

# RS485 MODBUS Module 8TR

Expansion Module – 8 triac outputs

Version 1.6

User Manual



CE

Manufactured for  
**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

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- 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

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### 2.1. *Purpose and description of the module*

The 8TR module is an innovative device that provides a simple and cost-effective extension of the number of lines of output in many of popular PLCs.

The module has 8 triac outputs. All of the outputs are isolated from the logic of using optocouplers.

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.

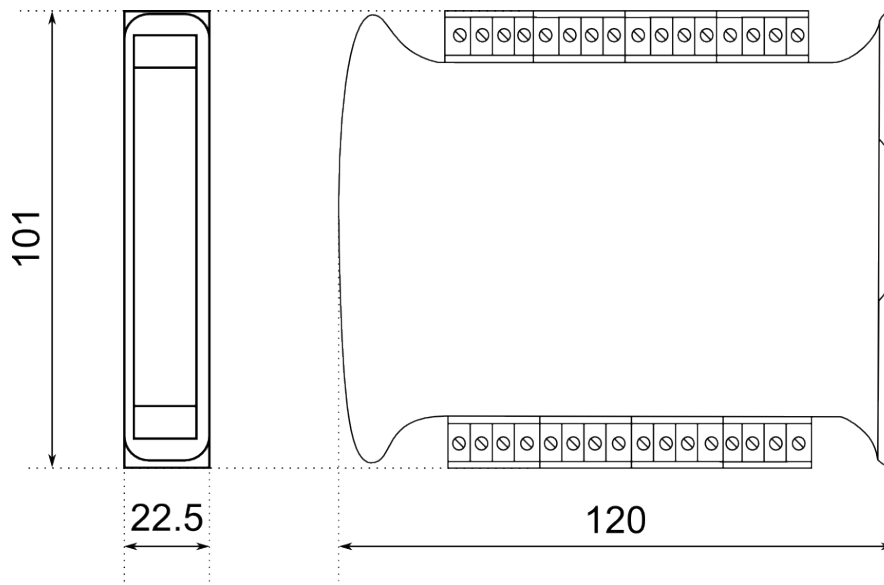
Module configuration is done via USB by using a dedicated computer program. You can also change the parameters using the MODBUS protocol.

## 2.2. Technical Specifications

<b>Power Supply</b>	Voltage	10-38VDC; 10-28VAC
	Maximum Current	200 mA @ 12V / 150 mA @ 24V
<b>Outputs</b>	No of outputs	8
	The maximum voltage	400VAC
	The maximum current	0.5A / channel
<b>Temperature</b>	Work	-10 °C - +50°C
	Storage	-40 °C - +85°C
<b>Connectors</b>	Power Supply	2 pins
	Communication	3 pins
	Outputs	10 pins
	Quick connector	IDC10
	Configuration	Mini USB
<b>Size</b>	Height	120 mm
	Length	101 mm
	Width	22,5 mm
<b>Interface</b>	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. 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  $\Omega$ .

### 3.3. Setting Module Address in RS485 Modbus Network

The following table shows how to set switch to determine the address of the module. The module address is set with the switches in the range of 0 to 31. Addresses From 32 to 255 can be set via RS485 or USB.

Addr	SW5	SW4	SW3	SW2	SW1	Addr	SW5	SW4	SW3	SW2	SW1	Addr	SW5	SW4	SW3	SW2	SW1
0	OFF	OFF	OFF	OFF	OFF	11	OFF	ON	OFF	ON	ON	22	ON	OFF	ON	ON	OFF
1	OFF	OFF	OFF	OFF	ON	12	OFF	ON	ON	OFF	OFF	23	ON	OFF	ON	ON	ON
2	OFF	OFF	OFF	ON	OFF	13	OFF	ON	ON	OFF	ON	24	ON	ON	OFF	OFF	OFF
3	OFF	OFF	OFF	ON	ON	14	OFF	ON	ON	ON	OFF	25	ON	ON	OFF	OFF	ON
4	OFF	OFF	ON	OFF	OFF	15	OFF	ON	ON	ON	ON	26	ON	ON	OFF	ON	OFF
5	OFF	OFF	ON	OFF	ON	16	ON	OFF	OFF	OFF	OFF	27	ON	ON	OFF	ON	ON
6	OFF	OFF	ON	ON	OFF	17	ON	OFF	OFF	OFF	ON	28	ON	ON	ON	OFF	OFF
7	OFF	OFF	ON	ON	ON	18	ON	OFF	OFF	ON	OFF	29	ON	ON	ON	OFF	ON
8	OFF	ON	OFF	OFF	OFF	19	ON	OFF	OFF	ON	ON	30	ON	ON	ON	ON	OFF
9	OFF	ON	OFF	OFF	ON	20	ON	OFF	ON	OFF	OFF	31	ON	ON	ON	ON	ON
10	OFF	ON	OFF	ON	OFF	21	ON	OFF	ON	OFF	ON						

