

# RESOL DeltaSol<sup>®</sup> BS Plus

**Mounting**

**Connection**

**Operation**

**Troubleshooting**

**Application examples**



48000550

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

DeltaSol<sup>®</sup> BS Plus



**Manual**

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

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Subject to technical change. Errors excepted.

**Safety advice:**

Please read the following information carefully before installing and operating the controller. In this way damage to the solar system caused by wrong installation will be avoided. Please make sure that the mounting is adapted to the characteristics of the building, that the local regulations are respected and is conform with the technical rules.

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

**Instructions:**

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.

Attention should be paid to

- valid local regulations
- respective valid standards and directives

These instructions are exclusively addressed to authorized skilled personnel.

- Only qualified electricians should carry out installation and maintenance work.
- Initial installation should be carried out by qualified personnel

**Description of symbols**

|                 |  |
|-----------------|--|
| <b>WARNING!</b> | <p><b>Warnings are indicated with a warning triangle!</b><br/> <b>→ They contain information on how to avoid the danger described.</b></p> |
|                 |  |

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.

**Information about the product**

**Proper usage**

This product is to be used in solar thermal and heating systems in compliance with the technical data specified in these instructions.

Improper use excludes all liability claims.

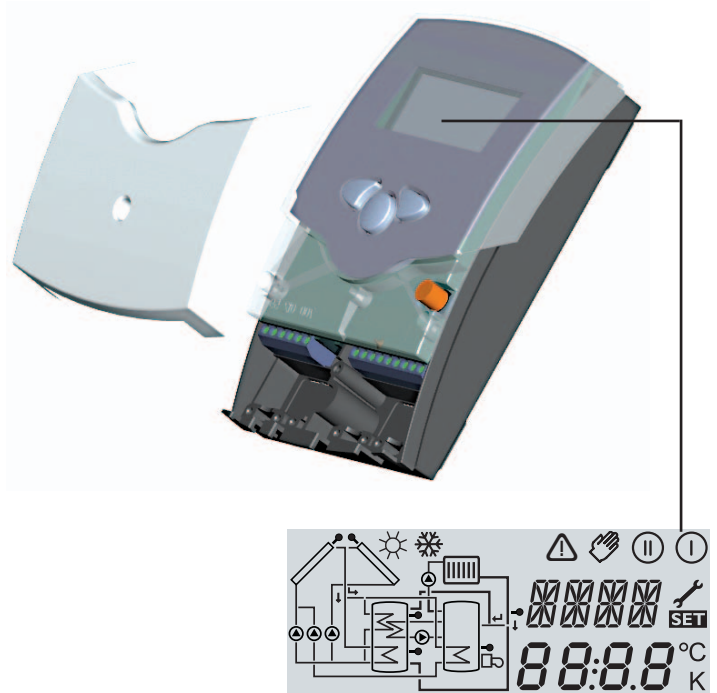


**Note**

Strong electromagnetic fields can impair the function of the controller.

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

- System-monitoring-display
- Up to 4 Pt1000 temperature sensors
- 9 basic systems to choose from
- Heat quantity balancing
- VBus®
- Function control
- Thermostat function (time controlled)
- Parametrization and control of the system by Service Center Software is possible
- User-friendly operation
- Housing with outstanding design

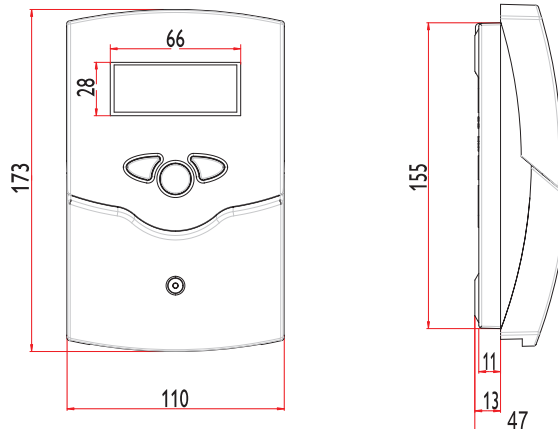


### Included with the BS Plus:

- 1 x DeltaSol® BS Plus
- 1 x accessory bag
  - 1 x spare fuse T4A
  - 2 x screws and dowels
  - 4 x strain relief and screws
  - 1 x capacitor 4,7 nF

### Additionally enclosed in the full kit:

- 2 x sensor FKP6
- 2 x sensor FRP6



### Technical data

#### Housing:

plastic, PC-ABS and PMMA

**Protection type:** IP 20 / DIN 40050

**Ambient temp.:** 32 ... 104 °F

**Size:** 172 x 110 x 46 mm

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

**Display:** System screen for system visualization, 16-segment display, 7-segment display, 8 symbols for system status and operating control lamp

**Operation:** by 3 pushbuttons in the front of the housing

**Functions:** Differential temperature controller with optional add-on system functions. Function control according to BAW-standards, operating hours counter for solar pump, tube collector function, thermostat function and heat quantity balancing.

