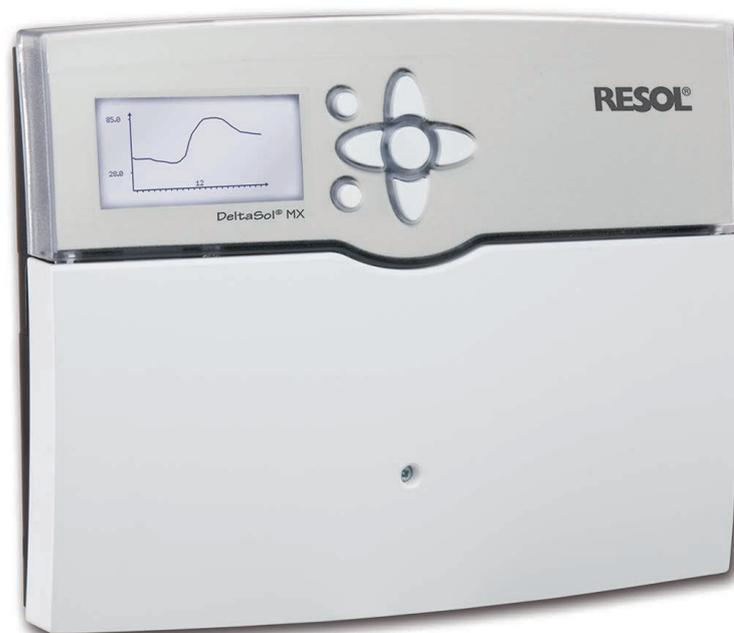


DeltaSol® MX

RESOL®

Manual for the
specialized craftsman

Mounting
Connection
Operation
Troubleshooting
Application examples



48006012

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-US/CA

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 solar controller is designed for use in standard solar thermal systems and heating systems in compliance with the technical data specified in this manual. Improper use excludes all liability claims.



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.

Target group

These instructions are exclusively addressed to authorized 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.

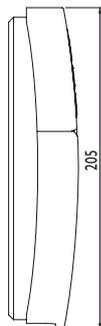
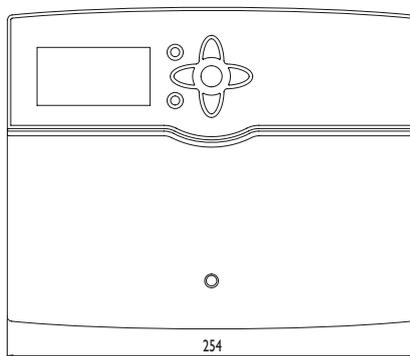
Subject to technical change. Errors excepted.

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| 1.1 Optional functions | 5 | 9.1 Optional functions | 50 |
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1 Overview

- Extra large graphic display
- 14 relay outputs
- 12 inputs for Pt1000, Pt500 or KTY temperature sensors (system dependent)
- 3 V40 impulse inputs
- 4 inputs for Grundfos Direct Sensors™ (2 × analog, 2 × digital)
- 4 PWM outputs for speed control of high-efficiency pumps
- Datalogging/firmware updates via SD memory card
- 2 internal, weather-compensated heating circuits
- Pre-programmed optional functions
- Drainback option
- Time-controlled thermostat function
- Thermal disinfection
- RESOL VBus®
- Energy-saving switch-mode power supply



Technical data

Inputs: 12 Pt1000, Pt500 or KTY temperature sensor inputs (7 of them can optionally be used for RTA11-m remote controls), 3 impulse inputs for V40 flowmeters; 4 Grundfos Direct Sensors™ (2 x analogue, 2 x digital), 1 CS10 solar cell

Outputs: 13 semiconductor relays, 1 dry-contact relay and 4 PWM outputs (convertible to 0-10 V signal outputs)

Switching capacity:

1 (1) A 240 V~ (semiconductor relay)

4 (2) A 24 V/240 V~ (dry-contact relay)

Total switching capacity: 6.3 A 240 V~

Power supply: 100...240 V~ (50...60 Hz)

Supply connection: type y attachment

Power consumption: < 1 W (standby)

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

Rated impulse voltage: 2.5 kV

Data interface: RESOL VBus®, SD card slot

VBus® current supply: 35 mA

Functions: solar system controller for use in solar and heating systems. 7 integrated calorimeters and control of 2 weather-compensated heating circuits. Adjustable system parameters and add-on options (menu-driven), balance and diagnostics functions, function control

Housing: plastic, PC-ABS and PMMA

Mounting: wall mounting, mounting into patch panels is possible

Indication / Display: full graphic display

Operation: 7 push buttons at the front

Ingress protection: IP 20/EN 60529

Protection class: I

Ambient temperature: 0...40 °C [32...104 °F]

Pollution degree: 2

Dimensions: 254 × 205 × 47 mm [10" × 8.1" × 1.9"]

1.1 Optional functions

Solar

Bypass
CS-Bypass
External heat exchanger
Evacuated tube collector
Target temperature
Frost protection
Backup heating suppression
Parallel relay
Cooling mode
Drainback
Twin pump
Heat dump
Flow rate monitoring

Arrangement

Parallel relay
Mixer
Store loading
Message relay
Heat exchange
Solid fuel boiler
Circulation
Return preheating
Function block
Irradiation switch

Heating

Thermal disinfection
DHW heating

2 Installation

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 [0.12"].

Please pay attention to separate routing of sensor cables and power supply cables.

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

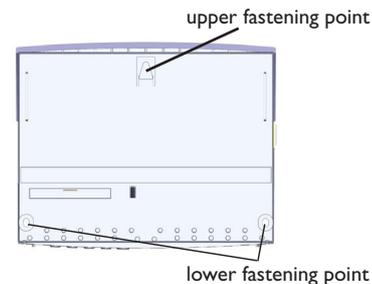
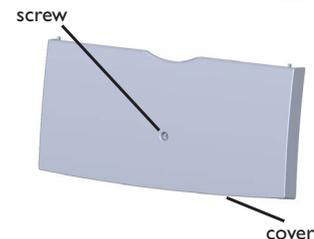
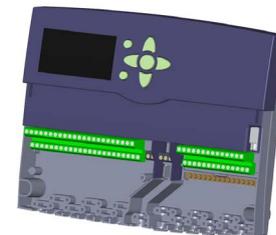
- Unscrew the cross-head screw from the cover and remove it along with the cover from the housing
- Mark the upper fastening point on the wall. Drill and fasten the enclosed wall plug and screw leaving the head protruding
- Hang the housing from the upper fastening point and mark the lower fastening points (centers 233 mm [8.8"])
- 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 6
- 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.



WARNING! Electric shock!



Upon opening the housing, live parts are exposed!

→ Always disconnect the controller from power supply before opening the housing!

2.2 Electrical connection



Note:

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

The controller is equipped with 14 **relays** in total to which loads such as pumps, valves, etc. can be connected:

Relays 1 ... 13 are semiconductor relays, designed for pump speed control:

Conductor R1 ... R13

Neutral conductor N (common terminal block)

Protective earth conductor PE \perp (common terminal block)

Relay 14 is a dry-contact changeover relay:

R14-A = normally open contact

R14-M = center contact

R14-R = normally closed contact

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:

The pump speed must be set to 100% when non-speed-controlled devices such as valves are connected.

WARNING!



Electric shock!

Upon opening the housing, live parts are exposed!

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

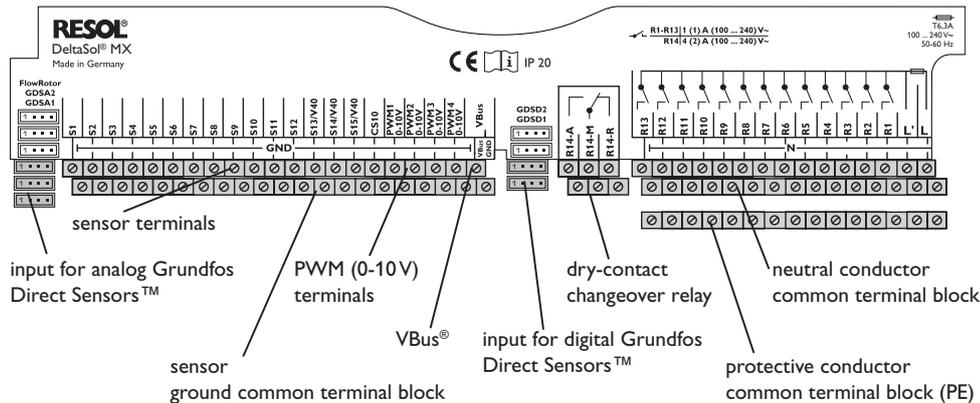
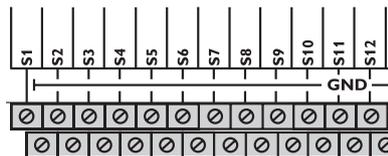


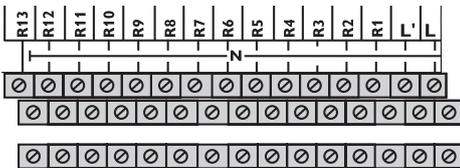
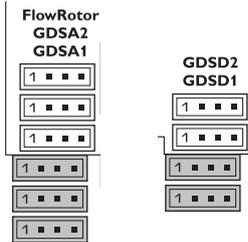
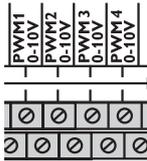
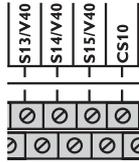
Note:

For more details about the initial commissioning procedure, see page 14.

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

Temperature sensors have to be connected to the terminals S1 ... S12 and GND (either polarity).





The terminals S13 to S15 can be used as impulse inputs for V40 flowmeters or as inputs for FS08 flow switches.

V40 flowmeters can be connected to the terminals S13/V40 to S15/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 **FlowRotor** to the input marked FlowRotor.

Connect the **analog** Grundfos Direct Sensors™ to the inputs GDSA1 and GDSA2.

Connect the **digital** Grundfos Direct Sensors™ to the GDS2 and GDS1 inputs.

Note: When Grundfos Direct Sensors™ are used, the sensor ground common terminal block must be connected to PE.

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

The **power supply connection** is at the terminals:

Neutral conductor N

Conductor L

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

Protective earth conductor PE ⊕ (common terminal block)

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 **VBus/GND** (either polarity). One or more RESOL VBus® modules can be connected via this data bus, such as:

- RESOL GA3 Large Display module / SD3 Smart Display
- 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 DeltaSol® MX). With the **RESOL ServiceCenter Software (RSC)**, measured values can be read, processed and visualized. The software allows an easy function control of the system.

Parameterizing the controller via the RESOL ServiceCenter Software is not yet possible. The feature will be made available in an upcoming version of the RESOL configuration tool RPT.

Note: For more information about accessories, see page 80.

WARNING! Electric shock!



L' is a fused contact permanently carrying voltage.

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

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 visualized, e. g. in a spreadsheet programme.
- Store adjustments and parameterizations on the SD card and, if necessary, retrieve them from there.
- Download firmware updates from the Internet and install them on the controller.



A standard SD card is not included with the *DeltaSol*® MX, but can also be purchased at RESOL.

For more information about using an SD card, see page 69.

3 Step-by-step parameterization

The *DeltaSol*® MX 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 configuring them. Therefore, to set up a complex system, careful planning is required. We recommend drawing a sketch of the system first.

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

1. Running the commissioning menu

The commissioning menu is run after the first connection and after every reset. It will request the following basic adjustments:

- Menu language
- Temperature unit
- Volume unit
- Pressure unit
- Energy unit
- Time
- Date
- Solar system
- Hydronic variant

At the end of the commissioning menu, a safety enquiry follows. If the safety enquiry is confirmed, the adjustments are saved.

For further information about the commissioning menu see page 14.

2. Registering sensors

If flowmeters, 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 71.

3. Activating solar optional functions

The basic solar system has been adjusted during commissioning. Now, optional functions can be selected, activated and adjusted.

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 37.

4. Activating optional arrangement functions

Now, optional functions for the non-solar part of the arrangement can be selected, activated and adjusted.

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 50.

5. Adjusting heating circuits and activating optional heating functions

Now, heating circuits can be activated and adjusted. Internal heating circuits are only offered as long as at least 3 relays are free.

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

To heating circuits and optional functions which require one or more relays, the corresponding number of free relays can be allocated. 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 59.

4 Operation and function

4.1 Buttons

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

Button  - scrolling upwards

Button  - scrolling downwards

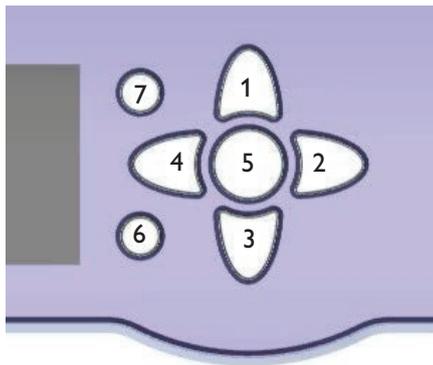
Button  - increasing adjustment values

Button  - reducing adjustment values

Button  - confirming

Button  - entering the status menu / chimney sweeper mode (system-dependent)

Button  - escape button for changing into the previous menu



4.2 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 key to reactivate the display illumination.

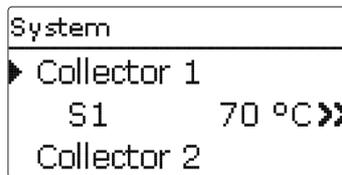
→ In order to scroll through a menu or to adjust a value, press either buttons  and  or buttons  and 

→ To open a submenu or to confirm a value, press button 

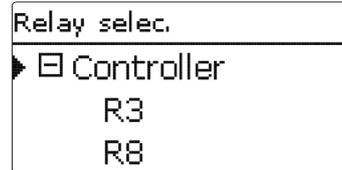
→ To enter the status menu, press button  – unconfirmed adjustments will not be saved

→ To switch one menu level upwards, press button  – unconfirmed adjustment will not be saved

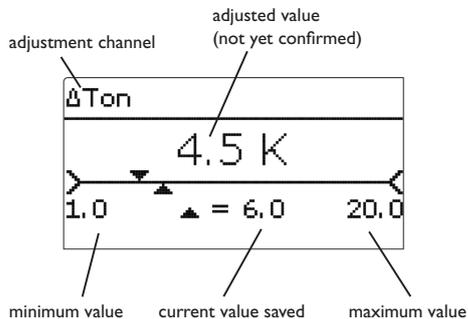
If no button has been pressed within a couple of minutes, the adjustment is cancelled and the previous value is retained.



If the symbol  is shown behind a menu item, pressing button  will open a new submenu.



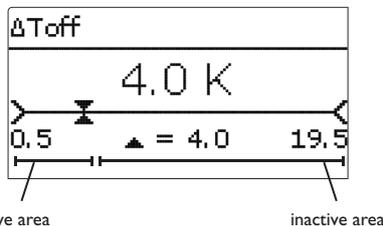
If the symbol  is shown in front of a menu item, pressing button  will open a new submenu. If it is already opened, a  is shown instead of the .



Values and adjustments can be changed in different ways:

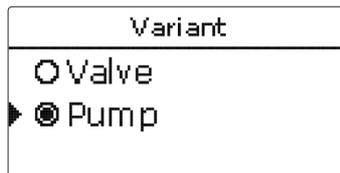
Numeric values can be adjusted by means of a slide bar. The minimum value is indicated to the left, the maximum value to the right. The large number above the slide bar indicates the current adjustment. By pressing buttons 2 or 4 the upper slide bar can be moved to the left or to the right.

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.

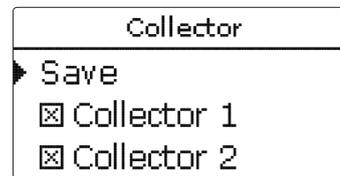


When two values are locked against each other, they will display a reduced adjustment range depending on the adjustment of the respective other value.

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.

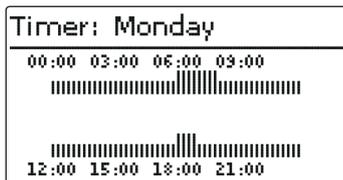


If more than one item of several can be selected, they will be indicated with checkboxes. When an item has been selected, an x appears inside the checkbox.

Adjusting the timer

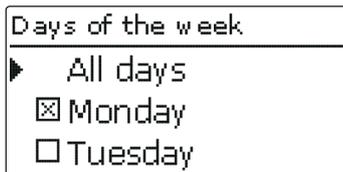
When the **Timer** option is activated, a timer is indicated in which time frames for the function can be adjusted.

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**.

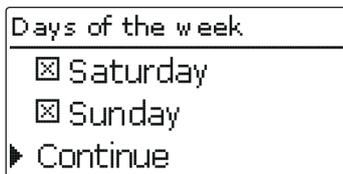


In order to adjust the timer, press button **5**.

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:

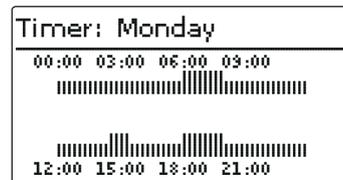
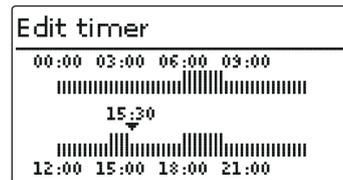
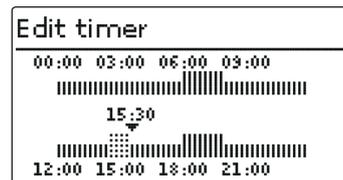
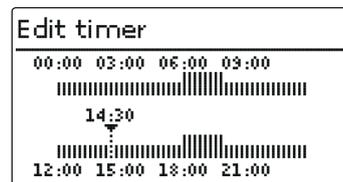
→ Move the cursor to the desired starting point of the time frame by pressing buttons **2** and **4**. Confirm the starting point of the time frame by pressing button **1**.

→ 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 three steps.

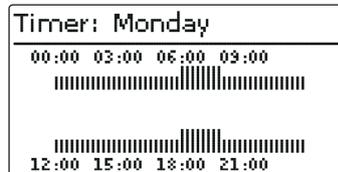
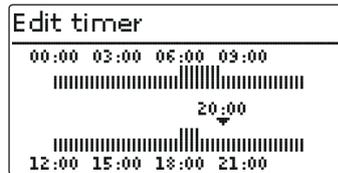
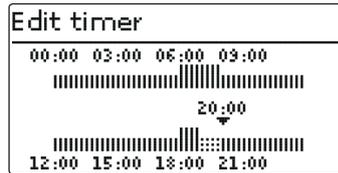
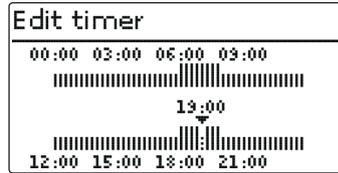
→ Press button **5** again to get back to the overview of current adjustments.



