ELOTECH
INDUSTRIEELEKTRONIK

RS7100

Operating unit for controlling

R4010 or M9040 top-hat rail modules

Temperature controller for 4 to 32 control zones

Installation and Operation Manual

Important!

Read carefully before use!

Keep for later reference!

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1 Introduction

1.1 Safety

General information

This manual contains instructions that you must observe for your own safety and in order to avoid damage to property. These instructions are supported by symbols and are used in this manual as shown.
Read this manual before you put the device into operation. Keep the manual in a place that is accessible to all users at all times.
If there are any difficulties during commissioning, we kindly ask you not to carry out any manipulations that may endanger your warranty claim.

Warning symbols

WARNING!

This symbol, in conjunction with the term "Warning," indicates that personal injury may occur if the appropriate precautions are not taken.

CAUTION!

This symbol, in conjunction with the term "Caution," indicates that damage to property or loss of data may occur if the appropriate precautions are not taken.

WARNING!

This symbol indicates that electrostatic discharge (ESD) can destroy components if the appropriate precautions are not taken.

Informative symbols

NOTE!

This symbol indicates important information about the product or its handling or additional uses.

REFERENCE!

This symbol indicates more information in other sections, chapters or other manuals.

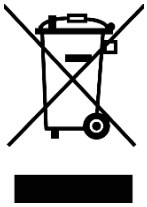
1.2 Intended Use

The device is intended for use only in industrial environments, as specified in the technical data (16). According to the EMC Directive 2014/30/EU, use in residential areas is not permitted. Any other use or use beyond that is regarded as inappropriate. The device is built in accordance with the applicable guidelines and standards as well as the applicable safety regulations. However, improper use may result in personal injury or damage to property. In order to avoid danger, the device may only be used:

- for the intended purpose,
- in perfect working order,
- by qualified persons,
- in compliance with the technical documentation supplied.

Even if the device is used appropriately or according to its intended purpose, it may pose application-related hazards, e.g. due to missing safety devices of the surrounding workplace or the surrounding plant or incorrect settings.

1.3 Disposal



DISPOSAL!

The device or replaced parts should not be put in the waste bin after the end of use, as it consists of materials that can be reused by specialised recycling plants.
Please, have the device and the packaging material properly disposed of in an **environmentally friendly manner**.
In doing so, the country-specific laws and regulations for waste treatment and disposal must be observed.

1.4 Further Information

NOTE!

In the PDF version of this manual, clicking on an image or an internal document reference will take you directly to further information.

Symbols used

Symbols are used recurrently in this manual to represent specific processes. The meaning of these symbols is as follows:

Symbol:	Importance:
⚙	This symbol shows a gear and indicates the factory default value of a parameter. If the device is reset, the parameter reassumes this value. Example:
	Setting range: **OFF**, **0.1 ... 10.0**⚙ **... 400.0 K**
	In this example, the setting range is between 0.1 and 400 K, the default value is 10 K (the parameter can also be set to OFF)
Link	The symbol shows two links in a chain that are connected to each other. It indicates a link to a chapter in this manual. Clicking on the underlined blue text takes you to the referenced section.
	This symbol refers to an external link. It shows a box with an arrow starting from the centre and pointing to "North-East".
MRE	The abbreviation **MRE** stands for **M**easuring **R**ange **E**nd. The RS7100 is capable of using different types of thermocouples (TC), for which reason the parameterization of a temperature value depends on the applied sensor type.
	MRE for TC Type J (Fe-CuNi) & Type K (NiCr-Ni): **800 °C** **MRE** for TC Type L (Fe-CuNi): **1200 °C**
	This symbol indicates that you should tap the button shown with your finger.
	This symbol indicates that you should tap the button shown with your finger and hold it for >1 second.

2 Device identification

2.1 Description of the RS7100

The RS7100 control unit can control up to 32 zones by controlling up to four R4010 controller modules and thus covers a wide range of control processes. The outstanding and unique ELOTECH control algorithm achieves particularly fast control with minimal overshoot, thus ensuring protection of particularly sensitive plant areas.

The RS7100 has a high-contrast 7-inch colour LCD with capacitive touch operation. The clear display of the user interfaces ensures intuitive operation. In addition, the internet-capable system can be remote-controlled via a VNC viewer app. This app enables the system to be monitored and controlled remotely. For the display, the user can choose between different view variants, such as the zone overview, process list or graph and PID display.

Protection of the plant is one of the most important objectives when using this control device. For example, the RS71000 protects the system by automatically interrupting the heating process in the event of temperature anomalies and recognises, among other things, the failure of a sensor. The system is then shut down to protect man and machine.

Just as important as the physical protection of the system is the protection of internal data and settings. User administration guarantees safe use of the RS7100. Various authorisation levels can be used to restrict the operability of the unit according to the application. This ensures that parameterisation can only be carried out by authorised persons. In addition, each login is recorded with a time stamp in a separate file. This data can be exported to a USB storage medium. Furthermore, all control-relevant parameters can be saved via USB or a complete set of parameters can be imported in the form of a tool recipe.

The RS7100 incorporates the most modern technology and extensive functions in order to be able to work optimally in every application. With the aid of the soft start, system areas are gently brought up to operating temperature or, for example, heat exchangers are dried to suit the machine. Self-optimisation helps in the search for the ideal control parameters, which determines the optimum parameters for the corresponding system after only a short time.

In addition to numerous other zone-related functions, the RS7100 also offers cross-system application support. Among other things, temperature reductions can be carried out globally, i.e. affecting all zones. This function can be useful, for example, to save energy during production breaks without having to switch off the unit. When production is to be continued, the unit can be brought back to operating temperature in a short time. Zones that take a long time to heat up or that need to maintain their set temperature for other reasons can be individually excluded from the global reduction.

2.2 Type Key

RS71XX	-	C	-	01	-	000	-	FB	-	P

Voltage	
5	24 V/DC

Fieldbus	
00	No
03	RS232 + RS485 + TTY
08	Profinet
09	Profibus
0A	OPC-UA

Version	
7100	Front panel installation
7110	Rear end variant
7120	DVI connection - without display

3 Assembly

3.1 Notes on Commissioning

The unit described here may only be used for its intended purpose! The operator of this product must prove that he has instructed his qualified personnel in electrical operation.
In accordance with DIN EN 50274:2002, there are no operating elements inside the housing that may or must be operated during operation.

The unit is intended for installation in a system, machine or switch cabinet in the indoor area (protection class: IP20) and is to be set up in such a way that it is protected from impermissible moisture, external heat and heavy soiling. The permitted ambient temperature range of 5 to 40 °C must be observed. Any hazards to the cables due to sharp edges during normal local use must be avoided.

The electrical connections must be made by a specialist in accordance with the local regulations. Only sensors corresponding to the set measuring range may be connected. When connecting thermocouples, the compensating cable must be laid up to the unit terminal. Transducer lines and signal lines (e.g. intersections or signal lines) must be laid separately from mains voltage lines. In order to comply with CE conformity, shielded sensor cables must be used.

Spatial separation between the unit and inductive consumers is recommended. This system control is FI-capable. The operator must ensure that the insulation values of the heating are > 1 MΩ. The differential current that then occurs (max. 230 µA) allows the problem-free use of a residual current circuit breaker for the entire system. Operation of the unit requires a power supply protected by a residual current circuit breaker and a suitable automatic circuit breaker.

The unit does not have any safety cut-out for other connected units or systems.

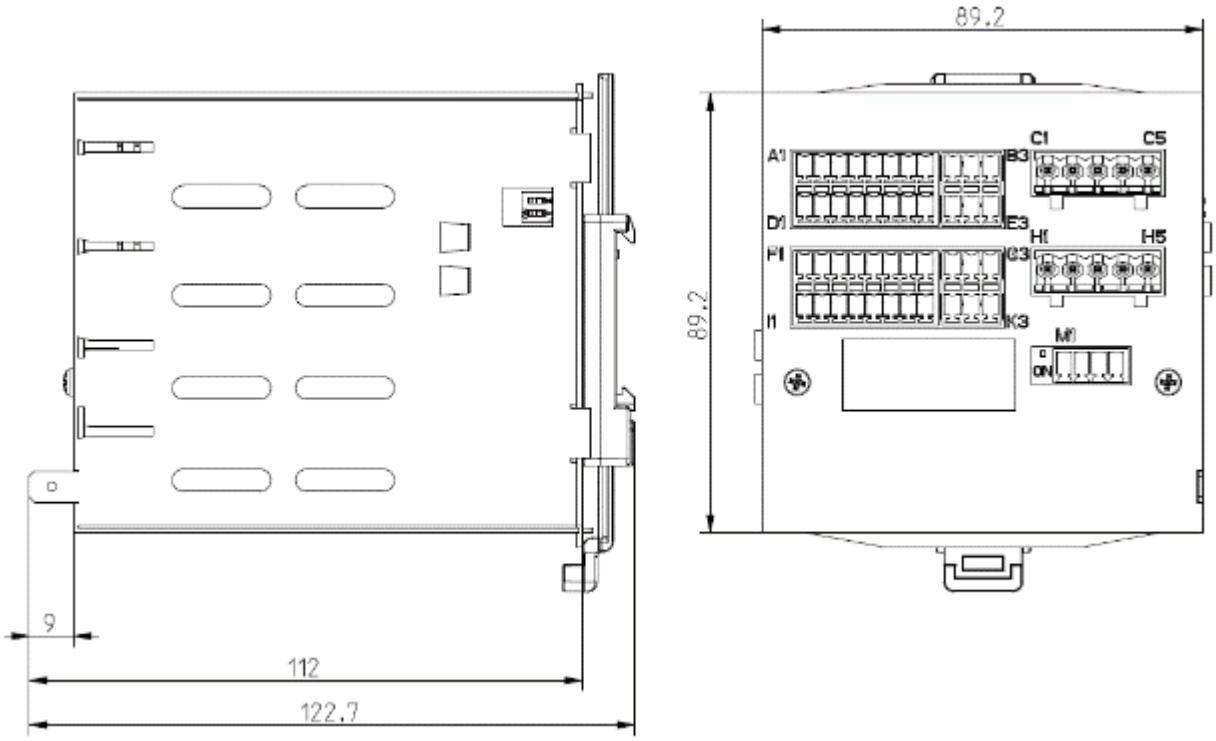
The protective conductor system of the unit serves only for the internal potential equalisation of the unit. The heaters connected to the heater plugs of the unit that have a metal housing must be equipped with a functioning protective conductor system by the operator of the system. The metal bodies of the connected heaters must be connected to the protective conductor system of the machine inside the machines.

The machine-related settings must be made first during commissioning.

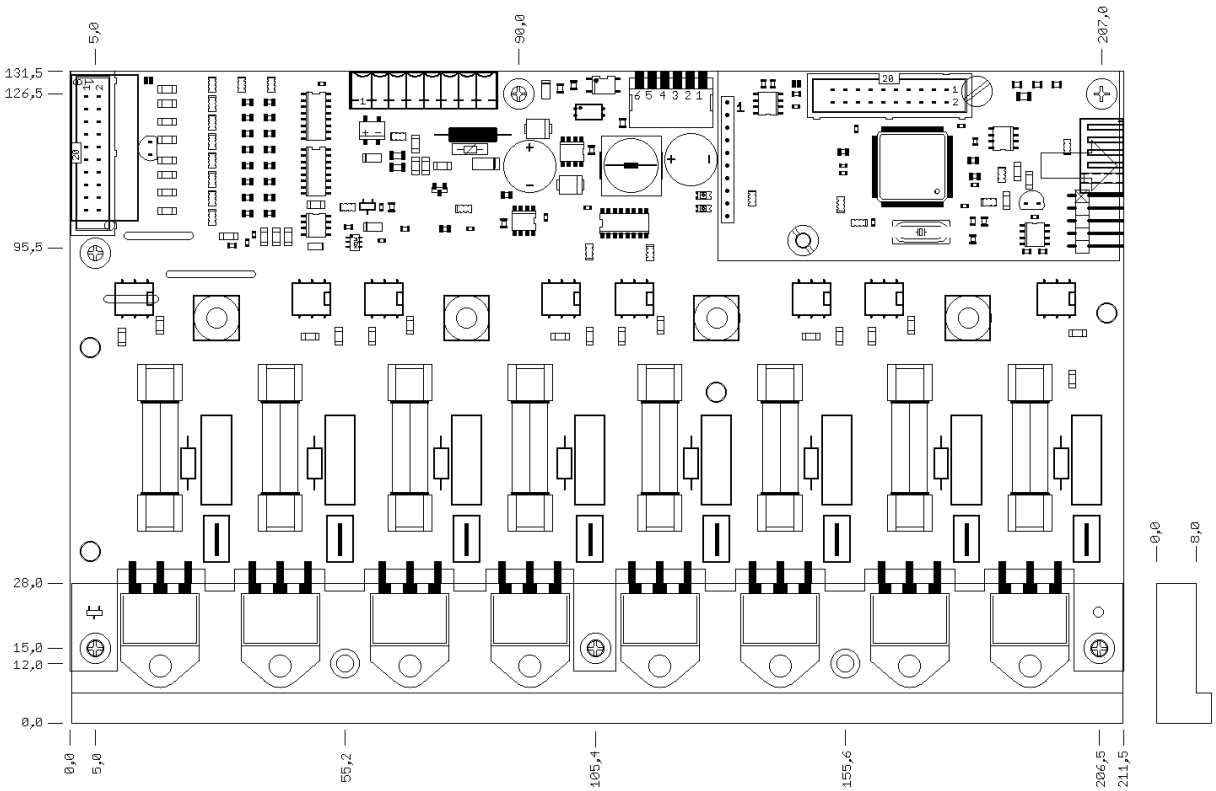
This description has been prepared with the greatest possible care. However, the information given does not constitute a guarantee of product characteristics. The manufacturer accepts no liability for errors. The manufacturer reserves the right to make changes at any time in the interest of technical progress. All rights reserved.