#### Inputs:

for 4 temperature sensors Pt1000

**Outputs:** 2 electromechanical relays

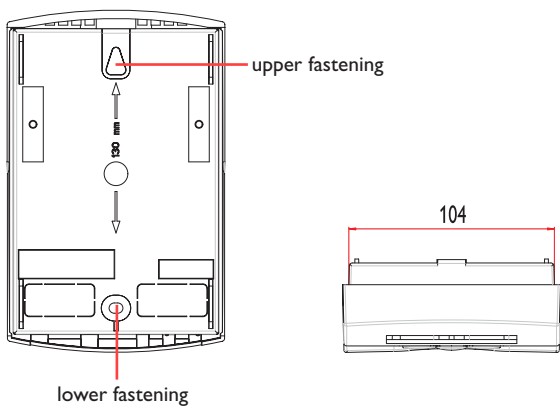
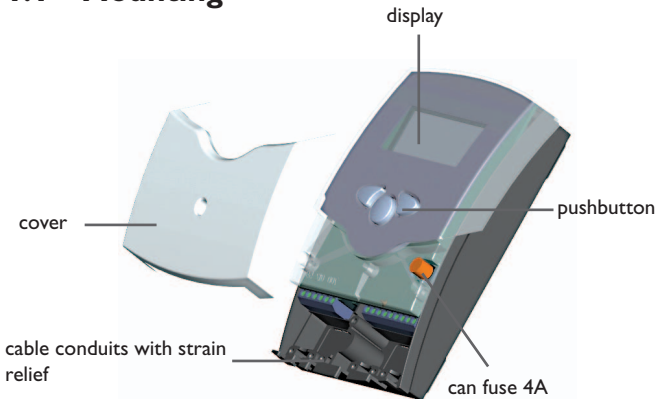
**Bus:** RESOL VBus®

**Power supply:** 115V~

**Total power supply:** 4 (2) A 115V~

# 1. Installation

## 1.1 Mounting

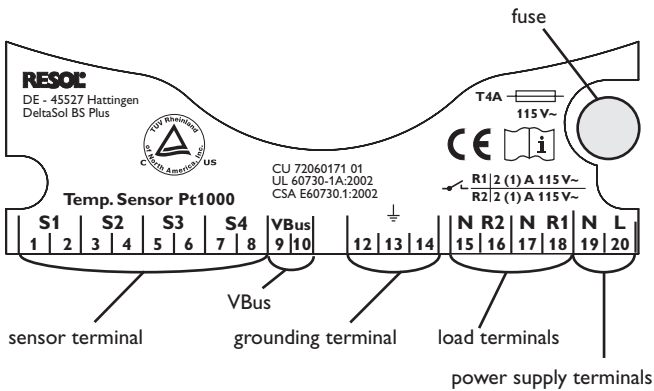


|  |   |
|--|---|
|  | <b>WARNING!</b> Electric shock!   |
|  | Opening the housing will expose live parts!<br>→ Switch off power supply and disconnect the device from mains before opening the housing! |

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

1. Unscrew the cross-head screw from the cover and remove it along with the 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 130 mm). Drill and insert the lower wall plug
4. Fasten the housing to the wall with lower fastening screw and tighten.

## 1.2 Electrical connection



The power supply to the controller must be carried out via an external power switch (last step!) and the supply voltage must be 115 V~ (50 ... 60 Hz). Flexible cables must be attached to the housing with the enclosed strain relief and the corresponding screws.

The controller is equipped with 2 semiconductor relays, to which **loads** such as pumps, valves etc. can be connected:

- Relay 1  
18 = conductor R1  
17 = neutral conductor N  
13 = grounding conductor
- Relay 2  
16 = conductor R2  
15 = neutral conductor N  
14 = grounding conductor

The **temperature sensors** (S1 up to S4) will be connected to the following terminals independently of the polarity:

- 1 / 2 = Sensor 1 (e.g. Sensor collector 1)
- 3 / 4 = Sensor 2 (e.g. Sensor store 1)
- 5 / 6 = Sensor 3 (e.g. Sensor collector 2)
- 7 / 8 = Sensor 4 (e.g. Sensor store 2)

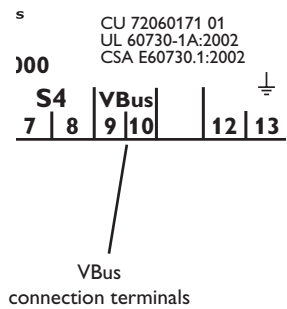
The **power supply** is effected to the clamps:

- 19 = neutral conductor N
- 20 = conductor L
- 12 = ground clamp

**Please note:**  
 The relays are semiconductor relays for pump speed control - a minimum load of 20W (power consumption of the load) is required for faultless function. The capacitor from the accessory bag must be connected in parallel to the respective relay output if it feeds auxiliary relays, motor valves, etc to prevent interference. The minimum pump speed must be set to 100% when auxiliary relays or valves are connected.

|  |   |
|--|---|
|  | <b>ATTENTION!</b> ESD damage!   |
|  | Electrostatic discharge can lead to damage to electronic components!<br>→ Take care to discharge properly before touching the inside of the device! |

