Installation and operating instructions

System Controller REGULUS KRS 9

Content

Safety instructions

A.1. - EC declaration of conformity

By affixing the CE mark to the unit the manufacturer declares that the „ Heating Circuit Controller", hereinafter refererred to as KRS9, conforms to the relevant safety regulations EC low voltage directive 2006/95/EC as well as the EC directive for electromagnetic compatibility 2004/108/EC.
Conformity has been verified and the corresponding documentation and the EC declaration of conformity are kept on file by the manufacturer.

A.2. - General instructions

These installation and operating instructions contain basic instructions and important information regarding safety, installation, commissioning, maintenance and the optimal use of the unit. Therefore these instructions must be read completely and understood by the installation technician/specialist and by the system user before installation, commissioning and operation of the unit.
The valid accident prevention regulations, VDE regulations, the regulations of the local power utility, the applicable DIN-EN standards and the installation and operating instruction of the additional system components must also be observed. The controller does not under any circumstances replace any safety devices to be provided by the customer!
Installation, electrical connection, commissioning and maintenance of the unit may only be carried out by specialists who possess the appropriate training.
For the user: Make sure that the specialist gives you detailed information on the function and operation of the controller. Always keep these instructions in the vicinity of the controller.

A.3. - Explanation of symbols

Danger	Failure to observe these instructions can result in danger to life from electric voltage.
Danger	Failure to observe these instructions can result in serious damage to health such as scalding, or even life-threatening injuries.
Caution	Failure to observe these instructions can result in destruction of the unit or the system, or damage to the environment.
Caution	Information which is especially important for the function and optimal use of the unit and the system.

A.4. - Changes to the unit

- Changes, additions to or conversion of the unit are not permitted without the written permission from the manufacturer
- It is likewise forbidden to install additional components that have not been tested together with the unit
- If it becomes clear that safe operation of the unit is no longer possible, for example because of damage to the housing, then turn the controller off immediately
- Any parts of the unit or accessories that are not in perfect condition must be exchanged immediately
- Use only original spare parts and accessories from the manufacturer
- Markings made on the unit at the factory must not be altered, removed or made illegible
- Only the settings actually described in these instructions may be made on the controller

Danger	Changes to the unit can compromise the safety and function of the unit or the entire system.

Safety instructions

A.5. - Warranty and liability

The controller has been manufactured and tested with regard to high quality and safety requirements. The unit is subject to the statutory guarantee period of two years from the date of sale.
The warranty and liability shall not include, however, any injury to persons or material damage that is attributable to one or more of the following causes:

- Failure to observe these installation and operating instructions
- Improper installation, commissioning, maintenance and operation
- Improperly executed repairs
- Unauthorised structural changes to the unit
- Installation of additional components that have not been tested together with the unit
- Any damage resulting from continued use of the unit despite an obvious defect
- Failure to use original spare parts and accessories
- Use of the device for other than its intended purpose
- Operation above or below the limit values listed in the specifications
- Force majeure

A.6. - About the controller

The System Controller KRS9 facilitates efficient use and function control of your solar or heating system. The device is impressive most of all for its functionality and simple, almost self-explanatory operation. For each step in the input process the individual entry keys are assigned to appropriate functions and explained. The controller menu contains headwords for the measured values and settings, as well as help texts or clearly-structured graphics.
The KRS9 can be used as a system controller for the various system variants illustrated and explained under „D.3. - Hydraulic variants / Systems / Diagrams" on page 10.

Important characteristics of the KRS9:
- Depiction of graphics and texts on an backlit display
- Simple viewing of the current measurement values
- Analysis and monitoring of the system by means of statistical graphics etc.
- Individual configuration of special functions
- Extensive setting menus with explanations
- Menu block can be activated to prevent unintentional setting changes
- Resetting to previously selected values or factory settings
- A wide range of additional functions are available

A.7. - Scope of supply

- System controller KRS9
- 3 screws 3,5x35mm and 3 plugs 6mm for wall installation
- 12 strain relief clips with 24 screws, replacement fuse 1x T2A / 250V, 1x T630mA / 250V
- Installation and instructions manual KES9
- Micro SD Card

Optionally contained depending on design/order:
- 2-3 PT1000 temperature sensors and immersion sleeves
- Ethernet

Additionally available:
- Pt1000 temperature sensor, immersion sleeves, overvoltage protection,
- CAN Bus Data Logger
- RC21 Room thermostat with remote adjuster

A.8. - Disposal and pollutants

The unit conforms to the European RoHS directive 2002/95/EC for the restriction of the use of certain hazardous substances in electrical and electronic equipment.

⚠ **Caution**   The unit must not under any circumstances be disposed of with ordinary household refuse. Dispose of the unit only at appropriate collection points or ship it back to the seller or manufacturer.

Description of controller

B.1. - Specifications

Electrical specifications:

Mains voltage	230VAC +/- 10%
Mains frequency	50...60Hz
Power consumption	max. ~3 VA
Switched power	
Electronic relay R1	min.5W...max.120W for AC3
Electronic relay R2	min.5W...max.120W for AC3
Mechanical relay R3	460VA for AC1 / 185W for AC3
Mechanical relay R4	460VA for AC1 / 185W for AC3
Mechanical relay R5	460VA for AC1 / 185W for AC3
Mechanical relay R6	460VA for AC1 / 185W for AC3
potential free relay R7	460VA for AC1 / 185W for AC3
0..10V	Output for 10 k Ω working resistance
PWM	Output Freq. 1 kHz, level 10 V
Internal fuse	T630mA / 250V slow blow (x3)
	4x T2A / 250V slow blow (x1)
Protection category	IP40
Protection class	II
Sensor inputs	8 x Pt1000
	2x Grundfos Direct Sensors
	1x RC21/RC22

Measuring range

PT1000	-40°C to 300°C
Grundfos Direct Sensor:	0°C-100°C (-25°C /120°C short term)
	1 l/min - 12 l/min (VFS1-12)
	2 l/min - 40 l/min (VFS2-40)
	5 l/min - 100 l/min (VFS5-100)
	10 l/min - 200 l/min (VFS10-200)

Network connections

Ethernet (optional)
CAN Bus

Real Time Clock   RTC with 24 hour power reserve

Permissible ambient conditions:

Ambient temperature	
for controller operation	0°C...40°C
for transport/storage	0°C...60°C
Air humidity	
for controller operation	max. 85% rel. humidity at 25°C
for transport/storage	no moisture condensation permitted

Other specifications and dimensions

Housing design	3-part, ABS plastic
Installation methods	Wall installation, optionally panel installation
Overall dimensions	228 x 180 x 53 mm
Display	Fully graphical display, 128 x 128 dots
Light diode	2: 1x red, 1x green
Operation	4 entry keys

Temperature sensors: (may not be included in the scope of supply)

Collector or boiler sensor	Pt1000, e.g. immersion sensor TT/S2 up to 180°C
Storage tank sensor	Pt1000, e.g. immersion sensor TT/P4 up to 95°C
Pipe-mounted sensor	Pt1000, e.g. pipe mounted sensor TR/P4 up to 95°C
Sensor leads	2x0.75mm² extendable up to 30m max.

B.2. - Temperature resistance table for Pt1000 sensors

°C	0	10	20	30	40	50	60	70	80	90	100
Ω	1000	1039	1077	1116	1155	1194	1232	1270	1308	1347	1385

Installation

⚠️ **Caution**	Install the controller only in dry areas and under the ambient conditions described under B.1 "Specifications".

⚠️ **Caution**	Controller must be inaccessible from the rear.

C.1. - Wall installation

1. Unscrew cover screw completely.

2. Remove Terminal connection cover. Unscrew the 2 small screws left and right and remove the upper part of the controller by lifting it out of the socket.

3. Mark the 3 mounting holes on the wall (see „C.2.1. Socket"). Make sure that the wall surface is even so that the housing does not become distorted when it is screwed on.

4. Using a drill and size 6 bit, drill 3 holes at the points marked on the wall and push in the plugs.

5. Hang the controller on the upper screw.

6. Align the housing and tighten the lower screws.

C.2. - Electrical connection

⚡ **Danger**	Before working on the unit, switch off the power supply and secure it against being switched on again! Check for the absence of power! Electrical connections may only be made by a specialist and in compliance with the applicable regulations. Do not use the controller if the housing shows visible damage.

⚠️ **Caution**	Low-voltage cables such as temperature sensor cables must be routed separately from mains voltage cables. Feed temperature sensor cables only into the left-hand side of the unit, and mains voltage cables only into the right-hand side.

⚠️ **Caution**	The customer must provide an all-pole disconnecting device, e.g. a heating emergency switch.

⚠️ **Caution**	The cables being connected to the unit must not be stripped by more than 55mm, and the cable jacket must reach into the housing just to the other side of the strain relief.

❗ **Caution**	Relay R1 and R2 are only suitable for standard pumps (5-120W) which are speed-controlled via the controller. The internal wiring of the controller is such that residual currents flow over relay R1 and R2 even in the rest condition. Therefore under no circumstances may valves, contactors or other consumers with lower power consumption be operated on this output.

❗ **Caution**	Controller and VFS sensor have to have the same ground potential. The VFS sensor has a functional earth connector (PELV). The PE-connector of the controller has to be connected to the pipe system near the sensor.

C.2.1. Socket

169.3

4.4

9

R4.5

33 33

195,4

139,3

M20 M20 M20 M20

11,8

3.5

161

Terminal connection
cover

Cover screw

C.2.2.
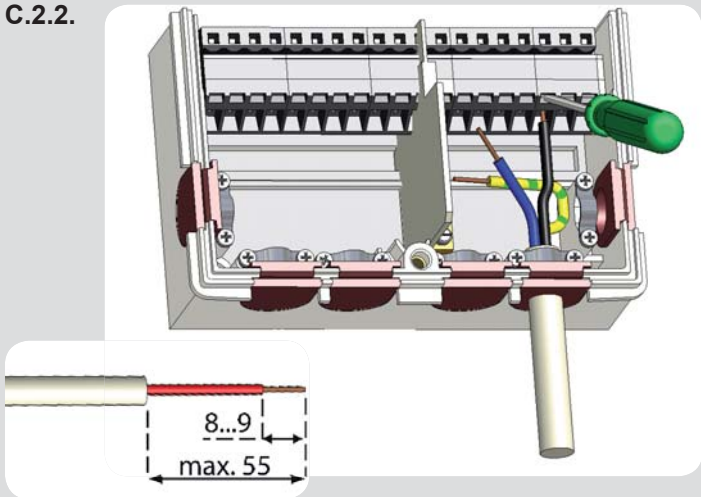
1. Select necessary program/hydraulics (s. „D.3. - Hydraulic variants / Systems / Diagrams" on page 10)

2. Remove terminal connection cover (s. „C.2.1. Socket" on page 7)

3. Strip cables by 55mmmax., insert, fit the strain relief devices, strip the last 8-9mm of the wires (Fig. „C.2.2.")

4. Open the terminals using a suitable screwdriver (Fig. „C.2.3.") and make electrical connections on the controller

5. Refit terminal connection cover and fasten screw.

6. Switch on mains voltage and place controller in operation.

C.2.3.
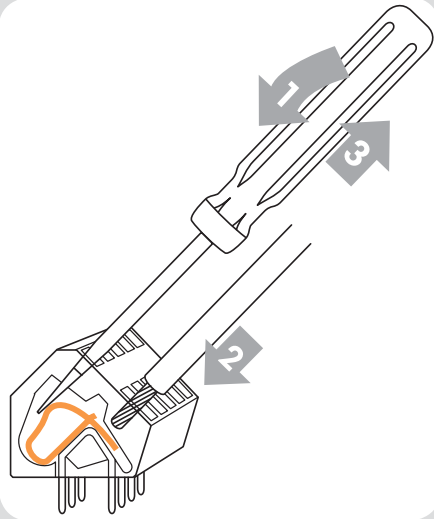
Instructions for clamps:

1. Insert screw driver into the upper hole. Push the lock clamp inside down.
   Keep the screw driver in this position.

2. Insert cable into the lower opening.

3. Remove screw driver. The clamp will lock the cable.

C.3. - Installing the temperature sensors

The controller operates with Pt1000 temperature sensors which are accurate to the degree, thus ensuring optimal control of system functions.

⚠ Caution	The temperature sensor cables must be routed separately from mains voltage cables, and must not, for example, be routed in the same cable duct!

❗ Caution	If desired the sensor cables can be extended to a maximum of 30m using a cable with a cross-section of at least 0.75mm². Make sure that there is no contact resistance! Position the sensor precisely in the area to be measured! Only use immersion, pipe-mounted or flat-mounted sensor suitable for the specific area of application with the appropriate permissible temperature range.

❗ Caution	Connect the VFS sensors with the matching jacks. To prevent damage to the Direct Sensors it is highly recommended to install them in to the return. When installing the Vortex Flow Sensors (VFS), observe the correct flow direction!

