RESOL DeltaSol® E

Mounting

Connection

Operation

Troubleshooting

48005340

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

DeltaSol® E

en-US/CA

Manual

www.resol.com

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General

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!

Equipment to be installed and used in accordance with the rules of the National Electrical Code (NEC) or with Canadian Electrical Code (CEC), Part I.

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.

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 qualified personnel named by the manufacturer.

Information about the product

Proper usage

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

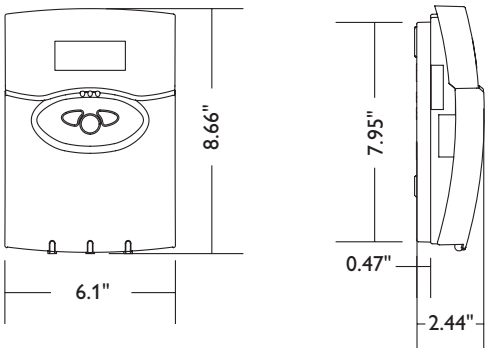
CE

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.

- 30 system layouts to choose from
- pump speed control, solar operating hours counter and energy metering
- 13 sensor inputs
- 7 relay outputs
- function control
- RESOL VBus®



The DeltaSol® E controller is designed for solar thermal systems and heating systems. It is pre-programmed for 7 basic systems and up to 30 variations which can even be used to control large systems. A multitude of adjustable functions and options are possible using 7 relay outputs, 13 sensor inputs for Pt1000, CS10, V40 and Din. 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 permits 2-way communication between modules, PCs or data loggers.

Included:

1 x DeltaSol® E

1 x accessory bag
- 2 x screw and wall plug
- 8 x strain relief and screw
- 1 x capacitor 4,7 nF

Technical Data:

Housing: plastic, PC-ABS and PMMA

Protection type: IP 20 / EN 60529

Ambient temp.: 32 ... 104 °F

Dimensions:
8.66" x 6.10" x 2.44"

Mounting: Wall mounting, mounting into patch-panels is possible

Display: 4-line LCD text display

Operation: 3 push buttons at the front

Functions: Solar system controller for use in solar thermal systems and conventional heating systems. With pre-programmed and selectable system layouts such as: standard-solar system, 2-tank systems, east-/west collector, heating circuit backup, heat exchange control, thermostatic backup heating, solid fuel boiler, further functions and options such as energy metering, collector cooling function, tube collector function, frost protection, minimum temperature limitation, speed control

Sensor inputs: 10 sensor inputs for Pt1000, 1 x CS10, 1 x V40/DIN

Relay output: 7 relay outputs: 3 semiconductor relays for speed control, 1 dry contact output

Bus: VBus®

Power supply: 115 V~

Switching capacity:
1 A (semiconductor relays)
2 A (electromechanical relays)
4 A (dry contact relay)
4 A sum of all relays
115 V~

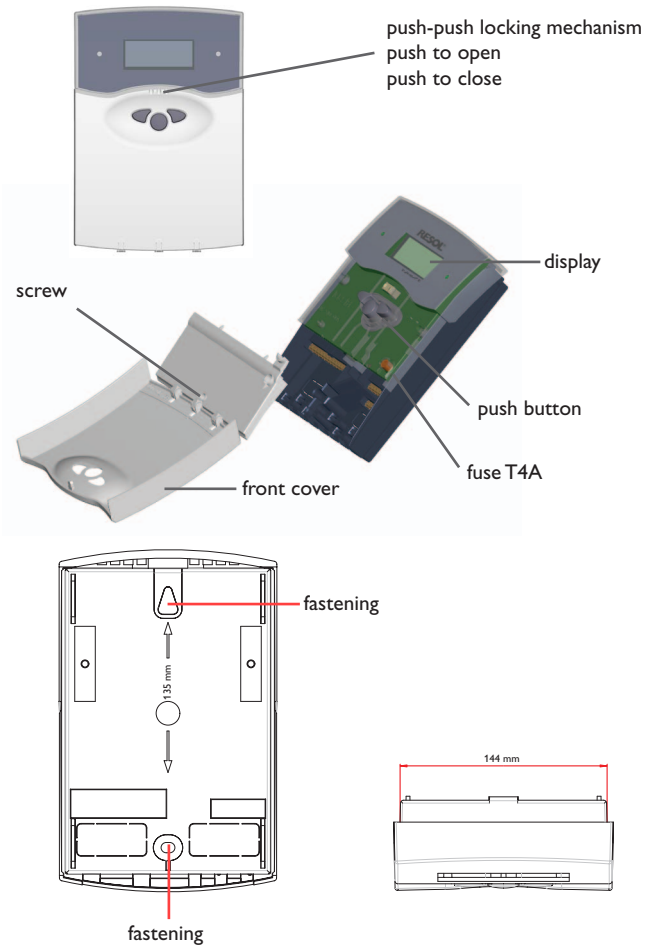
Rated impulse voltage: 2.5 kV

Mode of operation: Type 1.B / Type 1.Y

Degree of pollution: 2

1. Installation

1.1 Mounting to walls



WARNING!	Electric shock! Opening the housing will expose live parts! ➔ Switch off power supply and disconnect the device from power supply before opening the housing!

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 0.12" / 3 mm. Please pay attention to separate routing of sensor cables and power supply cables.

➔ 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.

➔ Mark the upper fastening point on the wall and drill and fasten the enclosed wall plug and screw leaving the head protruding.

➔ Hang the housing from the upper fastening point and mark the lower fastening point through the hole in the terminal box (centers on 5,3" / 135 mm). Drill and insert the lower wall plug.

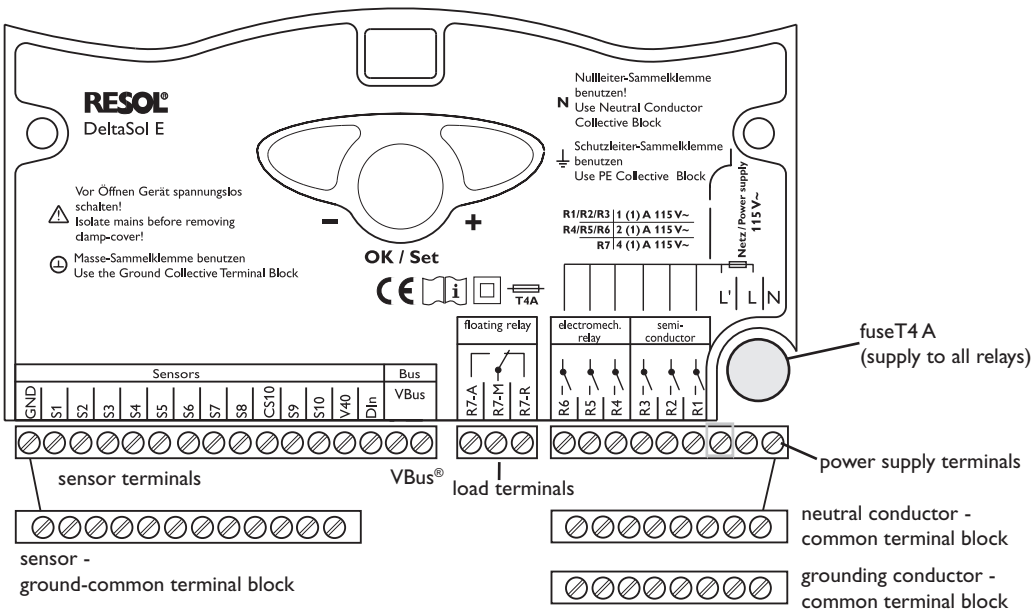
➔ Hang the housing from the upper fastening point and attach with the lower screw.

➔ Complete wiring connections in accordance with terminal allocations.

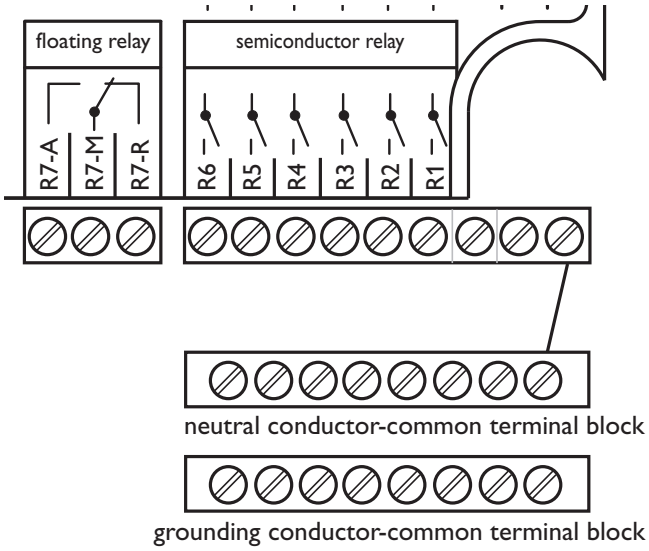
➔ Insert cover and attach with the cross-head screw. Close the front cover properly.

1.2 Electrical connection

1.2.1 Overview of electrical connections



1.2.2 Actuators
(pumps, valves etc.)



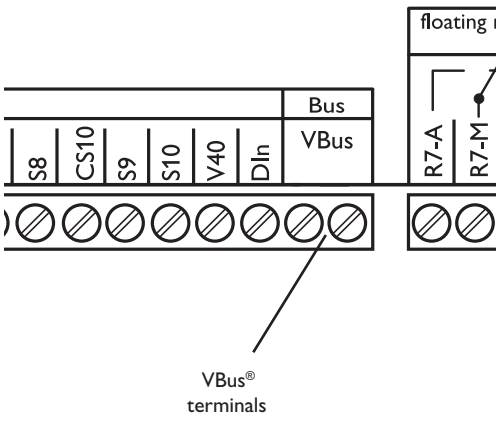
Note:
Relays R1 to R3 are semiconductor relays for pump speed control. A minimum load of 20 W (power consumption of the load) is required for faultless function. The capacitor from th e accessory bag must be connected in parallel to the respective relay output if it feeds auxiliary relays, motor valves, etc.
The minimum pump speed must be set to 100% when auxiliary relays or valves are connected.

