M-200
version 1.06

M-200

Data recorder

USER'S MANUAL

Version: 2012-07-09

The User's Manual is available also on CD-ROM.

metronic
CONTROL & MEASUREMENTS

Safety Information

! Read manual thoroughly before use to ensure safe installation and use of the recorder.

Incorrect installation of the recorder may cause serious injury or death.

The recorder has been manufactured according to the requirements of relevant EU directives.

The recorder must not be installed in explosive environments.

Information from the Manufacturer

! The Manufacturer reserves the right to modify some of the functions of the device.

CE

The device is compliant with EMC requirements (electromagnetic compatibility of industrial devices), according to Directive 2004/108/EEC.

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Sections of this manual marked with the symbol are available only in the manual found on the CD-ROM supplied with the recorder.

1 Recorder Functions

1.1 Intended Use of Device

The M-200 recorder may be used as a self-contained measuring device or as a component of an industrial measuring system. The supply voltage for the device is 24V AC/DC. The case enables installation in measurement cabinets.

1.2 Device Versions

The device is available in two versions:

- *M-200-0* – device equipped with RS485 communication port;
- *M-200-1* – device equipped with RS232 port for Mini PLUS printer support.

1.3 Types of Measurement Inputs

The device is equipped with three measurement inputs: two analogue inputs and one PLUS-type input.

The analogue inputs allow connection to the following sensors/transducers:

- RTD (2-, 3- or 4-wire connection, Pt100, Pt200, Pt500, Pt1000),
- thermocouples (type R, S, B, J, T, E, K, N),
- transducers with -10V ÷ +10V voltage output,
- transducers with 0kΩ ÷ 5kΩ resistance output, (2-, 3- or 4 wire connection),
- transducers with 0/4-20mA current loop output.

Please note

For sensors/transducers requiring 3- or 4-wire connections, you can connect only one transducer.

Please note

For sensors/transducers requiring 2-wire connections, the input system layout enables simultaneous connection of two transducers.

Please note

Cold junction temperature compensation of thermocouples is achieved automatically through an internal temperature sensor.

The PULS-type input may be used for connecting transducers with passive contact-type or OC transistor-type pulse outputs with frequencies between 0.001Hz and 10kHz.

1.4 Display, Indication LEDs, Function Buttons

1.4.1 Display

The device is equipped with a 5-digit LED display with three display colour options: green, orange, red. The display shows measurement results for each input as well as date and time information. Separate display colours may be configured for each measurement input. The colour will change when the alarm threshold assigned to the input is exceeded. The date and time are displayed in green. For details on how to configure display colours, refer to chapters 3.1.5 and 3.1.6.

1.4.2 LEDs

The device is equipped with 6 indication LEDs:

- REC – used for data recording function,
- USB – used for USB port and data exchange between recorder and flash storage device,
- BATT – not used,
- 1, 2, 3 LEDs – used for indicating which input is currently displaying values.

LED	Meaning	Indication process
REC	recording function off	LED is off
	recording function on	green light; flashing in orange indicates that another data record is being stored
	archive error	red light flashes
USB	no flash storage device in USB port or recorder unable to detect flash storage device plugged into USB port	LED is off
	flash storage device in USB port	green light
	data exchange between recorder and flash storage device in progress	orange light
1, 2, 3	value from channel 1, 2 or 3 is currently being displayed	appropriate LED lights up green
	date or time displayed	all LEDs off

Please note

Never remove the flash storage device from the USB port when moving data between recorder and flash storage device. Data may be lost.

1.4.3 Function Buttons

The device has two buttons on the front plate

- 1-2-3,
- USB REC

and one button on the back of the case: REC.

Button	Function
1-2-3	Short press displays the next value (disabled channels are not displayed): IN1 → IN2 → IN3 → time → date (day and month) → date (year).
	Pressing and holding (until a sound is heard) automatically shows successive measurement values (disabled channels are not displayed): IN1 → IN2 → IN3; if no channel is active, the time is displayed.
	If an alarm threshold is exceeded, a single press will confirm by how much: the first press confirms alarms assigned to RL1 output (if applicable); a second press confirms alarms assigned to RL2 output (if applicable).
USB/REC	If no flash storage device is plugged into the USB port, pressing and holding the button (until a confirmation sound is heard) will enable/disable recording (controlling data recording function through this device may be disabled. See chapter 3.1.8).
	If no flash storage device is plugged into the USB port, a single press will start/stop printing (M-200-1 only).
	If a flash storage device is plugged into the USB port, a single press will start copying the archive (see chapter 3.1.6).
	If a flash storage device is plugged into the port, press and hold the button (until a confirmation sound

	is heard) to programme the device with settings stored in the flash storage device (see chapter 5) and install new firmware (see chapter 1.6.1).
REC	If no flash storage device is plugged into the USB port, press and hold the button (until a confirmation sound is heard) to enable/disable recording.
	If a flash storage device is plugged into the USB port, a single press will start copying the archive (see chapter 1.6.1).
	If a flash storage device is plugged into the port, press and hold the button (until a confirmation sound is heard) to programme the device with settings stored in the flash storage device (see chapter 5) and install new firmware (see chapter 1.8).

1.5 Alarm and Control Functions

Two alarm and control thresholds may be set per channel (input). Each threshold may be configured as:

- high – exceeded when value rises above the set limit,
- low – exceeded when value falls below the set limit.

Alarm level and hysteresis are set separately for each threshold. Excess may be assigned to one of two output relays. It may also cause the recording frequency or the result display colour to change.

Each output relay operates in two modes:

- alarm mode – causes relay activation (constant or periodical). Return occurs upon confirmation of excess with the 1-2-3 button on the face plate;
- control mode – enables simple on/off control.

1.6 Recording Measurement Results

Results are stored in the 2GB internal memory of the device. Recording frequency may be adjusted in steps of 1 s – 1 h. Two recording speeds may be defined (speed II is activated when the set alarm and control thresholds are exceeded).

1.6.1 Copying Data to Mass Storage Device

Depending on the settings, data may be copied to a flash storage device as files containing either daily or monthly data. The device will assign a unique name to each file: *IDyymmdd.dat*, where:

- *ID* – device ID; allows files created by different devices to be distinguished;
- *yymmdd* – the date of the last record in the file, yy – year, mm – month, dd – day.

To copy data, plug a flash storage device into the USB port. If the USB LED lights up green, the device has detected the memory. The display will show the text from Fig. 1.1, where -00 is the file number.

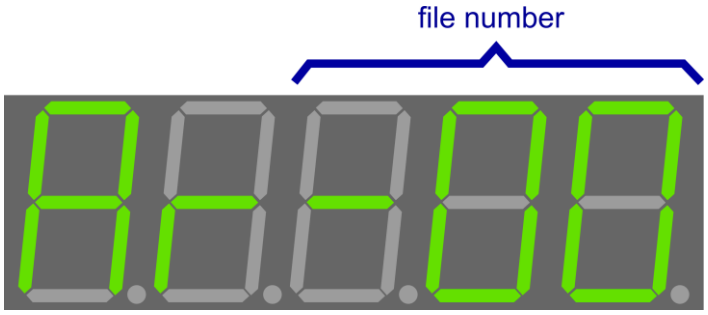


Fig. 1.1 Device display when a flash storage device is plugged into the USB port

Pressing the USB REC button will copy the file to the root folder of the flash storage device. While copying, the USB LED lights up orange. The bar on the display will start to fill up, indicating progress.

Please note

Pressing and holding the USB REC button may cause the device to be programmed with new settings (see chapter 5 for details) or new firmware to be installed (see chapter 1.8 for details).

Please note

Never remove the flash storage device from the USB port when moving data between recorder and flash storage device or data may be lost.

When the system has copied file number -xx, the USB LED lights up green and the system indicates it is ready to copy an older file by displaying the text shown in Fig. 1.1, where the archive number is.

When copying is complete, remove the flash storage device from the USB port, making sure beforehand that the USB LED is not orange.

Example:

If the device is configured to copy data in monthly files, in order to copy last month's data the current month's data (data batch no. -00) must be copied before copying the older file (data batch no. -00). If the device was configured to copy data in daily files, copying last month's data would require multiple presses of the USB REC button, which may be inconvenient and in which case the device settings may be changed.

1.6.2 Controlling Recording Function from Device Keyboard

The recording function may only be controlled from the keyboard if no flash storage device is plugged into the USB port. Pressing and holding either the USB REC button (on face plate) or REC button (on back plate) enables/disables recording. Note that the USB REC button may be blocked (see chapter 3.1.8).

1.7 Operation in a Computer-based Measurement and Control System

The device is equipped with the following communication ports which are independent of one another:

- RS485 with Modbus RTU protocol (version M-200-0 only),
- Ethernet port with Modbus TCP protocol and WWW server.

For details on Modbus RTU and Modbus TCP protocols (available functions, maps of registers), please see chapter 9.

1.7.1 WWW Server

To interface with the WWW server of the device, use a standard Internet browser. Enter the IP address of the device in the browser address bar. The WWW server enables current results to be viewed and archived data to be downloaded from the device. The website should be correctly displayed in Internet Explorer, Mozilla Firefox, Chrome, Opera and Safari browsers (slight differences in website appearance may occur).

