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RELAY OUTPUTS EXPANSION MODULE
with MODBUS RTU output

MR-RO-1

WARRANTY. The F&F products are covered by a warranty of the 24 months from the date of purchase. Effective only with proof of purchase. Contact your dealer or directly with us. More information how to make a compliant can be found on the website: www.fif.com.pl/reklamacje

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Do not dispose of this device in the trash along with other waste! According to the Law on Waste, electro coming from households free of charge and can give any amount to up to that end point of collection, as well as to store the occasion of the purchase of new equipment (in accordance with the principle of old-for-new, regardless of brand). Electro thrown in the trash or abandoned in nature, pose a threat to the environment and human health.

Purpose

The MR-RO-1 module is used as an external device that extends relay outputs of the PLC programmable controllers or other devices in which data is exchanged via the RS-485 port with MODBUS RTU protocol.

Features

* 1×NO/NC separated contact
* ON / OFF control
* output status
* timer control options:
  - delayed activation
  - delayed activation for a preset time
  - cyclic operation ON / OFF
  - cyclic operation OFF / ON
* state memory state after power outage
* automatic start for time function
* time of the last output switching
* number output switching
* number of executed cycles for time functions

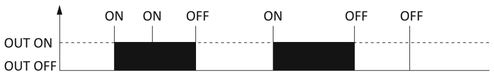
Functioning

The MR-RO-1 module is equipped with a controllable relay output (separated contact). The output operates according to the preset mode of operation and parameters assigned to it. The setting and reading the output status, operation parameters and adjustment of all communication and data exchange parameters is carried out via RS-485 port using MODBUS RTU communication protocol. Power is indicated by a green LED U light. Correct data exchange between the module and other device is indicated by the LED yellow Tx light.

OPERATION MODES

0. ON/OFF

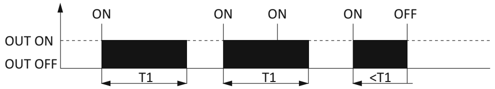
The default mode of module operation in which the output is directly switched on and off using commands sent via Modbus.



1. Delayed activation

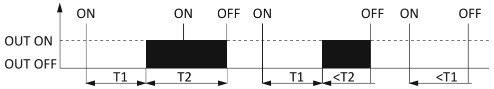
Upon receiving of the ON command, the controller measures the time set in parameter T1 and activates the relay. The relay will shut down after receiving the OFF command. Sending the OFF command during the T1 time countdown will abort the cycle. Another ON command received at the time T1 or when the relay is already switched on will be ignored.

2. Activation for a preset time



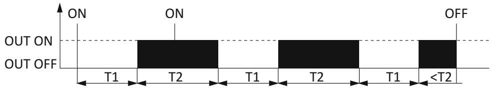
The relay activates after receiving the ON command, and deactivates when the preset time is up. Next cycle can be initiated by sending the next ON command. Sending the OFF command turns off the relay. The ON command received during T1 time will be ignored.

3. Delayed activation for a preset time



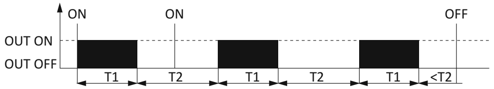
The module starts measuring time T1 after receiving the ON command and then closes the relay for a time T2, after which the relay is switched off. Next cycle after completing the previous one can be activated by sending another ON command. Sending the OFF command OFF breaks the execution of the cycle and turns off the relay. The ON command received during cycle execution will be ignored.

4. OFF/ON cycle



Cyclic operations OUT OFF (relay off) for the time T1 and OUT ON (relay on) for the time T2. The cycle is started by sending the ON command. The number of executed cycles depends on the 0x235 registry value. If this register is set to 0, the program will be executed cyclically until the OFF command is sent. If this registry value is other than zero (max. 65 535), the controller performs a predetermined number of cycles, then turns off. Sending the OFF command during the cycle breaks its execution and turns off the relay. The ON command received during cycle execution will be ignored. After the programmed number of cycles the next ON command starts the program from the beginning.