3.2 Dimensions

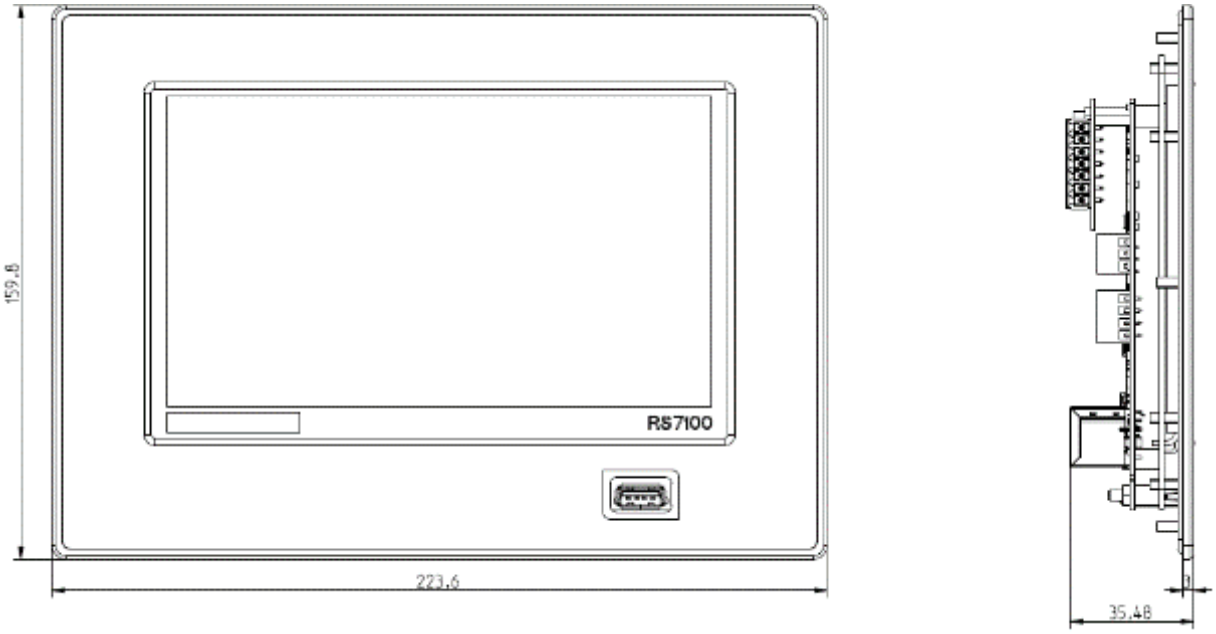
3.2.1 R4010



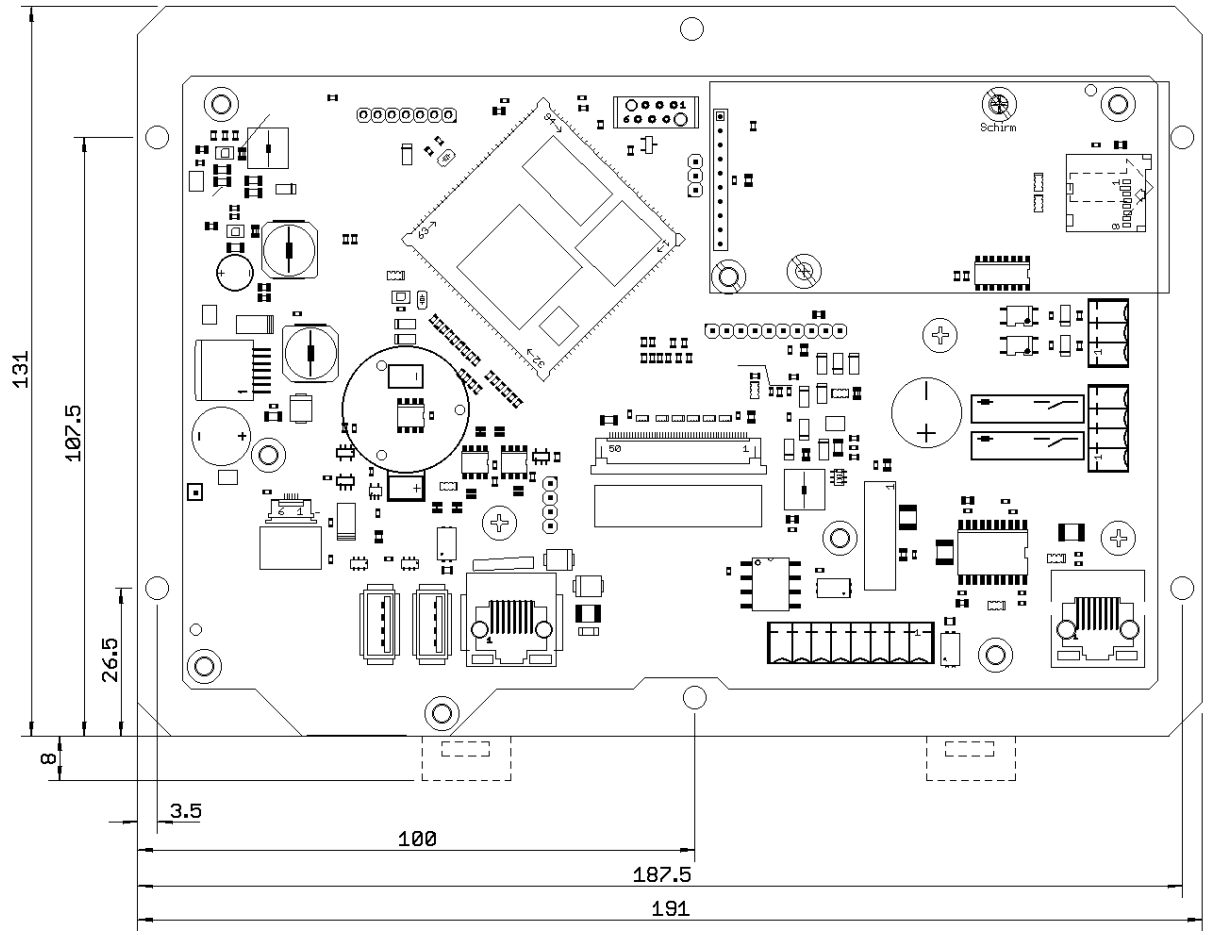
3.2.2 M9040



3.2.3 RS7100

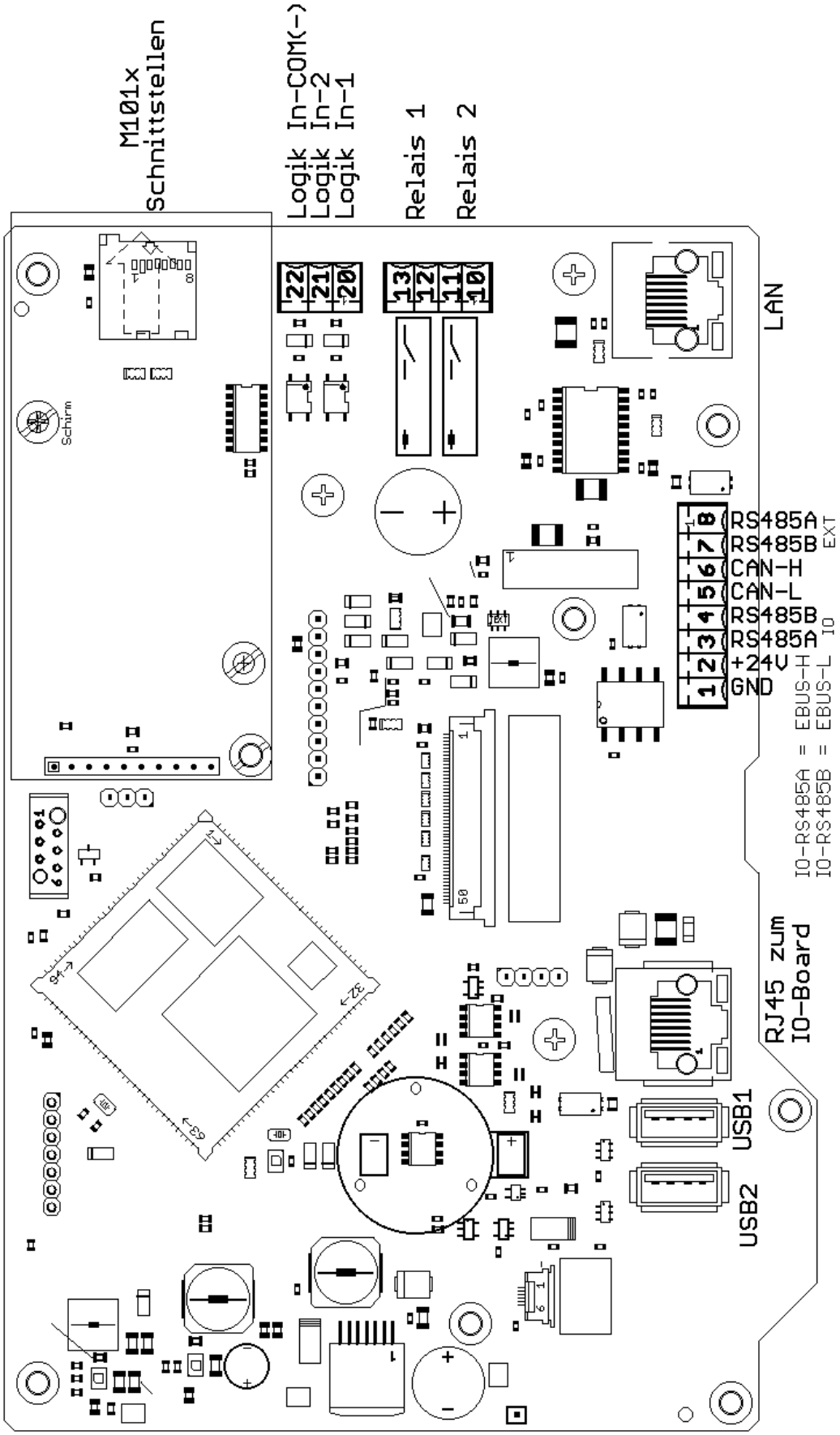


3.2.4 RS7120



4 Electrical Connections

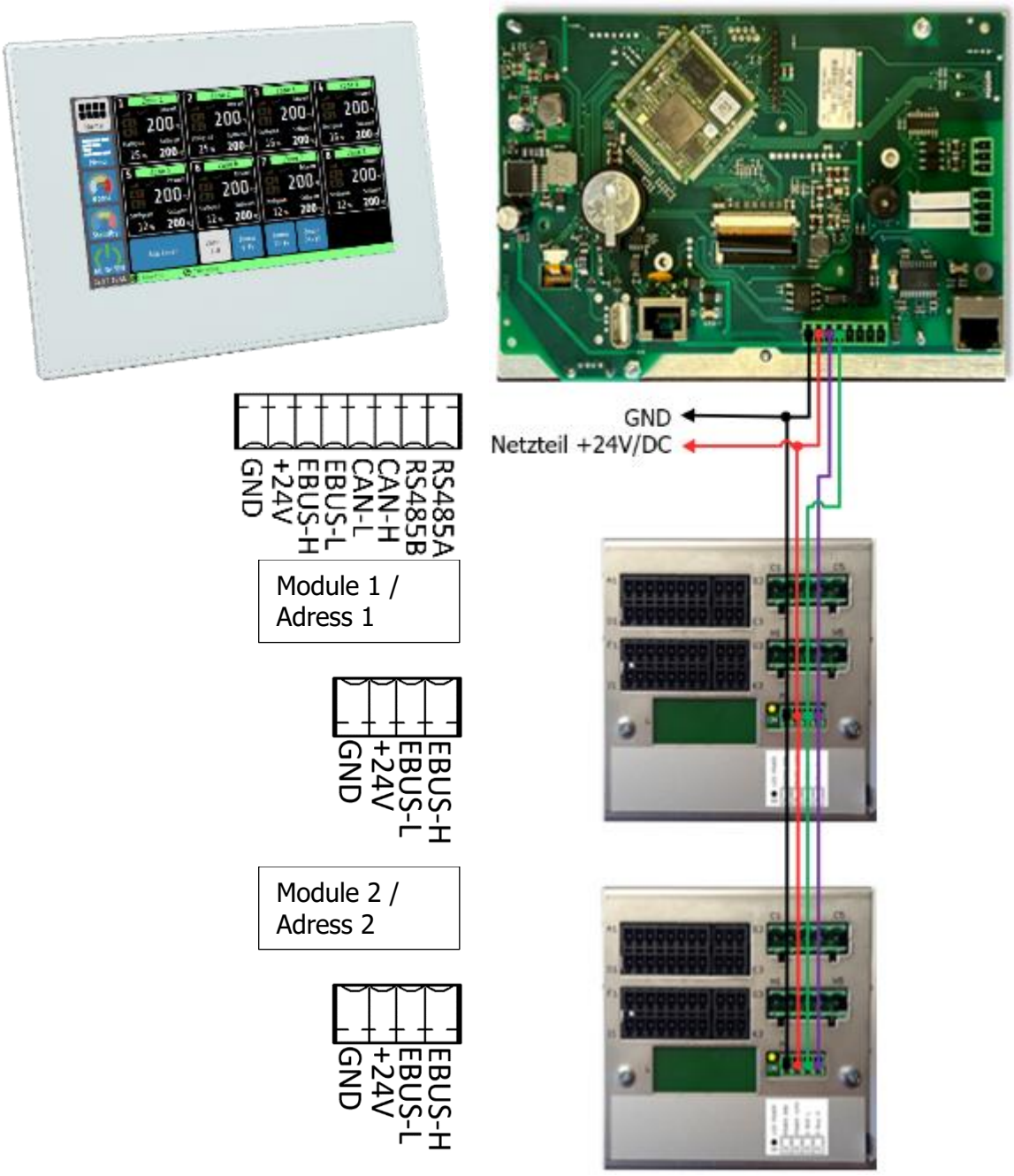
4.1 Connection Diagram RS71x0



4.2 Connecting RS7100 with R4010

4.2.1 Connection to Supply Voltage

The **RS7100** operating unit can be used to connect up to four IO hat machine assemblies. This allows up to 32 zones to be controlled and regulated.
When connecting the control system, make sure that the operating unit is connected in parallel with the IO modules.
See also 4.2.3 Connection Diagram: Power Supply / E-Bus.

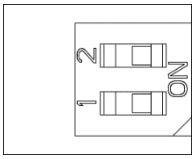


Further IO modules are to be connected in the same way.

One IO module can control up to 8 zones. zones.

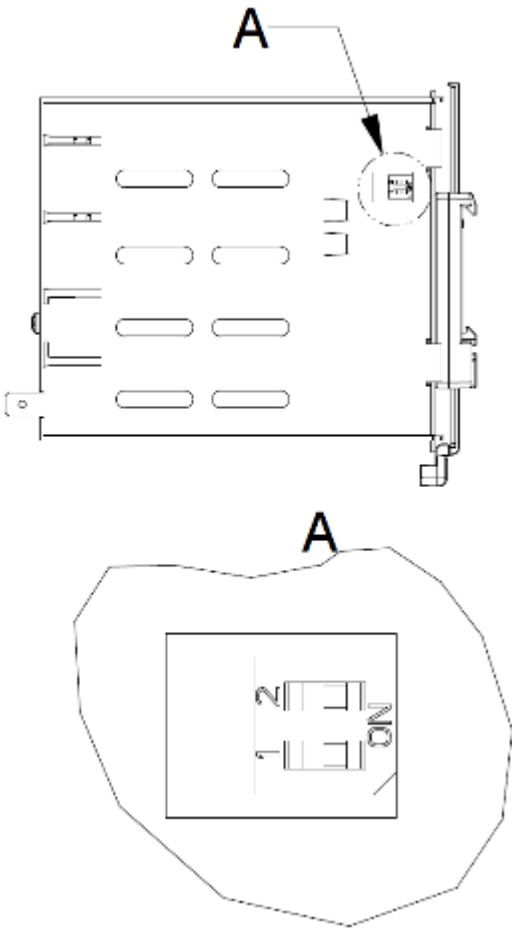
A terminating resistor is not required.

The addresses of the individual modules are set by the position of the DIP switches on the right-hand side of the unit..

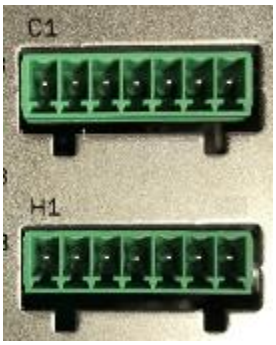


Adress	DIP switch 1	DIP-switch 2	control zone
1	OFF	OFF	1- 8
2	ON	OFF	9-16
3	OFF	ON	17-24
4	ON	ON	15-32

Please also note the correct setting of the total number of zones in the menu System 13.2



4.2.2 IO Module

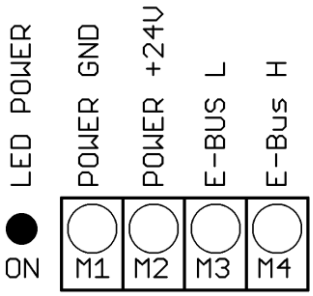


Continuous option

Ground connection

The ground connection (flat plug 6.3 mm) must be connected as short as possible (<20 cm) with a thick cable (>=4 qmm) to a ground rail!

4.2.3 Connection Diagram: Power Supply / E-Bus

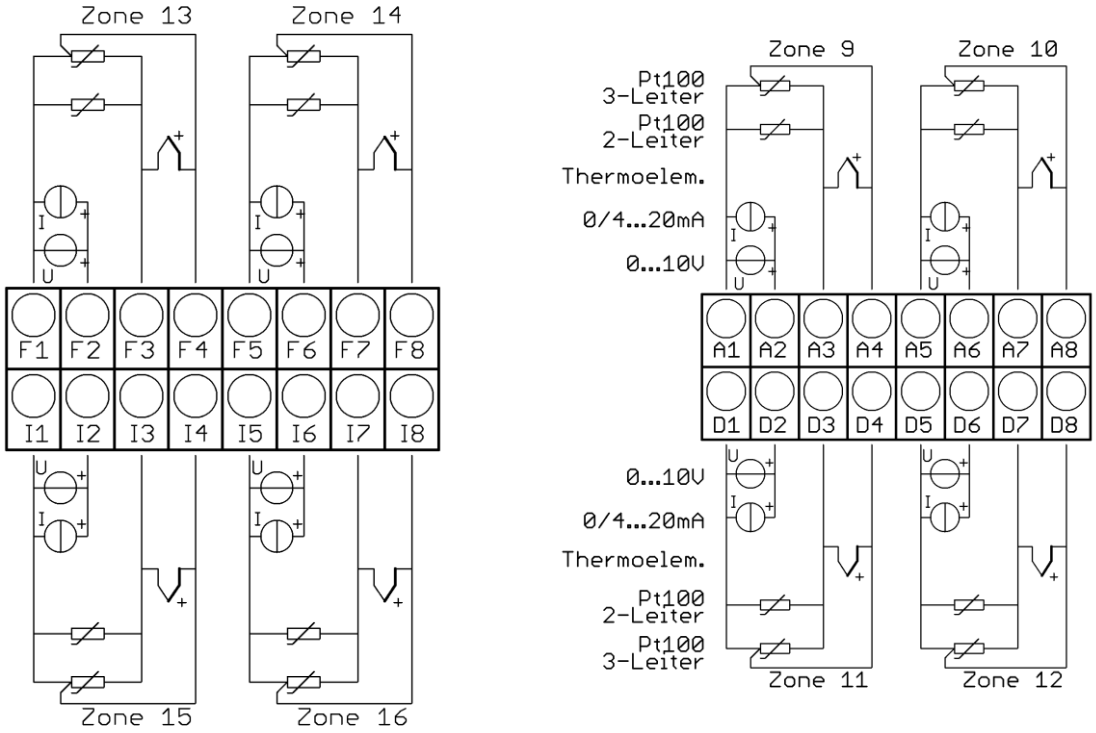


The LED lights up when the supply voltage is present.

This extension module is networked with the RS7100 controller via the E-bus.

The lines E-BUS L and E-BUS H must be connected to the corresponding terminals of the RS7100. The connection of the E-bus to the controller must be a shielded line. The shield must be connected to earth (housing) on one side of the R4010.

4.2.4 Connection Diagram: Sensor Input

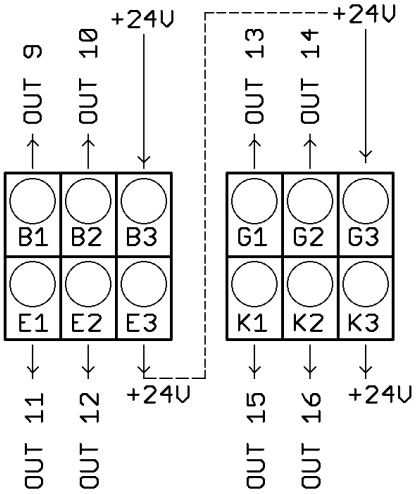


Sensors and logic outputs must not be connected to each other externally!

CAUTION!

PT100/Ni120: Depending on the connection type (2-wire/3-wire), the probe/sensor parameter must be selected accordingly.

4.2.5 Connection Diagram: Logical Output



The supply voltage for the logic outputs must be wired externally:
+24 V must be applied to terminals **B3** and **G3**.

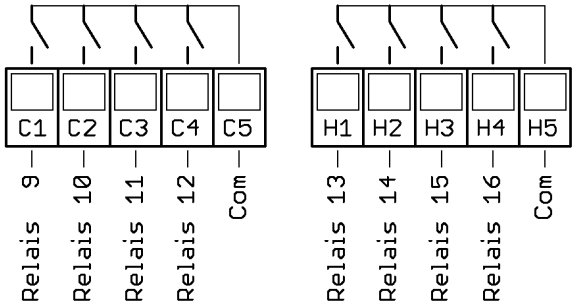
B3 is internally connected to E3 and G3 to K3.
The terminals E3 and K3 can thus be used to bridge the +24 V.

The 24 V are switched to the outputs Out x and thus control the SSRs. The reference potential is the ground of the supply voltage.

4.2.6 Connection Diagram: Relay Output

NOTE!

If the controller is equipped with continuous outputs, the relay outputs are omitted.

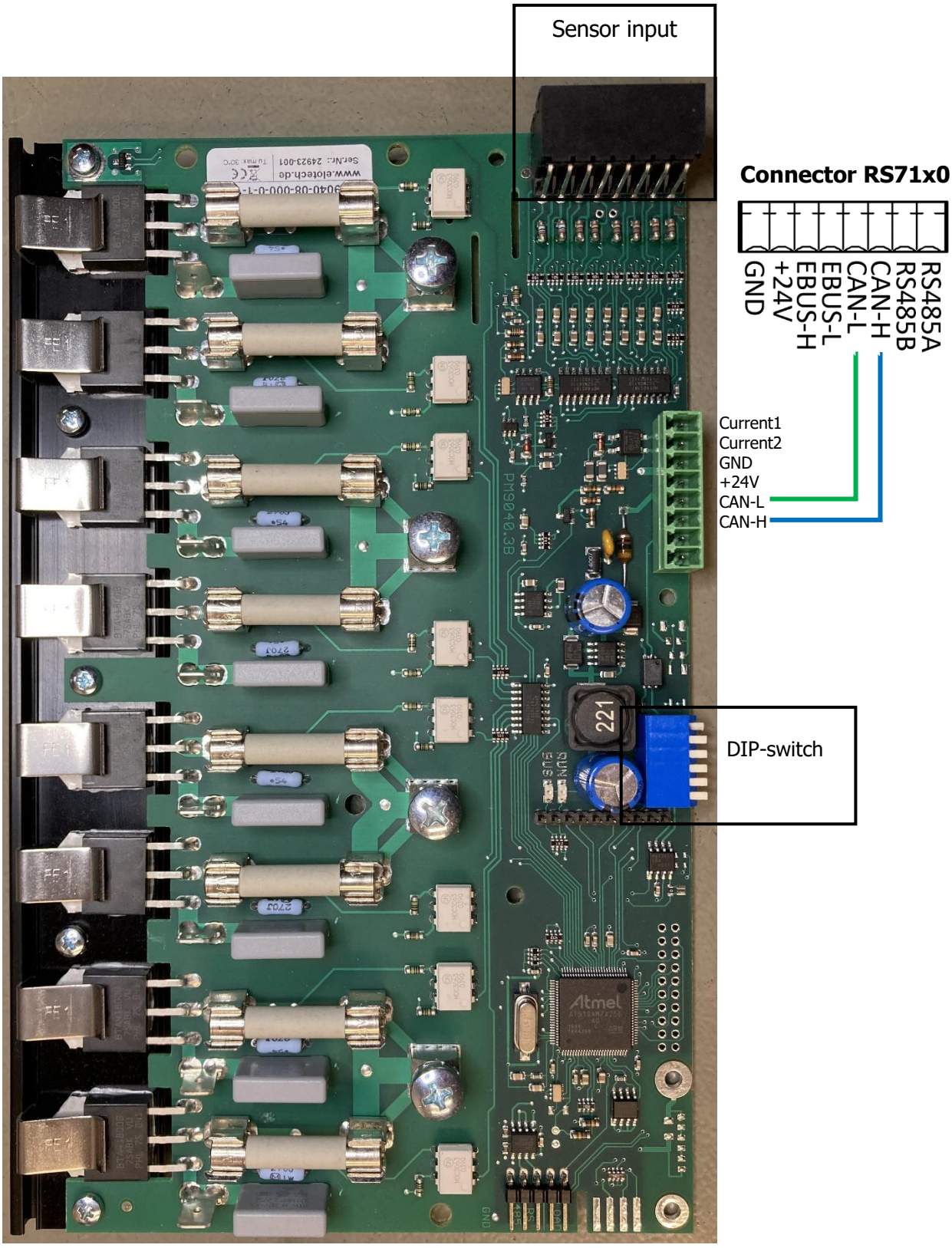


4.3 RS7120 Connection Diagram

Information about connection and specification of the M9040 are shown in a separate datasheet.

4.3.1 Anschluss CAN-Bus

The M9040 must be connected to the RS71x0 via CAN-Bus.



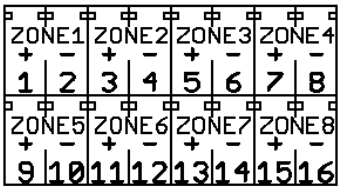
4.3.2 Address configuration M9040

The DIP-switch is used to configure the CAN-Bus address of the M9040
Address-range: 1 (DIP 1-5= OFF) to 32 (DIP 1-5 = ON)

When connecting a RS71x0 the following addresses must be used:
Zone 1-8: Address 1
Zone 9-16: Address 2
…etc.

