Temperature Controller

USER MANUAL

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Version 2.0

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IMPORTANT

Read the Bluefors Temperature Controller documentation carefully before use. Keep the documentation for future reference:

- User Manual
- System Description
- API reference

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IMPORTANT

The information contained within this document is effective as of the publication date. Bluefors Oy reserves the right to make changes to the product and information contained within this document relative to the specifications, features and design of the product.

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1 Introduction

The Bluefors Temperature Controller is an instrument for measuring temperature and for applying power to heaters. Up to eight external devices can be connected for the measurement of resistance or reactance. If a calibration curve is loaded into the device, temperature is deduced from the measured impedance. Current can be applied to up to four external heaters.

Figure 1: Control Unit and Pre-Amplifier

The main system components (see Figure 2) are as follows:

- Control Unit
- Pre-Amplifier
- Heater Cable
- Connecting Cable
- External Power Supply
- Power Supply Cable

The system components are specified in detail in the Bluefors Temperature Controller System Description document.

The system can be operated via:

1. A touchscreen user interface.

2. A web browser. Supported browsers are Chrome, Firefox, Opera, and Edge.

   The web browser is accessed by connecting to the internal web server of the device. The device web address can be found and programmed from the hardware user interface by pressing the System Info icon (⌨) on the Home screen toolbar and then the Network and Time icon (🖥) at the top of the screen.

3. Any program using an Application Programming Interface (API). REST, WebSocket, and MQTT protocols are supported. See the separate Bluefors Temperature Controller API documentation for further information.

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Item	Description	Additional information
1	Connecting Cable	Blue cable with LEMO ends Cable between the Control Unit and the Pre-Amplifier
2	Power Supply Cable	Black cable
3	External Power Supply	See separate manual for XP Power, model VEC50US24.
4	Control Unit	White box
5	Heater Cable	Blue cable with four LEMO connection leads
6	External Ground	Black cable
7	Pre-Amplifier	Black box

Figure 2: System components and connector panels

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2 Getting started

CAUTION

To avoid equipment damage, do not disconnect the Connecting Cable between the Pre-Amplifier and the Control Unit while the system is powered.

CAUTION

Use only the supplied External Power Supply.

1. Connect the blue Connecting Cable with the 30-pin connectors between the Pre-Amplifier and the Control Unit.

2. Connect the external Devices-Under-Test (DUTs) to the scanner D-connector inputs.

3. Connect the External Power Supply providing 24 V DC to the Control Unit. Connect the External Power Supply to the 110–240 V mains. The system starts up automatically.

4. Use the touchscreen to set up the device and to control the measurements.

5. There are two ways to shut down the device:
   a. Briefly press the off button on the Control Unit back panel.
   b. Use the touchscreen user interface to:
      i. Press the clock or the System Info icon on the Home screen toolbar.
      ii. Press the Shutdown button.
      iii. Confirm your action.

NOTE: After a power outage, the system will start automatically.

2.1 Setting up the network

2.1.1 Network settings

How a Temperature Controller is connected to a network is described below.

Network settings of the Temperature Controller can be found under System info (refer to section 3.8) as shown in Figure 3.

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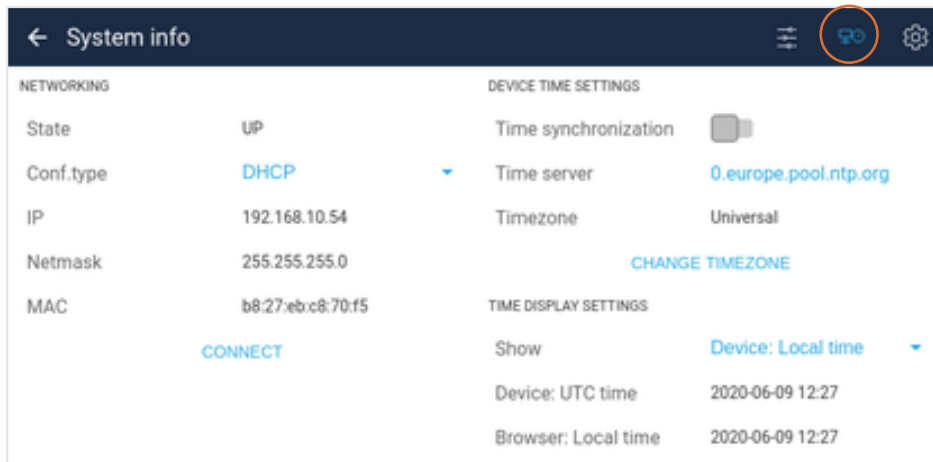
Figure 3: An example of DHCP network settings

If the network state indicates "UP", it means that the device is connected to the network and should be accessible via the internet. The Configuration type Dynamic Host Configuration Protocol (DHCP) searches for networks automatically. This is the default setting of the Temperature Controller when the device comes from the factory. The alternative Configuration type is "Static" which requires user interaction and should be used when DHCP is not available. A static connection can be achieved in two ways:

- Connecting the Temperature Controller to a Local Area Network (LAN) via an Ethernet cable
- Connecting the Temperature Controller to a computer via an Ethernet cable.

2.1.2   Connecting the Temperature Controller to a LAN

This instruction describes how a static connection is established via a LAN.

Figure 4: Back panel of the Temperature Controller

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1. Connect the Temperature Controller to an Ethernet wall socket via an Ethernet cable. The Ethernet port can be found in the back panel of the Temperature Controller (see Figure 4).

2. From your system administrator (for example, IT department), find out the netmask, gateway, and Domain Name System (DNS) values since they are dependent upon the local network. Also, ask if your device has a valid IPv4 address.

3. On the Temperature Controller, select the Configuration type "Static" and then insert the netmask, gateway, and DNS values into the corresponding fields in the Temperature Controller network settings.

4. Press "Connect" in the Temperature Controller network settings. To check that the network is functioning, type the Internet Protocol (IP) address of the Temperature Controller into a browser. If the Bluefors logo appears and the User Interface (UI) starts to download, the connection is established.

2.1.3 Connecting Temperature Controller directly to a computer

This instruction describes how a static connection is established via a computer.

1. Make an Ethernet connection between your computer and the Temperature Controller. Plug an Ethernet cable to the LAN-port on the back panel of the Temperature Controller (see Figure 4) and the other end to the Ethernet port of your computer. You might need a USB-to-Ethernet adapter if your computer doesn't have an Ethernet port.
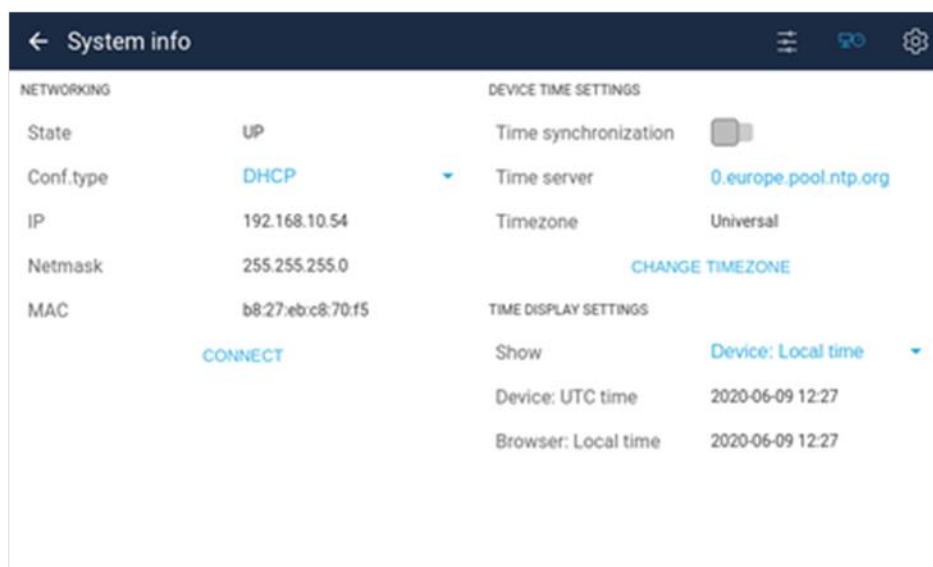
Figure 5: Example of Temperature Controller network settings

2. On the Temperature Controller network settings, set the IP and network mask (see Figure 5). The IP of the Temperature Controller could be, for example, 192.168.10.54 and, for the computer, 192.168.10.53. The IP itself is not important as long as they differ only in the last two digits. This makes sure the devices are in the same subnet. If the netmask is left empty, the Temperature Controller selects netmask 255.255.255.0 by default. Gateway and DNS are not needed if the device is connected directly to the computer. Do not press "Connect" yet.

3. Next, you have to set the IP of the computer. How it is done depends on the operating system of your computer. Below are instructions for Windows, but if you have another operating system, for example Mac OS or Linux, ask for help from your system administrator.

4. Press "Connect" on Temperature Controller (see Figure 5). To check that the network is functioning, type the IP address of the Temperature Controller into a browser. If the Bluefors logo

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appears and the UI starts to download, the connection is established. If the page does not reply, it might help to restart the computer and do the process again.