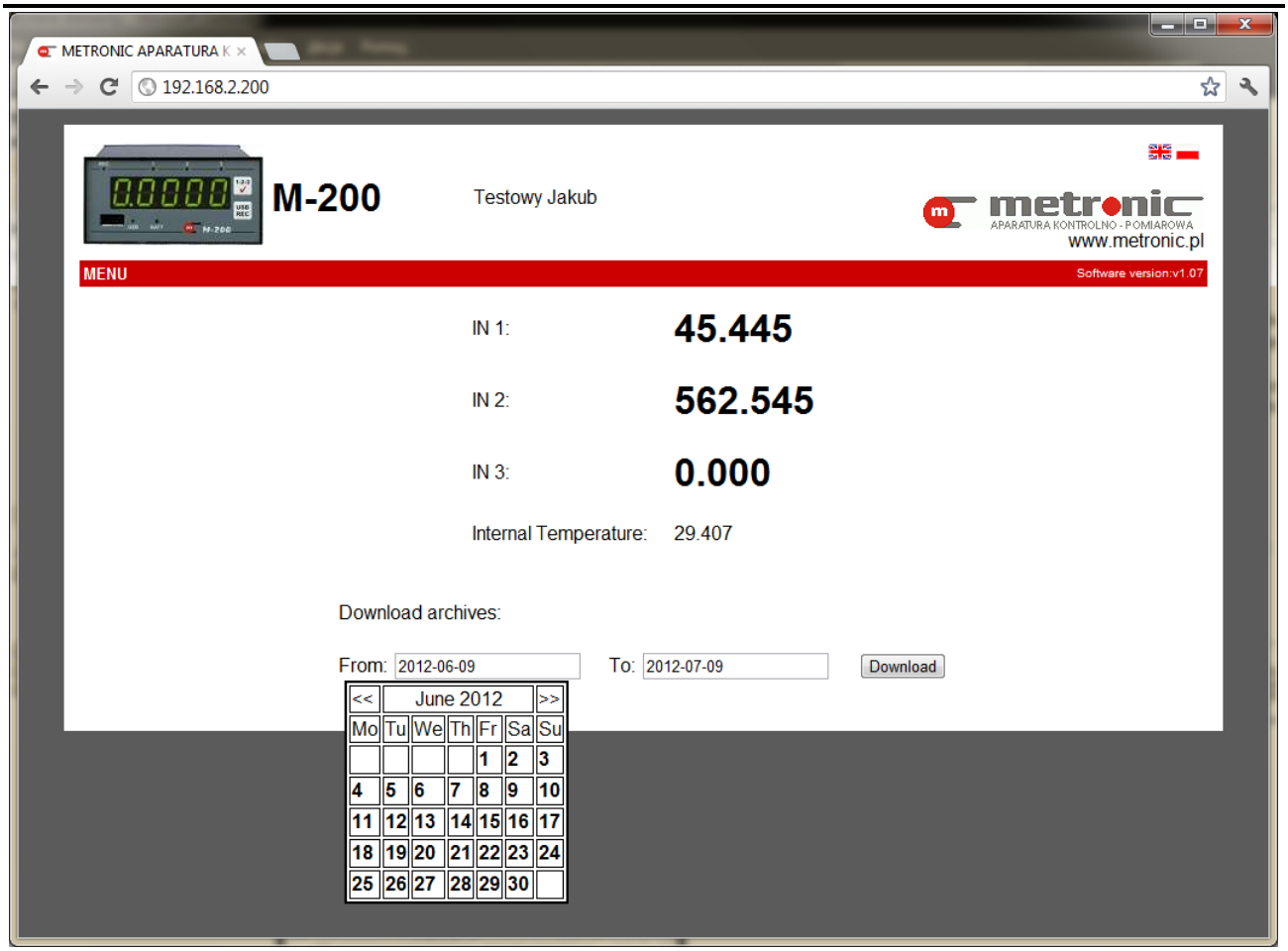


Fig. 1.2 WWW Server

1.8 Device – Printer Interaction

Version M-200-1 is equipped with an RS232 port to connect with printers (for printout configuration, see chapter 3.1.4).

Press USB/REC to print data. Printing will continue until USB/REC is pressed again.

```
M-200 v1.06 12170002
TEST NAGLOWKA
METRONIC AKP Krakow
ul. Wybickiego 7

2012-06-11 15:20:00   39.803 996.82   ROZ
2012-06-11 15:19:30   20.088 996.82   ROZ
2012-06-11 15:19:00   22.616 996.82   ROZ
2012-06-11 15:18:30   26.029 996.81   ROZ
2012-06-11 15:18:00   30.635 996.81   ROZ
2012-06-11 15:17:30   36.848 996.81   ROZ
2012-06-11 15:17:00   45.228 996.81   ROZ
2012-06-11 15:16:30   56.535 996.81   ROZ
2012-06-11 15:16:00   71.789 996.81   ROZ
2012-06-11 15:15:30   89.769 996.81   ROZ
2012-06-11 15:15:00   86.171 996.81   ROZ
2012-06-11 15:14:30   81.316 996.81   ROZ
2012-06-11 15:14:00   74.768 996.80   ROZ
```

Fig. 1.3 Example printout

1.9 Recorder Software Update

Current version of device software:

- is shown on the display immediately after the device is powered on,
- may also be checked by using the M-200.exe software (see chapter 3.1.1),
- is displayed by the WWW server of the device (see chapter 1.7.1),

The firmware version is also indicated on the device tag.

A flash storage device is needed to install new firmware. Copy the software file to the flash storage device root folder and plug into the device's USB port. Next, press and hold (until a sound is heard) the USB REC button to start installing the new software (the USB LED lights up orange). After completing firmware installation, the device will restart.

Please note

Releasing the USB REC button too early will cause the device to start copying recorded data. See chapter 1.6.1 for details.

Please note

Never remove the flash storage device from the USB port when moving data between recorder and flash storage device or data may be lost.

If the root folder also contains a settings file (m200.par, see chapter 5), the device will first apply the new settings before installing the firmware.

2 Assembly and Connection

2.1 Mechanical Assembly

The device's case is suited for panel mounting.

Case dimensions (W x H x L): 96mm X 48mm X 100mm.

Dimensions of panel cut-out (W x H): 92^{+08}mm x $45^{+0.6}$mm.

In order to ensure easy installation of electrical connections, an extra space of ca. 30 mm left behind the device is recommended.

Please note

The recorder should not exposed to direct heat generated by other equipment.

Please note

When assembled, the operating device should not be subjected to interference from other components (contacts, power relays, inverters).

2.2 Electrical Installation of Recorder

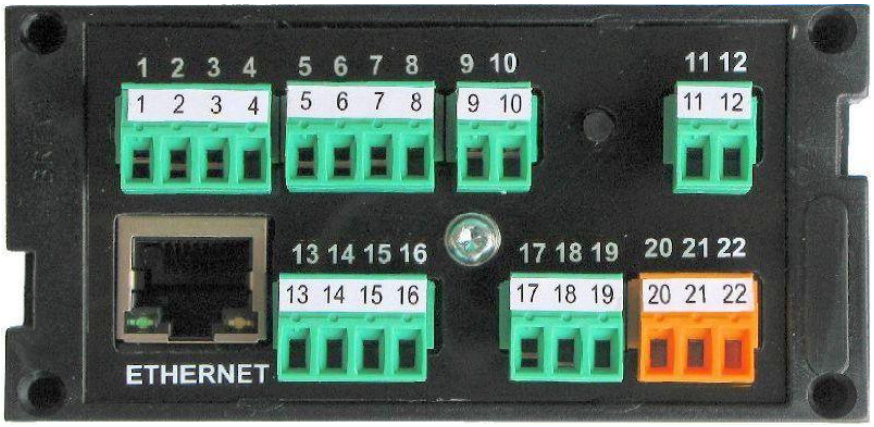


Fig. 2.1 Back plate of M-200

All electric circuits lead out to screw terminal blocks that enable connection of 1.5mm^2 wires.

2.2.1 Power Connection

The recorder may be supplied with:

- direct current: 10VDC ÷ 30VDC,
- alternating current: 24VAC, +5% / -20%.

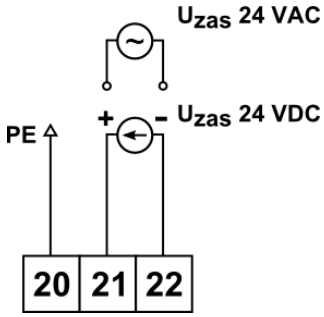


Fig. 2.2 Power connection

It is recommended that the terminal is connected marked PE to the ground potential terminal block of the measurement cabinet.

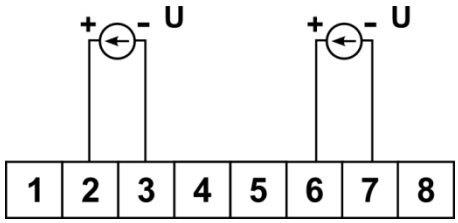
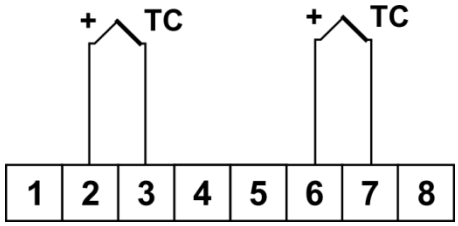
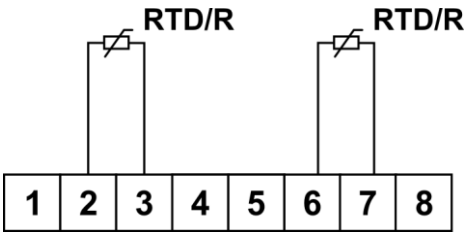
If supplying the device with direct current, the polarity of supply voltage is not critical, however connection as shown in Fig. 2.2 is recommended.

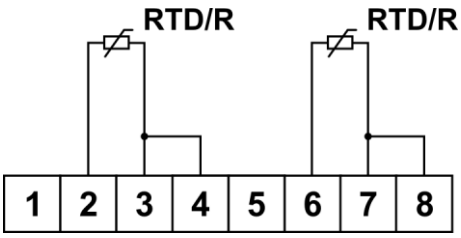
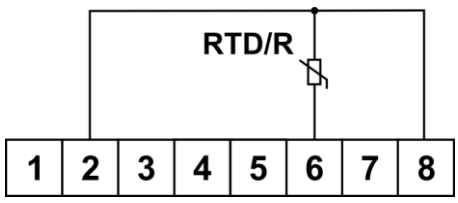
The recorder is equipped with a polymer fuse that cuts the supply circuit in case of failure. When the failure is rectified, the fuse will return to its normal state in a few minutes.

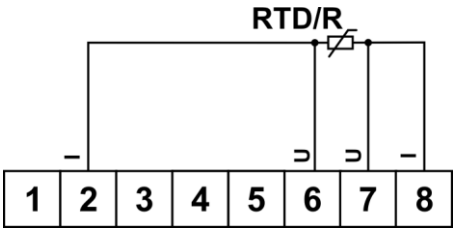
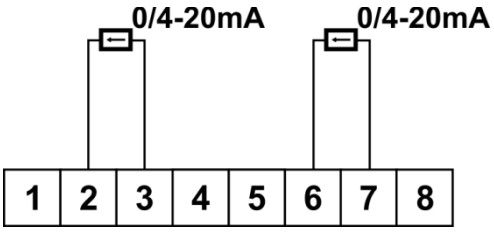
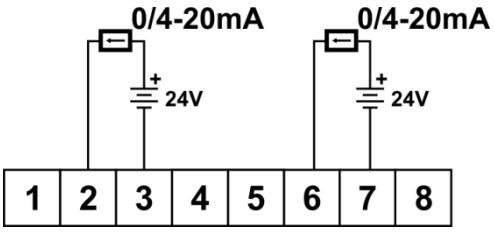
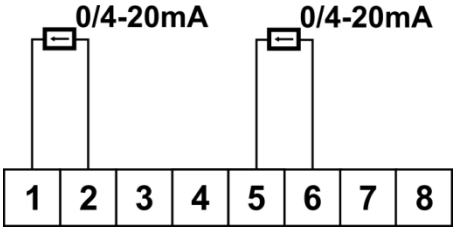
2.2.2 Connecting Transducers to Analogue Inputs

Please note

Connecting certain types of sensors or transducers may require jumpers inside the device to be switched. For details, see chapter 2.3.

<table>
<tr><th>Type of sensor (transducer)</th><th>Type of connection</th></tr>
<tr><td>Transducer with voltage output</td><td> 
</td></tr>
<tr><td>Thermocouple</td><td> 
</td></tr>
<tr><td>RTD/R
2-wire</td><td>Jumper J17 / J27 closed
 

Jumper J17 / J27 open
 
</td></tr>
<tr><td>RTD/R
3-wire</td><td> 
</td></tr>
</table>

RTD/R 4-wire	
0/4-20mA active transducer	
0/4-20mA transducer supplied from external power supply	
0/4-20mA transducer supplied from device	

For 2-wire sensors, different types of sensors on individual inputs may be combined freely, e.g. input one: RTD 2-wire sensor, input two: 4-20mA transducer.

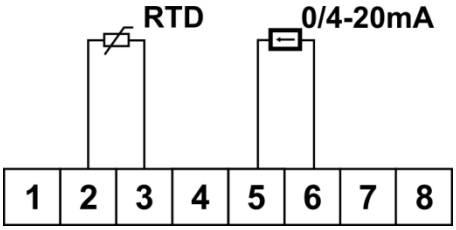


Fig. 2.3 Example connection of different types of sensors

2.2.3 Connecting Transducers to PULS-type Inputs

The device has one PULS-type input (IN3) that may be used for connecting transducers with passive contact-type or OC transistor-type outputs.