DIP-switch 6 sets a 120 Ohm terminal resistor. A terminal resistor must be placed at both ends of the Bus

4.3.3 Connection Diagram: Sensor input



Sensor-plug for zones 1-8
The polarity is relevant when applying thermocouple input

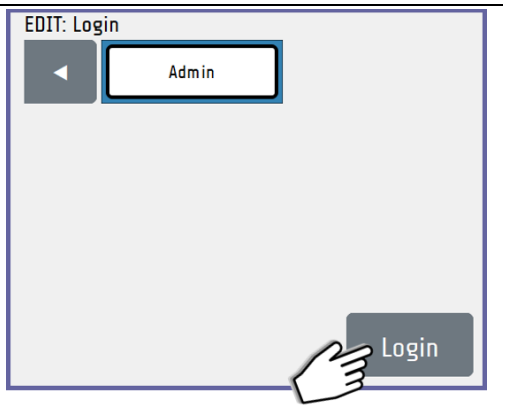
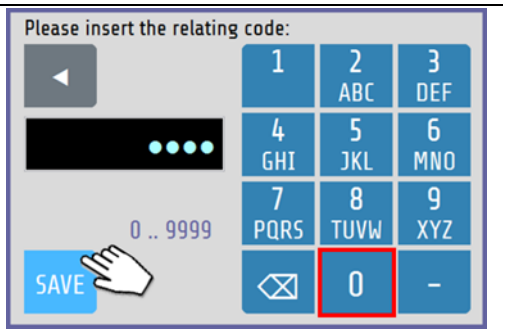
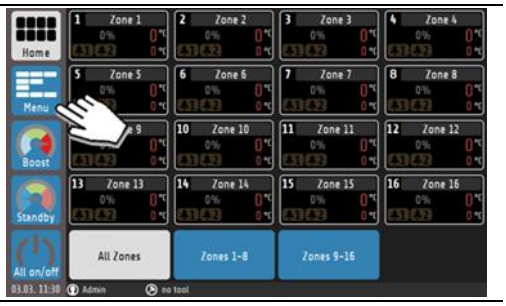
Using PT100-Sensors the polarity is irrelevant

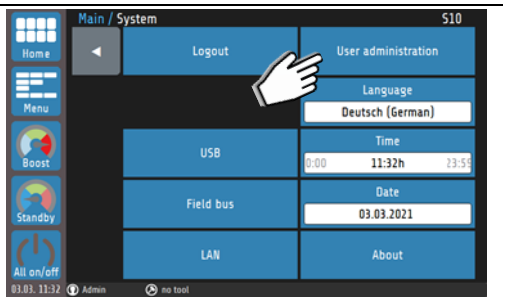
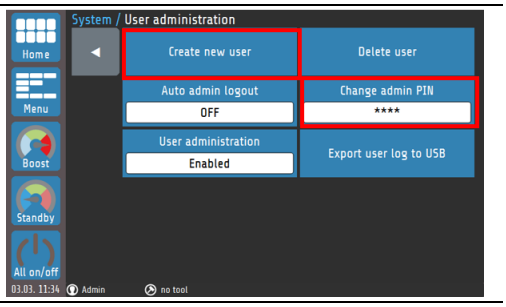
5 Getting Started (quick start)

In the delivery state, all parameters are factory-preset. Therefore, only a few steps have to be taken for initial commissioning.

5.1 Changing the Admin PIN and Creating Users

Before you can commence with the parameterisation of the individual zones, it is necessary for data protection that the Admin password be changed. The menu navigation from the first start of the device to the change of the Admin PIN is listed below. Only a few steps are required to access the **user management,** where you can create new users and change the Admin password.

No.	Description	Illustration
1.	Connecting and switching on the device.	
2.	After the device has powered up, the login window opens. Now tap **Login.**	
3.	An input box opens in which you have to enter the default Admin PIN. The PIN code is: **0 0 0 0** Confirm the entry via **SAVE**. This is followed by a notification from the system that you have been successfully logged in. Confirm this via **OK**.	
4.	After logging in, you can access the Home Screen (home). At the first time of use, all zones are switched off at startup. Via the Navigation Bar on the left, you can access the Main Menu.	
5.	In the menu overview, tap the System button.	

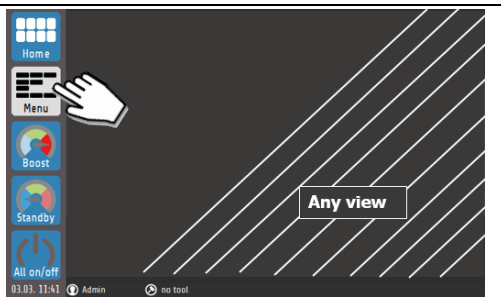
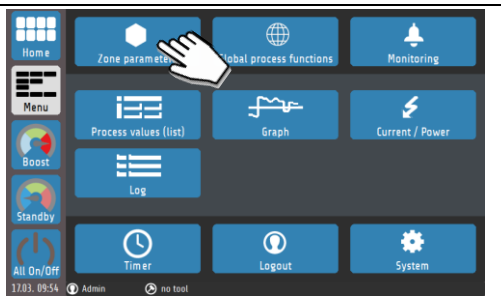
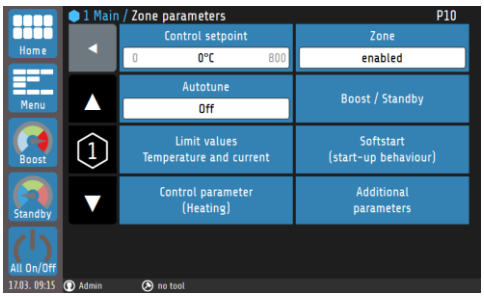
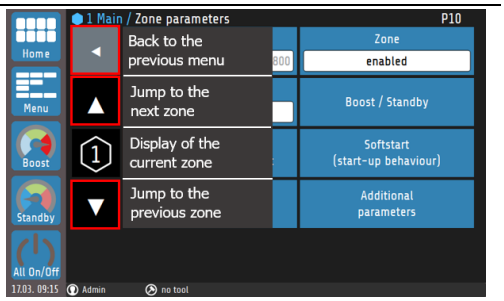
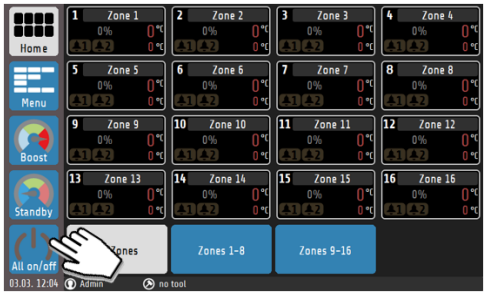
No.	Description	Illustration
6.	Now select the User Management in the system settings.	
7.	In **User Management,** you can create new users and change the Admin PIN or disable the User Management.	

NOTE!

For security reasons, the admin is automatically logged out 5 minutes after login by default.
This function can be adjusted or switched off in the user administration 13.1.

5.2 Starting the Control

Now the required parameters can be adapted to the application, if the default values are not already set appropriately. You can proceed as follows:

No.	Description	Illustration
1.	Tapping on the **Menu** button opens the menu overview.	
2.	Tapping the Zone Parameters button opens the parameterisation menu for the individual zones. Here, among other things, the control parameters (PID, ...) can be set individually.	
3.	All parameters that apply individually to the respective zone can be adjusted here. For further information, see chapter 7 Zone Parameters.	
4.	Tapping the black arrow keys takes you to the next or previous zone. The arrow at the top left will take you back to the previous menu.	
5.	If all zones to be controlled have been assigned the appropriate parameters, the control can be started. To do this, tap **All on/off** at the bottom left of the navigation **bar** and confirm the input (all zones will be switched on unless they are **off** in the zone parameters). Immediately after switching on the zones, the colour of both the button and the **status bar** at the bottom of the screen change.	

NOTE!

The colour of the status bar changes depending on the current control status. Please refer to the further information in chapter 6.2 Status Bar.

REFERENCE!

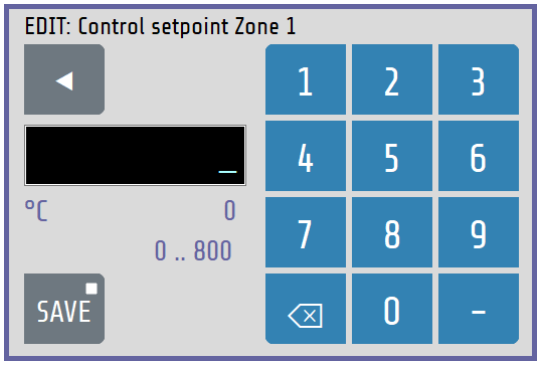
Parameters can also be assigned to multiple zones at the same time. The **Mulitsave** tool is used to parameterise many zones quickly and reliably.
For more information, see chapter 5.4 Multisave.

REFERENCE!

A complete parameter set can also be loaded as a tool recipe or backed up to a USB storage medium.
For more information, see chapter 9.2 Tool Menu.
.

5.3 Setting the Control Setpoint

By tapping the **Control setpoint** box in the **zone parameters** menus 7 an input box is opened in which the desired setpoint can be entered.



The parameter name of the zone (here: **Control Setpoint Zone 1**) is displayed in the header.

The numeric keyboard can be used to set the value of the parameter.

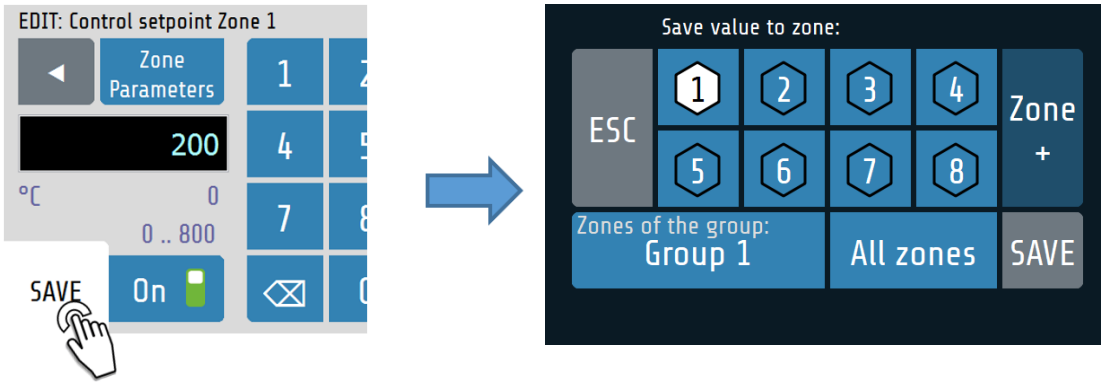
To accept the parameter value, it must be saved with the **SAVE** button.

Explanations for the individual boxes:

°C 150	Display of the currently set control setpoint.
0 .. 800	Setting range of the current parameter (**0... MRE**).
⌫	Deletes the last digit entered.
SAVE	Saves the value entered. Holding the Save button (>1 sec) opens the selection window to transfer the changed parameter value to multiple zones. 5.4 Multisave
◀	Closes the window without saving. If a value has already been entered, a pop-up message appears requesting confirmation.

5.4 Multisave

To save a value to multiple zones, the **Save** button can be pressed and held for 1 second when entering a parameter. After the time has elapsed, the button grows in size. The button can now be released and the zone selection screen appears:



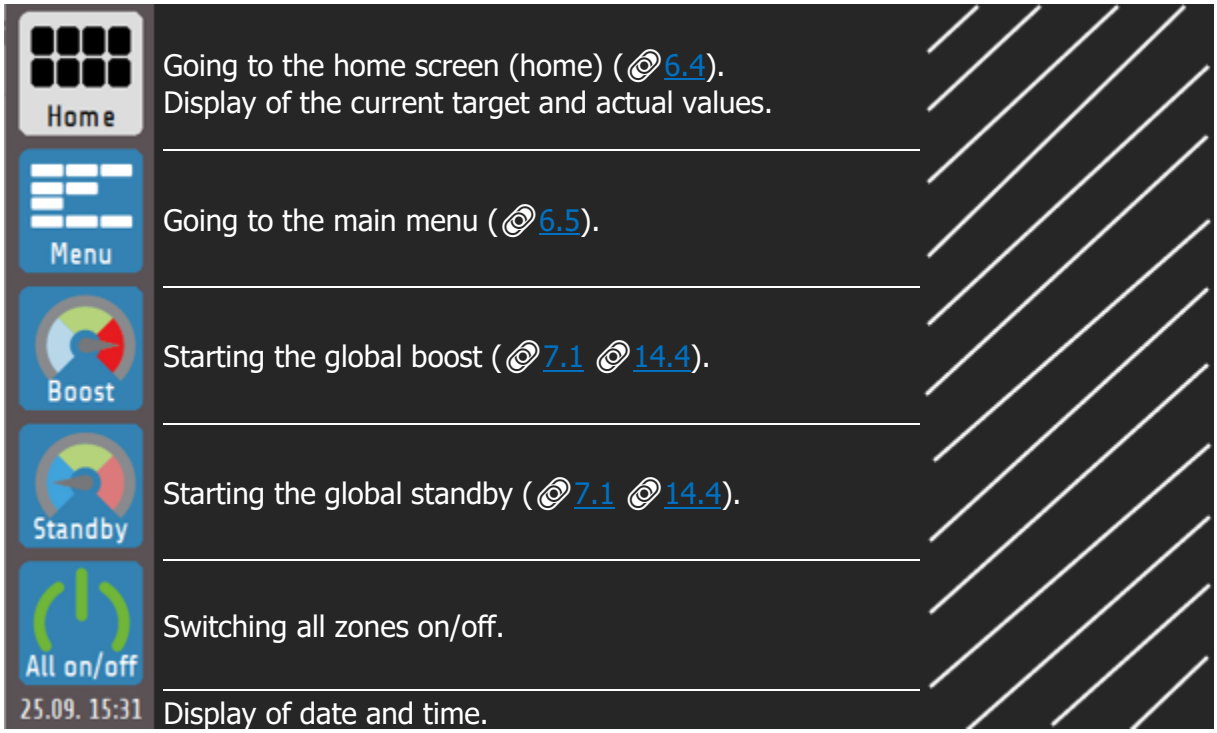
Explanations for the individual boxes:

	The currently selected zone is always marked in white and cannot be deselected. Zones can be added and removed by tapping another zone box. Zones with a black number on a white background accept the parameter value entered.
	You can switch between zones 1-8 or 9-16 respectively using the **Zone +** and **Zone -** buttons. The zones already selected remain activated.
	Selects all zones of the same group like the active zone. This button has no function if the current zone is not assigned to a group.
	The parameter value entered is assigned to all zones.
	Saves the parameter in the selected zones.
	Closes the window without saving.

6 Basic Display and Operation

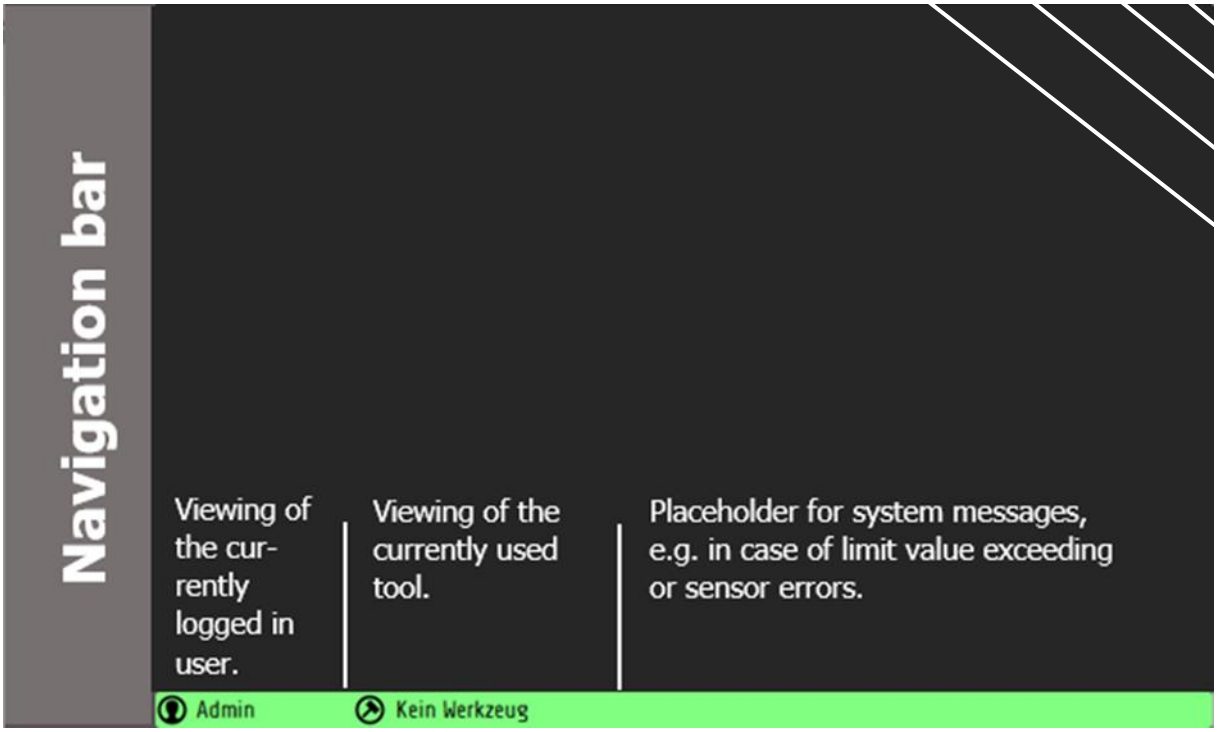
6.1 Navigation Bar

The **navigation bar** at the left edge of the screen takes you from each screen to the **home screen** and the **main menu** with one click. Functions can be executed directly via other quick buttons. The navigation bar is always visible.



6.2 Status Bar

The **status bar** provides a quick overview of the current state of the system. Among other things, the current user as well as information about the control in the form of a colour code are displayed here. The status bar is always located below the current menu at the height of the date display.



The colour of the status bar changes depending on the current actual values; the following applies:

Colour	Meaning	Illustration
Dark grey	All zones are switched off.	User Tool
Blue	At least one switched-on zone lies below the enable range.	User Tool
Green	All zones are within the range.	User Tool
Red	At least one zone lies above the enable range or there is a limit violation or other error.	User Tool

REFERENCE!

The **enable range** is ±5 K of the setpoint in the factory settings. You can adjust the range in the menus 8 Monitoring and 9 Global Process Functions.

REFERENCE!

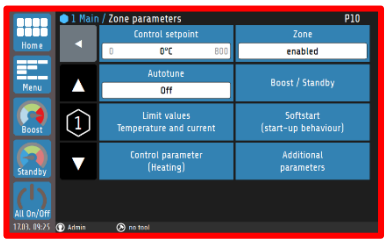
Adjustments to limit values and the signalling of other errors (including system errors) can be made using the 8 Monitoring.

6.3 Display of the Basic Menus

After switching on and initialising the device, the current measured values **(actual values**) and the **setpoints** of the control zones are displayed on a basic screen.

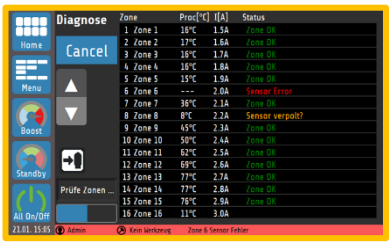
The operation of the various functions and setting the device is menu-guided. Starting from the **main menu,** the individual menu categories are shown below. The coloured frames around the menu images correspond to the frames placed in the main menu via the selection buttons:

Home (home screen)

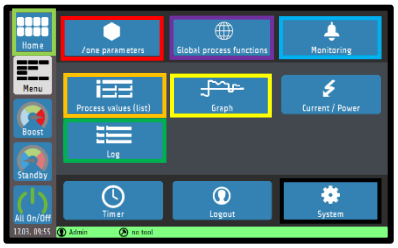


Zone parameters

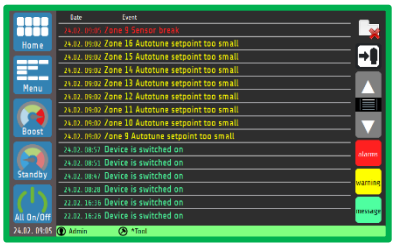
Graph



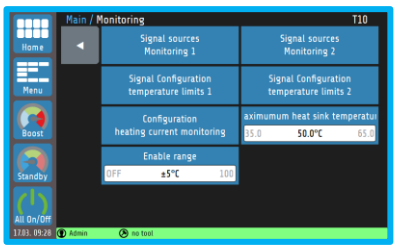
Process values



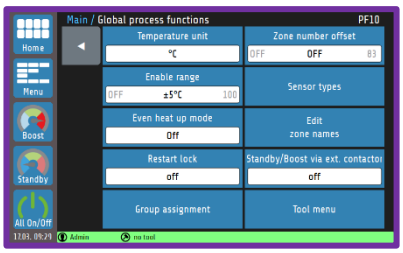
Main menu



Logbook



Monitoring (monitoring)



Global process functions

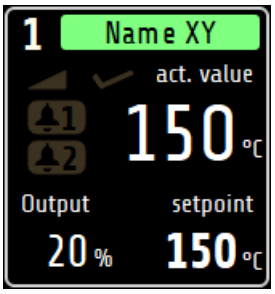
System

The individual parameters are largely displayed in plain text and can be set to different languages. The individual menus are explained in more detail below.

