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PANEL SIGNAL TRANSDUCER
0÷20 mA/0÷10 V

PA-02-MBT

5 902431 672557

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.

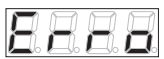
Description of the device

The PA-02-MBT is a 0÷20 mA/ 0÷10 V panel signal transducer with the possibility of setting two independent alarms that control two relays.
The result is scaled according to the linear characteristic set by the user.
The device is equipped with Modbus RTU bus that allows to remotely configure and read the measured parameters.
The module is enclosed in a 36×72 mm panel casing with a 14 mm display in the front part. Additionally, on the front panel there are LEDs indicating the current status of alarm outputs and one LED that indicates Modbus communication. The buttons are used for local configuration of the device parameters.

Main configuration menu

All device settings can be made using the configuration menu buttons available.
To enter the menu, press the [OK] button for about 2 seconds. The display will show 0000 indicating the service password input mode, the first digit will blink:

Enter the service password (default: 0000). The [UP/DOWN] buttons are used to change the value of a given item, the [OK] button confirms the set value of a given password position (currently set position blinks).
If you enter the incorrect password, an error message will be displayed:



and then the device will go into normal operation mode.
After entering the correct password, the first item of the main configuration menu will be displayed:

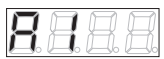
Exiting the menu will occur automatically after 30 seconds of inactivity or after selecting "EXIT"

and confirming the selection with [OK].
After entering the correct password, it is remembered for 2 minutes after leaving the menu, which allows you to re-enter the settings (within 2 minutes from the last time you left the menu) without having to re-enter the password.

Alarm configuration menu

The device has 2 relay outputs, which are controlled by two user-configurable alarms.
Alarm configuration menu can be found in position No. 1 in the main configuration menu - "ALAR":

After confirming the selection with [OK], the menu for selecting the alarm for configuration will be displayed.
To access the configuration submenu of alarm No. 1 , select "A1":

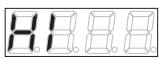


and then confirm your selection with [OK].

Position No. 1 of the alarm configuration submenu will be displayed - "En":

The "En" position is used to activate or deactivate the alarm function. After pressing the [OK] button, select whether you want the alarm function to be active - [YES] or inactive - [NO], and then confirm your selection with [OK].
Position No. 2 in the alarm configuration submenu is "LO":

The "LO" position is used to set the value of the lower threshold at which the alarm will be triggered.
The value can be changed in the range from the minimum displayable value (parameter "LO_d" in analogue options) to a value lower by 2 than the upper alarm threshold "HI".
After pressing the [OK] button, use the [UP/DOWN] buttons to set the expected value and then confirm the set value with the [OK] button.
Position No. 3 in the alarm configuration submenu is "HI":



The "HI" position is used to set the value of the upper threshold at which the alarm will be triggered.
The value can be changed in the range from the value higher by 2 than the lower alarm threshold "LO" to the maximum displayed value (parameter "HI_d" in the analogue options).

After pressing the [OK] button, use the [UP/DOWN] buttons to set the expected value and then confirm the set value with the [OK] button.

If the difference between the "HI" and "LO" values is less than the currently set hysteresis value "HYST", then the value "HYST" will be automatically reduced to the value "x", where (x = "HI" - "LO" -1).

Position No. 4 in the alarm configuration submenu is "HYST". (Hysteresis)

A drawing showing the operation of the alarm along with the set thresholds and the hysteresis value is shown below:

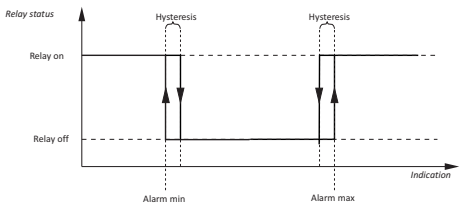


Fig.1. Alarm histeresis

The "HYST" position is used to set the hysteresis value for both thresholds (lower and upper) of the alarm operation, in the range from 1 to "x", where (x = HI_d - LO_d - 1), but no more than the difference between upper and lower alarm threshold.