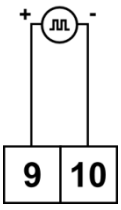


Fig. 2.4 Connecting a transducer to IN3 input

2.2.4 Connecting Receivers to Binary Outputs

The device is equipped with two electronic relays rated at 100mA / 60V.

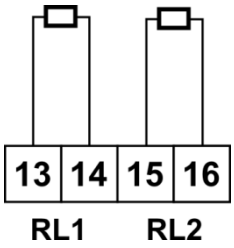


Fig. 2.5 Connecting receivers to relay outputs

2.2.5 Connecting RS485 Data Transmission Line (Only M-200-0)

The device connects to an RS485 serial busbar, i.e. 17 A(+) terminal is connected to A line terminal and 18 B(-) terminal to B line terminal. Terminal no. 19 GND may be used to connect the ground potential or the data transmission cable screen. Connection of an RS485 busbar termination system may be achieved by closing the appropriate jumpers inside the device (see chapter 2.3.3).

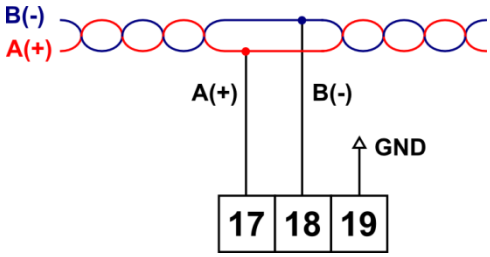


Fig. 2.6 Connecting device to RS485 data transmission line

2.2.6 Connecting Printer to RS232 Port (Only M-200-1)

Connection method is shown in Fig. 2.7.

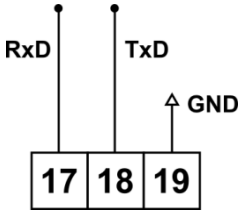


Fig. 2.7 Connecting printer to device

2.2.7 USB Port

The A-type USB port is located on the face plate. The port enables connection of external mass storage devices.

2.2.8 Ethernet Port

The Ethernet (100Base-T) port is located at the back of the device. The socket leads comply with EIA/TIA-568A/B. The socket enables connection of an 8-wire twisted pair cable with an RJ-45 plug.

2.3 Configuration of Jumpers Inside the Device

Changing the configuration of jumpers inside the device may be required in when:

- connecting transducers of a given type to analogue inputs,

- connecting/disconnecting filters on PULS-type inputs,
- activating/deactivating RS485 busbar termination.

This requires disassembly of the device's case. Use a flat screwdriver to gently prize open the two fasteners on the back plate, as shown in Fig. 2.8, and slide out the plates at the back of the case.

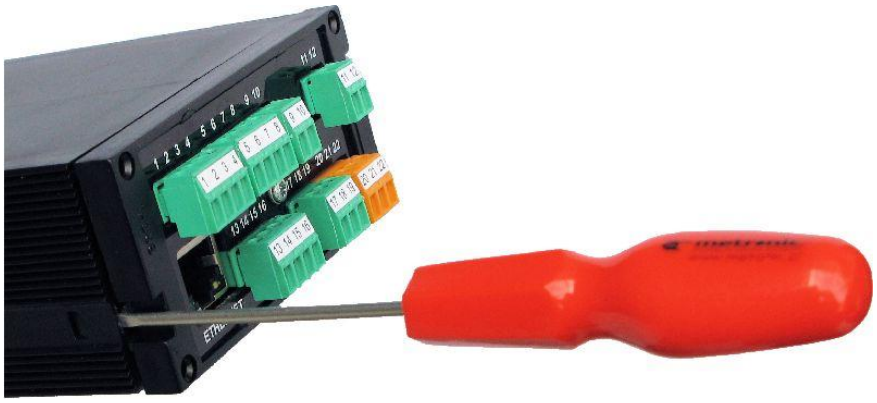


Fig. 2.8 Case disassembly

2.3.1 Configuring Jumpers for Analogue Inputs

Fig. 2.9 Jumpers for analogue input configuration

	INPUT 1							INPUT 2						
	J11	J12	J13	J14	J15	J16	J17	J21	J22	J23	J24	J25	J26	J27
RTD 2-p	•	•					•	•	•					•
TC		•							•					
U			•	•						•	•			
0/4-20mA(1)		•			•	•			•			•	•	
0/4-20mA(2)		•			•				•			•		

• indicates closed jumper
(1) 0/4-20mA-type inputs; transducers supplied from device
(2) 0/4-20mA-type inputs; transducers active or supplied from external power supply

	INPUT 1													
	J11	J12	J13	J14	J15	J16	J17	J21	J22	J23	J24	J25	J26	J27
RTD 3-p	•	•					•	•	•					•
RTD 4-p	•								•					

• indicates closed jumper

Example:
In order to connect a thermocouple to the first input and an active 4-20mA transducer to the second input, jumpers J12, J22, J25 and J26 need to be closed.

Please note
For 2-wire connections of RTD/R sensors, instead of closing jumpers J17 and J27 inside the device the appropriate terminals led outside the device may be closed. For details, see figure in chapter 2.2.2.

Please note
The default configuration is both inputs as 0/4-20mA active transducers.

2.3.2 Configuring Jumpers for PULS-type Inputs

Closing the FILTER jumper will cause activation of the filter.

Fig. 2.10 Filter activating/deactivating jumper

Please note
The default configuration is filter deactivated (jumper open).

2.3.3 Configuring Jumpers for RS485 Busbar Termination

Jumpers used for activating RS485 busbar termination may be found on the bottom side of the lower board. Closing both jumpers will activate the termination.

Please note
The default configuration is busbar termination disabled (jumpers open).

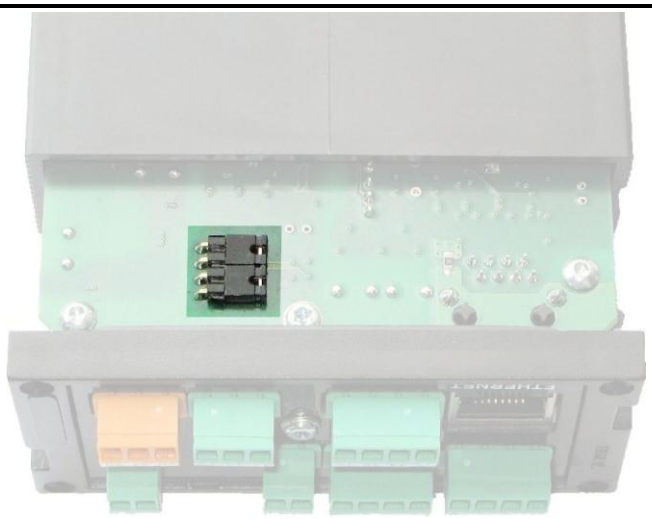


Fig. 2.11 Jumpers for activating RS485 busbar termination

3 Settings

The device settings may be programmed in two ways:

- online, by using the RS485 port and the *M-200.exe* software (M-200-0 only),
- offline, using configuration files stored on a flash storage device.

Apart from remote configuration, the *M-200.exe* software enables settings to files to be saved (which may then be used for configuring the device through the USB port and a flash storage device) and perform tests of measurement result readout.

Please note

M-200.exe may be downloaded free of charge from the manufacturer's website: www.metronic.pl.

The application works in two modes:

- ONLINE - the software communicates with the recorder through the RS485 port (M-200-0 only). All software functions are available.
- OFFLINE - the software operates without communicating with the recorder. In this mode, only settings to files may be saved.

When the software is run, choose the interface language (the default language is English; your selection will be saved and applied the next time the software is run) and press START..., a window for configuring software–module communication through the RS485 port will appear.

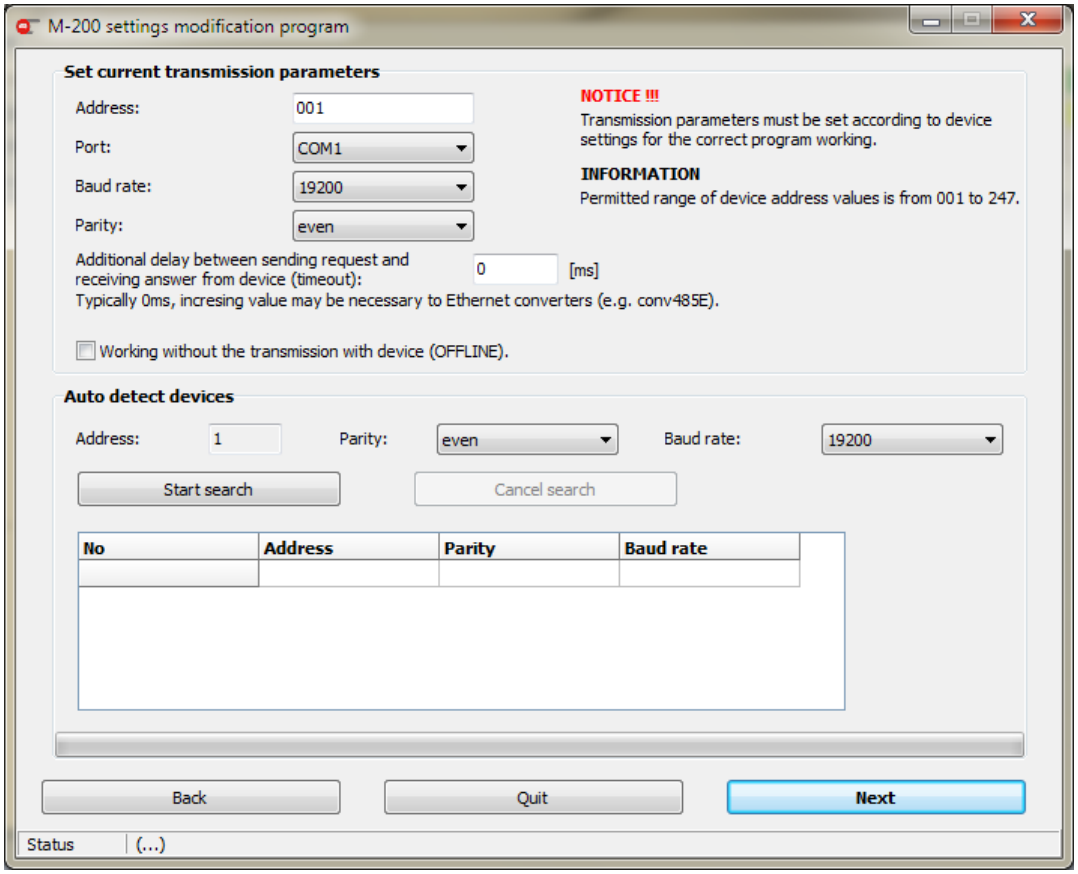


Fig. 3.1 Window for configuring communication between the software and the M-200 module

Set the transmission parameters according to device settings. If the module's transmission parameters are not known, the software automatically detects the device. Press Start search to use this function. The search process may take up to 20 min.

Next, choose one of the available functions:

- *Set device working parameters* – this function allows the settings from the device or a file (also offline) to be read, modification of settings and programming of the device (only online; only for M-200-0), or save the settings to a file.
- *Set date and time* – this function allows the date and time to be read from the device or a new date and time to be set (M-200-0 only).
- *Read current measurement results* – this function allows performance of a test readout of the measured values and the readings from the internal temperature sensor (M-200-0 only).

