

# RESOL DeltaSol<sup>®</sup> E (Version 2)

Mounting

Connection

Operation

Troubleshooting



11206125



The Internet portal for easy and secure access to your system data – [www.vbus.net](http://www.vbus.net)

Thank you for buying this RESOL product.

Please read this manual carefully to get the best performance from this unit.

# DeltaSol<sup>®</sup> E



Manual

[www.resol.com](http://www.resol.com)

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**Safety advice**

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

**Instructions**

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

**Information about the product**

**Proper usage**

The solar controller is designed for electronically controlling standard solar thermal and heating systems in compliance with the technical data specified in this manual.

Improper use excludes all liability claims.

**CE Declaration of conformity**

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



**Note:**

Strong electromagnetic fields can impair the function of the controller.

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

**Subject to technical change. Errors excepted.**


**Target group**

These instructions are exclusively addressed to authorised skilled personnel.

Only qualified electricians should carry out electrical works. Initial installation must be effected by the system owner or qualified personnel named by the system owner.

**Description of symbols**

**WARNING!** Warnings are indicated with a warning triangle!



→ They contain information on how to avoid the danger described.

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

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

**Note:**

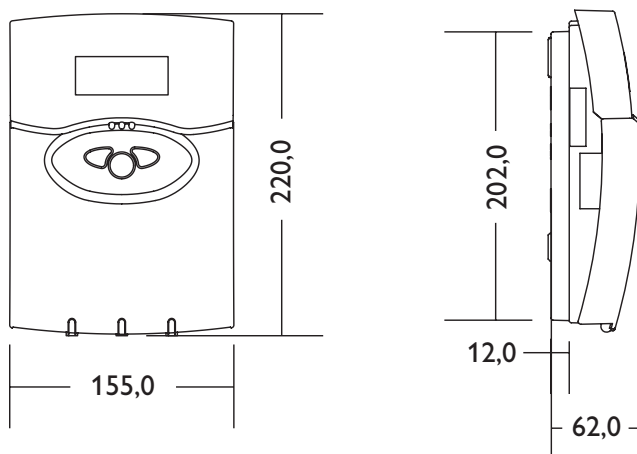
Notes are indicated with an information symbol.

→ Arrows indicate instruction steps that should be carried out.

**Disposal**

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

- 30 schemes to choose from
- speed control, solar operating hours counter and heat quantity measurement
- 12 sensor inputs
- 7 relay outputs
- function control
- RESOL VBus®
- 3 PWM outputs for the speed control of high-efficiency pumps



The DeltaSol® E controller is designed for solar thermal systems and heating systems. It is preprogrammed for 7 basic systems or 30 schemes which can even be used to control large systems. A multitude of adjustable functions and options are realised by 7 relay outputs, 12 sensor inputs for Pt1000, CS10 and V40. Due to its intelligent and easy-to-understand system configuration and its integrated calorimeter, the controller also offers the control of complex systems with up to 4 weather-compensated heating circuits. For data communication and remote maintenance, the controller is equipped with the RESOL VBus®, which opens the bidirectional way to modules, PCs or data logging.

#### Technical Data:

**Inputs:** 10 sensor inputs for Pt1000, CS10, V40

**Outputs:** 6 semiconductor relays, 3 of them for pump speed control, 1 potential-free relay and 3 PWM outputs (convertible to 0-10 V signal outputs)

**PWM frequency:** 512 Hz

**PWM voltage:** 10.5 V

**Switching capacity:**

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

2 (1) A 24 V= / 240 V~ (potential-free relay)

**Total switching capacity:** 4 A 240 V~

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

**Supply connection:** type Y attachment

**Standby:** 0.98 W

**Temperature controls class:** III

**Energy efficiency [%]:** 1,5

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

**Rated impulse voltage:** 2.5 kV

**Data interface:** RESOL VBus®

**VBus® current supply:** 35 mA

**Functions:** heating circuit backup, heat exchange control, thermostatic afterheating, solid fuel boiler, heat quantity measurement, collector cooling function, tube collector function, antifreeze function, minimum limitation, speed control, screed drying, function control

**Housing:** plastic, PC-ABS and PMMA

**Mounting:** wall mounting, mounting into patch panels is possible

**Indication/Display:** 4-line LC text display, illuminated, menu-driven (multilingual)

**Operation:** 3 push buttons at the front

**Ingress protection:** IP 20/EN 60529

**Protection class:** II

**Ambient temperature:** 0 ... 40 °C

**Pollution degree:** 2

**Dimensions:** 227 x 156 x 62 mm



Attention: Electrostatic discharge can cause damage of electronic components

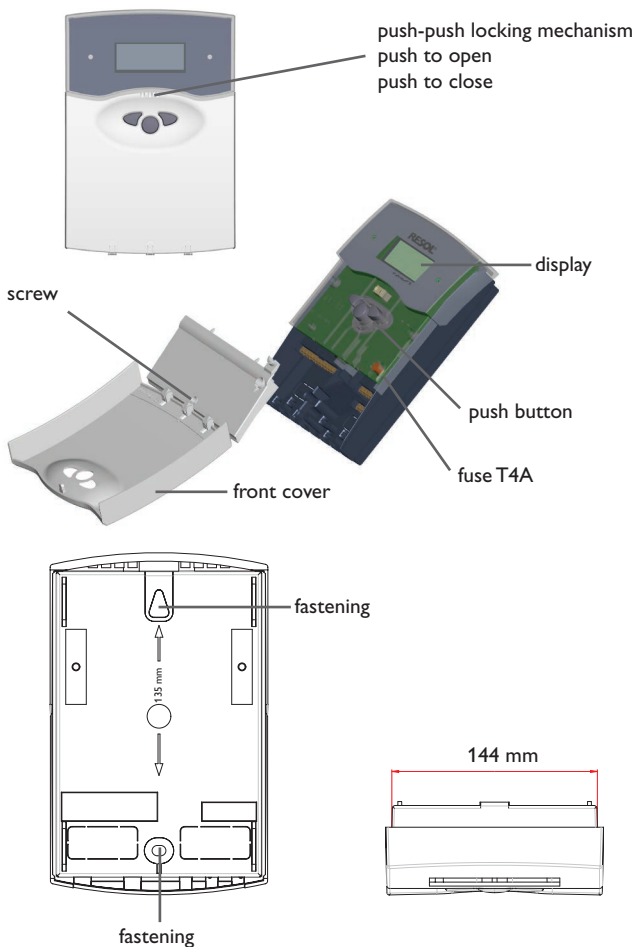


Warning: high-voltage components



## 1. Installation

### 1.1 Montage



#### WARNING! Electric shock!



Upon opening the housing, live parts are exposed!

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



#### Note:

Strong electromagnetic fields can impair the function of the controller.

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

The unit must only be located in dry interior locations. It is not suitable for installation in hazardous locations and should not be placed close to any electromagnetic fields. The controller must additionally be supplied from a double-pole switch with contact gap of at least 3 mm. Please pay attention to separate routing of sensor cables and mains cables.

1. Open the front cover by pushing it. Unscrew the cross-head screw from the cover and remove it along with the front cover from the housing.
2. Mark the upper fastening point on the wall and drill and fasten the enclosed wall plug and screw leaving the head protruding.
3. Hang the housing from the upper fastening point and mark the lower fastening point through the hole in the terminal box (centres 135 mm). Drill and insert the lower wall plug.
4. Hang the housing from the upper fastening point and attach with the lower screw.
5. Carry out connection in accordance with the terminal allocation.
6. Insert cover and attach with the cross-head screw. Close the front cover properly.

## 1.2 Electrical connection

### 1.2.1 Overview of electrical connections

**ATTENTION! ESD damage!**

Electrostatic discharge can lead to damage to electronic components!

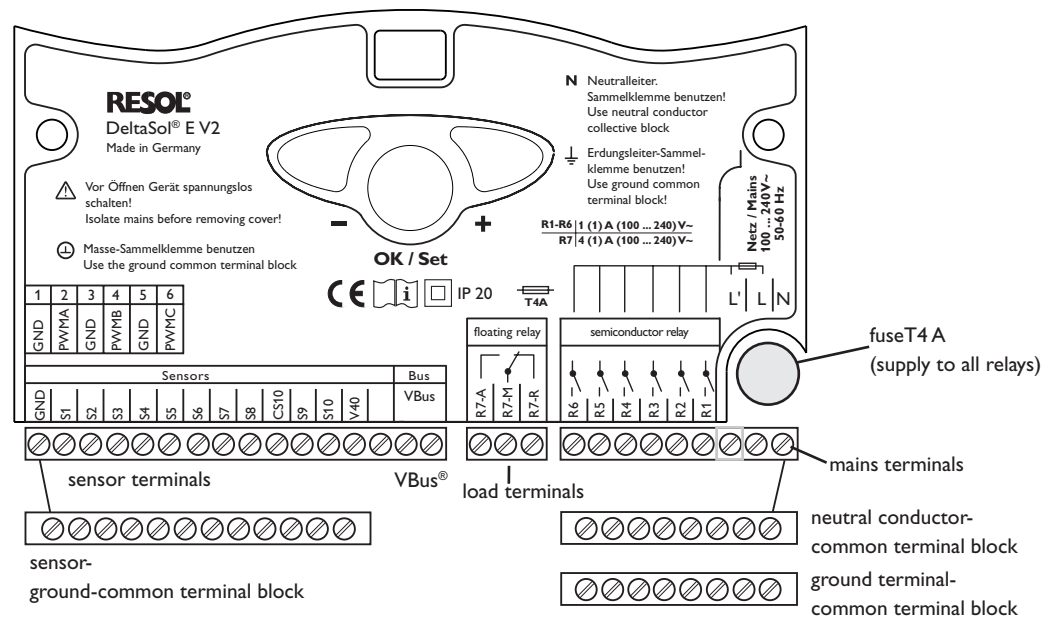
→ Take care to discharge properly before touching the inside of the device! To do so, touch a grounded surface such as a radiator or tap!

**WARNING! Electric shock!**

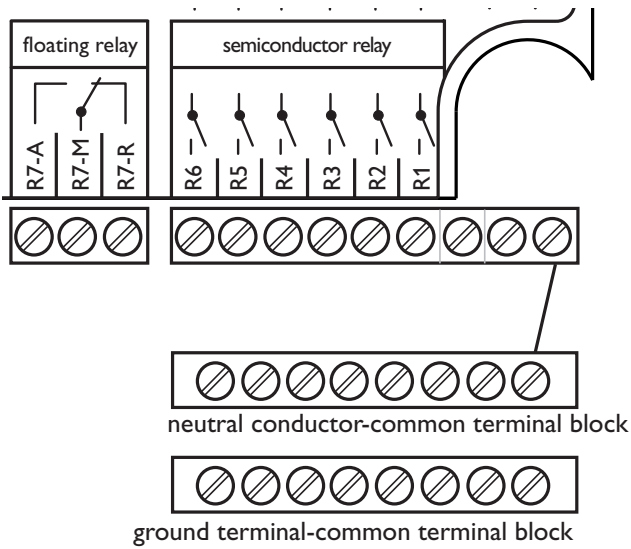
Upon opening the housing, live parts are exposed!

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

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



**1.2.2 Actuators (pumps, valves etc.)**



The controller is equipped with 7 relays to which **loads** (actuators) such as pumps, valves and auxiliary relays can be connected (A= normally open contact; R = normally closed/break contact):

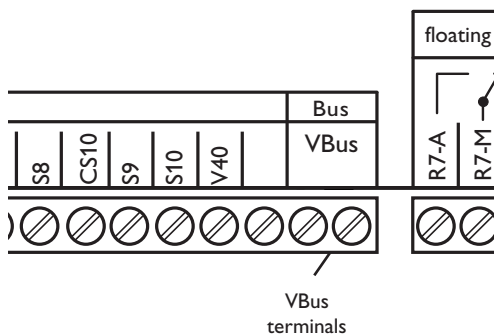
- **Relays R1 ... R6** are semiconductor relays:
  - R1 ... R3=normally open R1 ... R3 (designed for pump speed control)
  - R4 ... R6=normally open R4... R6
  - N = neutral conductor N (common terminal block)
  - ⊕ = ground terminal ⊕ (common terminal block)
- **Relay R7** is a potential-free (floating) relay with change-over contact:
  - R7-M = center contact R7
  - R7-A = normally open R7
  - R7-R = normally closed R7

In all systems with after-heating, R7 switches in parallel to R3 (via function block) in order to provide boiler demand if necessary.

**ATTENTION!** High-efficiency pumps can be connected to semiconductor relay outputs only!

**i Note:** The minimum pump speed must be set to 100 % when auxiliary relays or valves are connected.

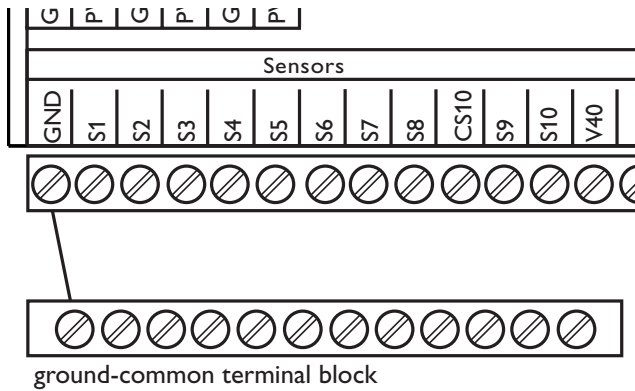
**1.2.3 Data communication/bus**



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

- RESOL WMZ, calorimeter
- RESOL large display/Smart Display
- RESOL Datalogger
- RESOL heating circuit modules HKM (up to 3 modules)

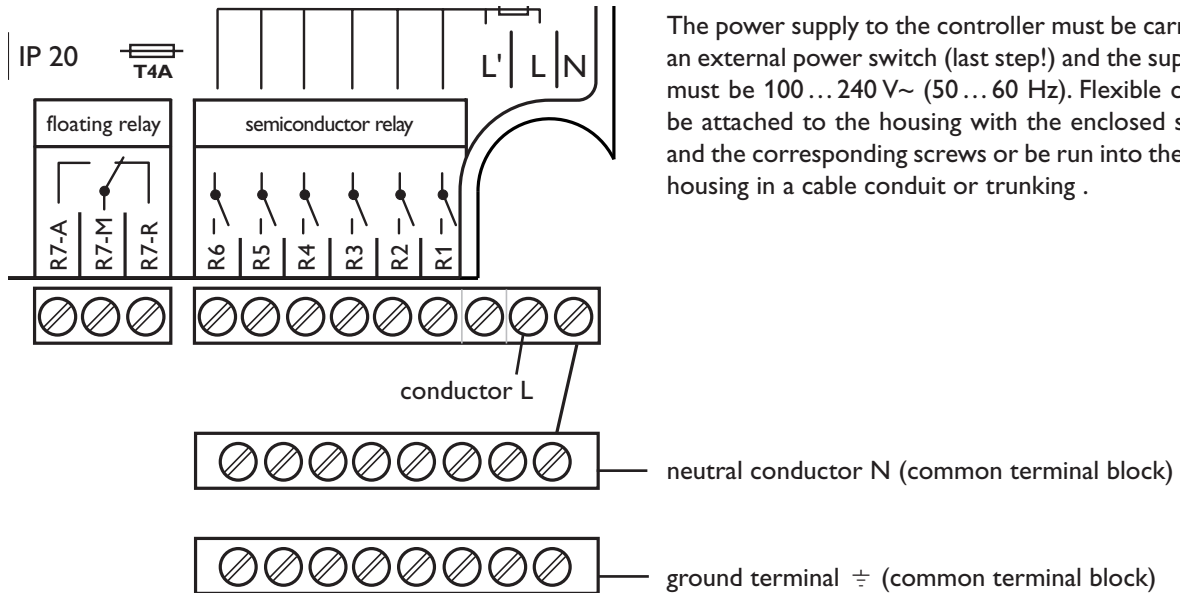
1.2.4 Sensors



The controller is equipped with 12 sensor inputs in total. The ground connection for the sensors has to be carried out via the ground terminal block (GND).