After pressing the [OK] button, use the [UP/DOWN] buttons to set the expected value, and then confirm the set value with the [OK] button.

Position No. 5 in the alarm configuration submenu is "T_ON" (time to relay switch on):

The "T_ON" position is used to set the delay time for switching on the alarm relay in the range of 0÷180 s.
After pressing the [OK] button, use the [UP/DOWN] buttons to set the expected value and then confirm the set value with the [OK] button.

Position No. 6 in the alarm configuration submenu is "TOFF" (time to relay switch off):

The "TOFF" position is used to set the delay time for switching off the alarm relay in the range of 0-180 sec. After pressing the [OK] button, use the [UP/DOWN] buttons to set the expected value.
and then confirm the set value with the [OK] button.
Position No. 7 in the alarm configuration submenu is "BACK":

The "BACK" position is used to exit the alarm configuration menu.

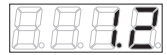
Alarm No. 2 must be configured in the same way by selecting "A2" in the menu for alarm configuration.

Configuration menu for communication parameters
The menu for configuration of communication parameters can be found in item No. 2 in the main configuration menu "CONN":

After confirming the selection with the [OK] button, the configuration menu for communication parameters will be displayed.
Position No. 1 in the configuration menu for communication parameters is "ADDR":

The "ADDR" position is used to set the address of the device seen through the Modbus RTU protocol in the range of 1÷247.
After pressing the [OK] button, use the [UP/DOWN] buttons to set the expected value and then confirm the set value with the [OK] button.
Position No. 2 in the configuration menu for communication parameters is "BAUD":

The "BAUD" position is used to set the communication speed of the RS-485 communication interface within the range of the values presented below:

Parameter	Information on display
1200 bps	
2400 bps	
4800 bps	
9600 bps	
19200 bps	
38400 bps	
57600 bps	
115200 bps	

After pressing the [OK] button, use the [UP/DOWN] buttons to set the expected value and then confirm the set value with the [OK] button.

Position No. 3 in the configuration menu for communication parameters is "PARI":

The "PARI" position is used to set the RS-485 communication interface parity bits control within the range of the values shown below:

Parameter	Information on display
Parity check disabled	
Parity bit	
Odd parity bit	

After pressing the [OK] button, set the expected value using the [UP/DOWN] buttons and then confirm the set value with the [OK] button.
According to the Modbus RTU standard, 2 stop bits are sent if the parity check is deactivated.
When the parity check is enabled, 1 stop bit is sent:

Data format without parity check

Start bit	8 data bits	2 stop bits

Data format with parity check

Start bit	8 data bits	Parity bit	1 stop bit

Position No. 4 of the communication parameters configuration menu is "BACK":

The "BACK" item is used to exit the configuration menu for configuration of communication parameters.

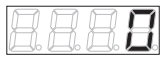
Configuration menu for display settings

The configuration menu for display settings can be found in position No. 3 in the main configuration menu - "DISP":

When you confirm your selection with the [OK] button, the configuration menu for display settings is displayed.
Position No. 1 of the display settings configuration menu is "REFR":

The "REFR" position is used to set the refreshing time of the result shown on the display in the range of 0.1÷10 seconds.
After pressing the [OK] button, use the [UP/DOWN] buttons to set the expected value and then confirm the set value with the [OK] button.
Position No. 2 of the display settings configuration menu is "ACCU':

The "ACCU" position is used to select the accuracy of displaying the currently measured value the range of the values presented below:

Parameter	Information on display
Result with decimal part	
Result without decimal part	

After pressing the [OK] button, use the [UP/DOWN] buttons to set the expected value and then confirm the set value with the [OK] button.
Position No. 3 of the display settings configuration menu is "LED":

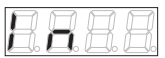
The "LED" position is used to enable or disable Modbus communication signaling with the [Tx] diode on the front panel of the device.
After pressing the [OK] button, set the expected value using the [UP/DOWN] buttons and then confirm the set value with the [OK] button.
Position No. 4 of the display settings configuration menu is "BACK":

The "BACK" position is used to exit the display settings configuration menu.