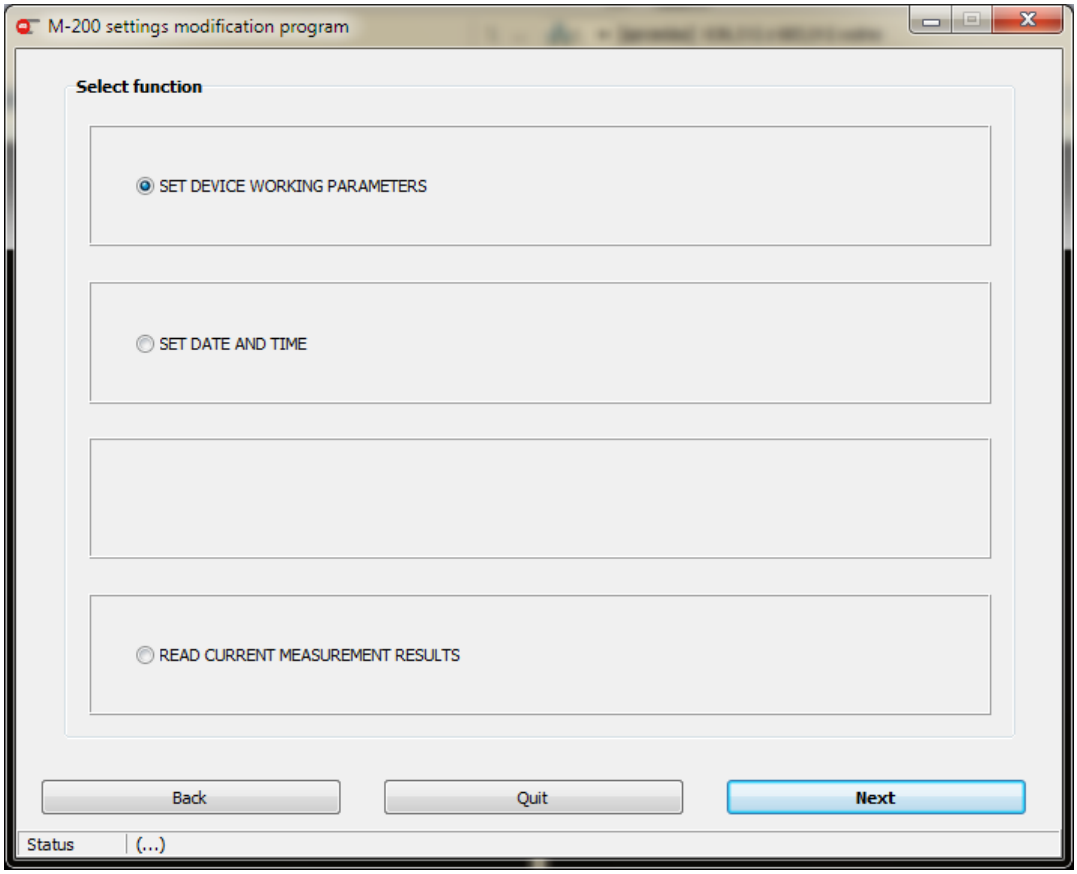


Fig. 3.2 Choosing software functions

3.1 Programming Settings

After choosing the *Set device working parameters*, it is possible to:

- open a parameters file from the computer's hard drive (.par file extension);
- download settings from the device (only in ONLINE mode);
- start configuration with default parameters.

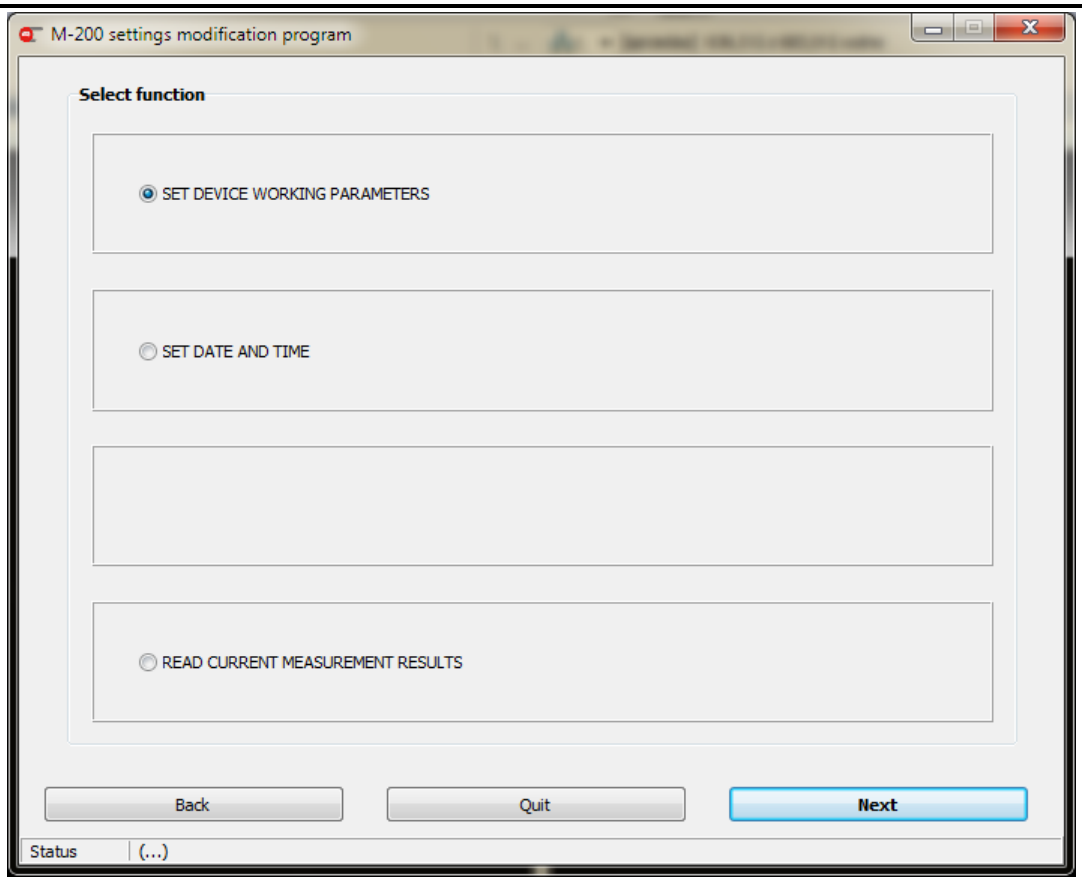


Fig. 3.3 Parameter source selection window

The configuration software will guide the user through the rest of the process:

- global settings (see chapter 3.1.1) and relay output settings (see chapter 3.1.2),
- RS485 port (see chapter 3.1.3) or RS232 port (see chapter 3.1.4) and Ethernet port (see chapter 3.1.5),
- measurement inputs (see chapter 3.1.6) and alarm and control thresholds (see chapter 3.1.7),
- recording function settings (see chapter 3.1.8).

3.1.1 Global Settings

The device version and device serial number may be viewed in the upper portion of the window (Fig. 3.4) (available only after downloading settings from the device or opening the device settings file in ONLINE mode. The information will therefore not be available if, for example, configuration is started with default settings).

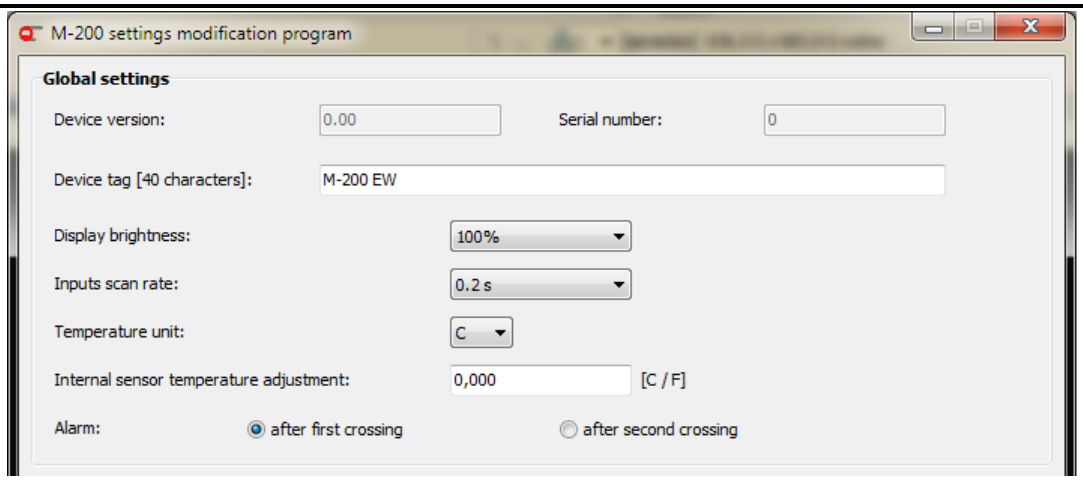


Fig. 3.4 Global settings

The user may enter/configure:

- *Device tag* – a text description of the device; max 40 characters; the device tag will be displayed in the archive header and on the website;
- *Display brightness* – two options may be chosen: 100% (maximum brightness) and 50% (reduced brightness);
- *Inputs scan rate*;
- *Temperature unit* – temperature may be displayed in °C or °F;
- *Internal sensor temperature adjustment* – used for cold junction temperature compensation of thermocouples. Setting the adjustment value (in the set temperature unit) will add that value to the temperature used for compensation;
- *Alarm* – reaction to excess may occur upon the first or the second detection of excess (choose *after second crossing* to prevent alarms from being activated as a result of brief signal fluctuations).

3.1.2 Relay Output (RL) Settings

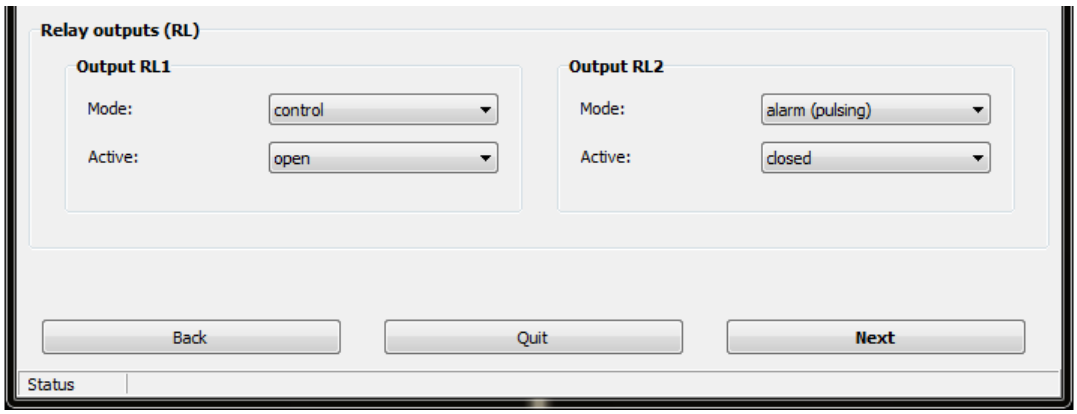


Fig. 3.5 Relay output (RL) settings

Each relay output operates in control or alarm mode.

- the *control* mode causes the relay to activate for the duration of the excess and return to its previous state when the excess stops;
- the *alarm* mode causes activation upon excess of a threshold (constant activation: *alarm*; pulsating activation: *alarm (pulsing)*) and lasts until the excess is acknowledged by pressing the button on the face plate.

Relay outputs may be set as:

- open,
- closed.

