

RS 485 Mini Modbus 1AO

Expansion Module – 1 analog output, 2 digital inputs

Version 1.2

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

The MOD-1AO module has 1 current analog output (0-20mA lub 4-20mA) and 1 voltage analog output (0-10V). Both outputs can be used at the same time. The modul is equipped in two digital inputs. In addition, terminals IN1 and IN2 can be used to connect one encoder. Setting the output current or voltage value is done via RS485 (Modbus protocol), so you can easily integrate the module with popular PLCs, HMI or PC equipped with the appropriate adapter.

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.

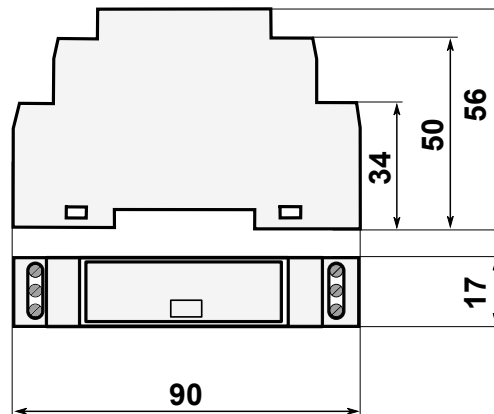
Module configuration is done via USB by using a dedicated computer program. You can also change the parameters using the MODBUS protocol.

2.2. Technical Specifications

| | | |
|-----------------------|------------------------|--|
| Power supply | Voltage | 10-38VDC; 20-28VAC |
| | Maximum Current | DC: 90 mA @ 24V AC: 170 mA @ 24V |
| Outputs | No of outputs | 2 |
| | Voltage output | 0V do 10V (resolution 1.5mV) |
| | Current output | 0mA do 20mA (resolution 5 μ A); 4mA do 20mA (value in ‰ – 1000 steps) (resolution 16 μ A) |
| | Measurement resolution | 12 bits |
| | ADC processing time | 16ms / channel |
| Digital inputs | No of inputs | 2 |
| | Voltage range | 0 – 36V |
| | Low state „0” | 0 – 3V |
| | High state „1” | 6 – 36V |
| | Input impedance | 4k Ω |
| | Isolation | 1500 Vrms |
| | Input type | PNP or NPN |
| Counters | No | 2 |
| | Resolution | 32 bits |
| | Frequency | 1kHz (max) |
| | Impulse Width | 500 μ s (min) |
| Temperature | Work | -20 °C - +65°C |
| | Storage | -40 °C - +85°C |
| Connectors | Power supply | 3 pins |
| | Communication | 3 pins |
| | Inputs and Outputs | 2 x 3 pins |
| | Configuration | Mini USB |
| Size | Height | 90 mm |
| | Length | 56 mm |
| | Width | 17 mm |
| Interface | RS485 | UP to 128 devices |

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.



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

| Name of parameter | 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 |
|---------|----------------|---|
| 40002 | Module address | From 0 to 255 |
| 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 |
| 40005 | Response Delay | Time in ms |
| 40007 | Modbus Mode | 0 – RTU 1 – ASCII |