Analog settings menu

The menu for configuring the analog settings is in position No. 4 in the main configuration menu - "ANLG":

After confirming the selection with the [OK] button, the analog setting menu will be displayed, in which we set the parameters responsible for the selection of the analog input and for the characteristics of converting the analog value to the display indication.
The first item of this menu is "IN":



After confirming the selection with the [OK] button, we will enter the input selection:

The "CURR" position means that the value on the display will be converted in proportion to the current measured at the current input, while selecting the "VOLT" position:

means that the value on the display will be converted in proportion to the voltage measured at the voltage input.

The following items will be discussed in relation to the characteristics shown below:

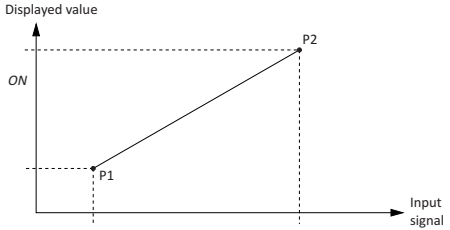


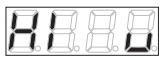
Fig. 2. Processing characteristics

Position No. 2 in the analogue settings menu depends on the selected measurement input.
If the current input is active, set the current for point P1 (Fig. 2), but if the voltage input is active, set the voltage for point P1 (Fig. 2).
Below is a description of both cases:

The position "LO_C" is used to set the current for point P1 on the characteristic curve.
After confirming the selection with the [OK] button, we will proceed to the setting of this value. The value is set in mA and can be changed from 0.0 mA to 20.0 mA.

Position "LO_V" is used to set the voltage for point P1 on the characteristic curve.
After confirming the selection with the [OK] button, we will proceed to the setting of this value. The value is set in V and can be changed from 0.0 V to 10.0 V.
The situation is similar for third menu item, in which we set the current for point P2, and in the case when the voltage input is active, we set the voltage for point P2 of the characteristic curve.
Below is a description of both cases:

The position "HI_C" is used to set the current for point P2 on the characteristic curve.
After confirming the selection with the [OK] button, we will proceed to the setting of this value. The value is set in mA and can be changed from 0.0 mA to 20.0 mA.



The position "HI_V" is used to set the voltage for point P2 on the characteristic curve.
After confirming the selection with the [OK] button, we will proceed to the setting of this value. The value is set in V and can be changed from 0.0 V to 10.0 V.

Position No. 5 of this menu is "LO_d", which is responsible for setting the displayed value for point P1. In short, it is the value that will be displayed when the value of current or voltage (depending on the measurement input selection) equals "LO_C" or "LO_V" respectively.

After confirming the selection with the [OK] button, we move on to setting the value.
This value can be changed from -999 to 9999.
Pressing the [OK] button again saves the setting.
The sixth position in this menu is "HI_d", which is responsible for setting the value displayed for point P2. In short, it is the value that will be displayed when the value of current or voltage (depending on the measurement input selection) equals "HI_C" or "HI_V" respectively.

After confirming the selection with the [OK] button, we move on to setting the value.
This value can be changed from -999 to 9999.
Pressing the [OK]button again saves the setting.
The last menu item is "BACK":

The “BACK" position is used to return to the main setting menu.