Removing a time frame:

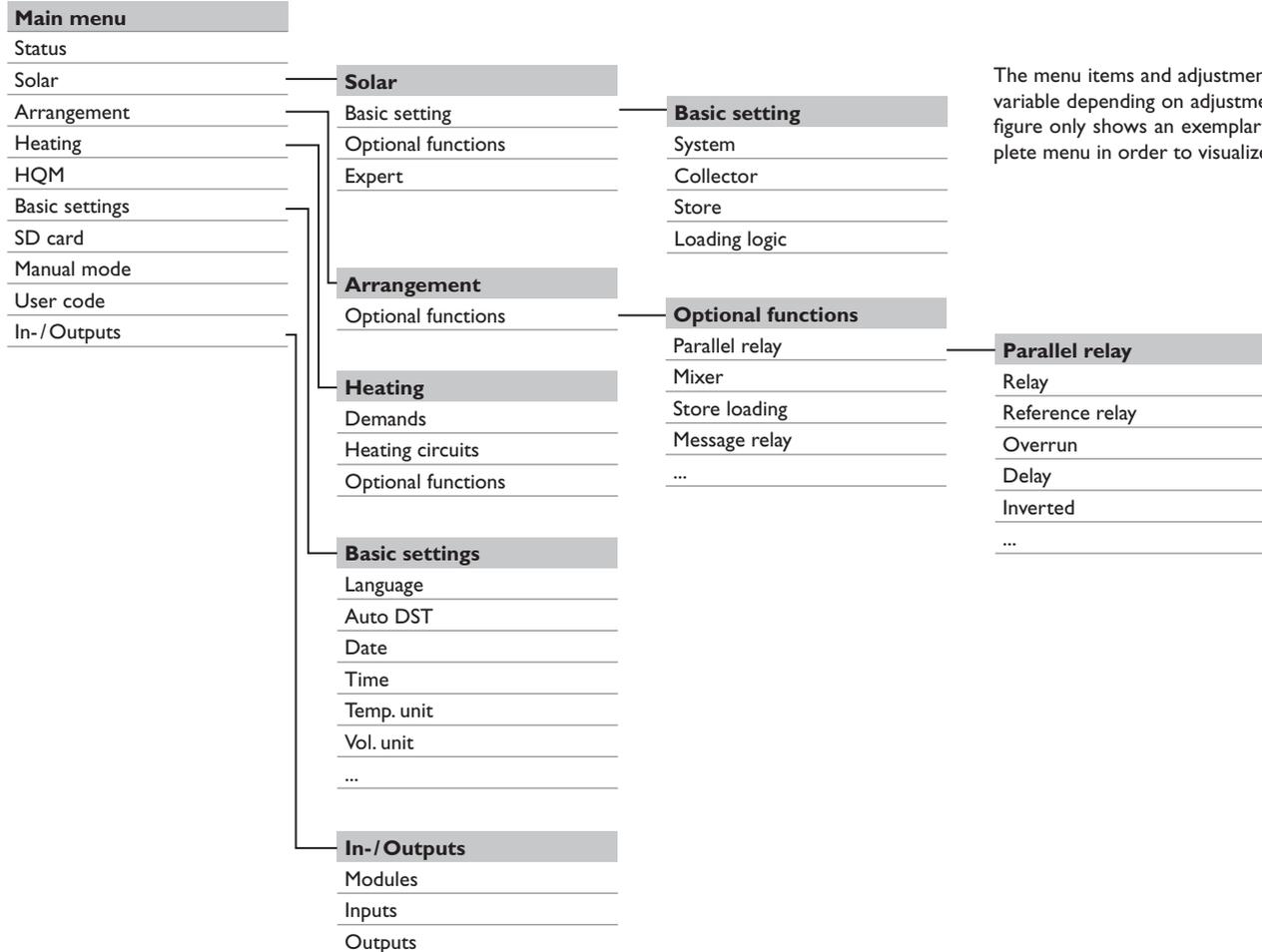
In order to remove an active time frame, proceed as follows:

- 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.
- In order to get back to the overview of current adjustments, press button **5** again.



en

4.3 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 visualize the menu structure.

5 Initial commissioning

When the hydronic system is filled and ready for operation, connect the controller to the power supply.

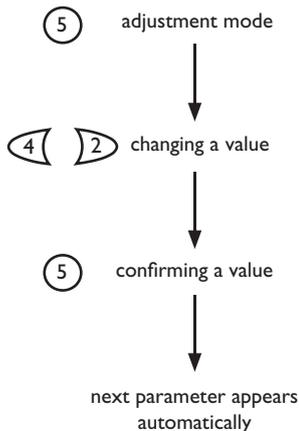
The controller runs an initialization phase in which the directional pad flashes red.

When the controller is commissioned for the first time or when it is reset, it will run a commissioning menu after the initialization 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.

| |
|-----------|
| Language |
| ▶ Deutsch |
| English |
| Francais |

2. Units:

→ Adjust the desired temperature unit.

| |
|------------|
| Temp. Unit |
| ○ °F |
| ▶ ● °C |

→ Adjust the desired volume unit.

| |
|-----------|
| Flow Unit |
| ○ Gallons |
| ▶ ● Litre |

→ Adjust the desired pressure unit.

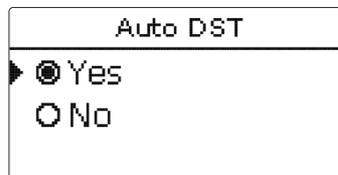
| |
|-------------|
| Press. Unit |
| ○ psi |
| ▶ ● bar |

→ Adjust the desired energy unit.

| |
|-------------|
| Energy Unit |
| ○ BTU |
| ▶ ● Wh |

3. Daylight savings time adjustment:

- Activate or deactivate the automatic daylight savings time adjustment.



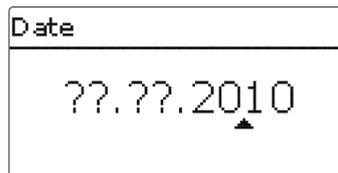
4. Time:

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



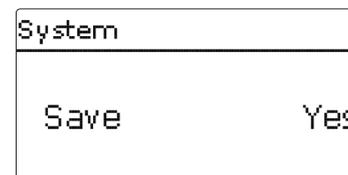
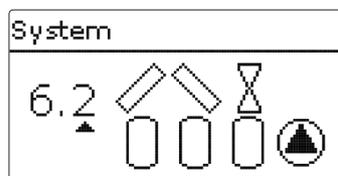
5. Date:

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



6. Selection of the solar system:

- Adjust the desired solar system (number of collectors and tanks, hydronic variants).



7. Completing the commissioning menu:

After the system 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.

5.1 Basic systems and hydronic variants

System

| Basic settings | |
|----------------|-----|
| ▶ System | 6.2 |
| Collector 1 | |
| Collector 2 | |

The controller is preprogrammed for 9 basic systems. The selection depends on the number of heat sources (collector fields) and heat sinks (tanks, pool). Factory setting is system 1.

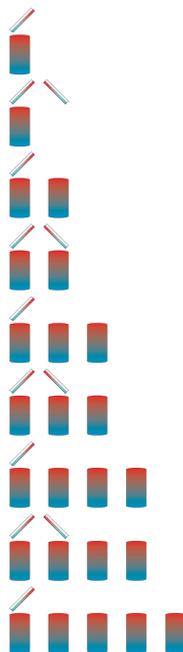
The selection of the basic solar system is one of the most important adjustments and is thus requested already in the commissioning menu.

First, the basic system is adjusted by means of the number of tanks and collectors fields, then the hydronic variant.

The selected system is visualized by the corresponding number of tank and collector symbols. The figure to the left shows system 6 which consists of 3 tanks and 2 collector fields ("east-/west collectors").

| | |
|---------------------------------|-----------|
| System 0: no solar system | |
| System 1: 1 collector field | - 1 tank |
| System 2: east-/west collectors | - 1 tanks |
| System 3: 1 collector field | - 2 tanks |
| System 4: east-/west collectors | - 2 tanks |
| System 5: 1 collector field | - 3 tanks |
| System 6: east-/west collectors | - 3 tanks |
| System 7: 1 collector field | - 4 tanks |
| System 8: east-/west collectors | - 4 tanks |
| System 9: 1 collector field | - 5 tanks |

A solar system with vertical tank loading is implemented as a 2-vertical tank loading system (tank top = tank 1; tank base = tank 2).



Variant

| Basic settings | |
|----------------|-----|
| ▶ System | 6.2 |
| Collector 1 | |
| Collector 2 | |

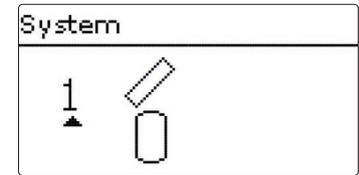
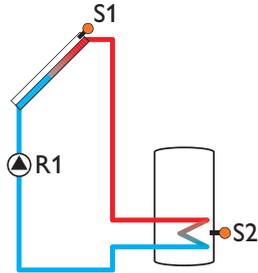
The hydronic variant refers to the different actuators that are to be controlled. They are visualized on the display by means of symbols, when the variant is selected. The upper symbol indicates the actuator belonging to the collector fields, the lower one the actuators belonging to the stores.

The exemplary figure shows the display indicated when system 6, variant 2 has been selected. In this case, each collector field has a 2-port valve, the tanks are loaded by means of pump logic.

For each variant, the controller allocates the corresponding relays and sensors. The allocations of all combinations are shown in chap. 5.2.

5.2 Overview of relay and sensor allocation

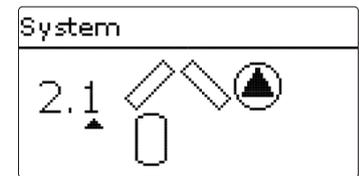
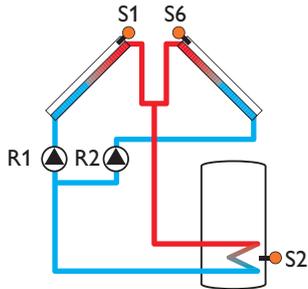
System 1



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump | Optional function |
| Sensor | Collector 1 | Tank base | Free |

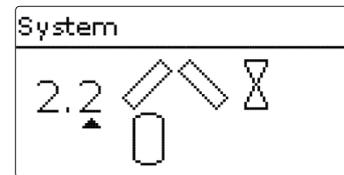
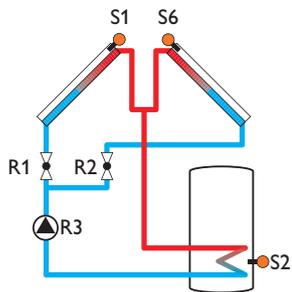
System 2 variant 1



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|--------------|--------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Pump coll. 1 | Pump coll. 2 | Optional function |
| Sensor | Collector 1 | Tank base | Free | Free | Free | Collector 2 | Free | Free | Free | Free |

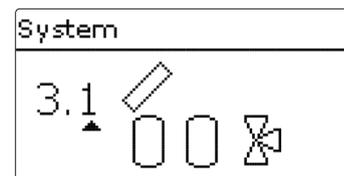
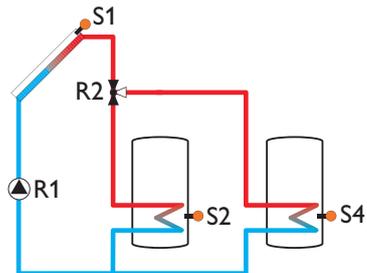
System 2 variant 2



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | 2PV coll. 1 | 2PV coll. 2 | Solar pump | Optional function |
| Sensor | Collector 1 | Tank base | Free | Free | Free | Collector 2 | Free | Free | Free | Free |

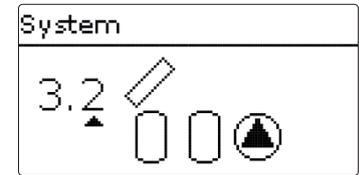
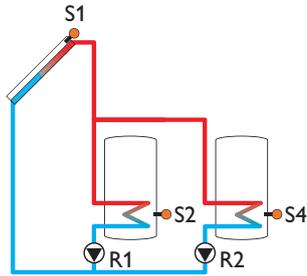
System 3 variant 1



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump | 3PV Tank 2 | Optional function |
| Sensor | Collector | Tank 1 base | Free | Tank 2 base | Free | Free | Free | Free | Free | Free |

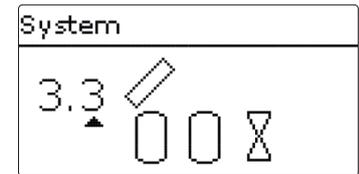
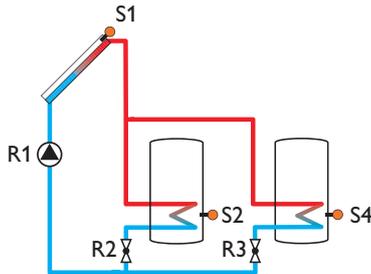
System 3 variant 2



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump Tank 1 | Solar pump Tank 2 | Optional function |
| Sensor | Collector | Tank 1 base | Free | Tank 2 base | Free | Free | Free | Free | Free | Free |

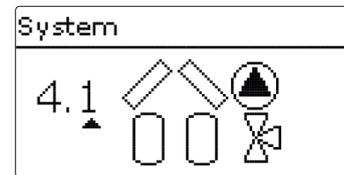
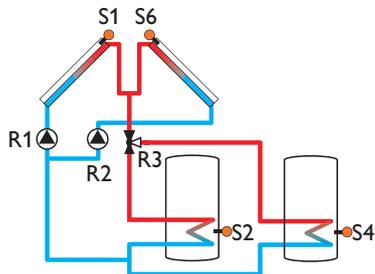
System 3 variant 3



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|------------|-------------|------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump | 2PV Tank 1 | 2PV Tank 2 | Optional function |
| Sensor | Collector | Tank 1 base | Free | Tank 2 base | Free | Free | Free | Free | Free | Free |

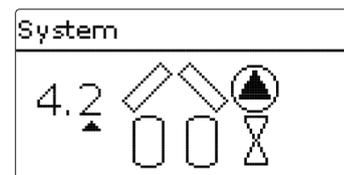
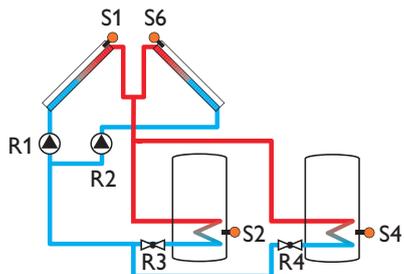
System 4 variant 1



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|--------------|--------------|------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Pump coll. 1 | Pump coll. 2 | 3PV Tank 2 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Free | Collector 2 | Free | Free | Free | Free |

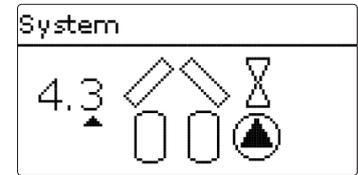
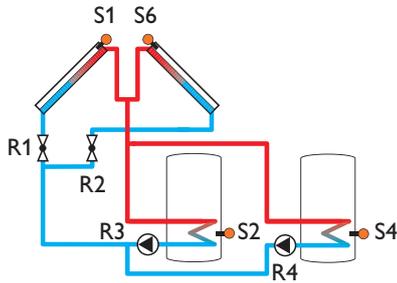
System 4 variant 2



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|--------------|--------------|------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Pump coll. 1 | Pump coll. 2 | 2PV Tank 1 | 2PV Tank 2 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Free | Collector 2 | Free | Free | Free | Free |

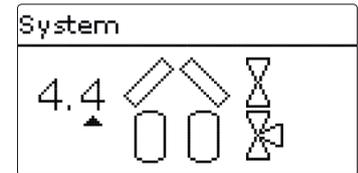
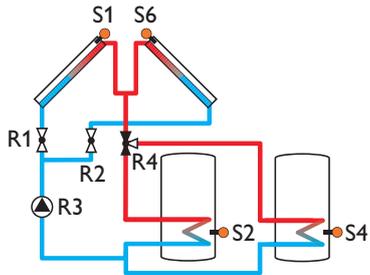
System 4 variant 3



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | 2PV coll. 1 | 2PV coll. 2 | Solar pump tank 1 | Solar pump tank 2 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Free | Collector 2 | Free | Free | Free | Free |

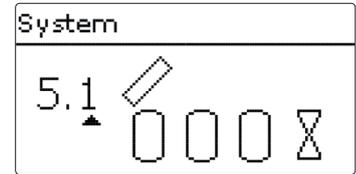
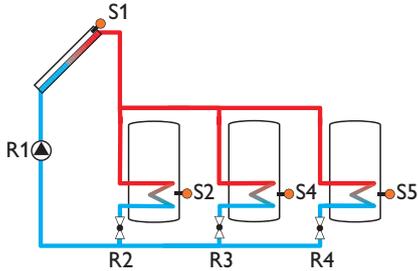
System 4 variant 4



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | 2PV coll. 1 | 2PV coll. 2 | Solar pump | 3PV Tank 1 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Free | Collector 2 | Free | Free | Free | Free |

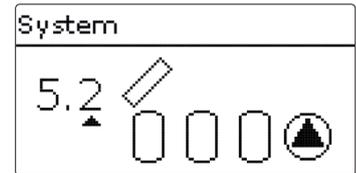
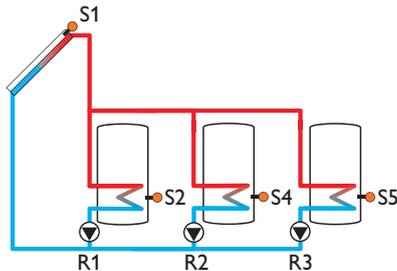
System 5 variant 1



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump | 2PV Tank 1 | 2PV Tank 2 | 2PV Tank 3 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Free | Free | Free | Free | Free |

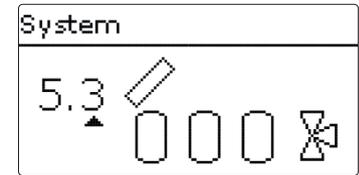
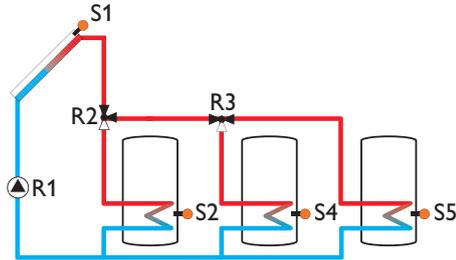
System 5 variant 2



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump tank 1 | Solar pump tank 2 | Solar pump tank 3 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Free | Free | Free | Free | Free |

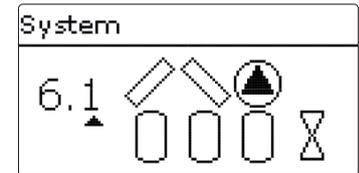
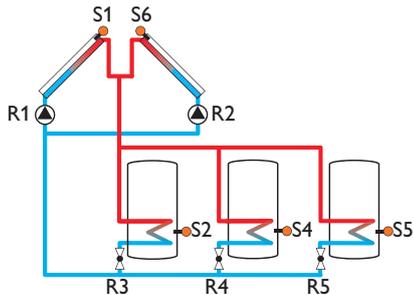
System 5 variant 3



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump | 3PV Tank 1 | 3PV Tank 2 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Free | Free | Free | Free | Free |

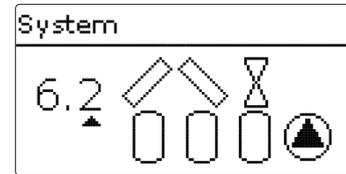
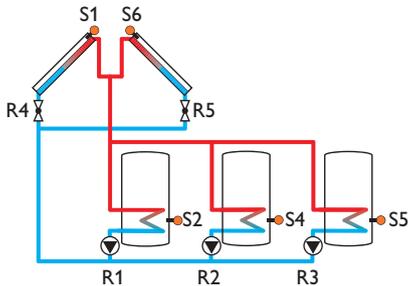
System 6 variant 1



