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MR-RO-1

Relay outputs
expansion module
with Modbus RTU output

5 908312 598718

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.

Functions

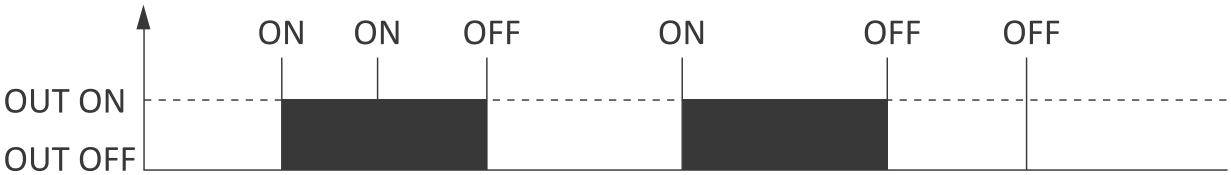
- 1×NO/NC separated contact;
- ON/OFF control;
- Output status;
- Timer control options:
  - delayed activation;
  - delayed activation for a preset time;
  - cyclic operation ON/OFF;
  - cyclic operation OFF/ON;
- State memory state after power outage;
- Automatic start for time function;
- Time of 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.

Working modes

Mode 0. ON/OFF



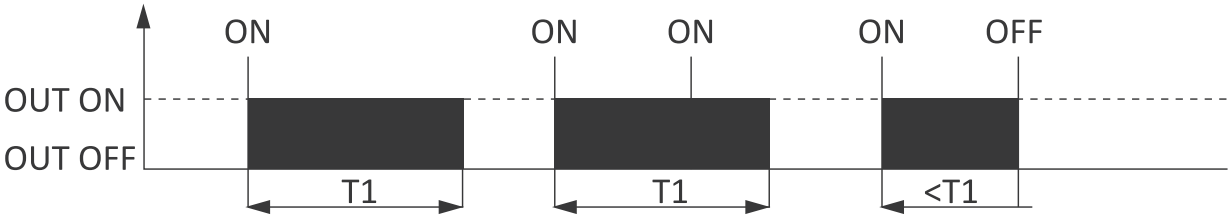
The default mode of module operation in which the output is directly switched on and off using commands sent via Modbus.

Mode 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.

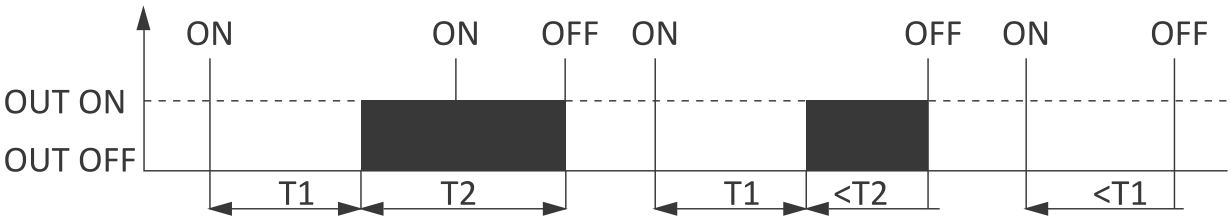
Another ON command received at the time T1 or when the relay is already switched on will be ignored.

Mode 2. Activation for a preset time



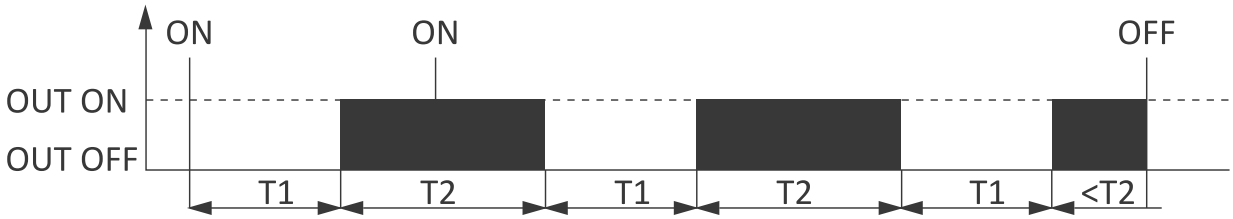
The relay activates after receiving the ON command, and deactivates when the preset time is up. Next cycle can be initiated by sending the next ON command. Sending the OFF command turns off the relay. The ON command received during T1 time will be ignored.