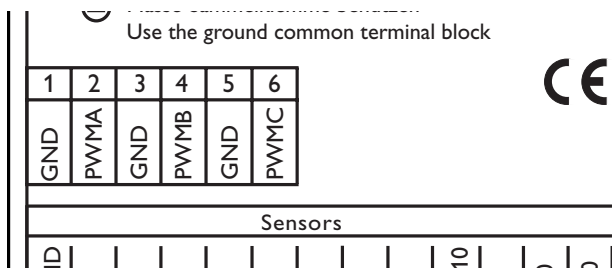
- **Temperature sensors** have to be connected to the terminals S1 ... S10 and GND (either polarity)
- The **irradiation sensor (CS10)** is to be connected to the terminals CS10 and GND with correct polarity. Connect the terminal GND of the sensor to the terminal GND of the controller (ground terminal block), and the terminal CS of the sensor to the terminal CS10 of the controller.
- A **flowmeter V40** can be connected to the terminals V40 and GND (either polarity).

1.2.5 Mains supply



The power supply to the controller must be carried out via an external power switch (last step!) and the supply voltage must be 100 ... 240 V~ (50 ... 60 Hz). Flexible cables must be attached to the housing with the enclosed strain relief and the corresponding screws or be run into the controller housing in a cable conduit or trunking .

1.2.6 PWM outputs

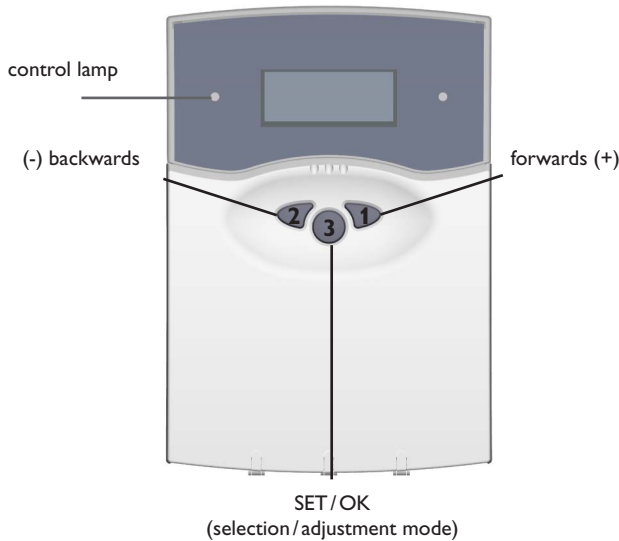


The speed of a HE pump is controlled by means of a PWM signal. The pump must be connected to the relay as well as to one of the PWM outputs of the controller.

The HE pump is supplied with power by switching the corresponding relay on or off. The terminals marked **PWM A, B and C/GND** are control outputs for pumps with a PWM control input.

## 2. Operation and function

### 2.1 Buttons for adjustment



The controller is operated via the 3 push buttons below the display. The forward-button (1) is used for scrolling forward through the menu or to increase the adjustment values. The backward-button (2) is similarly used for scrolling backwards and reducing values. Button 3 is used for selection of the menu lines and for confirmation.

- Briefly press button 3 in order to access the main menu
- Select the requested menu using buttons 1 and 2.
- Briefly press button 3, the selected submenu is then shown on the display. By selecting the menu line "back", the display returns to the former menu level.
- Press buttons 1, 2 and 3 to scroll until the chosen menu line is reached.
- Briefly press button 3 in the respective menu line to modify adjustment values - „change value“ appears on the display - adjust the requested value by pressing the buttons 1 and 2 (for large intervals, keep the button pressed).
- Briefly press button 3 in order to finish the adjustment.
- To save the change, answer the security inquiry „Save?“ by choosing „yes“ or „no“ (buttons 1 and 2) and confirm with button 3.

**i Note:** If in the display mode no button is pressed within 4 minutes, the display changes back to measured values menu (in the case of a message, the message menu is indicated).

When button 3 is pressed for 2 seconds, the display changes back to the main menu.

### 2.2 Control lamp

The controller is equipped with a red-/green control lamp. The following control and system status are signalled as shown:

- green                      automatic operation
- red flashing:            malfunction of the system
- green flashing:        manual mode



## 2.3 Menu structure

	MAIN MENU
1.	MERS. VALUES
2.	REPORTS
3.	SOLAR
4.	ARRANGEMENT
5.	WAZ
6.	MANUAL OPERATION
7.	USER CODE
8.	EXPERT

The clear-text display shows a 4-line part of the selected menu.

Adjustment and control of the controller are carried out via the menu. When the controller is commissioned, the display level is in the main menu. In the first line of each submenu you will find the option “back”, by means of which it is possible to get to the former menu level. In the following diagrams you will find the complete menu contents; since some of the menu points depend on the system, option or message, in some cases not all of the shown text lines are indicated.

MAIN MENU is shown on the display in the initial state. A selection can be made between 8 submenus.



### Note:

The choice of adjustment values and options depends on different functions and the user code. Some only appear in the display if they are available for the adjusted system parameters.

## 2.4 User codes

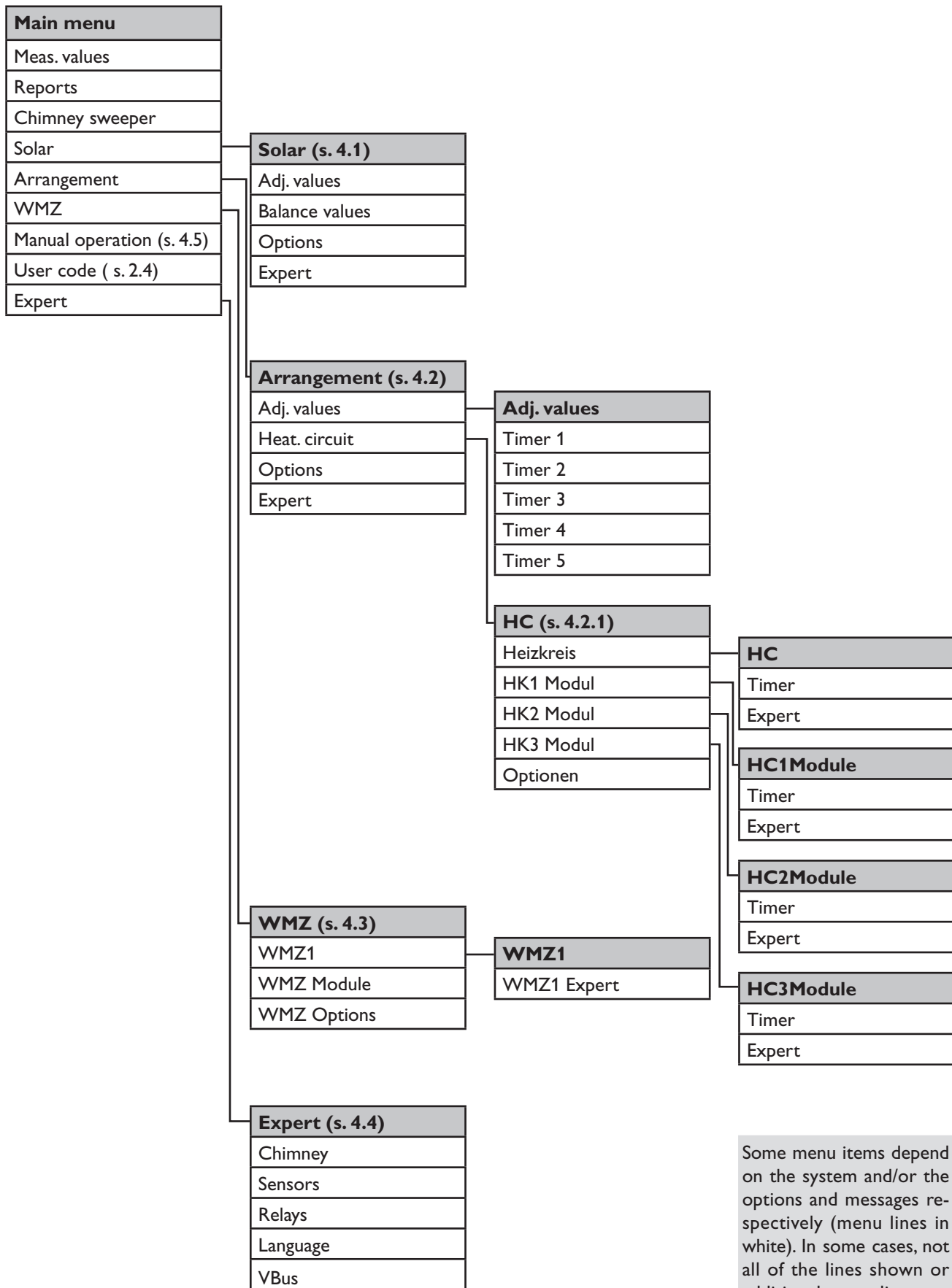
1. Expert **Code 0262** (factory setting)  
All menus and adjustment values are shown and all adjustments can be altered.
2. User **Code 0077**  
The expert level is shown, parameter access is restricted.
3. Customer **Code 0000**  
The expert level is not shown, adjustment values (solar) can be changed partly; modification of options, parameter and balance values is not possible.  
For safety reasons, the user code should generally be set to “0000” before the controller is handed to the customer!



### Note:

After the menu point “user code” has been chosen, enter the user code!

## 2.5 Menu overview



Some menu items depend on the system and/or the options and messages respectively (menu lines in white). In some cases, not all of the lines shown or additional menu lines are indicated.

### 3. Commissioning

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

The controller runs an initialisation phase in which the product name and the version number are indicated.

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

#### Commissioning menu

The commissioning menu consists of the following parameters.

**1. Language:**

→ Adjust the desired menu language.

**2. Time:**

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

**3. Date:**

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

**4. Scheme:**

→ Adjust the desired scheme.

**5. System:**

→ Adjust the desired system.

**6. Hydraulic variant:**

→ Adjust the desired hydraulic variant.

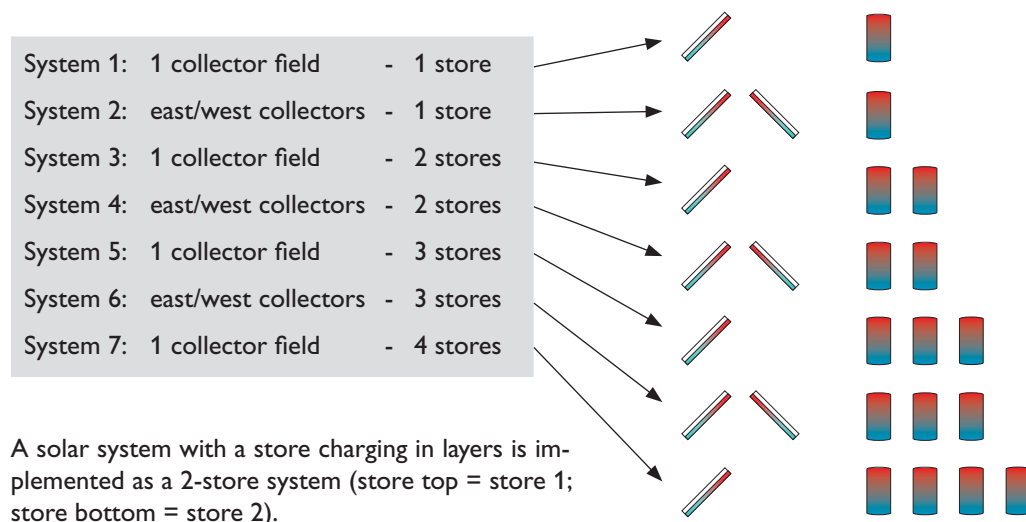
**7. Completing the commissioning menu:**

After the scheme and system selection a safety enquiry appears. In order to confirm, press button 3.

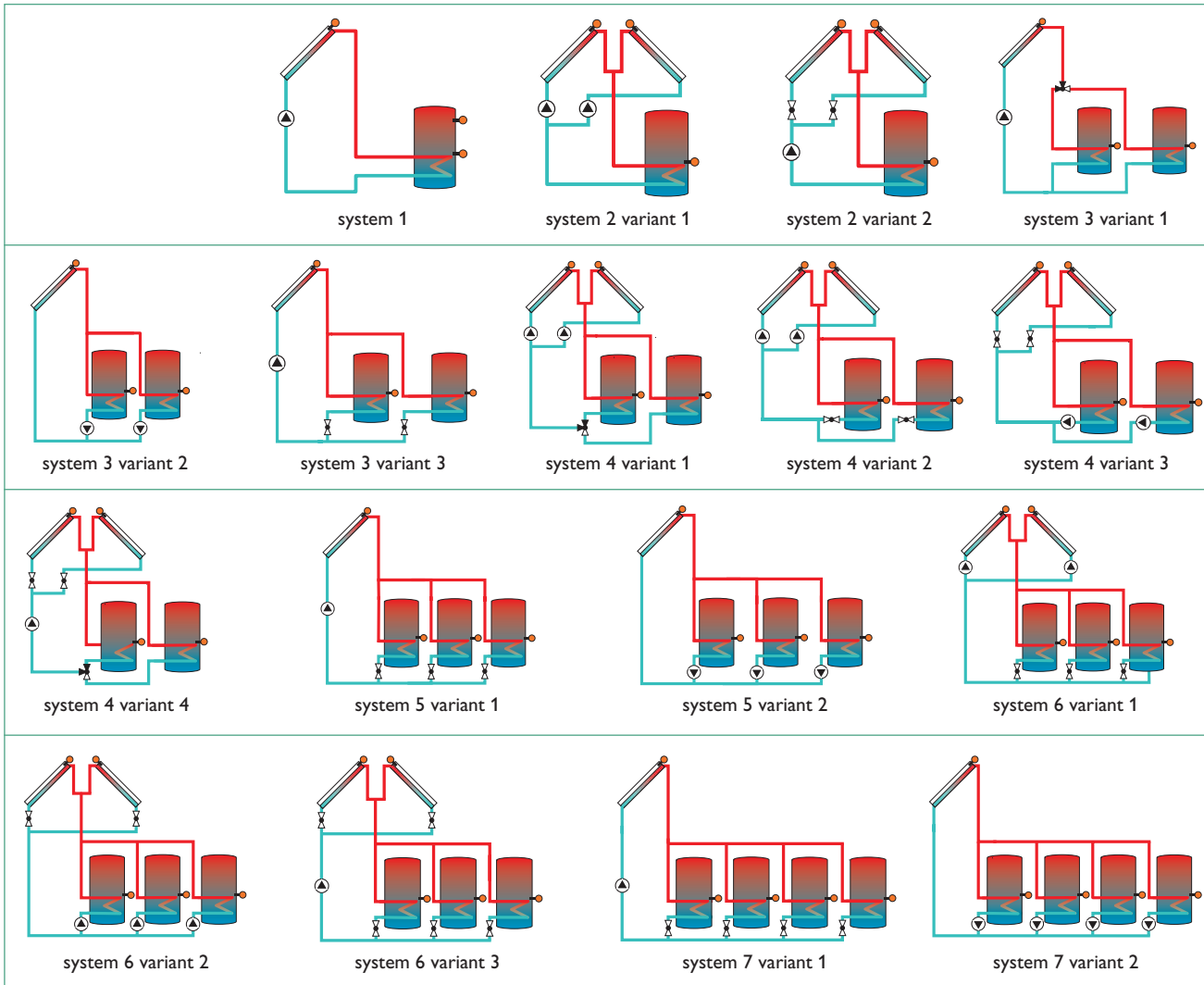
After having confirmed the safety enquiry the controller is ready for operation and normally the factory settings will give close to optimum operation.