### 1.2.1 Data communication/ Bus

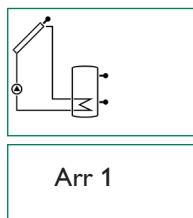


The controller comes with a RESOL VBus® for data transfer with and energy supply to external modules. The connection is carried out at the terminals marked „VBus“ (either polarity). One or more RESOL VBus® modules can be connected via this data bus, e.g.:

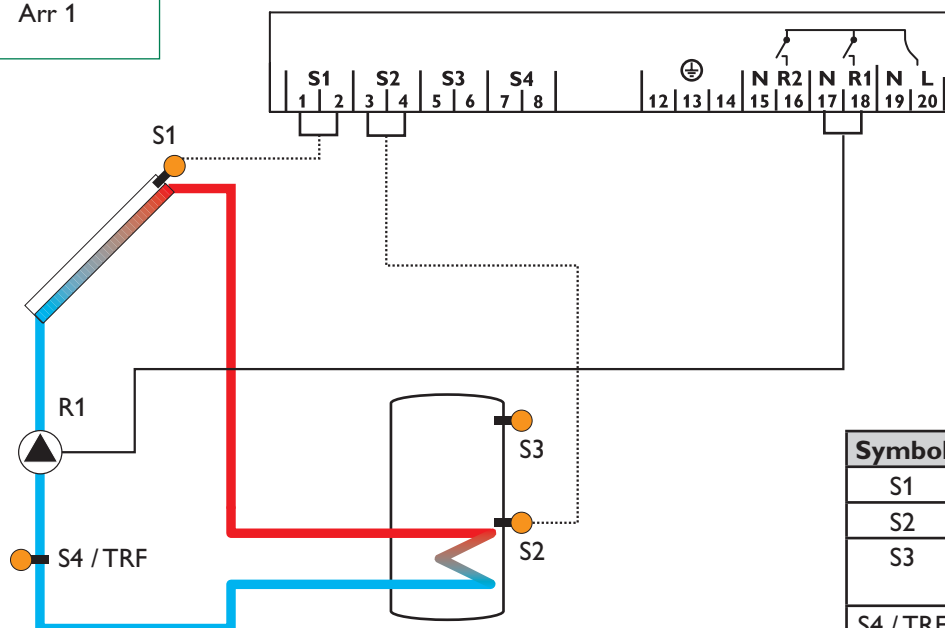
- calorimeter module WMZ
- large display GA3, smart display SD3
- data logger DL2
- RESOL remote display

Additionally, the controller can be connected to a PC with a RESOL RS-COM adapter. With the RESOL ServiceCenter Software (RSC) the controller parameters can be changed, measurements can be read out, processed and visualized. The software allows easy function control and adjustment of the system.

### 1.2.2 Terminal allocation - system 1



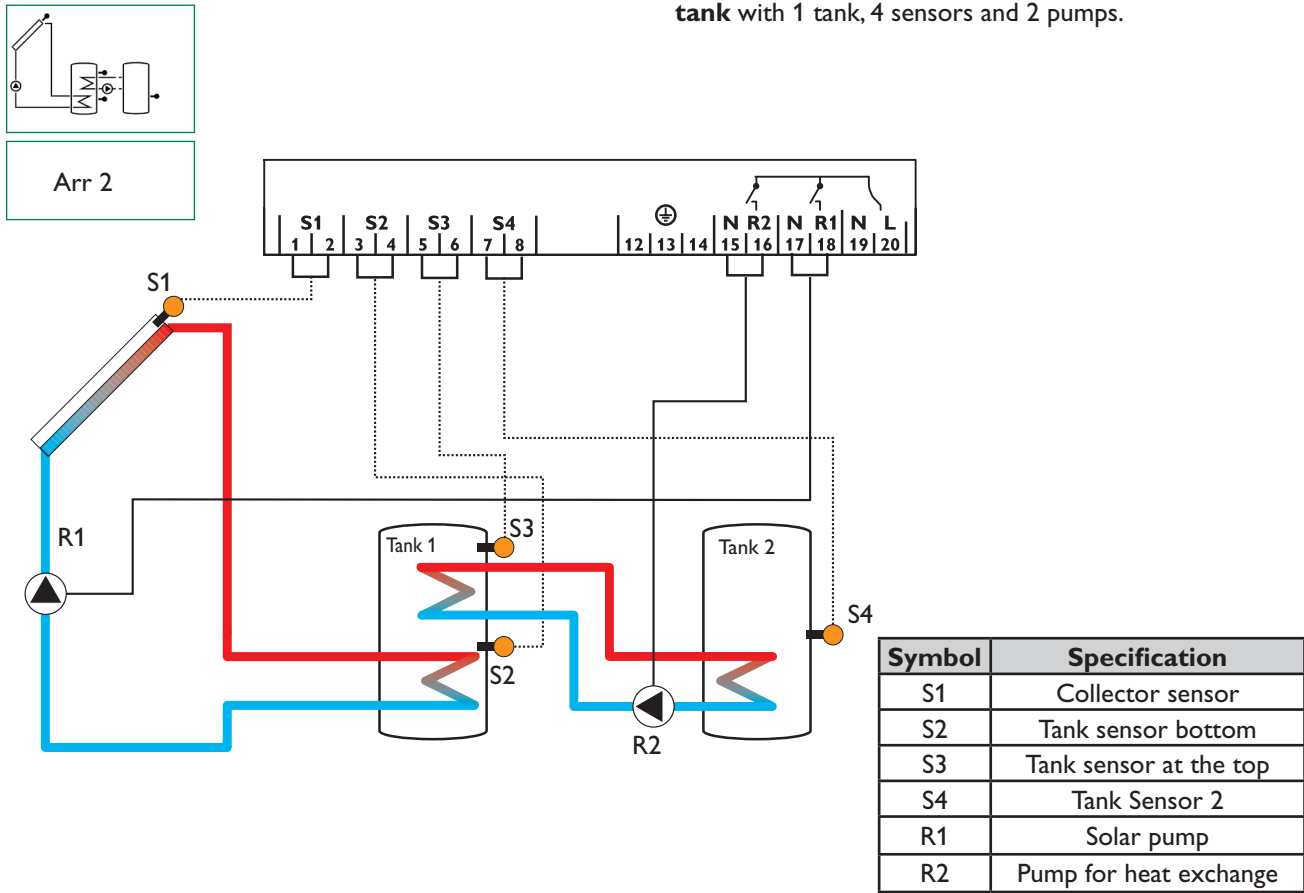
**Standard solar system** with 1 tank, 1 pump and 3 sensors. Sensor S4 / TRF can optionally be used for heat quantity balancing.