Please note

The device uses semiconducting relays, therefore a lack of supply voltage will always cause the contact to open.

3.1.3 RS485 Port Settings

The settings for the RS485 serial communication port are as follows:

- *Address* – range from 1 to 247; unique address of module on RS485 busbar;
- *Baud rate* – supported speeds: 1,200bps, 2,400bps, 9,600bps, 19,200bps, 115,200bps, 230,400bps;
- *Parity* – select a parity control option: none + 1bit stop, none + 2 bit stop, even, odd;
- *Timeout* – the minimum time before the device responds to an inquiry; may be set within the range of 0 ÷ 7,000ms.

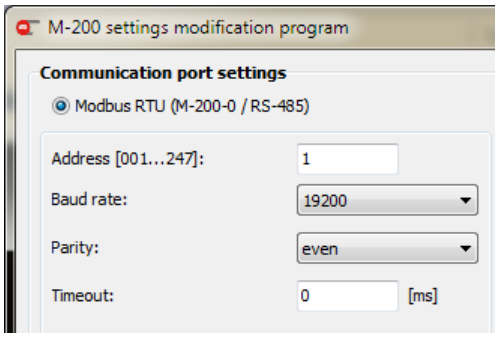


Fig. 3.6 RS485 port settings window

3.1.4 RS232 Port Settings and Interaction with Printer

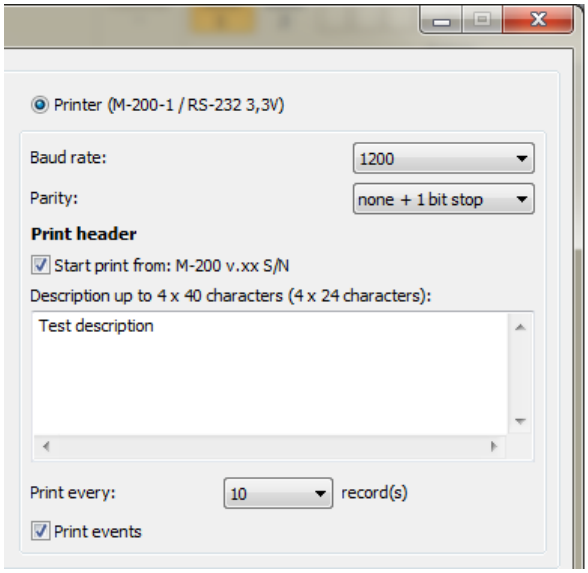


Fig. 3.7 RS232 port settings window

The settings for the RS232 serial communication port are as follows:

- *Baud rate* – supported speeds: 1,200bps, 2,400bps, 9,600bps, 19,200bps, 115,200bps, 230,400bps;
- *Parity* – select a parity control option: none + 1bit stop, none + 2 bit stop, even, odd.

The user may choose whether to add the M-200 v.xx S/N text at the beginning of the printout (v.xx is the device version and S/N the serial number) and enter an additional description. The user should also define which records to print (all, every 3rd, 6th, 10th, 30th, 60th record) and whether to also print events.

3.1.5 Ethernet Port Settings

Transmission settings for the Ethernet port are as follows:

- *IP address* – set according to the network in which the device will be operating;
- *Port* – assign port 502 to Modbus TCP;
- *Subnet mask* – set according to the network in which the device will be operating;
- *Gateway* – set according to the network in which the device will be operating;
- *DHCP server* – should be ON if device is connected directly to computer's network adapter; otherwise turn the DHCP server OFF;
- *Timeout* – the minimum time before the device responds to an inquiry;
- *MAC address* – the device MAC address may be viewed, but not edited.

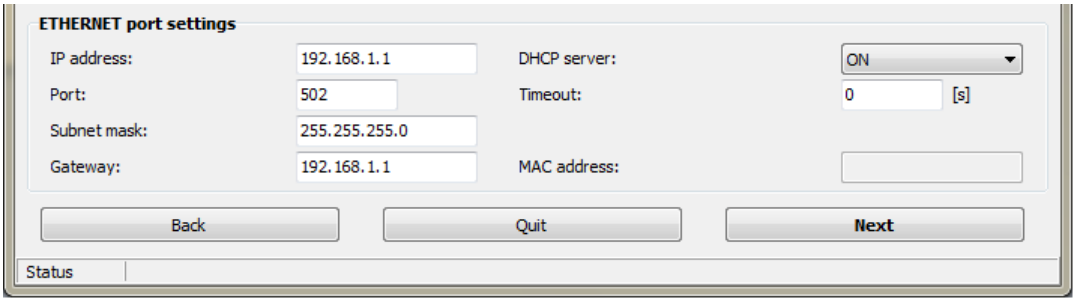


Fig. 3.8 Ethernet port settings

3.1.6 Settings of Measurement Inputs

Choose the input type and sensor category (options available for each measurement input are shown in the table below) and configure the parameters depending on the input type.

INPUT	INPUT TYPE	INPUT CATEGORY
IN1	TC / U (-1V … +1V)	linear characteristic
		R
		S
		B
		J
		T
		E
		K
		N
	U (-10V … +10V)	linear characteristic
	RTD / R 2-wire	linear characteristic
		Pt100+
		Pt100
		Pt200+

		Pt200
		Pt500+
		Pt500
		Pt1000+
		Pt1000
	RTD / R 3-wire	linear characteristic
		Pt100+
		Pt100
		Pt200+
		Pt200
		Pt500+
		Pt500
		Pt1000+
		Pt1000
	RTD / R 4-wire	linear characteristic
		Pt100+
		Pt100
		Pt200+
		Pt200
		Pt500+
		Pt500
		Pt1000+
		Pt1000
	0/4-20mA	linear characteristic
IN2	TC / U (-1V … +1V)	linear characteristic
		R
		S
		B
		J
		T
		E
		K
		N
	U (-10V … +10V)	linear characteristic
	RTD / R 2-wire	linear characteristic
		Pt100+
		Pt100
		Pt200+
		Pt200
		Pt500+

		Pt500
		Pt1000+
		Pt1000
	0/4-20mA	linear characteristic
IN3	frequency measurement	-
	binary input	-

Please note

RTD/R 3-wire and RTD/R 4-wire input types are available only for IN1 input. Choosing one will automatically disable IN2 input.

Please note

Input types Pt100+, Pt200+, Pt200+, Pt1000+ use inputs Pt100, Pt200, Pt200, Pt1000 for measurement but with accuracy increased by -50 °C to +250 °C.

Please note

Cold junction temperature compensation of thermocouples is achieved automatically.

Analogue Input Settings:

1. *Wire resistance adjustment* – function available only for RTD / R-type inputs; the set value must be within -100Ω to +100Ω. For 3- or 4-wire sensor connections (automatic compensation), resistance adjustment may be used for sensor error compensation by "offsetting" the characteristic with a negative or positive resistance value.
2. *Filter* – the value entered is the time constant of the digital low-pass filter.
3. *Value display format* – the number of decimal places when displaying results (1 – fractions are not displayed; 0.1 – one decimal place; 0.01 – two decimal places; 0.001 – three decimal places)
4. *Colour* – a display colour may be assigned to each result (choose between green, orange and red).

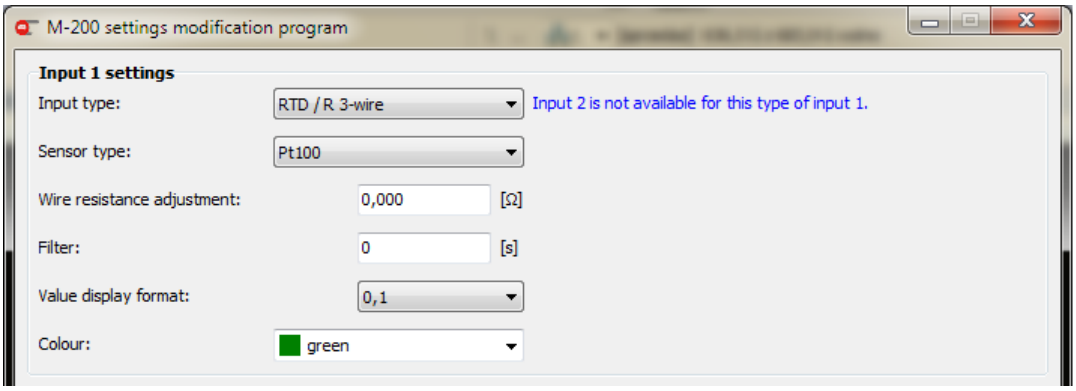


Fig. 3.9 Analogue input settings

PULS-type Input Settings:

1. *Colour* – a display colour may be assigned to each result (choose between green, orange and red).
2. *Filter* – the value entered is the time constant of the digital low-pass filter (only for input type: frequency measurement).

3. *Value display format* – the number of decimal places when displaying results (only for input type: frequency measurement).
4. *Value when closed* – value displayed when input is closed (only for input type: binary input).
5. *Closed tag*
6. *Value when open* – value displayed when input is open (only for input type: binary input).
7. *Open tag*

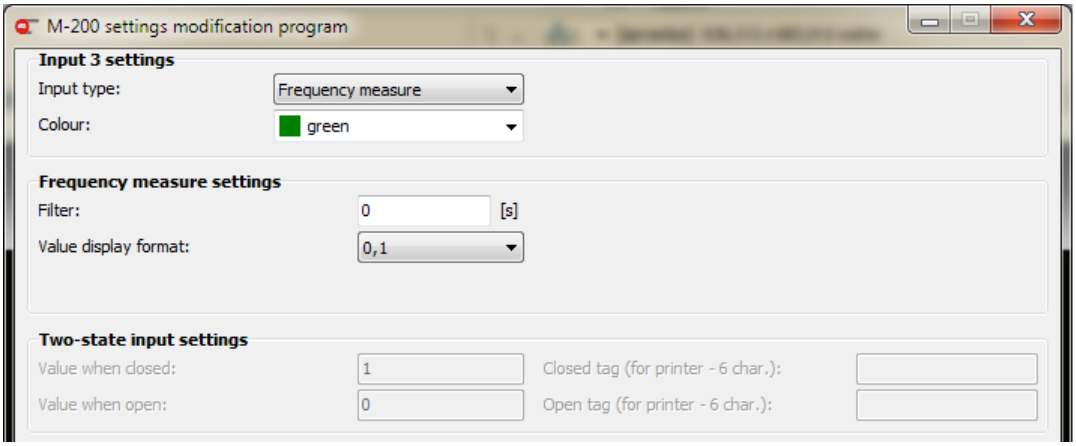


Fig. 3.10 PULS-type input settings

Linear Characteristic:

For type 1 and 2 inputs operating in *Linear characteristic* mode and type 3 input operating in *frequency measure* mode, enter the processing characteristic. Points of characteristic (max 50) are provided as pairs composed of the signal value (in mA, mV, Ω or Hz) and the quantity displayed. Linear interpolation is used for values between the entered points.

If the characteristic does not encompass the entire measurement range, a fixed value is assumed for the first and last point of the characteristic.

To finish entering values in the software, press 

. This will also refresh the preview of the characteristic in the graphical window.

