LUMEL

SCREEN RECORDER

# KD10


USER MANUAL

CE

# Contents

# 1. General specification

## 1.1. Purpose of the recorder

The KD10 screen recorder is used as a data collection station in systems measurement and control. It is used to measure, visualize, and control parameters of technical processes in various industries e.g. food and chemical. and papermaking. It can also be used as a standalone measuring and recording device.

The KD10 screen recorder is designed to measure voltage, current, temperature, resistance changes, and other quantities converted into a signal or electrical parameter. Communication interfaces (Ethernet, RS-485) can also be used as a source of measurement data. It contains all the processes appropriate for the measurement system: measurement of input signals, their processing, visualization and archiving of data, signaling and communication with the environment.

Processed measurement data is saved in internal memory and on an SD card.

## 1.2. Device characteristics

- Intuitive operation via touchscreen and Linux-based graphical user interface;
- 5.6" TFT color LCD screen, 640x480 pixels;
- communication interfaces: Ethernet 10/100 Base-T, Modbus TCP/IP Slave, Modbus TCP/IP Master, RS-485 Modbus Slave, RS-485 Modbus Master (depending on the version);
- IP54 housing protection from the user's side;
- time zone selection, automatic summer/winter time change, synchronization with time server;
- recording archive data on an SD card;
- server WWW and FTP;
- digital signature for archived data stored in SQLite3 or CSV format;
- alarm and audit log;
- ability to update firmware;
- dedicated visualization in the form of, among others: digital, analogue and trend displays;
- extensive mathematical functions.

## 1.3.Safety of use

**Attention!** Removing the recorder's casing during the warranty period will invalidate the warranty. Before removing the recorder's casing, turn off the power and disconnect the measuring circuits.

- The assembly and installation of electrical connections should be performed by a qualified person.
  for the installation of electrical devices.
- Before powering up the recorder, check that the connections are correct.
- The device is intended for installation and use in industrial electromagnetic environmental conditions.
- The building installation should have an on/off switch or circuit breaker located near the device and easily accessible to the operator and appropriately marked.

### 1.3.1. Warning and information signs

One or more of the following symbols may be used on the recorder and in the materials supplied with the device:

| | |
|---|---|
|  | Note: Please pay attention to the description in the device's user manual. |
|  | Protective conductor clamp. |
|  | Warning: the device is live. |
|  | Protection of electrostatic sensitive systems (ESD). |
|  | Waste electrical and electronic equipment (WEEE).<br>Dispose of in accordance with law. |

### 1.3.2. Operational safety

The KD10 recorder meets the safety requirements for electrical measuring instruments for automation according to PN-EN 61010-1 and the requirements for immunity to disturbances occurring in an industrial environment according to PN-EN 61000-6-2 and PN-EN 61000-6-4.

Incorrect connection of power supply, communication interfaces, measurement signals, and the use of equipment that does not comply with the description in this manual and the above standards may result in damage to the recorder.

### 1.3.3. Notes on device installation

The KD10 recorder is subject to various interference sources from the power supply network, either continuously or pulsed, which overlap with the measured signal (mainly due to the operation of other devices). High-intensity interference is particularly dangerous to the device's operation, as it can sporadically cause erroneous measurement results or accidental alarm triggering. The main factor preventing this is the recorder's installation on the site. in such a way that the level of the above-mentioned interference is reduced to a value below the immunity threshold of the device.

In this regard, it is recommended to follow the following recommendations:

- do not power the recorder from the mains near devices that generate high impulse interference in the power supply network and do not use common grounding circuits with them;
- signal cables should be shielded;
- the connections of communication interface circuits should be individually shielded, with twisted cables;
- all cable screens should be grounded on one side at the recorder;
- avoid sharing a ground wire with other devices;
- apply the general rule that wires (bundles) carrying different signals should be routed as far from each other as possible, and intersections of such bundles should be made at an angle of 90°;
- do not disassemble the recorder's casing. Any repairs or changes to the device's equipment should be performed by authorized persons;
- the assembly and installation of electrical connections should be performed by a person authorized to install electrical devices;
- device security measures may be less effective in the event of operation contrary to the manufacturer's instructions and the principles of good engineering practice;
- place the supplied ferrite filter on the power cable (near the recorder).

### 1.3.4. ESD precautions

The semiconductor elements used in the construction of the recorder may be damaged. as a result of static electricity discharge (ESD).

To prevent this from happening during service work, please follow these recommendations:

- dismantle devices only in an area protected against electrostatic discharge;
- in the work area, use conductive materials to dissipate electrostatic charges;
- for storing electronic components and packages, use only antistatic packaging;
- do not keep materials susceptible to generating electrostatic charges in the work area.

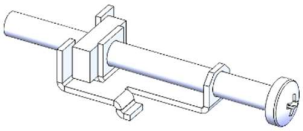
## 1.4.Recorder kit

The set includes:

1. KD10 recorder 1 pc.
2. Bracket for mounting in the board 1 set (4 pcs.)
3. Plug set 1 set (quantity depends on the execution)
4. Quick start guide 1 pc.
5. SD memory card 1 pc.
6. Key 1 pc.
7. Ferrite filter 1 pc.

1.

2.



3.

4.


5.

6.

7.

## 1.5.Construction of the recorder

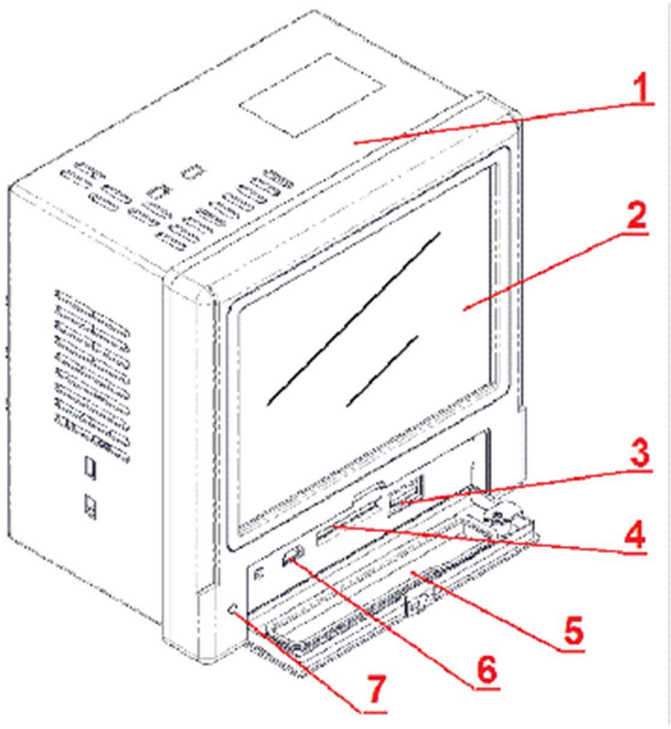



*Figure 1: Device structure.*

| Element | Description |
|---|---|
| 1 | Recorder housing |
| 2 | LCD touch screen |
| 3 | USB Host |
| 4 | SD card slot |
| 5 | Door with lock |
| 6 | USB Device |
| 7 | LED diode |

### 1.5.1. Screen

5.6-inch TFT color LCD screen, 640x480 pixel resolution, with touch panel.

### 1.5.2. RS-485 interface

The KD10 recorder has one or two (depending on the version) serial ports in RS-485 standard used for communication within computer systems and with other devices. The asynchronous MODBUS communication protocol is implemented on the serial link. The transmission protocol describes how information is exchanged between devices via a serial link. The implemented protocol is compliant with the Modicon PI-MBUS-300 Rev G specification.

Configuration for the RS-485 Modbus Slave serial port is in section 3.5. Configuration for the RS-485 Modbus Master serial port is in section 3.3.5.

| Parameter | Description |
|---|---|
| ID | 0xEF |
| Meter address | Values range from 1 to 247 |
| Transmission speed | 1200 bit/s, 2400 bit/s, 4800 bit/s, 9600 bit/s, 19200 bit/s, 38400 bit/s, 57600 bit/s, 115200 bit/s, 230400 bit/s. (115200 bit/s – default) |
| Operating mode | Modbus RTU |
| Information Unit | 8N2, 8E1, 8O1, 8N1. (8N2 – default) |
| Maximum response time | 600 ms |
| Maximum number of registers read | 122 registers – 2 bytes |
| Implemented functions | 03, 04 – reading registers (common address space) |
| | 17 – device identification |

Reading 4 16-bit integer registers, starting from the register with address 00 01 of float type (2x16 bits).

Task:

| Device address | Function | Register address | Number of registers | Sum of the CRC checksum |
|---|---|---|---|---|
| 01 | 04 | 00 01 | 00 04 | 20 0B |

Answer:

| Device address | Function | Number of bytes | Register values | | | | Sum of the CRC checksum |
|---|---|---|---|---|---|---|---|
| | | | 01 | 02 | 03 | 04 | |
| 01 | 04 | 08 | 00 0A | 00 0B | 00 63 | 00 64 | AND 39 |

**Function 03 – reading n-registers:**

Read 4 16-bit registers, starting from register address 00 01.

Task:

| Device address | Function | Register address | Number of registers | Sum of the CRC checksum |
|---|---|---|---|---|
| 01 | 03 | 00 01 | 00 04 | 15 C9 |

Answer:

| Device address | Func-tion | Num-ber of bytes | Value from the register | | | | Sum of the CRC checksum |
|---|---|---|---|---|---|---|---|
| | | | 01 | 02 | 03 | 04 | |
| 01 | 04 | 08 | 70 A4 | 41 CD | 00 00 | 41 A2 | 55 CB |

**Function 17 – Device identification:**

Task:

| Device address | Function | Register address |
|---|---|---|
| 01 | 11 | C0 2C |

Answer:

| Device address | Function | Number of bytes | Device ID | Device status | Sum of the CRC checksum |
|---|---|---|---|---|---|
| 01 | 11 | 02 | IF | FF | A7 7C |

### 1.5.3. Ethernet interface

The KD10 network parameter recorder is equipped with an Ethernet interface, enabling connection of the meter to a local or global network via an RJ45 socket. Implemented network services supported via the Ethernet interface include: web server, FTP server, and Modbus Slave TCP/IP.

**Attention!** Detailed information on configuring the interface on the device is described at the point *3.11. Ethernet Configuration*.

Obtaining access to Ethernet services requires connecting the KD10 recorder to the network via RJ45 socket operating in accordance with the TCP/IP protocol located on the rear of the housing.

Description of the meaning of the diodes of the RJ45 socket of the meter:

- yellow diode- when no data is being transmitted it lights up continuously, otherwise it does not light up;
- green diode- lights up irregularly when KD10 is properly connected to the mains, otherwise it does not light up.

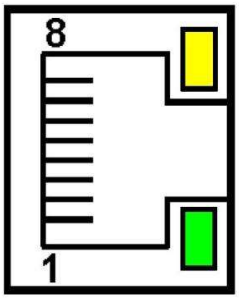



*Figure 2: Ethernet*

To connect KD10 to the network, it is recommended to use a twisted pair cable:

- U/FTP – twisted pair with each pair foiled;
- F/FTP – twisted pair with each pair foiled and additionally foil-shielded cable;
- S/FTP (formerly SFTP) – twisted pair with each pair foiled and additionally with a mesh screen;
- SF/FTP (formerly S-STP) – twisted pair with each pair additionally foiled in a foil screen and from the net;

| Core No. | Signal | Core color according to standard | |
|---|---|---|---|
| | | THIS/THIS 568A | THIS/THIS 568B |
| 1 | TX+ | white and green | white and orange |
| 2 | TX- | green | orange |
| 3 | RX+ | white and orange | white and green |
| 4 | EPWR+ | blue | blue |
| 5 | EPWR+ | white and blue | white and blue |
| 6 | RX- | orange | green |
| 7 | EPWR- | white-brown | white-brown |
| 8 | EPWR- | brown | brown |

Twisted-pair cable categories according to the European standard EN 50171, minimum: Class D (Category 5) – for high-speed local area networks, covers applications using a frequency band up to 100 MHz. For the Ethernet interface, a Category 5 STP (shielded) twisted-pair cable should be used with an RJ45 plug with wire colors (in accordance with the colors described in the table) in the following standard:

- EIA/TIA 568A for both plugs with the so-called straight KD10 connection to a network hub or network switch;

- EIA/TIA 568A for the first pin and EIA/TIA 568B for the second pin in the so-called interlaced (cross) connection used, among others, when directly connecting the N100 meter to a computer.

### 1.5.4. USB interface

The recorder has two USB interfaces: USB Host and USB Device.

Using the USB Host interface, the user can copy files between the SD card and the device connected to the USB Host. The USB Device acts as a service port.

### 1.5.5. SD memory card

The standard data storage medium in KD10 is an SD card with a capacity of up to 32 GB.

Archived data (depending on the configuration) as well as alarm and audit logs are saved on the SD card.

All archived data and log files are first saved to the recorder's internal memory. After a pre-defined portion of the records has been saved or after a user-configured time has elapsed, they are transferred to the SD card.

If the KD10 does not have an SD card installed during operation, all files (currently being written and those that have already been completed) are saved in the internal memory. Once the card is mounted, all completed files will be transferred from internal storage.

**Note: In the event of a power outage, a maximum of 1 MB of data stored in the internal memory is guaranteed to be retained.**

### 1.5.6. Rear panels of the recorder

The rear panel of the recorder for the version with 18 universal measurement inputs is shown in the figure below (*Figure* 3).

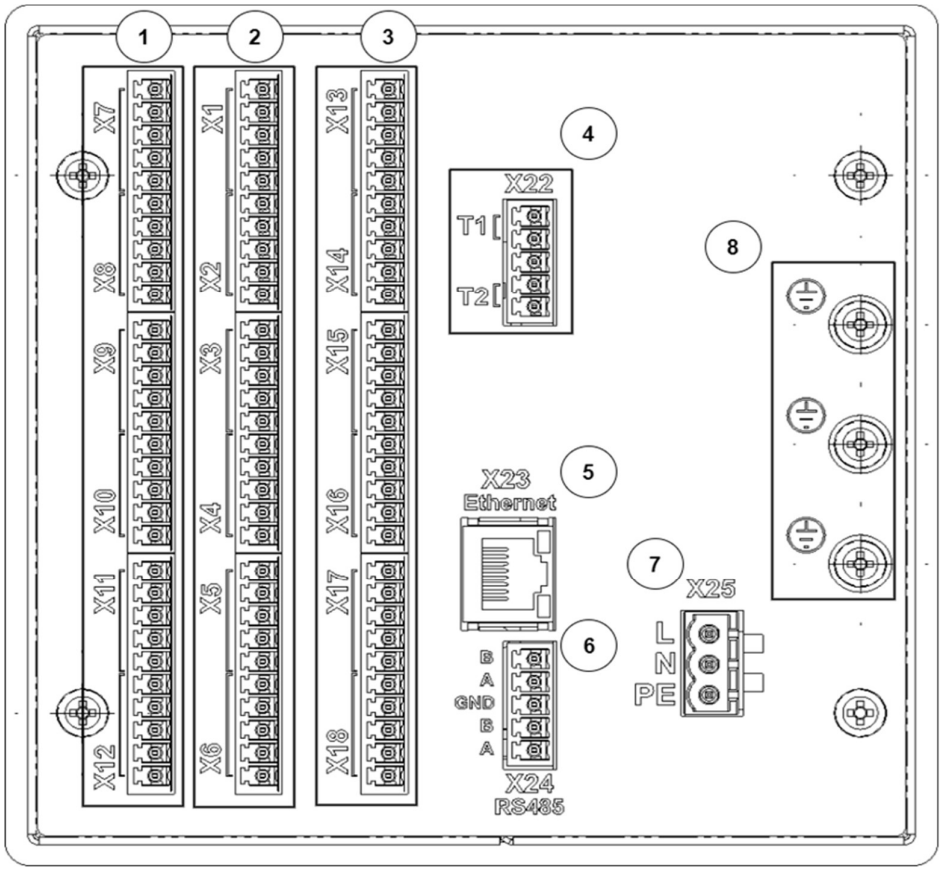



*Figure 3: Rear panel of the 18-channel recorder*

| Element | Description |
|---|---|
| 1 | Slot 1 – 6 programmable measurement inputs (x7 ... x12) |
| 2 | Slot 2 - 6 programmable measurement inputs (x1 ... x6) |
| 3 | Slot 3 - 6 programmable measurement inputs (x13 ... x18) |
| 4 | Temperature and resistance measurement inputs (x22) |
| 5 | Ethernet communication interface (x23) |
| 6 | RS-485 Modbus Slave communication interface (x24) |
| 7 | KD10 recorder power supply (x25) |
| 8 | Grounding terminals for connecting PE wires |

The rear panel of the recorder for versions with 12 universal measurement inputs and an expansion card (Slot 3), which differs depending on the version, is shown in the figure below (*Figure 4*).

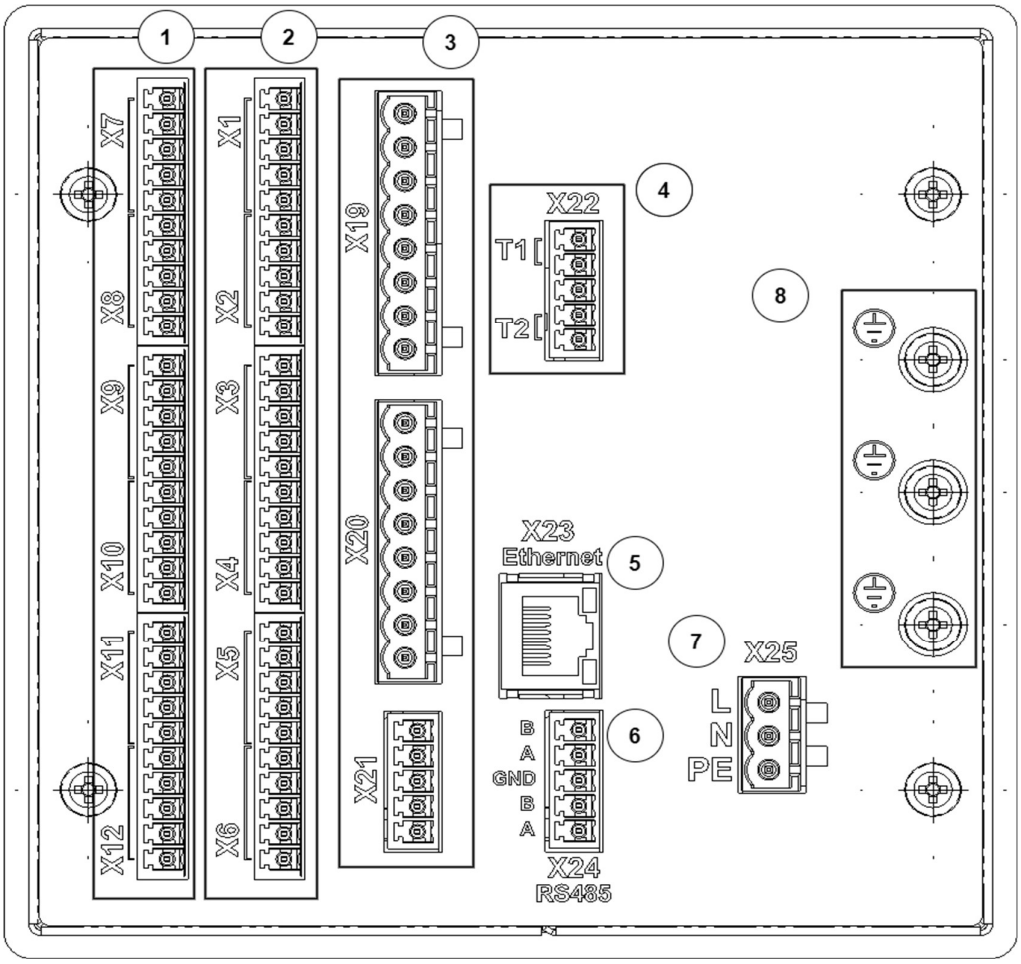



*Figure 4: Rear panel of a 12-channel recorder with expansion cards*

| Element | Description |
|---|---|
| 1 | Slot 1 – 6 programmable measurement inputs (x7 ... x12) |
| 2 | Slot 2 - 6 programmable measurement inputs (x1 ... x6) |
| 3 | Slot 3 with 4 possible expansion cards (by order code):<br>• 8 relay outputs (x19, x20) and RS-485 Modbus Master (x21)<br>• 6 binary inputs (x20), 4 relay outputs (x19) and RS-485 Master (x21)<br>• 6 binary inputs (x20), 3 analog outputs (x19) and RS-485 Master (x21)<br>• 4 binary inputs (x21), 6 analog outputs (x19, x20) |
| 4 | Temperature and resistance measurement inputs (X22) |
| 5 | Ethernet communication interface (X23) |
| 6 | RS-485 Modbus Slave communication interface (X24) |
| 7 | KD10 recorder power supply (X25) |
| 8 | Grounding terminals for connecting PE wires |

The rear panel of the recorder for versions with 6 universal measurement inputs and an expansion card (Slot 2), which differs depending on the version, is shown in the drawing (*Figure* 5).

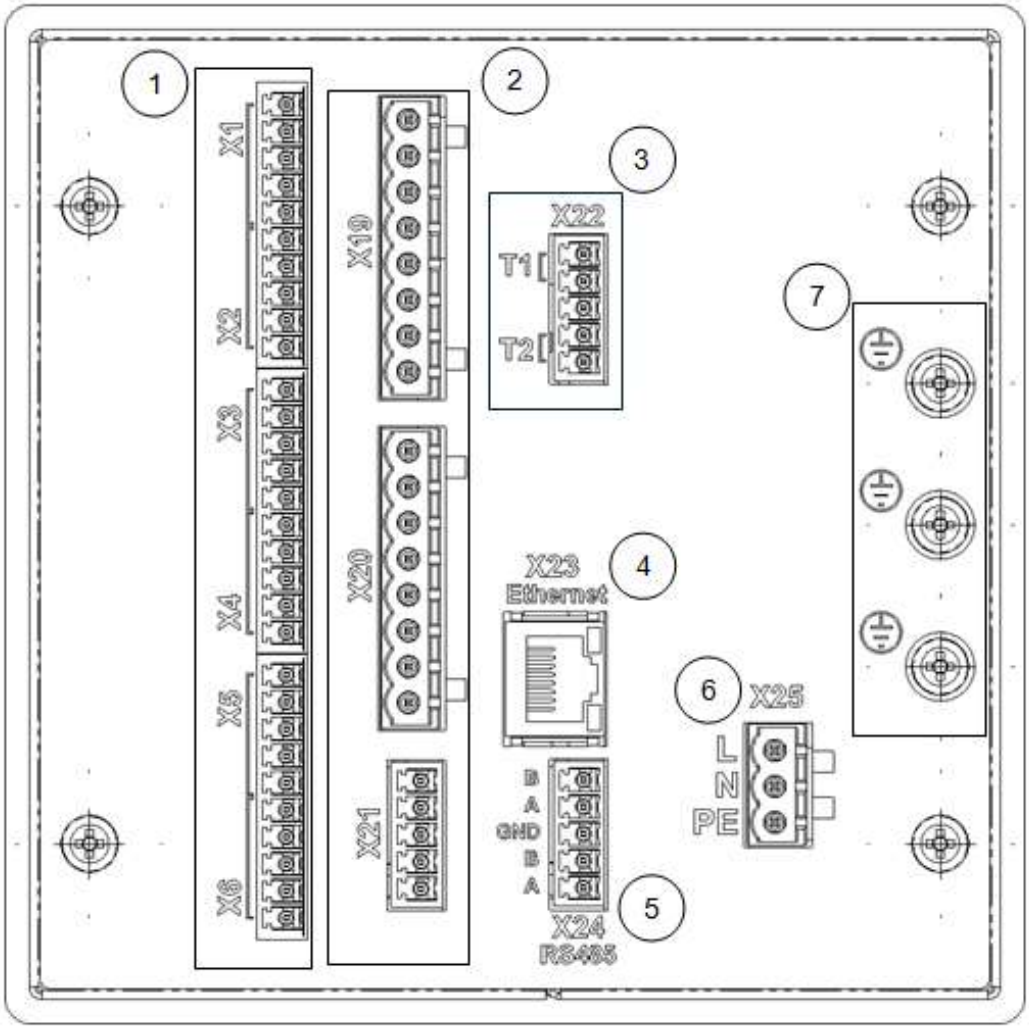



*Figure 5: Rear panel of a 6-channel recorder with expansion cards*

| Element | Description |
|---|---|
| 1 | Slot 1 – 6 programmable measurement inputs (x1 ... x6) |
| 2 | Slot 3 with 4 possible expansion cards (by order code):<br>• 8 relay outputs (x19, x20) and RS-485 Modbus Master (x21)<br>• 6 binary inputs (x20), 4 relay outputs (x19) and RS-485 Master (x21)<br>• 6 binary inputs (x20), 3 analog outputs (x19) and RS-485 Master (x21)<br>• 4 binary inputs (x21), 6 analog outputs (x19, x20) |
| 3 | Temperature and resistance measurement inputs (X22) |
| 4 | Ethernet communication interface (X23) |
| 5 | RS-485 Modbus Slave communication interface (X24) |
| 6 | KD10 recorder power supply (X25) |
| 7 | Grounding terminals for connecting PE wires |

The rear panel of the recorder for the versions with 12 universal measurement inputs without an expansion card is shown in the figure below (*Figure 6*).

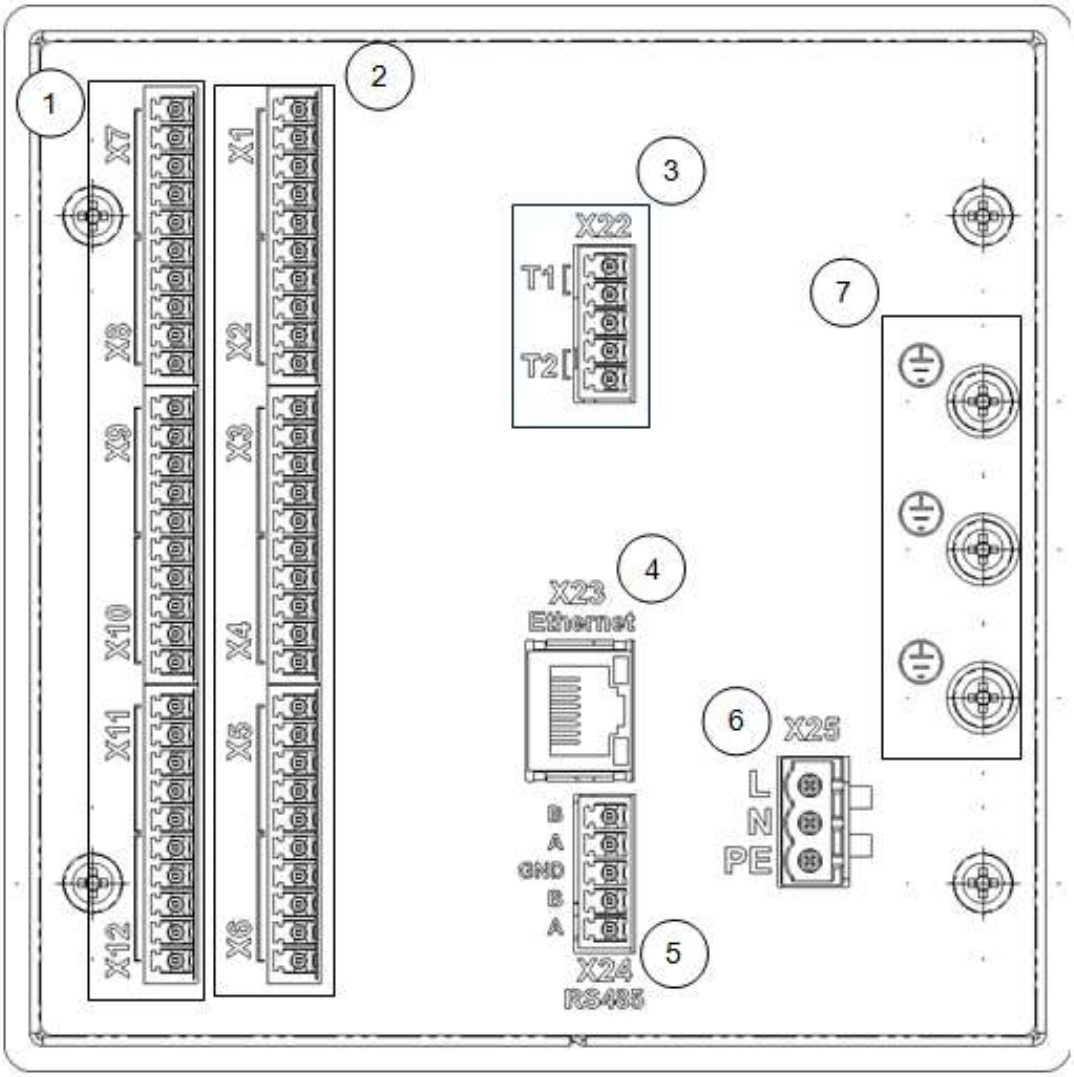



*Figure 6: Rear panel of a 12-channel recorder without an expansion card*

| Element | Description |
|---|---|
| 1 | Slot 1 – 6 programmable measurement inputs (x7 ... x12) |
| 2 | Slot 2 - 6 programmable measurement inputs (x1 ... x6) |
| 3 | Temperature and resistance measurement inputs. (X22) |
| 4 | Ethernet communication interface (X23) |
| 5 | RS-485 Modbus Slave communication interface (X24) |
| 6 | KD10 recorder power supply (X25) |
| 7 | Grounding terminals for connecting PE wires |

## 1.6.Connection diagrams

### 1.6.1. Universal measurement input card

#### 1.6.1.1. Voltage signal connection diagram

Detailed measurement ranges are presented in row 14 of the “measuring ranges” table in section 9.1.

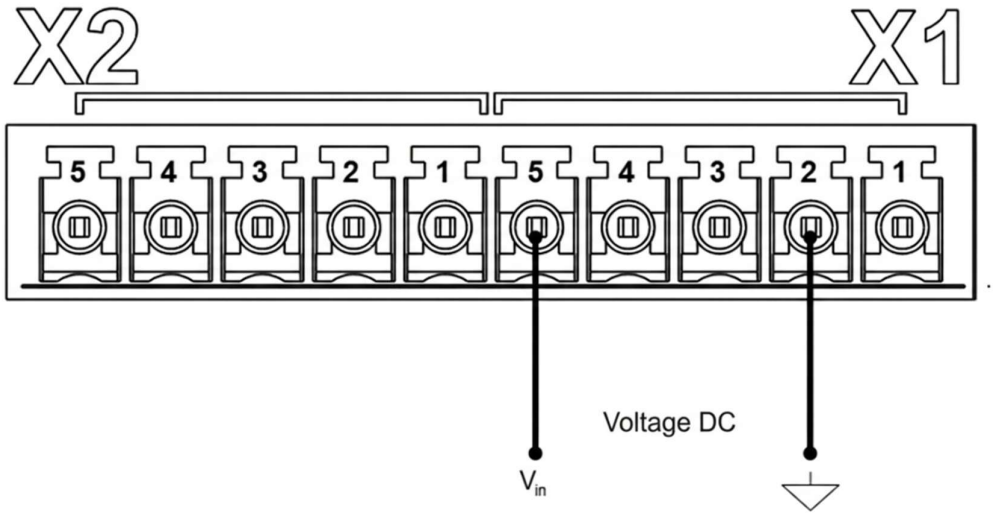



*Figure 7: Connection diagram for DC voltage signals*

#### 1.6.1.2. Current signal connection diagram

Detailed measurement ranges are presented in rows 15 and 16 of the “measuring ranges” table in section 9.1.