Mode 3. Delayed activation for a preset time



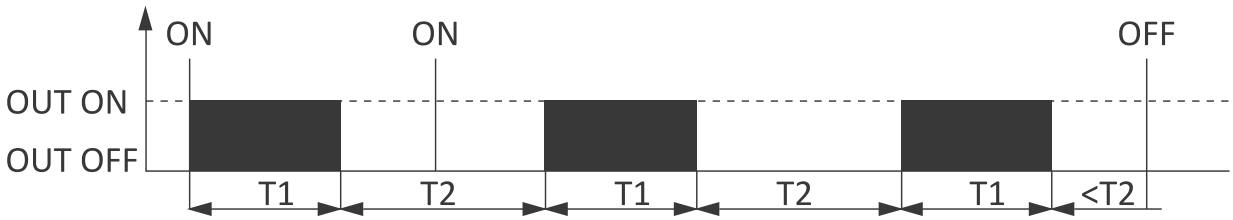
The module starts measuring time T1 after receiving the ON command and then closes the relay for a time T2, after which the relay is switched off. Next cycle after completing the previous one can be activated by sending another ON command. Sending the OFF command OFF breaks the execution of the cycle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

Mode 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.

Mode 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

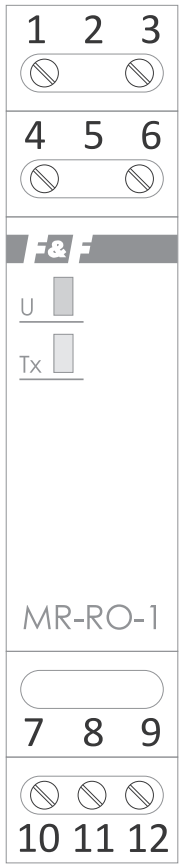
The active memory of the state restores the state of the program from before the power outage when the power is back on. State memory sets the contact in position from before the power outage for the 0 mode. Setting the state memory for modes 1-5 means that if at the time of the power outage the program 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.

RS-485 port is not galvanically isolated from the module supply voltage.

Galvanic isolation between the relay contacts and the system power supply and communication track (min. 3 kV).

Overcurrent protection for power supply and communication input (up to max. 60 V DC) with automatic return function.

Terminals description



module supply

1 – power supply (+)

3 – power supply (–)

RS-485 port

4 – serial port (A)

6 – serial port (B)

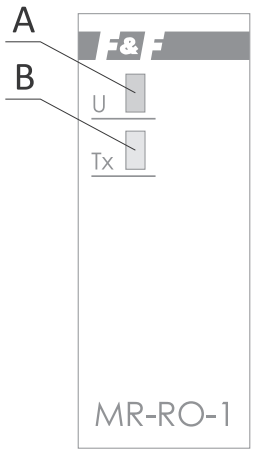
relay output

10 – NC contact

11 – COM contact

12 – NO contact

Device description



A – powerr supply

B – Modbus RTU data exchange

Mounting

Recommended use of interference and surge filters (e.g. OP-230 from the F&F offer).

It is recommended to use shielded twisted-pair cables to connect the module to another device.

When using shielded cables, ground the screens only on one side and as close to the device as possible.

The ends of the signal line should be terminated with termination modules (e.g. LT-04 from the F&F offer).