2.1.3.1 Setting the IP on a Windows computer

This instruction describes how to set the IP on a Windows computer.
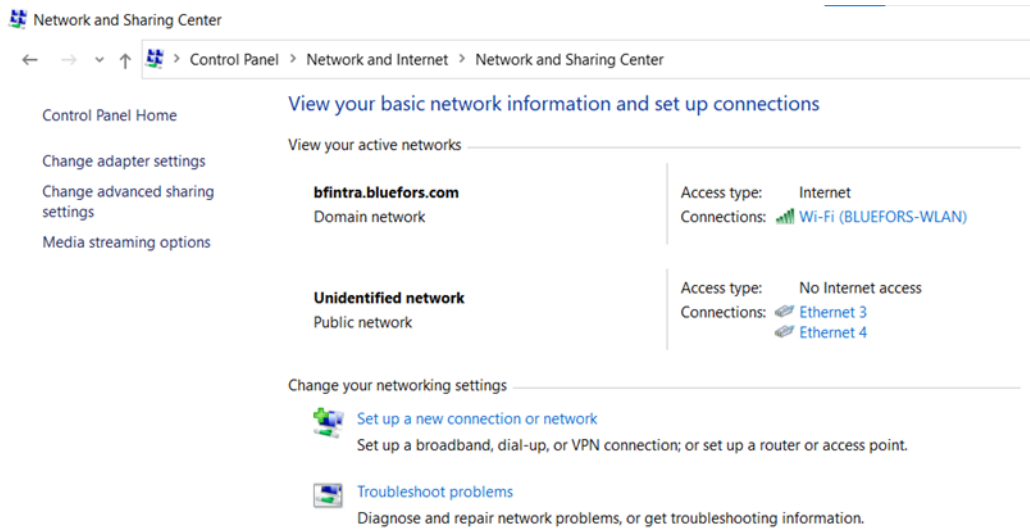
Figure 6: Setting the IP – Network and Sharing Center

1. On your Windows computer, go to Control Panel → Network and Internet → Network and Sharing Center (see Figure 6).
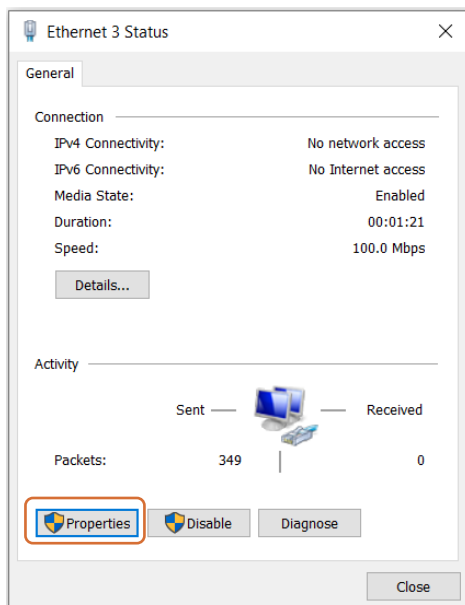
Figure 7: Setting the IP – Ethernet adapter properties

2. Click on the correct Ethernet adapter. If you are unsure, unplug the cable and see which connection disappears, and then re-plug. In the window that opens when you click on the Ethernet adapter, you can see the network activity. If there are no received packages, the connection is not yet established. Press "Properties" (see Figure 7).

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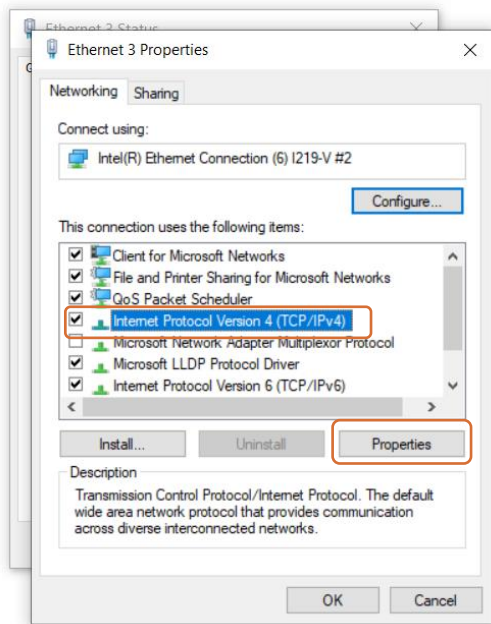
Figure 8: Setting the IP – Connection properties

3. From the list choose "Internet Protocol Version 4 (TCP/IPv4)" and then press "Properties" (see Figure 8).

4. Press "Use the following IP address" (see Figure 9). The IP address differs only on the two last digits of the IP address (using netmask 255.255.255.0) from the IP set on the Temperature Controller. The netmask must be the same as shown in Figure 7. Then press "OK".
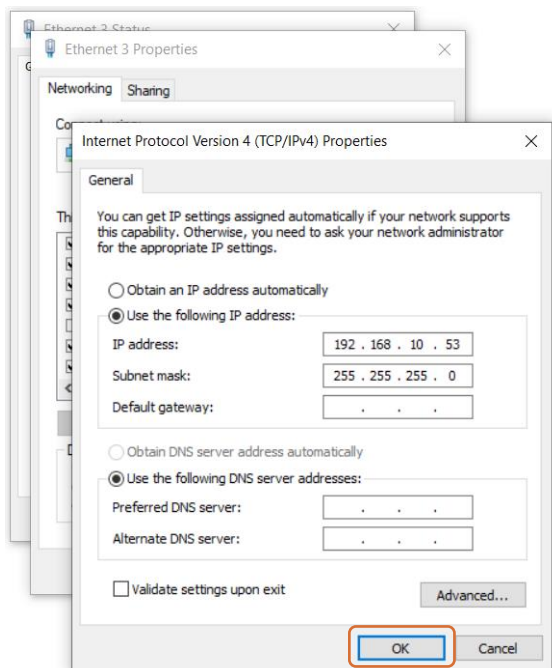
Figure 9: Setting the IP address

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3 User interface description

This chapter describes the functionality of the main elements in the device's User Interface (UI). The UI is accessible from the touchscreen of the device but can also be accessed via a web browser when connected to the IP address of the device.

3.1 Starting up

When the system starts, the screen shows a Bluefors logo and indicates that the UI application is loading.

3.2 Home screen
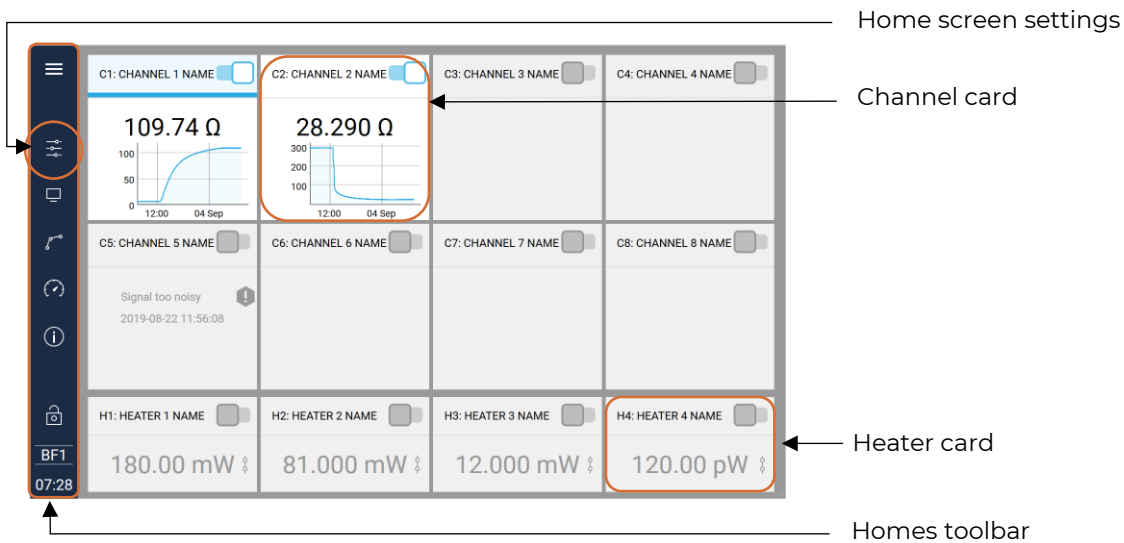
Figure 10: Home screen with default cards and toolbar

When the system is running, the Home screen shows eight measurement channel cards and four heater cards by default (see Figure 10). The Home screen toolbar is located on the left side of the display.

A channel card is the view of a single channel. A heater card is the view of a single heater. Press any card to open a full screen view of the card.

The number of visible channels and heaters on the Home screen (see Figure 11) can be changed via the Home screen settings menu, see Figure 3. For Home screen settings, see section 3.7.
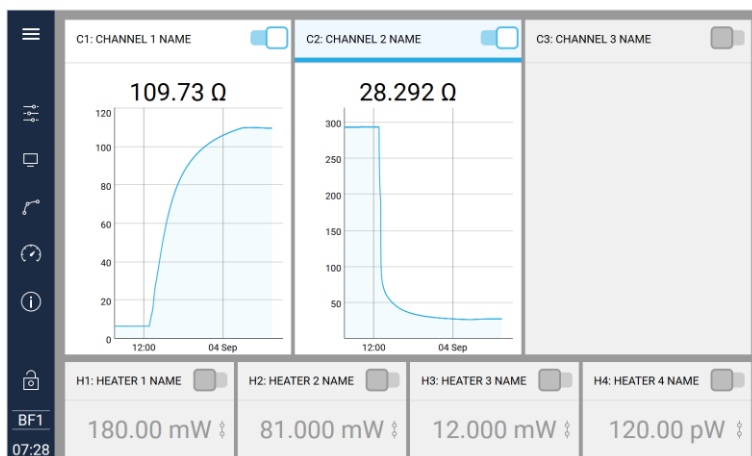
Figure 11: Example of the Home screen indicating three visible channels and four heaters

