HC Heating controller

RESOL®

Manual for the specialised craftsman

Mounting
Connection
Operation
Troubleshooting
Application examples

11201037

Thank you for buying this RESOL product.
Please read this manual carefully to get the best performance from this unit.
Please keep this manual carefully.

en
Manual
www.resol.com

Safety advice

Please pay attention to the following safety advice in order to avoid danger and damage to people and property.

Instructions

Attention must be paid to the valid local standards, regulations and directives!

Information about the product

Proper usage

The controller is designed for use in heating systems in compliance with the technical data specified in this manual.

Improper use excludes all liability claims.

CE-Declaration of conformity

The product complies with the relevant directives and is therefore labelled with the CE mark. The Declaration of Conformity is available upon request, please contact RESOL.

Note

Strong electromagnetic fields can impair the function of the controller.

➔ Make sure the controller as well as the system are not exposed to strong electromagnetic fields.

Subject to technical change. Errors excepted.

Target group

These instructions are exclusively addressed to authorised skilled personnel.

Only qualified electricians should carry out electrical works.

Initial installation must be effected by the system owner or qualified personnel named by the system owner.

Description of symbols

WARNING!

Warnings are indicated with a warning triangle!

➔ **They contain information on how to avoid the danger described.**

Signal words describe the danger that may occur, when it is not avoided.

- **WARNING** means that injury, possibly life-threatening injury, can occur.
- **ATTENTION** means that damage to the appliance can occur.

Note

Notes are indicated with an information symbol.

➔ Arrows indicate instruction steps that should be carried out.

Disposal

- Dispose of the packaging in an environmentally sound manner.
- Dispose of old appliances in an environmentally sound manner. Upon request we will take back your old appliances bought from us and guarantee an environmentally sound disposal of the devices.

RESOL®

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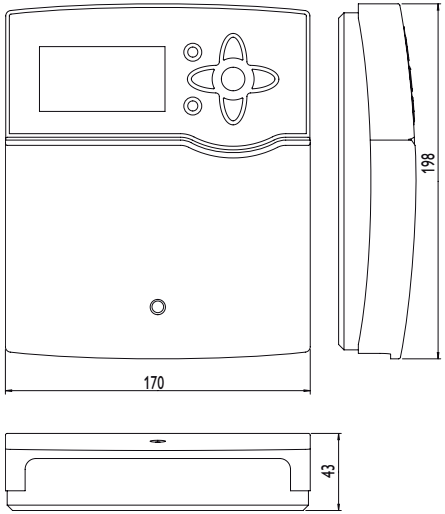
1 Overview

- **Extra large graphic display**
- **5 relay outputs**
- **8 (9) inputs for Pt1000, Pt500 or KTY temperature sensors (system dependent)**
- **2 inputs for digital Grundfos Direct Sensors™**
- **2 PWM outputs for speed control of high-efficiency pumps**
- **Datalogging / firmware updates via SD memory card**
- **9 pre-programmed basic systems**
- **1 mixed heating circuit, 1 unmixed heating circuit**
- **DHW heating**
- **Circulation (with EM extension module)**
- **Thermal disinfection (with EM extension module)**
- **Pre-programmed optional functions (with EM extension module)**
- **RESOL VBus®**
- **Energy-efficient switching-mode power supply**



Technical data

Inputs: 8 (9) inputs for Pt1000, Pt500, or KTY temperature sensors (can optionally be used for RTA11-M remote controls), 1 impulse input V40, inputs for 2 digital Grundfos Direct Sensors™, 1 input for a CS10 irradiation sensor

Outputs: 4 semiconductor relays, 1 potential-free relay, 2 PWM outputs

Switching capacity per relay:
1 (1) A 240 V~ (semiconductor relay)
4 (2) A 240 V~ (potential-free relay)

Total switching capacity: 4 A

Power supply: 100 ... 240 V~, 50 ... 60 Hz

Supply connection: type Y attachment

Standby power consumption: < 1W

Mode of operation: type 1.B.C.Y

Rated impulse voltage: 2,5 kV

Interfaces: RESOL VBus®, SD card slot

Functions: weather-compensated heating circuit control, afterheating, DHW heating with priority logic, circulation, thermal disinfection, heat quantity measurement, optional functions such as solid fuel boiler, return preheating, etc.

Housing: plastic, PC-ABS and PMMA

Mounting: wall mounting, also suitable for mounting into patch panels

Display: full graphic display, control lamp (directional pad) and background illumination

Operation: 7 push buttons at the front of the housing

Protection type: IP 20 / EN 60529

Protection class: I

Ambient temp.: 0 ... 40 °C

Degree of pollution: 2

Dimensions: 198 × 170 × 43 mm

2 Installation

WARNING! **Electric shock!**

Upon opening the housing, live parts are exposed!

➔ **Always disconnect the controller from power supply before opening the housing!**

2.1 Mounting

The unit must only be located in dry interior rooms.

The controller must additionally be supplied from a double pole switch with contact gap of at least 3 mm.

Please pay attention to separate routing of sensor cables and mains cables.

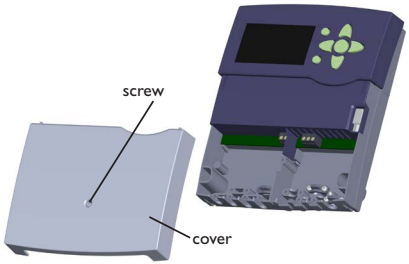
In order to mount the device to the wall, carry out the following steps:

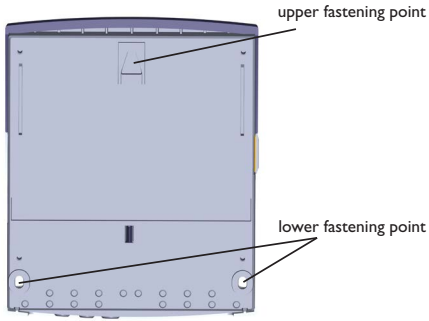
- ➔ Unscrew the cross-head screw from the cover and remove it along with the cover from the housing
- ➔ Mark the upper fastening point on the wall. Drill and fasten the enclosed wall plug and screw leaving the head protruding
- ➔ Hang the housing from the upper fastening point and mark the lower fastening points (centres 150 mm)
- ➔ Insert lower wall plugs
- ➔ Fasten the housing to the wall with the lower fastening screws and tighten
- ➔ Carry out the electrical wiring in accordance with the terminal allocation, see page 7
- ➔ Put the cover on the housing
- ➔ Attach with the fastening screw

Note

Strong electromagnetic fields can impair the function of the controller.

Make sure the controller as well as the system are not exposed to strong electromagnetic fields.





2.2 Electrical connection

WARNING! **Electric shock!**

Upon opening the housing, live parts are exposed!

➔ **Always disconnect the controller from power supply before opening the housing!**

WARNING! **ESD damage!**

Electrostatic discharge can lead to damage to electronic components!

➔ **Take care to discharge properly before touching the inside of the device! To do so, touch a grounded surface such as a radiator or tap!**

Note

Connecting the device to the power supply must always be the last step of the installation!

Depending on the product version, cables are already connected to the device. If that is not the case, please proceed as follows:

The controller is equipped with 5 **relays** in total to which loads such as pumps, valves, etc. can be connected:

Relays 1 ... 4 are semiconductor relays, designed for pump speed control:

Conductor R1 ... R4

Neutral conductor N (common terminal block)

Protective earth conductor PE ⏚ (common terminal block)

Relay 5 is a potential-free relay (normally open contact):

Connections to the R5 terminals can be made with either polarity.

Temperature sensors (S1 to S9) have to be connected to the terminals S1 ... S9 and GND (either polarity).

The terminal S9 can be used as an impulse input for a V40 flowmeter or a FS08 flow switch.

A V40 flowmeter can be connected to the terminals S9 / V40 and GND (either polarity).

Connect the irradiation sensor **CS10** to the terminals CS10 and GND with correct polarity. To do so, connect the cable marked GND to the GND common terminal block, the cable marked CS to the terminal marked CS10.

The terminals marked **PWM** are control outputs for high-efficiency pumps.

In the In-/Outputs menu, relays can be allocated to the PWM outputs.

Connect the **digital** Grundfos Direct Sensors™ to the RPD and VFD inputs.

The controller is supplied with power via a mains cable. The power supply of the device must be 100 ... 240 V~ (50 ... 60 Hz).

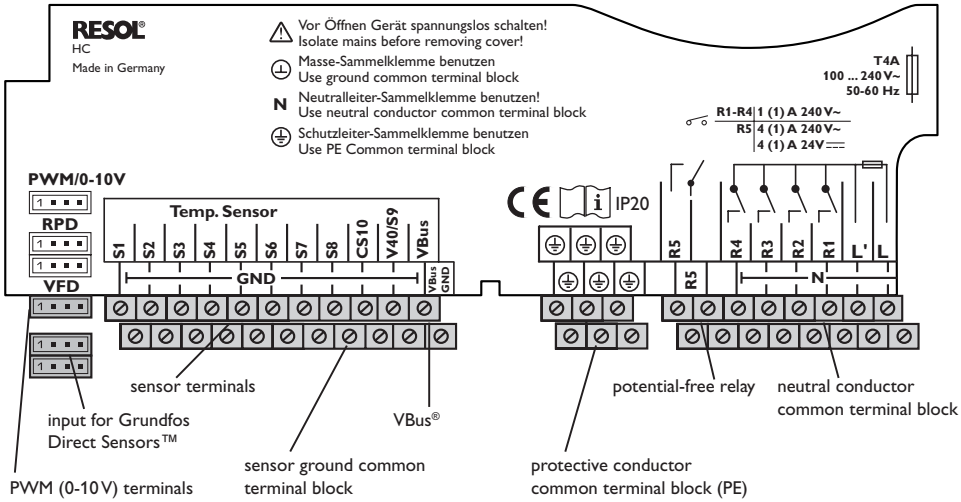
The **mains connection** is at the terminals:

Neutral conductor N

Conductor L

Conductor L' (L' is not connected with the mains cable. L' is a fused contact permanently carrying voltage)

Protective earth conductor PE ⏚ (common terminal block)



WARNING! **Electric shock!**

L' is a fused contact permanently carrying voltage.

➔ **Always disconnect the controller from power supply before opening the housing!**

Note

For more details about the initial commissioning procedure, see page 12.

2.3 Data communication / Bus

The controller is equipped with the RESOL **VBus®** for data transfer with and energy supply to external modules. The connection is carried out at the two terminals marked VBus and GND (either polarity). One or more RESOL VBus® modules can be connected via this data bus, such as:

- RESOL AM1 Alarm module
- RESOL DL2 Datalogger
- RESOL EM Extension module

Furthermore, the controller can be connected to a PC via the RESOL VBus® / USB or VBus® / LAN interface adapter (not included). With the **R**ESOL **S**ervice-**C**enter Software (RSC), measured values can be read, processed and visualised. The software allows an easy function control of the system.

Note:

For more information about accessories, see page 64.

2.4 SD card slot

The controller is equipped with an SD card slot.

With an SD card, the following functions can be carried out:

- Store measurement and balance values onto the SD card. After the transfer to a computer, the values can be opened and visualised, e. g. in a spreadsheet.
- Prepare adjustments and parameterisations on a computer and transfer them via the SD card.
- Store adjustments and parameterisations on the SD card and, if necessary, retrieve them from there.
- Download firmware updates from the Internet and install them on the controller.

For more information about using an SD card, see page 53.

3 Operation and function

3.1 Buttons

The controller is operated via the 7 buttons next to the display. They have the following functions:

Button 1 - scrolling upwards

Button 3 - scrolling downwards

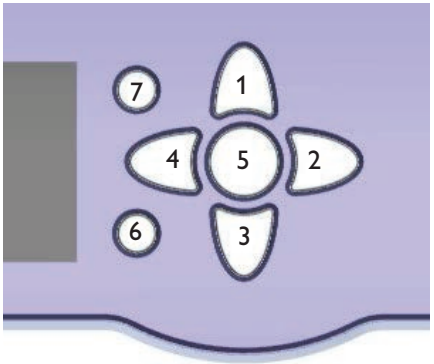
Button 2 - increasing adjustment values

Button 4 - reducing adjustment values

Button 5 - confirming

Button 6 - entering the status menu / chimney sweeper or screed drying mode (system-dependent)

Button 7 - escape button for changing into the previous menu



3.2 Selecting menu points and adjusting values

During normal operation of the controller, the display is in the main menu. If no button is pressed for a few seconds, the display illumination goes out.

Press any button to reactivate the display illumination.

➔ In order to scroll though a menu or to adjust a value, press either buttons 1 and 3 or buttons 2 and 4

➔ To open a sub-menu or to confirm a value, press button 5

➔ To enter the status menu, press button 6 – unconfirmed adjustments will not be saved

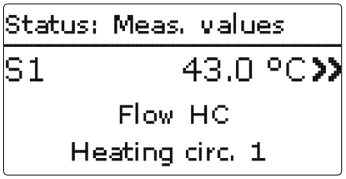
➔ To enter the previous menu, press button 7 – unconfirmed adjustments will not be saved

If no button has been pressed within a couple of minutes, the adjustment is cancelled and the previous value is retained.

Chimney sweeper / screed

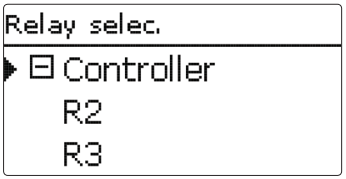
The chimney sweeper function or the screed drying function can be triggered with button 6. The chimney sweeper function is activated by default. In order to activate the screed drying function, the chimney sweeper function must be deactivated in all heating circuits (see page 34).

➔ In order to trigger the chimney sweeper or screed drying function, press and hold down button 6 for 5 s.

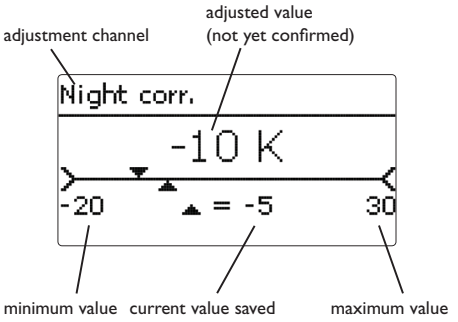


If the symbol » is shown behind a menu item, pressing button 5 will open a new sub-menu.

If a sensor has several functions, the symbol ▸ will appear next to the allocated sensor function. Use buttons 2 and 4 to scroll to the allocated functions.



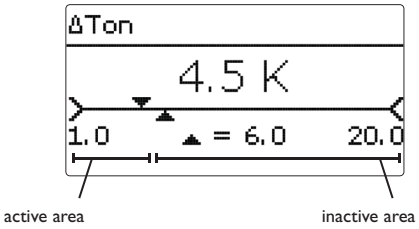
If the symbol ⊞ is shown in front of a menu item, pressing button 5 will open a new sub-menu. If it is already opened, a ⊟ is shown instead of the ⊞.



Values and adjustments can be changed in different ways:

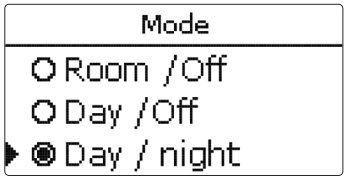
Numeric values can be adjusted by means of a slide bar. The minimum value is indicated to the left, the maximum value to the right. The large number above the slide bar indicates the current adjustment. By pressing buttons (2) or (4) the upper slide bar can be moved to the left or to the right.

Only after the adjustment has been confirmed by pressing button (5) will the number below the slide bar indicate the new value. The new value will be saved if it is confirmed by pressing button (5) again.

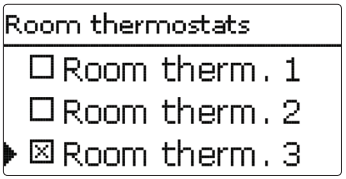


When 2 values are locked against each other, they will display a reduced adjustment range depending on the adjustment of the respective other value.

In this case, the active area of the slide bar is shortened, the inactive area is indicated as a dotted line. The indication of the minimum and maximum values will adapt to the reduction.



If only one item of several can be selected, they will be indicated with "radio buttons". When one item has been selected, the radio button in front of it is filled.

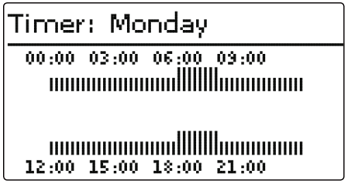


If more than one item of several can be selected, they will be indicated with checkboxes. When an item has been selected, an **x** appears inside the checkbox.

Adjusting the timer

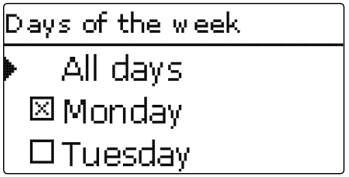
When the **Timer** option is activated, a timer is indicated in which time frames for the function can be adjusted.

First of all, an overview of the current adjustments is displayed. For each day of the week there is an overview display. The display can be switched back and forth between the different days by pressing buttons 2 or 4.

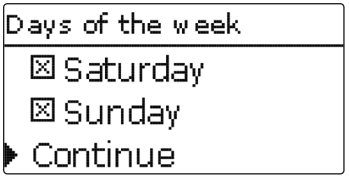


In order to adjust the timer, press button 5.

First the individual days of the week or all days of the week can be selected.



The last menu item after the list of days is **Continue**. If Continue is selected, the **Edit timer** menu opens, in which the time frames can be adjusted.



Adding a time frame:

The time frames can be adjusted in steps of 15 minutes.

In order to add an active time frame, proceed as follows:

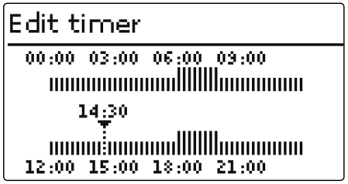
➔ Move the cursor to the desired starting point of the time frame by pressing buttons 2 and 4. Confirm the starting point of the time frame by pressing button 1.

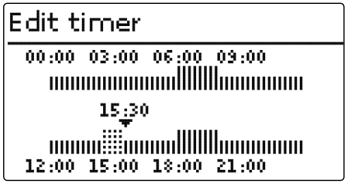
➔ Move the cursor to the desired ending point of the time frame by pressing buttons 2 and 4.

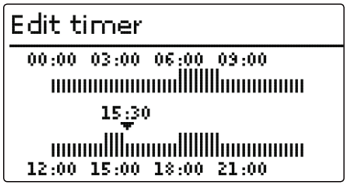
➔ The end of a time frame can be determined by pressing button 5.

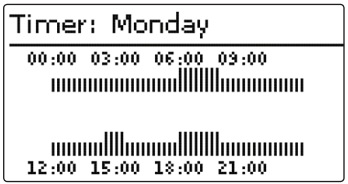
➔ In order to add another time frame, repeat the last 3 steps.

➔ Press button 5 again to get back to the overview of current adjustments.





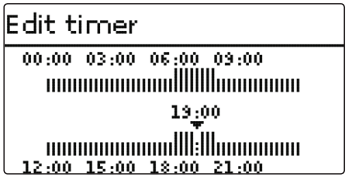




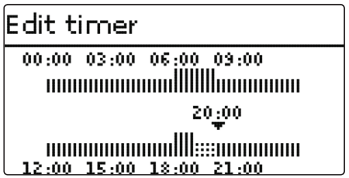
Removing a time frame:

In order to remove an active time frame, proceed as follows:

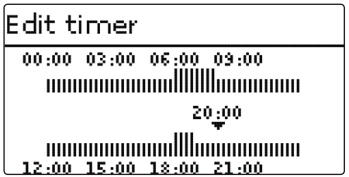
➔ Determine the point from which on the time frame is to be removed by pressing button 3.



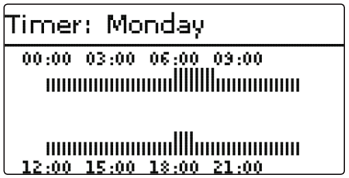
➔ Move the cursor to the desired ending point of the time frame by pressing buttons 2 and 4.



➔ In order to conclude removing the time frame, press button 5 upon reaching the desired ending point.



➔ Press button 5 again to get back to the overview of current adjustments.



4 Commissioning

4.1 Initial commissioning

When the hydraulic system is filled and ready for operation, connect the controller to the mains.

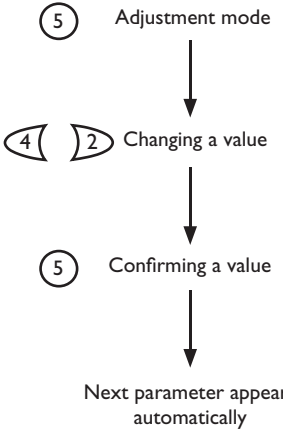
The controller runs an initialisation phase in which the directional pad flashes red.

When the controller is commissioned for the first time or when it is reset, it will run a commissioning menu after the initialisation phase. The commissioning menu leads the user through the most important adjustment channels needed for operating the system.