Configuration menu for general settings
The menu for configuring general settings can be found in position No. 2 in the main configuration menu - "OTHR":

After confirming the selection with the [OK] key, the general settings configuration menu will be displayed.
Position No. 1 of the general settings configuration menu - "VERS":

The "VERS" position is used to check the software version of the device.
After pressing the [OK] button, the device software version will be displayed. Pressing the [OK] button again will return to the general settings configuration menu.
Position No. 2 of the general settings configuration menu - "FACT":

The "FACT" position is used to restore the factory settings of the device. After pressing the [OK] button, the device will enter the service password entry mode. After entering the correct password, use the [UP/DOWN] buttons to select the desired action according to the following values:

Parameter	Information on display
YES – reset the device to factory settings	
NO – no action	

and then confirm the set value by pressing [OK].
Position No. 2 of the general settings configuration menu - "PASS":

The "PASS" position is used to change the service password. After pressing the [OK] button, the device will enter the mode of entering the current service code.
After entering the correct password, 4 zeros will be displayed - use the [UP/DOWN] and [OK] buttons to enter the new password. If the operation is carried out correctly, the message "SAVE" will be displayed confirming the change of the password:

After changing the service code, the main configuration menu will exit. You will be able to enter the menu again after entering a new password.

Position No. 3 of the general settings configuration menu - "BACK":

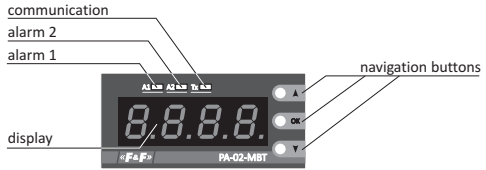
The "BACK" position is used to exit the general settings configuration menu.

Restoring factory settings

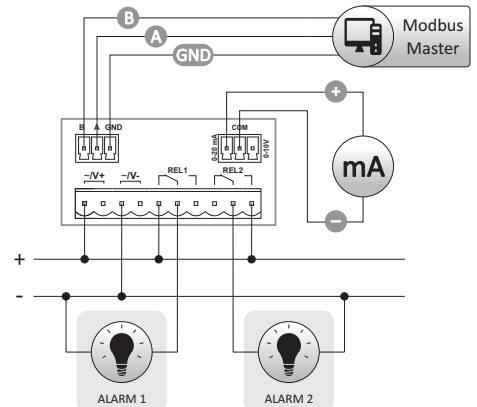
It is possible to restore the device to its factory settings, for example in case of loss of the service password.
To do this, turn on the power of the device while holding down the [UP] and [DOWN] buttons and keep them pressed for 30 seconds from the moment the power is turned on.
The factory settings reset will be confirmed by a test of the display.

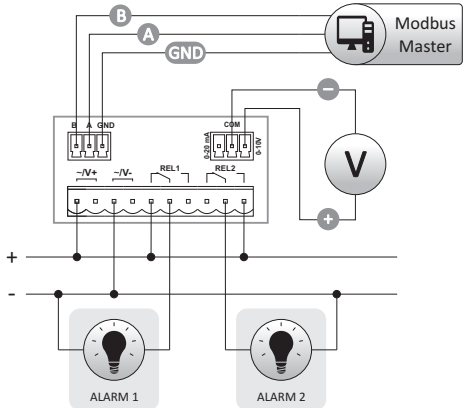
Parameter	Value
alarm 1 on	NO
alarm 1 minimum	10
alarm 1 maximum	80
alarm 1 hysteresis	1
alarm 1 TON	1.0 sec
alarm 1 TOFF	1.0 sec
alarm 2 on	NIE
alarm 2 minimum	10
alarm 2 maximum	80
alarm 2 hysteresis	1
alarm 2 TON	1 sec
alarm 2 TOFF	1 sec
Modbus address	1
communication speed	9600 bps
parity	off
display refresh time	1×/s
display accuracy	with decimal point
communication diode	on
service password	0000
analog input	voltage
low point voltage characteristic	0.0 V
high point voltage characteristic	10.0 V
lower value of the characteristic	0
upper value of the characteristic	100

Panel description



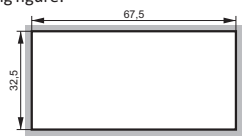
Connection scheme





Mounting

1. The device should be mounted in a cut-out prepared according to the following figure:



2. The device should be inserted from the front into the hole.
3. Then attach the fastening elements to the sides of the device from behind and stabilize the device with them.