D.1. - Terminal connection

The mains part of the terminal connection room is covered by a plastic sheet. Make sure that the controller is without voltage before removing it.
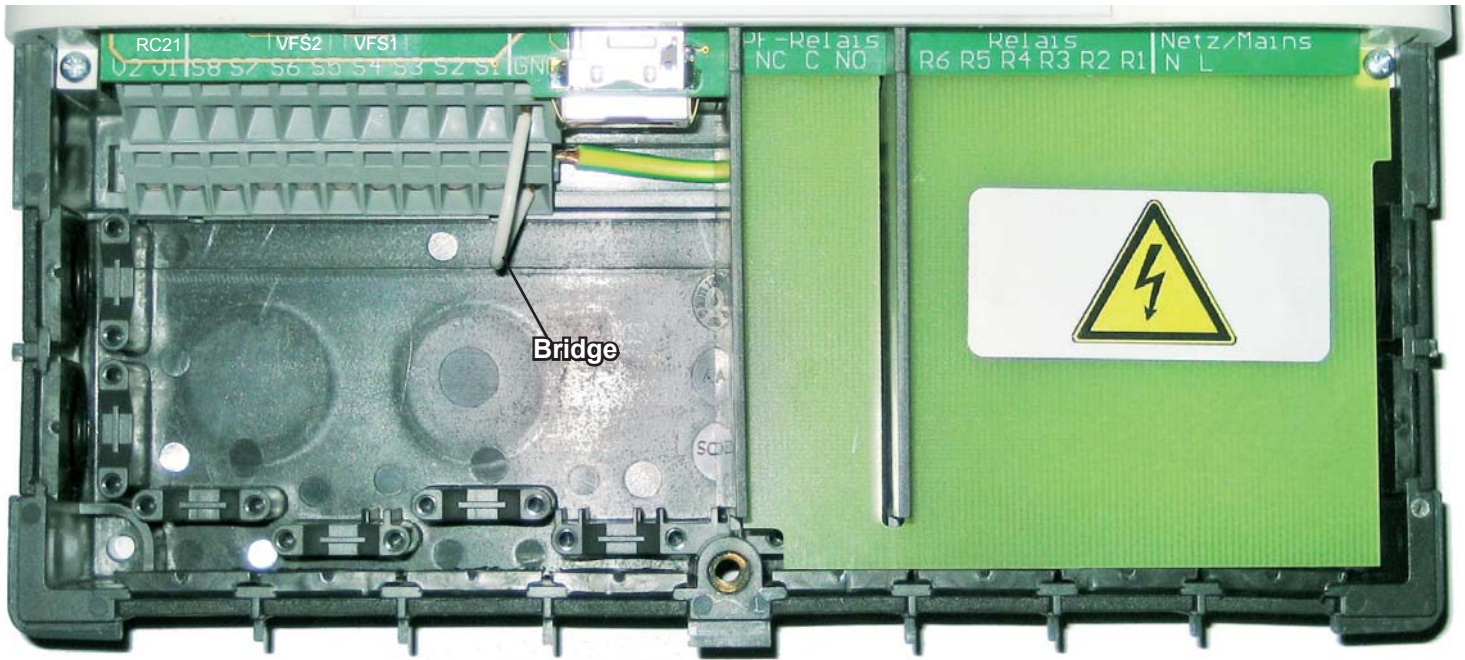
D.2. - Terminal connection diagram

Low Voltage	PF- relay	Relays Mains
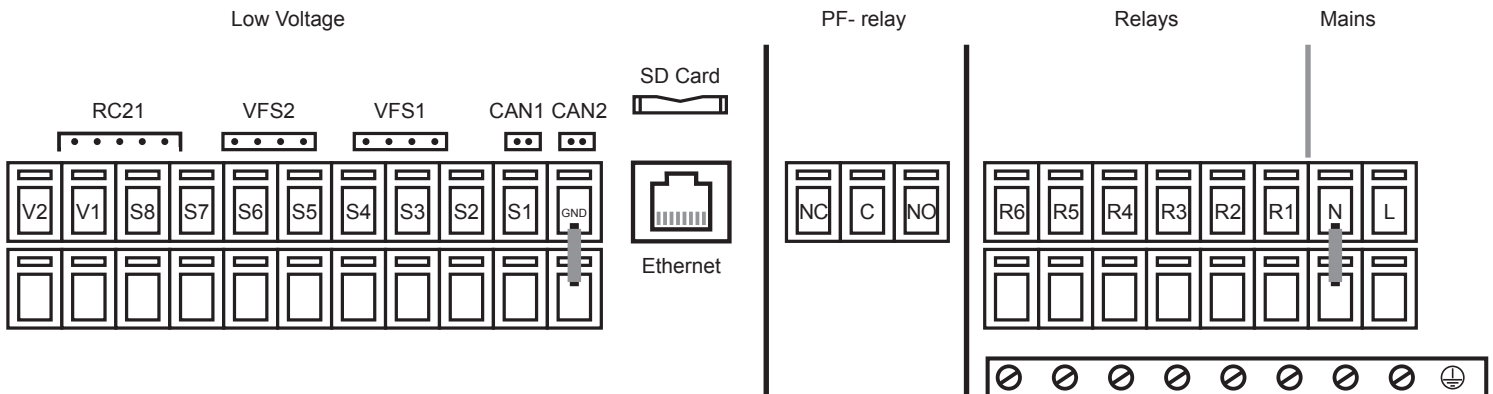
⚠ **Caution** max. 12V

Low voltage max. 12VAC/DC

Terminal:	Connection for:
S1	Sensor 1
S2	Sensor 2
S3	Sensor 3
S4	Sensor 4
S5	Sensor 5
S6	Sensor 6
S7	Sensor 7
S8	Sensor 8
V1	optional speed controlled output for High efficiency pumps
V2	optional speed controlled output for High efficiency pumps
VFS1	Grundfos Direct Sensor
VFS2	Grundfos Direct Sensor
RC21	Room thermostat + remote adjuster

SD Card Slot

for Data logging and firmware updates

⚠ **Caution**

Make sure the SD card's orientation is correct!
Card must be inserted without pressure. False insertion can damage the card slot!

Ethernet
for LAN network operations

CAN connector

Potential free Relay

NO
Normally open

C
Common

NC
Normally closed

⚠ **Danger** Netzseite 230VAC

Mains voltage 230VAC 50-60Hz

Terminal:	Connection for:
R1	Relay 1
R2	Relay 2
R3	Relay 3
R4	Relay 4
R5	Relay 5
R6	Relay 6
N	Mains neutral conductor N
L	Mains phase conductor L

The PE protective conductor must be connected to the PE metal terminal block!

D.3. - Hydraulic variants / Systems / Diagrams

variant / connection	Combi. storage + Heating circ.	Combi. storage+ Compressor+ Load. pump	Combi. storage+ Solar+ Burner	Combination store+ 2 Heating circ.	Boiler+ Heating circ.	Boiler+ Compressor+ Load. pump	Boiler+ Sola...
Temperature sensors low voltage only							
S1			Storage Solar (bottom)	Storage Solar (bottom)			Storage Sola...
S2		Storage HC (middle)	Storage HC (middle)				
S3	Storage Hot water (top)	Storage Hot water (top)	Storage Hot water (top)	Storage Hot water (top)	Storage Hot water (top)	Storage Hot water (top)	Storage Hot...
S4				Flow HC2			
S5	Flow HC1	Flow HC1	Flow HC1	Flow HC1	Flow HC1	Flow HC1	Flow HC1
S6			Burner				Burner
S7	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
S8			Collector	Collector			Collector
VFS1							
VFS2							
V1							
V2							
Relay outputs 230 VA							
R1 (ELR)			Solar pump	Solar pump			Solar pump
R2 (ELR)		Load. pump	Boiler pump			Load. pump	Boiler pump
R3				Heating pump 2	Hot water-pump	Hot water pump	Hot water-pu...
R4	Mixer Open	Mixer Open	Mixer Open	Mixer Open	Mixer Open	Mixer Open	Mixer Open
R5	Mixer Closed	Mixer Closed	Mixer Closed	Mixer Closed	Mixer Closed	Mixer Closed	Mixer Close...
R6	Heating pump	Heating pump	Heating pump	Heating pump 1	Heating pump	Heating pump	Heating pum...
R7 (pot. free)		Compressor	Burner request			Compressor	Burner reque...
V1							
V2							

	Puffer+ Boiler+ Heating circ.	Puffer+ Boiler+ Compressor	Puffer+ Boiler+ Solar+ Burner	2 mixed Heating circ.	2 mixed Heating circ.+ Compressor	2 mixed Heating circ.+ Solar+ Compressor
...r+ Burner						
...ar (bottom)			Storage Solar (bottom)			Storage Solar (bottom)
	Storage HC (middle)	Storage HC (top)	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)
...water (top)	Storage Hot water (top)	Storage DHW (top)	Storage Hot water (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)
	Flow HC1	HC1 Flow	Flow HC1	HC1 Flow	HC1 Flow	HC1 Flow
			Burner			
	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor	Outdoor
			Collector			Collector
		Load pump	Solar pump	Heating pump 1	Heating pump 1	Heating pump 1
		DHW-Pump	Boiler pump	Heating pump 2	Heating pump 2	Heating pump 2
...ump	Hot water-pump	Mixer Open	Hot water-pump	Mixer 1 Open	Mixer 1 Open	Mixer 1 Open
	Mixer Open	Mixer Closed	Mixer Open	Mixer 1 Closed	Mixer 1 Closed	Mixer 1 Closed
...d	Mixer Closed	Heating pump	Mixer Closed	Mixer 2 Open	Mixer 2 Open	Mixer 2 Open
...mp	Heating pump	Compressor	Heating pump	Mixer 2 closed	Mixer 2 closed	Mixer 2 closed
...est			Burner request		Verdichter	Burner
						Signal Solar pump

D.4. - RC 21 Room thermostat and remote adjuster

> **!** **Caution**
>
> RC21 is an optional accessory and not included in the scope of supply by default.
> The KRS9 is fully operational without the RC21.

The remote adjuster with integrated thermostat RC21 provides you with easy to use temperature controlled adjustment of heating from within your living space.

Settings
The dial is used to parallel translate the heating curve. The flow temperature (still regarding the outdoor temperature) is raised or lowered respectively by your adjusement. When the dial is turned all the way down, the heating circuit is switched off. Frost protection stays active to prevent damage.

Sensor
The RC21 contains a temperature sensor which is used by the controller.
If the settings in the controller permit it, the sensor is used to alter the flow temperature.

The switch changes the operation mode of the controller.

🕐 In **Timer mode** the temperature is controlled according to the set thermostat periods.

☼ In **Continous day** mode the set periods are ignored and the temperature is controlled according to the day time settings.

☽ In **Continous night mode** the temperature is usually set to lowest. This setting is best suited for periods of long absence like e.g. holidays.

Installation
Carefully remove the dial from the housing with a screwdriver.
Loosen the screw beneath. Remove the white part of the housing from the black socket.

The RC21 is connected via terminal block to the controller.

Remote adjuster (grey)
Room temperature sensor (green)
Sensor earth (white)
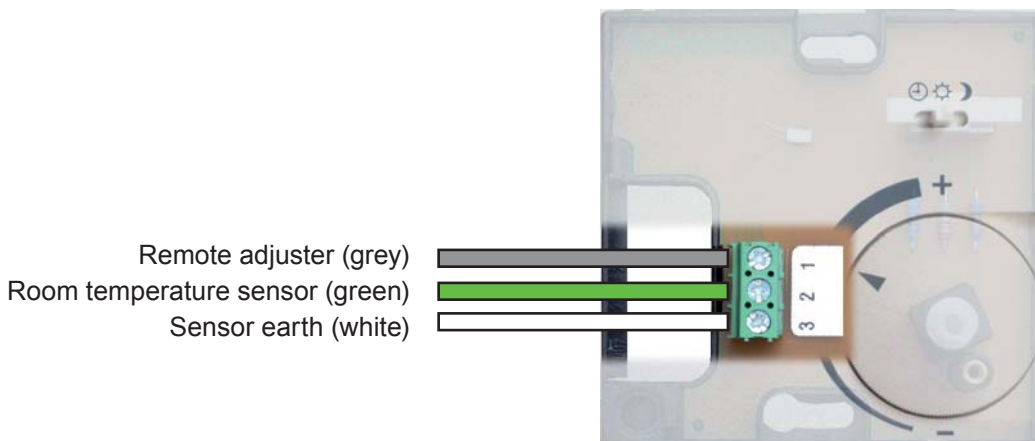
> **⚡ Danger!**
>
> The RC21 is suited for low voltage only!

E.1. - Display and input
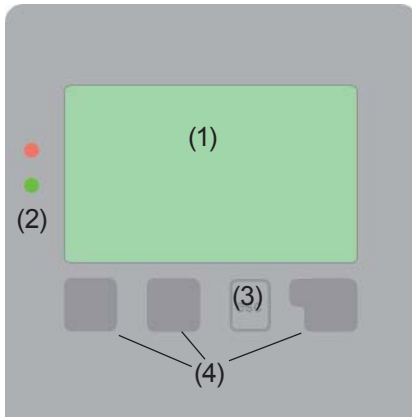
The display (1), with its extensive text and graphics mode, is almost self-explanatory, allowing easy operation of the controller.

To change from the overview to the settings menu, press the „esc" key.

The green status LED (2) lights up when a relay is active, the red LED blinks when an error occurs.

Inputs are made with 4 buttons (3+4), the functions of which change depending on context.
The „esc" key (3) is always used to cancel or exit a menu.

If applicable there will be a request for confirmation as to whether the changes which have been made should be saved.

The function of each of the other three keys (4) is shown in the display line directly above the keys; the right-hand key generally has a confirmation and selection function.

Examples of key functions:

+/-	= increase/decrease values
▼/▲	= scroll menu down/up
yes/no	= approve/reject
Info	= additional information
Back	= to previous screen
ok	= confirm selection
Confirm	= confirm setting

Examples of display symbols:

Pump (rotates in operation)

Valve (direction of flow in black)

Collector

Storage/Buffer

Hot water storage

Heating

Temperature sensor

Heat exchanger

Warning / Error message

New information available

Logging is active

More symbols can be found in the chapter „Special functions"

E.2. - Commissioning help

Setup wizard

Would you like to start the setup wizard?

no   yes

esc

The first time the controller is switched on and after the language and time have been set, a query appears as to whether you want to parametrise the controller using the commissioning help or not. The commissioning help can also be terminated or called up again at any time in the special functions menu. The commissioning help guides you through the necessary basic settings in the correct order, and provides brief descriptions of each parameter in the display.

Pressing the "esc" key takes you back to the previous value so you can look at the selected setting again or adjust it if desired. Pressing the "esc" more than once takes you back step by step to the selection mode, thus cancelling the commissioning help. Finally, menu „4.2. - Manual" on page 20 should be used to test the switch outputs with the consumers connected, and to check the sensor values for plausibility. Then switch on automatic mode.

> **Caution** Observe the explanations for the the individual parameters on the following pages, and check whether further settings are necessary for your application.

> **Caution** Additional functions are not configured during the commissioning. If necessary, configure those after finishing the commissioning.

E.3. - Free commissioning

If you decide not to use the commissioning help, you should make the necessary settings in the following sequence:
- Menu „10. - Language" on page 51
- Menu „3.10. - Time and Date" on page 19
- Menu „7.1. - Program selection" on page 30
- Menu„5. - Settings" on page 21, all values
- Menu „6. - Protective functions" on page 26, if necessary
- Menu „7. - Special functions" on page 30, if necessary,
Finally, menu „4.2. - Manual" on page 20 should be used to test the switch outputs with the consumers connected, and to check the sensor values for plausibility. Then switch on automatic mode.

> **Caution** Observe the explanations for the the individual parameters on the following pages, and check whether further settings are necessary for your application.

> **Caution** Additional functions are not configured during the commissioning. If necessary, configure those after finishing the commissioning.

E.4   Menu sequence and menu structure

HC1 Mode   Auto
S1 DF-Drain   53°C
S2 Buffer   53°C
S3 DHW   36°C
S5 Flow   38°C
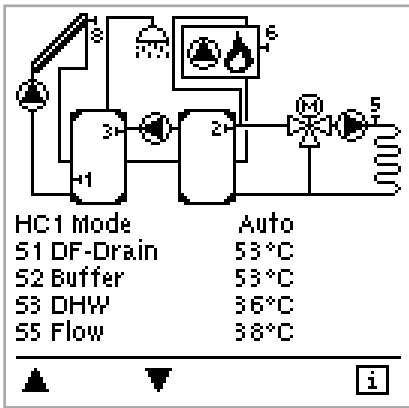
The graphics or overview mode appears when no key has been pressed for 2 minutes, or when the main menu is exited by pressing "esc".
The up and down buttons are used to scroll through the list of sensors and relays
.