Commissioning menu

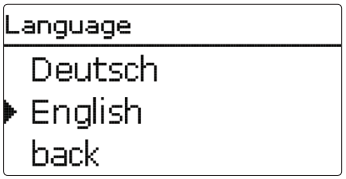
The commissioning menu consists of the channels described in the following. In order to make an adjustment, push button (5). Adjust the value by pressing buttons (4) and (2), then push button (5) to confirm. The next channel will appear in the display.

Button navigation



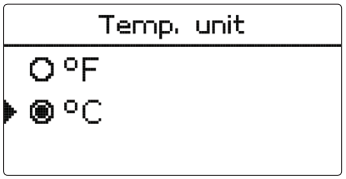
1. Language:

➔ Adjust the desired menu language.

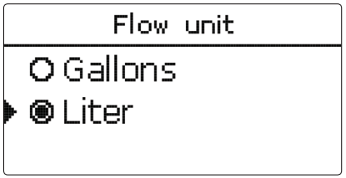


2. Units:

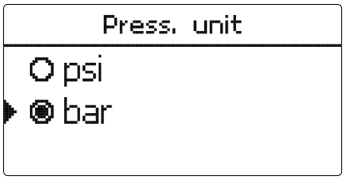
➔ Adjust the desired temperature unit.



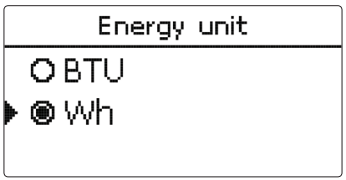
➔ Adjust the desired volume unit.



➔ Adjust the desired pressure unit.

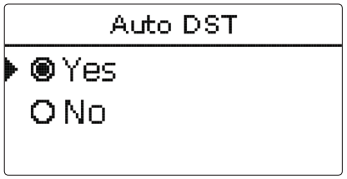


➔ Adjust the desired energy unit.



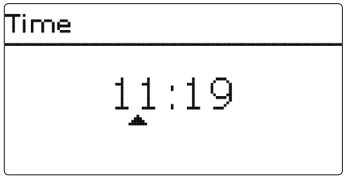
3. Daylight savings time adjustment:

➔ Activate or deactivate the automatic daylight savings time adjustment.



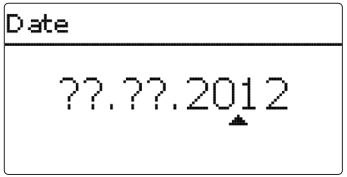
4. Time:

➔ Adjust the clock time. First of all adjust the hours, then the minutes.



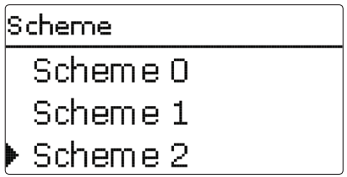
5. Date:

➔ Adjust the date. First of all adjust the year, then the month and then the day.



6. Basic system:

➔ Adjust the desired scheme (heating circuit, demand, DHW heating).

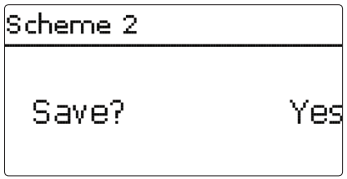


7. Completing the commissioning menu:

After the scheme has been selected, a security enquiry appears. If the safety enquiry is confirmed, the adjustments are saved.

➔ In order to confirm the security enquiry, press button (5).

➔ In order to reenter the commissioning menu channels, press button (7).



If the security enquiry has been confirmed, the controller is ready for operation and should enable an optimum system operation.

All adjustments made during commissioning can, if necessary, be changed later on in the **basic settings** menu.

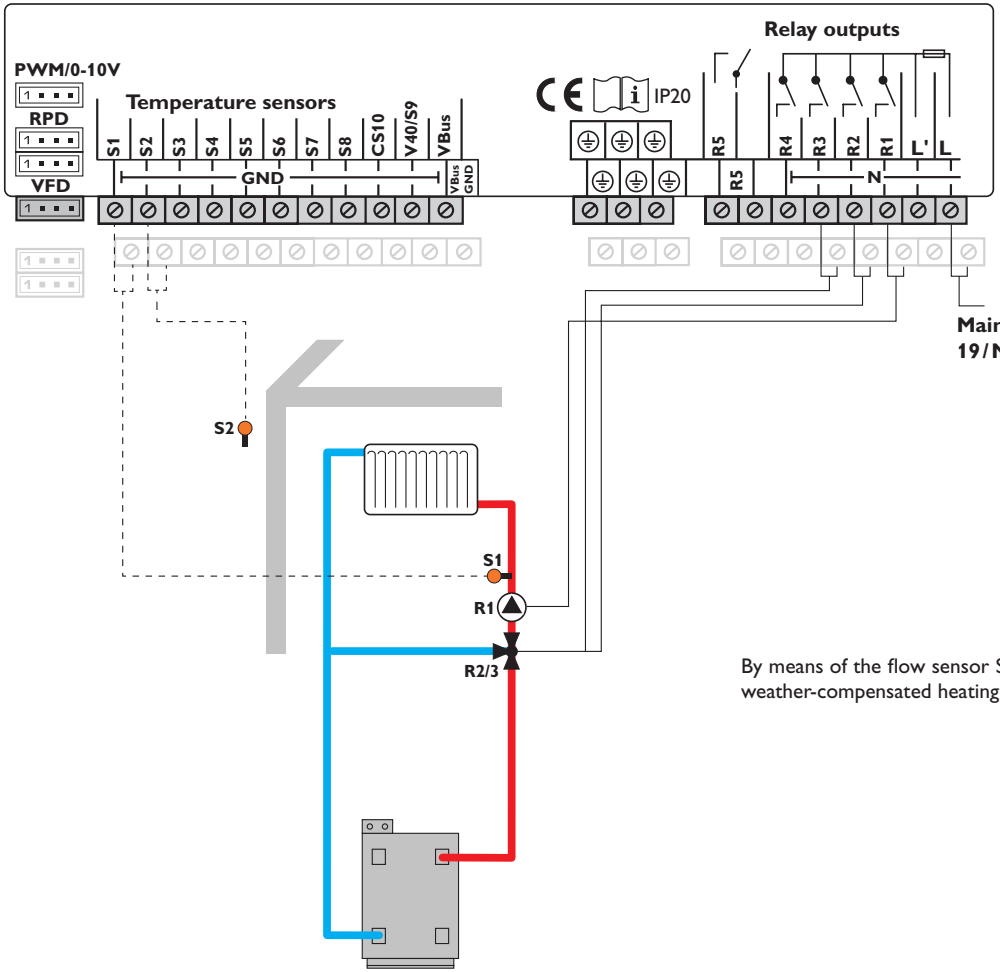
4.2 Schemes with basic settings

The controller is pre-programmed for 9 basic systems. The basic pre-adjustments have already been made. For afterheating it is necessary to allocate the demand and the boiler loading pump by means of shared relays. Afterwards the system can easily be extended.

Relay and sensor allocation correspond to the figure.

Scheme 0 has no pre-adjustments.

Scheme 1: one mixed heating circuit

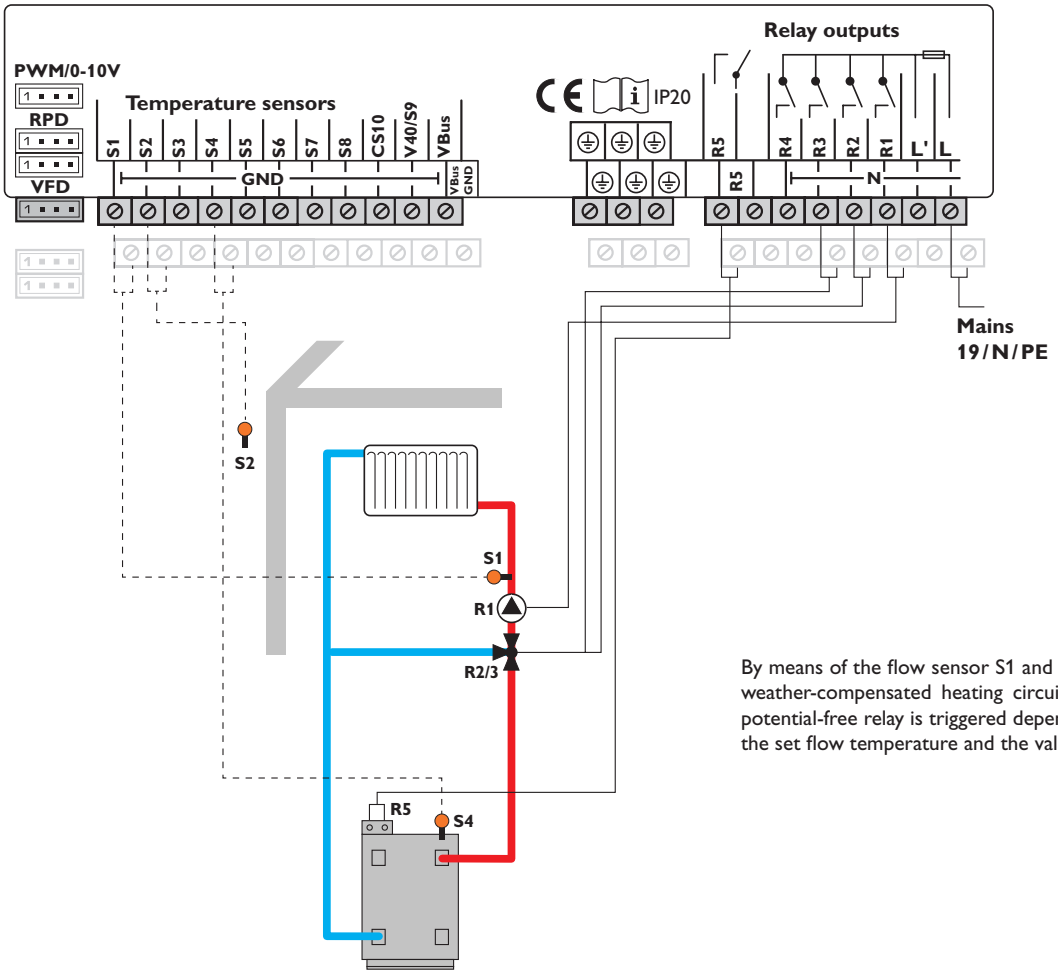


Sensors		
S1	Flow HC1	1/GND
S2	Outdoor	2/GND
S3	Free	3/GND
S4	Free	4/GND
S5	Free	5/GND
S6	Free	6/GND
S7	Free	7/GND
S8	Free	8/GND

Relays		
R1	Pump HC1	17/N/PE
R2	Mixer open	16/N/PE
R3	Mixer closed	15/N/PE
R4	Free	14/N/PE
R5	Free	13/12

By means of the flow sensor S1 and the outdoor temperature sensor S2, a mixed weather-compensated heating circuit can be controlled.

Scheme 2: one mixed heating circuit with afterheating (demand)

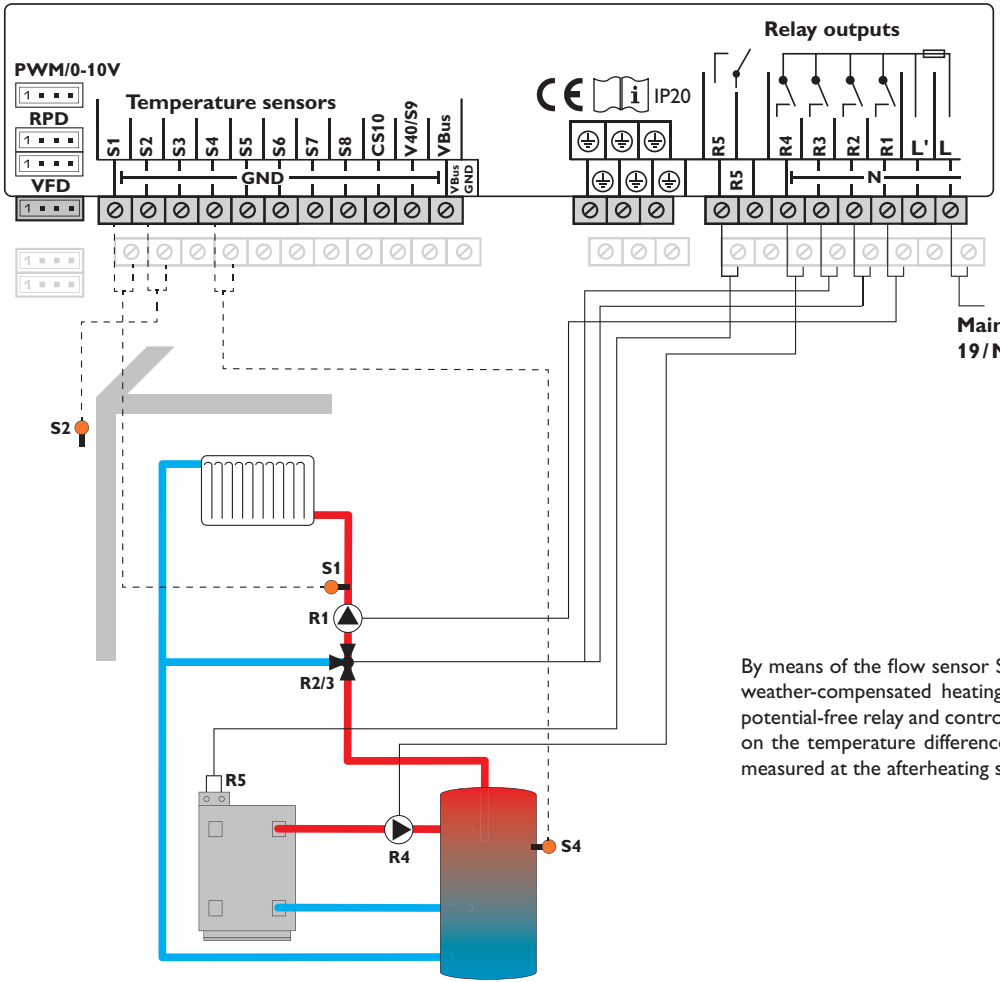


Sensors		
S1	Flow HC1	1/GND
S2	Outdoor	2/GND
S3	Free	3/GND
S4	Afterheating/boiler	4/GND
S5	Free	5/GND
S6	Free	6/GND
S7	Free	7/GND
S8	Free	8/GND

Relays		
R1	Pump HC1	17/N/PE
R2	Mixer open	16/N/PE
R3	Mixer closed	15/N/PE
R4	Free	14/N/PE
R5	Demand	13/12

By means of the flow sensor S1 and the outdoor temperature sensor S2, a mixed weather-compensated heating circuit can be controlled. Boiler demand via the potential-free relay is triggered depending on the temperature difference between the set flow temperature and the value measured at the afterheating sensor S4.

Scheme 3: one mixed heating circuit with afterheating (demand and boilder loading pump)

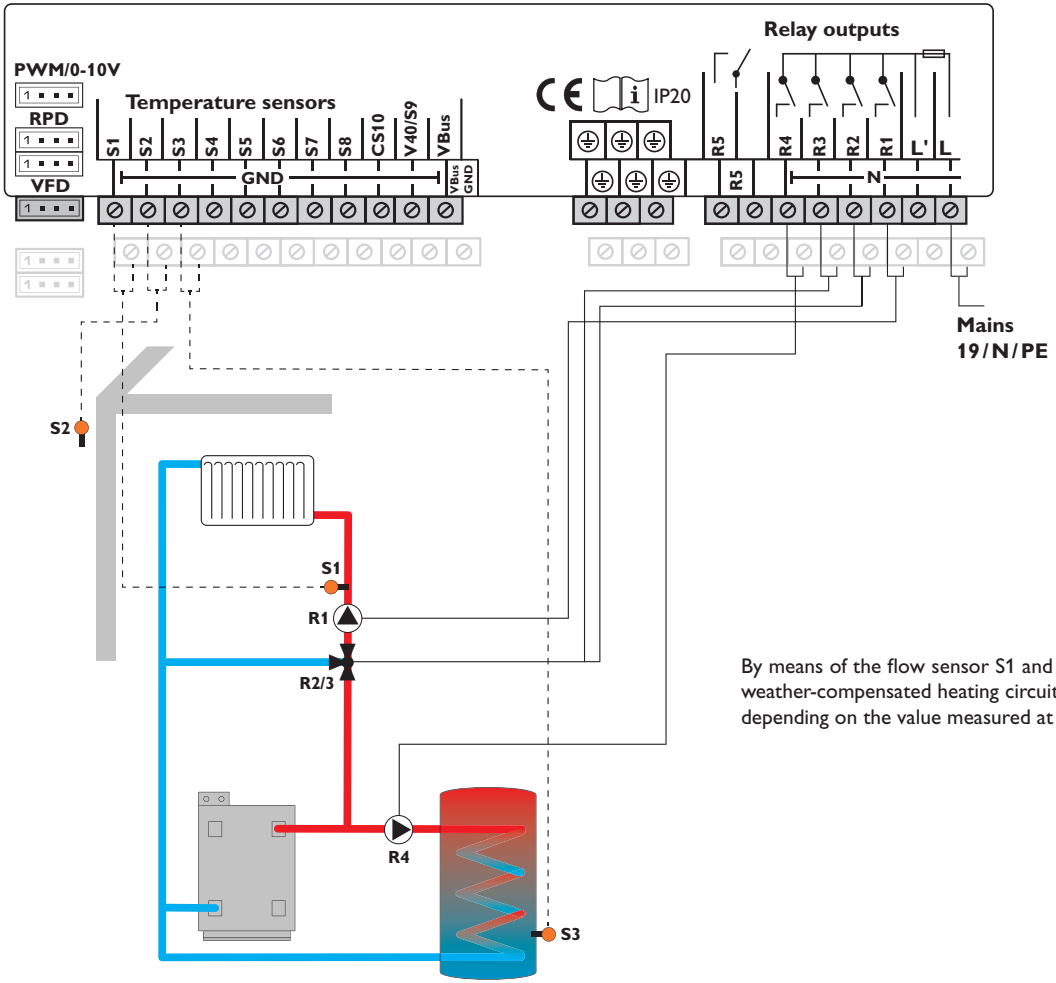


Sensors		
S1	Flow HC1	1/GND
S2	Outdoor	2/GND
S3	Free	3/GND
S4	Afterheating/boiler	4/GND
S5	Free	5/GND
S6	Free	6/GND
S7	Free	7/GND
S8	Free	8/GND

Relays		
R1	Pump HC1	17/N/PE
R2	Mixer open	16/N/PE
R3	Mixer closed	15/N/PE
R4	Boiler loading pump	14/N/PE
R5	Demand	13/12

By means of the flow sensor S1 and the outdoor temperature sensor S2, a mixed weather-compensated heating circuit can be controlled. Boiler demand via the potential-free relay and control of the boiler loading pump are triggered depending on the temperature difference between the set flow temperature and the value measured at the afterheating sensor S4.

Scheme 4: one mixed heating circuit with DHW heating

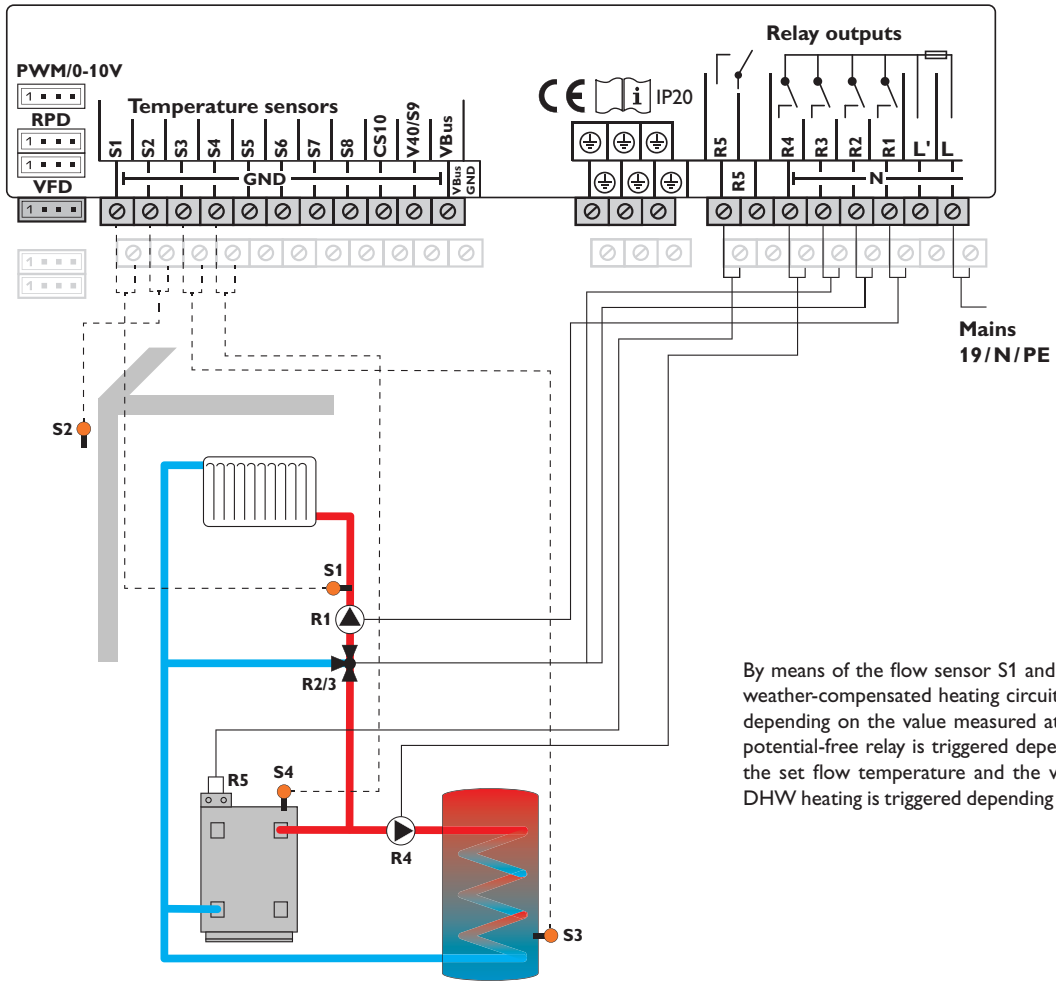


Sensors		
S1	Flow HC1	1/GND
S2	Outdoor	2/GND
S3	DHW	3/GND
S4	Free	4/GND
S5	Free	5/GND
S6	Free	6/GND
S7	Free	7/GND
S8	Free	8/GND

Relays		
R1	Pump HC1	17/N/PE
R2	Mixer open	16/N/PE
R3	Mixer closed	15/N/PE
R4	DHW loading pump	14/N/PE
R5	Free	13/12

By means of the flow sensor S1 and the outdoor temperature sensor S2, a mixed weather-compensated heating circuit can be controlled. DHW heating is triggered depending on the value measured at the DHW sensor S3.