### 3.4. 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

### 3.5. Communication settings

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

#### 3.5.1. Default settings

You can restore the default configuration by the switch SW6 ( see 3.5.2 - Restore the default configuration)

<b>Baud rate</b>	19200
<b>Parity</b>	No
<b>Data bits</b>	8
<b>Stop bits</b>	1
<b>Reply Delay [ms]</b>	0
<b>Modbus Mode</b>	RTU

### 3.5.2. Restore the default configuration

To restore the default configuration:

- turn off the power
- turn on the switch SW6
- turn on the power
- when power and communication LED flash turn off the switch SW6

**Caution!** After restoring the default configuration all values stored in the registers will be cleared as well.

### 3.5.3. Configuration registers

Modbus	Dec	Hex	Name	Values
Address				
40003	2	0x02	Baud rate	0 – 2400 1 – 4800 2 – 9600 3 – 19200 4 – 38400 5 – 57600 6 – 115200 other – value * 10
40005	4	0x04	Parity	0 – none 1 – odd 2 – even 3 – always 1 4 – always 0
40004	3	0x03	Stop Bits LSB	1 – one stop bit 2 – two stop bits
40004	3	0x03	Data Bits MSB	7 – 7 data bits 8 – 8 data bits
40006	5	0x05	Response delay	Time in ms
40007	6	0x06	Modbus Mode	0 – RTU 1 – ASCII

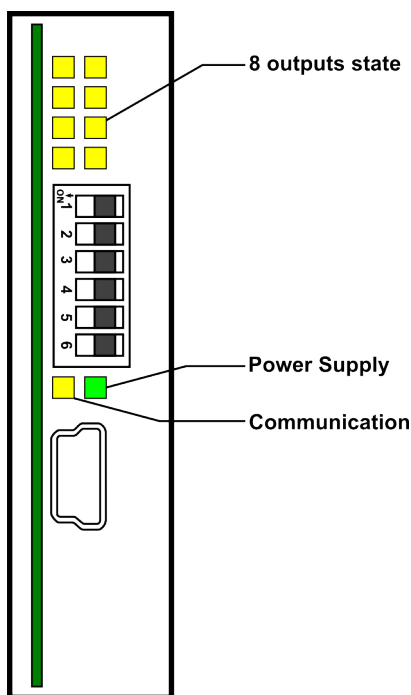
### 3.5.4. Watchdog function

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

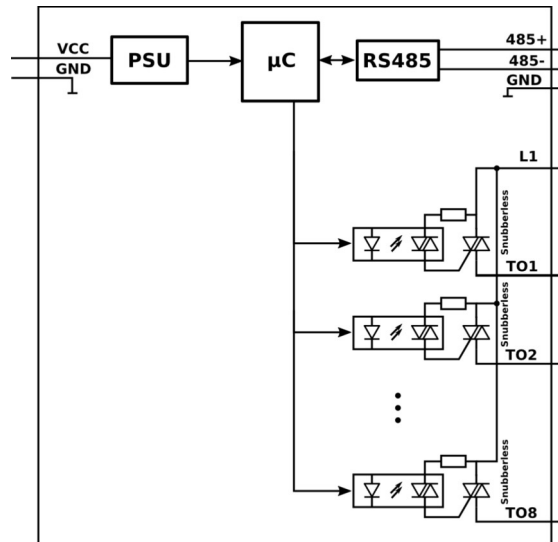
## 4. Indicators



Indicator	Description
Power supply	LED indicates that the module is correctly powered.
Communication	The LED lights up when the unit received the correct packet and sends the answer.
Outputs state	LED indicates that the output is on.

