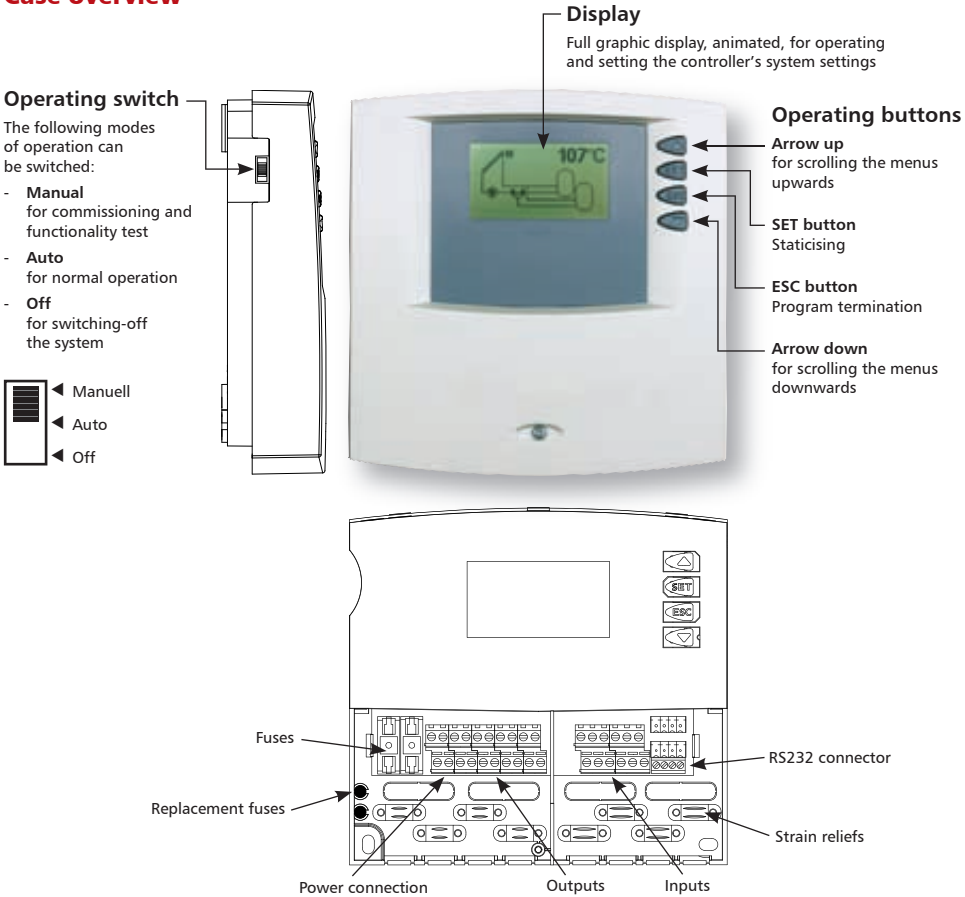
Operating instructions

Temperature Difference Controller
6 inputs / 3 outputs

EN

714.884 | 05.45

Case overview



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1. Safety information

1.1. Installation and commissioning

• When laying cables, ensure that no damage occurs to any of the constructional fire safety measures present in the building.

• The controller must not be installed in rooms where easily inflammable gas mixtures are present or may occur.

• The permissible environmental conditions must not be exceeded at the site of installation.

• Factory labels and serial numbers may not be altered, removed or rendered unreadable.

• Before connecting the device, make sure that the energy supply matches the specifications on the type plate.

• All devices connected to the controller must conform to the technical specifications of the controller.

• All operations on an open regulator are only to be conducted cleared from the power supply. All safety regulations for working on the power supply are valid. Connecting and / or all operations that require opening the regulator (e. g. changing the fuse) are only to be conducted by specialists. The controller is protected against overload and short circuit.

1.2. About this manual

This manual describes the installation, function and operation of a solar thermal controller.

When installing the remaining components, e. g. the solar collectors, pump assemblies and the storage unit, be sure to observe the appropriate installation instructions provided by each manufacturer.

Installation, electrical connection, commissioning and maintenance of the device may only be performed by trained professional personnel. The professional personnel must be familiar with this manual and follow the instructions contained herein.

1.3. Liability waiver

The manufacturer cannot monitor the compliance with these instructions or the circumstances and methods used for installation, operation, utilization and maintenance of this controller.

Improper installation can cause damages to material and persons.

This is the reason why we do not take over responsibility and liability for losses, damages or cost that might arise due to improper installation, operation or wrong utilization and maintenance or that occur in some connection with the aforementioned.

Moreover we do not take over liability for patent infringements or infringements - occuring in connection with the use of this controller - on third parties´ rights.

The manufacturer preserves the right to put changes to product, technical data or installation

and operation instructions without prior notice.

As soon as it becomes evident that safe operation is no longer possible (e. g. visible damage), please immediate take the device out of operation.

Attention: Ensure that the device cannot be accidentally placed into operation.

1.4. Description of symbols

Safety instructions

Safety instructions in the text are marked with a warning triangle. They indicate measures which can lead to injury of persons or safety risks.

Attention

indicates activities or processes that – when not carried out correctly – can lead to faulty operation or destruction of the device.

Notes

contains important information on operation or function and are bordered by horizontal lines above and below the text.

In addition, notes are bordered by horizontal lines above and below the text.

Operating steps

are represented by small triangles: „▶"

Operating buttons

are represented using the following symbols:

„SET" button: SET, „ESC" button: ESC

Arrow up: ▲, Arrow down: ▼

Display messages

- are described using italics

2. Installation

2.1. Opening / closing the case

Danger of electrocution! Remove the mains power supply before opening the case.

2

The top of the case is retained by two retaining pegs on the upper edge of the lower half of the case and fastened with a screw.

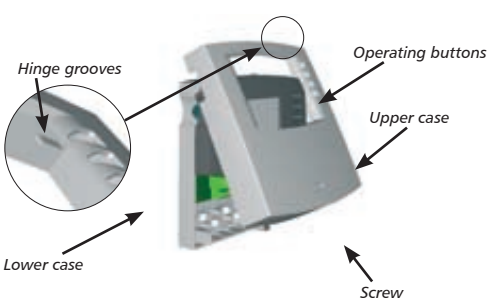
▶ **Opening the case:** Loosen the screw and remove the upper case in an upwards direction.

▶ **Closing the case:** Position the upper case at an angle to the lower case. Insert the hinge grooves into the retaining pegs of the lower case.

▶ Pivot the upper case down and feed the operating buttons through the matching holes.

▶ Fasten the case tightly with the screw.

Note: Do not use the case as a drilling template.



2.2. Installing the controller

Attention: The controller must only be installed in an area having an adequate level of protection (see chapter 8: Technical Data).

Fastening:

▶ Choose a suitable location

▶ Drill the upper fastening hole

▶ Screw in the screw

▶ Remove the upper case

▶ Hang the case in the recess ①

▶ Mark the position of the lower fastening holes ② and ③

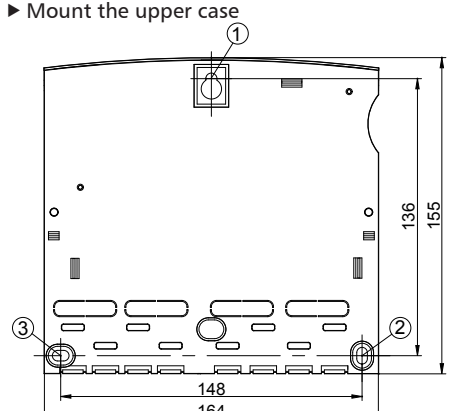
▶ Remove the case again

▶ Drill the lower fastening holes

▶ Re-hang the case in the recess ①

▶ Screw the case firmly using the lower fastening holes ② and ③

▶ Mount the upper case



2.3. Electrical connections

Remove the device from the mains supply before opening the case! All guidelines and regulations of the local electricity supplier must be observed!

The mains may only be switched on when the housing is closed. An installer must make sure that the IP protection class of the controller is not damaged during installation.

2.3.1. Cable layout

Depending on the type of installation, the cables may enter the device through the rear of the case ④ or the lower side of the case ⑤.

Cable feed from the rear ④:

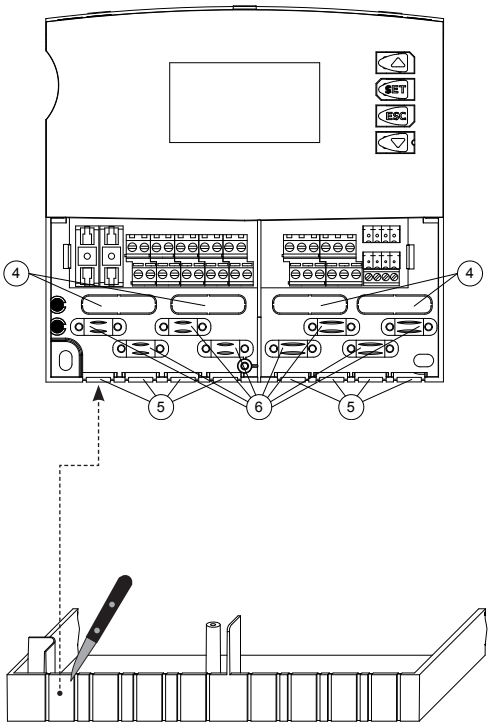
▶ Remove the plastic flaps from the rear side of the case using an appropriate tool.

Note: An external strain relief is intended for this type of cabling.

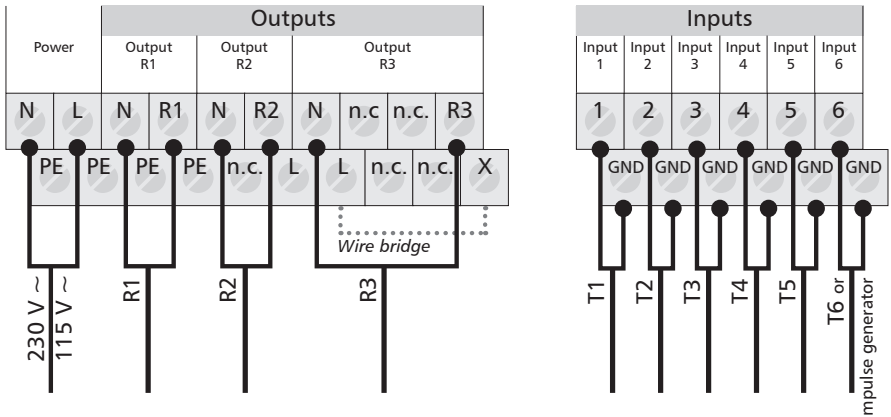
Cable feed from below ⑤:

▶ Cut the left and right plastic flaps using an appropriate tool (e. g. knife) and break them out of the case.

Note: Flexible cabling must be fastened to the case using the strain-relief clamps provided ⑥.



2.3.2. Terminal plan



Power connection

- Please note the type of power supply required from the type plate on the case of the device
- The protective conductor must also be connected
- Cables conforming to at least type H05 VV-… (NYM…) must be used

Outputs

- R1: Semiconductor relays (Triac), also suitable for RPM control
  max. switching current: 1 A
- Output R2: Semiconductor relays (Triac), also suitable for RPM control
  max. switching current: 1 A
- Output R3: electromagnetic relays, available with

- Potential free contact (without wire bridge) or
- Switched output 230 / 115 V ~ (with wire bridge),
  see chapter 2.3.3.
  Max. switching current 3.5 A

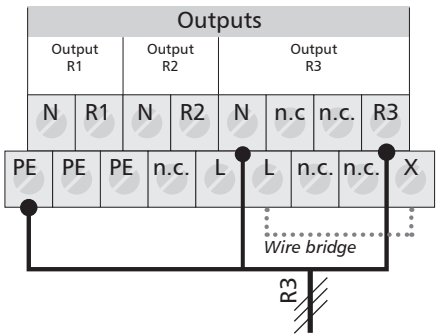
Inputs

- Inputs 1 - 5: for Pt1000 temperature sensor
- Input 6: for Pt1000 temperature sensor or impulse generator e. g. for measuring heat quantities

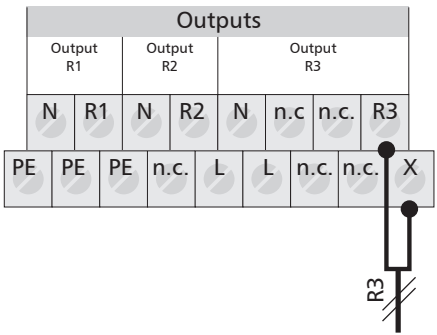
Note: Do not connect pumps with integrated electronic controllers. See chapter 4.4.7.

2.3.3. Connection diagram for output R3

■ **R3 as 230 V ~ / 115 V ~ switched output**

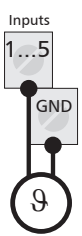


■ **R3 as voltage-free output**



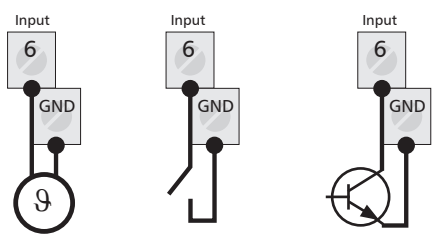
2.3.4. Connection diagram for input

■ **Inputs 1 - 5:**
Recording the temperature



T1...T5
(polarity irrelevant)

■ **Input 6:**
Recording the temperature- or pulse



T6
(polarity irrelevant)

via reed relay
(polarity irrelevant)

via open collector
(polarity relevant)

Note: The connection of the pump and sensors depends on the solar system chosen. (See terminal plan chapter 4.2) Each terminal may only be connected to a single connecting cable (max. 2,5 mm²). Fine core cables should use wire end sleeves (ferrules).