#### 3.1 Basic systems and hydraulic variants

The controller is preprogrammed for 7 basic systems. The selection depends on the number of heat sources (collector fields) and heat sinks (stores, pool). Factory setting is system 1.



Beginning with system 2, different hydraulic variants are possible (pump or valve control):



**Important note:** If you select a new system, any previous adjustments which have been done will be set back to the factory settings (reset)!



For each variant, the controller allocates the corresponding relays and sensors. The allocations of the most important combinations are shown in 3.5. The system and the variant have to be selected first (*SOLAR/OPTIONS/...*)!

### 3.2 Function blocks

Depending on the selected system/variant and other options e.g. internal heating circuit module, certain relays are already assigned. Relays which are not assigned can be allocated to one of the 5 function blocks other uses e.g.(extra valves, stores, heat sources etc ).

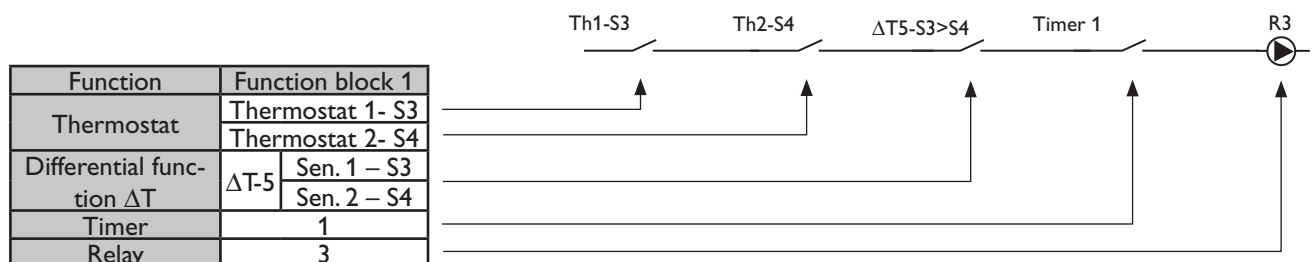
Each function block provides 4 functions:

- 1 temperature differential function
- 2 thermostat functions
- 1 timer (with 21 time frames)

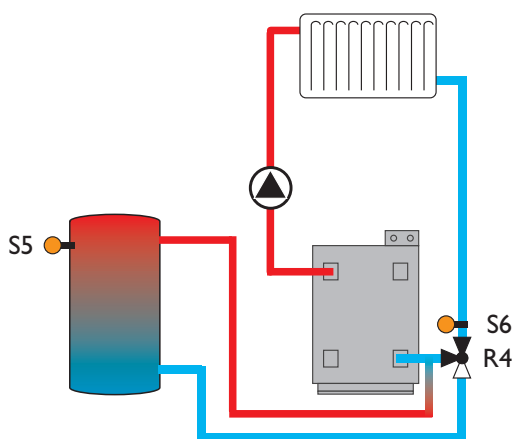
Function	Function block 1	Function block 2	Function block 3	Function block 4	Function block 5
Thermostat	Thermostat 1- S3	Thermostat 3- S5	Thermostat 5- S5	Thermostat 7- S7	Thermostat 9- S9
	Thermostat 2- S4	Thermostat 4- S6	Thermostat 6- S6	Thermostat 8- S8	Thermostat 10- S10
Differential function $\Delta T$	$\Delta T-5$   Sen. 1 – S3 Sen. 2 – S4	$\Delta T-6$   Sen. 1 – S5 Sen. 2 – S6	$\Delta T-7$   Sen. 1 – S5 Sen. 2 – S6	$\Delta T-8$   Sen. 1 – S7 Sen. 2 – S8	$\Delta T-9$   Sen. 1 – S9 Sen. 2 – S10
	Timer	1	2	3	4
Relay	3	4	5	6	7

Within a function block, these functions can be activated and combined as required in the menu (*ARRANGEMENT/OPTIONS/...*). All switch-on conditions of all activated functions have to be fulfilled in order to energise the relay allocated

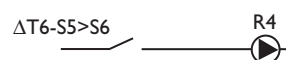
to the function block (*ARRANGEMENT/ADJ. VALUES/...*). These functions can be compared to switches connected in series:



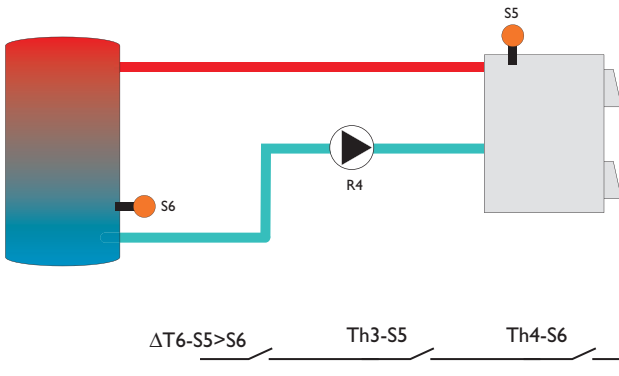
#### Examples:



The temperature differential function of a function block has to be activated in order to implement a simple return preheating function.



*ARRANGEMENT/OPTIONS/ΔT-FUNC6* change setting to „Yes“.

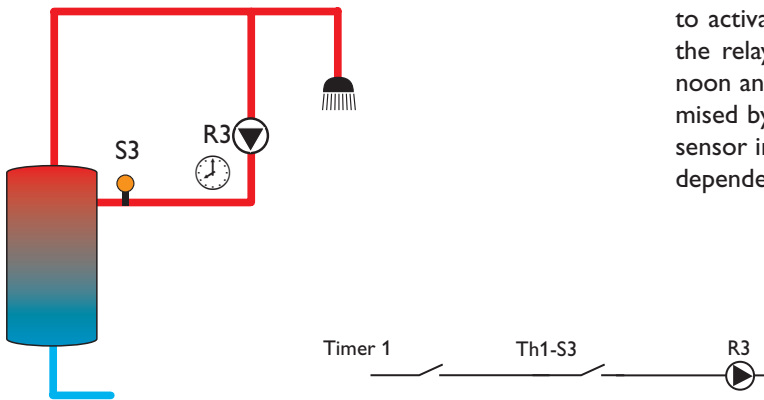


For the use of a further heat source (e.g. solid fuel boiler), one or two thermostat functions can be activated additionally to the differential function, in order to allocate a minimum temperature to the boiler or to limit the maximum store temperature.

- ARRANGEMENT/OPTIONS/ΔT-FUNC6.....change setting to “Yes“
- ARRANGEMENT/OPTIONS/THERMO.3.....change setting to “Yes“
- ARRANGEMENT/ADJ. VALUES/TH3 ON.....change value to “60“
- ARRANGEMENT/ADJ. VALUES/TH3 OFF.....change value to “55“
- ARRANGEMENT/OPTIONS/THERMO.4.....change setting to “Yes“
- ARRANGEMENT/ADJ. VALUES/TH4 ON.....change value to “58“
- ARRANGEMENT/ADJ. VALUES/TH4 OFF.....change value to “60“

minimum temperature limitation for the boiler

maximum temperature limitation for the store



In order to control a circulation pump, it might be enough to activate the timer. With the aid of the 21 time frames, the relay can be switched individually in the morning, at noon and in the evening. This process can be further optimised by activating a thermostat function so that - with a sensor in the circulation line- control is also temperature-dependent.

- ARRANGEMENT/OPTIONS/TIMER 1 .....change setting to “Yes“
- ARRANGEMENT/ADJ. VALUES/TIMER 1/T1-ON.....change value to “06:00“
- ARRANGEMENT/ADJ. VALUES/TIMER 1/T1-OFF.....change value to “08:00“
- ARRANGEMENT/ADJ. VALUES/TIMER 1/T2-ON.....change value to “11:30“
- ARRANGEMENT/ADJ. VALUES/TIMER 1/T2-OFF.....change value to “13:30“
- ARRANGEMENT/ADJ. VALUES/TIMER 1/T3-ON.....change value to “18:00“
- ARRANGEMENT/ADJ. VALUES/TIMER 1/T3-OFF.....change value to “21:00“
- ARRANGEMENT/OPTIONS/THERMO. 1 .....change setting to “Yes“
- ARRANGEMENT/ADJ. VALUES/TH1 ON.....change value to “50“
- ARRANGEMENT/ADJ. VALUES/TH1 OFF .....change value to “55“

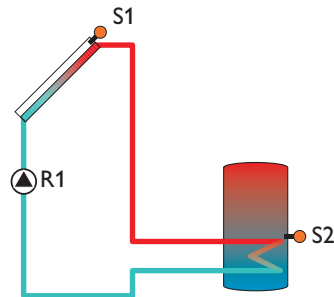
### 3.3 Adjusting the controller step-by-step

The following points are optional to suit the system requirements, points 16. and 17. should be adjusted before the system is handed over to the operator.

1. Activate internal heating circuit module if needed  
(ARRANGEMENT/HEAT. CIRCUIT/OPTIONS/HCI)
2. Adjust parameters for internal heating circuit module  
(ARRANGEMENT/HEAT. CIRCUIT/HCI/...)
3. Activate external heating circuit module(s) if needed  
(ARRANGEMENT/HEAT. CIRCUIT/OPTION/HCI (2,3) MODULE)
4. Adjust parameters for external heating circuit module(s)  
(ARRANGEMENT/HEAT. CIRCUITS/HCI (2,3) MODULE/...)
5. Activate desired functions with relay allocation (if needed)
  - Bypass  
(SOLAR/OPTIONS/BYPASS)
  - External heat exchanger  
(SOLAR/OPTIONS/EXT. HEAT. EX)
  - Cooling function  
(SOLAR/OPTIONS/COOL. FUNC.)
  - Parallel relay  
(SOLAR/OPTIONS/PAR.RELAY)
  - After-heating suppression  
(SOLAR/OPTIONS /AH SUPPRESS.)
  - HSE  
(ARRANGEMENT/OPTIONS/HSE)
  - Store loading  
(ARRANGEMENT/OPTIONS /STORE LOAD.)
  - Error message  
(EXPERT/MESSAGE REL.)
6. Activate further functions without relay allocation (if needed):
  - Tube collector function  
(SOLAR/OPTIONS/TUBE COL.)
  - Collector cooling function  
(SOLAR/OPTIONS/COL. COOLING)
  - Recooling function  
(SOLAR/OPTIONS/RECOOLING)
  - Frost protection  
(SOLAR/OPTIONS/FROST. PROT.)
  - Target temperature  
(SOLAR/OPTIONS/TARGET TEA.)
  - CS-Bypass  
(SOLAR/OPTIONS/CS-BYPASS)
7. Adjust special parameters of the selected options  
(SOLAR/ADJ. VALUES/...),  
(SOLAR/EXPERT/...) and  
(ARRANGEMENT/ADJ. VALUES/...)
8. Activate functions of function blocks (if needed)  
(ARRANGEMENT/OPTIONS/...)
9. Adjust switching conditions for the activated functions  
(ARRANGEMENT/ADJ. VALUES/...)
10. Activate heat measurement function (if needed)  
(WAZ/OPTIONS/...)
11. Adjust special parameters  
(WAZ/WAZ 1/EXPERT/...)
12. Deactivate warning message (if needed)  
(EXPERT/...)
13. Carry out sensor offset (if needed)  
(EXPERT/SENSORS/...)
14. Increase minimum speed (if needed)  
(EXPERT/RELAY/...)
15. Setup and adjust chimney sweeper function (if needed)  
(EXPERT/CHIMNEY/...)
16. Carry out relay test  
(MANUAL OPERATION/...)
17. Save adjustments  
(USER CODE/0000)

### 3.4 Overview of relay and sensor allocation

#### System 1



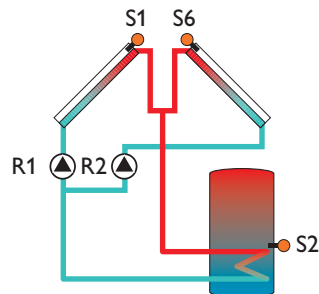
#### sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Th 1 Tby T-HE T1-ΔT5	Th 2 T2-ΔT5 T1-AH- HC	Th 3 Th 5 T1-ΔT6 T1-ΔT7 T2-AH- HC	Th 4 Th 6 T2-ΔT6 T2-ΔT7 HC T-FL	Th 7 T1-ΔT8 HC T-outd.	Th 8 T2-ΔT8 HC RTA11	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

#### relay allocation

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
solar pump	ext. HE	func. bl. 1 Load p.	cooling func. HC-pump func. bl. 2	func. bl. 3 HSE bypass par. relay HC-Mi open	func. bl. 4 store load. HC-Mi closed	func. bl. 5 message rel. AH suppress. HC-afterheat.

#### System 2 variant 1



#### sensor allocation

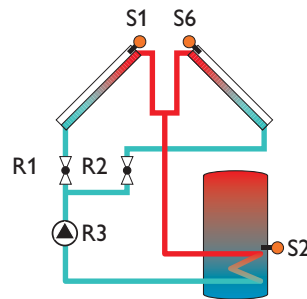
sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Th 1 Tby T-HE T1-ΔT5	Th 2 T2-ΔT5 T1-AH- HC	Th 3 Th 5 T1-ΔT6 T1-ΔT7 T2-AH- HC	Tcol2 Th 4 Th 6 T2-ΔT6 T2-ΔT7 HC T-FL	Th 7 T1-ΔT8 HC T-outd.	Th 8 T2-ΔT8 HC RTA11	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

#### relay allocation

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
pump col. 1	pump col. 2	func. bl. 1 ext. HE Load p.	cooling func. HC-pump func. bl. 2	func. bl. 3 HSE bypass par. relay HC-Mi open	func. bl. 4 store load. HC-Mi closed	func. bl. 5 message rel. AH suppress. HC-afterheat.



System 2 variant 2



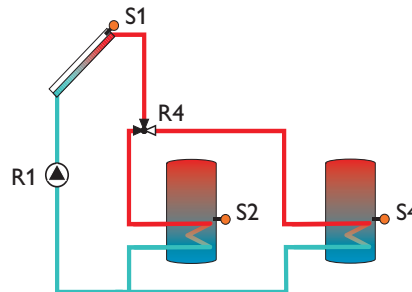
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Tby	T1-AH- HC	Th 3 Th 5 T1-ΔT6 T1-ΔT7 T2-AH- HC	Tcol2 Th 4 Th 6 T2-ΔT6 T2-ΔT7 HC-T-FL	Th 7 T1-ΔT8 HC T-outd.	Th 8 T2-ΔT8 HC RTA11	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

relay allocation

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
2-PV col. 1	2-PV col.2	solar pump	cooling func. HC-pump func. bl. 2	func. bl. 3 HSE bypass par. relay HC-Mi open	func. bl. 4 store load. HC-Mi closed	func. bl.5 message rel. AH suppress. HC-afterheat.