Main menu

Exit main menu
1. Measurements
2. Statistics
3. Periods
4. Operating mode
5. Settings
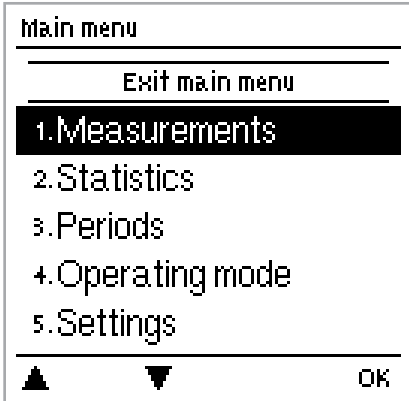
You can enter the Main menu by pressing the „esc" key. The following menus are available:

1. Measurements	Current temperature values with explanations
2. Statistics	Function control of the system with operating hours, etc.
3. Periods	Set Operating times, Time and Date
3. Operating mode	Automatic mode, manual mode or switch unit off
4. Settings	Set parameters needed for normal operation
5. Protections	Solar and frost protection, recooling, anti-seizing protection
6. Special functions	Program selection, sensor calibration, clock, additional sensor, etc.
7. Menu lock	Against unintentional setting changes
8. Service Data	For diagnosis in the event of an error
9. Language	Language selection

1. - Measurement values

```
1.Measurements
   Exit measurements
1.S1 DF-Drain sensor
                53°C
2.S2 HC Sensor
                53°C
3.S3 DHW
▲      ▼
```
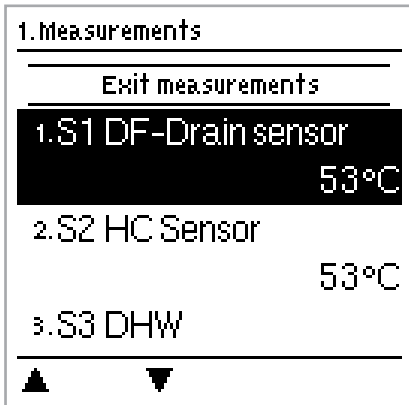
The menu "1. Measurement values" serves to display the currently measured temperatures.

The menu is closed by pressing "esc" or selecting "Exit measurement values".

Caution

If "Error" appears on the display instead of the measurement value, then there may be a defective or incorrect temperature sensor. If the cables are too long or the sensors are not placed optimally, the result may be small deviations in the measurement values. In this case the display values can be compensated for by making entries on the controller. Follow the instructions under „7.4. - Sensor calibration" on page 49.
What measurement values are displayed depends on the selected program, the connected sensors and the specific device design.

2. - Statistics
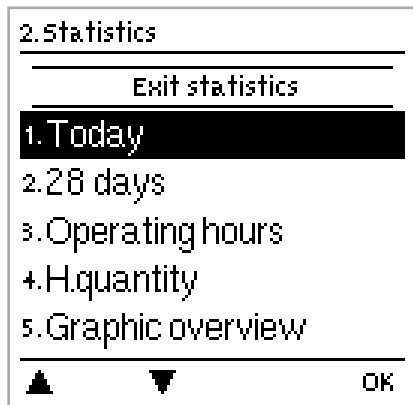
The menu "2. Statistics" is used for function control and long-term monitoring of the system.

The menu is closed by pressing "esc" or selecting "Exit statistics".

> **Caution**
> For analysis of the system data it is essential for the time to be set accurately on the controller. Please note that the clock continues to run for 24 hours if the mains voltage is interrupted, and must be reset afterwards. Improper operation or an incorrect time may result in data being deleted, recorded incorrectly or overwritten. The manufacturer accepts no liability for the recorded data!

2.1. - Today

Temperature diagram of the past 24 hours
In the graphical overview the characteristics of outdoor-, flow- etc.temperature for the present day is shown from 0-24h. The button on the right changes the unit of time and the two buttons on the left scroll through the diagram.

2.2. - 28 days

Flow temperature during the last 28 days
In the graphical overview the characteristics of e.g. the outdoor and flow temperature during the last 28 days are shown. The right button changes the unit of time (Days) and the two left buttons scroll through the diagram.

2.3. - Operating hours

Display of operating hours of the relays; various time ranges (day-year) are available.

2.4. - Heat quantity

Displays the heat quantity of the system

2.5. - Graphic overview
This provides a clearly-organised display of the data listed above as a bar graph. Various time ranges are available for comparison. The two left-hand side keys can be used to scroll through the data.

2.6. - Message log
Display of the last 20 events occurring in the system with indication of date and time.

2.7. - Reset/clear
Resetting and deleting the individual analyses. The function "All statistics" clears all analyses but not the error messages.

3. - Periods

```
3. Periods
─────────────────────
      Exit periods
1. Heating circuit day
3. Heating comfort
5. Hot water enable
11. Time & date
12. Daylight saving
─────────────────────
 ▲        ▼        OK
```
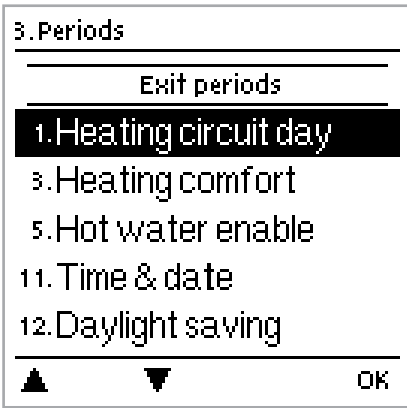
Menu "3. Times" is used to set the time, date, operating times for e.g. the heating circuit and hot water.

> **(!) Caution**   The associated temperature reference values are specified in menu 5 "Settings"!

The menu is closed by pressing "esc" or selecting "Exit periods".

3.1. - Heating circuit day

This menu is used to select the daytime mode times for the heating circuit; three time periods can be specified for each weekday and copied to other days.
Setting range: Three time ranges for each day of the week
Default: Mo-Su 6:00-22:00
Note: See 5. for the associated temperature settings

> **(!) Caution**   Times that are not specified are automatically considered to be nighttime mode. The set times are only taken into account in the heating circuit operating mode "Automatic"

3.2. - Heating circuit 2 day

This menu is used to select the daytime mode times for the second heating circuit; three time periods can be specified for each weekday and copied to other days.
Setting range: Three time ranges for each day of the week
Default: Mo-Su 6:00-22:00
Note: See 5. for the associated temperature settings

> **(!) Caution**   Times that are not specified are automatically considered to be nighttime mode. The set times are only taken into account in the heating circuit operating mode "Automatic"

3.3. - Heating comfort

This menu can be used to select a time range for each day of the week in which the heating circuit is supplied with an increased comfort temperature, e.g. for quick heating in the morning.
Setting range: One time range for each day of the week
Default: Mo-Su off
Note: See 5. for the associated temperature settings.

3.4. - Heating circuit 2 comfort

This menu can be used to select a time range for each day of the week in which the second heating circuit is supplied with an increased comfort temperature, e.g. for quick heating in the morning.
Setting range: One time range for each day of the week
Default: Mo-Su off
Note: See 5. for the associated temperature settings.

3.5. - Hot water enable

This menu is used to select the times when the domestic hot water heating is enabled (sensor 3); three time periods can be specified for each weekday and copied over to the following days.
Setting range: Three time ranges for each day of the week
Default: Mo-Su 6:00-22:00
Note: See 11. for the associated temperature settings

> **(!) Caution**   Times that are not specified are set to "disabled".

Periods

3.6. - Cooling periods

Cooling activity times
Set the desired time periods when the cooling (see „7.3.5. - Cooling" on page 35) should be active. 3 periods can be set per day, settings can also be copied to other days. Outside the set times the cooling function is switched off.
Setting range: from 00:00 to 23:59 /default setting: 06:00 to 22:00

3.7. - Thermostat

Thermostat activity times
Set the desired time periods when the cooling (see „7.3.4. - Thermostat" on page 34) should be active. 3 periods can be set per day, settings can also be copied to other days. Outside the set times the thermostat function is switched off.
Setting range: from 00:00 to 23:59 /default setting: 06:00 to 22:00

3.8. - Circulation

Circulation activity times
Set the desired time periods when the circulation (see „7.3.18. - Circulation" on page 46) should be active. 3 periods can be set per day, settings can also be copied to other days. Outside the set times the circulation function is switched off.
Setting range: from 00:00 to 23:59 /default setting: 06:00 to 22:00

3.9. - Antilegionella

Thermostat activity times
Set the desired time periods when the Antilegionella function (see „6.3. - Antilegionella" on page 27) should be active. 3 periods can be set per day, settings can also be copied to other days. Outside the set times the Antilegionella function is switched off.
Setting range: from 00:00 to 23:59 /default setting: 02:00 to 05:00

3.10. - Time and Date

This menu is used to set the current time and date.

> **!** **Caution** For analysis of the system data it is essential for the time to be set accurately on the controller. Please note that the clock keeps running for 24 hours if the mains voltage is interrupted, and must be reset afterwards.

3.11. - Daylight saving time

When this function is active, the controller's clock changes automatically to and from DST (DST, Daylight Savings Time).

4. - Operating Modes

```
4. Operating mode
─────────────────────
    Exit operating mode
─────────────────────
1.Heating circuit
                Auto
2.Manual
5.Dom. hot water
                Auto
─────────────────────
▲        ▼        Info
```
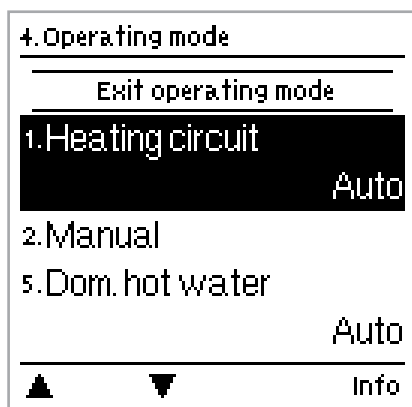
In menu 4. "Operating modes" the controller can either be placed in automatic mode, switched off, or placed in a manual operating mode

The menu is closed by pressing "esc" or selecting "Exit operating modes".

4.1. - Heating circuit

Auto = Automatic/Normal mode using the set times.
The controller works with the set operating times and the corresponding different reference flow temperature values only in the automatic mode.
After an interruption of the mains voltage the controller automatically returns to the last operating mode selected!
Continuous Day = The set values for day mode are used.
Continuous Night = The set values for night mode are used.
Reference Value = Fixed flow temperature regardless of the outdoor temperature. The desired flow temperature has to be set in menu 4.3.
14 day reference value = Specific fixed flow temperatures can be set for the next 14 days in menu 4.4. After 14 days, the reference temperature of the 14th day is used until the operating mode is changed.
Off = Heating circuit is switched off (except Frost protection).
Settings range: Auto, Continuous day, Continuous night, Reference value, 14 day reference, Off
Default: Automatic

4.2. - Manual

In Manual mode the individual relay outputs and the connected consumers can be checked for proper functioning and correct assignment.
Function in manual mode:
The relays and thus the connected consumer are switched on and off by pressing a key, with no regard to the current temperatures (which are displayed) and the parameters which have been set.

> ⚠️ **Danger**
> When operating mode "Manual" is activated, the current temperatures and the selected parameters are no longer considered. There is a danger of scalding or serious damage to the system. The operating mode "Manual" may only be used by specialists for brief function tests or during commissioning!

4.3. - Domestic Hot Water

The domestic hot water heating can be activated here. "Auto" makes use of the times set in the "times" menu (see menu 3.4), "On" activates continuously, and "Off" switches the DHW heating off. The times set here also apply for the enabling of the heat sources (e.g. Burner, Compressor, Thermostat), when those are configured to provide the energy for domestic hot water.
Settings range: Auto, On, Off
Default: Auto

5. - Settings

```
5.Settings
─────────────────────
      Exit settings
 6.Heating circuit
 8.DHW
 9.Solar
12.Burner
13.Boiler pump
───────────────────
 ▲       ▼        OK
```

The necessary basic settings required for the control function are made in menu "5. Settings".

> ⚠️ **Caution** This does not under any circumstances replace the safety devices to be provided by the customer!

The menu is closed by pressing "esc" or selecting "Exit settings".

> 🛈 **Caution** The following pages contain generally valid descriptions for the settings. Enumerations may vary .

> 🛈 **Caution** Configurable relay functions can be parametrised in their respective settings menu or the Special functions section.

5.1. - Difference

Settings for additional function, see also „7.3.1. - Difference" on page 32

5.2. - Heat Transfer

Settings for additional function, see also „7.3.2. - Heat transfer" on page 33

5.3. - Booster pump

Settings for additional function, see also „7.3.3. - Booster pump" on page 33

5.4. - Thermostat

Settings for additional function, see also „7.3.4. - Thermostat" on page 34

5.5. - Cooling

Settings for additional function, see also „7.3.5. - Cooling" on page 35

5.6. - Heating circuit

This menu contains all settings concerning the first heating circuit.

5.6.1. - Summer / Winter Day

Summer/Winter changeover in daytime mode
If this value is exceeded at outdoor sensor S7 during the daytime mode times, the controller automatically switches the heating circuit off = Summer mode.
If the outdoor temperature drops below this value, the heating circuit is switched on again = Winter mode.
Setting range: from 0°C to 30°C / default setting: 18°C

> 🛈 **Caution** In addition to the operating times in normal daytime operation, this setting is also valid for times with activated comfort temperature boost

5.6.2. - Summer / Winter Night

Summer/Winterchangeover in nighttime mode
If this value is exceeded at outdoor sensor S7 during the nighttime mode times, the controller automatically switches the heating circuit off = Summer mode.
If the outdoor temperature drops below this value, the heating circuit is switched on again = Winter mode.
Settings range: 0°C to 30°C / Default: 12°C

Heating circuit

5.6.3. - Curve

The characteristic curve is used to control the heat dissipation of the heating circuit relative to the outdoor temperature.

The demand for heat is different due to differences in the type of building/insulation/type of heating/outdoor temperature. For this reason the controller can make use of a normal straight curve (Setting simple) or a split curve (Setting split).

In the simple setting the curve can be adjusted with the help of the graphic diagram. The slope is changed, and the calculated reference flow temperature is displayed for -12 °C.

If the split mode is selected, the characteristic curve is adjusted in 3 steps. First the split point has to be set, after that the standard slope and finally the steepness of the curve after the split. While adjusting the curve the steepness of the slope and the calculated reference flow temperature for -12 °C outdoor temperature is displayed.
Settings range:
Characteristic curve : simple or split / Default: simple
Slope : 0.0...3.0 / Default: 0.8
Splitpoint at outdoor temp.: +10°C...-10°C
Angle: differs, depends on steepness and split point

The diagram shows the influence of the selected characteristic curve steepness (standard curve) on the calculated reference flow temperature of the heating circuit. The correct curve is appointed by setting the intersection point of the calculated maximum flow temperature and the minimum outdoor temperature.

Example:
Maximum calculated flow temperature 60°C at minimum outdoor temperature according to heat demand calculation -12°C.
The intersection results in a slope of 1.2.