Scheme 5: one mixed heating circuit with DHW heating and afterheating (demand for heating circuit and DHW)

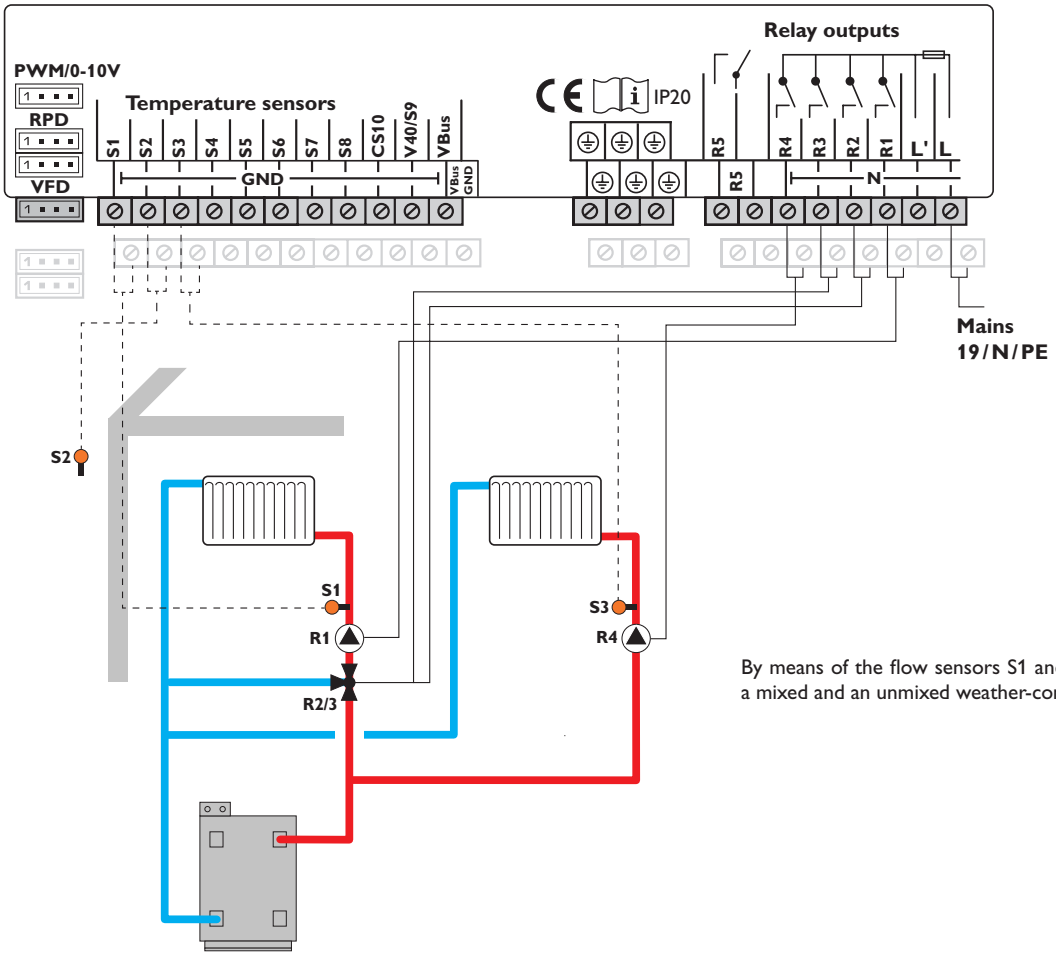


Sensors		
S1	Flow HC1	1/GND
S2	Outdoor	2/GND
S3	DHW	3/GND
S4	Afterheating/boiler	4/GND
S5	Free	5/GND
S6	Free	6/GND
S7	Free	7/GND
S8	Free	8/GND

Relays		
R1	Pump HC1	17/N/PE
R2	Mixer open	16/N/PE
R3	Mixer closed	15/N/PE
R4	DHW loading pump	14/N/PE
R5	Demand	13/12

By means of the flow sensor S1 and the outdoor temperature sensor S2, a mixed weather-compensated heating circuit can be controlled. DHW heating is triggered depending on the value measured at the DHW sensor S3. Boiler demand via the potential-free relay is triggered depending on the temperature difference between the set flow temperature and the value measured at the afterheating sensor S4. DHW heating is triggered depending on the value measured at the DHW sensor S3.

Scheme 6: one mixed and one unmixed heating circuit

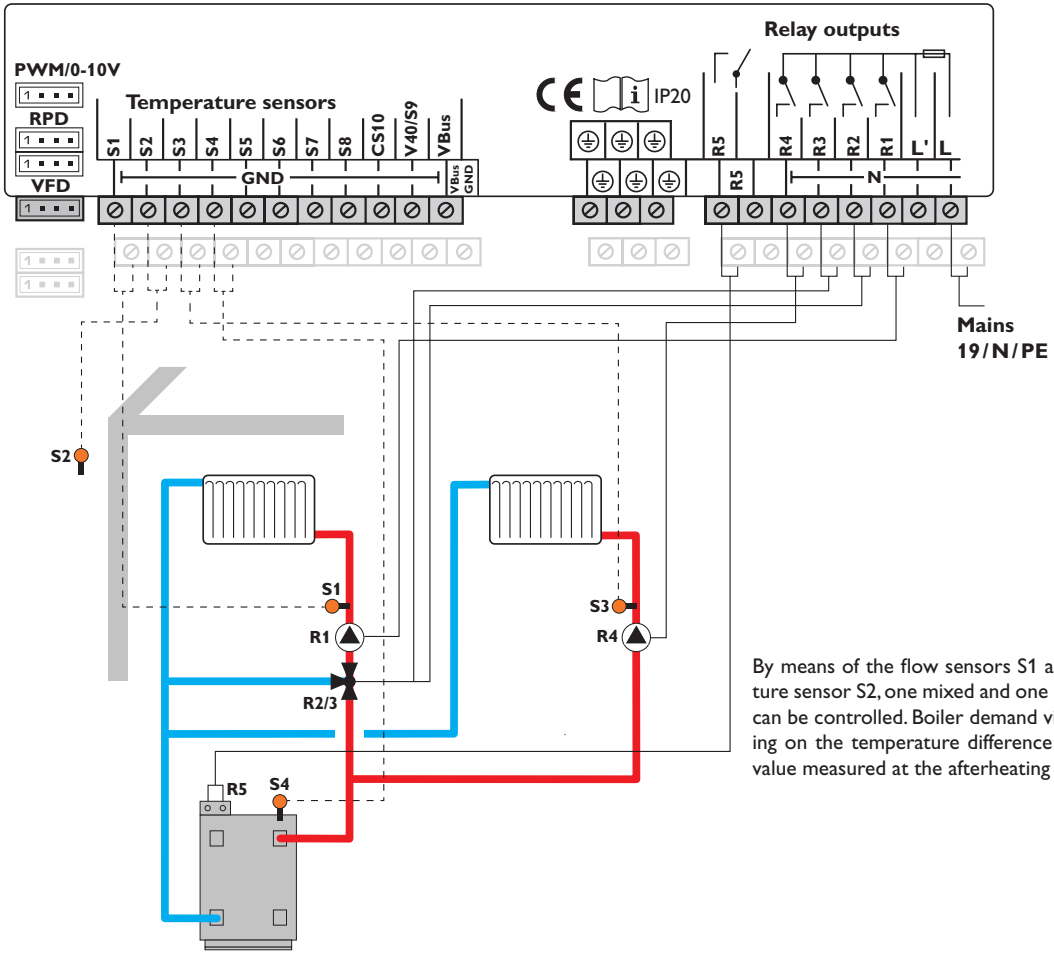


Sensors		
S1	Flow HC1	1/GND
S2	Outdoor	2/GND
S3	Flow HC2	3/GND
S4	Free	4/GND
S5	Free	5/GND
S6	Free	6/GND
S7	Free	7/GND
S8	Free	8/GND

Relays		
R1	Pump HC1	17/N/PE
R2	Mixer open	16/N/PE
R3	Mixer closed	15/N/PE
R4	Pump HC2	14/N/PE
R5	Free	13/12

By means of the flow sensors S1 and S3 respectively and the outdoor sensor S2, a mixed and an unmixed weather-compensated heating circuit can be controlled.

Scheme 7: one mixed and one unmixed heating circuit with afterheating (demand)

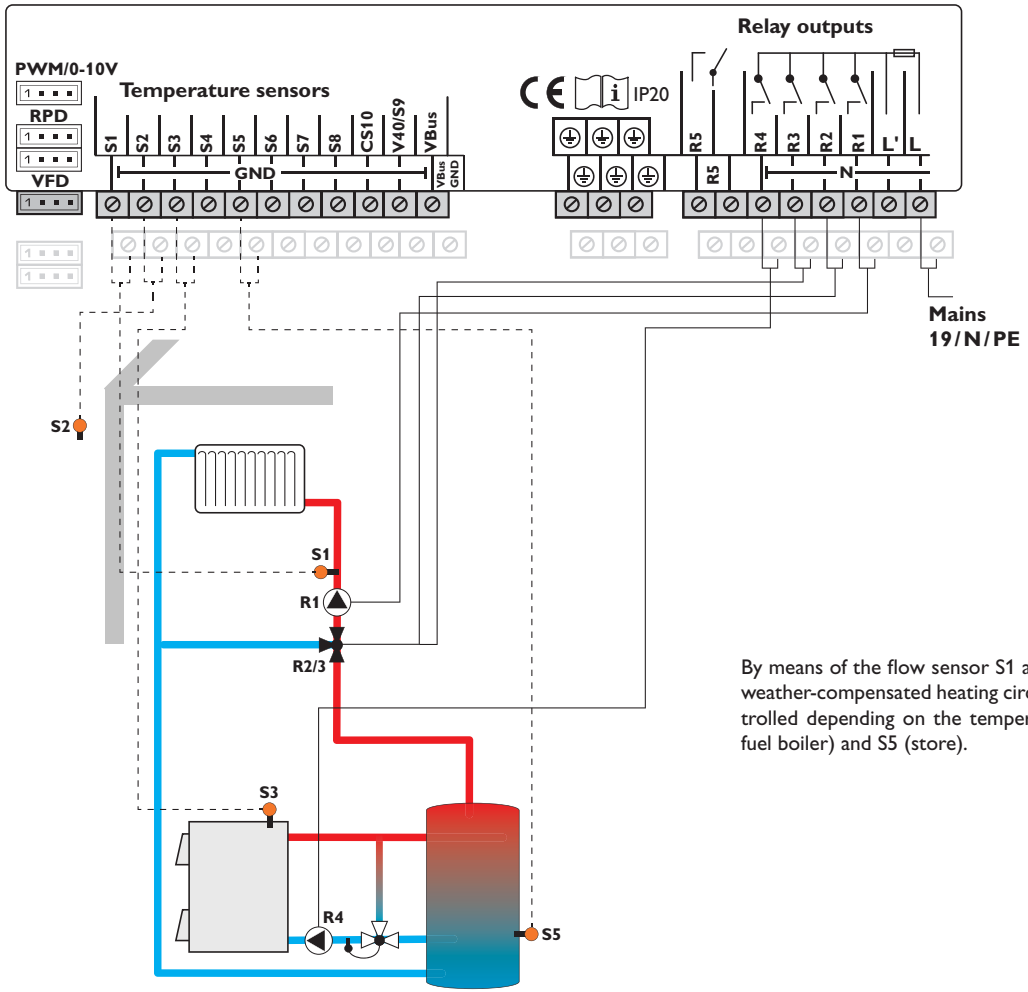


Sensors		
S1	Flow HC1	1/GND
S2	Outdoor	2/GND
S3	Flow HC2	3/GND
S4	Afterheating/boiler	4/GND
S5	Free	5/GND
S6	Free	6/GND
S7	Free	7/GND
S8	Free	8/GND

Relays		
R1	Pump HC1	17/N/PE
R2	Mixer open	16/N/PE
R3	Mixer closed	15/N/PE
R4	Pump HC2	14/N/PE
R5	Demand	13/12

By means of the flow sensors S1 and S3 respectively and the outdoor temperature sensor S2, one mixed and one unmixed weather-compensated heating circuit can be controlled. Boiler demand via the potential-free relay is triggered depending on the temperature difference between the set flow temperatures and the value measured at the afterheating sensor S4.

Scheme 8: one mixed heating circuit with solid fuel boiler

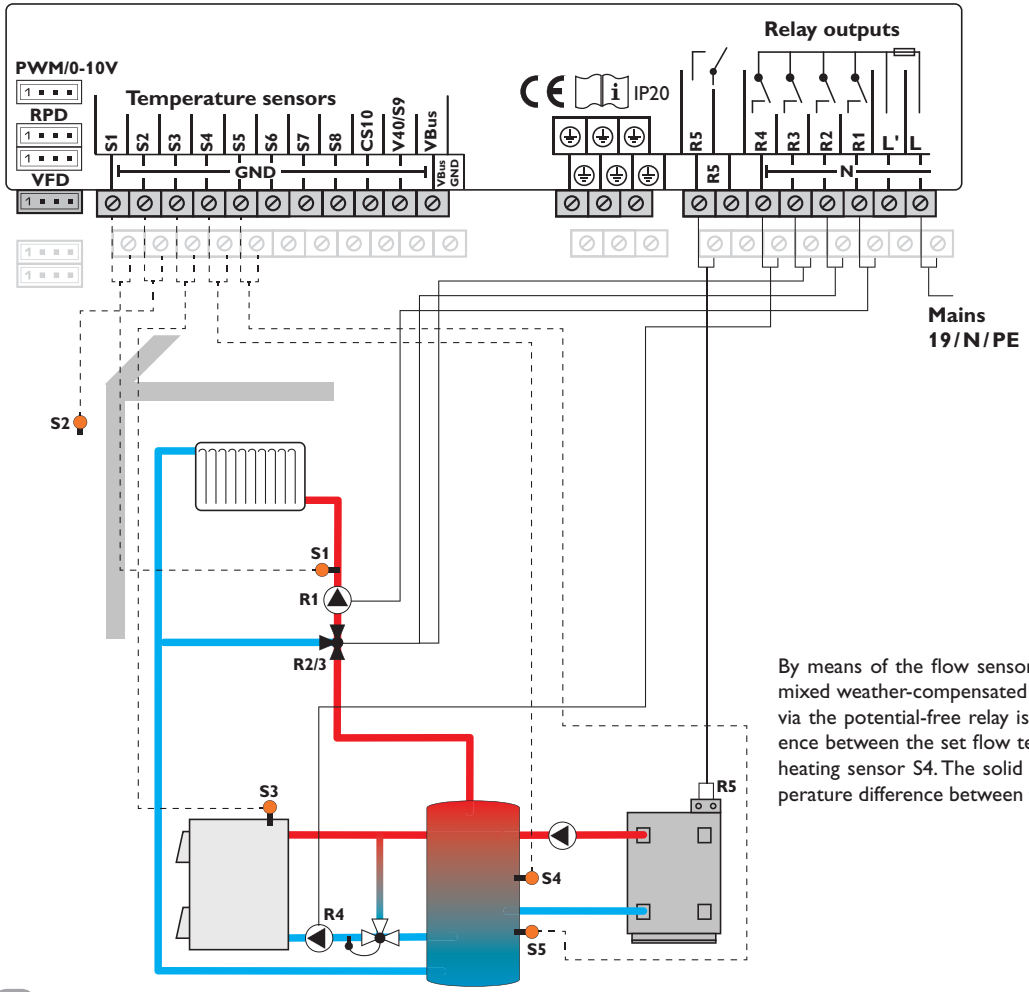


Sensors		
S1	Flow HC1	1/GND
S2	Outdoor	2/GND
S3	Solid fuel boiler	3/GND
S4	Free	4/GND
S5	Store	5/GND
S6	Free	6/GND
S7	Free	7/GND
S8	Free	8/GND

Relays		
R1	Pump HC1	17/N/PE
R2	Mixer open	16/N/PE
R3	Mixer closed	15/N/PE
R4	Pump SFB	14/N/PE
R5	Free	13/12

By means of the flow sensor S1 and the outdoor temperature sensor S2, a mixed weather-compensated heating circuit can be controlled. The solid fuel boiler is controlled depending on the temperature difference between the sensors S3 (solid fuel boiler) and S5 (store).

Scheme 9: one mixed heating circuit with solid fuel boiler and afterheating (demand)



Sensors		
S1	Flow HC1	1/GND
S2	Outdoor	2/GND
S3	Solid fuel boiler	3/GND
S4	Afterheating/boiler	4/GND
S5	Store	5/GND
S6	Free	6/GND
S7	Free	7/GND
S8	Free	8/GND

Relays		
R1	Pump HC1	17/N/PE
R2	Mixer open	16/N/PE
R3	Mixer closed	15/N/PE
R4	Pump SFB	14/N/PE
R5	Demand	13/12

By means of the flow sensor S1 and the outdoor temperature sensor S2, a mixed weather-compensated heating circuit can be controlled. Boiler demand via the potential-free relay is triggered depending on the temperature difference between the set flow temperature and the value measured at the afterheating sensor S4. The solid fuel boiler is controlled depending on the temperature difference between the sensors S3 (solid fuel boiler) and S5 (store).

4.3 Step-by-step parameterisation

The HC heating controller is a controller that offers a broad variety of functions to the user. At the same time, the user has a lot of freedom in configurating them. Therefore, to set up a complex system, careful planning is required. We recommend drawing a sketch of the system first.

If planning, hydraulic construction and electrical connection have all been carried out successfully, proceed as follows:

1. Running the commissioning menu

After the commissioning menu has been finished (see page 12), further adjustments can be made. The commissioning menu can be repeated any time by means of a reset (see page 53). Additional adjustments will be deleted.

2. Registering modules and sensors

If flowmeters, switches, Grundfos Direct Sensors™ and/or external extension modules are connected, these have to be registered in the In-/Outputs menu.

For further information about the registration of modules and sensors see page 56.

3. Adjusting heating circuits and activating optional heating functions

Now, further heating circuits can be activated and adjusted.

For the heating part of the arrangement, optional functions can be selected, activated and adjusted:

- DHW heating
- Circulation
- Thermal disinfection

Heating circuits and their optional functions can use shared relays for (boiler) demands, loading pumps or valves. They have to be selected in the shared relay menu first (see page 26). All free relays available on the controller and on the modules connected can be used.

The controller always suggests the numerically smallest free relay.

Sensors can be allocated to more than one function.

For further information about heating circuits and optional heating functions see page 26.

4. Adjusting the operating mode

After commissioning, the heating circuit is in automatic mode. The operating mode can be changed in the status menu:

- Automatic
- Day
- Night
- Summer
- Holiday
- Off

The operating mode of the first heating circuit also applies to all further heating circuits (via extension modules), if they are linked. If you wish to operate one of the heating circuits 2 ... 7 independently, deactivate the linking of the corresponding heating circuit (see page 34).