System 3 variant 1



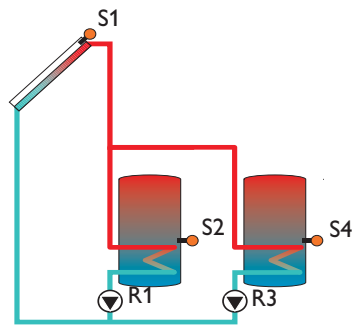
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Th 1 Tby T-HE T1-ΔT5	Th 2 Tst2b T2-ΔT5	Th 5 T1-ΔT7	Th 6 T2-ΔT7	Th 7 T1-ΔT8	Th 8 T2-ΔT8	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

relay allocation

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
solar pump	ext. HE	func. bl. 1	3 PV store 1-2	func. bl. 3 HSE bypass par. relay	func. bl. 4 store load.	func. bl. 5 message rel. AH suppress.

**System 3 variant 2**



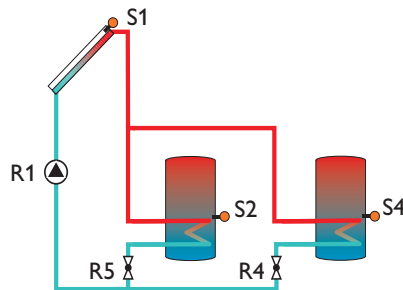
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Tby T-HE	Tst2b	Th 3 Th 5 T1-ΔT6 T1-ΔT7	Th 4 Th 6 T2-ΔT6 T2-ΔT7	Th 7 T1-ΔT8	Th 8 T2-ΔT8	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
solar pump st1	ext. HE	solar pump st2	func. bl. 2	func. bl. 3 HSE bypass par. relay	func. bl. 4 store load.	func. bl.5 message rel. AH suppress.

**System 3 variant 3**



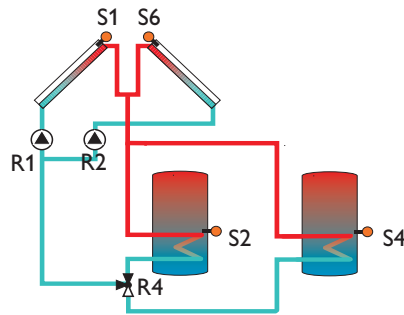
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Th 3 T1-ΔT5 T-HE	Th 4 T2-ΔT5 Tst2b	---	---	Th 7 T1-ΔT8	Th 8 T2-ΔT8	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
solar pump	ext. HE	func. bl. 1	2 PV store 2	2 PV store 1	func. bl. 4 store load.	func. bl.5 message rel. AH suppress.

**System 4 variant 1**



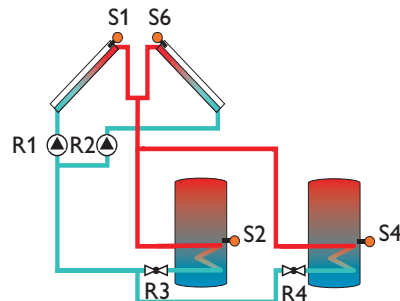
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Th 1 Tby T-HE T1-ΔT5	Th 2 Tst2b T2-ΔT5	Th 5 T1-ΔT7	Tcol2 Th 6 T2-ΔT7	Th 7 T1-ΔT8	Th 8 T2-ΔT8	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
pump col. 1	pump col. 2	func. bl. 1 ext. HE	3 PV store 1-2	func. bl. 3 HSE bypass par. relay	func. bl. 4 store load	func. bl.5 message rel. AH suppress.

**System 4 variant 2**



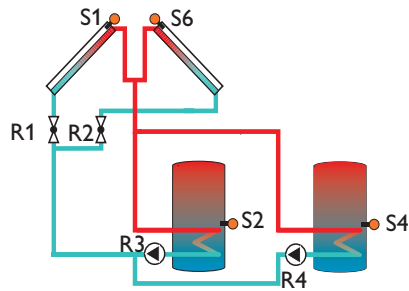
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Tby	Tst2b	Th 5 T1-ΔT7	Tcol2 Th 6 T2-ΔT7	Th 7 T1-ΔT8	Th 8 T2-ΔT8	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
pump col. 1	pump col. 2	2-PV store 1	2-PV store 2	func. bl. 3 HSE bypass par. relay	func. bl.4 store load.	func. bl. 5 message rel. AH suppress.

**System 4 variant 3**



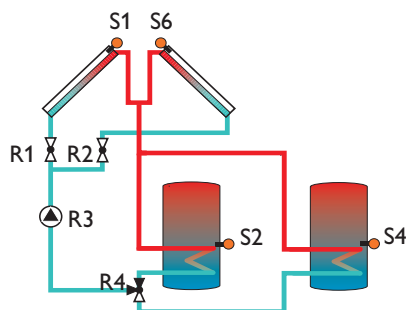
**sensor allocation**

sen.1	sen.2	Sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Tby	Tst2b	Th 5 T1-ΔT7	Tcol2 Th 6 T2-ΔT7	Th 7 T1-ΔT8	Th 8 T2-ΔT8	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
2-PV col. 1	2-PV col.2	solar pump st 1	solar pump st 2	func. bl. 3 HSE bypass par. relay	func. bl. 4 store load.	func. bl. 5 message rel. AH suppress.

**System 4 variant 4**



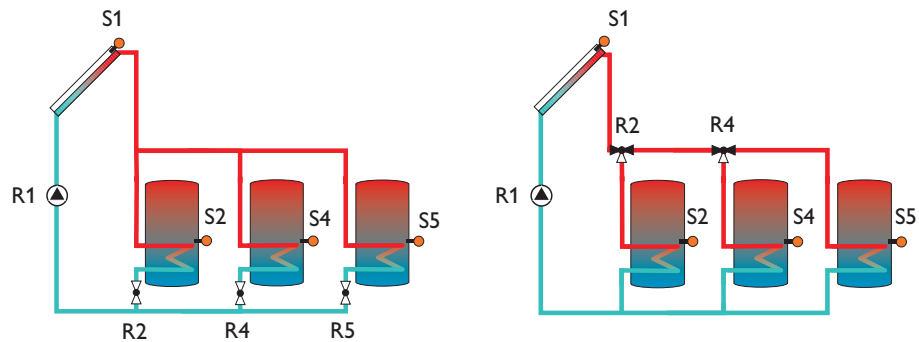
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Tby	Tst2b	Th 5 T1-ΔT7	Tcol2 Th 6 T2-ΔT7	Th 7 T1-ΔT8	Th 8 T2-ΔT8	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
2-PV Kol. 1	2-PV Kol.2	solar pump	3 PV store 1-2	func. bl. 3 HSE bypass par. relay	func. bl. 4 store load.	func. bl. 5 message rel. AH suppress.

**System 5 variant 1**



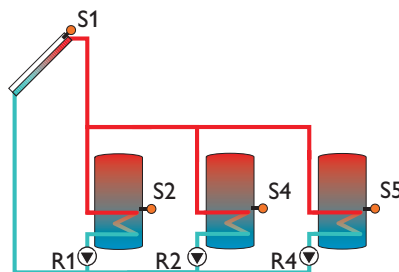
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Th 1 Tby T-HE T1-ΔT5	Th 2 Tst2b T2-ΔT5	Tst3b	---	Th 7 T1-ΔT8	Th 8 T2-ΔT8	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
solar pump	2 PV store 1 (3PV store 1)	func. bl. 1 ext. HE	2 PV store 2 (3PV store 2)	2 PV store 3 (---)	func. bl. 4 store load. HSE bypass par. relay	func. bl. 5 message rel. AH suppress.

**System 5 variant 2**



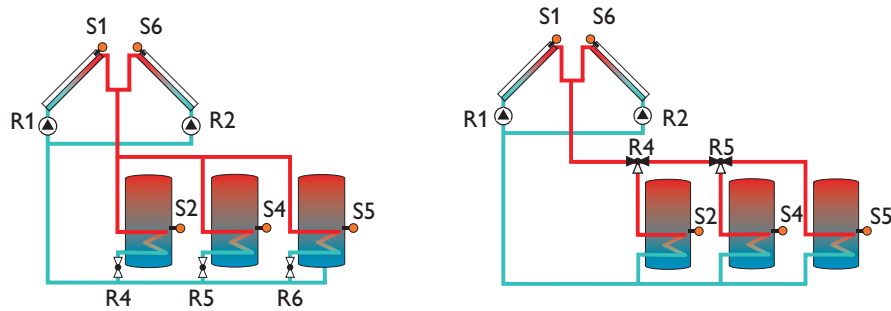
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Th 1 Tby T-HE T1-ΔT5	Th 2 Tst2b T2-ΔT5	Th 5 Tst3b T1-ΔT7	Th 6 T2-ΔT7	Th 7 T1-ΔT8	Th 8 T2-ΔT8	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
solar pump st1	solar pump st2	func. bl. 1 ext. HE	solar pump st 3	func. bl. 3	func. bl. 4 store load. HSE bypass par. relay	func. bl. 5 message rel. AH suppress.

**System 6 Variante 1**



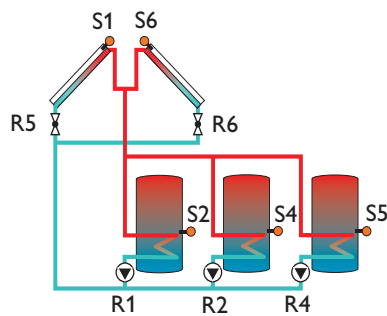
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Th 1 T1-ΔT5 Tby T-HE	Th 2 T2-ΔT5 Tst2b	Tst3b	Tcol2	---	---	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
pump col. 1	pump col. 2	func. bl. 1 HSE bypass par. relay ext. HE	2 PV store 1 (3 PV store 1)	2 PV store 2 (3 PV store 2)	2 PV store 3 (---)	func. bl. 5 message rel. AH suppress.

**System 6 variant 2**



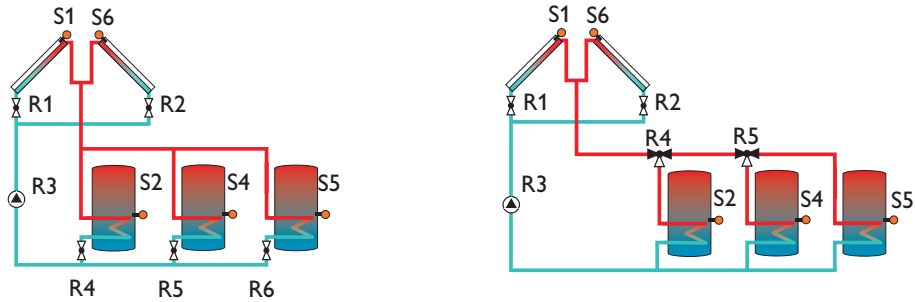
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Th 1 Tby T-HE T1-ΔT5	Th 2 Tst2b T2-ΔT5	Tst3b	Tcol2	---	---	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
solar pump st1	solar pump st2	func. bl. 1 HSE bypass par. relay ext. HE	solar pump st3	2-PV col.1	2-PV col.2	func. bl. 5 message rel. AH suppress.

**System 6 variant 3**



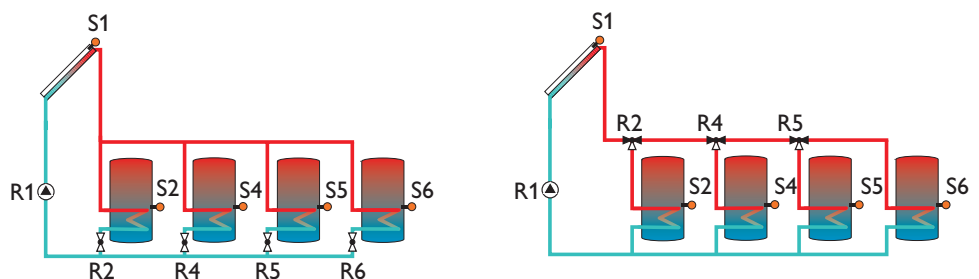
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tkol	Tspu DVGW	---	Tsp2u	Tsp3u	Tkol2	---	---	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
2-PV col. 1	2-PV col. 2	solar pump	2 PV store 1 (3 PV store 1)	2 PV store 2 (3 PV store 2)	2 PV store 3 (---)	func. bl. 5 message rel. AH suppress.

**System 7 variant 1**



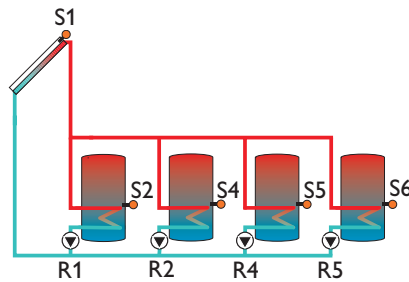
**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tcol	Tstb HSE	Th 1 Tby T-HE T1-ΔT5	Th 2 Tst2b T2-ΔT5	Tst3b	Tst4b	---	---	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
solar pump	2 PV store 1 (3 PV store 1)	func. bl. 1 HSE bypass par. relay ext. HE	2 PV store 2 (3 PV store 2)	2 PV store 3 (3 PV store 3)	2 PV store 4 (---)	func. bl. 5 message rel. AH suppress.

**System 7 variant 2**



**sensor allocation**

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40
Tkol	Tspu DVGW	Th 1 Tby T-WT T1ΔT5	Th 2 Tsp2u T2-ΔT5	Tsp3u	Tsp4u	Th 7 T1-ΔT8	Th 8 T2-ΔT8	Th 9 T1-ΔT9 T1 WMZ	Th 10 T2-ΔT9 T2 WMZ	WMZ

**relay allocation**

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
solar pump st1	solar pump st2	func. bl. 1 HSE bypass par. relay ext. HE	solar pump st3	solar pump st4	func. bl. 4 store load.	func. bl. 5 message rel. AH suppress.

**Abbreviations - sensors**

sensor	denomination
Tcol	temperature-collector
Tcol2	temperature-collector 2
Tstb	temperature-store 1 base
Tst2b	temperature-store 2 base
Tst3b	temperature-store 3 base
Tst4b	temperature-store 4 base
T-HE	temperature-heat exchanger
Tby	temperature-bypass
HSE	temperature- protection against legionella
Th 1-10	temperature-thermostat 1-10
T1-ΔT5-9	temperature- ΔT5-9 high
T2-ΔT5-9	temperature- ΔT5-9 low
T1-AH-HC	temperature- afterheating-heating circuit
T2-AH-HC	temperature- afterheating-heating circuit
HC T-FL	temperature- heating circuit flow
HC T-outd.	temperature- heating circuit outdoors
HC RTA11	heating circuit remote control
T1 WMZ	temperature- flow heat quantity measurement
T2 WMZ	temperature- return heat quantity measurement
WMZ	flowmeter

sensor	location
1	DeltaSol E
2	DeltaSol E
3	DeltaSol E
4	DeltaSol E
5	DeltaSol E
6	DeltaSol E
7	DeltaSol E
8	DeltaSol E
9	DeltaSol E
10	DeltaSol E
11	Flow HC
12	1. HKM (S1)
13	1. HKM (S2)
14	1. HKM (S3)
15	1. HKM (S4)
16	1. HKM (S5)

sensor	location
17	1. HKM (S6)
18	Flow 1. HKM
19	2. HKM (S1)
20	2. HKM (S2)
21	2. HKM (S3)
22	2. HKM (S4)
23	2. HKM (S5)
24	2. HKM (S6)
25	Flow 2. HKM
26	3. HKM (S1)
27	3. HKM (S2)
28	3. HKM (S3)
29	3. HKM (S4)
30	3. HKM (S5)
31	3. HKM (S6)
32	Flow 3. HKM

**Sensor allocation**

Sensors 1-10 are the sensors connected to the controller. Sensors 12-32 are the sensors connected to the additionally connected heating circuit modules. Sensors 11, 18, 25 and 32 show the calculated flow set temperature respectively.



