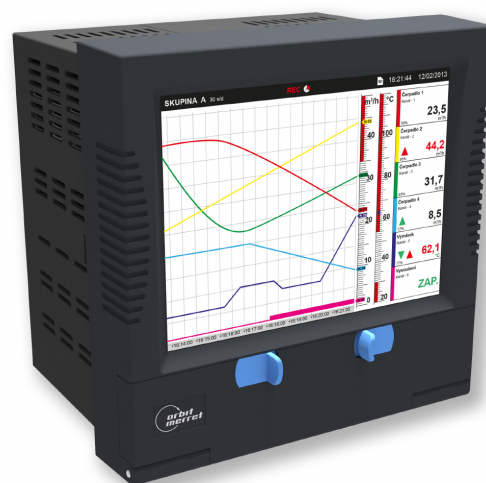


# OMR 700 User guide

Modular paperless recorder



## SAFETY INSTRUCTIONS

Please read carefully the enclosed safety instructions and observe them! Installation, all operational interventions, maintenance and service must be performed by a qualified personnel and in accordance with the attached information and safety regulations. The manufacturer is not liable for damage caused by improper installation, configuration, maintenance, and service.

The recorder must be installed according to the respective application. Incorrect installation can cause a malfunction, which can result in damage or accident.

The recorder uses dangerous voltages that can cause a fatal accident. Before you start solving problems (e.g. in case of failure or disassembly), the device must be disconnected from the power supply. For safety information the EN 61 010-1 + A2 standard must be observed.

When removing or inserting a card, observe the safety instructions and follow the recommended procedure. During any intervention the recorder must be disconnected from the power supply.

Do not attempt to repair or modify the device. A defective recorder must be sent for repair to the manufacturer.

These devices should be safeguarded by isolated or common fuses (breakers)!

The recorder is not designed for installation in potentially explosive surroundings (Ex). Use it only outside potentially explosive surroundings.

### Technical Data

Paperless recorders of the OMR 700 series conform to the European regulations 3/23/EU and 2014/30/EU.

They are up to the following European and Czech standards:

EN 61010-1, Electrical safety

EN 61326-1, Electronic measuring, control and laboratory devices - Requirements for EMC "Industrial use"

Seismic capacity:

IEC 980: 1993, art. 6

The recorders are applicable for unlimited use in agricultural and industrial areas.



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# 1 Introduction

Examples of typical use cases are at the end of this document in the [Examples](#) section.

# 1 Introduction

## 1.1 Device overview

The OMR 700 Paperless Recorder is a modular, highly configurable multifunctional device. It is mainly focused on measured value visualization and storage, however flexibility of configuration allows it to perform various tasks.

### Front panel

The front panel of the device consists of large touchscreen panel and front door. With the door closed, front panel of the device is water resistant according to IP64. It's possible to use a seal to keep the door protected against unauthorized access. With the front door opened, user has access to:

- external storage slots (SD Card, USB Flash)
- micro USB communication port
- status LEDs
- configurable user buttons
- reset button
- stylus (for using the device with gloves)

### Back side

The power supply card, built-in basic communication card and modular IO cards are accessible from the back side of the device.

Basic IO communication card has following ports:

- 10/100B Ethernet
- RS-485 (Modbus RTU)
- 5x digital input
- 2x digital output

# 1 Introduction

## 1.2 Basic building blocks

Functionality of the paperless recorder is based on following modules:

- a) Inputs and Outputs
- b) Nodes
- c) Screens
- d) Records
- e) Timers
- f) Constants
- g) Events
- h) Fieldbuses
- i) Groups

### Inputs and outputs

Provide means to capture measured values from input cards and to control other devices by output cards.

### Nodes

Central point for manipulation with values/data. Used to process measured data using mathematical and logical operations and prepare said data for visualization and recording.

### Screens

Graphical representation of measured or calculated values on display.

### Records

Used to store measured data to available storage in user-configurable format.

### Timers

Provide periodic execution of linked modules functions.

### Constants

User-configurable named values for further use.

### Events

Used to execute certain actions when input conditions are met.

### Fieldbuses

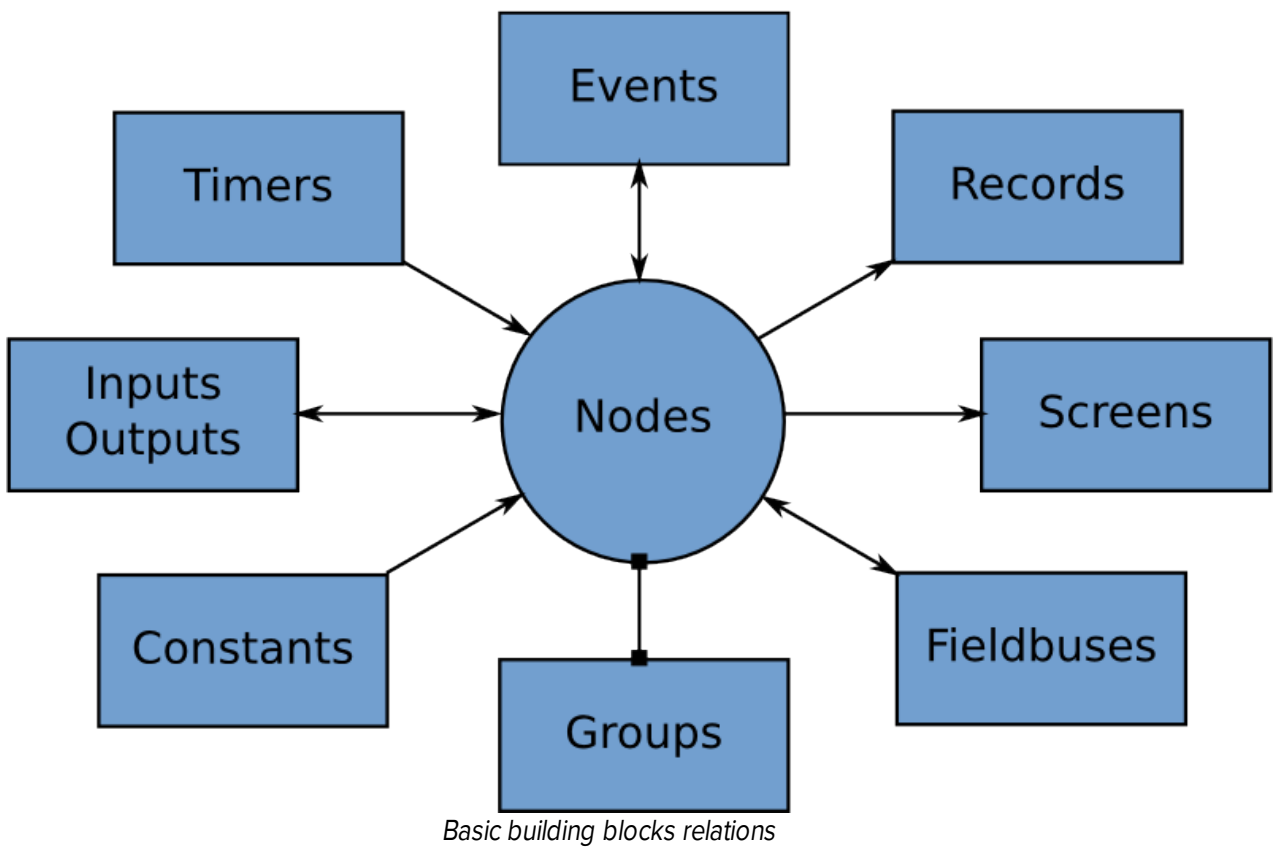
Communication using standard industrial network protocols.

### Groups

Create collections of related nodes for easier configuration.



# 1 Introduction



# 1 Introduction

## 1.3 Value types

In general the device operates with three types of values. These value types are mentioned throughout the documentation and device itself.

### **Mathematical**

In programming called floating point numbers, they are general values that can contain fractional part.

For example: 100, 13.5, -0.125

### **Counter**

Integer numbers. Positive or negative numbers without fractional part. They should be used when working with counters because they can store higher numbers than mathematical values.

### **Logical**

Two-state logical/binary values. On/Off, 1/0 or True/False.



## 2 Main screen

The most important part for interaction with the device is its screen. It provides access to all device functions, controls and also displaying measured values on the screen is the main way of data visualisation.



## 2 Main screen

### 2.1 First start

After you start the device for the first time (or after factory reset) you will be greeted by a setup wizard. There you can configure device language, time, time zone and set up an administrator account. Creating an administrator account will allow you to configure the device with a password of your choice instead of using the default "Universal" account with preset password.

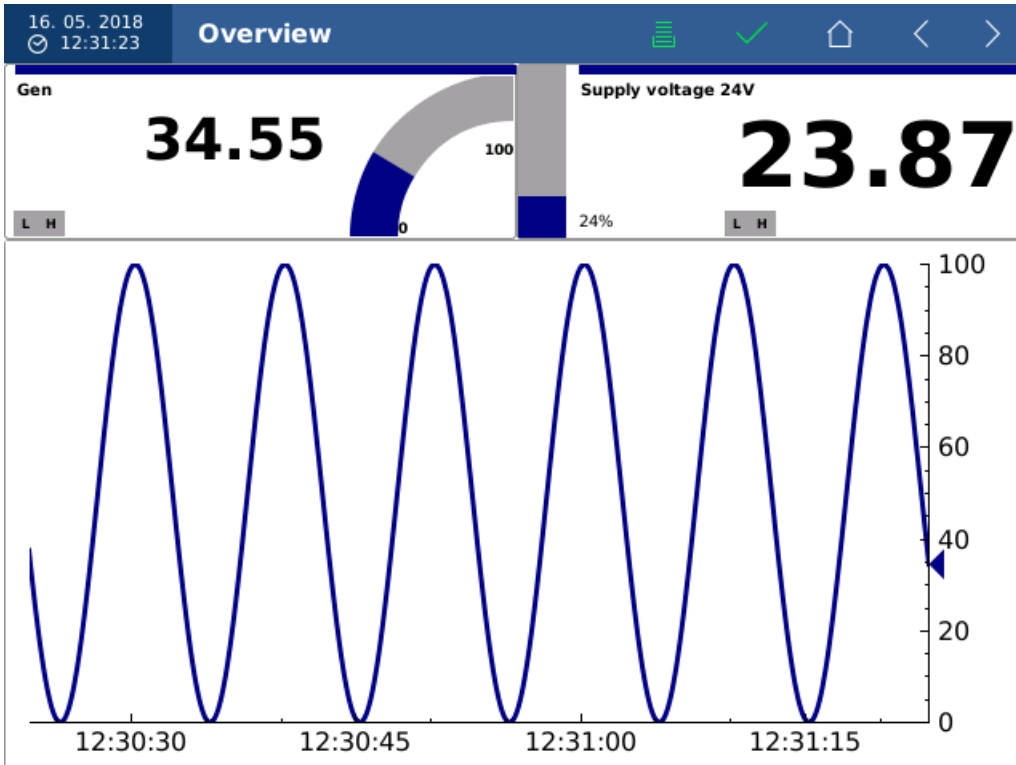
Since the device is modular and can serve various purposes, it does not come with a preset configuration. This means there are no nodes, screens, etc. configured and the default screen after turning the device on is blank. To setup basic functionality you can configure the device according to [examples](#).

# 2 Main screen

## 2.2 Overview

After turning the device on, you can see the main screen. It consists of control panel on the top and view area covering most of the display.

*Note: if there is no available screen configuration, the view area is empty and only the top panel is visible.*



Overview of the main screen

The panel on top of the screen provides access to device functions. It consists of:

- [Clock](#)
- [Screen selector](#)
- [Storage status indicator](#)
- [Device status indicator](#)
- [User button](#)
- [Screen switching buttons](#)

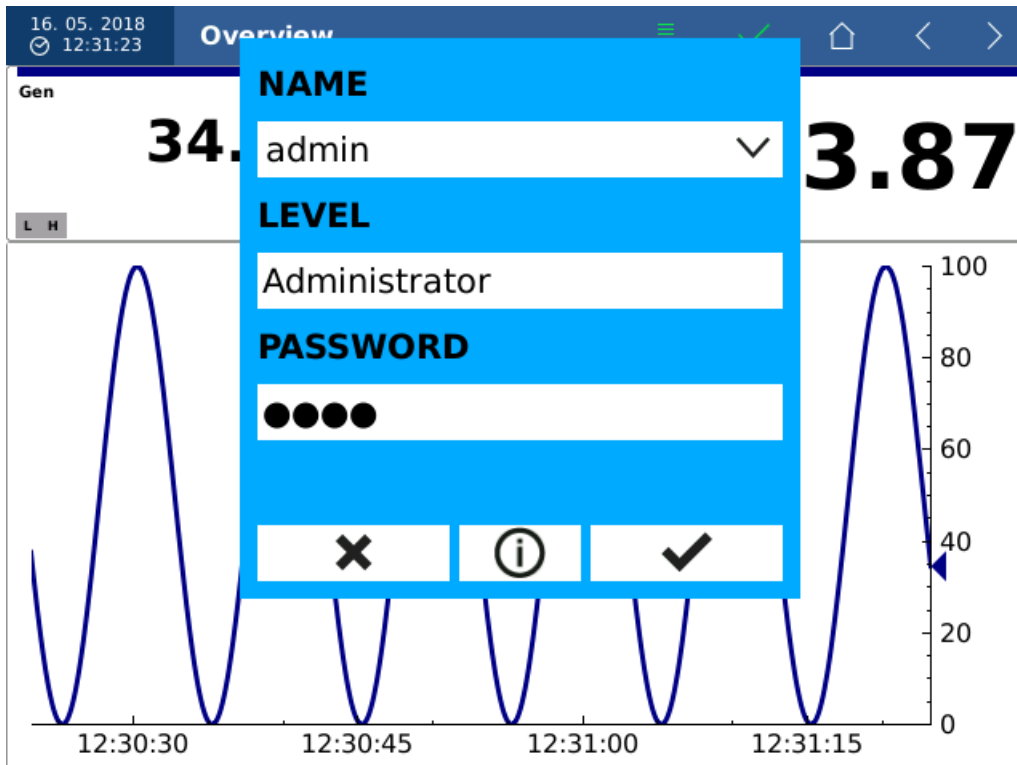
Value views that take up the rest of the screen can be configured in the [Screen module](#).

## 2 Main screen

### 2.3 Logging in

Logging-in, logging-out and access to menu is possible using the "user" button. The user button's icon changes depending on whether any user is logged-in and what are his user rights.

Clicking on the button while no user is logged in opens a login dialog



*Login dialog*

Select the name of the user you want to login as in the "NAME" field, type in the password and click on the OK button.

#### Panel without a logged-in user

The appearance of the bar without a logged-in user. Control buttons are disabled and therefore you cannot enter the menu, view errors, logs or open the storage media diagnostics. By default screen switching is also disabled.



*Main panel without a logged-in user*

#### Panel with a logged-in user - level "User"

User with access rights "User" has the right of switching over screens, viewing errors, logs and memory media.



*Main panel with a logged in user level "User"*



## 2 Main screen

### Panel with a logged-in user - level "Operator" and higher

User with access rights "Operator" and higher has, in addition, access to the menu.



*Main panel with "Operator" or higher level user logged-in*



## 2 Main screen

### 2.4 Switching screens

If you have multiple screens configured, you can use the main panel to switch between them manually. Clicking the screen name opens a menu with all the configured screens. To switch to next or previous screen, just click on the arrows on the right side of the panel.

Unless the option to [switch screens without login](#) is enabled, you need to be [logged-in](#) to perform this action.

Screen switching can also be done automatically using [slideshow](#) or by [events](#).





## 2 Main screen

### 2.5 Storage state

The "storage" icon provides an easy overview of current storage state.





The icon changes color according to remaining available storage capacity. If there is enough free space left, the icon is green. When any of the media is at least 80% full, the icon's color will change to yellow. After reaching 90% the icon turns red.

Clicking the icon opens the [storage diagnostics](#) dialog.

## 2 Main screen

### 2.6 Device state

The "status" icon shows the current status of the device.

Icon	State	Comment
	OK	The device works without any issues.
	Warning	The device operates outside of specified values, but without consequences on its functions. This state can be caused for example by undervoltage greater than 10%, by filling the memory in excess of 80%.
	Error	The device operates outside of specified values with possible consequences on its functions. This state can be caused for example by undervoltage greater than 20%, by filling the memory in excess of 90%.
	Critical error	The device operates outside of specified values with consequences on its functions. This state can be caused for example by undervoltage greater than 50% or by filling the memory up to 100 % so that it is not possible to make records.

States "Warning" and "Error" will return back to "OK" as soon as and only if conditions are back to normal. State "Critical error" has to be manually acknowledged by user with sufficient user rights. All these events are logged.

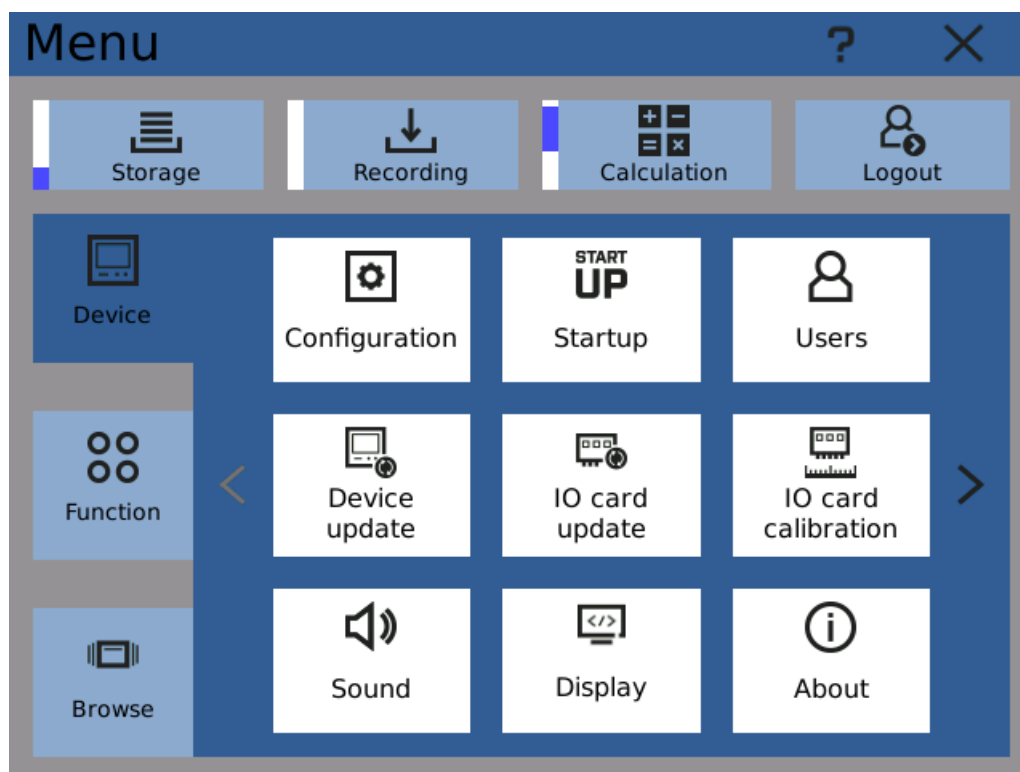
Apart from predefined triggers (power supply voltage, storage fill level, etc.) these system states can be triggered by setting appropriate configuration in [nodes](#).

## 3 Menu

Device configuration menu can be opened by logging in as authorized user and clicking on the menu icon on the main panel.

On the top of the menu you can see a group of [indicators](#). Below them are buttons for accessing device functions sorted into three categories

- [Device](#)
- [Function](#)
- [Browse](#)



Main menu

## 3 Menu

### 3.1 Indicators

#### **Storage indicator**

Represents state of device storage - internal, SD Card and USB Flash. The bar on the left shows used/free space of the storage with least free space at the moment.

Clicking on the indicator opens [storage diagnostics](#).

#### **Recording indicator**

If the device is recording at the moment, the indicator shows an animated progress bar on the left side. Clicking on the indicator toggles recording.

Before starting recording, make sure you have configured recording profiles and required storage media are available.

#### **Calculation indicator**

Displays an animated progress bar if the device calculations are turned on. Clicking on the indicator toggles calculation.

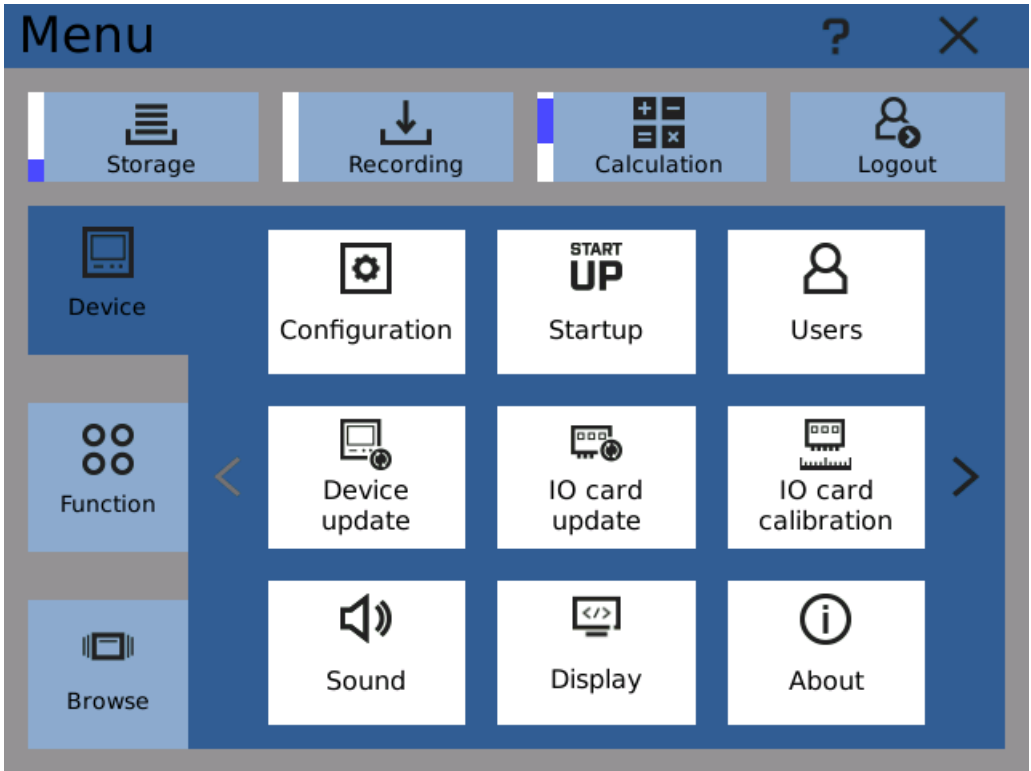
Turning off calculations can be used for maintenance or device configuration.

#### **Logout button**

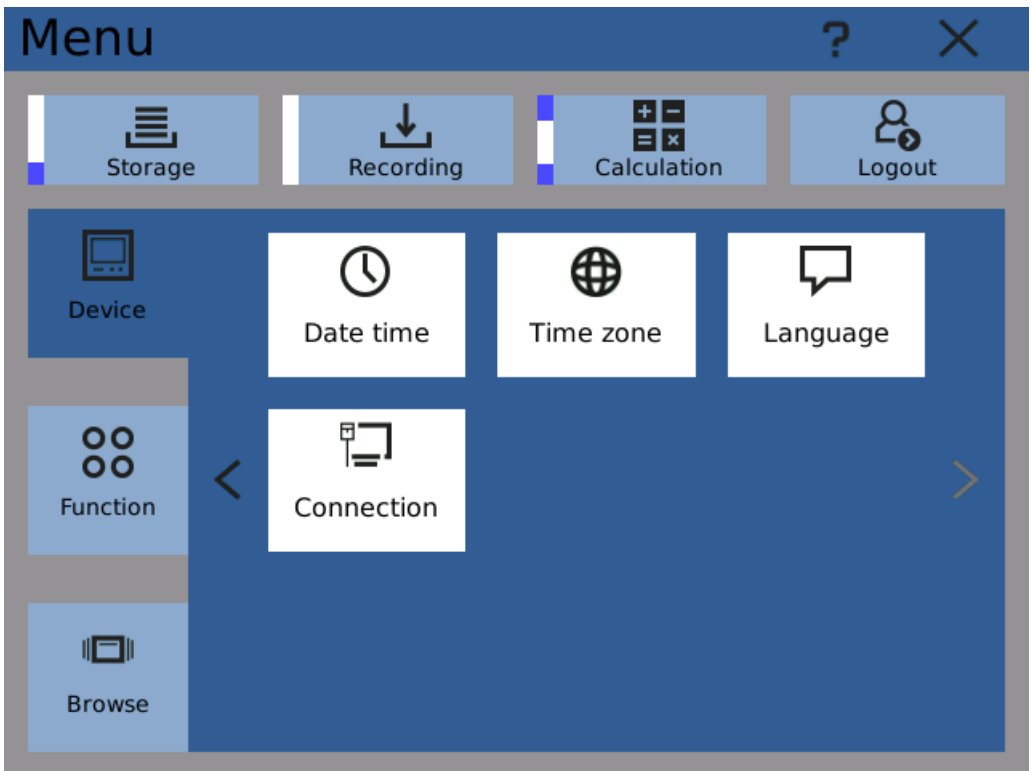
Clicking on the logout button logs-out the current user and closes the menu.

# 4 Device menu

The Device category in the main menu contains shortcuts to various device configuration and administration dialogs.



Device menu - first page



Device menu - second page

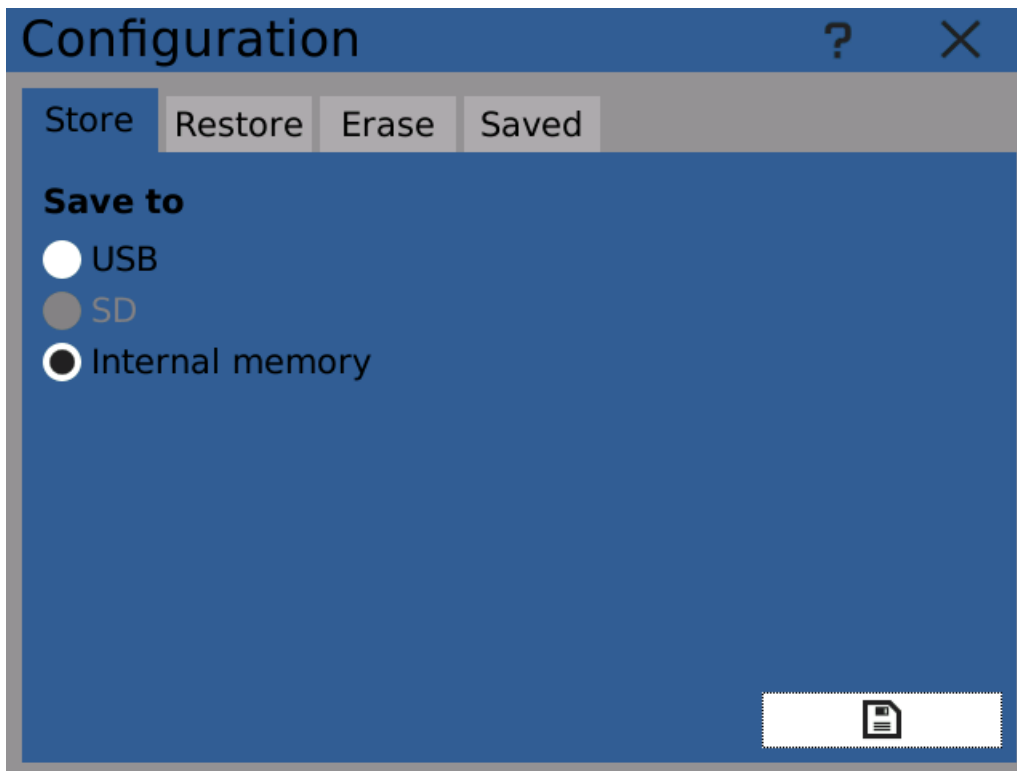
## 4 Device menu

### 4.1 Configuration

Using the Configuration dialog you can work with device configuration - save it as a package, load it from a package or erase it.

#### Store

Storing configuration creates a package with complete configuration of the device on the selected storage (Internal memory, SD Card or USB Flash). For identification, the name of the package consists of device serial number, firmware version and time of creation. This information is later used when restoring/loading the configuration package and should not be altered.

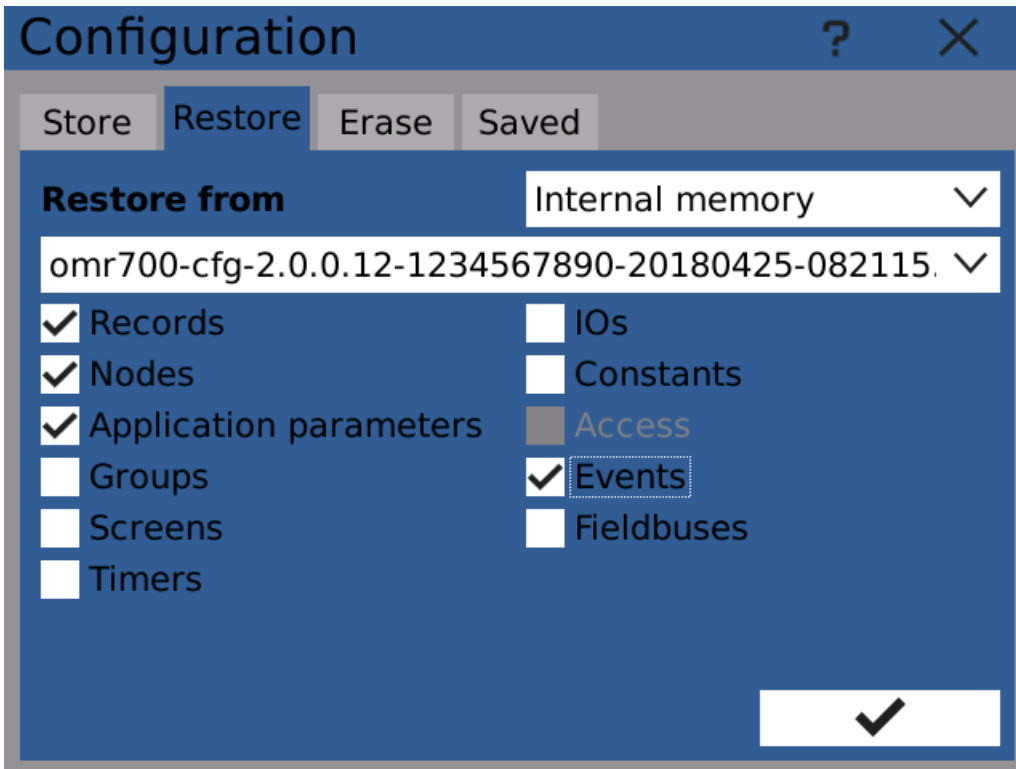


Configuration - store

#### Restore

Selecting a package and choosing which components of configuration are to be restored loads configuration from the package and replaces the currently used one. This way you can restore older configuration from backup or load configuration from another device.

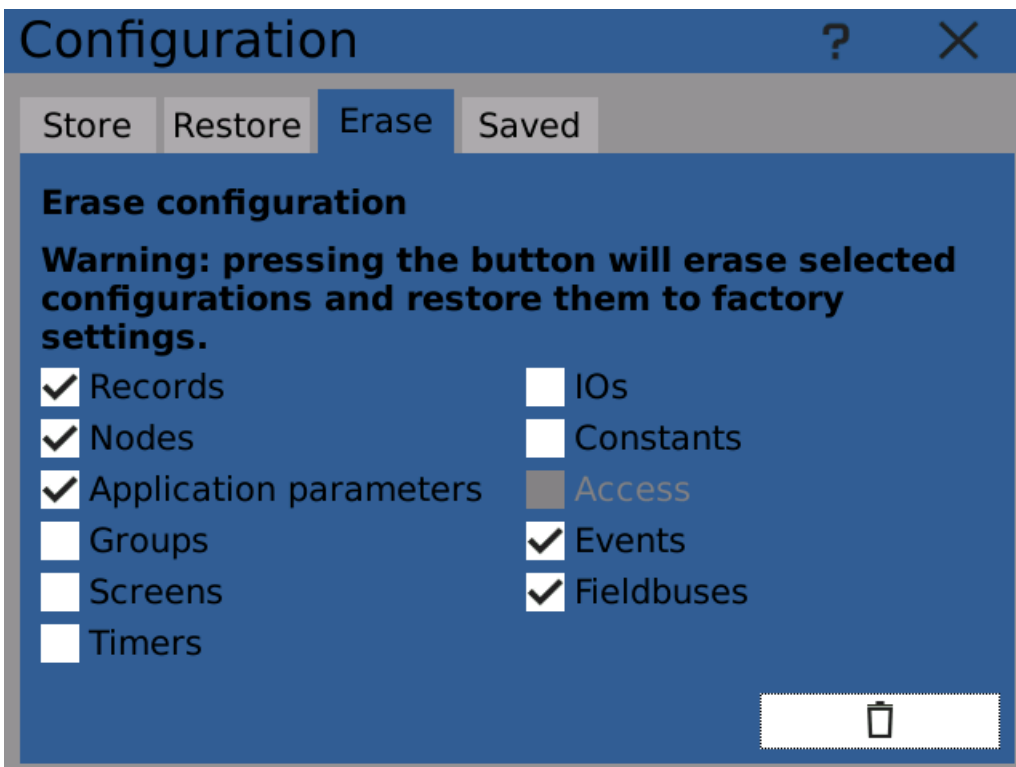
## 4 Device menu



Configuration - restore

### Erase

Selecting components and clicking on the erase button deletes configuration of all the selected components. Erasing all of them reverts device configuration back to factory settings.

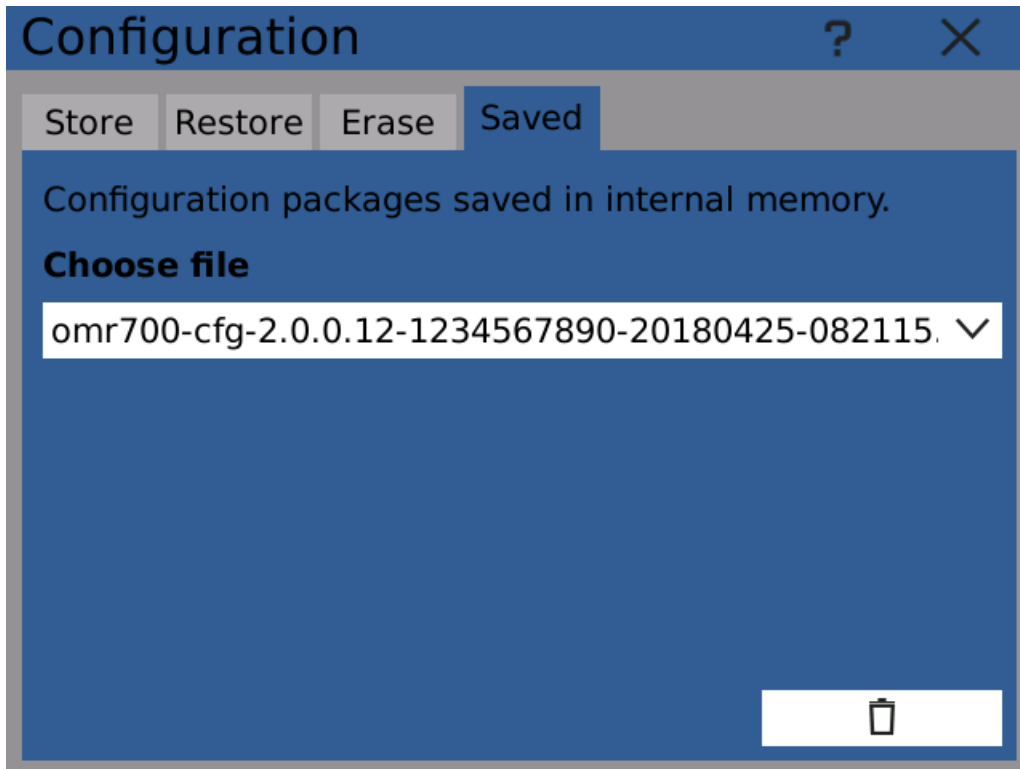


Configuration - erase

## 4 Device menu

### Saved

This window allows you to erase configuration packages stored on the device's internal storage. For deleting packages stored on SD Card or USB Flash you can use a computer.



*Configuration - saved*



# 4 Device menu

## 4.2 Startup

Startup configuration determines how the device acts after being turned on.

### Recording

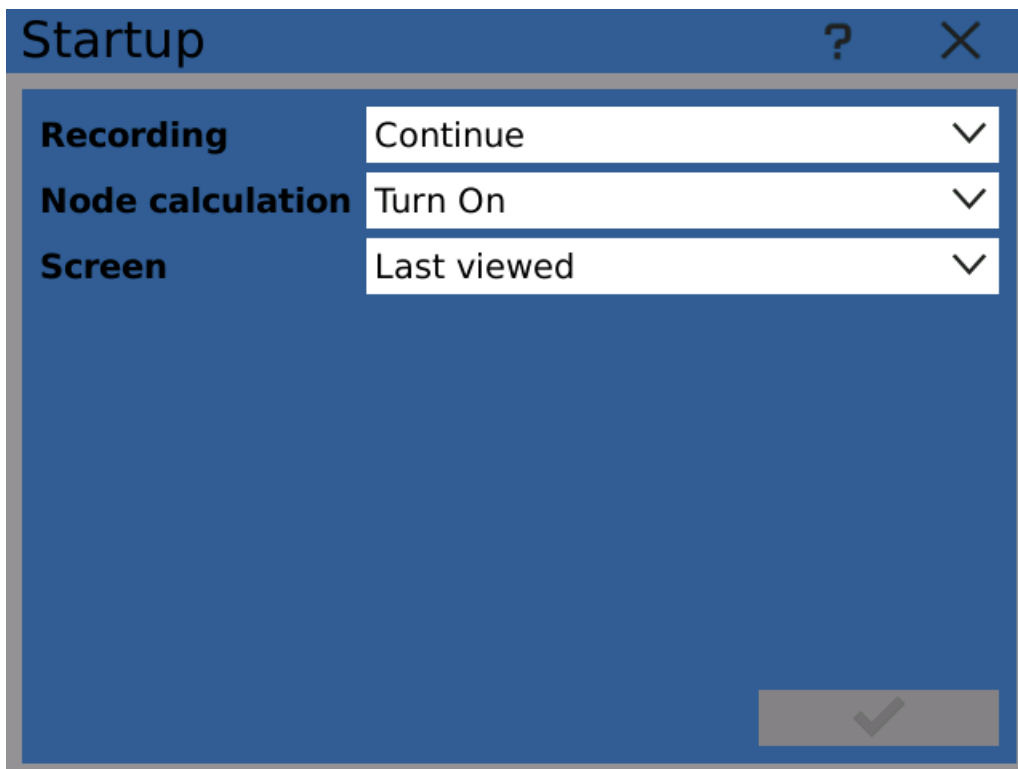
- Continue - if the device was recording when turned off, recording will resume
- Turn off - recording will not start on device start up
- Turn on - recording will start on device start up

### Node calculation

- Continue - if calculation was turned on when the device was turned off, calculation will resume
- Turn off - calculation will not be started on device start up
- Turn on - calculation will be started on device start up

### Screen

- Last viewed - the device will switch to displaying the same screen, that has been viewed when the device was turned off
- Selected screen - the device will switch to selected screen on start up



Configuration - startup

# 4 Device menu

## 4.3 Users

The Users dialog shows currently configured user profiles and can be used to add, remove or change them by users with sufficient user rights.

User rights level determines what actions the current user can and cannot do. It is advisable to assign low user rights levels to users that are only operating the device and use the higher level administrative user profiles just for administration.

One user account "Universal" is preconfigured and not possible to delete or change. This user has absolute rights and it's password is written in the documentation alongside serial number and other device-specific information. This user should not be used under normal conditions, only for example for recovering lost passwords.

### Name

Name of the user. This name is displayed for example while logging in or in logs.

### Level

User rights level.

Index	Access level	Group
0	Not logged in	Operation
1	User	Operation
2	Operator	Operation
3	Master	Operation
4	Service	Service
5	Configurator	Configuration
6	Administrator	Configuration
7	Producer	Configuration
8	Universal	Configuration

### User level groups

- Operation - users that actively use the device but do not configure it
- Service - device maintainer, can troubleshoot problems, calibrate inputs and install updates
- Configuration - device administrators who configure and prepare the device to be used by others

### Logged in

Indicates if the user is currently logged in or not.

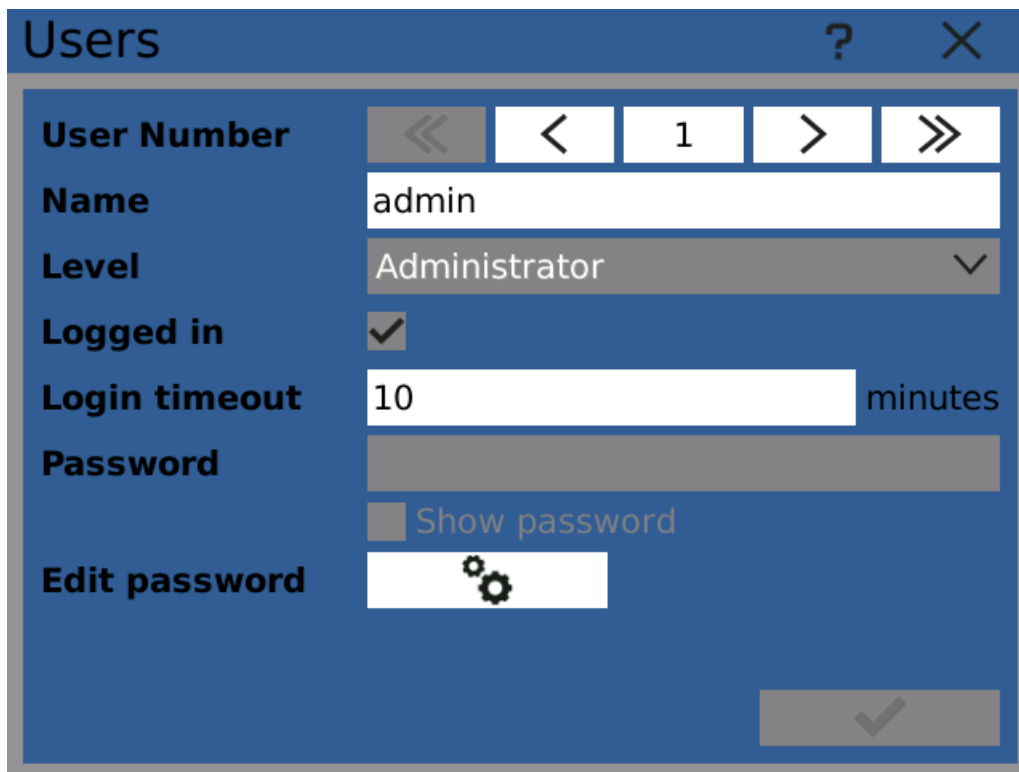
### Login timeout

Sets how much time has to pass without user interaction (touching the screen) before the user gets automatically logged out. It is safer to set lower time intervals.

# 4 Device menu

## Password

User password used for logging in. The password can be changed by clicking on "Edit password".



Configuration - users

## User rights level table

Action	Access right (by user level index)									
	0	1	2	3	4	5	6	7	8	
Screen switching	C	Y	Y	Y	Y	Y	Y	Y	Y	Y
Warnings and errors browsing	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Starting and stopping recording	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Changing system time	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Moving recorded data	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Browsing logs	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Displaying storage diagnostics	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Configuration of display and sound	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Acknowledging errors	N	N	N	Y	Y	Y	Y	Y	Y	Y
Changing constant values	N	N	N	Y	Y	Y	Y	Y	Y	Y
Display meter configuration	N	N	N	Y	Y	Y	Y	Y	Y	Y

# 4 Device menu

Diagnostics (I/O, system and connection)	N	N	N	N	Y	Y	Y	Y	Y
Event browser, Fieldbus browser	N	N	N	N	Y	Y	Y	Y	Y
Device and card firmware update	N	N	N	N	Y	Y	Y	Y	Y
Card calibration	N	N	N	N	Y	Y	Y	Y	Y
Record configuration	N	N	N	N	N	Y	Y	Y	Y
Function configuration (nodes, IO, timers, ...)	N	N	N	N	N	Y	Y	Y	Y
Start up configuration	N	N	N	N	N	Y	Y	Y	Y
Network configuration	N	N	N	N	N	N	Y	Y	Y
Device software reset	N	N	N	N	N	N	Y	Y	Y
Timezone configuration	N	N	N	N	N	N	Y	Y	Y
Language configuration	N	N	N	N	N	N	Y	Y	Y
User profile configuration	N	N	N	N	N	N	Y	Y	Y
Administrator account configuration	N	N	N	N	N	N	N	Y	Y
Producer account configuration	N	N	N	N	N	N	N	N	Y

Y ... Accessible  
 N ... Not accessible  
 C ... User-configurable

# 4 Device menu

## 4.4 Device update

Device update dialog allows you to update device software.

Software consists of two parts - firmware and system. It is necessary to have both packages prepared for upgrade.