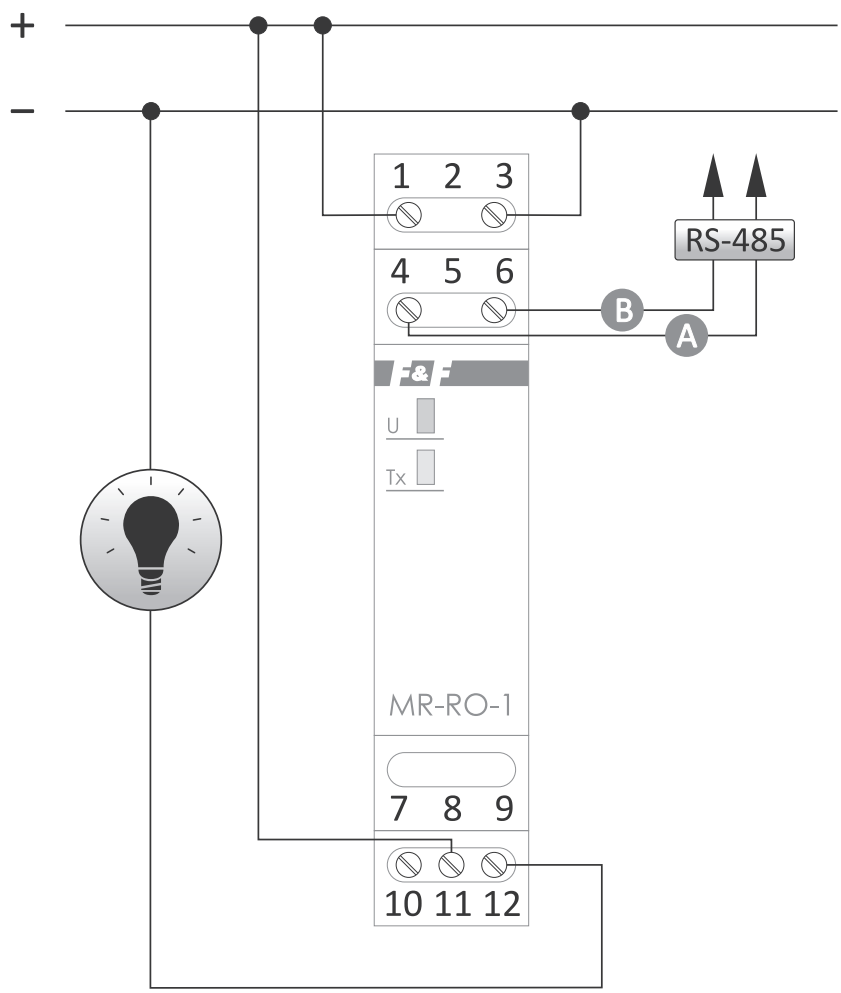
Do not route signal cables in parallel in close proximity to high and medium voltage lines.

Do not install the module in the immediate vicinity of high-power electric receivers, electromagnetic measuring instruments, phase power control devices and other devices that may cause interference.

1. Before installing the module, set the selected Modbus communication parameters and working modes.
2. Disconnect the power in the distribution box.
3. Install the module on the rail.

4. Connect the module's power supply to terminals 1(+) and 3(–) as marked.
5. Connect signal output 4(A) and 6(B) RS-485 port to the Master output.
6. Connect the 11-12 contact in series into power circuit of the controlled receiver.