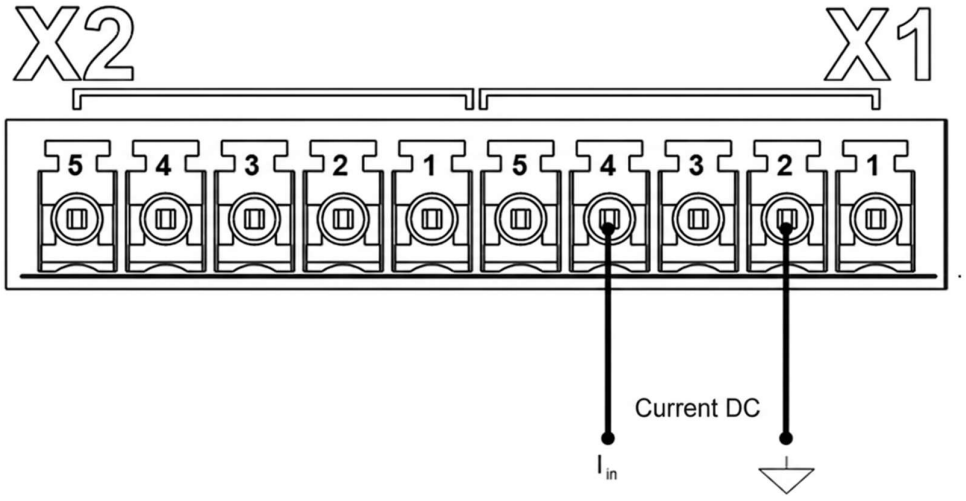



*Figure 8: DC current signal connection diagram*

#### 1.6.1.3. Thermocouple connection diagram

Detailed measurement ranges are presented in lines 5-10 of the “Measurement ranges” table in section 9.1.

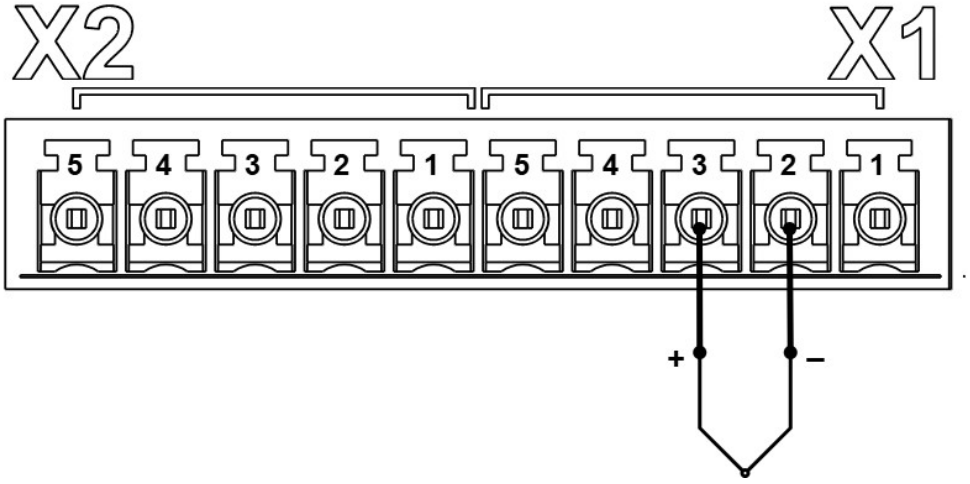



*Figure 9: TC thermocouple connection diagram*

#### 1.6.1.4. Shunt connection diagram

Detailed measurement ranges are presented in lines 11-13 of the “measuring ranges” table in section 9.1.

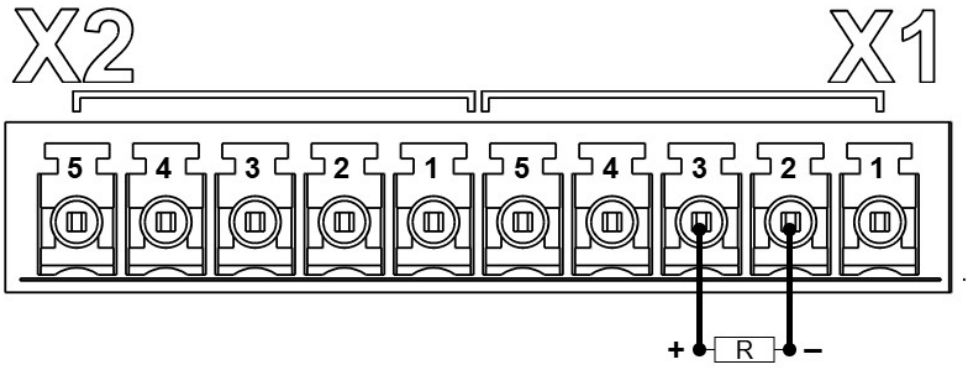



*Figure 10: Shunt connection diagram*

### 1.6.1.5. RTD resistive sensor connection diagrams

Detailed measurement ranges are presented in lines 1-4 of the “measuring ranges” table in section 9.1.

- RTD resistance sensor connection diagram - 3 wires
  (manual and automatic compensation)

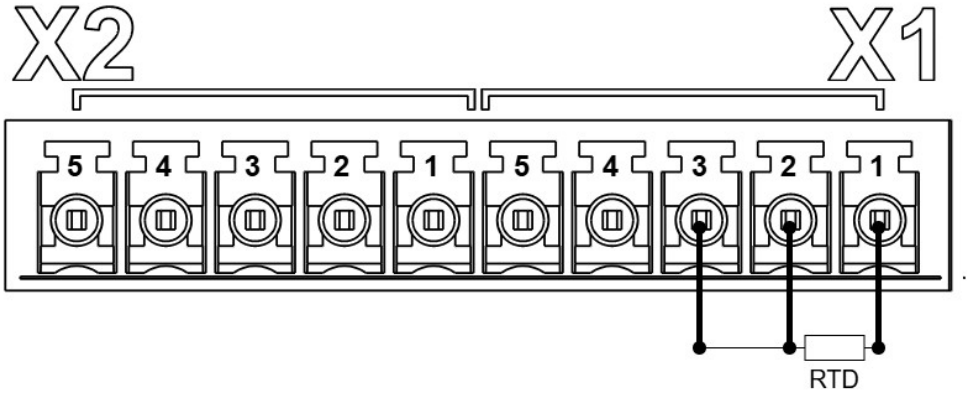



*Figure 11: RTD resistance sensor connection diagram – 3 wires*

- RTD resistance sensor connection diagram - 2 wires
  (manual compensation)

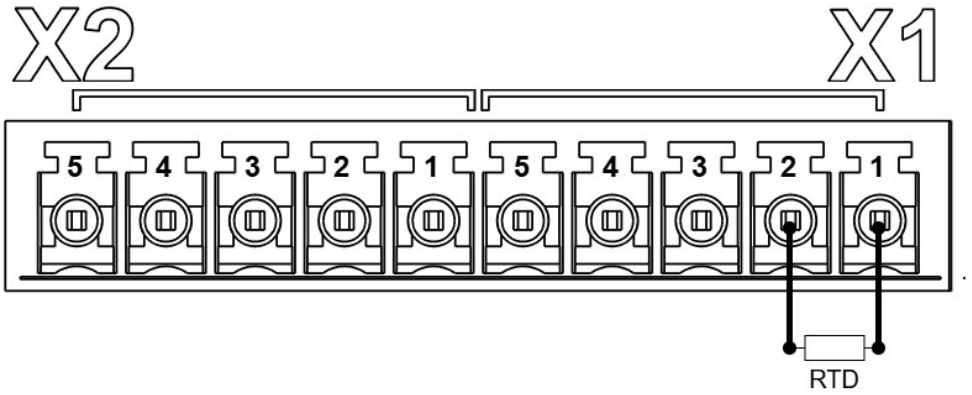



*Figure 12: RTD resistive sensor connection diagram – 2 wires*

### 1.6.2. 8-way relay output card

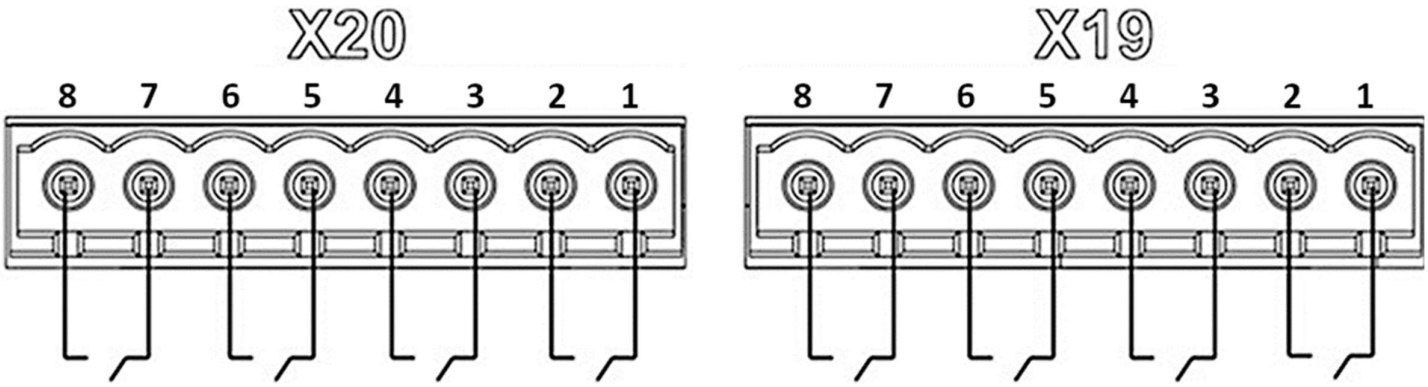



*Figure 13: 8-way relay output connectors*

Relay outputs are normally open (NO). Where:

| X20 | X19 |
|---|---|
| Terminals 9-10: Output 5 | Terminals 1-2: Output 1 |
| Terminals 11-12: output 6 | Terminals 3-4: Output 2 |
| Terminals 13-14: Output 7 | Terminals 5-6: Output 3 |
| Terminals 15-16: Output 8 | Terminals 7-8: output 4 |

### 1.6.3. Card with 6 binary inputs, 4 relay outputs

#### 1.6.3.1. Connecting 4 relay outputs

Relay outputs are normally open (NO). Where:

| X19 |
|---|
| terminals 1-2: output 1 |
| terminals 3-4: output 2 |
| terminals 5-6: output 3 |
| terminals 7-8: output 4 |

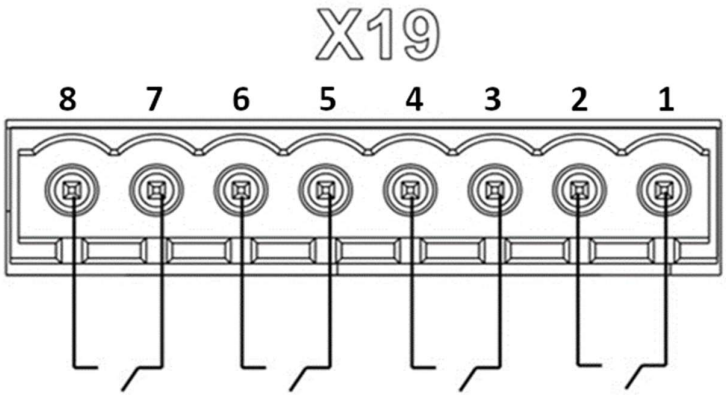



*Figure 14: Connector for 4 relay outputs*

#### 1.6.3.2. Connecting 6 binary inputs (X20)

Binary inputs controlled by signals:
0 ... 2 V DC - binary input inactive
8 ... 24 V DC - binary input active
8 ... 24 V DC – counting input (high level)

| X20 | |
|---|---|
| Terminal 9 | binary input S(X) In1 |
| Terminal 10 | binary input S(X) In2 |
| Terminal 11 | binary input S(X) In3 |
| Terminal 12 | common for S(X) COM1-3 inputs |
| Terminal 13 | binary input S(X) In4 |
| Terminal 14 | binary input S(X) In5 |
| Terminal 15 | binary input S(X) In6 |
| Clamp 16 | common for S(X) COM4-6 inputs |

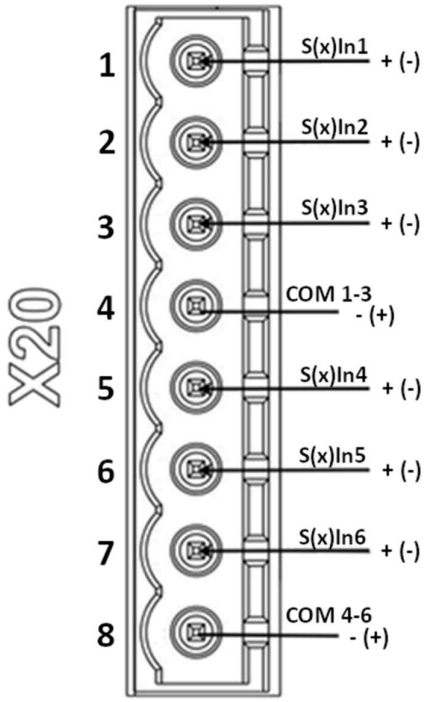



*Figure 15: 6 binary input connectors*

### 1.6.4. Card with 6 binary inputs, 3 analog outputs

#### 1.6.4.1. Connecting 3 analog outputs

The version with 3 analog outputs uses the upper part of the expansion card connector.

| X19 |
|---|
| Terminals 1–2: Analog output 1 (S(X) Out 1) |
| Terminals 4 – 5: Analog output 2 (S(X) Out 2) |
| Terminals 7 – 8: Analog output 3 (S(X) Out 3) |

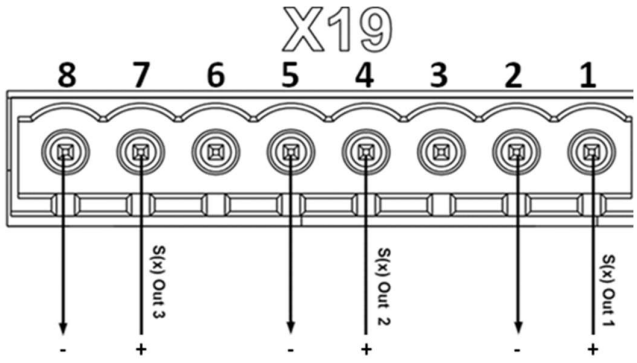



*Figure 16: 3 analog output connector*

**The connection of 6 binary inputs can be found in subsection 1.6.3.2.**

### 1.6.5. Card with 4 binary inputs, 6 analog outputs

#### 1.6.5.1. Connecting 6 analog outputs

The 6 analog output version uses both expansion card connectors.

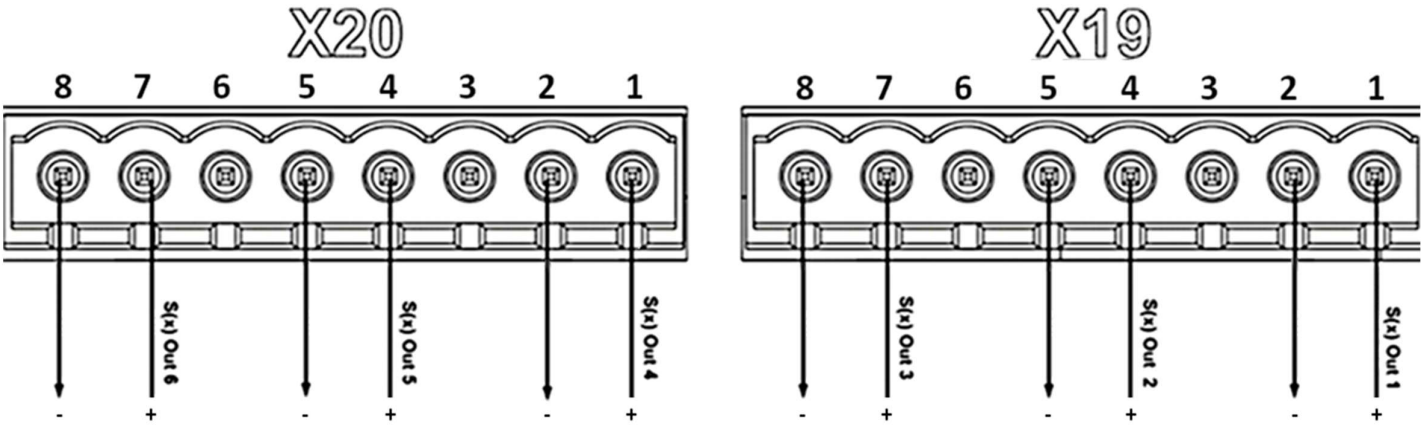



*Figure 17: 6 Analog Output Connectors*

| X20 | X19 |
|---|---|
| 1 – 2: analog output 4 (S(X) Out 4) | 1 – 2: analog output 1 (S(X) Out 1) |
| 4 – 5: analog output 5 (S(X) Out 5) | 4 – 5: analog output 2 (S(X) Out 2) |
| 7 – 8: analog output 6 (S(X) Out 6) | 7 – 8: analog output 3 (S(X) Out 3) |

#### 1.6.5.2. Connecting 4 binary inputs (X21)

Binary inputs controlled by signals:
0 ... 2 V DC - binary input inactive
8 ... 24 V DC - binary input active
8 ... 24 V DC – counting input (high level)

| X21 | |
|---|---|
| Clamp 1 | binary input S(X) In1 |
| Terminal 2 | binary input S(X) In2 |
| Terminal 3 | binary input S(X) In3 |
| Terminal 4 | binary input S(X) In4 |
| Terminal 5 | common for S(X) COM1-4 inputs |

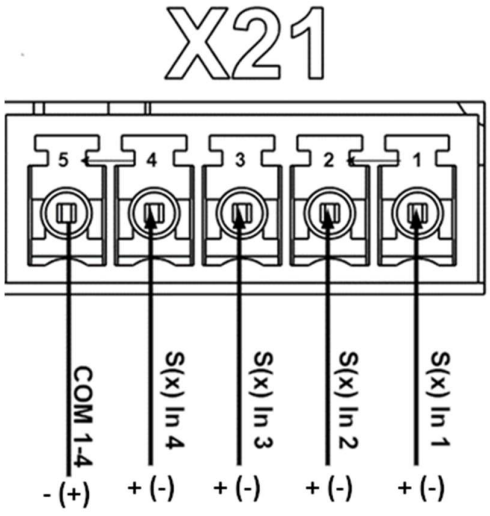



*Figure 18: Binary inputs*

### 1.6.6. RS-485 Modbus Master (X21)

The X21 connector performing the Modbus Master function is available in three versions of expansion cards:

- 8 relay outputs;
- 6 binary inputs, 4 relay outputs;
- 6 binary inputs, 3 analog outputs.

In each of the above versions, it is one interface with duplicated terminals A and B, and ground (GND).
The figure below shows the individual terminals of the RS-485 Modbus Master connector.

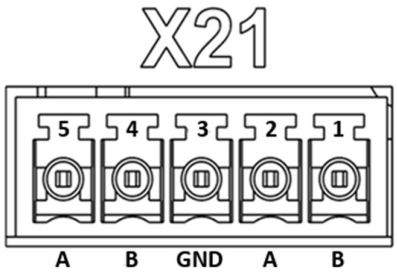



*Figure 19: RS-485 Modbus Master Interface*

### 1.6.7. Temperature connector (X22)

Connector X22 serves as a temperature connector. Available in all KD10 versions.

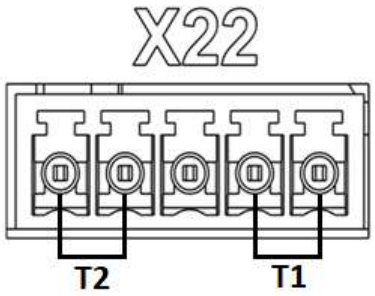



*Figure 20: Temperature connectors T1 and T2.*

### 1.6.8. RS-485 Modbus Slave connector (X24)

Connector X24 functions as a Modbus Slave. Available in all KD10 versions.

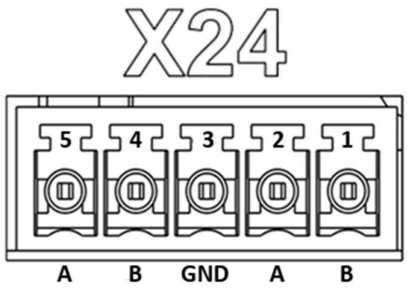



*Figure 21: RS-485 Modbus Slave Interface.*

## 1.7.Mounting method

The KD10 recorder is designed to be mounted on a panel using brackets. Housing dimensions 144 x 144 x 104 mm, mounting hole dimensions 138 x 138 mm.

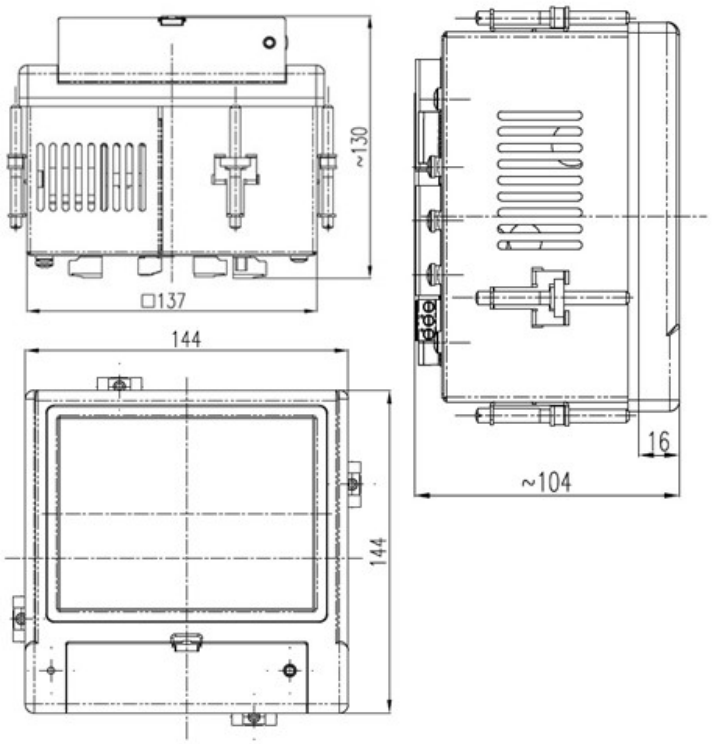



*Figure 22: Dimensions*

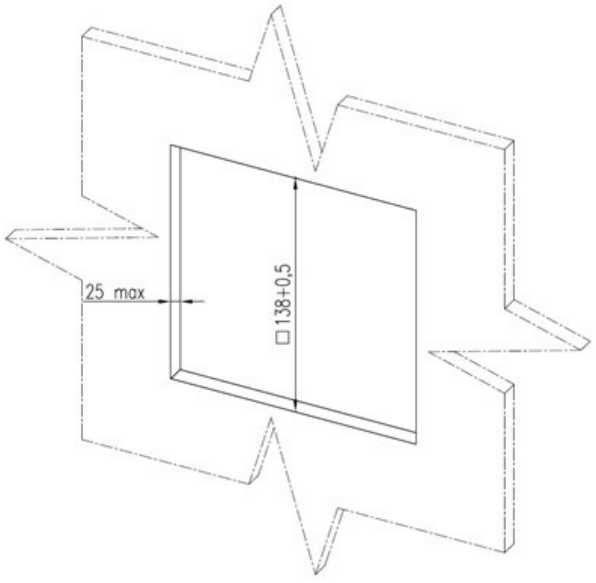



*Figure 23: Dimensions - mounting hole.*

# 2. Operating the device

## 2.1. Home screen

Once the device is turned on, the user will be redirected to the home screen. (*Illustration 1*). When you first start it up (for a standard configuration), this will be the first view of the digital displays screen.

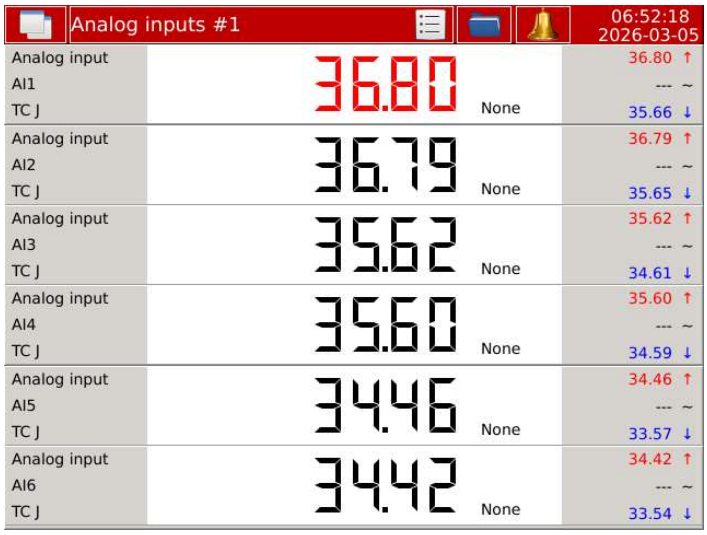



*Illustration 1: Home screen.*

Tapping the central area will display a tool overlay containing additional interface components (*Illustration* 2).


*Illustration2: Home screen – displaying the tool overlay.*

Interface elements are divided into two groups: navigation elements and functional elements.

### 2.1.1. Navigating the Home Screen – Navigation Elements

The first group are **navigation elements** (*Illustration 3*), allow the user to switch between available views and screens.

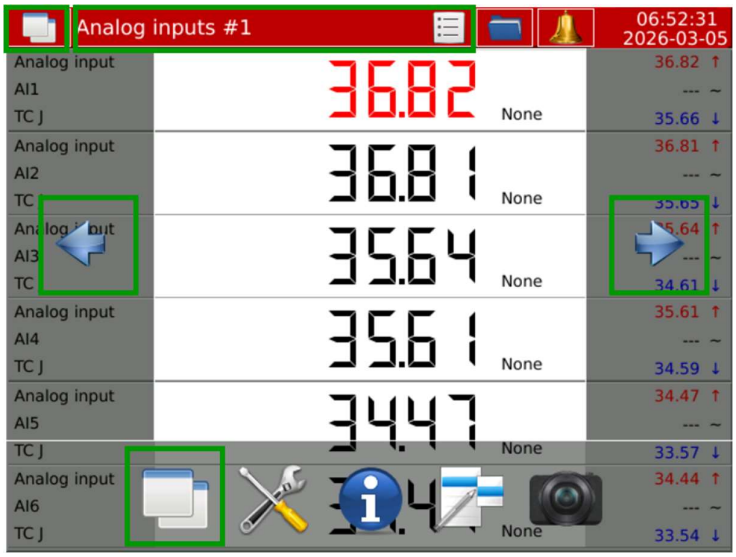



*Illustration 3: Main screen – navigation elements*

The table below shows the navigation elements found on the toolbar.

| Symbol | Description |
|---|---|
|  | Navigating through views. Tapping the right arrow displays the next view with a set of measured parameters. After reaching the last element, selecting the "move right" option returns you to the first screen. Moving left works similarly. |
|  | Navigate screens. Tapping an icon will display the next available screen. |

Screens and views can be configured in the visualization settings (chapter 3.8).

The navigation elements located in the top bar of the home screen allow you to move through the available screens and views in a non-linear manner using selection lists (*Illustration 4*).

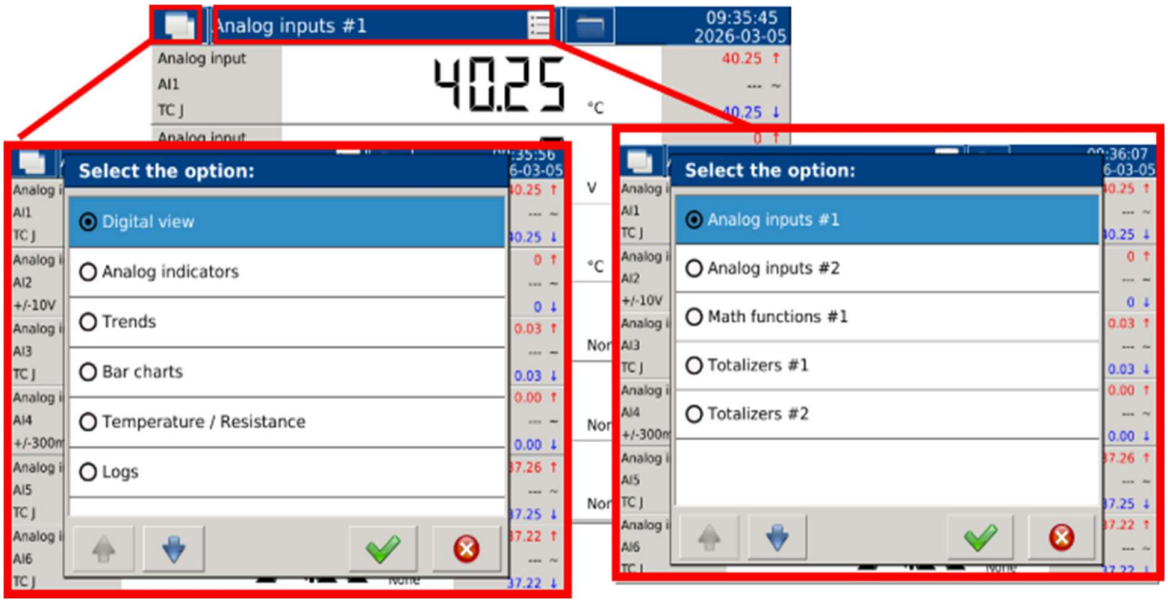



*Illustration 4: Home screen (navigation elements) - selection lists of available screens/views*

### 2.1.2. Home screen navigation – functional elements

The next group are **functional elements** (*Illustration 5*) which allow you to change the current recorder settings and access advanced configuration settings.

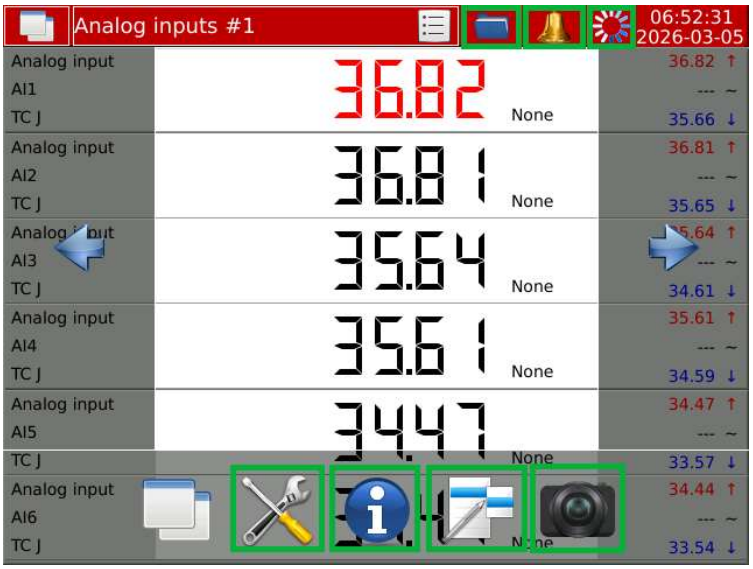



*Illustration 5: Home screen - functional elements.*

The table presents individual elements of the main screen along with a description of their functionality.

| Symbol | Description |
|---|---|
|  | Access the control panel to change device settings. Secured against unauthorized access by a login window. |
|  | Go to the system information window. |
|  | Access the context menu for managing selected device parameters. An example of the dialog is shown below. |
|  | Screenshot function. |
|  | Go to the alarm management window. For a more detailed description, see section 6 of the manual. |
|  | A file manager that allows you to manage the contents of your SD card. See section 4 of this manual for a more detailed description. |
|  | Animated icon for obtaining an IP address. |

The options available in the context menu depend on the screen on which it was invoked. In the illustration (*Illustration 6*) examples of possible choices are presented.