5. Activating optional arrangement functions

Now, optional functions for the arrangement can be selected, activated and adjusted:

- Heat exchange
- Return preheating
- Solid fuel boiler
- Mixer
- Parallel relay
- Irradiation switch
- Zone loading
- Error relay
- Function block

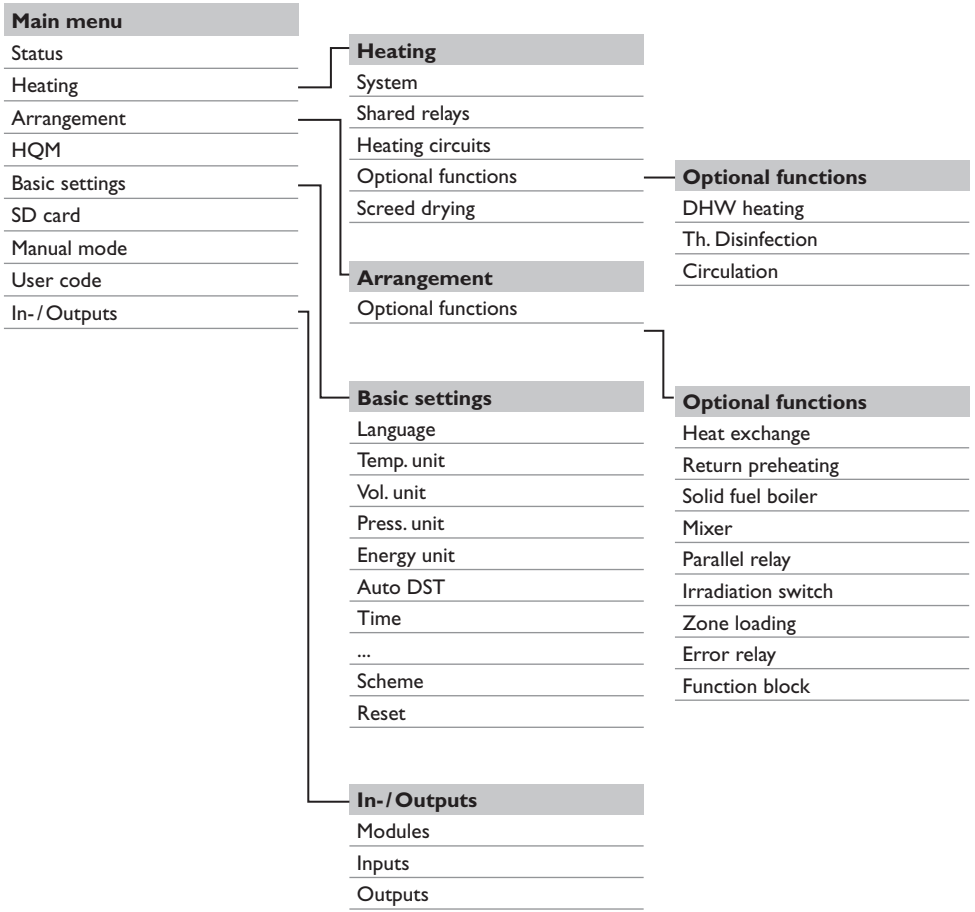
Free relays can be allocated to optional functions which require a relay. The controller always suggests the numerically smallest free relay.

Sensors can be allocated to more than one function.

For further information about the optional arrangement functions see page 43.

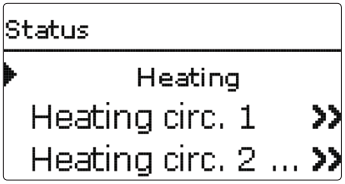
5 Functions and options

5.1 Menu structure



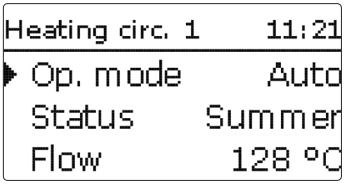
The menu items and adjustment values selectable are variable depending on adjustments already made. The figure only shows an exemplary excerpt of the complete menu in order to visualise the menu structure.

5.2 Status menu



The status menu contains information about the current states of all activated heating circuits, optional functions and HQM. Furthermore, measured and balance values as well as messages are indicated.

5.3 Heating



In the **Status/Heating** menu, the status of the activated heating circuits as well as of the selected optional functions is indicated. The status of the first heating circuit is also the start screen. In this menu, the operating mode of the heating circuit can be changed:

Automatic: Automatic heating mode with optionally activated DHW heating and circulation.

Day: Constant heating mode with the adjusted day correction.

Night: Constant heating mode with the adjusted night correction and the selected correction mode.

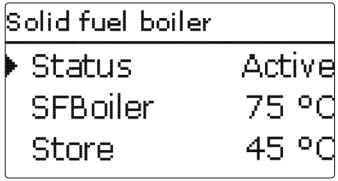
Summer: The heating circuit is switched off. The optionally activated DHW heating and circulation stay active.

Off: The heating circuit as well as the optionally activated DHW heating and circulation are switched off.

Holiday: Constant heating mode within an adjustable time frame with the adjusted night correction and the selected correction mode.

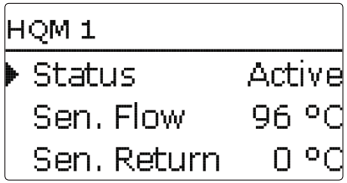
The operating mode of the first heating circuit also applies to all further heating circuits (via extension modules), if they are linked. If you wish to operate one of the heating circuits 2 ... 7 independently, deactivate the linking of the corresponding heating circuit (see page 34).

5.4 Arrangement



In the **Status/Arrangement** menu, the status information (Active, Inactive, Deactivated), the temperatures of the relevant sensors and the relays states are indicated.

5.5 HQM

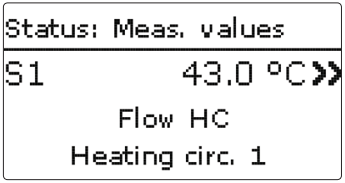


In the **Status/HQM** menu, all current measured values of the flow and return sensors, flow rate and power as well as heat quantity are indicated.

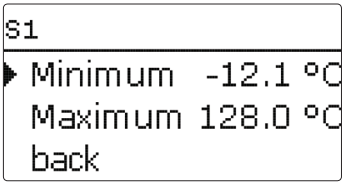
5.6 Meas./Balance values

In the **Status/Meas./Balance** menu, all current measurement values as well as a range of balance values are displayed. Some of the menu items can be selected in order to enter a sub-menu.

Each sensor and relay is indicated with the component or function it has been allocated to. If a sensor has several functions, the symbol ▸ will appear next to the allocated sensor function. Use buttons 2 and 4 to scroll to the allocated functions. The sensors and the relays of the controller and of all modules connected are listed in numerical order.



When a line with a measurement value is selected, another sub-menu will open.



If, for example, S1 is selected, a sub-menu indicating the minimum and maximum values will open.

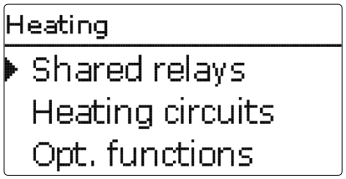
5.7 Messages

In the **Status / Messages** menu, error and warning messages which have not been acknowledged are indicated.

During normal operation, the message **Everything OK** is indicated.

A line break or short circuit in a sensor line is indicated as **!Sensor fault**. A precise error code can be found in the Status / Meas.- / Balance values menu.

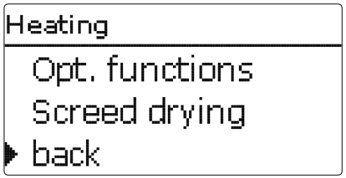
6 Heating



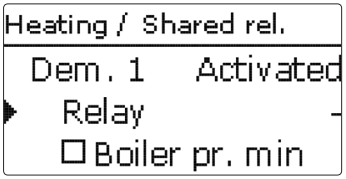
In this menu, all adjustments for the heating part of the arrangement or for the heating circuits respectively can be made.

Shared relays for demands, loading pumps or valves can be activated, heating circuits can be configured and optional functions can be selected and adjusted.

In this menu, the screed drying function can be activated and adjusted.



6.1 Shared relays



In this menu, up to 6 shared relays can be activated and adjusted. Further options such as **Boiler protection, Start-up** and **Overrun** are also available.

Shared relays will be available for selection in the heating circuits and in the relay allocation channels of the corresponding optional functions of the Heating menu. This way, several heating circuits and optional functions (heating) can demand the same heat source, use the same loading pump or switch a shared relay (e. g. a valve).

Note:
Activate and adjust the shared relays first. They will then be available in the heating circuits and optional functions.

Demand

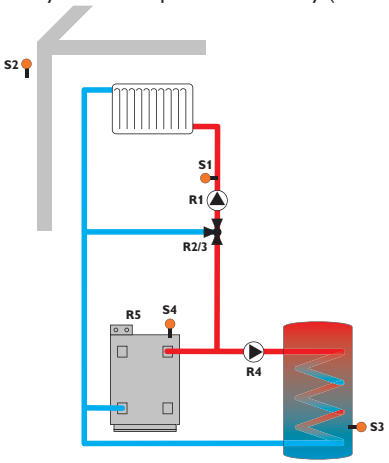
For demand of a boiler, for example, the shared relays **Demand 1** and **Demand 2** are available. The options **Boiler pr. min** and **Boiler pr. max** can be activated for the shared relays, allowing temperature-dependent control of the boiler demands. For this purpose, a boiler sensor is required.

The **Boiler pr. min** option is used for protecting the boiler against cooling. If the temperature falls below the adjusted minimum temperature, the allocated relay is energised until the minimum temperature is exceeded by 2 K.

The **Boiler pr. max** option is used for protecting the boiler against overheating. If the adjusted maximum temperature is exceeded, the allocated relay is switched off until the temperature falls by 2 K below the maximum temperature.

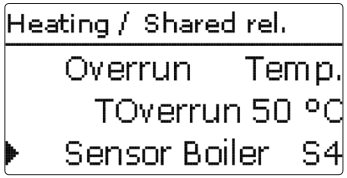
Example:

The potential-free relay R5 can be allocated to the shared relay **Demand 1**. R5 can then be used in the heating circuits or for DHW heating, for example, for a demand by means of a potential-free relay (scheme 5).



Pump

For loading pumps, the shared relays **Pump 1** and **Pump 2** are available. Concerning a demand, the options Start-up and Overrun can be activated for the shared relays. The demand can either be time- or temperature controlled. For temperature-dependent control an allocated boiler sensor is required.



The **Start-up** option is used for switching on the loading pump with a delay to a demand. If the adjusted minimum temperature at the allocated sensor is exceeded or the adjusted start-up time is reached, the corresponding relay switches on.

The **Overrun** option is used for switching off the loading pump with a delay to a demand. If the adjusted remaining boiler temperature is exceeded or the adjusted overrun time is reached, the corresponding relay switches off.

Valve

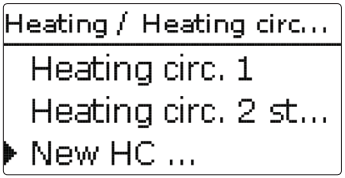
Valves and parallel relays can use the shared relays **Valve 1** and **Valve 2.** These shared relays are energised individually or along with a reference relay (e. g. loading pump).

Heating / Shared relays

Adjustment channel	Description	Adjustment range / selection	Factory setting
Dem. 1 ... 2	Boiler demand option	Activated, Deactivated	Deactivated
Relay	Relay selection	system dependent	system dependent
Boiler pr. min	Shared relay option for boiler protection min	Yes, No	No
Tmin	Boiler minimum temperature	10 ... 90 °C	55 °C
Boiler pr. max	Shared relay option for boiler protection max	Yes, No	No
Tmax	Boiler maximum temperature	20 ... 95 °C	90 °C
Sensor Boiler 1 ... 2	Boiler sensor selection	system dependent	system dependent
Pump 1 ... 2	Shared relay option for loading pump	Activated, Deactivated	Deactivated
Relay	Relay selection	system dependent	system dependent
Start-up	Pump delay	No, Time, Temperature	No
Delay	Delay to a demand	0 ... 300 s	60 s
TStart-up	Boiler start-up temperature	10 ... 90 °C	60 °C
Overrun	Pump overrun	No, Time, Temperature	No
Ov. time	Overrun time	0 ... 300 s	60 s
TOverrun	Remaining boiler temperature	10 ... 90 °C	50 °C
Sensor Boiler 1 ... 2	Boiler sensor selection	system dependent	system dependent
Valve 1 ... 2	Activation of a shared relay Parallel relay	Activated, Deactivated	Deactivated
Relay	Relay selection	system dependent	system dependent

6.2 Heating circuits

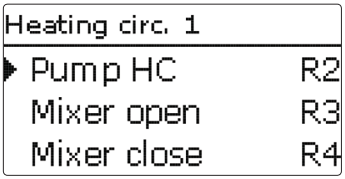
The controller has 1 mixed and 1 unmixed weather-compensated heating circuit and is able to control up to 5 further mixed heating circuits by means of extension modules.



If one or more extension modules are connected, they have to be registered with the controller. Only registered modules are available in the heating circuit selection (see page 56).

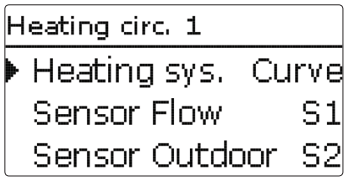
If **New HC...** is selected for the first time, the first heating circuit is allocated to the controller. The operating mode of the first heating circuit also applies to all further heating circuits which are linked.

In the heating circuit menu, relays for the heating circuit pump and the heating circuit mixer can be selected. Change the factory setting only if required.

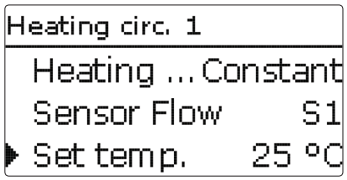


3 free relays are required for a mixed heating circuit. If less than 3 free relays are available on the controller or module, a static (unmixed) heating circuit can be allocated.

After the heating system has been selected (**Curve** or **Constant**), the required sensors can be allocated.

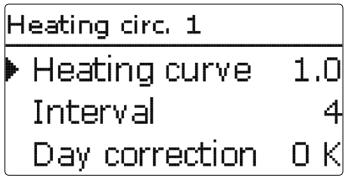


The heating system **Constant** is only available in a mixed heating circuit. An outdoor temperature sensor cannot be allocated.



The heating system **Constant** aims to keep the set flow temperature to a constant value which can be adjusted by means of the parameter **Set temperature**.

If the heating system **Curve** is selected, the controller calculates a set flow temperature by means of the outdoor temperature and the selected heating curve. In both cases, the dial setting of the remote control and the controller day correction or night correction are added.



Heating system Constant:

Set flow temperature = set temperature + remote control + day correction or night correction.

Heating system Curve:

Set flow temperature = heating curve temperature + remote control + day correction or night correction.

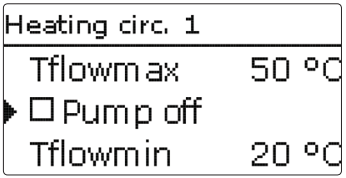
The calculated set flow temperature is limited by the adjusted values of the parameters **set flow temperature** and **flow minimum temperature** .

Flow maximum temperature ≥ flow set temperature ≥ flow minimum temperature

If the measured flow temperature deviates from the set flow temperature, the mixer will be activated in order to adjust the flow temperature correspondingly.

The mixer runtime can be adjusted with the parameter **Interval** .

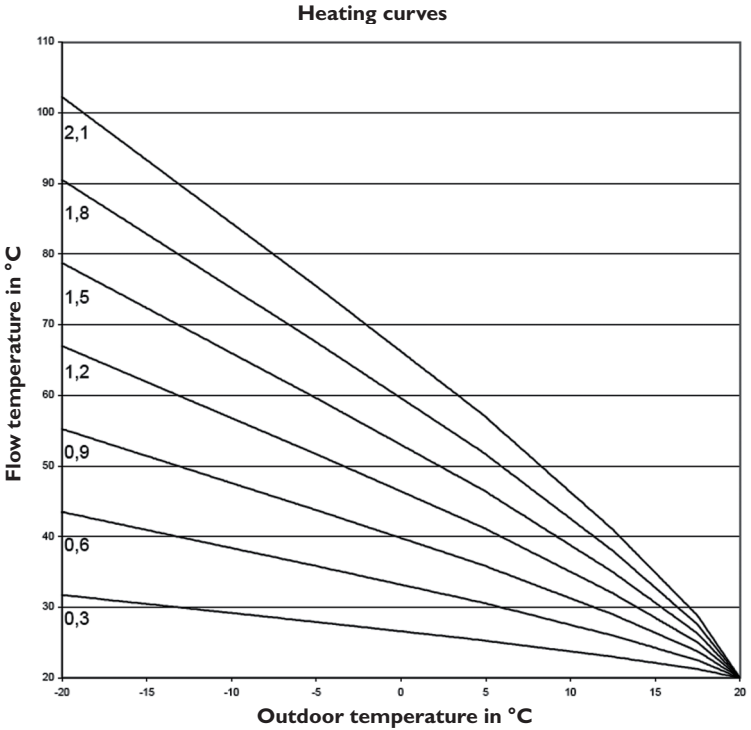
The parameter **Pump off** is used for switching off the heating circuit pump, if the adjusted value of the flow maximum temperature is exceeded by 5 K.



If the outdoor temperature sensor is defective, an error message will be indicated. For the duration of this condition, the maximum flow temperature -5 K is assumed as the set flow temperature.

The **Remote control** allows manual adjustment of the heating curve (± 15 K). Furthermore, the heating circuit can be switched off or a rapid heating can be carried out by means of the remote control.

Heating circuit switched off means that the heating circuit pump is switched off and the mixer closed. Flow temperature is boosted to maximum for rapid heating when the remote control is set to rapid heating.



Heating circ. 1	
▸ TSummer	20 °C
Daytime on	00:00
Daytime off	00:00

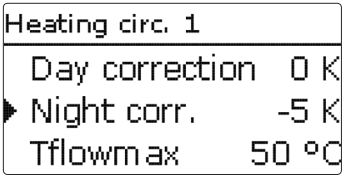
The automatic summer mode becomes active when the outdoor temperature exceeds the adjusted summer temperature **TSummer**. This can be limited to a daytime frame with the parameters **Daytime on** and **Daytime off**. Outside the adjusted time frame, the lower temperature **TNight** is used in summer mode. In summer mode, the heating circuit is switched off.

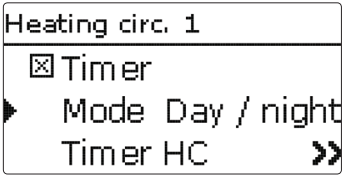
Heating circ. 1	
Daytime on	09:00
Daytime off	19:00
▸ TNight	14 °C

The option **Valve** can be used for allocating a relay which switches in parallel to the heating circuit (free relays or shared relays/ valve 1, 2).

Heating circ. 1
☐ Remote control
☐ Valve
▸ ☐ Timer

With the **Timer**, the day/night operation can be adjusted. During day phases, the set flow temperature is increased by the adjusted **Day correction** value, during night phases it is decreased by the **Night correction** value (night setback).





The parameter **Mode** is used for selecting between the following correction modes:

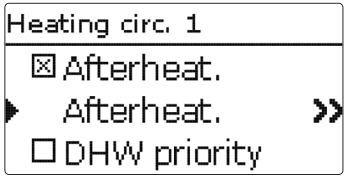
Day/Night: A reduced set flow temperature (night correction) is used during night operation.

Day/Off: The heating circuit and the optionally activated afterheating are switched off during night operation.

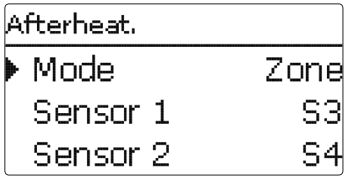
Room/Off: The heating circuit and the afterheating are switched off during night operation. If the temperature falls below the adjusted limit temperature at the allocated room sensor, the controller changes to the reduced heating mode.

Outdoor/Off: The heating circuit and the afterheating are switched off during night operation. If the temperature falls below the adjusted limit temperature at the allocated outdoor temperature sensor, the controller changes to the reduced heating mode.

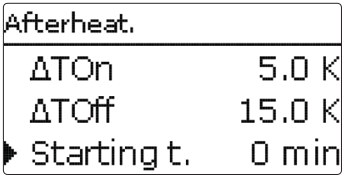
The **Timer HC** can be used for adjusting the time frames for day operation (see page 32).



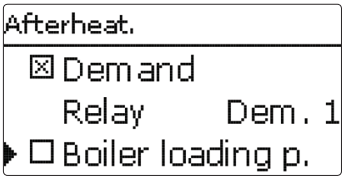
For heating circuit **Afterheating**, the calculated set flow temperature is compared with the temperature at one or two store (buffer) reference sensors (differential control). If this temperature difference **ΔTon** is too small, afterheating will be activated. It will be switched off, if the difference **ΔToff** between the store and the set flow temperature is large enough. If **Thermostat** is selected, the set flow temperature is compared with a store reference sensor. If **Zone** is selected, the set flow temperature is compared with 2 reference sensors. The switching conditions at both reference sensors have to be fulfilled.