2.3.5. Advice regarding the installation of temperature sensors

Only use the original Pt1000 sensors that are approved for use with the controller. The temperature sensor and silicon cable are temperature resistant up to +180 °C. The polarity of the sensor contacts is irrelevant.

All sensor cables carry low voltage and, to avoid inductive effects, must not be laid close to 230 volt or 400 volt cables (minimum separation of 100 mm). If external inductive effects are expected, e. g. from heavy current cables, overhead train cables, transformer substations, radio and television devices, amateur radio stations, microwave devices etc., then the cables to the sensors must be adequately shielded.

Sensor cables may be extended to a maximum length of ca. 100 m.

Cable length and cross sections:

Length up to 50 m	0.75 mm²
Length up to 100 m	1.5 mm²

3. Commissioning

Connect the sensors and pumps / switching valves to the controller before you connect the power supply.

▶ Connect the power supply (mains) to the controller

- *the controller will ask for the "Time" to be set and the correct "Solar system" to be chosen*

3.1. Setting the language

"Solar system" display screen

- *the language selection window is displayed*

▶ Select the language ▲▼

▶ Confirm the language SET

▶ Finish the settings ESC

- *the language is saved and the subsequent display screen "Time" is displayed*

3.2. Setting the time

"Time" display screen"

- *„12:00" will blink in the display*

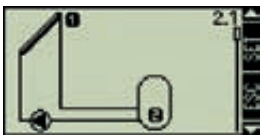
▶ Set the time ▲▼

▶ Confirm the time SET

▶ Finish the settings ESC

- *the time is saved and the subsequent display screen "Solar system" is displayed*

3.3. Choosing the solar system

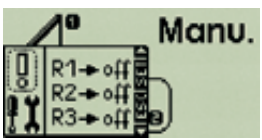


"Solar system" display screen

- *the first solar system is displayed*
- ▶ Choose the desired solar system ◀▼
- ▶ Confirm the solar system chosen SET
- *a small tick will now appear under the display number to confirm this setting*
- ▶ Exit system settings ESC

3.4. Operating switch

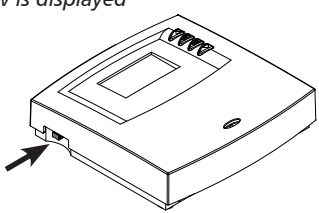
3.4.1. "Manual" mode of operation



"Manual" display screen

When operating the device for the first time, or when testing the function, the controller outputs can be manually switched. To do so

- ▶ Slide the operating switch upwards ("Manual" Position)
- *the display will be backlit in red and an information window is displayed*



- ▶ Choose the desired output ◀▼
- ▶ Press SET
- *switch the output using "on" or "off"*

You can view the temperature values at the sensors at any time for control purposes. To do so, press "ESC" to close the information window and accessing the temperature values using the arrow keys. Press the "SET" button to open the information window again.

After initial commissioning or testing for function:

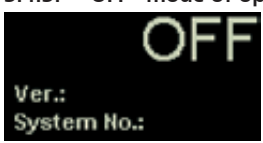
- ▶ Slide the operating switch to the "Auto" position

3.4.2. "Auto" mode of operation

This mode of operation is the automatic controller mode and should be set as standard for normal operation.

Note: The operating switch should always be set to "Auto".

3.4.3. "OFF" mode of operation



Display screen „OFF"

In "OFF" mode, all outputs (R1, R2, R3) are switched off. The display is lit with a red background and shows "OFF" in reverse, as well as the controller software version number and the number of the chosen system.

4. Device setup

System relevant settings for the controller can be made using the following menus:

Opening a menu

▶ Press SET for about 2 seconds

▶ Choose the menu ▲▼

▶ Press SET to open the desired submenu

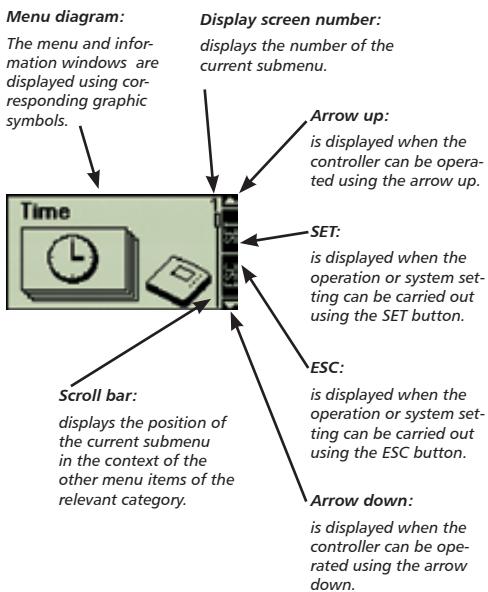
Leave the menu

▶ Press ESC

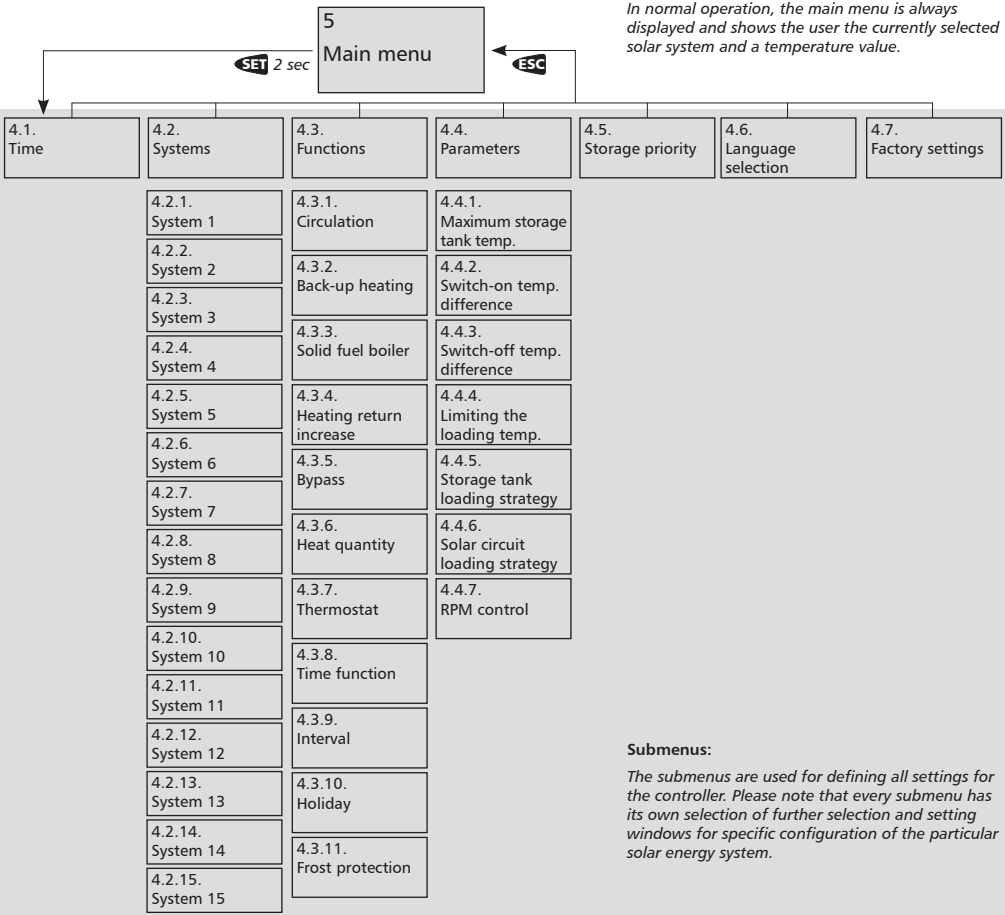
Please find further information about the submenus in the following chapters.

Display description

The fully graphical display of the controller allows simple and rapid operation and / or setup by the user. The following symbols are displayed for information:



Menu structure



Main menu:

In normal operation, the main menu is always displayed and shows the user the currently selected solar system and a temperature value.

Submenus:

The submenus are used for defining all settings for the controller. Please note that every submenu has its own selection of further selection and setting windows for specific configuration of the particular solar energy system.

4.1. Time

Display the time

▶ Press SET for about 2 seconds
- *the "Time" submenu is displayed*

▶ Press SET
- *the current time is now displayed*

Leave the submenu

▶ Press ESC

Set the time

▶ Press SET for about 2 seconds
▶ Press SET to access the submenu
- *the current time is now displayed*

▶ Press SET
- *the time blinks*

▶ Set the time ▲▼
▶ Press SET to store the time

Leave the submenu

▶ Press ESC

The current time is displayed or changed using the "Time" menu.

Note: The controller does not automatically switch between summer and winter time.

4.2. Systems

Open the submenu "Systems"

▶ Press SET for about 2 seconds
▶ Select the submenu "Systems" ▼
▶ Press SET
- *the currently active solar system is now displayed in the submenu, recognisable by the tick beneath the display number*

Choose the system

▶ Press ▲▼

Activate the system

▶ Press SET
- *a small tick will now appear under the display number and confirms this setting*

Leave the submenu

▶ Press ESC

Note: The system type that has now been activated will now be recognised by the controller software.

The desired solar system can be chosen using the „System" submenu. There are a total of 15 different systems to choose from.

4.2.1. System 1

1 Collector array - 1 Storage tank - 1 Pump

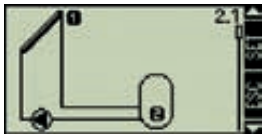
Description

The solar circuit pump (R1) is switched on as soon as the switch-on temperature difference between the collector array (T1) and the storage tank (T2) is reached. If the temperature difference between the collector array (T1) and the storage tank (T2) drops below the switch-off temperature difference, or the storage tank (T2) reaches the maximum storage temperature, then the solar circuit pump (R1) is switched off again.

Loading strategy

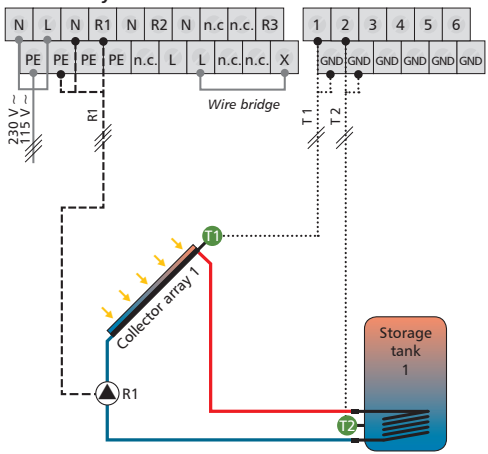
The loading strategy for the storage tank (T2) is set to use temperature differential control at the factory and can be adjusted using the Parameter menu (chapter 4.4), or set to use target temperature control.

Display



Display screen 2.1

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Lower temperature sensor for storage tank 1
R1 = Solar circuit pump 1

4.2.2. System 2

1 Collector array - 2 Storage tanks - 2 Pumps

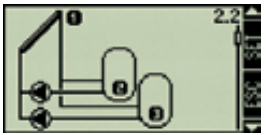
Description

If the switch-on temperature difference between the collector array (T1) and one of the two storage tanks (T2, T3) is exceeded, then the appropriate solar circuit pump (R1) or (R2) is switched on. Both storage tanks (T2, T3) are loaded one after the other, according to the priority switching (chapter 4.5), until either the relevant switch-off temperature difference between the collector array (T1) and storage tanks (T2, T3) falls below the threshold, or the maximum storage temperature is reached.

Loading strategy

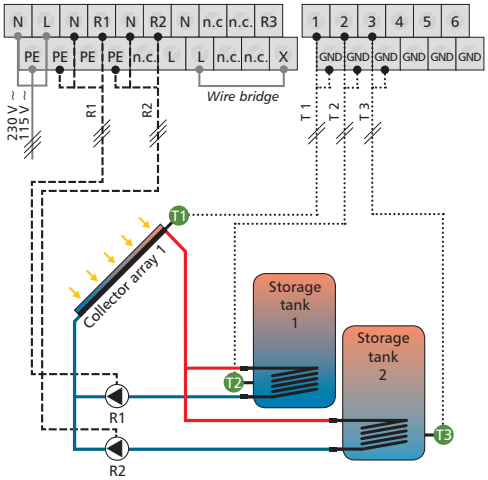
The loading strategy for storage tanks (T2, T3) is set to use temperature differential control at the factory and can be adjusted using the Parameter menu (chapter 4.4), or set to use target temperature control.

Display



Display screen 2.2

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Lower temperature sensor for storage tank 1
T3 = Lower temperature sensor for storage tank 2
R1 = Solar circuit pump 1
R2 = Solar circuit pump 2

4.2.3. System 3

1 Collector array - 2 Storage tanks - 1 Pump - 1 Valve

Description

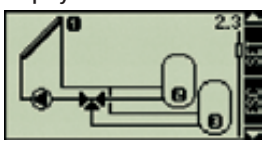
If the switch-on temperature difference between the collector array (T1) and one of the two storage tanks (T2, T3) is exceeded, then the solar circuit pump (R1) is switched on and the switching valve (R2) is set to the correct position depending on the storage tank to be loaded. Both storage tanks (T2, T3) are loaded one after the other, according to the priority switching (chapter 4.5), until either the relevant switch-off temperature difference between the collector array (T1) and storage tanks (T2, T3) falls below the threshold, or the maximum storage temperature is reached.

Loading strategy

The loading strategy for storage tanks (T2, T3) is set to use temperature differential control at the factory and can be adjusted using the Parameter menu (chapter 4.4), or set to use target temperature control.