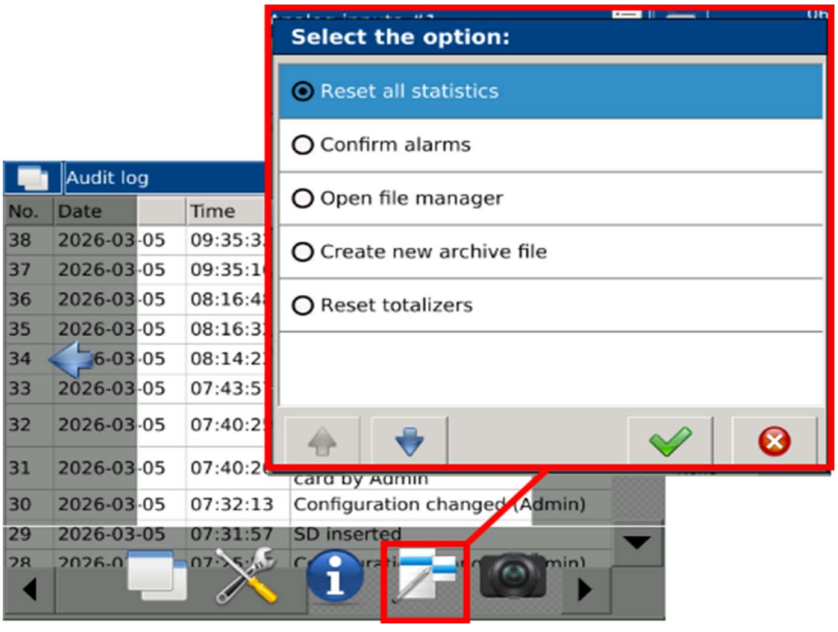



*Illustration 6: Context menu - alarm log.*

### 2.1.3. Login window

Certain operations require elevated privileges, such as accessing the control panel, selecting context menu options, or taking a screenshot. Privilege elevation is performed via the login window (*Illustration* 7).

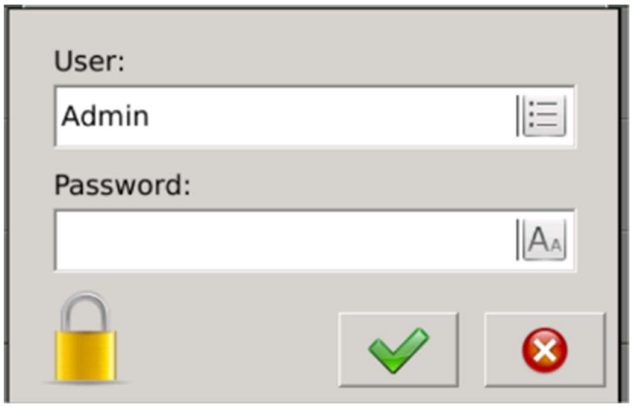



*Illustration 7: Login window.*

The login dialog box (*Illustration 7*) consists mainly of 4 elements: user selection from the list, edit field for entering the password, button for accepting login data (with a green icon on the left), and a button to exit the dialog box without accepting the data (with a red icon on the right).

When you touch the edit field where you enter the password, the on-screen keyboard will appear on the screen. In the illustration below (*Illustration 8*) is a view of the main window of the on-screen keyboard, which allows you to enter numbers, characters, or special characters. The example shown allows you to enter characters (lowercase letters).


*Illustration 8: On-screen keyboard.*

| Element | Description |
|---|---|
| 1 | Edit field. |
| 2 | Accepting the entered value and closing the dialogue. |
| 3 | Switch the keyboard between lowercase and uppercase letters. |
| 4 | Swapping tabs between a keyboard containing letters and a keyboard containing numbers and special characters. |
| 5 | Buttons allowing you to move the cursor left or right in the edit field displaying the element being edited (1). |
| 6 | Deleting a single item from the screen (1) directly behind the cursor. |
| 7 | Close the window without saving the name. |

In the illustration below (*Illustration 9*) is located view of the keyboard window allowing you to enter numerical values and available special characters.


*Illustration 9: On-screen keyboard - editor of numerical values and special characters.*

## 2.2.Screens and data presentation

The visualization of measurement parameters is organized into screens, each with its own view group. Using the configuration settings described in section 3.8 of the manual, the user can decide which screens and their associated view groups will be available for presentation. This allows for full control over both the number and as well as the content of the information presented.

Additionally, users can define their own sets of measurement channels for visualization on the recorder's display. This functionality is available on selected screens:

- large digital displays,
- analog indicators,
- trends,
- bar charts.

### 2.2.1. Measurement channel status colors

In the example below (*Illustration 10*) shows an example screen (large digital displays) with a view containing analog input values in different colors.

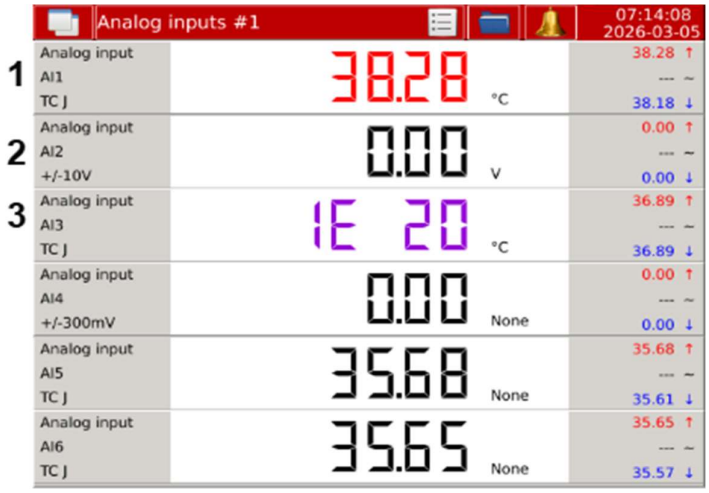



*Illustration 10: Main screen - measurement values for analog inputs*

| Option | Description |
|---|---|
| 1 | Alarm occurred on the displayed value. |
| 2 | Example of a correct measured value. |
| 3 | The value was not converted correctly. |

Each screen has unique features for presenting data. The following sections describe each type, along with the elements available to the user.

### 2.2.2. Large digital displays

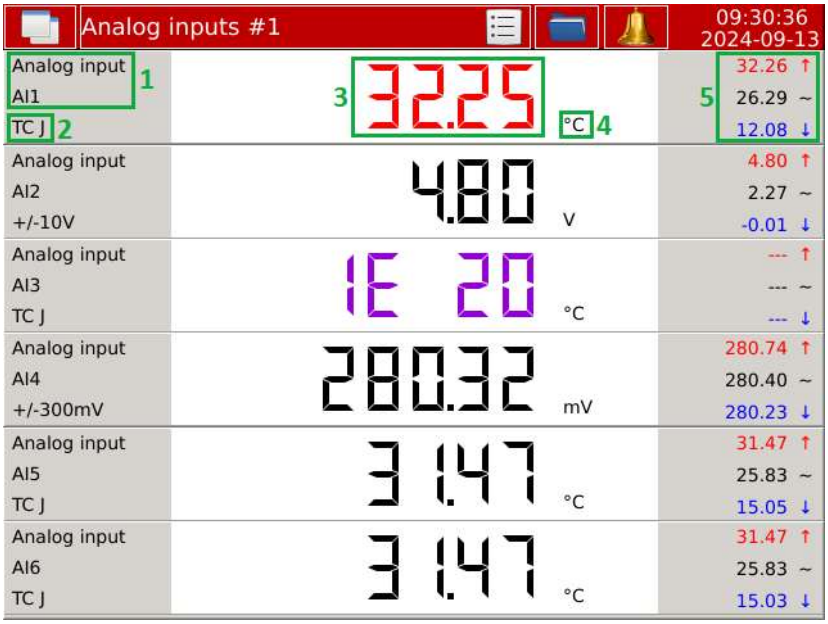



*Illustration 11: Screen - Large digital displays.*

| Option | Description |
|---|---|
| 1 | Input name and input type |
| 2 | Input type |
| 3 | Measured value |
| 4 | The unit assigned to the measured value |
| 5 | Minimum, maximum, and average values of rolling window measurements (enabled by setting the averaging window) |

### 2.2.3. Analog gauges


*Illustration 12: Screen - Analog gauges.*

| Option | Description |
|---|---|
| 1 | Analog indicator presenting the value of the measured parameter |
| 2 | Average of measurements from a rolling window (enabled by setting the averaging window) |
| 3 | Minimum and maximum values |
| 4 | Analog display scale for a given value |
| 5 | Entry name |
| 6 | Input type |
| 7 | Unit |
| 8 | Scale |
| 9 | Measured value in digital form |

### 2.2.4. Trends

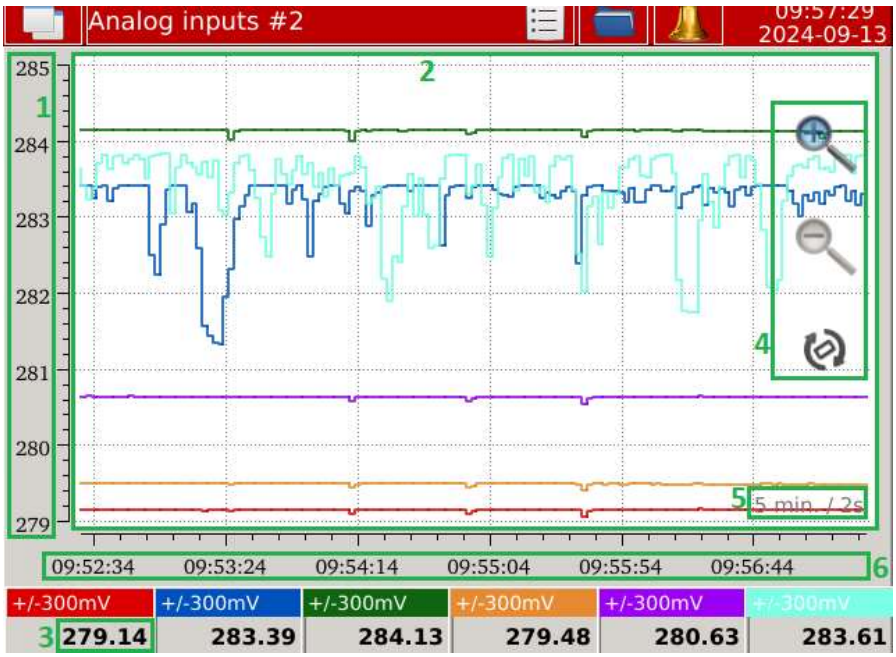



*Illustration 13: Screen - Trendy.*

| Option | Description |
|---|---|
| 1 | A scale describing the range of values at the time presented. The range is automatically scaled as the measured values change. |
| 2 | Main trend presentation window |
| 3 | The value of the measured parameter in digital form |
| 4 | Zoom in and out tool, rotate screen to portrait position |
| 5 | The time range of presenting values on trends with information on the frequency of parameter updates |
| 6 | Timeline updated automatically with subsequent measured values presented on the main screen |

### 2.2.5. Bar charts

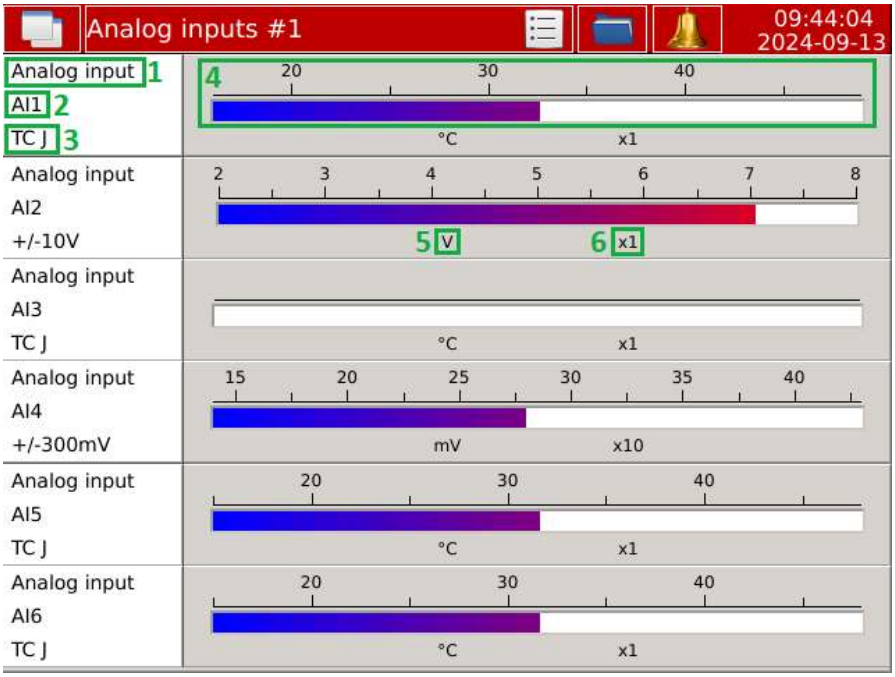



*Illustration 14: Screen - Bar charts.*

| Option | Description |
|---|---|
| 1 | Entry name |
| 2 | Entry type |
| 3 | Input type |
| 4 | Value on the scaled axis |
| 5 | Unit |
| 6 | Scale |

### 2.2.6. Temperature/Resistance Measurement Screen

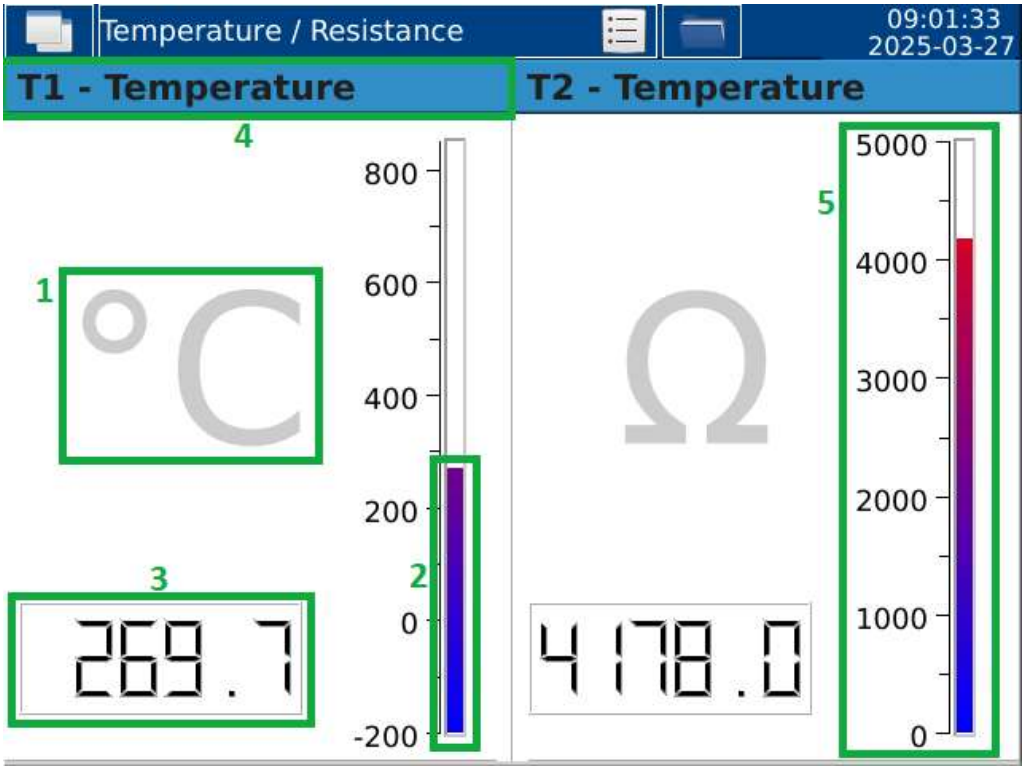



*Illustration 15: Screen – Temperature / Resistance.*

| Option | Description |
|---|---|
| 1 | Description of the unit assigned to a given field - depending on the sensor type (temperature or resistance) |
| 2 | Measured value indicator |
| 3 | Value measured in digital form |
| 4 | Channel description |
| 5 | Measurement scale adapted to the sensor type |



*Ilustracja 15: Ekran - Temperatura / rezystancja.*

### 2.2.7. Binary input measurement screen

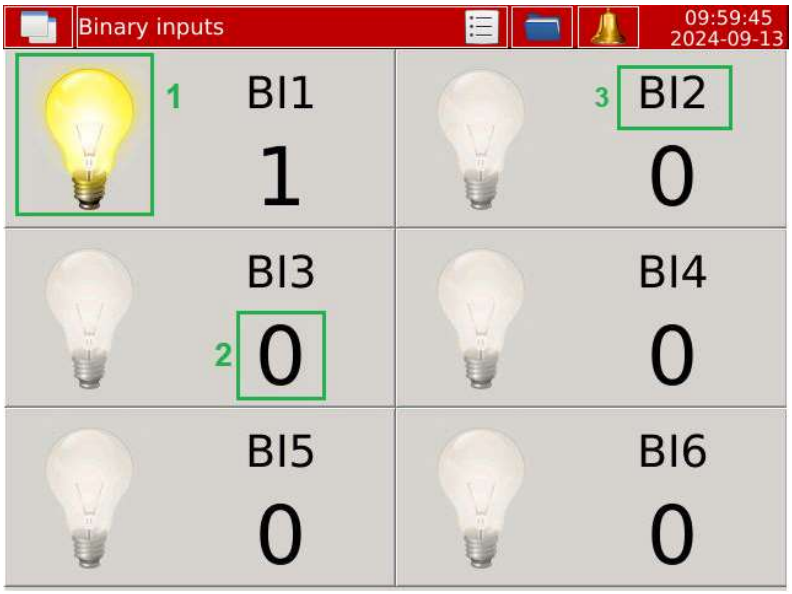



*Illustration 16: Screen - Binary inputs.*

| Option | Description |
|---|---|
| 1 | Visualization of the binary input status: bulb on – binary input connected, bulb off – binary input disconnected |
| 2 | • Binary input mode: information about the current input state<br>• Counter input mode: number of counted pulses |
| 3 | Description of the binary output, e.g.: BI2 – binary input number 2 |

### 2.2.8. Log Review

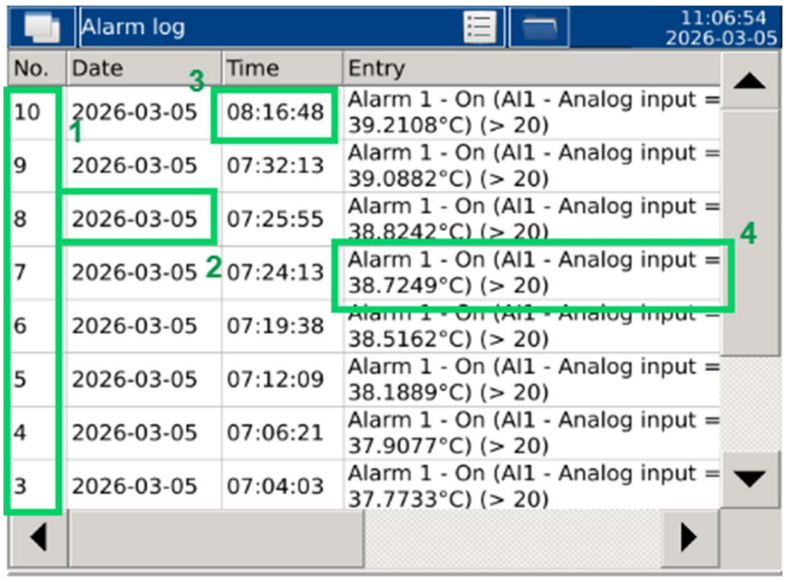



*Illustration 17: Logs.*

| Option | Description |
|---|---|
| 1 | Order of message occurrence |
| 2 | Date of the message |
| 3 | Time of message occurrence |
| 4 | Content of the message |

## 2.3.Other interface elements

### 2.3.1. Numeric Value Editor

The dialog box (*Illustration* 18) allows the user to enter fixed-point or floating-point numbers, depending on the edit field type.
At the top of the editor there is a range of values that can be saved.

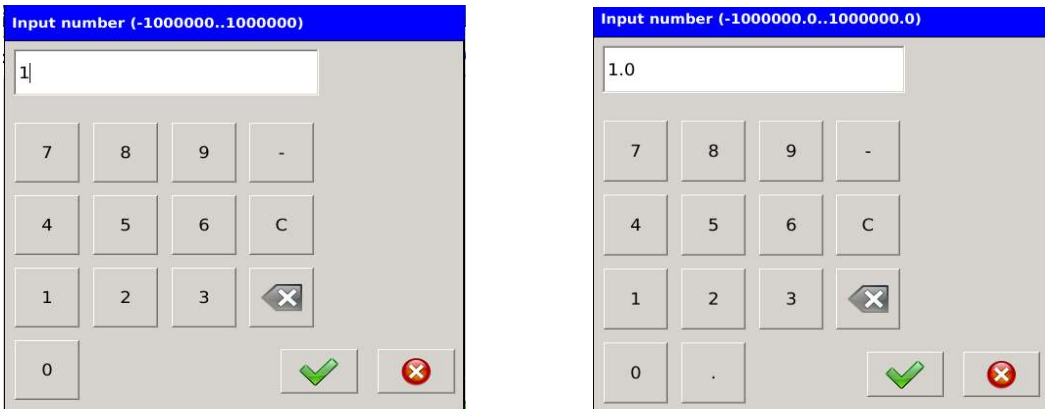



*Illustration 18: Fixed-point and floating-point numeric value editors.*

### 2.3.2. Selection lists

Multiple choice list (*Illustration 19)* -an element that allows you to select more than one option. Tapping an unselected parameter on the screen will select it. To cancel a selection, touch the screen again on the previously selected item. Additional buttons provide functions for automatically selecting or deselecting all options on the list.
Selection list (*Illustration 20*) allows you to select only one of the available options.

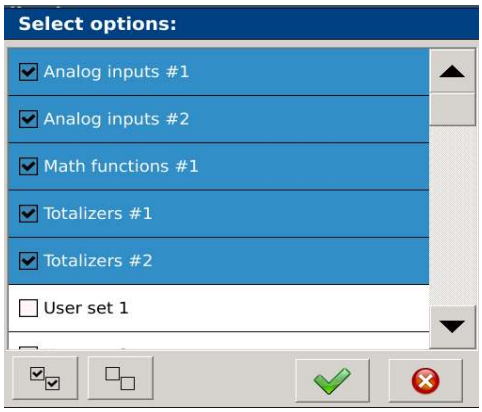



*Illustration 19: Single-selection list.*

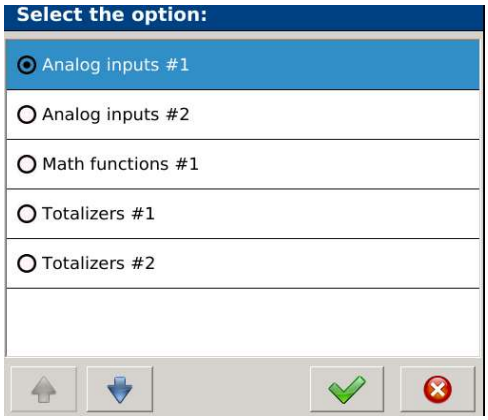



*Illustration 20: Multiple-selection list.*

# 3. Device configuration

## 3.1.Control panel

### 3.1.1. Login

The transition to the Control Panel is preceded by a login window (*Illustration 7, section 2.1.3*), protecting against unauthorized access to device settings. Users are identified by their username and password. Successful login will display a window with the selection of the type of operation on the device configuration file. (*Illustration 21*).

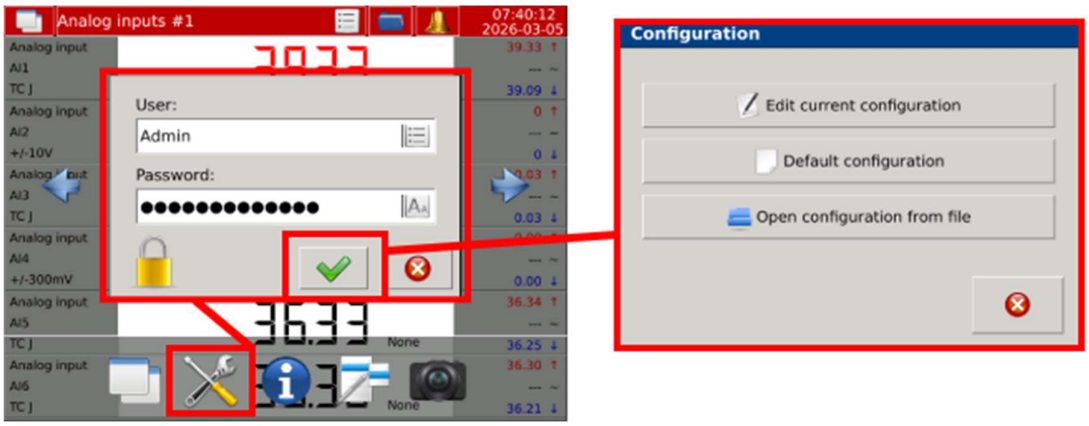



*Illustration 21: Configuration window - operation.*

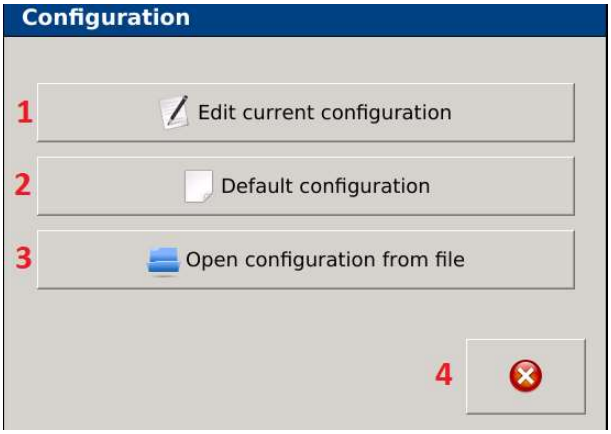



*Illustration 22: Configuration window.*

| LP. | Option | Description |
|---|---|---|
| 1 | Edit current configuration | Go to the control panel. |
| 2 | Default configuration | Restores the default configuration for the device. |
| 3 | Open configuration from file | Launches a file browser with the ability to select available configuration files. |
| 4 |  | Closes the window |

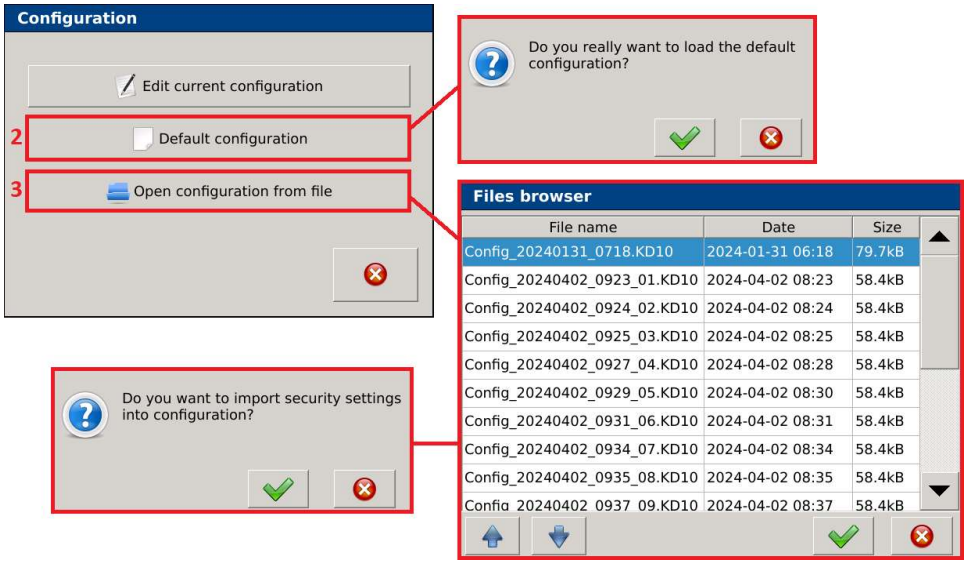



*Illustration 23: Configuration - View Options 2 and 3*

When selecting a configuration from a file (option 3), a message will appear informing you that you want to import security settings. Approve changes – the settings from the file will be applied. Discard changes – the security settings configuration (users, passwords, digital signatures) will remain unchanged from before the file was loaded.

File Browser (*Illustration 23* - in the lower right corner) presents the available configuration files that can be opened and configured in KD10. The file browser window contains:

| Option | Description |
|---|---|
| File name | Individual name defined by the user when saving. |
| Data | Restores the default configuration for the device. |
| Size | The amount of memory used by the file. |

### 3.1.2. Service

Using the control panel involves selecting one of the available parameter groups. Individual groups allow for complete configuration of the device depending on the user's requirements.

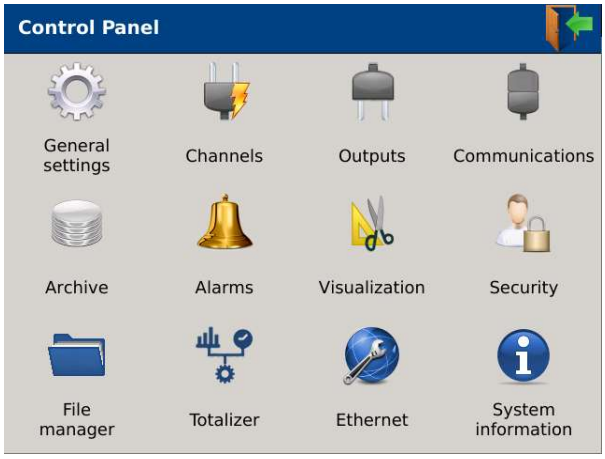



*Illustration 24: Control panel.*

Configuration editing is accomplished by selecting the appropriate option from the Control Panel's main screen. Tapping the selected icon displays a dialog presenting a set of configuration parameters.

In individual dialogues, the first tab is opened by default, subsequent tabs are switched according to the principle presented below (*Illustration 25*).

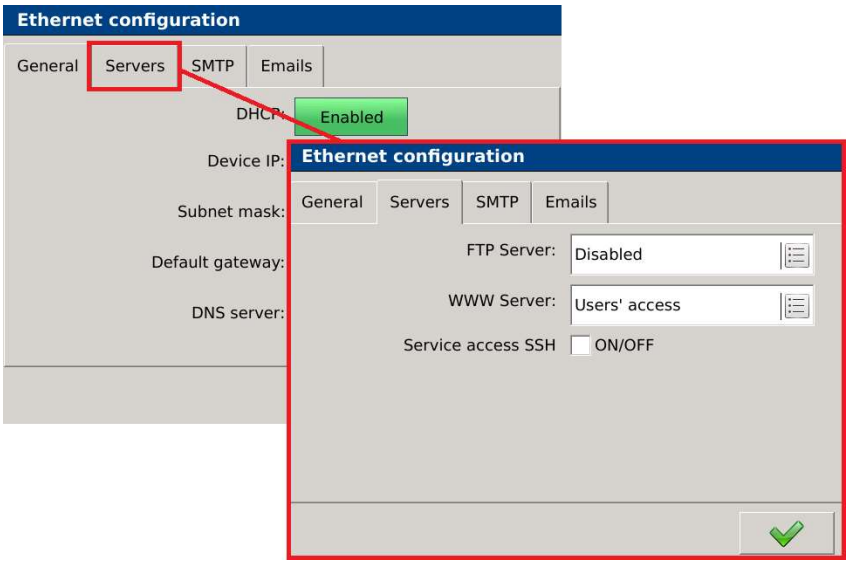



*Illustration 25: Example control panel configuration page – changing tab.*

Parameter groups such as Alarms or Security have an additional checkbox allowing you to select the parameter you want to configure. Navigation between them is as shown below (*Illustration 26*). By touching the field marked with number 1, we generate a selection list of available items.