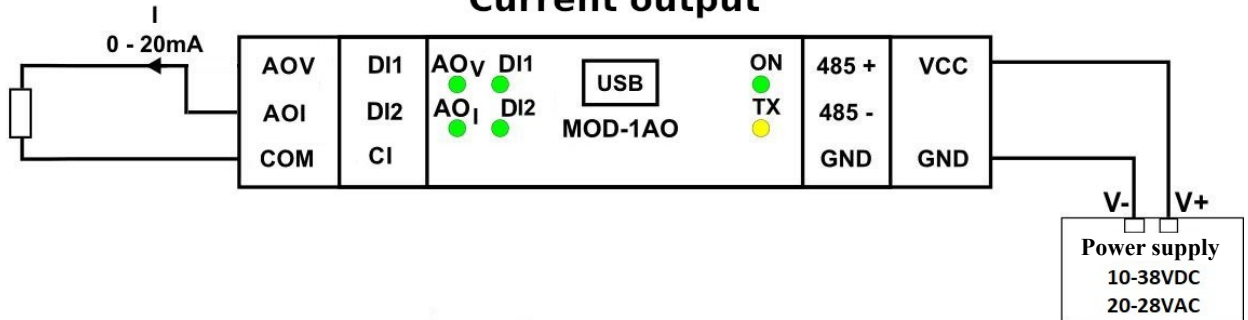
4. Indicators



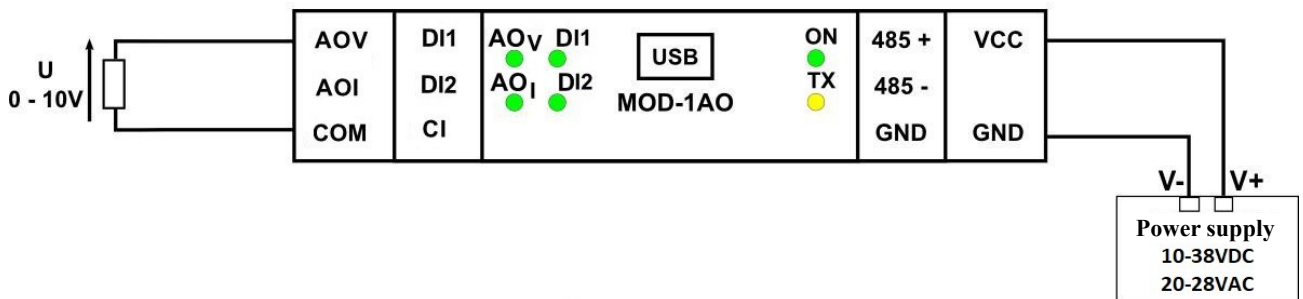
| Indicator | Description |
|-----------|---|
| ON | LED indicates that the module is correctly powered. |
| TX | The LED lights up when the unit received the correct packet and sends the answer. |
| AOV | The LED lights up when the output voltage is non-zero. |
| AOI | The LED lights up when the output current is non-zero. |
| DI1, DI2 | Input state 1, 2 |