| Symbol   | Specification                                     |
|----------|---|
| S1       | Collector sensor                                  |
| S2       | Tank sensor bottom                                |
| S3       | Tank sensor at the top (optionally)               |
| S4 / TRF | Sensor for heat quantity measurement (optionally) |
| R1       | Solar pump  |

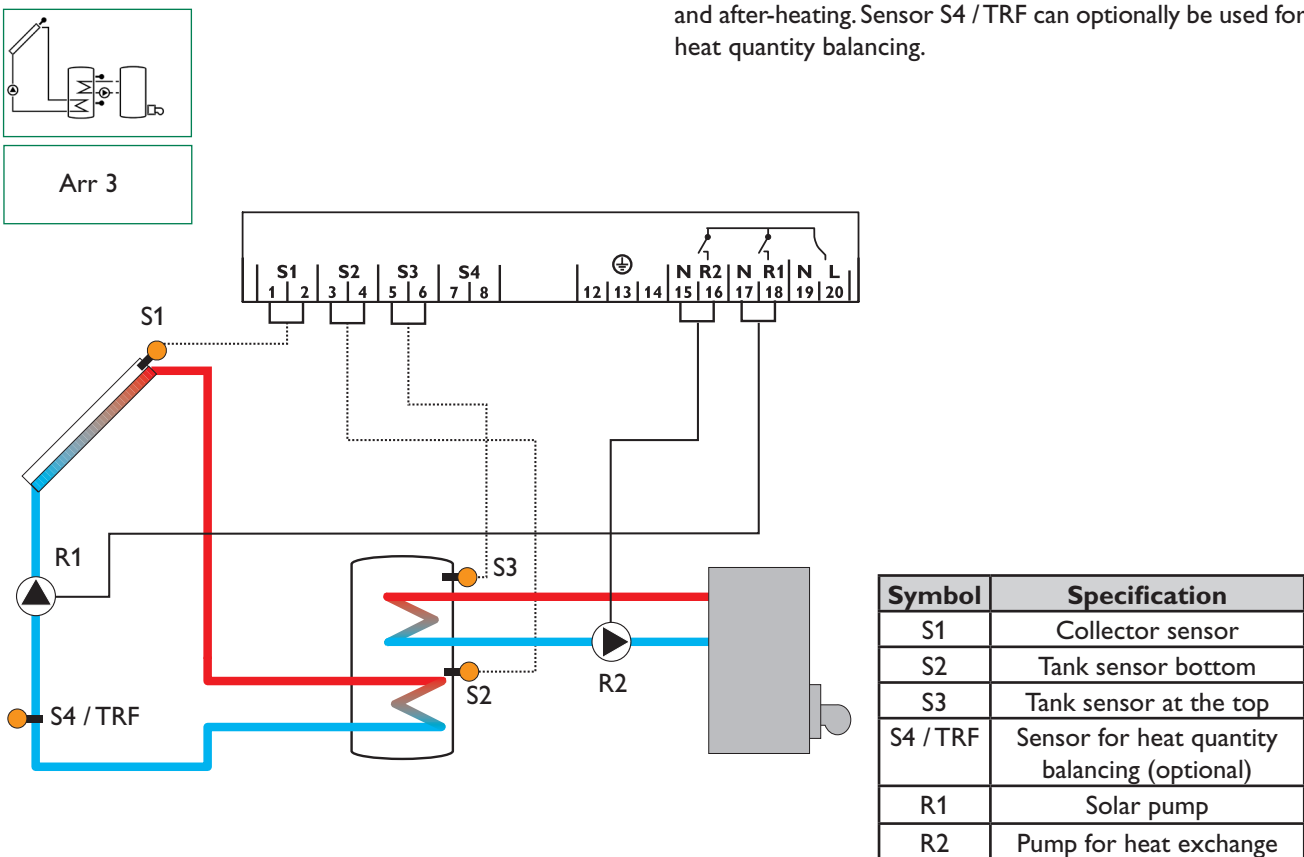
1.2.3 Terminal allocation - system 2

Solar system and heat exchange with an existing tank with 1 tank, 4 sensors and 2 pumps.



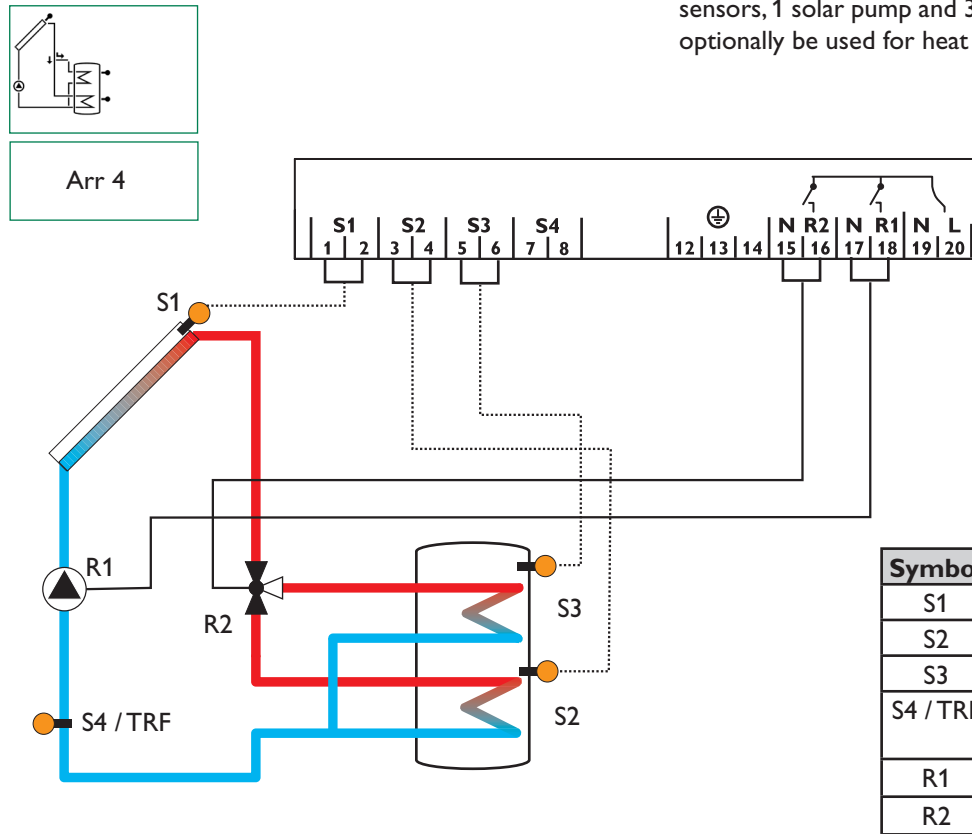
1.2.4 Terminal allocation - system 3

Solar system and after-heating with 1 tank, 3 sensors and after-heating. Sensor S4 / TRF can optionally be used for heat quantity balancing.