5. ON/OFF cycle

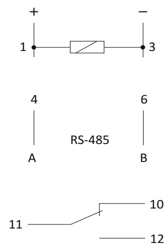


Cyclic operations OUT ON (relay on) for the time T1 and OUT OFF (relay off) for the time T2. The cycle is started by sending the ON command. The number of executed cycles depends on the 0x235 registry value. If this register is set to 0, the program will be executed cyclically until the OFF command is sent. If this registry value is other than zero (max. 65 535), the controller performs a predetermined number of cycles, then turns off. Sending the OFF command during the cycle breaks its execution and turns off the relay. The ON command received during cycle execution will be ignored. After the programmed number of cycles the next ON command starts the program from the beginning.

STATE MEMORY AND AUTOMATIC START

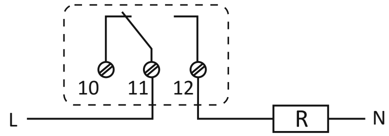
The active **memory of the state** restores the state of the program from before the power outage when the power is back on. State memory sets the contact in position from before the power outage for the 0 mode. Setting the state memory for modes 1-5 means that if at the time of the power outage the program was in progress, then when the power is restored it will be launched from the beginning.
Active **automatic start** function (only if the state memory function is inactive) is the automatic execution of the selected operating mode after switching on the power supply of the module.

IN/OUT description



1-3	converter power supply
4-6	RS-485 serial port
11	COM contact input
10	normally closed (NC) contact
12	normally open (NO) contact

Connection implementation
Activation with normally open contact (active)



Protection

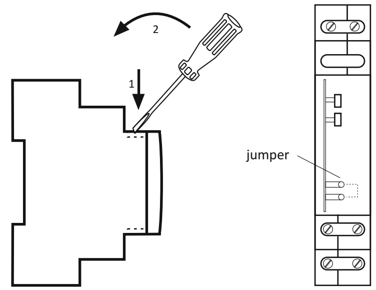
1. Galvanic isolation between the contacts of the relay and the system power supply and communication path (min. 3 kV).
2. No galvanic isolation between power supply and RS-485 line.
3. Overcurrent protection of power supply input and communication input (up to a maximum of 60 V DC) with automatic return feature.

Installation

1. Set the selected MODBUS communication parameters and communications parameters prior to unit installation.
2. Disconnect the power in the distribution box.
3. Install the module on the rail.
4. Connect the module power supply in accordance with the indications: 1(+) / 2(–).
5. Connect signal output A(4)/B(6) to the MASTER output of another device.
6. Connect the 11-12 contact in series into power circuit of the controlled receiver.

Reset of communication settings

The configuration jumper is located under the front casing of the module. Activating the controller with jumper closed will restore factory settings of the communication parameters. To do this, remove the front casing of the module and put the jumper cap on both pins. When the reset is done, remove the jumper.



Specifications

supply voltage	9÷30V DC
output	
contact	separated 1×NO/NC
AC-1 load	<16A
port	RS-485
communication protocol	Modbus RTU
operation mode	SLAVE
indication	
power	green LED
communication	yellow LED
power consumption	<0.3W
working temperature	-20÷50°C
terminal	2.5mm² screw terminals
tightening torque	0.4Nm
dimensions	1 module (18 mm)
mounting	on TH-35 rail
ingress protection	IP20

Communication parameters	
Protocol	MODBUS RTU
Operation mode	SLAVE
Port settings (factory settings)	bit/s: 1200 / 2400 / 4800 / **9600** / 19200 / 38400 / 57600 / 115200 Data bits: **8** Parity: **NONE** / EVEN / ODD Start bits: **1** Stop bits: 1 / 1.5 / **2**
Range of network addresses (factory setting)	1÷245 (**1**)
Command codes	1: Input state reading (0×01 - Read Coils) 3: Registers group reading (0×03 - Read Holding Register) 5: Output states recording (Write Single Coils) 6: Single register value setting (0×06) - Write Single Register)
Maximum frequency of queries	15Hz