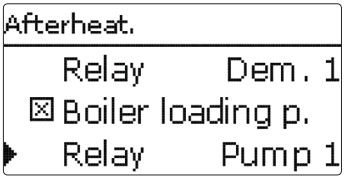


If the Correction mode **Day/Off, Room/Off** or **Outdoor/Off** is selected, the heating circuits and the afterheating are completely switched off during night operation. The adjusted value for the **Starting time** can be used for activating the afterheating before the day operation in order to heat the store to a sufficiently high temperature.



Separate relays can be allocated to a demand and to a boiler loading pump (free relays or shared relays/demand 1, 2 or pump1, 2 respectively). If shared relays are used, the parameters **Boiler protection, Demand, Overrun** become active, provided they have previously been adjusted.

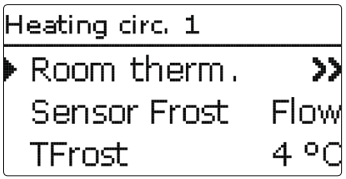


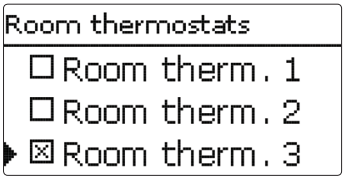


If **SFB Off** is activated, afterheating will be suppressed as long as a solid fuel boiler is switched on, which has previously been activated in the **Arrangement/Optional functions** menu.

At first, afterheating is activated and can be temporarily deactivated.

If the parameter **DHW priority** is activated, the heating circuit will be switched off and the afterheating be suppressed as long as DHW heating takes place, which has previously been activated in the Heating/Optional functions menu.

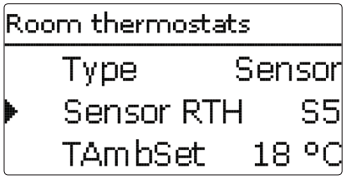




With the **Room thermostat** option, up to 5 room thermostats can be integrated into the control logic.

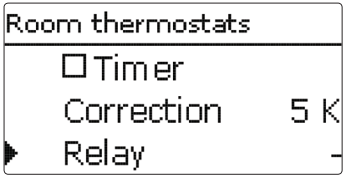
To each room thermostat, a sensor input can be allocated. The temperature at the allocated sensor is monitored. If the measured temperature exceeds the adjusted value **TAmbSet** at all activated room thermostats and if the parameter **HC off** is activated, the heating circuit will switch off.

Common room thermostats with potential-free outputs can be used alternatively. In this case, **Switch** must be selected in the **Type** channel. Beforehand, the corresponding input must also be set to **Switch** in the **Inputs/Outputs** menu. Only inputs set to Switch will be displayed in the channel **Sensor RTH** as possible inputs for a Switch type room thermostat.

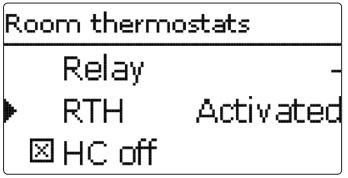


When the **Timer** option is activated, a timer is indicated in which time frames for the function can be adjusted. During these time frames, the adjusted room temperature decreases by the **Correction** value.

Note:
For information on timer adjustment see page 10.



To each room thermostat, an additional relay can be allocated. That relay will be energised if the temperature at the allocated sensor falls below the adjusted room temperature. This way, the room in question can be unlinked from the heating circuit via a valve as long as the room temperature is reached has the desired value.



In the channel **RTH**, the room thermostat can be temporarily deactivated or re-activated respectively. All adjustments remain stored.

Antifreeze function

The antifreeze function of the heating circuit can be used to temporarily activate an inactive heating circuit during sudden temperature drop in order to protect it from frost damage.

The temperature at the allocated antifreeze sensor **Sen. Frost** is monitored. If the temperature falls below the adjusted antifreeze temperature **TFrost**, the heating circuit will be activated until the antifreeze temperature is exceeded by 2 K, but at least for 30 min.

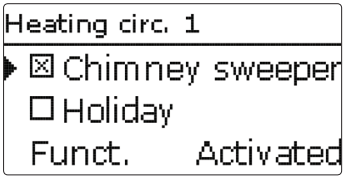
Heating / Heating circuits / New HC... / Internal or Module 1...5

Adjustment channel	Description	Adjustment range / selection	Factory setting
Pump HC	Heating circuit pump relay selection	system dependent	system dependent
Mixer open	Relay selection mixer open	system dependent	system dependent
Mixer close	Relay selection mixer closed	system dependent	system dependent
Heat. sys.	Selecting the heating system	Curve, Constant	Curve
Sensor Flow	Flow sensor selection	system dependent	system dependent
Sensor Outdoor	Outdoor temperature sensor selection	system dependent	system dependent
Heating curve	Heating curve	0.3 ... 3.0	1.0
Interval	Mixer interval	1 ... 20 s	4 s
Set temp.	Set temperature	10 ... 100 °C	25 °C
Day corr.	Day correction	-5 ... +45 K	0 K
Night corr.	Night correction	-20 ... +30 K	-5 K
Tflowmax	Maximum flow temperature	21 ... 90 °C	50 °C
Pump off	Deactivation of the heating circuit pump when Tflowmax is exceeded	Yes, No	No
Tflowmin	Minimum flow temperature	20 ... 89 °C	20 °C
TSummer	Summer temperature day	0 ... 40 °C	20 °C
Daytime on	Daytime on	00:00 ... 23:45	00:00
Daytime off	Daytime off	00:00 ... 23:45	00:00
TNight	Summer temperature night	0 ... 40 °C	14 °C
Remote control	Remote control option	Yes, No	No
Sen. RC	Remote control sensor input selection	system dependent	system dependent
Valve	Option valve in parallel to the heating circuit	Yes, No	No
Relay	Relay selection (valve)	system dependent	system dependent
Timer	Timer option	Yes, No	No
Mode	Correction mode selection	Day / Night, Day / Off, Room / Off, Outd. / Off	Day / Night
Sen. Room	Room sensor	system dependent	system dependent
TLimit	Limit temperature	-20 ... +30 °C	16 °C / 0 °C
Timer HC	Heating circuit timer	Yes, No	No

Adjustment channel	Description	Adjustment range / selection	Factory setting
Days of the week	Day selection	All days, Monday ... Sunday, Continue	All days
Edit timer	Time frame adjustment	00:00 ... 23:45	06:00 ... 22:00
Afterheat.	Afterheating option	Yes, No	No
Mode	Afterheating mode selection	Therm., Zone	Therm.
Sensor 1	Reference sensor 1	system dependent	system dependent
Sensor 2	Reference sensor 2 (if mode = Zone)	system dependent	system dependent
ΔTon	Switch-on temperature difference	-15.0 ... 44.5 K	5 K
ΔToff	Switch-off temperature difference	-14.5 ... 45.0 K	15 K
Starting t.	Afterheating starting time	0 ... 120 min	0 min
Demand	Demand option	Yes, No	No
Relay	Relay selection	system dependent	system dependent
Boiler loading p.	Boiler loading pump option	Yes, No	No
Relay	Relay selection	system dependent	system dependent
SFB Off	Solid fuel boiler off option	Yes, No	No
Funct.	De/activation of the afterheating	Activated, Deactivated	Activated
DHW priority	DHW priority option	Yes, No	No
Room therm. 1 ... 5	Room thermostat option (1 ... 5)	Yes, No	No
Type	Room thermostat type selection	Sensor, Switch	Sensor
Sensor RTH	RTH sensor input selection	system dependent	system dependent
TAmbSet	Room temperature	10 ... 30 °C	18 °C
Timer	RTH timer	Yes, No	No
Days of the week	Day selection	All days, Monday ... Sunday, Continue	All days
Edit timer	Time frame adjustment	00:00 ... 23:45	00:00 ... 00:00
Correction	Correction	1 ... 20 K	5 K
Relay	RTH relay selection	system dependent	system dependent
RTH	Room thermostat	Activated, Deactivated	Activated
HC off	Heating circuit off option	Yes, No	Yes
Sensor Frost	Antifreeze sensor	Flow, Outdoor	Flow
TFrost	Antifreeze temperature	+4 ... +10 °C / -20 ... +10 °C	+4 °C

Chimney sweeper function

The chimney sweeper function can be used for enabling a quick access to measurement conditions without menu operation for the chimney sweeper.



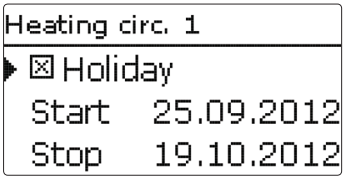
The chimney sweeper function is activated in all heating circuits by default. The chimney sweeper mode can be activated by pressing button (6) for 5 s.

In the chimney sweeper mode, the heating circuit mixer opens, the heating circuit pump and the afterheating contact are activated. While the chimney sweeper mode is active, the directional pad flashes red. Additionally, **Chimney sweeper** and a countdown of 30 min are indicated on the display.

When the countdown has elapsed, the chimney sweeper mode is automatically deactivated. If, during the countdown, button (6) is again pressed for more than 5 s, the chimney sweeper mode will end.

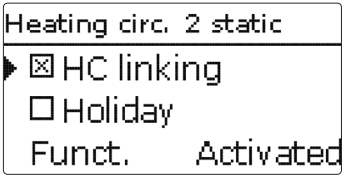
The **Holiday** option can be used for setting a start and a finish date for an absence.

If the heating circuit is set to the **Holiday** operating mode, it will automatically change to the night correction mode for the adjusted period.



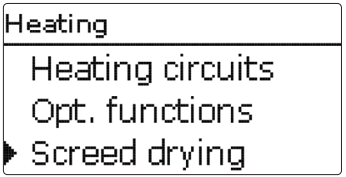
Adjustment channel	Description	Adjustment range / selection	Factory setting
Chimney sweeper	Chimney sweeper option	Yes, No	Yes
HC linking	Linking option Operating mode (HC 1 ... 7)	Yes, No	Yes
Holiday	Option Operating mode Holiday	Yes, No	No
Start	Start Operating mode Holiday	0 ... 31:1 ... 12:2001 ... 2050 (dd:mm:yyyy)	
Stop	Stop Operating mode Holiday	0 ... 31:1 ... 12:2001 ... 2050 (dd:mm:yyyy)	
Funct.	De/activation of the heating circuit	Activated, Deactivated	Activated

Beginning with the second heating circuit, all heating circuits offer the parameter **HC linking**. Using this parameter, the heating circuits adopt the operating mode of the first heating circuit. If you wish to adjust the operating mode of the heating circuits separately, deactivate the linking option.



Screed drying

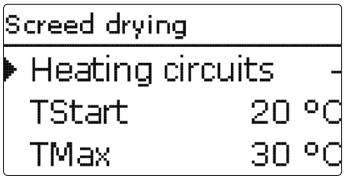
This function is used for time- and temperature-controlled screed drying in selectable heating circuits.



Note:

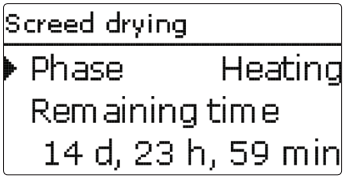
The screed drying function is blocked against the chimney sweeper function. In order to activate the screed drying function, the chimney sweeper function must be deactivated in all heating circuits.

The heating circuits can be selected in the **Heating / Screed drying** menu. At the end of this menu, the function can be set to standby by using the "Activated" item.

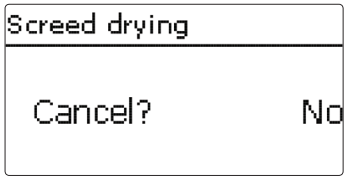


If button (6) is pressed and held down for at least 5 s, the screed drying programme will start.

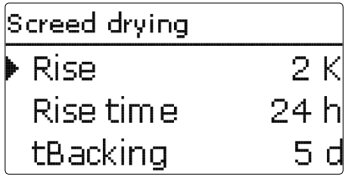
The message **Screed drying** is indicated on the display and the remaining time will be indicated as a countdown (dd:hh). During this process, the directional pad is flashing red.



If button (6) is pressed again and held down for at least 5 s, the screed drying programme will be aborted. For this reason, a security enquiry appears. If you wish to interrupt the screed drying function, confirm the security enquiry.



At the beginning of the screed drying function, the selected heating circuits are put into operation for the adjusted **rise time** with the start temperature as the set flow temperature. Afterwards, the set flow temperature increases in steps by the adjustable rise value for the duration of the adjustable rise time until the holding temperature is reached. After the holding time has elapsed, the set flow temperature is reduced in steps until the start temperature is reached again.



If the set flow temperature is not reached within 24 hours or after the rise time respectively, or if it is constantly exceeded, the screed drying function will be aborted.

The heating circuit switches off and an error message is displayed. The directional pad flashes red.

Error 1:	flow sensor defective
Error 2:	the flow temperature is higher than the set flow temperature + 5 K for over 5 min
Error 3:	the flow temperature is higher than the holding temperature + rise value for over 30 min
Error 4:	the flow temperature is higher than the set flow temperature + rise value for over 2 h
Error 5:	the flow temperature is lower than the set flow temperature - rise value for over a rise time period

During screed drying of the heating circuits selected, the other heating circuits run corresponding to their operating mode.

Button (7) can be used any time for changing to the status or main menu of the controller in order to carry out adjustments.

When the screed drying function has been successfully completed, the corresponding heating circuits change to their operating mode.

Screed drying is automatically deactivated. The chimney sweeper function is activated in all heating circuits.

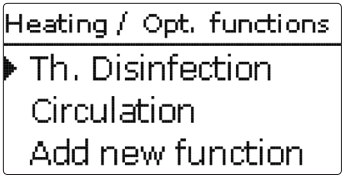
Heating / Screed drying

Adjustment channel	Description	Adjustment range / selection	Factory setting
Heating circuit	Heating circuit selection	HC1 ... 7	system dependent
TStart	Start temperature	10 ... 30 °C	20 °C
TMax	Holding temperature	20 ... 60 °C	30 °C
Rise	Rise	1 ... 10 K	2 K
Rise time	Rise time	1 ... 24 h	24 h
tBacking	Tmax holding time	1 ... 20 d	5 d
Funct.	Activation / Deactivation	Activated, Deactivated	Deactivated

Note:
Make sure the heating circuits are supplied with heat from a heat source (afterheating).

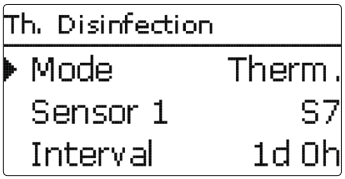
Note:
If an SD card has been inserted into the slot, a screed protocol will be generated.

6.3 Optional functions



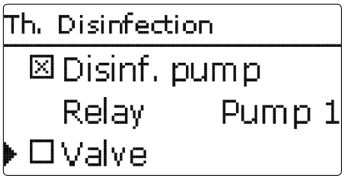
In this menu, additional functions can be selected and adjusted for the heating part of the arrangement.

By selecting **Add new function**, different pre-programmed functions can be selected. The optional functions are available as long as free relays are available.



When a function is selected, a sub-menu opens in which all adjustments required can be made.

In this sub-menu, a circulating pump relay can be allocated to the function. A relay switching in parallel to the corresponding pump can be selected in the **Valve** menu.



All optional functions of the heating contain the menu items **Demand** and **Boiler loading pump** which can be used for controlling a heat generator for afterheating.

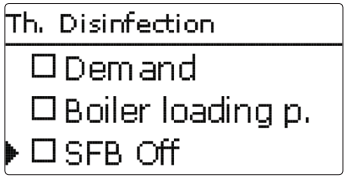
They can be activated separately or in common.

In the **Demand** menu, a heating demand relay can be allocated to the function. All free relays are available for selection.

A shared relay **Demand 1/2** can also be selected in this menu (see page 26).

In the **Boiler loading pump** menu, a loading pump can be allocated to the afterheating. Not only is it possible to directly allocate a relay, it is also possible to select a shared relay **Pump 1/2**. When selecting shared relays, further options such as the boiler protection, Start-up or overrun function are available (see page 26).

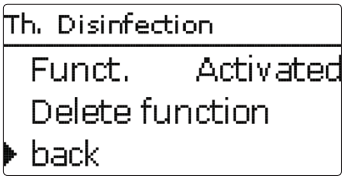
If a solid fuel boiler has been activated in the **Arrangement / Optional functions** menu and if the parameter **SFB Off** is activated, afterheating will be suppressed as long as a solid fuel boiler is switched on.



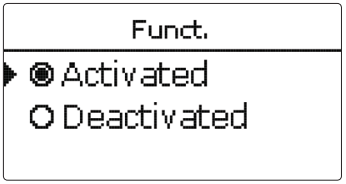
When a function has been selected and adjusted, it will appear in the **Opt. functions** menu above the menu item **Add new function**.

This allows an easy overview of functions already activated.

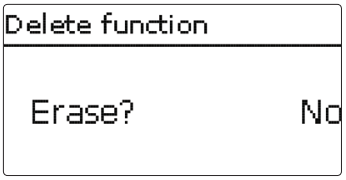
An overview about which sensor has been allocated to which component and which relay has been allocated to which function is given in the **Status / Service** menu.



At the end of each optional function sub-menu, the menu items **Function** and **Delete function** are available.

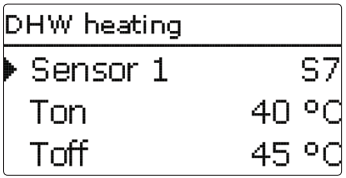


With the menu item **Function**, an optional function already selected can be temporarily deactivated or reactivated respectively. All adjustments remain stored, the allocated relays remain occupied and cannot be allocated to another function.

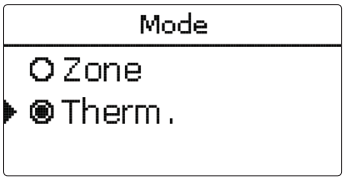


If the menu item **Delete function** is confirmed by pressing button (5), a security enquiry appears. The setting can be changed between **Yes** and **No** by pressing buttons (2) and (4). If Yes has been selected and confirmed by pressing button (5), the function is deleted and available under Add new function again.

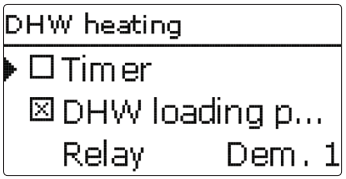
DHW heating



The DHW heating is used to demand an afterheating for heating the DHW store.



For DHW heating, 2 different modes are available:
Thermal mode:
The allocated demand relay is switched on when the temperature at the allocated sensor 1 falls below the adjusted switch-on temperature. If the temperature at the allocated sensor exceeds the adjusted switch-off temperature, the relay is switched off.
Zone mode:
If the Zone mode is selected, the switch-on and switch-off conditions must be fulfilled at 2 sensors for the relay to switch on or off respectively.



When the **Timer** option is activated, a timer is indicated in which time frames for the function can be adjusted.

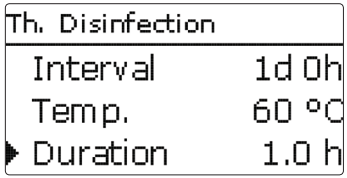
Heating / Opt. functions / Add new function / DHW heating

Adjustment channel	Description	Adjustment range / selection	Factory setting
DHW heating	DHW heating	system dependent	system dependent
Mode	Mode	Therm., Zone	Therm.
Sensor 1	Reference sensor 1	system dependent	system dependent
Sensor 2	Reference sensor 2 (if mode = Zone)	system dependent	system dependent
Ton	Switch-on temperature	0 ... 94 °C	40 °C
Toff	Switch-off temperature	1 ... 95 °C	45 °C
Timer	Timer option	Yes, No	No
Timer DHW1	Timer	00:00 ... 23:45	-
Days of the week	Day selection	All days, Monday ... Sunday, Continue	-
DHW loading p.	DHW loading pump option	Yes, No	Yes
Relay	Relay selection DHW loading pump	system dependent	system dependent
Valve	Valve option	Yes, No	No
Relay	Relay selection	system dependent	system dependent
Demand	Demand option	Yes, No	No
Relay	Relay selection	system dependent	system dependent
Boiler loading p.	Boiler loading pump option	Yes, No	No
Relay	Loading pump relay selection	system dependent	system dependent
SFB Off	Solid fuel boiler off option	Yes, No	No
Funct.	Activation / Deactivation	Activated, Deactivated	Activated
Delete function			
back			

Note:
For information on timer adjustment see page 10.

Thermal disinfection

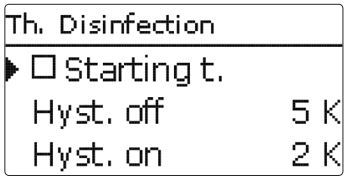
This function helps to contain the spread of Legionella in DHW stores by systematically activating the afterheating.