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3.3 Navigation

3.3.1 Home screen toolbar

The Home screen toolbar is located on the left of the Home screen and has two visual modes: normal and wide. Shift between the two modes by pressing the top icons on the toolbar as shown in Figure 12.
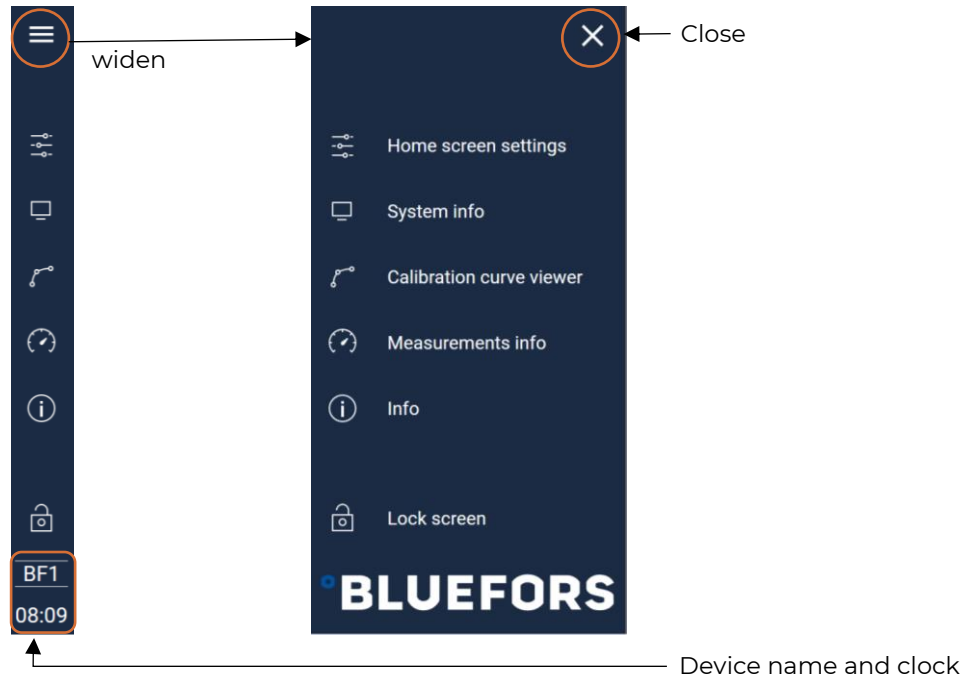
Figure 12: Home screen toolbar

The device name (in abbreviated form) and the device clock are shown at the bottom of the Home screen toolbar. For further information on these settings, see section 3.8.

3.3.2 Sub-View toolbar

When pressing the icons on the Home screen toolbar, a sub-view opens and a Sub-View toolbar appears at the top of the screen. Press the icons in the top-right of the Sub-View toolbar to navigate between the sub-views. Return to the Home screen by pressing the left arrow. See Figure 13.

Figure 13: Sub-View toolbar

3.4 Measurement channels

3.4.1 Channel card

A channel card is the view of a single channel. Pressing on a channel card provides a full screen view of the card. The channel card has the following elements as shown in Figure 14.

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Figure 14: Channel card elements
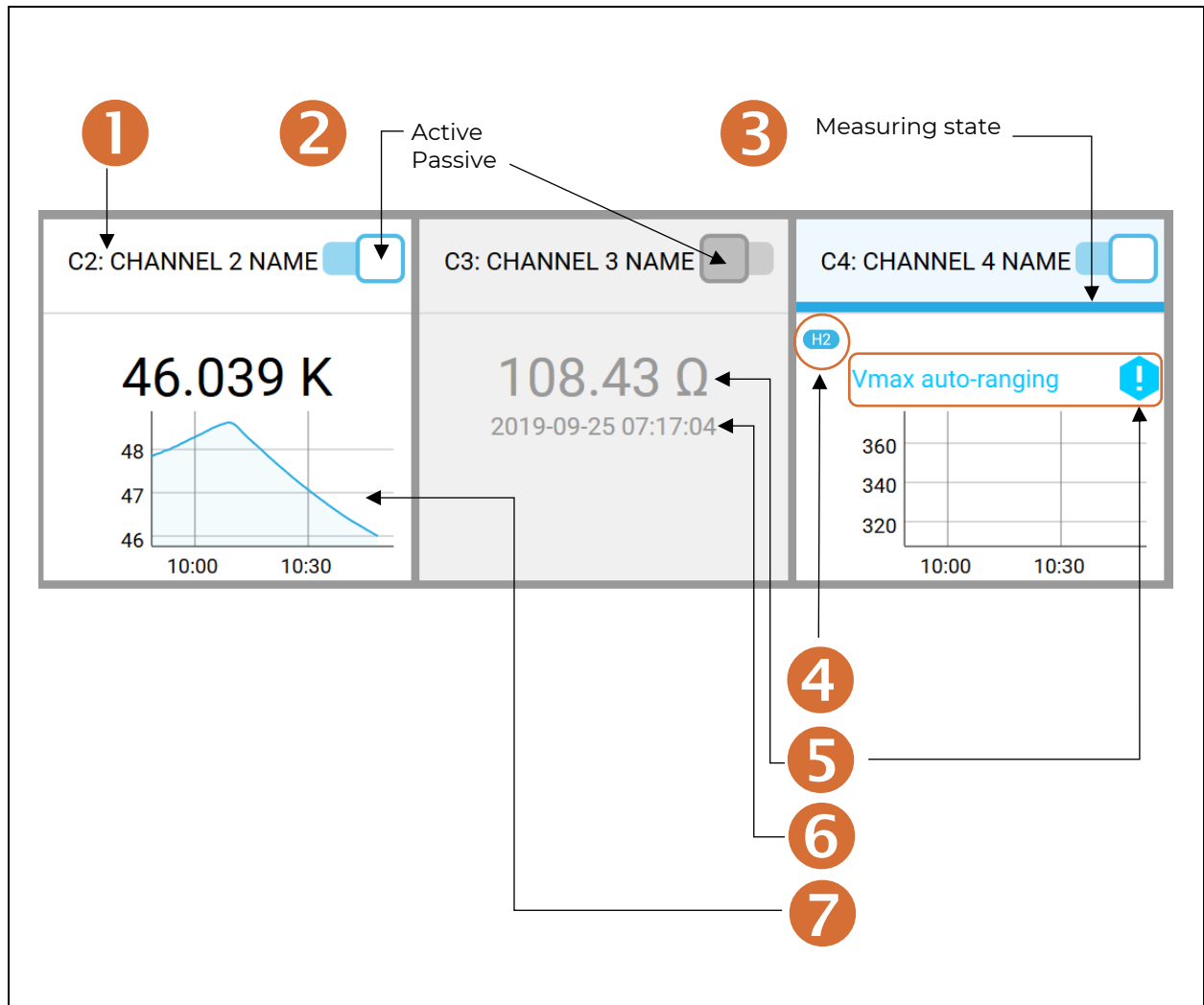
Item	Description
1	Channel number and name
2	Active (on/off) switch – the card's background is: • White when active • Grey when inactive
3	Measuring indicator – the card's title background color is: • Light blue when the device for that card is in a measuring state
4	Heater number (if connected heater is defined)
5	Latest measurement information: • Measurement value and units • Error (red)/warning (yellow)/notification (blue) received during measurement
6	Last measurement datetime (when in an inactive state)
7	Measurement data chart for the defined period (when in an active state).

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3.4.2 Channel views

This section details the views opened by pressing the channel card on the Home screen. These views give detailed information and access to the settings of the specific channels.

Navigate the different channels by pressing on the triangle icons. Edit the name of a channel by pressing the Pen icon. Return to the Home screen by pressing the left arrow. See Figure 15.
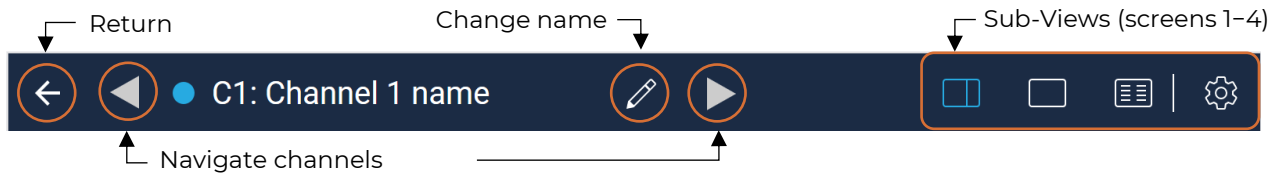
Figure 15: Channel Sub-View toolbar

3.4.2.1 Channel, screen 1: Chart view (icon ▭)
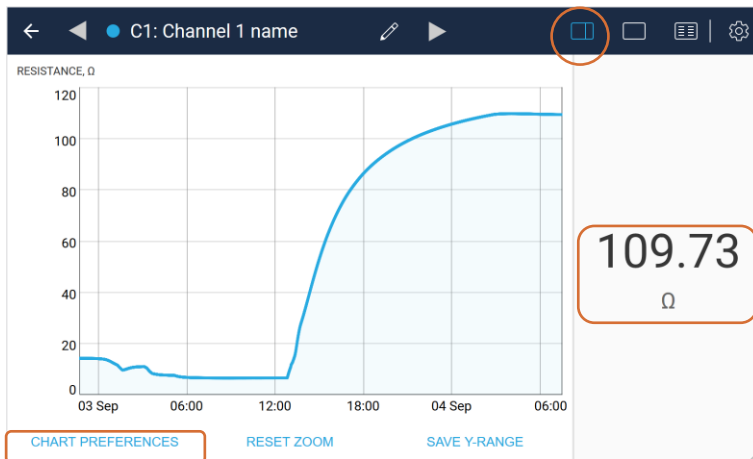
Figure 16: Channel, screen 1: Chart view

The Chart view on the Sub-View toolbar shows a measurement data graph of a defined period. The graph has pan and zoom functionality.