## Abbreviations - relay

relay	denomination
pump col. 1 (2)	solar pump collector field 1-2
Solar Pumpe Sp 1-4	solar pump store 1-4
2 PV St 1-4	2-port valve store 1-4
3 PV St 1-3	3-port valvel store 1-3
func. bl. 1-5	function block 1-5
HSE	protetion against legionella
bypass	bypass-circuit
cooling func.	cooling function
store load.	store loading
par. relay	parallel relay
ext. HE	external heat exchanger
message rel.	message relay
AH suppress.	afterheating suppression
HC-afterheat.	heating circuit afterheating
HC-pump	heating circuit pump
HC-Mi open	heating circuit mixer open
HC-Mi closed	heating circuit mixer closed
Load p. TDHW	DHW heating loading pump or 3-port valve respectively

## 4. Functions and options

### 4.1 Menu: Solar

#### System:

*SOLAR/OPTIONS/SYSTEM*

adjustment range: 1 ... 7

factory setting: 1

#### Hydraulic variants:

*SOLAR/OPTIONS/LOADING*

adjustment range: 1 ... 4

factory setting: 1

#### Schematic:

*SOLAR/OPTIONS/SCHEMATIC*

adjustment range: 000 ... 030

factory setting: 000

Select the appropriate basic system (see 3.2).

#### Note:

Select the basic system first, because the subsequent selection of a new system will reset all other adjustments to the factory settings.

Many hydraulic variants distinguish between pump and valve control e.g. for multiple stores. The adjustment has to be carried out in accordance with the overview of the basic systems with their hydraulic variants (see 3.2). Broadly speaking, variants with pumps allow speed control, variants with valves do not and will automatically set the minimum speed to 100%.

Alternatively to the basic system and hydraulic variant, one of the 30 pre-programmed schemes can be selected.

If a new scheme is selected subsequently, all other adjustments will be reset to the factory settings!.

**Bypass:***SOLAR/OPTIONS/BYPASS*

selection: „Yes“, „No“

factory setting: „No“

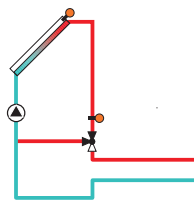
In order to prevent energy from being extracted from the store when starting store loading, this function makes sure that the cold fluid in the pipes is diverted past the store via a bypass (valve or pump). Once the pipe is warm enough, the store can be loaded.

The bypass relay is energised if the temperature at the reference sensor is by 2,5 K higher than the store temperature and if the switch-on condition for store loading (see store loading) is fulfilled. The relay is switched-off if this temperature difference is lower than 1,5 K. These temperature differences cannot be adjusted.

**Variant valve or bypass***SOLAR/EXPERT/BYPASS*

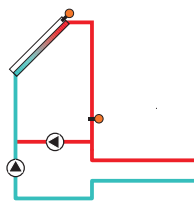
selection: „Valve“, „Pump“

factory setting: „Valve“

**Variant valve:**

A bypass valve is placed into the solar circuit.

The solar heat exchanger is first bypassed when store loading is possible. If the above-mentioned switch-on condition is fulfilled, the bypass relay switches the collector circuit via the heat exchanger.

**Variant pump:**

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

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

This variant is available in 1-collector systems only.

**Bypass sensor:***SOLAR/EXPERT/SEN. BYPASS*

adjustment range: 1 ... 10

factory setting: 3

The reference sensor is located in front of the valve or the pump respectively. The default is sensor 3, but this can be changed using this menu item.

**External heat exchanger:***SOLAR/OPTIONS/EXT. HEAT. EX.*

selection: „Yes“, „No“

factory setting: „No“

*SOLAR/ADJ. VALUES/HE ΔTON*

adjustment range: 2,0 ... 19,5 K

factory setting: 5,0 K

*SOLAR/ADJ. VALUES/HE ΔTOFF*

adjustment range: 1,5 ... 19,0 K

factory setting: 3,0 K

*SOLAR/EXPERT/SEN. EXT. HE*

adjustment range: 1 ... 10

factory setting: 3

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

The heat exchanger relay is activated if the temperature at the reference sensor exceeds the store temperature by the adjusted value “HE ΔTon” and if the switch-on conditions for store loading (see “store loading”) are fulfilled.

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

In contrast to the bypass function, a differential regulation between “T-HE” (“Sen. Ext. HE”) and “Tst” can be carried out by means of the heat exchanger relay.

The reference sensor (“Sen. Ext. HE”) can be arbitrarily allocated.

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

**Tube collector function:***SOLAR/OPTIONS/TUBE COL.*

selection: „Yes“, „No“

factory setting: „No“

*SOLAR/EXPERT/TUBE-RUN*

adjustment range: 5 ... 500 s

factory setting: 30 s

*SOLAR/EXPERT/TUBE-INIT*

adjustment range: 00:00 ... 00:00

factory setting: 07:00

*SOLAR/EXPERT/TUBE-FINAL*

adjustment range: 00:00 ... 00:00

factory setting: 19:00

*SOLAR/ADJ. VALUES/TUBE COL*

adjustment range: 1 ... 60 min

factory setting: 30 min

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

This function operates within a given time frame (“tube init“ and “tube-final“). It activates the collector circuit pump for 30 seconds (adjustable via the parameter “tube-run“) every 30 minutes (adjustable via the parameter “tube col“) in order to compensate for the delayed temperature measurement.

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

The collector circuit is operated at minimum pump speed.

**2-collector systems****2 separate collector circuits (2 pumps)**

Both collectors are operated independently from each other by means of this function.

If a store is being loaded by one collector, the other one is nevertheless operated after the adjusted standstill time.

**shared collector circuit (1 pump)**

If store loading is carried out by one collector, the other one is nevertheless operated after the adjusted standstill time.

This means the pump speed may reduce briefly to the minimum as the normal pump speed is ignored by the controller.

**Cooling function (1-store systems):***SOLAR/OPTIONS/COOL FUNC.*

selection: „Yes“, „No“

factory setting: „No“

The cooling function can be used in 1-store systems (basic systems 1 and 2). If the store temperature exceeds its maximum limitation ( $T_{stmax}$ ), the surplus energy in the collector can be diverted. The pump output uses maximum pump speed.

**Function (switching conditions):**

If  $T_{stmax}$  is exceeded, and the switch-on temperature difference  $\Delta T_{on}$  between collector and store are reached, the solar circuit (primary) and the cooling relay are operated.

If the switch-off temperature difference  $\Delta T_{off}$  is underrun during this period, the solar circuit and the cooling relay are switched-off.

**2-collector system:  
(basic system 2)**

In this system, only the collector circuit which fulfills the switch-on conditions described above, is operated.

**Collector cooling function:***SOLAR/OPTIONS/COL. COOLING*

selection: „Yes“, „No“

factory setting: „No“

if you select „Yes“:

*SOLAR/ADJ. VALUES/TCOLMAX*

adjustment range: 80 ... 160 °C

factory setting: 110 °C

hysteresis 5 K

The collector cooling function starts, when the adjusted maximum collector temperature is reached. If this temperature is underrun by 5 K, this function is switched off.

The collector is cooled via the heat transfer to the next free store (a store which is not blocked). The numerically last store is not used (swimming pool protection or in the case of multi-store systems).

The pump output (provided that the function is active) is controlled with maximum relative pump speed.

**Note:**

It is not possible to adjust a temperature value for the maximum collector temperature (Tcolmax) which is higher than the collector emergency shutdown temperature. There must be a difference between these two temperatures of at least 10 K.

**2-collector systems:****2 separated collector circuits (2 pumps):**

The collector circuit which needs to be cooled is operated. If one store is being loaded by another collector, this loading is continued.

**shared collector circuit (1 pump):**

“Pump speed“ depends on collector cooling which takes priority.

**Recooling:***SOLAR/OPTIONS/RECOOLING*

selection: „Yes“, „No“

factory setting: „No“

This function is used for keeping the system temperatures and consequently the thermal load as low as possible.

If the temperatures of all stores of the system have exceeded the maximum temperature, the Tstmax for the first store is temporarily overridden to reduce the surplus energy via the pipework and the collector. Note Tstmax may be exceeded so additional scald protection may be required.

This “circulation“ is switched-off once the maximum store temperature is underrun by 2 K.

**2-collector systems:**

Both collector circuits are activated in a 2-collector system.

**Combination with collector cooling function:**

If the option “collector cooling“ is activated in addition to the recooling function, the behaviour of the recooling function changes.

The objective is now to dissipate the energy supplied by collector cooling.

If the temperature at the collector decreases by 5 K below that of the store, the recooling function becomes active and the loading circuit is again operated to cool the store.

If the difference between collector and store decreases below 3 K during that cooling period, the function is switched-off.

**2-collector system:**

In a 2-collector system, the collectors are operated separately, using the switch-on conditions described above.

**Frost protection:***SOLAR/OPTIONS/FROST PROT.*

selection: „Yes“, „No“

factory setting: „No“

As soon as the temperature at the collector is 4 °C, the frost protection function operates the loading circuit between the collector and the 1<sup>st</sup> store in order to protect the medium in the loading circuit against freezing or coagulation.

If the collector temperature exceeds 5 °C, this function is switched-off.

If the 1<sup>st</sup> store in the system is blocked, this function is switched off or suppressed.

The pump output uses maximum pump speed.

**2-collector system:**

In these systems, the circuit which fulfills the switch-on condition described above is operated.

**Target temperature:***SOLAR/OPTIONS/TARGET TEM.*

selection: „Yes“, „No“

factory setting: „No“

if you select „Yes“.

*SOLAR/ADJ. VALUES/TCOLSET*

adjustment range: 20 ... 110 °C

factory setting: 65 °C

Pump speed is controlled according to collector temperature rather than (usual) temperature difference. The aim is to maintain constant collector temperature, adjustable with parameter “Tcolset”.

**Parallel relay:***SOLAR/OPTIONS/PAR. RELAY*

selection: „Yes“, „No“

factory setting: „No“

If the solar circuit pump is switched-on, this relay is activated in parallel.

In 2-collector systems which are working with 2 pumps, the parallel relay is activated if one of the 2 pumps is activated.

**CS-Bypass:***SOLAR/OPTIONS/CS-BYPASS*

selection: „Yes“, „No“

factory: setting „No“

if you select „Yes“:

*SOLAR/ADJ. VALUES/CS-BYP.*adjustment range: 100 ... 500 W/m<sup>2</sup>factory setting: 200 W/m<sup>2</sup>

If the irradiation exceeds the adjusted value CS-bypass, the collector circuit is operated. It is switched off when the irradiation has fallen below the value „CS-bypass“ for at least 2 minutes.

The collector circuit is operated with minimum pump speed.

**2-collector systems:**

If a loading of the store is carried out in these systems, the function is switched-off.

**Afterheating suppression:***SOLAR/OPTIONS/AH SUPPRESS.*

selection: „Yes“, „No“

factory setting: „No“

if you select „Yes“:

*SOLAR/EXPERT/AH SUPPRESS.*

adjustment range: St 1 ... St 4

factory setting: St 1

This function is active if a previously selected solar store (parameter designation: “AH suppress.” in the menu solar expert) is being loaded.

Solar loading means that store loading is only carried out for energy supply and not for cooling purposes etc.

**Collector emergency shutdown:***SOLAR/ADJ. VALUES/TCOLSEC*

adjustment range: 110 ... 200 °C

factory setting: 130 °C

hysteresis: 10K

At high collector temperatures (depending on system pressure or antifreeze concentration etc.) the systems stagnates. This means that solar loading is not possible.

If the adjusted temperature threshold „Tcolsec“ is exceeded, the corresponding collector will no longer be used for loading.

**collector blocked**

A collector is considered to be blocked, if either the sensor is defective or the emergency shutdown temperature is reached.

**Collector minimum limitation:**

*SOLAR/EXPERT/TCOLMIN*

adjustment range: -25 ... 90 °C

factory setting: 10 °C

hysteresis 2 K

This is the minimum temperature which must be exceeded for the solar pump to switch on. If the adjusted minimum temperature is not exceeded or the condition "collector blocked" is fulfilled.

**St2on... St4on:**

*SOLAR/OPTIONS/ST2 ON (... ST4 ON)*

selection: „Yes“, „No“

factory setting: „Yes“

By means of this function, the respective store can be "removed" from solar control. This means that it is no longer considered for solar loading.

The temperature of the store will be indicated but a sensor defect will not be recognised.

**Store loading:**

*SOLAR/ADJ. VALUES/ΔTON (...ΔT4ON)*

adjustment range: 1,0 ... 20,0 K

factory setting: 5,0 K

*SOLAR/ADJ. VALUES/ΔTOFF (...ΔT4OFF)*

adjustment range: 0,5 ... 19,5 K

factory setting: 3,0 K

If the adjusted switch-on difference  $\Delta T_{on}$  between collector and store is exceeded, the store will be loaded.

If this difference falls below the adjusted switch-off difference  $\Delta T_{off}$ , the loading function will be switched off.

Loading of the store will also be switched-off or suppressed if the relevant store or collector is blocked (collector blocked, see collector minimum limitation) or if the store is at maximum limitation.

*SOLAR/ADJ. VALUES/ΔTSET (...ΔT4SET)*

adjustment range: 2,0 ... 30,0 K

factory setting: 10,0 K

The parameter " $\Delta T_{set}$ " is the nominal temperature difference between collector and store used for pump speed control. Once  $\Delta T_{set}$  is reached, the pump speed is increased by 10 %.

**Store maximum limitation:**

*SOLAR/ADJ. VALUES/TSTMAX (...TST4MAX)*

adjustment range: 4 ... 95 °C

factory setting: 60 °C

If the adjusted maximum temperature  $T_{stmax}$  is exceeded, loading of the store is stopped. If the store cools down by more than 2 K (hysteresis), the store will be loaded again.

**Hysteresis**

*SOLAR/EXPERT/ΔT-STMAX (...ΔT-ST4MAX)*

adjustment range: 0,5 ... 5,0 K

factory setting: 2,0 K

**store emergency shutdown**

value 95 °C  
hysteresis = 2 K

If the cooling options are activated (e.g. collector cooling), the store will be loaded beyond the adjusted maximum temperature.

In order to avoid too high temperatures in the store, the emergency shutdown of the store is additionally provided, which also blocks the store for the cooling options. If a store reaches the temperature of 95 °C, the emergency shutdown is active.

**store blocked**

A store is blocked if either the corresponding sensor is defective or the emergency shutdown temperature has been reached.

**Priority logic and store sequence control:***SOLAR/ADJ. VALUES/PRIORITY ST1 (...ST4)*

adjustment range: 1 ... 4

factory setting: 1; 2; 3; 4

Priority logic is used in multi-store systems only.

If St1, St2, St 3, St4 are set to 1, the stores with a temperature difference to the collector are loaded in parallel as long as their switch-on conditions are fulfilled.

If St1 is set to 1, St2 to 2, St 3 to 3, and St4 to 4 (factory setting) the first store will be loaded first as long as its switch-on conditions are fulfilled. When the selected priority store reaches its adjusted maximum temperature, the subordinate stores will be loaded in numerical order via oscillating loading: store 1, then store 2, then store 3, then store 4.

**Store sequence control:***SOLAR/EXPERT/T-CIRC.*

adjustment range: 1 ... 60 min

factory setting: 15 min

The controller checks whether the stores can be loaded (switch-on difference).

When the priority store cannot be loaded, the subordinate stores are checked. If a subordinate store can be loaded, it will be loaded for the "oscillating loading time" ("t-circ."). After this period of time, the loading process stops. The controller monitors the increase in collector temperature. If it increases by the "collector rise temperature" ( $\Delta T\text{-col}$ ) within the loading break time "t-st", the elapsed break time is set to 0. The break time starts again.