6.4 Home Screen (home)

The **home screen** shows the **zone tiles**, with the current value and state indicators belonging to the respective zone.

The home screen can be switched between the view of zones 1-8, 9-16 and a view of all available zones. The 8-zone view has the highest information content, while the **All Zones** screen only shows the target and actual values as well as the signal display. Explanation of the individual boxes:

	The **zone tile** contains: the zone number, the individually adjustable zone name, the actual value and setpoint, the output ratio of the control, two configurable signal displays as well as a function display for soft start, ramp and self-optimisation. The colour-coded box with the zone name also indicates the state of the zone. The convention is similar to the colour coding of the Status Bar.
	Ramp function active/inactive
	Soft start active/inactive
	Self-optimisation active/inactive
	Signal 1: Alarm (red)/ Release (green)/ Inactive (grey)
	Signal 2: Alarm (red)/ Release (green)/ Inactive (grey)

NOTE!

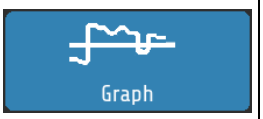
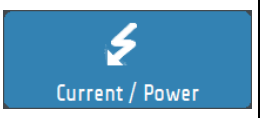
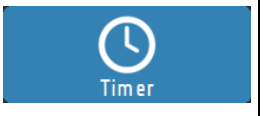
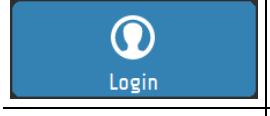
Tapping a zone tile takes you directly to the setpoint setting and to further parameterisations 7.

Holding a zone tile for >1 sec. shows the group affiliation of the zones. All zone tiles in a group have a white border 9.1.

6.5 Main Menu

The **main menu** serves as a central point for the individual function menus.

Explanation of the individual boxes:

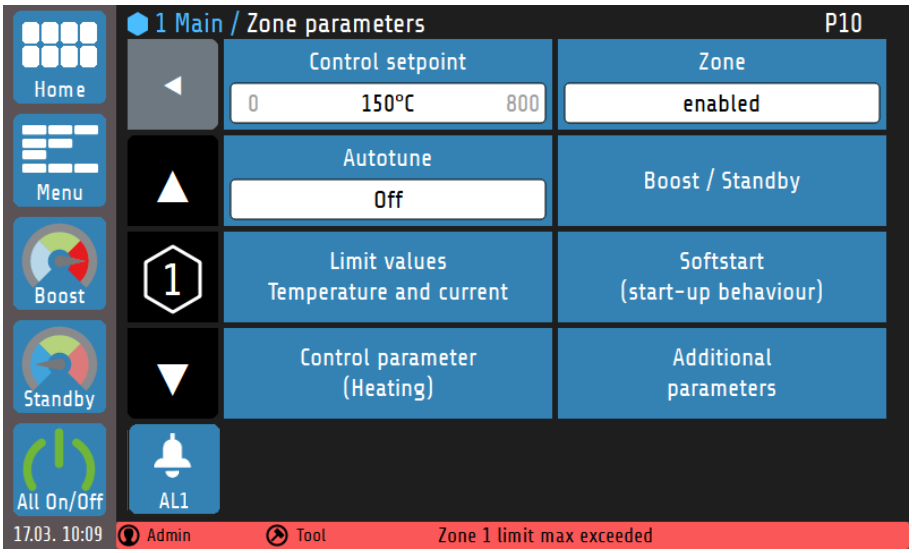
	Going to the **Zone Parameters** menu. Entry for one zone: **setpoint**, **control parameters**, **ramp**, **optimisation** and other control settings.
	Going to the **Global Process Functions** menu Configuration of parameters that affect all temperature control zones: including access to **the group assignment** or the **tool menu**.
	Going to the **Monitoring** menu Configuration of limit values for monitoring the process.
	Going to the **Process Values** display (list view). Overview display for all zones: **actual value**, **setpoint**, **output ratio,** current, **monitoring** status
	Going to the **Graph** menu. Display for max. 8 zones (switchable): Graphic display of the actual temperature value over time.
	Going to the **Current / Power** display Display of the maximum current, or maximum power and distribution to the phases as well as the current utilization of the device.
	Going to the **Log** menu Display of warning, alarm and status messages for the device
	Going to the **Timer** menu Configuration of times for automated switching on/off of the control. If the automatic timer is active, the clock icon is displayed in green.
	**Login / Logout** Button for logging users in or out
	Going to the **System** menu Configuration of interfaces and settings for language and time, user management.

NOTE!

In the PDF version of this guide, clicking on a box within the table will provide you with further information.

7 Zone Parameters

The zone parameters can be accessed via the menu or the zone tiles on the home screen. The following illustration shows the most important process parameters of a zone:



Explanations for the individual boxes:

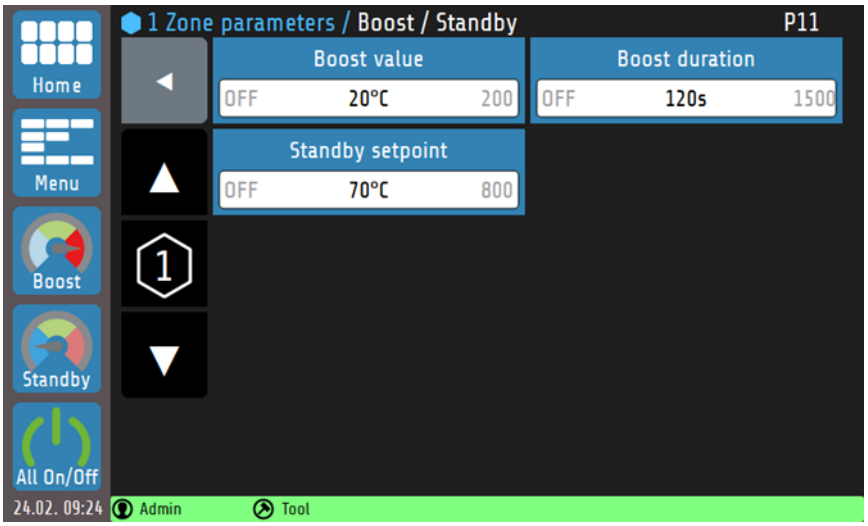
▲	Switch to the next zone.
1	Display of the current zone number.
▼	Switch to the previous zone.
Control setpoint 0 150°C 800	Control setpoint: The temperature value to which the selected zone is regulated. Tapping the box opens a numeric keyboard for changing the control setpoint.
	Setting range: **0⚙ to MRE °C** The setting range can be set via the parameter **setpoint min. / max.** 7.5.
Autotune Off	Self-optimisation configuration 14.3.
	Setting range: **off⚙, start, automatic at each restart**
Zone enabled	Switch the zone on/off. If this parameter is set to **off,** the zone does not participate in the global **All On/Off** function.
	Setting range: **on⚙, off**
Boost / Standby	Configuration of the boost and standby function 7.1.
Limit values Temperature and current	Configuration of the limit values for temperature and current 7.2.
Softstart (start-up behaviour)	Configuration of the soft start function 7.3.

Control parameter (Heating)	Configuration of control parameters including P, I, D and output ratio limitation 7.4.
Additional parameters	The menu provides additional parameters for controlling a zone 7.5.
AL1	Acknowledge button for the limit value monitoring. This can be used to acknowledge the **self-locking** of the monitoring of limit values 1 and 2 8.3. The button is invisible if: - no limit value violation has been detected and saved. - a saved limit value violation that is no longer present has been acknowledged.

⚙: Factory setting

7.1 Boost / Standby

The following figure shows the zone-dependent settings menu for the **Boost** and **Standby** function:



The **Boost** and **Standby** function can be started or stopped from the **navigation bar**. The zones whose **boost** and/or **standby** parameters are set to **OFF** are not affected when enabling the global boost/standby. For more information on the **Standby** and **Boost** function, see Chapter 14.4.

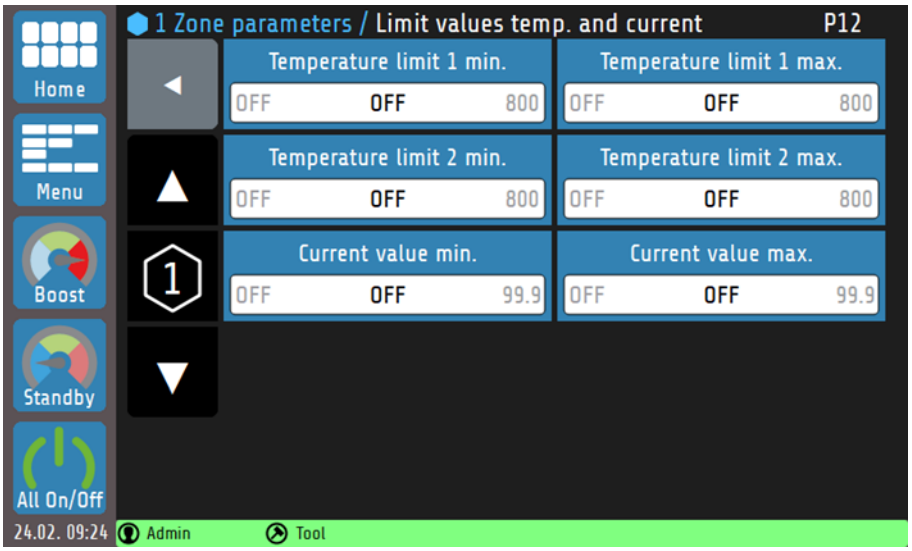
Explanations for the individual boxes:

Boost value OFF 20°C 200	Configuration of the (relative) **boost value**. The boost value is added to the setpoint and forms the boost temperature.
	Setting range: **OFF, 1 to 20⚙ to 200 K**
Boost duration OFF 120s 1500	Configuration of **the boost duration** (holding time of the boost temperature).
	Setting range: **OFF, 1 to 120⚙ to 1500 s**
Standby setpoint OFF 70°C 800	Configuration of **the standby setpoint**.
	Setting range: **OFF, 1 to 70⚙ to MRE °C**

⚙: Factory setting

7.2 Limit Values Temperature and Current

The limit values are used for **monitoring** the process values. If a limit value is undershot or overshot, an alarm message is output by the controller. Before using limit values, the limit value configuration must be set 8.



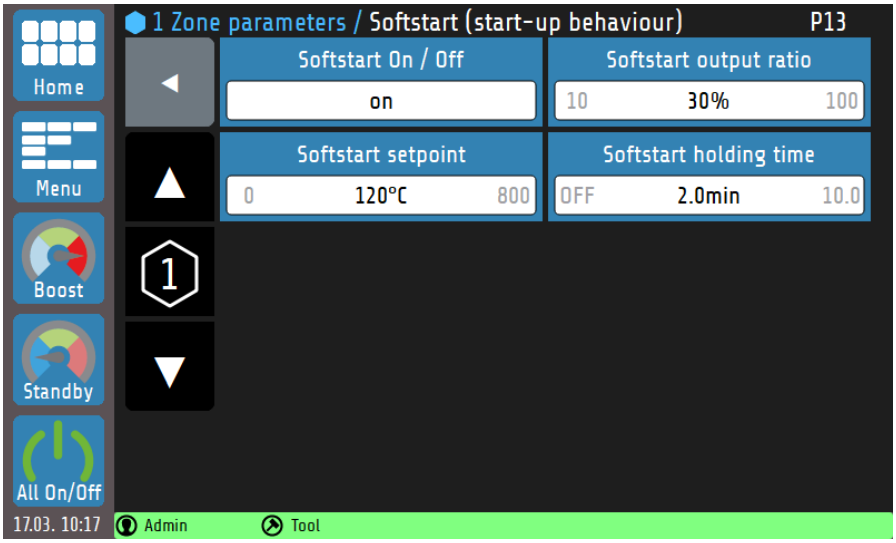
Parameter list: Limit values			
Parameter		**Selection/setting**	**Description**
Temperature limit value 1 min.	absolute	**OFF⚙, 1 to MRE °C**	Absolute limit value that must not be undershot.
	relative	**OFF⚙, -200 to 0 °C**	Relative limit value (relative to the setpoint) that must not be undershot.
Temperature limit value 1 max.	absolute	**OFF⚙, 1 to MRE °C**	Absolute limit value that must not be overshot.
	relative	**OFF⚙, 0 to 200 °C**	Relative limit value (relative to the setpoint) that must not be overshot.
T. limit value 2 min.	absolute	**OFF⚙, 1 to MRE °C**	Like limit value 1 min.
	relative	**OFF⚙, -200 to 0 °C**	
T. limit 2 max.	absolute	**OFF⚙, 1 to MRE °C**	Like limit value 1 max.
	relative	**OFF⚙, 0 to 200 °C**	
Min. current value		**OFF⚙, 0.1 to 99.9 A**	Minimum current intensity
Max. current value		**OFF⚙, 0.1 to 99.9 A**	Maximum current intensity
⚙: Factory setting			

REFERENCE!

For more information on **limit value monitoring,** see chapter **Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden.**.

7.3 Soft Start (start-up circuit)

For a detailed description of the **soft start** function 14.1.



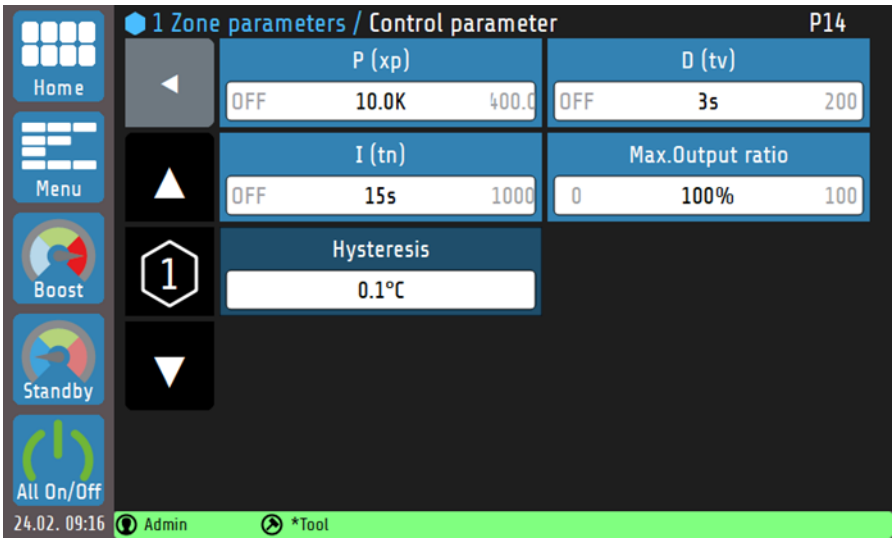
Explanations for the individual boxes:

Softstart On / Off on	The soft start function for a zone can be switched on and off here.
	Setting range: **on**⚙, **off**
Softstart setpoint 0 120°C 800	Configuration of the **soft start setpoint**.
	Setting range: **0 to 120**⚙ **to MRE °C**
Softstart output ratio 10 30% 100	Configuration of the **soft start output ratio**.
	Setting range: **10 to 30**⚙ **to 100 %**
Softstart holding time OFF 2.0min 10.0	Configuration of **soft start time** (holding time). After the holding time has expired, the soft start is finished.
	Setting range: **OFF**, **0.1 to 2.0**⚙ **to 10.0 min**

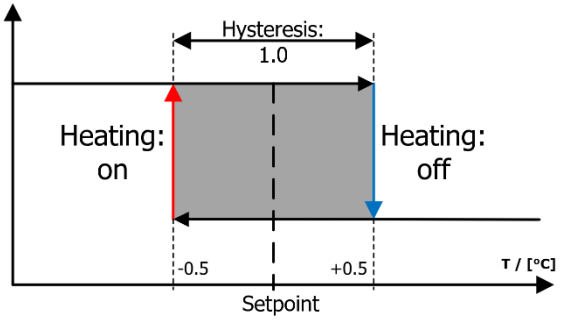
⚙: Factory setting

7.4 Control Parameters

The PID shares, the switching difference and the output ratio limitation can be set in the **Control parameters** menu.



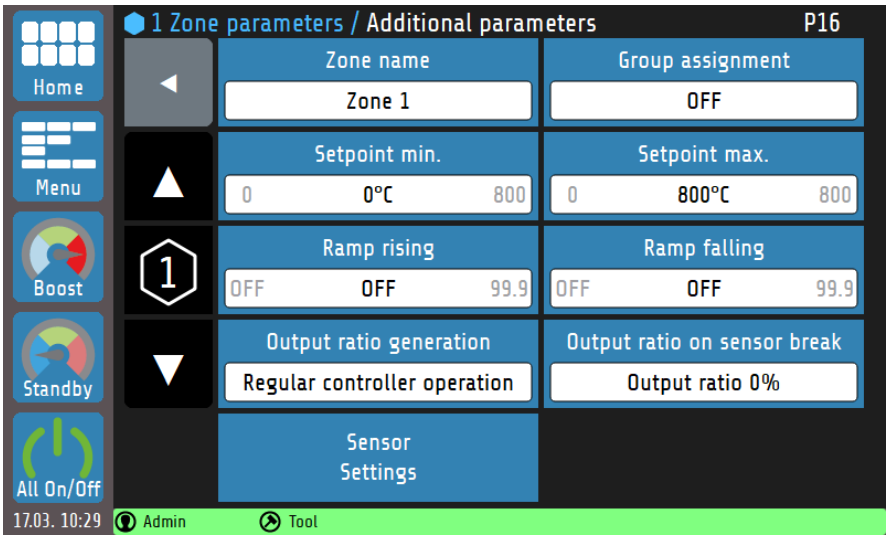
Explanations for the individual boxes:

P (xp) OFF 10.0K 400.0	Configuration of the proportional element [K]. If the parameter **P (xp) is set to OFF**, the PID control is deactivated in its entirety and a two-point control by means of switching difference is set.
	Setting range: **OFF, 0.1 to 10.0⚙ to 400.0 K**
D (tv) OFF 30s 200	Configuration of the differential element / the rate time [s].
	Setting range: **OFF, 1 to 30⚙ to 200 s**
I (tn) OFF 150s 1000	Configuration of the integral element / of the reset time [s].
	Setting range: **OFF, 1 to 150⚙ to 1000 s**
Max.Output ratio 0 100% 100	Output ratio limitation is only needed in the event of heavy over-dimensioned power supply to the controlled system. The output ratio is not usually limited (≙ **100%**). The output ratio limitation does not work during the self-optimisation phase.
	Setting range: **0 to 100⚙ %**
Hysteresis OFF 1.0°C 80.0	Only adjustable if **P(xp) = OFF**: Activation of two-point control mode. This reacts when the actual value exceeds the setpoint on both sides by the mean value of the switching difference. 
	Setting range: **OFF, 0.1⚙ to 80.0 °C**

⚙: Factory setting

7.5 Zone Parameters - Additional Parameters

In the **additional parameters** menu, there are additional setting options for controlling the selected zone:



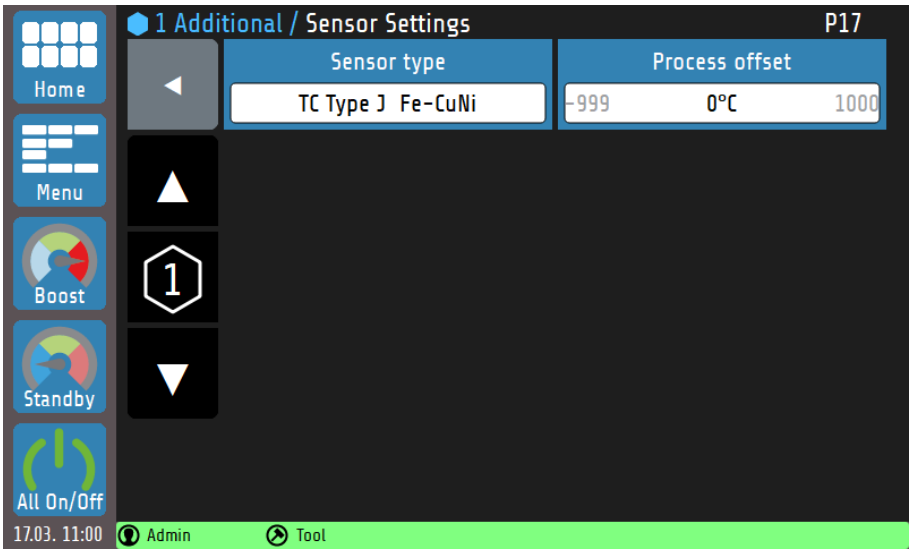
Explanations for the individual boxes:

Zone name Zone 1	Entry of any desired name for the zone. An on-screen keyboard opens to enter the name. The entry is confirmed with Enter.
Group assignment Group 1	Selection box for the group assignment 9.1.
Output ratio generation Regular controller operation	Selection box for the output ratio generation 14.5.
	Setting range: **Regular controller operation**⚙, **from manual input**, **Adoption from zone**
Output ratio on sensor break Output ratio 0%	Configuration for the output ration when a sensor fails.
	Setting range: **Output ration 0%**⚙, **Hold last ration**
Ramp rising OFF 25.0K/min 99.9	Configuration of the desired heating rate.
	Setting range: **OFF**⚙, **0.1 to 99.9 K/min**
Ramp falling OFF 25.0K/min 99.9	Entry of the desired cooling rate.
	Setting range: **OFF**⚙, **0.1 to 99.9 K/min**
Setpoint min. 0 0°C 800	Selection box for limiting the minimum setpoint entry.
	Setting range: **0**⚙ **to MRE °C**
Setpoint max. 0 800°C 800	Selection box for limiting the maximum setpoint entry.
	Setting range: **0 to MRE**⚙ **°C**
Sensor Settings	Each zone can be assigned its own sensor type and an offset value 7.5.1.