Use the touchscreen to pan and/or zoom as follows:

- Use the two-finger pinch gesture to zoom in either x or y-axis
- Slide with one finger to move around the zoomed area.

Use an external browser to pan and/or zoom as follows:

- Use click and release to select the zoom range
- Use shift + click and drag to pan.

The chart preferences can be configured further by opening the menu with the chart preferences button at the bottom of the screen. See Figure 16.

On the right side of the display, there is a visible latest measurement value, or there may be a notification, error message, or a warning (messages are explained in section 3.4.3). If a heater is connected to the channel, related information is also shown.

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3.4.2.2   Channel, screen 2: Number view (icon ☐)
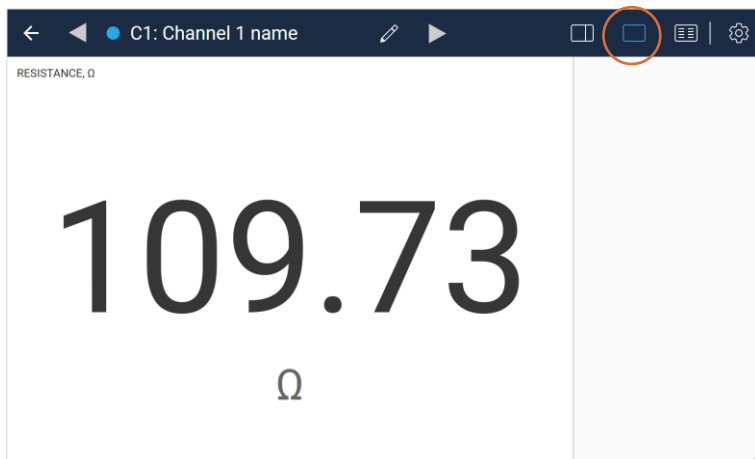
Figure 17: Channel, screen 2: Number view

The number view on the Sub-View toolbar (see Figure 17) is for displaying the latest measurement values in an enlarged font visible from a further distance. If a heater is connected to the channel, related information is also shown.

3.4.2.3   Channel, screen 3: Engineering view (icon ▤)
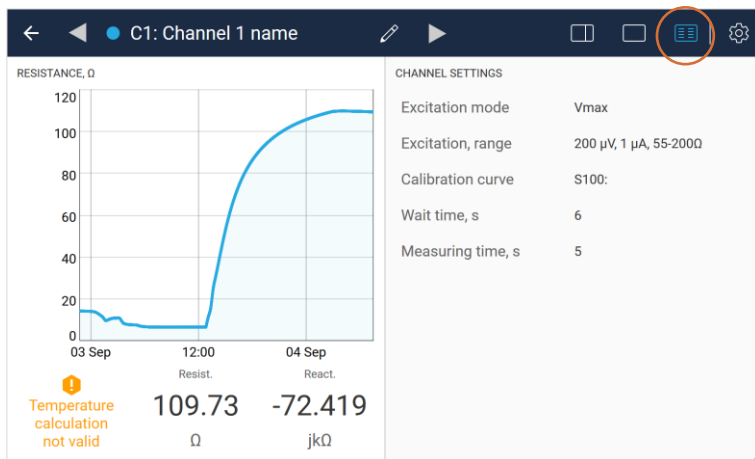
Figure 18: Channel, screen 3: Engineering view

The engineering view on the Sub-View toolbar (see Figure 18) is for displaying additional information related to the channel as follows:

- Measurement data chart for the defined period:
    - The chart is interactive: pan and zoom if needed
    - The chart settings are defined in the Chart Preferences dialog box (accessed via the screen 1, Chart view icon on the Sub-View toolbar)
- Latest measurement information
- Other channel settings
- Information related to the connected heater (if available).

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3.4.2.4 Channel, screen 4: Settings (icon ⚙)
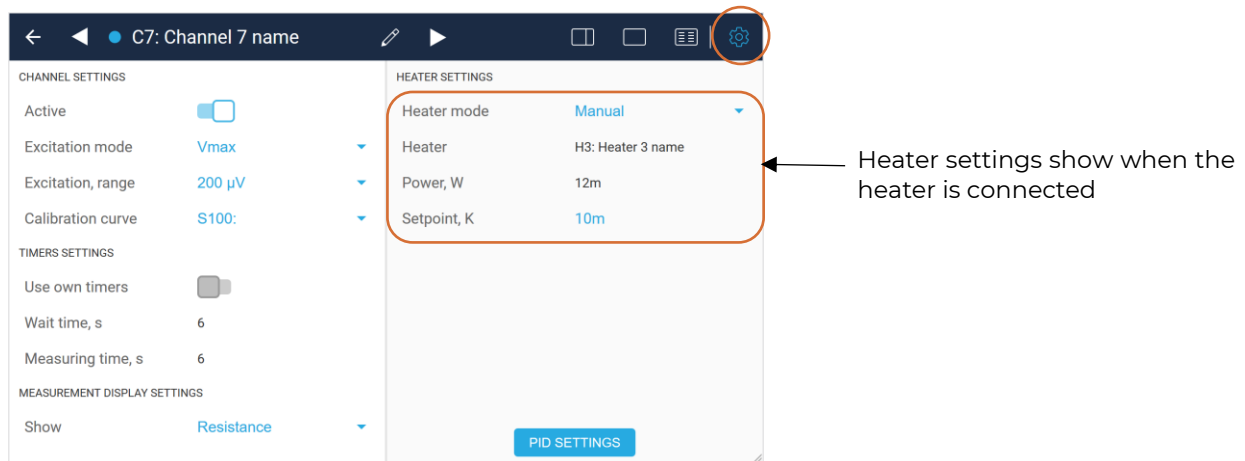
Figure 19: Channel, screen 4: Settings

The settings view on the Sub-View toolbar (see Figure 19) is the main control panel for configuring the measurement settings. The settings view has the following elements:

- **Active** (on/off) switch:
    o Select whether the channel is measured in the measurement loop. If the state is active, the channel is measured. The active switch in this view has the same function as the active switch on the Home screen.
- **Excitation mode** drop-down menu:
    o Current excitation
    o Vmax
    o Cerium Magnesium Nitrate (CMN)
- **Excitation range:** Set the actual excitation depending on the above Excitation mode selection:
    o Current excitation:
        ▪ Choose one of the current excitation amplitudes from the drop-down menu.
        ▪ See the table in "Resistance measurement ranges" in the Bluefors Temperature Controller System Description for the current excitation ranges.
    o Vmax:
        ▪ Highest possible voltage over sample without exceeding a given value. It is used for selecting current excitation amplitude.
    o CMN:
        ▪ Choose from two current excitations 50/150 µA, both which have the same excitation frequency of 64 Hz.
- **Calibration curve:** Select the right slot for calibration curve.
- **Timer settings** (wait-times and measurement times):
    o **Use own timers**: Switch between own or default timers for the channel
    o **Wait time**: Time to wait after switching channel and data is discarded
    o **Measuring time**: Time for the actual measurement after possible waiting
- **Measurement display settings**:
    o **Show:** Displayed unit of measurement (resistance/reactance/temperature).
- **Heater settings:**
    o **Proportional Integral Derivative (PID) settings button:** Information about a connected heater.

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3.4.3 Errors and warnings in channel cards

If the measured value in a channel is not reliable, an error (red) or a warning (yellow) is displayed in the channel card (see Figure 20). Table 1 lists the types of error and warning messages.

Table 1: Types of warnings and notifications in a channel card

Type	Text	Explanation
Error	No data	Internal error: not getting data from measurement hardware.
Error	Signal too noisy	Measured signal-to-noise ratio is too low for reliable data. Check sensor connection.
Error	Unreliable data	The measured data is unspecific.
Error	Overflow	Measured data is out of range.
Error	Common-mode overflow	Common mode is out-of-range.
Error	Zero measured value	Internal error, the device does not measure properly.
Error	Resistance too high	Resistance is above the maximum range.
Warning	Temperature below range	Temperature below programmed impedance temperature curve.
Warning	Temperature above range	Temperature above programmed impedance temperature curve.
Warning	Resistance below range	Resistance is below the calibration range.
Warning	Resistance above range	Resistance is above the calibration range.
Notification	Vmax auto-ranging	The current excitation is tuned to set the voltage to be the highest possible below the given value, Vmax.
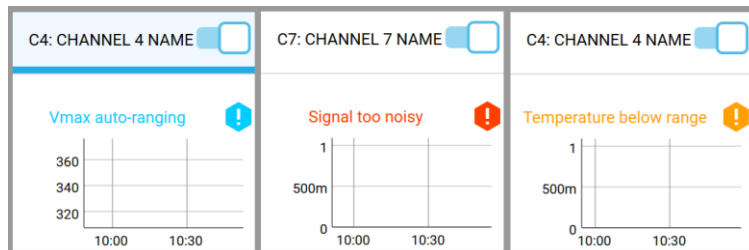
Figure 20: Examples of channel cards with corresponding notification, error, and warning messages

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3.5 Heater

3.5.1 Heater card

A heater card is a view of a single heater.