> **!** **Caution** The following settings can be used for parallel translation of the characteristic curve for certain time periods such as daytime and nighttime mode.

5.6.4. - Day correction

Parallel translation of the characteristic curve
The day correction produces a parallel translation of the heating characteristic during the daytime operating hours, since depending on the outdoor temperature it is possible that the building may not be optimally heated with the set characteristic. If the characteristic is not optimised, the following situation may occur:
in hot weather - the spaces are too cold
in cold weather - the spaces are too hot
In this case, one should gradually reduce the characteristic slope in steps of 0.2, each time raising the day correction by 2-4 °C.
This procedure can be repeated several times as needed.
Setting range: from -10°C to 50°C / default setting: 5 °C

5.6.5. - Night correction

Parallel translation of the characteristic curve
The night correction produces a parallel translation of the heating characteristic during the nighttime operating hours. If a negative value is set for the night correction, the reference flow temperature is lowered accordingly during the nighttime operating hours. In this manner, primarily at night, but also during the day when no-one is at home, the room temperature is lowered, thus saving energy.
Example: A day correction of +5°C and a night correction of -2°C produces a reference flow temperature in nighttime operation that is 7°C lower.
Setting range: from -30°C to 30°C / default setting: -2°C

5.6.6. - Comfort temperature boost

Parallel translation of the characteristic curve
The comfort temperature boost is added to the set day correction. In this manner it is possible to carry out quick heating and/or a higher temperature in the living spaces at a certain time each day.
Setting range: from 0°C to 15°C / default setting: 0°C = off

Heating circuit

5.6.7. - Minimum Flow

The minimum flow temperature is the lower limit of the heating curve, and by this, the reference flow temperature of the heating circuit. Furthermore, this valule is the reference flow temperature for the frost protection (see also „6.2. - Frost protection" on page 26).
Settings range : 5°C to 30°C / Default : 15°C

5.6.8. - Maximum Flow

This value is the upper limit of the reference flow temperature of the heating circuit. If the temperature exceeds this value, the heating circuit is switched off until the temperature drops below again.
Settings range: 30 °C to 105 °C / Default: 45 °C

5.6.9. - Reference/actual -

Switch on hysteresis for additional heating
This setting determines the allowed undershoot of the heating circuit temperature below the calculated reference flow temperature. If the temperature at the storage sensor HC drops below the reference flow temperature by this value, the additional heating will start the additional heat source after a delay of 5 minutes.
Settings range: 1°C to 10°C / Default: 2°C

5.6.10. - Reference/actual +

Switch off hysteresis
This settings determines the allowed overstepping of the heating circuit temperature to the calculated reference flow temperature. If the temperature exceeds the reference flow temperature by this value, the additional heating is switched off.
Settings range: -10°C to 10°C / Default: -2°C

5.6.11. - Storage HC

Position of the heating circuit buffer sensors
This menu is used to select the sensor that is used as reference sensor for the heating circuit request.
Settings range: S1, S2, S4, S6, S8, VFS1 T, VFS2 T

> **Caution**
>
> The request only works when an additional heat source is set as additional function, and the heat source is also set as heat request source
> (see also
> Thermostat: „7.3.4. - Thermostat" on page 34;
> Burner: „7.3.10.3. - HC request" on page 39;
> Compressor: „7.3.12.3. - HC request" on page 40)

5.7. - Solid fuel boiler

Settings for additional function, see also „7.3.6. - Solid fuel boiler" on page 36

Domestic hot water

5.8. - Settings Domestic Hot Water (DHW)

> **Danger**
>
> This does not under any circumstances replace the safety devices to be provided by the customer!

5.7.1. - Hot water Minimum

Minimum Domestic Hot Water temperature
If this temperature is undershot outside the set time periods, the domestic hot water heating and the additional heating are switched on.
Settings range: 10 °C to 60°C / Default: 30°C

Domestic hot water

5.8.1. - DHW reference

Minimum DHW temperature during operating hours
If the set temperature is undershot and the DHW heating charge is enabled i.e. the current time period is set, the DHW additional heating is switched on.
Settings range: 10 °C to 60°C / Default: 45°C

> **Caution**
>
> The request only works when an additional heat source is set as additional function, and the heat source is also set as heat request source
> (see also
> Burner: „7.3.10.2. - DHW request" on page 39,
> Compressor: „7.3.12.2. - DHW request" on page 40)

5.8.2. - DHW Hysteresis

Domestic Hot Water hysteresis
Charging the DHW and heat request is switched off when the temperature at the DHW reference sensor reaches the temperature set in „5.7.1. - Hot water Minimum" / „5.8.1. - DHW reference" plus DHW hysteresis.
Settings range: 2°C to 20°C / Default: 10°C

5.8.3. - Buffer DHW charge

Charging the DHW from the buffer
Charging the Domestic Hot Water from the buffer storage is switched on when the temperature at the buffer sensor is 8°C warmer than at the DHW sensor. It is switched off again when the temperature at the buffer sensor is only 4°C warmer than the DHW sensor or the temperature at the DHW sensor reaches „5.7.1. - Hot water Minimum" resp. „5.8.1. - DHW reference"
Settings range: On, Off / Default: Off

5.8.4. - DHW Priority

Primary Domestic Hot Water charging
When this function is active: During DHW charging the reference flow temperature is lowered to "Minimum flow termperature" (see „5.6.7. - Minimum Flow" on page 23), resulting in the mixer turning to "closed" position.
Settings range: Yes, No / Default: No

5.9. - Solar

Settings for additional function, see also „7.3.7. - Solar" on page 37

5.10. - Solarbypass

Settings for additional function, see also „7.3.8. - Solar bypass" on page 38

5.11. - Heat exchanger

Settings for additional function, see also „7.3.9. - Heat exchanger" on page 38

5.12. - Burner

Settings for additional function, see also „7.3.10. - Burner" on page 39

5.13. - Boiler pump

Settings for additional function, see also „7.3.11. - Boiler pump" on page 40

5.14. - Compressor

Settings for additional function, see also „7.3.12. - Compressor" on page 40

5.15. - Glycol pump

Settings for additional function, see also „7.3.14. - Glycol pump" on page 41

5.16. - Storage loading pump

Settings for additional function, see also „7.3.13. - Loading pump" on page 41

5.17. - Heating circuit 2

Settings for additional function, see also „7.3.15. - Heating circuit 2" on page 42

5.18. - Return flow increase

Settings for additional function, see also „7.3.16. - Return flow increase" on page 45

5.19. - Circulation

Settings for additional function, see also „7.3.18. - Circulation" on page 46

Settings

5.20. - Error messages

Settings for additional function, see also „7.3.19. - Messages" on page 46

5.21. - Pressure control

Settings for additional function, see also „7.3.20. - Pressure monitor" on page 47

5.22. - Parallel operation R1

Settings for additional function, see also „7.3.21. - Parallel operation R1" on page 47

5.23. - Parallel operation R2

Settings for additional function, see also „7.3.22. - Parallel operation R2" on page 47

Mixer

5.24. - Mixer

This menu contains all settings regarding the mixer of the 1. heating circuit

5.24.1. - Turn time

The mixer is turned open or closed for this period of time before a new measurement is made to control the flow temperature.
Settings range: 0.5 sec. to 3 sec. / Default : 2 sec

5.24.2. - Pause factor

The calculated pause time of the mixer is multiplied with the value set here. If the pause factor is "1", the normal pause time is used, "0.5" will use half the normal pause time, "4" would quadruple the pause time.
Settings range: 0.1 to 4.0 / Default: 1.0

5.24.3. - Increase

If the temperature rises very fast, this value is added to the measured flow temperature so that the mixer's reaction is stronger. If the measured temperature does not rise any more, the measured value is used again. The measurement occurs once every minute.
Settings range: 0 to 20 / Default: 8

Room controller

5.25. - Room controller

The settings necessary for the optional room controller RC21 are made in this menu.
The 3 modes "continous day", "continous night" and "Time controlled/automatic" can be switched at the RC21. Additionally the reference temperature of the flow can be parallel translated by turning the control wheel. If the wheel is set to minimum, only the minimum values that can be set in the frost protective function „6.2. - Frost protection" on page 26 menu will be used.

5.25.1. - Room controller

This value is used to set the amount of influence in percent the room temperature has on the reference flow temperature. For every degree of deviation of the room temperature from the reference room temperature the percentage of the calculated reference flow temperature set here is added to or, respectively, subtracted from the reference flow temperature, as long as it is within the limits of the min. and max. flow temperatures that can be set in the protective functions.
Example: Reference room temp.: e.g. 25 °C ; room temp.: e.g. 20 °C = 5 °C deviation.
calculated reference temp..: e.g. 40 °C : room controller: 10 % = 4 °C
5 X 4 °C = 20 °C. According to this 20 °C are added to the reference flow temperature, resulting in 60 °C. If the value is higher than the one set in max. flow temp., the resulting temperature is only the one set in max. flow temp.
Settings range: 0 % to 20 % / Default: 0

5.25.2. - Room reference day

The desired room temperature for day mode. As long as this temperature is not reached, the reference flow temperature is raised or respectiveley lowered according to the percentage setting in "room controller". If "room controller" is set to 0%, this function is deactivated.
Settings range: 10 °C to 30 °C / Default: 20 °C

5.25.3. - Room reference night

The desired room temperature for night mode. As long as this temperature is not reached, the reference flow temperature is raised or respectiveley lowered according to the percentage setting in "room controller". If "room controller" is set to 0%, this function is deactivated.
Settings range: 10 °C to 30 °C / Default: 20 °C

5.25.4. - RC influence

Determines on which heating circuit the room controller has an effect.
Settings range: HC1, HC2, both / Default: HC1

6. - Protective functions

```
6.Protections
_____

     Exit protections
1.Seizing protection
2.Frost protection

                    on

▲      ▼          OK
```
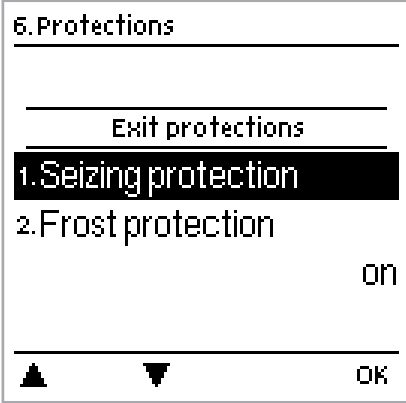
Menu "6. Protective functions" can be used to activate and set various protective functions. The menu is closed by pressing "esc" or selecting "Exit settings".

⚠ **Caution** This does not under any circumstances replace the safety devices to be provided by the customer!

6.1. - Anti-seizing protection

If the anti-seizing protection is activated, the controller switches the heat pump and the mixer on/off daily at 12:00 pm or weekly on Sundays at 12 pm for 5 seconds to prevent seizing of the pump/valve after long periods of inactivity.
Settings range: on, off/ Default: on

6.2. - Frost protection

A frost protection function can be activated for the heating circuit. If the outdoor temperature at sensor S7 drops below 1 °C and the heating circuit is switched off, the controller switches the heating circuit back on with the reference temperature set in min. flow temperature (see „5.6.7. - Minimum Flow" on page 23). As soon as the outdoor temperature exceeds 1°C the heating circuit is switched off again.
Frost protection - settings range: on, off / Default: on

🛇 **Caution** Switching the frost protection function off or setting the minimum flow temperature too low can lead to severe damage of the system.

Protective functions

 Caution
Antilegionella function is not shown in the menu "Protective functions". It is instead shown as submenu of the corresponding special function.
Special functions with AL are: Solid fuel boiler (s. „7.3.6. - Solid fuel boiler" on page 36), Solar (s. „7.3.7. - Solar" on page 37), Burner(s. „7.3.10. - Burner" on page 39), Circulation (s. „7.3.18. - Circulation" on page 46) and Compressor (s. „7.3.12. - Compressor" on page 40).

6.3. - Antilegionella

The Antilegionella function is used to heat the system in selected time periods to eliminate legionella bacteria.
Settings range: On, Off

6.3.1. - AL T set

This temperature has to be detected for the time set in AL residence time at the AL sensors for a successful heat up.
Settings range: 60-99 °C / Default setting: 70°C

6.3.2. - AL residence time

This determines the time span for which the AL T set temperature must be reached for a successfull AL heat up.
Settings range: 1-120 min / Default setting: 60 min

6.3.3. - Last AL heat up

This displays the date and time of the last successful heat up.
No settings

6.3.4. - AL sensor 1

This sensor is used to measure the AL temperature.
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

6.3.5. - AL Sensor 2

Optional AL sensor
When a second sensor is connected, both sensors must reach and hold the setpoint temperature for the residence time for a successful heat up.
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

6.3.6. - AL-times

During this periods the AL heat up is attempted.
Setting range: from 00:00 to 23:59 /default setting: 06:00 to 22:00

 Caution
This antilegionella function does not provide complete protection against Legionella, because the controller is dependent on sufficient energy being fed in, and it is not possible to monitor the temperatures in the entire range of the storage tanks and the connected piping system. To provide complete protection against Legionella bacteria, it must be ensured that the temperature is raised to the necessary temperature, and at the same time there must be water circulation in the storage tank and piping system by means of other additional energy sources and external control units.

 Caution
The antilegionella function is switched off at delivery.

 Danger
During the antilegionella function the storage tank is heated up above the set value "Tmax S(X)", which can lead to scalding and damage to the system.

 Caution
Whenever heating-up has been carried out with the antilegionella function switched on, an information message with the date appears on the display.

6.4. - Protective functions for Solar

> ⓘ **Caution**
>
> Antilegionella function is not shown in the menu "Protective functions". It is instead shown as submenu of the corresponding special function (see „7.3.7. - Solar" on page 37).

6.5. - System protection

Highest Priority Protection

System protection prevents overheating of system components by automatic shutdown of the solar pump. If "SProt Ton" is exceeded at the collector, the pump is switched off and stays off. The pump is activated again when the temperature drops below "SProt TOff".

System protection - Settings range: On / Off / Default setting: On
SP T on - Settings range: 60 °C to 150 °C / Default setting: 120 °C
SP T off - Settings range: 50 °C to T on minus 5 °C / Default setting: 115 °C

> ⚠ **Caution**
>
> When system protection is on, the temperature in the idle collector can be very high, thus increasing the pressure in the system. Pay close attention to the instructions of the system manufacturer.

6.6. - Collector protection

Collector protection prevents overheating of the collector. The pump is switched on to transfer heat from the collector to the storage tank.
If "CP Ton" is exceeded at the collector sensor, the pump is switched on until the temperature reaches "CP Toff" or the temperature "CP Tmax storage" is exceeded in the storage or pool.

Collectorprotection - Settings range: On / Off / Default setting: Off
CP T on - Settings range: 60°C to 150°C / Default setting: 110°C
CP T off - Settings range: 50°C to T on minus 5°C / Default setting: 100°C
CP Storage S(x) Max - Settings range: 0°C to 140°C / Default setting: 90°C

> ⚠ **Caution**
>
> System protection has a higher priority than collector protection. Even when the switch on conditions for collector protection are present, the solar pump will be switched off when SP T on is reached. Values for system protection will usually be higher than those of collector protection, depending on system components.

