F&F Filipowski sp. j.
Konstantynowska 79/81 95-200 Pabianice
phone/fax: (+48 42) 215 23 83 / 227 09 71 POLAND
http://www.fif.com.pl e-mail: biuro@fif.com.pl

ANALOG INPUT
EXTENSION MODULE
with output MODBUS RTU

MR-AI-1

5 9 0 8 3 1 2 5 9 4 6 2 8

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

MR-AI-1 module serves as an external analog input device extending PLCs or other devices in which data exchange is via the RS-485 according to the MODBUS RTU protocol.

Functioning

The module has 4 universal analog inputs. Input type compatible 0-10V (voltage U) or 4-20mA (current I) is determined using internal jumpers. The module measures the value of input current and voltage on all inputs regardless of the hardware configurations of input types (location of jumpers). However, they will be properly measured input values for which this entry is configured.
Reading values of the input currents or voltages and setting communication parameters is realized through the RS-485 port using MODBUS RTU communication protocol.
Switching voltage is indicated by a green LED U. Correct data exchange between the module and the second device unit is indicated by a yellow LED Tx.

Parameters of MODBUS RTU protocol

Communication parameters	
Protocol	MODBUS RTU
Work mode	SLAVE
Port settings (factory settings)	Bit numbers on sec: 1200 / 2400 / 4800 / 9600 / 19200 / 3840 / 57600 /115200 Data bits: 8 Parity: NONE/EVEN/ODD Start bits: 1 Stop bits: 1 / 2
Range of network addresses (factory settings)	1÷247 (90)
Range of base addresses	1÷238
Range of residual addresses (switch code)	0÷9
Command codes	3: Read value of outputs registry (0×03 - Read holding Register) 4: read all or some records of input values (0×04 - Read Input Register) 6: The setting of a single output (0×06 - Write Single Register) 16: The setting of multiple outputs (0×10 - Write Multiple Registers) 17: Read ID (0x11 - Report Slave ID)
The maximum frequency of queries	15Hz

Registers

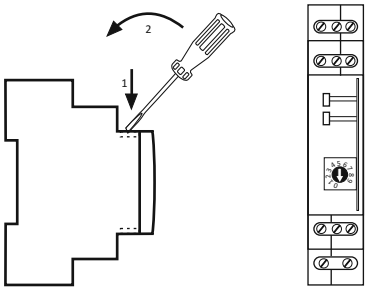
Communication parameters				
adress	**description**	**code**	**type**	**atr.**
0	read actual base sdress	03	int	read
0	save a new base adress: 1÷238	06, 16	int	write
Module can accept network addresses in the range 1 ÷ 247 The network address of the module is set in a complex way: using the MODBUS protocol to set the base address, the number in the range 1 to 238, and a multi-position switch to set address residual, ie the number from 0 to 9th The sum of these two values determines the network address (eg, 1 +6 = 7, 70 +3 = 73, 238 +9 = 247).				
1	read a speed of transmission	03	int	read
1	save a new speed of transmission	06, 16	int	write
The speed value [bits/sec] is given in the form of an integer divided by 100, for example, 9600 bit/sec write in figures 96; 115200 bit/sec write in figures 1152.				
2	read of actual parity value	03	int	read
2	save a new parity value	06, 16	int	write
Parity adopt appropriate meanings: NONE - 0; EVEN - 1, ODD - 2				
3	read of actual number of stop bits	03	int	read
3	save the number of stop bits	06, 16	int	write
Number of stop bits accepts the importance of 1 or 2				

INPUT parameters				
adress	**description**	**code**	**type**	**atr.**
1000÷ 1003	values of input currents AI 1÷4	04	int	read
1004÷ 1007	values of input voltages AI 1÷4	04	int	read
The current value is presented in the form of the total number of positive times 0.01 mA (eg registry values 103 corresponds to current of 1.03 mA). The voltage value is presented in the form of the total number of times the 0.01 V positive (eg, the registry value 456 corresponds to the voltage 4.56 V).				