The heater cards on the Home screen (see Figure 21) show the status of the heaters and provide the UI for controlling the heaters.
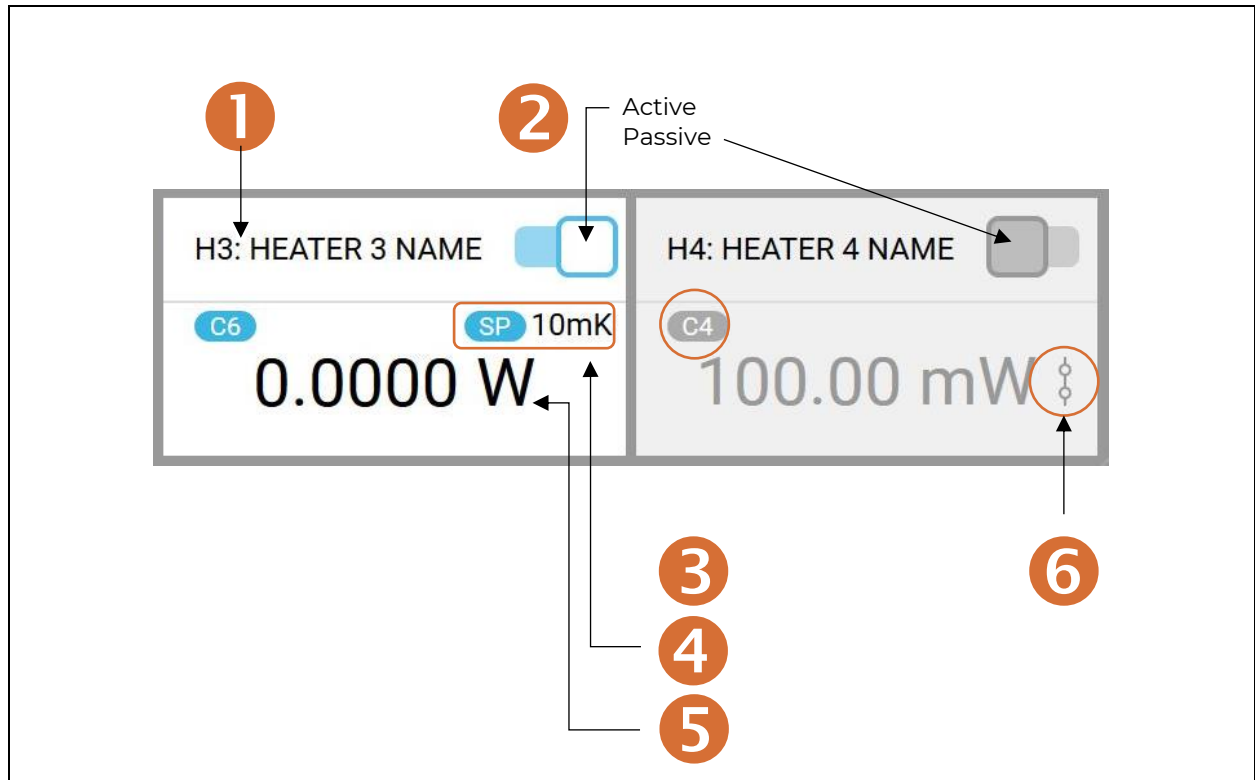
Item	Description
1	Heater number and name
2	Active (on/off) switch – the card's background is • White when active • Grey when inactive
3	Channel number (if a connected sensor channel is defined)
4	PID mode indicator with setpoint value
5	Applied power value
6	Shortcut indicator.

Figure 21: Heater card elements

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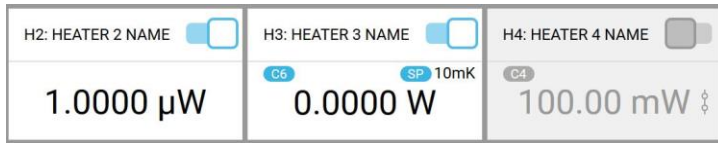
Figure 22: Examples of heater cards

Figure 22 shows examples of heater cards in the following configurations:

- Heater 2 is on and 1 µW of power is applied.
- Heater 3 is on. The algorithm (PID) controls the power by measuring the temperature of channel 6 which has setpoint of 10 mK. Currently no power is applied.
- Heater 4 is connected to channel 4 for possible control algorithm. The heater is turned off by the main switch and also the external relay is in a configuration that keeps the heater off.

Press the heater card to switch to the heater view.

3.5.2   Heater views

Heater settings can be accessed by pressing a heater card on the Home screen. These settings are for further configuration of heater parameters.

Navigate the different heaters by pressing on the triangle icons. Edit the name of a heater by pressing the Pen icon. Return to the Home screen by pressing the left arrow. See Figure 23.
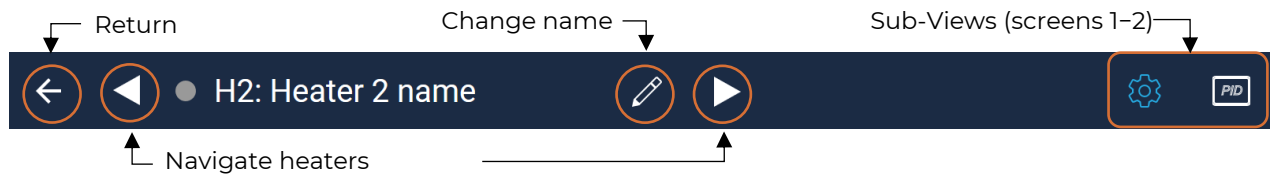
Figure 23: Heater Sub-View toolbar

3.5.2.1   Heater, screen 1: Main settings (icon ⚙)
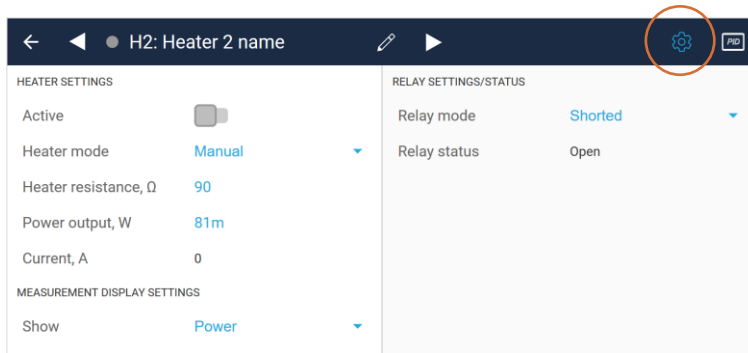
Figure 24: Heater, screen 1: Main settings

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Press the heater card on the Home screen. The heater main settings view on the Sub-View toolbar (see Figure 24) has the following elements:

- **Active** (on/off) switch:
    - White when active
    - Grey when inactive
    - The switch has the same function as the switch on the Home screen
- **Heater mode:** Choose between applying heater power manually or a by using the control algorithm (PID)
- **Heater resistance:** Set the conversion between current and power. The heater is a current source and thus incorrect resistance value leads to incorrect heating power
- **Power output:** Actual output power
- **Current:** Label to show used current
- **Measurement display settings:** Select to show current or power on the Home screen
    - **Show:** Displayed unit of measurement (power/current)
- **Relay settings/status:**
    - Relay mode: Sets which mode of external loop (shorted or open) enables heater
    - Relay status: Displays current status of external loop, if it is shorted or open.

3.5.2.2   Heater, screen 2: PID related settings (icon $\boxed{PID}$)

Figure 25: Heater, screen 2: PID related settings

The PID related settings view on the Sub-View toolbar (see Figure 25) shows closed-loop control algorithm (PID) related settings for the heater. See section "Closed-loop mode" in the Bluefors Temperature Controller System Description.

- **Algorithm:** Selected control algorithm
- **Algorithm parameters:**
    - For PID (**proportional (Kp), integration time (Ti)** and **derivative (Td))**: see equation (11) in the Bluefors Temperature Controller System Description
- **Setpoint, K**: This is the goal temperature that algorithm tries to reach and maintain
- **Max power, W**: The safety limit to the algorithm to limit applied heater power
- **Channel information**:
    - **PID settings button:** information about connected measurement channel.

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3.6 Screen lock (icon 🔒)

To prevent accidental changes, it is possible to lock the screen in the Home screen toolbar. Use the lock icon (see Figure 26) to lock the screen, and swipe the screen to unlock.
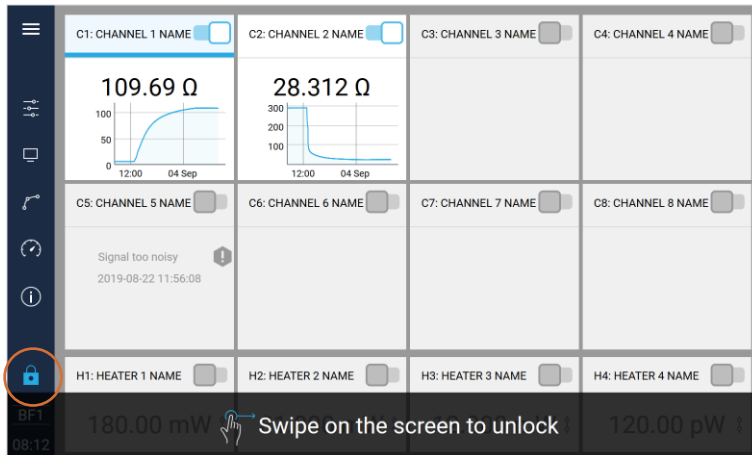
Figure 26: Lock view

3.7 Home screen settings (icon ⚙)

Use the Home screen settings icon on the Home screen toolbar to select which cards are visible on the Home screen. The time span for the displayed measurement data can also be set.
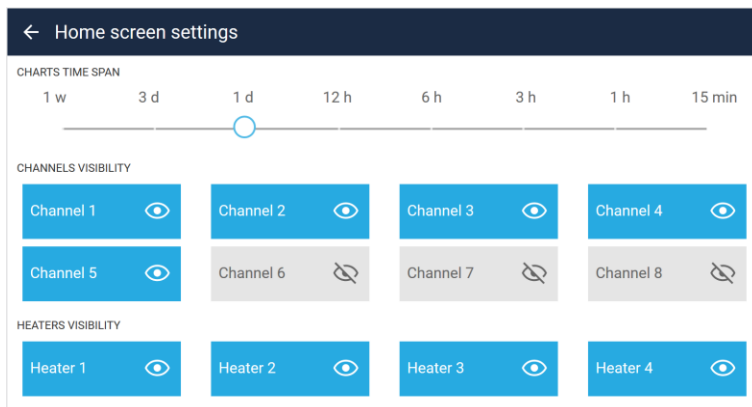
Figure 27: Home screen settings

As shown in Figure 27, the cards for measurement channels 1–5 and heater channels 1–4 are visible and the time span for displayed data has been set to one day.