As soon as the switch-on condition of the priority store is fulfilled, it will be loaded. If the switch-on condition of the priority store is not fulfilled, loading of the subordinate stores will be continued. If the priority store reaches its maximum temperature, oscillating loading will not be carried out.

**Loading break time:***SOLAR/EXPERT/T-ST*

adjustment range: 1 ... 60 min

factory setting: 2 min

**Collector rise temperature:***SOLAR/EXPERT/ $\Delta T\text{-COL}$* 

adjustment range: 1 ... 10 K

factory setting: 2 K

The controller has integrated registers which record the following values:

- maximum temperatures
- operating hours of the relays
- operating days since commissioning of the controller

The values can be reset, except for "operating days".

**Balancing functions:***SOLAR/BALANCE VALUES***4.2 Menu:Arrangement****HSE (protection against legionella):***ARRANGEMENT/OPTIONS/HSE*

selection: „Yes“, „No“

factory setting: „No“

The HSE-function checks whether the temperature at the given sensor (Sen-HSE) exceeds 60 °C at certain times for legionella control.

If 60 °C has not been achieved by the HSE start time, the HSE relay is energised in order to activate e.g. afterheating. The HSE start time (t-start) is adjustable.

The relay is switched-off once 60 °C is reached at the relevant sensor (factory setting 2 - selectable) or at midnight (reset point).

If the relevant sensor is defective, this function is suspended.

*ARRANGEMENT/ADJ. VALUES/T-START*

adjustment range: 00:00 ... 00:00

factory setting: 17:00

*ARRANGEMENT/EXPERT/SEN-HSE*

adjustment range: 1 ... 10

factory setting: 2

**Store loading:***ARRANGEMENT/OPTIONS/STORE LOAD.*

selection: „Yes“, „No“

factory setting: „No“

*ARRANGEMENT/ADJ. VALUES/TH7ON*

adjustment range: -40,0 ... 250,0 °C

factory setting: 40,0 °C

*ARRANGEMENT/ADJ. VALUES/TH7OFF*

adjustment range: -40,0 ... 250,0 °C

factory setting: 45,0 °C

*ARRANGEMENT/EXPERT/SEN-TH7*

adjustment range: 1 ... 10

factory setting: 7

*ARRANGEMENT/EXPERT/SEN-TH8*

adjustment range: 1 ... 10

factory setting: 8

*ARRANGEMENT/OPTIONS/TIMER 4*

selection: „Yes“, „No“

factory setting: „No“

*ARRANGEMENT/EINSTELLWERTE/TIMER2/T1(...21)-ON*

adjustment range: 00:00 ... 00:00

factory setting: 22:00

*ARRANGEMENT/ADJ. VALUES/TIMER2/T1(...21)-OFF*

adjustment range: 00:00 ... 00:00

factory setting: 05:00

**Function blocks:***ARRANGEMENT/OPTIONS/THERMO.1 (...10)*

selection: „Yes“, „No“

factory setting: „No“

*ARRANGEMENT/OPTIONS/ΔT-FUNC (...9)*

selection: „Yes“, „No“

factory setting: „No“

*ARRANGEMENT/OPTIONS/TIMER 1 (...5)*

selection: „Yes“, „No“

factory setting: „No“

*ARRANGEMENT/EXPERT/SEN-TH1 (...10)**ARRANGEMENT/EXPERT/SEN1-ΔT5(...9)**ARRANGEMENT/EXPERT/SEN2-ΔT5(...9)*

In order to carry out afterheating of a store within a certain store volume (store zone), this function uses 2 sensors to monitor the switch-on and switch-off level.

The switch-on and -off temperatures Th7on and Th7off are used as reference parameters.

Adjust the reference sensors via Sen-Th7 and Sen-Th8.

If the measured temperatures at both reference sensors fall below the adjusted switching threshold Th7on, the relay is switched-on. It is switched-off if the temperature at both sensors is higher than Th7off.

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

In addition to the above, a timeswitch can be set to temporarily block operation in 21 time frames (3 for each day) by means of the daily timer 4.

Depending on the selected basic system and activated options, there are up to 5 function blocks including thermostat functions, timer and differential functions. With these, further components or functions e.g. solid fuel boiler, heating backup and DHW afterheating can be implemented (see 3.3 for further examples).

Function blocks are assigned to the relays (see 3.5) and the relay cannot be changed. Each function block has allocated sensors that can be changed in the expert menu if needed. It is also possible to „double up“ in the programming and use a sensor already allocated to another function.

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



### Thermostat function (Function block 1 ... 5):

*ARRANGEMENT/OPTIONS/THERM01 (...10)*

selection: „Yes“, „No“

factory setting: „No“

*ARRANGEMENT/ADJ. VALUES/TH1(...10)ON*

adjustment range: - 40,0 ... 250,0 °C

factory setting: 40,0 °C

*ARRANGEMENT/ADJ. VALUES/TH1(...10)OFF*

adjustment range: - 40,0 ... 250,0 °C

factory setting: 45,0 °C

*ARRANGEMENT/EXPERT/SEN-TH1 (...10)*

adjustment range: 1 ... 10

factory setting: 3 (...10)

### ΔT-function (function block 1 ... 5):

*ARRANGEMENT/OPTIONS/ΔT-FUNC 5 (...9)*

selection: „Yes“, „No“

factory setting: „No“

*ARRANGEMENT/ADJ. VALUES/ΔT5(...9)ON*

adjustment range: 1,0 ... 50,0 K

factory setting: 5,0 K

*ARRANGEMENT/ADJ. VALUES/ΔT5(...9)OFF*

adjustment range: 0,5 ... 50,0 K

factory setting: 3,0 K

*ARRANGEMENT/EXPERT/SEN 1-ΔT5(...9)*

adjustment range: 1 ... 10

factory setting: 3 (...10)

*ARRANGEMENT/EXPERT/SEN 2-ΔT5(...9)*

adjustment range: 1 ... 10

factory setting: 4 (...10)

### Timer function (function block 1 ... 5):

*ARRANGEMENT/OPTIONS/TIMER 1 (...5)*

selection: „Yes“, „No“

factory setting: „No“

*ARRANGEMENT/ADJ. VALUES/TIMER 1 (...5)/T1(...21)-ON*

adjustment range: 00:00 ... 00:00

factory setting: 22:00

*ARRANGEMENT/ADJ. VALUES/TIMER 1 (...5)/T1(...21)-OFF*

adjustment range: 00:00 ... 00:00

factory setting: 05:00

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

Allocate the reference sensor in the expert menu.

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

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

Adjust the reference sensor in the expert menu.

Each timer function provides up to 21 time frames (3 for each day). The relay allocated to the function block is activated as long as the time frame (t(x)on ... t(x)off) is open. The switching conditions of all other activated functions of the function block have to be fulfilled as well.

### 4.2.1 Heating circuits:

#### Internal heating circuit control:

ARRANGEMENT/HEAT. CIRCUIT/OPTIONS/HC

selection: „Yes“, „No“

factory setting: „No“

#### Flow temperature

ARRANGEMENT/HEAT. CIRCUIT/HC/TFLOW

#### Outdoor temperature

ARRANGEMENT/HEAT. CIRCUIT/HC/TOUO

#### Status heating circuit

ARRANGEMENT/HEAT. CIRCUIT/HC/HC STAT.

#### Set flow temperature

ARRANGEMENT/HEAT. CIRCUIT/HC/FLOW SET

#### Status afterheating

ARRANGEMENT/HEAT. CIRCUIT/HC/AFTERH.

#### Store temperature 1 (2)

ARRANGEMENT/HEAT. CIRCUIT/HC/T(2)ST

#### Night correction:

ARRANGEMENT/HEAT. CIRCUIT/HC/NIGHT CORR.

adjustment range: -20 ... +30 K

factory setting: -5 K

#### Day correction:

ARRANGEMENT/HEAT. CIRCUIT/HC/DAY CORR.

adjustment range: -5 ... +45 K

factory setting: 5 K

#### Maximum flow temperature:

ARRANGEMENT/HEAT. CIRCUIT/HC/TFLOWMAX

adjustment range: 10 ... +100 °C

factory setting: 50 °C

The controller can control up to 4 independent weather-compensated heating circuits. One heating circuit can be controlled via the internal control functions and the others via an additional external module RESOL HKM3 each.

The internal heating circuit is activated in this menu.

The TFlow-value indicates the measured actual flow temperature of the heating circuit.

The Temperature-outdoor-value indicates the measured outdoor temperature depending on weather conditions.

Display of heating circuit status (summer, day, night, defect).

The flow set temperature is calculated from the measured outdoor temperature and the heating curve. Onto this, the dial setting of the remote control (RTA11-M) and the controller day correction or night correction are added. Flow set temperature = heating curve temperature + remote control + (day correction or night correction). If the calculated flow set temperature is higher than the adjusted maximum flow temperature, the flow set temperature will be equated with the maximum flow temperature.

Display of afterheating status (on, off).

Display of store temperature(s) of the heating circuit afterheating.

Adjustment channel for night correction (night set back) of the heating circuit. For the night correction function, time frames (see below) can be adjusted. Within these timeframes, the set flow temperature of the curve will be decreased (set back) by the adjusted temperature value.

Adjustment channel for the day correction function of the heating circuit. The day correction function is always active **outside** the 3 time frames of the night correction function. The flow set temperature of the curve will be decreased or increased by the adjusted temperature value.

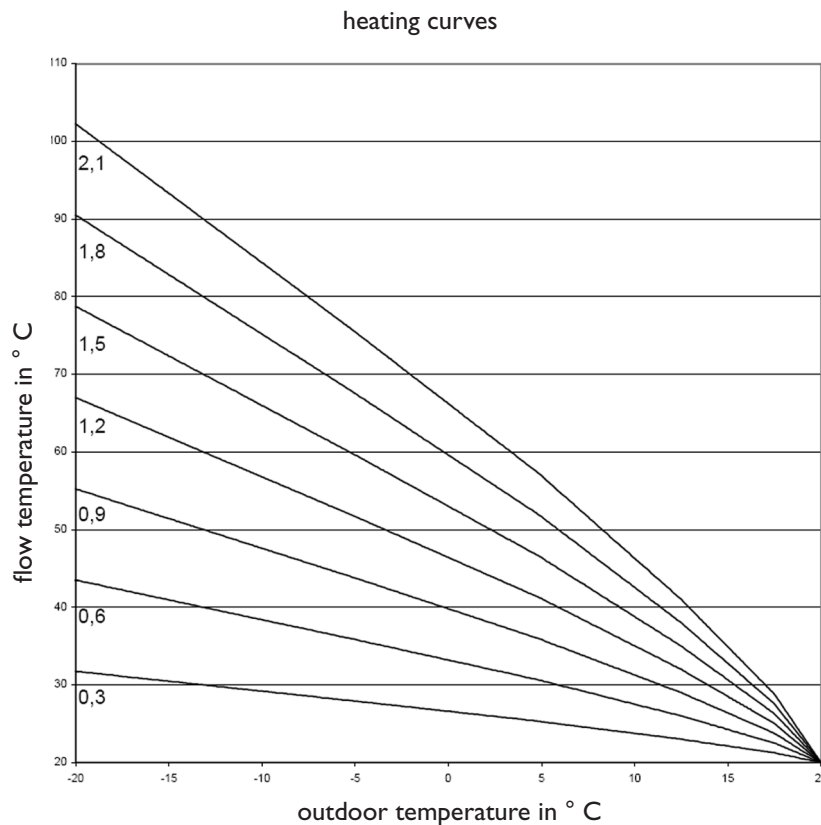
Adjustment channel for the admissible maximum flow temperature of the heating circuit. If the maximum flow temperature is exceeded, the heating circuit will be switched off (the mixer will close).

**Heating curve:***ARRANGEMENT/HEAT. CIRCUIT/HC/HEAT. CURVE*

adjustment range: 0,3 ... 3,0

factory setting: 1,0

The heating curve used by the controller can be increased or decreased to suit the building heating load as shown in the family of curves below. Increasing this value has the effect of raising the flow set temperature, reducing the value will lower the flow set temperature.

**Mixer:***ARRANGEMENT/HEAT. CIRCUIT/HC/MIXER*

adjustment range: 1 ... 20 s

factory setting: 4 s

The mixer function controls the mixing valve position according to the difference between the actual flow temperature and the set flow temperature. The valve is opened or closed in pulses depending on this deviation. The parameter „mixer“ allows the pulse operating time to be matched to suit the valve operating time.

**Sommer:***ARRANGEMENT/HEAT. CIRCUIT/HC/SUMMER*

adjustment range: 0 ... 40 °C

factory setting: 20 °C

Adjustment channel for summer operation. If the outdoor temperature exceeds the adjusted value, the heating circuit will be switched off. The hysteresis is 1,0 K.

**Timer:***ARRANGEMENT/HEAT. CIRCUIT/HC/TIMER/MODE*

selection: "Night/Day", "Off/Day", "Without"

factory setting: "Night/Day"

*ARRANGEMENT/HEAT. CIRCUIT/HC/TIMER/T1...21-ON*

adjustment range: 00:00 ... 00:00

factory setting: 22:00 (t1...t7-on)

*ARRANGEMENT/HEAT. CIRCUIT/HC/TIMER/T1...21-OFF*

adjustment range: 00:00 ... 00:00

factory setting: 05:00 (t1 ... t7-off)

**Example:** The night correction runs from Monday to Tuesday from 22:00 to 6:00 and Tuesday from 15:00 to 18:00, when t1-on is set to mon 22:00, t1-off to tue,6:00 and t2-on to tue,15:00 and t2-off to tue,18:00.

**Flow sensor:***ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/SEN.FLOW*

adjustment range: 1 ... 10

factory setting: 6

**Outdoor temperature sensor:***ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/SEN. OUT-DOOR*

adjustment range: 1 ... 10

factory setting: sensor 7

**Afterheating***ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/AFT.-HEAT*

selection: „None“, „Therm.“, „Store“

factory setting: „None“

*ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/ΔT AH ON*

adjustment range: -15,0 ... 49,5 K

factory setting: 4,0 K

*ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/ΔT AH OFF*

adjustment range: -14,5 ... 50,0 K

factory setting: 14,0 K

The timer determines whether day correction or night correction (set back ) is used for changing the set flow temperature. 21 different time frames (3 for each day) can be set for night correction of the heating circuit.

If one of the time frames is set to 'active', night correction will be active.

If none of them is active, the set flow temperature will be adapted with day correction. The timers are pre-allocated such that every day from 10:00 pm to 5:00 am (the following day) night set back is active.

The **mode** determines the operation mode of the timer:

*NIGHT/DAY* time frame for night correction*OFF/DAY* time frame for heating circuit off*WITHOUT:* timer deactivated

Adjustment channel for allocating the sensor in flow.

The default is sensor 6 – this can be reallocated if needed. A sensor which is already in use can be allocated without influencing its original function in the system.

Adjustment channel for allocating the outdoor temperature sensor.

The default is sensor 7 – this can be reallocated if needed. A sensor which is already in use can be allocated without influencing its original function in the system.

**Note:**

If additional external modules HKM3 are used, only 1 outdoor temperature sensor is required. In order to ensure that all heating circuits use the same outdoor temperature, adjust to sensor 13.

The set flow temperature is compared with the temperature at one or two store (buffer) reference sensors (differential control). If this temperature differential is too small ( $\Delta TH_{on}$ ), afterheating will be activated. It will be switched off, if the differential ( $\Delta TH_{off}$ ) between store and set flow temperature is large enough.