The main window also contains navigation buttons that allow  you to change subsequent options without opening an additional dialog box.

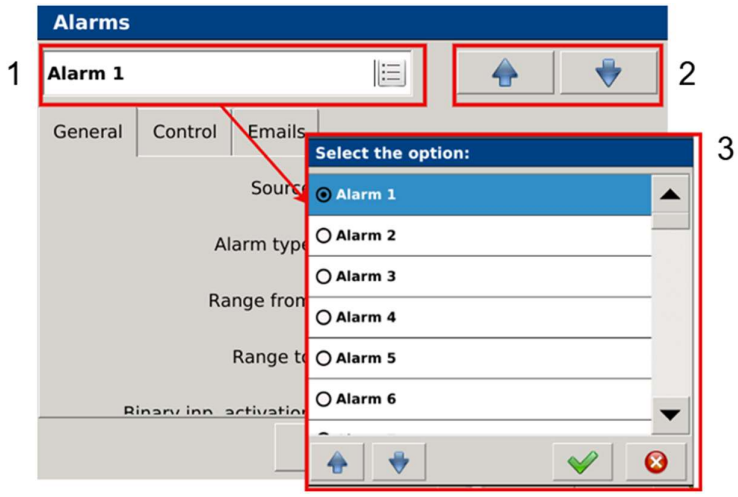
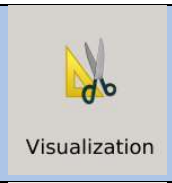
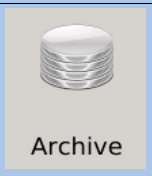
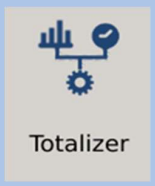
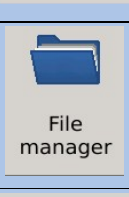



*Illustration 26: Alarm selection list.*

The individual Control Panel options are described in the table below.

| Option | Description |
|---|---|
|  General settings | Selecting a device name and ID. Changing the language and setting the date. and time. Editing LCD-related parameters, such as blanking, backlighting, and screen calibration. |
|  Channels | Channel configuration: analog inputs, binary inputs, temperatures, mathematical functions and Modbus Master inputs. |
|  Outputs | Depending on the version, it allows for the configuration of analog outputs or relay outputs. |
|  Alarms | Settings for individual alarms include source, type, and alarm enable/disable conditions. Additional options allow for setting relays, acknowledgements, switching delays, and alarm logs. |

| | |
|---|---|
|  | Settings for screens and trends. Users can enable or disable individual screens, select pre-defined parameter sets, or define their own to be displayed on the device. Trend settings include selecting parameter sets and defining the data presentation fields for each set. |
|  | Settings: DHCP, IP address, subnet mask, default gateway, DNS server, FTP and WWW server, SSH service access, SMTP and e-mail. |
|  | Modbus Slave and Modbus Master protocol settings (depending on the version) allowing you to set the transmission mode and speed. Device address settings and Modbus TCP-related parameters such as enabling or disabling the interface and port number. |
|  | Archiving parameter settings. General archiving parameters, e.g., number of records per file, archiving time range, conditional archiving, circular buffer. Managing individual archiving parameters: parameter selection, interval definition, and archiving condition. |
|  | User permission settings. Ability to assign a name, password, and access rights, as well as configure a digital signature for a given user. |
|  | Totalizer - configuration of channel totalizers. |
|  | A file manager that allows you to manage the contents of external media. |
|  | General information about the system, memory, hardware, updates and access to the service tab. |

### 3.1.3. Exiting the control panel

Closing the Control Panel is shown below (*Illustration 27*). After selecting the option, a dialog will be displayed confirming that the configuration editing has been completed.

#### 3.1.3.1. Saving configuration

The set configuration is saved by tapping the "Save and set configuration" field. In the event of configuration file corruption, a backup copy will be restored on the device.

The recorder allows you to save the configuration to a file on an SD card by tapping the "Save to file" field. This step requires inserting the SD card into the device's slot. Additionally, you can change the configuration file name by tapping the field with the current, automatically generated configuration name and making your own changes.

#### 3.1.3.2. Exit without saving changes

Tapping the "Leave as is" field exits the control panel with the previously saved configuration.

Touching the symbol  closes the dialog box and allows you to make corrections to the current, not yet saved configuration.

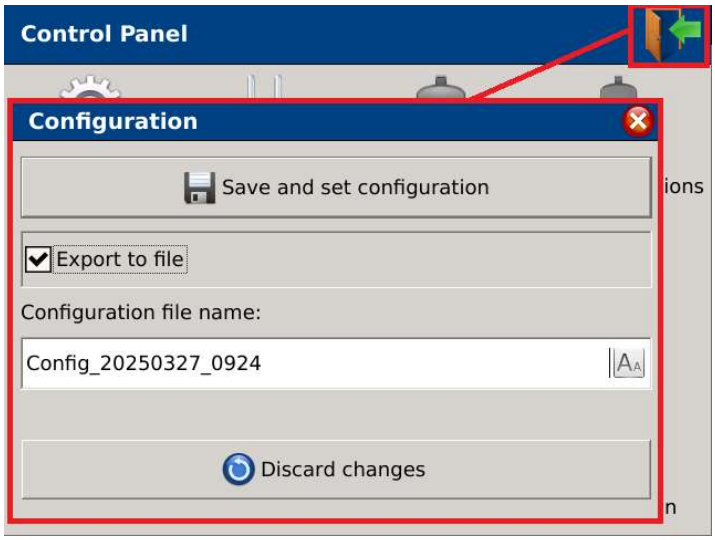



*Illustration 27: Saving the configuration.*

## 3.2.Configuring general settings

### 3.2.1. Basic parameters

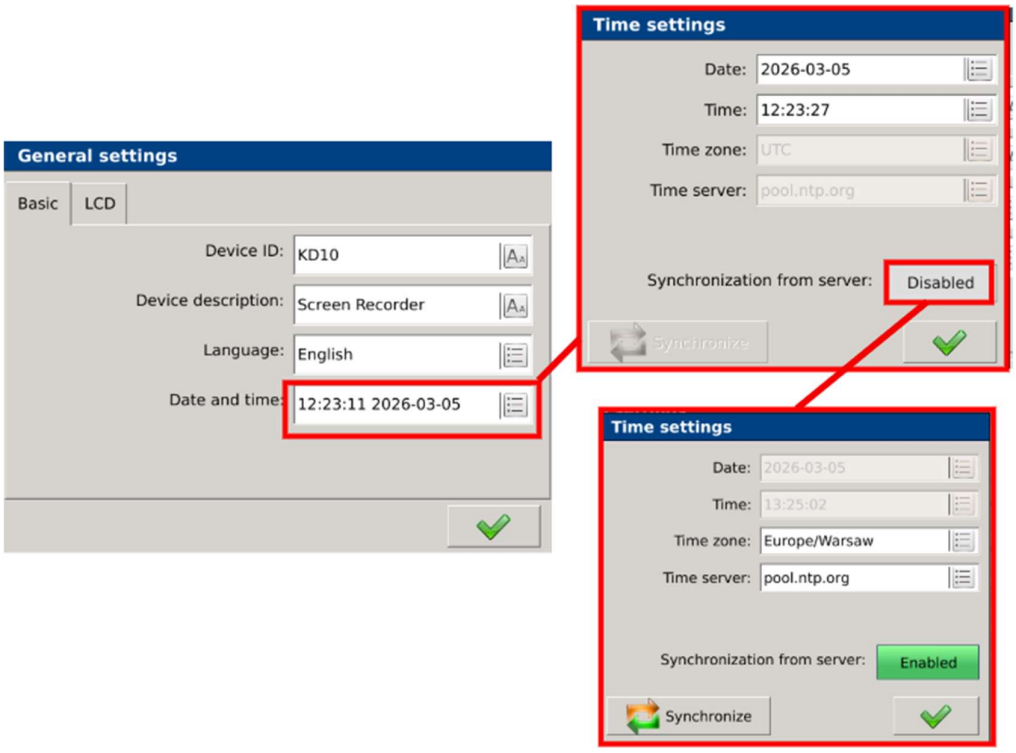



*Illustration 28: General settings - basic.*

| Parameter | Description |
|---|---|
| Device ID | Assigned identifier. User can change the description. |
| Device description | Editable device description. |
| Tongue | Option allowing you to select the device's operating language. |
| Date and time | Editing the date and time on your device. |
| Time zone | List of all time zones. |
| Time server | Selecting a time server that provides the UTC reference time. |
| Automatic synchro-nization | Enabling server synchronization prevents you from setting the date manually and time, which will be retrieved from the selected time server for the selected time zone. Disabling synchronization allows you to define your own date and time settings. |
| Synchronize | Force system time synchronization in the application. |

### 3.2.2. LCD settings

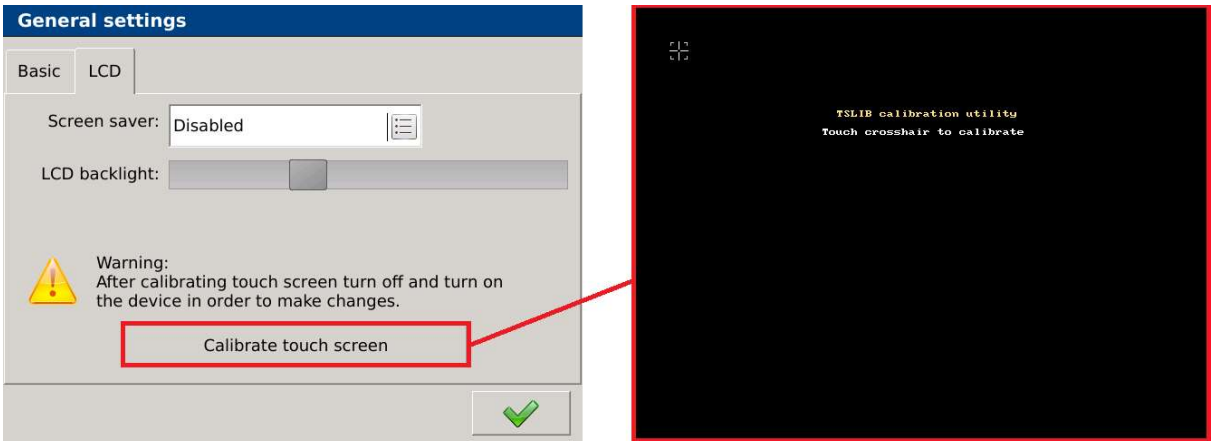



*Illustration 29: LCD settings.*

| Parameter | Description |
|---|---|
| Screen blanking | This option allows you to enable or disable the screen timeout. The user selects a time period from the list after which the device's screen will turn off or remain on. |
| LCD backlight | Adjusting the device's screen brightness. Using the slider, the user changes the backlight intensity. The maximum value will be set after swiping to the right, swiping to the left will decrease the screen brightness. |
| Calibration touch screen | By selecting the calibration option, the user operating the device will be redirected to the calibration window. In the next calibration steps, touch the screen at the points indicated on the screen. The screen is calibrated at five points, after calibration, the device will return to the initial screen. There is no way to interrupt the screen calibration. If the screen is incorrectly calibrated, the described process must be repeated. |

## 3.3.Channel configuration

The channels are: analog inputs, binary inputs, temperatures, mathematical functions, Modbus Master inputs. In the illustration below (*Illustration 30*) there is a channel configuration menu (Control Panel → Channels).

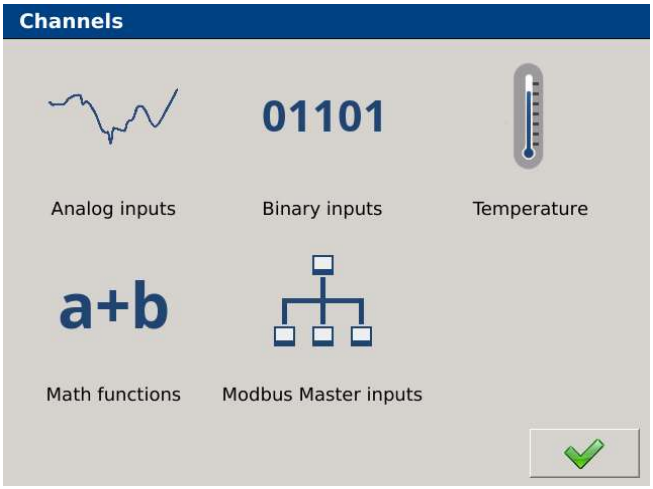



Illustration 30: Channel configuration menu.

After selecting the group we are interested in, a list of available entries expands.

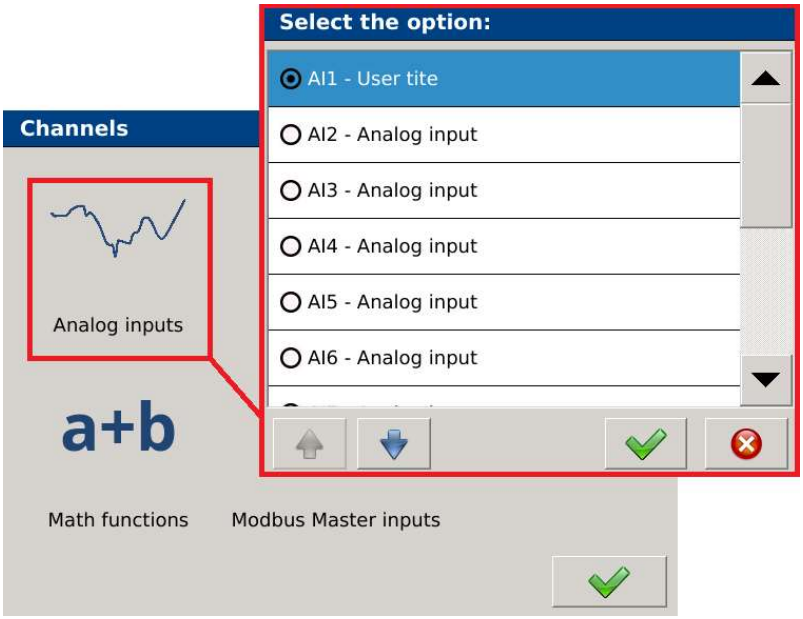



*Illustration 31: List of available inputs*

### 3.3.1. Analog input configuration

KD10, depending on the version, has 6/12/18 programmable analog inputs.

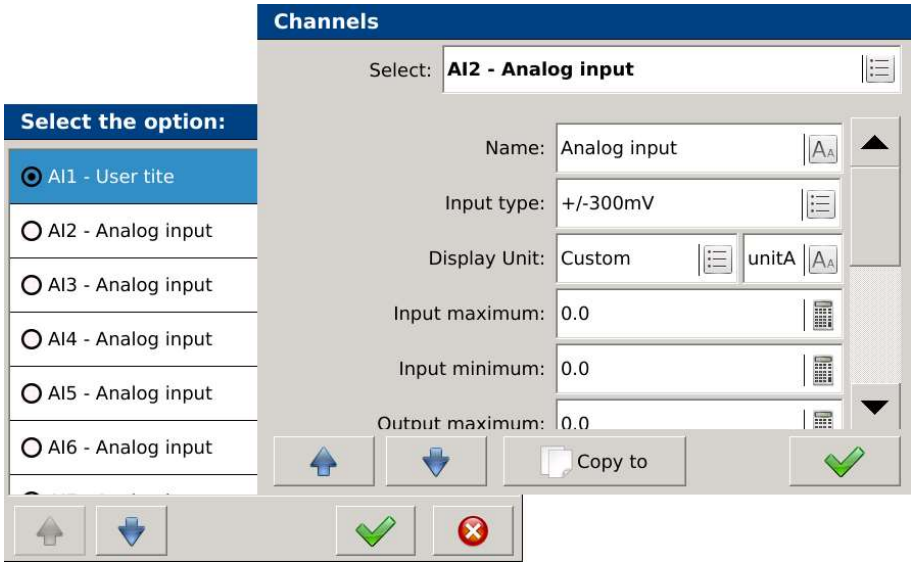



*Illustration 32: Analog input configuration window*

| Parameter | Description |
|---|---|
| Name | Edit name |
| Input type | • PT100<br>• PT1000<br>• TC E<br>• TC J<br>• TC K<br>• TC N<br>• TC R<br>• TC S<br>• +/- 60mV<br>• +/- 150mV<br>• +/- 300mV<br>• +/- 10V<br>• +/- 20mA<br>• 4...20mA |
| Displayed unit | None, Own, V, A, mV, kV, mA, kA, W, kW, MW, var, kvar, VA, kVA, MVA, kWh, MWh, kvarh, Mvarh, kVAh, MVAh, Hz, kHz, W, kW, °C, °F, K, %, %RH, pH, kg, bar, m, l, s, h, m3, obr, pcs, imp, rps, m/s, l/s, obr/min, rpm, mm/min, m/min, l/min, m3/min, pcs/h, m/h, km/h, m3/h, kg/h, l/h<br><br>Possibility to create a unit by the user ("Custom" option) |
| Maximum entry* | -1000000.0... 1000000.0 |
| Minimum entry* | -1000000.0... 1000000.0 |

| | |
|---|---|
| Maximum output* | -1000000.0... 1000000.0 |
| Minimum output* | -1000000.0... 1000000.0 |
| Float precision | 0...0.00000 |
| Averaging time entrances | 100...1000ms |
| Averaging window | 0...3600s |
| Compensation type | Auto/Manual |
| Compensation value | 0.0...20.0 |

*Used to scale measurement values. Default is 0 - no scaling.

### 3.3.2. Binary inputs

Binary inputs are available in versions with expansion cards:

- 6 binary inputs, 4 relay outputs,
- 6 binary inputs, 3 analog outputs,
- 4 binary inputs, 6 analog outputs.

For a channel, one of the available binary inputs BI can be selected as the input signal.

In the binary channel parameters window, you can change its name and input mode.

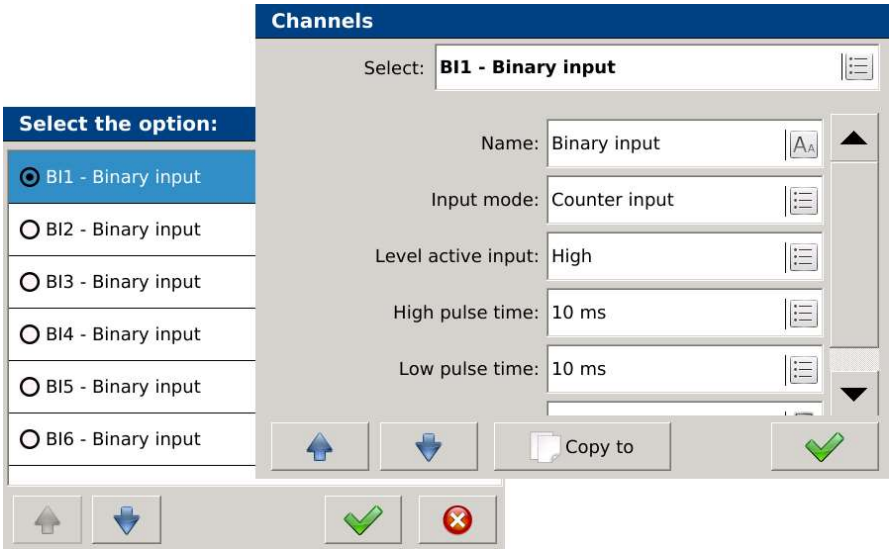



*Illustration 33: Configuration window for binary inputs.*

| Parameters | Description |
|---|---|
| Name | User name editing |
| Entry mode | Binary input/Counter input |
| **Parameters for input in counter mode** | |
| Activity level | High / Low |
| High Level Time | 1ms / 10ms / 100ms / 1s / 10s / 60s (10ms) |
| Low level time | 1ms / 10ms / 100ms / 1s / 10s / 60s (10ms) |
| Number of pulses per 1 | 1...100000 (1000) |

### 3.3.3. Temperature and resistance

The input signal for the channel can be temperature or resistance measurements T1 – T2.

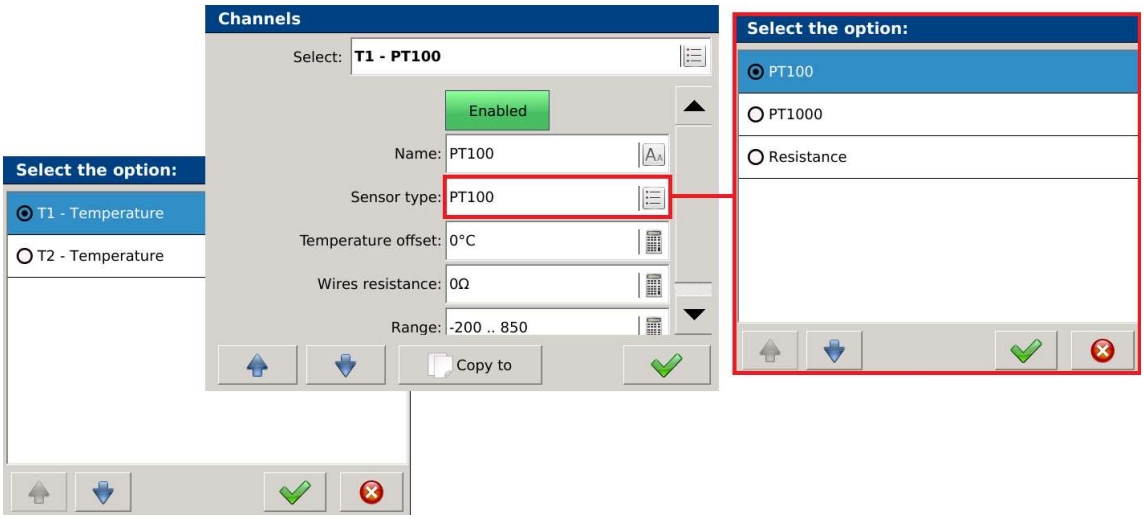



*Illustration 34: Temperature channel configuration window.*

Parameters for configuring the temperature or resistance measurement input:

| Parameter | Description |
|---|---|
| Status | On/Off |
| Name | Edit name |
| Sensor type | Selection of temperature sensor (PT100, PT1000) or resistance. |
| Temperature offset (PT100/ PT1000) | -100.0 …100.00 |
| Wire resistance | 0.0...10000.0 |
| Range | Selecting the range for the selected sensor type. Provides the ability to change the standard minimum and maximum values assigned to the selected sensor. |

### 3.3.4. Mathematical functions

The device has the ability to set 18 mathematical functions MT1...MT18.

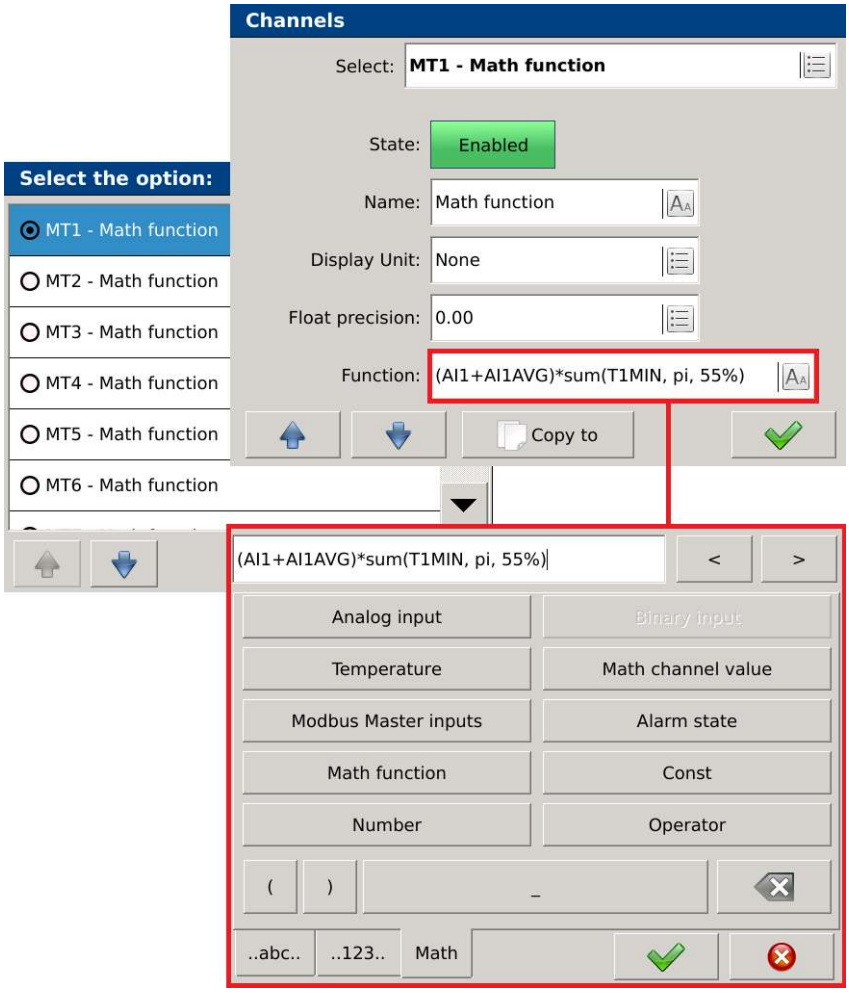



*Illustration 35: Math function configuration window.*

Parameters for configuring a mathematical function.

| Parameter | Description |
|---|---|
| Status | Turning on/off the math function |
| Name | Edit name |
| Displayed unit | None, Own, V, A, mV, kV, mA, kA, W, kW, MW, var, kvar, VA, kVA, MVA, kWh, MWh, kvarh, Mvarh, kVAh, MVAh, Hz, kHz, W, kW, °C, °F, K, %, %RH, pH, kg, bar, m, l, s, h, m3, obr, pcs, imp, rps, m/s, l/s, obr/min, rpm, mm/min, m/min, l/min, m3/min, pcs/h, m/h, km/h, m3/h, kg/h, l/h<br><br>Possibility to create a unit by the user ("Custom" option) |
| Function | Creating a mathematical function for this channel. |

The data source for configuring the mathematical function is analog inputs, temperature, Modbus Master inputs, the value of another mathematical channel, binary inputs and alarm statuses, mathematical and logical operators, and logical channel values such as average, maximum and minimum values.

In the figure below, the data source for the function is the scaled value of the analog input.

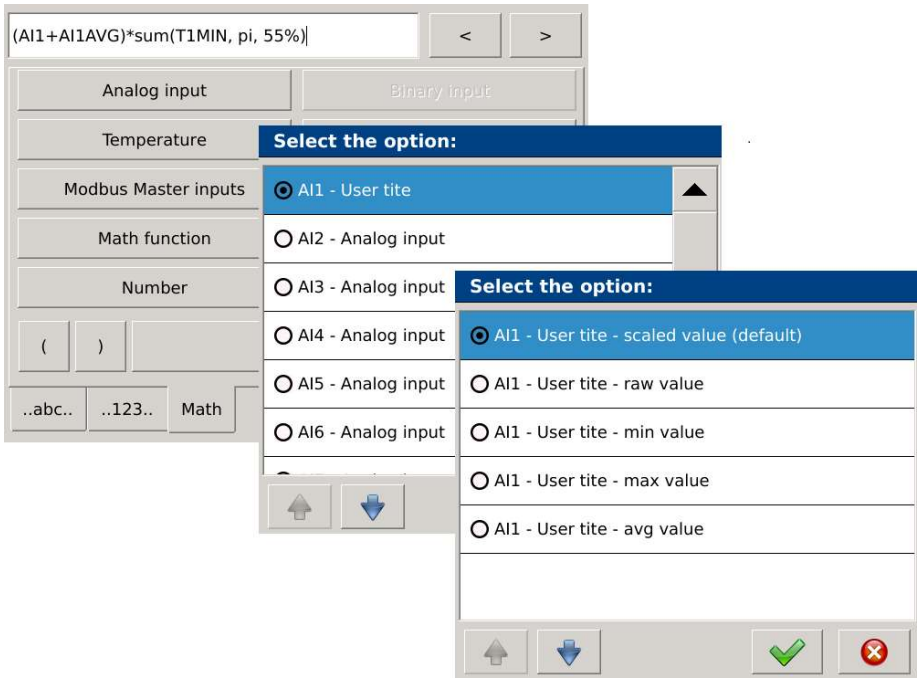



*Illustration 36: Selecting the data source for a mathematical function.*

Available mathematical and logical functions:

| Function | Description |
|---|---|
| round(x) | Returns the value of x rounded to the nearest integer |
| sin(x) | Sine of the number x |
| and(x) | Arcsine of the number x |
| birth(x) | Hyperbolic sine of x |
| cos(x) | Cosine of the number x |
| acos(x) | Arc cosine of x |
| cosh(x) | Hyperbolic cosine of x |
| tan(x) | The tangent of x |
| waiting(x) | Arctangent of x (in radians) |
| tanh(x) | Hyperbolic tangent of x |
| sqrt(x) | The square root of x |
| pow(x) | Power |
| fact(x) | Factorial |
| mod(val1,val2) | Returns the modulo of the numbers val1, val2 |

| | |
|---|---|
| min(v1,v2,v3,...) | Returns the minimum value of the numbers v1,v2,v3... |
| max(v1,v2,v3,...) | Returns the maximum value of the numbers v1,v2,v3... |
| avg(v1,v2,v3,...) | Returns the average value of the numbers v1,v2,v3... |
| sum(v1,v2,v3,...) | Returns the sum of the numbers v1,v2,v3... |
| abs(x) | Absolute value |
| ceil(x) | Returns the smallest integer greater than or equal to x |
| floor(x) | Returns the largest integer less than or equal to x |
| log(x) | The natural logarithm of x |
| log10(x) | The base 10 logarithm of x |

### 3.3.5. Modbus Master Inputs

Binary inputs are available in versions with expansion cards:

- 8 relay outputs,
- 6 binary inputs, 4 relay outputs,
- 6 binary inputs, 3 analog outputs.

The device can be configured with 32 logical channels with a Modbus Master input (MMI1-MMI32). Modbus Master in RTU mode is only available with a card with 8 relay outputs.

