types of Modbus Registers

There are 4 types of variables available in the module

| Type | Beginning address | Variable | Access | Modbus Command |
|------|-------------------|------------------|-------------------------|----------------|
| 1 | 00001 | Digital Outputs | Bit Read & Write | 1, 5, 15 |
| 2 | 10001 | Digital Inputs | Bit Read | 2 |
| 3 | 30001 | Input Registers | Registered Read | 3 |
| 4 | 40001 | Output Registers | Registered Read & Write | 4, 6, 16 |

3.4. Communication settings

The data stored in the modules memory are in 16-bit registers. Access to registers is via MODBUS RTU or MODBUS ASCII.

3.4.1. Default settings

| Parameter name | Value |
|------------------|-------|
| Address | 1 |
| Baud rate | 19200 |
| Parity | No |
| Data bits | 8 |
| Stop bits | 1 |
| Reply Delay [ms] | 0 |
| Modbus Type | RTU |

3.4.2. Configuration registers

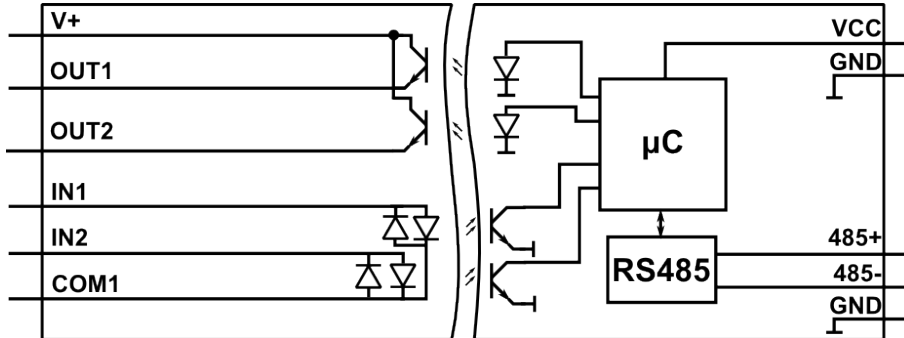
| Address | Name | Values |
|---------|----------------|---|
| 40003 | Baud rate | 0 – 2400 1 – 4800 2 – 9600 3 – 19200 4 – 38400 5 – 57600 6 – 115200 other – value * 10 |
| 40005 | Parity | 0 – none 1 – odd 2 – even 3 – always 1 4 – always 0 |
| 40004 | Stop Bits LSB | 1 – one stop bit 2 – two stop bits |
| 40004 | Data Bits MSB | 7 – 7 data bits 8 – 8 data bits |
| 40006 | Response delay | Time in ms |
| 40007 | Modbus Mode | 0 – RTU 1 – ASCII |

4. Indicators



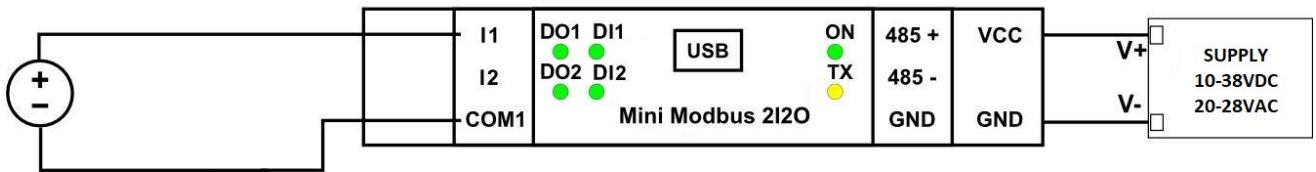
| Indicator | Description |
|-----------|---|
| ON | LED indicates that the module is correctly powered. |
| TX | The LED lights up when the unit received the correct packet and sends the answer. |
| DI1, DI2 | LED indicates that on the input is high state. |
| DO1, DO2 | LED indicates that on the output is high state. |