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|--------------|--------------|------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Pump coll. 1 | Pump coll. 2 | 2PV tank 1 | 2PV tank 2 | 2PV tank 3 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Collector 2 | Free | Free | Free | Free |

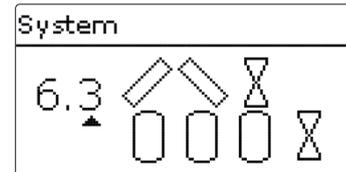
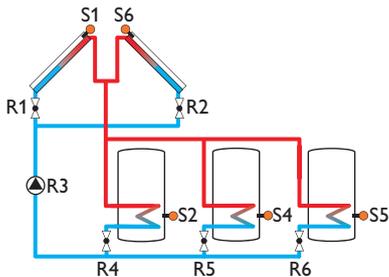
System 6 variant 2



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------------|-------------------|-------------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump tank 1 | Solar pump tank 2 | Solar pump tank 3 | 2PV coll. 1 | 2PV coll. 2 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Collector 2 | Free | Free | Free | Free |

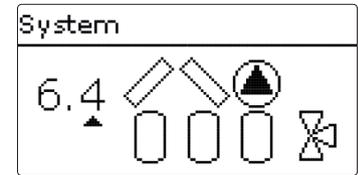
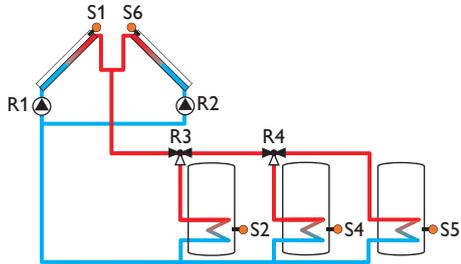
System 6 variant 3



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|
| Relay | 2PV coll. 1 | 2PV coll. 2 | Solar pump | 2PV Tank 1 | 2PV Tank 2 | 2PV Tank 3 | Optional function | Optional function | Optional function | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Collector 2 | Free | Free | Free | Free |

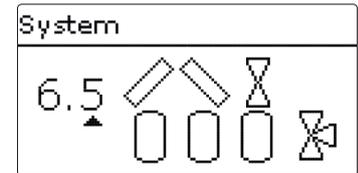
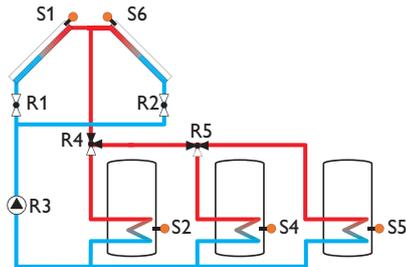
System 6 variant 4



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|--------------|--------------|------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Pump coll. 1 | Pump coll. 2 | 3PV tank 1 | 3PV tank 2 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Collector 2 | Free | Free | Free | Free |

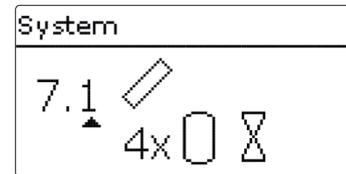
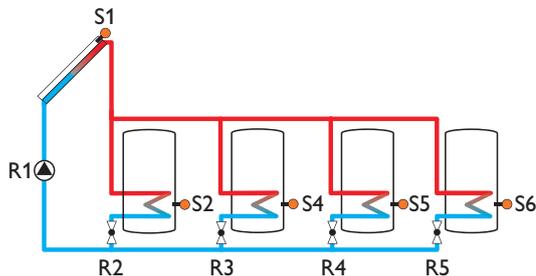
System 6 variant 5



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | 2PV coll. 1 | 2PV coll. 2 | Solar pump | 3PV Tank 1 | 3PV Tank 2 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Collector 2 | Free | Free | Free | Free |

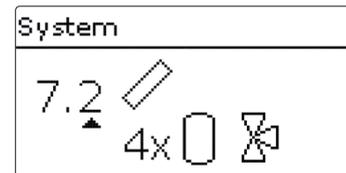
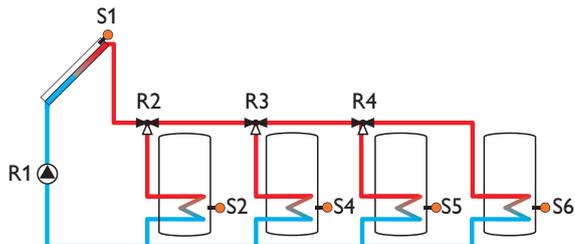
System 7 variant 1



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump | 2PV Tank 1 | 2PV Tank 2 | 2PV Tank 3 | 2PV Tank 4 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Tank 4 base | Free | Free | Free | Free |

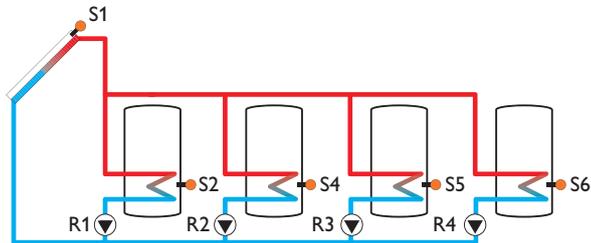
System 7 variant 2



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump | 3PV Tank 1 | 3PV Tank 2 | 3PV Tank 3 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Tank 4 base | Free | Free | Free | Free |

System 7 variant 3



System

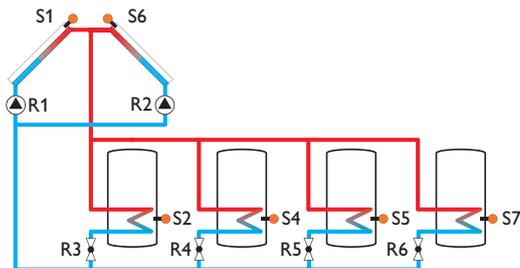
7.3

4x

Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump tank 1 | Solar pump tank 2 | Solar pump tank 3 | Solar pump tank 4 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Tank 4 base | Free | Free | Free | Free |

System 8 variant 1



System

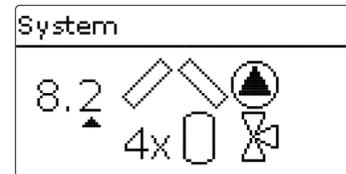
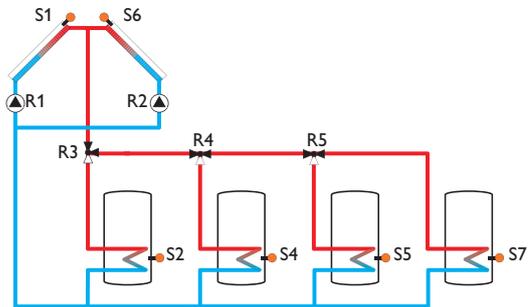
8.1

4x

Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|--------------|--------------|------------|-------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Pump coll. 1 | Pump coll. 2 | 2PV Tank 1 | 2PV Tank 2 | 2PV Tank 3 | 2PV Tank 4 | Optional function | Optional function | Optional function | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Collector 2 | Tank 4 base | Free | Free | Free |

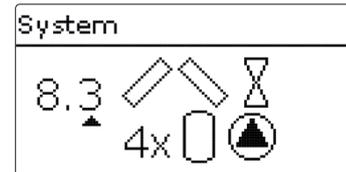
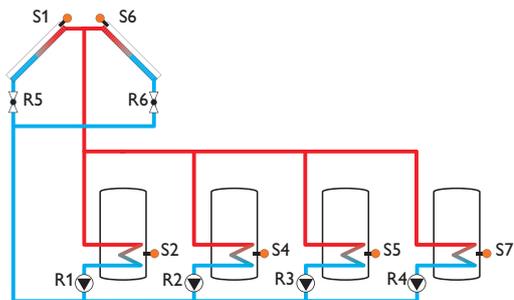
System 8 variant 2



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|--------------|--------------|------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Pump coll. 1 | Pump coll. 2 | 3PV Tank 1 | 3PV Tank 2 | 3PV Tank 3 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Collector 2 | Tank 4 base | Free | Free | Free |

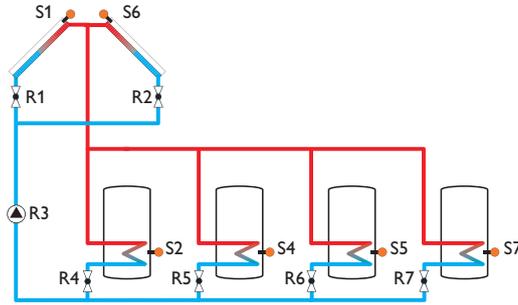
System 8 variant 3



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------------|-------------------|-------------------|-------------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump tank 1 | Solar pump tank 2 | Solar pump tank 3 | Solar pump tank 4 | 2PV coll. 1 | 2PV coll. 2 | Optional function | Optional function | Optional function | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Collector 2 | Tank 4 base | Free | Free | Free |

System 8 variant 4



System

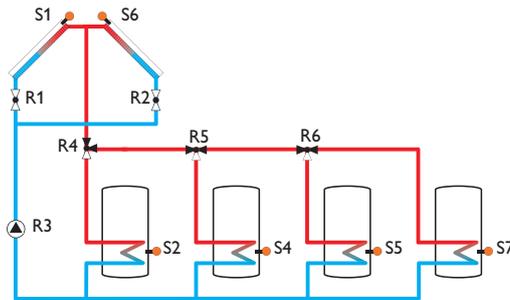
8.4 ▲

4x

Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------|-------------|-------------|-------------|-------------------|-------------------|-------------------|
| Relay | 2PV coll. 1 | 2PV coll. 2 | Solar pump | 2PV Tank 1 | 2PV Tank 2 | 2PV Tank 3 | 2PV Tank 4 | Optional function | Optional function | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Collector 2 | Tank 4 base | Free | Free | Free |

System 8 variant 5



System

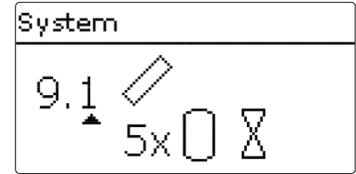
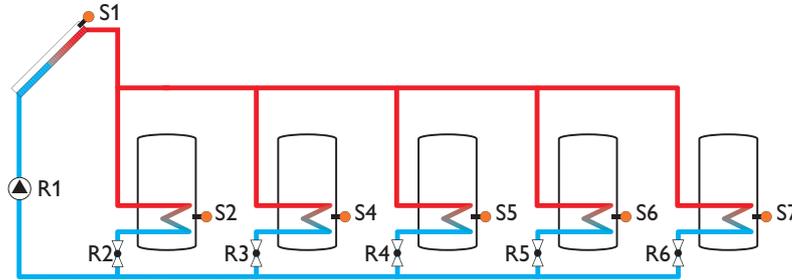
8.5 ▲

4x

Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|
| Relay | 2PV coll. 1 | 2PV coll. 2 | Solar pump | 3PV Tank 1 | 3PV tank 2 | 3PV Tank 3 | Optional function | Optional function | Optional function | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Collector 2 | Tank 4 base | Free | Free | Free |

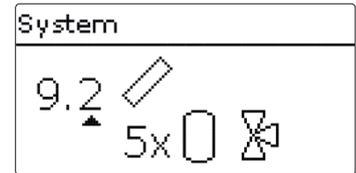
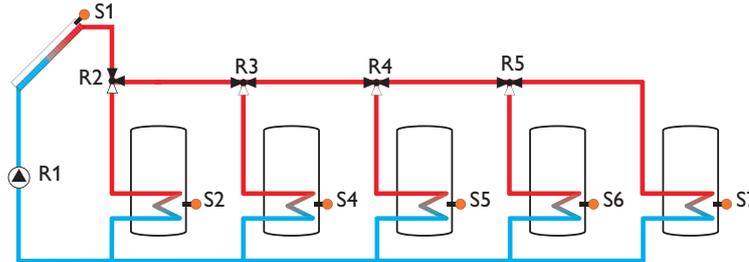
System 9 variant 1



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump | 2PV Tank 1 | 2PV Tank 2 | 2PV Tank 3 | 2PV Tank 4 | 2PV Tank 5 | Optional function | Optional function | Optional function | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Tank 4 base | Tank 5 base | Free | Free | Free |

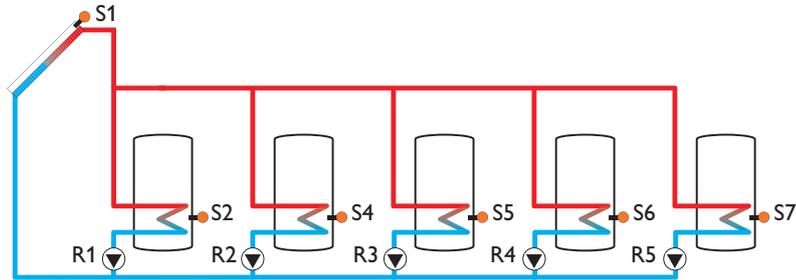
System 9 variant 2



Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------|-------------|------------|-------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump | 3PV Tank 1 | 3PV Tank 2 | 3PV Tank 3 | 3PV Tank 4 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Tank 4 base | Tank 5 base | Free | Free | Free |

System 9 variant 3



System

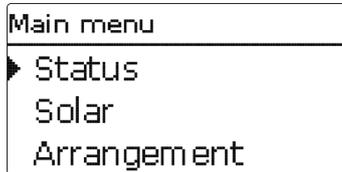
9.3

5x

Relay/sensor allocation

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10-14 |
|--------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Relay | Solar pump tank 1 | Solar pump tank 2 | Solar pump tank 3 | Solar pump tank 4 | Solar pump tank 5 | Optional function |
| Sensor | Collector 1 | Tank 1 base | Free | Tank 2 base | Tank 3 base | Tank 4 base | Tank 5 base | Free | Free | Free |

6 Main menu



In this menu, the different menu areas can be selected. The following menus are available:

- Status
- Solar
- Arrangement
- Heating
- HQM
- Basic settings
- SD card
- Manual mode
- User code
- In-/Outputs

- ➔ Select the menu area by pressing buttons **1** and **3**
- ➔ Press button **5** in order to enter the selected menu area

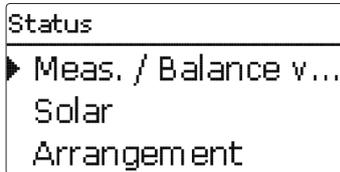


Note:

If no button is pressed for 1 min, the display illumination goes out. After 3 more minutes, the controller switches to the Status menu.

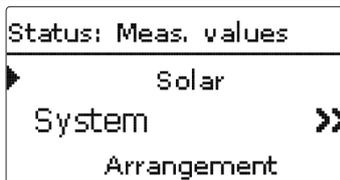
- ➔ In order to get from the Status menu into the Main menu, press button **7**.

7 Status



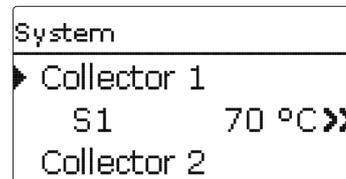
In the status menu of the controller, the status messages for every menu area can be found.

7.1 Meas./Balance values



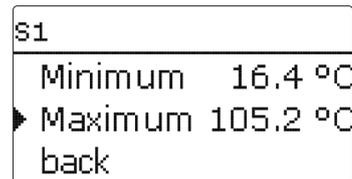
In the **Status/Meas./Balance values** menu, all current measurement values as well as a range of balance values are displayed. Some of the menu items can be selected in order to enter a submenu.

Additionally, all optional functions selected, the operating hours counter as well as activated energy metering are displayed.



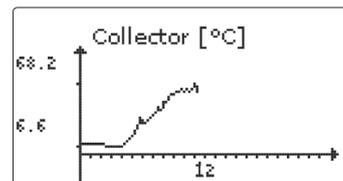
If, for example, **Solar/System** is selected, a submenu with the sensors and relays allocated to the solar system opens. In the submenu, the current temperatures and the current pump speed are displayed.

When a line with a measurement value is selected, another submenu will open.



If, for example, **S1** is selected, a submenu indicating the minimum and maximum values will open.

When the item **Chart** is selected, a progression chart appears.



The progression chart shows the development of the temperature at the corresponding sensor over the last 24 hours. Press buttons **2** and **4** to switch back and forth between a chart of the current day and one of the day before.

7.2 Solar

```
Status: Solar
┌───────────┴───────────┐
▶ System      Inactive
  Loading Inactive>>>
  back
```

In the **Status/Solar** menu, the status of the solar system, the solar loading and the selected optional functions are indicated.

7.3 Arrangement

```
Status: Arrangement
┌───────────┴───────────┐
▶ Circulation
                               Inactive>>>
  back
```

In the **Status/Arrangement** menu, the status of the selected optional functions is indicated.

7.4 Heating

```
Status: Heating
┌───────────┴───────────┐
▶ Demand 1
                               Inactive>>>
  HC Internal
```

In the **Status/Heating** menu, the status of the demands and heating circuits activated as well as of the selected optional functions is indicated.

7.5 Messages

```
Status: Messages
┌───────────┴───────────┐
▶ Everything OK
  Version      1.x x
  back
```

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.

If the optional function Flow rate monitoring is activated and has detected an error, the message **!Flow r. monit.** is indicated.

All messages will additionally be displayed in the corresponding menus. In order to acknowledge an error message, the corresponding menu has to be entered. If, for example, the message **!Flow r. monit.** appears, it will also be displayed in the Solar/Optional functions/Flow rate monitoring. In that menu, the message can be acknowledged.

7.6 Service

```
Service
┌───────────┴───────────┐
▶  Controller
                               S1
  Collector 1
```

In the **Status/Service** menu, each sensor and relay is indicated with the component or function it has been allocated to. For free sensors and relays, **Free** is indicated.

8 Solar

```
Solar
┌───────────┴───────────┐
▶ Basic settings
  Opt. functions
  Expert
```

In this menu, all adjustments for the solar part of the arrangement can be made. The Solar menu consists of the following submenus:

- Basic setting
- Optional functions
- Expert

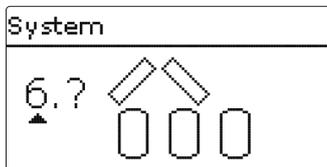
8.1 Basic solar settings

In this menu, all basic settings for the solar part of the arrangement can be adjusted.

In this menu, the hydronic system, which is the basis for the arrangement, can be adjusted. The setting is divided into systems and variants.

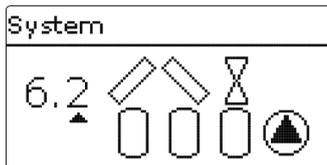
Both system and variant have usually been adjusted during commissioning. If the setting is changed later on, all adjustments for the solar part of the arrangement are set back to their factory settings.

If the change causes the solar system to require a relay that has been allocated to an arrangement or heating function before, all adjustments made in the non-solar function will be set back to their factory settings as well.



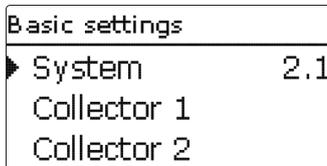
First of all, the basic solar system can be selected according to the number of tanks and collector fields in use. The corresponding numbers are indicated on the display.