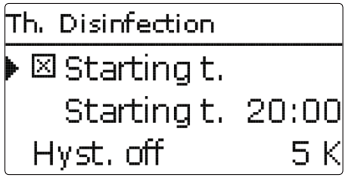
For thermal disinfection, the temperature at at least one reference sensor has to be monitored. This protection is ensured when, during the monitoring period Interval, the disinfection temperature Temp. is continuously exceeded at the reference sensor (at both reference sensors, if the zone mode has been selected) for the entire disinfection period.

If the thermal disinfection function is activated, the monitoring period starts as soon as the temperature at the reference sensor falls below the disinfection temperature. When the monitoring period ends, the allocated reference relay activates the afterheating. The disinfection period starts to count as soon as the temperature at the reference sensor (at both reference sensors, if the zone mode has been selected) exceeds the disinfection temperature.

If the temperature at the reference sensor (at both reference sensors, if the zone mode has been selected) exceeds the disinfection temperature by more than 5 K, the reference relay switches off until the temperature has fallen below a value of 2 K above the disinfection temperature.



Thermal disinfection can only be completed when the disinfection temperature is exceeded for the duration of the disinfection period without any interruption.



Due to the flexible control logic, the exact time of thermal disinfection is not predictable. In order to set a fixed time for the disinfection, the starting delay can be used.

If the starting delay option **Starting t.** is activated, a starting time for the thermal disinfection with starting delay can be adjusted. The activation of the afterheating is then delayed until that starting time after the monitoring period has ended.

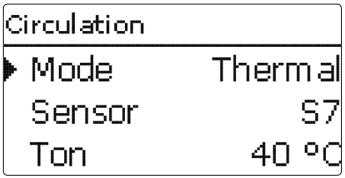
If the monitoring period ends, for example, at 12:00 o'clock, and the starting time has been set to 18:00, the reference relay will be energised with a delay of 6 hours at 18:00 instead of 12:00 o'clock.

If, before the delay time has elapsed, the disinfection conditions are fulfilled by any loading, thermal disinfection is considered as completed and a new monitoring period begins.

Heating / Opt. functions / Add new function / Th. Disinfection

Adjustment channel	Description	Adjustment range / selection	Factory setting
Mode	Mode selection	Therm., Zone	Therm.
Sensor 1	Reference sensor 1 selection	system dependent	system dependent
Sensor 2	Reference sensor 2 selection (if mode = Zone)	system dependent	system dependent
Interval	Monitoring period	0 ... 30, 1 ... 23 (dd:hh)	1d 0h
Temp.	Disinfection temperature	45 ... 90 °C	60 °C
Duration	Disinfection period	0.5 ... 24.0 h	1.0 h
Starting t.	Starting delay option	Yes, No	No
Starting t.	Starting point	00:00 ... 23:30	20:00
Hyst. on	Switch-on hysteresis	2 ... 20 K	5 K
Hyst. off	Switch-off hysteresis	1 ... 19 K	2 K
Desinf. pump	Disinfection pump option	Yes, No	Yes
Relay	Disinfection pump relay	system dependent	system dependent
Valve	Valve option	Yes, No	No
Relay	Relay Valve	system dependent	system dependent
Demand	Demand relay selection	Yes, No	No
Relay	Relay Demand	system dependent	system dependent
Boiler loading p.	Boiler loading pump option	Yes, No	No
Relay	Relay selection Boiler loading pump	system dependent	system dependent
SFB Off	Solid fuel boiler off option	Yes, No	No
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

Circulation



The circulation function can be used for controlling a circulation pump.

For the control logic, 5 different modes are available:

- Demand
- Thermal
- Timer
- Demand + Timer
- Thermal + Timer

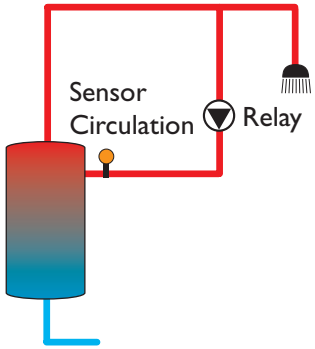
If one of the variants is selected, the corresponding adjustment channels will appear.

Demand

The switch-on condition is fulfilled, if a demand is being activated for the adjusted switch-on delay (contact closed). The switch-on condition is then met for the adjusted (minimum) runtime. The condition will then be ignored for the adjusted break time, the circulation will be in the break status.

Thermal

The temperature at the allocated sensor is monitored. The allocated relay switches on when the adjusted switch-on temperature is exceeded. If the temperature falls below the switch-off temperature, the relay switches off.



Timer

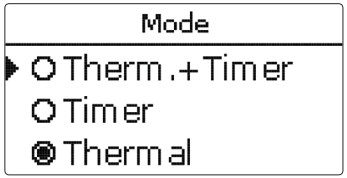
The relay is switched on during the adjusted time frames, outside of them it switches off. For information on how to adjust the timer, see below.

Demand + Timer

The relay operates when the switch-on conditions of both above mentioned variants are fulfilled.

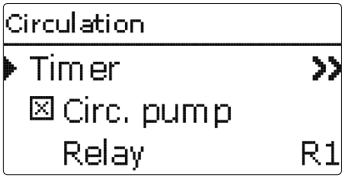
Thermal + Timer

The relay operates when the switch-on conditions of both above mentioned variants are fulfilled.



Note:

If the flow switch is connected to the input S1 ... S8, continuity must be detected for at least 5 s for the controller to react. In the case of the impulse input (S9) at least 1 s.



When the **Timer**, **Demand + Timer** or **Therm.+ Timer** variant is activated, a timer is indicated in which time frames for the function can be adjusted.

Note:

For information on timer adjustment see page 10.

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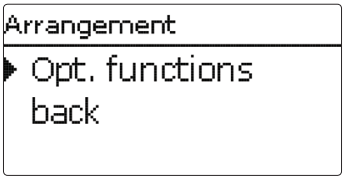
Arrangement / Opt. functions / Add new function / Circulation

Adjustment channel	Description	Adjustment range / selection	Factory setting
Mode	Variant	Demand, Thermal, Timer, Demand+Timer, Thermal +Timer	Thermal
Sensor	Circulation sensor selection	system dependent	system dependent
Ton	Switch-on temperature	10 ... 59 °C	40 °C
Toff	Switch-off temperature	11 ... 60 °C	45 °C
Delay	Demand switch-on delay	0 ... 3 s	0 s
Runtime	Runtime	01:00 ... 15:00 min	03:00 min
Break time	Break time	10 ... 60 min	30 min
Timer	Timer	Yes, No	No
Days of the week	Day selection	All days, Monday ... Sunday, Continue	-
Circ. pump	Circulation pump option	Yes, No	Yes
Relay	Relay selection	system dependent	system dependent
Valve	Valve option	Yes, No	No
Relay	Relay selection	system dependent	system dependent
Demand	Demand option	Yes, No	No
Relay	Relay selection	system dependent	system dependent
Boiler loading p.	Boiler loading pump option	Yes, No	No
Relay	Relay selection	system dependent	system dependent
SFB Off	Solid fuel boiler off option	Yes, No	No
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

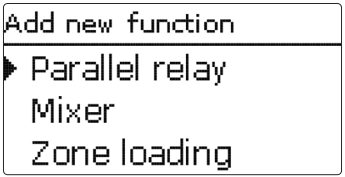
7 Arrangement



In this menu, all adjustments for the non-heating part of the arrangement can be made.

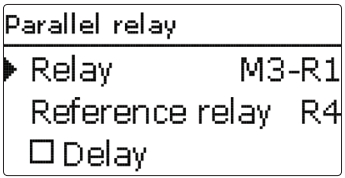
A range of optional functions can be selected and adjusted.

7.1 Optional functions



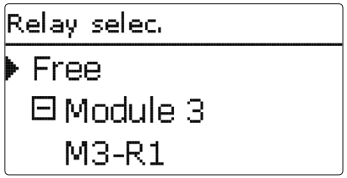
In this menu, additional functions can be selected and adjusted for the arrangement.

By selecting **Add new function**, different pre-programmed functions can be selected. The optional functions are available as long as free relays are available.



When a function is selected, a sub-menu opens in which all adjustments required can be made.

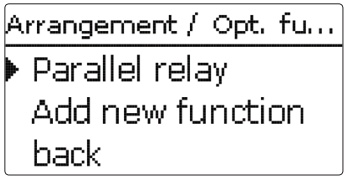
With this sub-menu, a relay and, if necessary, certain system components can be allocated to the function.



The menu item **Relay** is available in all optional functions. Therefore, it will not be explained in the individual function descriptions.

With this menu item, a relay can be allocated to the function. All free relays are available for selection.

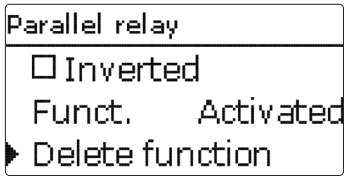
In the sub-menu **Controller**, all free relays of the controller are displayed. If external modules are connected and registered, their relays will be displayed in corresponding sub-menus.



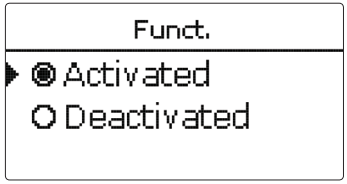
When a function has been selected and adjusted, it will appear in the **Opt. functions** menu above the menu item **Add new function**.

This allows an easy overview of functions already activated.

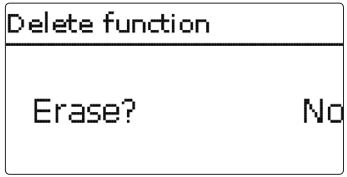
An overview about which sensor has been allocated to which component and which relay has been allocated to which function is given in the **Status / Meas. / Balance values** menu.



At the end of each optional function sub-menu, the menu items **Function** and **Delete function** are available.



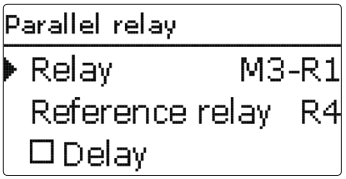
With the menu item **Function**, an optional function already selected can be temporarily deactivated or reactivated respectively. All adjustments remain stored, the allocated relays remain occupied and cannot be allocated to another function.



If the menu item **Delete function** is confirmed by pressing button (5), a security enquiry appears. The setting can be changed between **Yes** and **No** by pressing buttons (2) and (4). If Yes has been selected and confirmed by pressing button (5), the function is deleted and available under **Add new function** again. The corresponding relays are available again.

Parallel relay

Note:
If a relay is in the manual mode, the selected parallel relay will not be energised.



The **Parallel relay** function can be used to operate an allocated parallel relay alongside a selected reference relay. With this function, e. g. a valve can be controlled in parallel to the pump via a separate relay.

If the **Overrun** option is activated, the parallel relay remains switched on for the adjusted overrun time after the reference relay has been switched off.

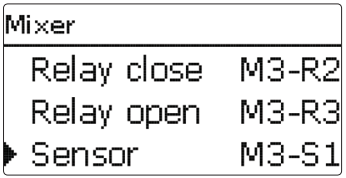
If the **Delay** option is activated, the parallel relay will be energised after the adjusted delay time has expired. If the reference relay is switched off again during the delay time, the parallel relay will not be switched on at all.

If the **Inverted** option is activated, the parallel relay switches on when the reference relay switches off and vice versa.

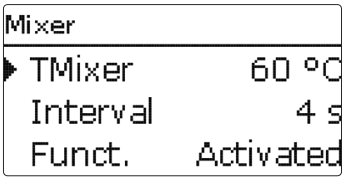
Arrangement / Opt. functions / Add new function / Parallel relay

Adjustment channel	Description	Adjustment range / selection	Factory setting
Relay	Relay selection	system dependent	system dependent
Reference relay	Reference relay selection	system dependent	system dependent
Delay	Delay option	Yes, No	No
Duration	Delay time	1 ... 30 min	1 min
Overrun	Overrun option	Yes, No	No
Duration	Overrun time	1 ... 30 min	1 min
Inverted	Inverted switching option	Yes, No	No
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

Mixer



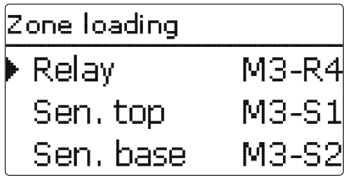
The mixer function can be used to adjust the actual flow temperature to the desired mixer target temperature **TMixer**. The mixer is opened or closed in pulses depending on this deviation. The pulses are determined by the adjustable **Interval**. The pause is determined by the difference between the actual value and the set value.



Arrangement / Opt. functions / Add new function / Mixer

Adjustment channel	Description	Adjustment range / selection	Factory setting
Relay close	Relay selection mixer closed	system dependent	system dependent
Relay open	Relay selection mixer open	system dependent	system dependent
Sensor	Sensor selection	system dependent	system dependent
TMixer	Mixer target temperature	0 ... 130 °C	60 °C
Interval	Mixer interval	1 ... 20 s	4 s
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

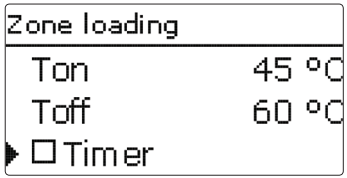
Zone loading



The **Zone loading** function can be used to load a store zone between 2 sensors (sensor top and sensor base). For monitoring the switch-on and switch-off conditions, 2 sensors are used. The switch-on and switch-off temperatures **Ton** and **Toff** are used as reference parameters.

If the measured temperatures at both allocated sensors fall below the adjusted switching threshold **Ton,** the relay is energised. It is switched off again when the temperature at both sensors has exceeded **Toff**.

If one of the two sensors is defective, zone loading is suppressed or switched off.



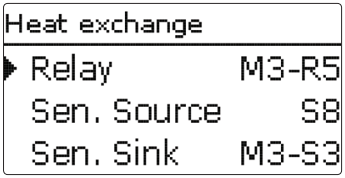
When the **Timer** option is activated, a timer is indicated in which time frames for the function can be adjusted.

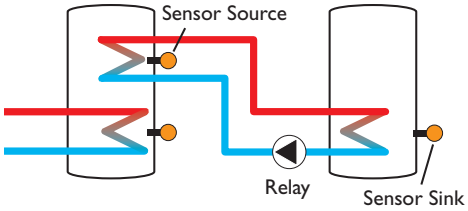
Note:
For information on timer adjustment see page 10.

Arrangement / Opt. functions / Add new function / Zone loading

Adjustment channel	Description	Adjustment range / selection	Factory setting
Relay	Relay selection	system dependent	system dependent
Sensor top	Top sensor selection	system dependent	system dependent
Sensor base	Base sensor selection	system dependent	system dependent
Ton	Boiler switch-on temperature	0 ... 94 °C	45 °C
Toff	Boiler switch-off temperature	1 ... 95 °C	60 °C
Timer	Timer option	Yes, No	No
Timer	Time frame adjustment	-	-
Days of the week	Day selection	All days, Monday ... Sunday, Continue	-
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

Heat exchange





The **Heat exchange** function can be used for transferring heat from a heat source to a heat sink.

The allocated relay is energised when all switch-on conditions are fulfilled:

- the temperature difference between the allocated sensors has exceeded the switch-on temperature difference
- the temperature difference between the allocated sensors has not fallen below the switch-off temperature difference
- the temperature at the heat source sensor has exceeded the minimum temperature
- the temperature at the heat sink sensor has fallen below the maximum temperature
- one of the adjusted time frames is active (if the **Timer** option is selected)

Speed control is deactivated by default. In order to activate speed control, reduce the minimum pump speed.

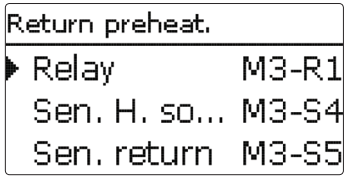
When the **Set temperature** difference is exceeded, pump speed control starts. If the temperature difference increases by the adjustable **Rise** value, the pump speed increases by 10 % respectively.

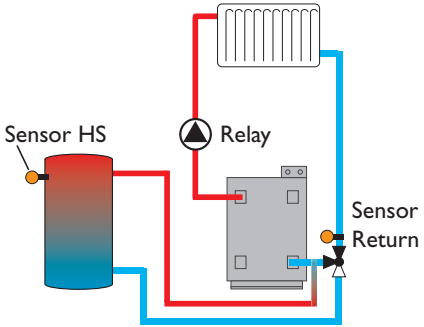
Note:
For information on timer adjustment see page 10.

Arrangement / Opt. functions / Add new function / Heat exchange

Adjustment channel	Description	Adjustment range / selection	Factory setting
Relay	Relay selection	system dependent	system dependent
Sen. Source	Heat source sensor selection	system dependent	system dependent
Sen. Sink	Heat sink sensor selection	system dependent	system dependent
ΔTon	Switch-on temperature difference	1.0 ... 30.0 K	6.0 K
ΔToff	Switch-off temperature difference	0.5 ... 29.5 K	4.0 K
ΔTset	Set temperature difference	1.5 ... 40.0 K	10.0 K
Rise	Rise	1.0 ... 20.0 K	2.0 K
Min speed	Minimum speed	20 ... 100 %	100 %
Tmax	Maximum temperature of the store to be loaded	10 ... 95 °C	60 °C
Tmin	Minimum temperature of the store to be loaded	10 ... 95 °C	10 °C
Timer	Timer	-	-
Days of the week	Day selection	All days, Monday ... Sunday, Continue	-
Timer	Time frame adjustment	00:00 ... 23:45	-
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

Return preheating





Arrangement / Opt. functions / Add new function / Return preheat.

Adjustment channel	Description	Adjustment range / selection	Factory setting
Relay	Relay selection	system dependent	system dependent
Sen. HS	Heat source sensor selection	system dependent	system dependent
Sen. Return	Return sensor selection	system dependent	system dependent
ΔTon	Switch-on temperature difference	2.0 ... 30.0 K	6.0 K
ΔToff	Switch-off temperature difference	1.0 ... 29.0 K	4.0 K
Summer off	Summer switch-off option	Yes, No	No
Sensor	Outdoor temperature sensor selection	system dependent	system dependent
Toff	Switch-off temperature	10 ... 60 °C	20 °C
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

The **Return preheating** function can be used for transferring heat from a heat source to the heating circuit return.

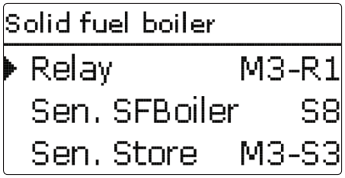
The allocated relay is energised when all switch-on conditions are fulfilled:

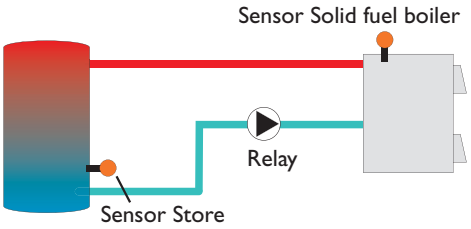
- the temperature difference between the allocated sensors has exceeded the switch-on temperature difference
- the temperature difference between the allocated sensors has not fallen below the switch-off temperature difference
- if **Summer off** is activated, the temperature at the outdoor temperature sensor falls below the adjusted outdoor temperature value
- the temperature at the allocated sensor does not exceed the switch-off temperature (if the **Summer off** option is selected)

Speed control is deactivated by default. In order to activate speed control, reduce the minimum pump speed.

With the summer switch-off option, the return preheating can be suppressed outside the heating period. If the heating circuit concerned is controlled by the controller, the adjustments automatically adapt to the heating circuit.

Solid fuel boiler





Arrangement / Opt. functions / Add new function / Solid fuel boiler

Adjustment channel	Description	Adjustment range / selection	Factory setting
Relay	Relay selection	system dependent	system dependent
Sen. Boiler	Solid fuel boiler sensor selection	system dependent	system dependent
Sen. Store	Store sensor selection	system dependent	system dependent
ΔTon	Switch-on temperature difference	2.0 ... 30.0 K	6.0 K
ΔToff	Switch-off temperature difference	1.0 ... 29.0 K	4.0 K
ΔTset	Set temperature difference	3.0 ... 40.0 K	10.0 K
Rise	Rise	1.0 ... 20.0 K	2.0 K
Min speed	Minimum speed	20 ... 100 %	100 %
Tmax St.	Maximum temperature	4 ... 95 °C	60 °C
Tmin Boiler	Minimum temperature	4 ... 95 °C	60 °C
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

The **Solid fuel boiler** function can be used for transferring heat from a solid fuel boiler to a store.

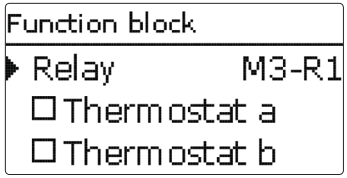
The allocated relay is energised when all switch-on conditions are fulfilled:

- the temperature difference between the allocated sensors has exceeded the switch-on temperature difference
- the temperature difference between the allocated sensors has not fallen below the switch-off temperature difference
- the temperature at the solid fuel boiler sensor has exceeded the minimum temperature
- the temperature at the store sensor has fallen below the maximum temperature
- one of the adjusted time frames is being active (if the **Timer** option is selected)

Speed control is deactivated by default. In order to activate speed control, reduce the minimum pump speed.