5. Module Connection

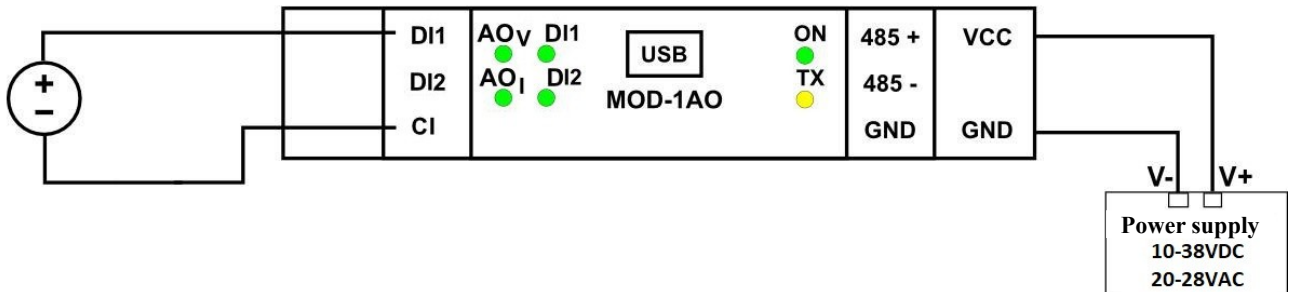
Current output



Voltage output



Input connection



6. Modules Registers

6.1. Registered access

| Address 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 | Modbus Mode | Read & Write | Modbus Mode (ASCII or RTU) |
| 40009 | 8 | 0x09 | Watchdog | Read & Write | Watchdog |
| 40033 | 32 | 0x20 | Received packets LSB | Read & Write | No of received packets |
| 40034 | 33 | 0x21 | Received packets MSB | Read & Write | |
| 40035 | 34 | 0x22 | Incorrect packets LSB | Read & Write | No of received packets with error |
| 40036 | 35 | 0x23 | Incorrect packets MSB | Read & Write | |
| 40037 | 36 | 0x24 | Sent packets LSB | Read & Write | No of sent packets |
| 40038 | 37 | 0x25 | Sent packets MSB | Read & Write | |
| 30051 | 50 | 0x32 | Inputs | Read | Input state; Bit is set if value \neq 0 |
| 30052 | 51 | 0x33 | Outputs | Read | Output state; Bit is set if value \neq 0 |
| 40053 | 52 | 0x34 | Current analog output 1 | Read & Write | Value of analog output: in μ A for 0 - 20mA (max 20480) in ‰ for 4-20mA (max 1000) |
| 40054 | 53 | 0x35 | Voltage analog output 2 | Read & Write | Value of analog output: in mV (max 10240) |
| 40055 | 54 | 0x36 | Counter 1 LSB | Read & Write | 32-bit counter 1 |
| 40056 | 55 | 0x37 | Counter 1 MSB | Read & Write | |
| 40057 | 56 | 0x38 | Counter2 LSB | Read & Write | 32-bit counter 2 |
| 40058 | 57 | 0x39 | Counter 2 MSB | Read & Write | |
| 40059 | 58 | 0x3A | CounterP 1 LSB | Read & Write | 32-bit value of captured counter 1 |
| 40060 | 59 | 0x3B | CounterP 1 MSB | Read & Write | |
| 40061 | 60 | 0x3C | CounterP 2 LSB | Read & Write | 32-bit value of captured counter 2 |
| 40062 | 61 | 0x3D | CounterP 2 MSB | Read & Write | |
| 40063 | 62 | 0x3E | Catch | Read & Write | Catch counter |
| 40064 | 63 | 0x3F | Status | Read & Write | Captured counter |
| 40065 | 64 | 0x40 | Default value of 1 analog current output | Read & Write | The default of analog output set at power supply and due to activation of watchdog. |

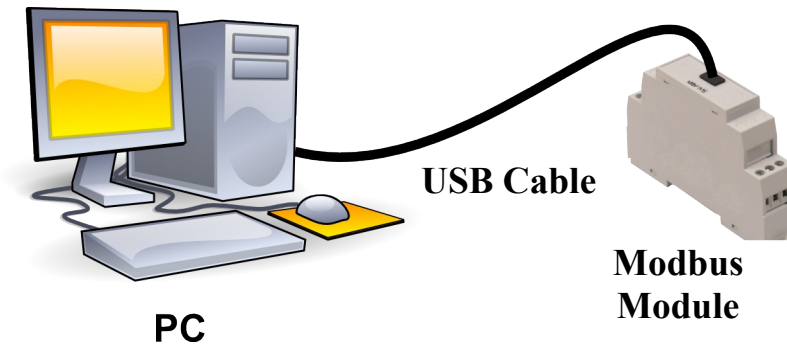
| Address Modbus Dec Hex | | | Register Name | Access | Description |
|---------------------------|----|------|--|--------------|---|
| 40066 | 65 | 0x41 | Default value of 2 analog voltage output | Read & Write | The default of analog output set at power supply and due to activation of watchdog. |
| 40067 | 66 | 0x42 | Current analog output 1 configuration | Read & Write | Current analog output configuration: 0 – OFF 2 – current output 0-20mA 3 – current output 4-20mA |
| 40068 | 67 | 0x43 | Voltage analog output 2 configuration | Read & Write | 0 – OFF 1 – voltage output |
| 40069 | 68 | 0x44 | Counter Config 1 | Read & Write | Counters 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 |
| 40070 | 69 | 0x45 | Counter Config 2 | Read & Write | |

6.2. Bit access

| Modbus Address | Dec Address | Hex Address | Register Name | Access | Description |
|----------------|-------------|-------------|---------------|--------------|--|
| 801 | 800 | 0x320 | Input 1 | Read | Input 1 state |
| 802 | 801 | 0x321 | Input 2 | Read | Input 2 state |
| 817 | 816 | 0x330 | Output 1 | Read | Current Analog Output state; Bit is set if value ≠ 0 |
| 818 | 817 | 0x331 | Output 2 | Read | Voltage Analog Output state; Bit is set if value ≠ 0 |
| 993 | 992 | 0x3E0 | Capture 1 | Read & Write | Capture counter 1 |
| 994 | 993 | 0x3E1 | Capture 1 | Read & Write | Capture counter 1 |
| 1009 | 1008 | 0x3F0 | Captured 1 | Read & Write | Captured value of counter 1 |
| 1010 | 1009 | 0x3F1 | Captured 2 | Read & Write | Captured value of counter 2 |

7. 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.

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