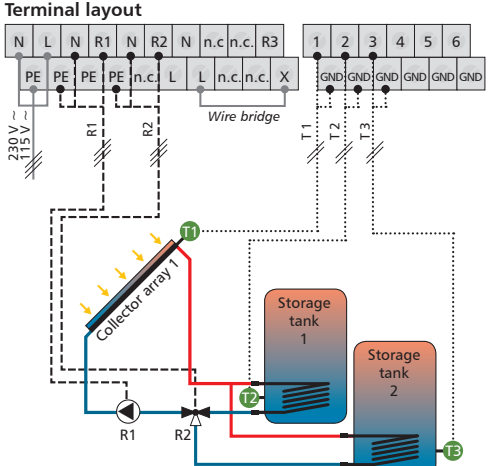
Note: When no voltage is on the system, the switching valve (R2) must be set to storage tank 1 (T2).

Display



Display screen 2.3

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Lower temperature sensor for storage tank 1
T3 = Lower temperature sensor for storage tank 2
R1 = Solar circuit pump 1
R2 = 3-way switching valve 1

4

4.2.4. System 4

1 Collector array - 3 Storage tanks - 3 Pumps

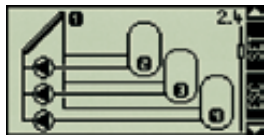
Description

If the switch-on temperature difference between the collector array (T1) and one of the three storage tanks (T2, T3, T4) is exceeded, then the appropriate solar circuit pump (R1, R2 or R3) is switched on. The storage tanks (T2, T3, T4) are loaded one after the other, according to the priority switching (chapter 4.5), until either the relevant switch-off temperature difference between the collector array (T1) and storage tanks (T2, T3, T4) falls below the threshold, or the maximum storage temperature is reached.

Loading strategy

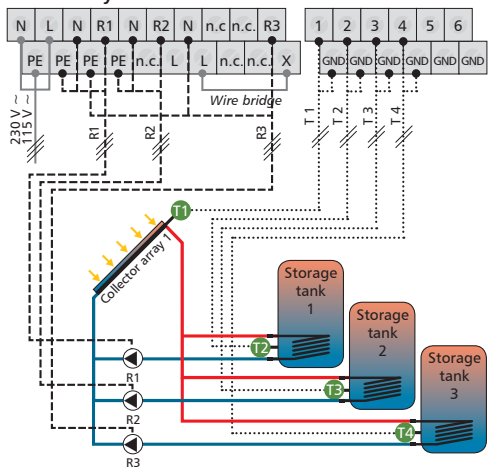
The loading strategy for storage tanks (T2, T3, T4) is set to use temperature differential control at the factory and can be adjusted using the Parameter menu (chapter 4.4), or set to use target temperature control.

Display



Display screen 2.4

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Lower temperature sensor for storage tank 1
T3 = Lower temperature sensor for storage tank 2
T4 = Lower temperature sensor for storage tank 3
R1 = Solar circuit pump 1
R2 = Solar circuit pump 2
R3 = Solar circuit pump 3

4.2.5. System 5

1 Collector array - 3 Storage tanks - 1 Pump - 2 Valves

Description

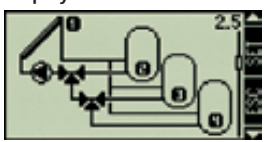
If the switch-on temperature difference between the collector array (T1) and one of the three storage tanks (T2, T3, T4) is exceeded, then the solar circuit pump (R1) is switched on and the two switching valves (R2, R3) are set to the correct position depending on the storage tank to be loaded. The storage tanks (T2, T3, T4) are loaded one after the other, according to the priority switching (chapter 4.5), until either the relevant switch-off temperature difference between the collector array (T1) and storage tanks (T2, T3, T4) falls below the threshold, or the maximum storage temperature is reached.

Loading strategy

The loading strategy for storage tanks (T2, T3, T4) is set to use temperature differential control at the factory and can be adjusted using the Parameter menu (chapter 4.4), or set to use target temperature control.

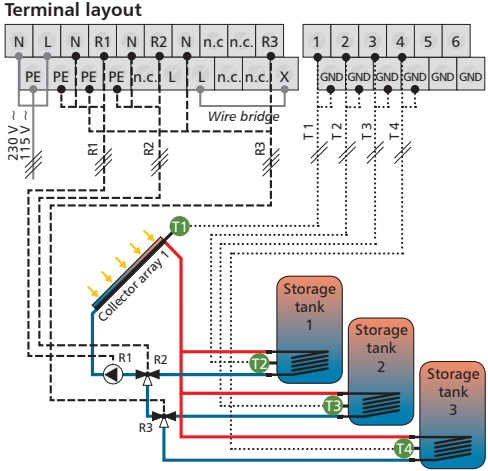
Note: When no voltage is on the system, switching valve 1 (R2) must be set to storage tank 1 (T2), and switching valve 3 (R3) must be set to storage tank 2 (T3).

Display



Display screen 2.5

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Lower temperature sensor for storage tank 1
T3 = Lower temperature sensor for storage tank 2
T4 = Lower temperature sensor for storage tank 3
R1 = Solar circuit pump 1
R2 = 3-way switching valve 1
R3 = 3-way switching valve 2

4.2.6. System 6

2 Collector arrays (east / west roof) - 1 Storage tank - 2 Pumps

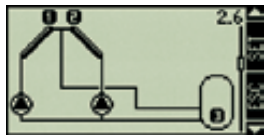
Description

If the switch-on temperature difference between the storage tank (T3) and one or the other of the collector arrays (T1, T2) is reached, then either solar circuit pump R1 for collector array (T1), or solar circuit pump R2 for collector array (T2) is switched on, depending on where the temperature difference occurs. If the switch-on temperature difference is reached for both collector arrays (T1, T2), then both pumps (R1, R2) are switched on. The pumps switch off independently of each other, when either the relevant switch-off temperature between one or both of the collector arrays (T1, T2) and the storage tank (T3) falls below the threshold, or the maximum storage temperature is reached.

Loading strategy

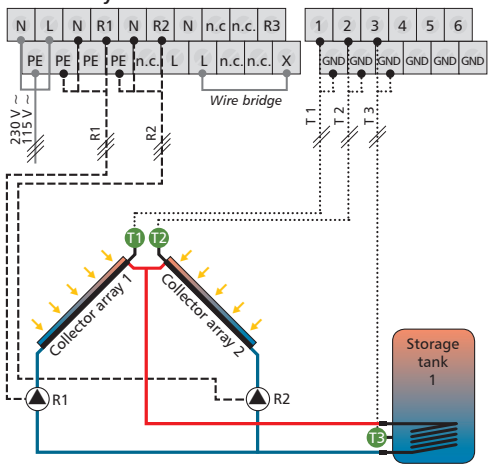
The loading strategy for the storage tank (T3) is set to use temperature differential control at the factory and can be adjusted using the Parameter menu (chapter 4.4), or set to use target temperature control.

Display



Display screen 2.6

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Temperature sensor for collector array 2
T3 = Lower temperature sensor for storage tank 1
R1 = Solar circuit pump 1
R2 = Solar circuit pump 2

4.2.7. System 7

2 Collector arrays (east / west roof) - 1 Storage tank - 1 Pump - 1 Valve

Description

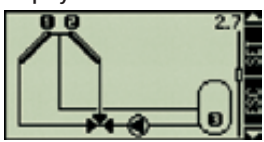
The solar circuit pump (R1) is switched on as soon as the switch-on temperature difference between one of the two collector arrays (T1, T2) and the storage tank (T3) is exceeded. The switching valve (R2) is always set so that flow occurs through the warmer of the two collector arrays (T1, T2). The pump (R1) switches off as soon as the switch-off temperature difference between the two collector arrays (T1, T2) and the storage tank (T3) falls below the threshold or the maximum storage temperature is reached.

Loading strategy

The loading strategy for storage tank (T3) is set to use temperature differential control at the factory and can be adjusted using the Parameter menu (chapter 4.4), or set to use target temperature control.

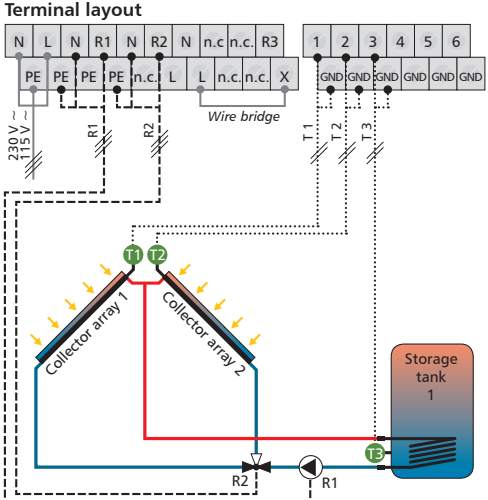
Note: When no voltage is on the system, the switching valve (R2) must be set to collector array 1 (T1).

Display



Display screen 2.7

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Temperature sensor for collector array 2
T3 = Lower temperature sensor for storage tank 1
R1 = Solar circuit pump 1
R2 = 3-way switching valve 1

4.2.8. System 8

2 Collector arrays (east / west roof), pump-controlled, - 2 Storage tanks - 2 Pumps - 1 Valve

Description

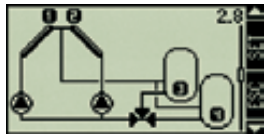
If the switch-on temperature difference between one of the two tanks (T3, T4) and collector array 1 (T1) or collector array 2 (T2) is exceeded, then the switching valve (R3) switches the relevant storage tank (T3 or T4) into the solar circuit. If the switch-on temperature difference between the storage tanks (T3 or T4) and one or the other of the collector arrays (T1, T2) is reached, then either solar circuit pump R1 for collector array (T1), or solar circuit pump R2 for collector array (T2) is switched on, depending on where the temperature difference occurs. If the switch-on temperature difference is reached for both collector arrays (T1, T2), then both pumps (R1, R2) are switched on. The switching valve (R3) controls the loading of the storage tanks (T3, T4) according to the priority switching (chapter 4.5). The pumps (R1, R2) switch off independently of each other, when either the relevant switch-off temperature for one or both of the collector arrays (T1, T2) with regard to the storage tanks (T3 or T4) falls below the threshold, or the maximum storage temperature is reached.

Loading strategy

The loading strategy for the storage tanks (T3, T4) is set to use temperature differential control at the factory and can be adjusted using the Parameter menu (chapter 4.4), or set to use target temperature control.

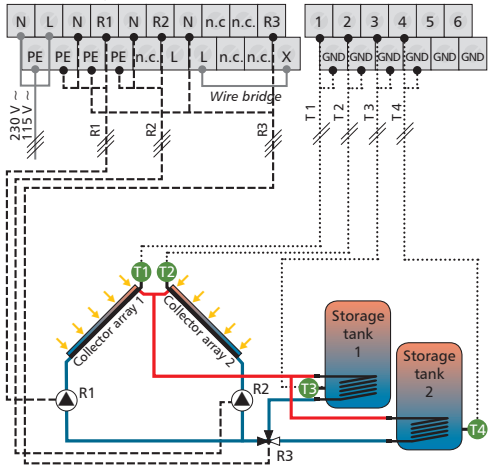
Note: When no voltage is on the system, the switching valve (R3) must be set to storage tank 1 (T3).

Display



Display screen 2.8

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Temperature sensor for collector array 2
T3 = Lower temperature sensor for storage tank 1
T4 = Lower temperature sensor for storage tank 2
R1 = Solar circuit pump 1
R2 = Solar circuit pump 2
R3 = 3-way switching valve 1

4.2.9. System 9

2 Collector arrays (east / west roof), valve-controlled, - 2 Storage tanks - 1 Pump - 2 Valves

Description

If the switch-on temperature difference between one of the two tanks (T3, T4) and collector array 1 (T1) or collector array 2 (T2) is exceeded, then the solar circuit pump (R1) is switched on, switching valve 1 (R2) switches the relevant storage tank into the solar circuit, and switching valve 2 (R3) switches the affected collector array (T1 or T2) also into the solar circuit. Switching valve 2 (R3) is always set so that flow occurs through the warmer of the two collector arrays (T1, T2). Switching valve 1 (R2) controls the loading of the storage tanks according to the priority switching (chapter 4.5).

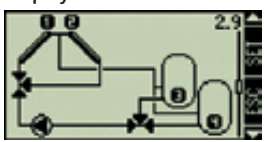
Pump (R1) switches off when the switch-off temperature falls below the threshold for storage tank 1 (T3) and storage tank 2 (T4) or the maximum storage temperature is reached.

Loading strategy

The loading strategy for storage tanks (T3, T4) is set to use temperature differential control at the factory and can be adjusted using the Parameter menu (chapter 4.4), or set to use target temperature control.

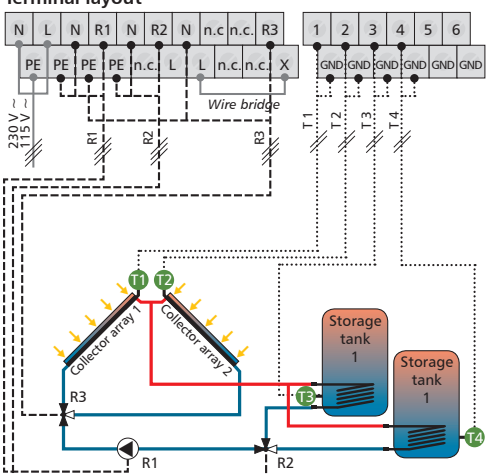
Note: When no voltage is on the system, switching valve 1 (R2) must be set to storage tank 1 (T3), and switching valve 2 (R3) must be set to collector array 1 (T1).