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!

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 ...R3** are semiconductor relays, designed for pump speed control:
  R1 ...R3 = normally open R1 ...R3
  N = neutral conductor N (common terminal block)
  PE = grounding conductor PE (common terminal block)
- **Relays R4, R5 and R6** are electromechanical relays with 1 normally open contact:
  R4, R5, R6 = normally open R4, R5, R6
  N = neutral conductor N (common terminal block)
  PE = grounding conductor PE (common terminal block)
- **Relay R7** is a dry contact relay with change-over contact:
  R7-M = center contact R7
  R7-A = normally open R7
  R7-R = normally closed R7

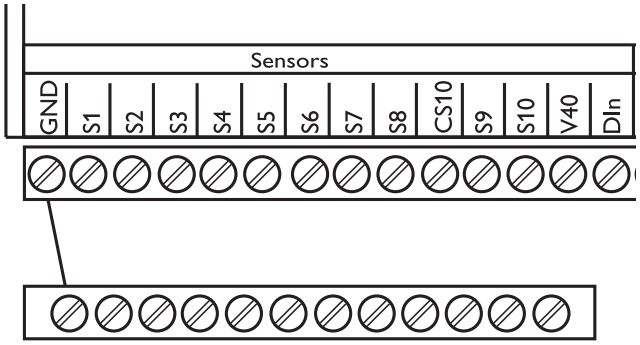
1.2.3 Data communication / bus



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

- RESOL calorimeter WMZ
- RESOL Large display module GA3 / Smart Display SD3
- RESOL DL2 Datalogger
- RESOL Heating circuit modules HKM (up to 3 modules)
- RESOL AM1 alarm module
- RESOL VBus®/PWM interface adapter
- RESOL VBus®/USB interface adapter

1.2.4 Sensors

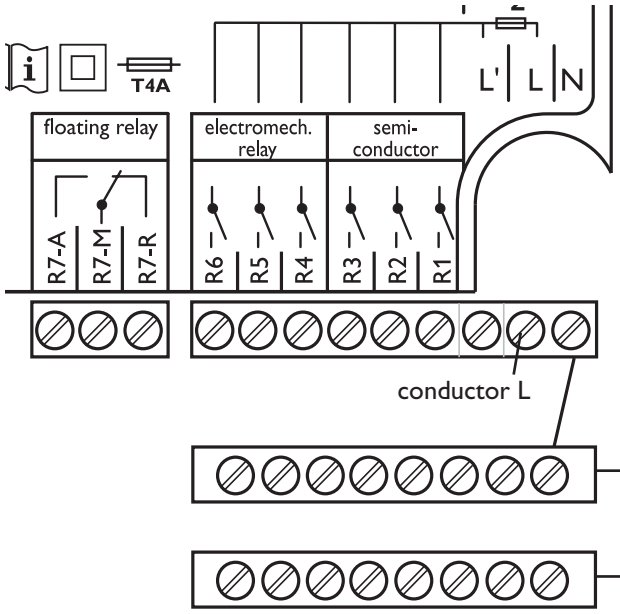


ground-common terminal block

The controller is equipped with 13 sensor inputs in total. The ground connection for the sensors has to be carried out via the ground terminal block (GND).

- Connect the **Temperature sensors** to the terminals S1 ... S10 and GND (either polarity)
- Connect the **irradiation sensor (CS10)** 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/DIN and DGND (either polarity).
  Or an **external message signal** can be connected to the terminals V40/DIN and DGND. When the signal contact closes the input Din, the message "!message ext." is generated. This signal is treated like an error, which means that the control lamp flashes red and the message relay is possibly energized.

1.2.5 Power supply

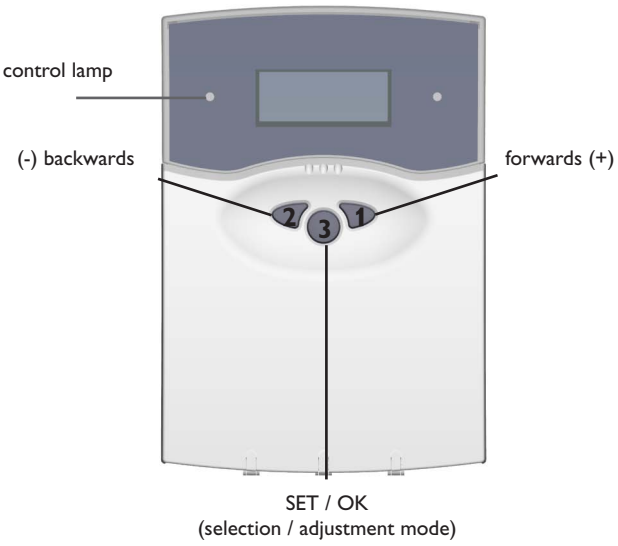


Connecting the device to the power supply must always be the last step of the installation!

The power supply to the controller must be carried out via an external power switch and the supply voltage must be 115 V~. 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 .

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 menus 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 choosen menu line is reached.

➔ Briefly press button 3 in the respective menu line to modifiy 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.

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. MEAS. VALUES
2. REPORTS
3. SOLAR
4. ARRANGEMENT
5. WMZ
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 sub-menus.

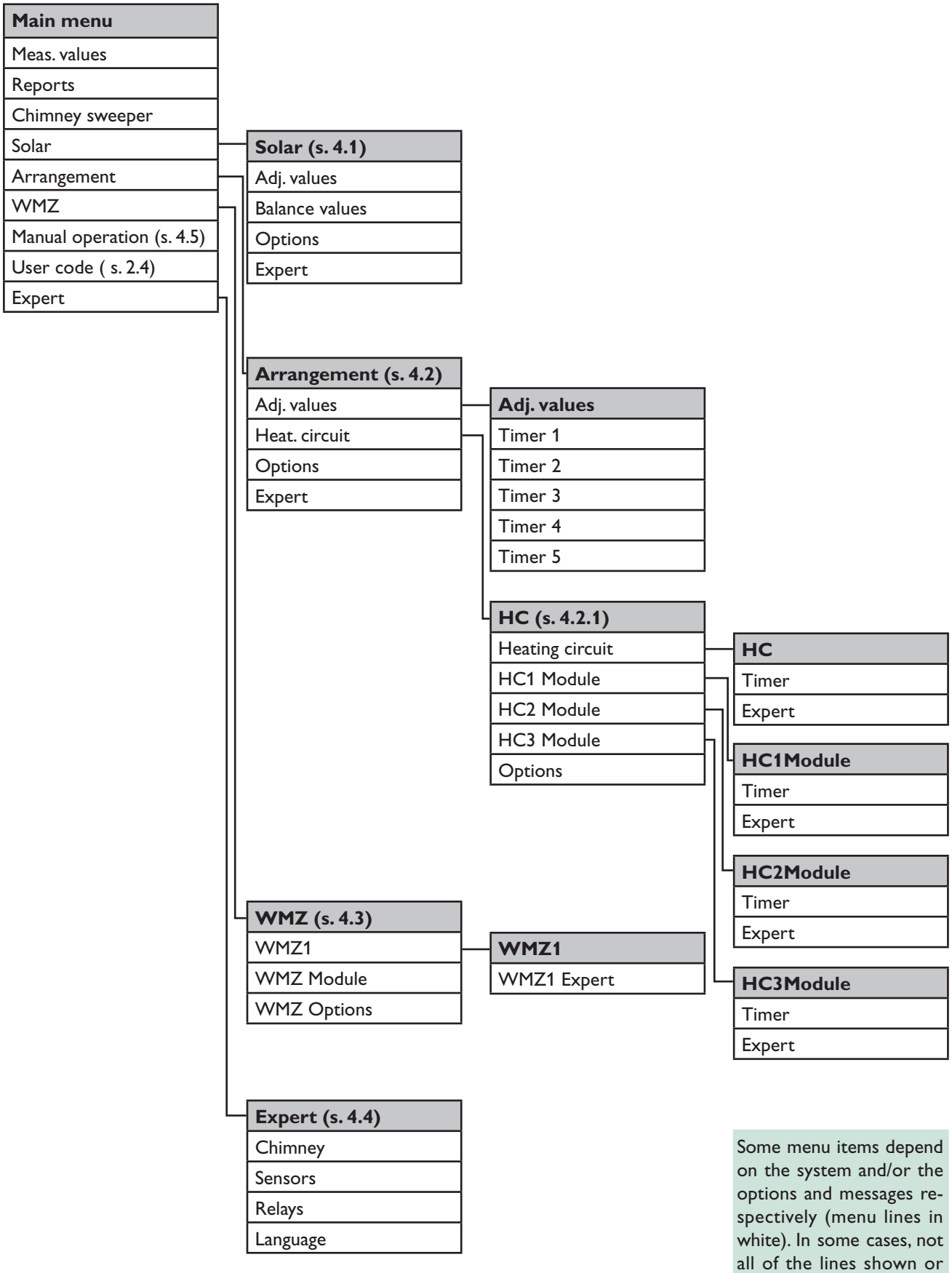
Note:
The choice of adjustment values and options depends on different functions and the user code. Some only appear in the display if they are available for the adjusted system parameters.

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 given to the customer!

Note:
After the menu point "user code" has been choosen, 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

3.1 Commissioning the controller

The controller is partially freely programmable. For special applications, the relays and the corresponding sensors are assigned in steps.
7 basic systems with different hydronic variations each are pre-programmed.