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3.8 System info (icon ⬚)

The System info viewer on the Home screen toolbar provides access to device information, updates, and network and time zone settings.

3.8.1 System info, screen 1: Device information and Firmware update (icon ⬚)
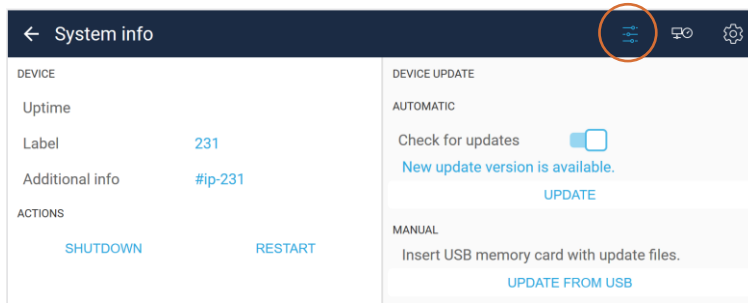
Figure 28: System info, screen 1: Device information and Firmware update

System info, screen 1 on the Sub-View toolbar (see Figure 28) is the default screen when selecting the System info icon on the Home screen toolbar.

- **Uptime:** Obtain the uptime of the device
- **Label:** Three-character long device name which shows in the Home screen toolbar
- **Additional info:** Can be used to describe the location of the device, or a long version of the device name, etc. This name can also be retrieved via an external API.
- **Actions buttons:**
  o Press the **Shutdown** button to shut down the device
  o Press the **Restart** button to restart the device
- **Check for updates** (on/off) switch:
  o Switch is white when active, and the device polls the update server for possible new updates (see Figure 28)
  o Switch is grey when inactive
- **Update button:** Press to start the update process, visible only if updates are available
- **Update from USB button**:
  o Insert a USB stick with update files and press the Update from USB button.

NOTE 1: Updates to the device are always controlled by the user.

NOTE 2: Further details on updates of the system are provided in section 4.

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3.8.2 System info, screen 2: Network and Time (icon 🖥🕐)
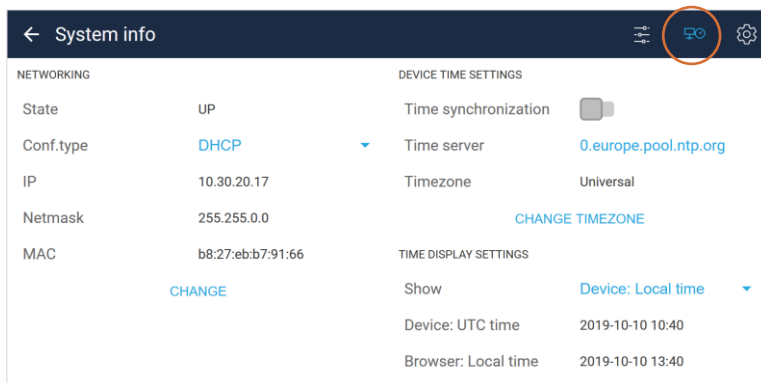
Figure 29: System info, screen 2: Network and Time

Network and device time zone settings are applied in System info, screen 2 on the Sub-View toolbar (see Figure 29). In network settings, either DHCP or static IP configurations can be selected. The device needs a valid IPv4 address, Netmask, default gateway and DNS server addresses.

The device has an internal Real-Time-Clock (RTC) to keep time when the power is switched off. In order to keep time stamps accurate, it is recommended that the device is connected to a network time-server. Synchronization can be enabled or disabled and a time-server can be selected.

The device keeps all data time stamps internally in UTC format. Local time can be selected for the device, which is typically the time zone of the country where the device is located. The UI of the device can show UTC, device time or browser time. For example, if the user connects from New York to a device in Helsinki using a browser, they can select the browser time-zone (New York) or the time zone of the device (Helsinki).

3.8.3 System info, screen 3: Debug view (icon ⚙)

By selecting Debug UI mode In System info, screen 3 on the Sub-View toolbar (see Figure 30), the user can view additional information. This setting is typically used when debugging problems with the device.

When the Debug mode is on, an additional icon appears on top of the screen
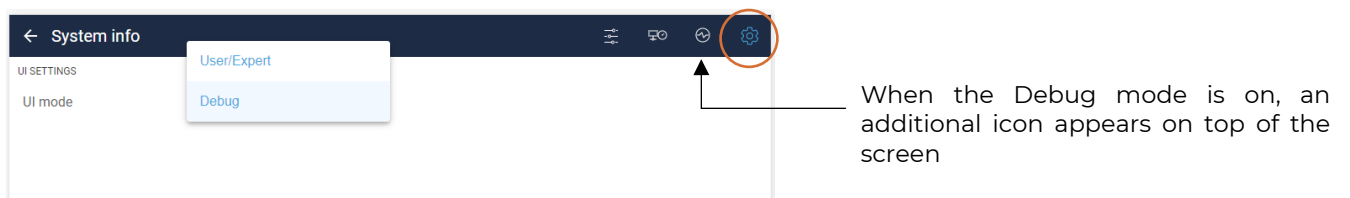
Figure 30: View to set Debug view on

3.9 Calibration curve viewer (icon ⌐)

The calibration curve viewer on the Home screen toolbar can be used to view calibration curves already loaded on the device or to upload new curves. In this section, the calibration curve relates to impedance-to-temperature conversion but it is more often used for resistance-to-temperature conversion.

> NOTE: The hardware user interface cannot be used to upload curves to the device. A connection via an external browser is required.

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3.9.1   View curve (icon ▤)
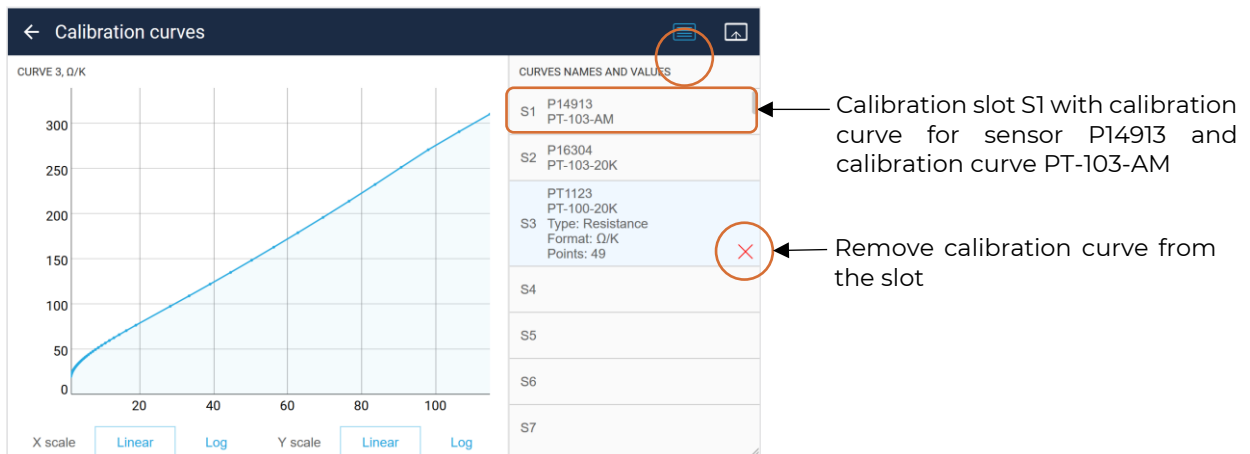
Figure 31: Calibration curve viewer

Calibration curves are viewed with the calibration curve viewer, screen 1 on the Sub-View toolbar (see Figure 31).

The impedance-to-temperature calibration curves are stored on the device. To select a curve for viewing, press an item on the list on the right of the screen. To remove a curve from the device, select the curve in the list and press the cross icon, see Figure 31.

Up to 100 curves can be stored in slots, marked with the letter S in the list, see Figure 31.

3.9.2   Loading curve (icon ◰)
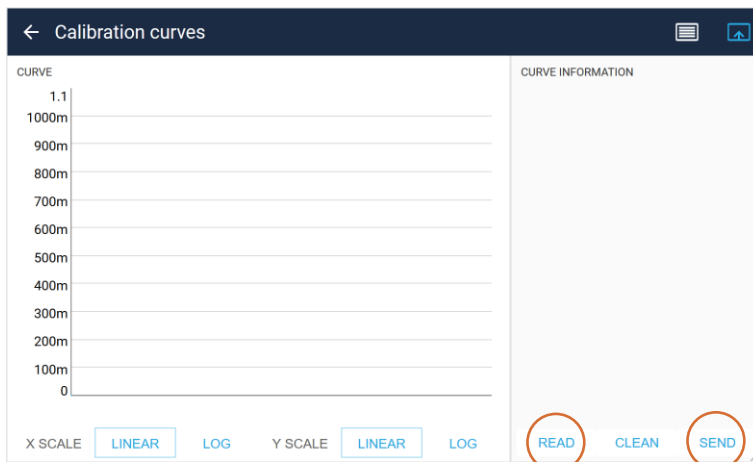
Figure 32: Calibration curve viewer when loading a curve

Use an external browser to upload calibration curves to the device.