Technical data

power supply	9÷30 V AC/DC
current consumption	max. 100 mA
load current of the relays (AC-1)	6 A
contacts	separated 2×NO/NC
measuring inputs	separated 0÷20 mA/0÷10 V
measurement accuracy	1%
alarm hysteresis	1÷9999
lower alarm threshold	-999÷9998
upper alarm threshold	-998÷9999
alarm delay	0.0 sec÷180.0 sec
minimal indication	-999
maximum indication	9999
communications parameters	
speed (adjustable)	1200÷115200 bit/s
data bits	8
stop bits	1 or 2
parity check	EVEN/ODD/NONE
address	1÷247
communication protocole	Modbus RTU
working temperature	-10÷40°C
terminal	
disconnectable terminals	2.5 mm²
tightening torque	0.4 Nm
disconnectable terminals	1.0 mm²
tightening torque	0.2 Nm
display height	14 mm
dimensions	72×36×72 mm
mounting hole dimensions	67.5×32.5 mm
mounting	panel
protection level	IP20

CE declaration

Copy of the CE declaration can be downloaded from the website: www.fif.com.pl from the product subpage

Communication parameters (default settings)	
Protocole	Modbus RTU
Operating mode	SLAVE
Range of network addresses	1÷247 (**1**)
Command codes	3: Read registers group (0x03 – Read Holding Registers) 6: Write a single register (0x06 – Write Single Register) 16: Write registers group (0x10 - Write Multiple Registers)
Port settings (default settings)	
Communication speed	1200/2400/4800/(**9600**)/19200/38400/57600/115200
Data bits	(**8**)
Parity	(**NONE**)/EVEN/ODD
Stop bits	1/(**2**)
Max. query frequency	15 Hz

Modbus registers

Measurement registers

address	description	type	access*
0 (0x0000)	Displayed value *(Integer)*	int	R
1 (0x0001)	Displayed value *(Fractional, decimal)*	int	R
2 (0x0002)	Displayed value [LSW] *(Younger value word in float format)*	float	R
3 (0x0003)	Displayed [MSW] *(Older value word in float format)*	float	R
4 (0x0004)	Voltage value at the voltage input *(Value measured in millivolts)*	int	R
5 (0x0005)	Voltage value at the current input *(Value measured in microamperes)*	int	R

*R – read only, R/W – read and write

Registers - alarm 1

address	description	type	access*
16 (0x0010)	Alarm activation *(1 - alarm on, 0 - alarm off)*	int	R/W
17 (0x0011)	Lower alarm threshold *(minimum [value from register 83]) (maximum [value from register 86] - 2)*	int	R/W
18 (0x0012)	Upper alarm threshold *(minimum [value from register 83] +2) (maximum [value from register 86])*	int	R/W
19 (0x0013)	Alarm hysteresis *(minimum 1) (maximum [value from register 86] - [value from register 83])*	int	R/W
20 (0x0014)	Alarm activation delay *(Value ×10, for example 100.0 sec.= 1000) (minimum 0 - no delay, maximum 1800 - 180.0 sec.)*	int	R/W
21 (0x0015)	Alarm deactivation delay *(Value ×10, for example 100.0 sec.= 1000) (minimum 0 - no delay, maximum 1800 - 180.0 sec.)*	int	R/W
22 (0x0016)	Current alarm status *(1 - alarm triggered, 0 - alarm not triggered)*	int	R