Display



Display screen 2.9

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Temperature sensor for collector array 2
T3 = Lower temperature sensor for storage tank 1
T4 = Lower temperature sensor for storage tank 2
R1 = Solar circuit pump 1
R2 = 3-way switching valve 1
R3 = 3-way switching valve 2

4.2.10. System 10

2 Collector arrays (east / west roof), valve-controlled, - 2 Storage tanks - 2 Pumps - 1 Valve

Description

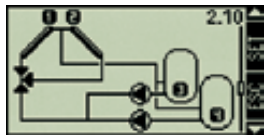
If the switch-on temperature difference between one of the two tanks (T3, T4) and collector array 1 (T1) or collector array 2 (T2) is exceeded, then the switching valve (R3) switches the relevant collector array (T1 or T2) into the solar circuit. Depending on which storage tank has reached the switch-on temperature, solar circuit pump R1 for storage tank 1 (T3) or solar circulation pump R2 for storage tank 2 (T4) is switched on. The switching valve (R3) is always set so that flow occurs through the warmer of the two collector arrays. Both storage tanks (T3, T4) are loaded one after the other, according to the priority switching (chapter 4.5), until either the relevant switch-off temperature difference falls below the threshold, or the maximum storage temperature is reached.

Loading strategy

The loading strategy for storage tanks (T3, T4) is set to use temperature differential control at the factory and can be adjusted using the Parameter menu (chapter 4.4), or set to use target temperature control.

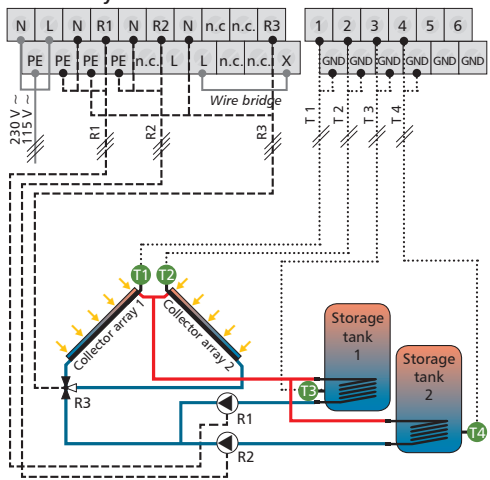
Note: When no voltage is on the system, the switching valve (R3) must be set to collector array 1 (T1).

Display



Display screen 2.10

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Temperature sensor for collector array 2
T3 = Lower temperature sensor for storage tank 1
T4 = Lower temperature sensor for storage tank 2
R1 = Solar circuit pump 1
R2 = Solar circuit pump 2
R3 = 3-way switching valve 1

4.2.11. System 11

1 Collector array - 1 Storage tank with heat exchanger - 2 Pumps

Description

The solar circuit pump (R2) is switched on as soon as the temperature difference between the collector array (T1) and the storage tank (T2) is larger than the switch-on temperature difference. The solar circuit pump (R2) switches off when the switch-off temperature falls below the threshold, or the storage tank (T2) reaches its maximum storage tank temperature, or the heat exchanger reaches its maximum loading temperature.

The storage tank loading pump (R1) is switched on as soon as the heat exchanger (T3) reaches its minimum loading temperature and the temperature difference between the external heat exchanger (T3) and the storage tank (T2) is larger than the switch-on temperature difference. The storage tank (T2) is loaded until the minimum loading temperature of the external heat exchanger (T3) falls below the threshold, or the switch-off temperature between the external heat exchanger (T3) and the storage tank (T2) falls below the threshold.

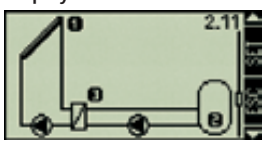
Loading strategy

The loading strategy for the external heat exchanger and the loading strategy for the storage tank are factory-set to use target temperature control. The strategies can be changed by using the Parameter menu (chapter 4.4).

Note: When using back-up heating, the minimum loading temperature of the heat exchanger must be set using the Parameter menu (chapter 4.4).

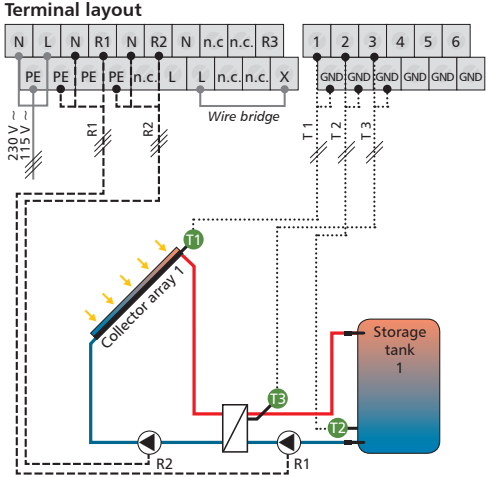
It is essential that the minimum loading temperature is larger than the set switch-off temperature of the back-up heating.

Display



Display screen 2.11

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Lower temperature sensor for storage tank 1
T3 = Secondary external heat exchanger temperature sensor
R1 = Storage tank loading pump
R2 = Solar circuit pump

4.2.12. System 12

1 Collector array - 2 Storage tanks with heat exchanger - 3 Pumps

Description

The solar circuit pump (R3) is switched on as soon as the switch-on temperature difference between the collector array (T1), and storage tank 1 (T2) or 2 (T3) is exceeded. If the switch-off temperature difference of storage tank 1 (T2) and storage tank 2 (T3) falls below the threshold, or storage tank 1 (T2) and storage tank 2 (T3) reach their maximum storage temperature, or the external heat exchanger (T4) reaches its maximum loading temperature, then the solar circuit pump (R3) switches off.

If the switch-on temperature difference between the external heat exchanger (T4) and one of the two storage tanks (T2, T3) is exceeded and the minimum loading temperature of the external heat exchanger (T4) has been reached, then storage tank loading pump 1 (R1) for storage tank 1 (T2) or storage tank loading pump 2 (R2) for storage tank 2 (T3) switches on. The storage tanks are loaded according to the priority switching (chapter 4.5), until the switch-off temperature difference between the external heat exchanger and the affected storage tank falls below the threshold, or the minimum loading temperature falls below the threshold.

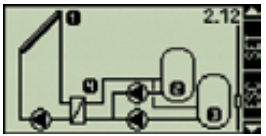
Loading strategy

The loading strategy for the external heat exchanger and the loading strategy for the storage tank are factory-set to use target temperature control. The strategies can be adjusted or changed by using the Parameter menu (chapter 4.4).

Note: When using back-up heating, the relevant minimum loading temperature of the external heat exchanger must be set using the Parameter menu (chapter 4.4).

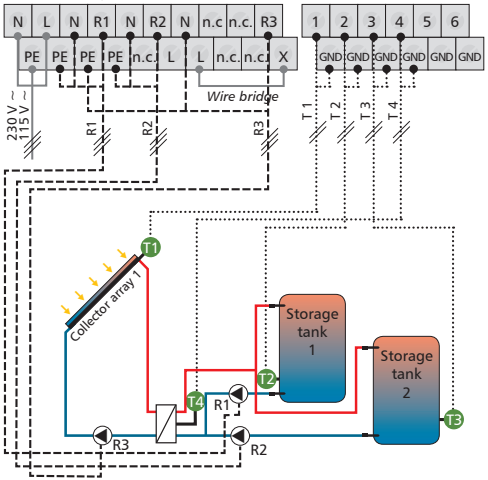
It is essential that the minimum loading temperature is larger than the set switch-off temperature of the back-up heating.

Display



Display screen 2.12

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Lower temperature sensor for storage tank 1
T3 = Lower temperature sensor for storage tank 2
T4 = Secondary external heat exchanger temperature sensor
R1 = Storage tank loading pump 1
R2 = Storage tank loading pump 2
R3 = Solar circuit pump

4.2.13. System 13

1 Collector array - 2 Storage tanks with heat exchanger - 2 Pumps - 1 Valve

Description

The solar circuit pump (R2) is switched on as soon as the switch-on temperature difference between the collector array (T1), and storage tank 1 (T2) or 2 (T3) is exceeded. If the switch-off temperature difference of storage tank 1 (T2) and storage tank 2 (T3) falls below the threshold, or storage tank 1 (T2) and storage tank 2 (T3) reach their maximum storage temperature, or the external heat exchanger (T4) reaches its maximum loading temperature, then the solar circuit pump (R2) switches off.

As soon as the switch-on temperature difference between the external heat exchanger (T4) and storage tank 1 (T2) or storage tank 2 (T3) is reached, and the relevant minimum loading temperature of the external heat exchanger (T4) has been reached, then the storage tank loading pump (R1) switches on. The switching valve (R3) controls the loading of the storage tanks (T2, T3), according to the priority switching (chapter 4.5), until the switch-off temperature difference between the external heat exchanger (T4) and the affected storage tank (T2, T3) has fallen below the threshold, or the relevant minimum loading temperature has fallen below the threshold.

Loading strategy

The loading strategy for the external heat exchanger and the loading strategy for the storage tank are factory-set to use target temperature control. The strategies can be adjusted or changed by using the Parameter menu (chapter 4.4).

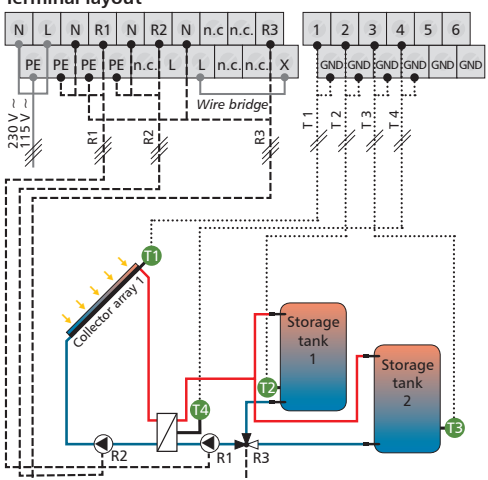
Note: When using back-up heating, the relevant minimum loading temperature of the external heat exchanger must be set using the Parameter menu (chapter 4.4). It is essential that the minimum loading temperature is larger than the set switch-off temperature of the back-up heating.

Note: When no voltage is on the system, the switching valve (R3) must be set to storage tank 1 (T2).

Display

Display screen 2.13

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Lower temperature sensor for storage tank 1
T3 = Lower temperature sensor for storage tank 2
T4 = Secondary external heat exchanger temperature sensor
R1 = Storage tank loading pump
R2 = Solar circuit pump
R3 = 3-way switching valve 1

4.2.14. System 14

2 Collector arrays (east / west roof) - 1 Storage tank with heat exchanger - 3 Pumps

Description

If the switch-on temperature difference between the storage tank (T3) and one or the other of the collector arrays (T1, T2) is reached, then either solar circuit pump 1 (R2) for collector array 1 (T1), or solar circuit pump 2 (R3) for collector array (T2) is switched on. The solar circuit pumps 1 (R2) and 2 (R3) switch off independently of each other, when either the relevant collector array switch-off temperature difference falls below the threshold or the maximum storage temperature is reached or the loading temperature of the external heat exchanger (T4) is reached.

The storage tank loading pump (R1) is switched on as soon as the external heat exchanger (T4) reaches its minimum loading temperature and the temperature difference between the external heat exchanger (T4) and the storage tank (T4) is larger than the switch-on temperature difference. Storage tank (T3) is loaded until the minimum loading temperature of the external heat exchanger (T4) is reached, or the switch-off temperature difference between the external heat exchanger (T4) and the tank (T3) falls below the threshold.

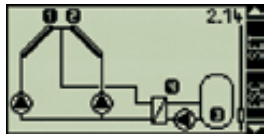
Loading strategy

The loading strategy for the external heat exchanger and the loading strategy for the storage tank are factory-set to use target temperature control. The strategies can be adjusted or changed by using the Parameter menu (chapter 4.4).

Note: When using back-up heating, the minimum loading temperature of the external heat exchanger must be set using the Parameter menu (chapter 4.4).

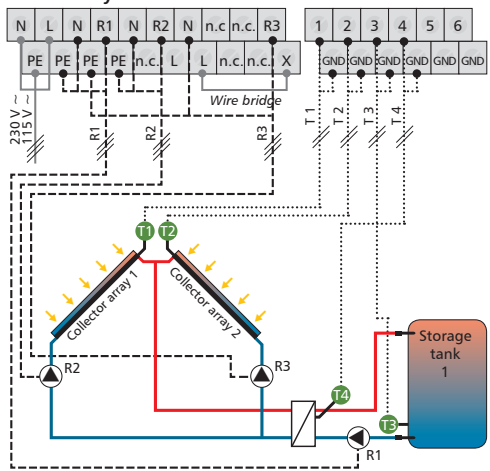
It is essential that the minimum loading temperature is larger than the set switch-off temperature of the back-up heating.

Display



Display screen 2.14

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Temperature sensor for collector array 2
T3 = Lower temperature sensor for storage tank 1
T4 = Secondary external heat exchanger temperature sensor
R1 = Storage tank loading pump
R2 = Solar circuit pump 1
R3 = Solar circuit pump 2

4.2.15. System 15

2 Collector arrays (east / west roof), 1 Storage tank with heat exchanger - 2 Pumps - 1 Valve

Description

The solar circuit pump (R2) is switched on as soon as the switch-on temperature difference between one of the two collector arrays (T1, T2) and the storage tank (T3) is exceeded. The switching valve (R3) is always set so that flow occurs through the warmer of the two collector arrays. The solar circuit pump (R2) switches off as soon as the switch-off temperature difference for both collectors (T1, T2) falls below the threshold, or the maximum storage tank temperature or the maximum loading temperature of the external heat exchanger is reached.