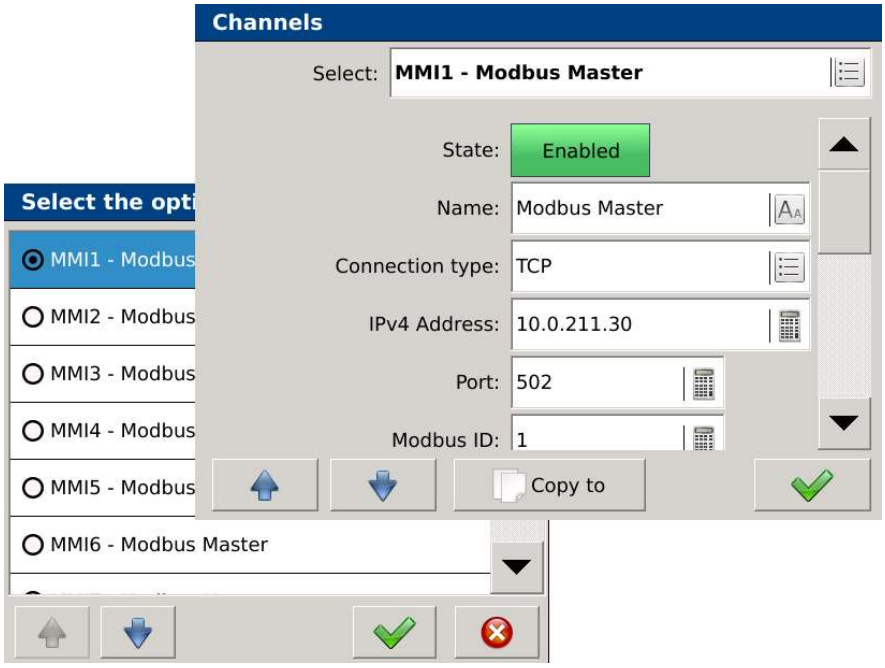



*Illustration 37: Channel configuration window for MMI.*

**Configuration parameters for Modbus Master input:**

| Parameter | Description |
|---|---|
| Status | Turn on/off the channel |
| Name | Edit name |
| Connection type | TCP/RTU **(RTU for the version with the card8 relay outputs)** |
| IPv4 Address | IP Address |
| Port | 1...65535 (502 - default) |
| Modbus ID | 1..255 (1 - default) |
| Register address | 0...100000 (0 - default) |
| Number of registers | 1…10 (1 - default) |
| Channel Register | Selecting a register for the measurement channel to calculate and store its value. |
| Register type | • int 16<br>• uint 16<br>• long 2x16<br>• 2x16 head<br>• long 2x16 swapped<br>• 2x16 head swapped<br>• float 2x16 3210<br>• float 2x16 0123<br>• float 2x16 2301<br>• float 2x16 1032<br>• float 32 3210<br>• float 32 0123<br>• float 32 2301<br>• float 32 1032 |
| Read function | • Read Holding Registers 0x03<br>• Read Input Registers 0x04 |
| Scanning frequency | 1s, 2s, 3s, 5s, 10s, 15s, 30s, 60s (1s) – at what intervals the Slave device is polled |
| Time constraints | 100ms, 200ms, 300ms, 400ms, 500ms, 600ms, 700ms, 800ms, 900ms, 1000ms (100ms) – waiting time for a response from the Slave device |
| Displayed unit | None, Own, V, A, mV, kV, mA, kA, W, kW, MW, var, kvar, VA, kVA, MVA, kWh, MWh, kvarh, Mvarh, kVAh, MVAh, Hz, kHz, W, kW, °C, °F, K, %, %RH, pH, kg, bar, m, l, s, h, m3, obr, pcs, imp, rps, m/s, l/s, obr/min, rpm, mm/min, m/min, l/min, m3/min, pcs/h, m/h, km/h, m3/h, kg/h, l/h<br><br>Possibility to create a unit by the user ("Custom" option) |
| Float precision | 0...0.00000 |

The Modbus registers read from the slave device are passed on to the logger registers (section 9.8.7).

In the case of Modbus Master RTU configuration (for a device with a card with 8 relay outputs), you need to set the transmission parameters, which can be found in the "Communication" tab (Control Panel → Communication → Modbus RTU → Modbus Master).

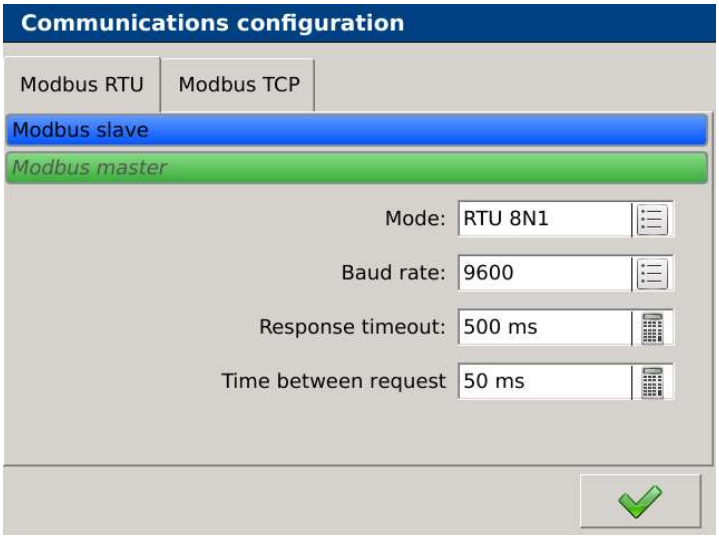



*Illustration 38: Modbus Master RTU configuration.*

## 3.4.Output configuration

### 3.4.1. Relay output configuration

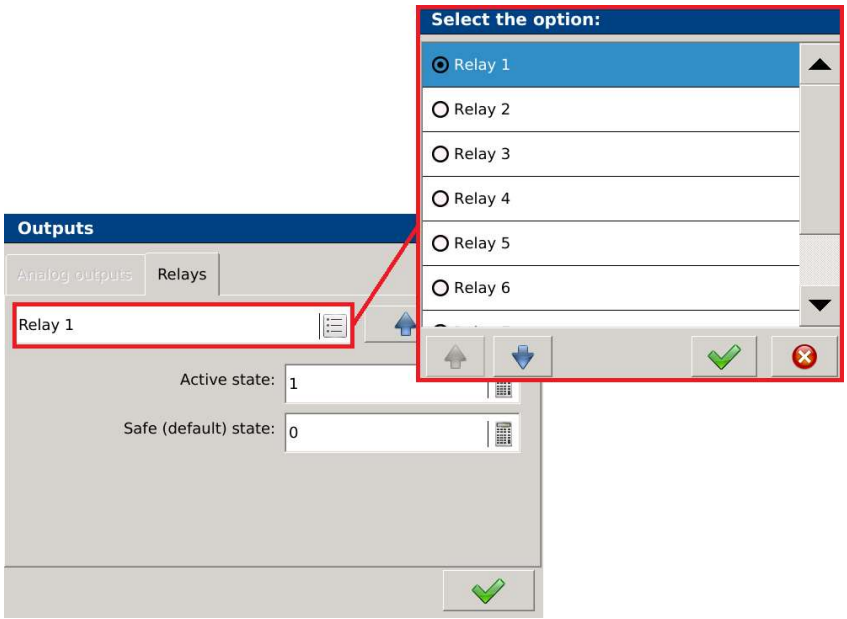



*Illustration 39: Output configuration - relays*

| Option | Description |
|---|---|
| Relay number | Selecting a relay for configuration |
| Active status | The value is set when the alarm condition assigned to a given relay is met. |
| Safe condition | The value set when the bound value is not ready. |

### 3.4.2. Analog output configuration

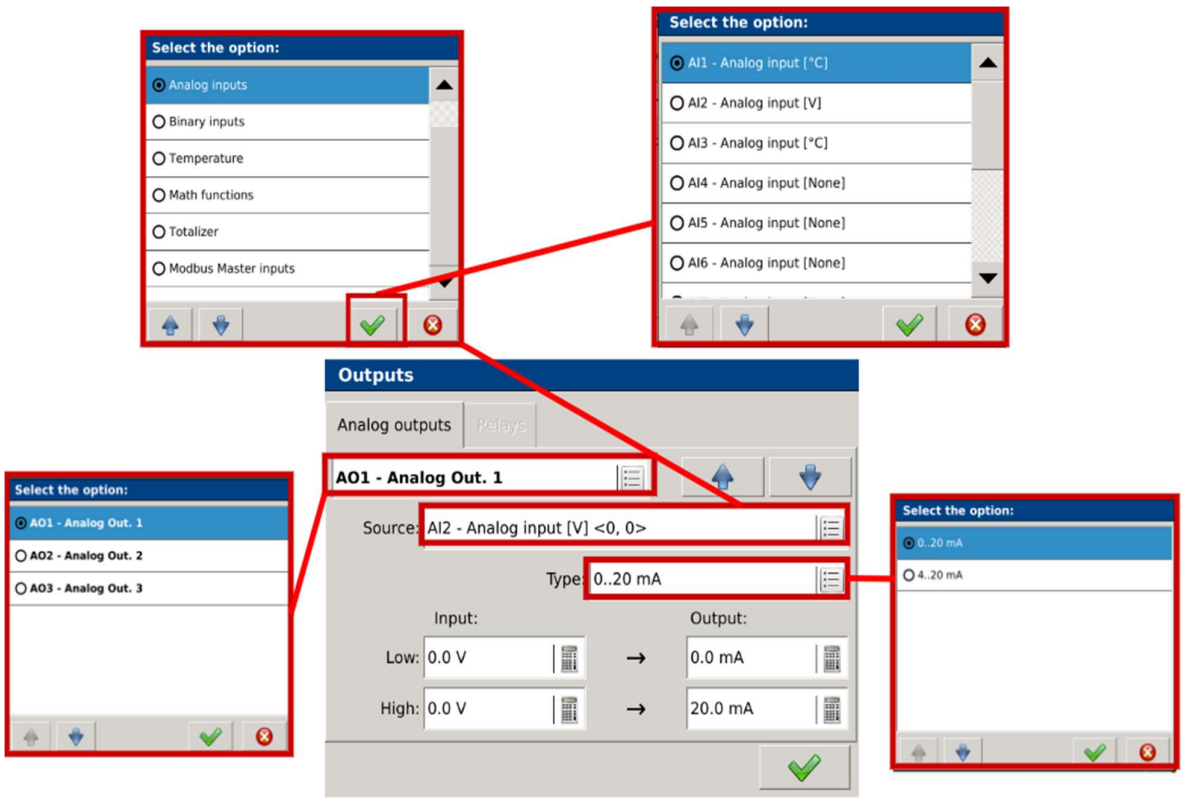



*Illustration 40: Analog output configuration.*

| Option | | Description |
|---|---|---|
| Analog output selection | | Selection of the currently configured analog output. |
| Source | | Selects the input source assigned to the analog output. |
| Type | | Analog output range selection. |
| Entry | Low | Lower value (of input source). |
| | High | High value (of input source). |
| Exit | Low | Lower value (at analog output). |
| | High | Upper value (at analog output). |

## 3.5.Communication configuration

### 3.5.1. Modbus RTU Slave Configuration

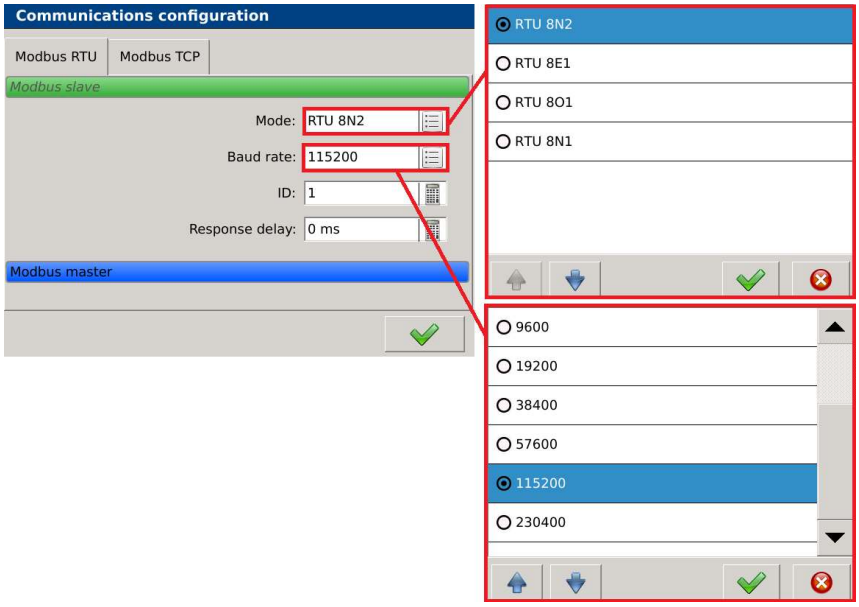



*Illustration 41: Configuration for Modbus RTU.*

| Parameter | Description |
|---|---|
| Mode | Specifies the transmission frame type of the RS-485 interface. |
| Speed | RS-485 interface transmission speed. |
| ID | Device identifier in the Modbus network. |
| Delayed response | Force response time delay. |

### 3.5.2. Modbus TCP Slave Configuration

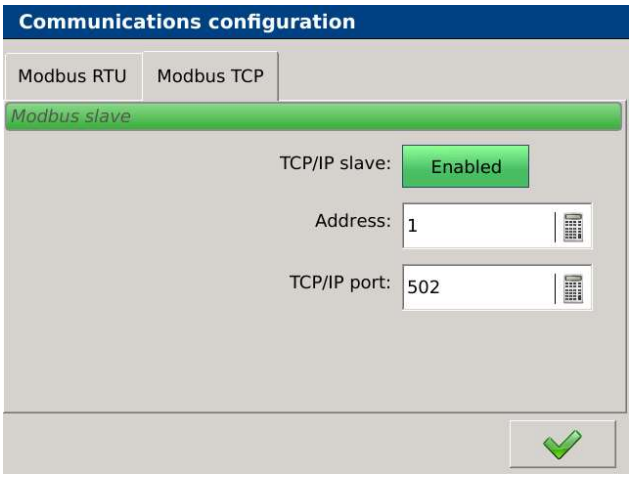



*Illustration 42: Modbus TCP configuration*

| Parameter | Description |
|---|---|
| ID | Device identifier in the Modbus network. |
| TCP/IP slave | Enable or disable Modbus TCP/IP mode. |
| TCP/IP port | Modbus TCP/IP protocol port number. |

## 3.6. Archiving configuration

The following files can be managed as part of archiving:

- Archive with parameters selected by the client,
- Alarm logs,
- Audit logs

Files are available in formats (select in the "Log file format" field on *Illustration 43*):

- SQLITE3
- CSV
- SQLITE3 with digital signature
- CSV with digital signature

| Parameter | Maximum estimated size | Number of records | |
|---|---|---|---|
| | | Minimum | Maximum |
| Archiving parameters | - | 1000 | 10000 |
| Audit logs | 32kB | - | - |
| Alarm logs | 32kB | - | - |

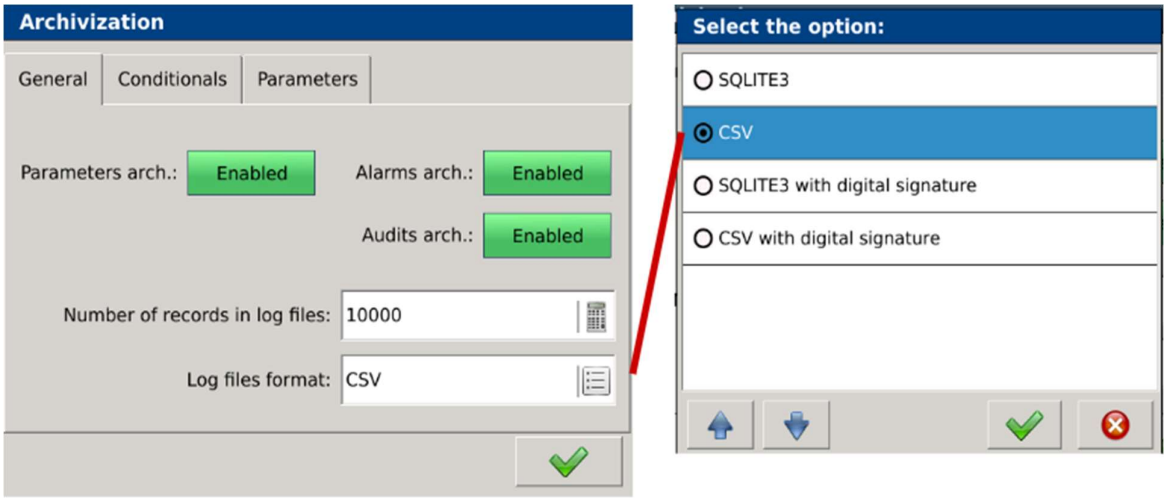



*Illustration 43: Archiving - general settings.*

In the tab **"Conditions"** the user can set the archiving conditions and time.

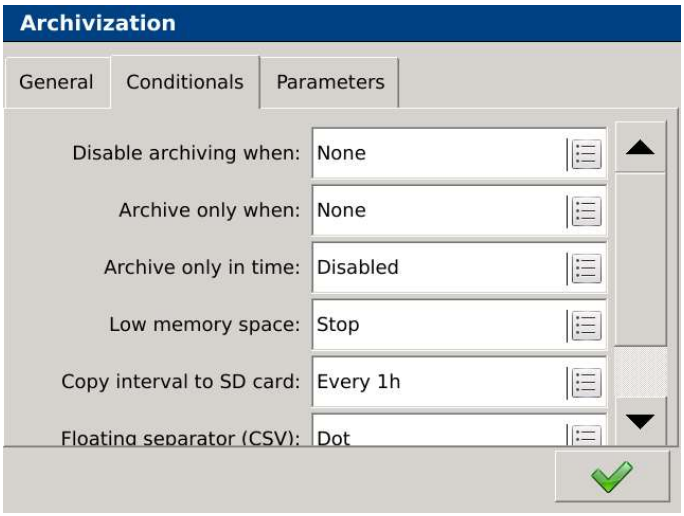



*Illustration 44: Archiving conditions.*

| **Parameter** | **Description** |
|---|---|
| Disable archiving when | Select the alarm that will disable archiving. Alarm1...Alarm12 |
| Archive only when | Select the alarm for which archiving will be enabled. Alarm1...Alarm12 |
| Archiving only in time | Edit time limit. |
| Not enough memory space | When there is no space left on the SD card:<br>-Stop – stops archiving<br>-Delete the oldest file (circular buffer) |
| Copy to SD card | Setting the time for cyclic copying of archive files to the SD card:<br>-1 min<br>-5 min<br>-10min<br>-15min<br>-30min<br>-1h |
| CSV float separator | -Comma<br>-Dot |
| Separator kolumn CSV | -Comma<br>-Semicolon<br>-Tabulator |

In the tab "**Parameters",** the user defines the parameters that will be archived.

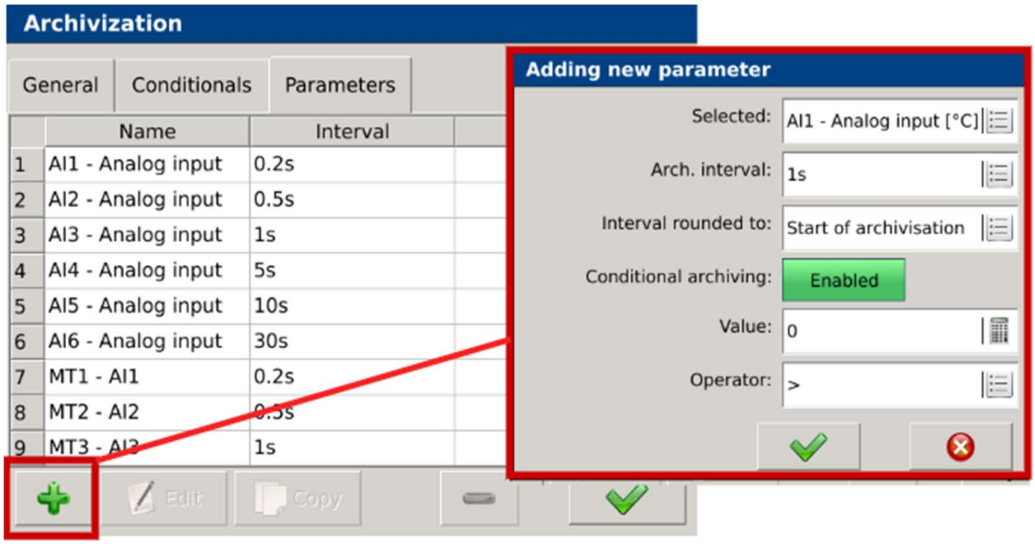



*Illustration 45: Archiving - adding a parameter.*

| **Option** | **Description** |
|---|---|
| Chosen | Selection of the parameter to be archived. |
| Archiving interval | Selecting the archiving interval for the selected parameter. |
| Interval rounded to | • archiving start – from the time the archiving starts (for example, every 1 hour with a start at 11:32 will be: 12:32, 13:32, etc.)<br>• whole hours – for example, every 1 hour with a start at 11:32 there will be: 12:00, 13:00, etc. |
| Conditional archiving | Enable or disable conditional archiving. |
| Value | The value assigned to the conditional archiving condition. |
| Condition | Conditional archiving condition. |

## 3.7.Alarm configuration

The device allows you to configure up to 64 alarms for measurement outputs.

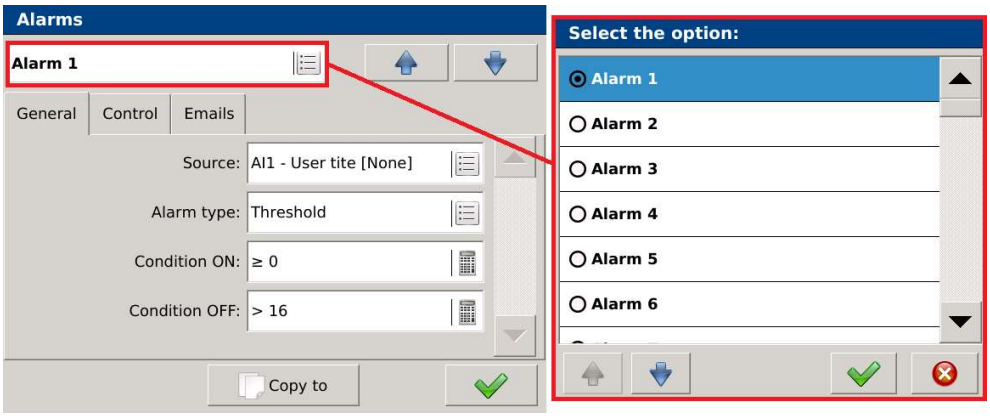



*Illustration 46: Alarm configuration - alarm selection.*

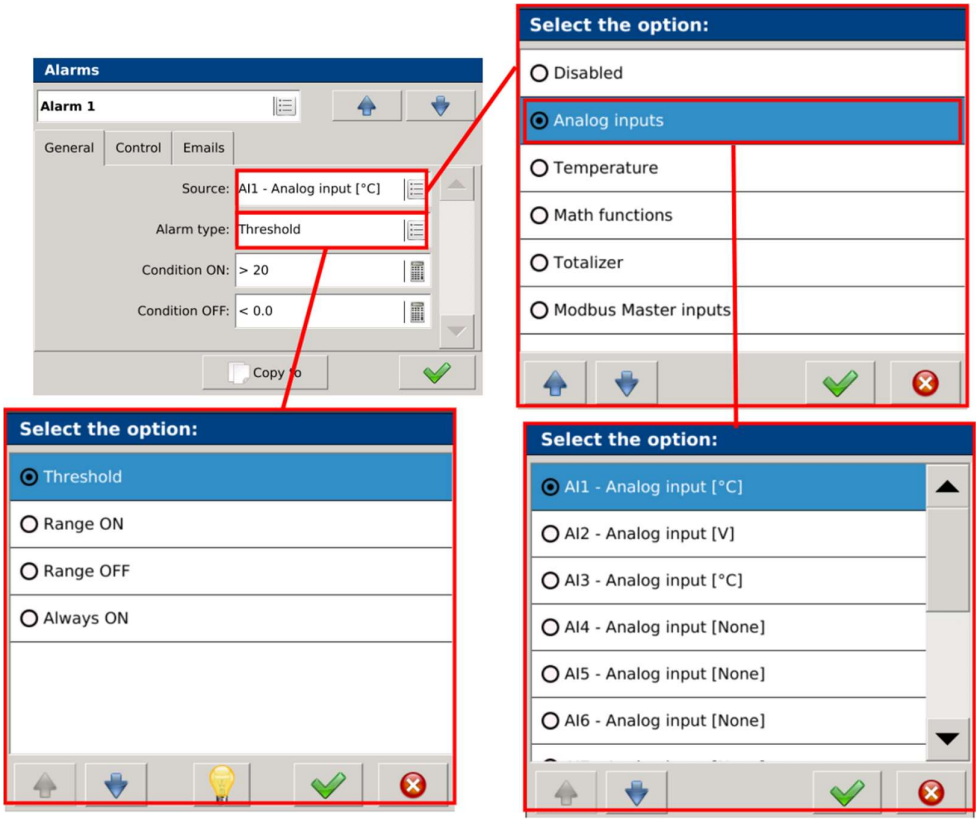



*Illustration 47: Alarms - main settings*

| Parameter | Description |
|---|---|
| Source | Selecting an alarm source. First, the user selects a parameter group, and then a specific channel. |
| Threshold | The alarm is activated if the following conditions are met **ON condition,** deactivated if met **OFF condition**. |
| On in the compartment | The alarm is triggered if the measured value is within within the specified range. A value outside the range disables the alarm. |
| Off in the compartment | The alarm remains off if the measured value is within within the specified range. A value outside the range triggers an alarm. |
| Always on | Alarm always on. |
| ON condition | Alarm trigger value. |
| OFF condition | Alarm disable value. |

**The KD10 version with relay outputs allows you to select the relay activated when an alarm occurs.**

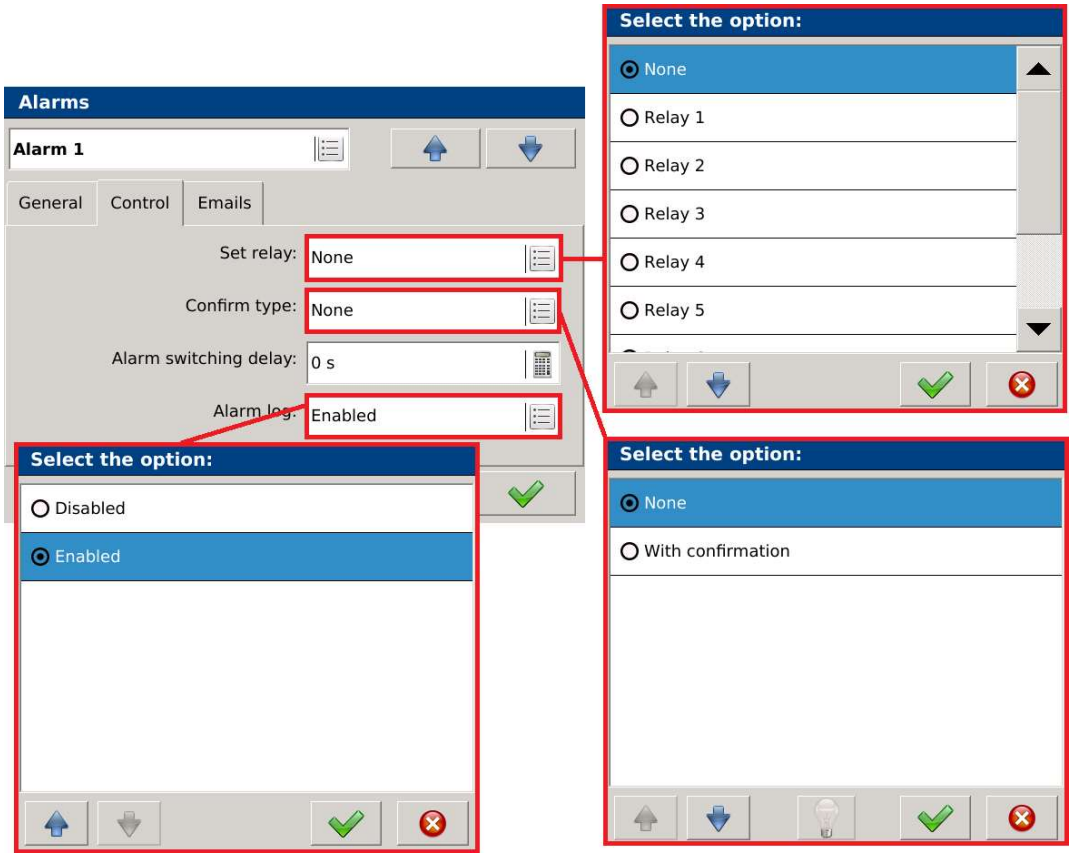



*Illustration 48: Configuring an alarm as a relay.*

| Parameter | | Description |
|---|---|---|
| Set relay | | Assigning a relay to an alarm output. |
| Confirmation type | Lack | After deactivating the alarm, the event information disappears. |
| | With confirmation. | After the alarm is deactivated, information about the event remains and requires confirmation. |
| Alarm switching delay | | Alarm state switching delay time. When an event occurs, the alarm will be enabled or disabled based on the set delay time. |
| Alarm log | | Sets an option to force alarm events to be written to the alarm log (Alarm Logs). |

## 3.8. Visualization configuration

### 3.8.1. Screens

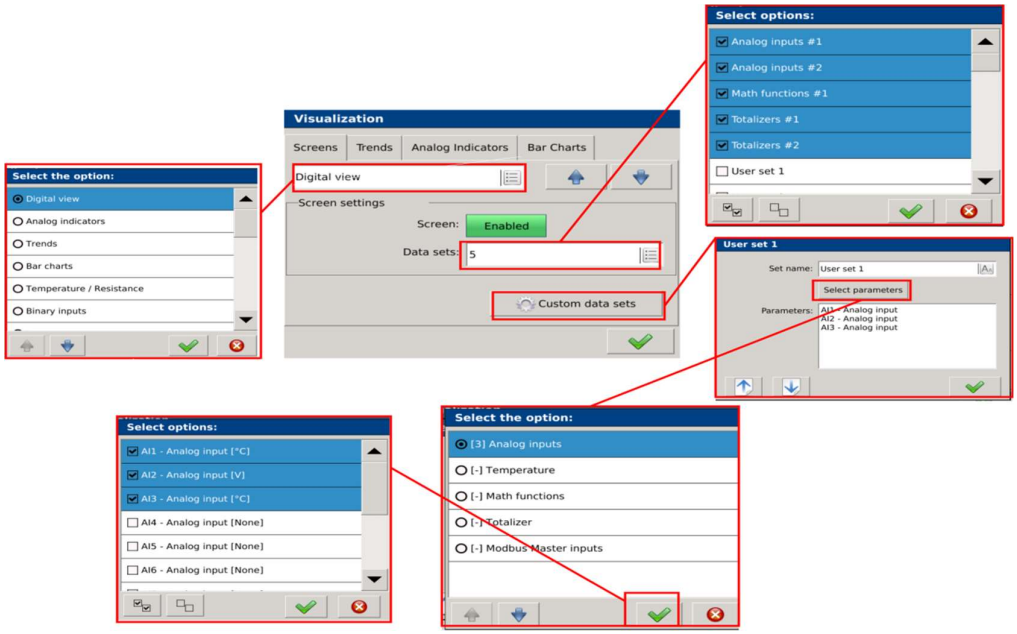



*Illustration 49: Screen configuration for large digital displays.*

| Parameter | | Description |
|---|---|---|
| Screens | | The user selects the screen type using a picklist (as shown in the example, or using the buttons<br>placed on the right side of the selection list). |
| Screen settings | Screen | On/Off – Turns the screen display on and off. |
| | Data sets | The user can select which data sets to display in the currently selected screen (in the example shown – Large Digital Displays). Ready-made data sets and individually defined sets (user sets) are available for selection. |
| User Collec- | Name of | The user can define their own collection name or leave the default |

| | | |
|---|---|---|
| tions | the collection | name. Using the buttons, the user can navigate between user collections. |
| | Parameters | A function that allows you to select parameters for a user set. First, the group to which the parameter is assigned is selected. For the user's convenience, information about the selected parameters in a given group is provided. For example, "[2] Totalizer" indicates that two parameters from the "Totalizer" group have been selected. The "[-]" indicates that no options have been selected in that group.<br>Additional options allow you to quickly select or delete all list items. |

### 3.8.2. Trends

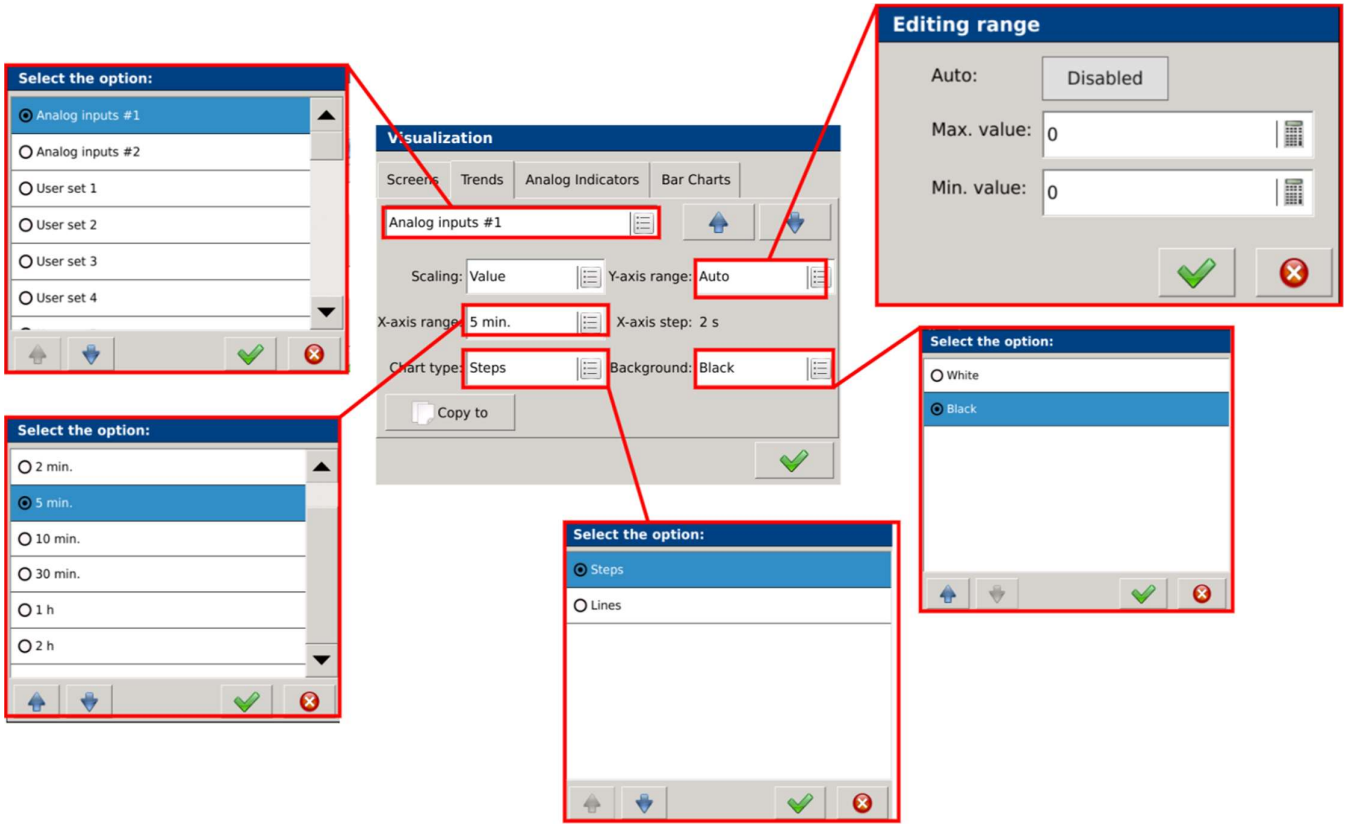



*Illustration 50: Trend screen configuration.*

| Parameter | | Description |
|---|---|---|
| Scaling | Value | Scaling to parameter values. |
| X-axis range | | Time range of data presentation on the trend screen. |
| Chart type | | The method of presenting measured values. Depending on the selected option, data is presented in a stepwise or linear format. |
| Background | | Select the background color for trend screens. |
| Y-axis range | Automatic | Enabling or disabling scaling affects the ability to edit the maximum and minimum values presented on the Y-axis of the trend screen. |
| | Max value | Maximum value of the Y axis for the parameter presented on the trend screen. |
| | Min. value | The minimum value of the Y axis for the parameter presented on the trend screen. |

### 3.8.3. Analog indicators and bar graphs

The configuration of analog displays and bar charts involves selecting the channel of interest and then assigning a range to it - it can be an automatic range or a manually defined range (*Illustration 51*).