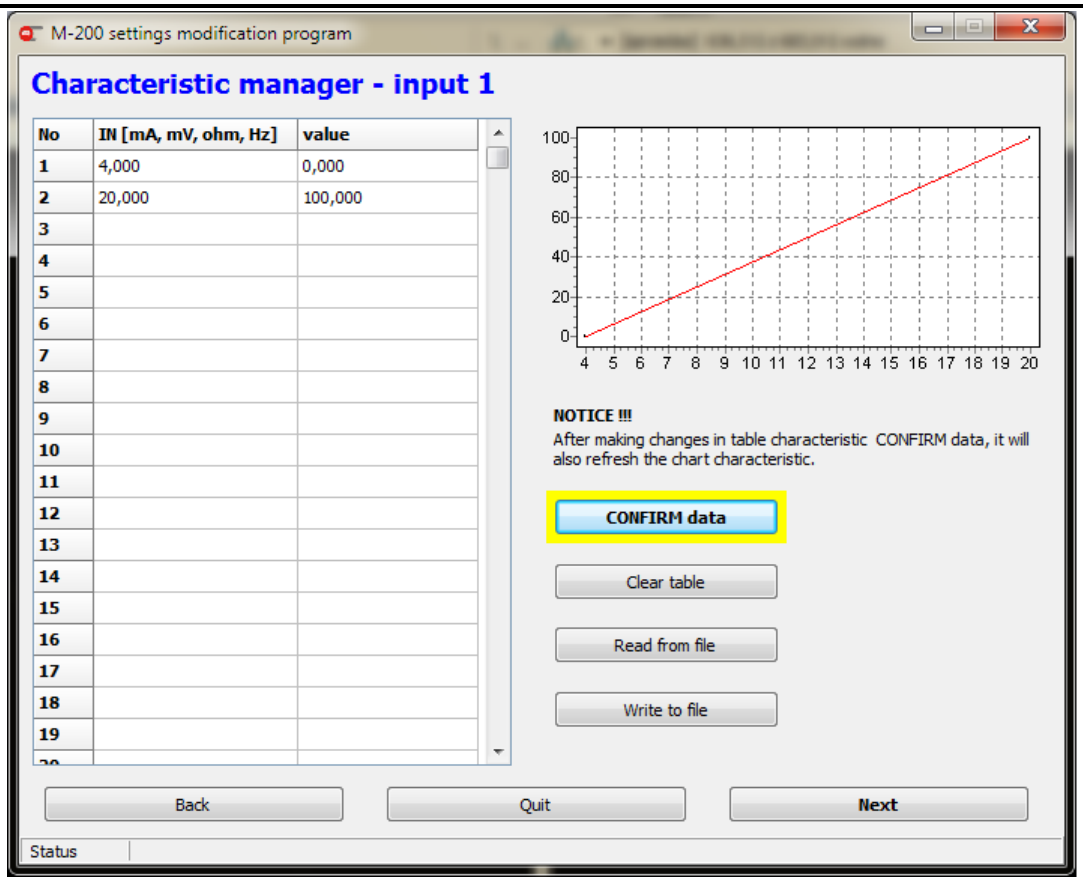


Fig. 3.11 Linear processing characteristic

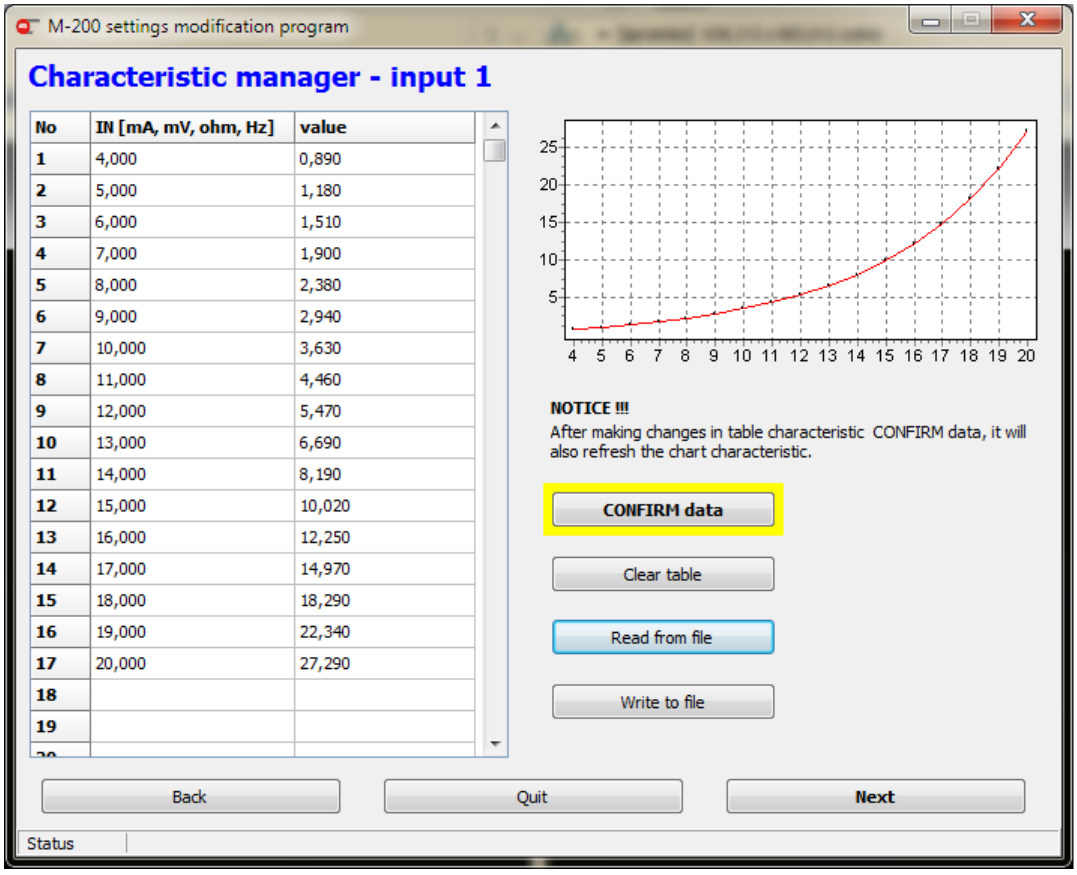


Fig. 3.12 Non-linear processing characteristic

The characteristic entered may be saved to a file (Write to file ; data will be stored in a .txt text file) or read from a file (Read from file) that was previously prepared, for example in Excel (the file should be saved in text format with text separated using tabs).

The correct file format is shown in Fig. 3.13 and Fig. 3.14:
a) the file must start with the header [M-200 charakterystyka]
b) all other rows should be numbered in the following format: 0=, 1=, 2=, etc.
c) columns must be separated using tabs.

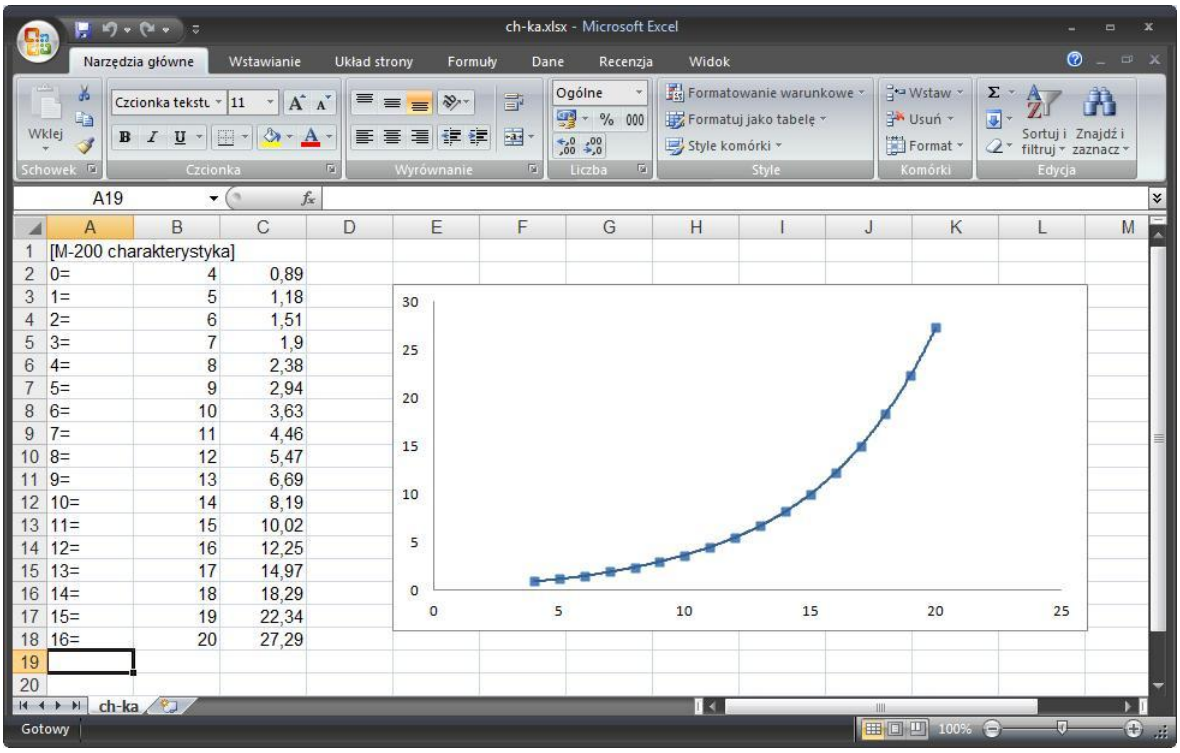


Fig. 3.13 Preparing a processing characteristic in Excel

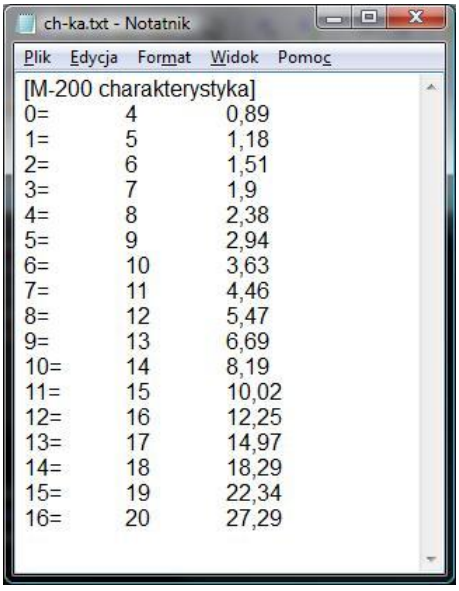


Fig. 3.14 The format of a .txt file with a processing characteristic

3.1.7 Alarm and Control Thresholds

A maximum of two alarm and control thresholds may be assigned to each measurement input. For each threshold, the user will configure separately:

a) *Level* - exceeding this value causes alarm activation; the alarm level uses the same units as the measured value.

b) *Hysteresis* - the difference between the threshold excess level and return. The hysteresis value uses the same units as the measured value.

c) *Mode*: *High* (i.e. excess occurs when the value measured exceeds the set limit) or *Low* (excess occurs when the value measured falls below the set limit).

d) *Use relay when alarm active* (*relay RL1*, *relay RL2*, *relays RL1, RL2*): exceeding the set alarm and control threshold causes activation of the set relay output(s); relay output configuration is described in chapter 3.1.2.

e) *Colour* (*none*, *red*, *orange*, *green*): the result display colour may be set to change every time the set alarm and control threshold is exceeded. The colour assigned to alarm 2 has higher priority, i.e. if both thresholds are exceeded simultaneously, the result will be displayed using the colour assigned to alarm 2. If the *colour* of alarm 2 is set to *none*, the result is displayed using alarm 1 colour.

Alarms may be activated upon either the first or the second occurrence of excess (see chapter 3.1.1). Exceeding the alarm and control threshold may also enable recording speed II (see chapter 3.1.8).