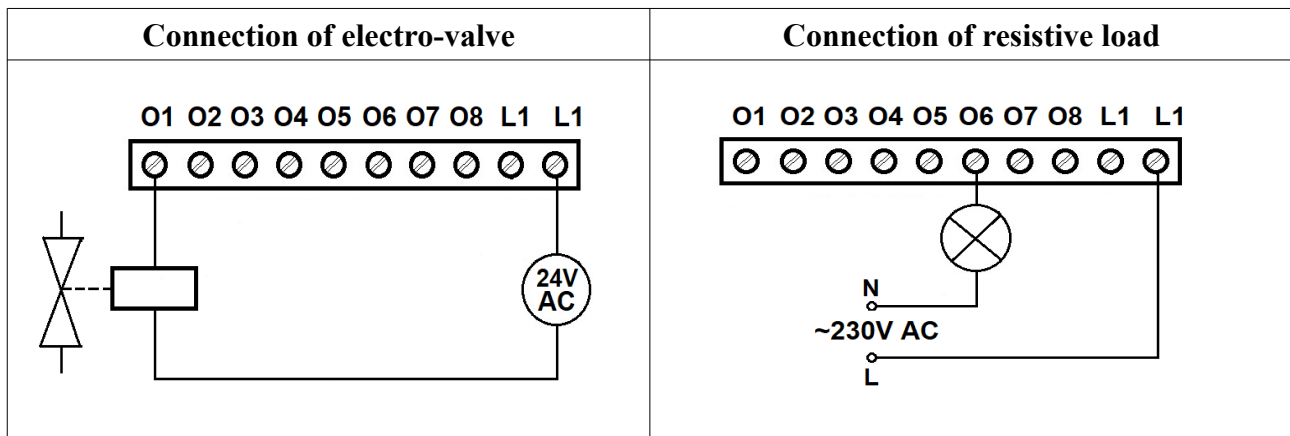


## 5. Block Diagram



## 6. Module Connection

### 6.1. Connection of load



## 6.2. Communication, power supply

Communication	Power supply, DC Voltage 24VDC	Power supply, AC Voltage 24VAC

## 6.3. Quick connector

Quick Connector is an unique feature of modules that allows you to quickly connect group of devices with a flat ribbon cable MOD-QC. Thanks to this solution, it is enough to connect power and RS485 communication to one of the devices in the group and the others will be powered and communicated with ribbon cable.

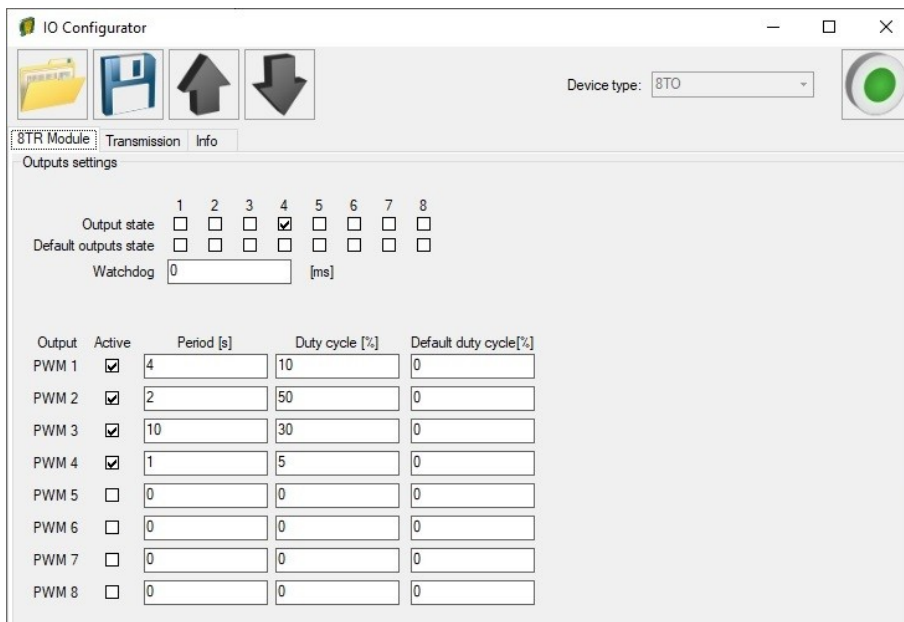
The Quick Connector is sufficient to connect up to 10 devices next to each other. What is important that the various types of modules in the SLIM family can be connected with the ribbon cable.



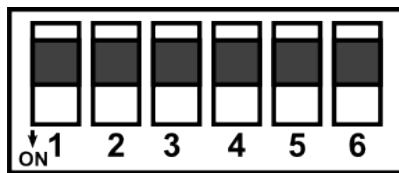
## 6.4. PWM Modulation

The MOD-8TR module is equipped with software that allows you to control the time of switching on each output individually by PWM modulation. To do this, two parameters should be provided:

- period [sec],
- duty cycle [%], the time of switching the output on during the period.