⚙: Factory setting

7.5.1 Sensor Settings

Each zone can be assigned its own sensor type and an offset value. A selection of various thermocouples (TC) is possible.



Explanations for the individual boxes:

Sensor type TC Type J Fe-CuNi	Selection of the sensor type (For measuring ranges 🔗).
	Setting range: **TC Fe-CuNi** (Type J⚙, Type L), **TC Ni-CrNi** (Type K)
Process offset -999 0°C 1000	This parameter is used to correct the input signal.
	Setting range: **-999 to 0⚙ to 1000 °C**

⚙: Factory setting

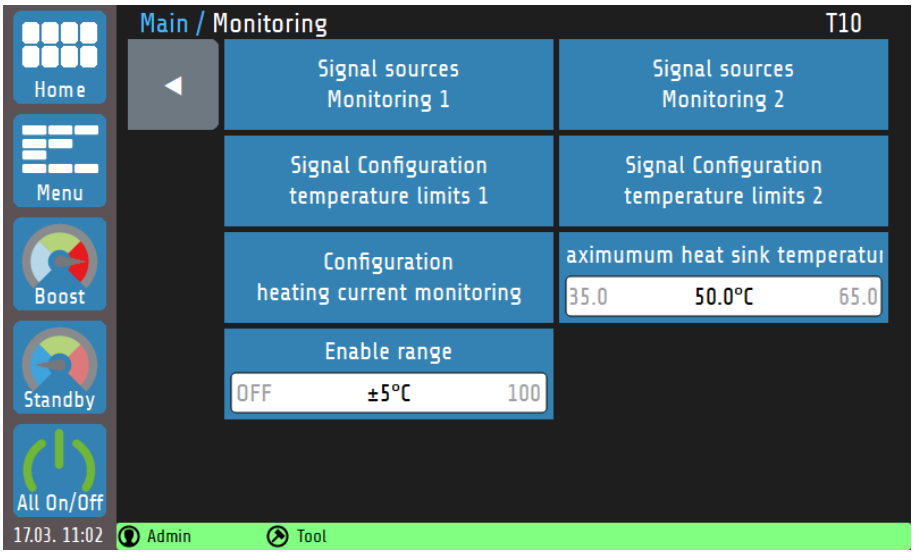
CAUTION!

Sensor types can only be changed for a block of 8 (zones 1-8, 9-16, ...). When changing the sensor type via the zone parameterisation, it must be noted that the change is transferred to the entire block of 8.
The **zones must therefore have the same sensor type** in order to avoid measurement and control deviations!

8 Monitoring

The **Monitoring** main menu summarises the setting options for monitoring the control system:

- Definition of the variables or events to be monitored (current intensity, temperature, device restart, etc.).
- Definition of the deviations of the actual values from limit values (relative or absolute in relation to the setpoint).
- Definition of the type of signalling of limit value violations or the reaching of desired actual value ranges (choice of output relay, signalling colour, signal delay, logical linking of several events, signal inversion, etc.).
- Definition of numerical values (zone-individual Limit Values can also be set in the menu Zone Parameters).



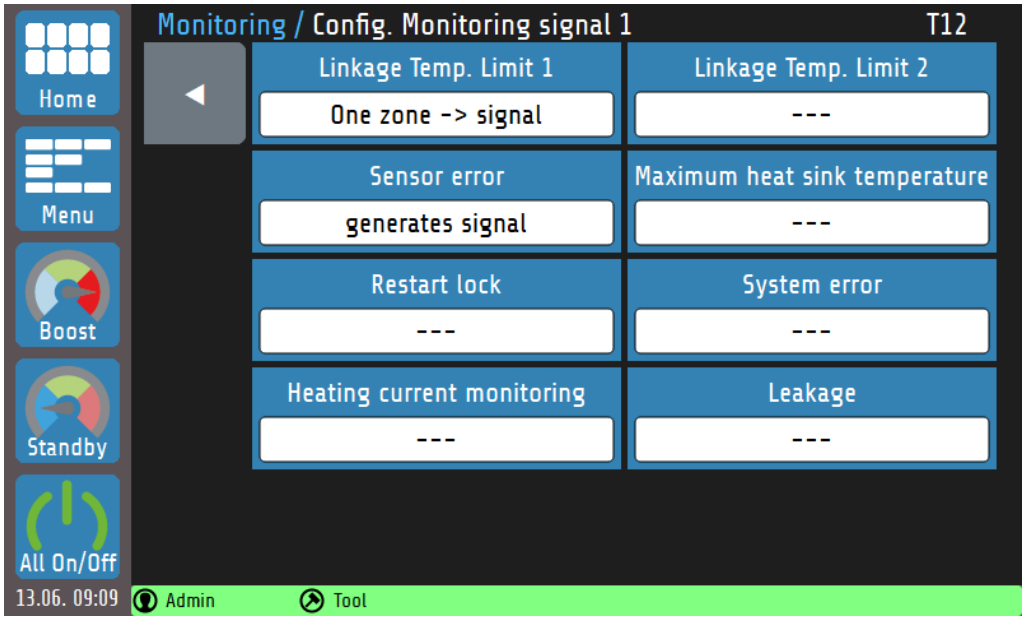
NOTE!

The output relays for monitoring signals 1 and 2 are not available in the standard equipment level but can be retrofitted. Regardless of this, the output relay linked with the **release window** is available in the standard equipment level. This parameter defines the cross-zone condition for starting production operation.

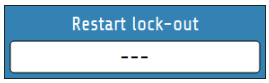
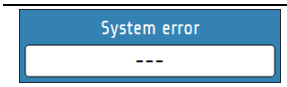
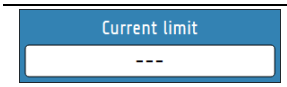
8.1 Selection of Signal Sources - Monitoring 1

The controller has two independent monitoring channels. The possible parameters and settings of the messages for Monitoring 1 are listed below. These parameters also exist analogously for Monitoring channel 2. The parameter selection can be accessed via the tile **Selection of signal sources Monitoring 1** or **Selection of signal sources Monitoring 2** in the Monitoring menu. Monitoring can be used to signal various events of the system and output them to the relays. All selected signal sources are linked via a logical OR.

If the monitoring signal is active, this is displayed by bell symbols . The colour of the depiction can be set to green, orange or red in the Monitoring menu under **Signal configuration temp. limit 1/2**. Other events have preset colours. If multiple events occur at the same time, the priority is: red, orange, green.



Depiction:	Selection:	Description:
Linkage Temp. Limit 1 One zone -> signal	---(2)	No signal if the limit value 1 is undershot or overshot.
	One zone ->singnal(1)	The monitoring signal is displayed as soon as the limit value 1 is undershot or overshot in **one** zone.
	All zones =>Signal	The monitoring signal in only displayed when the limit value 1 is undershot or overshot for all switched-on zones.
Linkage Temp. Limit 2 ---	---(1)	No signal if the limit value 2 is undershot or overshot.
	One zone ->Signal(2)	The monitoring signal is displayed as soon as the limit value 2 is undershot or overshot in **one** zone.
	All zones =>Signal	The monitoring signal in only displayed when the limit value 2 is undershot or overshot for all switched-on zones.
Sensor error generate signal	---(2)	No signal in case of sensor error.
	generates signal(1)	The monitoring signal is displayed when a sensor error has occurred (colour: red).
	---(1)(2)	No switch-on lock set.

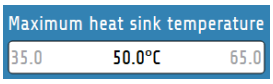
	**generates signal**	The monitoring signal is displayed when a restart event has triggered (colour: orange).
	---(1)(2)	No signal in case of system errors.
	generates signal	The monitoring signal is displayed when there is a system error (colour: red).
	**---**(1)(2)	No signalling when the limit value is overshot.
	generates signal	Monitoring signal is displayed when the heat sink temperature has overshot its limit value.
	**---**(1)	No signal in case of overshooting or undershooting the current limit value.
	generates signal(2)	The monitoring signal is displayed in case of overshooting or undershooting the current limit value (colour: red).
	---(1)(2)	Notificaion in the status bar about the zone where a leakage was detected (colour: red). **Note:** The alarm message **Leakage detected** can only be acknowledged by restarting the unit.
	generates signal	

(1): Factory setting for **signal sources monitoring 1**

(2): Factory setting for **signal sources monitoring 2**

8.2 Maximum Heat Sink Temperature

If the current heat sink temperature approaches the limit value, the output ratio of all affected zones is limited first. The output ratio limitation starts 5 K before the set limit value and is displayed with a yellow warning message in the **status bar**. As the heat sink temperature continues to rise, the output ratios are limited more severely. The maximum output ratio limitation of 50% is reached when the heat sink temperature has reached the limit value. In addition, a red alarm message appears. If the heat sink temperature reaches a value that is 5 K above the limit value, the main contactor of the device is switched off.

	If the maximum heat sink temperature is exceeded, the monitoring signal is triggered.
	Setting range: **35.0 to 50.0⚙ to 65.0 °C**

⚙: Factory setting

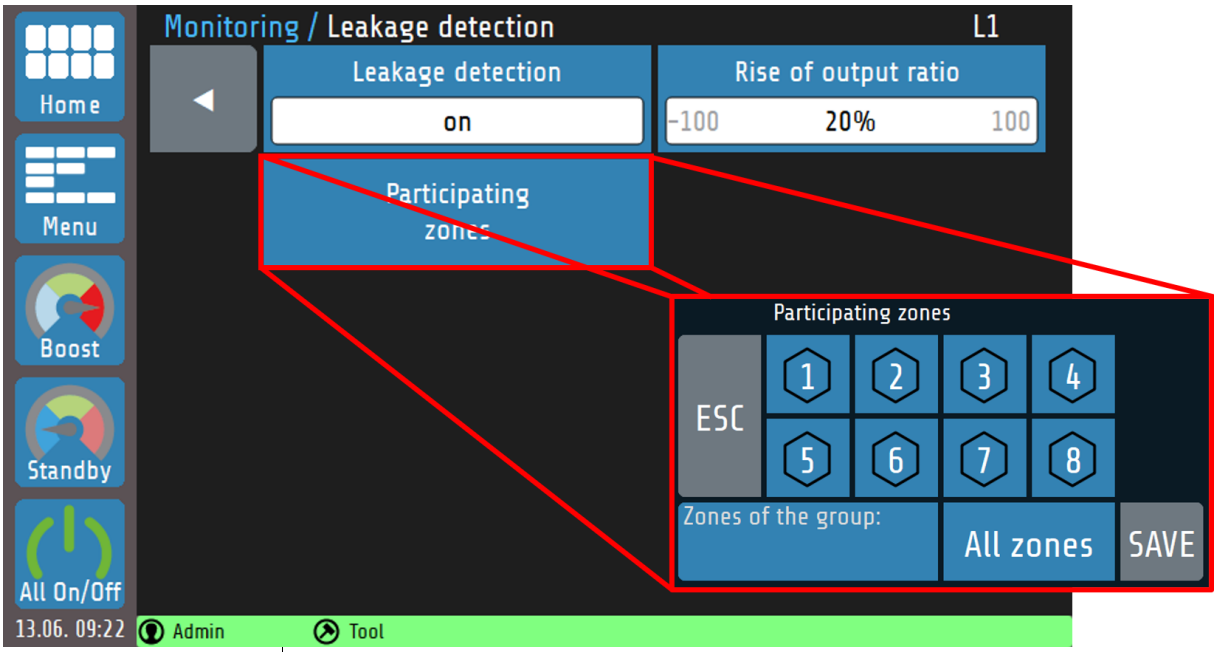
NOTE!

- The output ratio limitation is calculated from the limit value and the current heat sink temperature.
- The warning messages have a switch-on delay of 10 s.

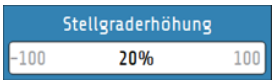
8.3 Leakage Detection

The **RS7100** can detect leaks in hot runner systems by monitoring the electrical power of the injectors. An increase in the average power consumption usually suggests a leakage as the cause. In this case, an alarm signal can be issued.

The alarm message **Leakage detected** can only be acknowledged by restarting the unit.



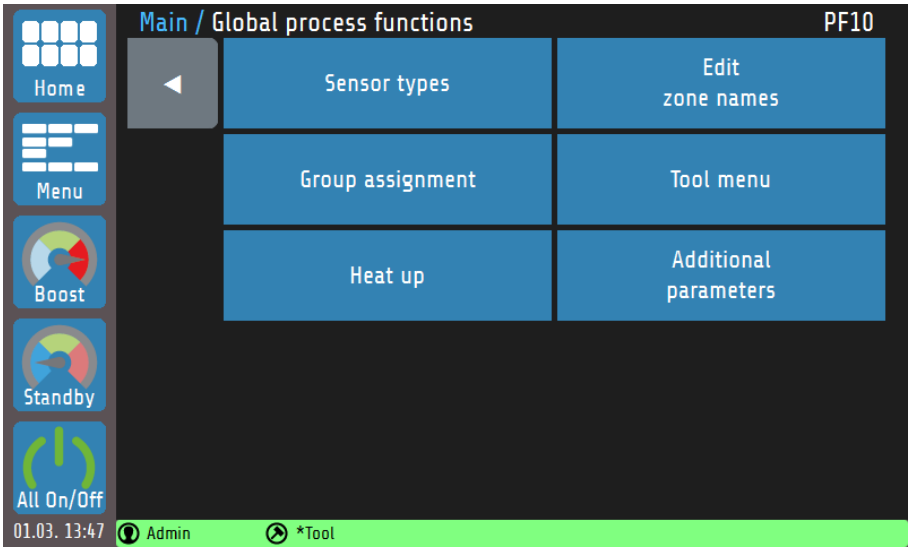
	Switching the leakage detection on and off.
	Setting range: **off⚙, on**
	The **Leakage detection** must be activated for each desired zone via the **Participating zones** menu.

	Definition of the **relative rise of output ratio**, related to the average power consumption, at which an alarm message appears.
	Setting range: **-100 to 20⚙ to 100 %**

⚙: Factory settings

9 Global Process Functions

The **Global Process Functions** menu contains the settings that affect the entire device or all control zones respectively:



Explanations for the individual boxes:

Sensor types	Possibility to set the individual sensor types for all zones.
	Setting range: **TC Fe-CuNi** (Type J⚙, Type L), **TC Ni-CrNi** (Type K)
Edit zone names	Here, an individual name can be assigned to each zone. The zone name can also be changed in the zone parameters 🔗7.
Group assignment	Any zones can be combined into a group here 🔗9.1.
Tool menu	Go to the **Tool menu** 🔗9.2.
Heat up	Selection and configuration of the heating modes when starting the system 🔗14.6.
	Setting range: **Off**⚙, **Even heat up mode**, **Energy optimised heat up**
Additional parameters	For further settings options 🔗9.3.

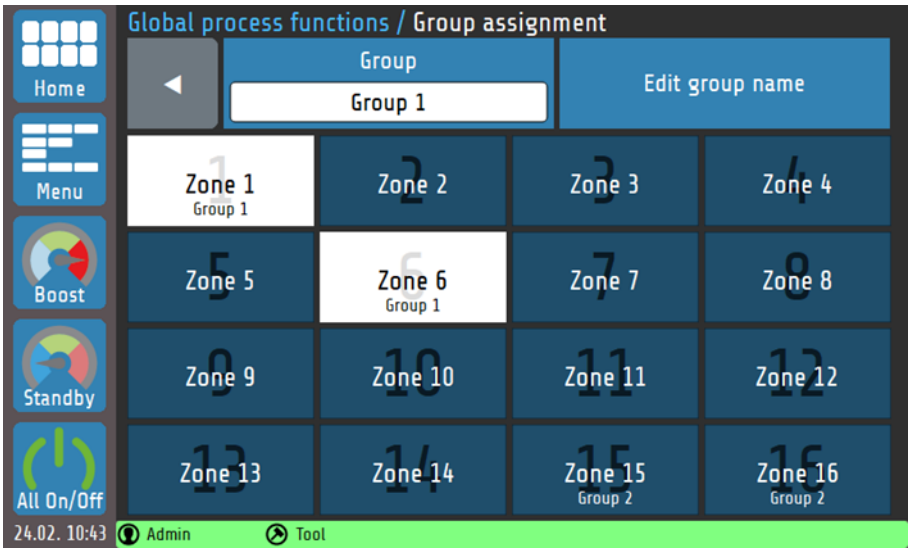
⚙: Factory settings

CAUTION!

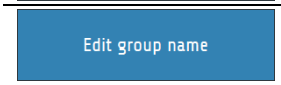
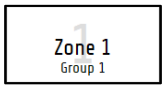
Sensor types can only be changed for a block of 8 (zones 1-8, 9-16, ...). When changing the sensor type via the zone parameterisation, it must be noted that the change is transferred to the entire block of 8.
The **zones must therefore have the same sensor type** in order to avoid measurement and control deviations!

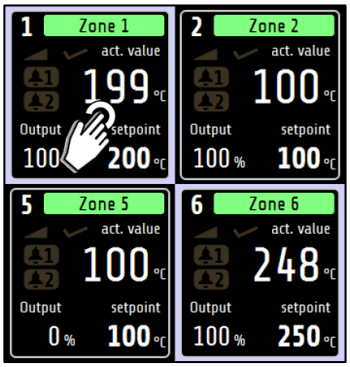
9.1 Group Assignment

Groups of zones make it easier to parameterise and operate the device.



Explanation of the individual boxes:

	Selection of one of eight groups to which the selected zones are to be assigned.
	Each group can be assigned an individual group name.
	The selection area of an unselected zone is displayed in dark blue.
	The selection area of a zone that is already assigned to a group also contains the name of the group. If these zones are reselected, the affiliation changes to the current group.
	A selected zone has a white background and includes the group name.



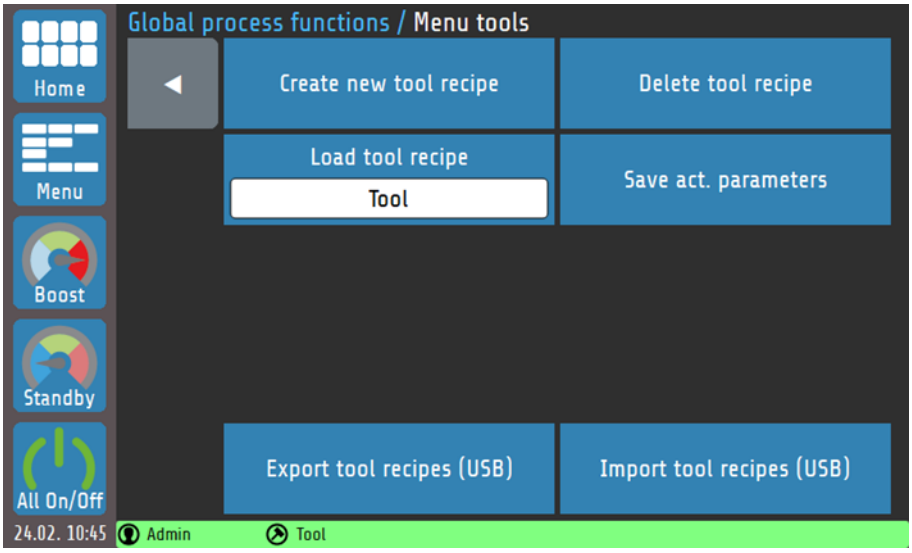
The group affiliation of a zone can also be displayed on the home screen. To do this, all you have to do is hold any zone tile for >1 sec. Subsequently, all zone tiles in a group are bordered white.