The storage tank loading pump (R1) is switched on as soon as the external heat exchanger (T4) reaches its minimum loading temperature and the temperature difference between the external heat exchanger (T4) and the storage tank (T4) is larger than the switch-on temperature difference. The storage tank (T3) is loaded until the minimum loading temperature of the external heat exchanger (T4) falls below the threshold, or the switch-off temperature difference between the external heat exchanger (T4) and the storage tank (T3) falls below the threshold.

Loading strategy

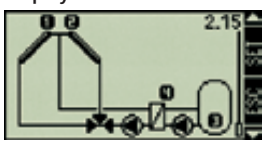
The loading strategy for the external heat exchanger and the loading strategy for the storage tank are factory-set to use target temperature control. The strategies can be adjusted or changed by using the Parameter menu (chapter 4.4).

Note: When using back-up heating, the minimum loading temperature of the external heat exchanger must be set using the Parameter menu (chapter 4.4).

It is essential that the minimum loading temperature is larger than the set switch-off temperature of the back-up heating.

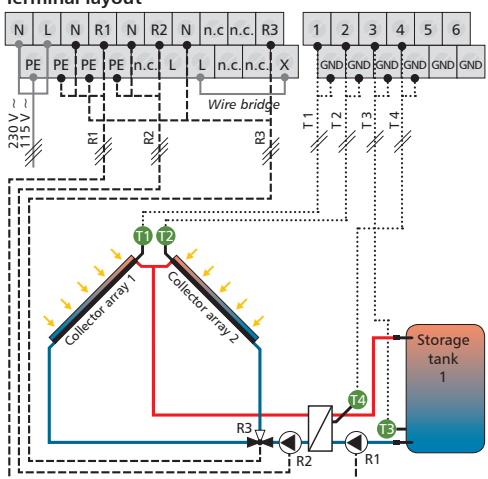
Note: When no voltage is on the system, the switching valve (R3) must be set to collector array 1 (T1).

Display



Display screen 2.15

Terminal layout



T1 = Temperature sensor for collector array 1
T2 = Temperature sensor for collector array 2
T3 = Lower temperature sensor for storage tank 1
T4 = Secondary external heat exchanger temperature sensor
R1 = Storage tank loading pump
R2 = Solar circuit pump
R3 = 3-way switching valve

4.3. Functions

Display screen 3

Open the submenu "Functions"

▶ Press SET for about 2 seconds

▶ Choose the "Functions" submenu ◀▲▼

Leave the submenu

▶ Press ESC

4

Additional controller settings can be made by using the "Functions" submenu. The controller also offers the possibility of simultaneously activating more than one function.

The following submenus can be opened using the "Functions" submenu:

Note: The selectable functions sometimes require an extra controller output for controlling a pump or switching valve. When all outputs are already occupied, a function requiring this output cannot be activated. In this case, an information window displays a corresponding message. It can be closed using the "ESC" button.

Information windows

The following information windows are displayed:

In this case, all outputs are occupied, so that the function requiring this output cannot be activated.

Here, not all settings necessary for activating this function have been made yet.

4.3.1. Circulation

Display screen 3.1

Accessing the "Circulation" submenu

In the "Functions" submenu (display screen 3)

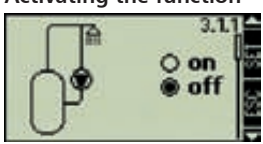
▶ Press SET

- *the "Circulation" submenu is displayed*

A circulation pump is either time or temperature dependent controlled. Both types of control can be combined with each other.

Time control	Temperature control
Time switch in 30 minute intervals	If the temperature in the circulation return falls below the „on" value, then the pump is switched on until the „off" temperature is reached.

Activating the function



Display screen 3.1.1

In the "Circulation" submenu (display screen 3.1)

▶ Press SET

- *the display screen 'on / off' is displayed*

▶ Press SET

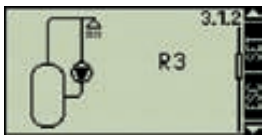
Note: An information window is displayed if the function cannot be activated.

- *the chosen option blinks*

▶ Choose 'on' or 'off' ◀▲▼

▶ Confirm SET

Choose the desired output



Display screen 3.1.2

▶ Press ▼

- *the display screen "Output" is displayed*

▶ Press SET

- *Output blinks*

▶ Choose the desired output ◀▲▼

▶ Confirm SET

Activating time control

Display screen 3.1.3

▶ Press ▼

- *the display screen "Time-controlled" is displayed*

▶ Press SET

- *the control box blinks*

▶ Activate / deactivate time control ◀▲▼

▶ Confirm SET

- *after activating the time control, a cursor blinks in the time window*

4

Switching on the time window

▶ Move the cursor in 30-minute steps ◀▼
▶ Press SET
- *sets current cursor position to 'on'*
- *the activated time segment shows as a bar display*

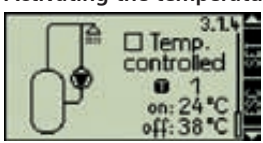
Switching off the time window

If you now wish to deactivate the defined times, then move the cursor to an existing bar and press the "SET" button.

▶ Move the cursor in 30-minute steps ◀▼
▶ Press SET
- *sets current cursor position to 'off'*

▶ Press ESC
- *finishes the operation and stores the time control settings*

Activating the temperature control



Display screen 3.1.4

▶ Press ▼
- *the display screen "Temperature-controlled" is displayed*

▶ Press SET
- *the control box blinks*

▶ Activate / deactivate temperature control ◀▼
▶ Confirm SET

Choosing the temperature input / Setting the limits

- *after activating the temperature control, the chosen input blinks*

▶ Choose the input ◀▼
▶ Confirm SET
- *the 'on' value blinks after confirming the input*

▶ Set the 'on' value ◀▼
▶ Confirm SET
- *the 'off' value blinks after confirming the 'on' value*

▶ Adjust the 'off' value ◀▼
▶ Finish ESC
- *the temperature control parameters are stored*

Leave the submenu

▶ Press ESC

4.3.2. Back-up heating

Display screen 3.2

Accessing the "Back-up heating"

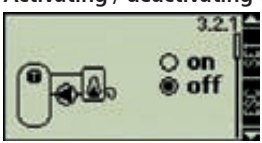
In the submenu "Functions" (display screen 3)

▶ Press SET
▶ Press ▼ until the display screen 3.2 / Back-up heating is displayed

This function allows thermostatic control of a pump for addition heating of the solar storage tank using an oil or gas burner. This function can also be limited to specific times by using additional time control.

Time control	Temperature control
Time switch in 30-minute intervals	If the temperature in the upper part of the storage tank falls below the "on" value, then the pump is switched on until the "off" temperature is reached.

Activating / deactivating the function



Display screen 3.2.1

In the "Back-up heating" submenu (display screen 3.2)

▶ Press SET

- *the display screen ‚on / off' is displayed*

▶ Press SET

Note: An information window is displayed if the function cannot be activated.

- *the chosen option blinks*

▶ Choose 'on' or 'off' ▲▼

▶ Confirm SET

Choose the desired output

Display screen 3.2.2

▶ Press ▼

- *the display screen "Output" is displayed*

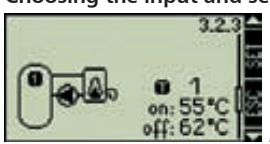
▶ Press SET

- *Output blinks*

▶ Choose the output ▲▼

▶ Confirm SET

Choosing the input and setting the temp. limits



Display screen 3.2.3

▶ Press ▼

- *the display screen "Temperature limits" is displayed*

▶ Press SET

- *the input blinks*

▶ Choose the input ▲▼

▶ Confirm SET

- *the 'on' value blinks after confirming the input*

▶ Adjust the 'on' value ▲▼

▶ Confirm SET

- *the 'off' value blinks after confirming the 'on' value*

▶ Adjust the 'off' value ▲▼

▶ Finish ESC

- *the temperature control parameters are stored*

Activating time control

Display screen 3.2.4

▶ Press ▼
- *the display screen "Time-controlled" is displayed*

▶ Press SET
- *the control box blinks*

▶ Activate / deactivate time control ▲▼
▶ Confirm SET
- *after activating the time control, a cursor blinks in the time window*

Switching on the time window

▶ Move the cursor in 30-minute steps ▲▼
▶ Press SET
- *sets current cursor position to 'on'*
- *the activated time segment shows as a bar display*

Switching off the time window

If you now wish to deactivate the defined times, then move the cursor to an existing bar and press the "SET" button.

▶ Move the cursor in 30-minute steps ▲▼
▶ Press SET
- *sets current cursor position to 'off'*

▶ Press ESC
- *finishes the operation and stores the time control settings*

Leave the submenu

▶ Press ESC

4.3.3. Solid fuel boiler

Display screen 3.3

Access the "Solid fuel boiler" submenu

In the submenu "Functions" (display screen 3)

▶ Press SET
▶ Press ▼ until the display screen 3.3 / Solid fuel boiler is displayed

This function allows thermostatic control of a pump for additional heating of the solar storage tank using a solid fuel boiler.

Functional description

In the temperature in the upper part of the storage tank falls below the 'on' value, and the temperature of the solid fuel boiler lies between the 'min' and 'max' values, then the pump is switched on. The pump switches off as soon as the storage tank temperature rises above the 'off' value or the solid fuel boiler temperature lies outside the 'min' or 'max' limits.

Activating / deactivating the function

Display screen 3.3.1

In the "Solid fuel boiler" submenu (display screen 3.3)

▶ Press SET

- *the display screen 'on / off' is displayed*

▶ Press SET

Note: An information window is displayed if the function cannot be activated.

- *the chosen option blinks*

▶ Choose 'on' or 'off' ▲▼

▶ Confirm SET

Choose the desired output

Display screen 3.3.2

▶ Press ▼

- *the display screen "Output" is displayed*

▶ Press SET

- *Output blinks*

▶ Choose the output ▲▼

▶ Confirm SET

Input allocation and programming of solar storage tank temperature limits

Display screen 3.3.3

▶ Press ▼

- *the display screen "Solar storage tank temperature limits" is displayed*

▶ Press SET

- *the input blinks*

▶ Choose the output ▲▼

▶ Confirm SET

- *the 'on' value blinks after confirming the input*

▶ Adjust the 'on' value ▲▼

▶ Confirm SET

- *the 'off' value blinks after confirming the 'on' value*

▶ Adjust the 'off' value ▲▼

▶ Confirm SET

Input allocation and programming of the solid fuel boiler temperature limits

Display screen 3.3.4

▶ Press ▼

- *the display screen "Solid fuel boiler temperature limits" is displayed*

▶ Press SET

- *the input blinks*

▶ Choose the input ◀▼
▶ Confirm SET
- *the "max" value blinks after confirming the input*
▶ Set the "max" value ◀▼
▶ Confirm SET
- *the "min" value blinks after confirming the "max" value*
▶ Set the "min" value ◀▼
▶ Finish data entry ESC
- *the solid fuel boiler parameters are stored*

Leave the submenu

▶ Press ESC

4.3.4. Heating return increase

Display screen 3.4

Accessing the "Heating return increase"

In the submenu "Functions" (display screen 3)

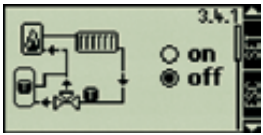
▶ Press SET
▶ Press ▼ until the display screen 3.4 / Heating return increase is displayed

This function allows temperature-dependent control of a switching valve for increasing the return temperature of the heating circuit.

Functional description

If the temperature difference between the solar storage tank and the heating return rises above the "on" value, then the switching valve is controlled so that the heating return flows through the solar storage tank. In this way, the solar heat from the storage tank can be used in the heating circuit. If the temperature difference falls below the "off" value, then the switching valve switches the heating return back to the back-up heating system.

Activating / deactivating the function



Display screen 3.4.1

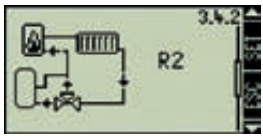
In the "Heating return increase" submenu (display screen 3.4)

▶ Press SET
- *the display screen 'on / off' is displayed*
▶ Press SET

Note: An information window is displayed if the function cannot be activated.

- *the chosen option blinks*
▶ Choose 'on' or 'off' ◀▼
▶ Confirm SET

Choose the desired output

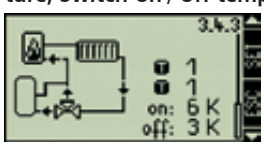


Display screen 3.4.2

▶ Press ◀▼
- *the display screen "Output" is displayed*
▶ Press SET
- *Output blinks*
▶ Press ▲◀▼
- *choosing the output*
▶ Confirm SET

Allocation of inputs

Solar storage tank / Heating return temperature; Switch-on / off temperature



Display screen 3.4.3

▶ Press ◀▼
- *the display screen "Solar storage tank heating return temperature limits" is displayed*
▶ Press SET
- *the solar storage tank temperature input blinks*
▶ Choose the input ▲◀▼
▶ Confirm SET
- *the heating return temperature input blinks*
▶ Choose the input ▲◀▼
▶ Confirm SET
- *the "on" value for the switch-on temperature difference blinks after confirming the input*
▶ Adjust the "on" value ▲◀▼
▶ Confirm SET
- *the 'off' value blinks after confirming the 'on' value (switch-off temperature difference)*
▶ Adjust the 'off' value ▲◀▼
▶ Confirm SET

Leave the submenu

▶ Press ESC

4.3.5. Bypass

Display screen 3.5

Accessing the "Bypass" submenu

In the submenu "Functions" (display screen 3)

▶ Press SET
▶ Press ◀▼ until the display screen 3.5 / Bypass is displayed

This function allows the solar circuit to be bypassed using a switching valve. In this way the collector circuit can be warmed before the storage tank is switched into the circuit. This is especially useful in larger solar energy systems having a large volume of heat transfer fluid.