- Press Loading curve icon on the Sub View Toolbar
- Press "Read" to read data file from disk
- Select file
- Confirm file selection / load file
- Select the curve slot number
- Press "Send" to send data to the device

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3.10 Measurements info (icon ⊘)

The Measurements info on the Home Screen Toolbar views give access to information and settings of the actual measurement.

3.10.1 Measurements info, screen 1: Measurement time settings (icon △)

Figure 33: Measurements info, screen 1: Measurement time settings

The Measurements info, screen 1 on the Sub-View toolbar (see Figure 33), is used when setting default wait and measurement times of the impedance measurement. Wait time is the time that data is neglected after a channel is changed. Wait time is needed for the analog electronics to settle after a channel has been changed. Measuring time is the time of the actual measurement after the wait time has finished.

The actions list on the right side of the screen can be used to stop and start the measurement loop, if Debug mode is enabled.

3.10.2 Measurements info, screen 2: Historical data (icon ⓛ)
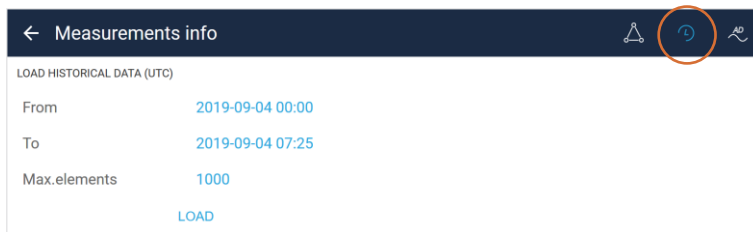
Figure 34: Measurements info, screen 2: Historical data

Sometimes, data over a selected timespan is required to be presented. For this reason, in the Measurements info view on the Sub-View toolbar (see Figure 34), a timespan of the viewed data can be selected.

The historical measurements data and the application's graph data sizes have the following limits:

- Hard limit of points in any graph
  - device touchscreen: 5000
  - external browser: 100000
- Hard limit of points in historical data response
  - 1000000
- Received data set is combined with available data while keeping the defined hard limit valid by dropping oldest data.

3.10.3 Measurements info, screen 3: Oscilloscope (icon $\stackrel{AD}{\sim}$)

Randomly sampled raw results of the AD converters can be monitored in the Measurements info view, screen 3 on the Sub-View toolbar. The green curve is the amplified voltage signal over the measured sensor, the blue curve is the amplified voltage signal from one end of the measured sample to ground. The time span is single sinusoidal excitation.

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The simplified functional diagram of the whole system is shown in the Bluefors Temperature Controller System Description, Figure 3 "Overall description of the system". Figure 35 shows part of this system with the green curve from amplifier A1 and the blue curve from amplifier A2.
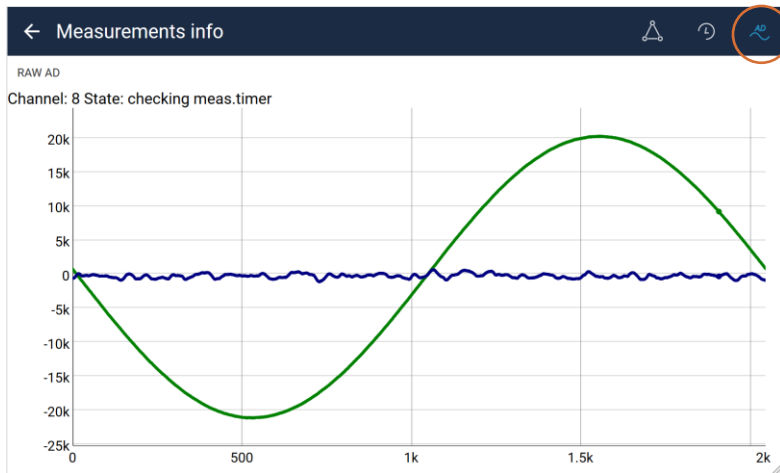
Figure 35: Measurements info, screen 3: Oscilloscope view

> NOTE: The blue curve will indicate whether there is large external noise in the system, for example 50/60 Hz.

3.11 Info (icon ⓘ)

The Info view on the Home screen toolbar provides access to versions, identifiers and other information related to the system.

3.11.1 Info view, screen 1: Application, Device, About, and License (icon ⓘ)
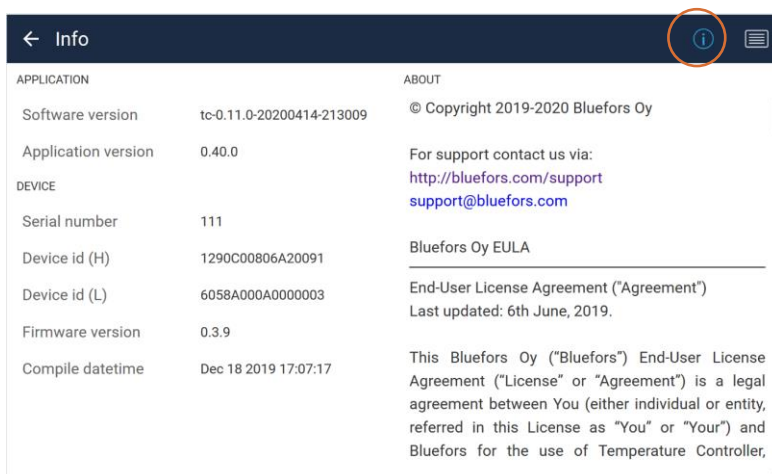
Figure 36: Info view, screen 1: Application, Device, About, and License

The Info view, screen 1 on the Sub-View toolbar (see Figure 36), provides current version information of the system software, the end-user agreement and a link for further information including any third-party software licenses used by the system.

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3.11.2 Info view, screen 2: Errors and warnings (icon ▤)
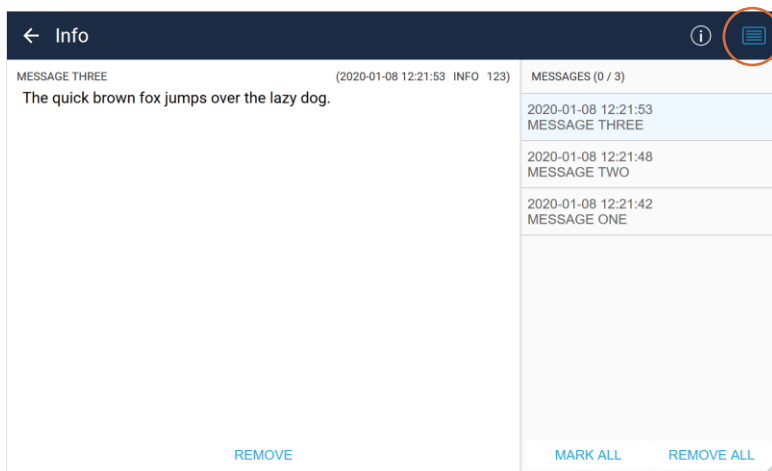
Figure 37: Info view, screen 2: Errors and warnings

The Info view, screen 2 on the Sub-View toolbar (see Figure 37), lists any possible error and warning messages related to the system. The messages are useful when corresponding with Bluefors support.

A message is counted as read when:

- It has been selected from the list by pressing on it
- It was the latest message in the list which was shown automatically.

The Mark all button is pressed to change the status of all 'unread' messages to 'read'.

A red number by the Info view icon on the Home screen toolbar shows the number of unread messages, see Figure 38.

Figure 38: Number of unread messages icon

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3.12   On-screen keyboards

For some settings, an on-screen keyboard appears.

There are two modes of on-screen keyboards, a numerical and a full keyboard. On the numerical keyboard, engineering units can be selected to help provide numbers in different ranges, for example, n, μ, m, x1, k, M, G, T. See Figure 39.

Pressing the display outside the keyboards will close them.
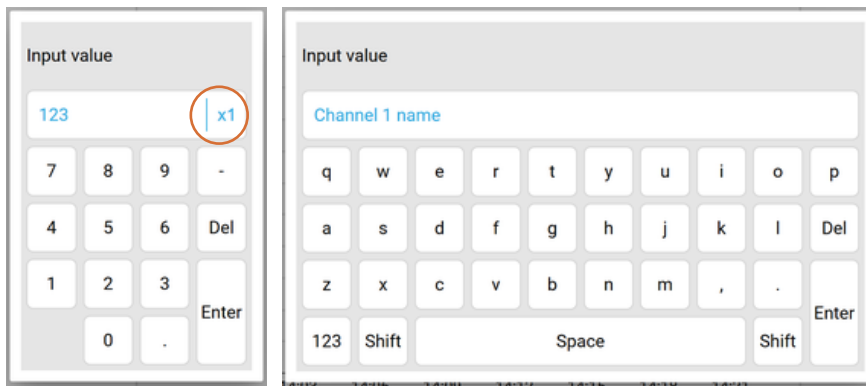

Figure 39: On-screen keyboards (engineering units - in pic is selected x1 - can be selected on numerical keyboard)

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4 Device update

Occasionally, new software updates for the device are available. There are two routes for updating the software of the device.