The exemplary figure shows system 6 with its 3 tanks and 2 collector fields (east-/west collectors).



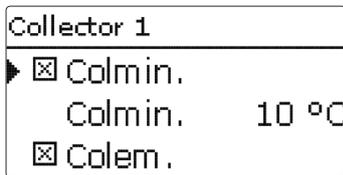
When the basic system has been selected and confirmed, the hydronic variant can be selected. The variant is visualized on the display by means of pump and valve symbols. The exemplary figure shows variant 2 of system 6 with a 2-port valve and a pump. For an overview of the basic systems and their variants see page 17.

The controller supports up to 2 collector fields and up to 5 solar tanks (with 2 collector fields only up to 4 solar tanks).



The following items in the Solar/Basic settings menu will adjust to the system selected.

Collector (1/2)



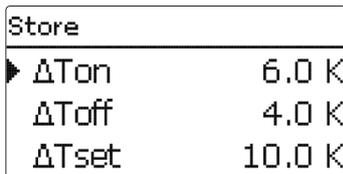
In systems with 2 collector fields, 2 separate menu items (**Collector 1** and **Collector 2**) are displayed instead of **Collector**.

For each collector field, a collector minimum limitation and a collector emergency shutdown temperature can be adjusted.

Solar/Basic settings/Collector (1/2)

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|---------------------------------|-------------------------------|-----------------|
| Colmin. | Minimum collector limitation | Yes, No | Yes |
| Colmin. | Minimum collector temperature | 10... 90 °C [50 ... 194 °F] | 10 °C [50 °F] |
| Colem. | Collector emergency temperature | 80... 200 °C [176 ... 392 °F] | 130 °C [266 °F] |

Store (1/2/3/4/5)



In systems with 2 or more tanks, the corresponding number of separate menu items (**Store 1** to **Store 5**) is displayed instead of **Store**.

For each tank, an individual ΔT control, a set and a maximum temperature, the priority, a hysteresis, a rise value, a minimum runtime and a minimum pump speed can be adjusted.

In multi-tank-systems with differing Store set/Maximum tank temperatures, all tanks are loaded up to their Stset temperatures first (according to their priority and the tank sequence control). Only when all tanks have exceeded Stset will they be loaded up to their Stmax temperatures, again according to their priority and the tank sequence control.

Solar/Basic settings/Store (1/2/3/4/5)

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|--------------------------------------|-----------------------------------|-------------------|
| Δ Ton | Switch-on temperature difference | 1.0 ... 20.0 K [2.0 ... 40.0 °Ra] | 6.0 K [12.0 °Ra] |
| Δ Toff | Switch-off temperature difference | 0.5 ... 19.5 K [1.0 ... 39.0 °Ra] | 4.0 K [8.0 °Ra] |
| Δ Tset | Set temperature difference | 1.5 ... 30.0 K [3.0 ... 60.0 °Ra] | 10.0 K [20.0 °Ra] |
| Stset | Tank set temperature | 4 ... 95 °C [40 ... 204 °F] | 45 °C [114 °F] |
| Stmax | Maximum store temperature | 4 ... 95 °C [40 ... 204 °F] | 60 °C [140 °F] |
| Priority | Priority | 1 ... 5 (system dependent) | system dependent |
| HysSt | Hysteresis maximum store temperature | 0.1 ... 10.0 K [0.2 ... 20.0 °Ra] | 2.0 K [4.0 °Ra] |
| Rise | Rise | 1.0 ... 20.0 K [2.0 ... 40.0 °Ra] | 2.0 K [4.0 °Ra] |
| tMin | Minimum runtime | 0 ... 300 s | 30 s |
| Min speed | Minimum speed | (20) 30 ... 100 % | 30 % |
| Deactivated | Blocked for solar loading | Yes, No | No |

The tank number refers to the corresponding tank sensor, not to the priority of the tank. In the Priority channel, the corresponding tank number is suggested as factory setting, but may be changed at will.

The tank numbers refer to the sensors as follows:

Tank 1 = sensor S2

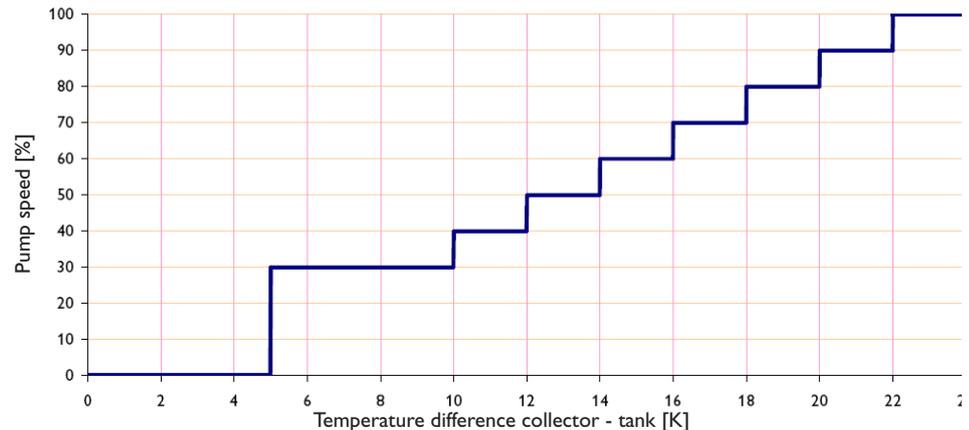
Tank 2 = sensor S4

Tank 3 = sensor S5

Tank 4 = sensors S6 or S7

Tank 5 = sensor S7

The controller works as a standard differential controller. If the switch-on difference is reached, the pump is activated at full speed for approx. 10 s. Then, the speed is reduced to the adjusted minimum pump speed value (factory setting = 30 %). If the temperature difference reaches the adjusted nominal temperature difference, the pump speed increases by one step (10 %). If the temperature difference increases by the adjustable rise value, the pump speed increases by 10 % respectively until the maximum pump speed of 100 % is reached. If the temperature difference decreases by the adjusted rise value, the pump speed is reduced accordingly. When the temperature difference falls below the adjusted switch-off temperature difference, the respective relay switches off.



Loading logic

| Load. logic | |
|--------------------------------------|--------|
| ▶ Load. break | 2 min |
| Circ. | 15 min |
| <input type="checkbox"/> Break speed | |

In systems with 2 or more tanks, loading logic adjustments can be made in this menu.

In systems 1 and 2, only the menu item **Pump delay** will be available.

Solar/Basic settings/Loading logic

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|--------------------|----------------------------|-----------------|
| Load. break | Loading break time | 1 ... 5 min | 2 min |
| Circ. | Circulation time | 1 ... 60 min | 15 min |
| Break speed | Break speed | Yes, No | No |
| Speed | Break speed | (20) 30 ... 100% | 30% |
| Pump delay | Pump delay | Yes, No | No |
| Delay | Delay time | 5 ... 600 s | 15 s |

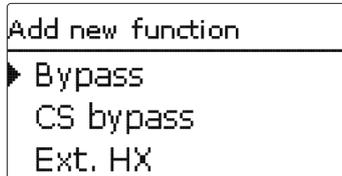
Tank sequence control:

If the priority tank cannot be loaded, the subordinate tank next in priority is checked. If useful heat can be added, it will be loaded for the circulation time (Circ. – factory setting 15 min). After this, the loading process stops and the controller monitors the increase in collector temperature during the loading break time Load. break. If it increases by 2 K, the break time timer starts again to allow the collector to gain more heat. If the collector temperature does not increase sufficiently, the subordinate tank will be loaded again for the Circ. time as before.

As soon as the switch-on condition of the priority tank is fulfilled, it will be loaded. If the switch-on condition of the priority tank is not fulfilled, loading of the second tank will be continued. If the priority tank reaches its maximum temperature, tank sequence control will not be carried out.

Each loading process will be carried out for the duration of the minimum runtime (tmin in the Solar/Basic settings/Store menu) at least, regardless of the switch-off condition.

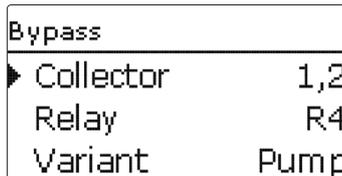
8.2 Solar optional functions



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

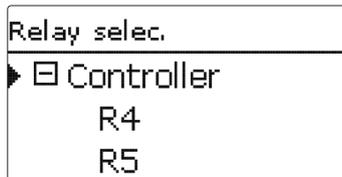
By selecting **Add new function**, different pre-programmed functions can be selected.

The kind and number of optional functions offered depends on the previous adjustments.



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

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

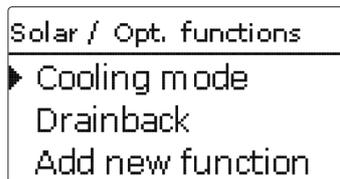


The menu item **Relay selec.** is available in most optional functions. Therefore, it will not be explained in the individual function descriptions.

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

If **Free** is selected, the function will run normally in the software but will not operate a relay.

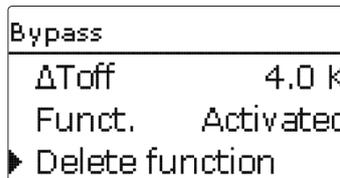
In the submenu **Controller**, all free relays of the controller are displayed. If external modules are connected and registered, their relays will be displayed in corresponding submenus.



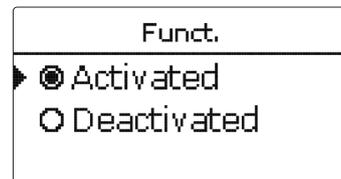
When a function has been selected and adjusted, it will appear in the **Opt. functions** menu above the menu item **Add new function**.

This allows an easy overview of functions already activated.

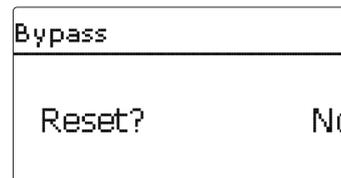
An overview about which sensor has been allocated to which component and which relay has been allocated to which function is given in the **Status/Service** menu.



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



With the menu item **Function**, an optional function already selected can be temporarily deactivated or re-activated 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.

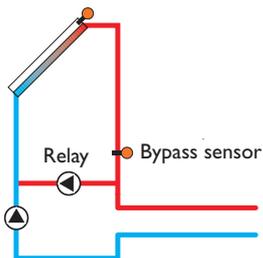
Bypass

| Bypass | |
|-------------|------|
| ▶ Collector | 1,2 |
| Relay | R4 |
| Variant | Pump |

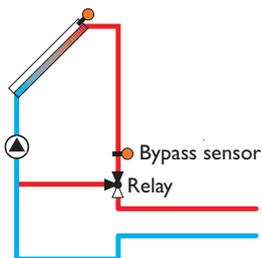
The **Bypass** function can be used to avoid an energy loss from the tank directly after loading has started. The still cold heat transfer medium in the pipework is diverted through a bypass past the tank. Once the pipe is warm enough, the tank can be loaded. The switch-on conditions can be adjusted individually.

| Variant | |
|---|--|
| <input type="radio"/> Valve | |
| ▶ <input checked="" type="radio"/> Pump | |

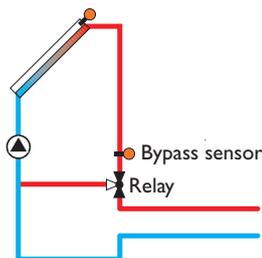
Variant pump:



Variant valve:



Variant valve (inverted):



Exemplary schematics for the bypass variants

Solar/Opt. functions/Add new function/Bypass

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-----------------------------------|-----------------------------------|------------------|
| Collector | Collector field | system dependent | system dependent |
| Relay | Bypass relay | system dependent | system dependent |
| Variant | Variant (pump or valve logic) | pump, valve | pump |
| Inverted | Valve logic inversion | Yes, No | No |
| Sensor | Bypass sensor | system dependent | system dependent |
| ΔT_{on} | Switch-on temperature difference | 1.0 ... 20.0 K [2.0 ... 40.0 °Ra] | 6.0 K [12.0 °Ra] |
| ΔT_{off} | Switch-off temperature difference | 0.5 ... 19.5 K [1.0 ... 39.0 °Ra] | 4.0 K [8.0 °Ra] |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

Depending on whether the bypass is energized by a valve or by a second pump, a corresponding adjustment can be made in the menu item **Variant**. Depending on the variant, different control logics are applied:

Pump:

In this version, a bypass pump is placed in front of the collector pump.

The bypass pump is first activated when tank loading is possible. If the switch-on condition is fulfilled, the bypass pump is switched off and the collector circuit pump is activated.

Valve:

A bypass valve is placed into the solar circuit.

The solar heat exchanger is first bypassed when tank loading is possible. If the above-mentioned switch-on condition is fulfilled, the bypass relay switches the valve and solar loading starts.

When the valve variant is selected, the option **Inverted** is additionally available. When the Inverted option is activated and the bypass circuit becomes activated, the relay switches on. When solar loading starts, the relay switches off again (see figure).

CS bypass

| CS bypass | |
|-------------|----------------------|
| ▶ Collector | 1,2 |
| Irrad. | 200 W/m ² |
| Delay | 120 s |

Solar/Opt. functions/Add new function/CS bypass

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-----------------------------|------------------------------|----------------------|
| Collector | Collector field | system dependent | system dependent |
| Irrad. | Switch-on irradiation | 100 ... 500 W/m ² | 200 W/m ² |
| Delay | Delay time | 10 ... 300 s | 120 s |
| Stmax off | Stmax switch-on suppression | Yes, No | Yes |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

The **CS bypass** function is a different possibility to activate the collector circuit. To enable the use of the CS bypass function, a CS10 irradiation sensor has to be connected.

When the CS bypass function is activated, the irradiation value is the switch-on condition for the collector circuit.

The relay remains switched on if the irradiation value is exceeded for the **Delay** time.



Note:

If both the CS bypass and the bypass function are activated, the CS bypass will only affect the bypass.

If the irradiation remains below the adjusted value for the adjusted delay time, the relay is switched off.

When the option **Stmax off** is activated, collector circuit activation is suppressed as long as all tank temperatures are above their respective maximum temperatures.

Solar external heat exchanger

| Ext. HX | |
|-----------|-----|
| ▶ Relay | R7 |
| Min speed | 30% |
| Store | 1,2 |

Solar/Opt. functions/Add new function/Ext. HX

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-------------------------------------|-----------------------------------|-------------------|
| Relay | Relay selection | system dependent | system dependent |
| Min speed | Minimum speed | (20) 30 ... 100% | 30% |
| Store | Tank sensor selection | system dependent | all stores |
| Sensor HX | Reference sensor ext. HX | system dependent | system dependent |
| Target temperature | Target temperature option | Yes, No | No |
| Sensor | Target temperature reference sensor | system dependent | system dependent |
| Targ. temp. | Target temperature | 15 ... 95 °C [60 ... 204 °F] | 60 °C [140 °F] |
| Δ Ton | Switch-on temperature difference | 1.0 ... 20.0 K [2.0 ... 40.0 °Ra] | 10.0 K [20.0 °Ra] |
| Δ Toff | Switch-off temperature difference | 0.5 ... 19.5 K [1.0 ... 39.0 °Ra] | 5.0 K [10.0 °Ra] |
| Overrun | Overrun time | 0 ... 15 min | 2 min |

This function is used to link loading circuits that are separated by an external heat exchanger.

The allocated relay is energized if one of the selected tanks is being loaded and there is a temperature difference between the sensor of the corresponding tank and the solar flow.

Any number of the solar tanks can be selected.

The relay is switched off if this temperature difference falls below the adjusted switch-off difference.

In contrast to the bypass function, a differential control between Sensor HX and the tank temperature can be carried out by means of the heat exchanger relay.

The reference sensor can be arbitrarily allocated.

In systems in which tanks are equipped with their own loading pumps, the relay “external heat exchanger“ controls the primary circuit pump.

The heat exchanger is protected by a non-adjustable antifreeze function.



Note:

Because of the special hydronics in systems with 2 collectors, the target temperature function will not work properly there.

Evacuated tube collector function

| Tube collector | |
|----------------|-------|
| ▶ Start | 08:00 |
| Stop | 19:00 |
| Run | 30 s |

Solar/Opt. functions/Add new function/ Evacuated tube collector

| Adjustment channel | Description | Adjustment range/ selection | Factory setting |
|--------------------|--------------------------|-----------------------------|------------------|
| Start | Start time frame | 00:00... 23:00 | 08:00 |
| Stop | Stop time frame | 00:30... 23:30 | 19:00 |
| Run | Pump runtime | 5... 600 s | 30 s |
| Break | Break | 1... 60 min | 30 min |
| Delay | Pump delay | 5... 600 s | 15 s |
| Collector | Collector field | system dependent | system dependent |
| Funct. | Activation/ Deactivation | Activated, Deactivated | Activated |

This function helps overcome the non-ideal sensor position with some evacuated tube collectors.

This function operates within an adjusted time frame. It activates the collector circuit pump for an adjustable runtime between adjustable pauses in order to compensate for the delayed temperature measurement.

If the runtime is set to more than 10 seconds, the pump will be run at 100 % for the first 10 s of the runtime. For the remaining runtime, the pump will be run at the adjusted minimum speed.

If the collector sensor is defective or the collector is blocked, this function is suppressed or switched off.

2-collector systems

In 2-collector systems, the evacuated tube collector function is available for each individual collector field.

If one of the collector fields is being loaded, the heat transfer fluid flows through the inactive field and only the corresponding relay is energized.

Target temperature

| Target temp. | |
|---------------|-------|
| ▶ Targ. temp. | 65 °C |
| Sensor | Gd1 |
| Rise | 2.0 K |

Solar/Opt. functions/Add new function/Target temperature

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-------------------------|----------------------------------|------------------|
| Targ. temp. | Target temperature | 20... 110 °C [68 ... 230 °F] | 65 °C [150 °F] |
| Sensor | Reference sensor | system dependent | system dependent |
| Rise | Rise | 1.0... 20.0 K [2.0 ... 40.0 °Ra] | 2.0 K [4.0 °Ra] |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

When the **Target temperature** function is activated, the pump speed control logic changes. The controller will remain at the minimum pump speed until the temperature at the allocated sensor exceeds the adjusted target temperature. Only then will the standard pump speed control start to operate. If the temperature at the allocated sensor changes by the adjusted **Rise** value, the pump speed will be adjusted correspondingly.

If the **Ext. HX** (see page 40) function has been activated, too, the target temperature control will pause while the external heat exchanger is loaded. While the external heat exchanger is loaded, its own pump speed control will come into effect.

Antifreeze

| Antifreeze | |
|------------|------|
| ▶ Frost on | 4 °C |
| Frost off | 6 °C |
| Collector | 1 |

Solar/Opt. functions/Add new function/Antifreeze

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-----------------------------------|---------------------------------|------------------|
| Frost on | Antifreeze switch-on temperature | -40 ... +15 °C [-40 ... +58 °F] | +4 °C [+40 °F] |
| Frost off | Antifreeze switch-off temperature | -39 ... +16 °C [-39 ... +60 °F] | +6 °C [+44 °F] |
| Collector | Collector field | system dependent | system dependent |
| Store (1 ... 5) | Tank succession order | system dependent | system dependent |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

The **Antifreeze function** can be used to keep the heat transfer fluid in the loading circuit from freezing or coagulating.