1. Adjust the basic system; sensors and relays will be allocated automatically (see 3.2 and 4.1).
2. Activate the internal heating circuit module if needed (see 4.2.1). If the corresponding relays are intended for other purposes, connect the external heating module(s) HKM.
3. Activate further options (bypass, external heat exchanger etc. see 4.1 and 4.2.)
4. Select free function blocks for further applications (return preheating, use of further heat sources; see 3.3 and 4.2.)
5. After every step, carry out special adjustments (switching conditions and limits; see 4.1 and 4.2).
6. A heat quantity measurement function (see 4.3) and other functions such as reports or chimney sweeper can be activated.

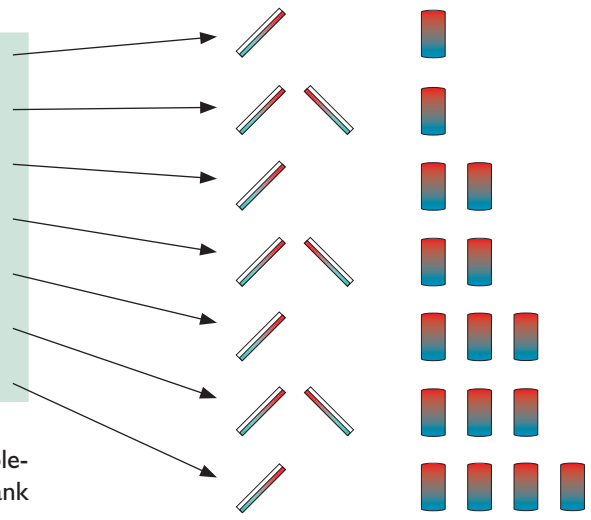
Alternatively, one of the 30 pre-programmed system layouts can be selected (see 4.1).

The controller can be adjusted in steps (see 3.4.). All functions, options and menu items are described in detail in chapter 4.

3.2 Basic systems and hydronic variations

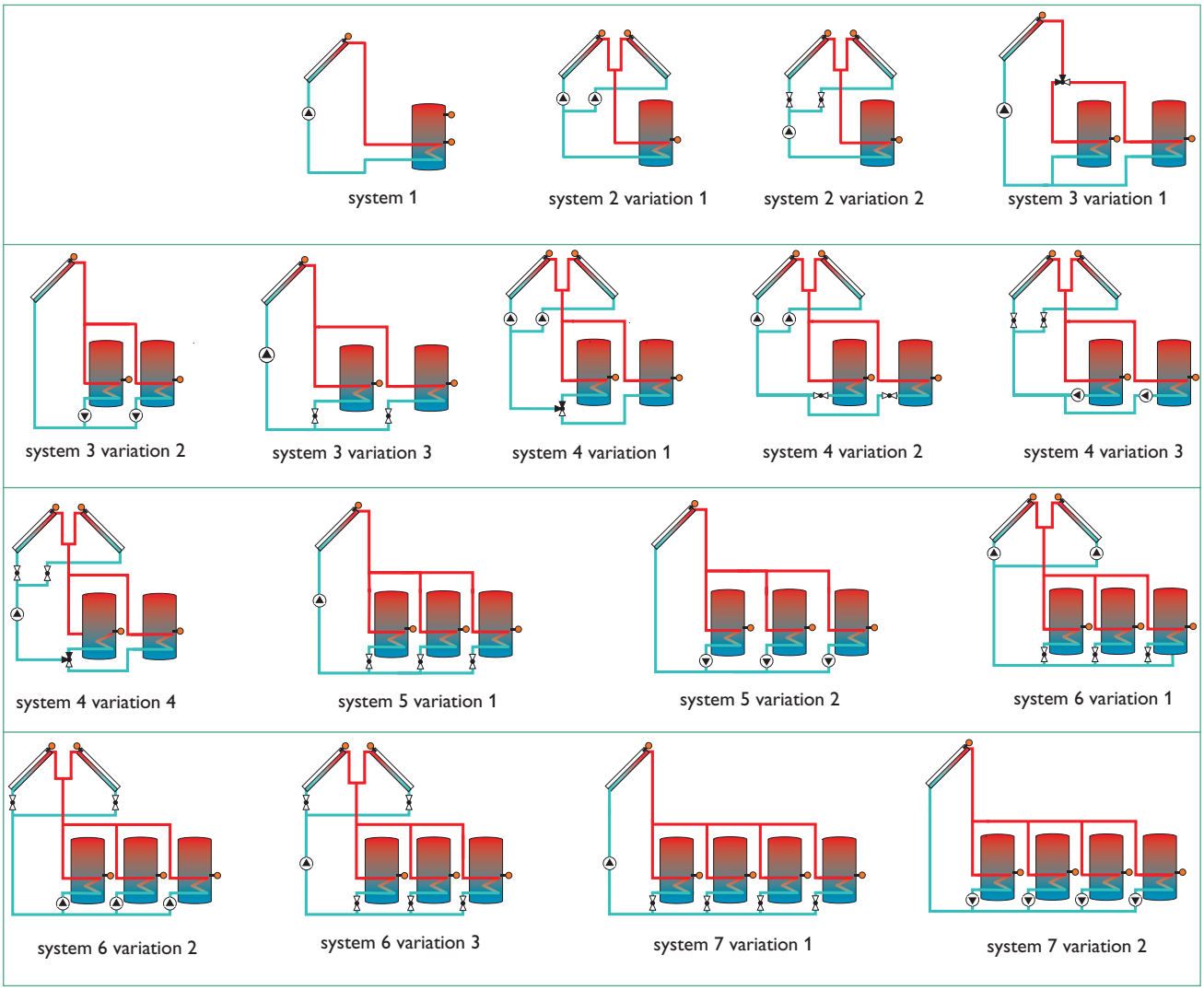
The controller is pre-programmed for 7 basic systems. The selection depends on the number of heat sources (collector fields) and heat sinks (tanks, pool). Factory setting is system 1.

System 1:	1 collector field	-	1 tank
System 2:	east/west collectors	-	1 tank
System 3:	1 collector field	-	2 tanks
System 4:	east/west collectors	-	2 tanks
System 5:	1 collector field	-	3 tanks
System 6:	east/west collectors	-	3 tanks
System 7:	1 collector field	-	4 tanks



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

Beginning with system 2, different hydronic variations are possible (pump or valve control):



For each variation, 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/...*)!

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

3.3 Function blocks

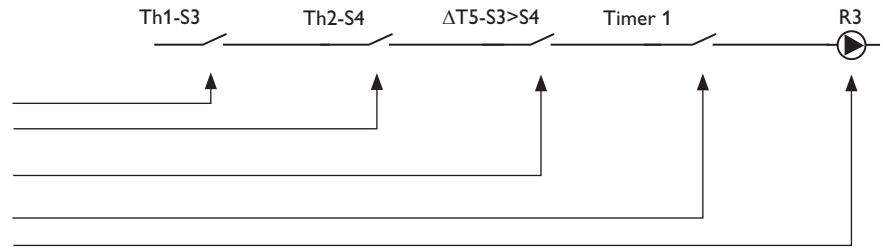
Depending on the selected system/variation and other options e.g. internal heating circuit module, certain relays are already assigned. Relays which are not assigned can be allocated to one of the 5 function blocks other uses e.g.(extra valves, tanks, heat sources etc).

Each function block provides 4 functions:
1 temperature differential function
2 thermostat functions
1 timer (with 21 time frames)

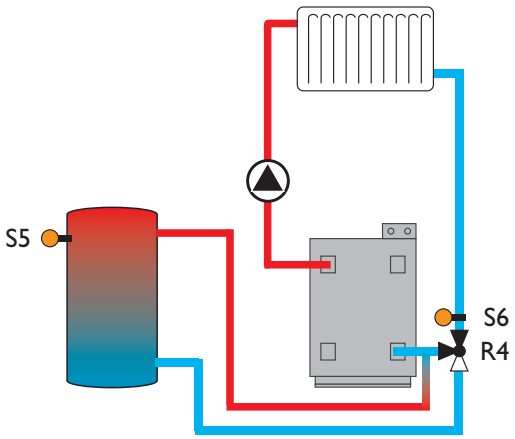
Function	Function block 1		Function block 2		Function block 3		Function block 4		Function block 5	
Thermostat	Th 1- S3		Th 3- S5		Th 5- S5		Th 7- S7		Th 9- S9	
	Th 2- S4		Th 4- S6		Th 6- S6		Th 8- S8		Th 10- S10	
Differential function ΔT	ΔT-5	Sen. 1 – S3	ΔT-6	Sen. 1 – S5	ΔT-7	Sen. 1 – S5	ΔT-8	Sen. 1 – S7	ΔT-9	Sen. 1 – S9
		Sen. 2 – S4		Sen. 2 – S6		Sen. 2 – S6		Sen. 2 – S8		Sen. 2 – S10
Timer	1		2		3		4		5	
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 energize the relay allocated to the function block (*ARRANGEMENT/ADJ. VALUES/...*). These functions can be compared to switches connected in series:

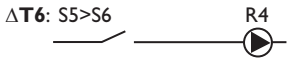
Function	Function block 1	
Thermostat	Th 1- S3	
	Th 2- S4	
Differential function ΔT	ΔT-5	Sen. 1 – S3
		Sen. 2 – S4
Timer	1	
Relay	3	



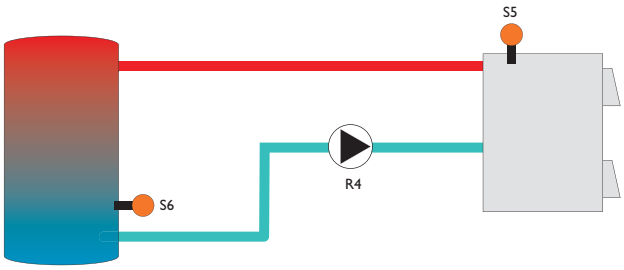
Examples:



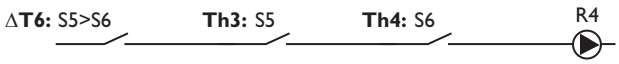
The temperature differential function of a function block has to be activated in order to implement a simple return preheating function.