REFERENCE!

There are many advantages to **group assignment**. Among other things, for the 🔗5.4 Multisave tool or the **parallel circuit** 🔗14.5.1.

9.2 Tool Menu

Tool recipes contain all control-relevant settings and can be created, loaded, saved and deleted as desired.



Explanation of the individual boxes:

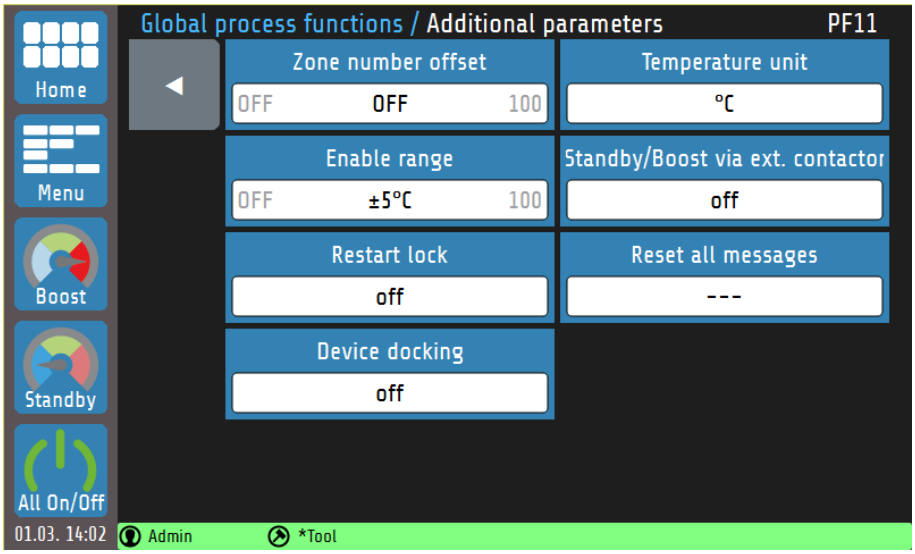
Create new tool recipe	Opens a keyboard with which the name of the new tool recipe can be entered.
Load tool recipe Tool	Opens a selection list with all recipes. The selected recipe is loaded and the parameters are assigned to the zones.
Save act. parameters	The current control-relevant settings can be saved in a previously created tool recipe.
Export tool recipes (USB)	All saved tool recipes are stored as a .tool file on the storage media. The name of the storage file contains the first six letters of the recipe and a timestamp. Example of a file name: **abcdefYYMMDDhhmm.tool**
Import tool recipes (USB)	Tool recipes can also be loaded from a storage medium onto the RS7100. Please note: The tool recipes of the same name will not be overwritten!

NOTE!

- A tool recipe can only be managed by a user with administrator or machine setter rights.
- A modified tool recipe (e.g. modified by changing a setpoint) is indicated by an asterisk ***** in the status bar.
- Up to 25 tool recipes can be stored on one device at the same time.
- Existing recipes are **not** overwritten during USB import.

9.3 Additional Parameters

In this menu further settings can be done, such as the **temperature unit**, **release range setting** or the **device docking**.



Explanation of the individual boxes:

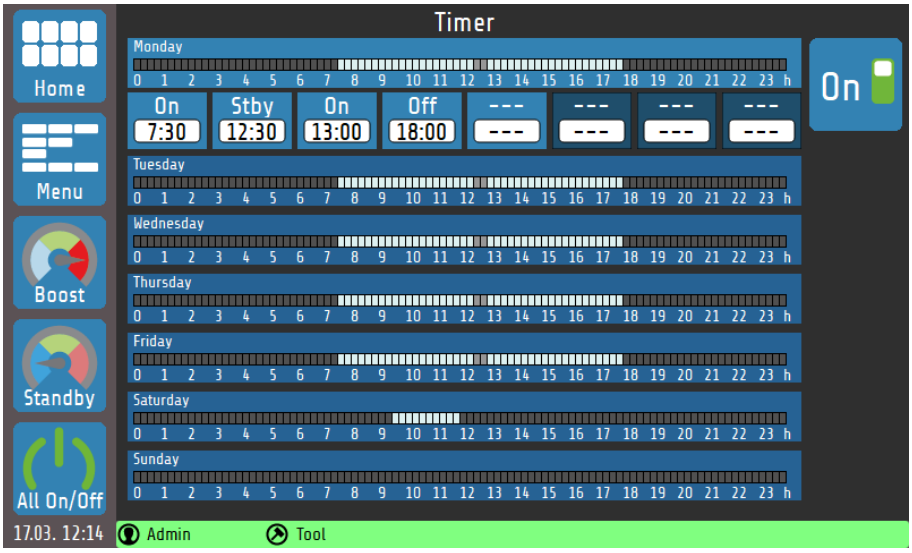
Zone number offset OFF OFF 83	Configuration of the **zone number offset**; the displayed numbering of all zones is incremented by the offset value. This allows the zone numbers to be assigned sequentially in case of several independent devices.
	Setting range for 8-zone device: **OFF**⚙, **1 to 91** Setting range for 16-zone device: **OFF**⚙, **1 to 83**
Temperature unit °C	Configuration of the temperature unit.
	Setting range: **°C**⚙, **°F**
Enable range OFF ±5°C 100	As soon as the actual values of all control zones are within the set release range (here: $_{Min/max}$ actual value = setpoint ± 5 °C), the release signal is output via a potential-free relay contact.
	Setting range (±): **OFF**, **1 to 5**⚙ **to 100 °C**
Standby/Boost via ext. contactor off	Temperature changes (**Standby**, **Boost**) can be controlled globally via an external, potential-free contact 🔗14.4.1.
	Setting range: **off**⚙, **Standby**, **Boost**
Restart lock-out off	If the restart lock is active, the zones will not be switched on again after the device is restarted. A query appears, asking whether the previously active zones should be reactivated immediately.
	Setting range: **on, off**⚙
Reset all messages ---	Restores "not shown messages" 🔗**Fehler! Verweisquelle konnte nicht gefunden werden.**.
	Setting range: **---**⚙, **Restore**
Device docking off	Extends the master unit by another RS7100. The necessary settings must be observed! 🔗**Fehler! Verweisquelle konnte nicht gefunden werden.**

	Setting range: **off**⚙, **Slave**, **Master**

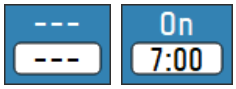
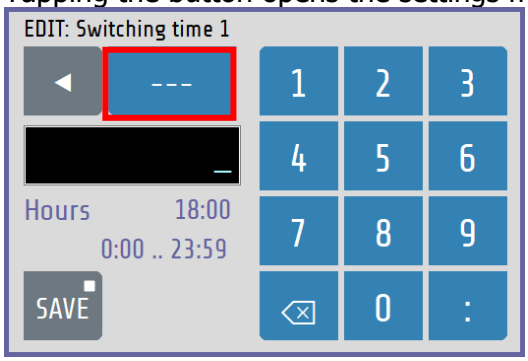
⚙: Factory settings

10 Timer

The **timer** enables the automated activation and deactivation of the global functions **All on/off** and **Standby** 6.1 Navigation bar.

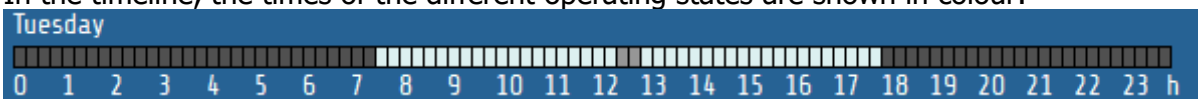


If the timeline of a day of the week is tapped, the buttons of the switching points for that day appear. Explanations for the individual boxes:

	Switching the automatic timer on/off
	This button represents a possible switching point. The top line (white on blue) shows the switching action, and the box below it (black on white) shows the time at which the action is performed. Tapping the button opens the settings menu:  Explanations for the settings menu: By repeatedly tapping the button marked in red here, three possible switching actions are selected: **---** (no time function), **On** (switch on), **Stby** (standby) and **Off** (switch off).

The desired time for the switching point can be entered using the numeric keys. The two settings (switching action and switching time) are saved by tapping **Save**.
The time presets are automatically arranged in ascending order from left to right when saved.
If the time entered is identical to time already set, the old entry is deleted.
If a switching time is set to "---", this switching time is deactivated and moved to the right.

In the timeline, the times of the different operating states are shown in colour:

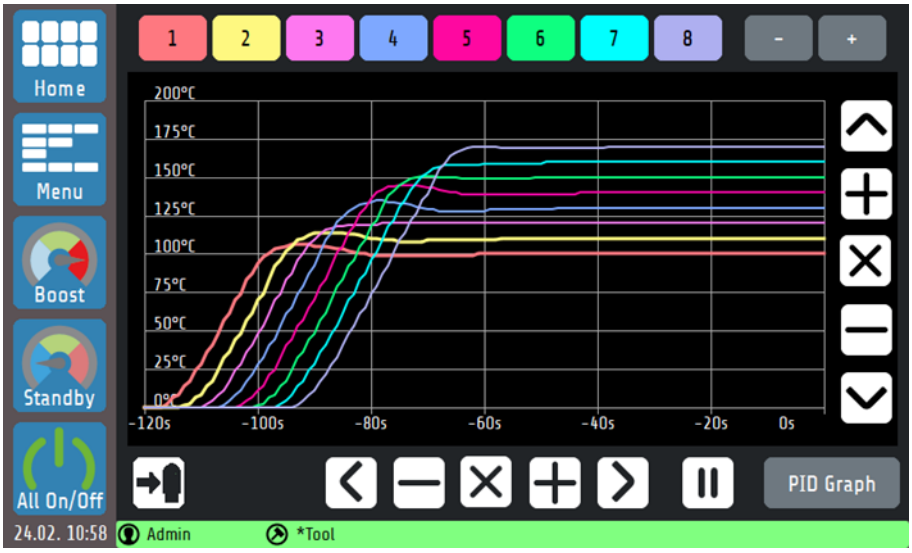


	Zones switched on
	Zones switched off
	Standby active

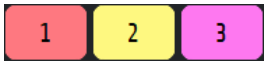
NOTE!
The selected setting can be saved to any days of the week at the same time by holding the **Save** button for > 1 second. 5.4 Multisave

11 Graph

A graphic display of the actual temperature values of up to eight zones is possible simultaneously by selecting the **Graph** function in the main menu:

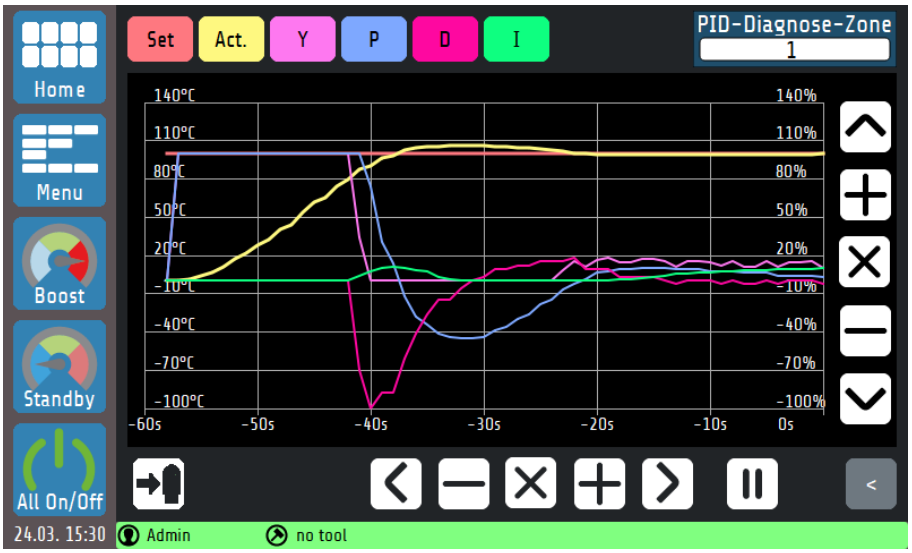


The curves of all zones can be saved immediately to a USB flash drive via the USB export button. Explanations for the individual boxes:

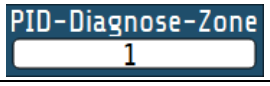
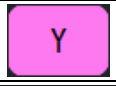
	Show/hide the temperature curve of a zone.
	Switching between zones 1-8, 9-16, etc.
	Saving all temperature values to USB flash drive in .csv format. This parameter is disabled if no USB storage device is present.
	Increasing or decreasing the vertical and horizontal resolution.
	Moving the view to the left, right, downwards or upwards.
	Resetting all zoom and moving actions to the default view.
	Freeze / Continue the view.
	Change to the PID Graph display.

11.1 PID Graph

By selecting the **PID Graph** button in the **Graph** menu, you can optionally display the curve of the PID components of a zone for further examination. The sum of the PID components the current output ratio **Y** in percent.



This view shows the temperature curve and the gradients of the P, I and D components for a selected zone. In this way, the influences of the three control parameters on the process can be explored and conclusions can be drawn about the output ratio generation. The control elements for scaling the graph behave as shown in chapter 10. Explanation of the individual boxes:

	Selection of a zone to be viewed.
	Pressing this shows or hides the curve of the setpoint or actual value.
	Pressing this shows or hides the curve of the output ratio.
	Pressing this shows or hides the curve of the P, D or I component.
	Back to Graph.

12 Logbook

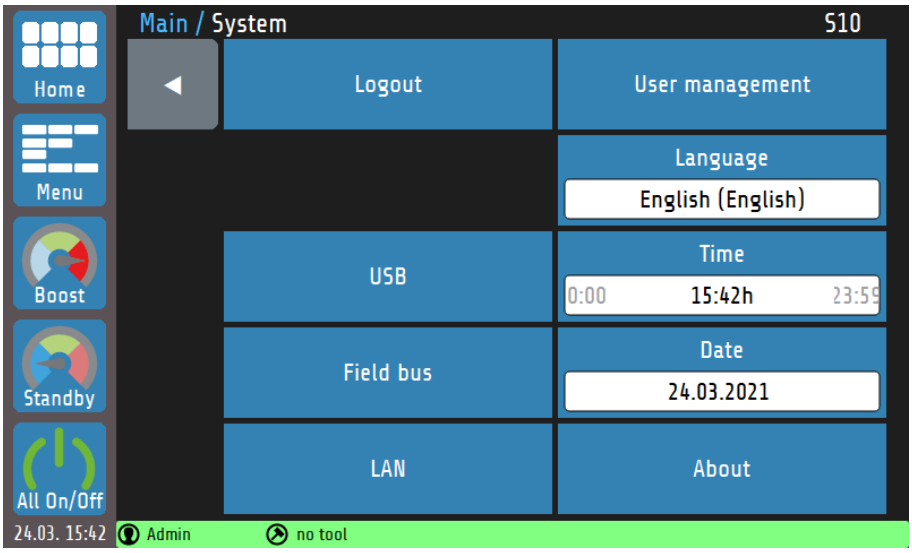
The **log**book displays and stores general events, alarms and warnings, along with the date and time they occur.

Explanations for the individual boxes:

	Scroll down/up page by page in the history.
	Filter for alarms/warnings/messages.
	Delete the logbook (administrator only).
	Export the logbook to a USB flash drive.

13 System

In the **System** menu there are other zone-independent settings:

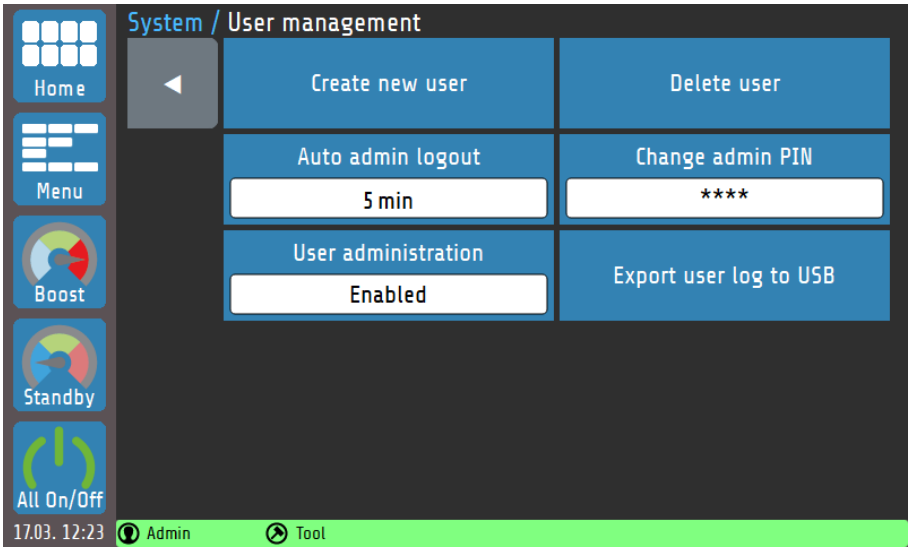


Explanations for the individual boxes:

Logout	User login or logout.
User administration	Configuration of the user settings 13.1.
USB	USB settings for saving and loading data.
Field bus	Settings menu for fieldbus connections.
LAN	Network setting: IP address, gateway, DHCP, VNC viewer, etc.
About	Device information, firmware update, restore factory settings, imprint 13.2.

13.1 User Management

In the **user management**, new users can be created or deleted by the administrator ("**Admin**").



Explanations for the individual boxes:

Auto admin logout 5 min	Setting of after how many minutes the administrator is automatically logged out. Setting range: **OFF, 1 to 5⚙ to 100 min**
User administration Enabled	If user management is enabled, rights can be restricted. Setting range: **Enabled⚙, Disabled**
Export user log to USB	Saves the time curve of the device's usage access to a USB storage device.

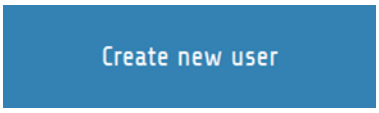
⚙: Factory settings

NOTE!

User management can also be disabled by the administrator. In this case, there are no restrictions on the operation of the device and the login query when starting the device is omitted. All users have the rights of an administrator 13.1.1.

13.1.1 Creating a New User

Only the administrator has permission to create new users in the User Management. Up to seven additional users can be created.



A new user is created as follows:

1. The process can be started by tapping the **Create New User** box. A keyboard opens. This can be used to enter the user's name.
2. The admin assigns the rights that are valid for the user. A distinction can be made here between the **machine setter** and **the operator**.
3. Issuing of a one to four-digit numeric password. Please note that the user password cannot be changed afterwards.

When the admin creates a new user, he can specify user rights. A distinction is made between the machine setter and the operator. The rights of the user types are listed below:

Administrator:	• Has all rights. • Is the only person who can create new users or delete existing ones. • Can disable user management. • Can reset the device to the factory settings.
Machine setter:	• Can set all parameters and edit tool recipes. • Does not have rights for user management.
Operator:	• Can set the setpoints of all zones. • Can switch the **Boost/Standby** function on and off.

13.1.2 Changing the Admin PIN

When the device is used for the first time, only the Admin user exists. He has the following factory-set login code:

Admin PIN: 0000

A new code can be assigned by tapping the **Change Admin PIN** box.

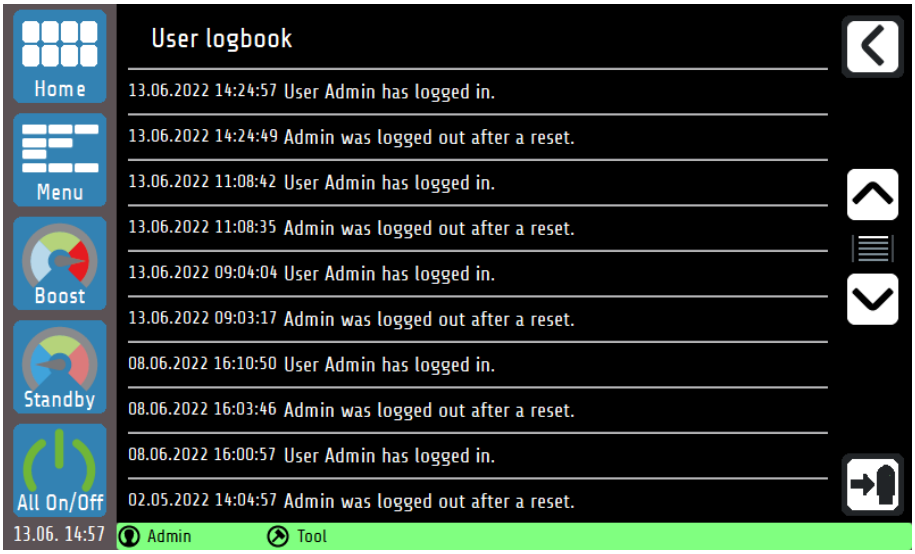
NOTE!