If the collector temperature falls below the adjusted **Antifreeze switch-on temperature**, the loading circuit between the collector and tank 1 is activated. If the collector temperature exceeds the adjusted **Antifreeze switch-off temperature**, the loading circuit is deactivated.

Heat will be extracted from the tanks according to the adjusted order. When all tanks have reached their minimum temperature of 5 °C [42 °F], the function becomes inactive.

If the function is activated, the pump is run at its maximum relative speed.

In 2-collector systems, the antifreeze menu is extended. The adjustment channels are separated numerically.

Backup heating suppression

| AH Suppression | |
|-------------------------------|-----|
| ▶ Relay | R5 |
| Store | 1,2 |
| <input type="checkbox"/> Tset | |

Solar/Opt. functions/Add new function/AH suppression

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-------------------------|----------------------------|------------------|
| Relay | Reference relay | system dependent | system dependent |
| Tank | Store sensor selection | system dependent | system dependent |
| Tset | Set temperature | Yes, No | No |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

Parallel relay

| Parallel relay | |
|----------------|-----------|
| ▶ Relay | R6 |
| Store | 1 |
| Funct. | Activated |

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

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-------------------------|----------------------------|------------------|
| Relay | Parallel relay | system dependent | system dependent |
| Tank | Store sensor selection | system dependent | system dependent |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

The **Backup heating suppression** blocks the conventional backup heating of a tank that is currently in solar loading.

This function is activated if a previously selected **Store** is being loaded.

Solar loading means that tank loading is only carried out for energy supply and not for cooling purposes etc. If the **Tset** option is activated, the backup heating will only be suppressed when the tank temperature exceeds Tset.

With this function, e. g. a valve can be controlled in parallel to a solar pump via a separate relay.

Switch-on condition for the solar parallel relay function is that one or more of the selected tanks is being loaded. If at least one of the selected tanks is being loaded, the parallel relay is energized.

The parallel relay function operates regardless whether the tank is subjected to regular solar loading or to a loading caused by an optional function (such as the collector cooling).



Note:

If a relay is in the manual mode, the selected parallel relay will not be energized.

Cooling mode

In the **Cooling mode** menu, different cooling functions are available. They can be used for keeping the solar system operational for a longer time during strong solar irradiation.

For this purpose, the adjusted maximum tank temperatures can be exceeded. The tank order for this overloading can be adjusted. Additionally, each individual tank can be excluded from this function.

Two different variants are available for the cooling mode: the system cooling and the collector cooling.

| Cooling mode | |
|--------------|-----|
| ▶ Var. | Off |
| Store 1 | - |
| St cooling | No |

System cooling:

If the system cooling variant has been selected and the switch-on temperature difference is exceeded, tank loading is continued even if the corresponding maximum temperature is exceeded, but only up to the emergency shutdown temperature. Tank loading continues until all tanks have reached the emergency shutdown temperature or until the switch-off temperature difference is reached.

Collector cooling:

If the collector cooling variant has been selected, tank loading is continued or reactivated when the collector maximum temperature is exceeded.

Tank loading continues until all tanks have reached the emergency shutdown temperature or until the collector temperature falls below the collector maximum temperature by at least 5 K. In 2-collector systems, separate adjustments can be made for each collector field. The control logic regards collector cooling operation as solar loading. The adjusted values for delay, minimum runtime, etc. remain valid. In addition to the cooling mode, tank cooling is available.

Tank cooling

When the tank cooling function is activated, the controller aims to cool down the tank during the night in order to prepare it for solar loading on the following day.

When the tank cooling function is activated, the solar pump is switched on if the maximum tank temperature is exceeded and the collector temperature falls below the tank temperature. The solar pump remains active until the tank temperature falls below the adjusted maximum tank temperature.

The tank order for the cooling is the same as in the overheating through system- or collector cooling.

The holiday function works like the tank cooling function but aims to cool the tank further down during times without DHW consumption in order to prepare it for solar loading on the following day. This function can only be activated if the tank cooling function is activated.

| Cooling mode | |
|---|-------|
| ▶ <input checked="" type="checkbox"/> Holiday | |
| Activ. | Timer |
| On 17.11.2010 | |

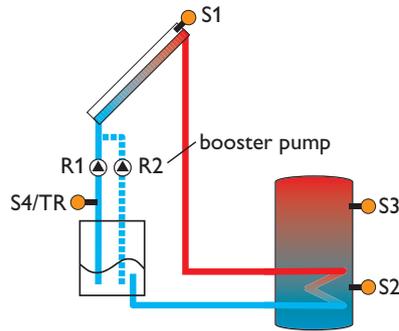
The holiday function can either be activated manually when a phase with no DHW consumption begins, or a time frame, during which the function is to become active, can be set in advance. If **manual** is selected, an input can be allocated to the function. When a switch is connected to the allocated input, it will act as an on/off switch for the holiday function.

Solar/Opt. functions/Add new function/Cooling mode

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-----------------------------------|-----------------------------------|-------------------|
| Var. | Cooling logic variant | Col. cool., Syst. cool., Off | Off |
| Tcolmax. | Collector maximum temperature | 70 ... 190 °C [158 ... 374 °F] | 100 °C [212 °F] |
| Tank (1 ... 5) | Tank succession order | system dependent | system dependent |
| St cooling | Tank cooling | Yes, No | No |
| ΔTon | Switch-on temperature difference | 1.0 ... 30.0 K [2.0 ... 60.0 °Ra] | 20.0 K [40.0 °Ra] |
| ΔToff | Switch-off temperature difference | 0.5 ... 29.5 K [1.0 ... 59.0 °Ra] | 15.0 K [30.0 °Ra] |
| Holiday | Holiday function | Yes, No | No |
| Activ. | Activation mode | Manual, Timer | Timer |
| On | Holiday function switch-on date | Dates up to 31.12.2099 | Current date |
| Off | Holiday function switch-off date | Dates up to 31.12.2099 | On + 7 days |
| Input | Holiday function switch input | system dependent | system dependent |
| Stmax (1 ... 5) | Maximum store temperature | 4 ... 95 °C [40 ... 204 °F] | 40 °C [104 °F] |
| Funct. | Activation / Deactivation | Activated, Deactivated | Activated |

Drainback option

| Drainback | |
|--------------|---------|
| Filling time | 5 min |
| Stab. time | 2.0 min |
| Initialis. | 60 s |



Exemplary drainback system layout
(R2 = booster pump)

A drainback system permits the heat transfer fluid to drain back into the holding tank when solar energy is not collected. The drainback option will initiate the filling of the system when solar loading begins.



Note:

A drainback system requires additional components such as a holding tank. The drainback option should only be activated if all components required are properly installed.

The parameter **Filling time** is used to adjust the time period for which the pump will be run at 100 % speed in order to fill the system.

The parameter **Stab. time** is used for adjusting the time period during which the switch-off condition will be ignored after the filling time has ended.

The parameter **Initialis.** is used for adjusting the time period during which the switch-on condition must be permanently fulfilled for the filling procedure to start.

The **Booster** option is used for switching on a second pump when filling the solar system. The corresponding relay is switched on at 100 % speed for the duration of the filling time.

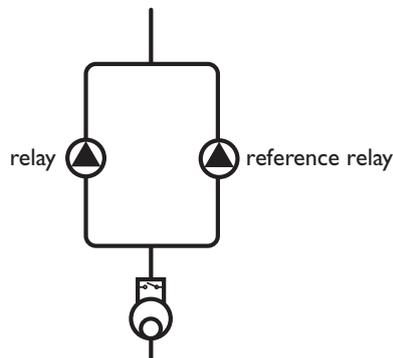
A short time (Delay time) after the system has been emptied, the **Drain impulse** option will switch on the solar pump for an adjustable **Duration**. Thus, a hydrostatic head will form in the flow pipe. When it falls back into the holding tank, water pockets remaining in the collector will be sucked down into the holding tank.

Solar / Opt. functions / Add new function / Drainback

| Adjustment channel | Description | Adjustment range / selection | Factory setting |
|--------------------|--------------------------------|------------------------------|------------------|
| Filling time | Filling time | 1 ... 30 min | 5 min |
| Stab. time | Stabilization time | 1.0 ... 15.0 min | 2,0 min |
| Initialis. | Initialization time | 1 ... 100 s | 60 s |
| Booster | Booster option | Yes, No | No |
| Relay | Booster pump relay selection | system dependent | system dependent |
| Drain impulse | Drain impulse option | Yes, No | No |
| Delay | Delay time | 1 ... 30 min | 3 min |
| Duration | Drain impulse loading duration | 1 ... 60 s | 10 s |
| Funct. | Activation / Deactivation | Activ., Deactivated | Deactivated |

Twin pump

| Twin pump | |
|--------------|-----|
| Relay | R9 |
| ▶ Ref. relay | R6 |
| Runtime | 6 h |



Exemplary figure of twin pumps in the solar flow with upstream flowmeter

Solar/Opt. functions/Add new function/Twin pump

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-----------------------------|-----------------------------------|------------------|
| Relay | Relay selection | system dependent | system dependent |
| Ref. relay | Reference relay selection | system dependent | system dependent |
| Runtime | Pump runtime | 1 ... 48 h | 6 h |
| Flow rate mon. | Flow rate monitoring option | Yes, No | No |
| Flow rate sen. | Flow rate sensor selection | Imp1 ... Imp3, Ga1, Ga2, Gd1, Gd2 | Imp1 |
| Delay | Delay time | 1 ... 10 min | 5 min |
| Funct. | Activation / Deactivation | Activ., Deactivated | Deactivated |

The **Twin pump** function controls the equal distribution of pump runtime in systems with two equally usable pumps.

If the allocated relay has exceeded its adjusted runtime and the next switch-on process is imminent, the reference relay is switched on instead. All characteristics are adopted.

If the reference relay has in turn exceeded its runtime as well, the first relay is switched on again in the next switch-on process.

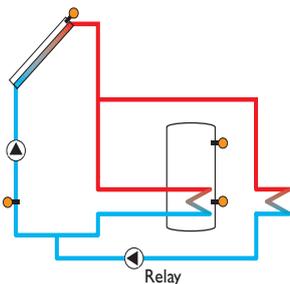
Additionally, the **Flow rate monitoring** option can be activated in order to activate the twin pump in the case of a flow rate error. When the flow rate monitoring option is activated, two additional adjustment channels appear for allocating a sensor and adjusting a delay time.

If the flow rate monitoring option is activated, an error message will appear when no flow rate is detected at the allocated sensor after the **Delay** time has passed. The active relay is considered as defective and will be blocked until the error message has been acknowledged. The second relay will be activated instead. The twin pump function will pause until the error message has been acknowledged.

When the error message is acknowledged, the controller runs a test during which it will energize the relay and again monitor the flow rate.

Heat dump

| Heat dump | |
|-----------|--------|
| Relay | R2 |
| Variant | Valve |
| Tcol. | 110 °C |

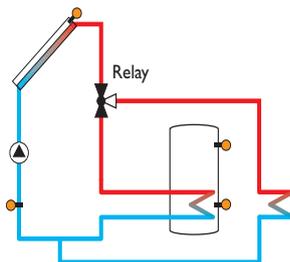


Variant pump



Note:

The switch-on collector temperature is blocked against the emergency switch-off temperature by 10K [20 °Ra].



Variant valve

The **Heat dump function** can be used to direct excess heat generated by strong solar irradiation to an external heat exchanger (e. g. fan coil) in order to prevent the collectors from overheating.

Whether the heat dump is activated via an additional pump or a valve can be adjusted in the menu item **Variant**.

Variant pump:

The allocated relay is energized with 100 %, if the collector temperature reaches the adjusted switch-on temperature. If the collector temperature falls by 5 K [10 °Ra] below the adjusted collector overtemperature, the relay will be switched off. In the variant pump, the heat dump function works independent from the solar loading.

Variant valve:

The allocated relay is activated in parallel to the solar pump, if the collector temperature reaches the adjusted switch-on temperature. If the collector temperature falls by 5 K [10 °Ra] below the adjusted collector overtemperature, the relay will be switched off.

If one of the tank temperatures exceeds its respective maximum temperature by more than 5 K [10 °Ra] while the heat dump function is active, the function is deactivated and an error message appears. If the temperature falls below this value by the hysteresis maximum tank temperature (HysSt in the Solar/Basic settings/Store menu), the heat dump function is released again.

Solar/Opt. functions/Add new function/Heat dump

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|---------------------------------|-------------------------------|------------------|
| Relay | Relay selection | system dependent | system dependent |
| Variant | Variant (pump or valve logic) | Valve, pump | Valve |
| Tcol. | Switch-on collector temperature | 40 ... 190 °C [104... 374 °F] | 110 °C [230 °F] |
| Funct. | Activation/Deactivation | Activated, Deactivated | Deactivated |

Flow rate monitoring

| |
|----------------|
| Flow rate mon. |
| ▶ Sensor |
| Ref. relay |
| Store 1 |

Solar/Opt. functions/Add new function/Flow rate mon.

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|----------------------------|-----------------------------------|-----------------|
| Sensor | Flow rate sensor selection | Imp1 ... Imp3, Ga1, Ga2, Gd1, Gd2 | - |
| Ref. relay | Reference relay selection | system dependent | - |
| Store | Tank sensor selection | system dependent | 1 |
| Time | Delay time | 1 ... 300 s | 30 s |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

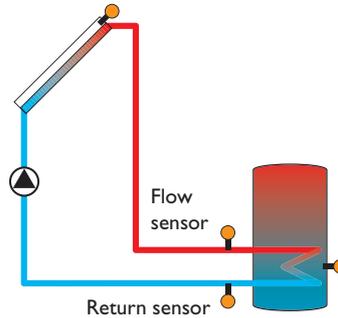
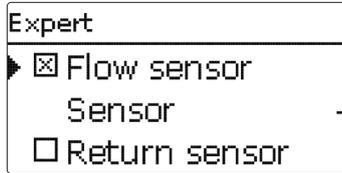
The **Flow rate monitoring** function can be used to detect malfunctions that impede the flow rate and to switch off the corresponding relay. This will prevent system damage, e. g. through a dry run of the pump.

If the flow rate monitoring function is activated, an error message will appear when no flow rate is detected at the allocated flowmeter after the delay time has passed.

- If a **Reference relay** has been selected, the flow rate monitoring function will become active when the allocated relay is switched on. In the case of an error, the complete solar system will be shut down.
- If a **Store** is selected, the flow rate monitoring function will become active when the allocated tank is being loaded. In the case of an error, the allocated tank will be blocked until the error message has been acknowledged. The next tank free for loading will be loaded instead.
- If both a **Store** and a **Reference relay** have been selected, the flow rate monitoring function will become active when the allocated relay is switched on. In the case of an error, the allocated store will be blocked until the error message has been acknowledged. The next store free for loading will be loaded instead.

The error message will appear both in the **Status/Messages** menu and in the **Status/Solar/Flow rate mon.** menu. It can only be acknowledged in the **Status/Solar/Flow rate mon.** menu. When the error message is acknowledged, the controller runs a test during which it will energize the relay and again monitor the flow rate.

8.3 Solar expert menu



Example of flow and return sensor positions

The **Expert** menu is only available when the expert user code has been entered.

In the expert menu, a flow and a return sensor can be selected and allocated. The activated sensors are then used to detect the switch-off condition.



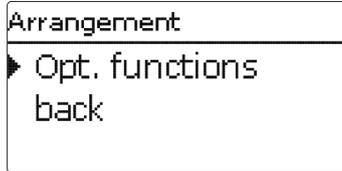
Note:

Because of the special hydronics in systems with 2 collectors, this function will not work properly there.

Solar/Expert

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-------------------------|----------------------------|-----------------|
| Flow sensor | Flow sensor option | Yes, No | No |
| Sensor | Flow sensor selection | system dependent | - |
| Return sensor | Return sensor option | Yes, No | No |
| Sensor | Return sensor selection | system dependent | - |

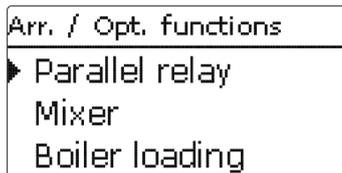
9 Arrangement



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

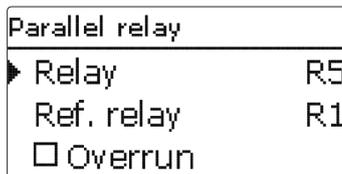
A range of optional functions can be selected and adjusted.

9.1 Optional functions



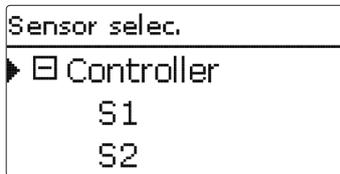
In this menu, additional functions can be selected and adjusted for the arrangement.

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 submenu opens in which all adjustments required can be made.

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

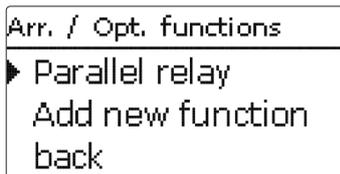


The menu item **Relay selec.** is available in all optional functions. Therefore, it will not be explained in the individual function descriptions.

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

If **Free** is selected, the function will run normally in the software but will not operate a relay.

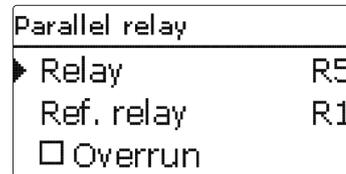
In the submenu **Controller**, all free relays of the controller are displayed. If external modules are connected and registered, their relays will be displayed in corresponding submenus.



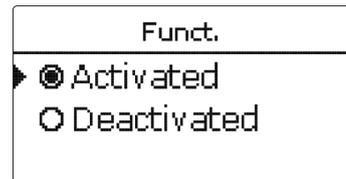
When a function has been selected and adjusted, it will appear in the **Opt. functions** menu above the menu item **Add new function**.

This allows an easy overview of functions already activated.

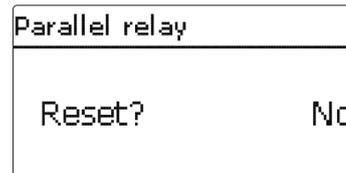
An overview about which sensor has been allocated to which component and which relay has been allocated to which function is given in the **Status/Service** menu.



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



With the menu item **Function**, an optional function already selected can be temporarily deactivated or re-activated 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

| Parallel relay | |
|----------------------------------|----|
| ▶ Relay | R5 |
| Ref. relay | R1 |
| <input type="checkbox"/> Overrun | |

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

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

Mixer

| Mixer | |
|----------------|----|
| ▶ Relay closed | R2 |
| Relay open | R4 |
| Sensor | S3 |

Arrangement/Opt. functions/Add new function/Mixer

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|------------------------------|------------------------------|------------------|
| Relay closed | 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 [32 ... 266 °F] | 60 °C [140 °F] |
| Interval | Mixer interval | 1 ... 20 s | 4 s |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

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 energized 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.

When the pump **Speed** option has been activated, the **Relay** will assume the pump speed information for the **Reference relay**. If the **Inverted** option is activated at the same time, the relay will only switch on/off without pump speed control.

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

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.