When the **Set temperature** difference is exceeded, pump speed control starts. If the temperature difference increases by the adjustable **Rise** value, the pump speed increases by 10 % respectively.

Function block



In addition to the pre-defined optional functions, function blocks consisting of thermostat functions, timer and differential functions are available. With the help of these function blocks, further components, functions respectively can be controlled.

To each function block, sensors and free relays can be allocated. Sensors already in use can be allocated again without impeding their control functions.

Within a function block the functions are interconnected (AND gate). This means that the conditions of all the activated functions have to be fulfilled for switching on the allocated relay. As soon as one condition is not fulfilled, the relay is switched off.

Thermostat function

The relay allocated to the function block is switched on, when the adjusted switch-on temperature (Th(x)on) is reached. It is switched off when the adjusted switch-off temperature (Th(x)off) is reached. The switching conditions of all other activated functions of the function block have to be fulfilled as well.

Allocate the reference sensor in the **Sensor** channel.

Adjust the maximum temperature limitation with Th(x)off > Th(x)on and the minimum temperature limitation with Th(x)on > Th(x)off. The temperatures cannot be set to an identical value.

ΔT function

The relay allocated to the function block is switched on as soon as the adjusted switch-on temperature difference (ΔT(x)on) is reached. It is switched off as soon as the adjusted switch-off temperature difference (ΔT(x)off) is reached. The switching conditions of all other activated functions of the function block have to be fulfilled as well.

The ΔT function is equipped with a speed control function. A set temperature difference and a minimum speed can be adjusted. The non-adjustable rise value is 2 K.

Reference relay

Up to 5 reference relays can be selected.

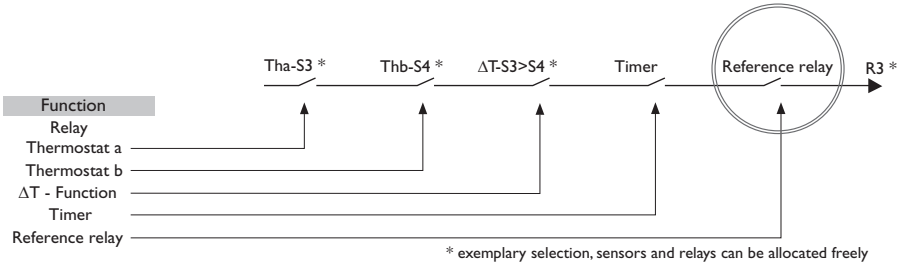
Whether the reference relays are to be switched in series (AND) or in parallel (OR) can be adjusted in the **Mode** channel.

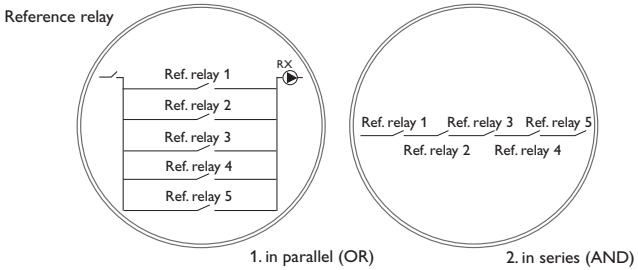
OR mode

If at least one of the reference relays is active, the switch-on condition for the function block is considered fulfilled. The switching conditions of all other activated functions of the function block have to be fulfilled as well.

AND mode

If all reference relays are active, the switch-on condition for the function block is considered fulfilled. The switching conditions of all other activated functions of the function block have to be fulfilled as well.

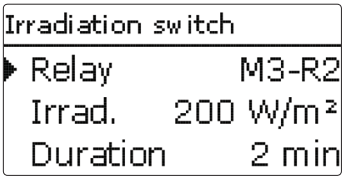




Arrangement / Opt. functions / Add new function / Function block

Adjustment channel	Description	Adjustment range / selection	Factory setting
Relay	Relay	system dependent	system dependent
Thermostat a	Thermostat a	Yes, No	No
Th-a on	Switch-on temperature Thermostat a	-40 ... 250 °C	40 °C
Th-a off	Switch-off temperature Thermostat a	-40 ... 250 °C	45 °C
Sensor	Sensor Thermostat a	system dependent	system dependent
Thermostat b	Thermostat b	Yes, No	No
Th-b on	Switch-on temperature Thermostat b	-40 ... 250 °C	40 °C
Th-b off	Switch-off temperature Thermostat b	-40 ... 250 °C	45 °C
Sensor	Sensor Thermostat b	system dependent	system dependent
ΔT function	Differential function	Yes, No	No
ΔTon	Switch-on temperature difference	1.0 ... 50.0 K	5.0 K
ΔToff	Switch-off temperature difference	0.5 ... 49.5 K	3.0 K
ΔTset	Set temperature difference	2 ... 100 K	10 K
Rise	Rise	1.0 ... 20.0	2.0 K
Min speed	Minimum speed	20 ... 100 %	100 %
Sen. Source	Heat source sensor	system dependent	system dependent
Sen. Sink	Heat sink sensor	system dependent	system dependent
Timer	Timer	Yes, No	No
Timer FB1	Time frame adjustment	00:00 ... 23:45	
Days of the week	Day selection	All days, Monday ... Sunday, Continue	-
Reference relay	Reference relay option	Yes, No	No
Mode	Reference relay mode	AND, OR	OR
Relay	Reference relay 1 selection	system dependent	system dependent
Relay	Reference relay 2 selection	system dependent	system dependent
Relay	Reference relay 3 selection	system dependent	system dependent
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

Irradiation switch



The **Irradiation switch** function can be used for operating a relay depending on the measured irradiation value.

The allocated relay is switched on if the adjusted irradiation value remains exceeded for the adjusted duration. If the irradiation falls below the adjusted value for the adjusted duration, the relay is switched off.

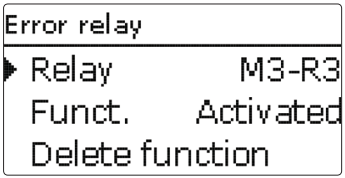
If the **Inverted** option is activated, the relay operates vice versa.

Arrangement / Opt. functions / Add new function / Irradiation switch

Adjustment channel	Description	Adjustment range / selection	Factory setting
Relay	Relay selection	system dependent	system dependent
Irrad.	Switch-on irradiation	50 ... 1000 W/m²	200 W/m²
Duration	Switch-on duration	0 ... 30 min	2 min
Inverted	Inverted switching option	Yes, No	No
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

en

Error relay



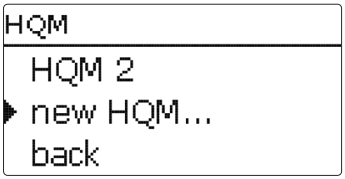
The **Error relay** function can be used to operate a relay in the case of an error. Thus, e. g. a signalling device can be connected in order to signal errors.

If the error relay function is activated, the allocated relay will operate when a sensor fault occurs.

Arrangement / Opt. functions / Add new function / Error relay

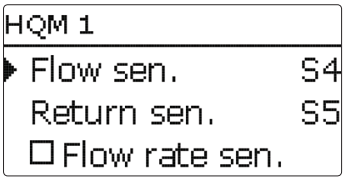
Adjustment channel	Description	Adjustment range / selection	Factory setting
Relay	Relay selection	system dependent	system dependent
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

8 HQM



In the **HQM** menu, up to 5 internal heat quantity measurements can be activated and adjusted.

By selecting the menu item **new HQM...**, a new heat quantity measurement can be activated.



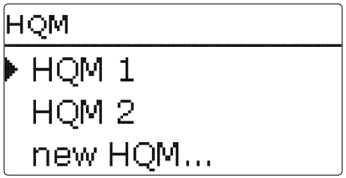
A menu opens in which all adjustments required for the heat quantity measurement can be made.

If the **Flow rate sensor** option is activated, the impulse input or, if available, a Grundfos Direct Sensor™ can be selected. Grundfos Direct Sensors™ are only available if they have been previously registered in the In-/Outputs menu. The impulse rate must be adjusted in that menu as well.

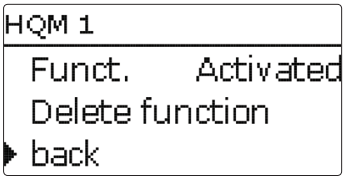
If the **Flow rate sensor** option is deactivated, the controller calculates the heat quantity by means of a fixed flow rate value. This is called heat quantity balancing. For this purpose, the flow rate must be read from the flowmeter at 100% pump speed and adjusted in the adjustment channel **Flow rate**. In addition to that, a **Relay** must be allocated. Heat quantity balancing is in effect whenever the allocated relay is active.

In the adjustment channel **Fluid type**, the heat transfer fluid must be selected. If either propylene glycol or ethylene glycol is selected, the adjustment channel **Ratio** is indicated in which the antifreeze ratio of the heat transfer fluid can be adjusted.

When the **Alternative unit** is activated, the controller will convert the heat quantity into the quantity of fossil fuels (coal, oil or gas) saved, or the CO_2 emission saved respectively. The alternative **Unit** can be selected. A **conversion factor** must be adjusted for the calculation. The conversion factor depends on the arrangement in use and has to be determined individually.



Heat quantity measurements already activated will appear in the **HQM** menu above the menu item **new HQM...** in numerical order.



If an activated heat quantity measurement is selected, the above mentioned menu with all adjustment values will re-open.

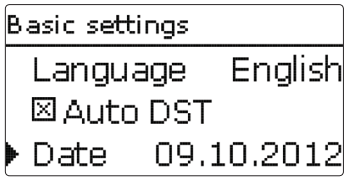
To deactivate a heat quantity measurement, select the menu item **Delete function** at the bottom of the menu.

The heat quantity measurement deleted will disappear from the list and become available for selection in the **new HQM...** menu again. The numeration of the other activated heat quantity measurements will not change.

HQM / new HQM...

Adjustment channel	Description	Adjustment range / selection	Factory setting
Flow sen.	Flow sensor selection	system dependent	system dependent
Return sen.	Return sensor selection	system dependent	system dependent
Flow rate sen.	Flow rate sensor option	Yes, No	No
Flow rate sen.	Flow rate sensor selection	Imp 1, Gd1, Gd2	-
Flow rate	Flow rate (only if Flow rate sen. = No)	1.0 ... 500.0 l/min	3.0 l/min
Relay	Relay selection	system dependent	system dependent
Fluid type	Heat transfer fluid	Tyfo LS, Propyl., Ethyl., Water	Water
Ratio	Glycol ratio in the heat transfer fluid (only if Fluid type = Propyl. or Ethyl.)	5 ... 100%	40%
Alternative unit	Alternative unit option	Yes, No	No
Unit	Alternative display unit	Coal, Gas, Oil, CO_2	CO_2
Factor	Conversion factor	0.01 ... 100.00	0.50
Funct.	Activation / Deactivation	Activated, Deactivated	Activated

9 Basic settings

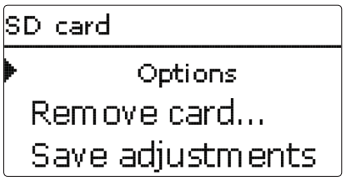


In the **Basic settings** menu, all basic parameters for the controller can be adjusted. Normally, these settings have been made during commissioning. They can be subsequently changed in this menu.

Basic settings

Adjustment channel	Description	Adjustment range / selection	Factory setting
Language	Selection of the menu language	Deutsch, English, Francais	Deutsch
Auto DST	Daylight savings time selection	Yes, No	Yes
Date	Adjustment of the current date	01.01.2001 ... 31.12.2099	01.01.2010
Time	Adjustment of the current time	00:00 ... 23:59	-
Temp. unit	Temperature unit	°C, °F	°C
Flow unit	Volume unit	Gallons, Litre	Litre
Press. unit	Unit of pressure	psi, bar	bar
Energy unit	Energy unit	Wh, BTU	Wh
Scheme	Scheme selection	0 ... 9	0
Reset	back to factory settings	Yes, No	No

10 SD card



The controller is equipped with an SD card slot for SD memory cards.

With an SD card, the following functions can be carried out:

- Logging measurement and balance values. After the transfer to a computer, the values can be opened and visualised, e. g. in a spreadsheet.
- Store adjustments and parameterisations on the SD card and, if necessary, retrieve them from there.
- Running firmware updates on the controller.

Running firmware updates

When an SD card with a firmware update is inserted, the enquiry **Update?** is indicated on the display. The setting can be changed between **Yes** and **No** by pressing buttons (2) and (4).

➔ To run the update, select **Yes** and confirm by pressing button (5).

The update is run automatically. The indication **Please wait** and a progress bar appear on the display. When the update has been completed, the controller will automatically reboot and run a short initialisation phase.

➔ To skip the update, select **No**.

The controller commences normal operation.

Note:
The controller will only recognise a firmware update file if it is stored in a folder named "RESOL\HC" on the first level of the SD card.

➔ Create a folder named "RESOL\HC" on the SD card and extract the downloaded ZIP file into this folder.

Starting the logging

➔ Insert the SD card into the slot

➔ Adjust the desired logging type and interval

Logging will start immediately.

Stopping the logging

➔ Select the menu item **Remove card...**

➔ After **Remove card** is displayed, remove the card from the slot

When **Linear** is adjusted in the **Logging type** adjustment channel, data logging will stop if the capacity limit is reached. The message **Card full** will be displayed.

If **Cyclic** is adjusted, the oldest data logged onto the SD card will be overwritten as soon as the capacity limit is reached.

Note:
Because of the increasing size of the data packets, the remaining logging time does not decrease linearly. The data packet size can increase, e. g. with the increasing operating hours value.

Storing controller adjustments

➔ To store the controller adjustments on an SD card, select the menu item **Save adjustments**.

While the adjustments are being stored, first **Please wait**, then **Done!** will be indicated on the display. The controller adjustments are stored as a .SET file on the SD card.

Loading controller adjustments

➔ To load controller adjustments from an SD card, select the menu item **Load adjustments**.

The File selection window is indicated.

➔ Select the desired .SET file.

While the adjustments are being loaded, first **Please wait**, then **Done!** will be indicated on the display.

Formatting the SD card

➔ Select the menu item **Format card**

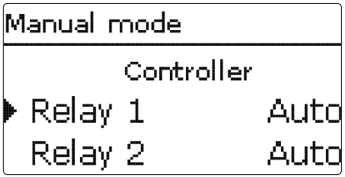
The content of the card will be deleted and the card will be formatted with the FAT file system.

Note:
To safely remove the SD card, always select the menu item **Remove card...** before removing the card.

SD card

Adjustment channel	Description	Adjustment range / selection	Factory setting
Remove card...	Safely remove card	-	-
Save adjustments	Save adjustments	-	-
Load adjustments	Load adjustments	-	-
Logging interval	Logging interval	00:01 ... 20:00 (mm:ss)	01:00
Logging type	Logging type	Cyclic, Linear	Linear
Format card	Format card	-	-

11 Manual mode



In the **Manual mode** menu, the operating mode of all relays in the controller and in connected modules can be adjusted.

All relays are displayed in numerical order, first those of the controller, then those of the individual modules connected. Modules are listed in numerical order.

In the menu item **All relays...**, all relays can at once be switched off (Off) or set to automatic mode (Auto):

Off = Relay is switched off (manual mode)

Auto = Relay is in automatic mode

The operating mode can be selected for each individual relay, too. The following options are available:

Off = Relay is switched off (manual mode)

Min. = Relay active with minimum speed (manual mode)

Max. = Relay active at 100 % speed (manual mode)

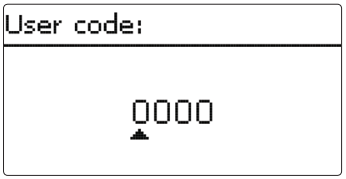
Auto = Relay is in automatic mode

Note:
After service and maintenance work, the relay mode must be set back to **Auto**. Otherwise normal operation will not be possible.

Manual mode

Adjustment channel	Description	Adjustment range / selection	Factory setting
Relay 1 ... X	Operating mode selection	Max., Auto, Min., Off	Auto
All relays...	Operating mode of all relays	Auto, Off	Off

12 User code



In the **User code** menu, a user code can be entered. Each number of the 4-digit code must be individually adjusted and confirmed. After the last digit has been confirmed, the menu automatically jumps to the superior menu level.

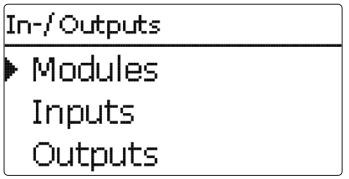
To access the menu areas of the expert level, the expert user code must be entered:

Expert user code: 0262

For safety reasons, the user code should generally be set to the customer code before the controller is handed to the customer!

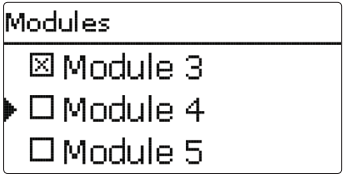
Customer user code: 0000

13 In-/Outputs



In the **In-/Outputs** menu, external modules can be registered, sensor offsets can be adjusted and relay outputs can be configured.

13.1 Modules



In this menu, up to 5 external modules can be registered.

All modules connected and acknowledged by the controller are available.

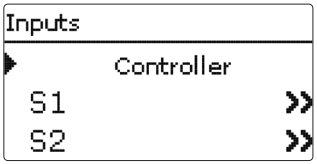
➔ To register a module, select the corresponding menu item by pressing button (5)

The checkbox indicates the selection. If a module is registered, all its sensor inputs and relay outputs will be available in the corresponding controller menus.

In-/Outputs/Modules

Adjustment channel	Description	Adjustment range/selection	Factory setting
Module 1 ... 5	Registering external modules	-	-

13.2 Inputs



In this sub-menu, the type of the sensor connected can be adjusted for each individual input. The following types can be selected:

- Switch
- KTY
- Pt500
- RTA11-M
- Pt1000
- None

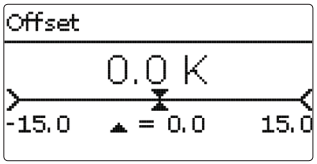
ATTENTION! **System damage!**

Selecting the wrong sensor type will lead to unwanted controller actions. In the worst case, system damage can occur!

➔ **Make sure that the right sensor type is selected!**

If KTY, Pt500 or Pt1000 are selected, the channel **Offset** appears, in which an individual offset can be adjusted for each sensor.

➔ In order to select a sensor for the offset adjustment, select the corresponding menu item by pressing button (5)



➔ To adjust the sensor offset, select the desired value by pressing buttons (2) or (4), then confirm by pressing button (5)

In-/Outputs/Inputs

Adjustment channel	Description	Adjustment range/selection	Factory setting
S1 ... S9	Sensor input selection	-	-
Type	Sensor type selection	Switch, KTY, Pt500, RTA11M, Pt1000, None	Pt1000
Offset	Sensor offset	-15.0 ... +15.0 K	0,0 K
Imp.1	Impulse input selection	-	-
Type	Sensor type selection	Impulse, Switch, KTY, Pt500, RTA11M, Pt1000, None	Impulse
Vol./Imp.	Impulse rate	0.1 ... 100.0	1.0
CS10	CS10 input	-	-
Type	CS type	A ... K	E
Offset	Delete offset	Yes, No	No
Gd1, 2	Digital Grundfos Sensor 1,2	-	-
Type	Grundfos Direct Sensor™ type	RPD, VFD, None	None
	if Type = VFD: Measuring range selection	10 - 200 l/min, 5 - 100 l/min, 2 - 40 l/min, 2 - 40 l/min (fast), 1 - 20 l/min, 1 - 12 l/min*	1 - 12 l/min

* For the inputs Gd1 and Gd2, the following sensor combinations are possible:
- 1 x RPD, 1 x VFD
- 2 x VFD, but with different measuring ranges only

CS sensor offset

If a CS10 irradiation sensor is to be connected, an offset has to be carried out before the connection is made.

To carry out the offset, proceed as follows:

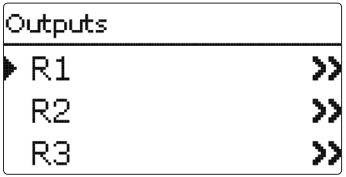
➔ Adjust the CS type in the **Type** channel

➔ Select the **Offset** channel

➔ Confirm the reset enquiry with **Yes**

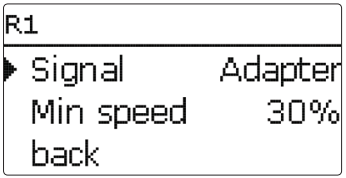
➔ Select **back** to return to the **Inputs** menu, then connect the CS sensor

13.3 Outputs



In this menu, the signal type and the minimum speed can be adjusted for each individual relay of the controller and the external modules.

➔ In order to make adjustments for a relay, select the corresponding menu item by pressing button (5).



For each relay, the signal type and the minimum pump speed can be adjusted.