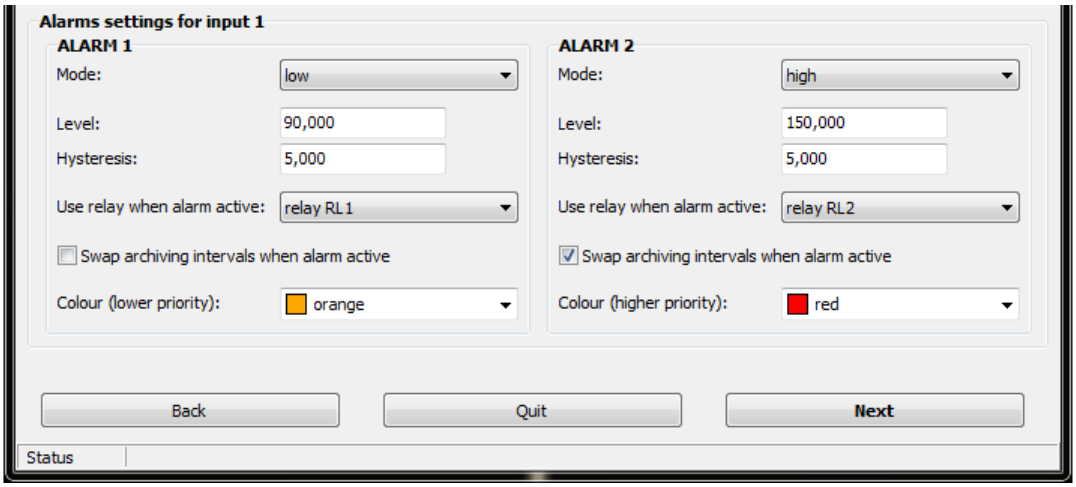


Fig. 3.15 Alarm settings

Example:
High alarm threshold, alarm level 50 °C, hysteresis 5 °C: excess occurs when temperature rises above 50 °C and stops when the temperature falls below 50 °C - 5 °C = 45 °C.

3.1.8 Recording Function Settings

Data is stored in a file located in the internal memory of the device. When configuring the recording function, the user will need to enter:

- a two-digit device *ID*: the archive file name is *IDyymmdd.dat*, where yy is the year, mm – month, dd – day on which the last record was stored in the file; assigning unique *IDs* will allow files created by different devices to be distinguished;

- *The division of archives* – archived data is divided into files copied one by one to the flash storage device (see chapter 1.6.1):
  - *daily* – copying data in the form of files containing data from a single day; choose this option to copy data quickly from the last several days;
  - *monthly* – copying data in the form of files containing data from a single month (this increases the time required to copy a single file); useful when accessing older data using flash storage device (e.g. several months earlier);
- *Lock the keyboard control archive* – this option allows the USB REC button function that controls the recording function to be locked;
- *Rec interval I* (*recording disabled*, 0.2s, *1s*, *10s*, *30s*, *1min*, *10min*, *30min*, *1h*): basic recording frequency;
- *Rec interval II* (*recording disabled*, 0.2s, *1s*, *10s*, *30s*, *1min*, *10min*, *30min*, *1h*): activates when the set alarm and control thresholds are exceeded (see chapter 3.1.7);
- *Gating archiving from two-state input*: recording may be stopped depending on the state of the binary input (input 3)
- *Record state changes / event*

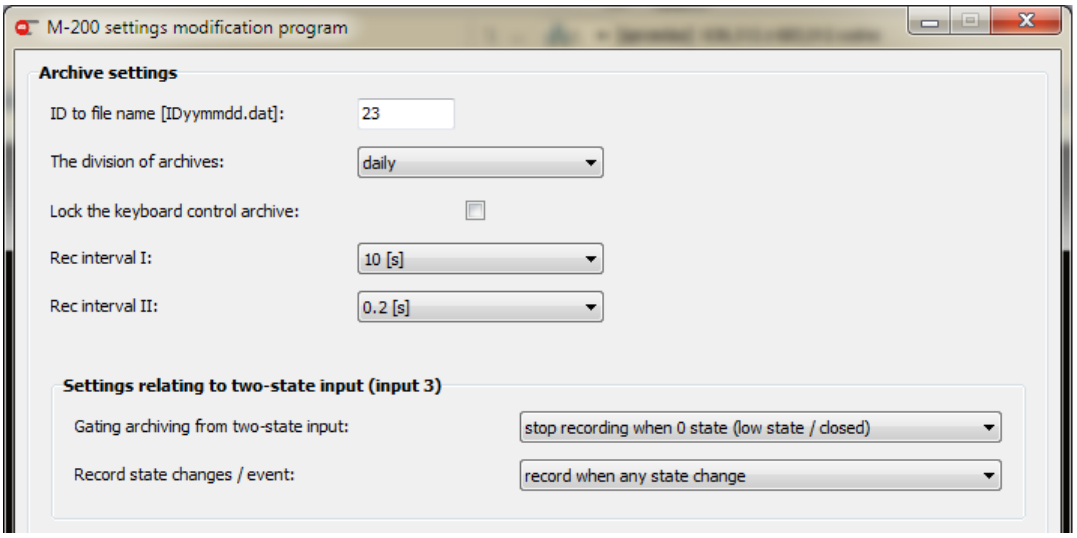


Fig. 3.16 Recording function settings

3.1.9 Programming the Device

The user may:

- programme the device (only in online mode); a confirmation message appears when the module is programmed;
- save settings to a file (may be used to programme the device offline using a flash storage device; see chapter 5);
- return to function selection (window shown in Fig. 3.2)

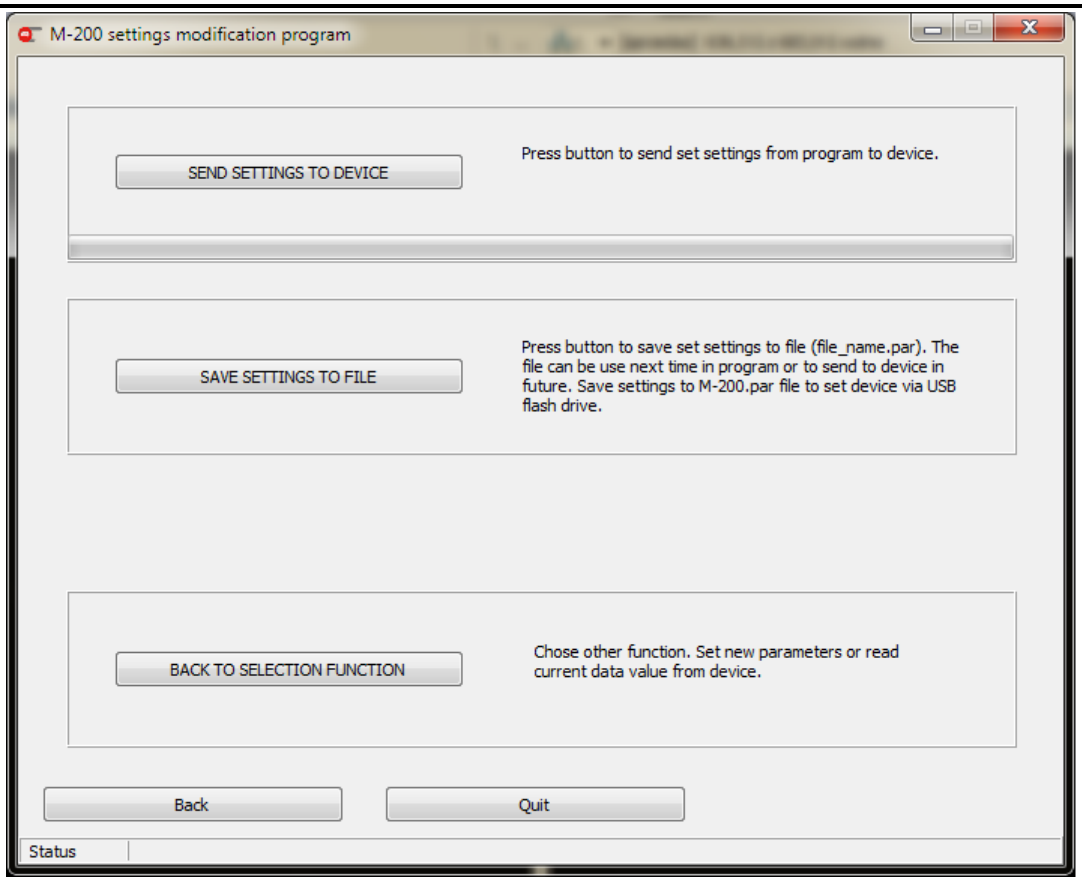


Fig. 3.17 Window for programming settings/saving settings to file

3.2 Setting Device Date and Time

Choosing the *Set date and time* function (see Fig. 3.2) allows the user to:

- read the date and time from the device,
- synchronise the date and time with the date and time of your computer system,
- manually enter the date and time.

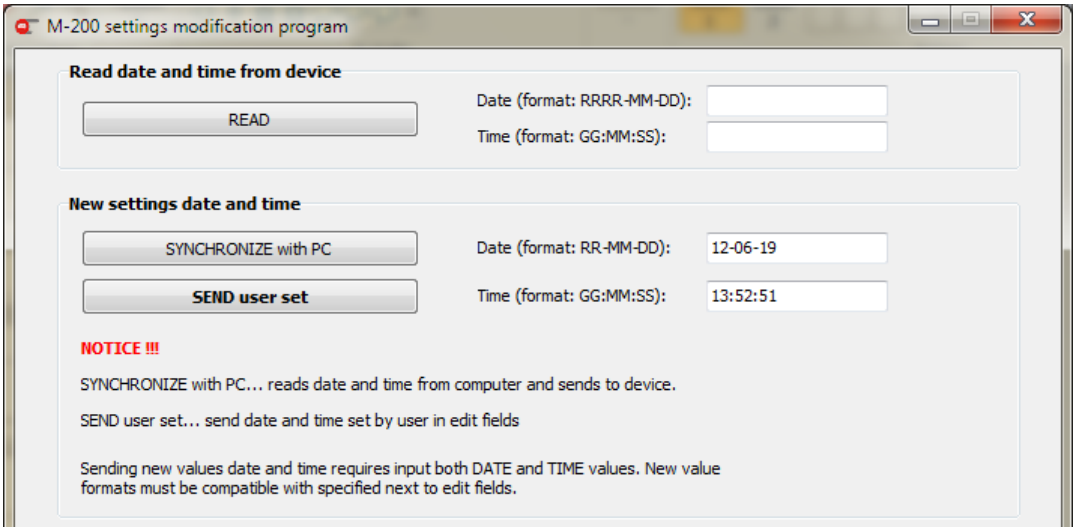


Fig. 3.18 Setting device date and time

4 Measurement Result Readout Test

After choosing the *Read current measurement results* (Fig. 3.2) function, use the window shown in Fig. 4.1 to set the result readout frequency and press START.

The software will apply the set readout frequency to:

- measured values ([mV] for TC/U sensors; [Ω] – for RTD/R sensors; [mA] – for 0/4-20mA transducers);
- measured temperature ([°C] or [°F]) or values calculated using the linear characteristic;
- readings from the internal temperature sensor used for cold junction temperature compensation of thermocouples.

The date and time of the last readout and a counter of data readouts are also displayed.