Boiler loading

| Boiler loading | |
|----------------|----|
| ▶ Relay | R5 |
| Sensor top | S4 |
| Sensor base | S5 |

Arrangement/Opt. functions/Add new function/Boiler 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 |
| TBoiler on | Boiler switch-on temperature | 0 ... 94 °C [32 ... 202 °F] | 45 °C [114 °F] |
| TBoiler off | Boiler switch-off temperature | 1 ... 95 °C [34 ... 204 °F] | 60 °C [140 °F] |
| Timer | Timer option | Yes, No | No |
| 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 |

Error relay

| Error relay | |
|-----------------|-----------|
| ▶ Relay | R6 |
| Funct. | Activated |
| Delete function | |

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 |

The **Boiler loading** function can be used to load a tank zone between 2 sensors. For the monitoring of switch-on and switch-off conditions, 2 sensors are used. The switch-on and switch-off temperatures **TBoiler on** and **TBoiler off** are used as reference parameters.

If the measured temperatures at both allocated sensors fall below the adjusted switching threshold TBoiler on, the relay is energized. It is switched off again when the temperature at both sensors has exceeded TBoiler off.

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



Note:

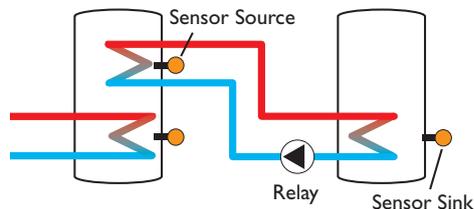
For information on timer adjustment see page 11.

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

If the error relay function is activated, the allocated relay will operate when a sensor fault occurs. If the flow rate monitoring function is activated, the error relay will additionally operate in the case of a flow rate error.

Heat exchange

| Heat exchange | |
|---------------|----|
| Relay | R6 |
| Sen. Source | S5 |
| Sen. Sink | S6 |



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 |
| ΔT_{on} | Switch-on temperature difference | 1.0 ... 30.0 K [2.0 ... 60.0 °Ra] | 6.0 K [12.0 °Ra] |
| ΔT_{off} | Switch-off temperature difference | 0.5 ... 29.5 K [1.0 ... 59.0 °Ra] | 4.0 K [8.0 °Ra] |
| ΔT_{set} | Set temperature difference | 1.5 ... 40.0 K [3.0 ... 80.0 °Ra] | 10.0 K [20.0 °Ra] |
| Min speed | Minimum speed | (20) 30 ... 100 % | 30 % |
| Tmax | Maximum temperature of the tank to be loaded | 1.0 ... 20.0 K [2.0 ... 40.0 °Ra] | 6.0 K [12.0 °Ra] |
| Tmin | Minimum temperature of the tank to be loaded | 0.5 ... 19.5 K [1.0 ... 39.0 °Ra] | 4.0 K [8.0 °Ra] |
| Timer | Timer | 1.5 ... 30.0 K [1.5 ... 60.0 °Ra] | 10.0 K [20.0 °Ra] |
| Days of the week | Day selection | 4 ... 95 °C [40 ... 204 °F] | 45 °C [114 °F] |
| Timer | Time frame adjustment | 4 ... 95 °C [40 ... 204 °F] | 60 °C [140 °F] |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

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

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

- the temperature difference between the allocated sensors has exceeded the switch-on 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

When the set temperature difference is exceeded, pump speed control starts. For every deviation of 2 K [4 °Ra], the pump speed will be adjusted by 10 %.

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

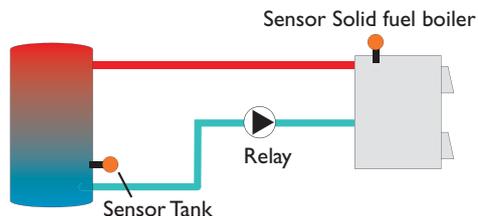


Note:

For information on timer adjustment see page 11.

Solid fuel boiler

| Solid fuel boiler | |
|-------------------|----|
| Relay | R8 |
| Sen. Boiler | S8 |
| Sen. Store | S9 |



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

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

- the temperature difference between the allocated sensors has exceeded the switch-on temperature difference
- the temperature at the solid fuel boiler sensor has exceeded the minimum temperature
- the temperature at the tank sensor has fallen below the maximum temperature

When the **Set temperature difference** is exceeded, pump speed control starts. For every deviation of 2 K [4 °Ra], the pump speed will be adjusted by 10 %.

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 | Tank sensor selection | system dependent | system dependent |
| ΔT_{on} | Switch-on temperature difference | 2.0 ... 30.0 K [4.0 ... 60.0 °Ra] | 6.0 K [12.0°Ra] |
| ΔT_{off} | Switch-off temperature difference | 1.0 ... 29.0 K [2.0 ... 58.0 °Ra] | 4.0 K [8.0°Ra] |
| ΔT_{set} | Set temperature difference | 3.0 ... 40.0 K [6.0 ... 80.0 °Ra] | 10.0 K [20.0°Ra] |
| Min speed | Minimum speed | (20) 30 ... 100% | 30% |
| Tmax st. | Maximum temperature | 10 ... 95 °C [50 ... 204 °F] | 60 °C [140 °F] |
| Tmin boiler | Minimum temperature | 10 ... 95 °C [50 ... 204 °F] | 60 °C [140 °F] |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

Circulation

| | |
|-------------|---------|
| Circulation | |
| ▶ Relay | R9 |
| Type | Thermal |
| Sensor | S10 |

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

For the control logic, 5 different variants are available:

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

Arrangement / Opt. functions / Add new function / Circulation

| Adjustment channel | Description | Adjustment range / selection | Factory setting |
|--------------------|------------------------------|--|------------------|
| Relay | Relay selection | system dependent | system dependent |
| Type | Variant | Demand, Thermal, Timer, Therm.+Timer, Demand+Timer | Thermal |
| Sensor | Circulation sensor selection | system dependent | system dependent |
| Ton | Switch-on temperature | 10 ... 59 °C [50 ... 138 °F] | 40 °C [104 °F] |
| Toff | Switch-off temperature | 11 ... 60 °C [52 ... 140 °F] | 45 °C [114 °F] |
| Timer | Timer | - | - |
| Days of the week | Day selection | All days, Monday ... Sunday, Continue | - |
| Timer | Time frame adjustment | 00:00 ... 23:45 | - |
| Sensor | FS08 sensor input selection | system dependent | system dependent |
| Delay | Demand switch-on delay | 0 ... 3 s | 0 s |
| Runtime | Runtime | 01:00 ... 15:00 | 03:00 min |
| Break time | Break time | 10 ... 60 min | 30 min |
| Funct. | Activation / Deactivation | Activated, Deactivated | Activated |

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

Thermal

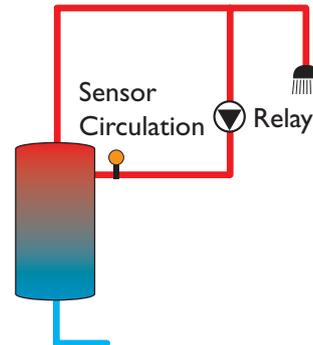
The temperature at the allocated sensor is monitored. The allocated relay switches on when the adjusted switch-on temperature is exceeded. If the temperature falls below the switch-off temperature, the relay switches off.

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.

Thermal + Timer

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



Demand

The allocated FS08 flow switch is monitored for circuit continuity. If circuit continuity is detected at the flow switch, the relay switches on for the adjusted runtime. After the runtime has ended, the relay is switched off. During the adjusted break time, the relay remains switched off even if continuity is detected at the flow switch.

Demand + Timer

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

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

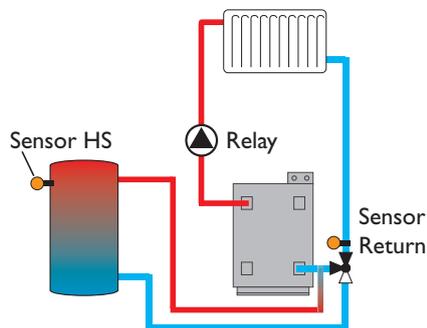


Note:

For information on timer adjustment see page 11.

Return preheating

| Ret. preheat. | |
|---------------|----|
| Relay | R8 |
| Sen. Return | S7 |
| Sen. HS | S8 |



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

The allocated relay is energized when both switch-on conditions are fulfilled:

- the temperature difference between the allocated sensors has exceeded the switch-on temperature difference
- the temperature at the outdoor temperature sensor has fallen below the adjusted outdoor temperature

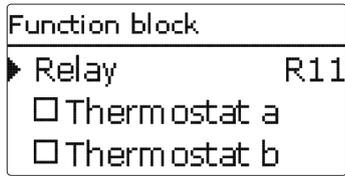
With the summer switch-off option, the return preheating can be suppressed outside the heating period.

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

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-----------------------------------|-----------------------------------|-------------------|
| Relay | Relay selection | system dependent | system dependent |
| Sen. Return | Return sensor selection | system dependent | system dependent |
| Sen. HS | Heat source sensor selection | system dependent | system dependent |
| ΔT_{on} | Switch-on temperature difference | 2.0 ... 30.0 K [4.0 ... 60.0 °Ra] | 6.0 K [12.0 °Ra] |
| ΔT_{off} | Switch-off temperature difference | 1.0 ... 29.0 K [2.0 ... 58.0 °Ra] | 4.0 K [8.0 °Ra] |
| Summer off | Summer switch-off option | Yes, No | No |
| Sensor | Outdoor sensor selection | system dependent | system dependent* |
| Toff | Switch-off temperature | 10 ... 60 °C [50 ... 140 °F] | 20 °C [68 °F] |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

*When a heating circuit has been activated, the value adjusted in the corresponding parameter in the heating circuit menu is suggested as factory setting.

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, resp. functions 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 (e. g. thermostat and timer) for switching 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 ($\Delta Th(x)_{on}$) is reached. It is switched off as soon as the adjusted switch-off temperature difference ($\Delta Th(x)_{off}$) 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.



Note:

For information on timer adjustment see page 11.

Reference relay

Up to 5 reference relays can be selected.

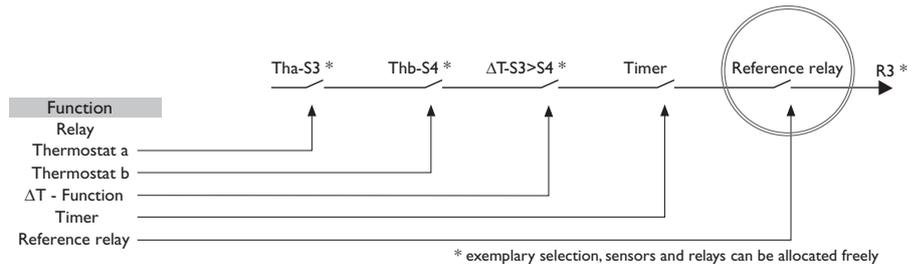
Whether the reference relays are to be switched in series (AND) or in parallel (OR) can be adjusted in the **Mode** channel.

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

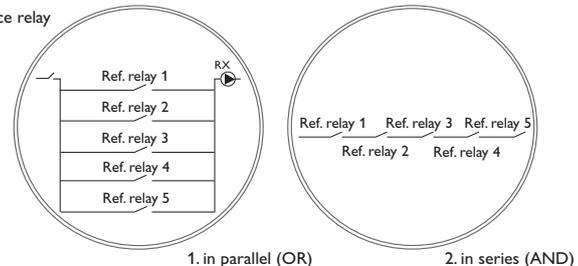
If all reference relays are active, the switch-on condition for the function block is considered fulfilled. The switching conditions of all other activated functions of the function block have to be fulfilled as well.



Note:

If more than one function block has been activated, relays of numerically higher function blocks may not be used as reference relays.

Reference relay



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 ... +482 °F] | +40 °C [104 °F] |
| Th-a off | Switch-off temperature Thermostat a | -40 ... +250 °C [-40 ... +482 °F] | +45 °C [114 °F] |
| 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 ... +482 °F] | +40 °C [+104 °F] |
| Th-b off | Switch-off temperature Thermostat b | -40 ... +250 °C [-40 ... +482 °F] | +45 °C [+114 °F] |
| 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 [2.0 ... 100.0 °Ra] | 5.0 K [10.0 °Ra] |
| ΔToff | Switch-off temperature difference | 0.5 ... 49.5 K [1.0 ... 99.0 °Ra] | 3.0 K [6.0 °Ra] |
| ΔTset | Set temperature difference | 3 ... 100 K [6 ... 200 °Ra] | 10 K [20 °Ra] |
| Min speed | Minimum speed | (20) 30 ... 100 % | 30 % |
| Sen. Source | Heat source sensor | system dependent | system dependent |
| Sen. Sink | Heat sink sensor | system dependent | system dependent |
| Timer | Timer | - | No |
| Days of the week | Day selection | All days, Monday ... Sunday, Continue | - |
| Timer | Time frame adjustment | 00:00 ... 23:45 | - |
| Ref. relay | Reference relay | Yes, No | No |
| Mode | Reference relay mode | OR, AND | OR |
| Relay | Reference relay 1 | all relays* | - |
| Relay | Reference relay 2 | all relays* | - |
| Relay | Reference relay 3 | all relays* | - |
| Relay | Reference relay 4 | all relays* | - |
| Relay | Reference relay 5 | all relays* | - |
| Funct. | Activation / Deactivation | Activated, Deactivated | Activated |

* Relays that have been selected as parallel relays (in the optional functions Solar/Parallel relay and Arrangement/Parallel relay) will not work as reference relays.

Irradiation switch

| | |
|---------------|----------------------|
| Irrad. switch | |
| ▶ Relay | R11 |
| Irrad. | 200 W/m ² |
| Duration | 2 min |

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

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

10 Heating

| | |
|----------------|--|
| Heating | |
| ▶ Demands | |
| HCs | |
| Opt. functions | |

Heating/Demands

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|-----------------|----------------------------|-----------------|
| Dem. 1 (2) | Demand 1 | Activated, Deactivated | Deactivated |
| Relay | Relay selection | system dependent | - |

The **Irrad. 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.

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

Demands can be activated, heating circuits can be parameterized and optional functions can be selected and adjusted.

10.1 Demands

| Heating / Demands | |
|-------------------|-------------|
| ▶ Dem. 1 | Activated |
| Relay | R7 |
| Dem. 2 | Deactivated |

In this menu, up to 2 heating demands can be activated and adjusted.

Activated demands will be available for selection in the relay allocation channels of the corresponding optional functions of the Heating menu. This way, several optional functions can demand the same heat source.

If, for example the dry-contact changeover relay R14 is allocated to Demand 1, the selection AH1 will then become available in addition to the free relays in the Demand adjustment channels of the optional functions for the heating part of the arrangement (see page 64). This way, e. g. the DHW heating function can demand the same boiler for backup heating as the thermal disinfection function.

10.2 Heating circuits

| New HC |
|--------------------|
| ▶ Internal back |

The controller has two internal, weather-compensated heating circuits and is able to control up to 5 external heating circuits by means of extension modules.

In the menu appearing when **New HC...** is selected, it is possible to choose between the internal heating circuits and, if available, registered 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.

Extension modules can be registered in the In-/Outputs/Modules menu (see page 71). If an internal or external heating circuit has been selected, a new menu opens. In this menu, all sensors and relays required for the heating circuit can be allocated, and all adjustments can be made.

The controller calculates the set flow temperature for each heating circuit by means of the averaged outdoor temperature and the selected heating curve. If the measured flow temperature deviates from the set flow temperature, the mixer is activated in order to adjust the flow temperature correspondingly.

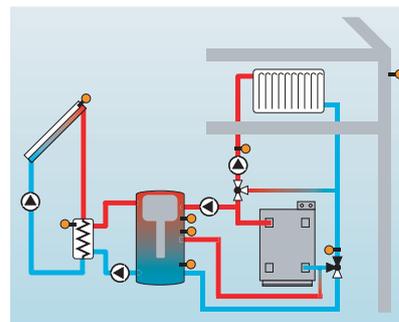
If the outdoor temperature falls below the point where the calculated set flow temperature would exceed the maximum flow temperature, the maximum flow temperature is treated as the set temperature for as long as the condition remains.

If the outdoor temperature sensor is defective, an error message is indicated. For the duration of this condition, the maximum flow temperature -5 K [-10 °Ra] is assumed as set flow temperature.

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).

Summer mode

The **Mode** channel adjustment determines how the heating circuit is set to summer mode:



Summer off: The summer mode becomes active when the outdoor temperature exceeds the adjusted summer temperature T_{Summer} .

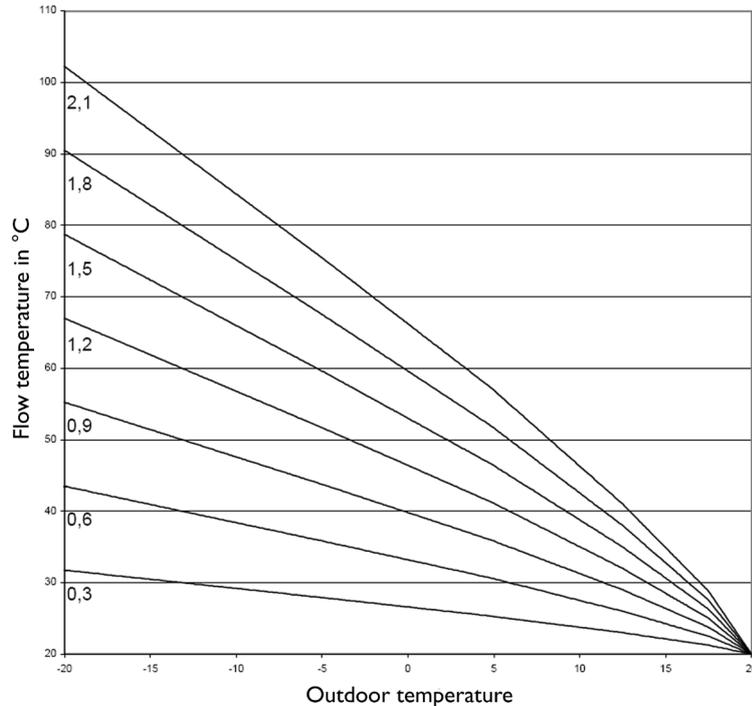
Ext. switch: A switch is connected to a selected sensor input. If the switch is operated, the heating circuit is set to summer mode regardless of the outdoor temperature.

Both: As long as the switch is not operated, summer mode control works as described for Summer off. If the switch is operated, the heating circuit is set to summer mode regardless of the outdoor temperature.

Summer temperature

If **Summer off** or **Both** has been selected in the **Mode** channel, the summer temperature **TSummer** can be adjusted. If the outdoor temperature exceeds the value adjusted in TSummer, the heating circuit pump is switched off.

heating curves



For the summer temperature, a daytime time frame can be adjusted with the channels **Daytime on** and **Daytime off**. Outside this time frame, the adjustable temperature **TNight** replaces TSummer.

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 **Room temperature** value at all activated room thermostats, the heating circuit pump is deactivated and the mixer closes.

If the **Timer RTH** option is activated, time frames can be set for the room thermostats (for information on how to adjust the timer see below). During these time frames, the adjusted room temperature is decreased by the **Correction** value.

Common room thermostats with dry-contact 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 (page 72). Only inputs set to **Switch** will be displayed in the channel **Sen. RTH** as possible inputs for a Switch type room thermostat. To each room thermostat, an additional relay can be allocated. That relay will operate when the temperature at the allocated sensor falls below the adjusted room temperature. This way, the room in question can be excluded from the heating circuit via a valve as long as the desired room temperature is reached.