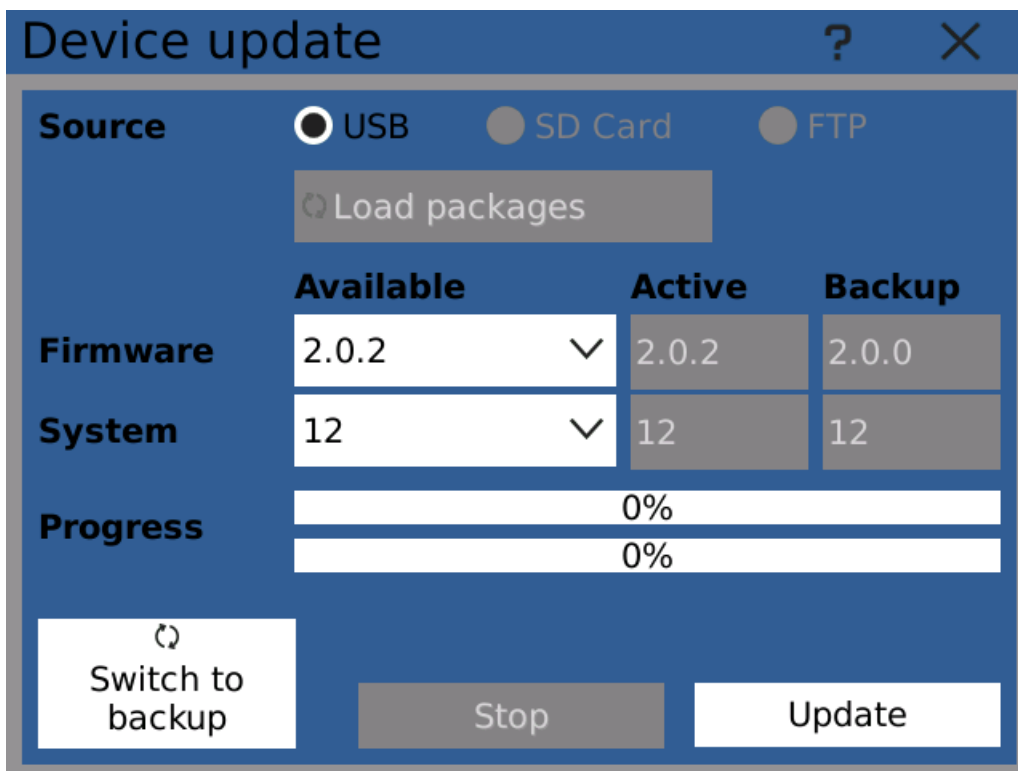
Note that the device has [two copies](#) of both firmware and system. You can see their versions as "Active" and "Backup". Update process replaces the "Backup" copy and then runs it on next device start, marking it as "Active".

### Update process

1. Download the latest packages from <http://www2.merret.cz/podpora/OMR700/Sw>
2. Place both of the on USB Flash in folder "omr700-upgrade"
3. Open the update dialog, select "USB" and click on "Load packages". Available software package versions should appear as "Available"
4. Click on "Update" and wait for the process to finish. It should not take more than 10 minutes.

After the update process finishes, it is recommended to restart the device.

Note: the "Switch to backup" button can be used to switch to [backup software.](#)



Device update dialog

## 4 Device menu

### 4.5 IO cards update

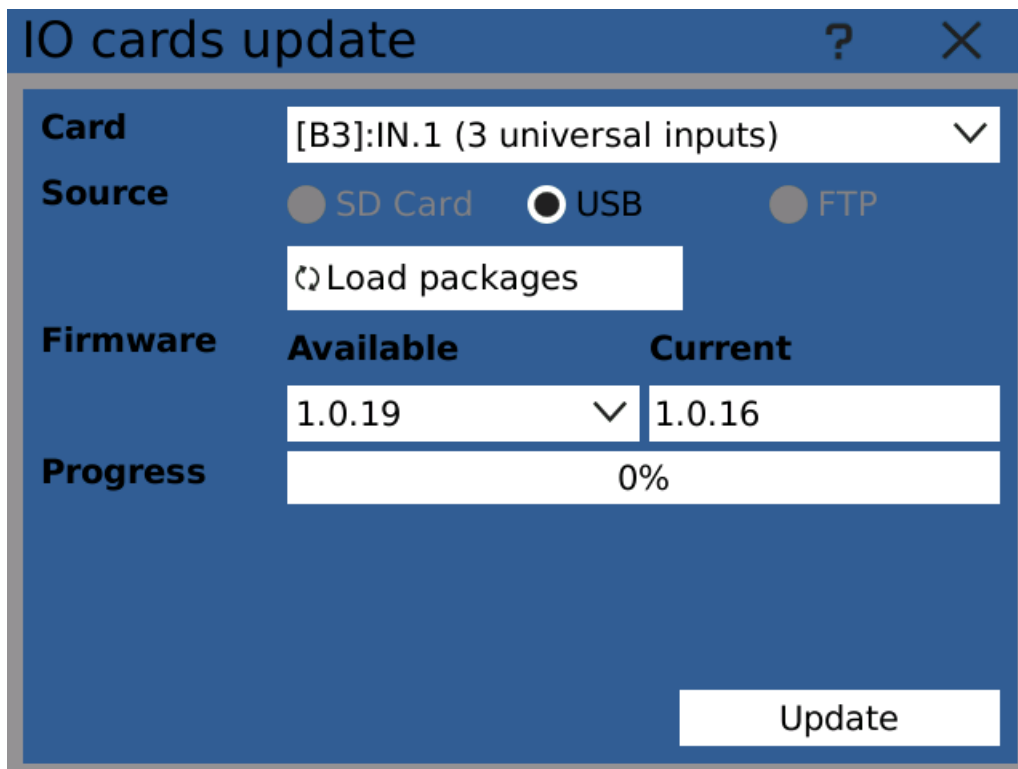
All IO cards have firmware of their own. Firmware packages are separate from device firmware - come packaged on their own.

IO cards update dialog allows you to select IO card, load firmware package from SD Card or USB Flash and update the card.

Latest IO card firmware can be downloaded from <http://www2.merret.cz/podpora/OMR700/Sw/Fw-cards/>

#### Update procedure

- 1) Choose a card from the card selector. Only the currently plugged-in cards will be visible. Version number of the currently running card firmware will become visible in the "Current Firmware" box.
- 2) Insert SD Card or USB Flash with the update package, select it and click on the "Load packages" button. If an appropriate package is found, it's version number will be visible in the "Available" selector. We recommend that you create a folder called "omr700-upgrade" on the storage media to store the packages.
- 3) Select the version of firmware you want to update to.
- 4) Pressing the button "Update" starts the update of the card firmware. Its progress is displayed by the progress bar. The whole update process should take just a few seconds.
- 5) After the update procedure finishes, the cards are put back to operation and are prepared for immediate use.



*IO cards update dialog*

## 4 Device menu

### 4.6 IO card calibration

Tool for custom IO card calibration.

IO cards have a calibration profile. The profile is preset during card production according to certified calibration equipment. In cases where it's necessary, this calibration profile can be replaced by user defined calibration. At any time it's also possible to remove user calibration and restore the factory settings.

<b>Position</b>	< B3 >
<b>Card Type</b>	IN.1 (3 universal inputs)
<b>Channel</b>	<< < 1 > >>
<b>Range</b>	Voltage 0 .. 10V ▾
<b>Offset</b>	0.00000
<b>Scale</b>	1.00000
<b>Value</b>	0.00054
Cal. Min	Store
Cal. Max	Restore
Restore factory calibration	

*IO card calibration dialog*

Calibration can be done separately for each range of each channel. It consists of two variables:

#### Offset

Offset value, calculated during the calibration. Offset shows the difference between the real and measured zero value. Ideally, this value is zero. This value is displayed in the selected range's units.

#### Scale

Scale value, calculated during the calibration. Ideally, this value is one. The value is a real number close to one.

The last field, "Value", show currently measured value. You can compare this value with the calibration device.

## CALIBRATION CONTROLS

#### Cal. Min

Calibrates the minimum value of the selected range.

## 4 Device menu

To calibrate value range minimum, it's necessary to apply minimum expected value to the input (for example 0V while calibrating 0 .. 10V range)

### Cal. Max

Calibrates the maximum value of the selected range.

To calibrate value range maximum, it's necessary to apply maximum expected value to the input (for example 10V while calibrating 0 .. 10V range)

### Store

Saves the measured calibration values persistently, so the calibration can be loaded and used even after device restart.

**It is recommended to store calibration values after completing the I/O card calibration.**

### Restore

Restores and applies the persistently stored calibration.

### Restore factory calibration

Restores and applies the factory calibration.

## CALIBRATION PROCEDURE

1. Select the card you wish to calibrate.
2. Select the desired channel.
3. Select the appropriate range.
4. The current calibration values and measured value are shown.
5. Proceed with the minimum value (offset) calibration by applying the precise range's minimum value to the card's input and press the "Cal. Min" button.
6. Now apply the precise range's maximum value to the input and press the "Cal. Max" button to calibrate the scale. Warning: it is not possible to calibrate the scale without calibrating the offset first.
7. Continue with calibration of all needed ranges and channels of the I/O card.
8. After successfully finishing calibrations, save the measured values by clicking on "Store".

*Note: It's not necessary to calibrate both Min and Max every time if one of the values is already calibrated properly*



## 4 Device menu

### 4.7 Sound

Select volume level using the slider. Setting the volume to 0 turns system sounds off.



*Sound configuration dialog*



## 4 Device menu

### 4.8 Display

Dialog Display configures for example screen brightness and color theme. Configuration options are sorted in following categories:

#### Display

##### Backlight

Brightness of the screen

##### Screensaver

Type of used screensaver. Type "Off" means screensaver never starts, "Blank" means the screen goes dark after selected period of time.

##### Dim screen after

Interval in minutes after which the backlight intensity lowers.

##### Start screen after

Interval in minutes after which the screensaver appears.

#### Access

##### Allow screen switching without login

When checked, it is possible to [switch screens](#) using controls on main panel without logging in first.

#### Slideshow

Turning on slideshow mode changes between selected screen in configured interval.

##### Enable

Permanently turns slideshow on or off.

##### Pause

Temporarily disables slideshow until unchecked or device restart. Can be used programmatically with [events](#).

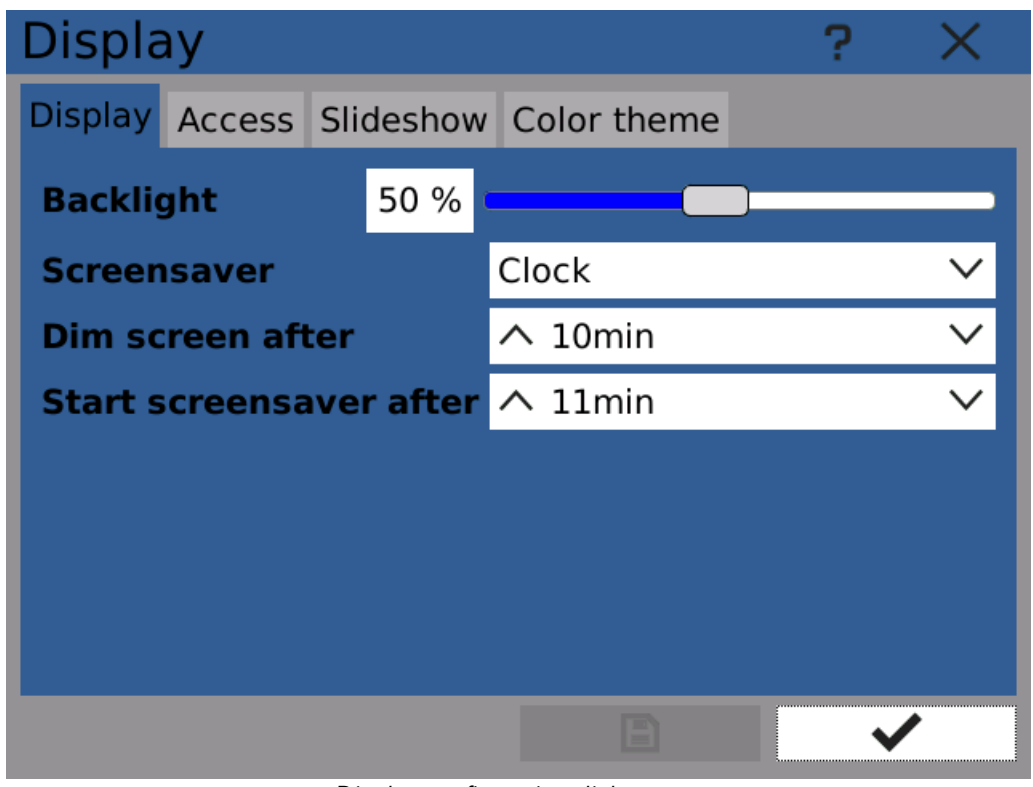
##### Interval

Time interval after which the current screen gets switched to next.

#### Color theme

The device allows you to choose between different color themes for main screen.

# 4 Device menu



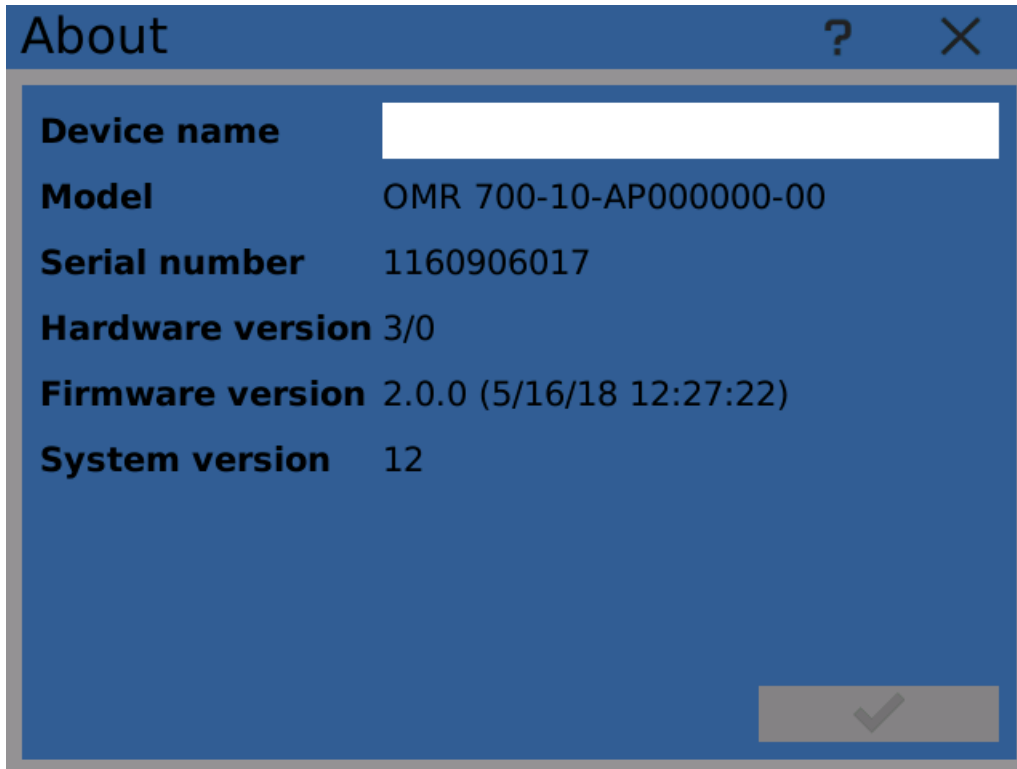
Display configuration dialog

## 4 Device menu

### 4.9 About

Various information about the device.

These values are useful for example when requesting customer support.



*Dialog About*

## 4 Device menu

### 4.10 Date time

System clock configuration. Configures device time (for the current [timezone](#)).

Apart from manual configuration, the device synchronizes time with network while connected to the Internet using NTP.

To change time

1. Select year
2. Select month
3. Select day in month by clicking on the calendar
4. Set time
5. Save by clicking on the OK button

**Warning: all records must be disabled while setting the time!**

*Note: change of time is stored in logs.*

The screenshot shows a 'Date and Time' configuration dialog. At the top, it says 'Date and Time' with a question mark and a close button. Below that, there are navigation arrows, the month 'May', and the year '2018'. A calendar grid follows, with days of the week (Mon to Sun) and dates. The date '16' is highlighted in yellow. Below the calendar, there is a 'Time:' label and a time input field showing '13:48' with up and down arrows. At the bottom right, there is a checkmark button.

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
18	30	1	2	3	4	5	6
19	7	8	9	10	11	12	13
20	14	15	16	17	18	19	20
21	21	22	23	24	25	26	27
22	28	29	30	31	1	2	3
23	4	5	6	7	8	9	10

Time: 13:48

✓

*Date and time configuration dialog*

## 4 Device menu

### 4.11 Time zone

The time zone is an important parameter, used throughout the device.

Start by selecting your region and then choosing the appropriate location from menus. Unless explicitly needed otherwise, turn on the "Automatically apply Daylight Saving Time" option. That way the device automatically changes time when daylight saving time change occurs.

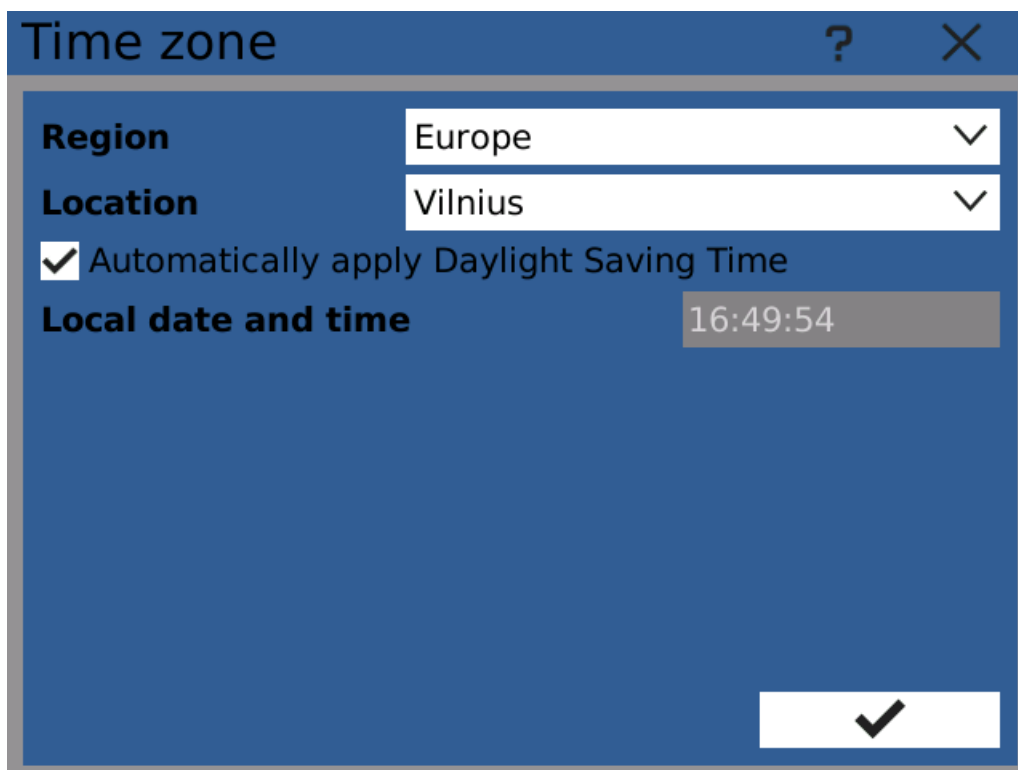
If the device clock and timezone are set properly, the "Local date and time" box should show the correct current time.

**Warning: all records must be disabled while setting the time zone!**

*Note: Changes of timezone are recorded in the log.*

*Note: Used time zone naming convention follows the official IANA time zone database*

*Technical note: the device internally stores all time information in UTC. Also records are stored in this way together with a note about configured timezone. This way it is possible to ensure that the timestamps are always clearly defined and there are no data losses while transitioning from daylight saving time to normal.*



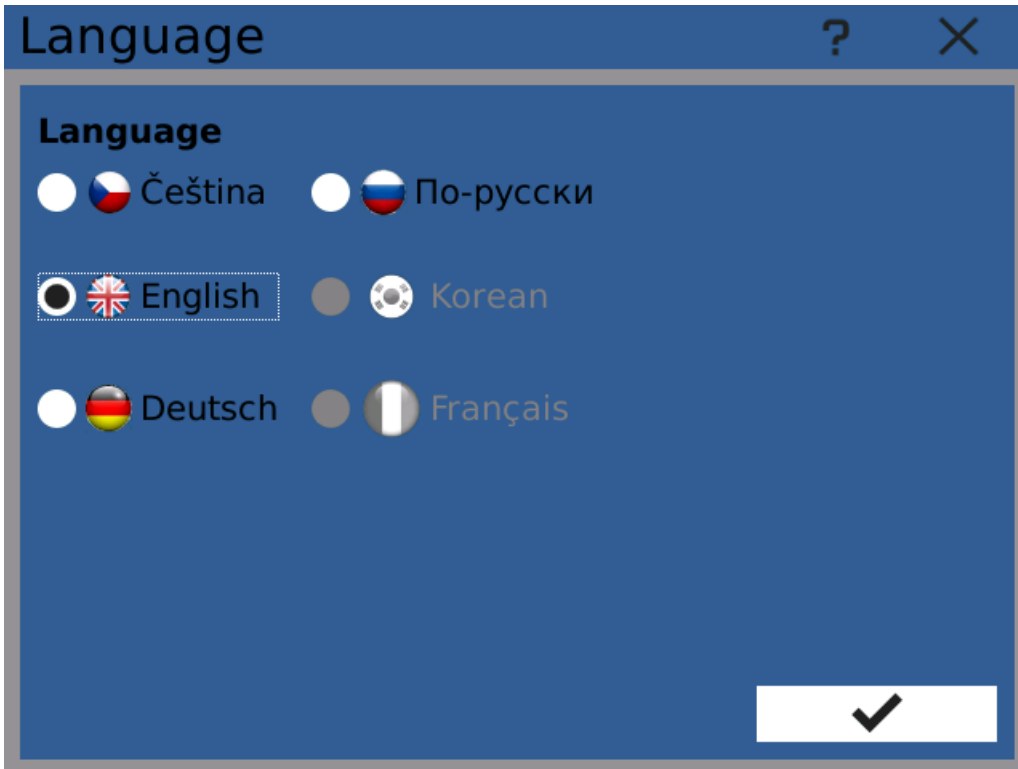
Time zone configuration dialog

*Time zone configuration dialog*

## 4 Device menu

### 4.12 Language

This dialog allows you to change system language. This selection also affects number formatting style (decimal separator, time and date format).



*Language configuration dialog*

## 4 Device menu

### 4.13 Connection

Dialog Connection configures network connection of the device.

The device has three network interfaces: Ethernet, USB Ethernet and WiFi.

*Note: USB Ethernet and WiFi are not available to use yet and will be enabled by software update later. WiFi is also available only for models with a WiFi module.*

#### General

Provides general overview over device network interfaces.

#### Hostname

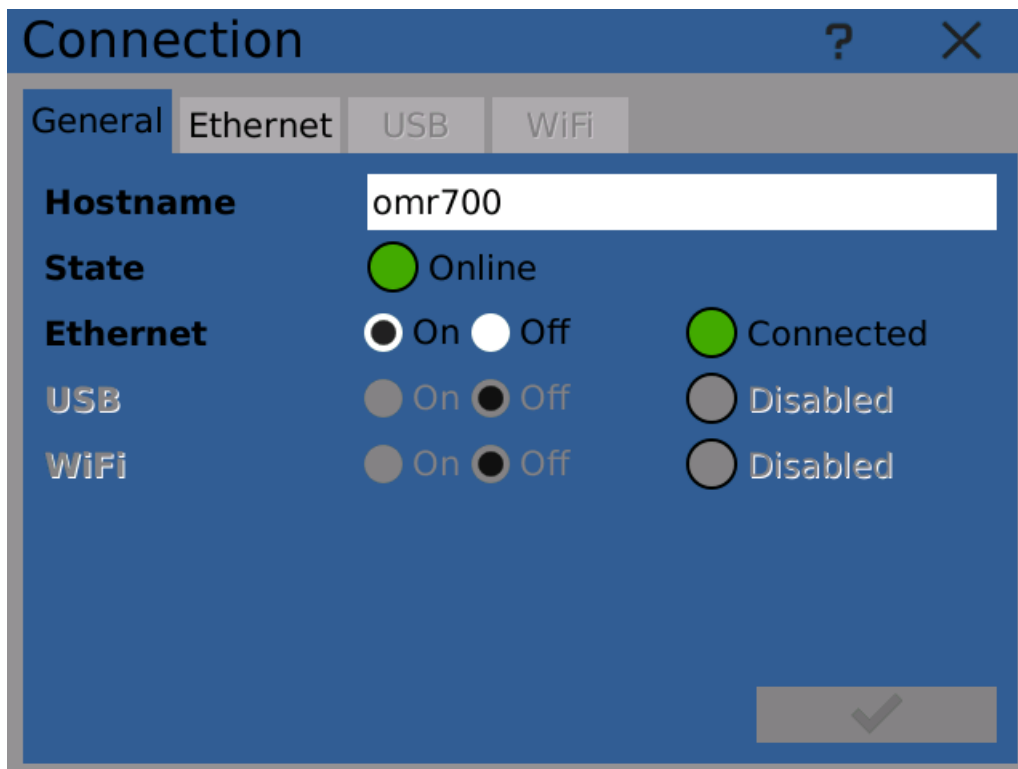
Device network name

#### State

General connection state.

- Offline - all network interfaces are off
- Idle - network interfaces are on but not connected
- Ready - At least one of the interfaces is connected
- Online - At least one of the interfaces is connected and has connection to the Internet

Clicking on "On" and "Off" turns enabled or disables interfaces.



Connection configuration dialog - general options

#### Ethernet

Ethernet interface offers network connection using standard 10/100B Ethernet. The Ethernet port can be found on the back of the device.





## 4 Device menu

### Service

Ethernet network connection is handled by the "Wired" service, eg. by fixed, cable connection. The service is available when the Ethernet cable is connected and can show following states:

### State

- Idle - the service is not active.
- Disconnected - the service has just disconnected and is switching to the "Idle" state.
- Failure - connection error has been detected.
- Association - the service is currently trying to connect to the remote device.
- Configuration - connection configuration is being loaded.
- Ready - the service is connected to the network.
- Online - the service is connected to the network and Internet connection is available.

### IPv4 Address

Current IP address of the interface.

*Note: the device does not support IPv6 addressing yet.*

### MAC Address

Hardware MAC address of the interface. This address is unique for every device. It is printed on the top of the case.

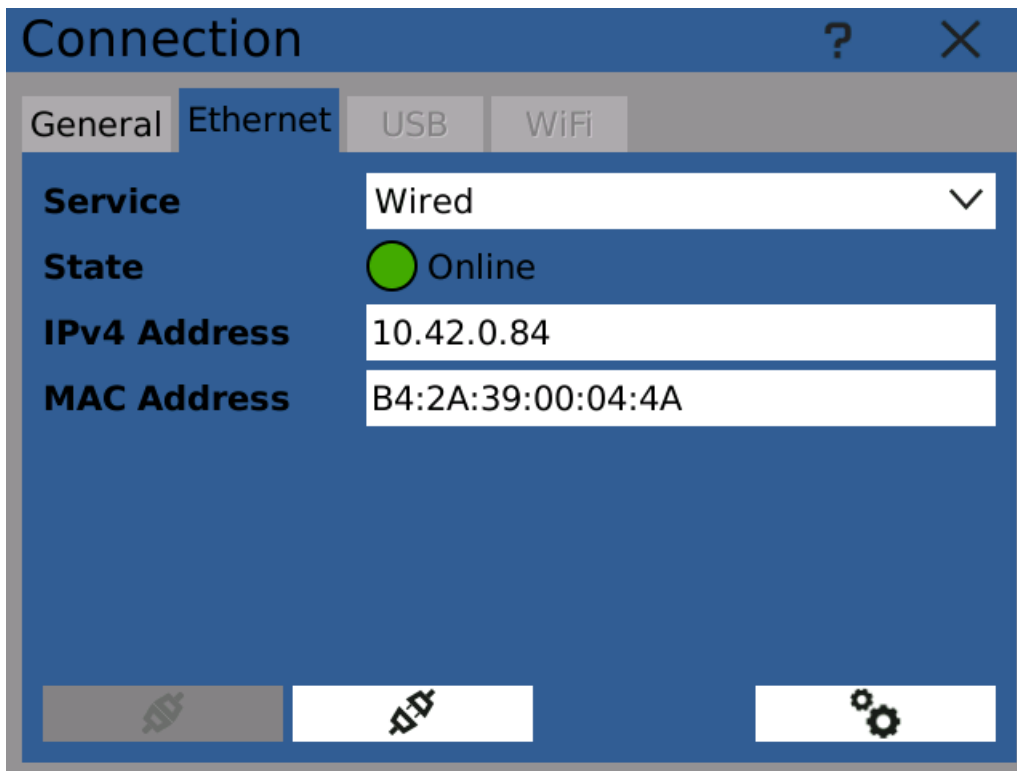
### Connect/Disconnect buttons

Connect or disconnect Ethernet connection

### Service configuration button

Opens the service configuration dialog

## 4 Device menu



Connection configuration dialog - Ethernet

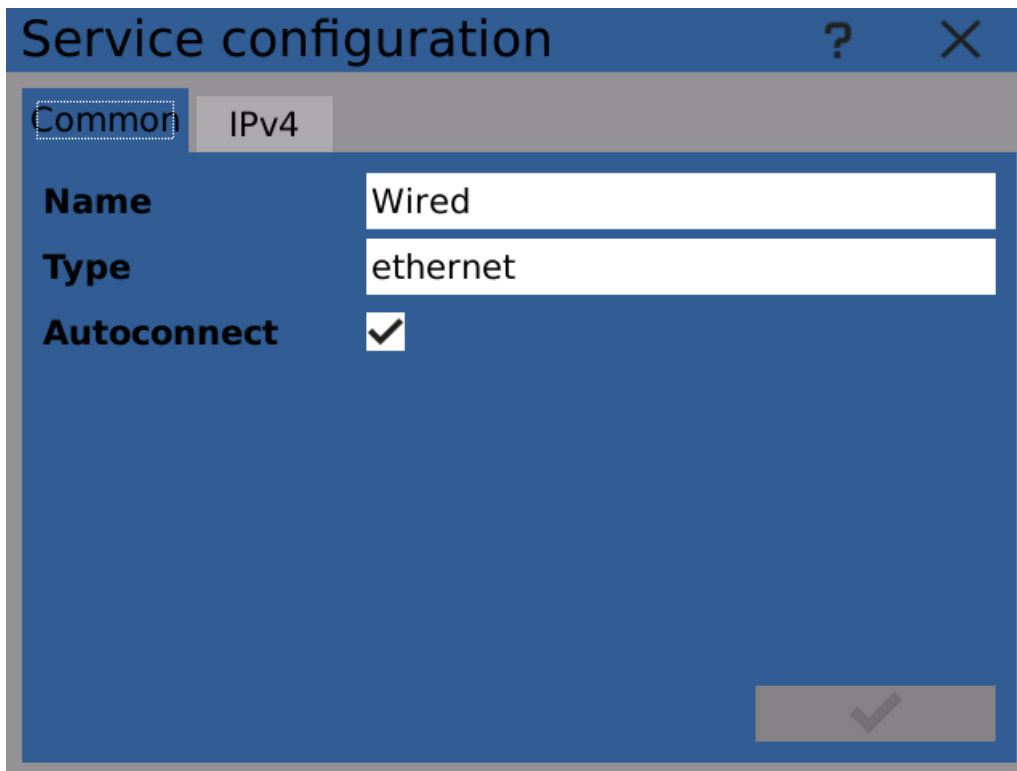
### 4.13.1 Service configuration

Configures the selected connection service profile.

#### Common

Common properties of the service. Displays its name and type. By checking "Autoconnect" this service is used whenever possible.

## 4 Device menu



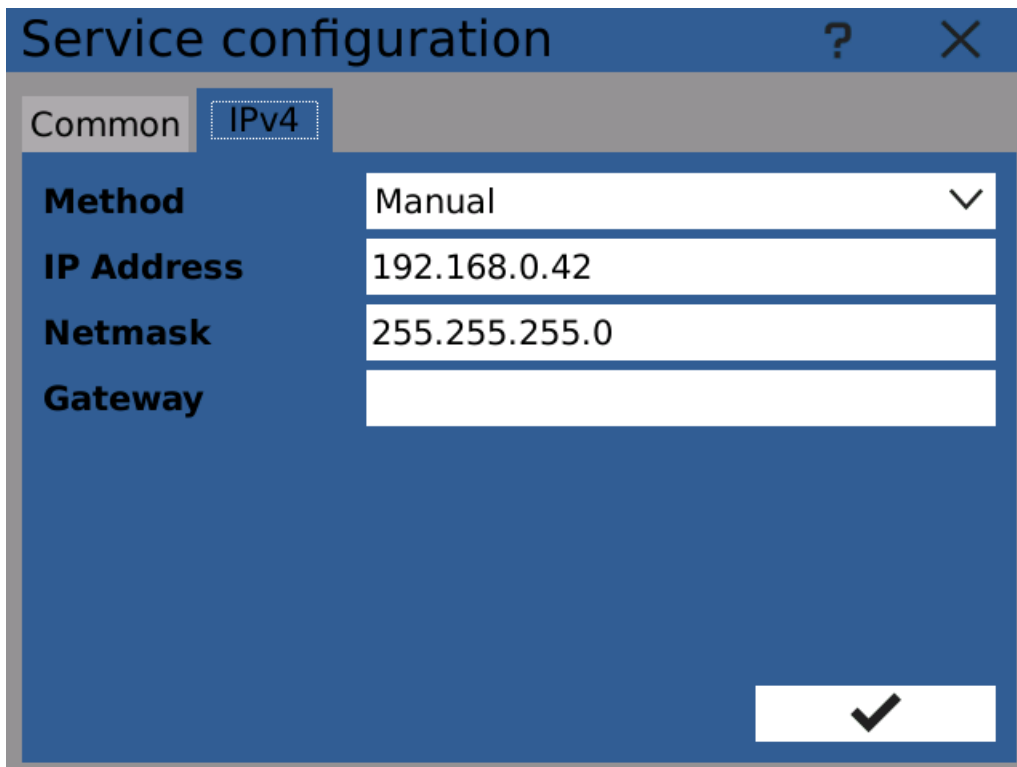
The image shows a 'Service configuration' dialog box with a blue header and a grey bar containing two tabs: 'Common' and 'IPv4'. The 'Common' tab is selected. The dialog contains three fields: 'Name' with the value 'Wired', 'Type' with the value 'ethernet', and 'Autoconnect' with a checked checkbox. A grey button with a white checkmark is located at the bottom right of the dialog.

<b>Name</b>	Wired
<b>Type</b>	ethernet
<b>Autoconnect</b>	<input checked="" type="checkbox"/>

Connection service configuration - common options

### IPv4

IP address configuration. IP address can be obtained either using DHCP or configured manually.



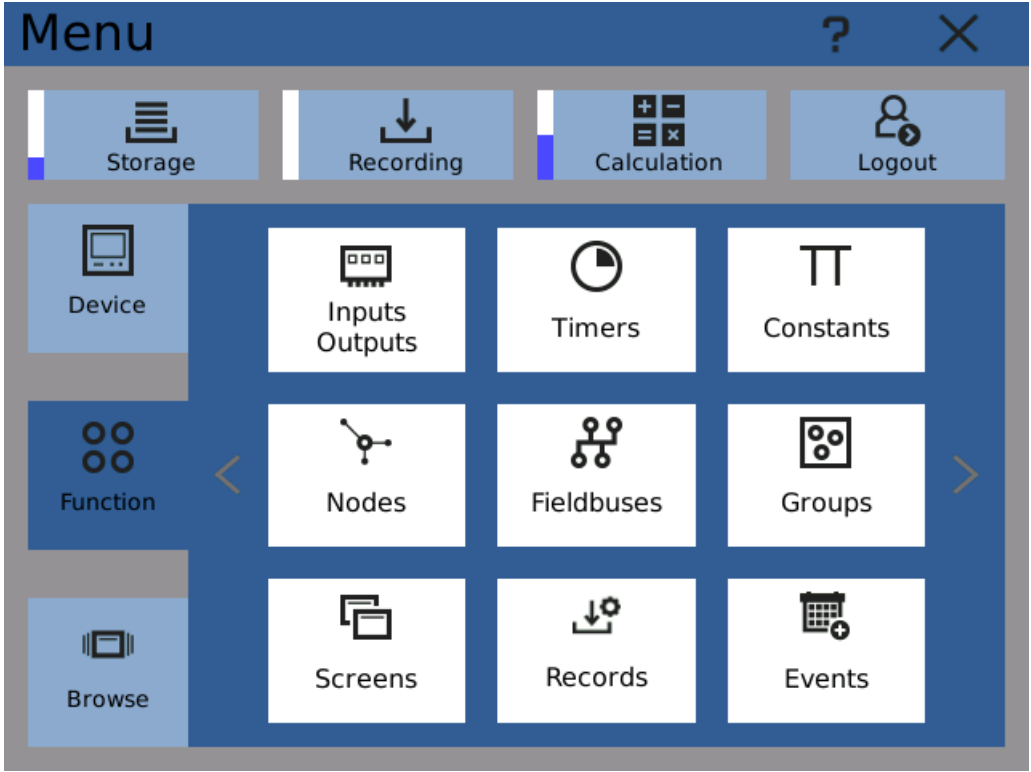
The image shows the same 'Service configuration' dialog box, but with the 'IPv4' tab selected. The 'Common' tab is now greyed out. The dialog contains four fields: 'Method' with a dropdown menu showing 'Manual', 'IP Address' with the value '192.168.0.42', 'Netmask' with the value '255.255.255.0', and 'Gateway' which is empty. A white button with a black checkmark is located at the bottom right of the dialog.

<b>Method</b>	Manual
<b>IP Address</b>	192.168.0.42
<b>Netmask</b>	255.255.255.0
<b>Gateway</b>	

Connection service configuration - IPv4 configuration

# 5 Function menu

Category function contains controls related to measuring, processing, visualization and storing data.



Function menu



# 5 Function menu

## 5.1 Inputs Outputs

Each of the modular IO (Input/Output) cards has a set of configuration options. These can be set separately for each channel.

### Position

Physical position/slot where the card is installed. There are 8 slots: A1-A4, B2-B5.

### Card type

Model of the card with short text explanation.

### Priority

Card data transfer priority. The default value "Low" is sufficient unless this card is supposed to perform high speed measurements (<10 ms sample interval).

In case of higher number of connected I/O cards, the data transfer rates can drop. By adjusting priorities you can achieve adequate transfer rates for all inputs.

Packet transfer rate also depends on card slot. Slots A1-A4 are two times faster than B2-B5 slots.

HIGH - the card will transfer every packet (1100 or 550 packets/s)

MEDIUM - the card will transfer every other packet (550 or 275 packets/s)

LOW - the card will transfer every fifth packet (220 or 110 packets/s)

### Channel

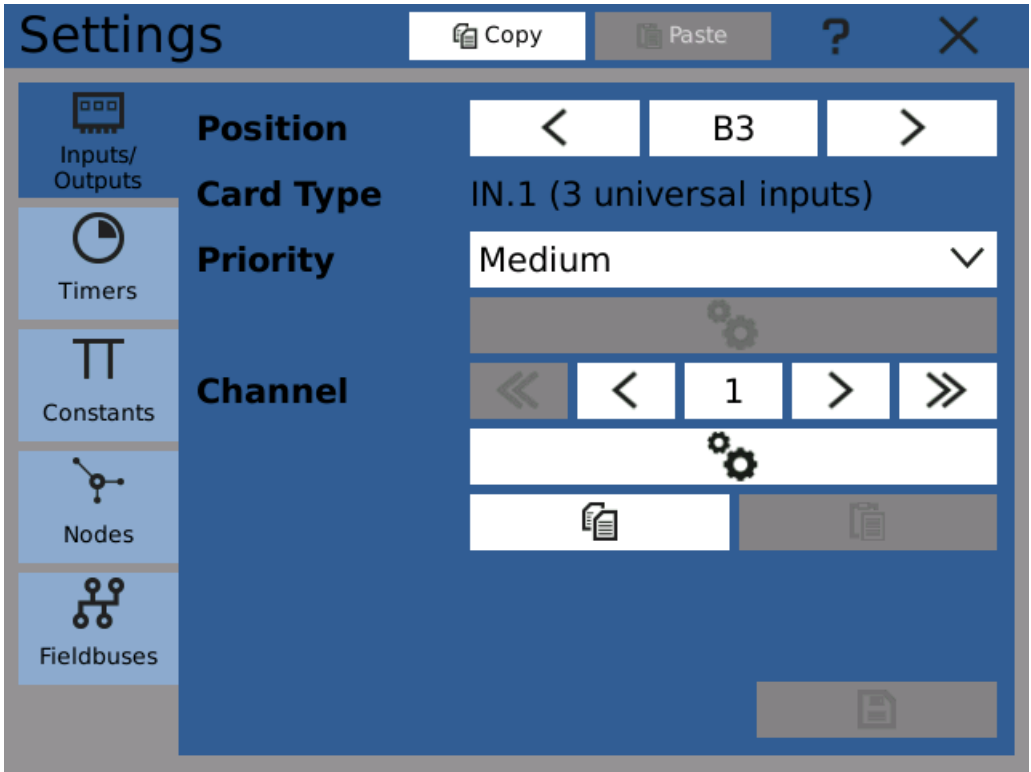
Channels of the card. Different cards have different number of channels. Here you can configure each channel separately. Configuration options depend on the card type.

You can copy card channel's configuration and apply it to a different channel using copy and paste buttons below the configuration button.

*Note: it's recommended to pass all values from card inputs through processing the values any further or displaying them.*

[IO-buffer type nodes](#) before

# 5 Function menu



*Input output configuration dialog*

# 5 Function menu

## 5.2 Timers

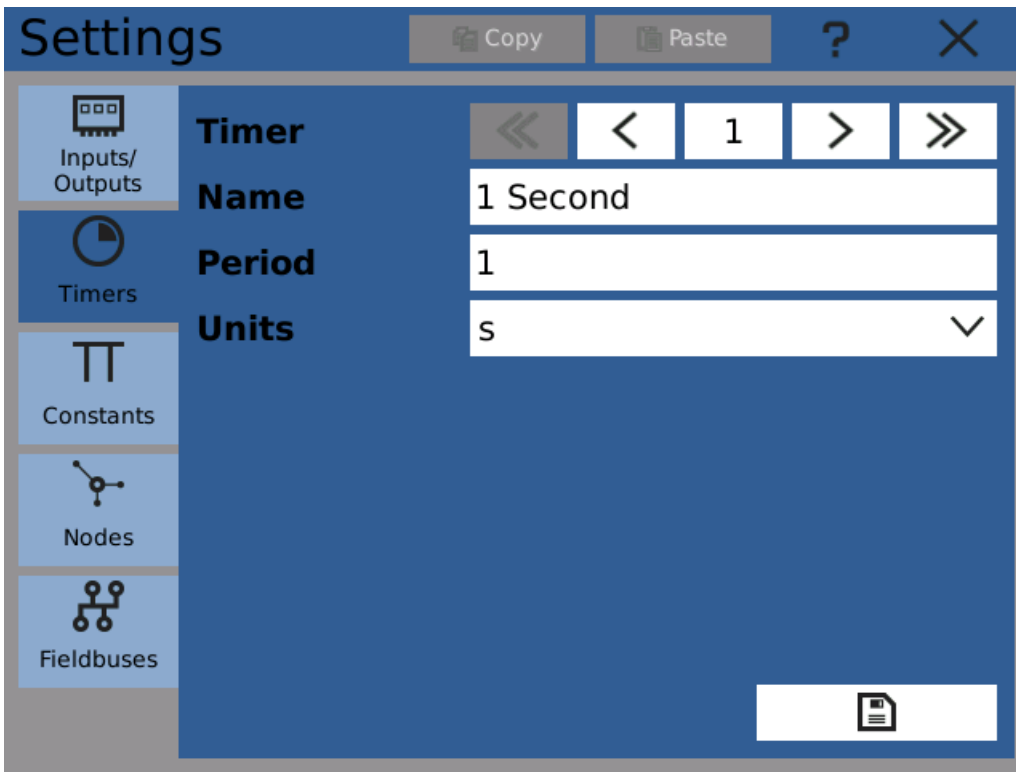
Timer are components that determine how fast certain actions take place. They are passive components, not processing data by themselves. By assigning them to nodes and records you can configure how fast they will be calculating and recording.

### Name

Name of the timer. You can use names like "Fast timer", or for example explicitly use the period "100ms timer"

### Period and Units

Period of the timer



Timer configuration dialog

# 5 Function menu

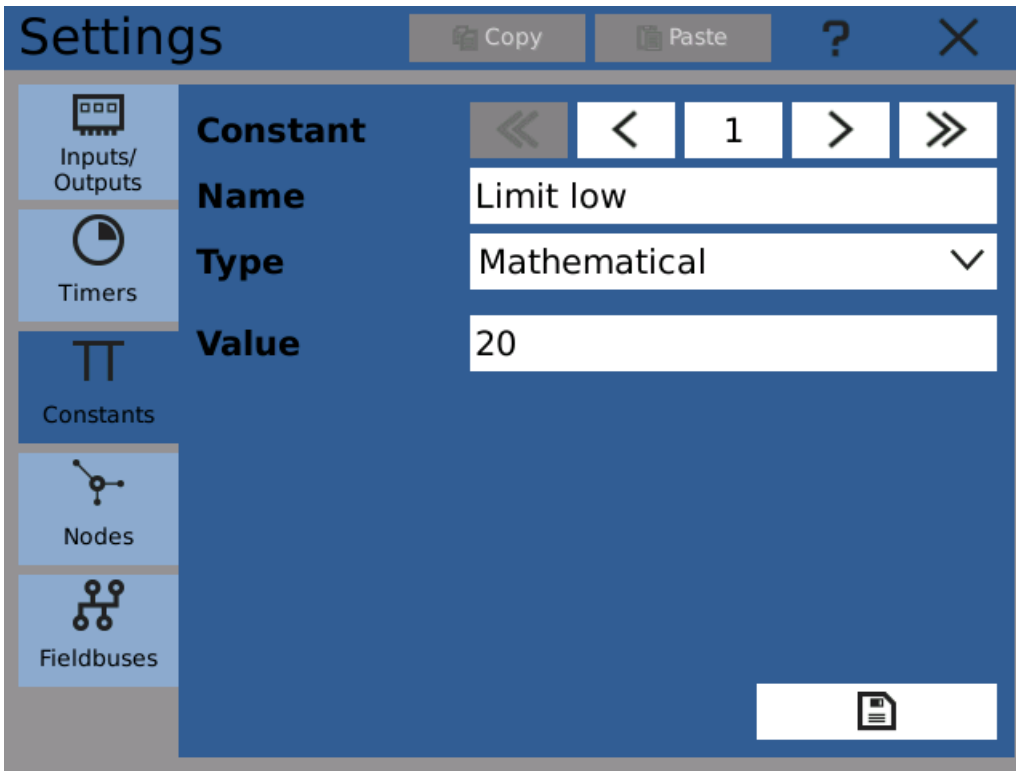
## 5.3 Constants

Constants are user-defined values. It is preferred to use them everywhere in configuration where one [mathematical/logical value](#) is used in more than one place or is expected to be changed from time to time.