Functional description

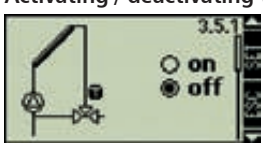
The temperature before the valve in the solar circuit is monitored and compared with the storage tank temperature. Once the temperature reaches

the switch-on value, the valve closes the bypass and switches the storage tank into the solar circuit. If the temperature falls below the threshold of the switch-off value, then the valve separates the storage tank from the solar circuit and opens the bypass. The switch-on / off values are defined in the controller.

In solar energy system 2.2 (2 Storage tanks – 2 Pumps – 1 Collector array) the bypass function is fixed to storage tank 1.

In all other solar energy systems, the control relates to the storage tank currently being loaded.

Activating / deactivating the function



Display screen 3.5.1

In the submenu "Bypass" (display screen 3.5)

▶ Press SET

- *the display screen 'on / off' is displayed*

▶ Press SET

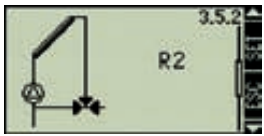
Note: An information window is displayed if the function cannot be activated.

- *the chosen option blinks*

▶ Choose 'on' or 'off' ▲▼

▶ Confirm SET

Choose the desired output



Display screen 3.5.2

▶ Press ▼

- *the display screen "Output" is displayed*

▶ Press SET

- *Output blinks*

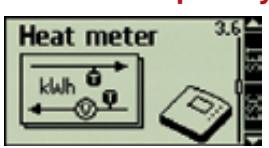
▶ Choose the desired output ▲▼

▶ Confirm SET

Leave the submenu

▶ Press ESC

4.3.6. Heat quantity



Display screen 3.6

Accessing the "Heat quantity" submenu

In the submenu "Functions" (display screen 3)

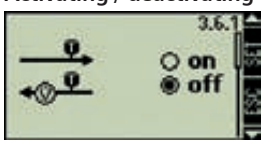
▶ Press SET

▶ Press ▼ until the display screen 3.6 / Heat quantity is displayed

The controller has a function for measuring the quantity of heat. This allows (e. g.) the heat fed into the storage tank from the solar energy system to be measured. To do this, the temperature of the supply and return of the solar energy system

must be measured. An extra flow meter in the solar circuit measures the volume flow in the form of impulses at input 6 of the controller. Since the heat quantity depends on the proportion of glycol in the heat transfer fluid, this is accounted for in the calculations. From these values, the controller determines the quantity of heat created and shows this on the display.

Activating / deactivating the function



Display screen 3.6.1

In the "Heat quantity" submenu (display screen 3.6)

▶ Press SET

- *the display screen 'on / off' is displayed*

▶ Press SET

Note: An information window is displayed if the function cannot be activated.

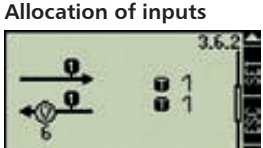
- *the chosen option blinks*

▶ Choose 'on' or 'off' ▲▼

▶ Confirm SET

- *finish the data entry*

Allocation of inputs



Display screen 3.6.2

▶ Press ▼

- *the display screen "Inputs" is displayed*

▶ Press SET

- *the supply temperature input blinks*

▶ Choose the input ▲▼

▶ Confirm SET

- *the return temperature input blinks*

▶ Choose the input ▲▼

▶ Confirm SET

▶ Finish data entry ESC

Setting the pulse value and glycol proportion

Display screen 3.6.3

▶ Press ▼

- *the display screen "l/Imp and glycol proportion" is displayed*

▶ Press SET

- *the l/Imp or Imp/l value blinks*

▶ Adjust the setting to a value between 1/10/25 [l/Imp] or 10/20/50/100/200/.../1000 [Imp/l] ▲▼

▶ Confirm SET

- *the glycol proportion blinks*

▶ Adjust the value ▲▼

▶ Confirm SET

▶ Finish data entry ESC

Leave the submenu

▶ Press ESC

4

4.3.7. Thermostat

Display screen 3.7

Accessing the "Thermostat" submenu

In the submenu "Functions" (display screen 3)

▶ Press SET

▶ Press ▼ until the display screen 3.7 / Thermostat is displayed

This function allows a controller output to be controlled depending on a pre-defined temperature range.

Functional description

If the temperature falls below the defined "on" value, the output is switched on until the temperature rises above the "off" value.

Activating / deactivating the function

Display screen 3.7.1

In the "Thermostat" submenu (display screen 3.7)

▶ Press SET

- *the display screen 'on / off' is displayed*

▶ Press SET

Note: An information window is displayed if the function cannot be activated.

- *the chosen option blinks*

▶ Choose 'on' or 'off' ▲▼

▶ Confirm SET

Choose the desired output

Display screen 3.7.2

▶ Press ▼

- *the display screen "Output" is displayed*

▶ Press SET

- *Output blinks*

▶ Choose the desired output ▲▼

▶ Confirm SET

Defining the input and temperature limits

Display screen 3.7.3

▶ Press ▼

- *the display screen "Temperature limits" is displayed*

▶ Press SET

- *the input blinks*

▶ Choose the input ▲▼

▶ Confirm SET

- *the 'on' value blinks after confirming the input*

▶ Choose the "on" value ▲▼

▶ Confirm SET

- *the 'off' value blinks after confirming the 'on' value*

▶ Choose the "off" value ◀▼
▶ Finish the data entry ESC
- *the thermostat control parameters are stored*

Leave the submenu

▶ Press ESC

4.3.8. Time function

Display screen 3.8

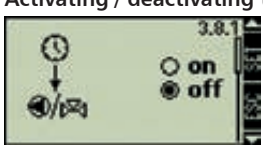
Accessing the "Time functions" submenu

In the submenu "Functions" (display screen 3)

▶ Press SET
▶ Press ▼ until the display screen 3.8 / Time function is displayed

This function allows a controller output to be controlled depending on a pre-defined time range.

Activating / deactivating the function



Display screen 3.8.1

In the "Time function" submenu (display screen 3.8)

▶ Press SET
- *the display screen 'on / off' is displayed*
▶ Press SET

Note: An information window is displayed if the function cannot be activated.

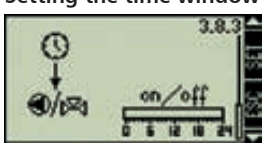
- *the chosen option blinks*
▶ Choose 'on' or 'off' ◀▼
▶ Confirm SET

Choose the desired output

Display screen 3.8.2

▶ Press ▼
- *the display screen "Output" is displayed*
▶ Press SET
- *Output blinks*
▶ Choose the output ◀▼
▶ Confirm SET

Setting the time window



Display screen 3.8.3

▶ Press ▼
- *the display screen "Time-controlled" is displayed*
▶ Press SET
- *the control box blinks*
▶ Activate / deactivate time control ◀▼
▶ Confirm SET
- *after activating the time control, a cursor blinks in the time window*

4

Switching on the time window

▶ Move the cursor in 30-minute steps ◀▼

▶ Press SET

- *sets current cursor position to 'on'*
- *the activated time segment shows as a bar display*

Switching off the time window

If you now wish to deactivate the defined times, then move the cursor to an existing bar and press the "SET" button.

▶ Move the cursor in 30-minute steps ◀▼

▶ Press SET

- *sets current cursor position to 'off'*

▶ Press ESC

- *finishes the operation and stores the time control settings*

Leave the submenu

▶ Press ESC

4.3.9. Interval

Display screen 3.9

Accessing the "Interval" submenu

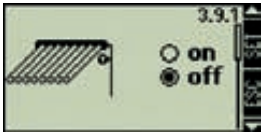
In the submenu "Functions" (display screen 3)

▶ Press SET

▶ Press ▼ until the display screen 3.9 / Interval is displayed

This function is useful when the collector temperature sensor is not directly mounted on the collector. To measure the actual collector temperature in the collector array, the solar circuit pump is controlled for a short test-on time, at definable intervals. This causes the heat transfer fluid in the collector array to be regularly pumped to the collector temperature sensor. Since this function must not always be activated (e. g. at night), it can be combined with a programmable time switch.

Activating / deactivating the function



Display screen 3.9.1

In the "Interval" submenu (display screen 3.9)

▶ Press SET

- *the display screen 'on / off' is displayed*

▶ Press SET

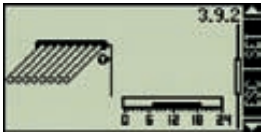
Note: An information window is displayed if the function cannot be activated.

- *the chosen option blinks*

▶ Choose 'on' or 'off' ◀▼

▶ Confirm SET

Setting the time window



Display screen 3.9.2

▶ Press ▼

- *the display screen "Time-controlled" is displayed*

▶ Press SET
- *the control box blinks*
▶ Activate / deactivate time control ◀▼
▶ Confirm SET
- *after activating the time control, a cursor blinks in the time window*

Switching on the time window

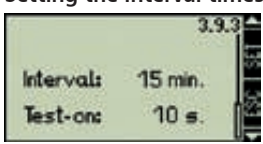
▶ Move the cursor in 30-minute steps ◀▼
▶ Press SET
- *sets current cursor position to 'on'*
- *the activated time segment shows as a bar display*

Switching off the time window

If you now wish to deactivate the defined times, then move the cursor to an existing bar and press the "SET" button.

▶ Move the cursor in 30-minute steps ◀▼
▶ Press SET
- *sets current cursor position to'off'*
▶ Press ESC
- *finishes the operation and stores the time control settings*

Setting the interval times



Display screen 3.9.3

▶ Press ▼
▶ Press SET
- *the interval time blinks*
▶ Adjust the interval time (adjustable from 1 min to 120 min) ◀▼
▶ Press SET
- *the interval time is confirmed and test-on time blinks*
▶ Adjust the test-on time (adjustable from 1 second to 240 seconds) ◀▼
▶ Press ESC
- *finishes and stores the interval time parameters*

Leave the submenu

▶ Press ESC

4.3.10. Holiday

Display screen 3.10

Accessing the "Holiday" submenu

In the submenu "Functions" (display screen 3)

▶ Press SET
▶ Press ▼ until the display screen 3.10 / Holiday is displayed

This function activates nightly storage tank back cooling and prevents high thermal loads of the solar system due to completely heated storage tanks.

Activate this function if:

- you intend to be absent for an extended period (holiday)

- no hot water is required for an extended period

The function is activated when:

- the collector temperature falls 8 K below the storage tank temperature at night between 10 pm and 6 am

The function is deactivated when:

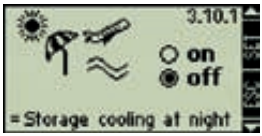
- the lower section of the storage tank cools down to 35 °C
- the temperature difference falls below 4 K

Note: In the case of multi-storage tank systems, only storage tank 1 is used for storage tank back cooling.

4

The holiday symbol in the main menu indicates that the holiday function is active.

Activating / deactivating the function



Display screen 3.10.1

In the "Holiday" submenu (display screen 3.10)

▶ Press SET

- *the display screen 'on / off' is displayed*

▶ Press SET

- *the chosen option blinks*

▶ Choose 'on' or 'off' ▲▼

▶ Confirm SET

Exit the submenu

▶ Press ESC

4.3.11. Frost protection

Display screen 3.11

Attention: This function is only useful in systems without anti-freeze in the heat transfer fluid.

Accessing the "Frost protection" submenu

In the submenu "Functions" (display screen 3)

▶ Press SET

▶ Press ▼ until the display screen 3.11 / Frost protection is displayed

This function can prevent the solar system freezing up if water is used as the heat transfer fluid.

The controller switches on the pump and pumps hot water from the storage tank to the collector to prevent it freezing.

The function activates the pump when:

- the collector temperature drops below 5 °C

The function deactivates the pump again when:

- the collector temperature rises above 7 °C again

The frost protection symbol in the main menu indicates that the frost protection function is active.

Note: This function only allows a solar energy system to be used without anti-freeze in very specific situations. This applies in regions where temperatures close to the freezing point are reached on very few days each year. Safety systems and

anti-frost measures must be taken and installation time if this is required. We also recommend using suitable anti-freeze fluids to prevent corrosion.

Activating / deactivating the function

Display screen 3.11.1

In the "Frost protection" submenu (display screen 3.11)

▶ Press SET

- *the display screen 'on / off' is displayed*

▶ Press SET

- *the chosen option blinks*

▶ Choose 'on' or 'off' ▲▼

▶ Confirm SET

Exit the submenu

▶ Press ESC

4

4.4. Parameters

Display screen 4

Open the submenu "Parameters"

▶ Press SET for about 2 seconds

▶ Choose the "Parameters" submenu ▲▼

Leave the submenu "Parameters"

▶ Press ESC

4

When the device is delivered, the parameters are set so that the controller provides optimum results when used with the integrated solar energy system.

The parameters can be modified to suit the individual requirements of the system. In this case, the operating data of the solar components used must be observed!

Note: The parameter settings are programmed to be dependent on the solar energy system chosen. This means that not all parameter settings are available for all types of solar energy systems.

The displays in the "Parameter" submenu always displays the currently chosen, and therefore active, system. An information window informs about the settings menu and the parameters that can be modified.