In response to the command "odzczyt ID" (code 17), we obtain a packet of information about the module: in the "Slave ID" code 0xEC; in the "Run Status Indicator" code 0xFF; in the "Additional Data" text "AI-1Mv1. 2 "

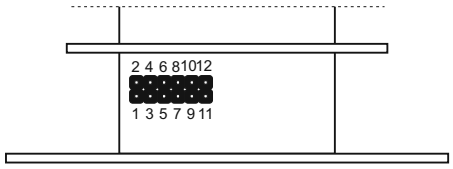
Setting the Network Address

Module can accept network addresses in the range 1 ÷ 247. The network address of the module is set in a complex way: using the MODBUS protocol to set the base address, the number in the range 1 to 238, and a multi-position switch to set address residual, ie the number from 0 to 9th The sum of these two values determines the network address (eg, 1 +6 = 7, 70 +3 = 73, 238 +9 = 247). Multi-position code switch is located under the front elevation. Cladding removed using flat-head screwdriver 3mm elevation gently undermining hooks on the sides of the enclosure. 3mm flat screwdriver to switch the rotary switch to the desired number, as a sub-address (range 0 to 9). Set a new module address is the sum of the values and partial base address, after setting the front elevation set up with special attention to the proper fitting of LEDs in the holes.



Configuration of inputs

Each of the four to enter the module can be configured as a current or voltage. For this purpose you should make the internal jumper settings on the connector configuration of the module. In order to do so, remove the front façade with a flat screwdriver 3mm tort challenging elevation hooks on the sides of the enclosure. Then pull out the rail clips from the guides (inside), then gently spread the housing halves. Connector configuration is on the vertical board between two horizontal.



Make setup of the jumpers accordance to the table below

Hardware configuration type of inputs		
input	type I	type U
AI1	2-4	4-6
AI2	1-3	3-5
AI3	8-10	10-12
AI4	7-9	9-11

Assembly

General assumptions:

* Recommend the use of filters and surge suppression (eg, OP-230 F&F).
* Recommended use of shielded twisted pair signal cables for connecting the module to another device.
* Communication lines must be completed by termination module LT-04 (F&F).
* When using shielded cables grounded screens performed only on one side and as close to the device.
* Do not lay signal cables in parallel in close proximity to the line of high and medium voltage.

* Do not install the module in close proximity to high power electrical loads, electromagnetic measurement devices, devices with phase power regulation, and other devices that may introduce noise.

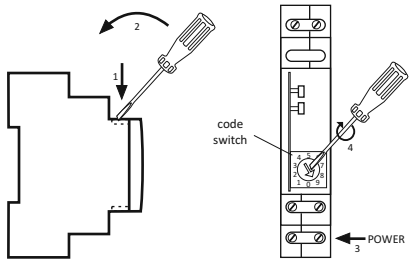
Installation

1. Make a hardware configuration according to the type wejśćmodułu transmitter connected to the analog input (U/I).
2. Set the address and communication parameters of module.
3. Take off the power.
4. Put the module on the rail.
5. Power supply of module connect to joints 10-12 accordance to mark.
6. Signal output 1-3 (port Rs485) connect to output of device type MASTER.
7. To selected inputs AI connect nalog converters accordance to theirs type (U/I).

Reset communication settings

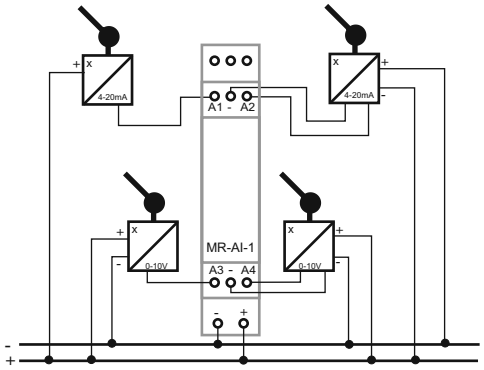
Under cover is available code switch.

1. Take OFF the power.
2. Remove front panel.
3. Set "9" on the switch.
4. Take ON the power and within 3 sec switch to "1".



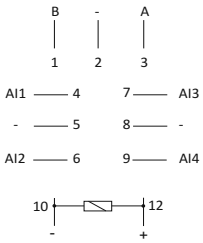
Inputs AI

A schematic diagram of various types of analog converters



Input/output description

1-3	port RS485
4/6/7/9	input signal AI.
2/5/8	galvanic connected to p.10
10-12	supply of relay



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

TECHNICAL DATA

supply	9÷30V DC
max. current consumption	30mA
number inputs	4
type of inputs/range	
current	0÷20mA
voltage	0÷10V
input resistance	
current	110kΩ
voltage	47Ω
error precision	0.5%
port	RS-485
communication protocol	MODBUS RTU
working temperature	-40°C÷50°C
storage temperature	-40°C÷70°C
relative humidity	85% to 30°C
connection	2.5mm² screw terminals
torque	0.4Nm
dimensions	1 module (18mm)
protection level	IP20

D170210