*R – read only, R/W – read and write

Registers -alarm 2

address	description	type	access*
23 (0x0017)	Alarm activation *(1 - alarm on, 0 - alarm off)*	int	R/W
24 (0x0018)	Lower alarm threshold *(minimum [value from register 83]) (maximum [value from register 86] - 2)*	int	R/W
25 (0x0019)	Upper alarm threshold *(minimum [value from register 83] +2) (maximum [value from register 86])*	int	R/W
26 (0x001A)	Alarm hysteresis *(minimum 1) (maximum [value from register 86] - [value from register 83])*	int	R/W
27 (0x001B)	Alarm activation delay *(Value ×10, for example 100.0 sec.= 1000) (minimum 0 - no delay, maximum 1800 - 180.0 sec.)*	int	R/W
28 (0x001C)	Alarm deactivation delay *(Value ×10, for example 100.0 sec.= 1000) (minimum 0 - no delay, maximum 1800 - 180.0 sec.)*	int	R/W
29 (0x001D)	Current alarm status *(1 - alarm triggered, 0 - alarm not triggered)*	int	R

*R – read only, R/W – read and write

Registers of analog signal processing settings

address	description	type	access*
80 (0x0050)	Type of input *(0 - input 0÷10 V, 1 - input 0÷20 mA)*	int	R/W
81 (0x0051)	Voltage of the initial characteristic point [P1 → p. 13] *(Value ×10, for example 10.0 V = 100)*	int	R/W
82 (0x0052)	Current of the initial characteristic point [P1 → p. 13] *(Value ×10, for example 10.0 mA = 100)*	int	R/W
83 (0x0053)	Value of the initial characteristic point [P1 → p. 13]	int	R/W
84 (0x0054)	Voltage of the final characteristic point [P2 → p. 13] *(Value ×10, for example 10.0 V = 100)*	int	R/W
85 (0x0055)	Current of the final characteristic point [P2 → p. 13] *(Value ×10, for example 10.0 mA = 100)*	int	R/W
86 (0x0056)	Value of the final characteristic point [P2 → p. 13]	int	R/W

* R/W – read and write

Communication settings

address	description	type	access*
256 (0x0100)	Modbus address *(minimum 1, maximum 247)*	int	R/W
257 (0x0101)	Transmission speed *0 – 1200 bps* *1 – 2400 bps* *2 – 4800 bps* *3 – 9600 bps* *4 – 19200 bps* *5 – 38400 bps* *6 – 57600 bps* *7 – 115200 bps*	int	R/W
258 (0x0102)	Parity check *0 – None* *1 – Even* *2 – Odd* *CAUTION!* *Setting the parity to ODD or EVEN automatically sets the communication to work with one stop bit. If there is no parity (NONE), 2 stop bits are automatically set.*	int	R/W
259 (0x0103)	Default configuration *Entering 1 restores the default configuration*	int	R/W

* R/W – read and write

Other registers

address	description	type	access*
32 (0x0020)	Display refresh interval *(minimum 1 - every 100 msec., maximum 100 - every 10 sec.)*	int	R/W
33 (0x0021)	Display accuracy *(0 - integer value (0),* *1 - value with one decimal place [0.0])*	int	R/W
34 (0x0022)	Control of the communication diode *(0 - LED does not flash during Modbus communication,* *1 - LED flashes during Modbus communication)*	int	R/W
64 (0x0040)	Password to access the menu from the keyboard *(minimum 0, maximum 9999)*	int	R/W
1024 (0x0400)	Operating time from power on [LSW] *Value is calculated as MSW * 65536 + LSW*	int	R
1025 (0x0401)	Operating time from power on [MSW] *Value is calculated as MSW * 65536 + LSW*	int	R
1026 (0x0402)	Serial number [MSW] *Value is calculated as MSW * 65536 + LSW*	int	R
1027 (0x0403)	Serial number [LSW] *Value is calculated as MSW * 65536 + LSW*	int	R
1028 (0x0404)	Manufacturing date *5 bits - day, 4 bits - month, 7 bits - year [without2000]*	int	R
1029 (0x0405)	Software version *(10 - 1.0 etc.)*	int	R
1030-1036 (0x0406–0x040C)	The device identifier "F&F_PA-02-MBT" *2 characters in each register*	char	R

*R – read only, R/W – * R/W – read and write