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



Note:

For information on timer adjustment see page 11.

Heating/HCs/New heating circuit/Internal

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|---------------------|--|---------------------------------------|------------------|
| HC pump | Heating circuit pump | system dependent | system dependent |
| Mixer open | Relay selection mixer open | system dependent | system dependent |
| Mixer closed | Relay selection mixer closed | system dependent | system dependent |
| Flow sensor | Flow sensor selection | system dependent | system dependent |
| Sen. Outd. | Outdoor sensor selection | system dependent | system dependent |
| Heating curve | Heating curve | 0.3 ... 3.0 | 1.0 |
| Day correction | Day correction | -5 ... +45 K [-10 ... +90 °Ra] | 0 K [0 °Ra] |
| Tflowmin | Minimum flow temperature | 10 ... 50 °C [50 ... 122 °F] | 20 °C [68 °F] |
| Tflowmax | Maximum flow temperature | 10 ... 100 °C [50 ... 212 °F] | 50 °C [122 °F] |
| Mode | Operation mode | Summer off, ext. switch, both | Summer off |
| TSummer | Summer temperature day | 0 ... 40 °C [32 ... 104 °F] | 20 °C [68 °F] |
| Daytime on | Daytime on | 00:00 ... 23:45 | 00:00 |
| Daytime off | Daytime off | 00:00 ... 23:45 | 00:00 |
| Ext. switch | External switch sensor input selection | system dependent | system dependent |
| Remote control | Remote control option | Yes, No | No |
| Sen. RC | Remote control sensor input selection | system dependent | system dependent |
| Timer | Timer option | Yes, No | No |
| Mode | Timer mode | Day / night, Day / off | Day / night |
| Night corr. | Night correction | -20 ... +30 K [-40 ... +60 °Ra] | -5 K [-10 °Ra] |
| Timer | Timer | - | - |
| Days of the week | Day selection | All days, Monday ... Sunday, Continue | - |
| Timer | Time frame adjustment | 00:00 ... 23:45 | - |
| Room therm. 1 ... 5 | Room thermostat option (1 ... 5) | Yes, No | No |
| Type | Room thermostat type selection | Sensor, Switch | Sensor |
| RTH sen. | RTH sensor input selection | system dependent | system dependent |
| TambSet | Room temperature | 10 ... 30 °C [50 ... 86 °F] | 18 °C [64 °F] |
| Timer | RTH timer | Yes, No, Inactive | No |

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|--|---------------------------------------|-------------------|
| Days of the week | Day selection | All days, Monday... Sunday, Continue | - |
| Timer | Time frame adjustment | 00:00... 23:45 | - |
| Correction | Correction | 1 ... 20 K [2 ... 40 °Ra] | 5 K [10 °Ra] |
| Relay | RTH relay selection | system dependent | - |
| RTH | Room thermostat | Activated, Deactivated | Activated |
| Backup heating | Backup heating option | Yes, No | No |
| Mode | Backup heating mode | Therm., Boiler | Therm. |
| Relay | Backup heating relay selection | system dependent | - |
| Sensor 1 | Backup heating sensor 1 selection | system dependent | - |
| Sensor 2 | Backup heating sensor 2 (only if Mode = Boiler) | system dependent | - |
| Loading pump | Loading pump option | Yes, No | No |
| Relay | Loading pump relay selection | system dependent | - |
| Overrun time | Loading pump overrun time | 0... 300 s | 60 s |
| Activ. | Activation / Deactivation | Activated, Deactivated | Deactivated |
| ΔT_{on} | Switch-on temperature difference | -15.0... +44.5 K [-30.0... +89.0 °Ra] | 5.0 K [10.0 °Ra] |
| ΔT_{off} | Switch-off temperature difference | -14.5... +45.0 K [-29.0... +90.0 °Ra] | 15.0 K [30.0 °Ra] |
| Function | Function activated / deactivated | Activated, Deactivated | Deactivated |
| Interval | Mixer interval | 1 ... 20 s | 4 s |
| Chimney sweeper | Chimney sweeper function | Yes, No | No |
| Antifreeze | Antifreeze option | Yes, No | Yes |
| Sensor | Antifreeze option sensor | Flow, Outdoor | Flow |
| TAntifr. | Antifreeze temperature | -20 ... +10 °C [-4 ... +50 °F] | +4 °C [+40 °F] |
| Flow set | Set flow temperature | 10 ... 50 °C [50 ... 122 °F] | 20 °C [68 °F] |
| DHW priority | DHW priority option | Yes, No | No |
| Funct. | Activation / Deactivation | Activated, Deactivated | Activated |

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.

If the chimney sweeper function is activated, the chimney sweeper mode can be accessed by pressing button **6** for 5 seconds.

In the chimney sweeper mode, the heating circuit mixer closes, the loading pump and the backup heating contact are activated. While the chimney sweeper mode is active, the directional pad is illuminated. Additionally, **Chimney sweeper** and a countdown of 30 minutes 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 10 seconds, the countdown starts again.

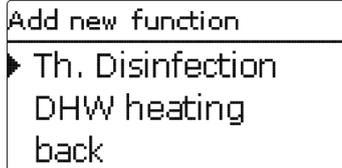
In order to abort the countdown and thus deactivate the chimney sweeper mode, briefly press button **6**.

Antifreeze option

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

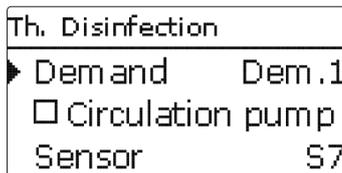
When the antifreeze option is activated, the temperature at the allocated sensor is monitored. If the temperature falls below the adjusted **antifreeze temperature**, the heating circuit is activated for the non-adjustable runtime of 30 min. Antifreeze operation has a fixed set flow temperature which can be changed in the **Flow set** channel.

10.3 Optional functions



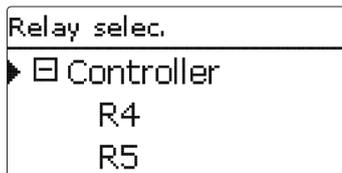
In this menu, additional functions can be selected and adjusted for the heating part of the arrangement.

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 submenu opens in which all adjustments required can be made.

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

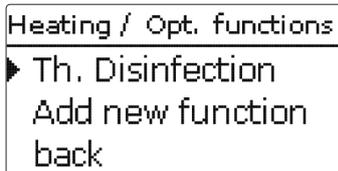


The menu items **Demand** and **Relay** are available in all optional heating functions. Therefore, they will not be explained in the individual function descriptions.

With these menu items, relays can be allocated to the selected functions. All free relays are available for selection.

If **Free** is selected, the function will run normally in the software but will not operate a relay.

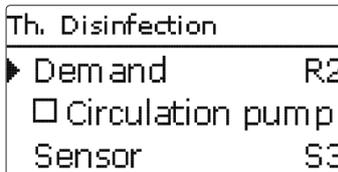
In the submenu **Controller**, all free relays of the controller are displayed. If external modules are connected and registered, their relays will be displayed in corresponding submenus.



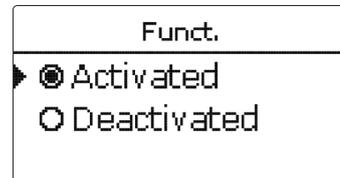
When a function has been selected and adjusted, it will appear in the **Opt. functions** menu above the menu item **Add new function**.

This allows an easy overview of functions already activated.

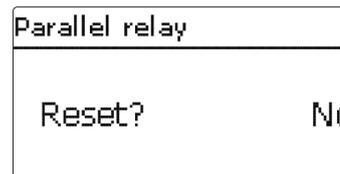
An overview about which sensor has been allocated to which component and which relay has been allocated to which function is given in the **Status/Service** menu.



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



With the menu item **Function**, an optional function already selected can be temporarily deactivated or re-activated 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.

Thermal disinfection

| | |
|---|-------|
| Th. Disinfection | |
| ▶ Demand | Dem.1 |
| <input type="checkbox"/> Circulation pump | |
| Sensor | S7 |

This function helps to contain the spread of Legionella in DHW tanks by systematically activating the backup heating.

For thermal disinfection, the temperature at the allocated sensor has to be monitored. This protection is ensured when, during the monitoring period, the disinfection temperature is continuously exceeded for the entire disinfection period.

If the thermal disinfection function is activated, the monitoring period starts as soon as the temperature at the allocated sensor falls below the disinfection temperature. When the monitoring period ends, the allocated reference relay activates the backup heating. The disinfection period starts to count as soon as the temperature at the allocated sensor exceeds the disinfection temperature.

If the temperature at the allocated sensor exceeds the disinfection temperature by more than 5 K [10 °Ra] the reference relay switches off until the temperature has fallen below a value of 2 K [4 °Ra] above the disinfection temperature.

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

If the disinfection conditions have been fulfilled by solar loading before the monitoring period ends, thermal disinfection is considered complete and a new monitoring period begins.

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.

| | |
|---|-------|
| Th. Disinfection | |
| <input checked="" type="checkbox"/> Start. time | |
| Start. time | 20:00 |
| ▶ Hyst. off | 5 K |

If the starting delay option **Starting time** is activated, a starting time for the thermal disinfection with starting delay can be adjusted. The activation of the backup heating 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 solar loading, thermal disinfection is considered complete and a new monitoring period begins.

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

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|----------------------------------|-------------------------------|------------------|
| Demand. | Demand relay selection | system dependent | system dependent |
| Circulation pump | Circulation pump option | Yes, No | No |
| Relay | Circulation pump relay selection | system dependent | system dependent |
| Sensor | Disinfection sensor selection | system dependent | system dependent |
| Interval | Monitoring period | 0 ... 30.1 ... 23 (dd:hh) | 1d 0h |
| Temperature | Disinfection temperature | 45 ... 90 °C [114 ... 194 °F] | 60 °C [140 °F] |
| Duration | Disinfection period | 0.5 ... 24.0 h | 1.0 h |
| Start. time | Starting delay option | Yes, No | No |
| Start. time | Starting point | 00:00 ... 23:30 | 20:00 |
| Hyst. off | Switch-off hysteresis | 1 ... 19 K [2 ... 38 °Ra] | 2 K [4 °Ra] |
| Hyst. on | Switch-on hysteresis | 2 ... 20 K [4 ... 40 °Ra] | 5 K [10 °Ra] |
| Funct. | Activation/Deactivation | Activated, Deactivated | Activated |

DHW heating

| | |
|---------------------------------------|----|
| DHW heating | |
| ▶ Demand | R3 |
| <input type="checkbox"/> Loading pump | |
| <input type="checkbox"/> Overrun time | |

The **DHW heating** is used to demand an backup heating for heating the DHW tank.

If the **Loading pump** option is activated, another adjustment channel appears, in which a relay can be allocated to the loading pump. The allocated relay is switched on and off with the demand relay.

If the **Overrun** option is activated, another adjustment channel appears, in which the overrun time can be adjusted. If the overrun time option is activated, the loading pump relay remains switched on for the adjusted **Duration** after the demand relay has been switched off.

| | |
|---|--|
| Mode | |
| <input type="radio"/> Boiler | |
| ▶ <input checked="" type="radio"/> Therm. | |

For the DHW heating, 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 1 exceeds the adjusted switch-off temperature, the relay is switched off.

Boiler mode:

If the Boiler mode has been selected, another sensor can be allocated in the channel Sensor 2. The switch-on, or the switch-off conditions respectively, then have to be fulfilled at both sensors in order for the relay to be switched on or 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 11.

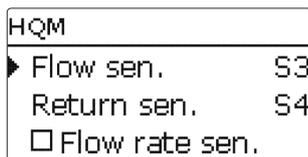
Heating/Opt. functions/Add new function/DHW heating

| Adjustment channel | Description | Adjustment range/selection | Factory setting |
|--------------------|----------------------------------|---------------------------------------|------------------|
| Demand | Demand relay selection | system dependent | - |
| Loading pump | Loading pump option | Yes, No | No |
| Relay | Loading pump relay selection | system dependent | - |
| Overrun time | Overrun option | Yes, No | No |
| Duration | Overrun time | 1 ... 10 min | 1 min |
| Mode | Operating mode | Boiler,Therm. | Therm. |
| Sensor 1 | Sensor 1 | system dependent | system dependent |
| Sensor 2 | Sensor 2 (only if Mode = Boiler) | system dependent | system dependent |
| Ton | Switch-on temperature | 0 ... 94 °C [32 ... 202 °F] | 40 °C [104 °F] |
| Toff | Switch-off temperature | 1 ... 95 °C [34 ... 204 °F] | 45 °C [114 °F] |
| Timer | Timer option | Yes, No | No |
| 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 |

11 HQM



In the **HQM** menu, up to seven internal energy meterings energy meterings can be activated and adjusted. By selecting the menu item **new HQM...**, an new energy metering can be activated.



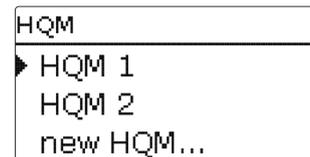
A menu opens in which all adjustments required for the energy metering can be made.

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.

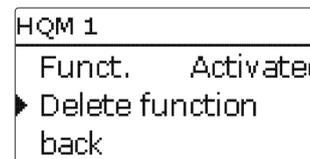
If the **Flow rate sensor** option is deactivated, the controller calculates the heat quantity by means of a fixed flow rate value. This is called heat quantity balancing. For this purpose, the flow rate must be read from the flowmeter at 100 % pump speed and adjusted in the adjustment channel **Flow 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 CO₂ 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.



Energy meterings already activated will appear in the HQM menu above the menu item **new HQM...** in numerical order.



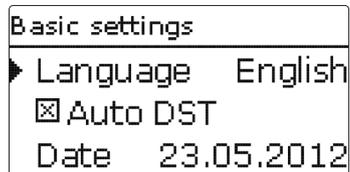
If an activated energy metering is selected, the above mentioned menu with all adjustment values will re-open. To deactivate an energy metering, select the menu item **Delete function** at the bottom of the menu.

The energy metering deleted will disappear from the list and become available for selection in the new HQM... menu again. The numeration of the other activated energy meterings 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 |
| Sensor | Flow rate sensor option | Yes, No | No |
| Flow Sensor sen. | Flow rate sensor selection | Imp1 ... Imp3, Ga1, Ga2, 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 | - |
| Fluid type | Heat transfer fluid | Tyfo LS, Propyl., Ethyl., Water | Water |
| Ratio | Glycol ratio in the heat transfer fluid (only if Fluid type = Propylene glycol or Ethylene glycol) | 20 ... 70 % | 40 % |
| Alternative unit | Alternative unit option | Yes, No | No |
| Unit | Alternative display unit | Coal, Gas, Oil, CO ₂ | CO ₂ |
| Factor | Conversion factor | 0.0000001 ... 100.0000000 | 0.5000000 |
| Funct. | Activation/Deactivation | Activated, Deactivated | Deactivated |

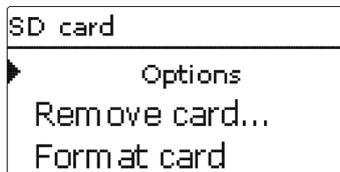
12 Basic settings



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, Français, Italiano, Español, Suomi, Česká, Nederlands | 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, Liter | Liter |
| Press. Unit | Unit of pressure | psi, bar | bar |
| Energy Unit | Energy unit | Wh, BTU | Wh |
| Reset | back to factory settings | Yes, No | No |



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 visualized, e. g. in a spreadsheet.
- Store adjustments and parameterizations on the SD card and, if necessary, retrieve them from there.
- Running firmware updates on the controller.

Firmware updates

The current software can be downloaded from www.resol.de/firmware. 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 initialization phase.



Note:

Only remove the card when the initialization phase is completed and the main menu is shown on the display of the controller!

→ To skip the update, select **No**.

The controller commences normal operation.



Note:

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

→ Create a folder named "RESOL" 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.

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 | - | - |

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.

14 Manual mode

| Manual mode | |
|-------------|------|
| Controller | |
| ▶ Relay 1 | Auto |
| Relay 2 | Auto |

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 be switched off (Off) or set to automatic mode (Auto) at once:

Off = Relay is switched off (manual mode)

Auto = Relay is in automatic mode

| Relay 1 |
|---|
| <input type="radio"/> Max |
| ▶ <input checked="" type="radio"/> Auto |
| <input type="radio"/> Min |

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 |
|--------------------|------------------------------|----------------------------|-----------------|
| All relays... | Operating mode of all relays | Auto, Off | Off |
| Relay 1 ... X | Operating mode selection | Max, Auto, Min, Off | Auto |

15 User code

User code:
0000
▲

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

16 In-/Outputs

In-/Outputs
▶ Modules
Inputs
Outputs

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

In-/Outputs/Modules

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

16.1 Modules

Modules
▶ Module 1
 Module 2
 Module 3

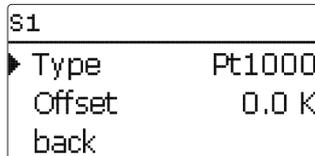
In this menu, up to 5 external modules can be registered.

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.

16.2 Inputs



In this submenu, 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!

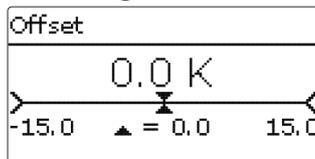


Selecting the wrong sensor type will lead to unwanted controller actions. In the worst case, system damage can occur!

→ **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 ... S12 | Sensor input selection | - | - |
| Type | Selecting the sensor type | Switch, KTY, Pt500, RTA11M, Pt1000, None | Pt1000 |
| Offset | Sensor offset | -15.0... +15.0 K [-30.0 ... +30.0 °Ra] | 0.0 K [0.0 °Ra] |
| Imp.1 ... 3 | Impulse input selection | - | - |
| Type | Selecting the sensor type | 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 |
| Ga1, 2 | Analog Grundfos Direct Sensor™ | - | - |
| Type | Grundfos Direct Sensor™ type | RPS, VFS, None | None |
| Max. | Maximum pressure (if Type = RPS) | 0.0 ... 16.0 bar | 6.0 bar |
| Min | Minimum flow rate (if Type = VFS) | 1 ... 399 l/min | 2 l/min |
| Max. | Maximum flow rate (if Type = VFS) | 2 ... 400 l/min | 40 l/min |
| Gd1, 2 | Digital Grundfos Direct Sensor™ | - | - |
| 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

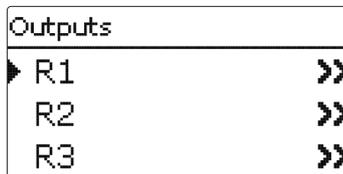
- Confirm the reset enquiry with **Yes**
- Select back to return to the **Inputs** menu, then connect the CS sensor



Note:

When Grundfos Direct Sensors™ are used, the sensor ground common terminal block must be connected to PE (see page 6).