For example if you have several nodes that all should have the same limit-high value, you can create a constant for it and set this value in one place as opposed to having to configure each node separately.

Changing values of constants also requires [lower user rights](#) than modifying configuration, so they can be used to allow to fine-tune device operation by users instead of requiring service/administrator access.

Constants can be either [mathematical or logical](#).



Constant configuration dialog





# 5 Function menu

## 5.4 Nodes

Nodes are an integral part of the device's function. Node is an object which reads value from the selected input or inputs, can perform various operations with the data periodically and holds the result. The resulting value can then be displayed, used as an input for another node(s), recorded, etc.

There are several types of nodes with different functions. Each of those types processes the input value with specified function. By chaining nodes you can achieve more complex functions.

Each node has several configuration groups

- [Basic settings](#) - name, alias, timer, ...
- [Unit](#) - displayed along with value
- [Function](#) - the core function of the node
- [Additional settings](#) - Outputs, limits, state detection, ...

### 5.4.1 Basic settings

#### **Name**

Node name.

#### **Unit**

If the node represents physical value such as voltage, current, mass, etc., you can assign it one of the available units. Discussed in a [separate chapter](#).

#### **Alias**

Short name to be displayed where name is too long (for example in graph tags)

#### **Timer**

Assigned [timer](#). The period of the timer determines how often the node gets recalculated. Node without assigned timer does not process any data and is invalid.

#### **History**

Value history stored in short-term memory. The configured value represents number of stored samples.

Value history is used for plotting graphs on the screen. You should assign history for every node that is to be displayed in a plot.

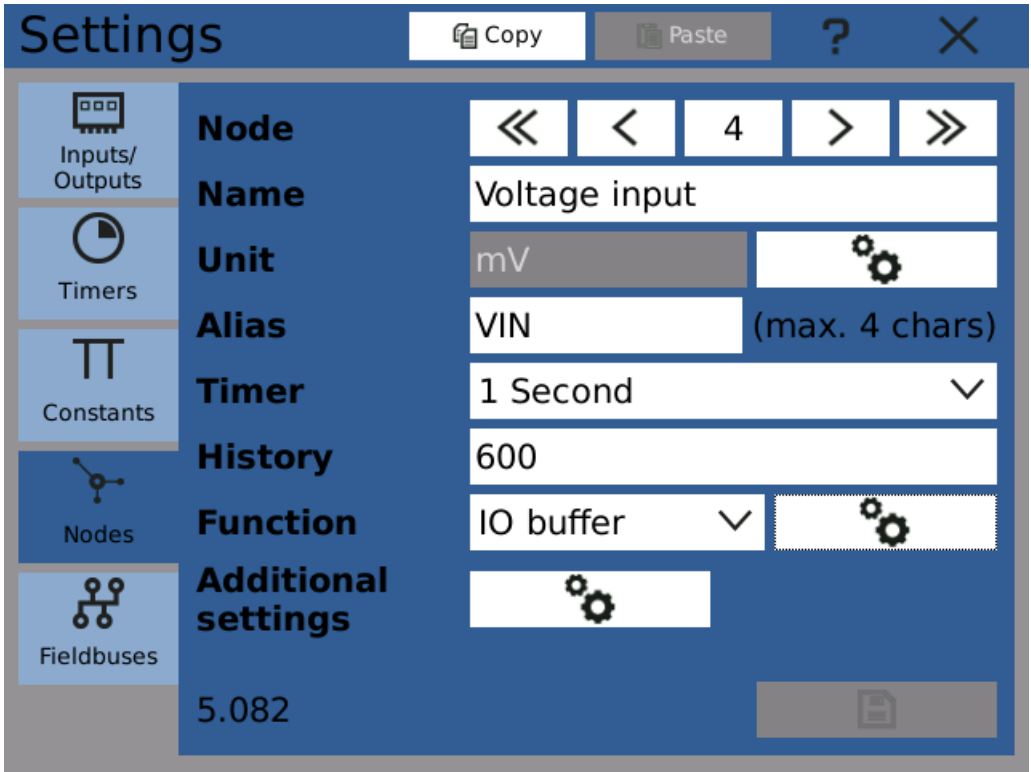
#### **Function**

Here you can select one of available node functions and configure it using the configure button. Discussed in a [separate chapter](#).

#### **Additional settings**

Configuring node limits (allowed value band) and outputs (for controlling IO card outputs and Fieldbuses). Discussed in a [separate chapter](#).

# 5 Function menu



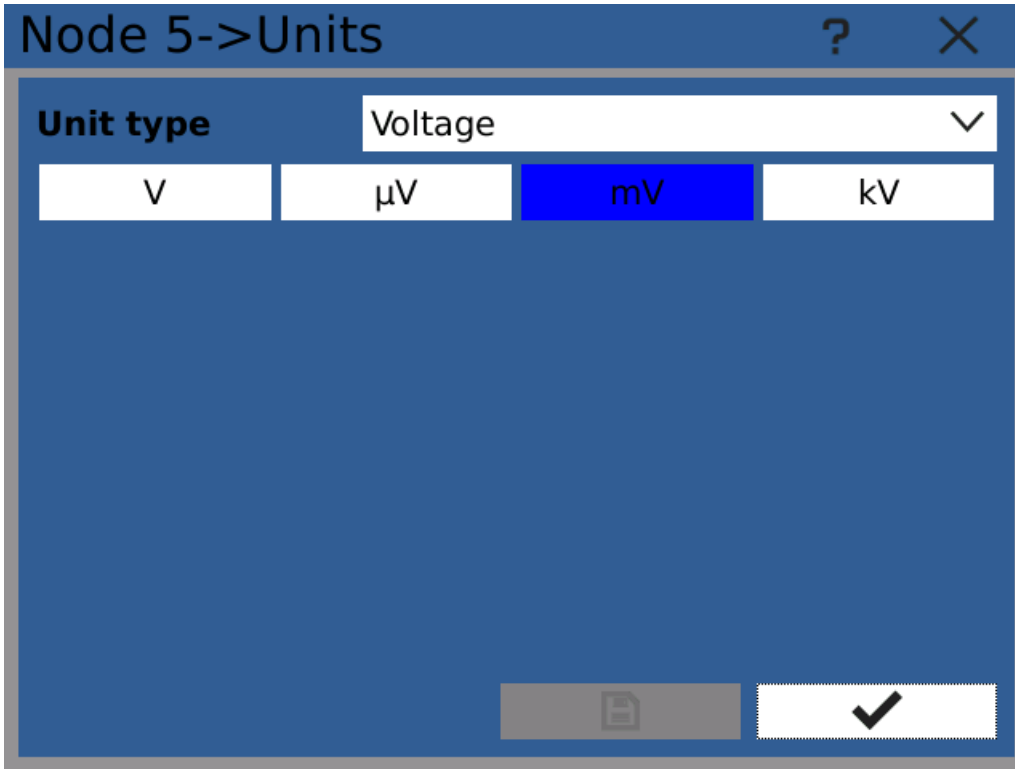
Node configuration - common options

## 5.4.2 Unit

Configures node unit such as Volts, Amperes and other. Unit is then shown along with the value while displayed on the screen or recorded.

There are several unit type groups which contain similar preconfigured units.

## 5 Function menu



### 5.4.3 Function

Configures the node core function: how the node obtains and processes it's value.

There are several functions available

- Math
- Logic
- IO Buffer
- Comparator
- Generator
- Integrator
- Batch limit
- Engine hours

#### Math

Applies mathematical operations to selected inputs. The supported operations are adding, subtracting, multiplying, dividing and other. The number of parameters differs based on the selected function.

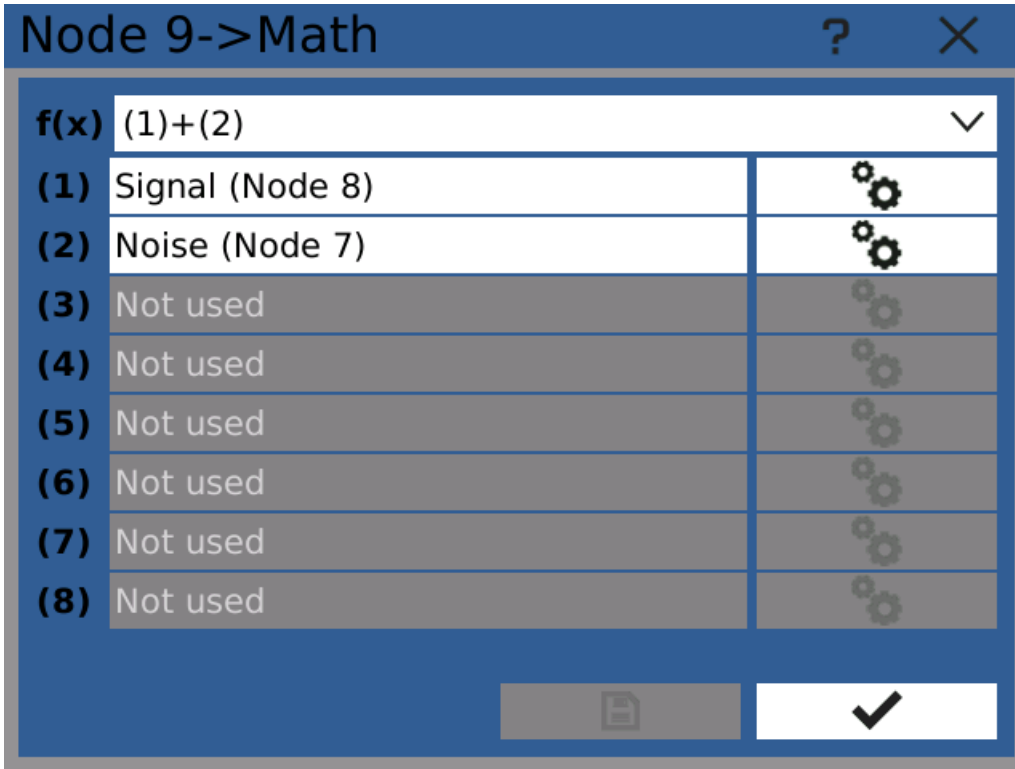
#### **f(x)**

Function used for calculations. The name matches the order of calculation and parameters. For example: Entering (1) + (2) means that parameter 2 should be added to parameter 1.

#### **(1) ... (8)**

Parameters of the selected function. You can select the parameter by clicking on appropriate configure button. It is not necessary to configure all the parameters.

## 5 Function menu



Math node configuration

### Logic

Logical functions perform logical operations or act as flip-flops using selected inputs.

#### f(x)

Function used for calculations. The name matches the order of calculation and parameters. For example: Entering (1)+(2)+ ... (7)+(8) means that logical OR will be applied on parameters 1 to 8.

#### (1) ... (8)

Parameters of the selected function. You can select the parameter by clicking on appropriate configure button. It is not necessary to configure all the parameters.

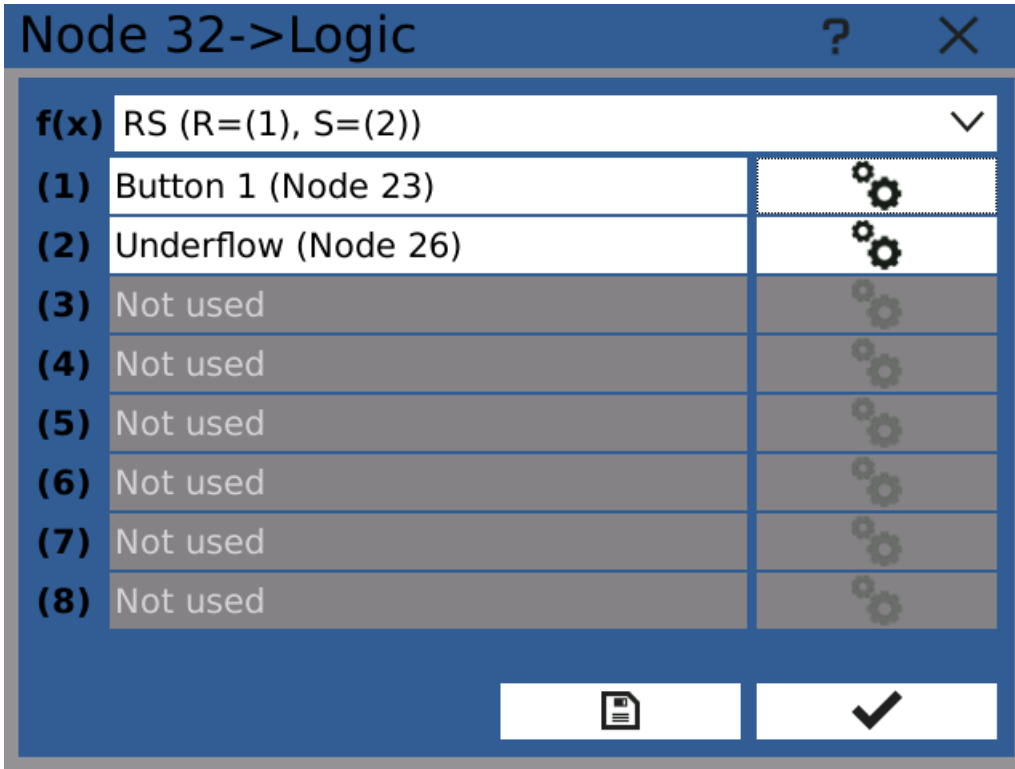
### OPERATOR NOTATION

Operator	Function
!	Negation
+	Logical OR
·	Logical AND
⊕	Logical XOR

### FLIP-FLOPS:

Type	Function
RS	Reset-set (The "R" input has a priority).
SR	Set-reset (The "S" input has a priority).

## 5 Function menu



*Logic node configuration*

### IO Buffer

IO Buffer node reads measured values from selected input and makes them accessible for use without any further calculations. In comparison to using directly IO input to display values on the screen, to store them in records, etc. you gain the option to assign the value a unit and use the value history functions.

Typical use case is plotting the measured value directly on the screen.

## 5 Function menu

Node 31->IO Buffer

Position << < B1 > >>

Type Fixed inputs/outputs

Channel << < 1 > >>

Register Cold junction temperature ▾

IO buffer node configuration

### Comparator

To check if a value exceeds specified limits a comparator node can be used. This node compares the input value with up to two limits (high and low). The node output value is logical. Comparator state while input value is within limits is addressed as OFF, and the state while input value exceeds limits as ON.

#### GENERAL

##### Input

Input value used for calculations.

##### Limit High

Upper limit value.

##### Limit Low

Lower limit value.

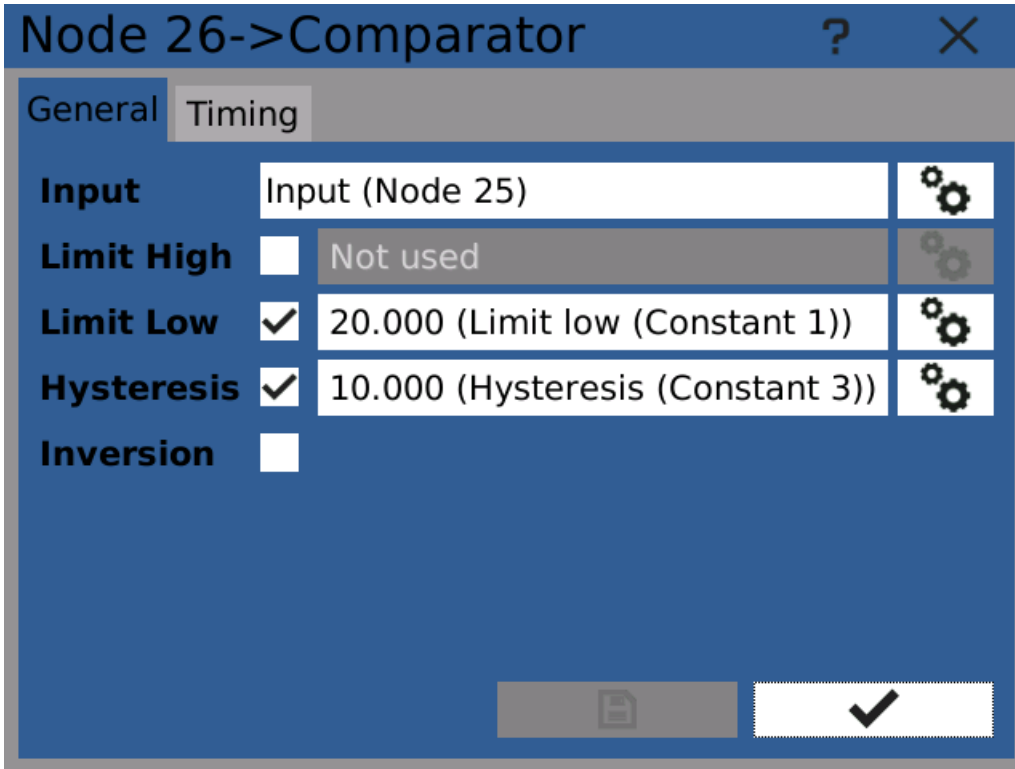
##### Hysteresis

Hysteresis applied for both limits. The hysteresis band is distributed symmetrically around the limit value.

##### Inversion

Without inversion, the output value of comparator is logical zero while limits are not exceeded and logical one otherwise. With inversion switched on, the output value is logical one while limits are not exceeded and logical zero otherwise.

## 5 Function menu



Comparator node configuration - general

### TIMING

#### Delay ON

The delay between input value exceeding a limit and comparator state change.

#### Delay OFF

The delay between input value returning back within limits and comparator state change.

#### Minimum time ON

The shortest time interval of the ON state.

#### Minimum time OFF

The shortest time interval of the OFF state.

## 5 Function menu

Node 5->Comparator

General Timing

**Delay ON** 2.500 [s]

**Delay OFF** 0.000 [s]

**Minimum time ON** 5.000 [s]

**Minimum time OFF** 0.000 [s]

Note: The node tick is: 10 [ms]

Comparator node configuration - timing

### Generator

Generator node can be used to generate various signals like saw, sine, white noise and other.

#### Type

Clicking on the button displays a choice of six types. The types are rising saw, declining saw, triangular waveform, rectangular waveform, sinus function graph and random data.

#### Minimum

Minimum function range.

#### Maximum

Maximum function range.

#### Period

Time to replay the function. Period can be set only for the functions that require it.

#### Duty cycle

The percentage signal ratio between the length of the front and rear edges, or if the signal is in its maximum or minimum. The specified percentage always indicates the length of each front edge or the length of the maximum value (e.g. if we have 20% - 20% of the period is in maximum and 80% of the period is in minimum). Duty cycle can be set only for the functions that require it.



## 5 Function menu

Parameter	Value	Unit
Type	Sine wave	
Min	5	[-]
Max	95	[-]
Period	30 * 1	[s]
Duty cycle	0	[%]

Generator node configuration

### Integrator

Integrator nodes integrate the input value over a period of time. Value of the node is a sum of all values on its input values over time.

#### Input

Input to be integrated

#### Negative input

Allows negative values on input. Enabling this options means the integrated value decreases when there is a negative value on input.

#### Dead zone

Value on the input has to exceed this limit to be integrated. If the input value is negative, its absolute value has to exceed this limit.

#### Multiplier

Multiplies the input value before integrating it.

#### Divider

Divides the input value before integrating it.

#### Preset value

Every time the preset input is triggered the integrator value is set to this value.

#### Reset input

Triggering this input sets the integrator value to zero. The reset input reacts to input value change from Off to On (rising edge).

## 5 Function menu

### Preset input

Triggering this input sets the integrator value to preset value. The preset input reacts to input value change from Off to On (rising edge).

### Hold input

The integrator value does not change as long as the hold input value remains On (log 1).

Parameter	Value	Settings
Input	GEN (Node 14)	⚙️
Negative input		
Dead zone	Not used	⚙️
Multiplier	1.000 (Value)	⚙️
Divider	1.000 (Value)	⚙️
Preset value	42.000 (Value)	⚙️
Reset input	Not used	⚙️
Preset input	Switch 1 (I/O B1/13)	⚙️
Hold input	Switch 2 (I/O B1/14)	⚙️

⏏️ ✓

*Integrator node configuration*

### Batch limit

Batch limit node can be used in cases where it's necessary to generate output signal periodically according to continuously incrementing input.

In the case of the input value being 0 in the beginning and constantly increasing, the output will be toggled once the input value reaches "period" value. And then every time the input value reaches  $N \times \text{period}$  value.

### Input

Input value. Has to be non-decrementing, for example an integrator.

### Period

How much has the input have to increase for the node to generate output signal

### Output

Output signal type

- Pulse high - node output is normally Off/0 and switches to On/1 every time input value increase reaches period value

## 5 Function menu

- Pulse low - node output is normally On/1 and switches to Off/0 every time input value increase reaches period value
- Toggle - node output is toggled(Off/0 to On/1 or On/1 to Off/0) every time input value increase reaches period value

### Time

How long the output signal lasts. Has to be a multiple of node timer period.

<b>Input</b>	INT (Node 16)	⚙️
<b>Period</b>	100.000 (Value)	⚙️
<b>Output</b>	Pulse high	▼
<b>Time</b>	0.100	[s]

Note: The node tick is: 10 [ms]

⏏️ ✓

*Batch limit node configuration*

## Engine hours

Engine hours nodes calculate the time (in hours) the input signal spent in the ON state.

### Input

Detected logical input signal.

### Reversed

Count down from preset value to zero instead of counting up.

### Preset value

Every time the preset input is triggered the engine hours value is set to this value.

### Reset input

Triggering this input sets the node value to zero. The reset input reacts to input value change from Off to On (rising edge).

### Preset input

Triggering this input sets the node value to preset value. The preset input reacts to input value change from Off to On (rising edge).

## 5 Function menu

Field	Value
Input	LOG VSTUP 1 (Node 5)
Reversed	<input type="checkbox"/>
Preset value	0.000 (Value)
Reset input	Switch 1 (I/O B1/13)
Preset input	Not used

Engine hours node configuration

### 5.4.4 Additional settings

This window contains several additional configuration options.

#### Limits

By configuring node limits you can control how a node acts when its value reaches certain level. Apart from raising system-wide warning/error, the device can react to reaching a limit using [Events](#).

This configuration option is only available for nodes with mathematical and counter [types](#).

#### Minimum/Maximum

Configured thresholds for following options

#### When limit underflows/overflows

What action should be taken when the aforementioned thresholds are reached. If required the device can signal underflow or overflow as system warning/error/critical error.

#### Displayed value saturation

Checking this options will stop displayed node value from reaching above its maximum and below its minimum. However for other uses (for example recording) the value can exceed selected limits.

*Note: displayed value saturation can be used for example to guarantee that lines in a chart never leave the visible area.*

## 5 Function menu

**Additional settings** ? X

Limits Restore Outputs

**Minimum**  4.750

**Maximum**  5.250

**When limit underflows**

Nothing

Warning

Error

Critical error

**When limit overflows**

Nothing

Warning

Error

Critical error

**Displayed value saturation**  No  Yes

Additional node settings- limits

### State

Node state detection allows to raise a warning or error when the node state changes to a selected value.

#### State detection

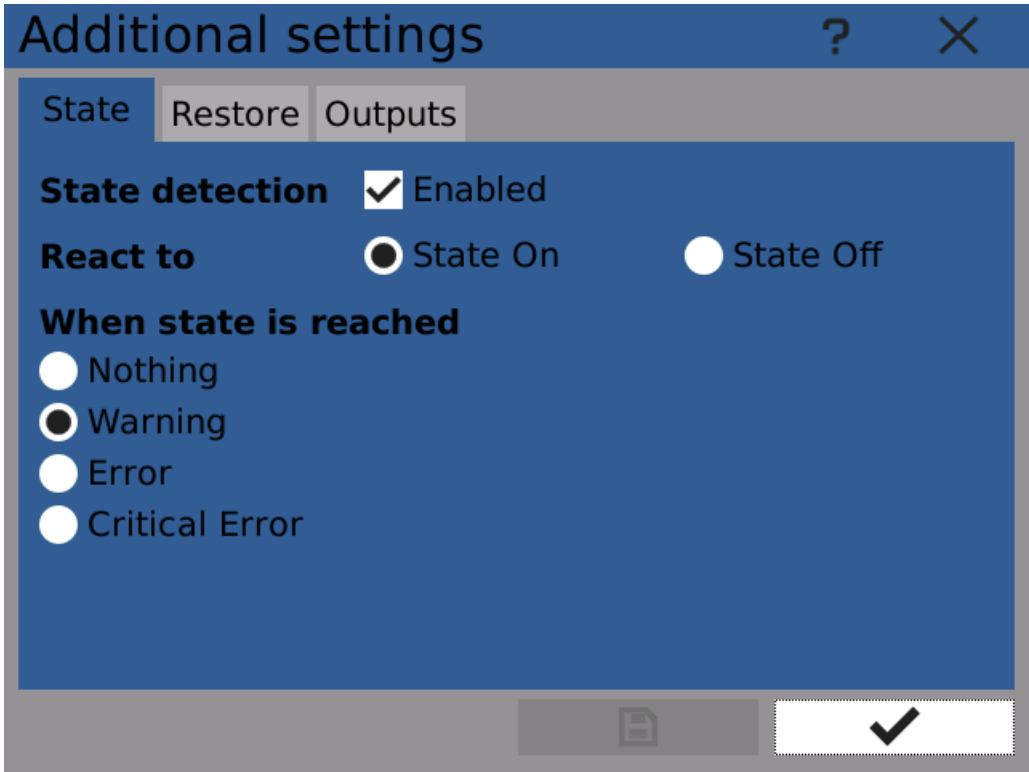
Enables or disables this feature

#### React to

Which state should raise a warning/error.

This configuration option is only available for nodes with logical [type](#).

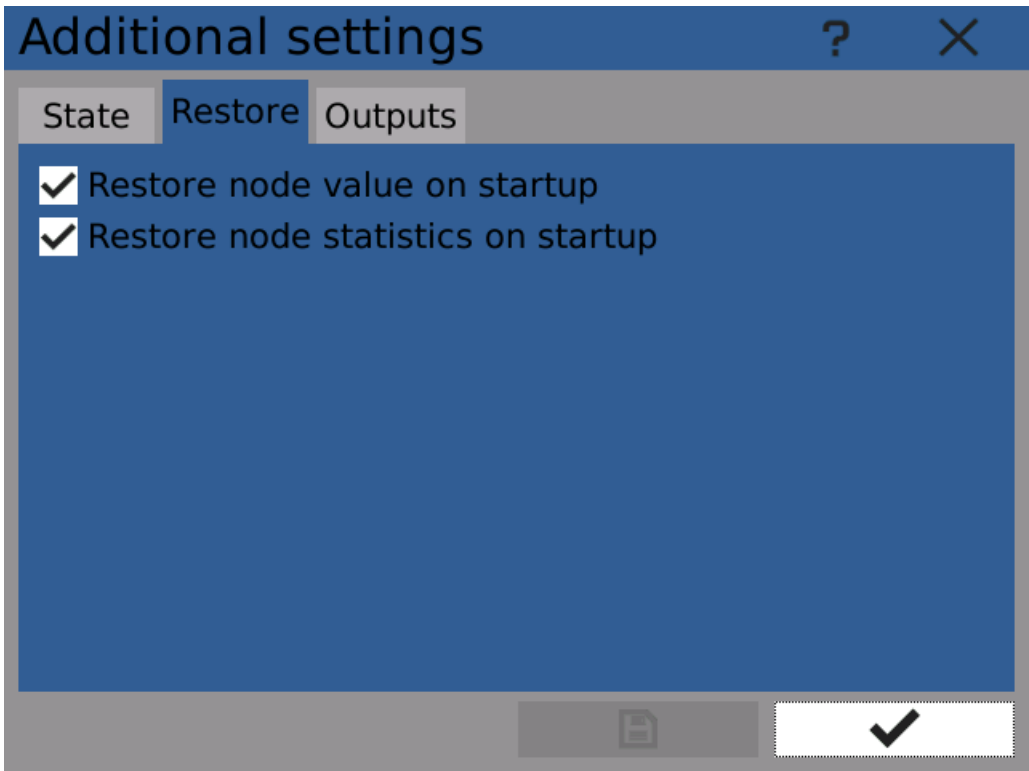
## 5 Function menu



*Additional node settings - state*

### Restore

These options provide a way to restore node value and/or statistics after device turns on.



*Additional node settings - restore*

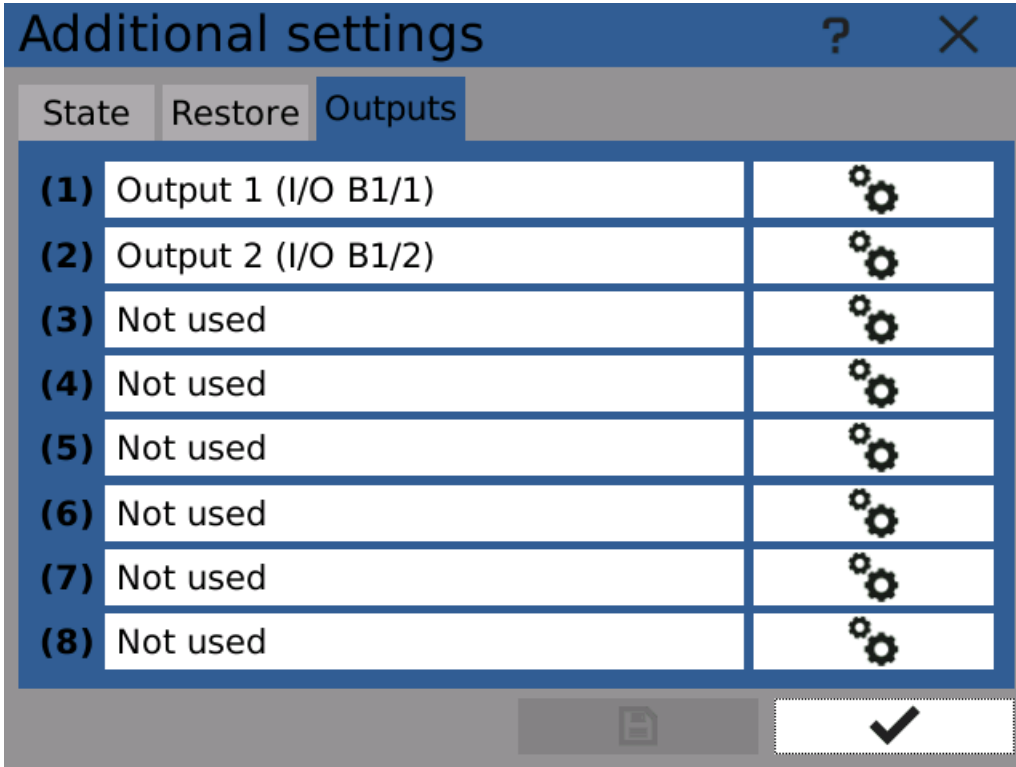
# 5 Function menu

## Outputs

Node outputs provide a way to send node value to be used in a different module (I/O, Fieldbus, ...).

Nodes with mathematical value can control analog outputs and nodes with logical value can control digital outputs.

*Note: If you need to control outputs (e.g. switch relays) when a node value reaches a specified level, create a second node-comparator for this task and use it's output.*



Additional node settings - outputs



## 5 Function menu

### 5.5 Fieldbuses

Fieldbus module can be used to transfer data remotely using protocols such as Modbus. The device can use several different fieldbuses at once. The data transfer is possible both ways, eg. both read and write access is available, if configured appropriately. This way it is possible to access current measured data from a remote device or for example trigger custom defined actions remotely using the [Events](#) module.

Fieldbus configuration varies depending on selected type. For example if you set the fieldbus to work as a Modbus TCP Slave, an option to set the IP port becomes accessible.

Each fieldbus can have several cells configured. A cell represents a value with defined name and several other properties depending on selected fieldbus type.

Summary of all configured fieldbuses and their cells can be displayed using the [Fieldbus browser](#).

#### 5.5.1 Modbus TCP Slave

Fieldbus configured as a Modbus TCP Slave can communicate with any standards-compliant device acting as a Modbus TCP Master. There can be only one Modbus TCP Slave fieldbus configured at a time.

Values exposed to the master device do not have any preset configuration, everything is user-configurable.

##### **IP Port**

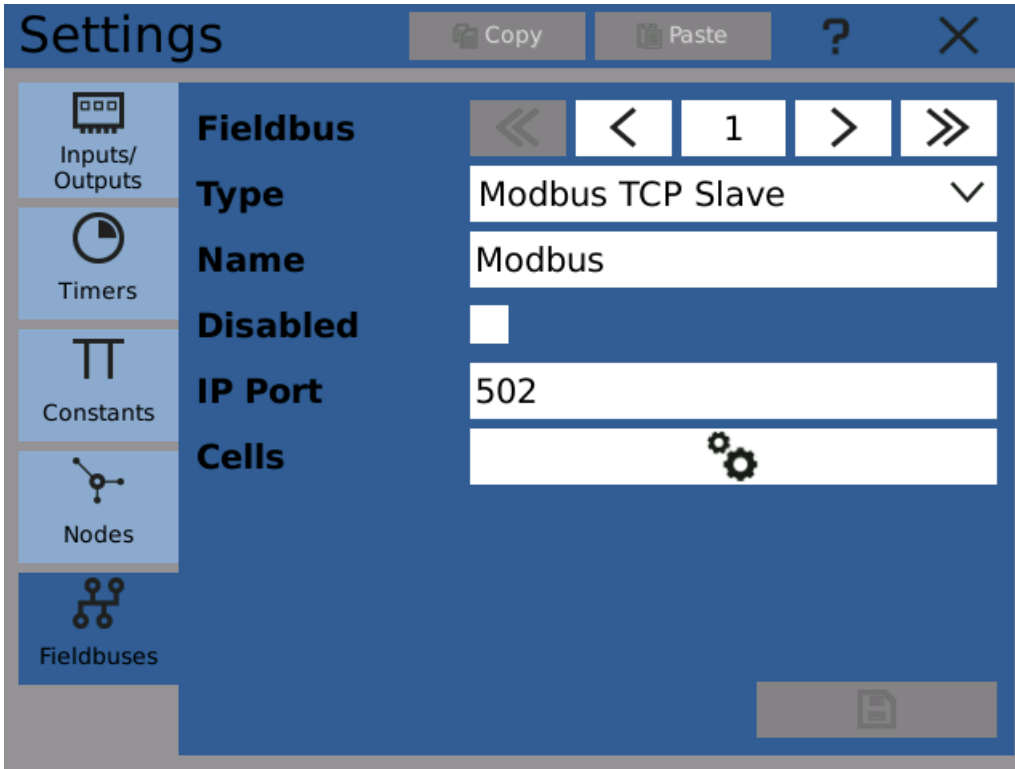
TCP port, at which the slave listens. The standard and recommended value is 502.

##### **Cells**

Configuration of [Modbus cells](#).



## 5 Function menu



*Modbus TCP Slave configuration*

### 5.5.2 Modbus RTU Master

Fieldbus configured as a Modbus RTU Master can communicate with any standards-compliant device acting as a Modbus RTU Slave using RS485. There can be only one fieldbus of this type at a time.

Modbus master can communicate with several slave devices. All the values it uses with are organized in cells. Cells are assigned as a value with specified address on one of the slaves.

While configuring set up first the serial port, then slave devices and after that define Modbus cells.

#### **Config**

RS485 serial port configuration.

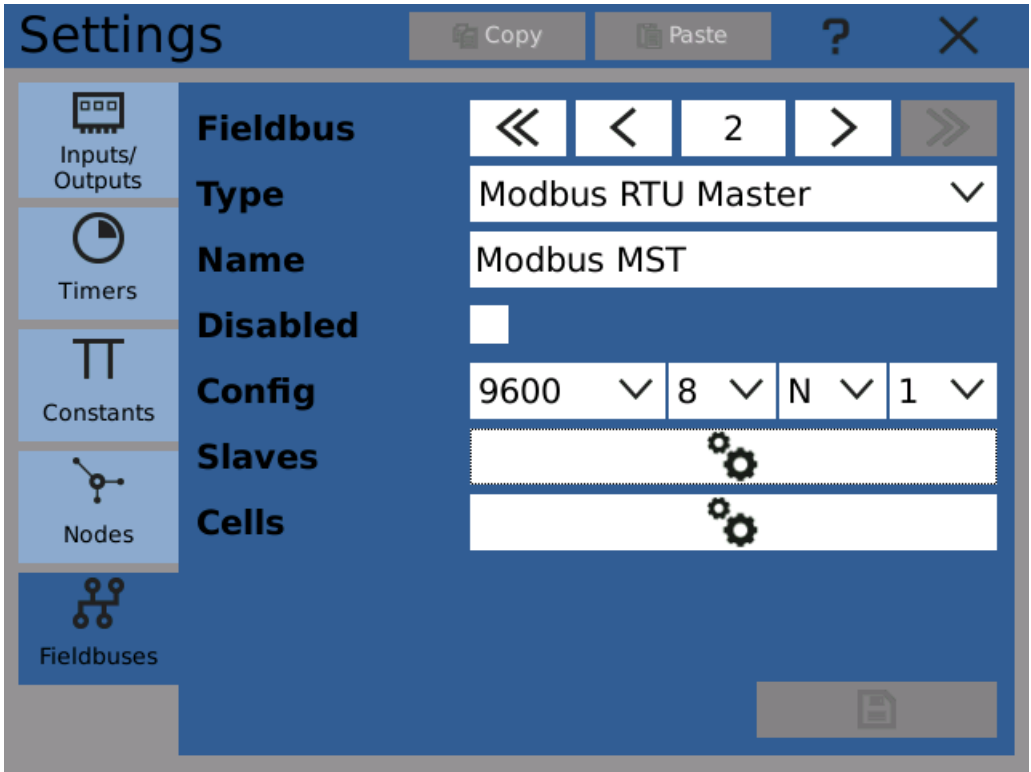
#### **Slaves**

Configuration of [slave devices](#).

#### **Cells**

Configuration of [Modbus cells](#).

# 5 Function menu



Modbus RTU Master configuration

## 5.5.3 Modbus cells

All Modbus type fieldbuses have common configuration of their cells. Each cell represents a value (one or two registers).

**Cell**  
Cell index.

**Name**  
User defined cell name.

**Disabled**  
If checked, this cell is ignored. This option is intended to temporarily disable remote access.

**Slave**  
Which slave device value the cell represents.  
Available only when the fieldbus is configured as master.

**Value type**  
See chapter [value types](#).

**Access**  
Options vary depending on fieldbus type and selected value type.  
Modbus master

- Read Input Register - The cell reads input register from slave.
- Read Holding Register - The cell reads holding register from slave.
- Write Holding Register - The cell writes to the slaves holding register.

## 5 Function menu

- Read Discrete Input - The cell reads discrete input value from slave.
- Read Coil - The cell reads coil on the slave.
- Write Coil - The cell writes to the coil on slave.

### Modbus slave

- Input register - The cell represents a numerical value that the master can use as it's input.
- Holding register - The cell represents a numerical value that can be read and written both by master and slave.
- Discrete input - The cell represents a logical value that the master can use as it's input.
- Coil - The cell represents a logical value that can be read and written both by master and slave.

### Conversion

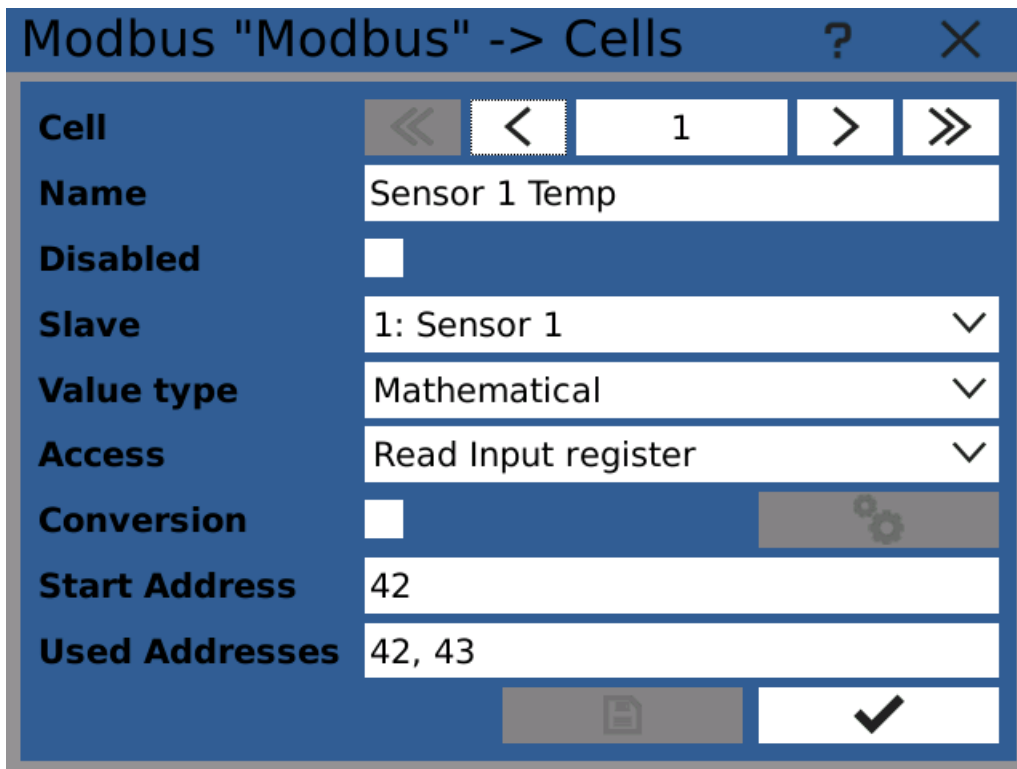
Data type and range [conversion](#) (optional).


### Start Address

Address of the first register used for data exchange. If necessary, following addresses can be used automatically as well.

### Used Addresses

Calculated used address(es).



Cell	Navigation
<b>Name</b>	Sensor 1 Temp
<b>Disabled</b>	<input type="checkbox"/>
<b>Slave</b>	1: Sensor 1
<b>Value type</b>	Mathematical
<b>Access</b>	Read Input register
<b>Conversion</b>	<input type="checkbox"/> 
<b>Start Address</b>	42
<b>Used Addresses</b>	42, 43
<input type="button" value="Save"/> <input checked="" type="checkbox"/>	

Modbus cell configuration

### 5.5.4 Modbus slaves

Each Modbus slave is a device reachable over the modbus protocol. It is identified by it's address.

#### Slave

Slave index.

## 5 Function menu

### Name

User defined name.

### Disabled

If checked, this slave is ignored. This option is intended to temporarily disable remote access.

### Slave ID

Identifies this slave on the bus (1 - 240).

### Optimization

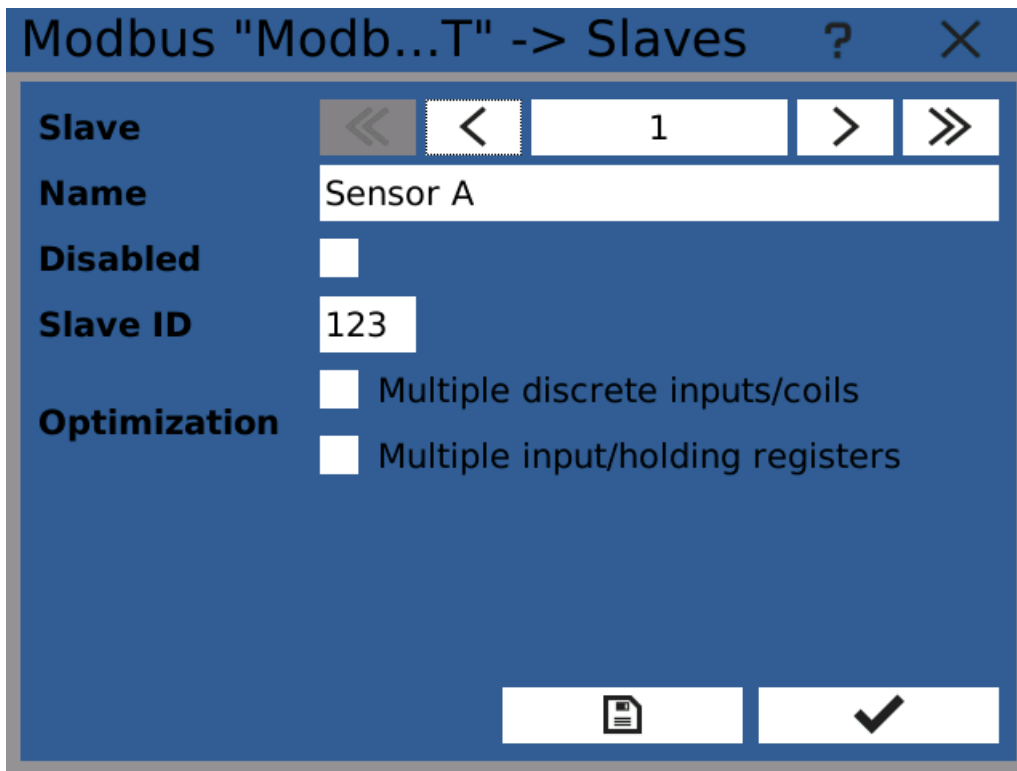
Optional optimizations for device compatibility

### Multiple discrete input/coils

Access discrete inputs/coils in batch at once.

