MB-TC-1

Temperature transducer
for use with thermocouples

K, J, T, N, S, E, B, R

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CE

Functioning

The transducer is used to measure temperature with different types of thermocouples. It is possible to connect thermocouples of the following types: K, J, T, N, S, E, B, R.

The user can read the current temperature of the hot junction (thermocouple) and the cold junction (temperature at the thermocouple connection point).

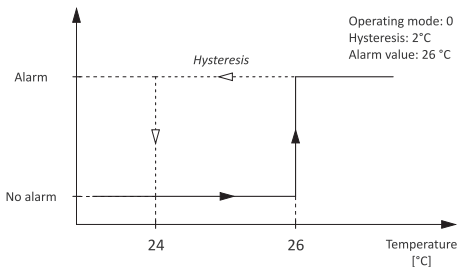With this measurement, it is possible to display the relative and absolute temperature for the object being measured.

In addition, the device has the ability to set 4 independent alarms.

Each of the alarms has the possibility of setting an activation hysteresis of 0÷256°C and 2 triggering modes:

» Alarm reacts to a rise in temperature above the preset one;
» Alarm reacts on temperature drop below preset.

Examples of alarm settings

Operating mode: 0
Hysteresis: 2°C
Alarm value: 26 °C

Alarm

Hysteresis

No alarm

24   26   Temperature [°C]

Temperature increase alarm (cooling)

Operating mode: 1
Hysteresis: 2°C
Alarm value: 22 °C

Alarm

Hysteresis

No alarm
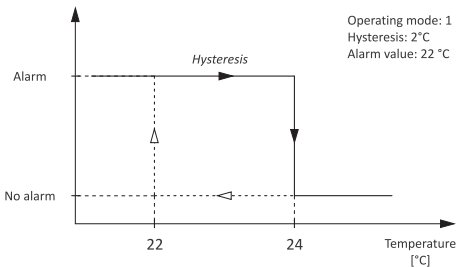
22   24   Temperature [°C]

Temperature decrease alarm (heating)
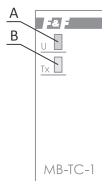
A – power supply
B – Modbus RTU data exchange

Separation

No galvanic isolation between power supply, RS-485 line and sensor input.

Use a shielded twisted-pair cable with a conductor cross-section of not less than 0.2 mm² to create RS-485 lines. The maximum line length must not exceed 1000 m. The line ends should be terminated with LT-04 termination modules (from the F&F offer).

```
1  2  3
◎     ◎
4  5  6
◎     ◎
▮ ⛁ ▮
U ▯
Tx ▯

MB-TC-1
◎     ◎
7  8  9

10 11 12
```

transducer power supply
  1 – power supply (+)
  3 – power supply (–)
RS-485
  4 – serial port (A)
  6 – serial port (B)
sensor power supply
  7 – power supply (+)
  9 – power supply (–)

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.

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

1. Set selected Modbus communication parameters before installing the module.
2. Disconnect the power supply.
3. Install the module on the rail.
4. Connect the module's power supply to terminals 1-3 as marked.
5. Connect signal output 4-6 (RS-485 port) to the master output.
6. Connect the temperature probe as indicated: wire (+) to terminal 7 and wire (–) to terminal 9.

Implement communication connections according to RS-485 standard specification.
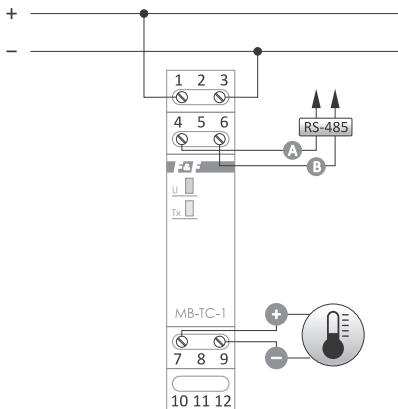
	ON/OFF	**Blinks**
green LED	system works properly (ON)	internal error device
yellow LED	no communication (OFF)	communication correct

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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.
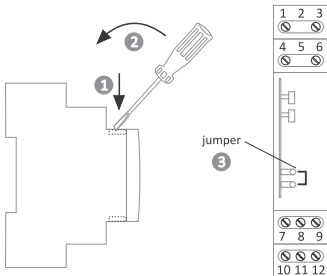
Technical data

power supply	9÷30 V DC
measuring range	depends on the type of sensor
maximum measurement error	±2°C
temperature sensor type	K, J, T, N, S, E, B, R
power indication	green LED
communication indication	yellow LED

port	RS-485
communication protocol	Modbus RTU
working type	Slave
communication parameters	
baud rate (adjustable)	1200÷115200 bit/s
data bits	8
stop bits	1/1.5/2
parity bit	EVEN/ODD/NONE
address	1÷247
power consumption	0.3 W
working temperature	-20÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 moduł (18 mm)
mounting	on TH-35 rail
ingress protection	IP20

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.