The GUI appearance and configuration of bar charts are identical to those of analog indicators.

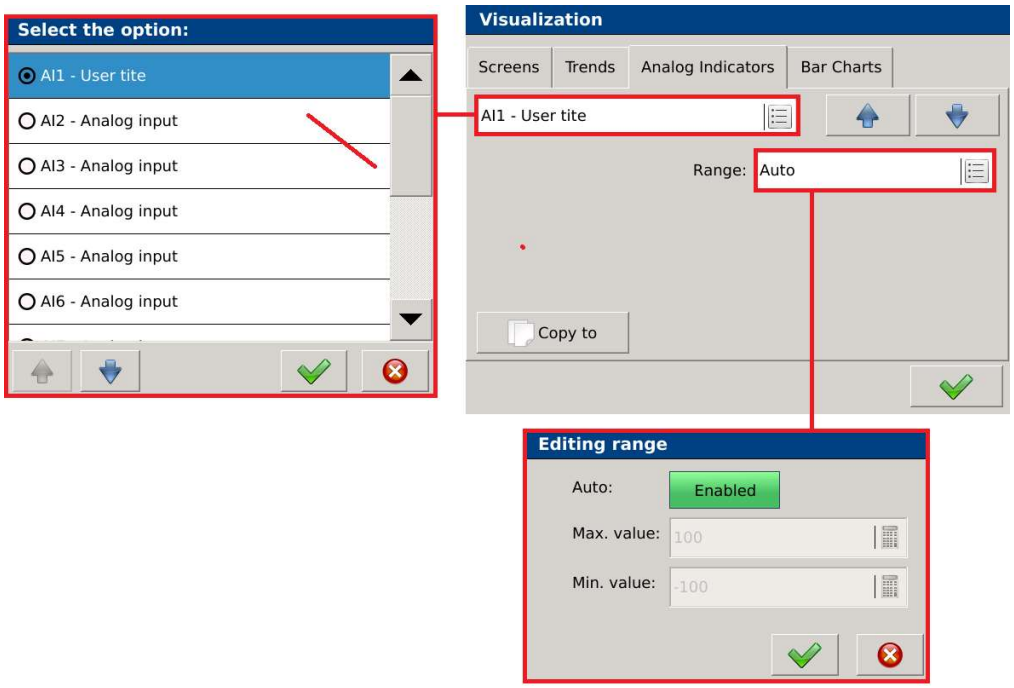



*Illustration 51: Screen configuration for analog gauges.*

## 3.9.Security configuration

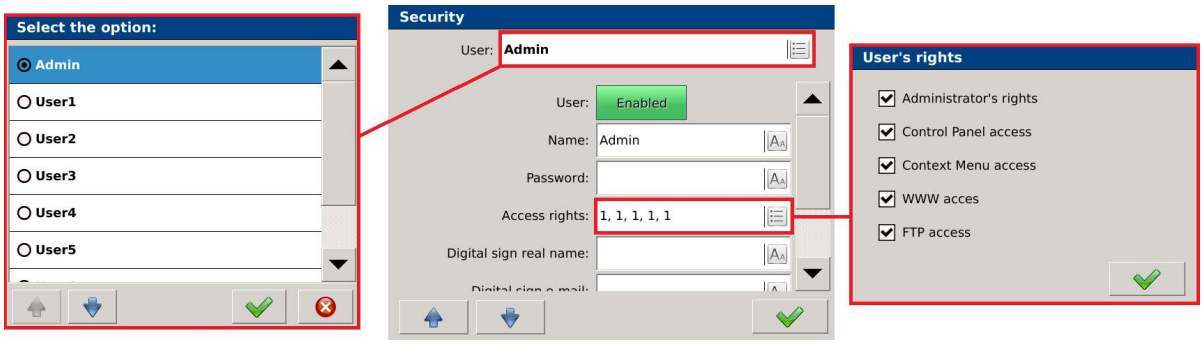



*Illustration 52: Setting User Access Rights*

| **Parameter** | | **Description** |
|---|---|---|
| User | | Enable or disable the currently edited user. |
| Name | | Editable user ID. Contains eight defined users. Default names: Admin, User 1, User 2 ... User 7. |
| Password | | It is possible to assign a password to individual users. The password is required when logging in to the configuration settings. |
| Access rights | Administrator rights | Permissions allowing you to change user permissions. |
| | Access to the control panel | Ability to view and edit control panel parameters. |
| | Access to the context menu | Allows you to acknowledge alarms in the context menu, and additionally provides access to file management and alarm confirmation on the website. |
| | Access to the web | Authorized access to the website. |
| | FTP access | Authorized access to the FTP server. |
| Digital signature name | | Username needed to generate a digital signature (usually first and last name) |
| Digital email signature | | E-mail needed to generate a digital signature |
| Digital signature comment | | Comment on the digital signature (not required to generate a digital signature) |
| Signature Expiration Time | | Digital signature expiration time |

Navigation between users can be done using a selection list (called up after touching the field at the top of the main screen (in the example shown with the currently selected one – Admin), or using the buttons  .

A user without administrator rights can only see windows that match the access permissions set.

In the security configuration it is possible to configure a digital signature, which is later used in archiving after selecting the option **SQLITE3 with digital signature** or **CSV with digital signature**.

Initially, all digital signature configuration fields are blank and no user has an active digital signature.

To activate a digital signature, complete the required configuration fields. After completing them and saving the settings, a key pair necessary for the digital signature to function is automatically created. From this point on, the digital signature becomes active.

The user password should be at least 8 characters long and should contain one uppercase letter. and a lowercase letter, at least one number and a special character. If these requirements are not met, the password will not be saved and a window with the information (*Illustration 53*).

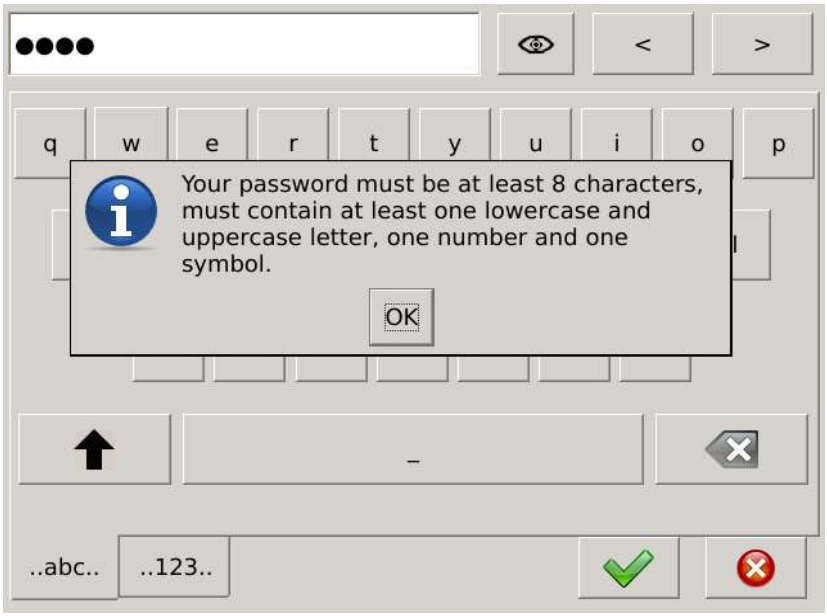



*Illustration 53: Digital Signature Password*

## 3.10. Totalizer – logical channel adder

KD10 has 12 adders (Counter/Integral) for logical channels (TOT1-TOT12), the adder configuration is in the "Totalizer" tab (Control panel → Totalizer).

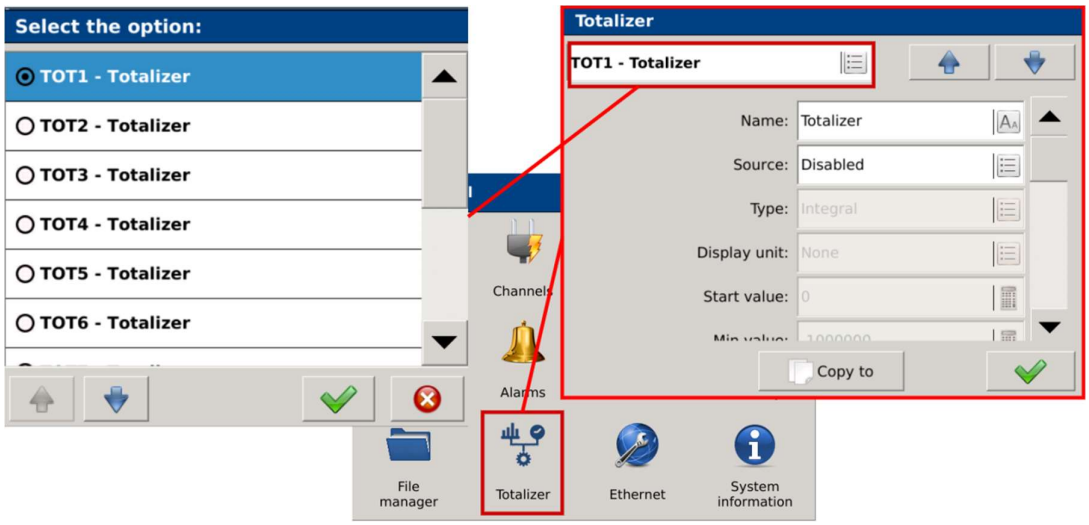



*Illustration 54: Totalizer configuration.*

Below is a table with configuration parameters for the selected totalizer.

| Parameter | Description |
|---|---|
| Name | Edit name. |
| Source | The signal source for which the totalizer will count. |
| Type | Integral/Numerator. |
| Displayed unit | None, Own, V, A, mV, kV, mA, kA, W, kW, MW, var, kvar, VA, kVA, MVA, kWh, MWh, kvarh, Mvarh, kVAh, MVAh, Hz, kHz, W, kW, °C, °F, K, %, %RH, pH, kg, bar, m, l, s, h, m3, obr, pcs, imp, rps, m/s, l/s, obr/min, rpm, mm/min, m/min, l/min, m3/min, pcs/h, m/h, km/h, m3/h, kg/h, l/h<br><br>Possibility to create a unit by the user ("Custom" option) |
| Initial value | -1000000...1000000 (0 – default) |
| Minimum value | -1000000...1000000 (-100 – default) |
| Maximum value | -1000000...1000000 (100 – default) |
| Negative ranges | On/Off |
| Exceeding | 0.0...10000.0 |
| Multiplier | 0.0...1000000.0 |
| Counting direction | Up (Summation)/Down (Subtraction) |

| | |
|---|---|
| Float accuracy | 0...0.00000 |
| Time base | 1 sec / 1 min / 1 h / 1 day |
| Login every | Determines the interval at which a given totalizer will be entered into the “Totalizer log”.<br>**hh : mm : ss** |
| Time constraints | Defines the totalizer counting time, after which the totalizer counts again.<br>Counting options:<br>• Into infinity,<br>• Daily,<br>• Daily from – to (at specified hours),<br>• Weekly,<br>• Monthly. |
| The week starts with | The day that starts counting on a weekly basis.<br>• Monday<br>• Tuesday<br>• Wednesday<br>• Thursday<br>• Friday<br>• Saturday<br>• Sunday |
| From an hour ago | The hour that starts counting in the "Daily from-to" mode. **hh : mm : ss** |
| Until the hour | The time defining the end of counting in the "Daily from-to" mode. **hh : mm : ss** |
| Reset time | Specifies the reset time of the totalizer in daily, weekly and monthly mode, after which the totalizer starts counting again. |
| Totalizer reset when | Selecting a logical channel whose logical state is 1 will set the adder state to its programmed minimum value and restart counting. |
| Turn off the totalizer when | Selection of a logical channel whose state 1 disables the adder operation. |

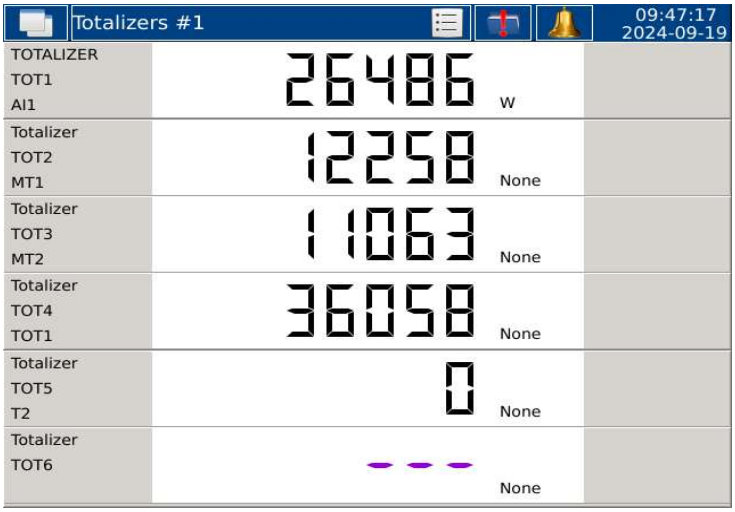



*Illustration 55: Totalizer screen view*

## 3.11. Ethernet configuration

### 3.11.1. General settings

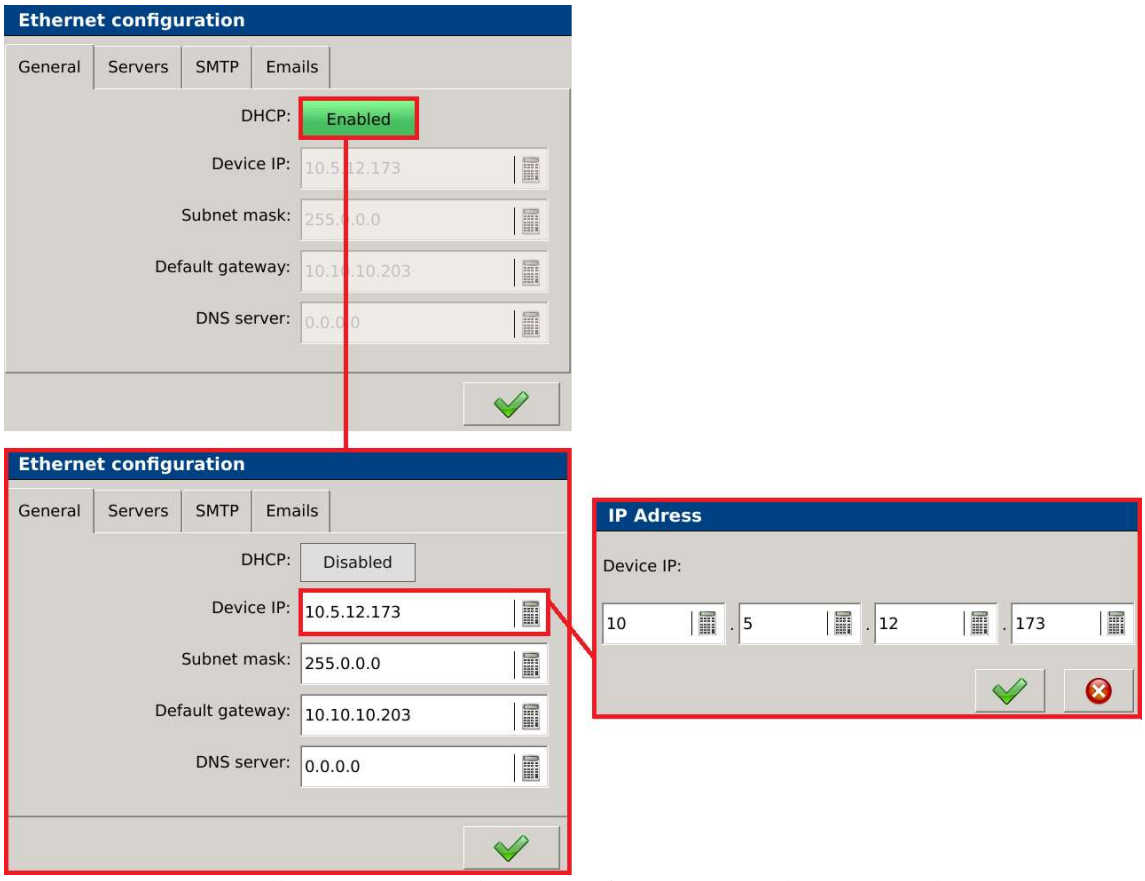



*Illustration 56: Ethernet configuration window - general.*

| Parameter | Description |
|---|---|
| DHCP | Enables or disables DHCP support. When enabled, it activatessupport for automatic acquisition of Ethernet interface IP protocol parameters from external DHCP servers within the same LAN. |
| Device IP | Edit field for changing the IP address. |
| Subnet mask | Edit field for changing the subnet mask. |
| Default gateway | Edit field for changing the default gateway. |
| DNS server | Edit field for changing the DNS server. |

### 3.11.2. FTP and WWW server settings

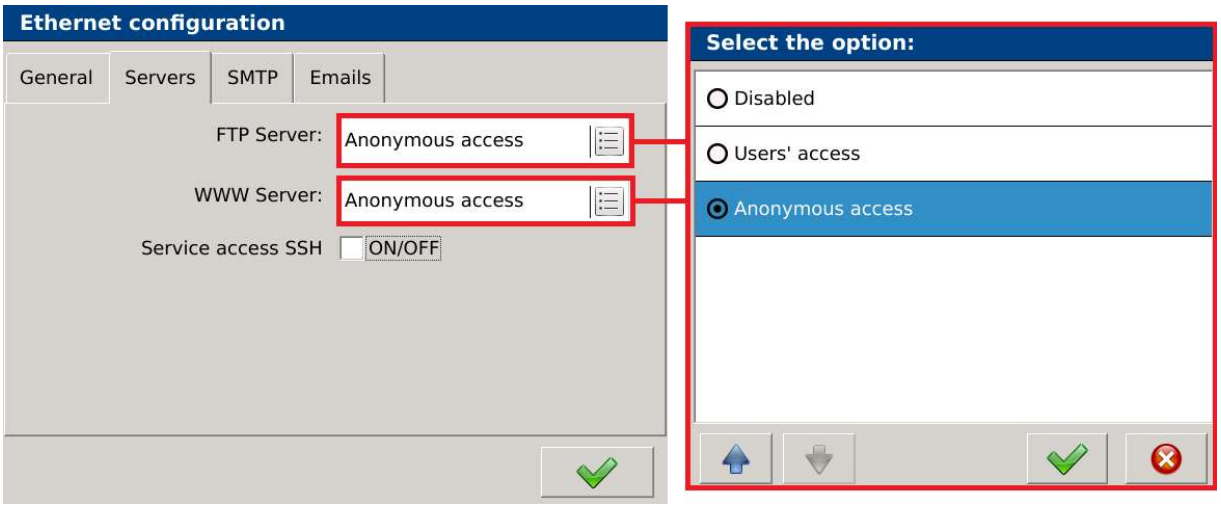



*Illustration 57: Ethernet Configuration – Servers*

| Parameter | | Description |
|---|---|---|
| FTP server<br>Web server | Off | No access to the web or FTP server |
| | Authorized access | Access requires authorization (login required) |
| | Anonymous access | Access without authorization (no login required) |

### 3.11.3. Email client settings

The figure below shows the SMTP configuration dialog box.

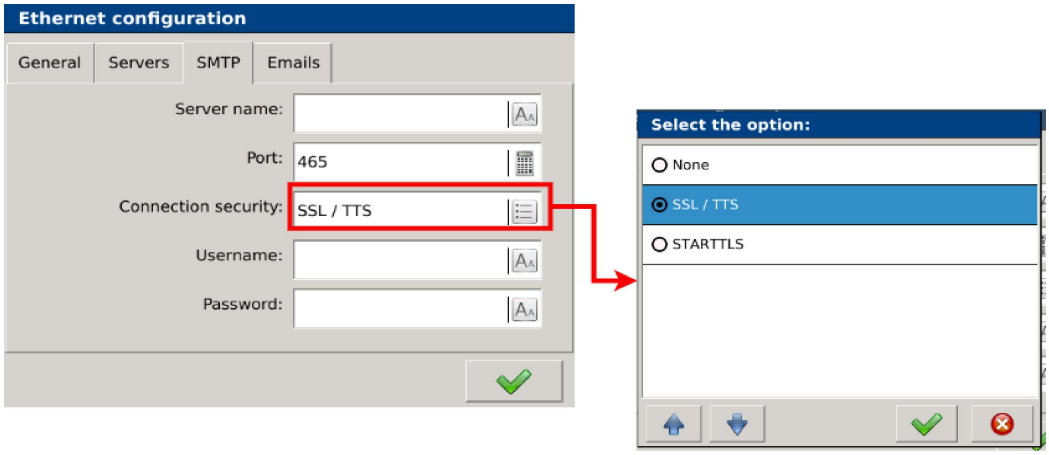



*Illustration 58: Ethernet Configuration - SMTP*

| Parameter | Description |
|---|---|
| Server name | Outgoing mail server |
| Port | Outgoing mail server port |
| Connection security | Selecting outgoing email security options |
| Username | Message sender ID |
| Password | Access password |

The email address list configuration is located in the "Email" tab and its contents are shown in the figure below.

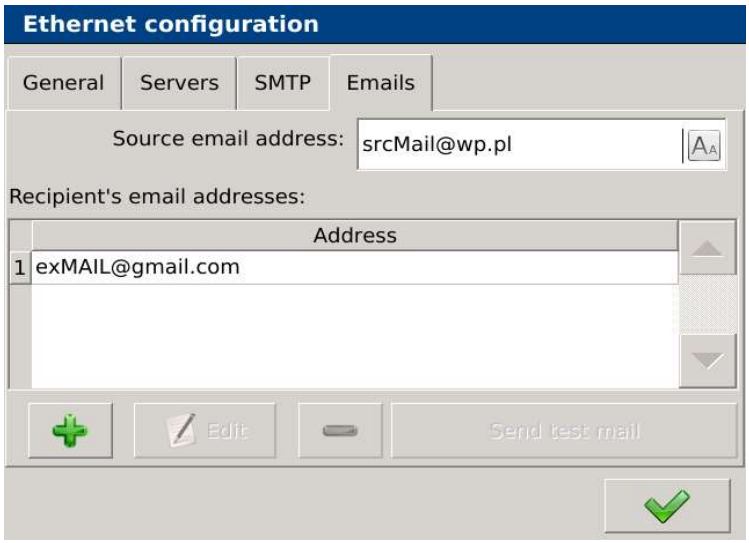



*Illustration 59: Ethernet Configuration - Email.*

| Parameter | Description |
|---|---|
| Source address | Outgoing mail server |
| List of receiving email addresses | List of receiving addresses with the possibility of editing. **Maximum 10** addresses on the list. |
|  | Add a new recipient address to the address list or remove an existing address from the list. |
| Edition | Changing an existing address in the recipient list. |
| Send a test message | Sending a test message to an address on the recipient list. |

### 3.11.4. Obtaining an IP Address

When the animated icon appears (*Illustration 60*), the device begins the process of acquiring an IP address. During this time, the existing IP connection may be dropped. The acquisition process takes up to 3 minutes. If the user's network problems persist, the device will restart. Once the IP address is successfully acquired, the icon disappears from the blue bar.

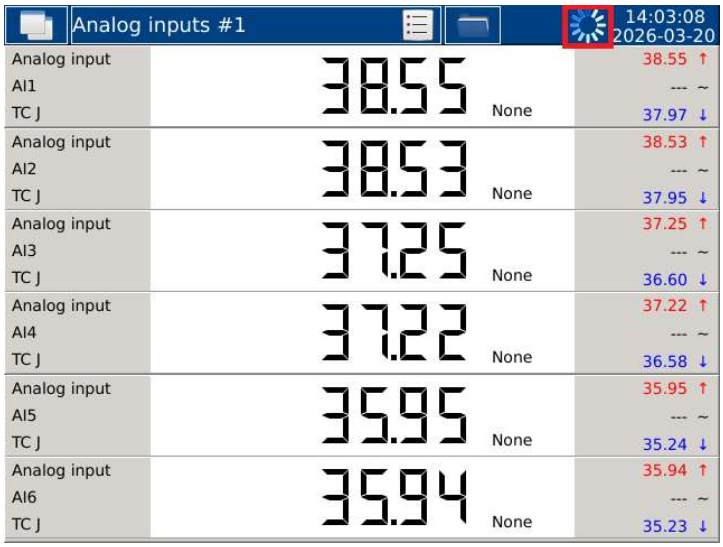



*Illustration 60: Main screen – IP loading wheel.*

## 3.12. System information and software updates

To update the KD10 recorder software, copy the files to the SD card with the update. After completing the given action, the next step is to insert the SD card to the screen recorder.

In the Control Panel, in the System Information tab, select the "Update" group and proceed to select the update file.

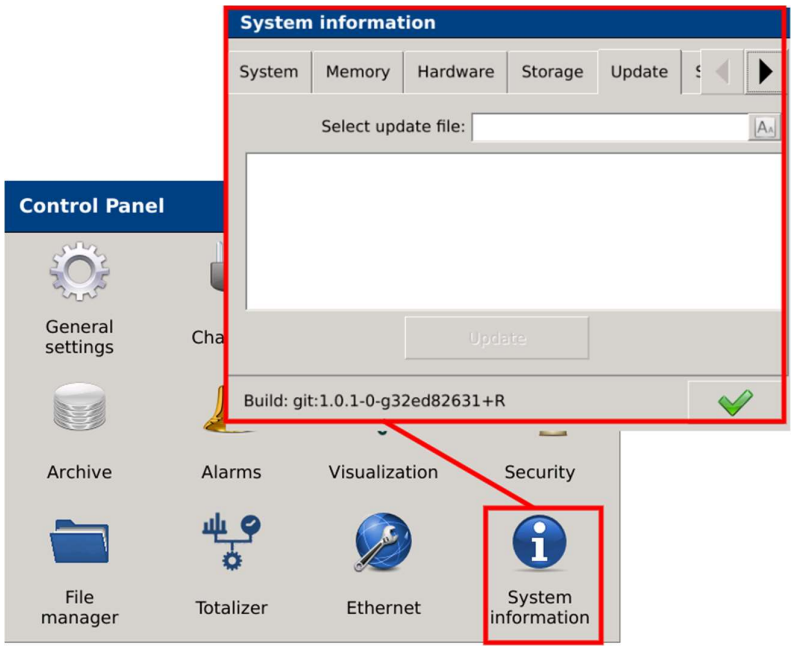



*Illustration 61: Control Panel - System Information.*

The user confirms their selection from the list of detected files. The next window displays information about the update.

We confirm the process by pressing the "Update" button.

# 4. File manager

The user can edit files stored on the SD card or USB host from the device using the file manager.

You can access file management from two places in the app. The first way is to tap the icon on the top bar of the home screen (*Illustration 62*). The second option is to tap the "File Manager" icon in the lower left corner of the control panel (*Illustration 24*).

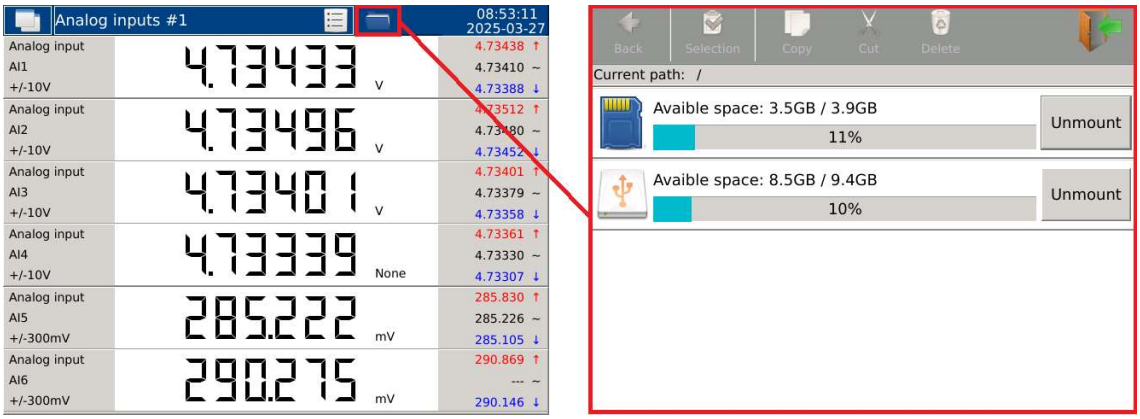



*Illustration 62: Going to the file manager - navigation.*

After selecting the editable resource, such as an SD card or USB host, we gain the ability to edit the files contained on it. Below is an example of selecting a file located on the SD card along with the editing options assigned to it.