### Multiple input/holding registers

Access input/holding registers in batch at once.



Slave	Name	Disabled	Slave ID	Optimization
1	Sensor A	<input type="checkbox"/>	123	<input type="checkbox"/> Multiple discrete inputs/coils <input type="checkbox"/> Multiple input/holding registers

*Modbus slave configuration*

### 5.5.5 Profibus DP Slave

Profibus DP slave fieldbus implements the Profibus communication standard. It is available only if the hardware Profibus DP Slave card is present (in position B5).

### Address

Slave address. Used to identify slave devices on the bus.

# 5 Function menu

## Watchdog

Defines the watchdog delay in communication frames. In the case of communication error, the device tries to reestablish the communication for the configured interval before clearing memory buffers.

This is a security feature used for example to switch off all relay outputs once the connection to the master device is lost.

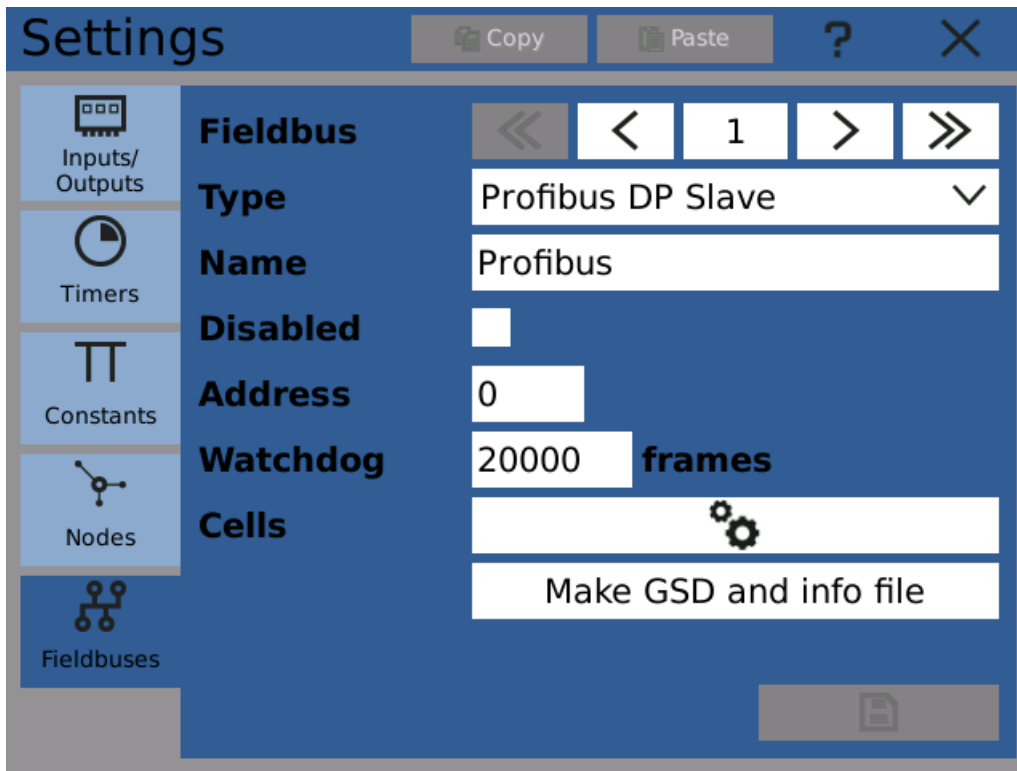
## Cells

Configuration of [profibus cells](#).

## Make GSD and info file

Exports description of configured cells to external storage (USB flash / SD Card)

GSD file format follows the Profibus specification. The info file is a text file describing the configuration in an easily readable format.



Profibus DP Slave configuration

### 5.5.6 Profibus cells

Profibus uses cells to transfer values. Each cell represents one such value. It has a type, an address and several other options.

#### Name

Cell name

#### Disabled

Disables and hides the cell. Used for configuration and testing.

## 5 Function menu

### Value type

One of the standard [value types](#).

### Direction

Transfer direction.

- Input - Master sends data to Slave
- Output - Slave provides data to Master

### Conversion

Data type and range [conversion](#) (optional).

### Start Address, Bit

Address of the value. Mathematical and counter values take up several address positions (bytes).

Logical values take up just one bit - it has to be specified as well.

It is recommended to fill the address space from zero, without spaces in between.

### Used Addresses

The total address space the cell occupies.

Profibus "Profibus" -> Cells

Cell: << < 1 > >>

Name: Temperature

Disabled:

Value type: Mathematical

Direction: Output

Conversion:  [gear icon]

Start Address: 0 Bit 0

Used Addresses: 0 - 3

[document icon] [checkmark]

*Profibus cell - mathematical*

## 5 Function menu

Profibus "Profibus" -> Cells

Cell: << < 2 > >>

Name: Record toggle

Disabled:

Value type: Logical

Direction: Input

Conversion: [Greyed out]

Start Address: 4 Bit 3

Used Addresses: 4 / 3

[Save icon] [Checkmark icon]

*Profibus cell - logical*

### 5.5.7 Fieldbus convertor

Convertor can be optionally used to convert data types and value ranges. It takes the input value A and converts it to selected data type and range as value B.

#### Type

Data type

#### Range

Value range (optional)

#### Byte order

Order of bytes in data type.

# 5 Function menu

Cell "Sensor ... -> Convertor ? X

**Value A**

Type Floating point 32bit

Range

Byte order Native

**Value B**

Type Unsigned integer 32bit

Range

Byte order 0 - 1 - 2 - 3

Fieldbus convertor configuration

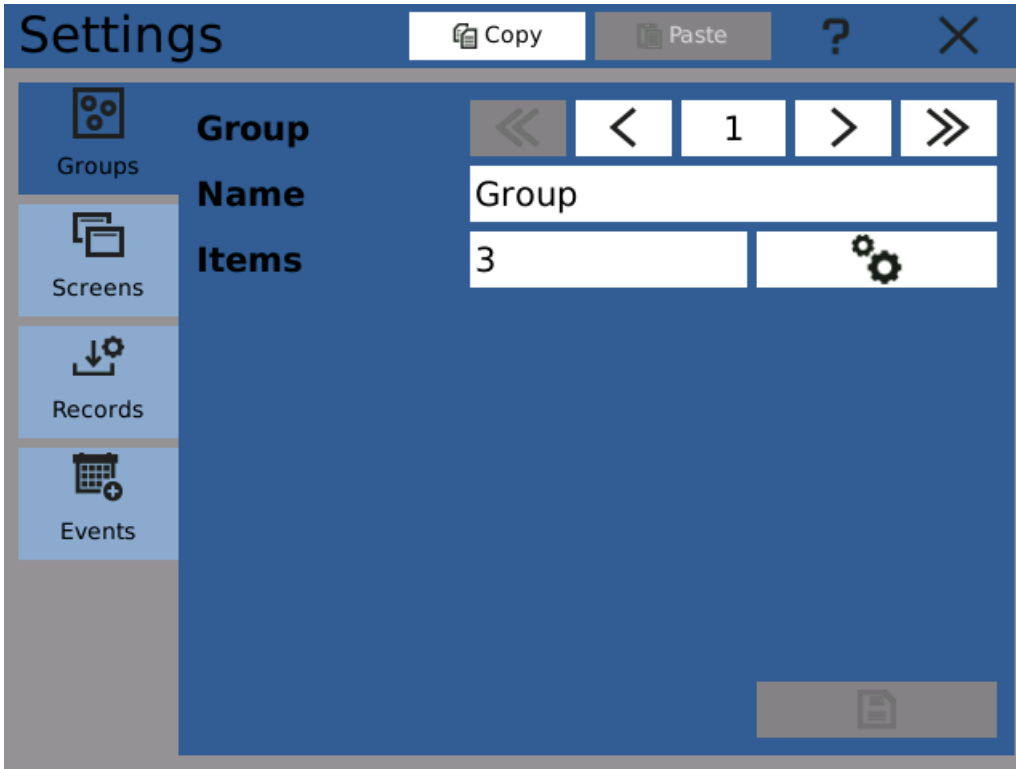


# 5 Function menu

## 5.6 Groups

In cases where it's useful to create collections of nodes, it's possible to use groups. The typical use case is where the device measures several values for two independent instruments A and B. Then you can create Group A with instrument A's measurements and Group B with instrument B's measurements.

Each group has a name and a number of assigned nodes.



Group configuration dialog

*Note: In cases where it's not useful to create collection of nodes for easier and more structured configuration, it's possible to utilize all other functions without using groups.*

*Note: In earlier software versions it was possible to assign also IO's, constants and other items into groups, but that is no longer supported.*

# 5 Function menu

## 5.7 Screens

Screens are used to display measured values on the display.

It's possible to configure several screens and then switch between them manually or automatically.

### Name

Displayed screen name.

### Group

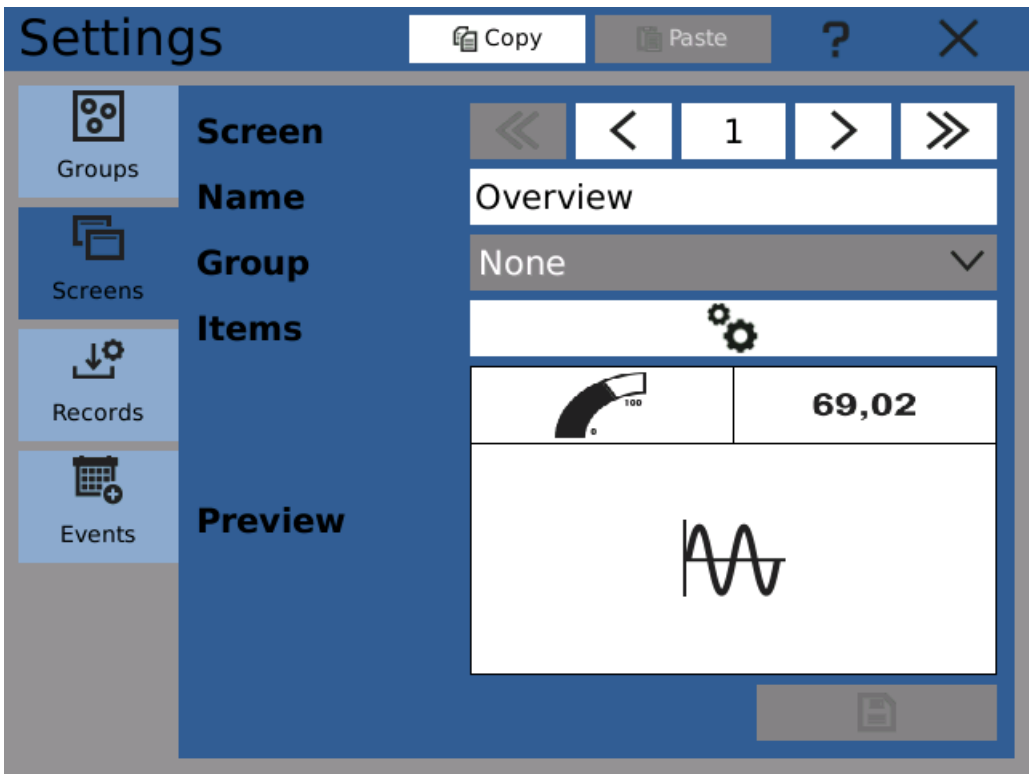
Assigned group. If a group is assigned, it's possible to display only nodes from this group on the screen. With no group assigned, there is no restriction.

### Items

Configuration of screen items - views.

### Preview

Symbolical screen configuration preview.



Screen configuration dialog

### 5.7.1 Screen configurator

Each screen consists of a grid with one or more "views". Views can occupy one or more fields in the grid.

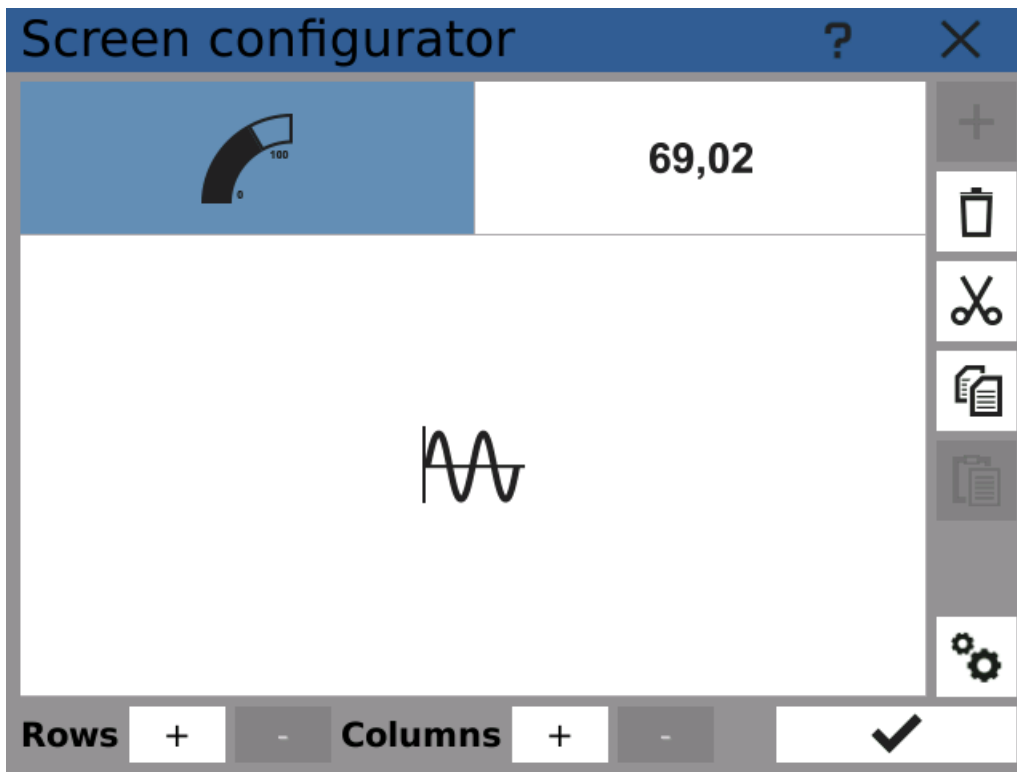
## 5 Function menu

Views are used to visualize assigned source value and optionally additional information. As a source value it's possible to use IO channel, node, constant and others, but it's generally recommended to use only nodes, because they allow displaying of more additional information.

Available views are:

- [Numeric](#) - digital value meter
- [Gauge](#) - gauge display imitating analog meter
- [Bargraph](#) - bargraph meter
- [Binary](#) - binary/logical value display
- [Image](#) - remote image or video display
- [Run chart](#) - displaying value changes in time

The largest part of the window is the active grid area. Here you can place view on the screen as. You can select areas or views by clicking on them or by dragging your finger. Selected area and views are marked with blue color.



*Screen layout configurator*

### CONTROLS

#### Rows +/-

Adds or removes one row from the grid. It's not possible to remove a row occupied by a view

#### Columns +/-

Adds or removes one column from the grid. It's not possible to remove a column occupied by a view.

#### Add view ("+")

Adds view to a selected area.



## 5 Function menu

### Delete view (trash can)

Removes view(s) from selected area.

### Cut view (scissors)

Removes one view and places it in the clipboard. There is always just one item in the clipboard.

### Copy view (two documents)

Copies one selected view into the clipboard. There is always just one item in the clipboard.

### Paste view (clipboard)

Pastes one view from the clipboard into the selected area.

### Configure view (wheels)

Opens configuration window of the selected view.

## ADDING A NEW VIEW

To insert a view in the grid simply select an area in the grid and click on the "Add view" button.

## MOVING A VIEW

Selecting a view and clicking on "Cut view" places it in the clipboard. By selecting a new area and clicking on "Paste view" the view gets inserted into the new area.

### 5.7.2

#### Numeric view

Numeric view displays numeric value and optionally some additional information.

Displaying additional information such as statistics and limits is only supported if the source is a node, other source types display only their current value.

#### Source

Source of the displayed value

#### Scale

Used scale - value range. It affects displayed value percentage and bargraph.

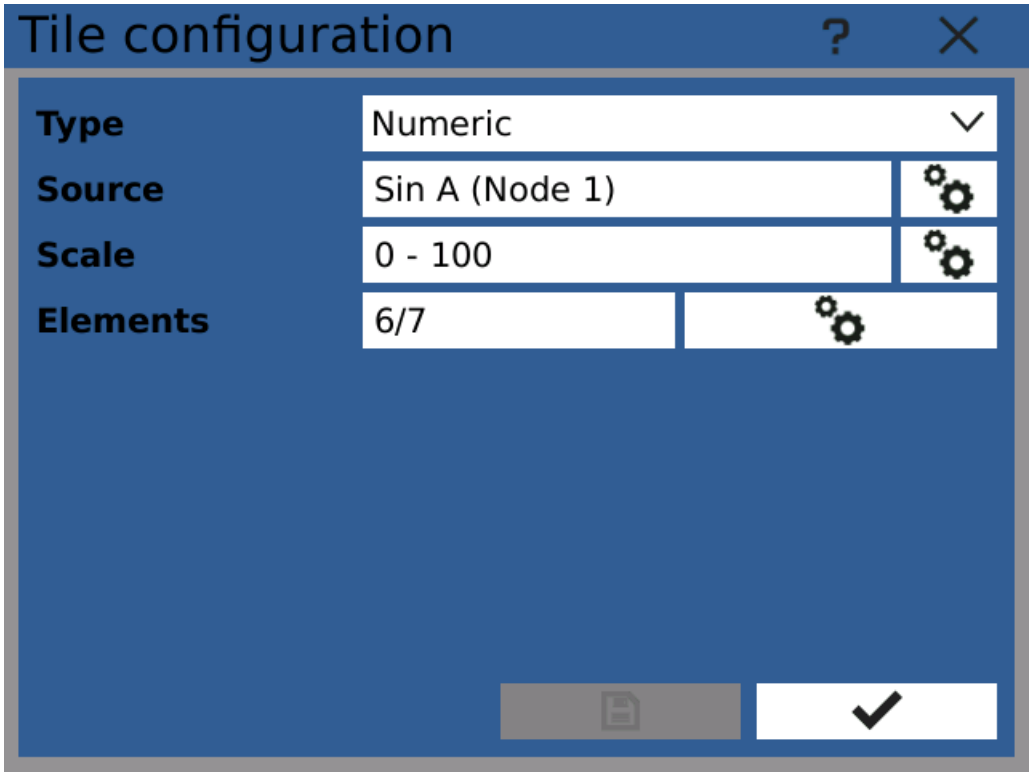
#### Elements

Elements of the view. Numeric view always displays the numeric value and optionally:

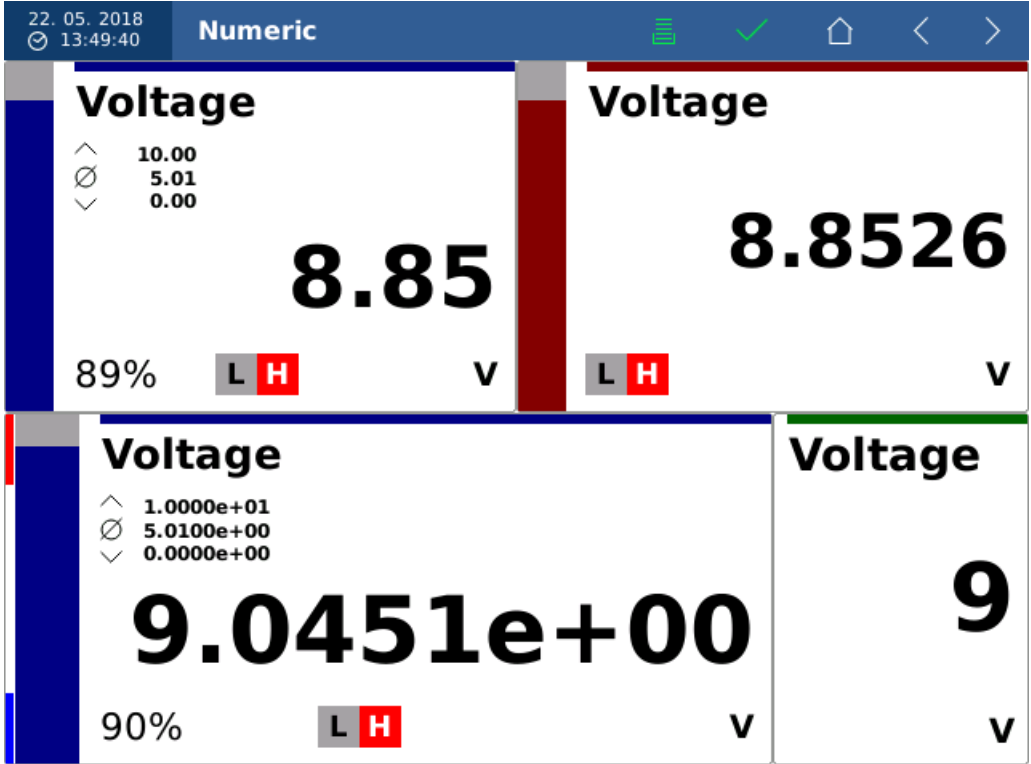
- Header
- Bargraph
- Statistics
- Percentage
- Limits indicator
- Unit

These elements can be further [configured](#).

# 5 Function menu



Numeric view configuration



Various configurations of numeric view

# 5 Function menu

## 5.7.3 Gauge view

Gauge view shows graphical representation of selected value similar to analog gauge meter.

Displaying additional information such as statistics and limits is only supported if the source is a node, other source types display only their current value.

### Source

Source of the displayed value

### Scale

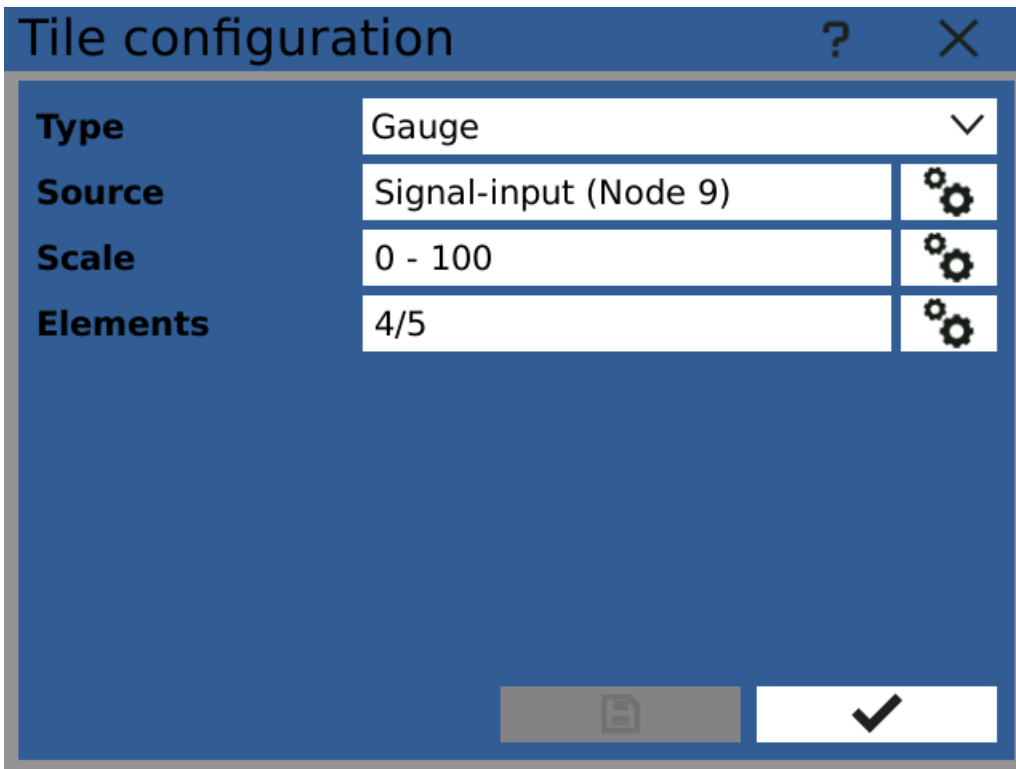
Used scale - value range.

### Elements

Elements of the view. Numeric view always displays the gauge and optionally:

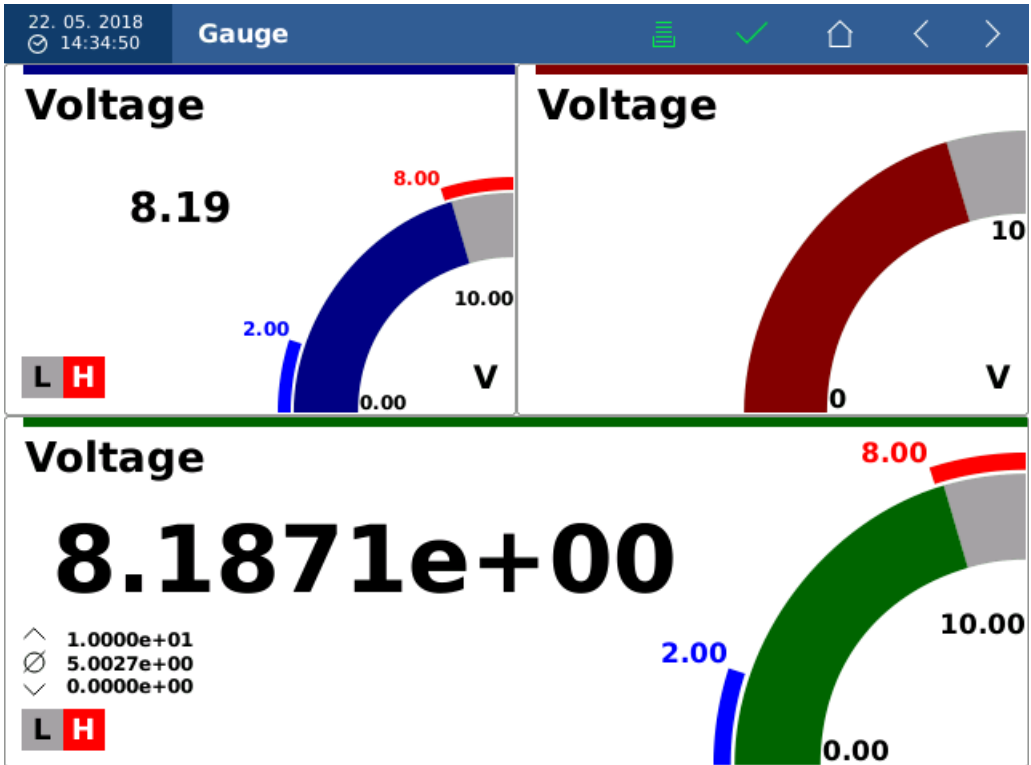
- Header
- Statistics
- Limits indicator
- Value

These elements can be further [configured](#).



Gauge view configuration

## 5 Function menu



Various configurations of gauge view

### 5.7.4 Bargraph view

Displays source value in a bargraph. Depending on dimensions of the view the bargraph is displayed either in a vertically or horizontally.

Displaying additional information such as statistics and limits is only supported if the source is a node, other source types display only their current value.

#### Source

Source of the displayed value

#### Scale

Used scale - value range.

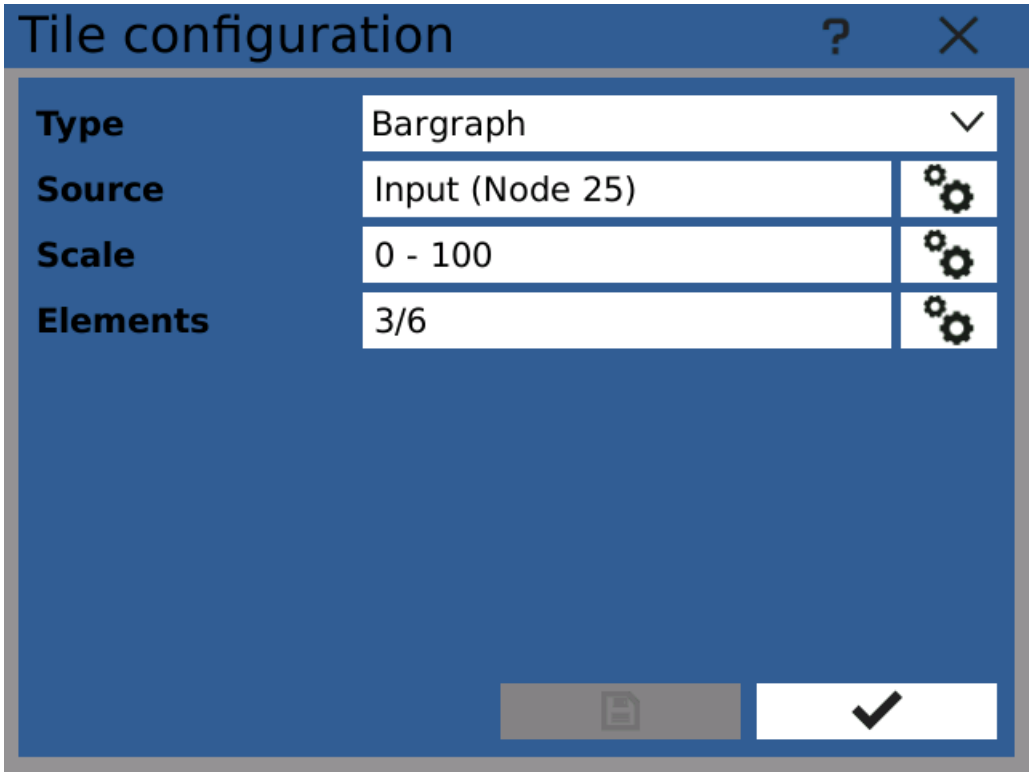
#### Elements

Elements of the view. Numeric view always displays the bargraph and optionally:

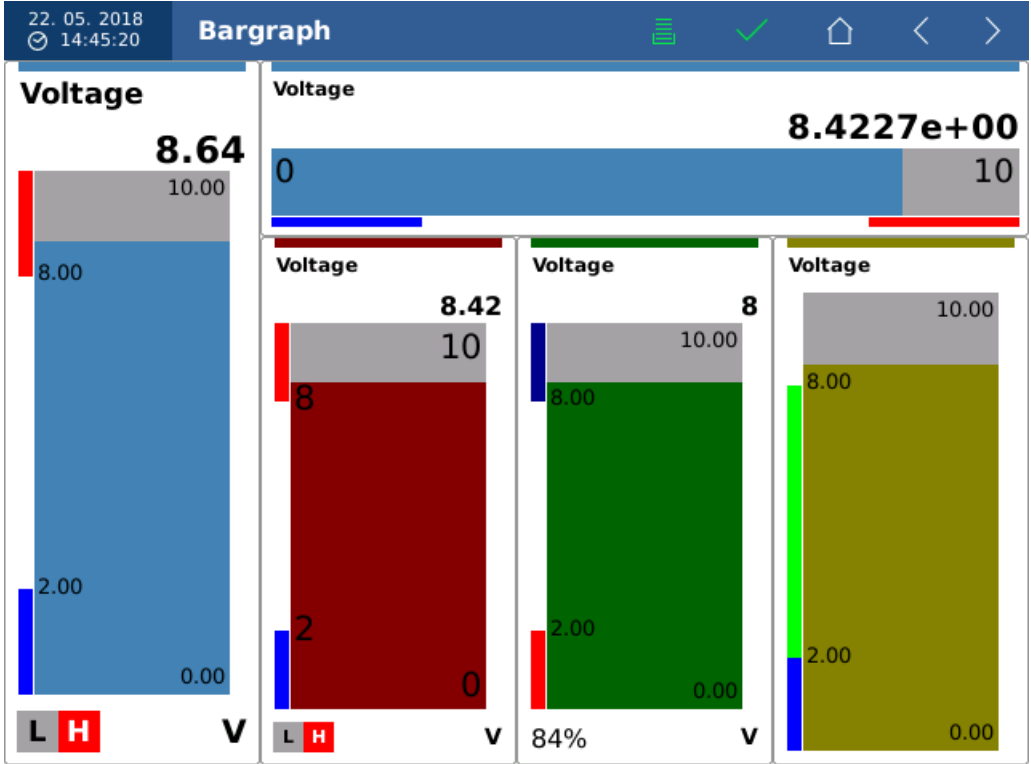
- Header
- Percentage
- Limits indicator
- Unit
- Value

These elements can be further [configured](#).

# 5 Function menu



Bargraph view configuration



Various configurations of bargraph view



# 5 Function menu

## 5.7.5 Binary view

Binary view displays logical source values.

Logical zero (false/off) is displayed by the indicator as red color with tag "OFF". Logical one (true/on) is displayed in green with tag "ON"

### Source

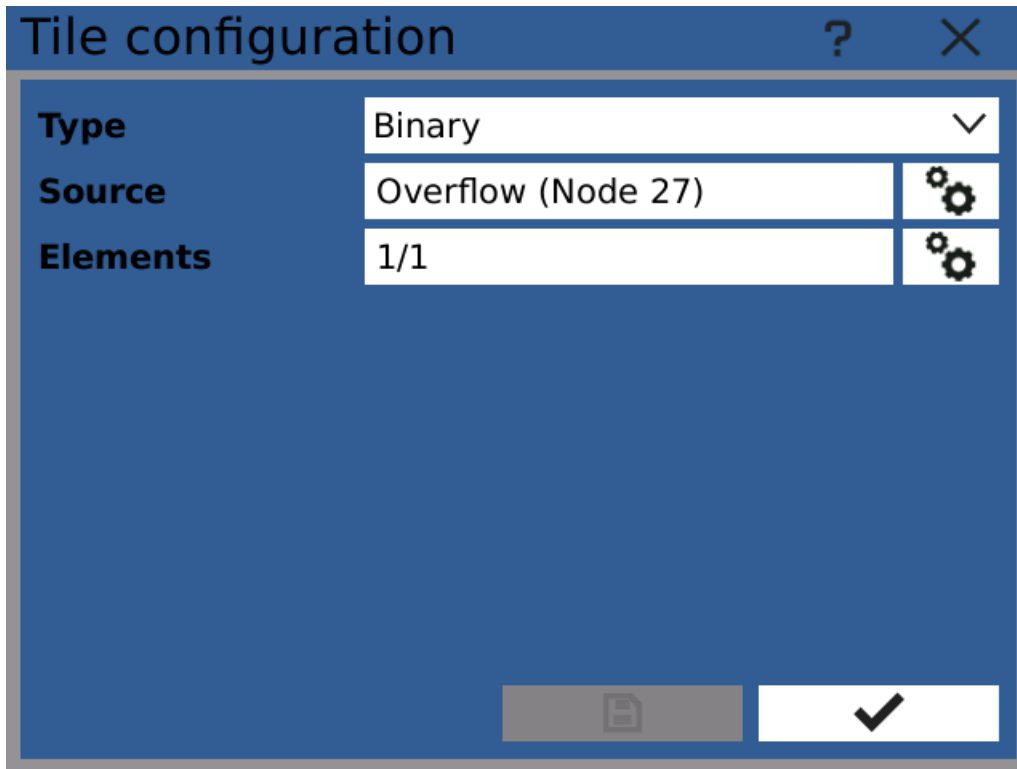
Source of the displayed value

### Elements

Elements of the view. Numeric view always displays the binary indicator and optionally:

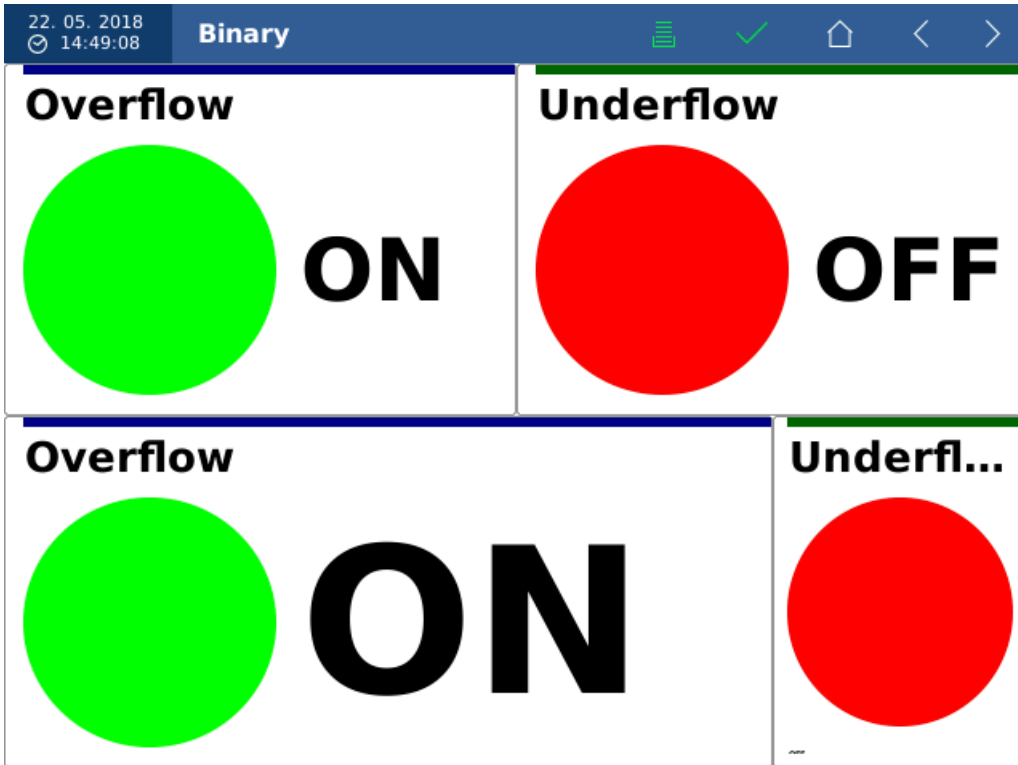
- Header
- Binary indicator

These elements can be further [configured](#).



Binary view configuration

## 5 Function menu



Binary view examples

### 5.7.6 Image view

Image view displays remote image from network specified as an URL.

#### URL

Address of the image. For example: <http://www.example.com/image.jpg>

#### Refresh

Whether the image is periodically refreshed. That can be used to display images from IP cameras that allow accessing the current frame as a JPEG image.

#### Refresh interval

Delay between refreshing the image.

#### Elements

- Image

This element can be further [configured](#).

# 5 Function menu

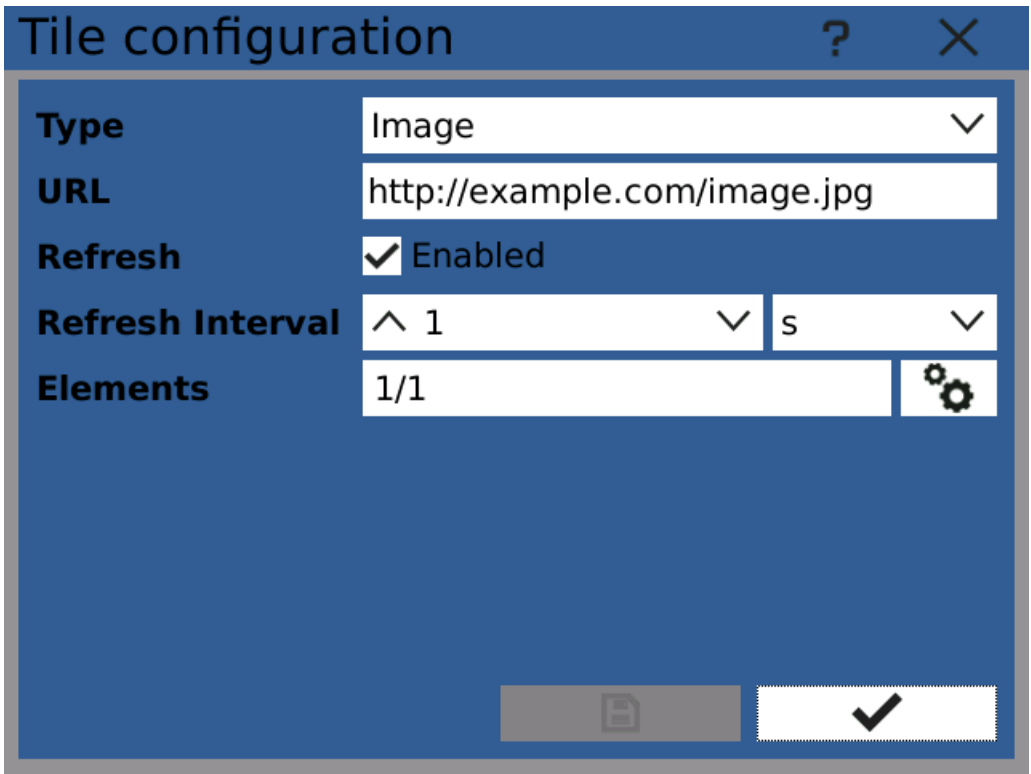
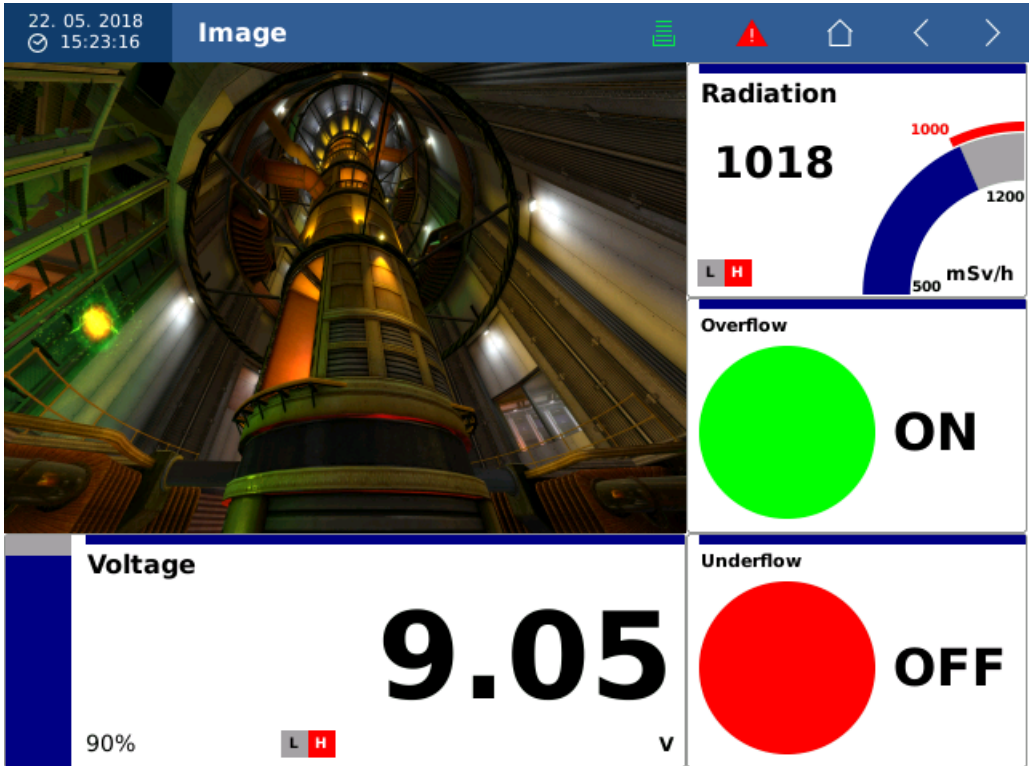


Image view configuration



Example usage of image view

# 5 Function menu

## 5.7.7 Run chart view

To display graphs of values in time, use Run chart view.

Run chart allows you to chart values of several sources in a plot. The plot always has one time axis and one or more value axes.

It's recommended to use only nodes and constants as sources. When using [nodes](#), make sure that their configured history size can cover the whole time frame of the plot.

### Axes

Configured value axes (scales) of the chart. By default there is one logical and one mathematical.

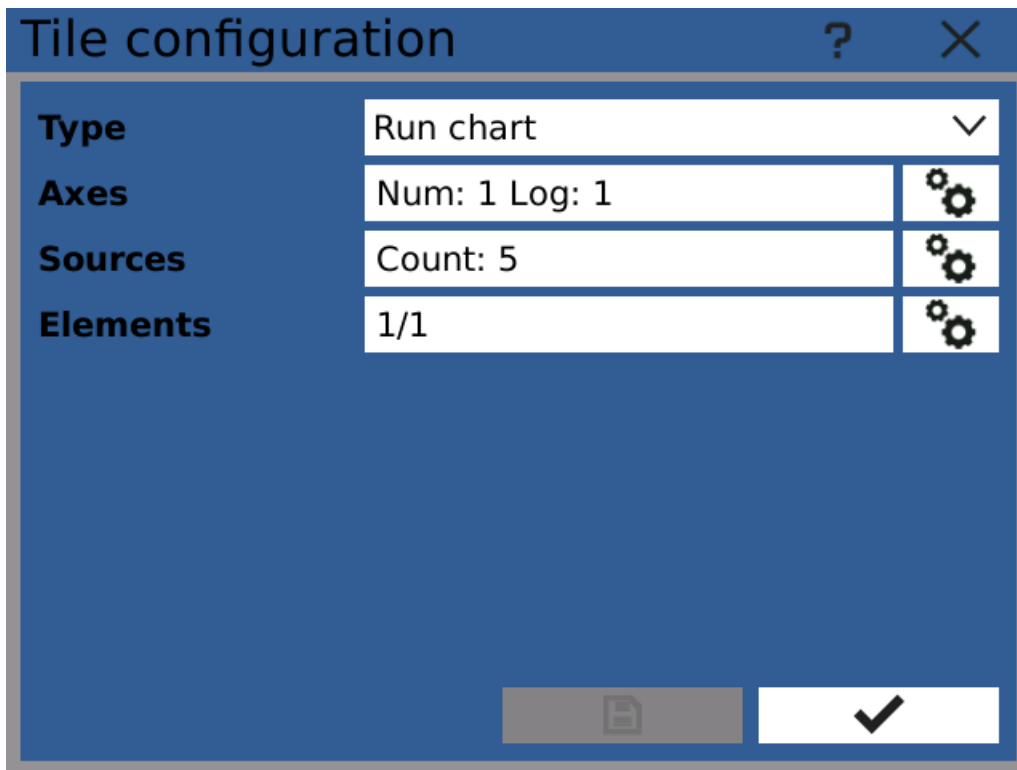
### Sources

Source values for the chart. Each source has to be assigned to one of the axes.