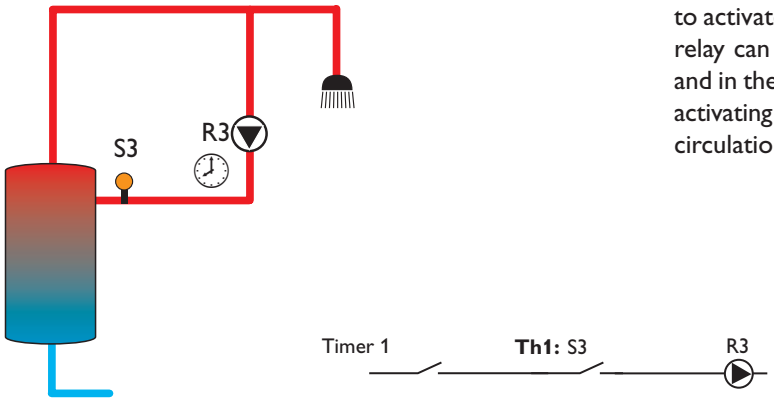
ARRANGEMENT/OPTIONS/ΔT-FUNCS change setting to "Yes".



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 tank 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 "140" — minimum temperature limitation for the boiler
ARRANGEMENT/ADJ. VALUES/TH3 OFF..... change value to "130"
ARRANGEMENT/OPTIONS/THERMO.4..... change setting to "Yes"
ARRANGEMENT/ADJ. VALUES/TH4 ON..... change value to "136" — maximum temperature limitation for the tank
ARRANGEMENT/ADJ. VALUES/TH4 OFF..... change value to "140"



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 optimized 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 "120"
ARRANGEMENT/ADJ. VALUES/TH1 OFF ..... change value to "130"

3.4 Adjusting the controller step-by-step

Before adjusting the controller, select the language (*EXPERT/LANGUAGE/...*).
Points 1. – 3. have to be adjusted for all systems. Points 4. – 18. are optional to suit the system requirements. Points 19. and 20. should be adjusted before the system is released to the end user.

1. Select basic solar system
   (*SOLAR/OPTIONS/SYSTEM*)
2. Select hydronic variation (beginning with system 2)
   (*SOLAR/OPTIONS/LOADING*)
   Alternatively to steps 1 and 2:
   load system layout (schematic)
   (*SOLAR/OPTIONS/SCHEMATIC*)
3. Adjust date and time
   (*ARRANGEMENT/ADJ. VALUES/TIME*)
4. Activate internal heating circuit module if needed
   (*ARRANGEMENT/HEAT. CIRCUIT/OPTIONS/HC*)
5. Adjust parameters for internal heating circuit module
   (*ARRANGEMENT/HEAT. CIRCUIT/HC/...*)
6. Activate external heating circuit module(s) if needed
   (*ARRANGEMENT/HEAT. CIRCUIT/OPTION/HC1 (2,3) MODULE*)
7. Adjust parameters for external heating circuit module(s)
   (*ARRANGEMENT/HEAT. CIRCUITS/HC1 (2,3) MODULE/...*)
8. 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*)

   Backup-heating suppression
   (*SOLAR/OPTIONS /AH SUPPRESS.*)

   Protection against Legionnaires' disease
   (*ARRANGEMENT/OPTIONS/HSE*)

   Tank loading
   (*ARRANGEMENT/OPTIONS /TANK LOAD.*)

   Error message
   (*EXPERT/MESSAGE REL.*)
9. Activate further functions without relay allocation (if needed):
   Evacuated 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 TEM.*)

   CS-Bypass
   (*SOLAR/OPTIONS/CS-BYPASS*)
10. Adjust special parameters of the selected options
    (*SOLAR/ADJ. VALUES/...*),
    (*SOLAR/EXPERT/...*) and
    (*ARRANGEMENT/ADJ. VALUES/...*)
11. Activate functions of function blocks (if needed)
    (*ARRANGEMENT/OPTIONS/...*)
12. Adjust switching conditions for the activated functions
    (*ARRANGEMENT/ADJ. VALUES/...*)
13. Activate heat measurement function (if needed)
    (*WMZ/OPTIONS/...*)
14. Adjust special parameters
    (*WMZ/WMZ 1/EXPERT/...*)
15. Deactivate warning message (if needed)
    (*EXPERT/...*)
16. Carry out sensor offset (if needed)
    (*EXPERT/SENSORS/...*)
17. Increase minimum speed (if needed)
    (*EXPERT/RELAY/...*)
18. Setup and adjust chimney sweeper function (if needed)
    (*EXPERT/CHIMNEY/...*)
19. Carry out relay test
    (*MANUAL OPERATION/...*)
20. Save adjustments
    (*USER CODE/0000*)

3.5 Overview of relay and sensor allocation

Abbreviations - sensors

sensor	denomination
Tcol	temperature collector
Tcol2	temperature collector 2
Tstb	temperature tank 1 bottom
Tst2b	temperature tank 2 bottom
Tst3b	temperature tank 3 bottom
Tst4b	temperature tank 4 bottom
T-HE	temperature heat exchanger
Tby	temperature bypass
HSE	temperature protection against legionnaires' disease
Th 1-10	temperature thermostat 1 to 10
T1 ΔT5-9	temperature ΔT5 to 9 high
T2 ΔT5-9	temperature ΔT5 to 9 low
T1 AH-HC	temperature backup heating-heating circuit
T2 AH-HC	temperature backup heating-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
Digital input	message input

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. HCM (S1)
13	1. HCM (S2)
14	1. HCM (S3)
15	1. HCM (S4)
16	1. HCM (S5)

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

Sensor allocation

Sensors 1-10 are the sensors connected to the controller.

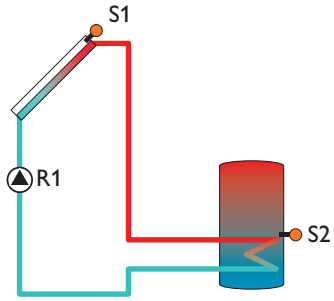
Sensors 12-32 are the sensors connected to the additionally connected heating circuit modules.

Sensors 11, 17, 25 and 32 show the calculated flow set temperatures.

Abbreviations - relay

relay	denomination
pump col. 1 (2)	solar pump collector field 1to 2
Solar pump St 1-4	solar pump tank 1 to 4
2 PV St 1-4	2-port valve tank 1 to 4
3 PV St 1-3	3-port valve tank 1 to 3
func. bl. 1-5	function block 1-5
HSE	protection against legionnaires' disease
bypass	bypass-circuit
cooling func.	cooling function
tank load.	tank loading
par. relay	parallel relay
ext. HE	external heat exchanger
message rel.	message relay
AH suppress.	backup heating suppression
HC backup heat.	heating circuit backup heating
HC pump	heating circuit pump
HC Mi open	heating circuit mixing valve open
HC Mi closed	heating circuit mixing valve closed

System 1



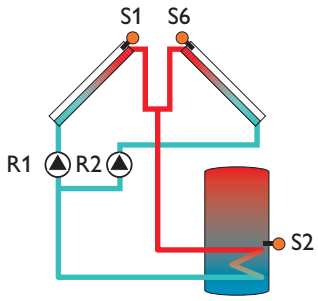
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
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 Digital input

relay allocation

relay 1	relay 2	relay 3	relay 4	relay 5	relay 6	relay 7
solar pump	ext. HE	func. bl. 1	cooling func. HC pump func. bl. 2	func. bl. 3 HSE bypass par. relay HC Mi open	func. bl. 4 tank load. HC Mi closed	func. bl. 5 message rel. AH suppress. HC backup heat.

System 2 variation 1



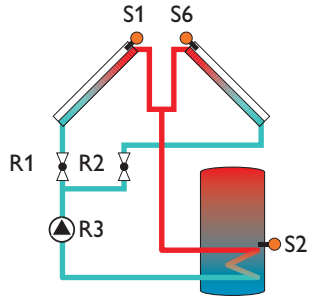
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
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 Digital input

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	cooling func. HC pump func. bl. 2	func. bl. 3 HSE bypass par. relay HC Mi open	func. bl. 4 tank load. HC Mi closed	func. bl. 5 message rel. AH suppress. HC backup heat.

System 2 variation 2



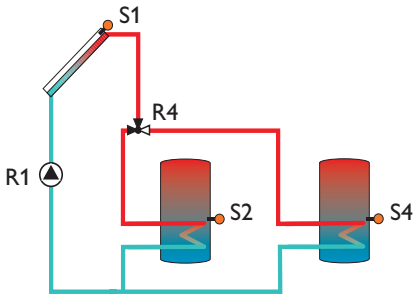
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/DIN
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 Digital Input

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 tank load. HC Mi closed	func. bl.5 message rel. AH suppress. HC backup heat.

System 3 variation 1



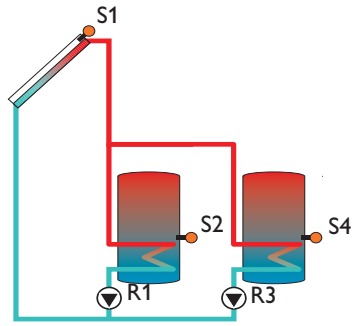
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
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 Digital input

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 tank 1-2	func. bl. 3 HSE bypass par. relay	func. bl. 4 tank load.	func. bl. 5 message rel. AH suppress.