- Using automatic checking (see section 4.1)
- Manual download (see section 4.2).

After pressing the update button, the device automatically updates and reboots. If an updated image is faulty, or a flashed image is corrupted, the update process is stopped and the user is notified.

> NOTE: The device will not install updates before the user selects the update button.

4.1 Automatic update check (icon ⌷)

By default, the automatic update check is turned off. It is activated by pressing the System info icon on the Home screen toolbar, and then pressing the Check for updates on/off switch, see Figure 40.

If an update is available, the user is notified. To install the update, the user presses the Update button, see Figure 40. After pressing the Update button, the device handles downloading of available updates automatically. The update requires a system reboot to finalize the update which is also completed automatically. The whole process takes about 25–30 minutes.

> NOTE: The update uses port 9000 to access the update server bluefors-updates.com. An exception must be made to the firewall rules on local-area-network administration if automatic checking of updates is to be used.
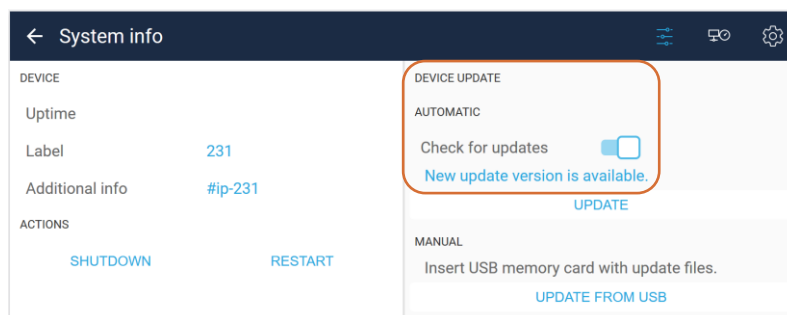

Figure 40: System info, screen 1 (device and update information)

From System info, screen 1 on the Sub-View toolbar, the user can enable the automatic checking of updates and install the downloaded update, see Figure 40.

For a full description of System info, screen 1 on the Sub-View toolbar, see section 3.8.1.

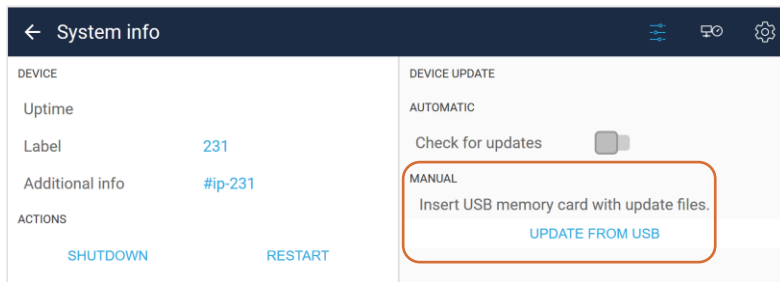°BLUEFORS

4.2 Manual update

Figure 41: Manual update on System info, screen 1: Device information and Firmware update

If the user does not want the system to update automatically, the system can be manually updated using a USB drive (see Figure 41).

Step 1

1. Available updates are notified by email which contains a download address.
2. Download the update file and the hash file from the received URL. Both files have the same name with one file suffixed with the extension .sha256, for example:
   a. tc-0.10.6-20200102-212933.mender
   b. tc-0.10.6-20200102-212933.mender.sha256.
3. Copy both files to a USB drive.

Step 2

1. Insert the USB drive to the back of the device.
2. Initiate the update from the System info, screen 1 (press icon ⬜ on the Home screen toolbar, then press icon ⚙ on the Sub-View toolbar).
   a. Press the Update from USB button, see Figure 41.

For a full description of System info, screen 1 on the Sub-View toolbar, see section 3.8.1.

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5 Replacing the battery

The Bluefors Temperature Controller has an internal 3V (CR1220) battery to maintain time with the RTC when the system is not powered. If the battery level is low, the user is notified via the warning message "RTC battery low, please change the battery" on the UI. This warning is triggered when the battery voltage is lower than 2.4V.
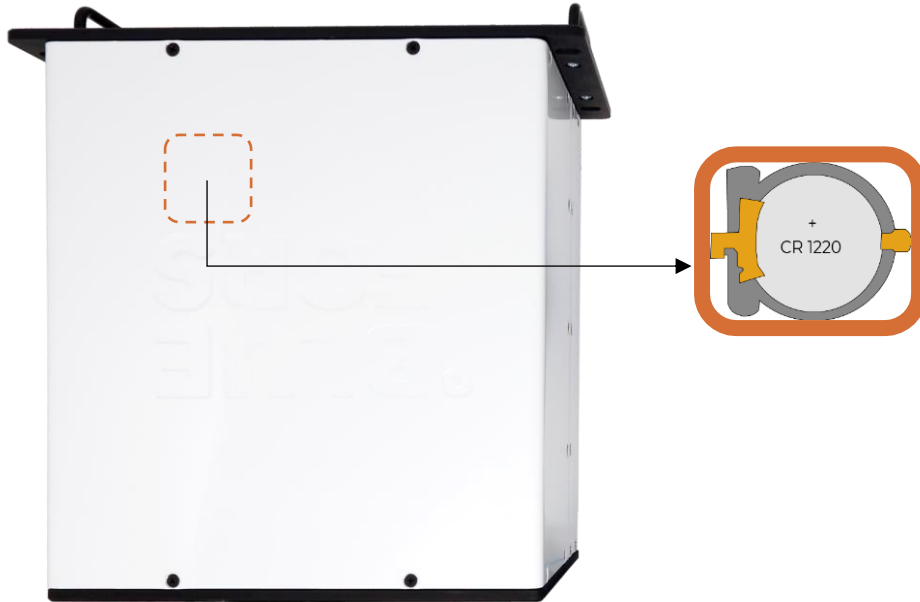

Figure 42: Location of the battery inside the Control Unit

The battery is to be replaced when the voltage is too low. Remove the battery from the Control Unit as follows (see Figure 42):

1. Turn off the power from the device and remove the External Power Supply from the back of the Control Unit.
2. Remove the top lid of the Control Unit as follows:
   a. Remove the 20 screws that hold it in position.
   b. Loosen the screws which hold the front panel mechanics to assist the removal of the top lid, see Figure 43.
   c. Carefully, slide the top lid away from the Control Unit, see Figure 44. If it does not move freely, loosen the bottom lid screws.
   d. Remove the old battery with a small screwdriver and insert a new battery (3V, CR1220).

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Figure 43: Top lid screws

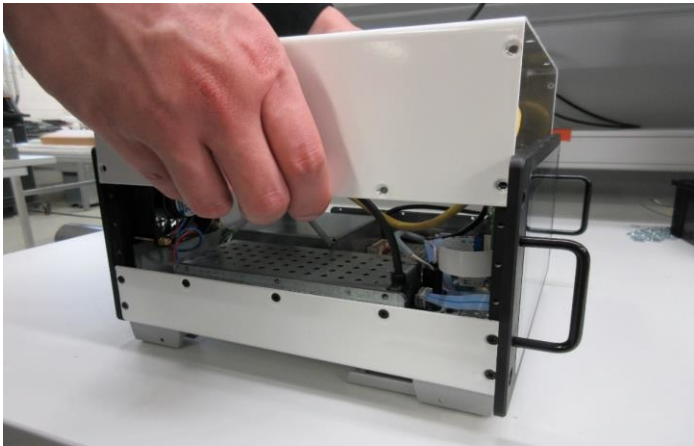Figure 44: Opening the top lid

Check the battery as follows:

1. Install the top lid on the Control Unit in the reverse order to removal.
2. Install the External Power Supply to the Control Unit and turn on the power to the device.
3. Go to System info and select Debug mode in the final screen view.
4. Go to the second screen view and check the battery level. It should show a value above 3V.

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6 Important information

6.1 Intended use

WARNING

Only use the device for the intended purpose
it has been designed for.

The Bluefors Temperature Controller is a Class A product intended for use in an industrial environment. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

6.2 Proper use

CAUTION

Operating temperature +10°C – +40°C.

CAUTION

Use 110V–240V.

CAUTION

Disconnect before carrying out maintenance
or repair.

Read the Bluefors Temperature Controller System Description and the External Power Supply manuals before use. Also refer to the separate warranty documentation.

The device can only be opened for changing the clock battery, or in cases when Bluefors support has given express instructions. See section 5 in this manual for instructions on how to change the battery. Other user-made operations could void the warranty.

6.3 Care

If required, only use a dry cloth to clean the device.
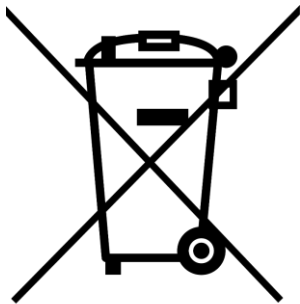
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6.4 Safety

> ⚠️ **WARNING**
>
> Use only the supplied External Power Supply.

6.5 Disposal information

The device and supplied battery must be taken to appropriate recycling at the end of their working life. Within the EU, replaced devices can be returned to the manufacturer for disposal. Elsewhere, dispose the device in accordance with your local applicable regulations.

6.6 Custom applications

> 🛈 **IMPORTANT**
>
> The information contained within this publication covers a wide range of applications and may not specifically apply to your equipment layout or custom set up.

Contact us directly (support@bluefors.com) if you have any question about the specifications or any other content contained within this publication.

6.7 Customer service

For support, contact support@bluefors.com.

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