Select the after-heating type via the parameter "Aft.-Heat." ("None", "Therm.", or "Store").

If "None" is selected, no afterheating will be carried out.

If "Therm." is selected, the set flow temperature is compared with a store reference sensor.

If "Store" is selected, the comparison is made with 2 reference sensors. The switching conditions to both reference sensors have to be fulfilled.

**Sensor 1 store***ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/S1 STORE*

adjustment range: 1 ... 10

factory setting: 4

With this parameter, the 1<sup>st</sup> reference sensor for heating circuit afterheating can be selected.

**Sensor 2 store***ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/S2 STORE*

adjustment range: 1 ... 10

factory setting: 5

With this parameter, the 2<sup>nd</sup> reference sensor can be selected for store-dependent afterheating.

**Afterheating demand***ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/REL. AHOFF*

selection: „DSE“, „HC1“, „HC2“, „HC3“

factory setting: „DSE“

Select the relay by means of which afterheating is demanded (DSE or heating circuit module).

Allocate minimum runtime and overrun time of the relay.

*ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/AH-MIN.*

adjustment range: 0 ... 90 min

factory setting: 0 min

*ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/AH*

adjustment range: 0 ... 1000 s

factory setting: 0 s

**Manual correction (remote control)***ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/MAN. CORR.*

selection: „Yes“, „No“

factory setting: „No“

The remote control (RTA11-M) allows manual adjustment of the heating curve ( $\pm 15$  K). The remote control is optional and it is not included in the full kit.

The heating circuit can be switched off manually, if the remote control is set to the position “heating circuit off”. Heating circuit switched-off means that the heating circuit pump is switched off and the mixer closed.

Flow temperature is boosted to maximum for rapid heating when the remote control it is set to “rapid heating”.

**Sensor remote control***ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/SEN. REMOTE*

adjustment range: 1 ... 10

factory setting: 8

Adjustment channel for allocating the remote control sensor. The factory setting is sensor 8.

**Chimney sweeper***ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/CHIMNEY*

selection: “Yes“, “No“

factory setting: “No“

When this option is activated, the heating circuit opens (mixer opens) and the heating circuit pump is switched-on (provided that the chimney sweeper function is active, see 4.4). The protective function of the heating pump maximum limitation will still be active.

## External heating module:

### Heating circuit module

*ARRANGEMENT/HEAT. CIRCUIT/OPTIONS/HCI(2,3)MODULE*

selection: „Yes“, „No“

factory setting: „No“

*ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/SEN. OUTDOOR*

adjustment range: 1 ... 17

factory setting: 7

change to: 13

### Store priority:

*ARRANGEMENT/HEAT. CIRCUIT/HCI(2,3)MODULE/STORE*

*PRIO.*

selection: „On“, „Off“

factory setting: „Off“

*ARRANGEMENT/HEAT. CIRCUIT/HC-MODULE/...*

### Screed drying option

*SCREED HEAT*

Selection: „Yes“, „No“

Factory setting: „No“

*TSTART*

Adjustment range: 10.0... 59.0 °C

Factory setting: 20.0 °C

*TMAX*

Adjustment range: 11.0... 60.0 °C

Factory setting: 40.0 °C

*RISE*

Adjustment range: 1.0 ... 10.0 K

Factory setting: 2.0 K

*RISE TIME*

Adjustment range: 1 ... 72 h

Factory setting: 24 h

*TBACKING*

Adjustment range: 1 ... 20 d

Factory setting: 5 d

*START*

Selection: „Yes“, „No“

Factory setting: „No“

Up to 3 additional external heating circuit modules (HKM) can be activated if further compensated heating circuits are required.

If the external heating circuit module HKM3 is additionally used, only 1 outdoor temperature sensor is required.

In order to ensure that all heating circuits control using the same outdoor temperature, adjust to sensor 13 and connect the external sensor to the HKM module.

This function switches off the heating circuit when domestic hot water is being afterheated.

For this purpose, the option domestic hot water priority and afterheating via store loading (see 4.2) of the controller DeltaSol® E have to be active as well.

The displays and functions are comparable to those of the internal heating circuit (see also manual „RESOL HKM3“).

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

The heating circuits can be selected in the **Arrangement/Heat. circuit/HC/Expert** menu. At the end of this menu, the function can be set to standby by using the „Start“ item.

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

#### Note:

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

**DHW heating option**

(available only when the heating circuit afterheating has been activated)

*ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/DHW HEAT.*

Selection: „Yes“, „No”

Factory setting: „No”

**DHW priority option**

(available only when the DHW heating option has been activated)

*ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/DHW PRIORITY*

Selection: „Yes“, „No”

Factory setting: „No”

*ARRANGEMENT/TDHW/TDHW ON*

Adjustment range: 0,0 ... 94,0 °C

Factory setting: 50,0 °C

*ARRANGEMENT/TDHW/TDHW OFF*

Adjustment range: 1,0 ... 95,0 °C

Factory setting: 55,0 °C

*ARRANGEMENT/TDHW/TIMER*

Selection: „Yes“, „No”

Factory setting: „No”

*ARRANGEMENT/TDHW/TIMER/T1(...21)-ON*

Adjustment range: 00:00 ... 00:00

Factory setting: Mo., 06:00 (t1-on), Mo., 17:00 (t2-on)...

*ARRANGEMENT/TDHW/TIMER/T1(...21)-OFF*

Adjustment range: 00:00 ... 00:00

Factory setting: Mo., 09:00 (t1-off), Mo., 22:00 (t2-off)...

**Loading pump option**

(available only if relay 3 DeltaSol® E is free)

*ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/LOAD P.*

Selection: „Yes“, „No”

Factory setting: „No”

*ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/SEN. DHW*

Selection: 1 ... 10

Factory setting: 3

**Legionella protection option**

*ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/LEGIO PROT.*

Selection: „Yes“, „No”

Factory setting: „No”

The DHW heating function can be used to heat the DHW store by demanding an afterheating.

The allocated demand relay of the heating circuit is switched on when the temperature at the allocated sensor Sen. DHW falls below the adjusted switch-on temperature TDHW. When the temperature at the allocated sensor exceeds the adjusted switch-off temperature TDHW off, the relay is switched off.

When the Timer option is activated, a weekly timer appears. With this timer, time frames for the functions can be adjusted.

When the Loading pump option is activated, the loading pump is switched on in parallel to the DHW afterheating demand.

The Legionella protection option can be used to contain the spread of Legionella in DHW stores by systematically activating the afterheating.

When the Legio prot. option is activated, the controller heats up the DHW store such that the temperature at Sen. DHW exceeds a temperature of 60 °C for 30 minutes every day at 7:00 p.m.

### 4.3 Menu: Heat quantity measurement

*WMZ/OPTIONS/WMZ (WMZ-MODULE)*

selection: „Yes“, „No“

factory setting: „No“

*WMZ/WMZ 1/ EXPERT/ FLOWMETER*

selection: „Yes“, „No“

factory setting: „No“

*WMZ/WMZ 1/ EXPERT/ SEN. FLOW*

adjustment range: 1 ... 10

factory setting: 9

*WMZ/WMZ 1/ EXPERT/ SEN. RETURN*

adjustment range: 1 ... 10

factory setting: 10

#### Heat quantity measurement without flowmeter RESOL V40

Set *WMZ/OPTIONS/WMZ* to „Yes“ and

*WMZ/WMZ 1/ EXPERT/ FLOWMETER* to „No“

*WMZ/WMZ 1/ EXPERT/ FLOW*

adjustment range: 1,0 ... 50,0 l

factory setting: 3,0 l

*WMZ/WMZ 1/ EXPERT/ RELAY*

adjustment range: 1 ... 7

factory setting: 1

#### Heat quantity measurement with flowmeter RESOL V40

Set *WMZ/OPTIONS/WMZ* to „Yes“ and

*WMZ/WMZ 1/ EXPERT/ FLOWMETER* to „Yes“

*WMZ/WMZ 1/ EXPERT/ VOL./ PULS.*

adjustment range: 0,5 ... 99,5 (liter/pulse)

factory setting: 1 (liter/pulse)

#### Antifreeze type

*WMZ/WMZ 1/ EXPERT/ ANTIFREEZE TYPE*

selection: 0, 1, 2, 3

factory setting: 1

#### Antifreeze

*WMZ/WMZ 1/ EXPERT/ ANTIFREEZE*

adjustment range: 20 ... 70 Vol %

factory setting: 40 Vol %

#### Heat quantity

*WMZ/WMZ 1/ HEAT*

The controller has a separate integrated calorimeter which can be configured with or without flowmeter V40. Furthermore, the values of a separate WMZ module can be displayed.

Allocate the sensors. Factory settings are as shown – but other sensors can be allocated without influencing their original function in the system.

The heat quantity measurement calculation (estimation) uses the difference between flow and return temperature and the user entered flow rate. The flow rate should be read from the window of the flow setter at 100 % pump speed. Heat quantity measurement is carried out when the output selected in the „RELAY“ menu is active.

The heat quantity measurement calculation uses the difference between flow and return temperature and the volume flow transmitted by the flowmeter.

Adjust the pulse rate corresponding to the flowmeter V40 used (see the flag on the V40 cable):

V40-06: 1 litre/pulse

V40-15: 10 litres/pulse

others: 25 litres/pulse

Adjustment channel to ensure the controller uses the correct specific heat capacity for the heat transfer fluid used.

0 for water

1 for propylene glycol

2 for ethylene glycol

3 for Tyfocor® LS

Adjustment channel for the concentration water/ glycol for antifreeze types 1 and 2.

The overall heat quantity results from the sum of the values in Wh, kWh and MWh.

The different values can be reset to 0. To reset, select the desired value and answer the security prompt „Save?“ with „No“.



#### 4.4 Menu: Expert

##### System warning “ $\Delta T$ too high“

*EXPERT/ $\Delta T$  TOO HIGH*

selection: „Yes“, „No“

factory setting: „Yes“

##### System warning “Non-ret. valve“

*EXPERT/NON-RET. VAL.*

selection: „Yes“, „No“

factory setting: „Yes“

##### Message relay (error message)

*EXPERT/MESSAGE REL.*

selection: „Yes“, „No“

factory setting: „No“

##### Chimney sweeper

*EXPERT/CHIMNEY*

selection: “Yes“, “No“

factory setting: “No“

*EXPERT/CHIMNEY SWEEPER*

##### Solar shutdown

*EXPERT/SOLAR*

selection: “Yes“, “No“

factory setting: “Yes“

##### Sensor offset

*EXPERT/SENSORS/CS-TYPE*

selection: A, B, C, D, E

factory setting: E

*EXPERT/SENSORS/CS ADJUST*

*EXPERT/SENSORS/CS OFFSET*

*EXPERT/SENSORS/SENSOR 1 (...10)*

selection: -5,0 ... 5,0 K

factory setting: 0,0 K

##### Minimum speed

*EXPERT/RELAY/MIN SPEED 1 (...3)*

adjustment range: 30 ... 100 %

factory setting: 30 %

This message is shown, if solar loading has been carried out for a period of 20 minutes with a differential higher than 50 K.

The message function can be deactivated by selecting “No“.

This message is shown if between 11 p.m. and 5.00 a.m. the collector temperature is higher than 40 °C or a store is loaded because of a high temperature difference.

The message function can be deactivated by selecting “No“.

Activate this function by selecting “Yes“. If the controller detects a fault, the message relay is energised (e.g. for signal lights).

These errors are::

- Sensor defective
- Real-time-clock (RTC) defective
- Storage module (EEPROM) defective

A message caused by one of the plausibility controls (non-return valve,  $\Delta T$  too high) does not activate the relay.

This function is used for activating a given relay state when required.- e.g. flue gas measurement if the system controls a boiler. Activate this function by selecting “Yes“.

Adjust the required relay status in the chimney sweeper menu (expert/chimney sweeper).

If the chimney sweeper function is activated, “chimney sweeper“ is indicated in the main menu.

In this menu, the menu level and „solar“ control are deactivated. The sensors of the solar thermal system will no longer be monitored for errors.

Adjust the CS-type in this menu. The CS-type should be matched to the code letter printed on the CS type label.

The CS-offset adjustment should be carried out with the irradiation sensor disconnected.

Furthermore, an offset for sensors 1 ... 10 can be carried out.

Relays 1 to 3 are semiconductor relays for pump speed control of standard pumps. Relative pump speed is adapted in 10 % steps to the current temperature difference between the collector and the store (see also 4.1 speed control).

In some cases, it is necessary to adapt the factory setting of the minimum pump speed (30%). If it is set to 100 %, pump speed control is deactivated (valves).

## Maximum speed

*EXPERT/RELAY/MAX SPEED1 (...3)*

Adjustment range: 30 ... 100%

Factory setting: 100 %

## Pump speed control

*EXPERT/RELAY/SIGNAL1 (...3)*

Selection: On/Off, Puls, PSol, Phea, 0-10V

Factory setting: Puls

Relay allocation:

Control 1 for R1/PWMA

Control 2 for R1/PWMA

Control 3 for R1/PWMA

### **WARNING! Electric shock!**



During the overrun time, the relay symbol disappears from the display and the pump is inactive, but the relay is still energised!

➔ **Switch off power supply and disconnect the device from power supply before working on the device or the cables connected!**

## Language

*EXPERT/LANGUAGE*

factory setting: „Deutsch“

## 4.5 Menu: VBus

*EXPERT/VBUS*

*EXPERT/VBUS/OPTIONS*

Selection: SDFK, SD6

Factory setting: -

*EXPERT/VBUS/SDFK/CHANNEL 1 (...4)*

Adjustment range: S1...S10 (channel 1...3), R1...7 (channel 4)

Factory setting: -

*EXPERT/VBUS/SD6/CHANNEL 1 (...6)*

Adjustment range: S1...S10 (channel 1...6), R1...7 (channel 1...6), WMZ (only the internal calorimeter can be allocated to channel 6)

Factory setting: -

## 4.6 Menu: Manual mode

*MANUAL OPERATION/ALL RELAYS*

*MANUAL OPERATION/RELAY 1 (...7)*

selection: Off, Min, Auto, Max

factory setting: Auto

In the „Max speed“ channel, a maximum pump speed can be adjusted for the corresponding output.

With this parameter, the pump control type can be adjusted.

The following types can be selected:

Adjustment for standard pump without speed control

- On/Off (pump on / pump off)

Adjustment for standard pump with speed control

- PULS (pulse packet control via semiconductor relay)

Adjustment for high efficiency pump (HE pump)

- PSOL (PWM profile for a high-efficiency solar pump)

- PHEA (PWM profile for a high-efficiency heating pump)

- 0-10V (speed control via a 0-10V signal)

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

In the submenu „language“, different languages are available (German, English, French, Castellano, Italian).

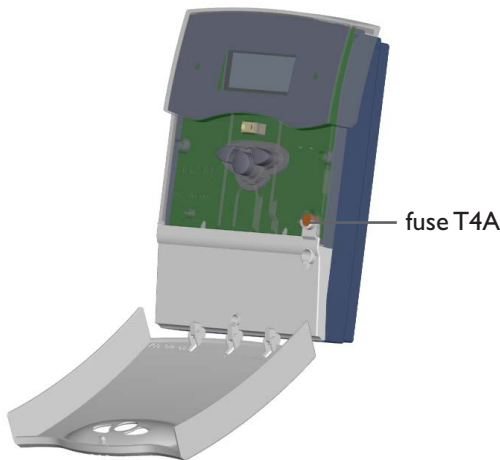
In this menu, sensors and relays can be allocated to the channels of a SDFK or SD6 connected.

Activate the corresponding VBus® package (SDFK, SD6) in the Options menu.