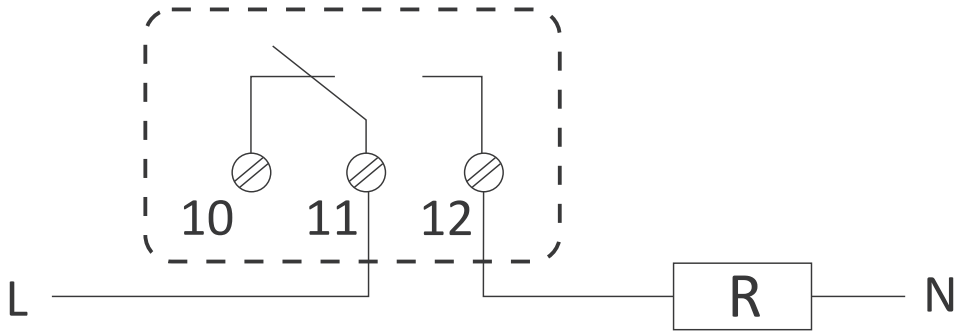
Wiring diagram



Implementation of communication connections according to RS-485 standard specification.

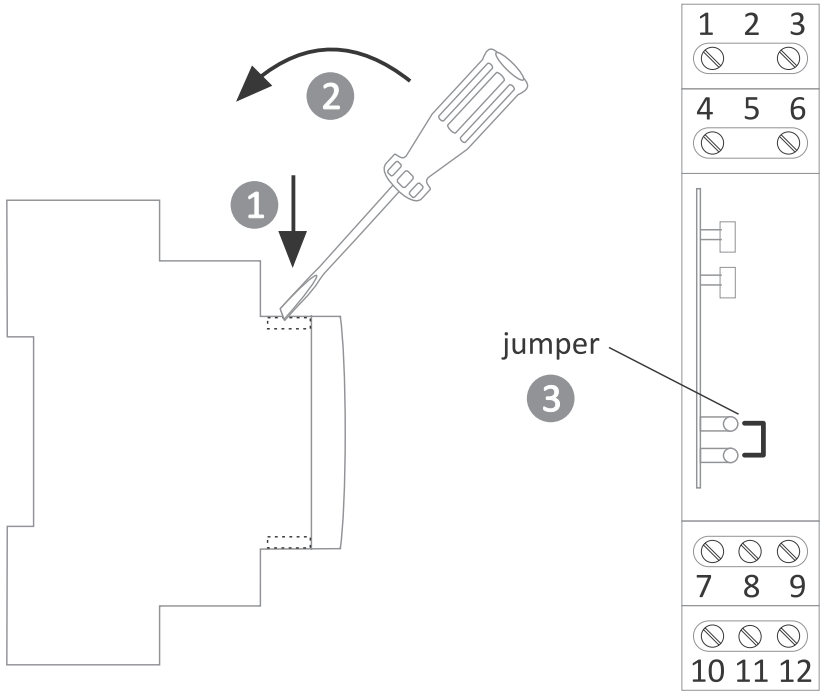
Connection implementation

Activation with normally open contact (active)



Communication settings reset

A configuration jumper is available under the module casing. Starting the controller with the jumper closed restores the factory settings of the communication parameters. To do this, remove the casing of the module and put the jumper on both pins. After the reset is done, remove the jumper.



MB Config service software

Service program for quick configuration of the device.
The program is available on the appliance sub-page or under the "Downloads" tab on the website: www.fif.com.pl.

Technical data

power supply	9÷30 V DC
maximum load current (AC-1)	16 A
contact	separated 1×NO/NC
port	RS-485
communication protocol	Modbus RTU
operating mode	Slave
power indication	green LED
communication indication	yellow LED
communcation parameters	
baud rate (adjustable)	1200÷115200 bits/s
data bits	8
stop bits	1/1.5/2
parity bits	EVEN/ODD/NONE
address	1÷247
power consumption	0.6 W
working temperature	-20÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
mounting	on TH-35 rail
ingress protection	IP20

Warranty

F&F products are covered by a 24-month warranty from the date of purchase. The warranty is only valid with proof of purchase. Contact your dealer or contact us directly.

CE declaration

F&F Filipowski L.P. declares that the device is in conformity with the essential requirements of the Low Voltage Directive (LVD) 2014/35/EU and the Electromagnetic Compatibility (EMC) Directive 2014/30/UE.