Communication registers

address	description	funct.	type	atrib.
256	Reading of current one and recording of new base address: 1÷245	03 06	int	read write
257	Reading of current one and recording of new transmission rate: 0:1200 / 1:2400 / 2:4800 / 3:9600 / 4:19200 / 5:38400 / 6:57600 / 7:115200	03 06	int	read write
258	Reading of current one and recording of new parity value: 0:NONE / 1:EVEN / 2:ODD	03 06	int	read write
259	Reading of current one and recording of new stop bits quantity: 0:1bit / 1:1.5bit / 2:2bits	03 06	int	read write
260	Factory settings: Enter 1.	06	int	write

Please note! Any change in communication parameters (transmission rate, quantity of stop bits, parity) will be applied only after power restart.

1024-1025	Module operation time [s] R1024×256²+R1024	03	int	read
1026-1027	Serial number R1026×256²+R1027	03	int	read
1028	Production date: 5 bits-day; 4 bits-month; 7 bits-year (without 2000)	03	int	read
1029	Software version	03	int	read
1030	Completion: 0 - Lo; 1 - Hi.	03	int	read
1031-1035	Identifier: F& | F | MB | -4 | DI	03	int	read
1039	Configuration jumper: 0-open; 1-closed	03	int	read

The transducer does not support broadcast commands (address 0).

Configuration registers

address	description	func.	type	atrib.
512	Out1: operation mode 0- ON/OFF; 1- delayed activation; 2 - activation for a preset time; 3 - delayed activation for a preset time; 4 - OFF/ON cycle; 5- ON/OFF cycle.	03/06	int	read write
513	Out1: time base V1 (1÷65 535) T1 time = V1 × F1	03/06	int	read write
514	Out1: multiplier F1 0 - ×0,1 (T1: 0,1÷6553,5s) 1 - ×1 (T1: 1÷65 535s)	03/06	int	read write
515	Out1: time base V2 (1÷65 535) T2 time = V2 × F2	03/06	int	read write
516	Out1: multiplier F2 0 - ×0,1 (T2: 0,1÷6553,5s) 1 - ×1 (T2: 1÷65 535s)	03/06	int	read write
517	Out1: number of ON/OFF cycles for modes 4 and 5 (1÷65 535) Value 0 – continuous operation (unlimited number of cycles)	03/06	int	read write
518	Out1: State memory. 0 – inactive; 1 – active.	03/06	int	read write
519	Out1: Automatic start. 0 – inactive; 1 – active.	03/06	int	read write

Output registers

address	description	command	type	atrib.
0	Out1: Recording of the output state ON/OFF Entering 1 (command ON) executes the program dependent on the selected operating mode. Entering 0 (command OFF) breaks the execution of the selected program and opens the contact.	05/06	int	read write

Entering the ON command (0xFF00) executes the program dependent on the selected operating mode.
Entering the OFF command (0x0000) breaks the execution of the selected program and opens the contact.

1	Out1: output state reading ON/OFF 0 – contact open 1 – contact closed	03	int	read
16/17	Out1: contact closing counter [s] R17×256²+R16	03	int	read
32/33	Out1: time of the last contact closing [s] R33×256²+R32	03	int	read
48/49	Out1: total time of contact switching [s] R49×256²+R48	03	int	read
64/65	Out1: number of the completed program cycles (applies to mode 4 and 5) R65×256²+R64	03	int	read

Please note!
Total time and number of contact switching are not retained after power failure.

Configuration parameters – factory settings	
operation mode	0 (ON/OFF)
V1 - time base T1	0
F1 - multiplier for T1	1
V2 - time base T2	0
F2 - multiplier for T2	1
Number of cycles	0 (continuous operation)
State memory	0 (OFF)
Automatic start	0 (OFF)

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