### Elements

- Run chart

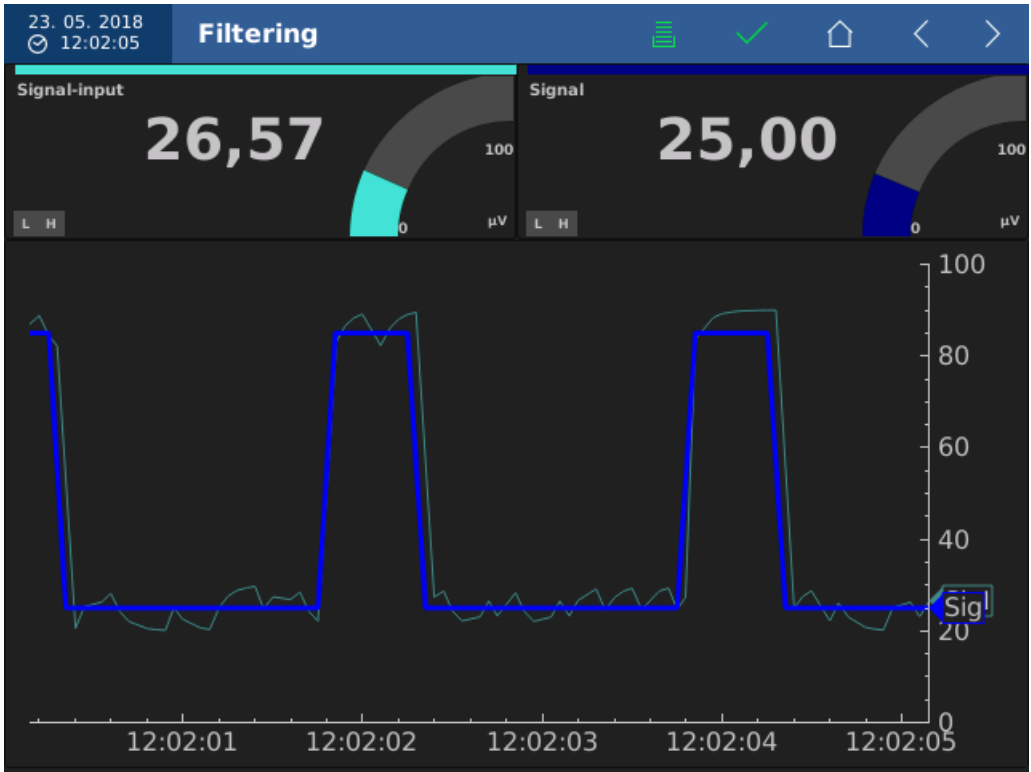
This element can be further [configured](#).



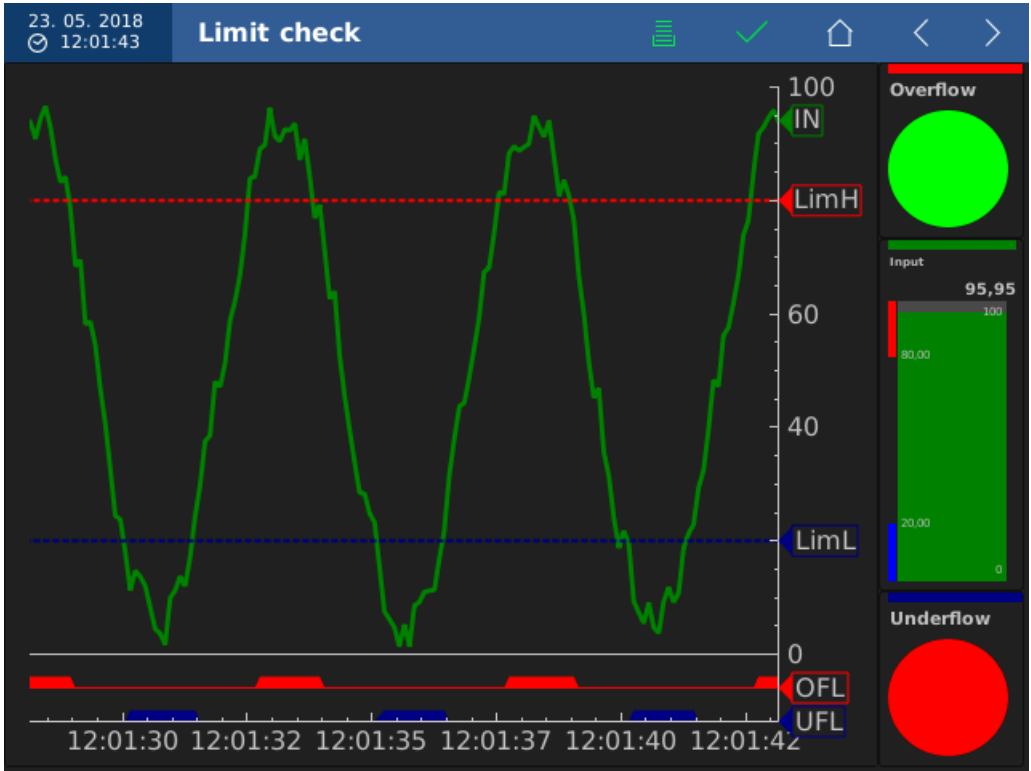
Run chart view configuration



# 5 Function menu

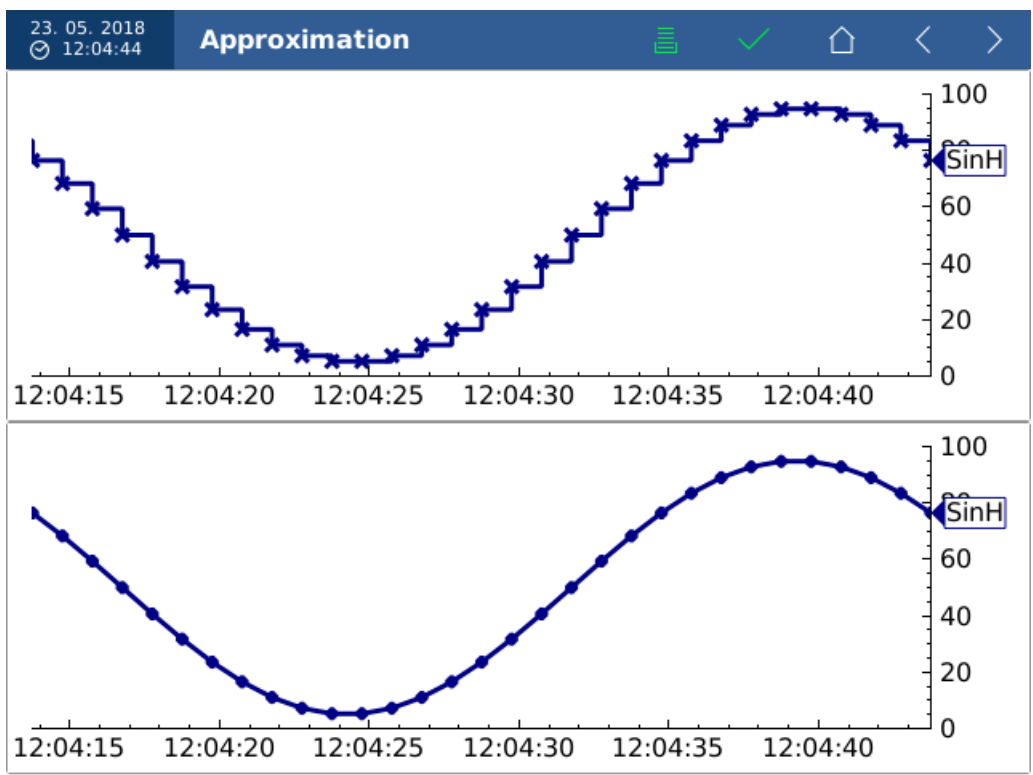


Simple run chart usage

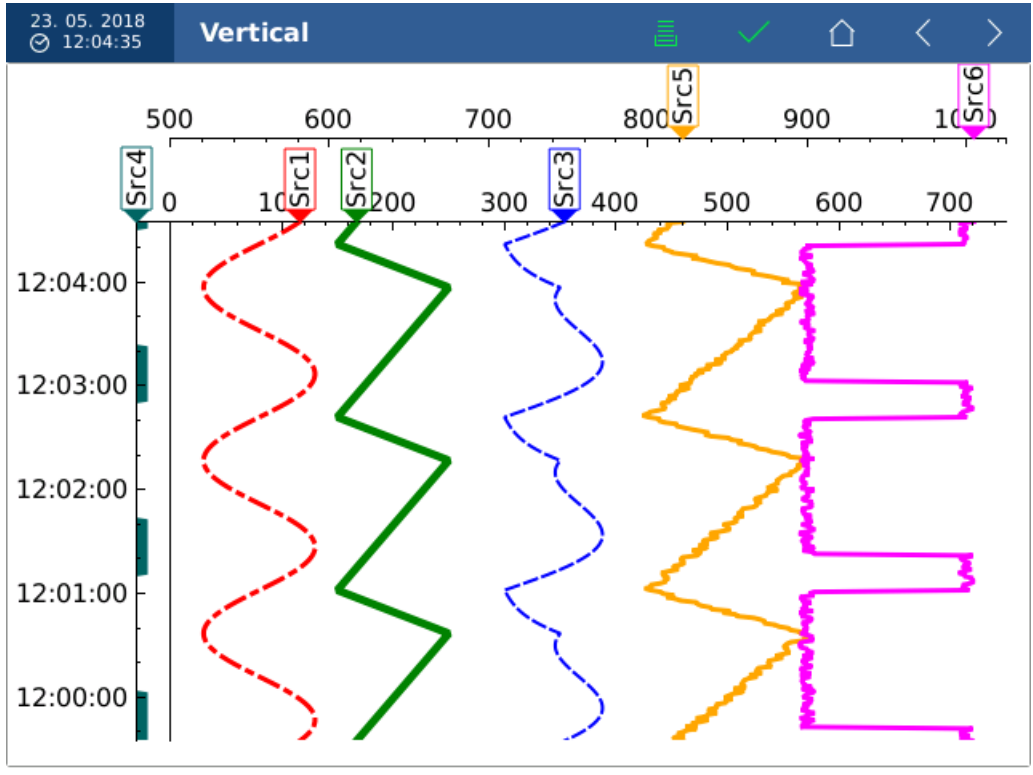


Run chart with binary inputs

# 5 Function menu



Approximation and data point visualization



Vertical layout, multiple value axes and different pen types

Note: screen color theme can be set in [display configuration](#).

# 5 Function menu

## 5.7.8 View elements

View elements are parts of screen views. They are used in different views. For example the bargraph in [bargraph view](#) is also used as optional bargraph on the left side of [numeric view](#). This means that both look the same way and are configured in the same way.

### Bargraph

Bargraph displays value in a vertical or horizontal bargraph with optionally additional information.

Bargraph itself retains color of the source value. If configured, it's possible to visualize value bands as color strips next to the bargraph and also numerical value labels.

#### Band underflow, Band allowed, Band overflow

Color strips next to the bargraph displaying value bands according to configured [limit values](#).

#### Limit values

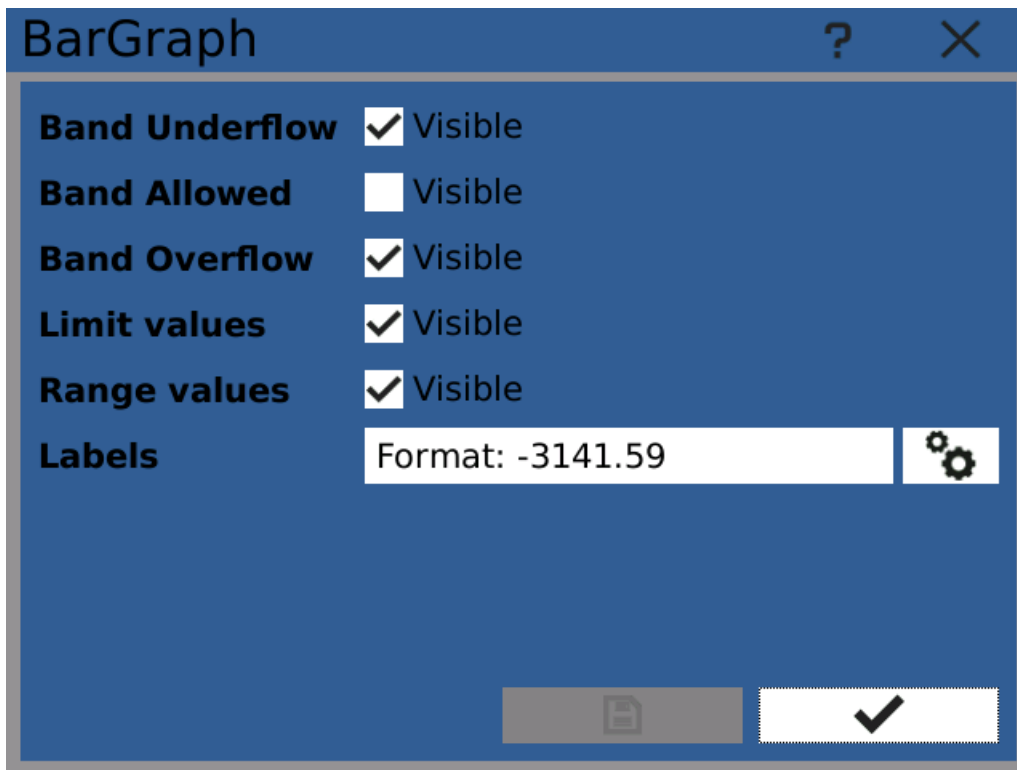
Labels with [limit values](#) displayed as numbers.

#### Range values

Labels displaying range of the bargraph (minimum and maximum) as numbers.

#### Labels

Formatting of numbers in labels.



*Bargraph element configuration*

### Binary

Element binary displays [logical values](#) with color indicator and text.

## 5 Function menu

If the source logical value is false/off, the indicator is red with text "OFF". If the source logical value is true/on, the indicator is green with text "ON".

### Gauge

Gauge displays source value in a way similar to analog gauge meters.

Gauge itself retains color of the source value. If configured, it's possible to visualize value bands as color strips next to the gauge and also numerical value labels.

#### Band underflow, Band allowed, Band overflow

Color strips next to the gauge displaying value bands according to configured [limit values](#).

#### Limit values

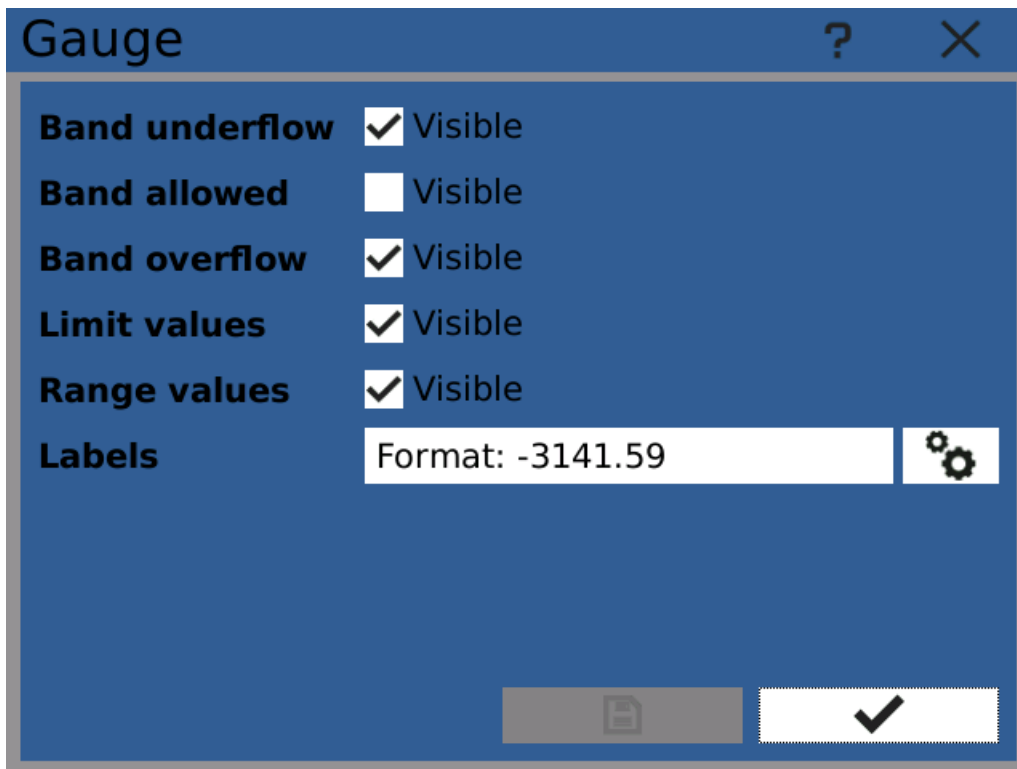
Labels with [limit values](#) displayed as numbers.

#### Range values

Labels displaying range of the gauge (minimum and maximum) as numbers.

#### Labels

Formatting of numbers in labels.



*Gauge element configuration*

### Header

Header shows source name and it's assigned color as a color stripe on top.

There are no configuration options.



## 5 Function menu

### Image

Image displays an image from the source.

#### Aspect ratio

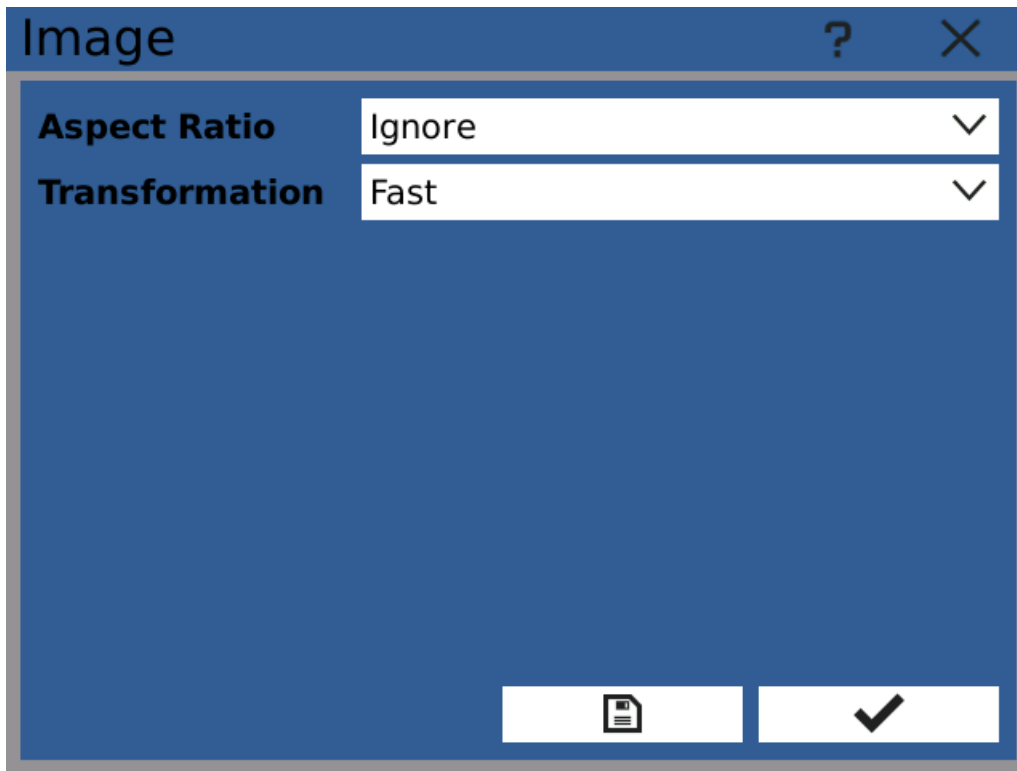
Scales the image to fit the whole available space.

- Ignore - Image is scaled without considering its aspect ratio
- Keep - Image is scaled in a way that keeps its aspect ratio and assures the whole image is visible
- Keep by expanding - Image is scaled in a way that keeps its aspect ratio by filling the whole available space, potentially not making the whole image visible.

#### Transformation

To scale an image an image transformation is used.

- Fast - Computationally efficient transformation. Intended for fast changing images for example from a web camera.
- Smooth - High quality transformation for static images.



*Image element configuration*

### Limits indicator

Limits indicator shows if source value has exceeded its set limits.

It is a simple box with "L" and "H" symbols. When source value reaches into underflow band, "L" is highlighted in red. Correspondingly "H" is highlighted when value reaches into overflow band.

Assigned source has to have [limits configured and enabled](#) for limits indicator to work.

Limits indicator has no configuration options.



## 5 Function menu

### Percentage

Percentage shows current source value corresponding to configured range.

The displayed percentage is always within 0% and 100%

View element Percentage has no configuration options.

### Run chart

Run chart element configures how run chart is displayed. It provides additional configuration options after setting up sources and axes in the screen view itself.

#### Orientation

- Horizontal - Time axis is horizontal, value axis(axis) vertical.
- Vertical - Time axis is vertical, values axis(axis) horizontal.

#### Time range

Configures time range of the displayed chart.

#### True sampling

True sampling guarantees that each sample of the source gets displayed in the chart. This configuration option works only with sources that have history and can slow down chart refresh times by displaying too many values.

Without true sampling enabled the chart dynamically changes sample rate and does not always plot every sample in the chart.

Use this option if you need to precisely plot slow graphs.

#### Approximation

Enabling approximation smooths plotted graphs by connecting neighboring data points with straight lines. Without approximation a stepped line is used.

With approximation enabled the graphs more closely resemble measured analog signals. With approximation disabled the curves more closely represent how the measured values are processed by the device and recorded.

#### Refresh rate

Use this option to limit refresh rate of the chart.

#### Grid

Shows or hides grid in the chart area.

#### Time format

Format of labels on the time axis. Use one of the predefined formats or optionally define your own.

## 5 Function menu

**Run Chart**

**Orientation** Horizontal

**Time range** ^ 30 s

**True sampling**  Enabled

**Approximation**  Enabled

**Refresh rate**  Limit ^ 0s

**Grid**  Time  Value

**Time format** hh:mm:ss

File icon button | Checkmark button

*Run chart element configuration*

### Statistics

Element Statistics displays source statistical values if available.

Statistical values are: minimum value, maximum value and average value.

Element Statistics has no configuration options.

### Unit

Unit shows configured [unit](#) of the assigned source, such as V, A, mmHg and other.

Element Unit has no configuration options.

### Value

View element Value displays current value of the assigned source in numerical form.

It's possible to configure format of the value.

### Format

- Fixed - format with fixed amount of decimal digits, for example: 1.25, 100, 123.45
- Exponent - displays value using exponent, for example: 1.234e-5, 7.12e+10

### Precision

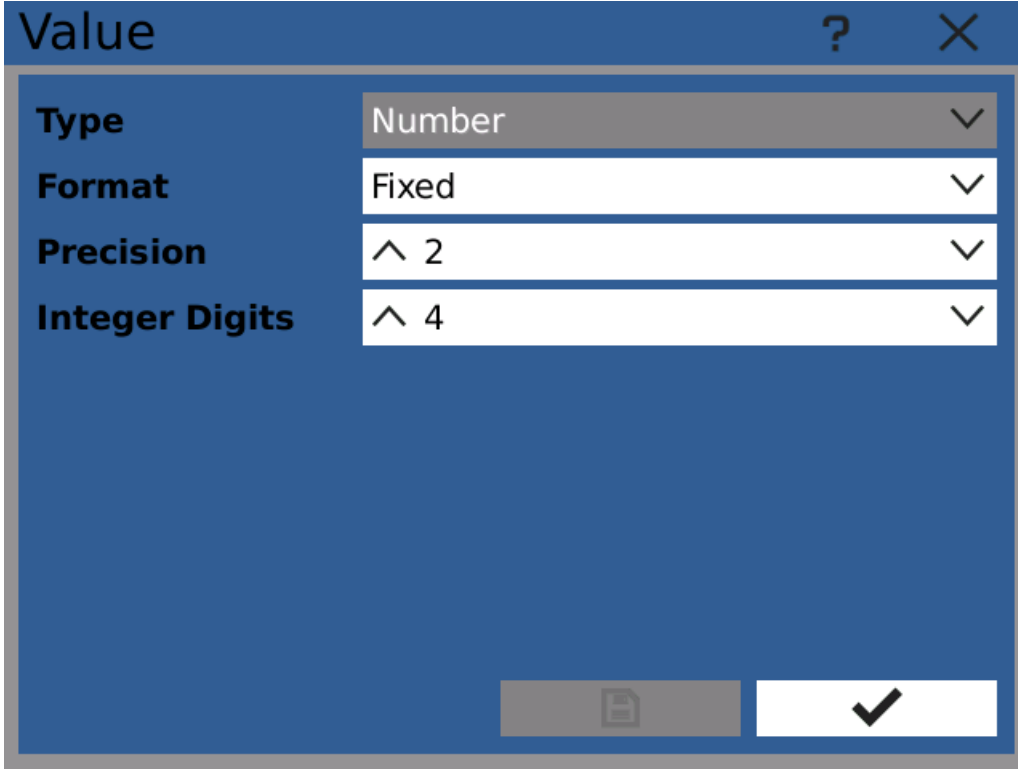
For the fixed format precision represents the number of digits after the decimal point.

For the exponent format it sets represents the maximum number of significant digits (trailing zeroes are omitted).

## 5 Function menu

### Integer digits

Sets the maximum number of integer digits (before the decimal point) for fixed format.



Property	Value
Type	Number
Format	Fixed
Precision	^ 2
Integer Digits	^ 4

*Value element configuration*



# 5 Function menu

## 5.8 Records

To record and store measured values permanently it is required to create one or more recording profiles. After creating profiles you can start recording by clicking on the recording button in the main menu or automatically using Events.

A recording profile determines which values get stored, where, how fast, etc. Creating multiple recording profiles allows the device for example to record with different sample rate, to different storage and more.

This configuration window is used to set up these profiles.

### **Name**

Name of the recording profile. It is stored in the recorded file.

### **File name**

Format of the file name of created recording files. You can optionally select custom extension which is then added to the file names for easier orientation.

### **File type**

Format of the recording files.

- Binary - default format. Size optimized, tamper-resistant. It's necessary to use OMR Viewer to read these files.
- CSV - plain text comma separated file. Use this format if you need to read files directly by standard software (Excel, Calc, etc.). This format takes up more space and cannot be stored in the device internal storage.

It's not possible to change file type after the recording has once started.

### **Timer**

Assigned timer's period determined sample recording sample rate.

### **Memory**

Where the files are stored (Internal memory/SD Card/USB Flash).

It's not possible to change memory after the recording has once started.

### **Records per file**

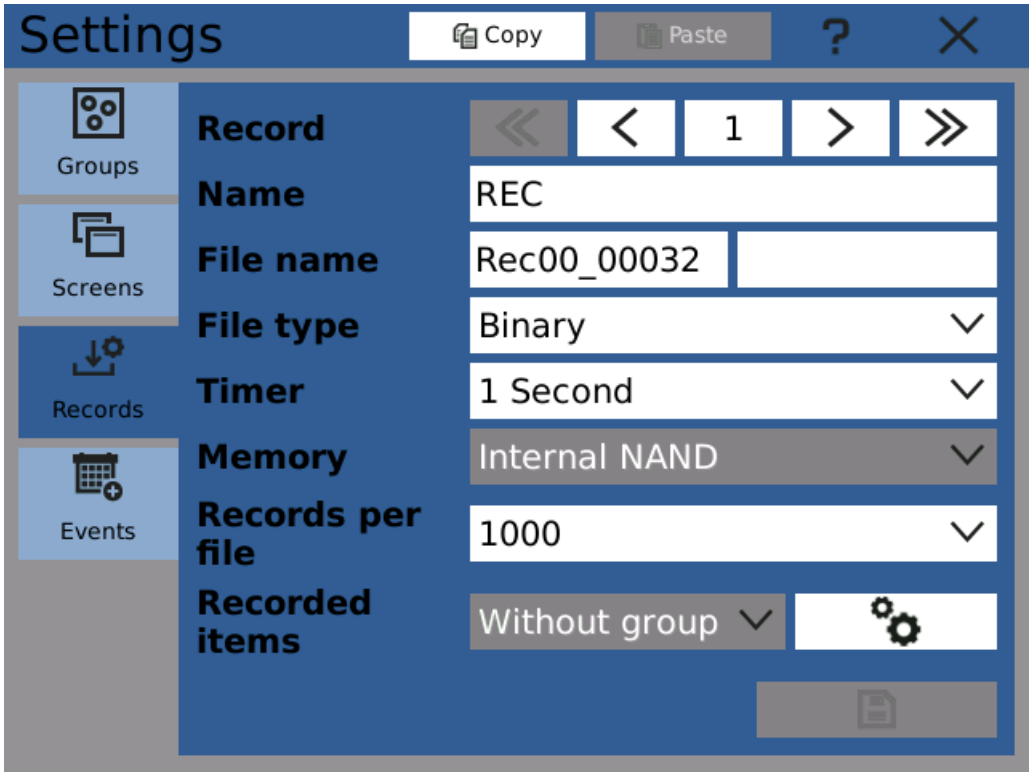
Maximum number of samples stored in one file. After this amount is reached the current file is closed and recording continues with a new file.

### **Recorded items**

Values that are to be recorded.

Selecting a group limits selection only to items of this group.

# 5 Function menu



Record configuration

# 5 Function menu

## 5.9 Events

Event module allows the device to trigger custom-defined actions when specific conditions occur. The usual use-case is triggering recording remotely or controlling outputs based on system condition.

Event take place at a specific moment in time when any of the conditions (called "causes") is met. It has no duration nor holds a value. Once an event occurs, it triggers all its effects.



Event configuration

### 5.9.1 Causes

Every event can have several causes configured. Note that for the event to be caused it is sufficient to meet any of the configured conditions.

#### BUTTON

Buttons at the front side of the device can be configured for use as a trigger.

There are three actions, that can be selected:

- Actions "pressed" and "released" react on simple button press or release without any additional conditions.
- Action "clicked" is triggered when the button is pressed and then released in a short period of time.

#### NODE CHANGE

Logical node value change. It's possible to use falling or rising edge.

#### NODE LIMIT

Node limit state change.



## 5 Function menu

- Underflow - Triggered when node value falls below configured minimum
- Overflow - Triggered when node value rises above configured maximum
- Limits OK - Triggered when value returns to normal

### SYSTEM CONDITION

Transition to system condition.

This cause does not take into consideration which state the device has been in before the transition happened, only the current state.

### FIELDBUS

Logical-type fieldbus cell value change.

#### 5.9.2 Effects

When the event takes place, a number of different effects (actions) can be triggered as an effect. Each event can have up to four different effects. Note that all the effects are triggered at the same time.

### RECORD

Starts, stops or toggles recording.

### SET I/O

Sets output register to a selected value. The value can be either logical or mathematical. This effect can typically be used to switch a relay.

### SCREEN SWITCH

Switches to the selected screen.

### SLIDESHOW

Pauses or resumes [Slideshow](#).

### SCREENSHOT

Creates screenshot in the selected destination storage.

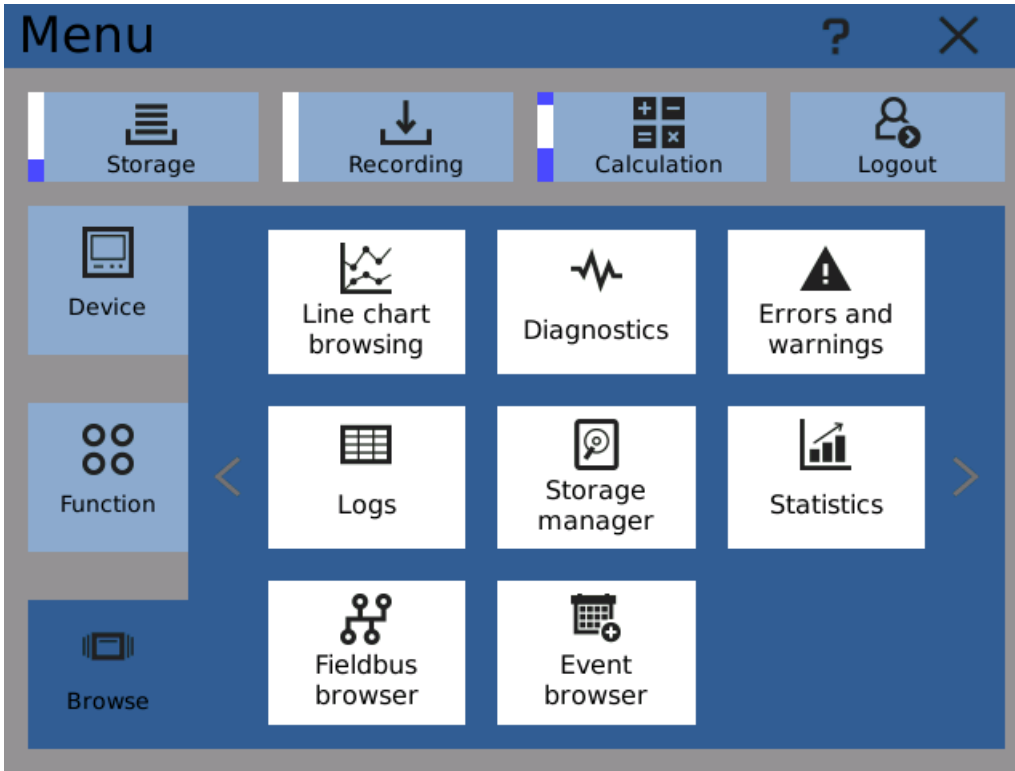
### CLEAR STATISTICS

Removes statistical values of the selected node.



## 6 Browse menu

The Browse category contains tools for browsing and managing recorded data and device diagnostics.



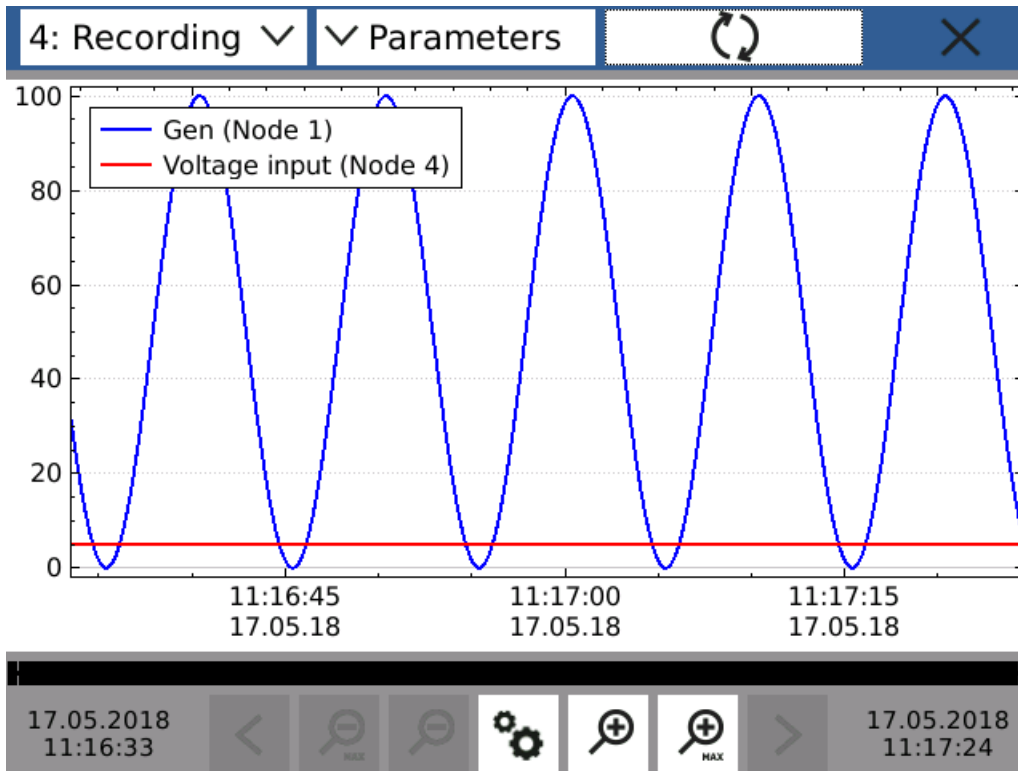
*Browse menu*

# 6 Browse menu

## 6.1 Line chart browsing

This tool allows you to display recorded values.

This browser is meant just to find out if the required data is stored by the device and to get some overview of the values. To see values in greater detail and work with them it's better to use PC software OMR Viewer.



Browsing recorded values

### RECORD

Select a record that you wish to browse.

### PARAMETERS

Select parameters of the record to browse.

### RELOAD BUTTON

Fetches data and displays them in the plot.

### VIEW BUTTONS

Buttons on the bottom of the screen can be used to browse the displayed data by changing displayed time range.

*Note: the slider below the plot shows position of the view in all displayable values.*

*Note: the value axis scales automatically to accommodate all values in the selected range.*

# 6 Browse menu

## 6.2 Diagnostics

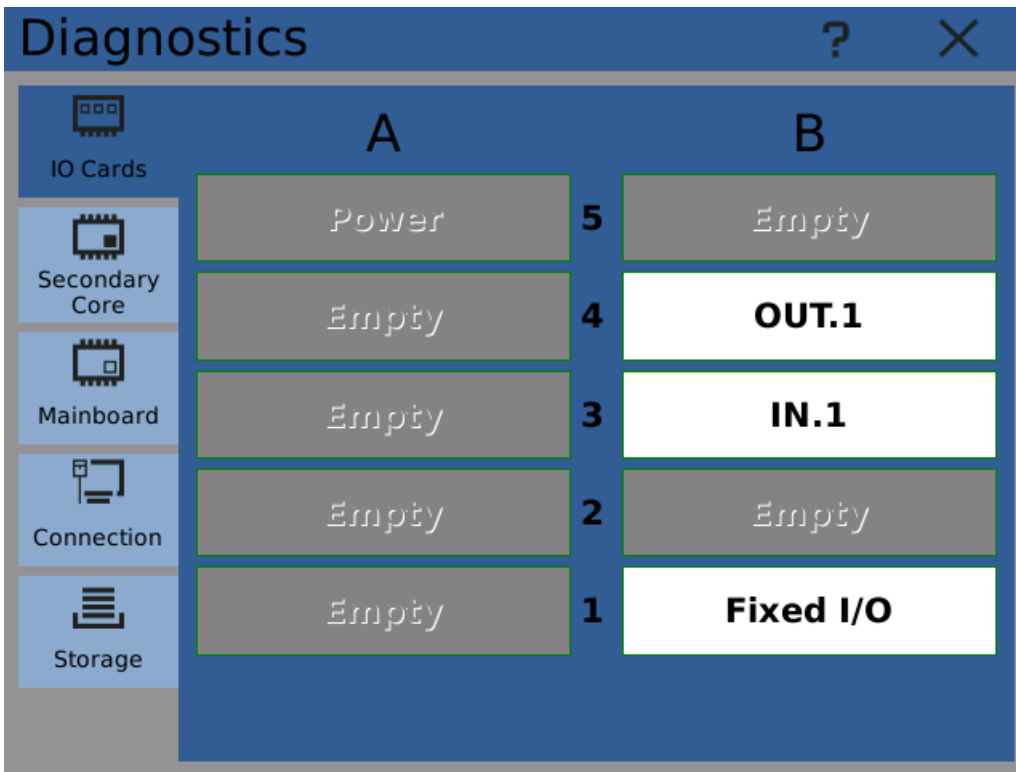
Diagnostics dialog displays various information about different parts of the device.

### 6.2.1 IO Cards

Shows IO cards currently plugged in the device.

Empty IO card positions are displayed in gray, positions with cards in white. If according to current configuration an IO card is missing or an IO card of different type is present in its place, the appropriate slot is highlighted in red.

Clicking on (non-empty) card positions opens diagnostics window where you can see detailed information about the present card and directly view its registers.



IO cards diagnostics - overview

Tip: viewing raw measured data in IO card diagnostics is a good way to troubleshoot card channel connection issues.

Tip: diagnostics dialog allows you to manually switch digital outputs. Just make sure the output is not already assigned as a node output.

### 6.2.2 Secondary core

Secondary core is a real time coprocessor used by the device. These values can be used to troubleshoot problems and are not meant to be used during normal operation.

#### FW version

Version of the currently running firmware.

## 6 Browse menu

### Core state

Current state of the core. Normal value is "Running"

### ICC state

Inter Core Communication. Normal value is "ICC is valid".

### Heartbeat

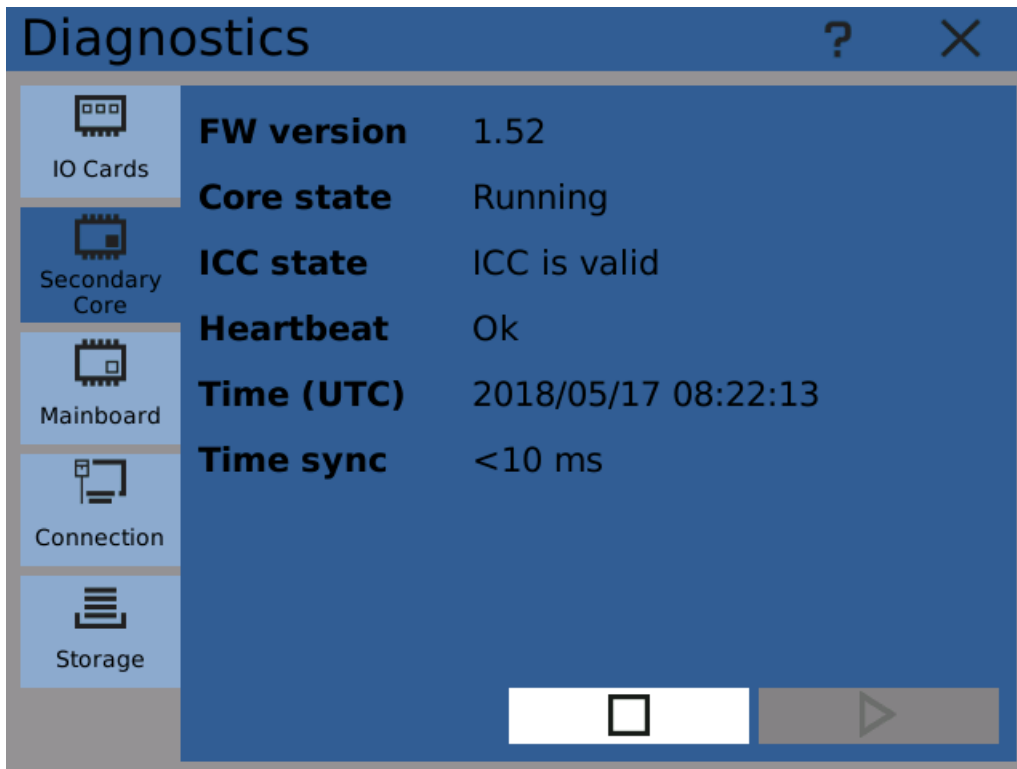
Signalizes if the secondary core is responding.

### Time (UTC)

Current time used by the coprocessor in UTC (Universal Time Coordinated).

### Time sync

Difference between main system time and coprocessor time. Normal value should be <10ms.



*Secondary core diagnostics*

### 6.2.3 Mainboard

Displays information about the device main board functions.

These values can be used to troubleshoot potential issues with the device and are not meant to be used during normal operation.

### Power supply 24V

Current voltage of the 24V power supply.

## 6 Browse menu

### Power supply 5V

Current voltage of the 5V power supply.

### Device temp.

Temperature measured inside of the device.

### Ambient light

Intensity of the ambient light as measured by the sensor under the front door.

### Button 1 and 2

State of user buttons on the front panel. 1 signalizes the button is pressed.

### RTC battery

State of the RTC (Real Time Clock) battery. If the battery is low, the device might lose system time when unplugged from power source.

### RTC time (UTC)

Current time of the Real Time Clock.



### Update RTC

Stores current system time to the Real Time Clock.

### Reboot

Reboots the device immediately.

The screenshot shows a 'Diagnostics' window with a blue header and a sidebar on the left. The sidebar contains icons and labels for 'IO Cards', 'Secondary Core', 'Mainboard', 'Connection', and 'Storage'. The main area displays the following data:

<b>Power supply 24V</b>	23.87 V
<b>Power supply 5V</b>	5.09 V
<b>Device temp.</b>	25.3 °C
<b>Ambient light</b>	78 %
<b>Button 1</b>	1
<b>Button 2</b>	0
<b>RTC battery</b>	Batt low
<b>RTC time (UTC)</b>	N/A
<b>Update RTC</b>	
<b>Reboot</b>	

Mainboard diagnostics

## 6 Browse menu

### 6.2.4 Connection

Shows information about current network connections.

To configure network interfaces, use [connection settings](#).