The following submenus can be opened using the "Parameter" submenu:

4.4.1. Maximum storage tank temperature

Display screen 4.1

In the submenu "Parameters" (display screen 4)

▶ Press SET until the display screen 4.1 / Maximum storage tank temperature is displayed

▶ Press SET again

- *the display screen "Maximum storage tank temperature" of the blinking storage tank is displayed*

▶ Switch between existing storage tanks ▲▼

▶ Press SET

- *the chosen storage tank and corresponding maximum value blinks*

▶ Set the maximum storage tank temperature ▲▼

▶ Confirm the value SET

▶ Leave the submenu ESC

4.4.2. Switch-on temperature difference

Display screen 4.2

In the submenu “Parameters” (display screen 4)

- ▶ Press SET
- ▶ Press ▼ until the display screen 4.2 / Switch-on temperature difference is displayed
- ▶ Press SET
- \- *the input window with the switch-on temperature difference (on) between the blinking storage tank and the collector is displayed*
- ▶ choose between the various switch-on temperature differences ▲▼
- ▶ Press SET
- \- *the chosen storage tank - collector and current switch-on temperature difference blinks*
- ▶ Change the switch-on temperature difference ▲▼
- ▶ Confirm the value SET
- ▶ Leave the submenu ESC

4.4.3. Switch-off temperature difference

Display screen 4.3

In the submenu “Parameters“ (display screen 4)

- ▶ Press SET
- ▶ Press ▼ until the display screen 4.3 / Switch-off temperature difference is displayed
- ▶ Press SET
- \- *the display screen with the switch-off temperature difference (off) between the blinking storage tank and collector is displayed*
- ▶ choose between the various switch-off temperature differences ▲▼
- ▶ Press SET
- \- *the chosen storage tank - collector and current switch-off temperature difference blinks*
- ▶ Change the switch-off temperature difference ▲▼
- ▶ Confirm the value SET
- ▶ Leave the submenu ESC

4.4.4. Limiting the loading temperature (external heat exchangers only)

Display screen 4.4

In the submenu "Parameters" (display screen 4)

- ▶ Press SET
- ▶ Press ▼ until the display screen 4.4 / Limiting the loading temperature is displayed
- ▶ Press SET
- - *the display shows the maximum loading temperature of the blinking storage tank - external heat exchanger*
- ▶ Choose between the max / min values for storage tank 1 / storage tank 2 ▲▼
- ▶ Press SET
- - *the chosen max or min value blinks*
- ▶ Adjust the value ▲▼
- ▶ Save the value SET
- ▶ Leave the submenu ESC

With external heat exchangers, a maximum and minimum loading temperature, measured at the external heat exchanger, is set for every storage tank. The temperature range of the storage tank loading can be limited through the use of the maximum and minimum loading temperature function. In this way (e. g.) destruction of the thermal layering in the storage tank, and subsequent starting of a fossil fuel heating system, can be avoided, or undesired high temperatures in the upper area of the storage tank (risk of scalding) can also be avoided.

4.4.5. Storage tank loading strategy

Display screen 4.5

In the submenu "Parameters" (display screen 4)

- ▶ Press SET
- ▶ Press ▼ until the display screen 4.5 / Storage tank loading strategy is displayed
- ▶ Press SET
- - *the display screen to choose the target temperature control / ΔT-control is displayed*
- - the storage tank temperature sensor blinks
- ▶ Choose between the storage tanks ▲▼
- ▶ Press SET
- - *the chosen option blinks*
- ▶ Choose the type of control ▲▼
- ▶ Press SET
- ▶ Adjust the value ▲▼
- ▶ Confirm the value SET
- ▶ Leave the submenu ESC

The storage tank of a solar energy system is loaded according to a particular loading strategy. One must decide between target temperature control and temperature differential control. A separate strategy is defined for each storage tank, i. e. if two storage tanks are present, one can be loaded according to a target temperature strategy and the other according to temperature difference.

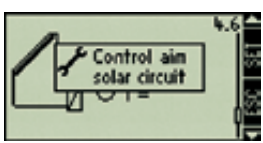
Target temperature control:

Loading is controlled so that the storage tank / external heat exchanger are loaded at a constant temperature (target temperature), if possible. The aim is to obtain the best possible thermal layering in the storage tank and to suppress the fossil fuel back-up heating as early as possible via (e. g.) a storage tank feed "from above".

Temperature differential control:

Loading is controlled so that the defined temperature difference between the collector and storage tank / plate heat exchanger is as constant as possible.

4.4.6. Solar circuit loading strategy (plate heat exchangers only)



Display screen 4.6

In the submenu "Parameters" (display screen 4)

- ▶ Press SET
- ▶ Press ▼ until the display screen 4.6 / Limiting the loading temperature is displayed
- ▶ Press SET
- - *the ΔT / T chosen option blinks*
- ▶ Choose between ΔT / T ▲▼
- ▶ Press SET
- - *the target temperature / temperature differential value blinks*
- ▶ Adjust the value ▲▼
- ▶ Save the value SET
- ▶ Leave the submenu ESC

As with the storage tanks, with the solar circuit loading one must choose between target temperature and temperature differential control strategies.

4.4.7. RPM control

Display screen 4.7

Note: The controller is set at the factory to „RPM control". With this setting, no pumps with integrated electronic speed control should ever be connected to the R1 and R2 outputs.

In the submenu "Parameters" (display screen 4)

- ▶ Press SET
- ▶ Press ▼ until the display screen 4.7 / RPM control is displayed
- ▶ Press SET
- - *Output R1 blinks*
- ▶ Choose between R1 and R2 ▲▼
- ▶ Press SET
- - *the chosen option blinks*
- ▶ Choose "on" or "off" ▲▼
- ▶ Confirm the selection SET
- ▶ Leave the submenu ESC

4

The R1 and R2 outputs can be configured to function either as RPM controllers or simple switches.

RPM controlled output (‚on') for:

- Pumps without integrated electronic speed control. The RPM control of the R1 and R2 outputs occurs via internal electronic relays in the controller.

Switched output (‚off') for:

- Pumps with integrated electronic speed control
- Valves (this setting is automatically set by the controller when a solar system with valves is selected)
- External relays (e.g. for controlling pumps).

RPM control (speed control on)

The control system attempts to maintain a constant temperature difference between the collector and the storage tank. The pump performance is continuously adjusted and the volume flow pumped is increased or reduced, depending on the temperature difference.

Switched output (speed control off)

When switched on, the pump runs at maximum speed and delivers a constant volume flow.

4.5. Storage priority

Display screen 5

Open the submenu "Storage priority"

▶ Press SET for about 2 seconds
▶ Choose the "Storage priority" submenu ▲▼

Leave the submenu

▶ Press ESC

Description

If 2 or 3 storage tanks are used in a solar energy system a storage priority must be set. The storage priority sets the priority according to which the storage tanks are loaded. One must decide between first-priority and second-priority storage tanks.

Control

If the first-priority storage tank reaches its switch-on temperature difference before the second-priority storage tank does, then the first-priority storage tank is loaded until its maximum storage temperature is reached. Only then should the second-priority storage tank be loaded.

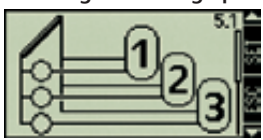
If the second-priority storage tank reaches its switch-on temperature difference before the first-priority storage tank does, then first of all the second-priority storage is loaded, however, only until the first-priority storage tank has reached its switch-on temperature difference. In order to determine this value, the switch-on conditions are constantly checked while the second-priority storage tank is loaded.

In addition, the solar circuit is put to a stop and the increase of temperature in the collector array is monitored during the test-on time. If the first-priority storage tank switch-on temperature is reached, then the first-priority storage tank is loa-

ded. If this temperature is not reached, then the second-priority storage tank is loaded. This test is repeated every 30 minutes.

When the device is delivered, the time interval and the test-on time are set to 30 minutes and 2 minutes, but can be changed later on.

Defining the storage priority



Display screen 5.1

(Sample display)

In the submenu "Storage priority" (display screen 5)

▶ Press SET

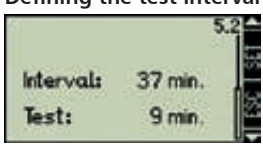
Note: The submenu screen displayed depends on the solar energy system chosen.

▶ Press SET
- *Storage priority blinks*

▶ Press ▲▼
- *change the storage priority*

▶ Press SET
- *confirm the storage priority*

Defining the test interval



Display screen 5.2

▶ Press ▼
- *Interval time / Test-on time*

▶ Press SET
- *the interval time blinks*

▶ Press ▲▼
- *change the interval time*

▶ Press SET
- *confirm the interval time*
- *the test-on time blinks.*

▶ Press ▲▼
- *change the test-on time*

▶ Press ESC
- *confirm the test-on time*

▶ Finish the settings ESC

Leave the menu

▶ Press ESC

4.6. Language selection

Display screen 6

Accessing the "Language" submenu

▶ Press SET for about 2 seconds

▶ Choose the "Language" submenu ▲▼

Exit the submenu

▶ Press ESC

Select the language

Display screen 6.1

In the "Language" submenu (display screen 6)

▶ Press SET

- *the "Language selection" display screen is displayed*

▶ Press SET

- *the chosen option blinks*

▶ Select the language ▲▼

▶ Confirm the language selection SET

▶ Finish the settings ESC

4.7. Factory settings

Display screen 7

Accessing the "Factory settings" submenu

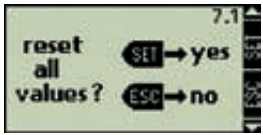
▶ Press for about 2 seconds SET

▶ Choose the "Factory settings" submenu ▲▼

Exit the submenu

▶ Press ESC

Resetting the factory settings



Display screen 7.1

In the "Factor settings" submenu (display screen 7)

▶ Press SET

- *a display screen containing the prompt "Reset all values?" opens*

▶ Press for "Yes" SET

- *the controller deletes all set values and opens the "Time" display screen. After you set the time, the "Solar system" display screen opens to allow you to select a solar system.*

▶ Press for "No" ESC

- *the controller exits the display screen without deleting the values*

The following are reset:

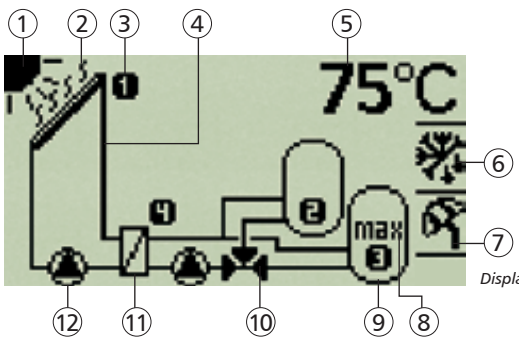
- All parameters
- The system selected
- All functions and their values are set to default values
- The min/max values of the temperature sensors
- Delta operating hours
- Storage tank priority reset to default (sequence: 1, 2, 3)
- Delta heat meter
- System time is reset to 12.00h

5. Main menu

In normal operation of the controller, the main menu with the selected solar system and other functions set are shown on the display. You can access the values of the individual sensors, pumps/ switching valves running times and additional functions set using the arrow keys. Other symbols provide information on the condition of the solar system.

Symbols

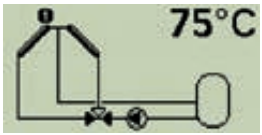
The various symbols are displayed as soon as additional functions are activated or values exceed or fall below parameters. The display message below shows all symbols simultaneously as an example. In practice, they appear in various combinations.



Display screen main menu

1. **Sun:** Shown as soon as the switch-on condition of the solar circuit is fulfilled.
2. **Collector overheated:** Shown when the collector temperature exceeds 130 °C. Hidden when the collector temperature falls below 127 °C
3. **Temperature sensor:** Shows the temperature sensor selected. The numbers correspond to the connection to the terminal layout
4. **Solar system**
5. **Temperature indication:** The temperature of the selected sensor at the collector, storage tank or heat exchanger is shown
6. **Frost protection symbol:** Shown when the frost protection function is activated (see 4.3.11.)
7. **Holiday symbol:** Shown when the holiday function is activated (see 4.3.10.)
8. **Storage tank max. indication:** Flashes when the maximum storage tank temperature is reached
9. **Storage tank**
10. **3-way switching valve:** Animated in flow direction
11. **External heat exchanger**
12. **Pump:** Active pump rotates in display

5.1. Display of current values



Switching the display of current values

▶ Press ◀▲▼

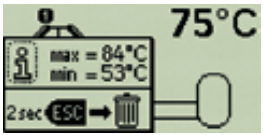
- *the current values of all sensors and pumps / valves connected to the controller are displayed, one after another.*

■ Collector temperature sensor (east / west)
- *current temperature [°C]*
■ Storage tank (1...3) temperature sensor
- *current temperature [°C]*
■ Pump(s)
- *cumulative running time [h]*
■ Switching valve(s)
- *cumulative running time [h]*

▶ ESC switches to the current value of collector 1

If functions are activated, the function diagram with the corresponding current values is displayed.

5.2. Min / Max display



Accessing the Min / Max values

▶ Choose the desired temperature sensor ◀▲▼
▶ Access the information window SET
- *the Min / Max values are displayed*

Resetting the Min / Max values

▶ Press SET for about 2 seconds
- *the Min / Max values are reset to the current temperature*

Close the information window

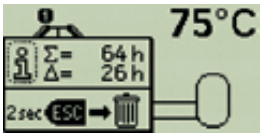
▶ Press ESC or automatically after 30 seconds

The minimum and maximum values of the connected temperature sensor are always stored and accessible.

The values stored can be reset at any time.