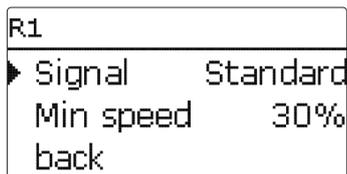
16.3 Outputs



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 = Pulse packet speed control (factory setting)

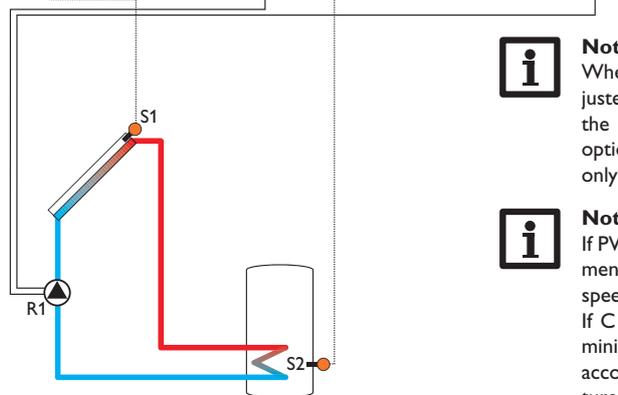
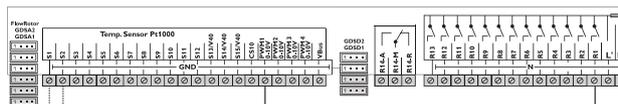
With the signal types Adapter, 0-10 V and PWM, the relay itself is not involved in speed control. A separate connection for the corresponding signal will have to be made (see figure).

If PWM is selected, the channels Output and Profile appear. In the Output channel, one of the 4 PWM outputs can be selected. In the Profile channel, a PWM characteristic curve corresponding with the pump in use can be selected (see page 74).

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.

In- / Outputs / Outputs

| Adjustment channel | Description | Adjustment range / selection | Factory setting |
|--------------------|--------------------------|--------------------------------|-----------------|
| R1 ... R13 | Relay output selection | - | - |
| Signal | Signal type | Adapter, 0-10 V, PWM, Standard | Standard |
| Output | PWM output selection | 17, 18, 19, 20 | - |
| Profile | PWM characteristic curve | A, B, C, D, E, F | A |
| Min speed | Minimum speed | (20) 30 ... 100 % | 30 % |



Example of the electrical connection of a high-efficiency pump



Note:

When the minimum pump speed value adjusted in the **Outputs** menu differs from the minimum pump speed adjusted in an optional function that uses the same output, only the higher value will be come into effect.

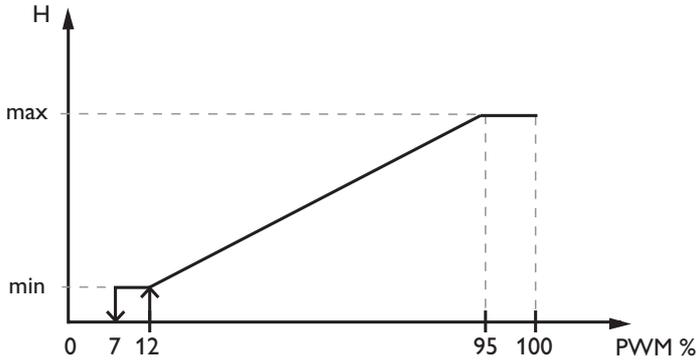


Note:

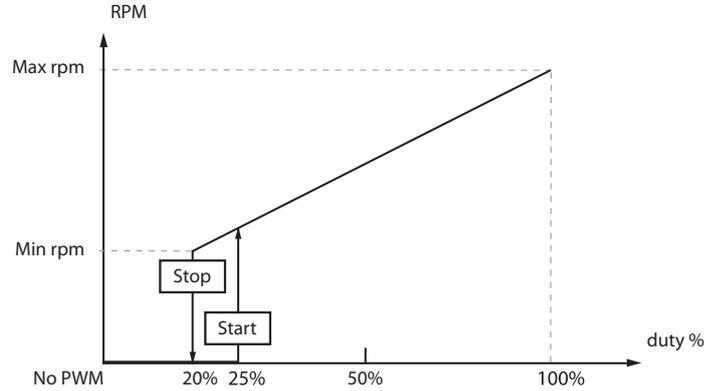
If PWM is selected for an output, the adjustment range for the corresponding minimum speed will extend to 20 ... 100 %. If C is selected in the **Profile** channel, the minimum speed must be set at least to 25 % according to information from the manufacturer.

16.4 PWM profiles

PWMA (e. g. manufacturer WILO)

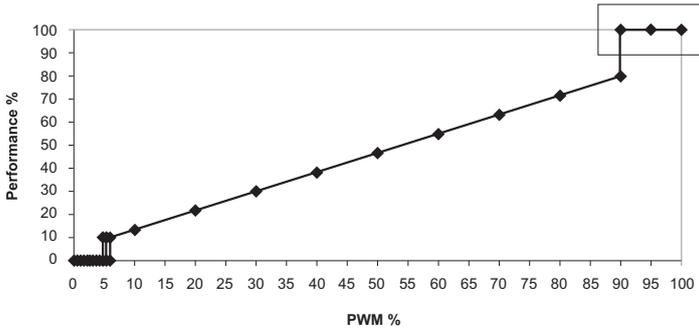


PWMC (e. g. manufacturer Laing)

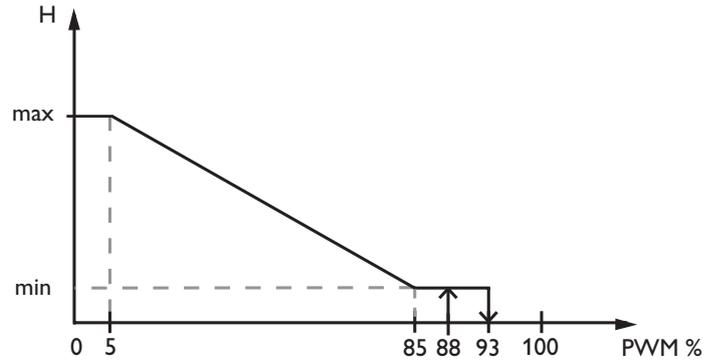


PWMB (e. g. manufacturer Grundfos)

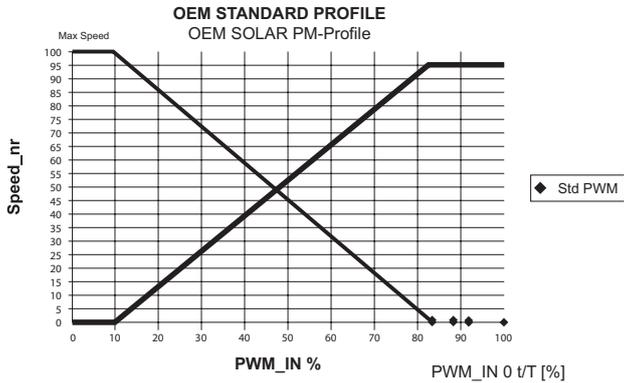
Solar PM Profile



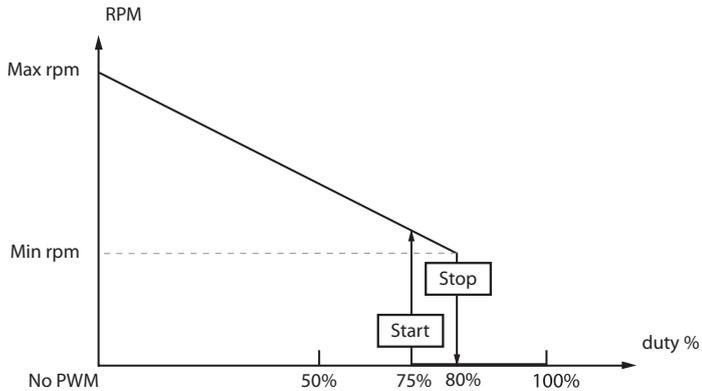
PWMD (e. g. manufacturer WILO)



PWM E (e. g. manufacturer Grundfos)



PWM F (e. g. manufacturer Laing)



17 Troubleshooting

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



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 |

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.

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?

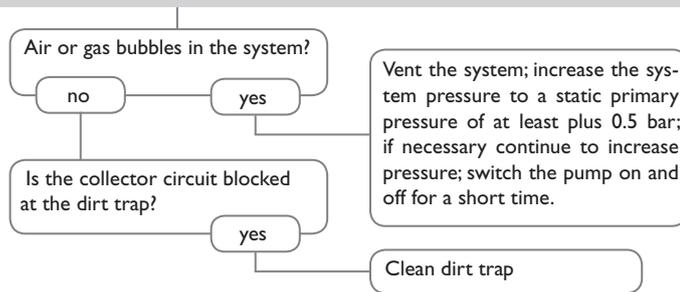
no

yes

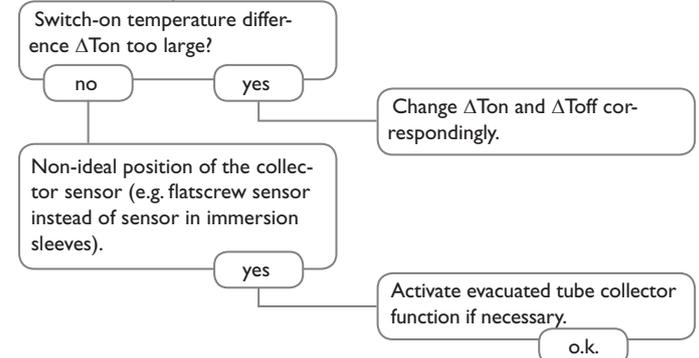
The fuse of the controller could be blown. The fuse holder (which holds the spare fuse) becomes accessible when the cover is removed. The fuse can then be replaced.

Check the supply line and reconnect it.

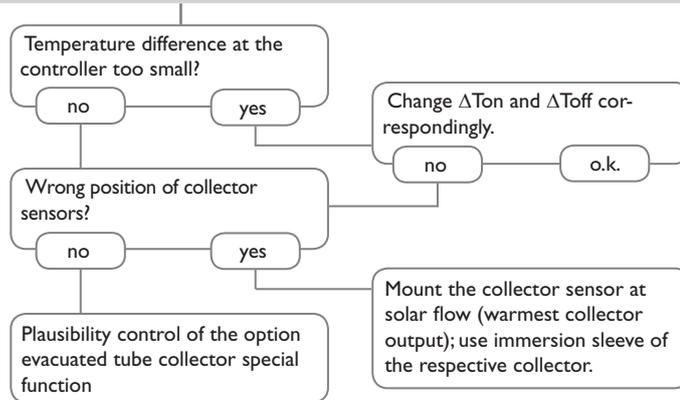
Pump is overheated, but no heat transfer from the collector to the tank, flow and return have the same temperature; perhaps also bubbling in the lines.



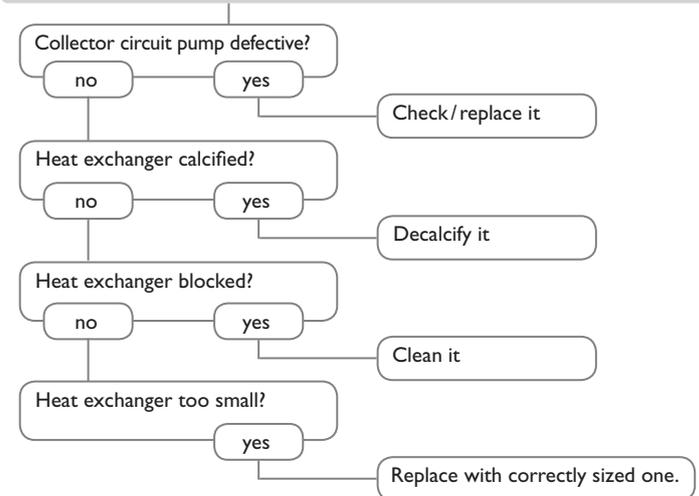
Pump starts up very late.



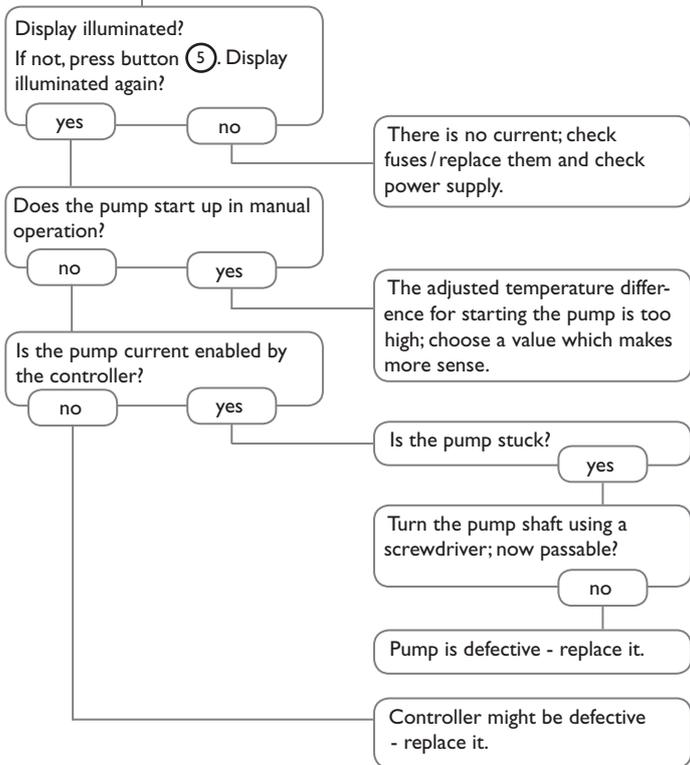
Pump starts for a short moment, switches off, switches on again, etc.



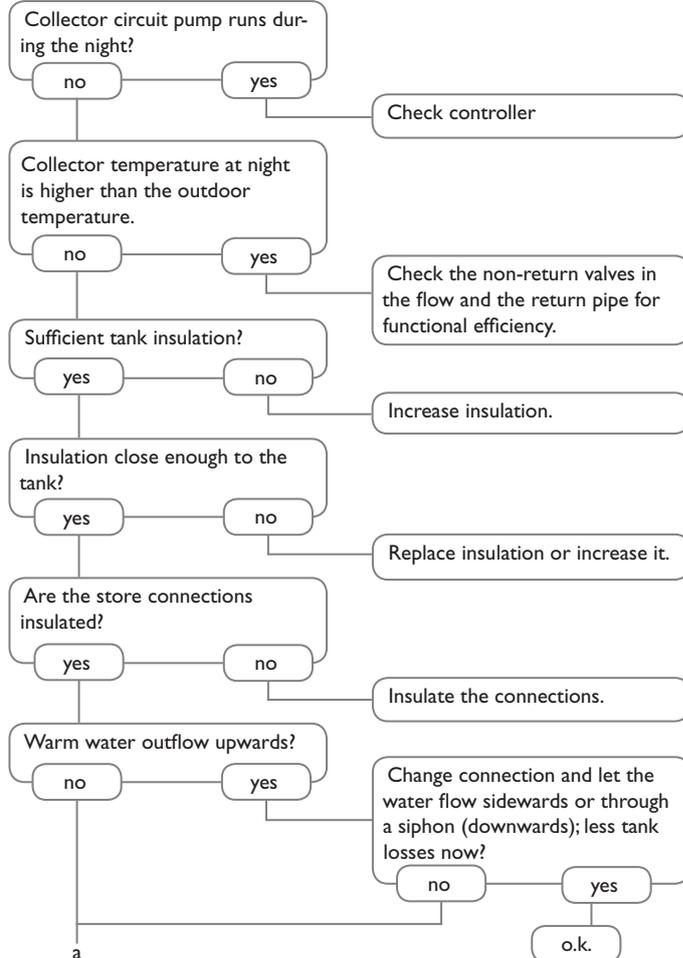
The temperature difference between store and collector increases enormously during operation; the collector circuit cannot dissipate the heat.

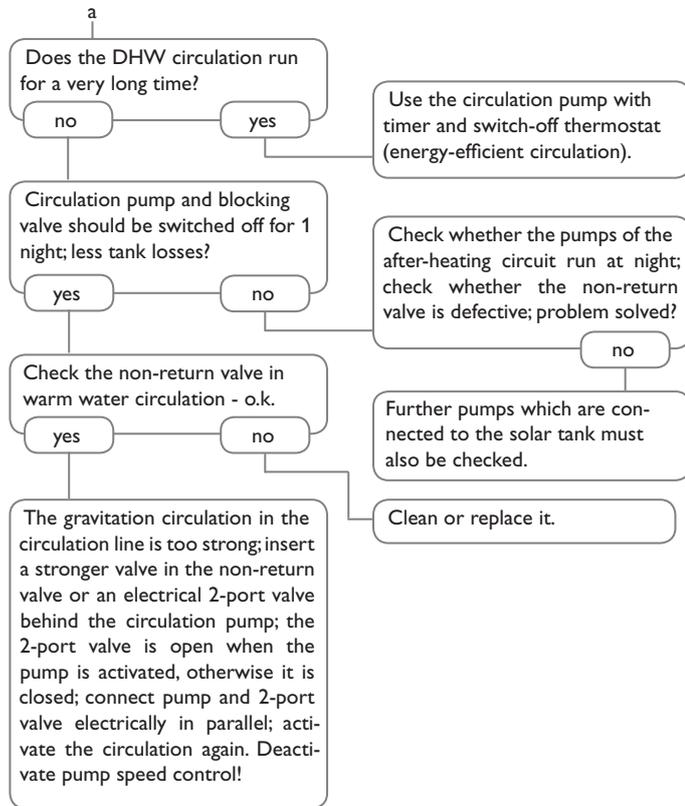


The solar circuit pump does not work, although the collector is considerably warmer than the tank.



Tanks cool down at night.





18 Accessories

18.1 Sensors and measuring instruments



Temperature 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.



Overvoltage protection device

In order to avoid overvoltage damage at collector sensors (e.g. caused by local lightning storms), we recommend installing the overvoltage protection RESOL SP10.

RESOL SP10 Article no.: **180 110 70**



VFS and RPS Grundfos Direct Sensors™

The RPS Grundfos Direct Sensor™ is an analogue sensor that measures both temperature and pressure.

The VFS Grundfos Direct Sensor™ is an analogue sensor that measures both temperature and flow rate.

RPS 0-10 bar Article no.: **130 000 40**

VFS 1-12 analogue Article no.: **130 000 20**

VFS 2-40 analogue Article no.: **130 000 30**

VFD and RPD Grundfos Direct Sensors™

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

The VFD Grundfos Direct Sensor™ is a digital 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 RESOLV40 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.).

RESOLV40 Article no.: **280 011 00**



Smart Display SD3 / Large Display GA3

The RESOL Smart Display is designed for simple connection to RESOL controllers with RESOL VBus®. It is used for visualizing data issued by the controller: collector temperature, tank temperature and energy yield of the solar thermal system. The use of high-efficiency LEDs and filter glass assures a high optical brilliance and good readability even in poor visibility conditions and from a larger distance. An additional power supply is not required. One module is required per controller.

The RESOL GA3 is a completely mounted large display module for visualization of collector- and tank temperatures as well as the heat quantity yield of the solar system via one 6-digit and two 4-digit 7-segment-displays. An easy connection to all controllers with RESOL VBus® is possible. The front plate is made of antireflective filterglass and is printed with a light-resistant UV-lacquering. The universal RESOL VBus® allows the parallel connection of 8 large displays as well as additional VBus® modules.

RESOL SD3 Article no.: **180 004 90**

RESOL GA3 Article no.: **180 006 50**



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 signaled, 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 recognized 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 DeltaSol® MX.

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



DL2 Datalogger

This additional module enables the acquisition and storage of large amounts of data (such as measuring and balance values of the solar 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**



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**



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

The 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, visualizing and archiving data via the VBus®. 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®. 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.

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