#### Hostname

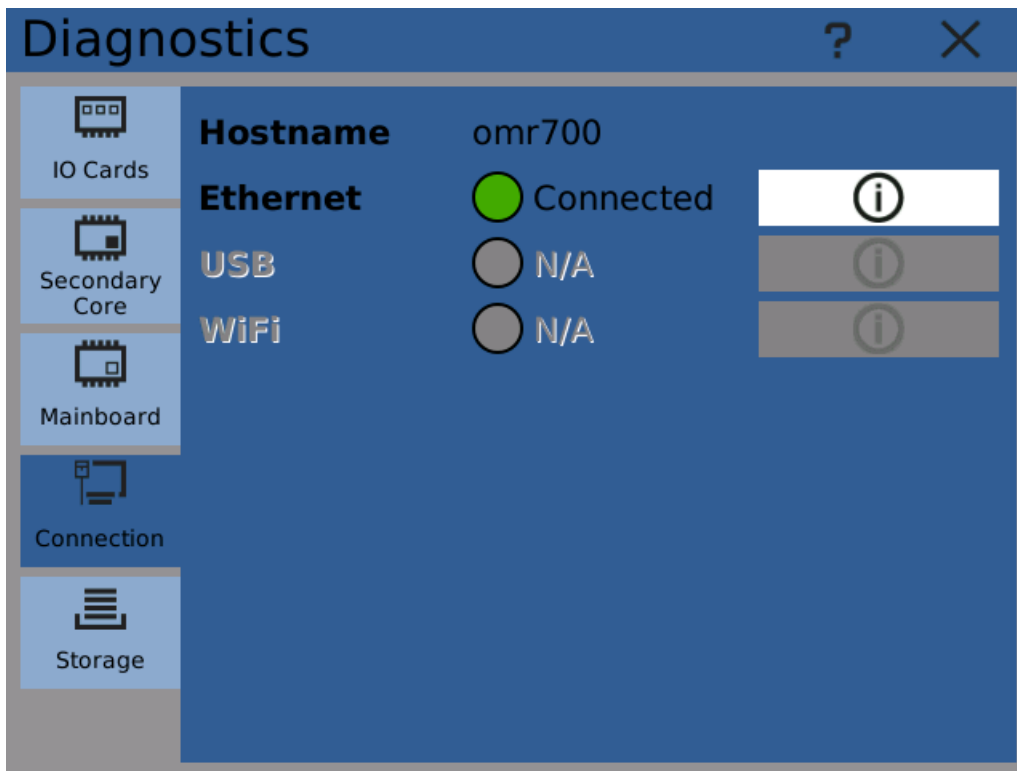
Current device network name.

#### Interface

The icon shows the current interface state

- Connected (green) - interface is connected to a network
- Disconnected (red) - interface is enabled but disconnected
- Off (grey) - interface is disabled

Each of the device network interfaces also has it's own MAC address and IP. You can see them by clicking on the info button.



Connection diagnostics

### 6.2.5 Storage

The device can use several storage media. They are used for storing records, screenshots and configurations.

Icons next to the storage label indicate the current state of the storage.

- Green - the storage is available and ready
- Yellow - the storage is ready but running out of space
- Red - error or the storage is almost out of space

## 6 Browse menu

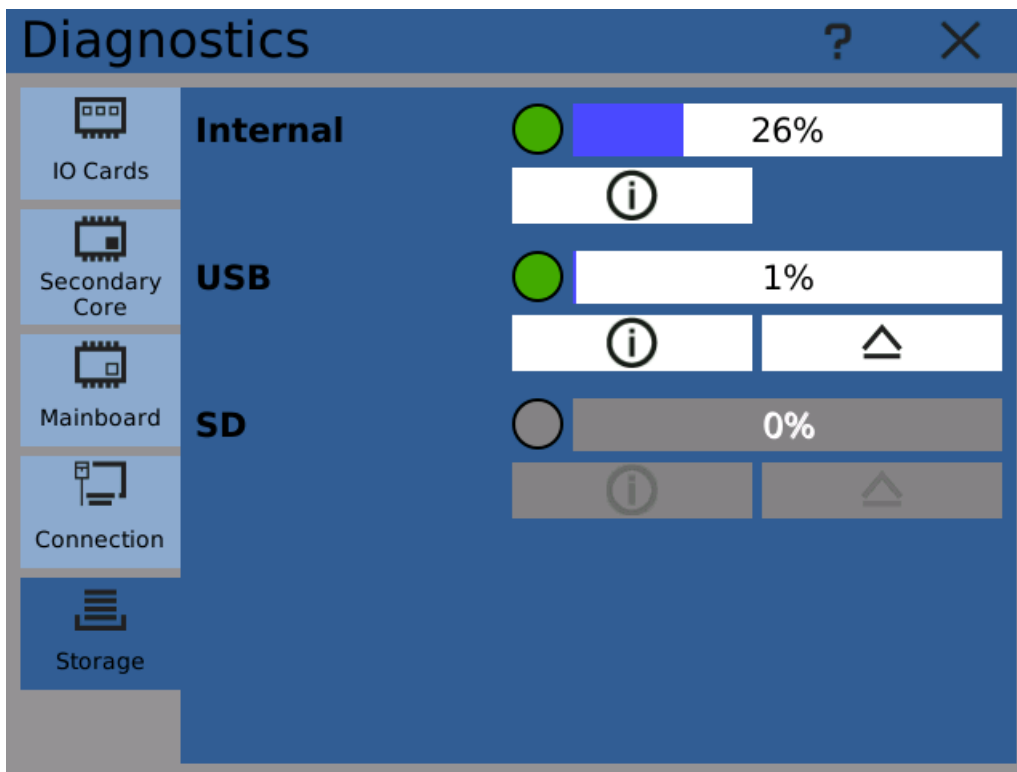
- Grey - the storage is not available

The progressbar next to the state indicator shows how much space is used/left on the device.

Additional information about the storage device can be displayed by clicking on the info button.

Clicking on the eject button safely removes the storage device so it can be physically unplugged.

**Warning:** disconnecting storage devices without ejecting them before can lead to data loss!



*Storage diagnostics*

### Internal

Internal built-in storage. It is always available

### USB

USB Flash disk plugged in the device front panel.

### SD

SD Card present in the device front panel slot.

*Note: running out of space stops recording to the affected storage media.*

## 6 Browse menu

### 6.3 Errors and warnings

Errors and warnings dialog displays current device issues. These warnings and issues can be either device/system problems or user-defined indications.

Each of the entries that appear here is also stored in system logs.

There are three levels of errors and warnings

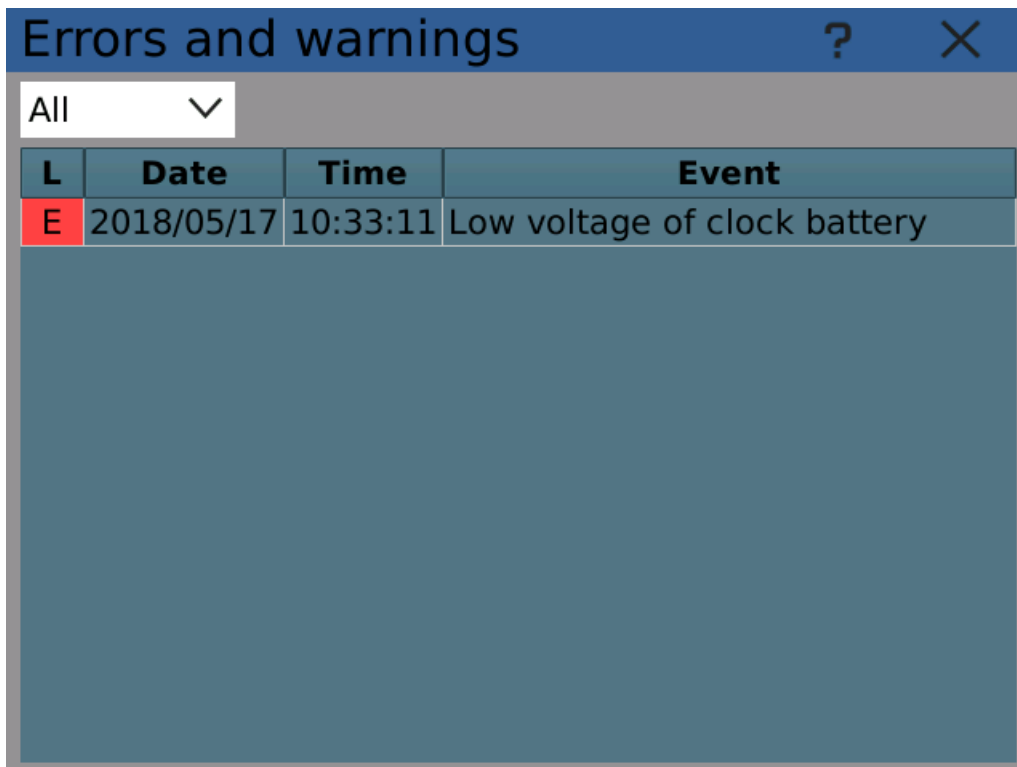
- Warning - the device can function further, but does not operate in normal conditions
- Error - a problem appeared that can affect device functions
- Critical error - a significant malfunction affecting core device functions

Warnings and errors disappear from the table once system conditions return back to normal. For example when the device registers low voltage on power supply, the appropriate warning is displayed here as long as the voltage remains low. Once the situation returns to normal, the warning disappears. The only exception to this rule are critical errors. These remain visible until they are manually acknowledged or the device is turned off. After that you can see them only in [system logs](#). Critical errors don't disappear by themselves automatically and have to be acknowledged by a user with appropriate [user rights](#).

Each entry has a level, date and time and event type. Additional information can be displayed by clicking on the entry.

Critical errors can be acknowledged by clicking on them and then clicking on the "Acknowledge" button.

It's possible to filter entries by level using the level selector.



L	Date	Time	Event
E	2018/05/17	10:33:11	Low voltage of clock battery

*Displaying current errors and warnings*





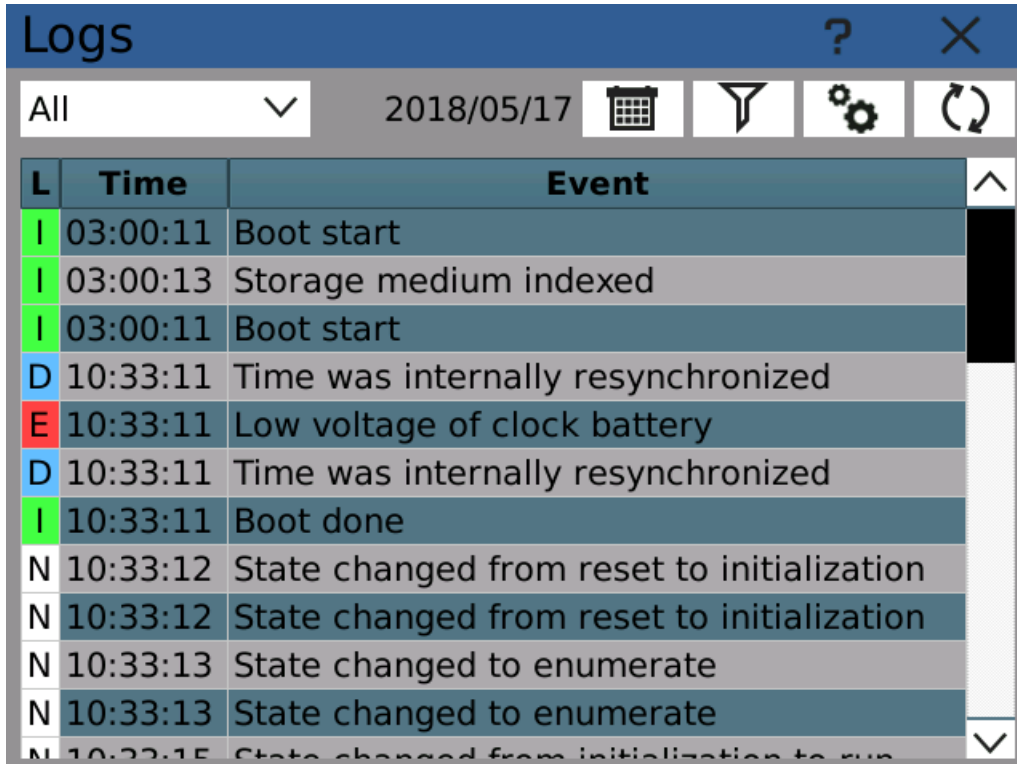
## 6 Browse menu

## 6 Browse menu

### 6.4 Logs

All significant system events and issues are stored in system logs. System logs are stored on the device and can be browsed later if needed.

This dialog allows you to browse these logs. Using the navigation buttons you can select the day, time range you wish to see and further filter by level or event type. Clicking on a row in the log table opens a dialog with detailed information about the log.



The screenshot shows a 'Logs' dialog box with a dark blue header. Below the header is a toolbar with a dropdown menu set to 'All', a date field showing '2018/05/17', and icons for calendar, filter, settings, and refresh. The main area contains a table with columns 'L', 'Time', and 'Event'. The table lists various system events with their corresponding log levels (I, D, E, N) and timestamps.

L	Time	Event
I	03:00:11	Boot start
I	03:00:13	Storage medium indexed
I	03:00:11	Boot start
D	10:33:11	Time was internally resynchronized
E	10:33:11	Low voltage of clock battery
D	10:33:11	Time was internally resynchronized
I	10:33:11	Boot done
N	10:33:12	State changed from reset to initialization
N	10:33:12	State changed from reset to initialization
N	10:33:13	State changed to enumerate
N	10:33:13	State changed to enumerate
N	10:33:15	State changed from initialization to run

*Browsing logs*

Logs that are no longer needed can be deleted using the [Storage manager](#).

## 6 Browse menu

### 6.5 Storage manager

Storage manager is used to work with recorded values and system logs stored in the internal device storage.

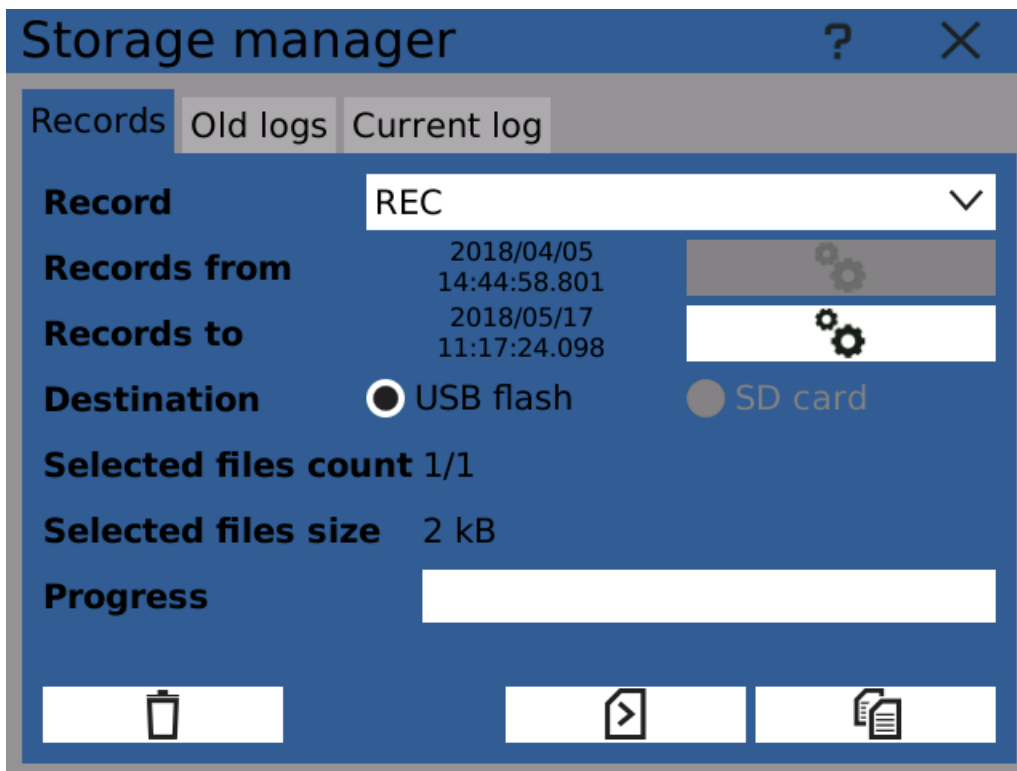
There are several tabs available according to the access rights of the current user.

#### Records

Tools for copying, moving and deleting recorded files. By choosing a recording profile and time range a number of files is selected. The number of selected files and their size is displayed.

If you want to copy or move selected files to external storage (SD Card, USB Flash), select the storage you wish to use and click on the copy or move button.

Selected files can also be permanently deleted by clicking on the delete button.

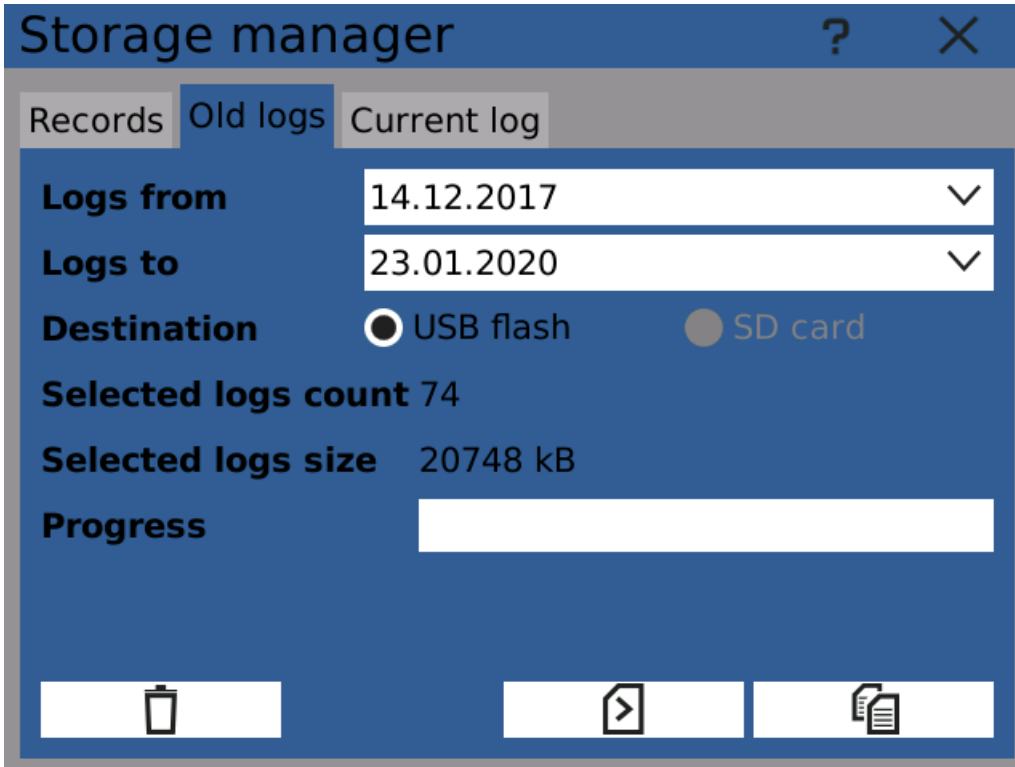


Storage manager - records

#### Old logs

Logs are stored in files. For each day there is a separate files. Old logs work with logs older than the current day. Just like in the records tab you can select log files from specific time range and then copy, move or permanently delete them.

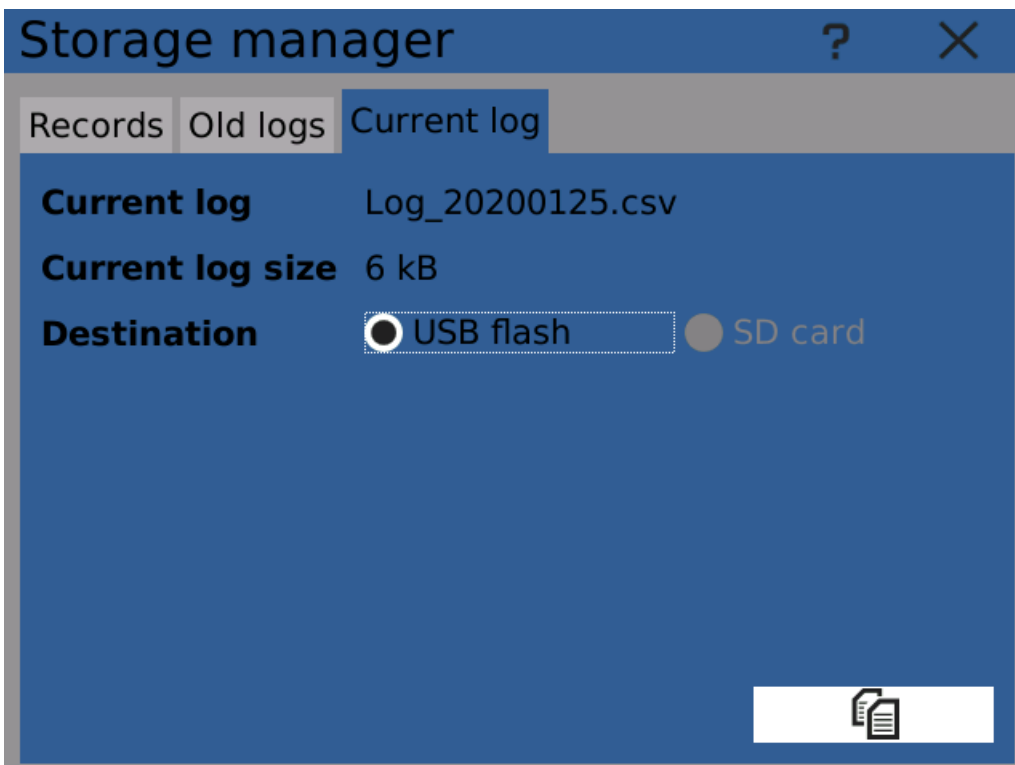
## 6 Browse menu



Storage manager - old logs

### Current log

Current log tab works with current day log file. Since the current log file can't be removed you can choose to copy it to an external storage of your choice.



Storage manager - current log



## 6 Browse menu

### Wipe

The wipe tab is a service tool available only for users with access level Producer and Universal. It allows to completely, permanently remove all record and log files. These options are not meant to be used during normal operation.



## 6 Browse menu

### 6.6 Statistics

Clicking on the "Statistics" button in the main menu erases all node statistical information (minimum/maximum/average values).

Clearing statistics automatically can be done using [Events](#).

# 6 Browse menu

## 6.7 Fieldbus browser

Fieldbus browser displays all configured cells of all fieldbuses in a simple table.

Each cell shows it's name, current value and short information about type.

### MODBUS

Modbus cell types use following shortcuts to determine cell type

- DI - Discrete Input
- CO - Coil
- IR - Input Register
- HR - Holding Register

	Name	Value	Info	
1	<input checked="" type="radio"/> Sensor 1 Temp	82.160	HR 42, 43	▲
2	<input checked="" type="radio"/> Switch 1	<input checked="" type="checkbox"/>	CO 44	
3	<input type="radio"/>			
4	<input type="radio"/>			
5	<input type="radio"/>			
6	<input type="radio"/>			
7	<input type="radio"/>			
8	<input type="radio"/>			
9	<input type="radio"/>			
10	<input type="radio"/>			
11	<input type="radio"/>			
12	<input type="radio"/>			▼

Fieldbus browser

# 6 Browse menu

## 6.8 Event browser

Event browser displays basic information about configured events in a table.

Each event shows the following:

**State**

- Green dot - enabled
- Gray dot - disabled
- White dot - not configured

**Name**

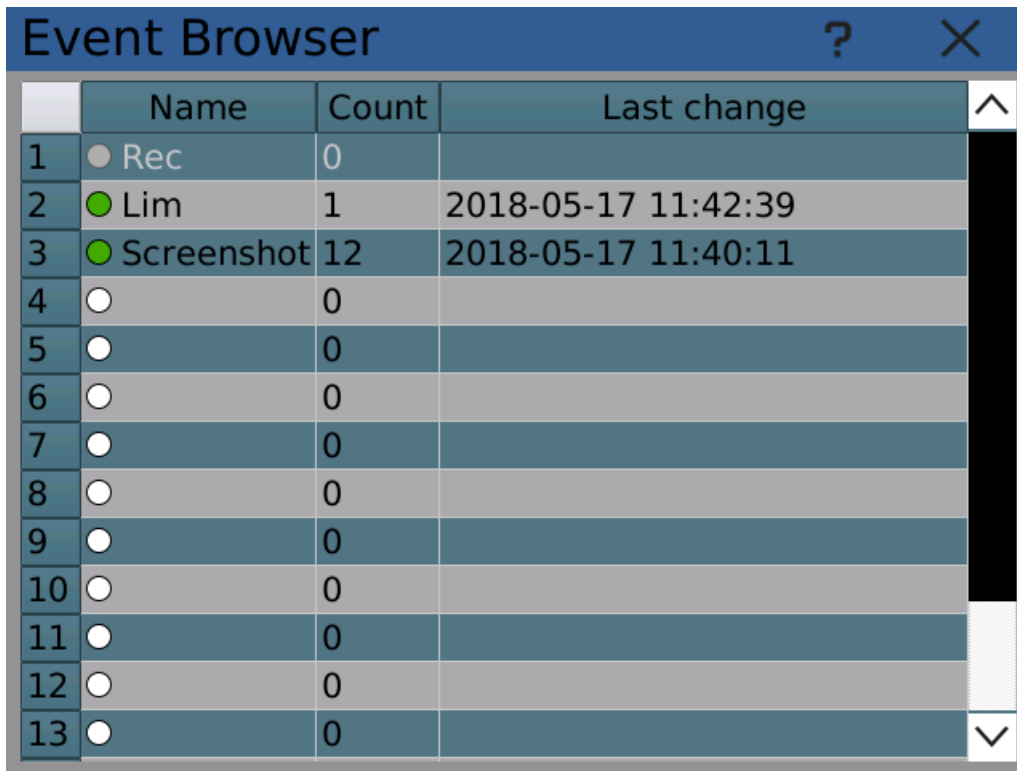
Name of the event

**Count**

How many times the event has occurred.

**Last change**

Last time the event occurred.



The screenshot shows a window titled "Event Browser" with a table of events. The table has four columns: a selection column with numbers 1-13, a "Name" column with event names and state indicators, a "Count" column, and a "Last change" column with timestamps. The "State" column uses colored dots: a gray dot for "Rec", a green dot for "Lim", and a green dot for "Screenshot". Other events have white dots. The "Last change" column shows timestamps for "Lim" and "Screenshot".

	Name	Count	Last change
1	● Rec	0	
2	● Lim	1	2018-05-17 11:42:39
3	● Screenshot	12	2018-05-17 11:40:11
4	○	0	
5	○	0	
6	○	0	
7	○	0	
8	○	0	
9	○	0	
10	○	0	
11	○	0	
12	○	0	
13	○	0	

Event browser

Note: The "Count" and "Last change" indicators are reset on device startup or configuration change.

Note: Events are also recorded in the system log.





## 7 PC Software

There are two PC programs that can be used with the device to remotely view measured values and process recorded values on the computer.

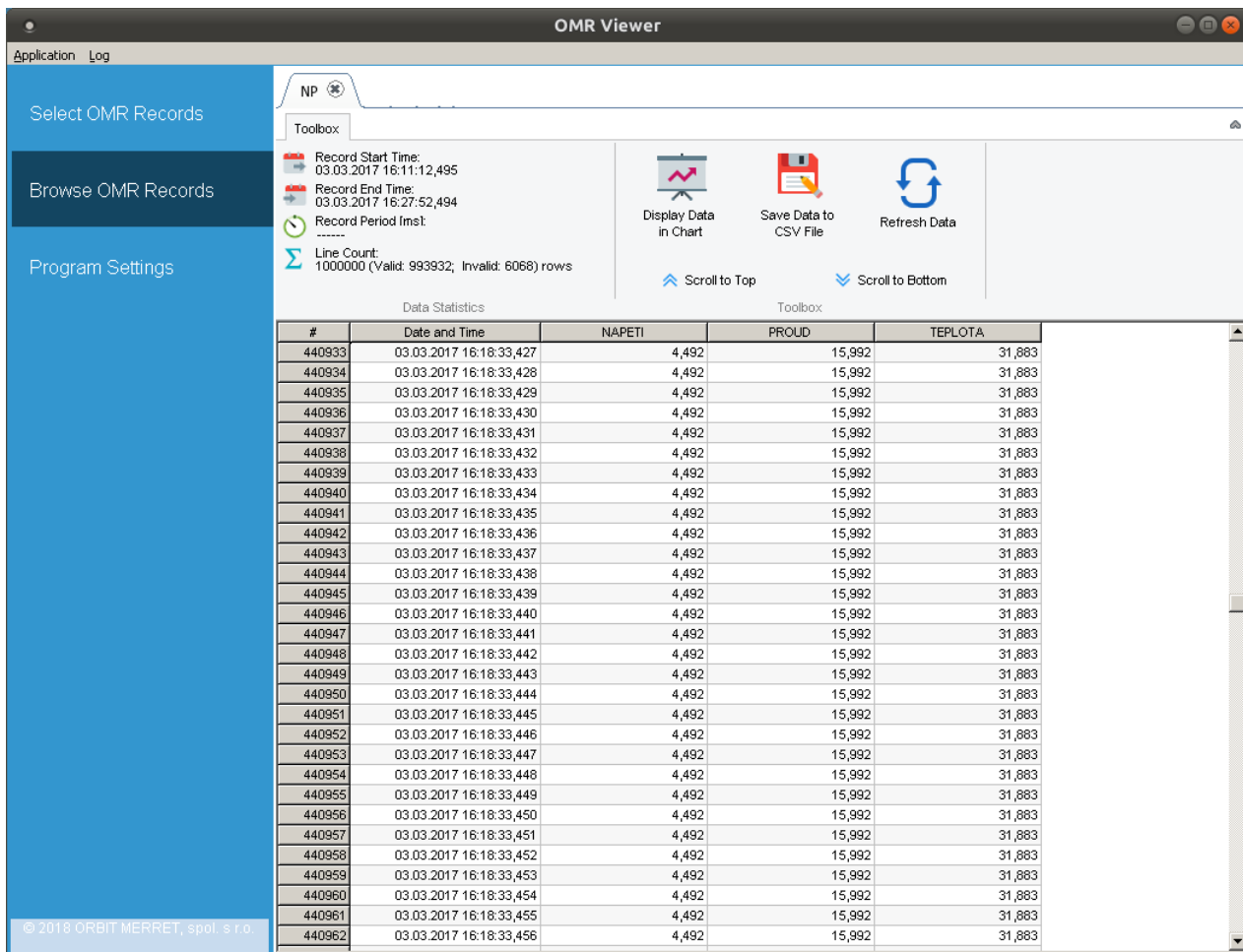
These programs can be downloaded free of charge from the company website.

# 7 PC Software

## 7.1 OMR Viewer

Browsing recorded values stored locally or over computer network. It can display values numerically but also plot selected time intervals in a chart and print them.

This software is required to read binary records and it is a convenient way to browse even recordings in CSV format.



Displaying recorded values in OMR Viewer

# 7 PC Software

## 7.2 Recorder

Displaying measured values in real time on computer over network. The program displays the same screens as the device it's connected to.



PC application Recorder



## 8 Examples

This chapter lists several typical use-case configuration examples.

### **Example 1: Voltage measurement with IN.1 card**

Simple single channel voltage measurement using IN.1 card's input.

### **Example 2: Controlling a relay with a comparator**

How to switch relay outputs based on measured input

### **Example 3: Recording measured values**

Creating a recording profile and recording measured values.

### **Example 4: Recording on button click**

Starting and stopping recording in more convenient ways.

### **Example 5: Reading measurements with Modbus TCP**

Using Fieldbuses to access measured values remotely over the network with Modbus-enabled devices.

### **Example 6: Converting electrical value to physical**

Converting measured electrical values to physical values they represent.

# 8 Examples

## 8.1 Example 1: Voltage measurement with IN.1 card

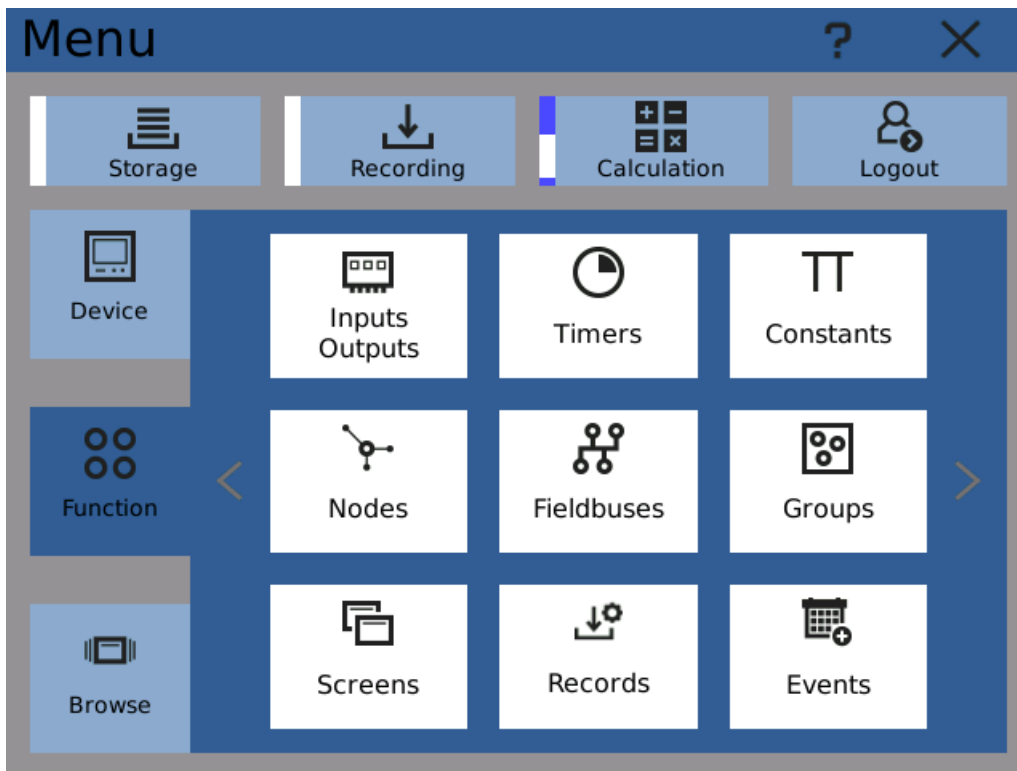
A simple example showing how to measure voltage using IN.1 card and display the measured value on the screen.

### Prerequisites

- Administrator access - you need to log-in as a user with administrator (or higher) rights. It's possible to use for example administrator account created in wizard after the first device start.
- IN.1 input card
- Voltage source connected to IN.1 card's input

### 1) Opening the Function menu

After logging into the device it is necessary to configure IO card input first. Configuration dialog can be found in the main menu, tab Function -> Inputs Outputs.



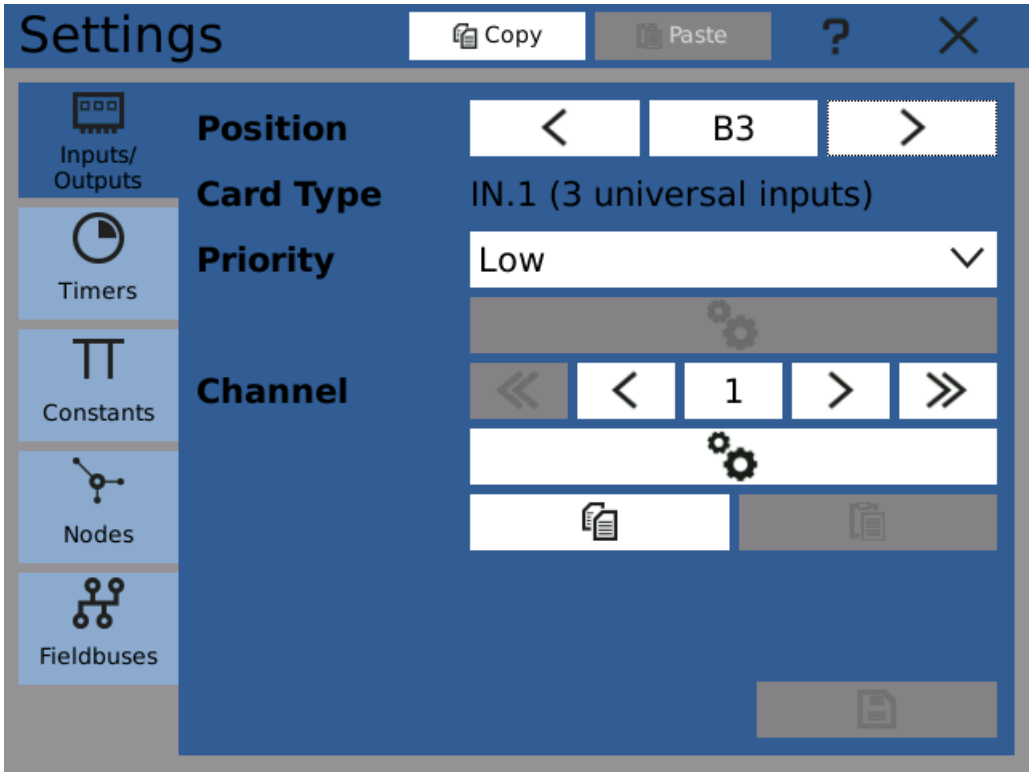
Menu Function

### 2) Selecting the input channel

In the "Inputs Outputs" dialog select the IN.1 card and channel you wish to use. In this case a channel 1 of card in "B3" position is used.

*Note: you can find card's connection schematics in the IO card catalogue.*

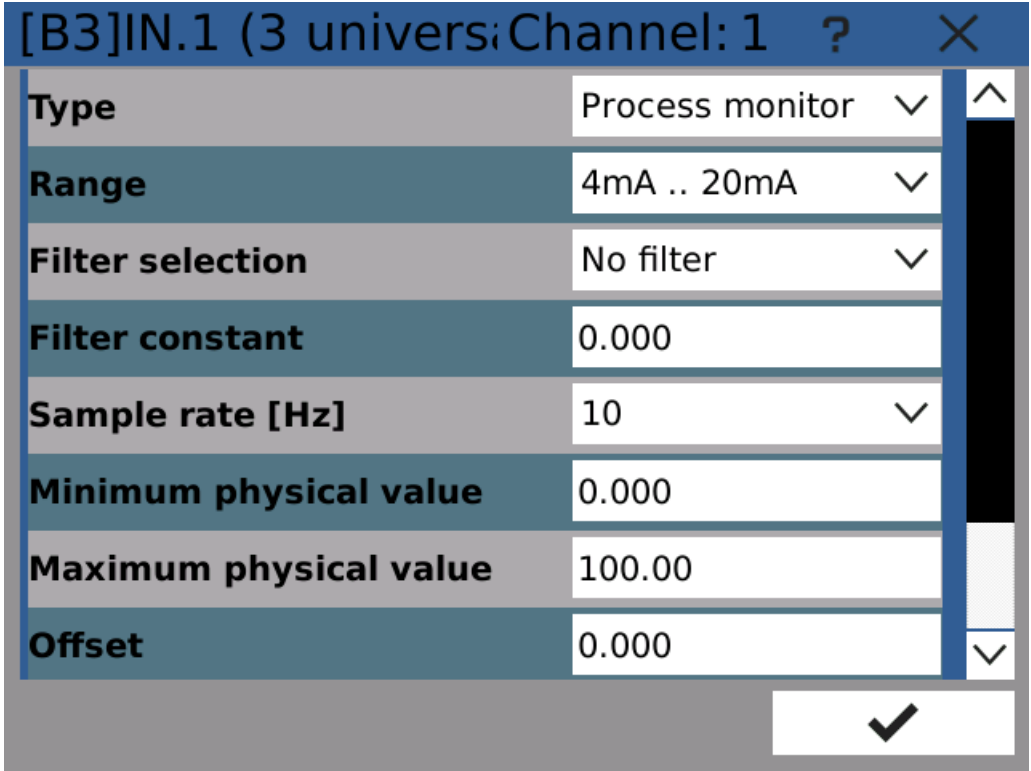
# 8 Examples



Selecting the IN.1 card and channel

### 3) Opening the channel configuration dialog

Press the "Configure" button (below the channel selector) to open channel configuration.

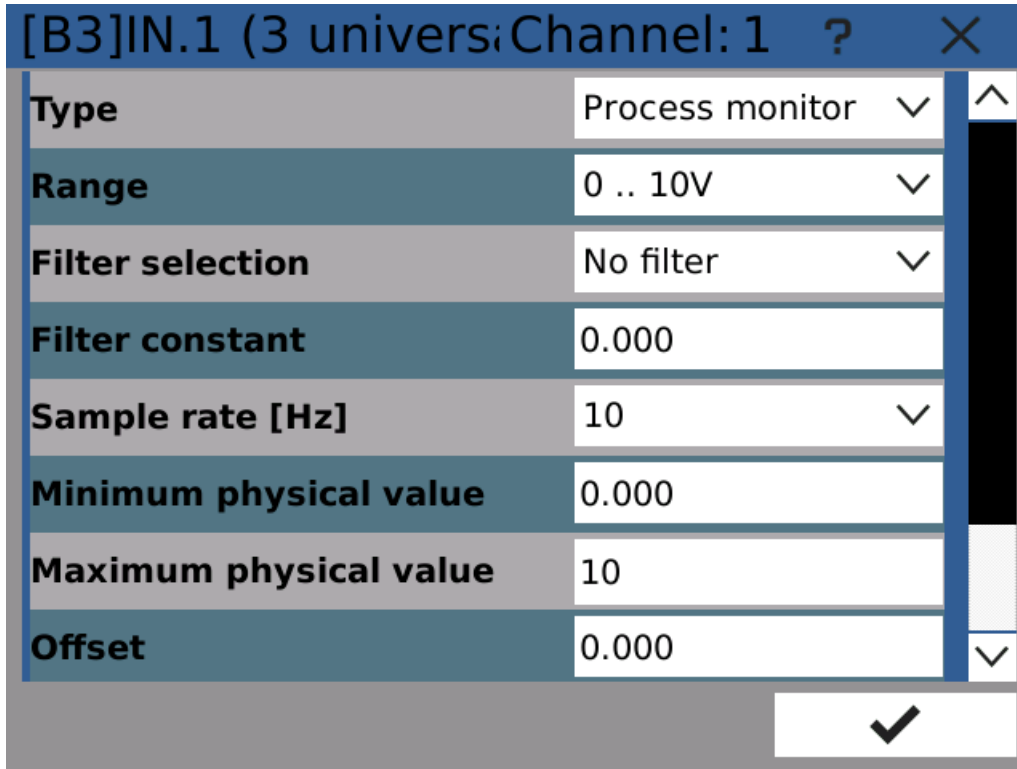


Default channel configuration

## 8 Examples

### 4) Selecting input range

Select the "0 .. 10V" range and set the maximum physical value to 10.



[B3]IN.1 (3 univers; Channel: 1 ? X	
Type	Process monitor
Range	0 .. 10V
Filter selection	No filter
Filter constant	0.000
Sample rate [Hz]	10
Minimum physical value	0.000
Maximum physical value	10
Offset	0.000

*Configured channel*

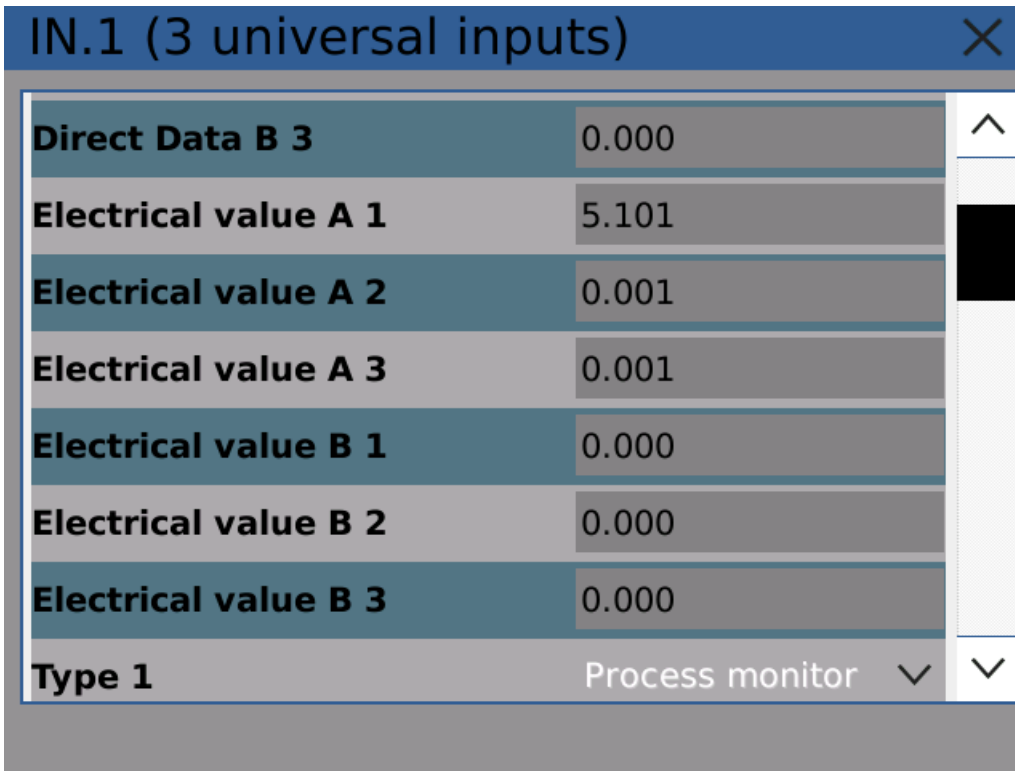
Range sets the input value range. In this case we want to measure low DC voltages in the range of 0 - 10V. All the other configuration options can be left at default values.

### 5) Checking if everything is OK

Now it's usually a good idea to take a look into diagnostics to make sure the input card is connected and configured properly.