5

5.3. Operating hours display



Accessing operating hours

▶ Choose the desired pump or valve

▶ Access the information window SET

- ∑ *the operating hours counter is displayed (cannot be reset)*
- Δ *the operating hours counter is displayed (can be reset)*

Resetting the operating hours

▶ Press SET for about 2 seconds

- *the value is reset to 0 hours*

Close the information window

▶ Press ESC or automatically after 30 seconds

The cumulative operating hours of the connected pumps or valves are always stored.

Here, a distinction is made between total operating hours (∑) and delta operating hours (Δ). Total operating hours cannot be deleted or reset. However, delta operating hours can be reset to zero at any time.

6. Service

6.1. Updating the controller software

The controller is programmed in the factory with the latest controller software at the time of production. Therefore, the software does not usually have to be updated.

However, if you would like to use newer controller software or if an update is required for technical reasons, you can download the controller software from the internet and transfer it to the controller from a computer via the RS232 interface.

6.1.1. Checking the version number of the controller software at the controller

Slide the controller's operation switch to the "OFF" position to display the controller software version number (see chapter 3.3.3).

6.1.2. Downloading the controller software

Before you update the software, check whether there is a more recent version on the internet service pages and whether an update makes sense. To update the controller software, you require the following files which you can download from the internet site and save on your computer:

- "Update.exe" data transfer program
- "*.bin" new controller software

This software can be found in the internet under the following address:

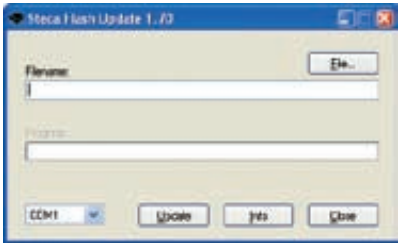
www.stecasolar.com/service/tr0603.

6.1.3. Connecting the RS232 cable to the controller

- ▶ Disconnect the controller from the power supply
- ▶ Open the upper case (see chap. 2.1)
- ▶ Connect the transfer cable (see appendix)
- ▶ Close the upper case
- ▶ Connect the controller to the mains power supply
- ▶ Connect the transfer cable to the COM port of your PC or laptop

6.1.4. Performing the update

Note: When the software is updated, all customer-specific data except the time is retained.

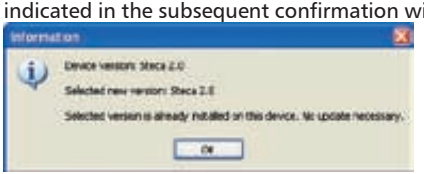


- ▶ Start the Update.exe data transfer program
- ▶ Click the "File" button and select the controller software saved on your computer
- *it then appears in the "File name" field*
- ▶ Select the COM port for data transfer
- *this is generally COM-1 or COM-2*
- ▶ Click the "Update" button

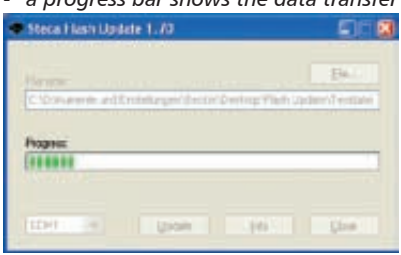
- *the confirmation screen shows the version number of the existing controller software in the device and the new controller software*

▶ Click the "Yes" button

Note: If the software version on the device is higher than the new controller software, this is indicated in the subsequent confirmation window.



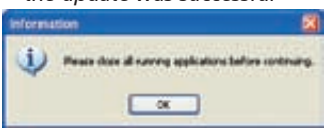
- *the update is started*
- *the controller goes blank and is backlit in yellow*
- *a progress bar shows the data transfer status*



Note: "Transfer error" is displayed if data transfer is interrupted or if the cables are not connected properly. Please check the cables and repeat the update.

6.1.5. Completing the update

- *an information window opens to indicate that the update was successful*



6.1.6. Disconnecting the cables

The data transfer cable must be disconnected after the update is complete. To do so, follow the procedure described above for connecting the cable.

Note: If the controller display remains blank and the display lighting blinks red after the update, the program was not transferred fully. Please check the cables and repeat the update.

7. Troubleshooting

The controller is a quality product, conceived for years of continuous trouble-free operation. If a problem occurs, the cause of the problem very often lies not in the controller but in the peripheral components. The following description of some well-known problems should help the installer and operator to isolate the problem, so that the system can be placed back into operation as quickly as possible and to avoid unnecessary costs. Of course, not all possible problems can be listed here. However, most of the normal problems encountered with the controller can be found in the list below. Only return the controller when you are absolutely sure that none of the problems listed below is responsible for the fault.

7.1. Cause of failures

Symptom	Secondary symptoms	Possible cause	Procedure
Controller does not appear to function at all	Display shows nothing No display illumination	Controller power supply is interrupted	- Check the controller power cable - Check the fuse(s)
The solar pump does not operate, despite the fact that the switch-on conditions are satisfied	The pump symbol in the display rotates	Pump power supply is interrupted	- Check the pump power cable - Check the fuse in the controller (replacement fuse is located in the case)
	The pump symbol in the display does not rotate	- The maximum storage tank temperature has been reached - The maximum collector temperature has been reached - In multi-storage tank systems: The system is waiting for a priority test	No fault
	The pump symbol in the display does not rotate, the display illumination is red „Manu:“ blinks in the display	The operation switch is set to manual operation and the pump output is set to “off”	Set the operation switch back to automatic operation
	The pump symbol in the display does not rotate, the display illumination is red and blinks	Fault (short circuit or open circuit) in a temperature sensor)	- On the controller, request the current values from all connected temperature sensors - Replace all defective sensors and / or cabling

Symptom	Secondary symptoms	Possible cause	Procedure
The solar pump(s) operate, despite the fact that the switch-on conditions are not satisfied	The pump symbol in the display rotates	- The interval function is activated - The holiday function is activated - The frost protection function is activated	- No fault - Deactivate the relevant function, if necessary
A function cannot be activated	The message "All outputs are occupied" shows in the display	All controller outputs are already in use, outputs cannot be doubly used	No fault
	The message "Please check the settings" shows in the display	The functions have not been correctly configured	Check all the configuration settings for the desired function
"System error" shows in the display System errors occur when the temperature difference between the collector and storage tank is > 80K, even though the pump is running		Despite the running pump, no circulation is occurring in the solar circuit because - The pump is faulty or not correctly connected - The isolating valve in the solar circuit is still closed - Air is in the solar circuit	- Correct the fault in the system - Exit from the fault message

7.2. Pt1000 Temperature sensor values

A potentially defective sensor can be checked using an ohmmeter. To do this, the sensor must be disconnected, its resistance measured, and the value compared with the figures in the table below. Small deviations are acceptable.

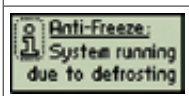
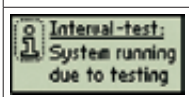
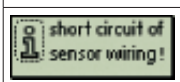
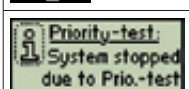
Attention! Remove the device from the mains supply before opening the case!

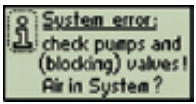
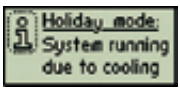
Temperature [°C]	-30	-20	-10	0	10	20	30	40	50	60	70
Resistance [Ω]	882	922	961	1000	1039	1078	1117	1155	1194	1232	1271

Temperature [°C]	80	90	100	110	120	130	140	150	160	170	180
Resistance [Ω]	1309	1347	1385	1423	1461	1498	1536	1573	1611	1648	1685

7.3. Information windows

The following information windows are display whenever system settings of a function are not completely set, errors occur in the system or the controller activates certain functions.

Display	Description	Measures
	Function cannot be activated as all outputs are already occupied. Outputs cannot be double-assigned.	If the already selected system layout is to be retained, this function cannot be used.
	Function cannot be activated as the function settings are not complete.	Please make all function settings.
	The “Frost protection” function (chapter 4.3.11) is active. The solar circuit pump is running, as the collector temperature has dropped below 5 °C.	
	The “Interval” function (chapter 4.3.9) is active. The system runs to transport the heat transfer fluid from the collector to the temperature sensor.	
	There is a short circuit in the temperature sensor input currently selected.	Check the sensor wires and ensure that they are connected correctly to the controller.
	Short-circuit symbol.	
	The system is checking whether a storage tank can be loaded with higher priority (chapter 4.5). The pump is deactivated during this checking period.	

Display	Description	Measures
	The temperature difference between the collector and the storage tank > 80 K, although the solar circuit pump is running. Possible causes: Air in the system, the pump is faulty, isolating valve in the solar circuit is closed.	Check your solar system for possible error sources.
	The temperature sensor input currently selected is interrupted.	Check the sensor wires and ensure that they are connected correctly to the controller.
	Interruption symbol.	
	The "Holiday" function (chapter 4.3.10) is active. The solar system is running to cool the storage tank.	Please activate this function only if you will be absent for an extended period and deactivate it after you return.

8. Guarantee

The manufacturer assumes the following guarantee obligations towards the end user:

The manufacturer will remove all manufacturing and material faults that appear in the regulator and affect the correct functioning of the device during the guarantee period. Normal wear does not constitute a fault. The warrantee is void if, after completion of the purchase contract with the end user, the fault is attributable to the end user or a third party, is caused in particular by improper installation or commissioning, improper or negligent handling, excessive claims, inappropriate resources, faulty construction work, inappropriate building grounds or improper operation or use. The warrantee is only valid if after discovery the fault is immediately claimed to your specialized dealer. The claim is to be sent by the specialized dealer to the manufacturer. A copy of the purchase contract must be enclosed.

An exact fault description is required for a rapid settlement. The warrantee expires 24 months after the purchase contract has been completed by the end user, unless the manufacturer has expressively agreed to an extension period in writing. The manufacturer's warrantee based on the purchase contract with the end user is not affected by these present guarantee obligations.

The manufacturer is entitled to carried out the warrantee by repairing the fault or delivering a replacement. This does not include exchange, shipping or reinstallation costs. If repairs or replacement delivery are / is not possible or not carried out within an appropriate time despite a reasonable grace period determined by the customer, the decrease in value caused by the fault will be replaced or provided that is in the user's interests not sufficient, the contract will be changed.

Further claims against the manufacturer based on this guarantee obligation, in particular customer claims for damages due to lost profit, compensation for use and direct damages are excluded, provided claims must not be made according to law.

9. Technical Data

Temperature Difference Controller	
System voltage	230 V ~ (± 15 %), 50 Hz [optional 115 V ~ (± 15 %), 60 Hz]
Max. self consumption	≤ 3 W
Inputs	6
5 x temperature determination (Pt1000), 1 x temperature determination or pulse	
Output	3
1 x switch output relay, max. switching current 1 A 2 x Triac for speed control, max. switching current 3,5 A	
Number of preset hydraulic systems	15
Interfaces	RS232, IS-Bus
Operation temperature range	0 °C...+45 °C
LCD-Display	animated LCD-Display with 2 colour backlight
Protection type	IP 20 / DIN 40050
Dimensions l x w x h	170 x 170 x 46 mm

Performance data

Output	Power output	Fuse
R1	230 W (230 V ~) / 115 W (115 V ~)	Internal fuse: 2,5 A MT, 250 V
R2	230 W (230 V ~) / 115 W (115 V ~)	
R3	800 W (230 V ~) / 400 W (115 V ~)	Internal fuse: 4 A MT, 250 V

Appendix

Parameter settings

	Factory setting	Adjustable to min.	Adjustable to max.
Storage tank 1-3 maximum temperature	60 °C	0 °C	95 °C
Switch-on temperature difference 1-3 (STDon)	8 K	STDoff +2 K	50 K
Switch-off temperature difference 1-3 (STDoff)	4 K	0 K	STDon - 2 K
Loading circuit 1-2 temperature limit max.	100 °C	Load min. +2 K	130 °C
Loading circuit 1-2 temperature limit min.	0 °C	0°C	Load max. -2 K
Storage tank 1-3 temperature differential loading strategy	8 K	0 K	80 K
Storage tank 1-3 absolute temperature loading strategy	60 °C	0 °C	100 °C
Solar circuit temperature differential loading strategy	10 K	0 K	80 K
Solar circuit absolute temperature loading strategy	70 °C	0 °C	100 °C

Fixed switching thresholds	Factory settings
Collector max.	130 °C
Collector reactivation temperature	127 °C
Collector switching hysteresis (for valve switching)	10 K
Storage tank reactivation hysteresis max.	3 K

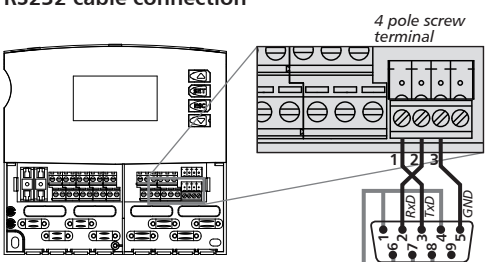
RS232 interface

RS232 is a serial interface for transfering data between the controller and a PC or laptop. This interface allows you to copy a new software version to the controller.

RS232 plug layout and connection

4-pin screw-type terminal	9-pin Sub-D	
1	3	RXD
2	2	TXD
3	5	GND

RS232 cable connection



Picture: RS232 cable connection

RS232 connector (solder side)

Cable link

Max. cable length = 5 m

Data transfer speed = 115.2 kB/s

Use an RS232 / RS485 converter for data transfer over greater distances.

IS-Bus

IS-Bus is a communication interface between the controller and expansion modules or remote displays. IS-Bus is currently not yet in use.

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