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 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 on the product page.

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 Stop bits: 1/1,5/2
Network address range (factory settings)	1÷247 (1)
Command codes	3: Read the values of a group of registers (0×03 – Read Holding Register) 6: Set the value of a single register (0×06) – Write Single Register)
Max. frequency of queries	15 Hz

> ⓘ Registers are read with 0x03 commands and written with 0x06 command.

Basic registers			
address	description	type	atr
0 (0x00)	Absolute temperature measured by the thermocouple (*value multiplied ×10, the last digit represents the decimal part*)	int	R
1 (0x01)	Temperature minus cold junction temperature, [relative temperature (thermocouple temperature - cold junction temperature)]. (*value multiplied ×10, the last digit represents the decimal part*)	int	R
2 (0x02)	Cold junction temperature, [internal temperature]. (*value multiplied ×10, the last digit represents the decimal part*)	int	R
3 (0x03)	Maximum recorded reading (*value multiplied ×10, the last digit represents the decimal part*)	int	R
4 (0x04)	Minimum recorded indication (*value multiplied ×10, the last digit represents the decimal part*)	int	R

Legend:
R – read

Transducer settings			
address	description	type	atr
5 (0x05)	Alarm status bit 4: 0 – measurement correct; 1 – measurement outside the range of the selected thermocouple type bit 3: 0 – Alarm 4 triggered 1 – Alarm 4 inactive bit 2: 0 – Alarm 3 triggered 1 – Alarm 3 inactive bit 1: 0 – Alarm 2 triggered 1 – Alarm 2 inactive bit 0: 0 – Alarm 1 triggered 1 – Alarm 1 inactive	int	R
6 (0x06)	Thermocouple type: 0 – K 1 – J 2 – T 3 – N 4 – S 5 – E 6 – B 7 – R	int	R/W

Legend:
R – read
R/W – read/write

Transducer settings cont.			
address	description	type	atr
7 (0x07)	Operation mode bits 7, 6, 5, 4 – free bit 3: 1 – Alarm 4 triggered above the set temperature 0 – Alarm 4 triggered below the set temperature bit 2: 1 – Alarm 3 triggered above the set temperature 0 – Alarm 3 triggered below the set temperature bit 1: 1 – Alarm 2 triggered above the set temperature 0 – Alarm 2 triggered below the set temperature bit 0: 1 – Alarm 1 triggered above the set temperature 0 – Alarm 1 triggered below the set temperature	int	R/W
8 (0x08)	Alarm hysteresis 1 (0÷255)	int	R/W
9 (0x09)	Alarm hysteresis 2 (0÷255)	int	R/W
10 (0x0A)	Alarm hysteresis 3 (0÷255)	int	R/W

Transducer settings cont.			
address	**description**	**type**	**atr**
11 (0x0B)	Alarm hysteresis 4 (0÷255)	int	R/W
12 (0x0C)	Alarm value 1 (-2048÷2047)	int	R/W
13 (0x0D)	Alarm value 2 (-2048÷2047)	int	R/W
14 (0x0E)	Alarm value 3 (-2048÷2047)	int	R/W
15 (0x0F)	Alarm value 4 (-2048÷2047)	int	R/W
16 (0x10)	Number of temperature samples to be averaged (0÷30) 0 – Transducer OFF	int	R/W
17 (0x11)	Absolute temperature correction (-100÷100°C)	int	R/W
18 (0x12)	Entering a value of 1 cancels the stored maximum and minimum temperature values, always read as 0	int	R/W

Legend:
R/W – read/write

Communication settings			
address	description	type	atr
256 (0x100)	Modbus address (minimum 1, maksimum 247)	int	R/W
257 (0x101)	Baud rate 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 (0x102)	Parity check 0 – None 1 – Even 2 – Odd	int	R/W
259 (0x103)	Number of stop bits 0 – 1 bit 1 – 1,5 bits 2 – 2 bits	int	R/W

Legend:
R/W – read/write

Others entries			
address	**description**	**type**	**atr**
260 (0x0104)	Entering a value of 1 restores the default configuration	int	R/W
1024 (0x0400)	Working time [s] [LSW]	int	R
1025 (0x0401)	Working time [s] [MSW]	int	R
1026 (0x0402)	Serial number (High)	int	R
1027 (0x0403)	Serial number (Low)	int	R
1028 (0x0404)	Production date (5 bits – day, 4 bits – month, 7 bits – year [without 2000])	int	R
1029 (0x0405)	Software version (10 – 1.0 etc.)	int	R
1030--1035 (0x0406-0x040B)	Identifier "F&F_MB-TC-1"	char	R
1039 (0x040F)	Configuration jumper status: (0 – open, 1 – close)	int	R

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