Open the card diagnostics in Menu -> Browse -> Diagnostics -> IO cards and open the IO cards diagnostic registers.

## 8 Examples



Channel Name	Value
Direct Data B 3	0.000
Electrical value A 1	5.101
Electrical value A 2	0.001
Electrical value A 3	0.001
Electrical value B 1	0.000
Electrical value B 2	0.000
Electrical value B 3	0.000
Type 1	Process monitor

*IO card channel physical value diagnostics*

The "Electrical value A 1" field should display input voltage.

### 6) Creating a timer

To further process the measured value we need to use a node. Nodes are the central component used to configure the recorder and in most cases the measured values are processed through them.

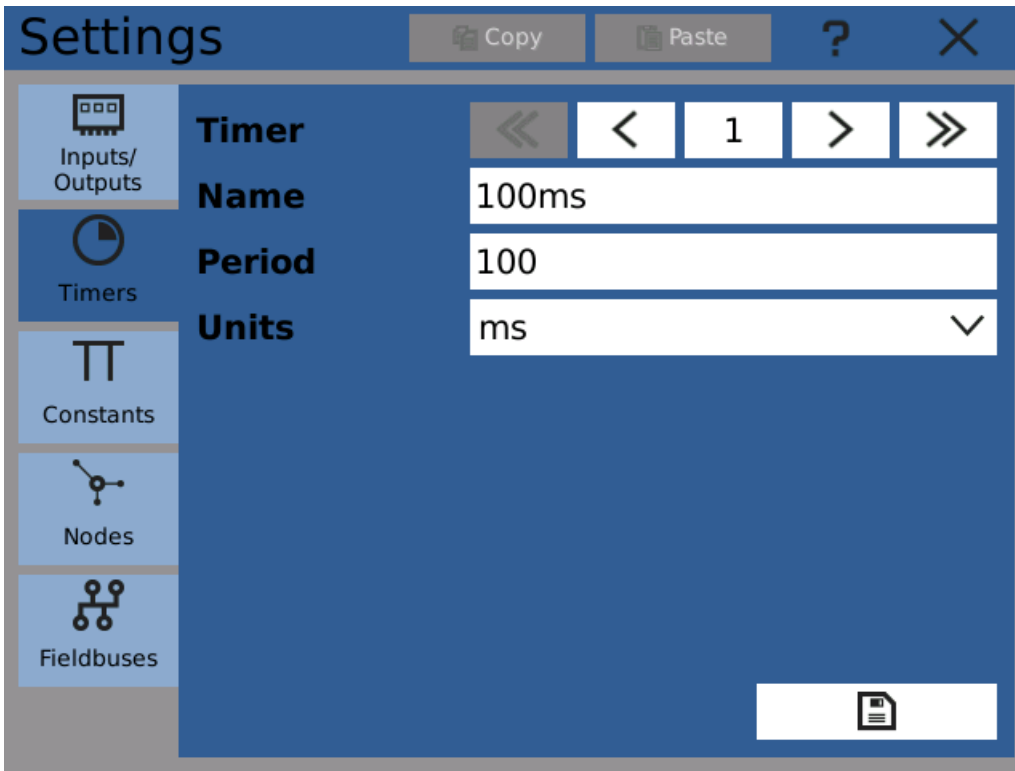
First it's necessary to configure a timer. It determines how fast the node will read and process the input value.

Open the timer configuration window in Menu -> Function -> Timers.

For this example we will create a timer with 100ms period.



## 8 Examples



*Setting up a timer*

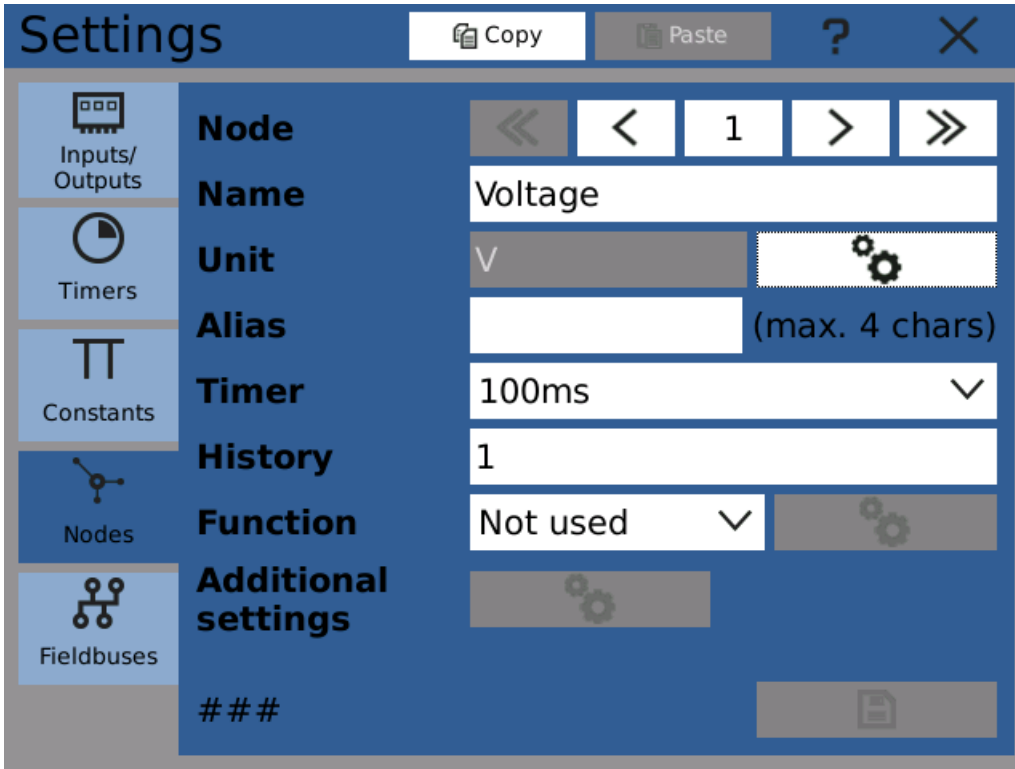
### 7) Creating a node

Now it's time to create the node. Click on the "Nodes" tab on the left of the window. Select an appropriate node name. This node is going to be processing input voltage value, so "Voltage" is suitable.

After that select the previously created timer.

Optionally it's possible to select a unit. This unit will be later displayed on the screen.

## 8 Examples



Setting up a node

The three crosses in the bottom left corner indicate that the node currently has no value. That's because no function is assigned.

### 8) Configuring node function

To be properly configured a node has to have a function. For this example we need to read value from IO card.

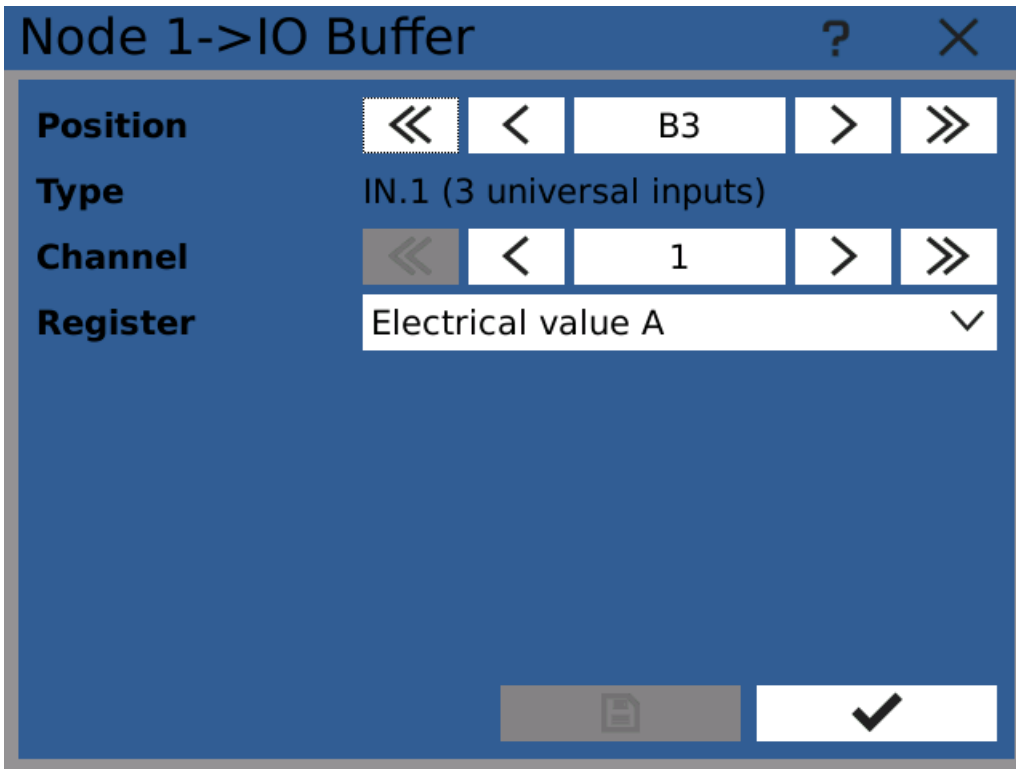
Select the "IO buffer" function from the drop-down menu, save the changes using the "Save" button in the bottom right corner. Now open the function configuration by clicking on the "Configuration" button next to the function menu.

In the IO buffer configuration dialog select the IN.1 card and the channel that has been configured before.

From the "Register" menu select "Electrical value A".

Click the Ok button in the bottom right corner to save the configuration and close the dialog.

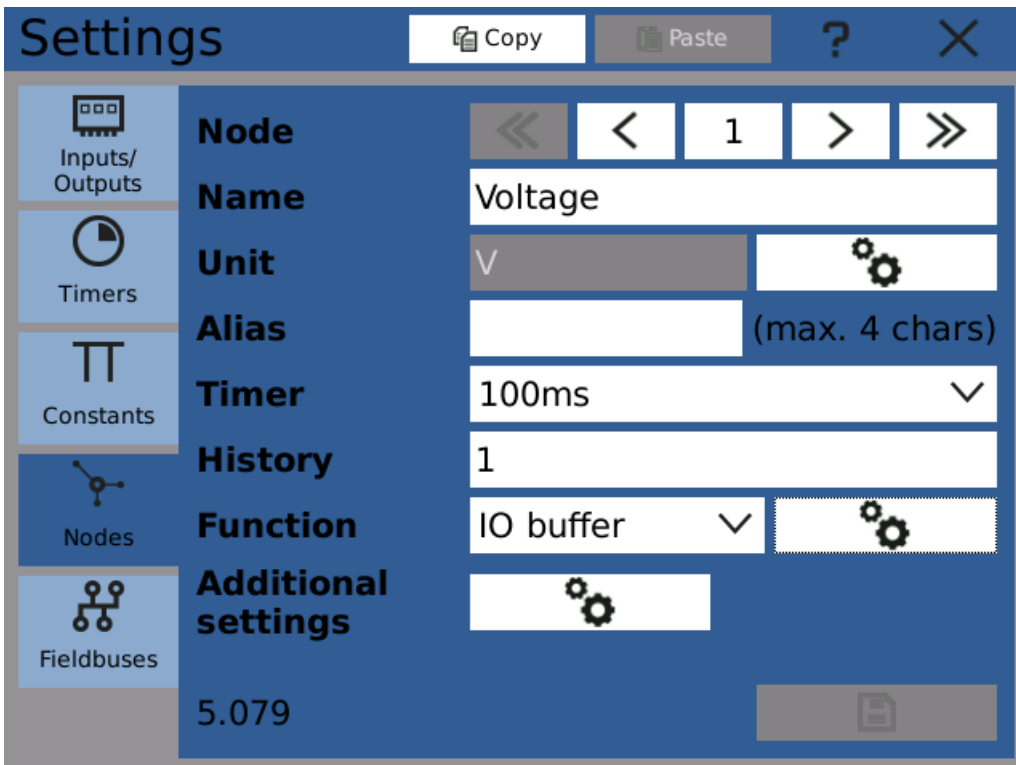
## 8 Examples



Selecting IO buffer input

### 9) Checking node configuration

The node is now configured. Its value indicator in the bottom left corner should display the current input voltage.



Node configuration finished

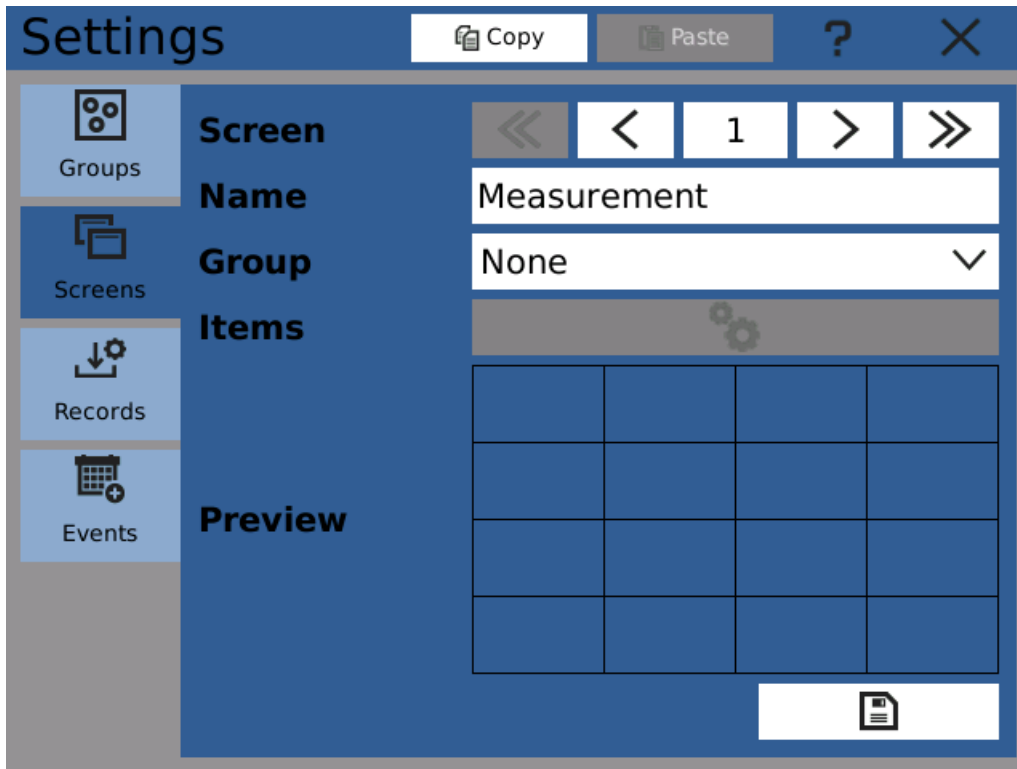
## 8 Examples

### 10) Creating a new screen

Now it's time to display the value on the screen. Open the "Screens" configuration in the Function menu.

Assign a name for the new screen and click "Save".

*Note: it's not necessary to use groups for simple configuration.*



*Creating a new screen*

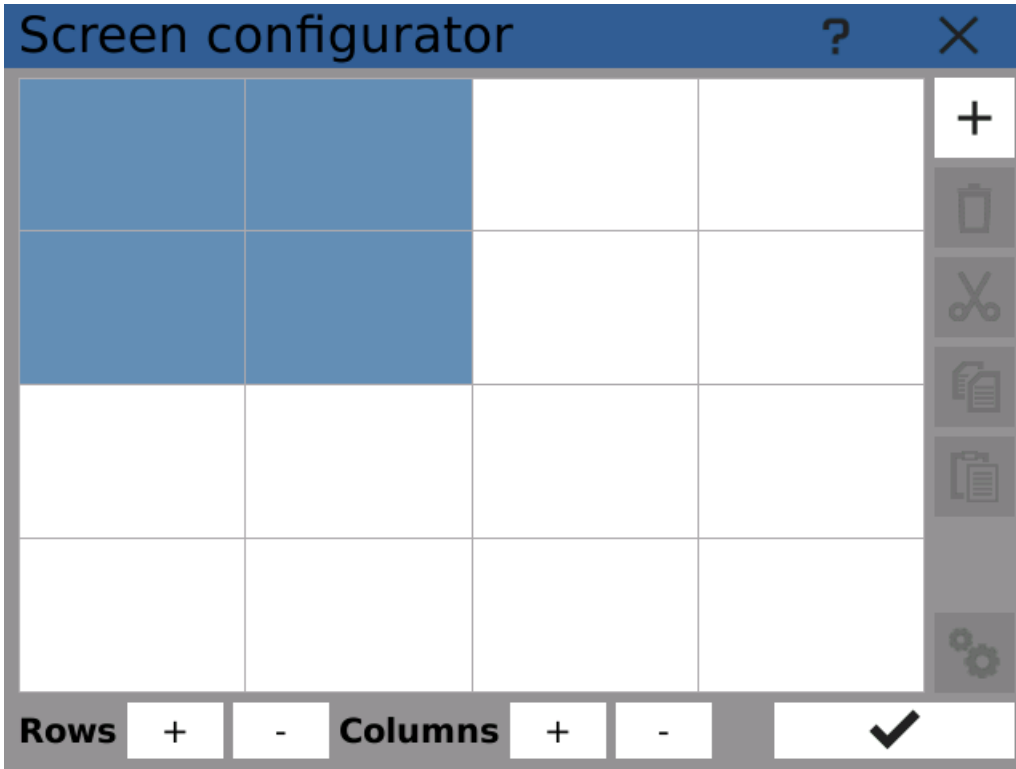
### 11) Creating a new view

Open the screen configurator dialog using the configuration button.

The screen configurator allows you to place views (meters) on the screen in a defined grid.

Select an area you wish to place the view into by dragging your finger across it. The selected area is indicated in blue.

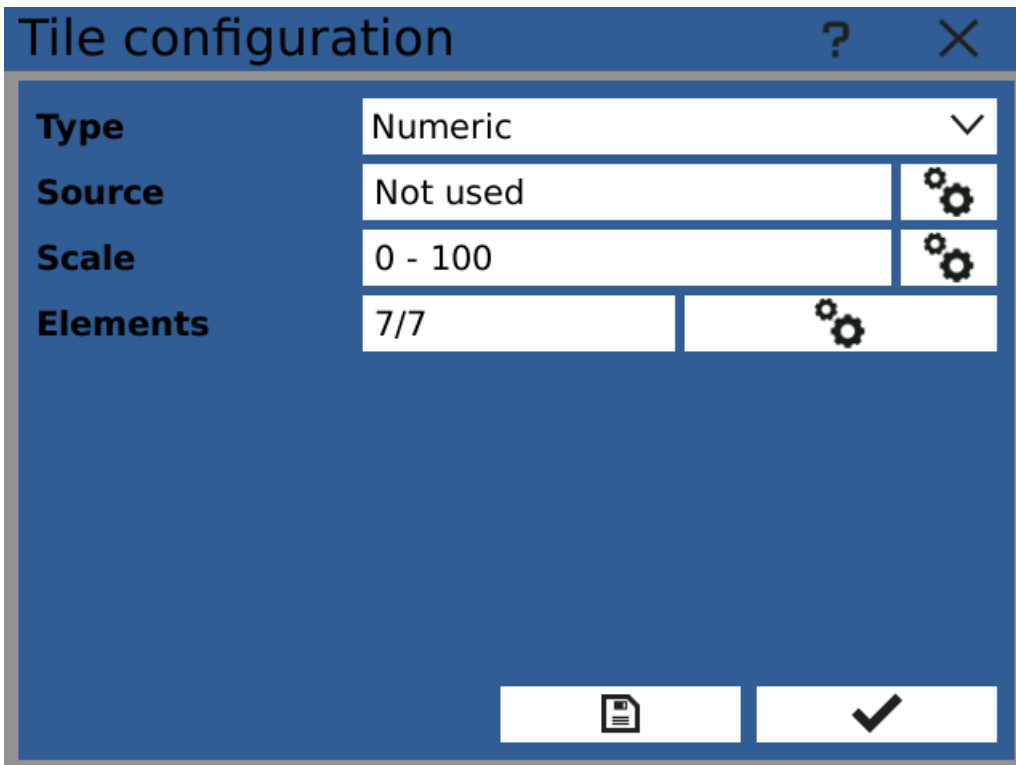
## 8 Examples



*Selecting an area in screen configurator*

### 12) Configuring the view

Click on the add ("+") button to add a view tile into the selected area.  
Choose "Numeric" as a type.



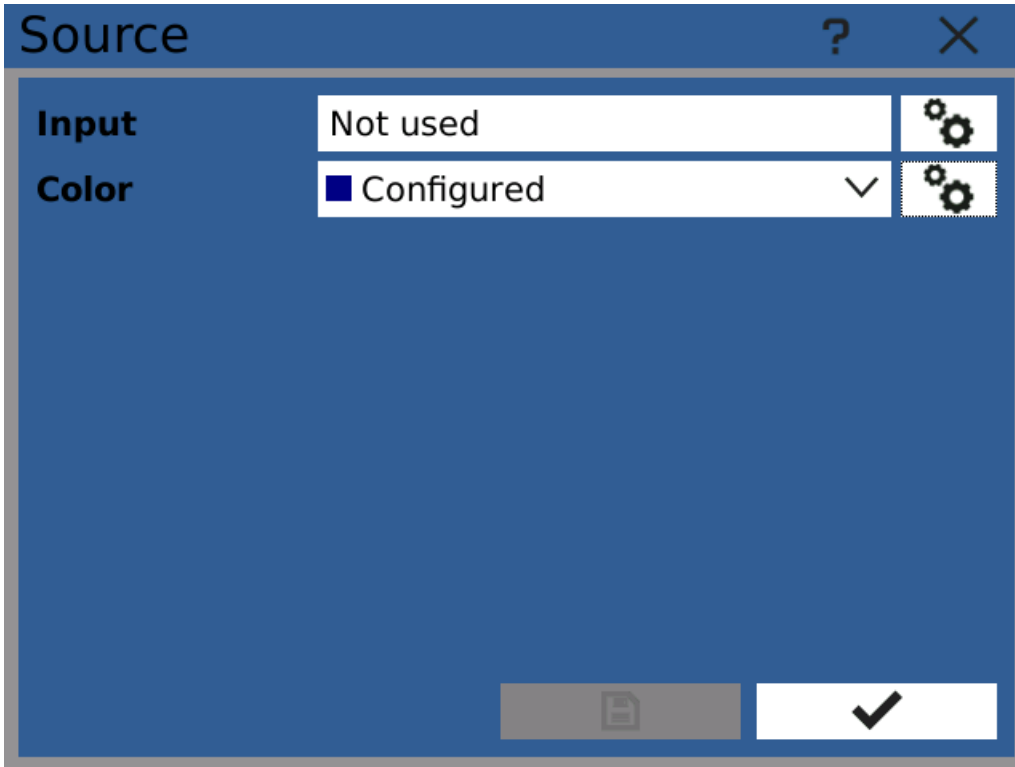
*Configuring a numeric view tile*

## 8 Examples

### 13) Assigning a source

Now it's necessary to assign a source so the view has a value to display. Click on the source configuration button.

Source has an input and a color. As an input you should usually choose a node. Select the "Voltage" node as an input and optionally choose a color. Then save and close the dialog.



*View source configuration*

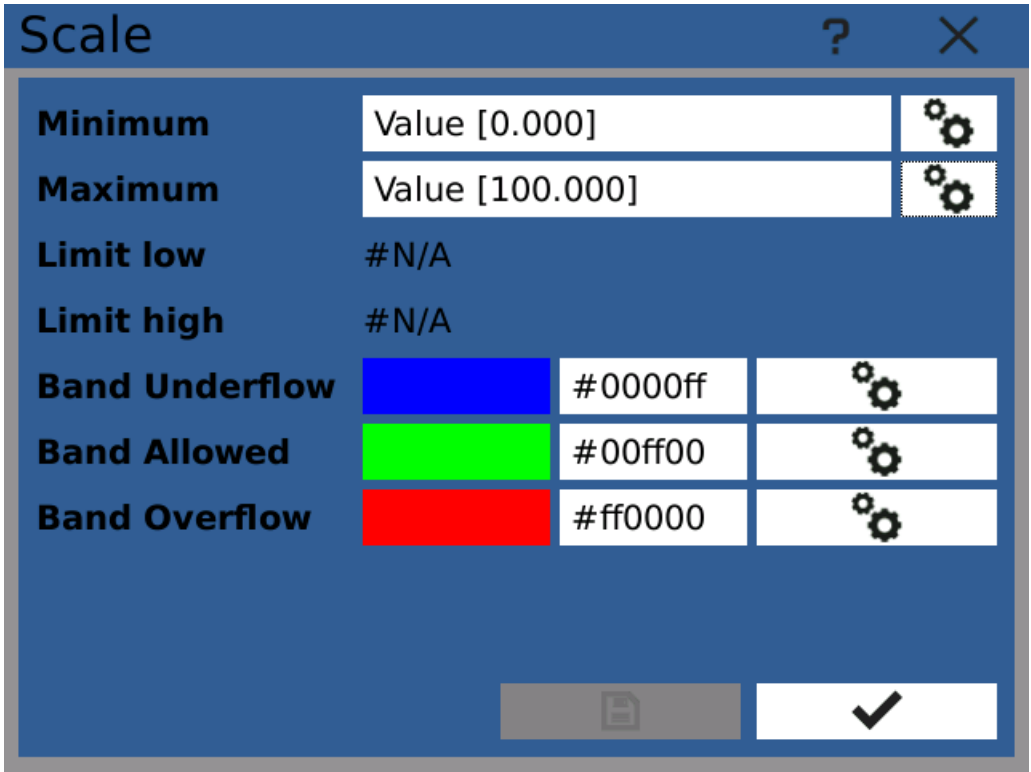
### 14) Configuring the scale

Apart from source the view also has a scale. Scale determines the range of values the view can display.

The default scale is 0-100 but we are measuring values of 0-10V.

Click on the scale configuration button to open the configuration dialog.

# 8 Examples



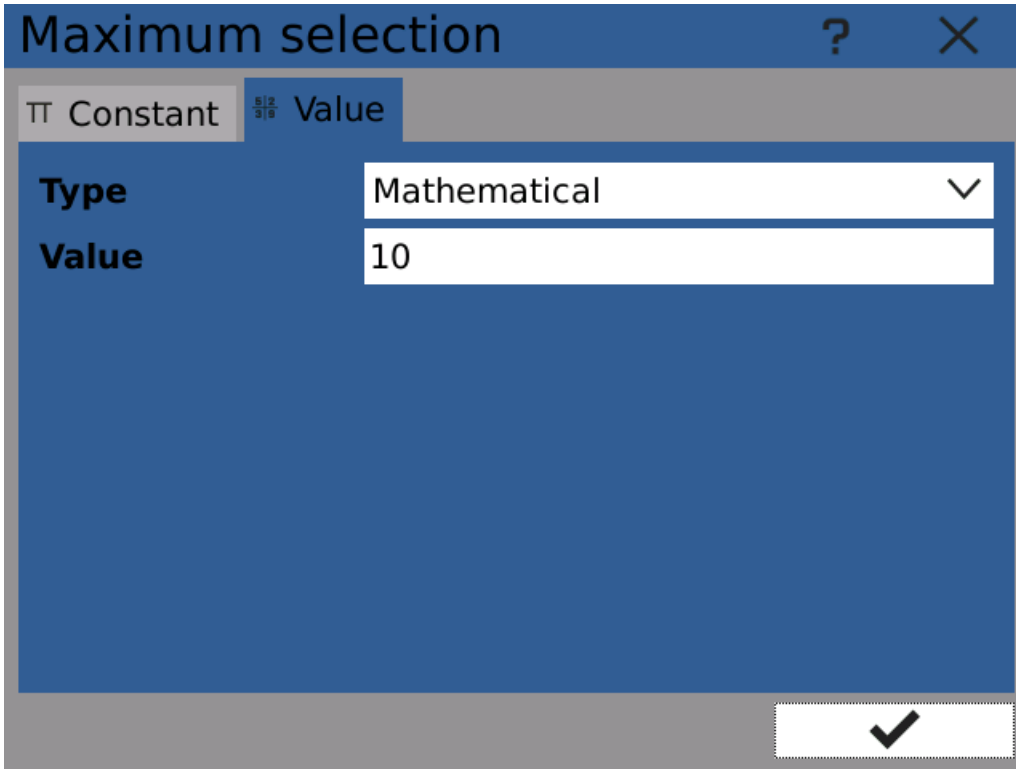
Scale configuration

## 15) Changing scale maximum value

To change the value maximum from default 100 to more appropriate 10 open the scale maximum configuration dialog by clicking on the scale maximum configuration button.

In the configuration option click on the value field and change the value to 10. Then save and close the dialog.

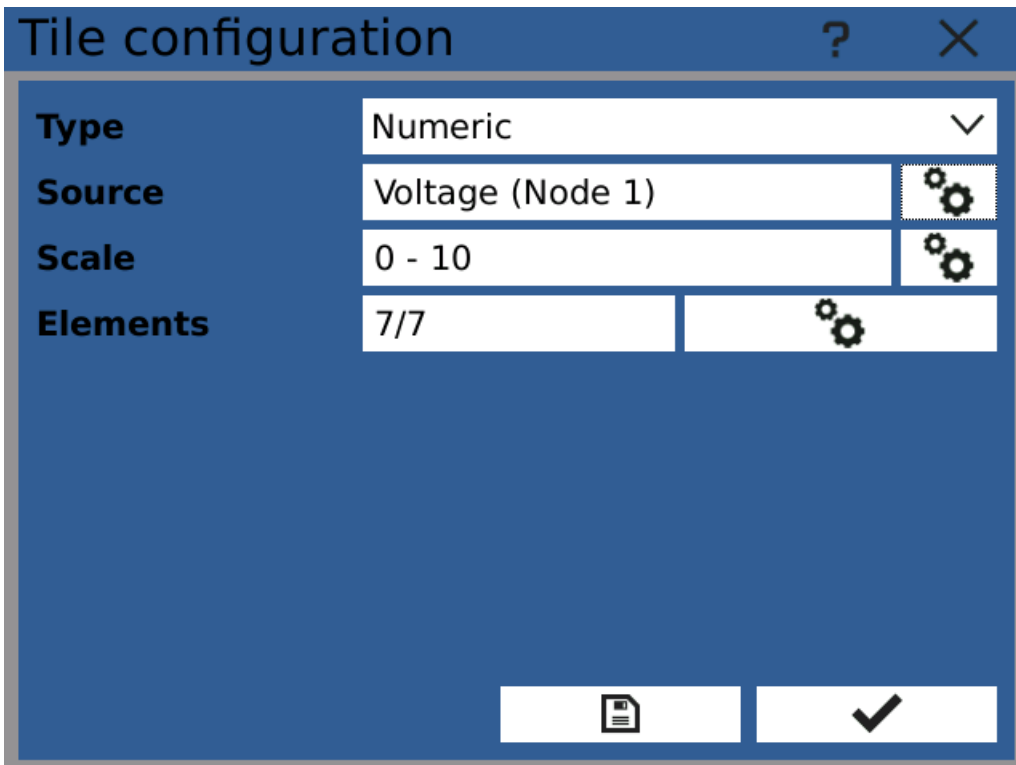
## 8 Examples



*Changing scale maximum value*

### 16) Checking the view configuration

The view is now configured. Additional configuration options are available by clicking on elements configuration buttons.



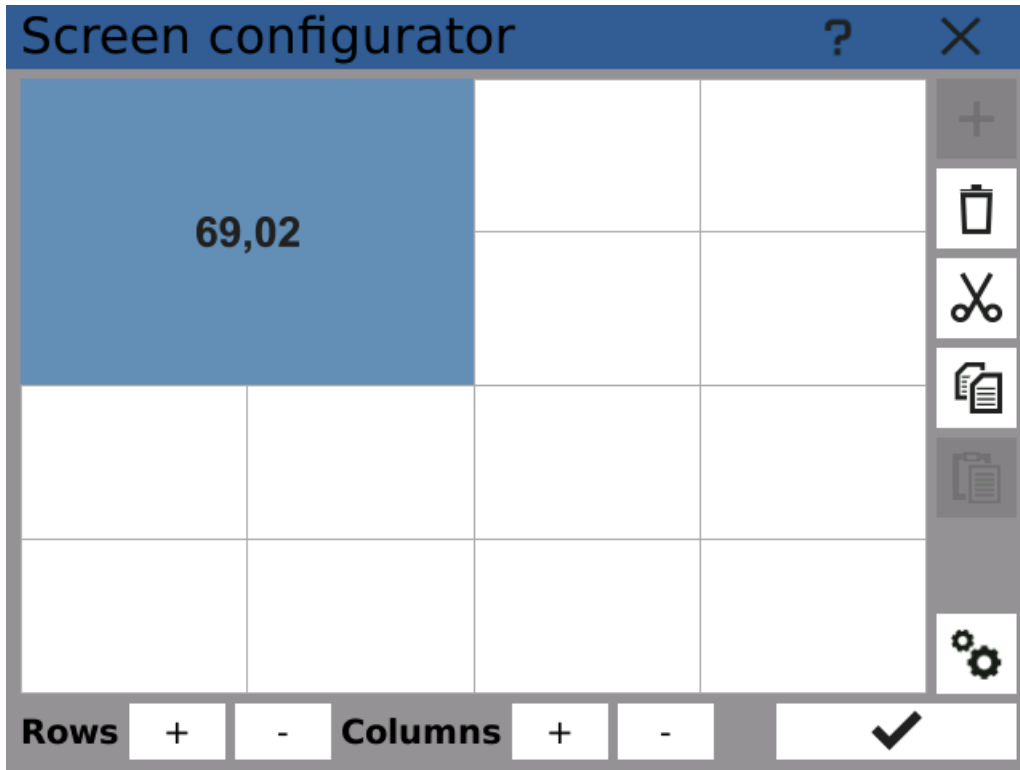
*View configuration is finished*



## 8 Examples

### 17) Checking the view tile placement

Save and close the dialog. The screen configurator now shows that a numeric view has been placed on the screen.

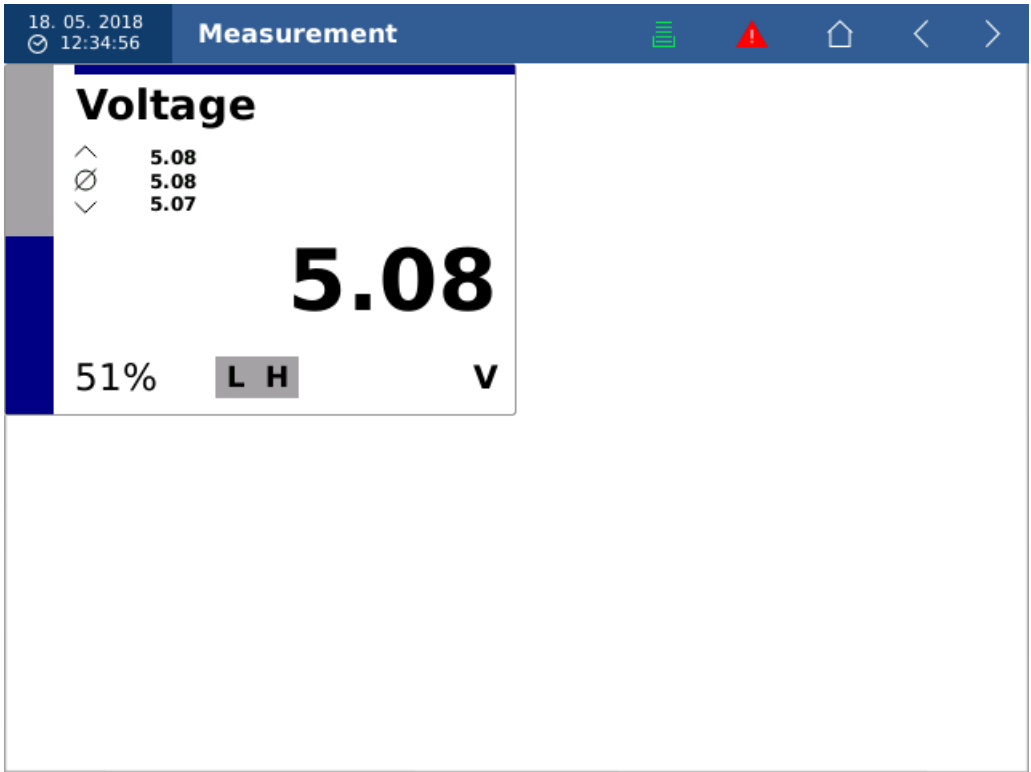


*A view is placed in the screen grid*

### 18) Done!

Save and close the screen configurator and return to the main screen. You can see the configured view displaying the measured value.

# 8 Examples



*Configuration finished*

# 8 Examples

## 8.2 Example 2: Controlling a relay with a comparator

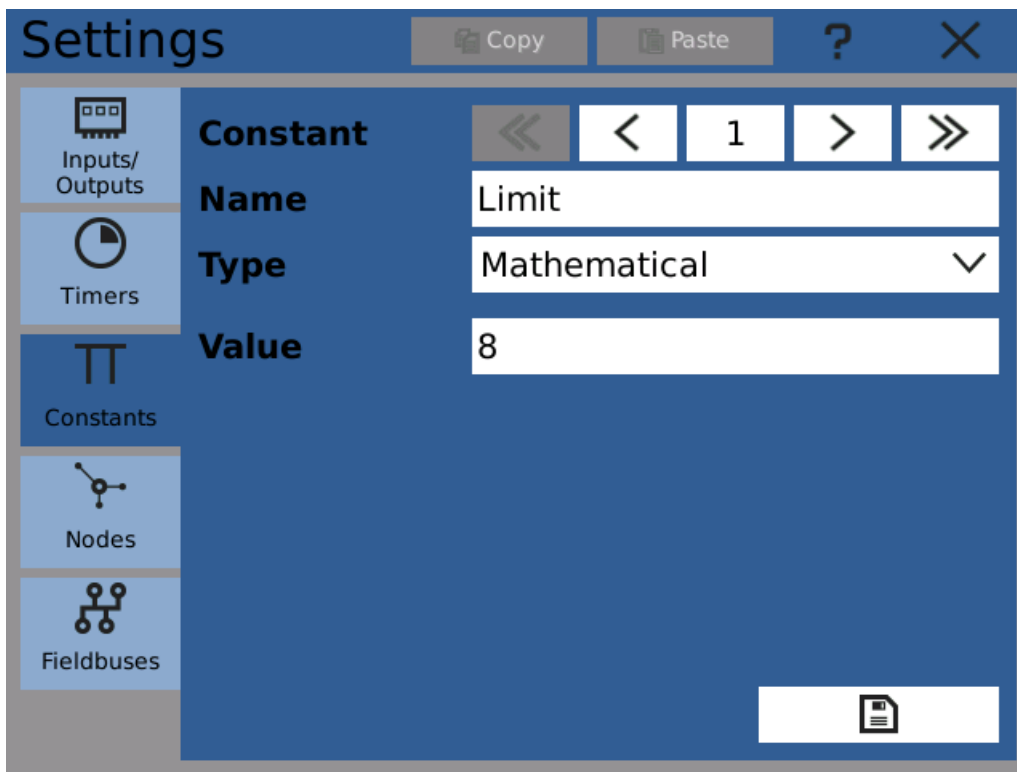
This example shows a typical situation where we need to switch relay contacts after reaching defined voltage value on input. The input value is taken from node "Voltage", which has been configured in the previous example.

### Prerequisites

- Finishing Example 1
- Relay output card

### 1) Defining a limit

First we need to specify the limit value of measured voltage as a constant. Configuration of constants can be found in the main Menu -> Functions. Choose any value in the input's measurement range (0 .. 10 V).

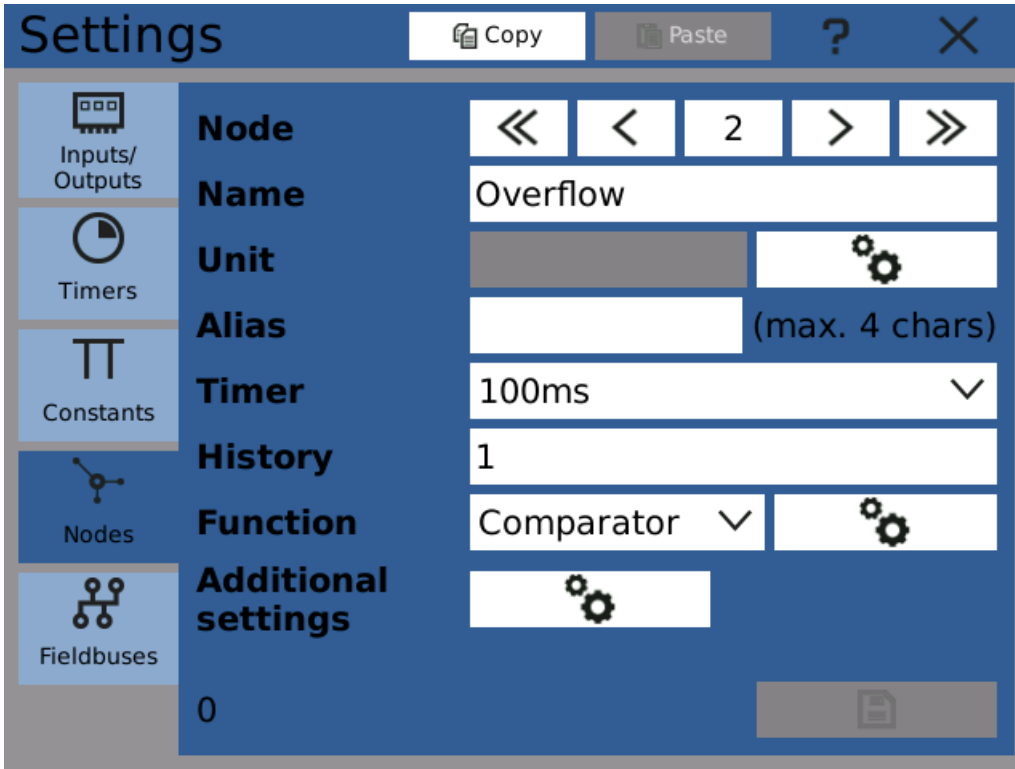


Defining a limit as a constant

### 2) Creating a comparator

The next step is to create a new node - comparator. It will periodically compare if the measured value is higher than the limit value and set it's value according to the result as 0 (false) or 1 (true). We can use the same timer as the measured value's node uses.

## 8 Examples



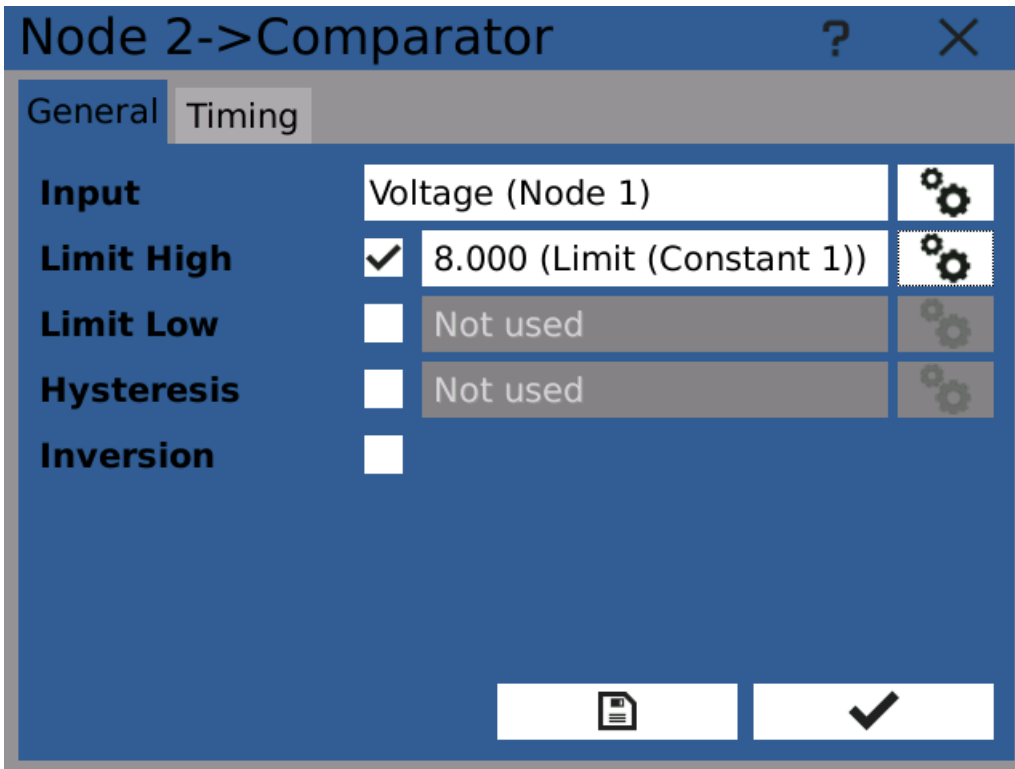
Creating a new comparator

### 3) Configuring the comparator

Configuration of comparator inputs can be entered by clicking on the configuration button, next to the "Function" selector. Here we can choose which values are to be compared. In this example we will be configuring an overflow detector.

As an input select the node "Voltage" from previous example. Then enable "Limit high" and assign the "Limit" constant to it.