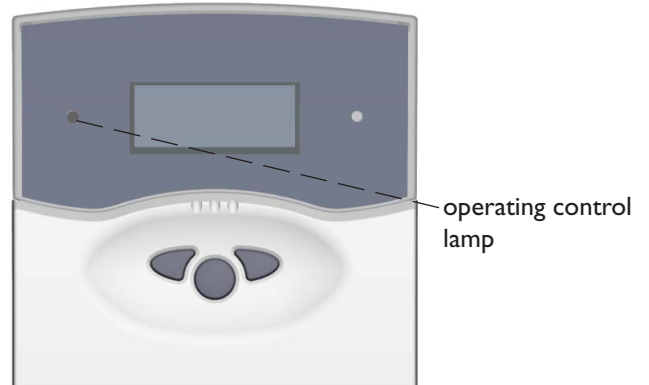
Allocate the sensors and relays in the sub-menus of the SDFK and SD6 channels.

In this menu, individual or all relays can be switched-on (relay test), switched-off, or set into automatic mode.

### 5. Troubleshooting



In the case of an error, a message is shown on the display of the controller:



Control lamp flashes red.

Sensor defect. An error code instead of a temperature is displayed in the sensor display channel.

888.8

- 888.8

Cable broken.  
Check cable.

Short circuit.  
Check cable.

Disconnected Pt1000 temperature sensors can be checked with an ohmmeter. In the following table, the resistance values with the corresponding temperatures are shown.

°C	Ω	°C	Ω
-10	961	55	1213
-5	980	60	1232
0	1000	65	1252
5	1019	70	1271
10	1039	75	1290
15	1058	80	1309
20	1078	85	1328
25	1097	90	1347
30	1117	95	1366
35	1136	100	1385
40	1155	105	1404
45	1175	110	1423
50	1194	115	1442

resistance of the Pt1000 sensors

Control lamp off.

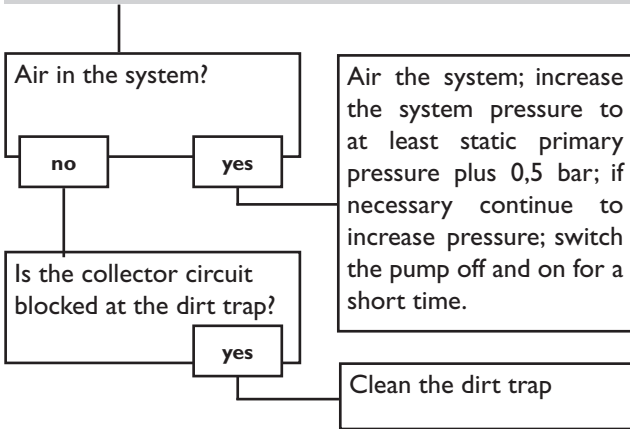
If the light is off, check the power supply of the controller..

no

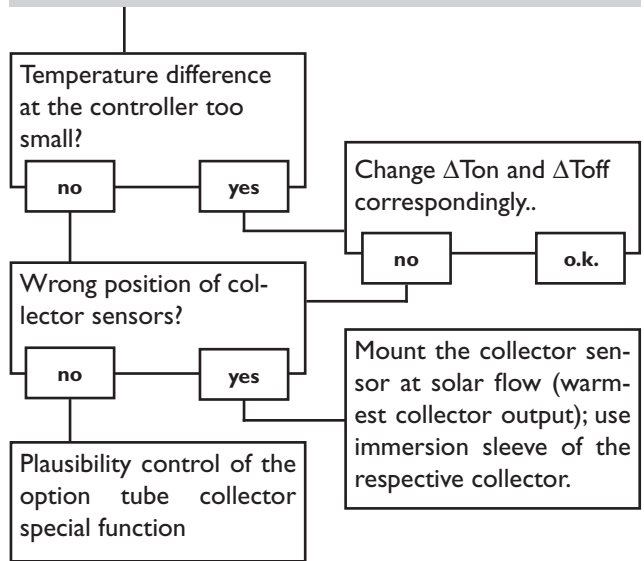
o.k.

The fuse of the controller is defective. This fuse can be replaced when the cover and the terminal cover are removed (spare fuse is enclosed in accessory bag).

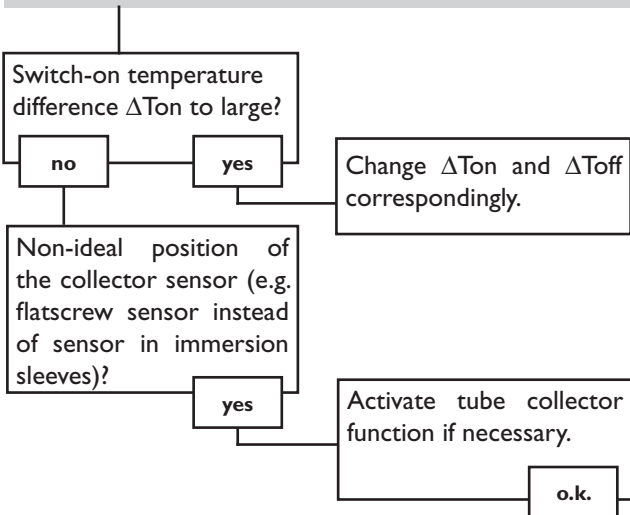
Pump is overheated, but no heat transfer from the collector to the store, flow and return have the same temperature; perhaps also bubble in the lines.



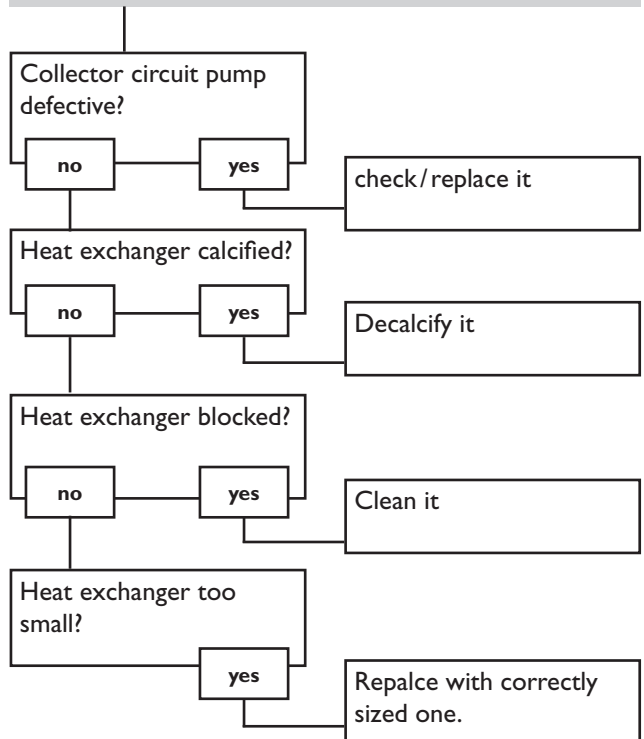
Pump starts for a short moment, switches-off, switches-on again, etc.

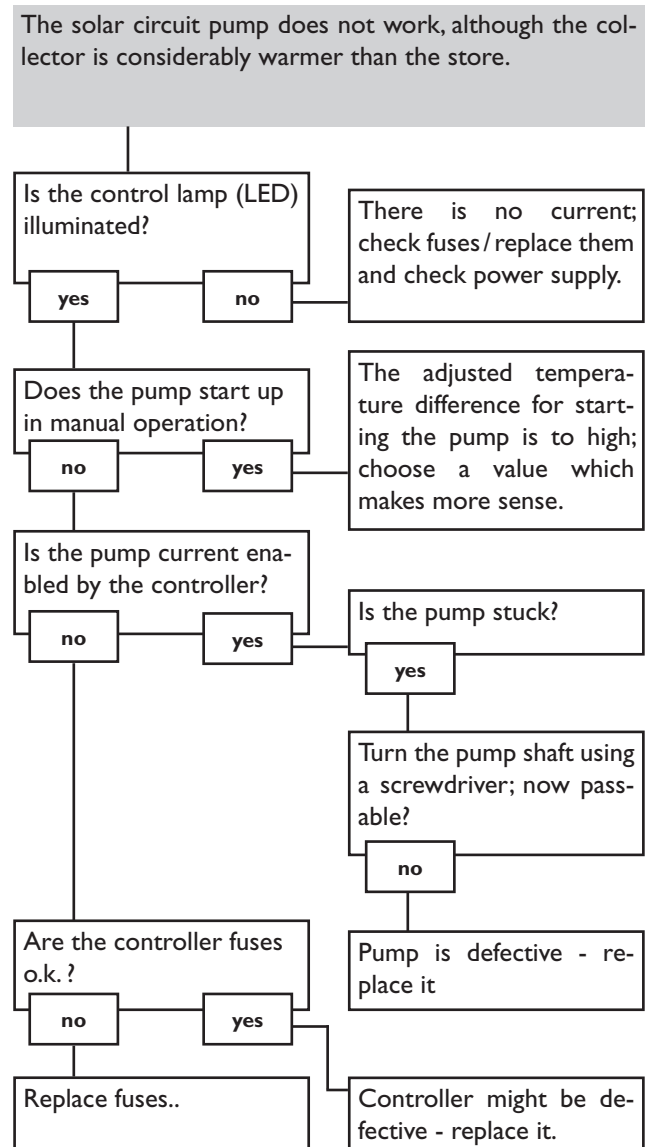
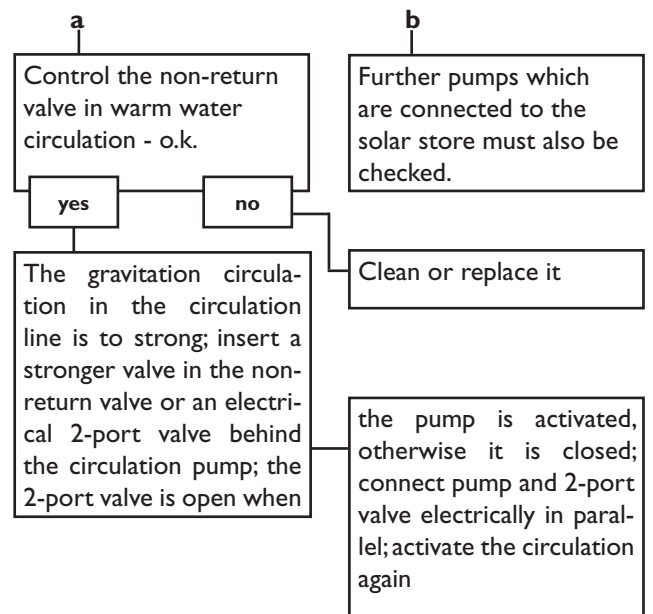
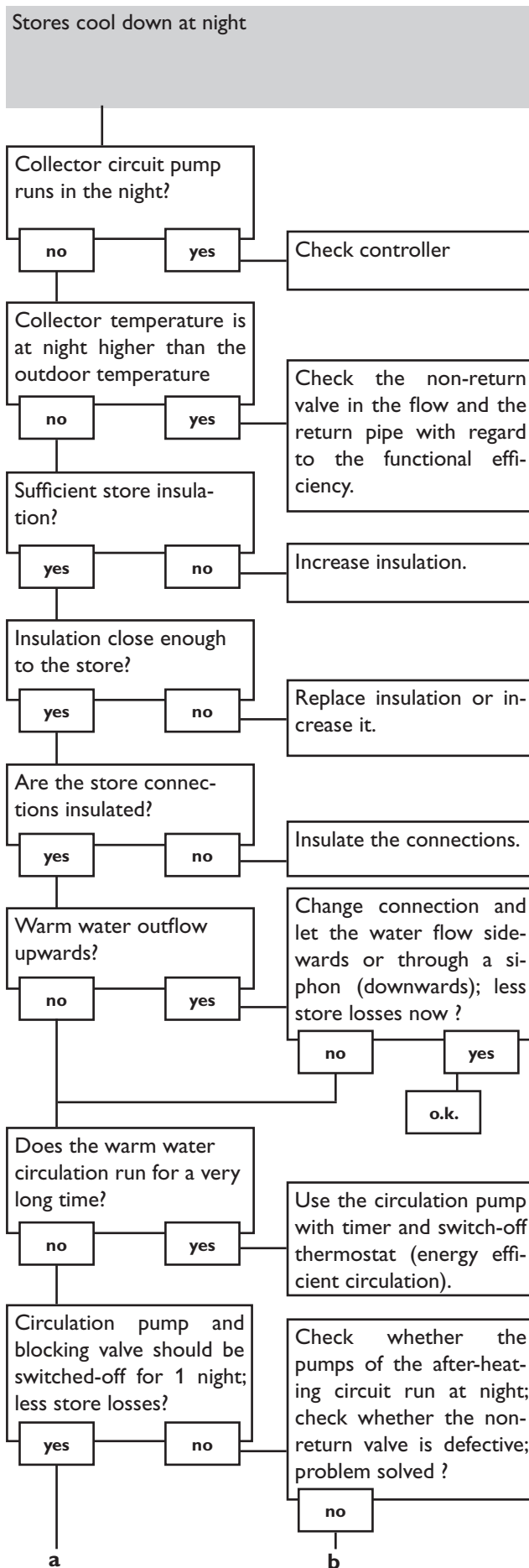


Pump starts up very late



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





## 6. Accessories

### 6.1 Sensors and measuring instruments



#### Temperature sensors

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



#### Overvoltage protection device

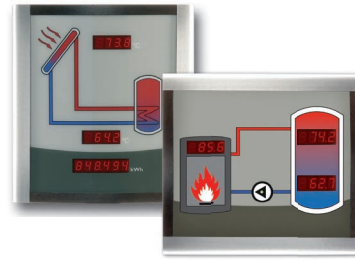
In order to avoid overvoltage damage at collector sensors (e.g. caused by local lightning storms), we recommend the overvoltage protection RESOL SP10.



#### V40 flowmeter

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

### 6.2 VBus® accessories



#### Smart Display SD3 / Large Display GA3

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

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



#### AM1 Alarm module

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

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



**HKM3 Heating circuit extension module**

The HKM3 heating circuit extension module enables the control of an additional heating circuit. A simple VBus® connection is enough to add a complete weathercompensated heating circuit to the controller. The HKM3 is equipped with 6 sensor inputs, one of which can be used for the optional RTA11-M remote control. Four semiconductor relays are available for controlling the mixing valve and the heating circuit pump. Additionally, a potential-free relay can be used for afterheating demand. In combination with the controller connected, the HKM3 not only controls the basic functions of the heating circuit and the DHW priority, it also has an antifreeze function and a blocking protection for the heating circuit pump.



**DL2 Datalogger**

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



**DL3 Datalogger**

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



**VBus.net**

The Internet portal for easy and secure access to your system data. VBus.net is all about the data of your RESOL controller. Live data of your system, customized filter settings and much more await you.

**6.3 Interface adapters**

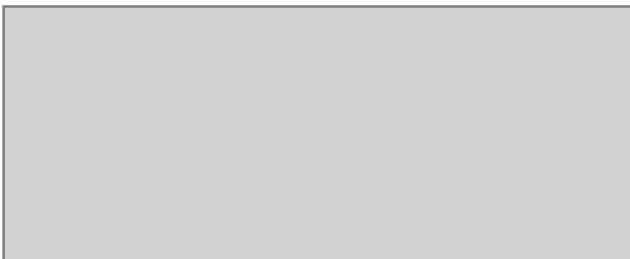


**RESOL VBus®/USB & VBus®/LAN interface adapters**

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

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

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**Important note**

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

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

**Note**

The design and the specifications can be changed without notice.

The illustrations may differ from the original product.

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