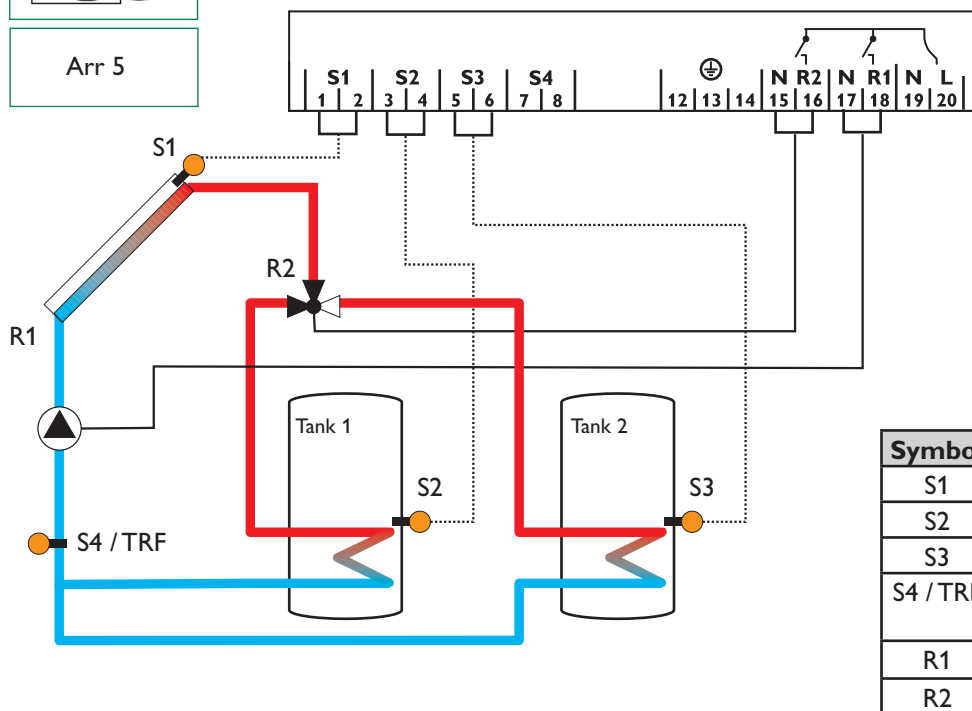
1.2.5 Terminal allocation - system 4

Solar system and vertical tank charging with 1 tank, 3 sensors, 1 solar pump and 3-way-valve. Sensor S4 / TRF can optionally be used for heat quantity balancing.



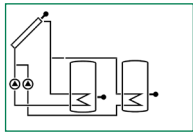
1.2.6 Terminal allocation - system 5

2-tank-solar system with valve logic with 2 tanks, 3 sensors, 1 solar pump and 1 3-way-valve. Sensor S4 / TRF can optionally be used for heat quantity balancing.

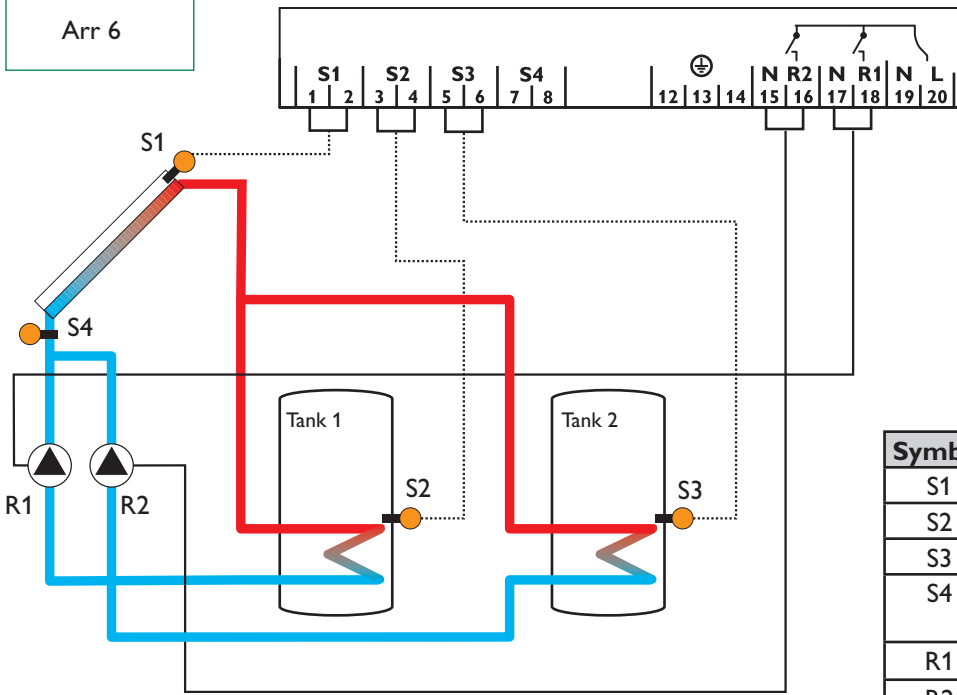


1.2.6 Terminal allocation - system 6

2-tank solar system with pump logic with 2 tanks, 3 sensors and 2 solar pumps.