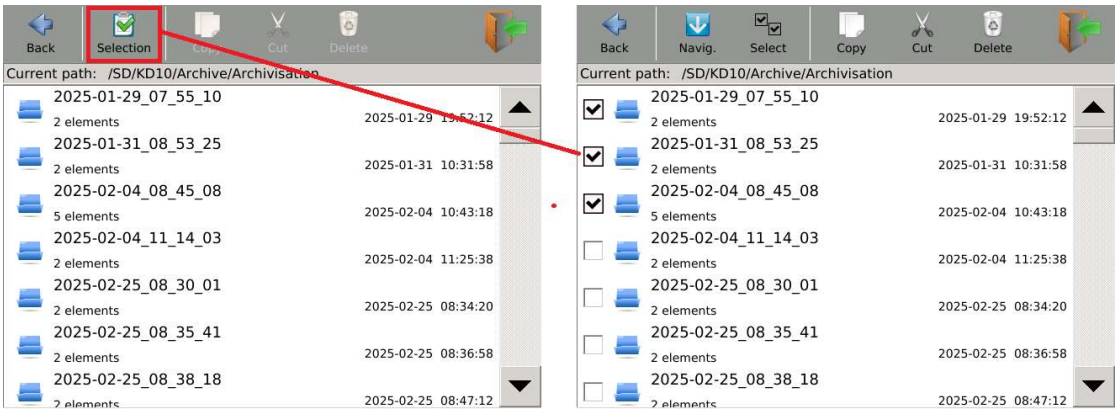
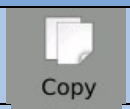
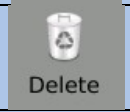
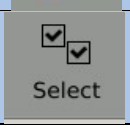



*Illustration 63: File manager - file selection.*

| Option | Description |
|---|---|
|  | Copying the selected item to any desired location on the card memory. |
|  | Moving the selected item to any desired location on the card memory. |
|  | Delete the selected item from the memory card. |
|  | Exit file manager. |
|  | Selection of selected files and folders. |

# 5. Data archiving

The archive configuration is described in section 3.6. Archiving Configuration.

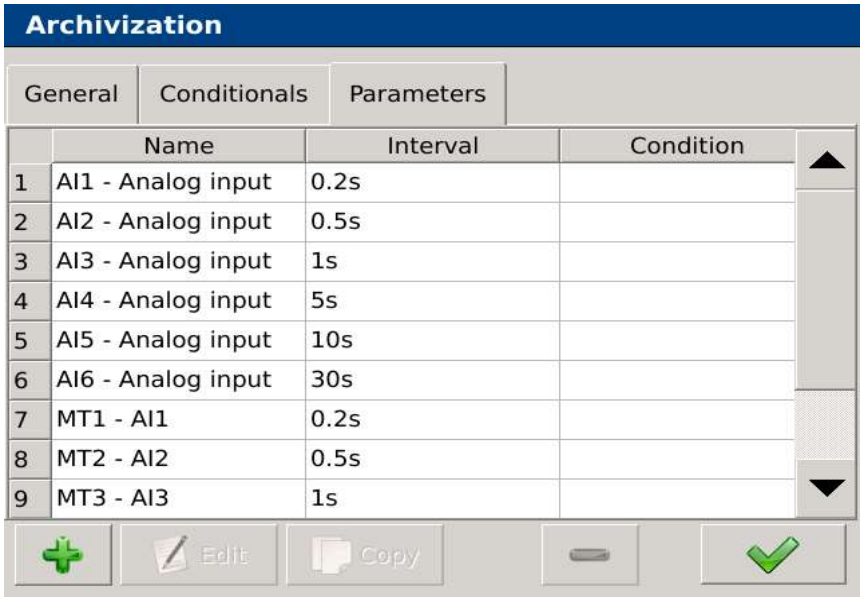



*Illustration 64: Archiving parameters editing window.*

Downloading archive files is possible via a web server or FTP client e.g. FileZilla software or directly from an SD card.

Sample file with archived data:**2023-11-12 13_24_21.KD10Arch.sqlite3**

The file name includes the date and time the file was created. In the example above (bold text), the file has already completed archiving (all records set during archiving configuration are completed). If the file has not completed archiving, it is displayed in the file system. with "_" at the beginning: **_2023-11-12 13_24_21.KD10Arch.sqlite3**

When you make changes to the archiving configuration (e.g. adding new parameters or changing archiving conditions), a new file is created with the time and date of its creation.

The file contains basic information about the archived parameters:

| **Parameter** | **Description** |
|---|---|
| id/record | automatically assigned record identifier, |
| date | date of occurrence of the archived parameter |
| time | time of occurrence of the archived parameter |
| channel* value | rescaled channel value |
| channel* valueRaw | raw channel value |
| channel* avg | average channel value from the rolling window |
| channel* min | minimum channel |
| channel* max | maximum channel value |
| channel* flag | channel flag |

*channel is the name of the channel in the "Parameters" tab of the archiving configuration (*Illustration 63*)

A digital signature is "encrypted" information that allows verification of the authenticity and correctness of an archive file. A properly verified file provides assurance that the file's contents have not been modified and unambiguous information about its owner.

The software is used to handle file archiving and verify digital signatures **PowerArchive**.

Digital signatures can also be verified in free programs that support OpenPGP, e.g. Kleopatra.

**Signature configuration is described in section 3.9.**

# 6. Alarms

The KD10 recorder in some versions (according to the order code) is equipped with 4 or 8 relay alarm outputs.

The rules for configuring alarms are described in section 3.7. Alarm Configuration.

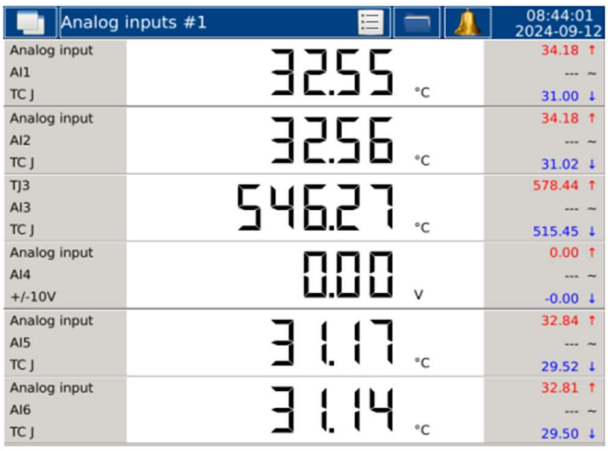



*Illustration 65: View without active alarm.*

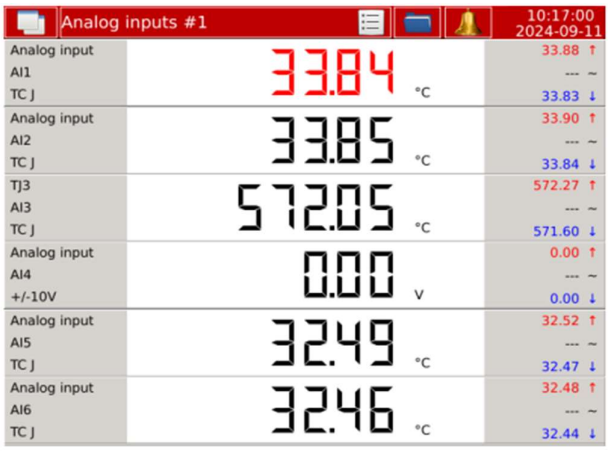



*Illustration 66: View with active alarm.*

The above illustration on the left (*Illustration 65*) shows the operating mode in which no alarm-activating event occurred. In the illustration on the right (*Illustration 66*) you can see the operating mode with the alarm enabled.

When an alarm is triggered, the information bar at the top of the screen changes color from blue to red. An additional element is also displayed.  .

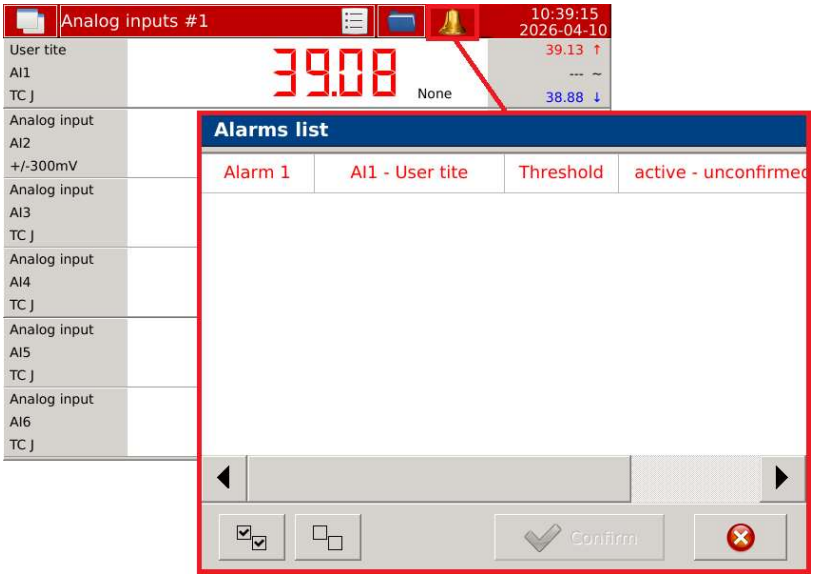



*Illustration 67: Alarm list.*

Touching the element generated when the alarm is triggered in the top panel will display the alarm confirmation window.

Confirming a selected alarm changes its color and status description to confirmed, just like in the illustration below (*Illustration 68*).

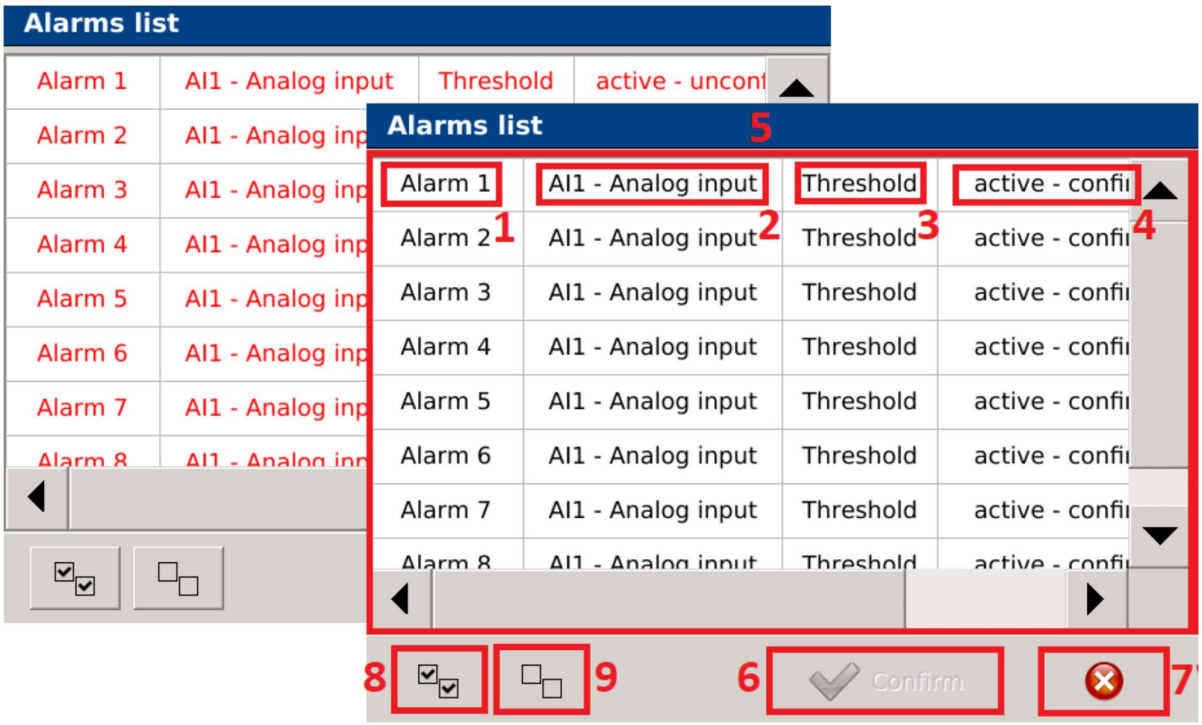



*Illustration 68: Confirming an alarm from the list.*

| Option | Description |
|---|---|
| 1 | Alarm number, set by the user. |
| 2 | Channel assigned to a given alarm. The parameter value triggers activation or turning off the alarm. |
| 3 | The alarm type assigned to the displayed event. |
| 4 | Current alarm status. |
| 5 | Main window with information about alarm occurrences. |
| 6 | A function that allows you to confirm alarms. |
| 7 | Exiting the dialogue. |
| 8 | Select all alarms. |
| 9 | Deselect all alarms. |

If the alarm configuration is set to report the alarm status in the alarm logs, events related to the activation or deactivation of the alarm will be recorded.

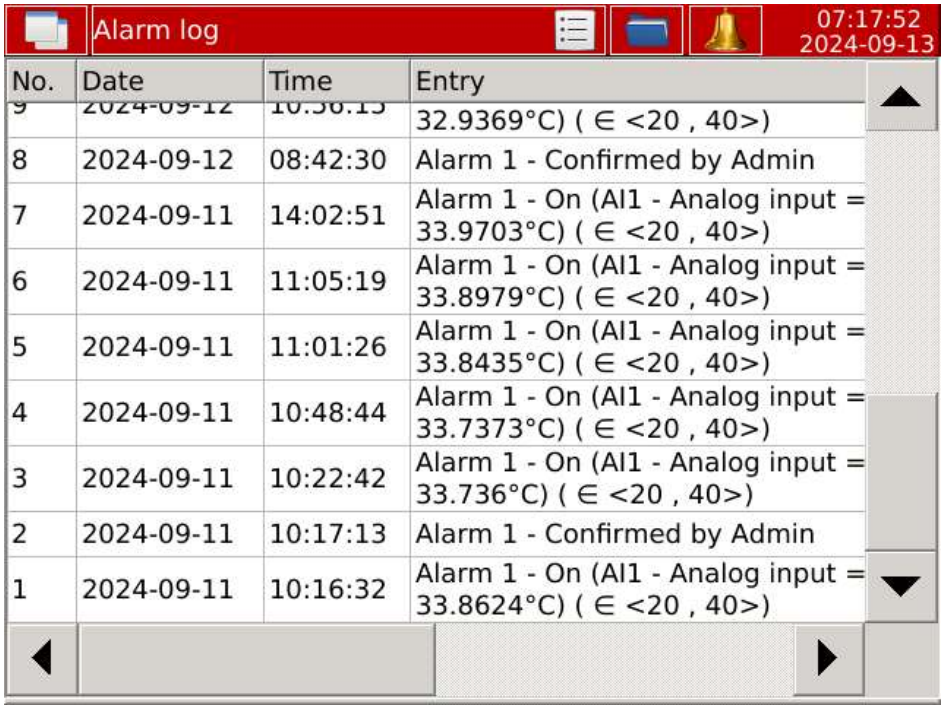



*Illustration 69: Alarm log.*

| **Option** | **Description** |
|---|---|
| No. | A number specifying the order in which alarm events occurred. |
| Data | Date the event occurred. |
| Time | Time of occurrence of the event. |
| Entry | An entry containing information about an event. The description includes the alarm ID, the event, and the value that triggered the event. |

Alarm logs are managed using the context menu (*Illustration 70*). Details regarding its opening are described in point 2.1.2 and presented at *Illustration 6.* Option *Clear this journal*, will clear the log window of saved entries. Option *Acknowledging alarms*, will redirect you to the previously described dialog for confirming selected alarms. The deletion and confirmation options require confirmation of your authorizations. After selecting this option, a dialog is generated in which the user enters their username and assigned password.

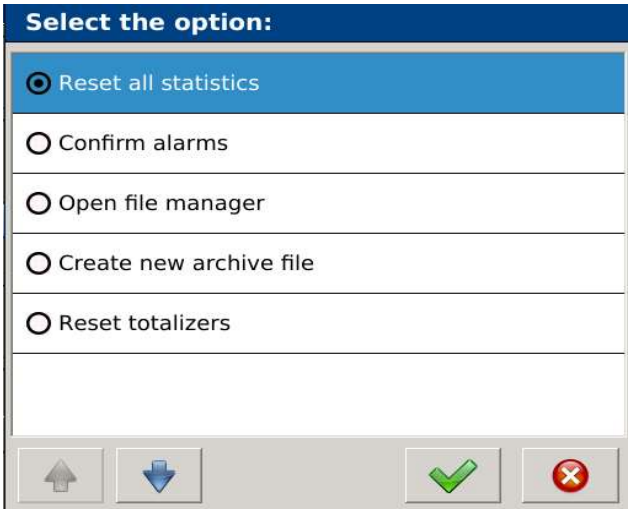



*Illustration 70: Context menu.*

Alarm logs are saved on the SD card. The file containing the current logs is saved as **alarm.log.sqlite3** the **alarm.log.csv.**

A preview of the list of files stored on the SD card is shown below.

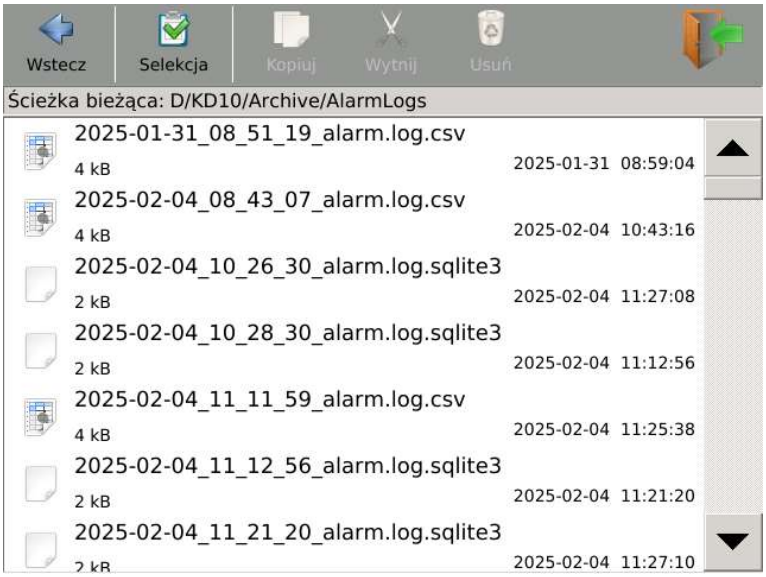



*Illustration 71: Alarms - entries in the log file.*

Example file name for both formats:

- 2023-09-07_12_26_30_alarm.log.sqlite3
- 2023-09-07_12_26_30_alarm.log.csv

# 7. Web server

We gain access to the web server by entering the IP address assigned to a given screen recorder in the browser window.

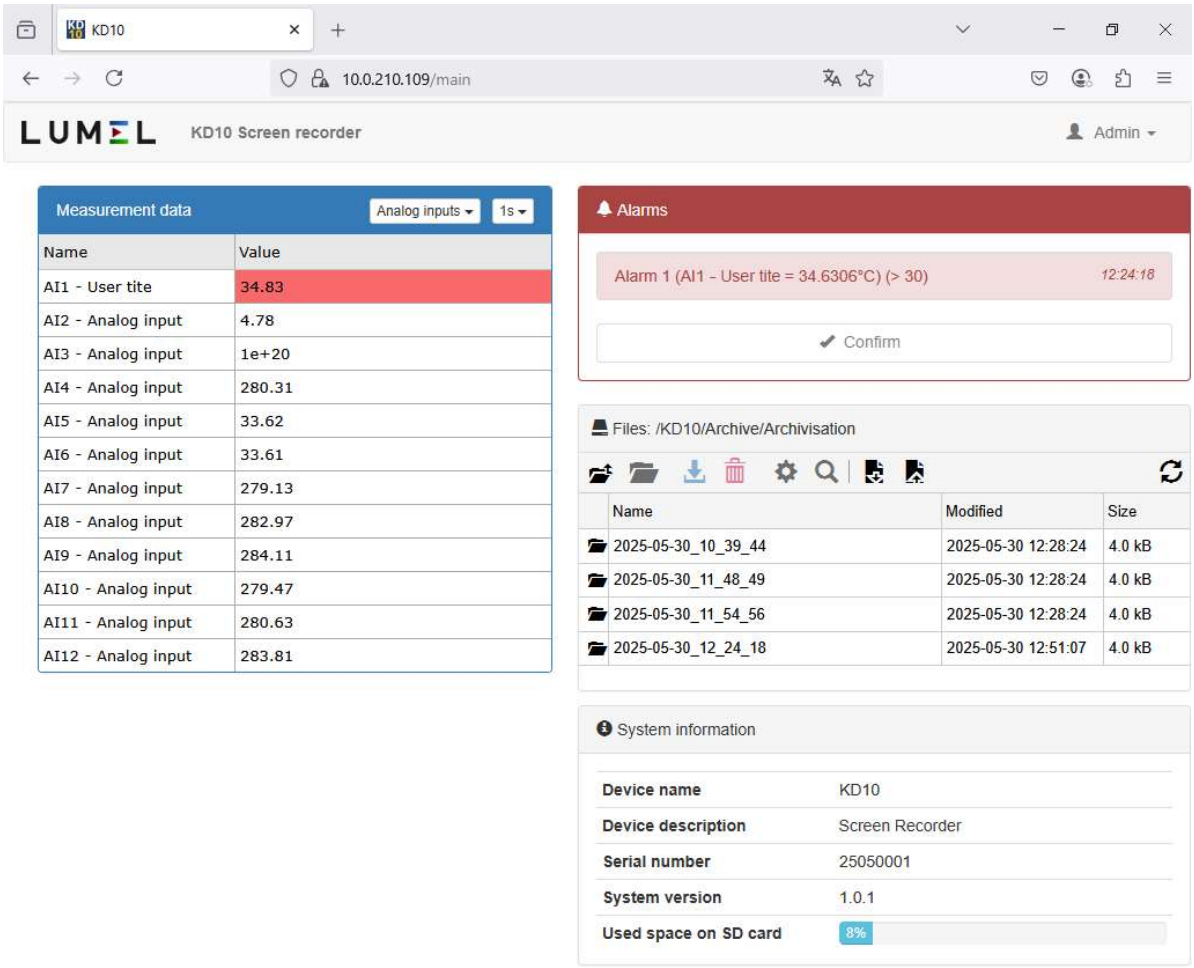



*Illustration 72: Website view.*

## 7.1.Navigation

### 7.1.1. Login

Depending on the Ethernet configuration settings, the user is provided with two modes of access to the web server. The first mode **Authorized access** is preceded by a login window. **Anonymous access** automatically redirects to a website with limited functionality.

The login window is shown in the illustration below (*Illustration 72*). Login and password are consistent with the device's security configuration (section 3.9).

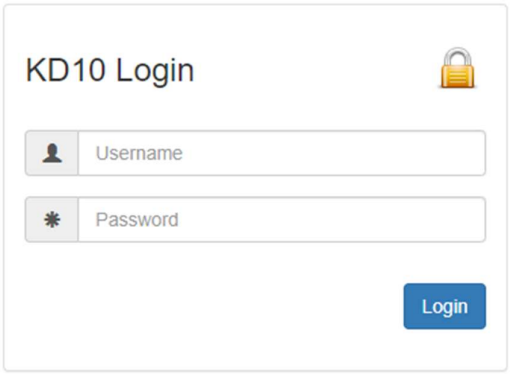



*Figure 73: Web server - login.*

### 7.1.2. Functionality

The website presents the current measurement results with adjustable refresh time, visible in the illustration below (*Illustration 74*). Measurement sets can be individually configured or presented in prepared sets. Values associated with the occurrence of an alarm (not confirmed) turn red.

Measurement data — Analog inputs — 1s

| Name | Value |
|---|---|
| AI1 - User tite | 34.83 |
| AI2 - Analog input | 4.78 |
| AI3 - Analog input | 1e+20 |
| AI4 - Analog input | 280.31 |
| AI5 - Analog input | 33.62 |
| AI6 - Analog input | 33.61 |
| AI7 - Analog input | 279.13 |
| AI8 - Analog input | 282.97 |
| AI9 - Analog input | 284.11 |
| AI10 - Analog input | 279.47 |
| AI11 - Analog input | 280.63 |
| AI12 - Analog input | 283.81 |

*Illustration 74: Table with measured values – www.*

The alarm section presents the current alarm status in authorized access mode, with the ability to confirm alarms.


*Illustration 75: Table with a list of active alarms.*

Log file management, configuration, and archiving sections. Module editing and viewing are only possible in authorized access mode.

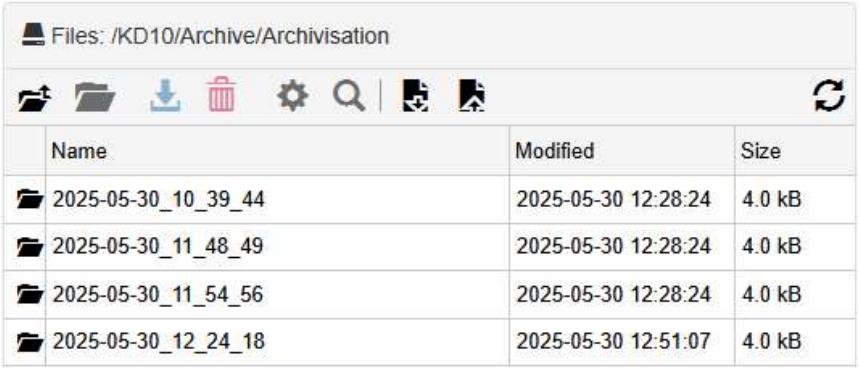



*Illustration 76: File Manager – www.*

The information section contains basic information about the device.

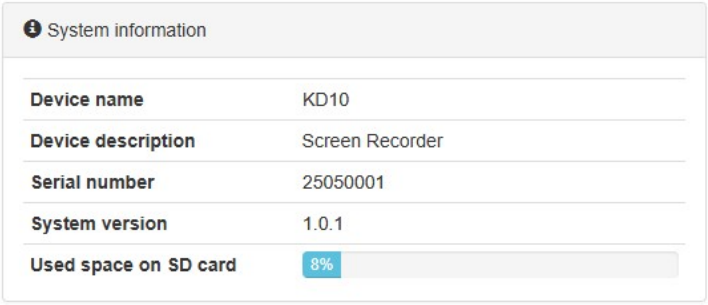



*Illustration 77: Device Information - www.*

### 7.1.3. Configuring user measurement data sets

Defining measurement data sets is performed as follows.

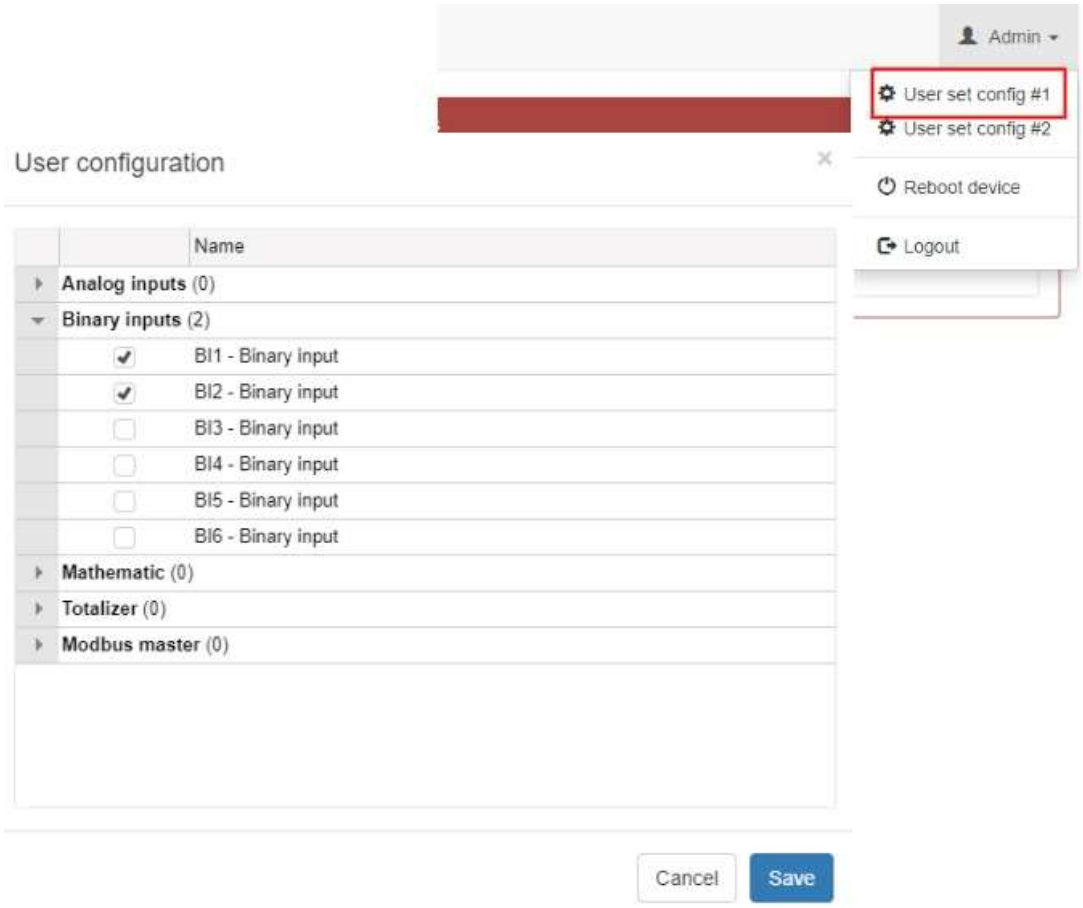



*Illustration 78: Selecting a user set - website.*

In the next window, select the data to be presented in the measurement data window. The user selects a parameter group, in which they can expand the list and select or deselect selected parameters. After completing the configuration, select the option **Save** (to save changes) or **Cancel** (close the window without making any changes).

### 7.1.4. Selecting and viewing measurement data sets

Below is an expanded list of measurement data sets, with user-configured sets at the end. Changing the refresh time allows you to regulate the frequency of measurement data updates presented on the page.