System 3 variation 2



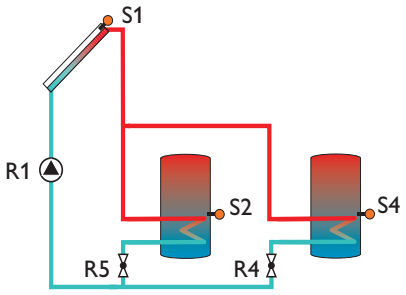
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
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 Digital input

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 tank load.	func. bl.5 messge rel. AH suppress.

System 3 variation 3



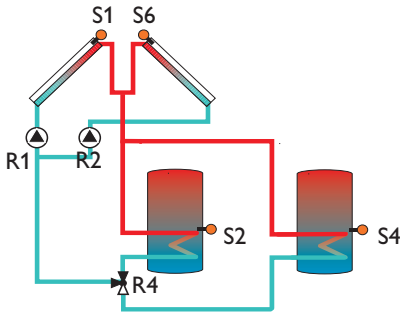
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/ Din
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 Digital input

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 tank 2	2 PV tank 1	func. bl. 4 tank load.	func. bl.5 message rel. AH suppress.

System 4 variation 1



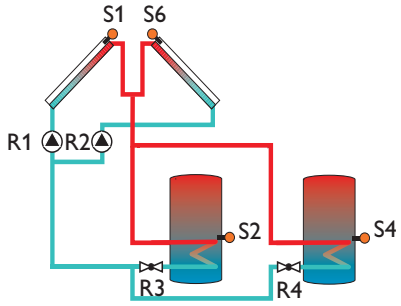
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
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 Digital input

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 tank 1-2	func. bl. 3 HSE bypass par. relay	func. bl. 4 tank load	func. bl.5 message rel. AH suppress.

System 4 variation 2



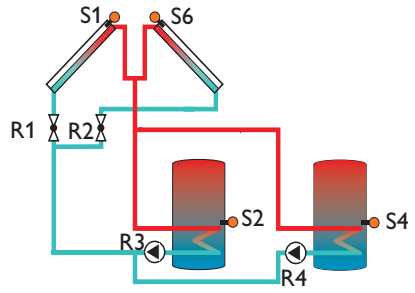
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
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 Digital input

relay allocation

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

System 4 variation 3



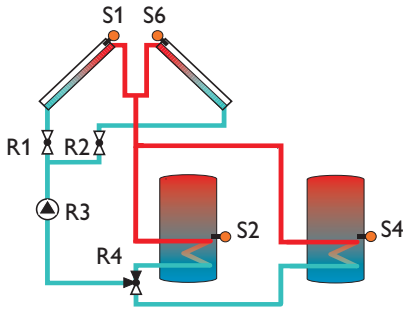
sensor allocation

sen.1	sen.2	Sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
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 Digital input

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 tank load.	func. bl. 5 message rel. AH suppress.

System 4 variation 4



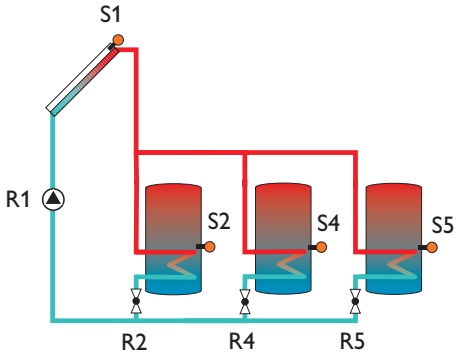
sensor allocation

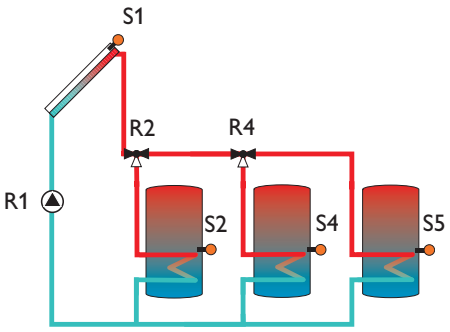
sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
Tcol	Tstb HSE	Tby	Tst2b	Th 5 T1 ΔT7	Tcol2 Th 6 T2 ΔT7	Th 7 T1 ΔT8	Th 8 T2 ΔT8	Th 9 T1 ΔT9 T1 WMZ	Th 10 T2 ΔT9 T2 WMZ	WMZ Digital input

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 tank 1-2	func. bl. 3 HSE bypass par. relay	func. bl. 4 tank load.	func. bl. 5 message rel. AH suppress.

System 5 variation 1





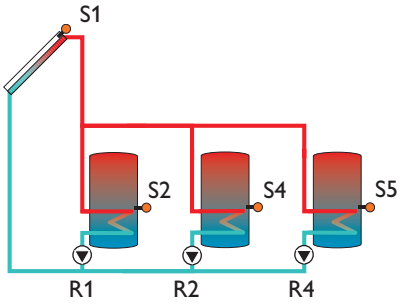
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
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 Digital input

relay allocation

relay 1	relay 2	relay 3	relay 4	relay 5	relay6	relay 7
solar pump	2 PV tank 1 (3PV tank 1)	func. bl. 1 ext. HE	2 PV tank 2 (3PV tank 2)	2 PV tank 3 (---)	func. bl. 4 tank load. HSE bypass par. relay	func. bl. 5 message rel. AH suppress.

System 5 variation 2



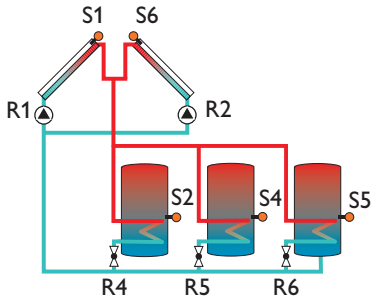
sensor allocation

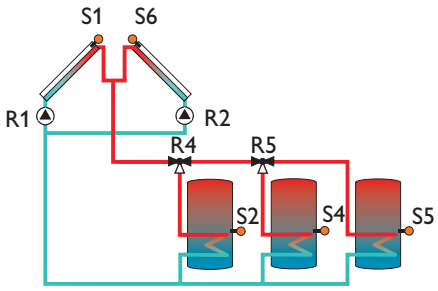
sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
Tcol	Tstb HSE	Th 1 Tby T-HE T1 ΔT5	Th 2 Tst2b T2 ΔT5	Th 5 Tst3b T1 ΔT7	Th 6 T2 ΔT7	Th 7 T1 ΔT8	Th 8 T2 ΔT8	Th 9 T1 ΔT9 T1 WMZ	Th 10 T2 ΔT9 T2 WMZ	WMZ Digital input

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 tank load. HSE bypass par. relay	func. bl. 5 message rel. AH suppress.

System 6 variation 1





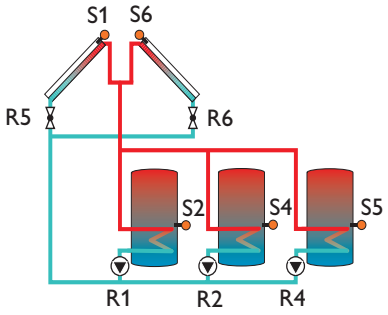
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
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 Digital input

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 tank 1 (3 PV tank 1)	2 PV tank 2 (3 PV tank 2)	2 PV tank 3 (---)	func. bl. 5 message rel. AH suppress.

System 6 variation 2



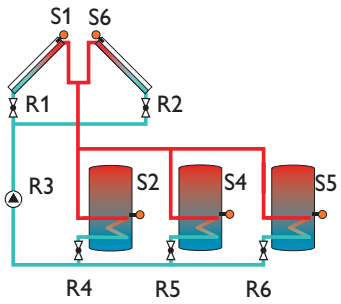
sensor allocation

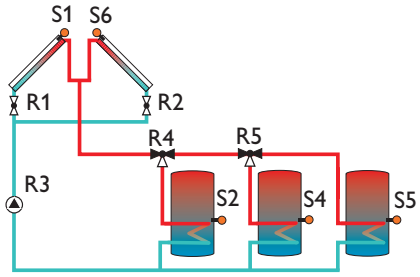
sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
Tcol	Tstb HSE	Th 1 Tby T-HE T1 ΔT5	Th 2 Tstp2b T2-ΔT5	Tst3b	Tcol2	---	---	Th 9 T1 ΔT9 T1 WMZ	Th 10 T2 ΔT9 T2 WMZ	WMZ Digital input

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 variation 3





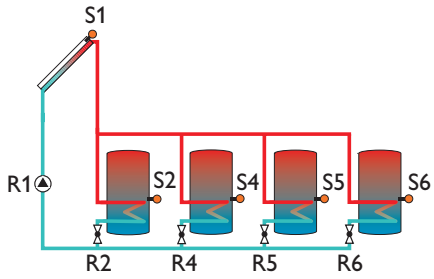
sensor allocation

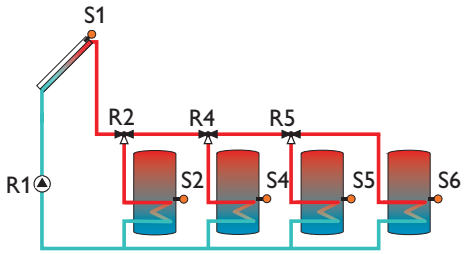
sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
Tcol	Tspb HSE	---	Tsp2b	Tsp3b	Tcol2	---	---	Th 9 T1 ΔT9 T1 WMZ	Th 10 T2 ΔT9 T2 WMZ	WMZ Digital input

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 tank 1 (3 PV tank 1)	2 PV tank 2 (3 PV tank 2)	2 PV tank 3 (---)	func. bl. 5 message rel. AH suppress.