If the admin password should be lost, a **machine setter** can reset the device to the **factory settings**. The Admin PIN then corresponds once again to the factory setting **0000**.

Please note that all parameters will be deleted, so take appropriate precautions for data backup, e.g. in the form of **tool recipes** 9.2.

13.1.3 User Logbook

In the **user logbook**, logins and logouts as well as user actions are saved with a time stamp.

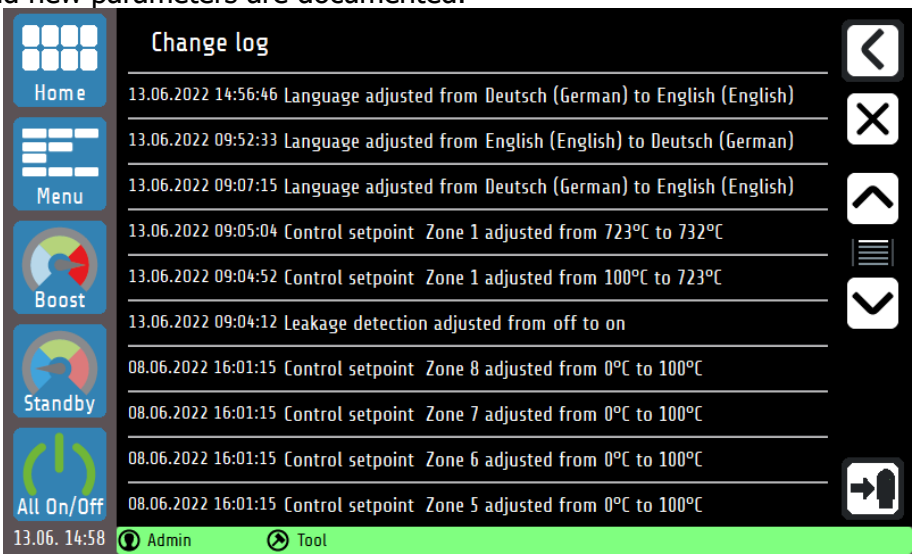


Explanations to the buttons:

	Back to the User Management.
	Scrolling up and down.
	Export of the Logbook to an USB stick.

13.1.4 Change Log

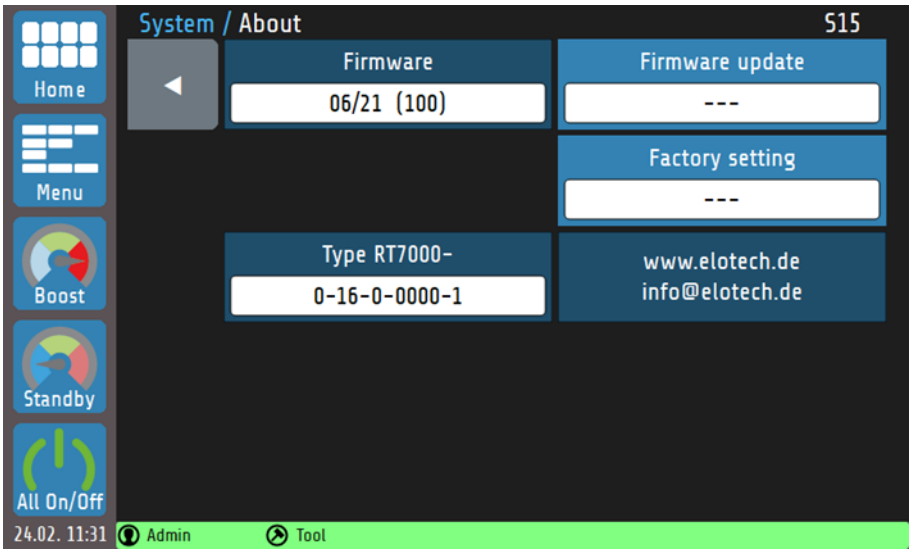
In the **change logbook**, all changes to parameters are saved with a time stamp. Both the previous and new parameters are documented.



Clear the whole change log (only for Admin).

13.2 About (firmware updates and factory settings)

Device-specific information can be read and modifications made by tapping **About** in the system settings.



Explanation of the individual boxes:

Firmware 39/20 (100)	Display of the currently installed firmware.
Firmware update ---	Opens a dialog box that can be used to install a firmware update via USB.
Factory setting ---	Resets all parameters to factory setting and deletes all users (except **Admin**).
Type RT7000- 0-16-0-0000-1	Display of the
www.elotech.de info@elotech.de	Manufacturer's service contact details.

NOTE!

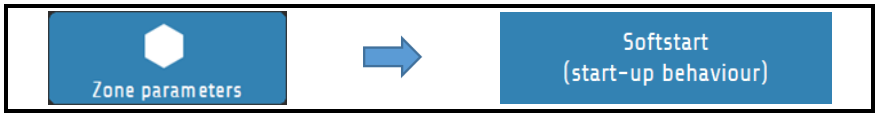
To **load a firmware update**, a folder of the type:
" RT7000_V2022_12.ELOX " must be present on an empty USB stick.
Do **not** place the individual files on the storage medium.

14 More Detailed Description of the Functions

The following chapters contain more detailed information about the individual functions and explain the content and effect of the functions.

14.1 Soft Start (start-up circuit)

The soft starting of cold machines and systems extends the machine lifetime and saves energy at the same time.



In order for a zone to start via **soft start,** a limited output ratio (default 30%) and a **soft start setpoint** must first be defined. After reaching the soft start setpoint, the temperature is controlled for the duration of the **holding time**. After the holding time has elapsed, the zones are adjusted to the desired setpoint.

REFERENCE!

If a Temperature Ramp is parameterised for a zone, it becomes active only when the holding time of the **soft start** has elapsed.

The start-up circuit is active if:

- the controller is switched on **and**
- the current actual value is less than the difference between *soft start setpoint and 5% of the measuring range*.

If the soft start is in operation, the 14.3 Self-Optimising cannot be called up during this time. In addition, the soft start always has priority over the ramp and, if necessary, other setpoint specifications.

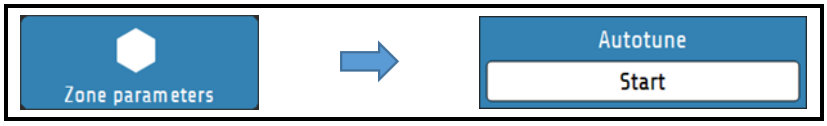
14.2 Temperature Ramp

The **ramp function** is available for linear and controlled temperature increase or reduction.

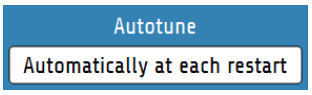
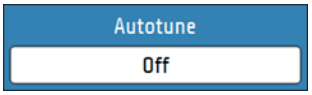
The temperature of a zone is increased or decreased in even steps via a setpoint ramp [$^{K}/_{min}$] in accordance with an adjustable heating rate [K]. The **ramp function** deactivates as soon as the set control setpoint is reached. The start-up circuit oversteers the ramp function. The ramp becomes active only after the start-up circuit has expired.

14.3 Self-Optimising

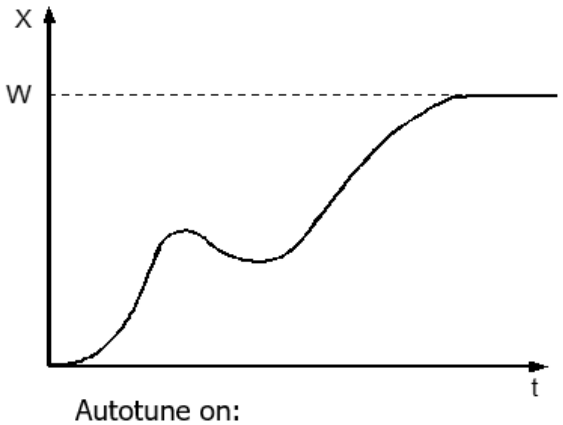
The RS7100 is able to determine the optimal control parameters for each connected load independently.



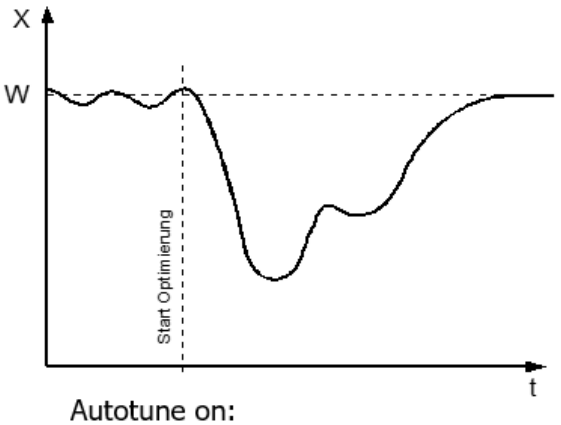
Optimisation can be triggered at any time by selecting **Autotune = Start**. After calculating the feedback parameters, the controller automatically guides the measured value to the desired setpoint. Self-optimisation can be set in the zone parameters as follows:

	Selection: **Start** Starts the optimisation immediately.
	Selection: **Automatically at each restart** An optimisation is performed after each device restart.
	Selection: **Off** Optimisation is stopped or no optimisation is carried out.

An error message is displayed if the optimisation takes longer than 20 minutes. The optimisation algorithm determines the characteristic data of the section in the closed control loop and calculates the feedback parameters (xp, Tv, Tn) of a PID controller, which are valid over a wide range.
Optimisation takes place at start-up just before the set setpoint. When optimising at a setpoint that has already been reached, a temperature reduction of approx. 3.5% of the measuring range is initially carried out.



Autotune on:
Optimisation to a heating system



Autotune on:
Optimisation to already achieved setpoint

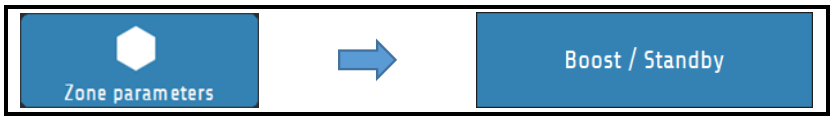
NOTE!

For the execution of the self-optimisation, it should be noted that:

- the setpoint must be at least 5% of the measuring range,
- there must be no sensor error,
- the soft start must not be active.

14.4 Global Temperature Changes (standby, boost)

The global temperature changes are configured for both the **Boost** and **Standby** functions via the Zone Parameters and can be done individually for each zone 7.1.



Global temperature increase: "**Boost**"
The **Boost** function leads to a short-term temperature increase that goes beyond the control setpoint. To do this, a **boost value** must first be set. The "Boost Temperature " is composed of the sum of the **setpoint** and the **boost value**. If the **Boost value** parameter is set to **OFF,** the zone does not participate in the global temperature increase.
In addition, a **boost duration** can be set. The boost temperature is held for the time set as the **boost duration**. The time period for which the boost remains active begins only after reaching the boost temperature. The function is automatically deactivated on expiry of this time. It should be noted that the **Boost** function can switch off at different times for zones with the same **boost duration** depending on how long the heating up has taken. If the **boost duration** is set to **OFF,** the **Boost** function for this zone switches off immediately after reaching the boost temperature.

Global temperature reduction: "**Standby**"
Standby mode saves energy during breaks or a short production stop without having to shut down the complete system.
Global temperature reduction lowers the control setpoint for all zones to the **standby setpoint**. If the **standby setpoint** parameter is set to **OFF**, the zone does not participate in the global standby function. The button is located in the navigation bar and is always visible in each menu. The standby state must be switched off manually.

Global temperature changes are activated and deactivated using the Navigation Bar.

14.4.1 Standby / Boost via External Control Signal

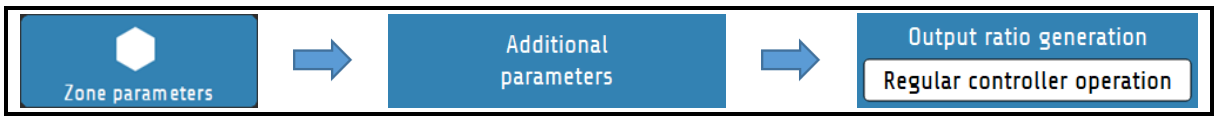
The global functions **Standby** and **Boost** can also be activated by an external control signal. Whether, and if so, which of the two functions should be operated can be set in the **Global Process Functions** menu. The respective function can then no longer be started via the touch display.
Whenever the external control signal is active (and configured to Boost or Standby), the two functions can no longer be operated via the touch display.

In addition, the external control signal is prioritised over an input via the touch display. Example: The external control signal is parameterised to standby and the boost has been activated via the touch display. When the external signal becomes active, the boost is immediately aborted and the standby is initiated.

When controlling the **Boost** function via the external signal, the **Boost duration** parameter loses its effectiveness. The boost remains active until the control signal switches off again.

14.5 Output Ratio Generation

The output ratio generation determines the operating mode of a zone. The device can generate the output ratio in four different ways. The switching of the operating mode is mainly relevant in the case of sensor errors. Several options are available at this point in order to continue operating a zone with a defective sensor in emergency mode.

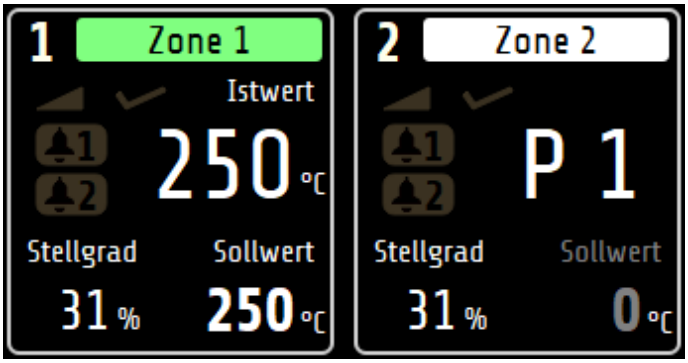


In addition to the output ratio generation from **the control mode,** in which the device determines the output ratio by means of control calculations and adjusts it dynamically, the operating mode can also be configured differently.

14.5.1 Parallel Connection of Zones (coupling, output ratio adoption)

One possible operating mode is the **output ratio adoption from another zone.** We also talk about the *coupling* or *parallel connection* of zones.
If a measuring sensor of a zone fails during operation, it is possible to couple the affected zone to another, similar zone.
After this mode of operation has been selected, a selection window opens in which the desired zone can be selected for coupling.

The parallel connection allows the work process to be continued with a correct function and terminated to subsequently carry out repair. The coupling of zones causes the defective zone to take over the **output ratio** of an intact zone.



A coupled zone is symbolised on the **home screen** by a white bar within the **zone tile**. Instead of the actual value, this zone contains a **P** (for **parallel connection**) and the number of the coupled zone (here: **Zone 1**)

REFERENCE!

When **coupling** zones - for security reasons - only zones that are in the same group can be selected 9.1.
If no Group Assignment has been carried out, any zone can be selected for coupling.

The coupling of zones is an operating mode that can be used to avert acute damage to the system in the event of a fault or machine downtime during an ongoing process.

WARNING!

If the coupling/parallel connection of zones is used as an emergency function, the fault in the system that activated the function should be rectified immediately after the work process has been completed!
Improper actions can result in personal injury or damage to property!

14.5.2 Automatic Output Ratio Adoption

The **automatic output ratio adoption** offers the possibility of an automated change of operating mode in the event of a sensor failure.

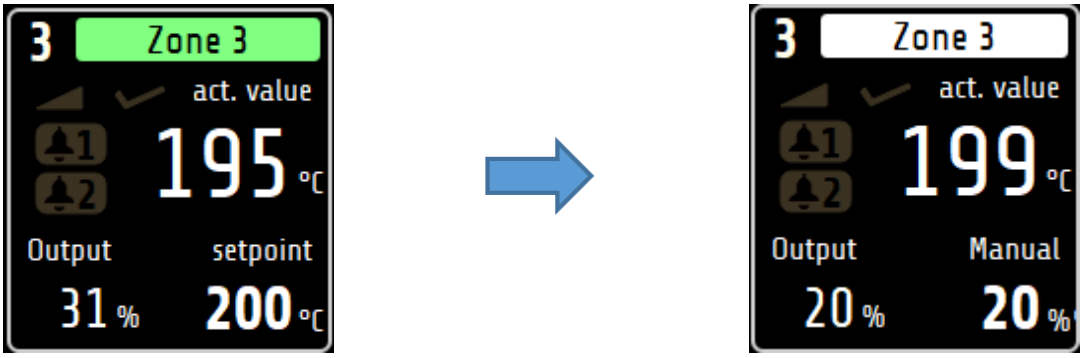
The zone normally operates in **control mode**. When the zone is stabilised, the device automatically switches to Manual Operation (manual output ratio) in the event of a sensor error and continues with the last valid output ratio. The output ratio can subsequently be changed by the operator.

An output ratio of 0% is output if:

- the output ratio is 100% at the moment of the sensor breakage,
- the control deviation from the measuring range is >0.25% at the moment of the sensor breakage,
- the soft start circuit is active at the moment of the sensor breakage,
- the controller is currently following a setpoint ramp,
- the P-share (x_p) = 0.

14.5.3 Manual Operation (manual output ratio)

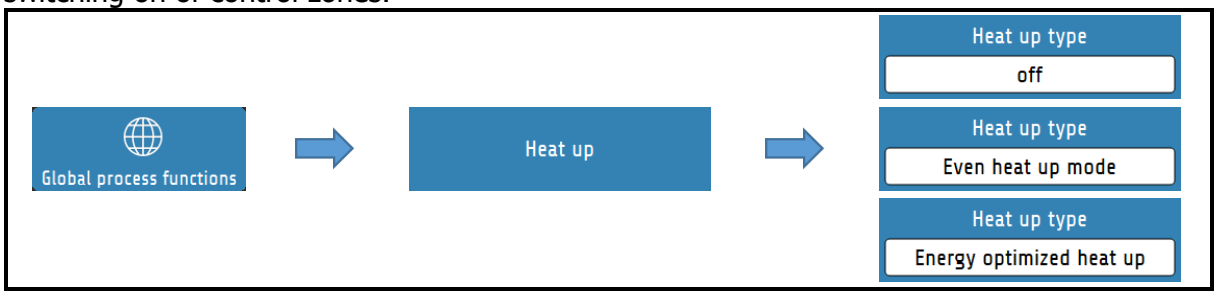
In the **manual operation,** the controller operates with an output ratio set by the operator (*manual output ratio*) – control is out of service. In **manual operation,** the zone tile on the **Home** screen changes as follows:



The zone now no longer follows colour coding but is permanently displayed in white. The set manual output ratio is displayed instead of the setpoint. The manual output ratio can be entered in the Home Screen (home) by tapping the zone tile.

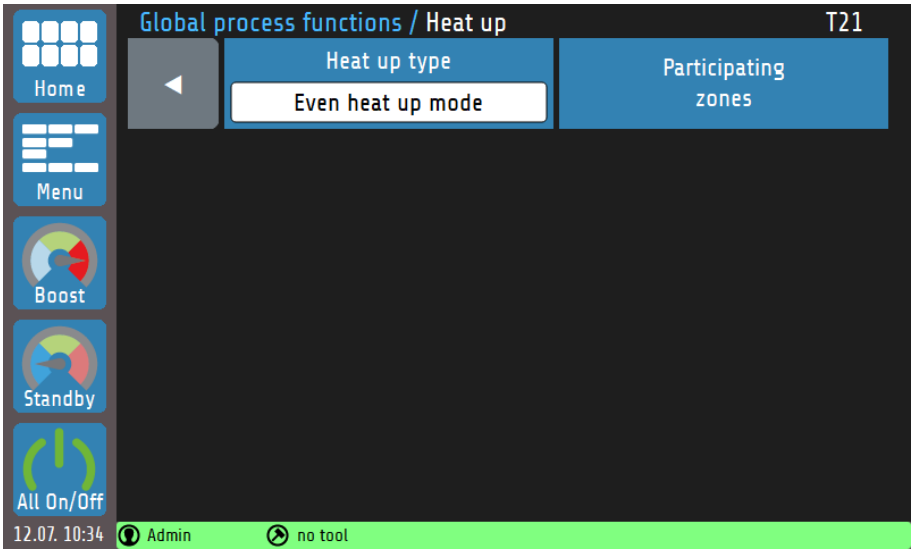
14.6 Heat Up Modes

The system can be heated up at the start of operation in different ways. The system can be heated evenly to the same temperature by compound heating by means of a control zone, or **energy optimised** with the objective of reducing the energy requirement by the time-delayed switching on of control zones.