5. Block diagram

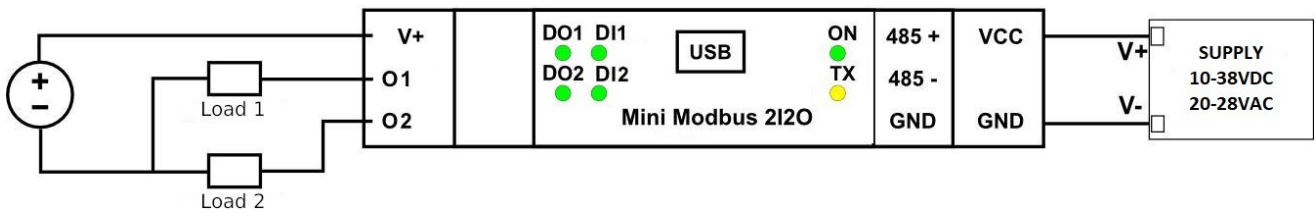


6. Module Connection

Input connection



Output connection PNP type



7. Modules Registers

7.1. Registered access

| Modbus | Dec | Hex | Register Name | Access | Description |
|--------|-----|------|-----------------------|--------------|---|
| 30001 | 0 | 0x00 | Version/Type | Read | Version and Type of the device |
| 40002 | 1 | 0x01 | Address | Read & Write | Module Address |
| 40003 | 2 | 0x02 | Baud rate | Read & Write | RS485 baud rate |
| 40004 | 3 | 0x03 | Stop Bits | Read & Write | No of Stop bits |
| 40005 | 4 | 0x04 | Parity | Read & Write | Parity bit |
| 40006 | 5 | 0x05 | Response Delay | Read & Write | Response delay in ms |
| 40007 | 6 | 0x06 | TModbus Mode | Read & Write | Modbus Mode (ASCII or RTU) |
| 40009 | 8 | 0x08 | Watchdog | Read & Write | Watchdog |
| 40013 | 12 | 0x0C | Default Output State | Read & Write | Default output state (after power on or watchdog reset) |
| 40033 | 32 | 0x20 | Received packets MSB | Read & Write | No of received packets |
| 40034 | 33 | 0x21 | Received packets LSB | Read & Write | |
| 40035 | 34 | 0x22 | Incorrect packets MSB | Read & Write | No of received packets with error |
| 40036 | 35 | 0x23 | ncorrect packets LSB | Read & Write | |
| 40037 | 36 | 0x24 | Sent packets MSB | Read & Write | No of sent packets |
| 40038 | 37 | 0x25 | Sent packets LSB | Read & Write | |
| 40051 | 50 | 0x32 | Inputs | Read | Inputs state |
| 40052 | 51 | 0x33 | Outputs | Read & Write | Outputs state |
| 40053 | 52 | 0x34 | Counter 1 MSB | Read & Write | 32-bit counter 1 |
| 40054 | 53 | 0x35 | Counter 1 LSB | Read & Write | |
| 40055 | 54 | 0x36 | Counter 2 MSB | Read & Write | 32-bit counter 2 |
| 40056 | 55 | 0x37 | Counter 2 LSB | Read & Write | |
| 40057 | 56 | 0x38 | CCounter 1 MSB | Read & Write | 32-bit value of captured counter 1 |
| 40058 | 57 | 0x39 | CCounter 1 LSB | Read & Write | |
| 40059 | 58 | 0x3A | CCounter 2 MSB | Read & Write | 32-bit value of captured counter 2 |
| 40060 | 59 | 0x3B | CCounter 2 LSB | Read & Write | |
| 40061 | 60 | 0x3C | Counter Config 1 | Read & Write | Counter Configuration +1 – time measurement (if 0 counting impulses) +2 – autocatch counter every 1 sec +4 – catch value when input low +8 – reset counter after catch +16 – reset counter if input low +32 – encoder |
| 40062 | 61 | 0x3D | Counter Config 2 | Read & Write | |
| 40063 | 62 | 0x3E | Catch | Read & Write | Catch counter |
| 40064 | 63 | 0x3F | Status | Read & Write | Captured counter |

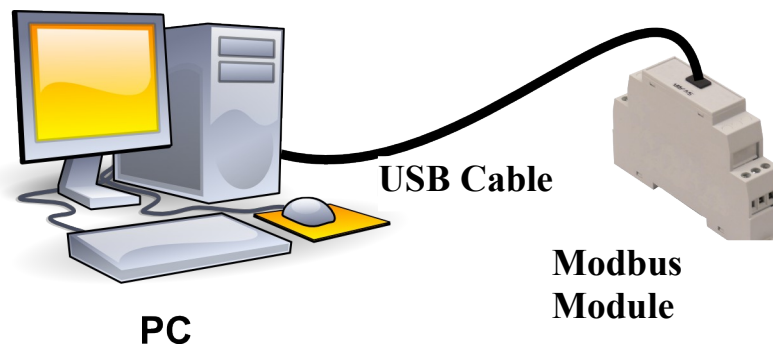
7.2. Bit access

| Modbus Address | Dec Address | Hex Address | Register name | Access | Description |
|----------------|-------------|-------------|---------------------------|--------------|-----------------------------|
| 193 | 192 | 0x0C0 | Default state of output 1 | Read & Write | Default state of output 1 |
| 194 | 193 | 0x0C1 | Default state of output 2 | Read & Write | Default state of output 2 |
| 10801 | 800 | 0x320 | Input 1 | Read | Input 1 state |
| 10802 | 801 | 0x321 | Input 2 | Read | Input 2 state |
| 817 | 816 | 0x330 | Output 1 | Read & Write | Output 1 state |
| 818 | 817 | 0x331 | Output 2 | Read & Write | Output 2 state |
| 1153 | 1152 | 0x480 | Capture 1 | Read & Write | Default state of output 1 |
| 1154 | 1153 | 0x481 | Capture 2 | Read & Write | Default state of output 2 |
| 1169 | 1168 | 0x490 | Captured 1 | Read & Write | Captured value of counter 1 |
| 1170 | 1169 | 0x491 | Captured 2 | Read & Write | Captured value of counter 2 |

8. Configuration software

Modbus Configurator is software that is designed to set the module registers responsible for communication over Modbus network as well as to read and write the current value of other registers of the module. This program can be a convenient way to test the system as well as to observe real-time changes in the registers.

Communication with the module is done via the USB cable. The module does not require any drivers.



Configurator is a universal program, whereby it is possible to configure all available modules.

Table of content

| | |
|---|----|
| 1. Safety rules..... | 3 |
| 2. Module Features..... | 3 |
| 2.1. Purpose and description of the module..... | 3 |
| 2.2. Technical Specifications..... | 4 |
| 2.3. Dimensions of the product..... | 5 |
| 3. Communication configuration..... | 5 |
| 3.1. Grounding and shielding..... | 5 |
| 3.2. Network Termination..... | 5 |
| 3.3. Types of Modbus Registers..... | 6 |
| 3.4. Communication settings..... | 6 |
| 3.4.1. Default settings..... | 6 |
| 3.4.2. Configuration registers..... | 7 |
| 4. Indicators..... | 7 |
| 5. Block diagram..... | 8 |
| 6. Module Connection..... | 8 |
| 7. Modules Registers..... | 9 |
| 7.1. Registered access..... | 9 |
| 7.2. Bit access..... | 10 |
| 8. Configuration software..... | 11 |



Manufactured for:
Aspar s.c.
ul. Oliwska 112
80-209 Chwaszczyno
Poland

ampero@ampero.eu
www.ampero.eu

tel. +48 58 351 39 89; +48 58 732 71 73