System 7 variation 1





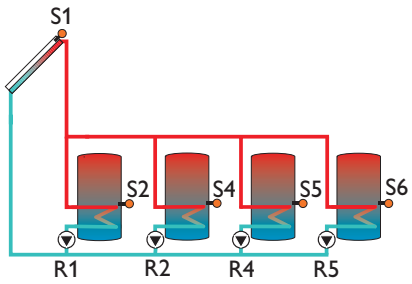
sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
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 Digital input

relay allocation

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

System 7 variation 2



sensor allocation

sen.1	sen.2	sen.3	sen.4	sen.5	sen.6	sen.7	sen.8	sen.9	sen.10	V40/Din
Tcol	Tspb HSE	Th 1 Tby T-WT T1 ΔT5	Th 2 Tsp2u T2 ΔT5	Tsp3b	Tsp4b	Th 7 T1 ΔT8	Th 8 T2 ΔT8	Th 9 T1 ΔT9 T1 WMZ	Th 10 T2 ΔT9 T2 WMZ	WMZ Digital input

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 tank load.	func. bl. 5 message rel. AH suppress.

4. Functions and options

4.1 Menu: Solar

System:

SOLAR/OPTIONS/SYSTEM
adjustment range: 1 ... 7
factory setting: 1

➔ 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.

Hydronic variation:

SOLAR/OPTIONS/LOADING
adjustment range: 1 ... 4
factory setting: 1

Many hydronic variations distinguish between pump and valve control e.g. for multiple tanks. The adjustment has to be carried out in accordance with the overview of the basic systems with their hydronic variations (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 %.

Schematic:

SOLAR/OPTIONS/SCHEMATIC
adjustment range: 000 ... 030
factory setting: 000

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

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

Bypass:

SOLAR/OPTIONS/BYPASS
selection: "Yes", "No"
factory setting: "No"

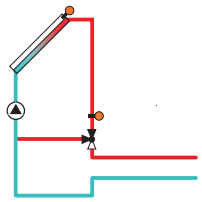
In order to prevent energy from being extracted from the tank when starting tank loading, this function makes sure that the cold fluid in the pipes is diverted past the tank via a bypass (valve or pump). Once the pipe is warm enough, the tank can be loaded.

The bypass relay is energized if the temperature at the reference sensor is by 5 °Ra higher than the tank temperature and if the switch-on condition for tank loading (see tank loading) is fulfilled. The relay is switched off if this temperature difference is lower than 3 °Ra. These temperature differences cannot be adjusted.

Variations with valve or bypass

SOLAR/EXPERT/BYPASS
selection: "Valve", "Pump"
factory setting: "Valve"

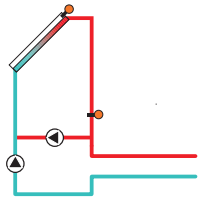
Variation valve:



A bypass valve is placed into the solar circuit.

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

Variation pump:



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

The bypass pump is first activated when tank loading is possible. If the 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 field 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 ... 40.0 °Ra
factory setting: 12.0 °Ra

SOLAR/ADJ. VALUES/HE ΔTOFF
adjustment range: 1.0 ... 39.0 °Ra
factory setting: 8.0 °Ra

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 tank temperature by the adjusted value "HE ΔTon" and if the switch-on conditions for tank loading (see "tank 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 tanks are equipped with their own loading pumps, the relay "external heat exchanger" controls the primary circuit pump.

Evacuated 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 evacuated 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 tank is being loaded by one collector, the other one is operated after the adjusted off time.

shared collector circuit (1 pump)

If tank loading is carried out by one collector, the other one is operated after the adjusted off 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-tank systems):

SOLAR/OPTIONS/COOL FUNC.
selection: "Yes", "No"
factory setting: "No"

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

Function (switching conditions):

If Tstmax is exceeded, and the switch-on temperature difference ΔTon between collector and tank are reached, the solar circuit (primary) and the cooling relay are operated.

If the switch-off temperature difference ΔToff is not met 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: 170 ... 320 °F
factory setting: 230 °F
hysteresis 10 °Ra

The collector cooling function starts, when the adjusted maximum collector temperature is reached. If this temperature is underrun by 10 °Ra, this function is switched off.

The collector is cooled via the heat transfer to the next available storage tank. The numerically last tank is not used (swimming pool protection or in the case of multi-tank 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 20 °Ra.

2-collector systems:

2 separated collector circuits (2 pumps): The collector circuit which needs to be cooled is operated. If one tank 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 tanks of the system have exceeded the maximum temperature, the Tstmax for the first tank is temporarily overidden to reduce the surplus energy via the piping and the collector. Note Tstmax may be exceeded so additional scald protection may be required.

This "circulation" is switched off once the maximum tank temperature is underrun by 4 °Ra.

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 10 °Ra below that of the tank, the recooling function becomes active and the loading circuit is again operated to cool the tank.

If the difference between collector and tank decreases below 6 °Ra 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 40 °F, the frost protection function operates the solar loop between the collector and the first tank in order to protect the medium in the loading circuit against freezing or coagulation.

If the collector temperature exceeds 42 °F, this function is switched off.
If the first tank 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: 70 ... 230 °F
factory setting: 150 °F

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/m²
factory setting: 200 W/m²

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.

The CS sensor is an optional equipment and is not included in the delivery scope.

2-collector systems:

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

Backup heating 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 tank (parameter designation: "AH suppress." in the menu solar expert) is being loaded.

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

Collector emergency shutdown:

SOLAR/ADJ. VALUES/TCOLSEC
adjustment range: 230 ... 390 °F
factory setting: 270 °F
hysteresis: 20 °Ra

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: -20 ... +200 °F
factory setting: +50 °F
hysteresis 4 °Ra

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 tank can be "removed" from solar control. This means that it is no longer considered for solar loading.

The temperature of the tank will be indicated but a sensor defect will not be recognized.

Tank loading:

SOLAR/ADJ. VALUES/ΔTON (...ΔT4ON)
adjustment range: 2.0 ... 40.0 °Ra
factory setting: 12.0 °Ra

SOLAR/ADJ. VALUES/ΔTOFF (...ΔT4OFF)
adjustment range: 1.0 ... 39.0 °Ra
factory setting: 8.0 °Ra

If the adjusted switch-on difference ΔTon between collector and tank is exceeded, the tank will be loaded.

If this difference falls below the adjusted switch-off difference ΔToff, the loading function will be switched off.

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

SOLAR/ADJ. VALUES/ΔTSET (...ΔT4SET)
adjustment range: 3.0 ... 60.0 °Ra
factory setting: 20.0 °Ra

The parameter "ΔTset" is the nominal temperature difference between collector and tank used for pump speed control. Once ΔTset is reached, the pump speed is increased by 10 %.

Tank maximum limitation:

SOLAR/ADJ. VALUES/TSTMAX (...TST4MAX)
adjustment range: 40 ... 200 °F
factory setting: 140 °F

Hysteresis

SOLAR/EXPERT/ΔT-STMAX (...ΔT-ST4MAX)
adjustment range: 1.0 ... 10.0 °Ra
factory setting: 4.0 °Ra

If the adjusted maximum temperature Tstmax is exeeded, loading of the tank is stopped. If the tank cools down by more than 4 °Ra (hysteresis), the tank will be loaded again.

tank emergency shutdown

value 200 °F
hysteresis = 4 °Ra

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

In order to avoid too high temperatures in the tank, the emergency shutdown of the tank is additionally provided, which also blocks the tank for the cooling options. If a tank reaches the temperature of 200 °F, the emergency shutdown is active.

tank blocked

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

Priority logic and tank sequence control:

SOLAR/ADJ. VALUES/PRIORITY ST1 (...ST4)

adjustment range: 1 ... 4
factory setting: 1; 2; 3; 4

Priority logic is used in multi-tank systems only.

If St1, St2, St 3, St4 are set to 1, the tanks with a temperature difference with respect 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 tank will be loaded first as long as its switch-on conditions are fulfilled. When the selected priority tank reaches its adjusted maximum temperature, the subordinate tanks will be loaded in numerical order via oscillating loading: tank 1, then tank 2, then tank 3, then tank 4.

Tank sequence control:

SOLAR/EXPERT/T-CIRC.

adjustment range: 1 ... 60 min
factory setting: 15 min

Loading break time:

SOLAR/EXPERT/T-ST

adjustment range: 1 ... 60 min
factory setting: 2 min

Collector rise temperature:

SOLAR/EXPERT/ΔT-COL

adjustment range: 2 ... 20 °Ra
factory setting: 4 °Ra

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

When the priority tank cannot be loaded, the subordinate tanks are checked. If a subordinate tank 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" (ΔT-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 tank is fulfilled, it will be loaded. If the switch-on condition of the priority tank is not fulfilled, loading of the subordinate tanks will be continued. If the priority tank reaches its maximum temperature, oscillating loading will not be carried out.

Balancing functions:

SOLAR/BALANCE VALUES

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".

4.2 Menu: Arrangement

HSE (protection against legionnaires' disease):

ARRANGEMENT/OPTIONS/HSE

selection: "Yes", "No"
factory setting: "No"

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

The HSE-function checks whether the temperature at the given sensor (Sen-HSE) exceeds 140 °F at certain times for legionella control.

If 140 °F has not been achieved by the HSE start time, the HSE relay is energised in order to activate e.g. back-up heating. The HSE start time (t-start) is adjustable.

The relay is switched off once 140 °F 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.

Tank loading:

ARRANGEMENT/OPTIONS/TANK LOAD.

selection: "Yes", "No"
factory setting: "No"

ARRANGEMENT/ADJ. VALUES/TH7ON

adjustment range: -40.0 ... 480.0 °F
factory setting: 110.0 °F

ARRANGEMENT/ADJ. VALUES/TH7OFF

adjustment range: -40.0 ... 480.0 °F
factory setting: 120.0 °F

ARRANGEMENT/EXPERT/SEN-TH7

adjustment range: 1 ... 10
factory setting: 7

ARRANGEMENT/EXPERT/SEN-TH8

adjustment range: 1 ... 10
factory setting: 8

In order to carry out backup heating of a tank within a certain tank volume (tank 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 treshold 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, tank loading is suppressed or switched off.