6.6.1. - Recooling

In hydraulic systems with solar when the recooling function is activated excess energy from the storage tank is fed back into the collector. This only takes place if the temperature in the storage tank is higher than the value "Recool Tsetpoint" and the collector is at least 20°C cooler than the storage tank and before the storage tank temperature has dropped below the value "Recool Tsetpoint". In systems with several storage tanks the setting applies to all storage tanks.

Recooling - Settings range: On, Off / Default setting: Off
Rückkühl Tsoll - Settings range: 0°C to 99°C / Default setting: 70°C

> ⓘ **Caution**
>
> Energy is lost via the collector when Recooling is active! Recooling should only be activated on rare occasions with minimum heat requirement, e.g. when no one is home for a longer period of time.

Protective functions

6.6.2. - Frost protection

A two-stage frost protection function can be activated. In stage 1 the controller switches the pump on for 1 minute every hour if the collector temperature drops below the set value "Frost stage 1".
If the collector temperature drops further to the set value "Frost stage 2" the controller switches the pump on continuously.
If the collector temperature then exceeds the value "Frost stage 2" by 2°C, the pump switches off again.

Frost protection setting range: On, Off / default setting: off
Frost stage 1 setting range: from -25°C to 10°C or off/default setting: 7°C
Frost stage 2 setting range: from -25°C to 8°C/default setting: 5°C

> **Caution**
>
> This function causes energy to be lost via the collector! It is normally not activated for solar systems with antifreeze. Observe the operating instructions for the other system components!

6.7. - Seizing protection

If the seizing protection is activated, the controller switches the relay in question and the connected consumer on every day at 12:00 (setting "daily") or weekly on Sundays at 12:00 (setting "weekly") for 5 seconds in order to prevent the pump and/or the valve from sticking after an extended stationary period.
Setting range: daily, weekly, off/default setting: Off

6.8. - Collector alarm

If this temperature is exceeded at the collector sensor when the solar pump is on a warning or error message is triggered. A warning message is shown in the display.
Collector alarm - Settings range: On / Off / Default setting: Off
Collector Tmax - Settings range: 0 °C to 110 °C / Default setting: 90 °C

7. - Special functions

```
7. Special functions

    Exit special functions
 1. Program selection
 2. Speed control R1
 3. Speed control R2
 6. Relay 1           Solar
 7. Relay 2           Boiler pump
 ▲        ▼           OK
```

Menu "7. Special functions" is used to set basic items and expanded functions.

⚠ **Caution**   Except for the time all settings should only be made by a specialist.

The menu is closed by pressing "esc" or selecting "Exit special functions".

🛈 **Caution**   The enumeration of the menus may vary from system to system.

7.1. - Program selection

The suitable hydraulic variant for the specific application is selected and set here (see „D.3. - Hydraulic variants / Systems / Diagrams" on page 10 ff). The associated diagram is displayed.
Settings range: 1-6/ Default setting: 1

🛈 **Caution**   Normally the program selection is made only once during initial commissioning by the specialist. Incorrect program selection can lead to unpredictable errors.

7.2. - Speed control

With speed control the KRS9 makes it possible to vary the speed of connected pumps. Speed controlled can be R1, R2, PWM and 0-10V output.

⚠ **Caution**   This function should only be activated by a specialist. Depending on the pump and pump level used, the minimum speed should not be set too low, because otherwise the pump or the system may be damaged. The information provided by the relevant manufacturer must also be observed! If in doubt, the min. speed and the pump stage should generally be set too high rather than too low.

7.2.1. - Variant

The following speed variants are available here:
Off: There is no speed control. The connected pump is only switched on or off with full speed.
Variant V1: After the purging time the controller switches to the set max. speed. If the temperature difference ΔT between the reference sensors (collector and storage tank) is less than the set value, then the speed is decreased by one stage after the control time elapses. If the temperature difference between the reference sensors is greater than the set value, then the speed is increased by one stage after the control time elapses. If the controller has adjusted the speed of the pump down to the lowest level and the ΔT between the reference sensors is ΔT off, the pump is switched off.
Variant V2: After the purging time the controller switches to the set min. speed. If the temperature difference ΔT between the reference sensors (collector and storage tank) is bigger than the set value, then the speed is increased by one level after the control time elapses. If the temperature difference ΔT between the reference sensors is below the set value, then the speed is decreased by one level after the control time elapses. If the controller has adjusted the speed of the pump down to the smallest level and the ΔT between the reference sensors is $T\Delta$off, the pump is switched off.
Variant V3: After the purging time the controller switches to the set min. speed. If the temperature at the reference sensor (collector) is higher than the setpoint to be set subsequently, then the speed is increased by one stage after the control time expires. If the temperature at the reference sensor (collector) is less than the setpoint to be set subsequently, then the speed is decreased by one stage after the control time expires.
Setting range: V1,V2,V3, off/default setting: off

Special functions

Speed control

7.2.2. - Type of pump

The type of speed controlled pump must be entered here.
Standard: Speed control for standard pumps.
0-10V: Speed control of e.g. High efficency pumps by 0-10V signal.
PWM: Speed control of e.g. High efficency pumps by PWM signal.

> **(!) Caution**
>
> The selection of the type of pump is not applicable for R1 and R2. Various other submenus may be inaccessible, depending on the additional function selected.

7.2.3. - Pump menu

This menu contains the settings for 0-10V or PWM pump.

> **(!) Caution**
>
> When selecting this submenu, you may be prompted to save the speed control settings.

7.2.3.1. - Pump

In this menu, preconfigured profiles for various pumps can be selected or can be set in the menu „Manual" (see „K.1. - Pump" on page 54). Please note that individual settings are still possible even when a profile has been selected.

7.2.4. - Purging time

During this time period, the pump is running with full speed (100%) to ensure trouble-free startup. After this time has passed, the pump is set to speed control and is set to max. speed or min speed, depending on the speed control variant „7.2.1. - Variant" on page 30 chosen. Purging time can not be applied with PWM or 0-10V output.
Settings range: 5 to 600 seconds / Default setting: 8 seconds

7.2.5. - Sweep time

Sweep time determines the inertia of the speed control to prevent strong fluctuations in temperature. Sweep time is the timespan for a complete change from minimum to maximum pump speed.
Settings range: 1 to 15 minutes / Default setting: 4 minutes

7.2.6. - max. speed

The maximum speed of the pump is specified here. During the setting the pump runs at the specified speed and the flow rate can be determined.
Settings range: 70% to 100% / Default setting: 100%

> **(!) Caution**
>
> The indicated percentages are guide values that may vary to a greater or lesser extent depending on the system, pump and pump level.

7.2.7. - min. speed

The minimum speed of the pump at relay R1 is specified here. During the setting the pump runs at the specified speed and the flow rate can be determined.
Settings range: („K.1.8. - Speed when „On"" on page 54) to max. speed -5% / Default setting: 30%

> **(!) Caution**
>
> The indicated percentages are guide values that may vary to a greater or lesser extent depending on the system, pump and pump level. 100% is the maximum possible voltage/frequency of the controller.

7.3. - Relay functions

Free, i.e. in the specific hydraulic variant unused relays, can be assigned to various additional functions. Every additional function can only be assigned once.

R1 and R2: ELRs / electronically speed controlled relays.

R3 to R6: Mechanical relay 230V

R7: Potential free relay

V1 and V2: PWM and 0-10 V output

Please pay special attention to the relay's technical information („B.1. - Specifications" on page 5).

The symbols shown here are displayed on the main overview screen when the special function is activated.

> **Caution**   The enumeration of the menus may vary.

7.3.1. - Difference

The relay is switched on when a specific temperature difference (Δ **T**) is reached.

7.3.1.1. - Difference

Settings range: On, Off

7.3.1.2. - Δ T Difference

Switch on - difference:
When this temperature difference is reached, the relay is switched on.
Settings range: 5-20 K / Default setting: 8 K
Switch off - difference:
When this temperature difference is reached, the relay is switched off.
Settings range: 2-19 K / Default setting: 4 K (the upper limit is the switch on - difference)

7.3.1.4. - DF source (sensor)

Heat source sensor for Difference function
This determines the sensor for the heat source.
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

7.3.1.5. - Diff Tmin

Minimum temperature at source sensor to enable the difference relay
When the temperature at the source sensor is below this level, the difference function is disabled.
Settings range: 0 to 90°C / Default setting: 20°C

7.3.1.3. - DF Drain (sensor)

Drain sensor / Target sensor for difference function
This determines the sensor for the target storage.
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

7.3.1.6. - Diff Tmax

Maximum temperature at target sensor to enable difference function
If the temperature at the target sensor exceeds this value, difference function is disabled.
Settings range: 0 to 99°C / Default setting: 60°C

Relay functions

Relay funtions

7.3.2. - Heat transfer

This is used to transfer energy from one storage to another with a pump.
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

7.3.2.1. - △ T Heat transfer

Temperature difference for heat transfer function.
When the temperature difference between HT Source and HT Drain reaches ΔT Heat Transfer On, the relay is switched on. As soon as the difference drops to ΔT Heat Transfer Off, the relay is switched off again.
On: Settings range: 5-20 K/ Default setting: 8 K
Off: Settings range: 2 K to ΔT on / Default setting: 4 K

7.3.2.2. - Setpoint

Setpoint temperature of the target storage
When this temperature is reached in the target storage, heat transfer is switched off.
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

7.3.2.3. - HT Tmin

Minimum temperature in source storage to enable the heat transfer
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

7.3.2.4. - HT Source (sensor)

This menu determines the sensor that is placed in the source storage.
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

7.3.2.5. - HT Drain (Target sensor)

This determines the sensor placed in the storage that is receiving energy from the source storage.
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

7.3.3. - Booster pump

Additional pump that fills the system at the start of every solar loading.

7.3.3.1. - Booster

Settings range: S1-S8, VFS1-2, active storage / Default: keine

7.3.3.2. - Fill time

Time the pump is switched on
This setting determines the length of time span the pump is switched on at the start of a solar loading.
Settings range: 0-120 seconds / Default setting: 30 seconds

7.3.4. - Thermostat

Thermostat is used for time and temperature controlled additional heating.
Settings range: On, Off

> **Danger!** Temperature values which are set too high can lead to scalding or damage to the system. Scalding protection must be provided by the customer!

> **Caution** In Energy savings mode, different settings may apply, see e.g. T eco.

7.3.3.3. - Thermostat

Settings range: On, Off

7.3.4.1. - TH Set

Taget temperature at thermostat sensor 1. Below this temperature, additional heating is switched on, till
TH set + hysteresis is reached.
Settings range: 0-100°C / Default setting: 50

7.3.4.2. - TH hysteresis

Hysteresis of setpoint temperature.
Settings range: -20-+20K / Default setting: 10K

7.3.4.3. - Thermostat sensor 1

T set is measured with thermostat sensor 1.
When thermostat sensor 2 is connected, the relay switches on when T set is undershot at thermostat Sensor 1, and switches off when T set + hysteresis at thermostat sensor 2 is exceeded.
Settings range: S1-S8, VFS1-2, active storage / Default setting: none

7.3.4.4. - Thermostat sensor 2

Optional switch off sensor
When T set + hysteresis is exceeded at the optional thermostat sensor 2, the relay is switched off.
Settings range: S1-S8, VFS1-2, active storage / Default setting: none

7.3.4.5. - T eco

For Energy saving mode
When Energy saving mode is active: During solar loading T eco is used instead of TH set. When the temperature drops below T eco at thermostat sensor 1, the relay is switched on and heats up to T eco + hysteresis.
Settings range: 0-100°C / Default setting: 40°C

7.3.4.6. - Storage

For Energy saving mode
Loading this storage activates the Energy saving mode
When this storage is loaded by solar, additional heating is only switched on when the temperature is below T eco.
Settings range: (Storage sensors) / Default setting: first storage

7.3.4.7. - Energy saving mode

Energy saving mode switches the heating on when T eco is undershot und heats up to T eco + hysteresis when solar loading is active.
Settings range: On, Off / Default setting: Off

7.3.4.8. - Periods

Thermostat activity times
Set the desired periods of time when the thermostat should be active. 3 periods can be set per day, settings can also be copied to other days. Outside the set times the thermostat is switched off.
Setting range: from 00:00 to 23:59 /default setting: 06:00 to 22:00

Relay functions

7.3.5. - Cooling

This is used to cool e.g. storages down to a reference temperature by radiating heat or for a time- and temperature controlled air conditioning.

7.3.5.1. - Cooling

Settings range: AC, simple, Off

7.3.5.2. - Co Tref

The reference temperature at thermostat sensor 1. If the temperature exceeds this value, the cooling function is switched on till Co Tref + hysteresis is reached.
Settings range: 0-100°C / Default: 50°C

7.3.5.3. - Hysteresis

If the temperature at the reference sensor drops below Co T ref + hysteresis, the relay is switched off.
Settings range: 0-100 / Default setting: -10

7.3.5.4. - Delay

Delay of cooling and additional heating
To prevent switching off additional heating or cooling when temperature fluctuations occur, it is possible to delay the switching of the corresponding relay for up to 5 minutes. When the conditions are still met for the whole time, the relay is switched.
Settings range: 0 to 60 minutes / Default: 1 minute

7.3.5.5. - Cooling sensor

Reference sensor of the cooling function.
Settings range: S1-S8, VFS1-2, active storage, RC / Default: none

7.3.5.6. - Cooling periods

Cooling activity times
Set the desired periods of time when the cooling should be active. 3 periods can be set per day, settings can also be copied to other days. Outside the set times the cooling function is switched off.
Setting range: from 00:00 to 23:59 /default setting: 06:00 to 22:00

Relay functions

7.3.6. - Solid fuel boiler

The relay is used to control the pump of an additional solid fuel boiler.

7.3.6.1. - Solid fuel boiler

Settings range: On, Off

7.3.6.3. - SF Tmax

Maximum temperature in the storage. If this is exceeded, the relay is switched off.
Settings range: Off to 100°C / Default setting: 70° C

7.3.6.2. - SF Tmin

Minimum temperature in the solid fuel boiler to switch on the pump. If the temperature at the boiler sensor is below this temperature, the relay is disabled.
Settings range: 0 ° C to 100° C / Default setting: 70° C

7.3.6.4. - Δ T SF

Switch on and Switch off condition for the temperature difference between boiler and storage.
Switch on temperature difference Δ T SF
Settings range: 5 to 20 K / Default setting: 8
Switch off temperature difference Δ T SF
Settings range: 0 K to Switch Δ T SF / Default setting: 7

7.3.6.5. - Boiler sensor

This determines the sensor that is used as boiler sensor.
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

7.3.6.6. - Storage sensor

This determines the sensor that is used as storage sensor.
Settings range: S1-S8, VFS1-2, Active storage/ Default setting: none

Relay functions

Relay functions

7.3.7. - Solar

This function is used to control a solar pump.