## 8 Examples



Comparator configuration finished

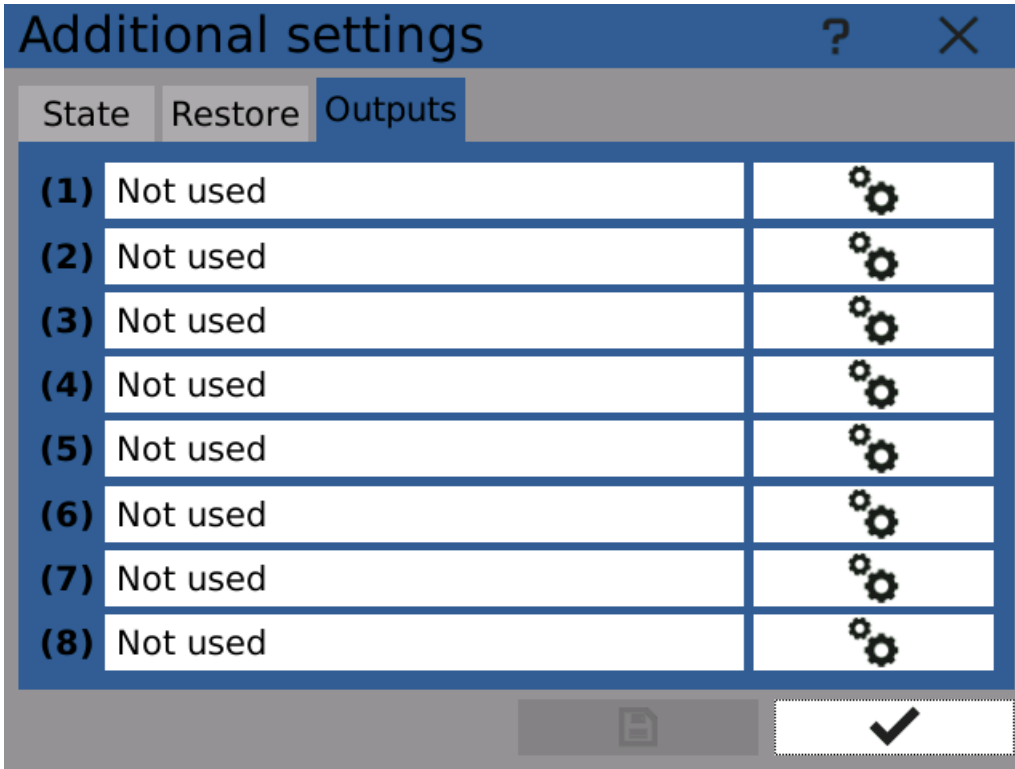
Save the configuration and close the dialog.

Now the comparator is configured and should be changing value according to voltage input.

#### 4) Opening the outputs configuration

Go back to the "Overflow" node settings, open the "Additional settings" configuration and switch to the "Outputs" tab.

## 8 Examples



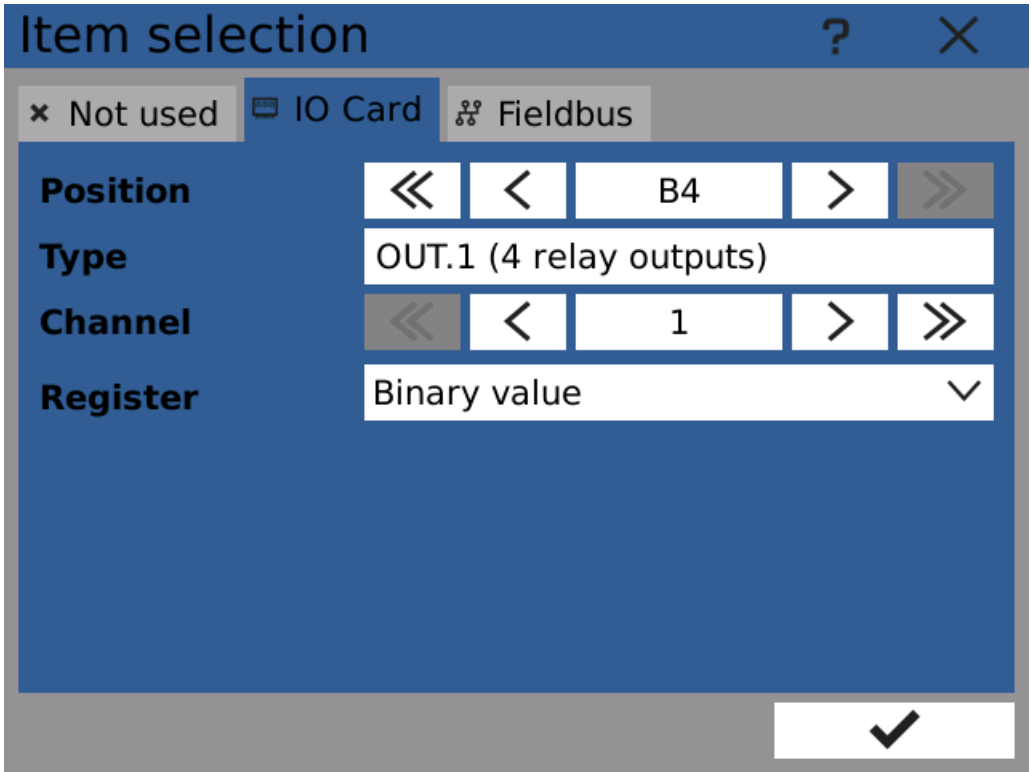
Comparator without any outputs

You can see that no outputs are used yet.

### 5) Assigning an output

Click on the configure button on the first row to assign an output. In the opened configuration dialogue go to the "IO" tab, select the relay and channel you wish to control and from the "Register" selector choose "Binary value".

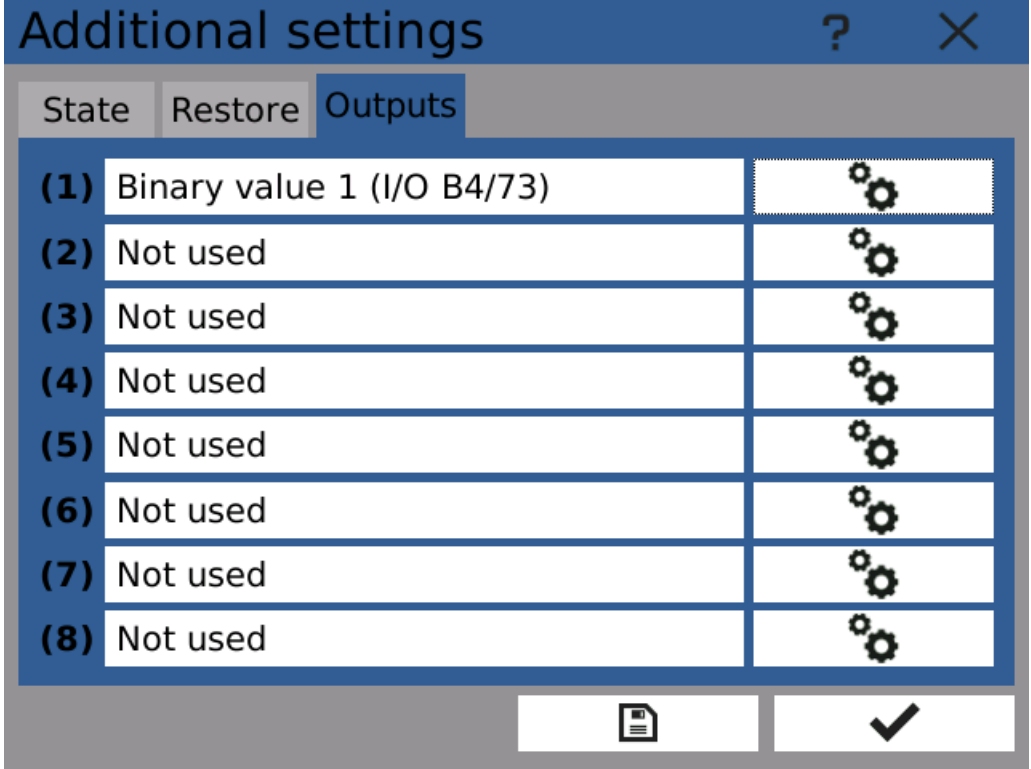
# 8 Examples



Selecting a relay as an output

### 6) Done!

The relay control is configured and its contacts will switch when an input voltage overflow is detected.



Configuration finished



## 8 Examples

*Note: it is possible to use several different techniques to display the current state of the relay. If we need to display the limit overflow, it's possible just to create a binary meter on the screen and set it to display the comparator node's value. However, this value does not necessarily have to correspond with the relay's contacts state, for example when the relay is configured as inverting. To display the true state of relay's contacts, set the binary meter to show the relay I/O card channel's register "State".*



# 8 Examples

## 8.3 Example 3: Recording measured values

Creating a new recording profile to record node values is a matter of few clicks. As a source of values we can use nodes from previous examples.

### Prerequisites

- Finishing Example 1 and 2

### 1) Creating a recording profile

First we start by creating a new recording profile. The profile specifies a group of sources whose values are going to be recorded. It also sets the sample rate, storage media and other parameters. It is possible to create several profiles and use them at the same time. Configuration window can be opened by clicking the tile "Record" in main Menu -> Function.

### 2) Configuring recording parameters

Set the recording profile a meaningful name. It is possible to optionally set filename for better identification of recorded files. Configure the next parameters according to your requirements. Groups are not used in this example so we leave the "Without group" option in the selector.

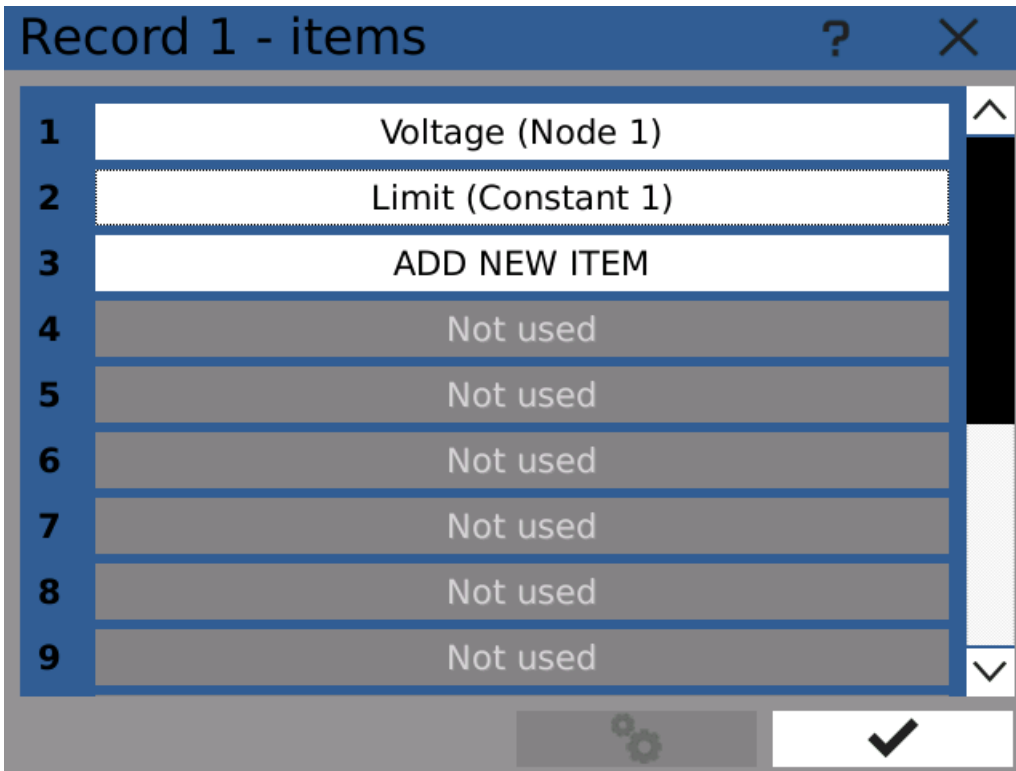


Creating a new recording profile

### 3) Adding recorded items

Click the configure button next to the "Recorded items" label to open configuration dialogue. Here we select which sources we want to record. Add the sources one by one by clicking the "ADD NEW ITEM" button.

## 8 Examples



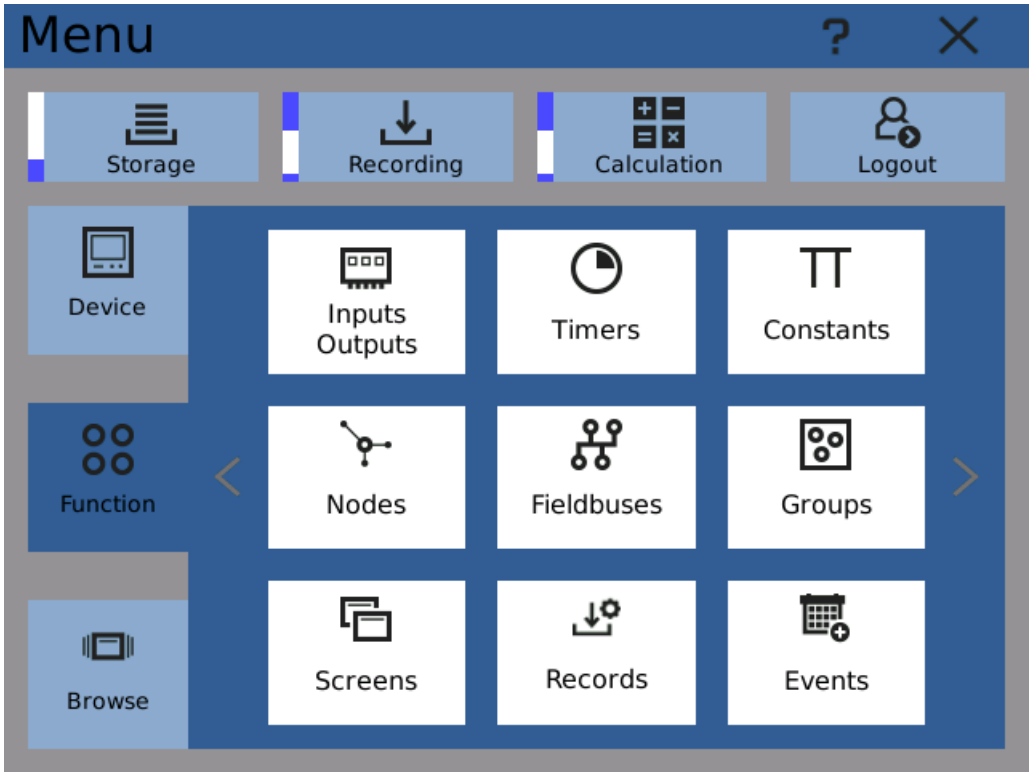
Adding sources to the recording profile

### 4) Done!

Now you can go to the main menu and start recording by clicking the "Recording" button on the top of the screen. The recording starts immediately and the animated indicator shows that recording is in progress.

The "Storage" button next to it should now show the current state of storage media.

# 8 Examples



Recording in process

Note: you can browse the recorded data with the [Line chart browser](#) or more conveniently by using the [PC software](#).

# 8 Examples

## 8.4 Example 4: Recording on button click

This example demonstrates how to configure simple event and shows the basic principles of causes and effects.

### Prerequisites

- Finishing Example 3

The default way to start and stop recording is by clicking the "Recording" button in main menu. However, it is also possible to configure events to trigger recording by various other means. In this example we will configure the button 1 to start recording and the button 2 to stop it.

It is necessary to take into consideration that triggering start of recording and stopping recording are two separate actions and thus require two separate events.

### 1) Creating a new event

First step is to create a new event and assign a name. Configuration must be saved in order to continue to the next step.



Creating a new event

### 2) Assigning a cause

Now we have to configure the cause, that will trigger our new event. After clicking on the configuration button, you will see cause configuration dialog. Select the type "Button" and then choose "Button 1" and action "Clicked". This means that our event "Recording start" will occur every time the button 1 is clicked (pressed and released shortly after).

## 8 Examples

Event "Record...rt" -> Causes ? X

Cause	<< < 1 > >>
Type	Button v
Disabled	<input type="checkbox"/>
Button	Button 1 v
Action	Click v

Save Confirm

Creating new cause

### 3) Assigning and effect

After configuring the cause, open the Effects configuration dialogue. Select type "Record" and action "Start". This means every time event occurs recording will be started.

Event "Recordi...rt" -> Effects ? X

Effect	<< < 1 > >>
Type	Record v
Action	Start v

Save Confirm

Configuring effect

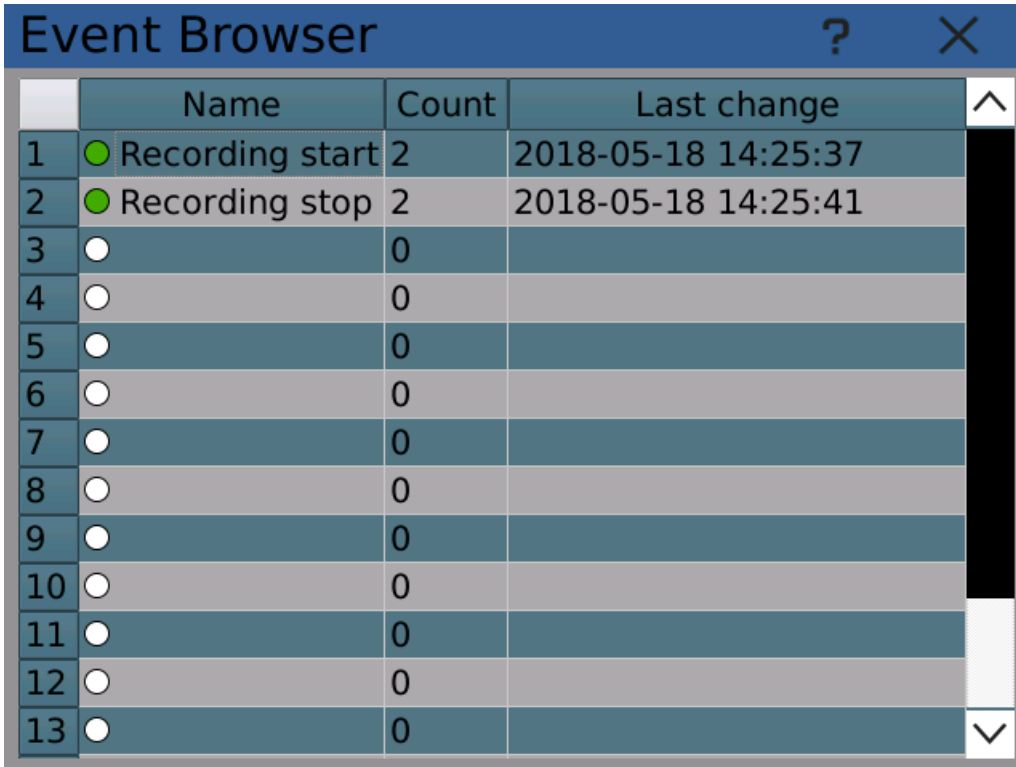
# 8 Examples

## 4) Creating an event to stop recording

Now create second event (in our example called "Recording stop") with cause type "Button", reacting on button 2 click and having an effect type "Record" with action "Stop".

## 5) Done!

You can now start control recording using user buttons. You can also view event statistics in "Event browser" which can be found in main menu in the "Browse" tab.



The screenshot shows a window titled "Event Browser" with a table of event statistics. The table has four columns: an index column, a "Name" column, a "Count" column, and a "Last change" column. The first two rows are highlighted in blue and show "Recording start" and "Recording stop" events, both with a count of 2 and a timestamp of 2018-05-18 14:25:37 and 2018-05-18 14:25:41 respectively. The remaining rows (3-13) are greyed out and show a count of 0. The window has a blue header bar with a question mark and a close button (X).

	Name	Count	Last change
1	● Recording start	2	2018-05-18 14:25:37
2	● Recording stop	2	2018-05-18 14:25:41
3	○	0	
4	○	0	
5	○	0	
6	○	0	
7	○	0	
8	○	0	
9	○	0	
10	○	0	
11	○	0	
12	○	0	
13	○	0	

Statistics in the Event browser

# 8 Examples

## 8.5 Example 5: Reading measurements with Modbus TCP

Some situations require reading measurements right away from a remote device. In such cases it is possible to use the Fieldbus module. This module allows the device to function for example as a Modbus TCP slave.

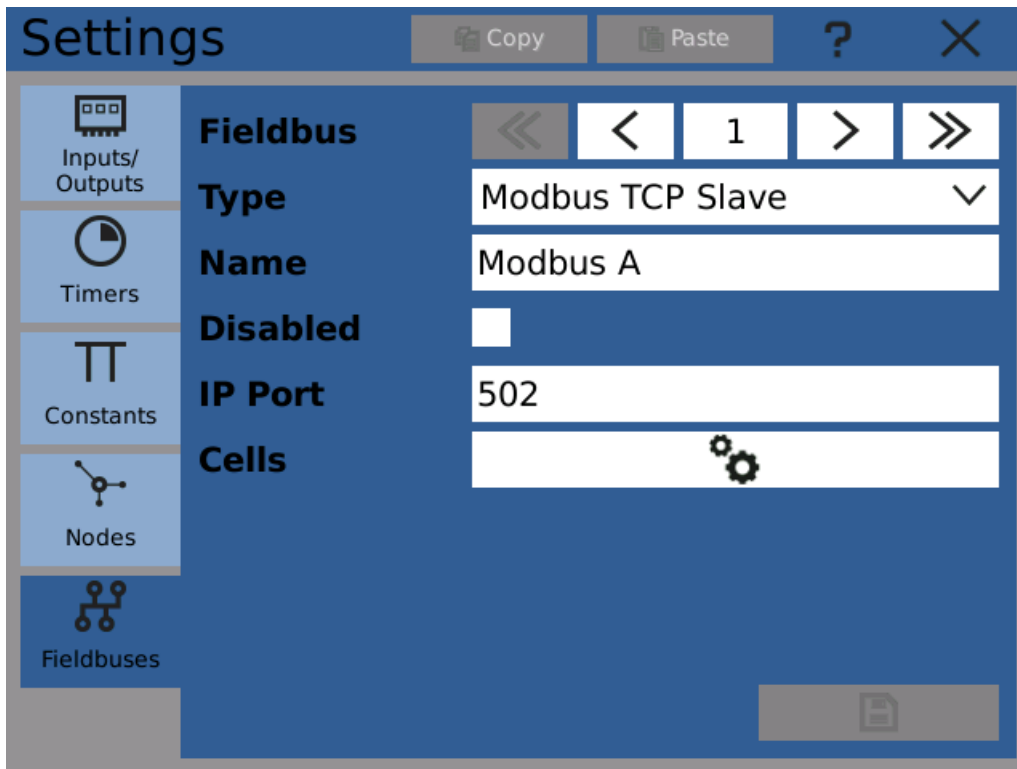
This example shows how to set up the Fieldbus module and read measured voltage remotely over data network.

### Prerequisites

- Finishing Example 1
- Having a device or software that can act as a Modbus TCP master

### 1) Creating a new fieldbus

First we need to create a new fieldbus. Go to the "Fieldbuses" configuration window in the Main menu -> Function. Create a new Modbus TCP Slave.



Creating new Modbus TCP type fieldbus

### 2) Creating a new cell

Now we need to create a new cell, which will be used for remote access. Since the measured voltage value is a number with floating decimal point, we need to use "Mathematical" value type. Next, select proper access method. Because we only want to read this value remotely, choose "Input register". As the last step, select the address you wish to use. The "Used Addresses" box shows the real address range, which has to be used for reading the value.

## 8 Examples

Modbus "Modbus A" -> Cells

Cell	<< < 1 > >>
Name	Voltage meas.
Disabled	<input type="checkbox"/>
Value type	Mathematical
Access	Input register
Conversion	
Start Address	1234
Used Addresses	1234, 1235

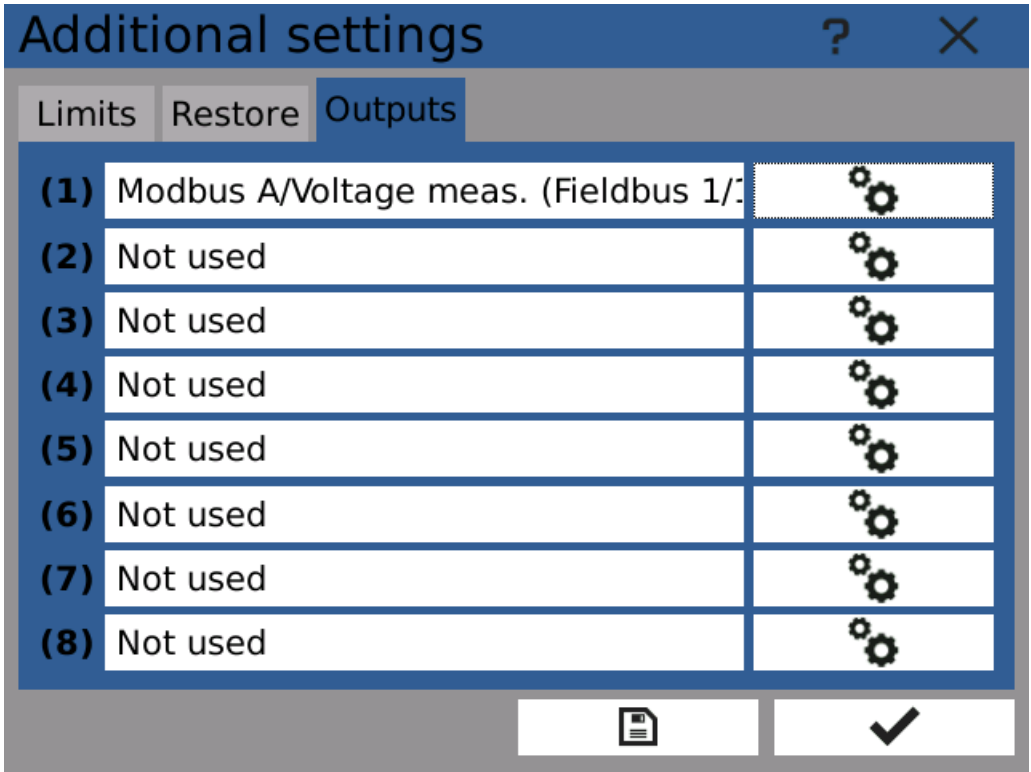
Configuring new fieldbus cell for remote access

### 3) Assigning a value to the cell

The fieldbus module is configured now. As a next step, we have to assign the measured value to the new fieldbus cell. We will use the node "Voltage" defined in previous examples. Go to the node configuration and open the "Additional settings" configuration dialog. In the "Outputs" tab select the new fieldbus and the "Voltage meas." cell.



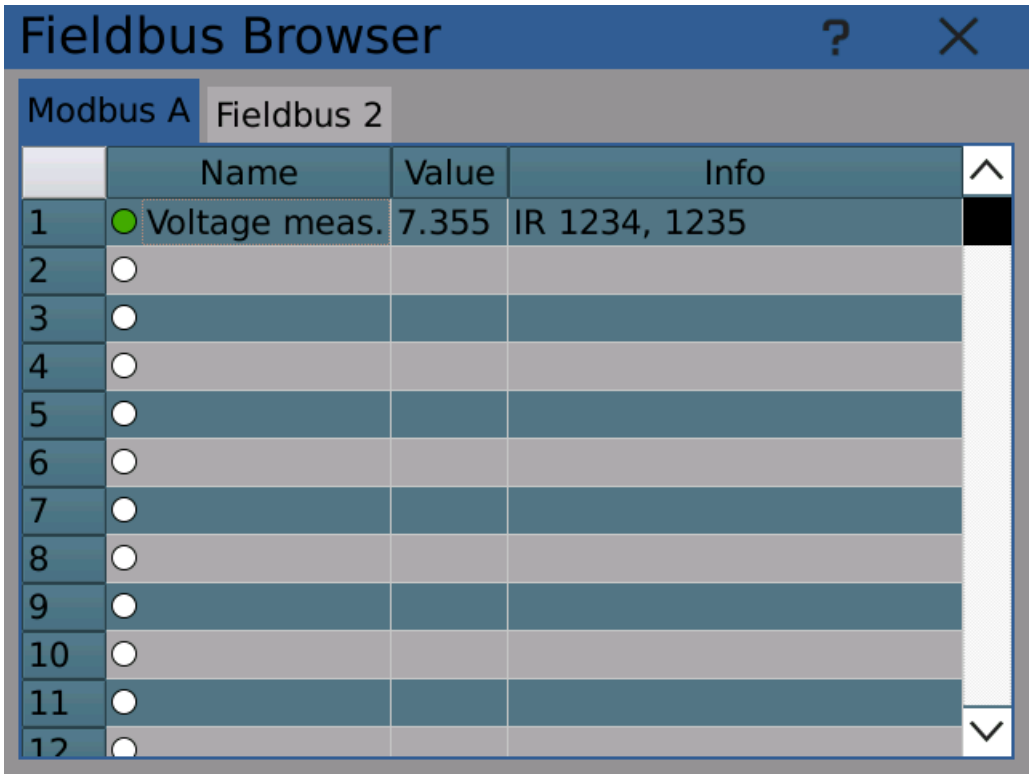
# 8 Examples



Selecting fieldbus cell as a node output

### 4) Done!

The result can be seen in the Fieldbus browser dialog and you can use any device acting as a Modbus TCP master to read the measured value.



Fieldbus browser with configured voltage measurement cell



# 8 Examples

# 8 Examples

## 8.6 Example 6: Converting electrical value to physical

In some cases the input electrical value (voltage/current) doesn't directly correspond with the measured physical value and has to be converted first.

This example shows a case where the input 4-20mA current from a sensor represents pressure of 0 - 1MPa.

### Prerequisites

- Finishing example 1
- 4-20 mA source connected to IN.1 card input

The configuration is very similar to the one used in Example 1 with just one significant difference. In the IO card input configuration we set up physical value conversion and then use IO channel input's physical value instead of electrical value.

### 1) Follow the Example 1 steps 1 - 3

Connect 4-20 mA current source to IN.1 card's input (the example uses channel 1) and follow the first three steps of example 1.

### 2) Set the input to convert electrical value to physical

As the range select 4..20mA and physical value range from 0 to 1000 (0 - 1000 kPa).

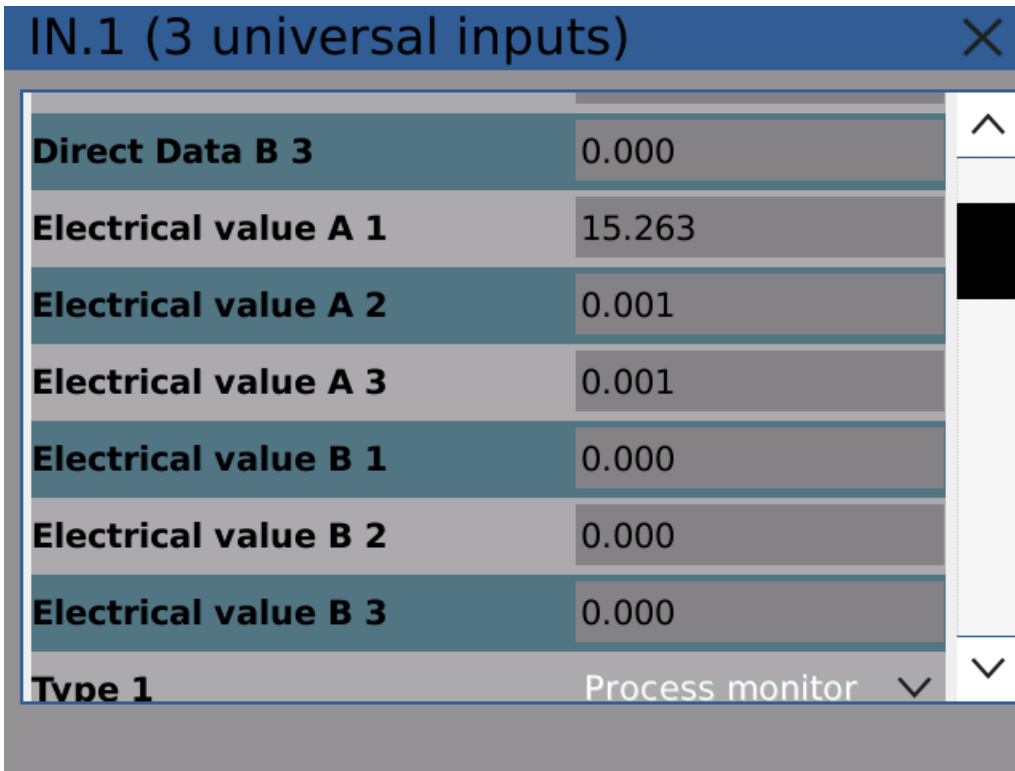
[B3]IN.1 (3 univers; Channel: 1) ? X	
Type	Process monitor
Range	4mA .. 20mA
Filter selection	No filter
Filter constant	0.000
Sample rate [Hz]	10
Minimum physical value	0.000
Maximum physical value	1000
Offset	0.000

Configuring input channel

### 3) Check the conversion in diagnostics

Input card diagnostics show how the measured electrical current is converted to physical value.

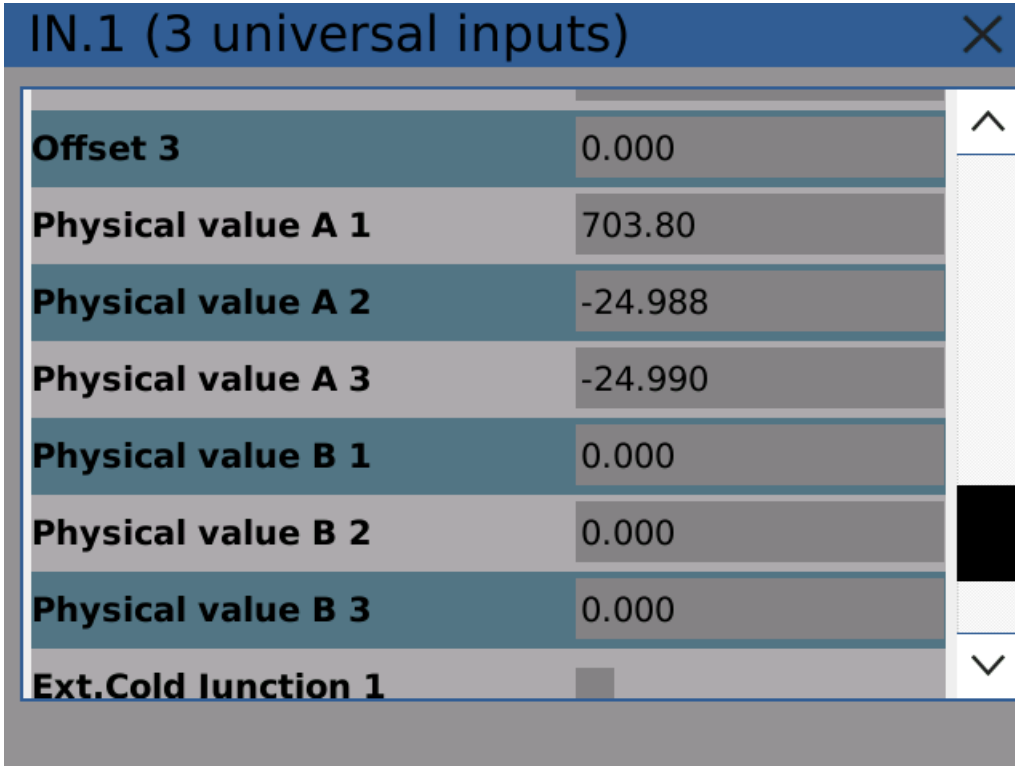
## 8 Examples



The screenshot shows a window titled "IN.1 (3 universal inputs)" with a close button (X) in the top right corner. The window contains a list of input values with a scroll bar on the right. The values are as follows:

Input Name	Value
Direct Data B 3	0.000
Electrical value A 1	15.263
Electrical value A 2	0.001
Electrical value A 3	0.001
Electrical value B 1	0.000
Electrical value B 2	0.000
Electrical value B 3	0.000
Type 1	Process monitor

*Input electrical value*



The screenshot shows a window titled "IN.1 (3 universal inputs)" with a close button (X) in the top right corner. The window contains a list of input values with a scroll bar on the right. The values are as follows:

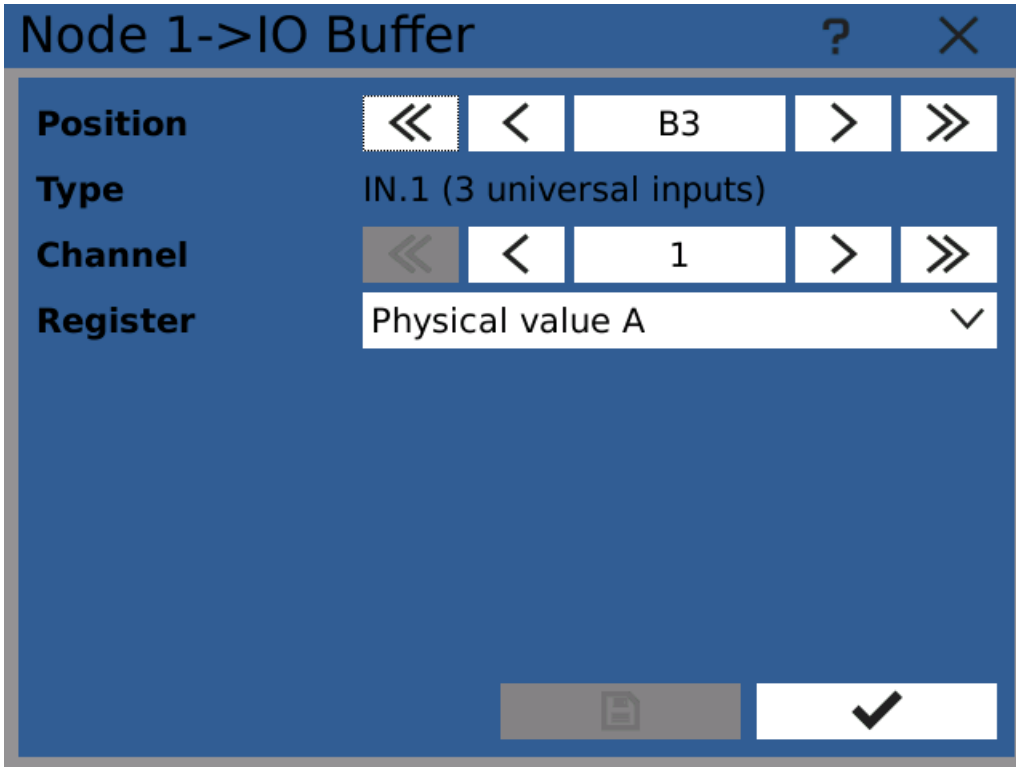
Input Name	Value
Offset 3	0.000
Physical value A 1	703.80
Physical value A 2	-24.988
Physical value A 3	-24.990
Physical value B 1	0.000
Physical value B 2	0.000
Physical value B 3	0.000
Ext.Cold Junction 1	

*Converted physical value*

#### 4) Create a node

Following example 1 create a timer and a node. Change the name to "Pressure" and unit to "kPa". When assigning input to the node, select "Physical value" instead of "Electrical value".

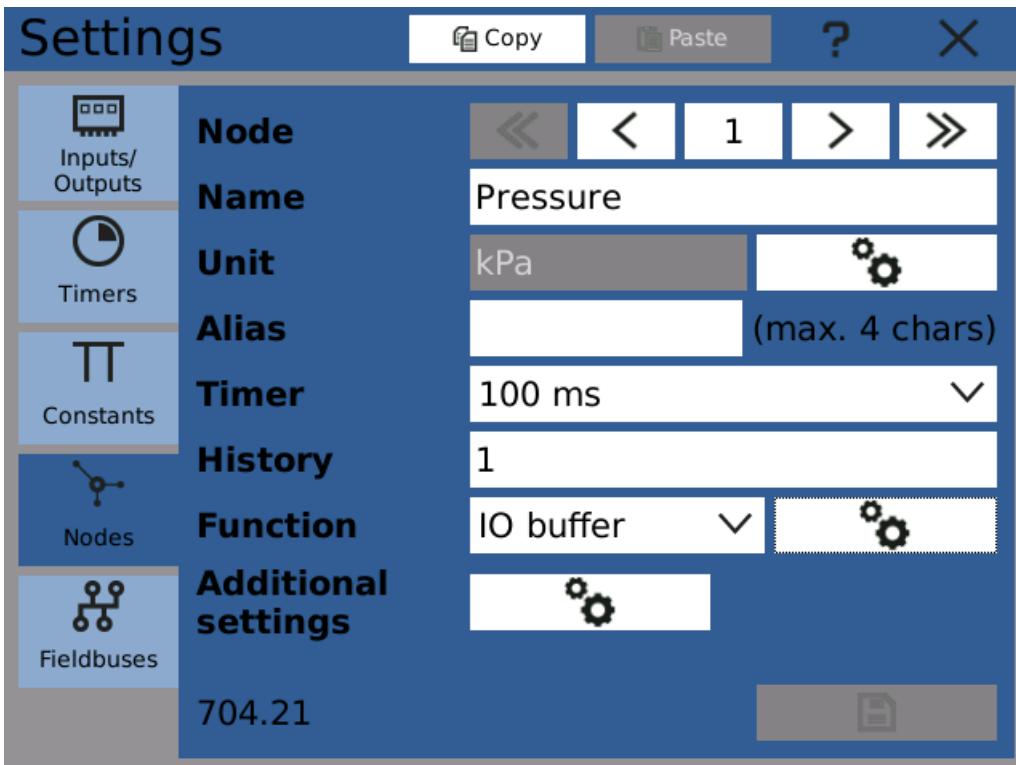
## 8 Examples



*Assigning input card's recalculated physical value to node*

### 5) Check the node configuration

Now the node should be set up correctly to display measured pressure in kPa.



*Node shows pressure in kPa*

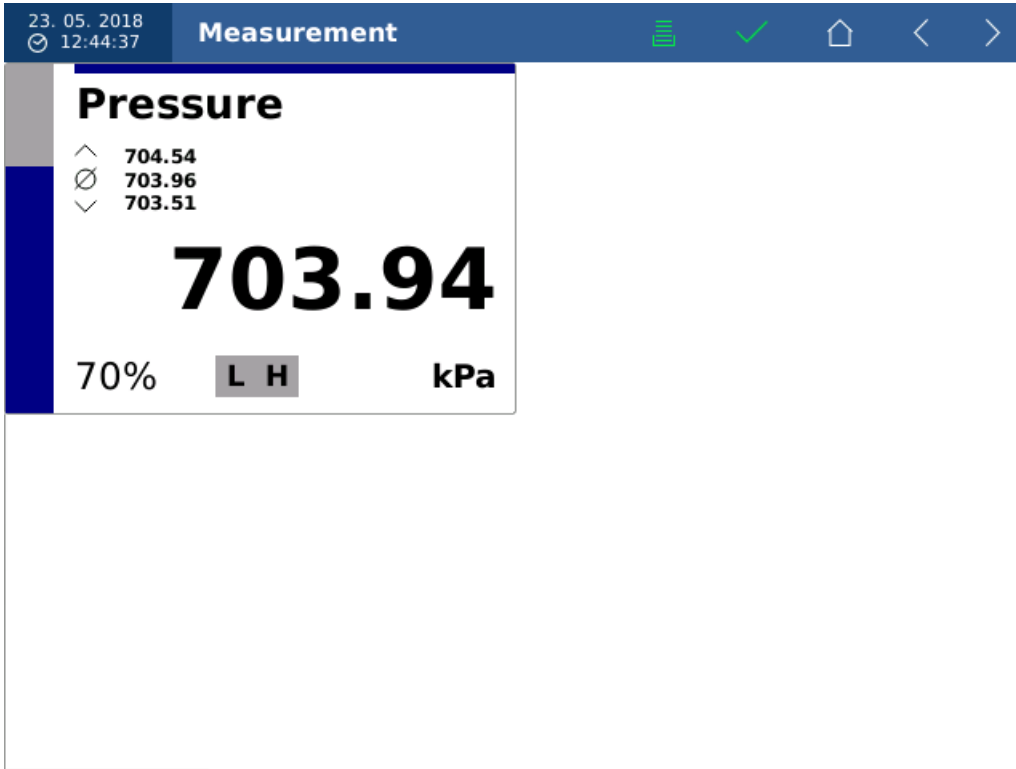
# 8 Examples

## 6) Display measured pressure on the screen

Following example 1 create a numeric view to display measured value on the screen. Keep in mind that the pressure is displayed in range of 0 - 1000 kPa so set up the scale accordingly.

## 7) Done!

You can now see the measured pressure in kPa on the screen.



*Configuration finished*



## 9 Troubleshooting

In case of any problems with the device, there are still ways to solve the situation using one of the built-in safety mechanisms.



# 9 Troubleshooting

## 9.1 Rescue mode

### Principle of operation

In case of problems with the device's functionality caused by faulty configuration, it is possible to start the device in Rescue mode and proceed with necessary fixes. The Rescue mode loads only user profile configuration and can be used to delete configuration part by part or all at once and restore the device to factory settings. Also it is possible to apply software updates.

### Switching to Rescue mode

To switch to the Rescue mode, hold both user buttons on start-up for the whole duration of system boot. If the control panel turns red, the switch was successful.

*Note: because in the Rescue mode the user interface and graphics settings are not loaded, the main window will show only blank workspace and the device's menu will be in English.*

### Restoring device functionality

Before proceeding any further, it is advisable to backup you current configuration on a Flash drive or SD card. Then you can use the Configuration manager to restore older configuration. If it is not available, the best way to proceed is to delete that part of configuration, which has been modified most recently and thus is the most probable cause of issues. If this step doesn't work, it is possible to continue deleting other parts of configuration until the issues disappear.

Another way to solve the issues is to update device software to the latest available version, which might already contain a solution to the problem.

If none of these steps lead solve the issues, it is necessary to contact the customer support and have the last used configuration package at hand.

### Switching back to normal mode

After proceeding with the steps above the device must be returned back to normal state. Press the reset button (RST) on the front panel and wait until the device reboots (without pressing any buttons).





## 9 Troubleshooting

### 9.2 Backup software

The device has two equal, independent copies of both firmware and system as a safety mechanism. In case of update problems or device malfunction, it is possible to switch to backup.

It is generally not recommended to proceed with this operation unless necessary, because switching from newer to older firmware version can lead to configuration corruption.

When necessary, there are two ways to switch to backup.

1. Using the "Switch to backup" button in [Device update dialog](#)
2. Holding the reset button while starting the device until the "Rec" LED flashes blue once.