ARRANGEMENT/OPTIONS/TIMER 4

selection: "Yes", "No"
factory setting: "No"

ARRANGEMENT/ADJ. VALUES/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

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.

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)

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 backup heating 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/THERMO1 (...10)

selection: "Yes", "No"
factory setting: "No"

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

adjustment range: - 40.0 ... 480.0 °F
factory setting: 120.0 °F

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

adjustment range: - 40.0 ... 480.0 °F
factory setting: 120.0 °F

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

adjustment range: 1 ... 10
factory setting: 3 (...10)

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.

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: 2.0 ... 100.0 °Ra
factory setting: 10.0 °Ra

ARRANGEMENT/ADJ. VALUES/ΔT5(...9)OFF

adjustment range: 1.0 ... 99.0 °Ra
factory setting: 6.0 °Ra

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)

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.

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

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:

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 HKM2 sold separately.

Internal heating circuit control:

ARRANGEMENT/HEAT. CIRCUIT/OPTIONS/HC

selection: "Yes", "No"
factory setting: "No"

The internal heating circuit is activated in this menu.

Flow temperature

ARRANGEMENT/HEAT. CIRCUIT/HC/TFLOW

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

Outdoor temperature

ARRANGEMENT/HEAT. CIRCUIT/HC/TOUTD

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

Status heating circuit

ARRANGEMENT/HEAT. CIRCUIT/HC/HC STAT.

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

Set flow temperature

ARRANGEMENT/HEAT. CIRCUIT/HC/FLOW SET

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, not included in delivery scope) 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 set to the maximum flow temperature.

Status backup heating

ARRANGEMENT/HEAT. CIRCUIT/HC/AFTERH.

Display of backup heating status (on, off).

Tank temperature 1 (2)

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

Display of tank temperature(s) of the heating circuit backup heating.

Night correction:

ARRANGEMENT/HEAT. CIRCUIT/HC/NIGHT CORR.

adjustment range: -40...+50 °Ra
factory setting: -10 °Ra

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 time frames, the set flow temperature of the curve will be decreased (set back) by the adjusted temperature value.

Day correction:

ARRANGEMENT/HEAT. CIRCUIT/HC/DAY CORR.

adjustment range: -10...+80 °Ra
factory setting: 10 °Ra

Adjustment channel for the day correction function of the heating circuit. The day correction function is always active except during 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.

Maximum flow temperature:

ARRANGEMENT/HEAT. CIRCUIT/HC/TFLOWMAX

adjustment range: 50... 200 °F
factory setting: 120 °F

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 mixing valve will close).

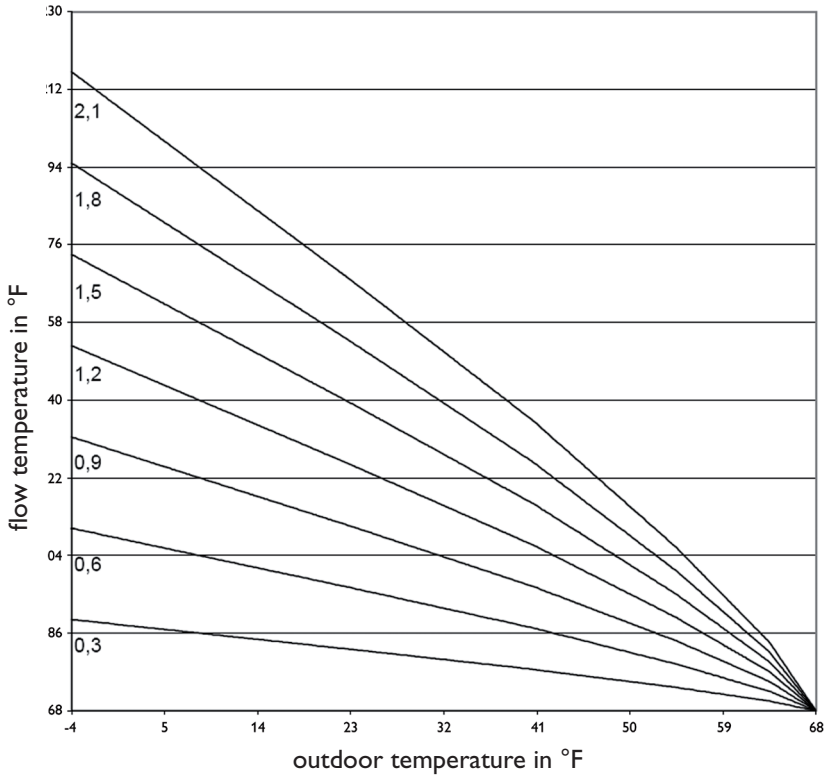
Heating curve:

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.

heating curves



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.

Summer:

ARRANGEMENT/HEAT. CIRCUIT/HC/SUMMER

adjustment range: 32 ...100 °F
factory setting: 70 °F

Adjustment channel for summer operation. If the outdoor temperature exceeds the adjusted value, the heating circuit will be switched off. The hysteresis is 2 °Ra.

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 10:00 p.m. to 6:00 a.m. and Tuesday from 03:00 p.m. to 06:00 p.m., when t1-on is set to mon 10:00 p.m., t1-off to tue, 6:00 a.m. and t2-on to tue,03:00 p.m. and t2-off to tue, 06:00 p.m.

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 factory set 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

Flow sensor:

ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/SEN.FLOW
adjustment range: 1 ... 10
factory setting: 6

Adjustment channel for allocating the flow temperature sensor.

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.

Outdoor temperature sensor:

ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/SEN. OUTDOOR
adjustment range: 1 ... 10
factory setting: sensor 7

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 HKM2 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.

Backup heating

ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/AFT.-HEAT
selection: "None", "Therm.", "Tank"
factory setting: "None"

ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/ΔT AH ON
adjustment range: -30.0 ... +89.0 °Ra
factory setting: 8.0 °Ra

ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/ΔT AH OFF
adjustment range: -29.0 ... +90.0 °Ra
factory setting: 25.0 °Ra

The set flow temperature is compared with the temperature at one or two tank (buffer) reference sensors (differential control). If this temperature differential is too small (ΔTHon), backup heating will be activated. It will be switched off if the differential (ΔTHoff) between tank and set flow temperature is large enough.

➔ Select the backup heating type via the parameter "Aft.-Heat." ("None", "Therm.", or "Tank").

If "None" is selected, no backup heating will be carried out.
If "Therm." is selected, the set flow temperature is compared with a tank reference sensor.
If "Tank" is selected, the comparison is made with 2 reference sensors. The switching conditions to both reference sensors have to be fulfilled.

Sensor 1 tank

ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/S1 TANK

adjustment range: 1 ... 10
factory setting: 4

With this parameter, the first reference sensor for heating circuit backup heating can be selected.

Sensor 2 tank

ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/S2 TANK

adjustment range: 1 ... 10
factory setting: 5

With this parameter, the second reference sensor can be selected for tank-dependent backup heating.

Backup heating demand

ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/REL. AHOFF

selection: "DSE", "HC1", "HC2", "HC3"
factory setting: "DSE"

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

With this parameter, the relay by means of which backup heating is demanded (DSE or heating circuit module) can be selected.

➔ Allocate minimum runtime and overrun time of the relay.

Manual correction (remote control)

ARRANGEMENT/HEAT. CIRCUIT/HC/EXPERT/MAN. CORR.

selection: "Yes", "No"
factory setting: "No"

The remote control RTA11-M is used for displacing the heating curve. It allows manual adjustment of the heating curve (± 30 °Ra) and 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 mixing valve 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 the chimney sweeper function in the expert menu (see 4.4) is activated and when the chimney sweeper option in this menu is activated, the heating circuit opens (mixing valve opens) and the heating circuit pump is switched on. The protective function of the heating pump maximum limitation will still be active.

External heating module:

Heating circuit module

ARRANGEMENT/HEAT. CIRCUIT/OPTIONS/HC1(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

Up to 3 additional external heating circuit modules (HKM) can be activated if further compensated heating circuits are required. The HKM module is optional and is not included in the full kit.

If the external heating circuit module HKM2 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.

Tank priority:

ARRANGEMENT/HEAT. CIRCUIT/HC1(2,3)MODULE/TANK PRIO.

selection: "On", "Off"
factory setting: "Off"

This function switches off the heating circuit when domestic hot water is given priority.

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

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

The displays and functions are comparable to those of the internal heating circuit (see also manual "RESOL HKM 2").

4.3 Menu: Energy metering

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

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 orginal function in the system.

Heat quantity estimation without flowmeter RESOL V40

Set WMZ/OPTIONS/WMZ to "Yes" and
WMZ/WMZ 1/EXPERT/FLOWMETER to "No"

WMZ/WMZ1/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

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.

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)

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

Adjustment channel for the pulse rate corresponding to the flowmeter V40 used (see the flag on the V40 cable):

V40-06: 1 liter/pulse
V40-15: 10 liters/pulse
others: 25 liters/pulse

Antifreeze type

WMZ/WMZ 1/EXPERT/ANTIFREEZE TYPE
selection: 0,1, 2, 3
factory setting: 1

Adjustment channel to ensure the contoller uses the correct specific heat capcacity for the heat transfer fluid used .
0 for water
1 for propylene glycol
2 for ethylene glycol
3 for Tyfocor® LS

Antifreeze concentration

WMZ/WMZ 1/EXPERTE/ANTIFREEZE
adjustment range: 20 ... 70 Vol %
factory setting: 40 Vol %

Adjustment channel for the concentration water/glycol for antifreeze types 1 and 2.
Example: 40 Vol % means: 40 % glycol and 60 % water

Heat quantity

WMZ/WMZ 1/HEAT

The overall heat quantity results from the sum of the values in Btus (and 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 "ΔT too high"

EXPERT/ΔT TOO HIGH
selection: "Yes", "No"
factory setting: "Yes"

This message is shown, if solar loading has been carried out for a period of 20 minutes with a differential higher than 90 °Ra.