7.3.7.1. - Solar

Settings range: On, Off

7.3.7.2. - Tmin S (X)

Enable/start temperature at sensor X:
If this value is exceeded at the applicable sensor X and the other conditions are also met, then the controller switches on the associated pump and/or valve. If the temperature at the sensor drops below this value by 5°C, then the pump and/or the valve are switched off again.
Settings range : 0°C to 40°C / Default setting: 20°C

7.3.7.3. - ∆ T Solar S (X)

Switch-on/switch-off temperature difference for sensor X :
If this temperature difference between the reference sensors is exceeded and the other conditions are also met, then the controller switches the applicable relay on. When the temperature drops to ΔT Off, then the relay is switched off.
Settings range: ΔT from 6°C to 20°C / ΔT-Off from 2°C to 19°C
Default setting: ΔT 10°C / ΔT-Off 5°C.

> **❗ Caution**
> If the set temperature difference is too small, this may result in ineffective operation, depending on the system and sensor positions. Special switching conditions apply for speed control (see „7.2. - Speed control" on page 30).

7.3.7.4. - Tmax S (X)

Switch-off temperature at sensor X
If this value is exceeded at the applicable sensor X, the controller switches the associated pump and/or valve off. If the temperature falls below this value again and the other conditions are also met, then the controller switches the pump and/or valve on again.
Settings range: 0°C to 150°C / Default setting: 60°C

> **⚠ Danger**
> Temperature values which are set too high can lead to scalding or damage to the system. Scalding protection must be provided by the customer!

7.3.7.5. - Start aid function

With some solar systems, especially with vacuum tube collectors, it may occur that the measurement value acquisition at the collector sensor occurs too slowly or too inaccurately because the sensor is often not at the hottest position. When the start help is activated the following sequence is carried out:
If the temperature at the collector sensor increases by the value specified under "Increase" within one minute, then the solar pump is switched on for the set "Purging time" so that the medium to be measured can be moved to the collector sensor. If this still does not result in a normal switch-on condition, then the start help function is subject to a 5-minute lockout time.
Start help setting range: on, off/default setting: off
Purging time setting range: 2 ... 30 sec./default setting: 5 sec.
Increase setting range: 1°C....10°C/default setting: 3°C/min.

> **❗ Caution**
> This function should only be activated by a specialist if problems arise with acquisition of measurement values. In particular follow the instructions of the collector manufacturer.

7.3.8. - Solar bypass

Use the relay to switch a bypass valve or a bypass pump
This can direct the flow past the storage, when the flow temperature at the bypass sensor is lower than the storage that has to be charged.

7.3.8.1. - Solar bypass

Settings range: On; Off

7.3.8.2. - Variant

This menu determines wether a pump or valve is used to direct the flow through the bypass.
Settings range: Pump, Valve / Default setting: Valve

7.3.8.3. - Bypass sensor

The flow sensor for the bypass function is selected in this menu. Do not install in the return flow.
Settings range: S1-S8, VFS1, VFS2 / Default setting: none

7.3.9. - Heat exchanger

This adds a heat exchanger and a secondary pump to the solar circuit.
This menu is ony available when the additional function "Solar" (see „7.3.7.1. - Solar" on page 37) is active.

7.3.9.1. - Heat exchanger

Settings range: On / Off

7.3.9.2. - HE sensor

The sensor that is used for the control of the secondary pump. It should be installed on the primary side of the heat exhcanger.
Settings range: S1-S8, VFS1-2, active storage / Default: None

Relay functions

Special functions

7.3.10. - Burner

This function activates a heat request for a burner, as soon as Tref is undershot, until Tref + hysteresis is reached, or a request from the heating circuit or the domestic hot water is present. In Eco Mode, energy saving settings are used when the solar pump is running.

7.3.10.1. - Burner

Settings range: On, Off

7.3.10.2. - DHW request

The burner is started when the domestic hot water is in need of heat energy.
Settings range: On, Off / Default: On

7.3.10.3. - HC request

The burner is started when the heat circuit is in need of heat energy.
Settings range: On, Off / Default: On

7.3.10.4. - Antilegionella

See „6.3. - Antilegionella" on page 27

7.3.10.5. - Burner sensor

The reference sensor of the burner function. If Tref is undershot at this sensor, the burner is switched on.
Settings range: S1-S8, VFS1-2, active storage / Default: S6

7.3.10.6. - Delay

Switch on delay, applies to cooling and heat request. The burner is switched on after this time has passed, after all switch on conditions are met for the whole period of time. This is to prevent unnecessary switching caused by temperature fluctuations, or to give a regenerative energy source the time needed to heat up.
Settings range: 0-60 minutes / Default: 1 minute

7.3.10.7. - Eco mode (during solar charge)

The Eco mode can be used in two different modes for the burner.
TurnOff: When solar charge is active, the burner is always switched off.
TurnDown: When a heat request by the heating circuit is present, the burner is switched on when the switch-on conditions are met and an additional offset (see below) is undershot.
Domestic hot water is heated by the burner when Teco DHW is undershot.
Settings range: TurnOff, TurnDown, Off

7.3.10.8. - Heating circuit offset

This is the temperature offset setting for the Eco mode „TurnDown" (s.above.).
Settings range: -40 to -1 / Default: -10

7.3.10.9. - Burner offset

If the 0-10V outputs V1 and/or V2 are used for the burner, the requested temperature corresponds to the voltage . This setting alters the temperature.
Settings range: -20 to +20°K / Default: 10°K

Relay functions

Relay functions

7.3.11. - Boiler pump

The boiler pump is switched with the burner. This menu is only available when the additional function burner is active.

7.3.11.1. - Boiler pump

Settings range: On / Off

7.3.11.2. - BP Tmin

Minimum temperature at the burner sensor to enable the boiler pump. As soon as this temperature is exceeded at the set sensor, and sufficient ΔT is present, the relay is switched on.
Settings range: 0-80°C / Default: 20°C

7.3.11.3. - BP Tmax

Maximum temperature at the burner sensor. As soon as this temperature is exceeded, the relay is switched off.
Settings range: 0-80°C / Default: 70°C

7.3.12. - Compressor

This is used to switch a relay to control a compressor of a heat pump.

7.3.12.1. - Compressor

Settings range: On, Off

7.3.12.2. - DHW request

The compressor is started for a domestic hot water request.
Settings range: On, Off

7.3.12.3. - HC request

The compressor is started for a heating circuit request.
Settings range: On, Off

7.3.12.4. - Heat pump run time

The compressor is switched on for at least this time period.
Settings range: 10 to 30 min

7.3.12.5. - Heat pump idle time

After switching off, the relay is stopped for at least this period of time.
Settings range: 10 to 30 min

7.3.12.6. - Heat pump delay

When a heat request is present, the compressor waits for this period of time and switches on afterwards.
Settings range: 10 to 30 min

7.3.12.7. - Periods

Compressor activity times
Set the desired periods of time when the compressor should be active. 3 periods can be set per day, settings can also be copied to other days. Outside the set times the compressor is switched off.
Setting range: from 00:00 to 23:59 /default setting: 06:00 to 22:00

7.3.13. - Loading pump

This switches the load pump of a heat pump on when a heat request of the heating circuit or the domestic hot water is present. Only available when the compressor was activated.

7.3.14.2. - Loading pump

Settings range: On, Off

7.3.13.1. - Loading pump overrun

The load pump is running longer than the compressor for this period of time.
Settings range: 0-300 seconds / Default: 20 seconds

7.3.14. - Glycol pump

The glycol pump is switched in line with the compressor.
Function is only available when "compressor" is activated.

7.3.14.3. - Glycol pump

Settings range: On, Off

7.3.14.1. - Gylcol pump overrun

The pump is running longer than the compressor for this period of time.
Settings range: 0-300 seconds / Default: 20 seconds

Relay functions

7.3.15. - Heating circuit 2

A heating circuit pump is switched on and off depending on the reference value.
The reference temperature is calculated by a combination of outdoor temperature and characteristic curve.

7.3.15.1. - Heating circuit 2

Settings range: Off, Auto, Continous Day, Continous night, Reference Value, 14 day reference

7.3.15.2. - S/W Day

Summer/Winter changeover in daytime mode
If this value is exceeded at outdoor sensor S1 during the daytime mode times, the controller automatically switches the heating circuit off = Summer mode.
If the outdoor temperature drops below this value, the heating circuit is switched on again = Winter mode.
Settings range: from 0°C to 30°C / default setting: 18°C

> **Caution**
>
> In addition to the operating times in normal daytime operation, this setting is also valid for times with activated comfort temperature boost and activated low-rate period boost.

7.3.15.3. - S/W Night

Summer/Winterchangeover in nighttime mode
If this value is exceeded at outdoor sensor S1 during the nighttime mode times, the controller automatically switches the heating circuit off = Summer mode.
If the outdoor temperature drops below this value, the heating circuit is switched on again = Winter mode.
Settings range: 0°C to 30°C / Default: 12°C

7.3.15.4. - Variant

Conditions for the switch off of the heating circuit pump
In mode flow (FL) the pump is switched off when the reference temperature is exceeded.
In mode "Summer/Winter" (S/W), the pump is switched off at Tmax in winter mode, and always switched off in summer mode.
Settings range : FL / SW / Default : FL

7.3.15.5. - Curve

The characteristic curve is used to control the heat dissipation of the heating circuit relative to the outdoor temperature.
The demand for heat is different due to differences in the type of building/insulation/type of heating/outdoor temperature. For this reason the controller can make use of a normal straight curve (Setting simple) or a split curve (Setting split).
In the simple setting the curve can be adjusted with the help of the graphic diagram. The slope is changed, and the calculated reference flow temperature is displayed for -12 °C.
If the split mode is selected, the characteristic curve is adjusted in 3 steps. First the split point has to be set, after that the standard slope and finally the steepness of the curve after the split. While adjusting the curve the steepness of the slope and the calculated reference flow temperature for -12 °C outdoor temperature is displayed.
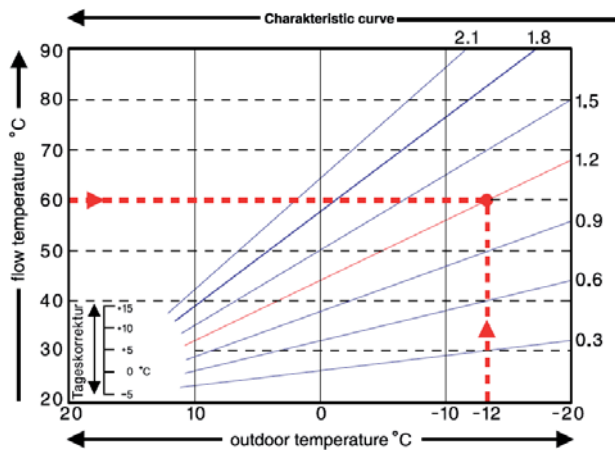*Settings range:*
Characteristic curve : simple or split / Default: simple
Slope : 0.0...3.0 / Default: 0.8
Splitpoint at outdoor temp.: +10°C...-10°C
Angle: differs, depends on steepness and split point

The diagram shows the influence of the selected characteristic curve steepness (standard curve) on the calculated reference flow temperature of the heating circuit. The correct curve is appointed by setting the intersection point of the calculated maximum flow temperature and the minimum outdoor temperature.

Example:
Maximum calculated flow temperature 60°C at minimum outdoor temperature according to heat demand calculation -12°C.
The intersection results in a slope of 1.2.

> **(!) Caution**
>
> The following settings can be used for parallel translation of the characteristic curve for certain time periods such as daytime and nighttime mode.

7.3.15.6. - Day correction

The day correction produces a parallel translation of the heating characteristic during the daytime operating hours, since depending on the outdoor temperature it is possible that the building may not be optimally heated with the set characteristic. If the characteristic is not optimised, the following situation may occur:
in hot weather - the spaces are too cold
in cold weather - the spaces are too hot
In this case, one should gradually reduce the characteristic slope in steps of 0.2, each time raising the day correction by 2-4 °C.
This procedure can be repeated several times as needed.
Setting range: from -10°C to 50°C / default setting: 5 °C

7.3.15.7. - Night correction

Parallel translation of the characteristic curve
The night correction produces a parallel translation of the heating characteristic during the nighttime operating hours. If a negative value is set for the night correction, the reference flow temperature is lowered accordingly during the nighttime operating hours. In this manner, primarily at night, but also during the day when no-one is at home, the room temperature is lowered, thus saving energy.

Example: A day correction of +5°C and a night correction of -2°C produces a reference flow temperature in nighttime operation that is 7°C lower.
Setting range: from -30°C to 30°C / default setting: -2°C

7.3.15.8. - Comfort temperature boost

Parallel translation of the characteristic curve
The comfort temperature boost is added to the set day correction. In this manner it is possible to carry out quick heating and/or reach a higher temperature in the living spaces at a certain time each day.
Setting range: from 0°C to 15°C / default setting: 0°C = off

Relay functions

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7.3.15.9. - Minimum Flow

The minimum flow temperature is the lower limit of the heating curve, and by this, the reference flow temperature of the heating circuit. Furthermore, this valule is the reference flow temperature for the frost protection (see also „6.2. - Frost protection" on page 26).
Settings range : 5°C to 30°C / Default : 15°C

7.3.15.10. - Maximum Flow

This value is the upper limit of the reference flow temperature of the heating circuit. If the temperature exceeds this value, the heating circuit is switched off until the temperature drops below again.
Settings range: 30 °C to 105 °C / Default: 45 °C

7.3.15.11. - Reference/actual -

Switch on hysteresis for additional heating
This setting determines the allowed undershoot of the heating circuit temperature below the calculated reference flow temperature. If the temperature at the storage sensor HC drops below the reference flow temperature by this value, the additional heating will start the additional heat source after a delay of 5 minutes.
Settings range: 1°C to 10°C / Default: 2°C

> **Caution**
> The heat request is started if the flow temperature (resp. one of the flow temperatures when two heating circuits are active) is below the reference temperature for 5 minutes.

7.3.15.12. - Reference/actual +

Switch off hysteresis
This setting determines the allowed overstepping of the heating circuit temperature to the calculated reference flow temperature. If the temperature exceeds the reference flow temperature by this value, the additional heating is switched off.
Settings range: -10°C to 10°C / Default: -2°C

> **Caution**
> If sensor S4 is not connected, the additional heating source (connected to relay R5) is switched off if the heating circuit sensor S2 (resp. the heating circuits S2 and S3) reach or exceed the reference flow temperature.

> **Caution**
> To prevent the additional heating source from switching on unnecessarily, it is recommended to install sensor S4 on the same level or lower than the heating circuit outputs in the buffer.