The CE and MID Declaration of Conformity, along with the references to the standards in relation to which conformity is declared, can be found at www.fif.com.pl from the product subpage.

Modbus RTU protocol parameters

Communication parameters	
Protocole	Modbus RTU
Operating mode	Slave
Port settings (factory settings)	Number of bits per second: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Data bits: 8 Parity: NONE, EVEN, ODD Start bits: 1 Stop bits: 1/1.5/2
Network address range (factory settings)	1÷245 (1)
Command codes	1: Input all states reading (0×01 – Read Coils) 3: Registers group reading (0×03 – Read Holding Register) 5: Output states recording (0×05 – Write Single Coil) 6: Single register value setting (0×06) – Write Single Register)

Communication parameters (cont.)

Max. frequency of queries	15 Hz

Communication registers

address	description	func.	type	atr.
256	Reading of current one and recording of new base address: 1÷245	03 06	int	R/W
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	R/W
258	Reading of current one and recording of new parity value: 0:NONE / 1:EVEN / 2:ODD	03 06	int	R/W
259	Reading of current one and recording of new stop bits quantity: 0: 1 bit/1: 1,5 bit/2: 2 bits	03 06	int	R/W
260	Factory settings restore: Enter value 1.	06	int	W

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]: $1024 \times 256^2 + R1025$	03	int	R

Communication registers (cont.)

address	description	func.	type	atr.
1026 ÷ 1027	Serial number: R1026×256²+R1027	03	int	R
1028	Production date: 5 bits – day; 4 bits – month; 7 bits – year (without 2000)	03	int	R
1029	Software version	03	int	R
1031 ÷ 1035	Identifier: F& | F | MB | 1 | RO	03	int	R
1039	Configuration jumper: 0 – open; 1 – close	03	int	R

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

Configuration registers

address	description	func.	type	atr.
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	R/W
513	Out1: V1 time base (1÷65535) T1 time = V1 × F1	03 06	int	R/W

Configuration registers (cont.)

address	description	func.	type	atr.
514	Out1: F1 multiplier 0: ×0.1 (T1: 0.1÷6553.5 s) 1: ×1 (T1: 1÷65535 s)	03 06	int	R/W
515	Out1: V2 time base (1÷65535) T2 time = V2 × F2	03 06	int	R/W
516	Out1: F2 multiplier 0: ×0.1 (T2: 0.1÷6553.5 s) 1: ×1 (T2: 1÷65535 s)	03 06	int	R/W
517	Out1: number of ON/OFF cycles for modes 4 and 5 (1÷65535) Value 0 – continuous operation (unlimited number of cycles)	03 06	int	R/W
518	Out1: State memory. 0 – inactive; 1 – active	03 06	int	R/W
519	Out1: Autostart. 0 – inactive; 1 – active	03 06	int	R/W

Legend: R – read, W – write

Outputs registers

address	description	func.	type	atr.
0	Out1: Recording of the output state ON/OFF Entering 1 (command ON) executes the program depen-dent on the selected operating mode. Entering 0 (command OFF) breaks the execution of the selected program and opens the contact.	05 06	int	W
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 – open contact; 1 – close contact	03	int	R
16/17	Out1: contact closing counter [s]: R17×256²+R16	03	int	R
32/33	Out1: time of the last contact closing [s]: R33×256²+R32	03	int	R
48/49	Out1: total time of contact switching [s]: R49×256²+R48	03	int	R
64/65	Out1: number of the comple-ted program cycles (applies to mode 4 and 5): R65×256²+R64	03	int	R

Outputs registers (cont.)

address	description	func.	type	atr.

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

Configuration parameters (factory settings)

Operation mode	0 (ON/OFF)
V1 – T1 time base	0
F1 – T1 multiplier	1
V2 – T2 time base	0
F2 – T2 multiplier	1
Number of cycles	0 (continuous operation)
State memory	0 (OFF)
Automatic start	0 (OFF)