The signal type determines the way speed control of a connected pump is effected. The following modes are available:

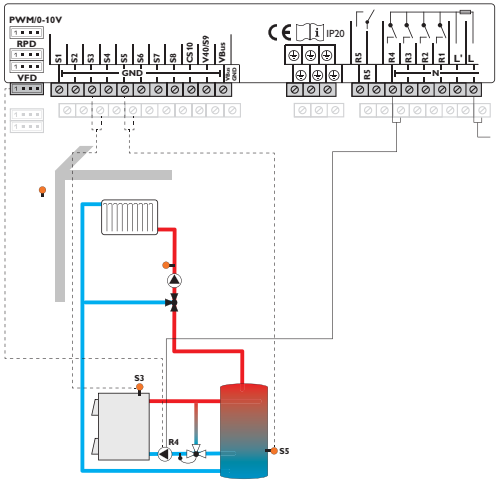
Adapter = Speed control signal via a VBus®/PWM interface adapter
0-10 V = Speed control via a 0-10 V signal
PWM = Speed control via a PWM signal
Standard = Burst control (factory setting)

With the signal types **Adapter, 0-10 V** and **PWM**, the relay itself is not involved in speed control. A separate connection for the corresponding signal will have to be made (see figure).

If **PWM** is selected, the channels **Output** and **Profile** appear. In the **Output** channel, one of the 2 PWM outputs can be selected. In the **Profile** channel, a PWM characteristic curve corresponding with the pump in use can be selected (see page 59).

In order to reduce the number of switching processes for high-efficiency pumps, the controller is equipped with a relay overrun function that automatically comes into effect when the speed control signal is not issued by the relay itself. The corresponding relay will then remain switched on for an hour after the switch-off conditions are fulfilled.

Note:
If **PWM** is selected for an output, the adjustment range for the corresponding minimum speed will extend to 20 ... 100 %.
If **C** is selected in the **Profile** channel, the minimum speed must be set at least to 25 % according to information from the manufacturer.

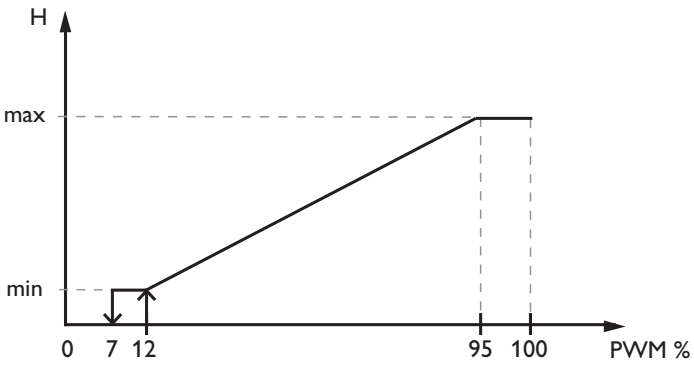


In-/Outputs/Outputs

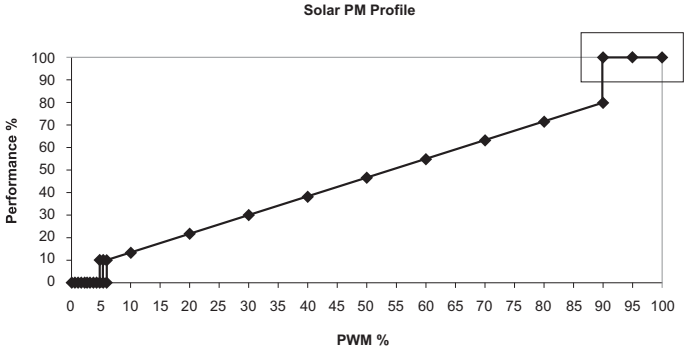
Adjustment channel	Description	Adjustment range/selection	Factory setting
R1 ... R5	Relay output selection	-	-
Signal	Signal type	Adapter, 0-10 V, PWM, Standard	Standard
Output	PWM output selection	7.8	-
Profile	PWM characteristic curve	A, B, C, D, E, F	A
Min speed	Minimum speed	(20) 30 ... 100 %	30 %

13.4 PWM profiles

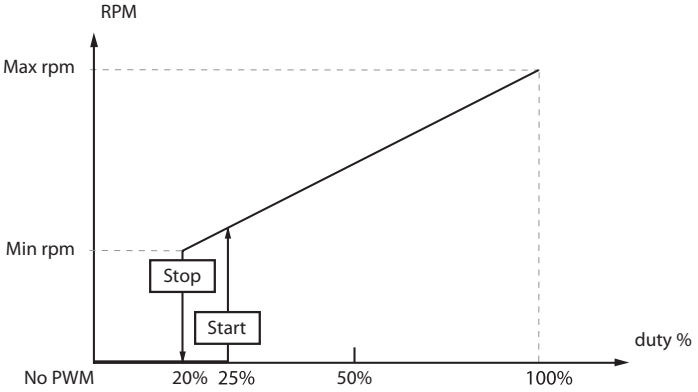
PWM A (e. g. manufacturer WILO)



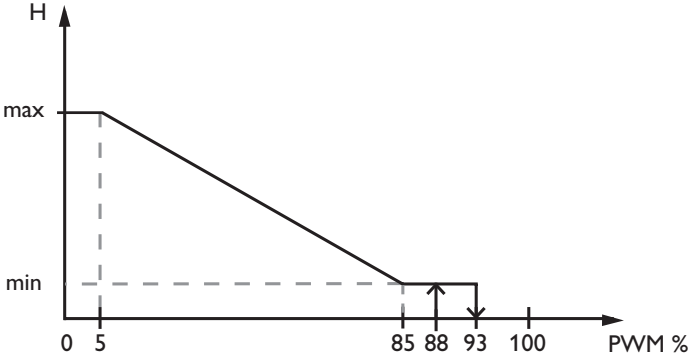
PWM B (e. g. manufacturer Grundfos)



PWM C (e. g. manufacturer Laing)

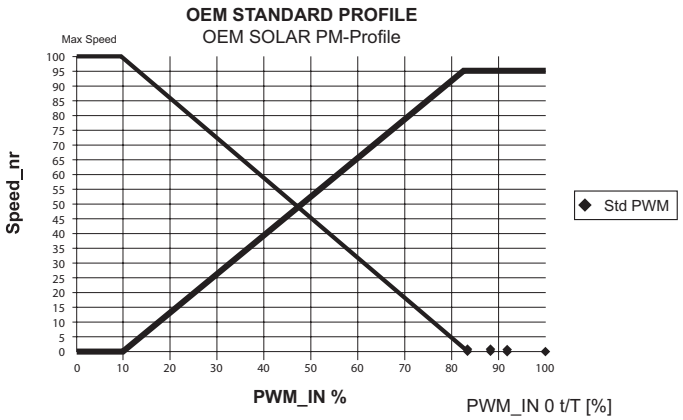


PWM D (e. g. manufacturer WILO)

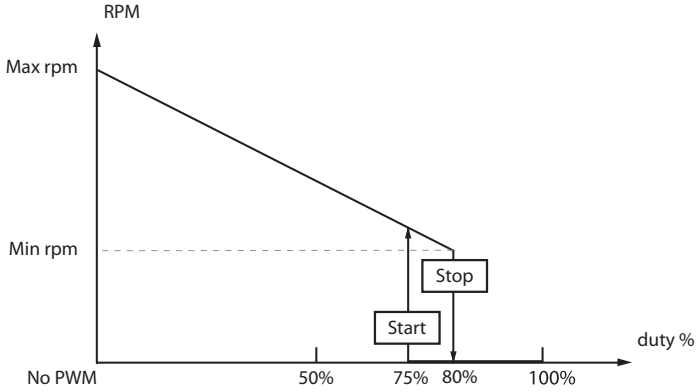


en

PWM E (e. g. manufacturer Grundfos)

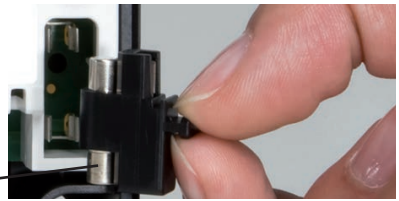


PWM F (e. g. manufacturer Laing)



14 Troubleshooting

If a malfunction occurs, a message will appear on the display of the controller.



Fuse

WARNING! **Electric shock!**

Upon opening the housing, live parts are exposed!

➔ **Always disconnect the controller from power supply before opening the housing!**

The controller is protected by a fuse. The fuse holder (which also holds the spare fuse) becomes accessible when the cover is removed. To replace the fuse, pull the fuse holder from the base.

Directional pad flashes red.

Sensor fault. The error code **!Sensor fault** is displayed instead of a temperature on the sensor display channel.

Short circuit or line break

Disconnected temperature sensors can be checked with an ohmmeter. Please check if the resistance values correspond with the table.

°C	°F	Ω Pt500	Ω Pt1000	Ω KTY	°C	°F	Ω Pt500	Ω Pt1000	Ω KTY
-10	14	481	961	1499	55	131	607	1213	2502
-5	23	490	980	1565	60	140	616	1232	2592
0	32	500	1000	1633	65	149	626	1252	2684
5	41	510	1019	1702	70	158	636	1271	2778
10	50	520	1039	1774	75	167	645	1290	2874
15	59	529	1058	1847	80	176	655	1309	2971
20	68	539	1078	1922	85	185	664	1328	3071
25	77	549	1097	2000	90	194	634	1347	3172
30	86	559	1117	2079	95	203	683	1366	3275
35	95	568	1136	2159	100	212	693	1385	3380
40	104	578	1155	2242	105	221	702	1404	3484
45	113	588	1175	2327	110	230	712	1423	3590
50	122	597	1194	2413	115	239	721	1442	3695

The display is permanently off.

Press button (5). Display illuminated?

no

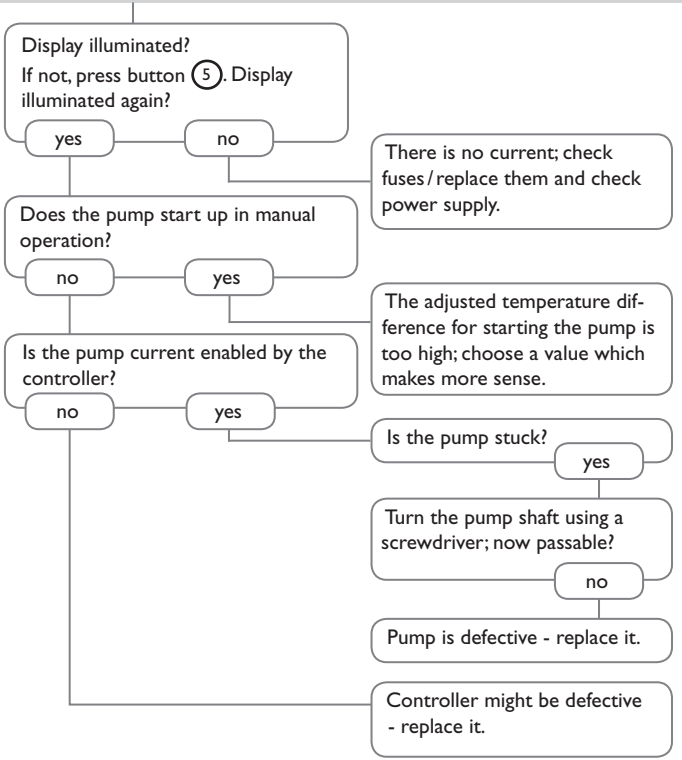
yes → Controller has been in standby, everything o.k.

Check the power supply of the controller. Is it disconnected?

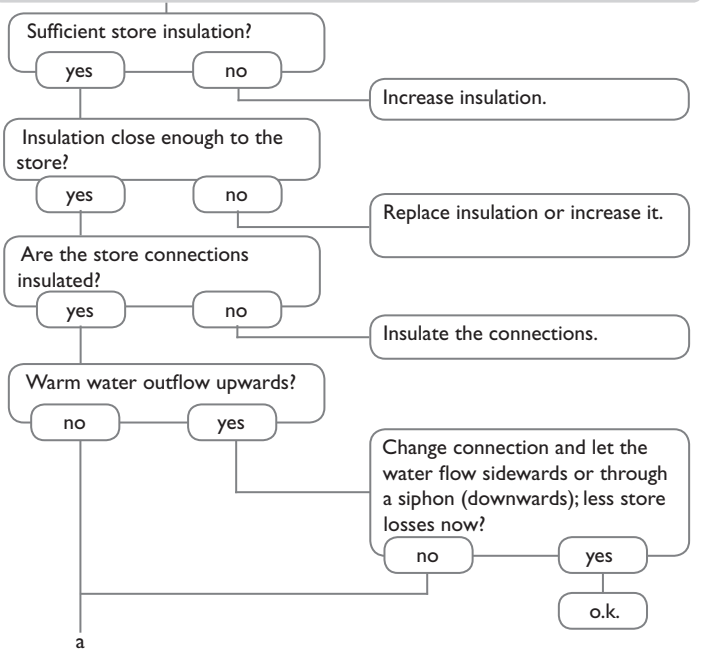
no → The fuse of the controller could be blown. The fuse holder (which holds the spare fuse) becomes accessible when the cover is removed. The fuse can then be replaced.

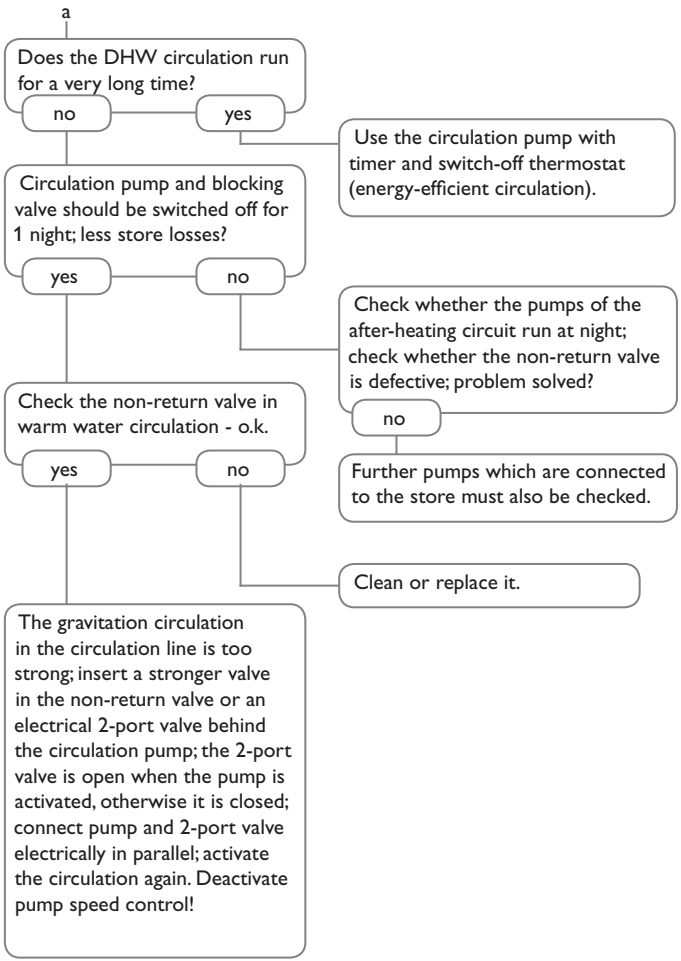
yes → Check the supply line and reconnect it.

The heating circuit pump does not work, although this is indicated on the display.



Stores cool down at night.




a
Does the DHW circulation run for a very long time?
no
yes
Use the circulation pump with timer and switch-off thermostat (energy-efficient circulation).
Circulation pump and blocking valve should be switched off for 1 night; less store losses?
yes
no
Check whether the pumps of the after-heating circuit run at night; check whether the non-return valve is defective; problem solved?
no
Further pumps which are connected to the store must also be checked.
Check the non-return valve in warm water circulation - o.k.
yes
no
Clean or replace it.
The gravitation circulation in the circulation line is too strong; insert a stronger valve in the non-return valve or an electrical 2-port valve behind the circulation pump; the 2-port valve is open when the pump is activated, otherwise it is closed; connect pump and 2-port valve electrically in parallel; activate the circulation again. Deactivate pump speed control!

15 Accessories

15.1 Sensors and measuring instruments

Sensors

The product range includes high-precision platinum temperature sensors, flatscrew sensors, outdoor temperature sensors, indoor temperature sensors, cylindrical clip-on sensors, also as complete sensors with immersion sleeve.

Remote control

RESOL RTA11-M Article no.: **136 000 20**

VFD and RPD Grundfos Direct Sensors™

The RPD Grundfos Direct Sensor™ is a sensor that measures both temperature and pressure.

The VFD Grundfos Direct Sensor™ is a sensor that measures both temperature and flow rate.

RPD 0-10 bar Article no.: **130 000 90**

VFD 1-12 digital Article no.: **130 000 80**

VFD 2-40 digital Article no.: **130 001 00**

V40 flowmeter

The RESOL V40 is a measuring instrument for detecting the flow of water or water/glycol mixtures. After a specific volume has passed, the V40 reed switch sends an impulse to the calorimeter. The heat quantity used is calculated by the calorimeter using these impulses and the measured temperature difference with the help of pre-defined parameters (glycol type, concentration, heat capacity, etc.).

RESOL V40 Article no.: **280 011 00**

15.2 VBus® accessories

AM1 Alarm module

The AM1 Alarm Module is designed to signal system failures. It is to be connected to the VBus® of the controller and issues an optical signal via the red LED if a failure has occurred. The AM1 also has a relay output, which can e. g. be connected to a building management system (BMS). Thus, a collective error message can be issued in the case of a system failure. Depending on the controller and the sensors connected, different fault conditions can be signalled, e. g. sensor failures, excess or negative system pressure as well as errors in the flow rate, such as a dry run of the pump.

The AM1 Alarm module ensures that occurring failures can be immediately recognised and repaired, even if the system and the controller are difficult to access or located in a remote place. Thus, the reliability and the stable yield of the system are ensured.

RESOL AM1 Article no.: **180 008 70**

EM Extension module

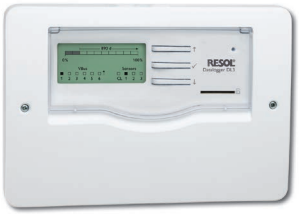
The EM Extension module offers 5 additional relay outputs and 6 additional sensor inputs for the controller.

HKM3 Heating circuit extension module

HKM3 Heating circuit extension module for a weather-compensated heating circuit

RESOL EM Article no.: **145 440 80**

RESOL HKM3 Article no.: **145 440 60**



DL3 Datalogger

Be it solar thermal, heating or DHW heat exchange controllers – with the DL3 you can easily and conveniently log system data of up to 6 RESOL controllers. Get a comprehensive overview of all controllers connected with the large full graphic display. Transfer data with an SD memory card, or use the LAN interface to view and process data on your PC.

RESOL DL3 Article no.: **180 009 90**

DL2 Datalogger

This additional module enables the acquisition and storage of large amounts of data (such as measuring and balance values of the system) over a long period of time. The DL2 can be configured and read-out with a standard Internet browser via its integrated web interface. For transmission of the data stored in the internal memory of the DL2 to a PC, an SD card can be used. The DL2 is appropriate for all controllers with RESOL VBus®. It can be connected directly to a PC or router for remote access and thus enables comfortable system monitoring for yield monitoring or for diagnostics of faults.

RESOL DL2 Article no.: **180 007 10**

15.3 Interface adapters

RESOL VBus®/USB & VBus®/LAN interface adapters

The new VBus®/USB interface adapter is the interface between the controller and a personal computer. With its standard mini-USB port it enables a fast transmission of system data for processing, visualising and archiving data via the VBus®. A full version of the RESOL ServiceCenter software is included.

The VBus®/LAN interface adapter is designed for the direct connection of the controller to a PC or router. It enables easy access to the controller via the local network of the owner. Thus, controller access and data charting can be effected from every workstation of the network. The VBus®/LAN interface adapter is suitable for all controllers equipped with a RESOL VBus®. A full version of the RESOL ServiceCenter software is included.

RESOL VBus®/USB Article no.: **180 008 50**

RESOL VBus®/LAN Article no.: **180 008 80**

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Distributed by:

RESOL – Elektronische Regelungen GmbH

Heiskampstraße 10
45527 Hattingen / Germany

Tel.: +49 (0) 23 24 / 96 48 - 0
Fax: +49 (0) 23 24 / 96 48 - 755

www.resol.com
info@resol.com

Important note

The texts and drawings in this manual are correct to the best of our knowledge. As faults can never be excluded, please note:

Your own calculations and plans, under consideration of the current standards and directions should only be basis for your projects. We do not offer a guarantee for the completeness of the drawings and texts of this manual - they only represent some examples. They can only be used at your own risk. No liability is assumed for incorrect, incomplete or false information and / or the resulting damages.

Note

The design and the specifications can be changed without notice.

The illustrations may differ from the original product.

Imprint

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