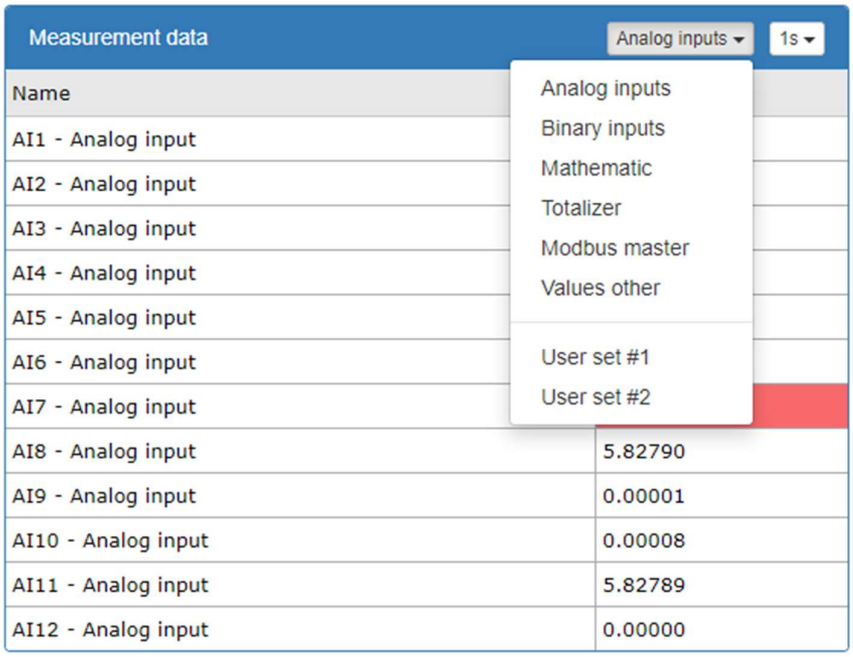



*Illustration 79: List of display value sets.*

### 7.1.5. Alarm confirmation

Alarm module window with information about alarm occurrences.


*Illustration 80: Alarm occurrence.*

The user selects the alarm to be confirmed and confirms the selection with the option **Confirm**.


*Illustration 81: Select alarm to acknowledge.*

### 7.1.6. File manager

Below is a description of the individual functions of the file manager on the web server.

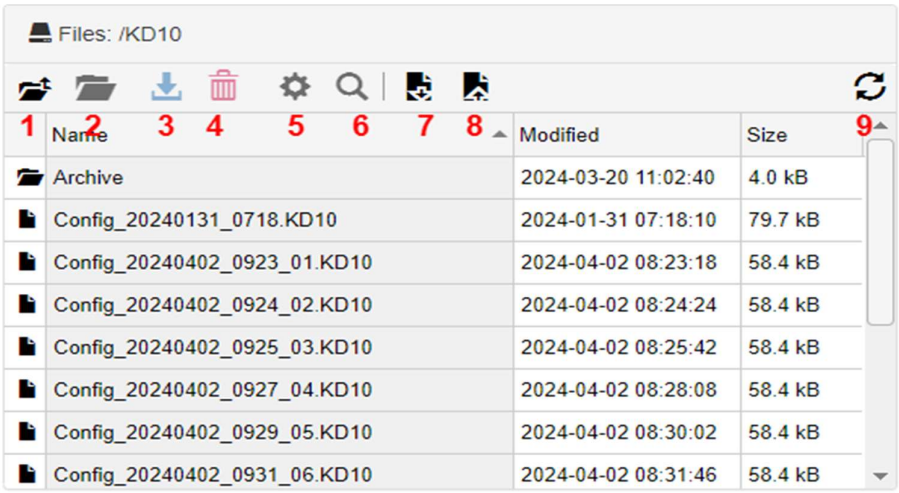



*Illustration 82: File manager - website.*

| Item number (icons) | Description |
|---|---|
| 1 | Go to a folder higher in the path. |
| 2 | Opening a folder. |
| 3 | Downloading available files. |
| 4 | Deleting files |
| 5 | Setting configuration from file. |
| 6 | Preview of file contents (archive files). |
| 7 | Downloading current configuration. |
| 8 | Transferring a file to a memory card. |
| 9 | Refreshing and updating the file list. |

### 7.1.7. Log out and restart the device

The option to log out of the server is located in the upper right corner of the browser. From the drop-down list after selecting the currently logged in user, select **Log out** (*Illustration 83 – Option 2*).

Remote restart of the device via the website can be performed as shown in the illustration (*Illustration 83 – Option 1*). To restart the device from the drop-down list after selecting the currently logged in user, select the option **Restart your device**. In the next window, confirm the restart of KD10.

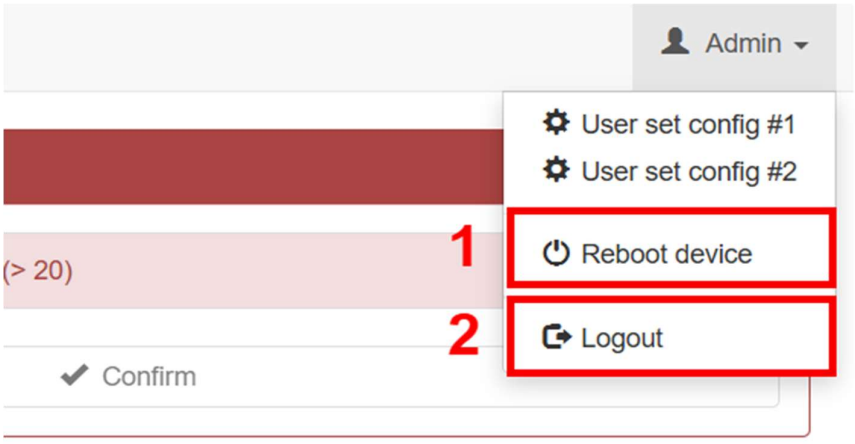



*Illustration 83: Logout/restart device.*

## 7.2.Access levels

| No. | Option | Authorized access | | Anonymous access |
|---|---|---|---|---|
| | General | | | |
| 1 | Login / Logout | ✓ | | × |
| 2 | Restart the device | ✓ | | × |
| 3 | Configuration of user measurement data sets. | ✓ | | × |
| | Measurement data | | | |
| 4 | Preview of measurement data | ✓ | | ✓ |
| 5 | Selecting defined sets | ✓ | | ✓ |
| 6 | Selecting user sets | ✓ | | × |
| 7 | Changing the measurement data refresh time | ✓ | | ✓ |
| 8 | Disabling the refreshing of measurement data | ✓ | | ✓ |
| | Alarms | | | |
| 9 | Alarm preview | ✓ | | ✓ |
| 10 | Acknowledging alarms* | ✓ | × | × |
| | Files | | | |
| 11 | File preview* | ✓ | × | × |
| 12 | Refreshing file list* | ✓ | × | × |
| 13 | Opening and closing directories* | ✓ | × | × |
| 14 | Download files* | ✓ | × | × |
| 15 | Deleting files* | ✓ | × | × |
| 16 | Setting configuration from file* | ✓ | × | × |
| 17 | Archive file preview* | ✓ | × | × |
| | System Information | | | |
| 18 | View system information | ✓ | | ✓ |

* function availability depends on user permission settings

# 8. PC programs

## 8.1.KD10 Setup

**KD10 Setup** is a program that allows you to prepare a configuration file for the KD10 recorder. This file should be placed on an SD card and allows you to load a user-prepared configuration.

### 8.1.1. Program operation

The KD10Setup program interface is identical to the KD10 recorder menu, which makes it easier to use.

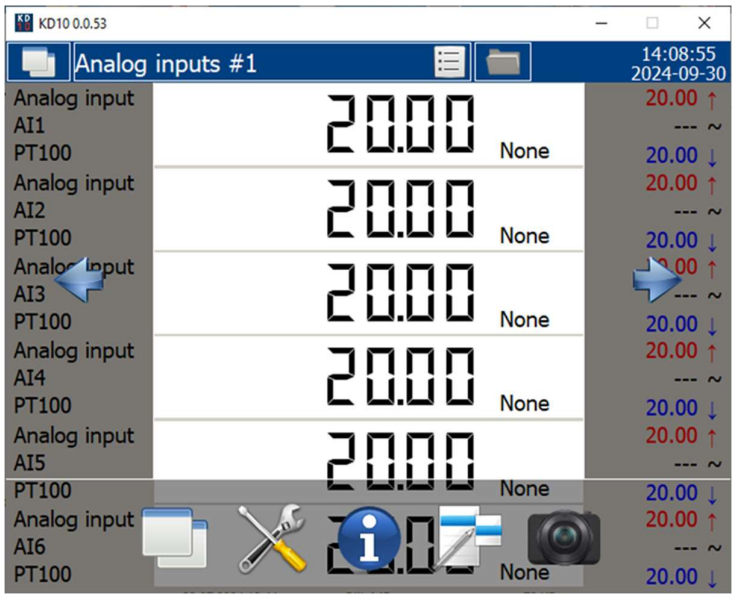



*Illustration 84: KD10 Setup software view.*

After entering the settings  a window for selecting a measurement card depending on the number of analog inputs is displayed.

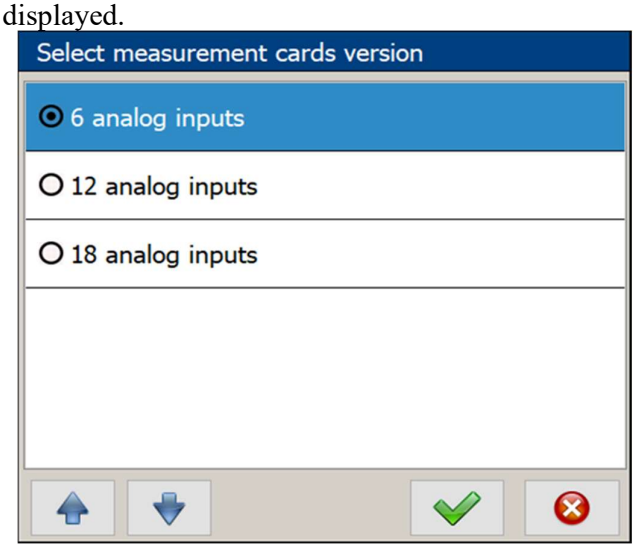



*Illustration 85: Measurement card selection options.*

The next step is to select an expansion card.

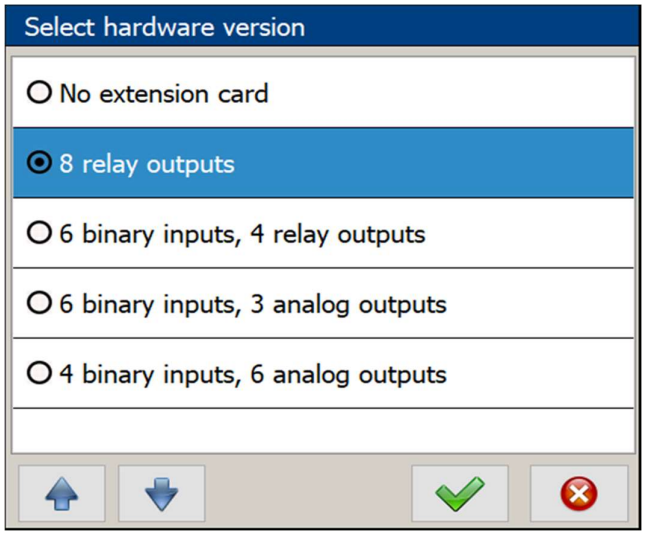



*Illustration 86: Expansion card selection options.*

After selecting the appropriate cards for the configurable device, we move on to editing configuration and control panel view

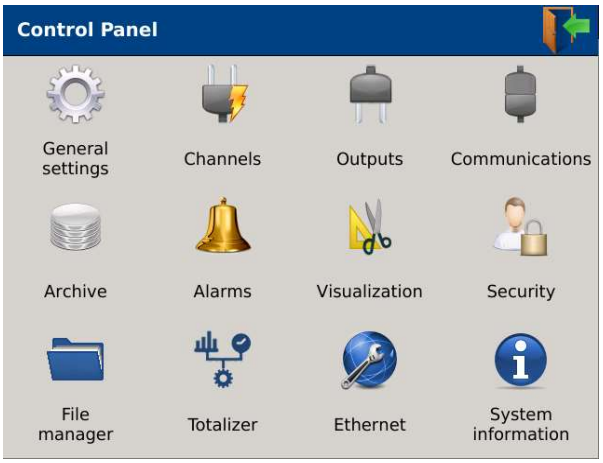



*Illustration 87: Control panel view.*

Once all options are set and the control panel is closed, the user configuration is saved.

### 8.1.2. Saving the settings file

The user configuration file is saved in the folder where the KD10Setup program is installed.

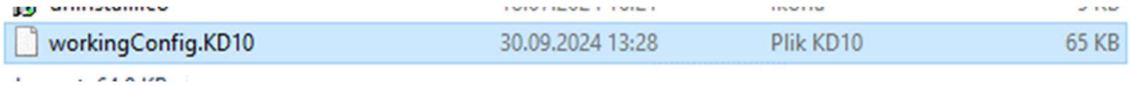



*Illustration87: Configuration file*

To load the configuration on the KD10 recorder, this file must be copied to the SD card in the KD10 folder.

# 9. Technical data

## 9.1. Universal measurement input card

**Measurement ranges**

| LP. | Entry type | Range of indications (rated range) | Class |
|---|---|---|---|
| 1 | PT100 | -200...850 ºC (-200...850 ºC) | 0,1 |
| 2 | PT1000 | -200...850 ºC (-200...850 ºC) | |
| 3 | 400 Ω | 0...440 Ω (0...400 Ω) | |
| 4 | 4000 Ω | 0...4040 Ω (0...4000 Ω) | |
| 5 | Type E thermocouple | -205...1000 ºC (-150...1000 ºC) | |
| 6 | Type J thermocouple | -205...1200 ºC (-150...1200 ºC) | |
| 7 | K-type thermocouple | -205...1372 ºC (-150...1372 ºC) | |
| 8 | N-type thermocouple | -205...1372 ºC (-150...1372 ºC) | |
| 9 | R-type thermocouple | -50...1768 ºC (-50...1768 ºC) | |
| 10 | S-type thermocouple | -50...1768 ºC (-50...1768 ºC) | |
| 11 | Voltage input 60 mV | -75...75 mV (-60...60 mV) | |
| 12 | Voltage input 150 mV | -155...155 mV (-150...150 mV) | |
| 13 | Voltage input 300 mV | -310...310 mV (-300...300 mV) | |
| 14 | Voltage input 10 V | -13...13 V (-10...10 V) | |
| 15 | Current input 0...20 mA | -24...24 mA (-20...20 mA) | |
| 16 | Current input 4...20 mA | 3,6...22.0 mA (4...20 mA) | |

**Parameters of the measurement tracks**

| | |
|---|---|
| Current in the sensor circuit during resistance measurements | < 175 µA |
| Input resistance for voltage measurements: thermocouples, 60 mV, 150 mV, 300 mV, 0...10 V | > 1 MΩ |
| Input resistance for current ranges | < 11 Ω |
| Measuring lead resistance compensation range (maximum single lead resistance) | < 20 Ω |
| Automatic terminal temperature compensation range for thermocouple sensor measurements | -30...80 ºC |
| Insulation between channels | 500 V DC |

**Additional measurement errors**

| | |
|---|---|
| Automatic compensation of the reference junction temperature | < 1 ºC |
| Automatic compensation of wire resistance for thermoresistance sensors | < 0.5 ºC |
| Automatic compensation of wire resistance for resistance measurements | < 0.2 Ω (range 400 Ω)<br>< 2 Ω (range 4000 Ω) |
| From changes in ambient temperature (main measurement path and cable resistance compensation paths) | 50% class / 10 K |

**Measurement frequency: 10Hz (the card measures every 100ms)**

## 9.2.Expansion cards

Additional cards and their inputs depend on the KD10 recorder build code.

### 9.2.1. Three isolated analog outputs

| Parameter | Value |
|---|---|
| Type: | 3 galvanically isolated current outputs |
| Output signal: | 0/4...20 mA |
| Output measurement error: | ±0.2% of the measuring range |
| Load resistance: | ≤ 500Ω |
| Response time: | 200 ms |

### 9.2.2. Six isolated analog outputs

| Parameter | Value |
|---|---|
| Type: | 6 galvanically isolated current outputs |
| Output signal: | 0/4...20 mA |
| Output measurement error: | ±0.2% of the measuring range |
| Load resistance: | ≤ 500Ω |
| Response time: | 200 ms |

### 9.2.3. Binary inputs

| Parameter | Value |
|---|---|
| Type: | 2 groups of 3 binary inputs with common ground |
| Control signal: | 0…2/8...24 V DC |
| Switching frequency: | up to 50 Hz input voltage in the range of 8...24 V DC |

### 9.2.4. Relay outputs

| Parameter | Value |
|---|---|
| Type: | 8 or 4 programmable electromagnetic relays, normally open (NO) |
| Contact voltage / load current: | ≤ 250 V AC / 1,5 A<br>≤ 30V DC / 1A |
| Basic output error: | 200 ms + hysteresis time |

## 9.3. Reference conditions and rated operating conditions

| | |
|---|---|
| Storage conditions<br>(temperature and humidity) | Temperature: -20…70°C (-22…158 °F)<br>Humidity: less than 75% RH (non-condensing) |
| Operating conditions (temperature and humidity) | Temperature: 0…23…50°C (32…93.2…122°F)<br>Humidity: less than 75% RH (non-condensing) |
| Power supply | 85…253 V AC, 40…400 Hz<br>90…300 V DC |
| Power consumption | ≤ 20 VA |
| Dust and water resistance | IP54 – from the front side<br>IP20 – terminal side |

## 9.4.Operational safety according to PN-EN 61010-1

| | |
|---|---|
| Installation Category | III |
| Degree of pollution | 2 |
| Insulation voltage to earth | • RS-485: 500V AC/DC<br>• Ethernet: 250V AC / 500V DC<br>• Temperature measurement input: 500V AC/DC<br>• Power supply and relay output circuits: 2140 V AC/DC<br>• Analog outputs: 500V AC/DC<br>• Binary inputs: 1200V AC/DC |
| Maximum operating voltage to ground | For power supply circuits and relay outputs: 300 V<br>For measuring input: 50 V<br>For RS-485, Ethernet, relay outputs, analog outputs and binary inputs: 50 V |
| Height above sea level | < 2000 m |

## 9.5.Electromagnetic compatibility

| | |
|---|---|
| Electromagnetic emission | compliant with EN 61000-6-4 |
| Immunity to interference | compliant with EN 61000-6-2 |

## 9.6.Installation

| | |
|---|---|
| Dimensions (width x height x depth) | 144 × 144 × 104 mm (5.669" × 5.669" × 4,094") |
| Mounting hole dimensions (width x height) | $138^{-0,5}$ x $138^{-0,5}$ mm ($5.433^{-0,02}$" × $5.433^{-0,02}$") |
| Libra | 1,5 kg (52.9 oz.) |

## 9.7.Compliance with standards

| | |
|---|---|
| EN 61010 | Operational safety |
| EN 61000-6-4 | Electromagnetic compatibility |
| EN 61000-6-2 | |

## 9.8.Register tables

The KD10 recorder contains data stored in 16-bit and 32-bit registers. The bits in the 16-bit registers are numbered from least significant to oldest (b0 ... b15). 32-bit registers (4 bytes, 2 x 16 bits) contain float registers with byte arrangement: B4 B3 B2 B1.

**Attention!** All addresses given are physical addresses. Some computer programs use logical addressing, in which case the addresses must be incremented by 1.

The KD10 register map is presented below.

| Address range | Register type | Description |
|---|---|---|
| 0000 - 0019 | Integer (16 bits) | Information and status registers. |
| 0300 - 0363 | Integer (16 bits) | Alarms |
| 0800 - 0802 | Float (2 x 16 bits) | Temperature |
| 0900 - 0910 | Float (2 x 16 bits) | Binary inputs |
| 1000 - 1170 | Float (2 x 16 bits) | Universal analog measurement inputs |
| 1200 - 1222 | Float (2 x 16 bits) | Totalizer |
| 1600 - 1634 | Float (2 x 16 bits) | Mathematical functions |
| 2000 - 2062 | Float (2 x 16 bits) | Modbus Master → for one selected register |
| 2400 - 3020 | Float (2 x 16 bits) x 10 | Modbus Master Group → Forwarding |

### 9.8.1. Information registers and statuses

| Register | Register type | Parameter |
|---|---|---|
| 0000 | Integer (16 bits) | Device ID - 0xEF (239) |
| 0001 | Integer (16 bits) | Main program version |
| 0002 | Integer (16 bits) | Measurement card program version |
| 0003 | Integer (16 bits) | Status 1 |
| 0004 | Integer (16 bits) | Status 2 |
| 0005 | Integer (16 bits) | Status 3 |
| 0006 | Integer (16 bits) | Time: seconds |
| 0007 | Integer (16 bits) | Time: hours and minutes (hour * 100 + minutes) |
| 0008 | Integer (16 bits) | Date: month and day (month * 100 + day) |
| 0009 | Integer (16 bits) | Dates: year |
| 0010 | Integer (16 bits) | Serial number |
| 0011 | Integer (16 bits) | Serial number |
| 0012 | Integer (16 bits) | Password to confirm the execution of the CMD command |
| 0013 | Integer (16 bits) | CMD command assignment number |
| 0014 | Integer (16 bits) | Hardware version of the device |

| | | |
|---|---|---|
| 0015 | Integer (16 bits) | The fifth and fourth bytes (B5.B4) of the meter's MAC address, format: B5:B4:B3:B2:B1:B0 25651 (0x6433 = 64:33) |
| 0016 | Integer (16 bits) | The third and second bytes (B3.B2) of the meter's MAC address, format: B5:B4:B3:B2:B1:B0 56090 (0xDB1A = DB:1A) |
| 0017 | Integer (16 bits) | The first and zero bytes (B1.B0) of the meter's MAC address, format: B5:B4:B3:B2:B1:B0 27051 (0x69AB = 69:AB) |
| 0018 | Integer (16 bits) | The third and second bytes (B3.B2) of the meter's IP address, IPv4 format: B3.B2.B1.B0 49320 (0xC0A8 = 192.168) |
| 0019 | Integer (16 bits) | The first and zero bytes (B1.B0) of the meter's IP address, IPv4 format: B3.B2.B1.B0 356 (0x0164 = 1.100) |

### 9.8.2. Binary input registers

| Register | Register type | Description |
|---|---|---|
| 0900 | Float 3210 (2 x 16 bits) | Binary input 0 |
| 0902 | Float 3210 (2 x 16 bits) | Binary input 1 |
| 0904 | Float 3210 (2 x 16 bits) | Binary input 2 |
| 0906 | Float 3210 (2 x 16 bits) | Binary input 3 |
| 0908 | Float 3210 (2 x 16 bits) | Binary input 4 |
| 0910 | Float 3210 (2 x 16 bits) | Binary input 5 |

### 9.8.3. Universal analog measurement input registers

| Register | Register type | Parameter |
|---|---|---|
| 1000 | Float 3210 (2 x 16 bits) | Universal Analog Input 1 |
| 1010 | Float 3210 (2 x 16 bits) | Universal Analog Input 2 |
| 1020 | Float 3210 (2 x 16 bits) | Universal Analog Input 3 |
| 1030 | Float 3210 (2 x 16 bits) | Universal Analog Input 4 |
| 1040 | Float 3210 (2 x 16 bits) | Universal Analog Input 5 |
| 1050 | Float 3210 (2 x 16 bits) | Universal Analog Input 6 |
| 1060 | Float 3210 (2 x 16 bits) | Universal Analog Input 7 |
| 1070 | Float 3210 (2 x 16 bits) | Universal Analog Input 8 |
| 1080 | Float 3210 (2 x 16 bits) | Universal Analog Input 9 |
| 1090 | Float 3210 (2 x 16 bits) | Universal Analog Input 10 |
| 1100 | Float 3210 (2 x 16 bits) | Universal Analog Input 11 |
| 1110 | Float 3210 (2 x 16 bits) | Universal analog input 12 |
| 1120 | Float 3210 (2 x 16 bits) | Universal Analog Input 13 |
| 1130 | Float 3210 (2 x 16 bits) | Universal analog input 14 |
| 1140 | Float 3210 (2 x 16 bits) | Universal Analog Input 15 |
| 1150 | Float 3210 (2 x 16 bits) | Universal analog input 16 |
| 1160 | Float 3210 (2 x 16 bits) | Universal analog input 17 |
| 1170 | Float 3210 (2 x 16 bits) | Universal analog input 18 |

### 9.8.4. Totalizer

| Register | Register type | Parameter |
|---|---|---|
| 1200 | Float 3210 (2 x 16 bits) | Totalizer 0 |
| 1202 | Float 3210 (2 x 16 bits) | Totalizer 1 |
| 1204 | Float 3210 (2 x 16 bits) | Totalizer 2 |
| 1206 | Float 3210 (2 x 16 bits) | Totalizer 3 |
| 1208 | Float 3210 (2 x 16 bits) | Totalizer 4 |
| 1210 | Float 3210 (2 x 16 bits) | Totalizer 5 |
| 1212 | Float 3210 (2 x 16 bits) | Totalizer 6 |
| 1214 | Float 3210 (2 x 16 bits) | Totalizer 7 |
| 1216 | Float 3210 (2 x 16 bits) | Totalizer 8 |
| 1218 | Float 3210 (2 x 16 bits) | Totalizer 9 |
| 1220 | Float 3210 (2 x 16 bits) | Totalizer 10 |
| 1222 | Float 3210 (2 x 16 bits) | Totalizer 11 |

### 9.8.5. Mathematical functions

| Register | Register type | Description |
|---|---|---|
| 1600 | Float 3210 (2 x 16 bits) | Mathematical Function 0 |
| 1602 | Float 3210 (2 x 16 bits) | Mathematical Function 1 |
| 1604 | Float 3210 (2 x 16 bits) | Mathematical Function 2 |
| 1606 | Float 3210 (2 x 16 bits) | Mathematical Function 3 |
| 1608 | Float 3210 (2 x 16 bits) | Mathematical Function 4 |
| 1610 | Float 3210 (2 x 16 bits) | Mathematical Function 5 |
| 1612 | Float 3210 (2 x 16 bits) | Mathematical Function 6 |
| 1614 | Float 3210 (2 x 16 bits) | Mathematical Function 7 |
| 1616 | Float 3210 (2 x 16 bits) | Mathematical Function 8 |
| 1618 | Float 3210 (2 x 16 bits) | Mathematical Function 9 |
| 1620 | Float 3210 (2 x 16 bits) | Mathematical Function 10 |
| 1622 | Float 3210 (2 x 16 bits) | Mathematical Function 11 |
| 1624 | Float 3210 (2 x 16 bits) | Mathematical Function 12 |
| 1626 | Float 3210 (2 x 16 bits) | Mathematical Function 13 |
| 1628 | Float 3210 (2 x 16 bits) | Mathematical Function 14 |
| 1630 | Float 3210 (2 x 16 bits) | Mathematical Function 15 |
| 1632 | Float 3210 (2 x 16 bits) | Mathematical Function 16 |
| 1634 | Float 3210 (2 x 16 bits) | Mathematical Function 17 |

### 9.8.6. Modbus Master – one selected register

| Register | Register type | Description |
|---|---|---|
| 2000 | Float 3210 (2 x 16 bits) | MODBUS MASTER 0 |
| 2002 | Float 3210 (2 x 16 bits) | MODBUS MASTER 1 |
| 2004 | Float 3210 (2 x 16 bits) | MODBUS MASTER 2 |
| 2006 | Float 3210 (2 x 16 bits) | MODBUS MASTER 3 |
| 2008 | Float 3210 (2 x 16 bits) | MODBUS MASTER 4 |
| 2010 | Float 3210 (2 x 16 bits) | MODBUS MASTER 5 |
| 2012 | Float 3210 (2 x 16 bits) | MODBUS MASTER 6 |
| 2014 | Float 3210 (2 x 16 bits) | MODBUS MASTER 7 |
| 2016 | Float 3210 (2 x 16 bits) | MODBUS MASTER 8 |
| 2018 | Float 3210 (2 x 16 bits) | MODBUS MASTER 9 |
| 2020 | Float 3210 (2 x 16 bits) | MODBUS MASTER 10 |
| 2022 | Float 3210 (2 x 16 bits) | MODBUS MASTER 11 |
| 2024 | Float 3210 (2 x 16 bits) | MODBUS MASTER 12 |
| 2026 | Float 3210 (2 x 16 bits) | MODBUS MASTER 13 |
| 2028 | Float 3210 (2 x 16 bits) | MODBUS MASTER 14 |
| 2030 | Float 3210 (2 x 16 bits) | MODBUS MASTER 15 |
| 2032 | Float 3210 (2 x 16 bits) | MODBUS MASTER 16 |
| 2034 | Float 3210 (2 x 16 bits) | MODBUS MASTER 17 |
| 2036 | Float 3210 (2 x 16 bits) | MODBUS MASTER 18 |
| 2038 | Float 3210 (2 x 16 bits) | MODBUS MASTER 19 |
| 2040 | Float 3210 (2 x 16 bits) | MODBUS MASTER 20 |
| 2042 | Float 3210 (2 x 16 bits) | MODBUS MASTER 21 |
| 2044 | Float 3210 (2 x 16 bits) | MODBUS MASTER 22 |
| 2046 | Float 3210 (2 x 16 bits) | MODBUS MASTER 23 |
| 2048 | Float 3210 (2 x 16 bits) | MODBUS MASTER 24 |
| 2050 | Float 3210 (2 x 16 bits) | MODBUS MASTER 25 |
| 2052 | Float 3210 (2 x 16 bits) | MODBUS MASTER 26 |
| 2054 | Float 3210 (2 x 16 bits) | MODBUS MASTER 27 |
| 2056 | Float 3210 (2 x 16 bits) | MODBUS MASTER 28 |
| 2058 | Float 3210 (2 x 16 bits) | MODBUS MASTER 29 |
| 2060 | Float 3210 (2 x 16 bits) | MODBUS MASTER 30 |
| 2062 | Float 3210 (2 x 16 bits) | MODBUS MASTER 31 |

### 9.8.7. Modbus Master – Transferred Group

| Register | Register type | Description |
|---|---|---|
| 2400 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 0 |
| 2420 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 1 |
| 2440 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 2 |
| 2460 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 3 |
| 2480 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 4 |
| 2500 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 5 |
| 2520 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 6 |
| 2540 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 7 |
| 2560 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 8 |
| 2580 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 9 |
| 2600 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 10 |
| 2620 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 11 |
| 2640 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 12 |
| 2660 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 13 |
| 2680 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 14 |
| 2700 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 15 |
| 2720 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 16 |
| 2740 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 17 |
| 2760 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 18 |
| 2780 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 19 |
| 2800 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 20 |
| 2820 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 21 |
| 2840 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 22 |
| 2860 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 23 |
| 2880 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 24 |
| 2900 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 25 |
| 2920 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 26 |
| 2940 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 27 |
| 2960 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 28 |
| 2980 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 29 |
| 3000 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 30 |
| 3020 | 10 registers x (16 or 32 bits)* | MODBUS MASTER GROUP 31 |

* Depending on the Modbus Master channel configuration (section 3.3.5) - overwritten registers 1 do 1.

# 10. Execution codes

| **KD10 Screen Recorder-** | X | X | XX | X | X |
|---|---|---|---|---|---|
| **Measurement inputs**: | | | | | |
| 6 programmable measurement inputs | 1 | | | | |
| 12 programmable measurement inputs | 2 | | | | |
| 18 programmable measurement inputs | 3 | | | | |
| **Additional inputs/outputs**[1] | | | | | |
| lack | | 0 | | | |
| 8 relay outputs | | 1 | | | |
| 6 binary inputs, 4 relay outputs | | 2 | | | |
| 6 binary inputs, 3 analog outputs | | 3 | | | |
| 4 binary inputs, 6 analog outputs | | 4 | | | |
| **Execution** | | | | | |
| standard | | | 00 | | |
| special* | | | XX | | |
| **Language version:** | | | | | |
| multilingual Polish/English | | | | M | |
| other* | | | | X | |
| **Acceptance tests:** | | | | | |
| no additional requirements | | | | | 0 |
| with additional quality control certificate | | | | | 1 |
| with calibration certificate | | | | | 2 |
| as agreed with the recipient* | | | | | X |

[1]option not available for 18 programmable measurement inputs

*only after consultation with the manufacturer

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