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

System warning "Non-ret. valve"

EXPERT/NON-RET. VAL.
selection: "Yes", "No"
factory setting: "Yes"

This message is shown if between 11.00 p.m. and 5.00 a.m. the collector temperature is higher than 110 °F or a tank is loaded because of a high temperature difference.

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

Message relay (error message)

EXPERT/MESSAGE REL.
selection: "Yes", "No"
factory setting: "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

An error message does not activate the relay.

Message input

EXPERT/MESSAGE INP.

selection: "Yes", "No"
factory setting: "No"

In this menu, the message input Din is activated.

Chimney sweeper

EXPERT/CHIMNEY

selection: "Yes", "No"
factory setting: "No"
EXPERT/CHIMNEY SWEEPER

This function is used for activating a preselected relay status when required.- e.g. flue gas measurement if the system controls a boiler.

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

Afterwards, activate this function by selecting "Yes". If the chimney sweeper function is activated, "chimney sweeper" is indicated in the main menu.

Solar shutdown

EXPERT/SOLAR

selection: "Yes", "No"
factory setting: "Yes"

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.

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: -10.0 ... +10.0 °Ra
factory setting: 0.0 °Ra

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. This offset is used for correcting the sensor value with the temperature difference in the case of an imprecise value. The controller uses the corrected value for the control function.

Minimum speed

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

adjustment range: 30 ... 100 %
factory setting: 30 %

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 tank (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).

Language

EXPERT/LANGUAGE

factory setting: "English"

In the submenu "language", different languages are available (Deutsch, English, français, castellano, italiano).

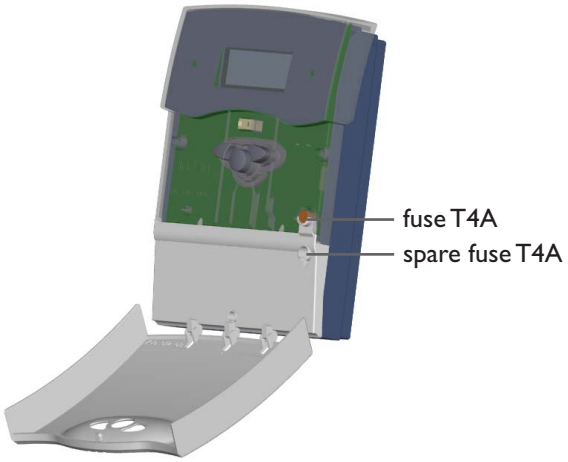
4.5 Menu: Manual mode

MANUAL OPERATION/ALL RELAYS
MANUAL OPERATION/RELAY 1 (...7)

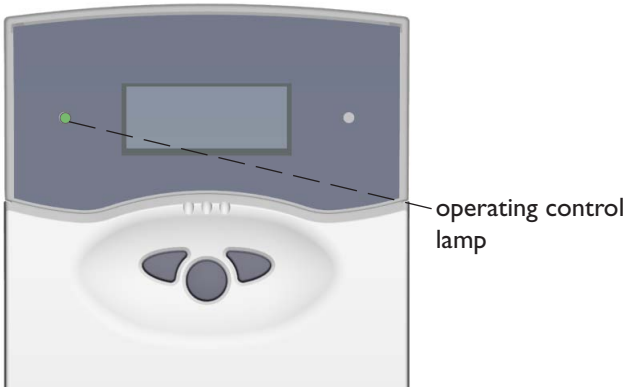
selection: "Off", "Auto", "On"
factory setting: "Auto"

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

Cable broken. Check cable.

- 888.8

Short circuit. Check cable.

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

°F	Ω	°F	Ω
14	961	131	1213
23	980	140	1232
32	1000	149	1252
41	1019	158	1271
50	1039	167	1290
59	1058	176	1309
68	1078	185	1328
77	1097	194	1347
86	1117	203	1366
95	1136	212	1385
104	1155	221	1404
113	1175	230	1423
122	1194	239	1442

resistance of the Pt1000 sensors

Control lamp off

Check the power supply. Is it disconnected?

no

The fuse of the controller could be blown. It can be replaced after the front cover has been removed (spare fuse is enclosed in the fuse holder).

yes

Check the supply line and reconnect it.

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

- Air in the system?
  - no
  - yes → Air in the system; increase the system pressure to at least static primary pressure plus 7.25 psi (0,5 bar); if necessary continue to increase pressure; switch the pump off and on for a short time.
- Is the collector circuit blocked at the dirt trap?
  - yes → Clean the dirt trap

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

- Temperature difference at the controller too small?
  - no
  - yes → Change ΔTon and ΔToff correspondingly
    - no
    - o.k.
- Wrong position of collector sensors?
  - no → Plausibility control of the option tube collector special function
  - yes → Mount the collector sensor at solar flow (warmest collector output); use immersion sleeve of the respective collector.

Pump starts up very late

- Switch-on temperature difference ΔTon to large?
  - no
  - yes → Change ΔTon and ΔToff correspondingly
- Non-ideal position of the collector sensor (e.g. flatscrew sensor instead of sensor in immersion sleeves)?
  - yes → Activate tube collector function if necessary
    - o.k.

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

- Collector circuit pump defective?
  - no
  - yes → Check / replace it
- Heat exchanger calcified?
  - no
  - yes → Decalcify it
- Heat exchanger blocked?
  - no
  - yes → Clean it
- Heat exchanger too small?
  - yes → Replace with correctly sized one

Tanks cool down at night

Collector circuit pump runs in the night?
- no → Collector temperature is at night higher than the outdoor temperature
- yes → Check controller

Collector temperature is at night higher than the outdoor temperature
- no → Sufficient tank insulation?
- yes → Check the check valve in the flow and the return pipe with regard to the functional efficiency.

Sufficient tank insulation?
- yes → Insulation close enough to the tank?
- no → Increase insulation.

Insulation close enough to the tank?
- yes → Are the tank connections insulated?
- no → Replace insulation or increase it.

Are the tank connections insulated?
- yes → Warm water outflow upwards?
- no → Insulate the connections.

Warm water outflow upwards?
- no → Does the warm water circulation run for a very long time?
- yes → Change connection and let the water flow horizontally or through a siphon (downwards); less tank losses now ?
  - no → Does the warm water circulation run for a very long time?
  - yes → o.k.

Does the warm water circulation run for a very long time?
- no → Circulation pump and blocking valve should be switched off for 1 night; less tank losses?
- yes → Use the circulation pump with timer and switch-off thermostat (energy efficient circulation).

Circulation pump and blocking valve should be switched off for 1 night; less tank losses?
- yes → a
- no → Check whether the pumps of the backup heating circuit run at night; check whether the non-return valve is defective; problem solved?
  - no → b

a

Control the non-return valve in warm water circulation - o.k.
- yes → The thermosiphoning in the circulation line is to strong; insert a stronger valve in the non-return valve or an electrical 2-port valve behind the circulation pump; the 2-port valve is open when the pump is activated, otherwise it is closed; connect pump and
- no → Clean or replace it

b

Further pumps which are connected to the solar tank must also be checked.

2-port valve electrically in parallel; activate the circulation again

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

Is the control lamp (LED) illuminated?
- yes → Does the pump start up in manual operation?
- no → There is no current; check fuses / replace them and check power supply.

Does the pump start up in manual operation?
- no → Is the pump current enabled by the controller?
- yes → The adjusted temperature difference for starting the pump is to high; choose a value which makes more sense.

Is the pump current enabled by the controller?
- no → Are the controller fuses o.k.?
- yes → Is the pump stuck?
  - yes → Turn the pump shaft using a screwdriver; now passable?
    - no → Pump is defective - replace it

Are the controller fuses o.k.?
- no → Replace fuses.
- yes → Controller might be defective - replace it.

6. Accessories

Sensors

Our 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.
For more information, see our catalogue and price list.

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.

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

Smart Display SD3

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

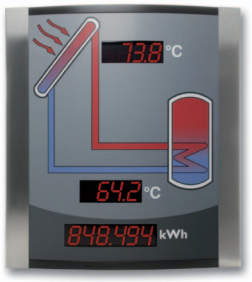
RESOL SD3 (unit °F) Article no.: **180 007 77**

Large Display GA3

The RESOL Large Display GA3 is designed for simple connection to RESOL controllers via the RESOL VBus®. It is used for visualizing the data issued by the controller: collector and store temperature as well as heat quantity produced in the solar system.

The use of high-efficient LEDs and antireflective filter glass assures a high optical brilliance and good readability - even in poor lighting conditions and at a larger distance.

RESOL GA3 (unit °F) Article no.: **180 007 87**



DL2 Datalogger

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

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

VBus® / USB interface adapter

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, visualizing and archiving as well as the parametrization of the controller via the VBus®. A full version of the RESOL ServiceCenter software is included.

RESOL VBus® / USB interface adapter Article no.: **180 008 80**

VBus®/PWM interface adapter

The VBus®/PWM interface adapter is used for the speed control of a pump via a PWM or 0-10V signal. Via the VBus® the adapter receives information from the controller about speed. The speed is converted into a PWM or direct voltage signal and put out to the corresponding terminals.

RESOL VBus®/PWM interface adapter Article no.: **180 008 60**

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 a red LED if a failure has occurred. The AM1 also has a dry contact 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.

RESOL AM1 Alarm module Article no.: **180 008 77**

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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.

Editor: RESOL - Elektronische Regelungen GmbH

Please note:
The design and the specifications are to be changed without notice.
The illustrations may differ from the original product.