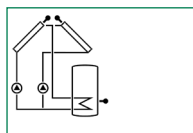
Arr 6



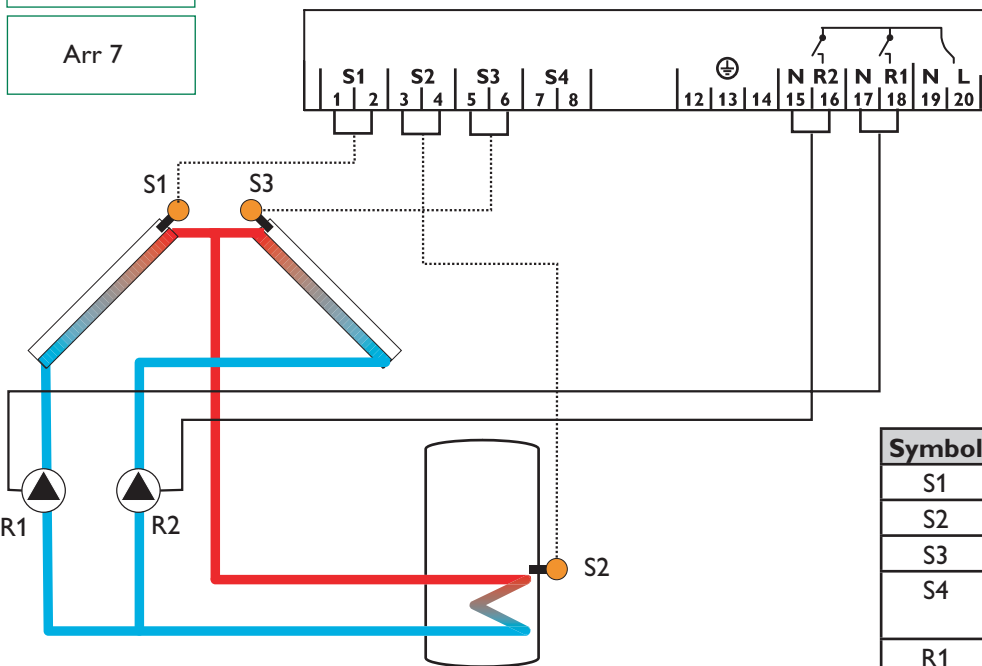
| Symbol | Specification              |
|--------|----------------------------|
| S1     | Collector sensor           |
| S2     | Tank sensor 1              |
| S3     | Tank sensor 2              |
| S4     | Measuring sensor (optinal) |
| R1     | Solar pump 1               |
| R2     | Solar pump 2               |

1.2.7 Terminal allocation - system 7

Solar system with east-west collectors, 1 tank, 3 sensors and 2 solar pumps.



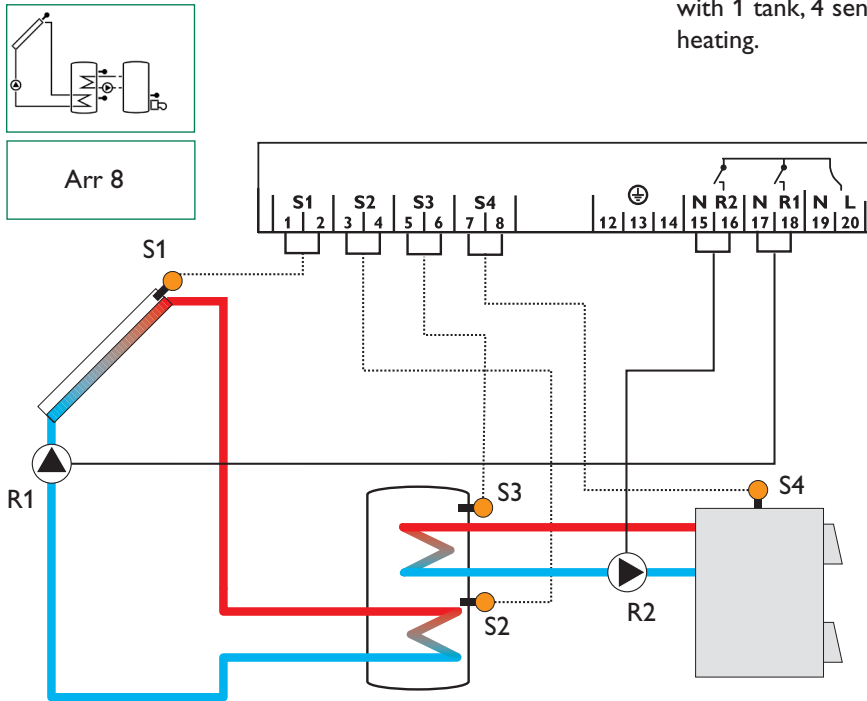
Arr 7



| Symbol | Specification              |
|--------|----------------------------|
| S1     | Collector sensor           |
| S2     | Tank sensor 1              |
| S3     | Collector sensor 2         |
| S4     | Measuring sensor (optinal) |
| R1     | Solar pump collector 1     |
| R2     | Solar pump collector 2     |

1.2.8 Terminal allocation - system 8

Solar system with solid fuel boiler after-heating with 1 tank, 4 sensors, 1 solar pump and 1 pump for after-heating.