## 7. Switches



Switch	Function	Description
1	Module address +1	Setting module address from 0 to 31
2	Module address +2	
3	Module address +4	
4	Module address +8	
5	Module address +16	
6	Restoring default settings	Restoring default settings (see 3.5.1 - Default settings and 3.5.2 - Restore the default configuration).

## 8. Modules Registers

### 8.1. Registered access

Modbus	Dec	Hex	Register Name	Access	Description
30001	0	0x00	Version/Type	Read	Version and Type of the device
30002	1	0x01	Switches	Read	Switches state
40003	2	0x02	Baud rate	Read & Write	RS485 baud rate
40004	3	0x03	Stop Bits & Data Bits	Read & Write	No of Stop bits & Data Bits (see 3.5.3)
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	0x08	Watchdog	Read & Write	Watchdog
40013	12	0x0C	Default outputs state	Read & Write	Default outputs state
40019	18	0x12	PWM Output	Read & Write	PWM output state
40020	19	0x13	Default output 1 duty cycle	Read & Write	Value default duty cycle output 1 From 0 to 100%
40021	20	0x14	Default output 2 duty cycle	Read & Write	Value default duty cycle output 2 From 0 to 100%
40022	21	0x15	Default output 3 duty cycle	Read & Write	Value default duty cycle output 3 From 0 to 100%
40023	22	0x16	Default output 4 duty cycle	Read & Write	Value default duty cycle output 4 From 0 to 100%
40024	23	0x17	Default output 5 duty cycle	Read & Write	Value default duty cycle output 5 From 0 to 100%
40025	24	0x18	Default output 6 duty cycle	Read & Write	Value default duty cycle output 6 From 0 to 100%
40026	25	0x19	Default output 7 duty cycle	Read & Write	Value default duty cycle output 7 From 0 to 100%
40027	26	0x1A	Default output 8 duty cycle	Read & Write	Value default duty cycle output 8 From 0 to 100%
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	

Modbus	Dec	Hex	Register Name	Access	Description
40052	51	0x33	Outputs	Read & Write	Outputs state
40133	132	0x84	Period PWM output 1	Read & Write	Range adjustment period: 0-65535 [s]
40134	133	0x85	Period PWM output 2	Read & Write	Range adjustment period: 0-65535 [s]
40135	134	0x86	Period PWM output 3	Read & Write	Range adjustment period: 0-65535 [s]
40136	135	0x87	Period PWM output 4	Read & Write	Range adjustment period: 0-65535 [s]
40137	136	0x88	Period PWM output 5	Read & Write	Range adjustment period: 0-65535 [s]
40138	137	0x89	Period PWM output 6	Read & Write	Range adjustment period: 0-65535 [s]
40139	138	0x8A	Period PWM output 7	Read & Write	Range adjustment period: 0-65535 [s]
40140	139	0x8B	Period PWM output 8	Read & Write	Range adjustment period: 0-65535 [s]
40141	140	0x8C	Duty cycle output 1	Read & Write	Value duty cycle output 1 From 0 to 100%
40142	141	0x8D	Duty cycle output 2	Read & Write	Value duty cycle output 2 From 0 to 100%
40143	142	0x8E	Duty cycle output 3	Read & Write	Value duty cycle output 3 From 0 to 100%
40144	143	0x8F	Duty cycle output 4	Read & Write	Value duty cycle output 4 From 0 to 100%
40145	144	0x90	Duty cycle output 5	Read & Write	Value duty cycle output 5 From 0 to 100
40146	145	0x91	Duty cycle output 6	Read & Write	Value duty cycle output 6 From 0 to 100%
40147	146	0x92	Duty cycle output 7	Read & Write	Value duty cycle output 7 From 0 to 100%
40148	147	0x93	Duty cycle output 8	Read & Write	Value duty cycle output 8 From 0 to 100%