7.3.15.13. - Outdoor sensor

Reference sensor for the outdoor temperature
Settings range: S1-S8, VFS1-2, active storage

7.3.15.14. - Flow sensor

Reference sensor for the flow temperature of the 2nd heating circuit
Settings range: S1-S8, VFS1-2, active storage

7.3.16. - Return flow increase

This function is used to raise the temperature of e.g. the return flow by making it pass through the storage.
Settings range: On, Off

7.3.16.1. - Return flow increase

Settings range: On, Off

7.3.16.2. - RF Tmin

Minimum temperature at storage sensor to enable the return flow increase. When this temperature is exceeded at storage sensor and sufficient ∆T is present, the relay is switched on.
Settings range: 0-80°C / Default setting: 20°C

7.3.16.3. - RF Tmax

Maximum temperature at the return flow sensor. If this temperature is exceeded, the relay is switched off.
Settings range: 0-80°C / Default setting: 70°C

7.3.16.4. - ∆T return flow

Switch-on temperature difference:
When this difference is exceeded between return flow sensor and storage sensor, the relay is switched on.
Settings range: 5-20 K / Default setting: 8 K
Switch-off temperature difference:
When this difference is exceeded between return flow sensor and storage sensor, the relay is switched off.
Settings range: 2-19 K (limited by ∆T Storage RF On) / Default setting: 4 K

7.3.16.5. - Return flow (sensor)

Determines the sensor for return flow increase.
Settings range: S1-S8, VFS1-2, active Storage / Default setting: none

7.3.16.6. - Storage (sensor)

Determines the storage sensor
Settings range: S1-S8, VFS1-2, active Storage / Default setting: none

7.3.17. - Domestic hot water valve

This function is used for a time and temperature control of a domestic hot water valve
Settings range: On, Off

Relay functions

7.3.18. - Circulation

A ciculation pump at the domestic hot water storage is temperature and time controlled by this function.

7.3.18.1. - Circulation

Settings range: On, Off

7.3.19.1. - Circulation Tmin

If the temperature drops below this value during a circulation period at the circulation sensor, or a heat request is caused due to water being tapped, the circulation pump is started.
Settings range : 10° C to 90° C / Default : 51° C

7.3.19.2. - Circulation hysteresis

If Circulation Tmin is exceeded by this value, the circulation pump is switched off.
Settings range : 1K to 20K / Default : 5K

7.3.19.3. - Circulation sensor

Determines the sensor that is used as reference sensor for the circulation.
Settings range: S1-S8, VFS1-2, active storage / Default: none

7.3.19.4. - Circulation pause time

To prevent too frequent switching of the circulation pump, a pause period can be activated here, that determines the minimum pause between switch off and switch on.
Settings range: Off to 20 min / Default: 15 min

7.3.19.5. - Purging time

If the circulation pump cannot reach the necessary temperature after this time has passed, the pump is switched off. This is to prevent unnecessary long running of the pump, e.g. because the hot water storage is too cold.
Settings range: 1...20 min / Default: 2 min

7.3.19.6. - Circulations periods

Operating times of the circulation
Set the desired periods of time when the circulation should be active. 3 periods can be set per day, settings can also be copied to other days. Outside the set times the cooling function is switched off.
Setting range: from 00:00 to 23:59 /default setting: 06:00 to 22:00

7.3.19. - Messages

The relay is switched on when one or more of the protective functions are activated.
This function can be inverted, so that the relay is always on until a protective functions goes active.
Settings range: On, Inverted, Off / Default: Off

Collector protection
System protection
Frost protection
Recooling
Antilegionella
Messages

Relay functions

7.3.20. - Pressure monitor

The relay is switched on when the pressure drops below set minimum or exceeds the set maximum pressure.
Settings range: On, Off / Default setting: Off

7.3.20.1. - Pressure monitor

This menu is used to configure the system pressure montoring via direct sensor. As soon as the set limits are exceeded, the relay is switched on.

7.3.20.2. - RPS1 / RPS2

Type of pressure sensor
This menu is used to determine the type of pressure sensor used.
Please note: If e.g. VFS1 is connected, RPS1 option is not shown.
Settings range: Off; 0-0.6 bar; 0-1 bar; 0-1.6 bar; 0-2.5 bar; 0-4 bar; 0-6 bar; 0-10 bar
Default setting: Off

7.3.20.3. - Pmin

Minimum pressure. If this value is undershot, an error message is displayed and the relay is switched on.
Settings range: Off; 0,0 to 1.6 bar
Default setting:

7.3.20.4. - Pmax

Maximum pressure. If this value is exceeded, an error message is displayed and the relay is switched on.
Settings range: Off; 0,0 to 10 bar
Default setting: 1.6 bar

7.3.21. - Parallel operation R1   7.3.22. - Parallel operation R2

The relais is switched on at the same time as the set relay R1 or R2.

7.3.21.2. - Parallel operation R (X)

Settings range: On, Off

7.3.21.1. - Delay

This menu determines how long after the start of R1 or R2 the parallel relay is switched on.
Settings range: 0-120 seconds / Default setting: 30 seconds

7.3.21.3. - Followup time

This menu determines how long after the switch off of R1 or R2 the parallel relay is switched off.
Settings range: 0-120 seconds / Default setting: 30 seconds

7.3.23. - Always on

Relay is permanently switched on.

7.3.24. - Heat quantity

Constant flow

When the heat metering mode „Flow rate" is selected, an approximated heat quantity is calculated using the values the user has to enter. These are type of glycol/AntiFreeze, glycol portion and flow rate. These values are put into correlation with the temperature data of collector sensor and storage sensor. If necessary a correction value for ΔT can be set: Since for the heat metering the collector and the storage temperature are used, a difference to the flow respectively return flow temperature can be compensated by changing Offset ΔT accordingly.

Example:

Displayed collector temp. 40°C, measured flow temperature 39°C, displayed storage temperature 30°C, measured return temperature 31°C = results in a correction value of -20% (displayed ΔT 10K, real ΔT 8K = -20% correction)

> **(!) Caution** The heat quantity measured in the mode "Constant Flow Rate" is a calculated approximation for function control of the system.

7.3.24.1. - Flow sensor (X)

This determines the sensor that is used to measure the flow temperature.
Settings range: S1-S8, VFS1-2, active collector, active storage/ Default setting: S1

7.3.24.2. - Return sensor

This determines the sensor that is used to measure the return temperature.
Settings range: S1-S8, VFS1-2, Aktiver Collector, Active storage/ Default setting: S1

7.3.24.3. - Anti freeze type

Set the type of anti freeze used. If none is used, please set to 0.
Settings range: Ethylen, Propylen / Default setting: Ethylen

7.3.24.4. - Glycole percentage

The percentage of anti freeze agent in the system.
Settings range: 0-100% / Default setting: 45%

7.3.24.5. - Flow rate (X)

Flow rate that is used to calculate the heat quantity
This determines the flow rate in litres per minute that is used for the calcualtion of the heat quantity.
Settings range: 0-100 l/min / Default setting: 5 l/min

7.3.24.6. - Offset Δ T

Correction value for temperature difference
Since for the heat metering the collector and the storage temperature are used, a difference to the flow respectively return flow temperature can be compensated by changing Offset ΔT accordingly.
Example:
Displayed collector temp. 40°C, measured flow temperature 39°C, displayed storage temperature 30°C, measured return temperature 31°C = results in a correction value of -20% (displayed ΔT 10K, real ΔT 8K = -20% correction)
Settings range: -50 to +50% / Default setting: 0%

7.3.24.7. - VFS (X)

The VFS type is set here.
Settings range: Off; 1-12; 1-20; 2-40; 5-100; 10-200; 20-400 / Default setting: Off

7.3.24.8. - VFS - Position

This setting determines the position of the VFS sensor.
Settings range: flow, return / Default setting: return

> **⚠ Caution** To prevent damage to the Vortex Flow Sensor it is strongly recommended to install it in the return flow. If it is necessary to install in the flow, it is imperative not to exceed the maximum temperatures of the sensor! (0° C to 100°C and -25°C to 120°C short term)

7.3.24.9. - Reference sensor

The reference sensor used for the heat metering is set here.
Settings range: S1-S8, VFS1-2, active collector, active storage/ Default setting: S1

7.3.25. - Pressure monitor

A message is shown when the pressure drops below set minimum or exceeds the set maximum pressure.
No relay is switched, for that see „7.3.20. - Pressure monitor" on page 47.

7.3.26. - Pressure monitor

A message is shown and the LED flashes when the pressure deviates from the set minimum or maximum value.
Settings range: On, Off / Default setting: Off

7.3.26.1. - RPS1 / RPS2

Type of pressure sensor
This menu is used to determine the type of pressure sensor used.
Please note: If e.g. VFS1 is connected, RPS1 option is not shown.
Settings range: Off; 0-0.6 bar; 0-1 bar; 0-1.6 bar; 0-2.5 bar; 0-4 bar; 0-6 bar; 0-10 bar
Default setting: Off

7.3.26.2. - Pmin

Minimum pressure.
If this value is undershot, an error message is displayed and the relay is switched on.
Settings range: Off; 0,0 to 1.6 bar
Default setting:

7.3.26.3. - Pmax

Maximum pressure.
If this value is exceeded, an error message is displayed and the relay is switched on.
Settings range: Off; 0,0 to 10 bar
Default setting: 1.6 bar

7.4. - Sensor calibration

Deviations in the temperature values displayed, for example due to cables which are to long or sensors which are not positioned optimally, can be compensated for manually here. The settings can be made for each individual sensor in steps of 0.8°C (temperature) resp. 0.2% of the measuring range of the VFS / RPS sensor (flow rate / pressure) per step.
Offset Sensor Settings range: -100 ... +100 / Default setting: 0

> **Caution**
> Settings are only necessary in special cases during commissioning and are only to be made by a specialist. Wrong settings may lead to malfunctions.

7.5. - Commissioning

Starting the commissioning help guides you in the correct order through the basic settings necessary for commissioning, and provides brief descriptions of each parameter in the display.
Pressing the "esc" key takes you back to the previous value so you can look at the selected setting again or adjust it if desired. Pressing the "esc" more than once takes you back to the selection mode, thus cancelling the commissioning help.

> **Caution**
> May only be started by a specialist during commissioning! Observe the explanations for the the individual parameters in these instructions, and check whether further settings are necessary for your application.

7.6. - Factory settings

All of the settings that have been made can be reset, thus returning the controller to its delivery state.

> **Caution**
> The entire parametrisation, analyses, etc. of the controller will be lost irrevocably. The controller must then be commissioned once again.

Special functions

7.7. - SD-Card

Settings for the data logging and firmware update function with SD card.

7.7.1. - Logging

Activate the logging function and set the file format used.
Settings range: CSV, TSV, JSON, Off / Default setting: Off

7.7.2. - Free storage

Displays the available space on the SD card.

7.7.3. - Load configuration

This is used to load settings from the SD card.

> ⚠️ **Caution** Current settings are over written.

7.7.4. - Save configuration

All settings can be stored on the SD card.

7.7.5. - Firmware update

This is used to update the controllers firmware with a version saved on the SD card.

> ⚠️ **Caution** Under no circumstances switch off the controller during update, since this can lead to irrevocable damages. Settings may be changed by an update. Reset the controller to factory settings after reset and commence the commissioning process.

7.7.6. - Unmount

This is used to unmount the SD card from the system.

> ⚠️ **Caution** To prevent damage to the SD card or loss of data, please unmount the card before removing it from the controller.

7.8. - Sleep mode

When this function is active, the controller's backlight is automatically switched off when no button has been pressed for 2 minutes.

8. - Menu lock

```
8. Menu lock


        Exit menu lock
1. Menu lock

                    off


  ▲        ▼           Info
```
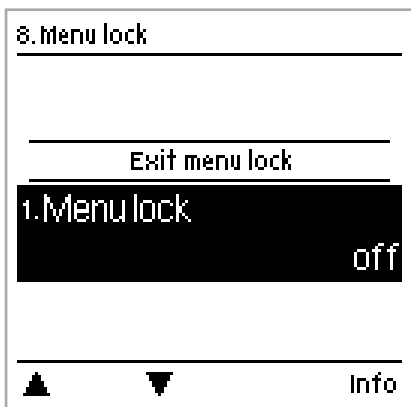
Menu „8. - Menu lock" can be used to secure the controller against unintentional changing of the set values.

The menu is closed by pressing "esc" or selecting "Exit menu lock".

The menus listed below remain completely accessible despite the menu lock being activated, and can be used to make adjustments if necessary:
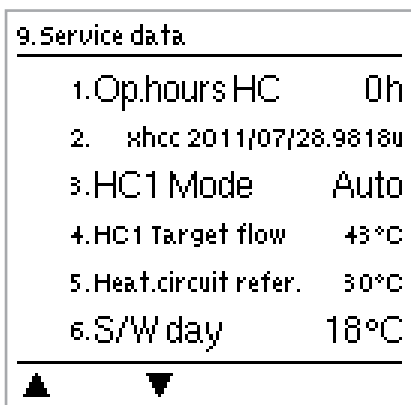
1.   Measurement values
2.   Statistics
3.5.   Time and Date
8.   Menu lock
9.   Service values

To lock the other menus, select "Menu lock on".
To enable the menus again, select "Menu lock off".
*Setting range: On, Off / default setting: off*

9. - Service values

```
9. Service data

  1. Op.hours HC      0h

  2.    xhcc 2011/07/28.9818u

  3. HC1 Mode       Auto

  4. HC1 Target flow   43°C

  5. Heat.circuit refer.  30°C

  6. S/W day        18°C
  ▲        ▼
```

The menu „9. - Service values" can be used for remote diagnosis by a specialist or the manufacturer in the event of an error, etc.

Service values are stored on the SD card when logging is active.

10. - Language

```
10. Language


        Exit language
1. Deutsch

2. English



  ▲        ▼           OK
```
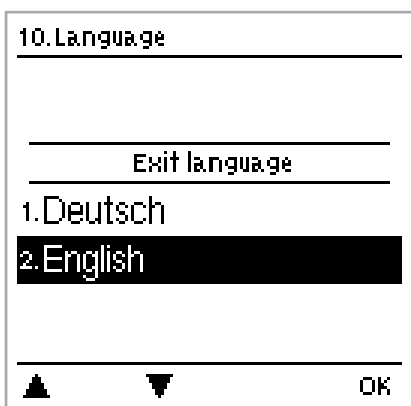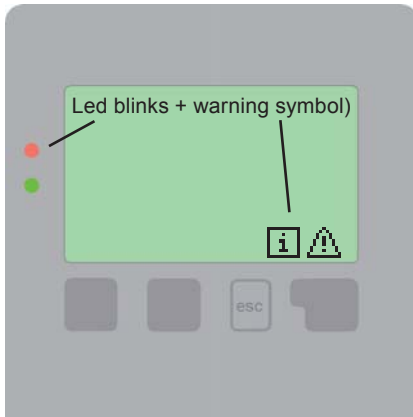
Menu „10. - Language" can be used to select the menu language. This is queried automatically during initial commissioning.
The choice of languages may differ, however, depending on the device design.