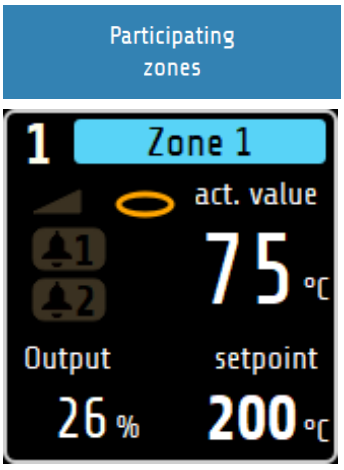


14.6.1 Even Heat Up Mode

If the **even heat up mode** is switched on, the heating speed is set by the zone with the lowest actual value, the **compound control zone**.



The control zone is regulated to the specified setpoint during heating at full power, while the output ratios of the connected zones are dynamically oriented to the actual value of the compound control zone. Thus, all zones have approximately the same actual value during the heating phase.



The zones that are to participate in the compound heating are selected via the box **Participating Zones**.

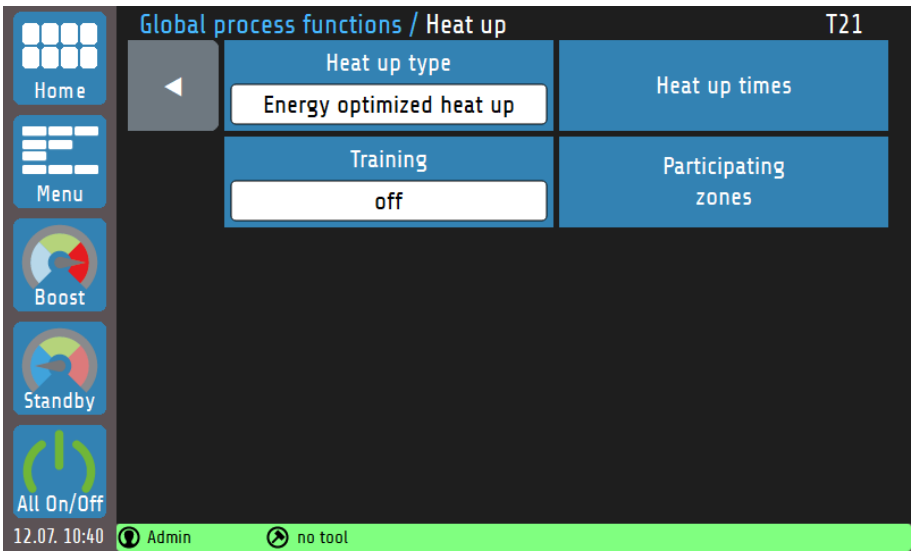
Zones that are currently participating in the even heat up mode are marked by a yellow ring on the home screen. Furthermore, a message that the **heat up mode** is active appears in the **status bar** during the active heat up.

NOTE!

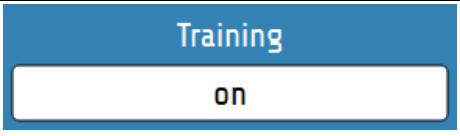
Faster heating zones can have a temperature difference of approx. +15 °C compared to the compound control zone.

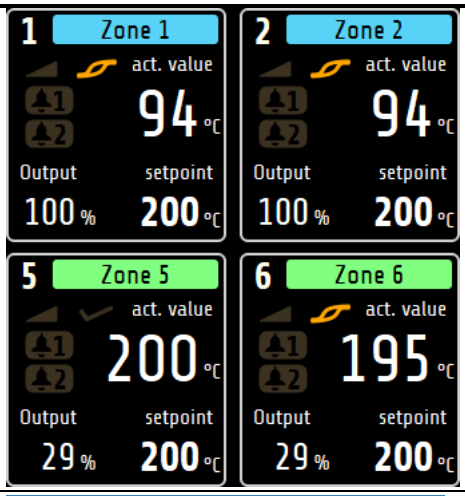
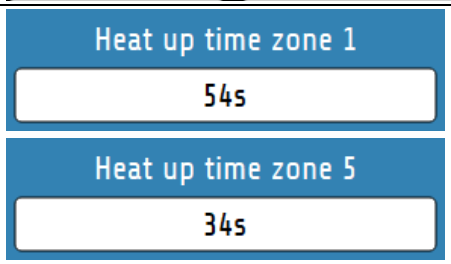
14.6.2 Energy Optimised Heat Up

It is usual for parts of a control system to differ in their mass, thermal conductivity and thus heating speed. To reduce the energy consumption and energy costs, systems can be heated up in such a way that faster zones are only started when they will reach their setpoints at the same time as slower heating zones.



In **energy optimised heat up**, the time that a zone needs to reach its setpoint is first measured. The next time the system is started up, the zones are switched on with a time delay so that all zones reach their operating point at the same time. In order to start the system with energy-optimisation, proceed as follows:

No.	Description	Illustration / reference
1.	In order to determine the heating times, the control zones should first be **optimised**. Optimisation is not necessary if regulation without optimisation produces satisfactory results, or if adequate regulation is achieved through the input of appropriate PID parameters.	14.3 Self-Optimising.
2.	Select the parameter **Training** and set it to **on**. The next time the system is started, the **RS7100** measures the heating times of each zone.	
3.	Now switch the **RS7100** off by the mains switch or the **All On/Off** button and only switch it on again when all zones have cooled down.	

No.	Description	Illustration / reference
4.	The time measurement starts as soon as the control system has been started again. Make sure that the zones have cooled to ambient temperature so that the measurement is not influenced. Zones that are in **energy optimised heat up mode** are illustrated symbolically on the Home Screen (home). On completion of the "Teaching procedure", the parameter **Training** is automatically reset to **off**.	
5.	On completion of heating, the taught time values can be viewed under **Heat up times** and manually changed if necessary.	

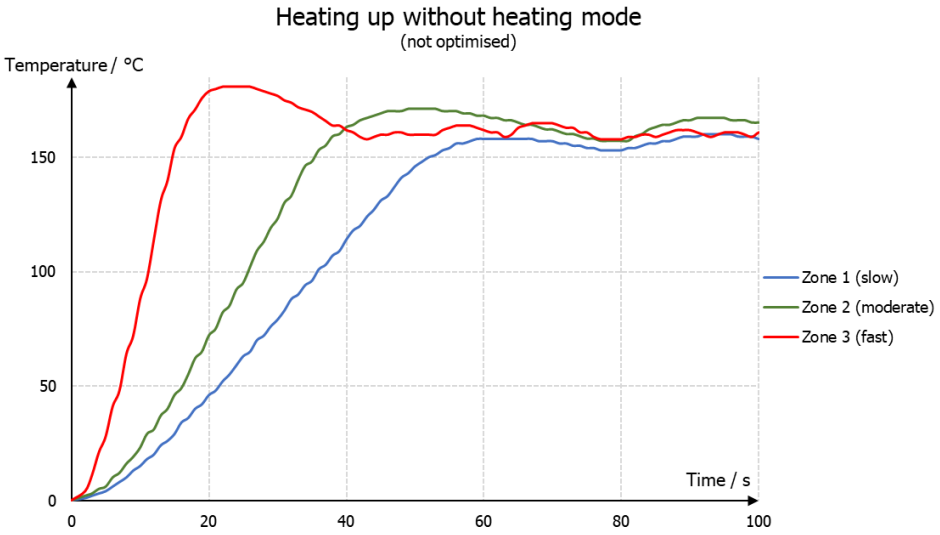
When the system is restarted in future, the zones are heated with a time delay. In the example from step 5, **Zone 1** requires 55 seconds to reach the setpoint, while **Zone 5** needs only 34 seconds. Accordingly, Zone 3 is switched on **21 seconds later**.

14.6.3 Comparison of the Heating Modes

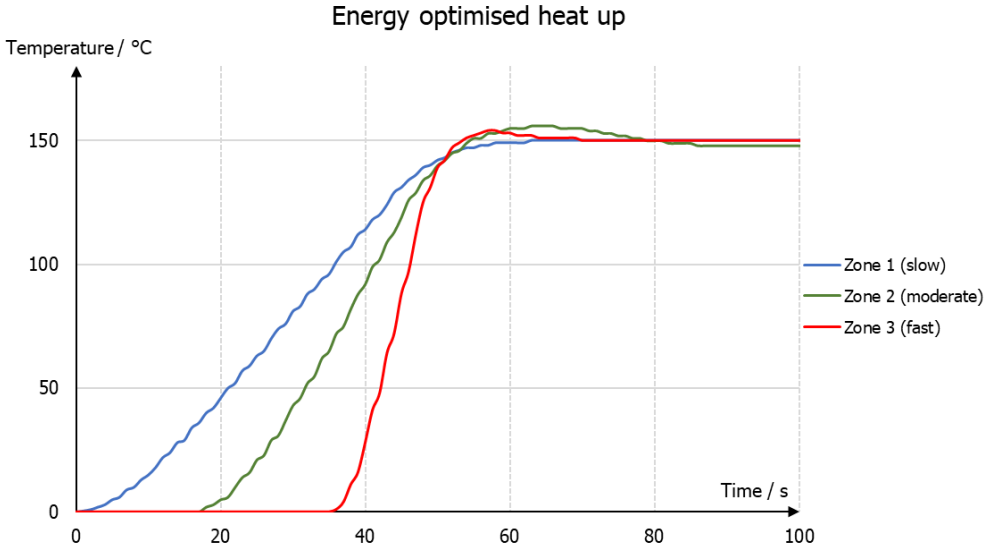
In this chapter the three heating modes **compound heating**, **energy-optimised heating** and **heating without heating mode** (parameter: **OFF**) will be compared graphically.

Three control zones are considered in the following examples. Zone 1 is the zone with the lowest heating rate and Zone 3 that with the highest. The setpoint for all zones is 150 °C.

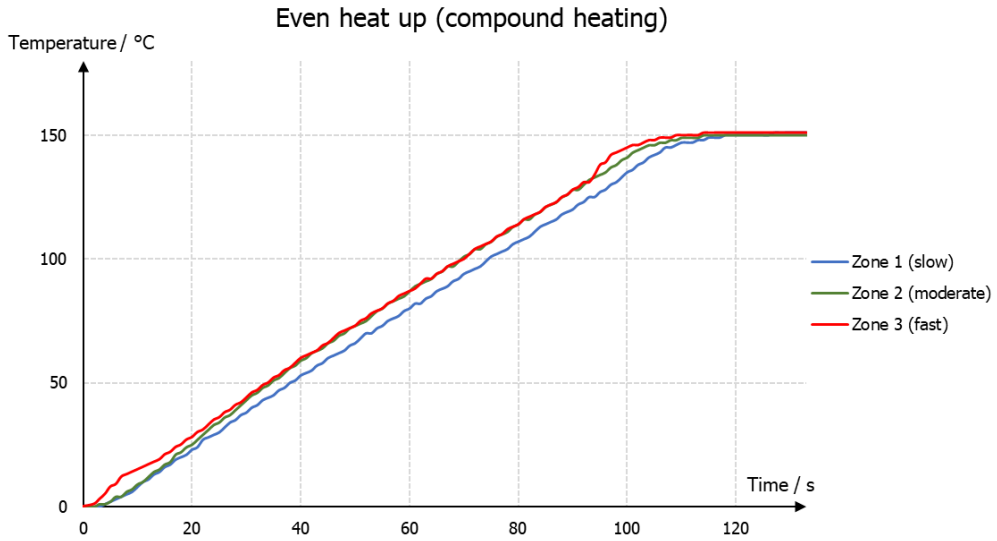
If the device is started **without heating mode**, all activated zones begin to heat at the same time. Faster zones (e.g. small components such as nozzles) reach their setpoints much earlier than slower zones. Note that the zones have not been optimised in the following illustration. The deviations of the actual values from the setpoint are minimised by a completed optimisation 14.3 Self-Optimising.



If a production process requires all zones to reach their operating temperature (setpoint) before production can begin, **energy optimised heating** is recommended. The zones switch on in succession so that the operating temperature is reached at the same time. Energy costs are lowered, as faster zones are switched on later and the setpoint does not need to be maintained until further zones are ready for operation.

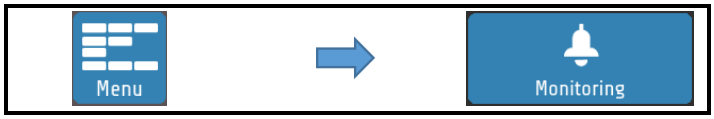


In compound heating, all participating zones are heated evenly, i.e. the actual values are always similar. The slowest zone is heated at 100% output ratio, while the faster zones are heated with less power. In this case, too, the setpoint of all zones is reached simultaneously. **Compound heating** is suitable for heating that is gentle on the machine, as thermally induced mechanical stresses occur due to the heating process. These stresses are reduced by even heating or even expansion.



14.7 Monitoring

Monitoring can be used to apply various monitoring functions to the individual zones.



The **monitoring** has two independent signal paths (channels), which are represented in the zone tiles of the home screen by the bell symbols . If the monitoring signal of a channel is active, the colour of the bell symbol changes from grey to a selectable signal colour (red, orange or green). Certain events such as system errors have specified colours. If multiple events occur with different colours, the priority is: red, orange, green.

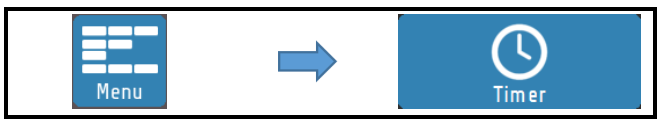
In the monitoring menu, you can specify which type of monitoring functions should be integrated into the signal chain of the respective channels.

The following configurations are possible:

- Monitoring temperature limit value overshoot/undershoot (relative/absolute),
- Monitoring temperature limit value within tolerance band (relative/absolute),
- Heater current monitoring.

Via the selectable colours, as well as the possibility to invert the logic of the signal, it is possible to signal both limit value violations and alarm states as well as releases.

14.8 Timer



The timer offers the possibility to start or stop the control mode of the device automatically, or to put the control zones into the **standby** state. Individual times can be set for each day of the week. It should be noted, however, that when the device is operated beyond the daily limits (12 midnight), the last switching point of the day is valid until the first switching point of the following day. If no switching point is defined on the following day, the last regular switching point is valid for several days until the next switching time occurs.

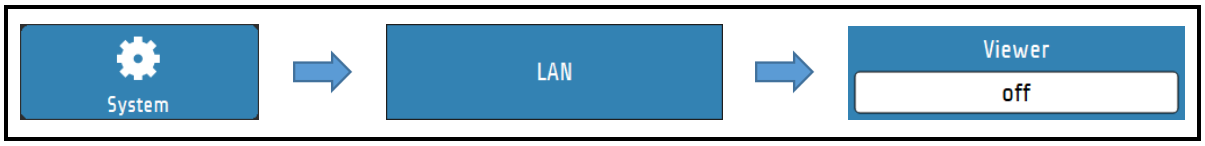
After restarting the device, the operating state (**On**/**Off**/**Standby**) present at the time of switch-off is restored, regardless of the currently valid switching value of the timer. The regular timer mode only starts again with the entry of the chronologically next switching point.

14.9 DHCP

The RS7100 is capable of communicating with a DHCP-Server. Thus, the IP-Parameters of the connected network will automatically be adopted by the device.
DHCP can also be disabled so that users can manually set IP-Parameters.

14.10 Viewer

With the Viewer function, the RS7100 can be remotely controlled with the help of a computer, smartphone or tablet. Transmission is via **VNC** (Virtual Network Computing). In order to connect to the RS7100, a four-digit code must be entered. This code can be viewed and changed in the LAN menu.



A **VNC viewer** is required on the respective terminal device.
The following links offer a selection of VNC viewer applications that have been tested with our products:

- Apple
  https://apps.apple.com/de/app/vnc-viewer-remote-desktop/id352019548
- Android
  https://play.google.com/store/apps/details?id=com.realvnc.viewer.android&hl=de
- Windows
  https://www.tightvnc.com/download.php

15 Error Messages

Display	Meaning	Possible remedy
	Measuring range overflow, sensor error	Check the sensor and cable
	Measuring range underflow, sensor error.	Check the sensor and cable; check the actual value offset; thermocouple poles swapped?
REMOTE: Parameters locked	Operation is not possible because the controller is controlled via a fieldbus.	Profibus: The "Remote" parameter in the fieldbus menu is turned on.
DataFlash Init Error	Error in the display texts.	Contact the manufacturer.
ERR 0	Factory adjustment parameters incorrect.	Send the device to the factory for inspection.
ERR 8	Power fail-safe parameter memory reports errors.	Delete error message; check parameters. In case of repeated occurrence, send device to the factory for inspection.
ERR IO-Board	Error of the output stage assembly	Return the device to the factory for inspection.
Attention! Unplug the mains plug!	The cover plate of the device has been opened during operation.	Switch the device off immediately and unplug the mains plug 📎4

16 Technical Data

16.1 Inputs (R4010)

Sensor Inputs

Designation	Standard	Measuring Range	Measuring Accuracya[a]	Ambient influence
Number		Corresponds to number of zones		
Typ J (Fe-CuNi)	DIN EN 60584-1	0…800 °C	< 0,25 %	< 0,01 %/K
Typ K (NiCr-Ni)	DIN EN 60584-1	0…1200 °C	< 0,25 %	< 0,01 %/K
Typ L (Fe-CuNi)	DIN EN 60584-1	0…800 °C	< 0,25 %	< 0,01 %/K
Typ N (NiCrSi-NiSi)	DIN EN 60584-1	0…1200 °C	< 0,25 %	< 0,01 % / K
Typ S (PtRh-Pt)	DIN EN 60584-1	0…1600 °C	< 0,25 %	< 0,01 % / K
PT100 2-wire	sensor current < 1 mA	-100…800 °C	< 0,2 %	< 0,01 % / K
PT100 3-wire	sensor current < 1 mA	-100…800 °C	< 0,2 %	< 0,01 % / K
Ni120 2-wire	DIN EN 60751	0…250 °C	< 0,2 %	< 0,01 % / K
Ni120 3-wire	DIN EN 60751	0…250 °C	< 0,2 %	< 0,01 % / K
Linear 0…10V	internal res. > 100 kΩ	0,0…100,0 °C	< 0,25 %	< 0,01 % / K
Linear 0…20mA	I.R. < 100 Ω	0,0…100,0 °C	< 0,25 %	< 0,01 % / K
Linear 4…20mA	I.R. < 100 Ω	0,0…100,0 °C	< 0,25 %	< 0,01 % / K
Reference junction		internal		
Linearisation error		0,2 %		
Reference junction accuracy		± 0,5 K		
Protective device		• Sensor breakage protection: electronic detection with signalling Verpolungsschutz • Reverse polarity protection		

[a] The accuracy specifications refer to the maximum measuring range scope.

16.2 Outputs (R4010)

Logic outputs:	Voltage, bistable, 0/24 V DC, max. 500 mA, short-circuit proof.
Relay outputs:	Relay make contact; max. 250V AC, max. 2A, resistive load

16.3 Interfaces (RS7100)

Feldbus

RS232	Galvanically isolated
RS485	
TTY	

Ethernet

Addressing range:	IP address adjustable
Connection:	RJ45 on rear

USB

Connection:	Front side for storage medium E.g.: for firmware update, Saving/loading parameter sets, ...

16.4 Electrical Data

Electrical safety:	According to DIN EN 61010-1:2010; overvoltage category II up to 300 V mains voltage; pollution degree 2
CE marking:	The unit complies with the Electromagnetic Compatibility Directive (2014/30/EU) and the Low Voltage Directive (2014/35/EU), which form the basis for the CE marking.

16.5 Environmental influences

Ambient temperature range	
Operation:	5…40 °C
Transport, storage:	0…70 °C
Climatic ambient conditions	
Climatic resistance:	≤ 75 % rel. humidity without condensation
Storage:	Class 1K2
Transport:	Class 2K3
Operation:	Class 3K3
Mechanical ambient conditions	
Storage:	Class 1M2
Transport:	Class 2M2
Operation:	Class 3M2
Electromagnetic compatibility (EMC)	
Interference emission:	Class A
Interference immunity:	Industrial

16.6 Display and operation

Operating unit:	7-inch (17.8 cm) colour LCD with capacitive touch panel
Resolution:	800 x 480 pixels

16.7 Housing

Enclosure type:	Panel-mounted aluminium front enclosure (RS7000) Aluminium enclosure with top hat rail bracket (R4010)	
Protection type:	IP20	
Protection class:	1	
Weight:	RS7100	ca. 500 g
	R4010	ca. 600 g
Dimensions:	↗3.2 Dimensions	

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Subject to technical changes!