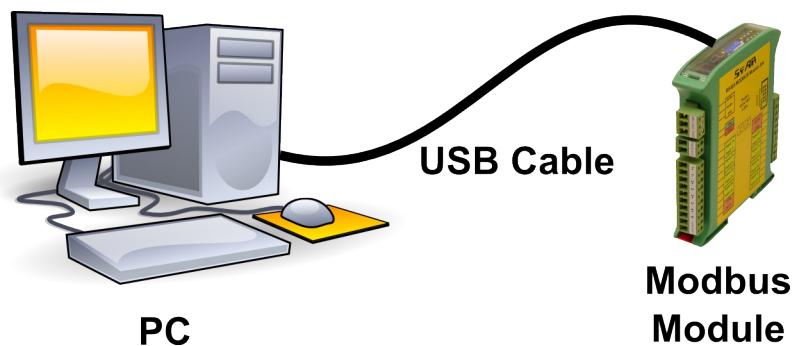
## 8.2. Bit access

Modbus Address	Dec Address	Hex Address	Register name	Access	Description
193	192	0x0C0	Default output 1 state	Read & Write	Default output 1 state
194	193	0x0C1	Default output 2 state	Read & Write	Default output 2 state
195	194	0x0C2	Default output 3 state	Read & Write	Default output 3 state
196	195	0x0C3	Default output 4 state	Read & Write	Default output 4 state
197	196	0x0C4	Default output 5 state	Read & Write	Default output 5 state
198	197	0x0C5	Default output 6 state	Read & Write	Default output 6 state
199	198	0x0C6	Default output 7 state	Read & Write	Default output 7 state
200	199	0x0C7	Default output 8 state	Read & Write	Default output 8 state
817	816	0x330	Output 1	Read & Write	Output 1 state
818	817	0x331	Output 2	Read & Write	Output 2 state
819	818	0x332	Output 3	Read & Write	Output 3 state
820	819	0x333	Output 4	Read & Write	Output 4 state
821	820	0x334	Output 5	Read & Write	Output 5 state
822	821	0x335	Output 6	Read & Write	Output 6 state
823	822	0x336	Output 7	Read & Write	Output 7 state
824	823	0x337	Output 8	Read & Write	Output 8 state

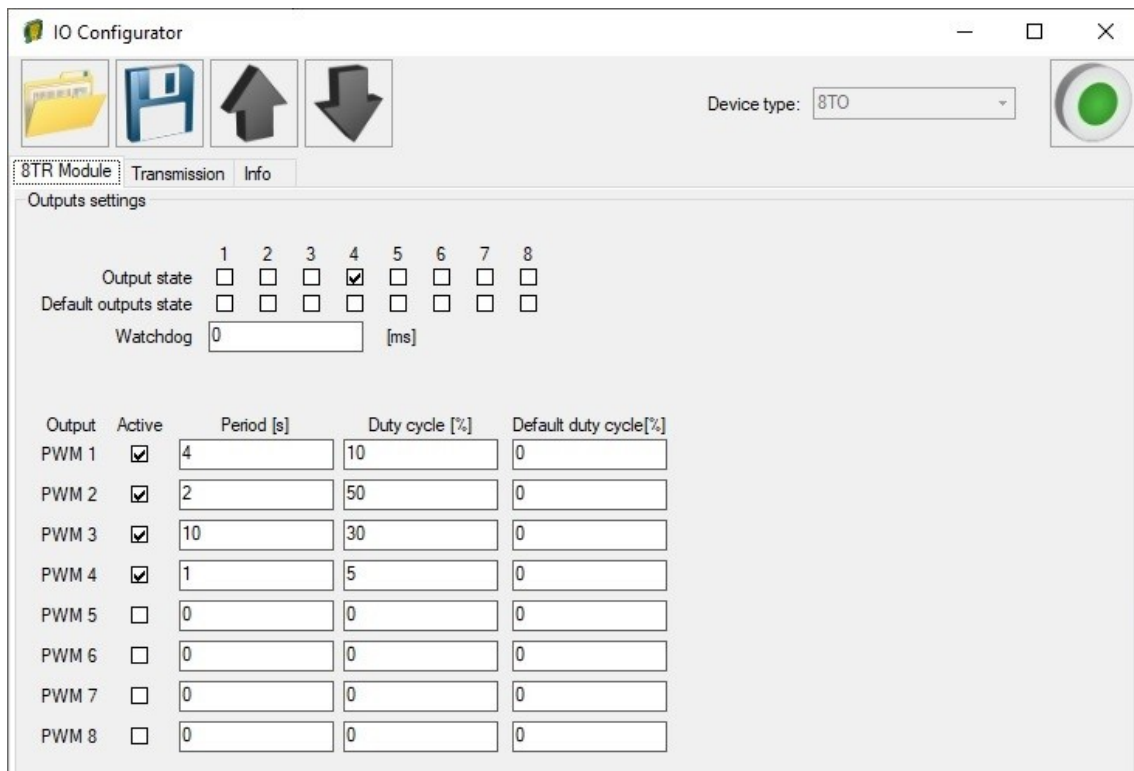
## 9. Configuration software

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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