Malfunctions

Z.1.   Malfunctions with error messages

Led blinks + warning symbol)

If the controller detects a malfunction, the red light flashes and the warning symbol also appears in the display. If the error is no longer present, the warning symbol changes to an info symbol and the red light no longer flashes.
To obtain more detailed information on the error, press the key underneath the warning or info symbol.

⚠ Danger	Do not try to solve any malfunction yourself. Consult a specialist in the event of an error!

Possible error messages:	Notes for the specialist:
Sensor x defective	Means that either the sensor, the sensor input at the controller or the connecting cable is/was defective (Resistance table see „B.2. - Temperature resistance table for Pt1000 sensors" on page 5).
Collector alarm	Means that the collector has fallen/fell below the temperature set under menu „6.8. - Collector alarm" on page 29.
Restart	Means that the controller was restarted, for example due to a power failure. Check date&time!
Time & Date	This message appears automatically after a mains failure because time&date have to be checked, and reset if necessary.

Z.2   Replacing the fuse

> ⚠️ **Danger**
>
> Repairs and maintenance may only be performed by a specialist. Before working on the unit, switch off the power supply and secure it against being switched on again unintentionally! Check for the absence of power!

> ⚠️ **Danger**
>
> Only use the supplied spare fuses or fuses of the same design with the following specifications: T630mA / 250V and T2A / 250V .

If the mains voltage is switched on and the controller still does not function or display anything, then the internal device fuse may be defective. In that case, open the device as described under C, remove the old fuse and check it. Exchange the defective fuse for a new one, locate the external source of the error (e.g. pump) and exchange it. Then first recommission the controller and check the function of the switch outputs in manual mode as described under „4.2. - Manual" on page 20

Z.2.1

Fuse T630mA / 250V

Fuses T2A / 250V
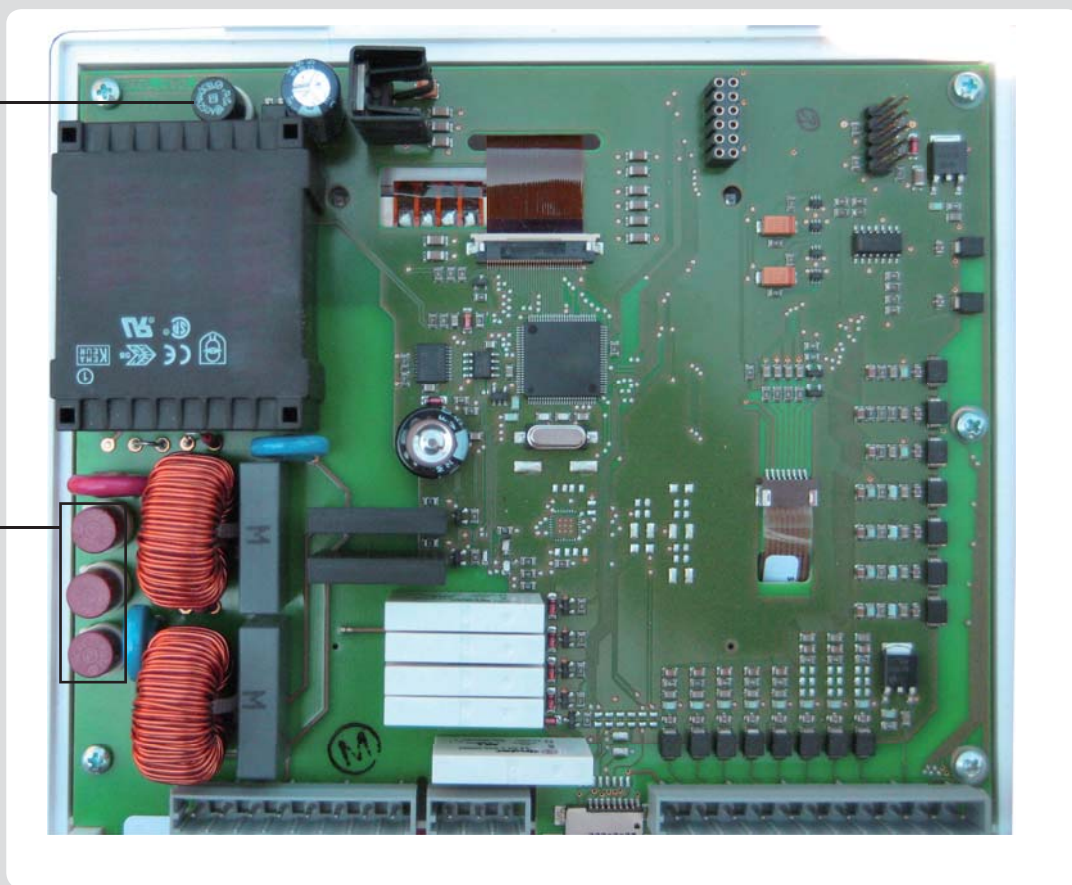
Z.3   Maintenance

> ⓘ **Caution**
>
> In the course of the general annual maintenance of your heating system you should also have the functions of the controller checked by a specialist and have the settings optimised if necessary.

Performing maintenance:
- Check date and time (see „3.10. - Time and Date" on page 19
- Assess/check plausibility of analyses (see „2. - Statistics" on page 17)
- Check error memory (see „2.6. - Message log" on page 17)
- Verify/check plausibility of the current measurement values (see „1. - Measurement values" on page 16)
- Check the switch outputs/consumers in manual mode (see„4.2. - Manual" on page 20)
- Possibly optimise the parameter settings

K. - Appendix

Manual pump configuration (see „7.2. - Speed control" on page 30). It is recommended however to use the preset profiles.

K.1. - Pump

In this menu, preconfigured profiles for various pumps can be selected. Please note that individual settings are still possible even when a profile has been selected.

K.1.1. - Output Signal

This menu determines the type of pump used: Solar pumps perform at their highest power when the signal is also at the max, heating pumps on the other hand are set to highest power wenn the control signal is at the lowest. Solar = normal, heating = Inverted.
Settings range: Normal, Inverted / Default setting: Normal

K.1.2. - PWM off

This signal is put out when the pump is switched off (pumps that can detect cable break need a minimum signal).
Settings range: (Solar:) 0 to 50% / Default setting: 0% - (Heating:) 50% to 100% / Default setting: 100%

K.1.3. - PWM on

This signal is needed to turn the pump on at minimum speed.
Settings range: (Solar:) 0 to 50% / Default setting: 10% - (Heating:) 50% to 100% / Default setting: 90%

K.1.4. - PWM Max

This determines the output signal for the highest speed of the pump, that is used e.g. during purging or manual operation.
Settings range: (Solar:) 50 to 100% / Default setting: 100% - (Heating:) 0% to 50% / Default setting: 0%

K.1.5. - 0-10V off

This voltage is put out when the pump is turned off (pumps that can detect cable break need a minimum voltage).
Settings range: (Solar:) 0,0 to 5,0 V / Default setting: 1.0 V - (Heating:) 5.0 to 0.0 V / Default setting: 4.0 V

K.1.6. - 0-10V on

This voltage is needed to turn the pump on at minimum speed.
Settings range: (Solar:) 0.0 to 5.0 V / Default setting: 1.0 V - (Heating:) 5.0 to 10.0 V / Default setting: 9.0 V

K.1.7. - 0-10V Max

This determines the output voltage for the highest speed of the pump, that is used e.g. during purging or manual operation
Settings range: (Solar:) 5.0 to 10.0 V / Default setting: 10.0 V - (Heating:) 0.0 to 5.0 V / Default setting: 0.0 V

K.1.8. - Speed when „On"

This menu determines the calculated and displayed speed of the pump. If e.g. 30% is set here and the signal set in „PWM on/0-10V on" is put out, 30% speed is displayed. When the signal set in „PWM max/0-10V max" is put out, 100% speed is displayed. Everything in between is calculated accordingly.
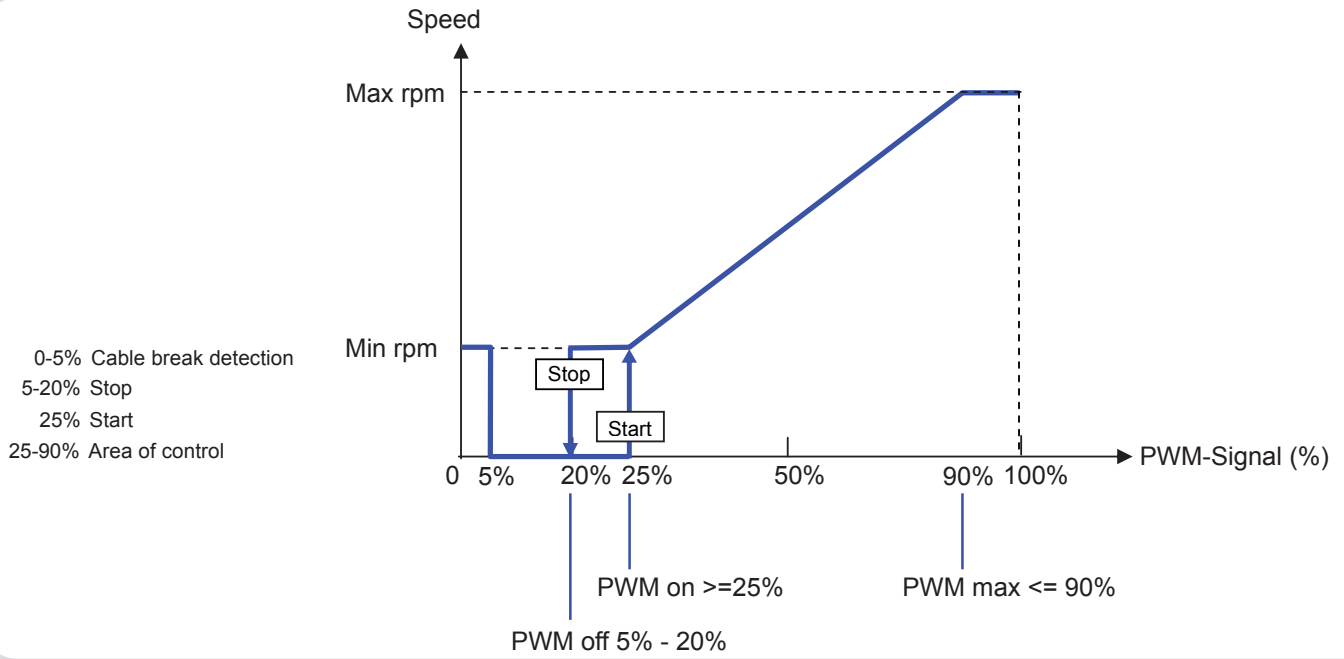*Settings range: 10 to 90 % / Default setting: 30 %*

> **Caution** This function has no influence on the regulation, but changes only the speed displayed.

K.1.9. - Show signal

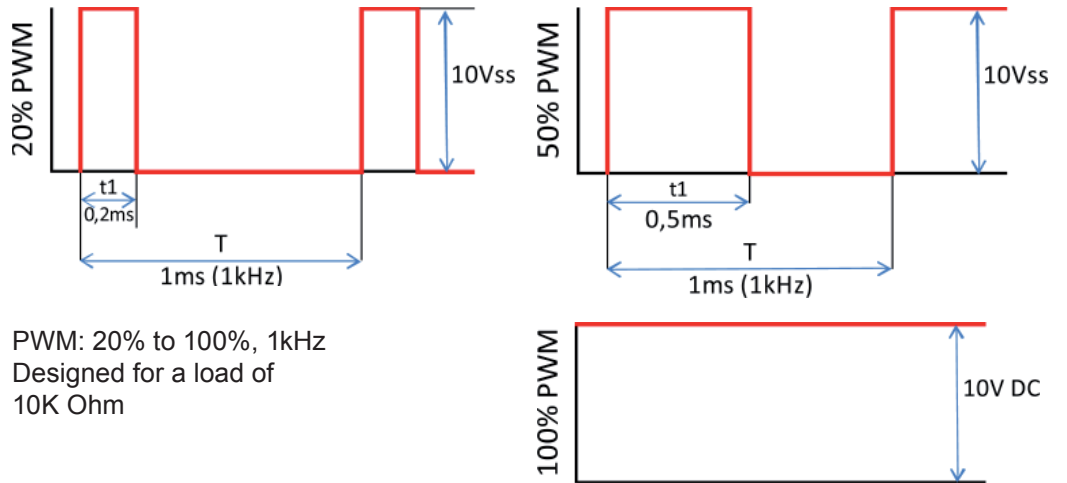Displays the set signal in text and a graphical diagram.

K.1.10. Example for pump settings

Speed

Max rpm

Min rpm

0-5%   Cable break detection
5-20% Stop
25%   Start
25-90% Area of control

Stop

Start

0 5%   20% 25%   50%   90% 100%   PWM-Signal (%)

PWM on >=25%   PWM max <= 90%

PWM off 5% - 20%

K.1.11. Technical data PWM and 0-10V

Technical data PWM:

20% PWM

10Vss

t1
0,2ms

T
1ms (1kHz)

50% PWM

10Vss

t1
0,5ms

T
1ms (1kHz)

PWM: 20% to 100%, 1kHz
Designed for a load of
10K Ohm

100% PWM

10V DC

Technical data 0-10V:
0-10V: 2V to 10V (20% to 100%)
Designed for a load of 10K Ohm.

10V = 100% Speed
5V = 50% Speed
2V = 20% Speed
0V = Off

Instead of setting the flow rate for the system using a flow rate limiter, it is better to adjust the flow rate using the switch on the pump and by means of the "max. speed" setting on the controller (see „7.2. - Speed control"). This saves electric energy.

The service values (see „9. - Service values" on page 51) include not only current measurement values and operating states, but also all of the settings for the controller. Save the service values at least once after commissioning has been successfully completed (see „7.7.4. - Save configuration" on page 50).

In the event of uncertainty as to the control response or malfunctions the service values are a proven and successful method for remote diagnosis. Save the service values (see „9. - Service values" on page 51.) at the time that the suspected malfunction occurs. Send the service value table with a brief description of the error to the specialist or manufacturer.

To protect against loss of data, record any analyses and data that are particularly important to you (see 2.) at regular intervals.

Disposal

IMPORTANT INFORMATION ON DISPOSAL IN COMPLIANCE WITH THE EUROPEAN DIRECTIVE 2002/96/ES

European Directive 2002/96/EC requires that the equipment bearing this symbol on the product and/or its packaging must not be disposed of with unsorted municipal waste. The symbol indicates that this product should be disposed of separately from regular household waste streams. It is your responsibility to dispose of this and other electric and electronic equipment via designated collection facilities appointed by the government or local authorities. Correct disposal and recycling will help prevent potential negative consequences to the environment and human health. For more detailed information about the disposal of your old equipment, please contact your local authorities, waste disposal service, or the shop where you purchased the product.

WEEE registration number: 02771/07-ECZ