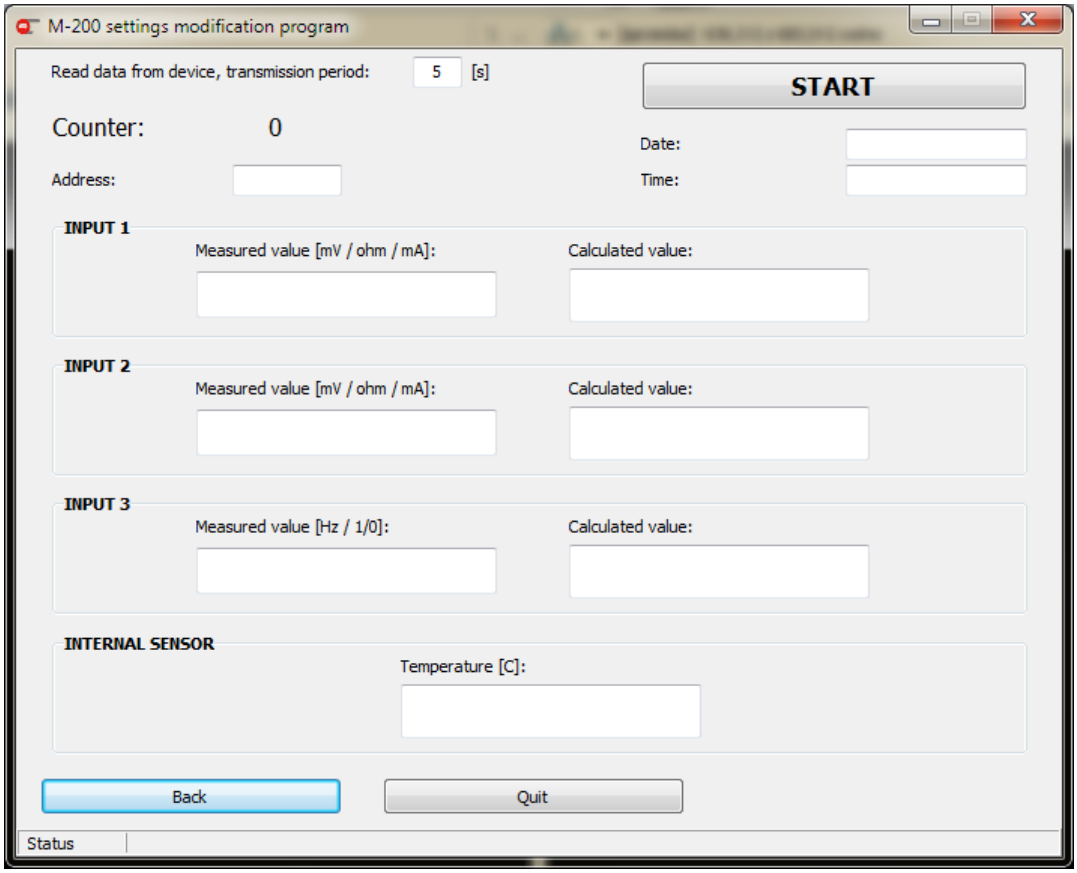


Fig. 4.1 Current measurement result readout window

During data readout, the status bar is displayed at the bottom of the window:

- Transmission successful:

- Data exchange in progress:

- Transmission failed:

To finish the readout, press STOP.

5 Programming Device Using USB Memory

A flash storage device is used to programme the device using settings from a file. Copy the *M-200.par* or *m-200.par* settings file (for details on creating settings files, see chapter 3.1.9) to the root folder of the flash storage device and plug the memory into the USB port on the device. Next, press and hold (until a sound is heard) the USB REC button to start programming the device with new settings (the USB LED lights up orange). When programming is complete, the device will restart.

Please note

Releasing the USB REC button too early will cause the device to start copying recorded data. See chapter 1.6.1 for details.

Please note

Never remove the flash storage device from the USB port when moving data between recorder and flash storage device or data may be lost.

If the root folder also contains a file with recorder firmware, the device will first apply the new settings and then install the firmware (see chapter 1.8).

6 Technical Data

FACE PLATE	
Type of display:	7-segment, 3-colour (green, orange, red) LED display
Height of digits:	14.2mm
Indication:	6 two-colour LEDs (red and green) "REC", "USB", "BATT", "1", "2", "3"
Keyboard:	2 buttons: "1-2-3", "USB REC"
USB port:	USB type A compliant
REAR PLATE	
Wire connection:	Screw-type terminal blocks, max wire section 1.5mm2 three 4-position terminal blocks two 2-position terminal blocks three 3-position terminal blocks
Ethernet port:	RJ-45
"REC" buttons:	Controlling the recording function
INPUTS	
Galvanic separation between inputs:	None
Galvanic separation from other circuits:	None
ANALOG INPUTS	
Number of inputs:	2: 2-wire connection 1: 3- or 4- wire connection
Type of inputs:	RTD/R, TC/U, 0/4-20mA; set input type using jumpers inside device
RTD/R Input Configuration	
Sensor type:	Pt100, Pt200. Pt500, Pt1000, resistance-type
Sensor connection method:	4-, 3- or 2-wire
Sensor current:	200□A; 2-, 3-wire connection 400□A; 4- wire connection
Wire resistance compensation in 4- or 3-wire connection:	automatic + constant within the range of -100 ...+100Ω
Wire resistance compensation In 2-wire connection:	constant within the range of -100 ...+100Ω
Wire resistance:	max 50Ω
Resistance measurement range:	max 5kΩ
Conversion characteristic for R:	Linear, 50-point
TC/U Input Configuration	
Cold junction compensation:	Internal Pt1000 sensor
Cold junction compensation range:	-50.0 °C to +99.9 °C
Voltage measurement range:	- 10V to +10V
Maximum resistance of compensation wires (to the sensor):	150 Ω
Input resistance:	>10kΩ
Conversion characteristic (for U):	Linear, 50-point

Configuration of 0/4-20mA Input	
Measurement range:	0-24mA
Input resistance:	92 □ +/-5%
Transducer powered from device:	No
Maximum input voltage:	±30VDC between I+ and I- terminals
Conversion characteristic:	Linear, 50-point
Measurement Error	
Measurement accuracy (at ambient temp. of 25 °C):	As specified in the table for the given sensor type
Temperature drift (between 0 °C and 50 °C):	0.025% of the range /10 °C
PULS-TYPE INPUT	
Maximum input voltage:	30VDC or 30Vp-p
Measurement range:	From 0.001Hz to 20kHz (from 0.001Hz to 1kHz if filtrating condenser is connected)
Minimum pulse width:	20µs (0.5ms if filtrating condenser is connected)
Voltage (OC):	3.3V
Current (contact):	3.3mA
Switch on / off threshold:	2.7V / 2.4V
BINARY OUTPUTS	
Number of outputs:	2
Type of outputs:	Semiconducting relays
Maximum load current:	100mA (AC/DC)
Maximum voltage:	60V (AC/DC)
RS485 SERIAL PORT	
Signals output on terminal block:	A(+), B(-), GND
Galvanic separation:	Yes, 500V AC/DC
Maximum load:	32 receivers / transmitters
Transmission protocol:	Modbus RTU
Maximum length of line:	1,200 m
Transmission rate:	1.2, 2.4, 9.6, 19.2, 115.2, 230.4kbps – programmable
Parity control:	Even, Odd, None – programmable
Frame:	1 start bit, 8 data bits, 1 stop bit (1 or 2 stop bits for None)
Minimum timeout:	0 ÷ 7,000ms – programmable
Maximum differential voltage A(+) – B(-):	±14V
Maximum total voltage A(+) – "ground" or B(-) – "ground"	-7 .. +12V
Minimum output signal of transmitter:	1.5V (at R0=27Ω)
Minimum sensitivity of receiver:	200mV / R_{WE}=12kΩ
Minimum impedance of data transmission line:	27Ω
Short-circuit / thermal protection:	Yes

ETHERNET PORT	
Transmission protocol:	Modbus TCP, ICMP (ping), DHCP server, http server
Interface:	100BaseT Ethernet
Number of connections opened simultaneously:	4
Connection:	RJ-45
Indication LEDs:	2, in RJ45 socket
USB Port	
Port:	Type A, USB compliant
Version:	USB 1.1
Recording indication:	Green and red LED on the face plate
INTERNAL DATA MEMORY	
Capacity:	2GB
Recording indication:	Green and red LED on the face plate
POWER SUPPLY	
Supply voltage:	24VAC (+5% / -10%) 20 … 30VDC (any polarity)
Power consumption:	Max 5W
WORKING CONDITIONS	
Working temperature:	-20 °C ÷ +50 °C
Storage temperature:	-30 °C ÷ +70 °C
Relative humidity during operation	5 ... 90% without condensation
MECHANICAL DIMENSIONS – CASE	
Type of case:	For mounting in panels, PPO
Dimensions:	96mm x 48mm x 100mm
Dimensions of panel cut-out:	92^{+08}mm x $45^{+0.6}$mm
Maximum panel thickness:	5mm
Weight:	ca. 0.3kg

Sensor range table:

INPUT CATEGORY	RANGE	ACCURACY	CHARACTERISTIC
Pt100 / Pt200 / Pt500 / Pt1000	-200 to +850 °C	+/-0.5 °C	IEC751
Pt100+ / Pt200+ / Pt500+ / Pt1000+	-50 to +250 °C	+/-0.3 °C	IEC751
J (Fe – CuNi)	-210 to +1,200 °C	+/-0.5 °C*	IEC584
K (NiCr – Ni)	-270 to +1,370 °C	+/-0.5 °C*	IEC584
T (Cu – CuNi)	-270 to +400 °C	+/-0.5 °C*	IEC584
E (NiCr – CuNi)	-270 to +1,000 °C	+/-0.5 °C*	IEC584
N (NiCrSi – NiSi)	-270 to +1,300 °C	+/-0.5 °C*	IEC584
B (Pt30Rh –Pt6Rh)	0 to +1,820 °C	+/-0.5 °C*	IEC584
R (Pt13Rh – Pt)	-50 to +1,760 °C	+/-0.5 °C*	IEC584
S (Pt10Rh – Pt)	-50 to +1,760 °C	+/-0.5 °C*	IEC584
R	0 to 5,000Ω	+/-0.1 %	linear
U	-1 to +1V	+/-0.5%	linear
0/4-20mA	0-20mA or 4-20mA	+/-0.2%	linear

* Accuracy does not include cold junction temperature measurement error (+/- 2 °C)

7 Equipment and Accessories

7.1 Basic Components

- M-200 device 1 pc
- 4-position terminal blocks 3 pc
- 3-position terminal blocks 3 pc
- 2-position terminal blocks 2 pc
- Printed User's Manual 1 pc
- CD-ROM (manual in electronic version and M-200 PMU.exe software) 1 pc
- Warranty card 1 pc

7.2 Accessories

- Service-type RS485 ↔ USB converter (no galvanic separation) CONV485USB.
- RS485 ↔ USB converter with galvanic separation CONV485USB-I.
- RS485 ↔ Ethernet converter CONV485E.
- Breve supply transformer PSS 10VA 230/24VAC.
- Breve supply transformer PSS 30VA 230/24VAC.

8 Entity Launching the Product on the EU Market

Entity launching the product on the European Union market:

Manufacturer: METRONIC Aparatura Kontrolno – Pomiarowa
31-261 Kraków, ul. Wybickiego 7
Phone No.: / Fax: 12 6326977, 12 6237599
www.metronic.pl

Notes: