

RS 485 Mini Modbus 1AO

Expansion Module – 1 analog output, 2 digital inputs

Version 1.5

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.

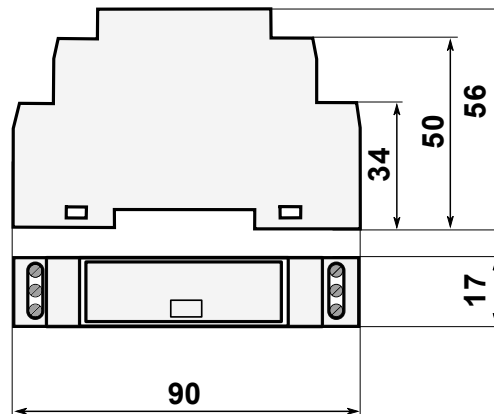
Module configuration is done via USB by using a dedicated computer program. You can also change the parameters using the MODBUS protocol.

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	-10 °C - +50°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

3.4.3. Watchdog function

This 16-bit register specifies the time in milliseconds to watchdog reset. If module does not receive any valid message within that time, all Digital and Analog Outputs will be set to the default state.

This feature is useful if there is an interruption in data transmission and for security reasons. Output states must be set to the appropriate state in order to assure the safety of persons or property.

The default value is 0 milliseconds which means the watchdog function is disabled.

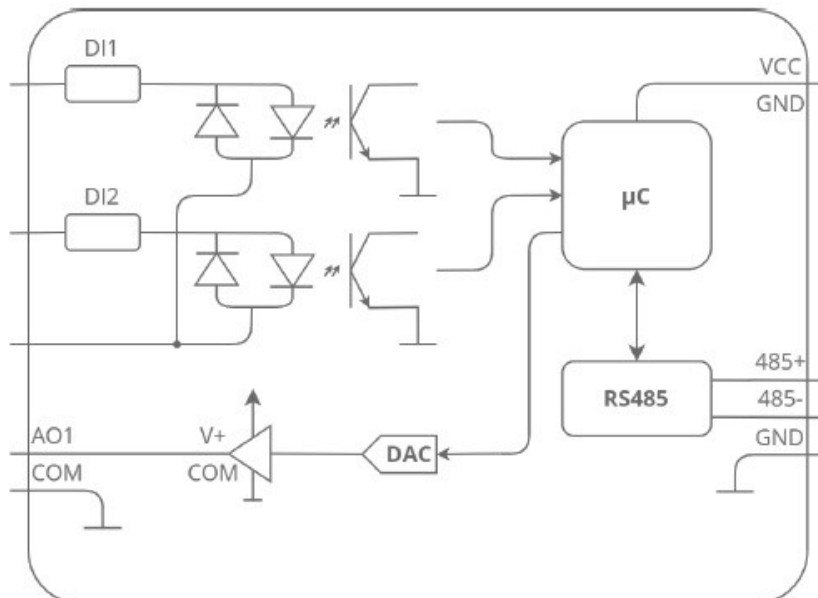
Range: 0-65535 ms

4. Indicators



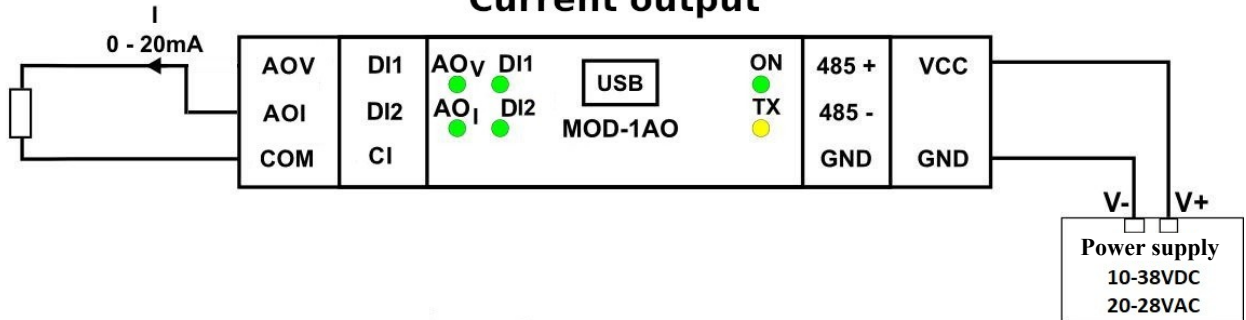
Indicator	Description
ON	LED indicates that the module is correctly powered.
TX	The LED lights up when the unit received the correct packet and sends the answer.
AOV	The LED lights up when the output voltage is non-zero.
AOI	The LED lights up when the output current is non-zero.
DI1, DI2	Input state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

5. Block diagram

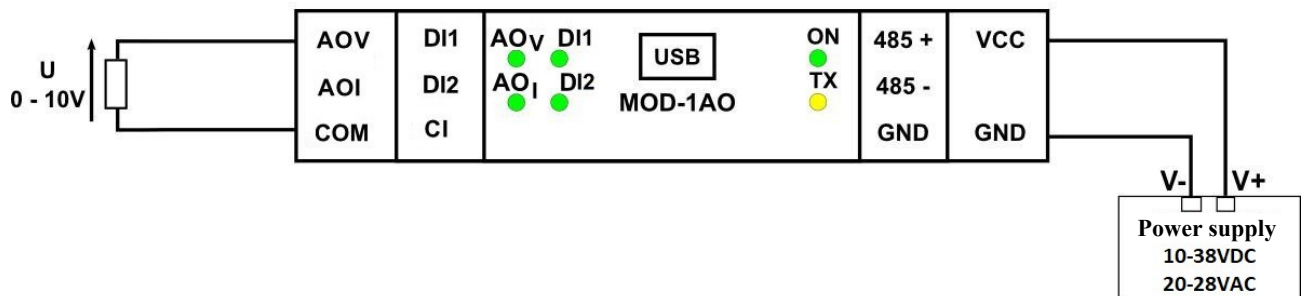


6. Module Connection

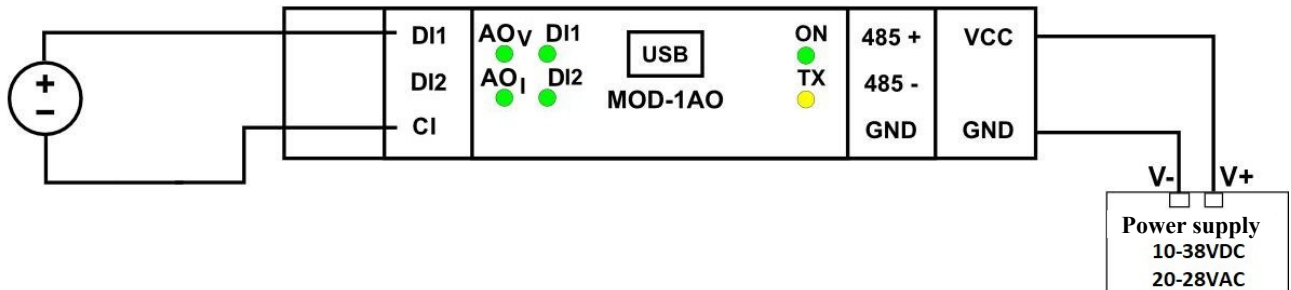
Current output



Voltage output



Input connection



7. Modules Registers

7.1. 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.

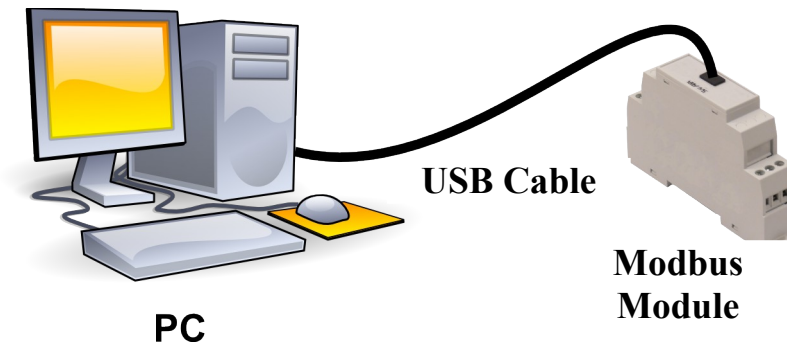
Address Modbus Dec Hex			Register Name	Access	Description
40066	65	0x41	Default value of 2 analog voltage output	Read & Write	The default of analog output set at power supply and due to activation of watchdog.
40067	66	0x42	Current analog output 1 configuration	Read & Write	Current analog output configuration: 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	

7.2. 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

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.

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