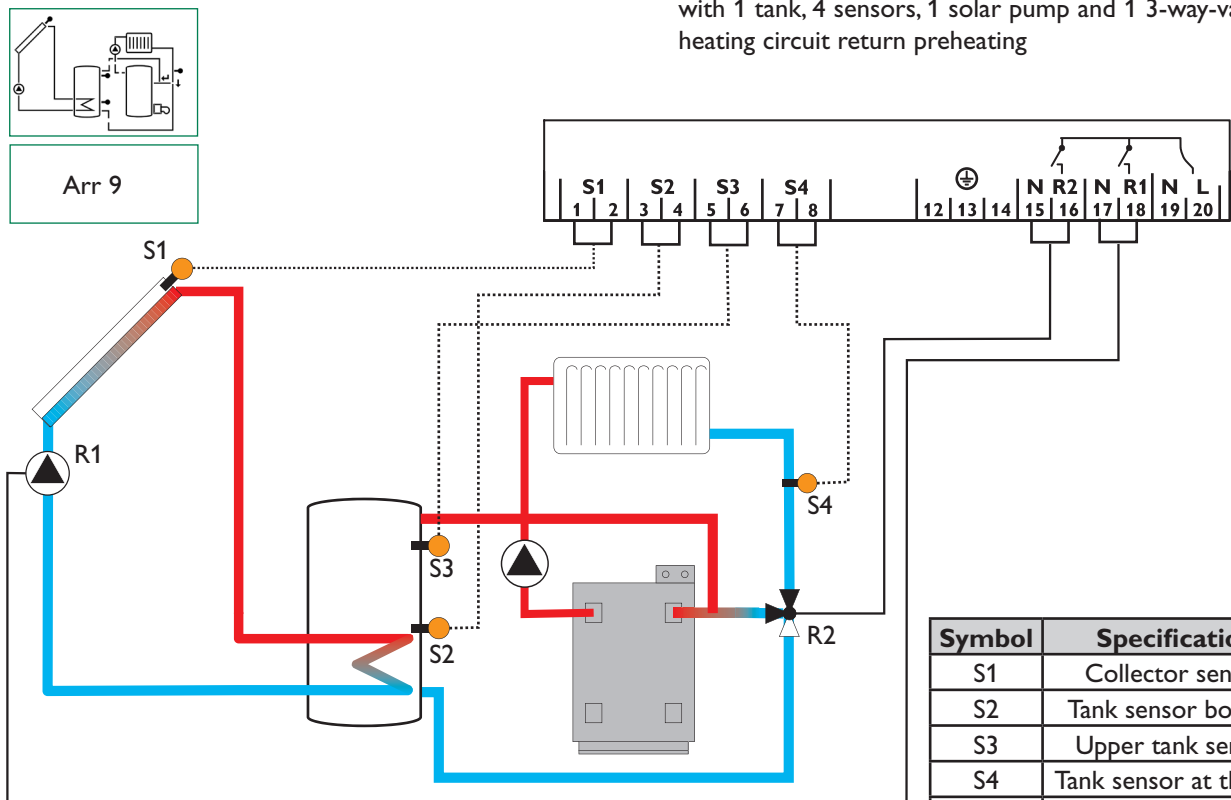


Arr 8

| Symbol | Specification            |
|--------|--------------------------|
| S1     | Collector sensor         |
| S2     | Tank sensor bottom       |
| S3     | Tank sensor at the top   |
| S4     | Tank - solid fuel boiler |
| R1     | Solar pump               |
| R2     | Solid fuel boiler pump   |

1.2.9 Terminal allocation - system 9

Solar system and heating circuit return preheating with 1 tank, 4 sensors, 1 solar pump and 1 3-way-valve for heating circuit return preheating

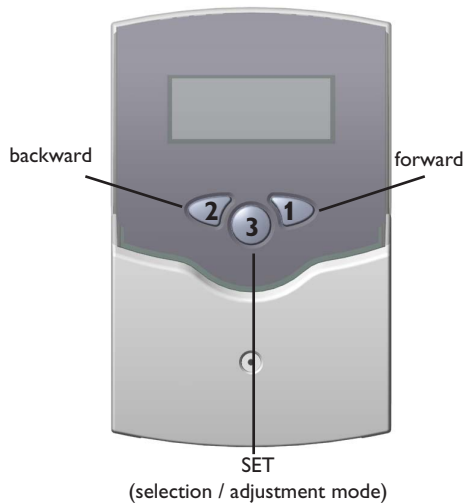


Arr 9

| Symbol | Specification          |
|--------|------------------------|
| S1     | Collector sensor       |
| S2     | Tank sensor bottom     |
| S3     | Upper tank sensor      |
| S4     | Tank sensor at the top |
| R1     | Solar pump             |
| R2     | 3-way-valve            |

## 2. Operation and function

### 2.1 Pushbuttons for adjustment



The controller is operated by 3 pushbuttons below the display. The forward-key (1) is used for scrolling forward through the indication menu or to increase the adjustment values. The backwards-key (2) is accordingly used for the reverse function.

For adjustment of last indication channel, keep button 1 pressed for 3 seconds. If an **adjustment value** is shown on the display, **SET** is indicated. In this case you can press the key „Set“ (3) in order to change into input mode.

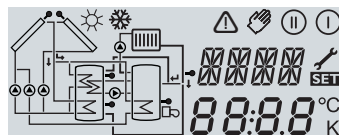
Select a channel by keys 1 and 2

Shortly press key 3, so that **SET** is blinking.

Adjust the value by keys 1 and 2

Shortly press key 3, so that **SET** permanently appears, the adjusted value is now saved.

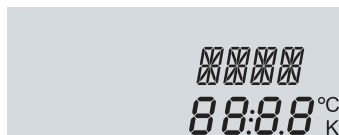
### 2.2 System monitoring display



monitoring-Display

The system monitoring display consists of 3 blocks: **channel display**, **tool bar** and **system screen** (active system scheme).

#### 2.2.1 Channel display

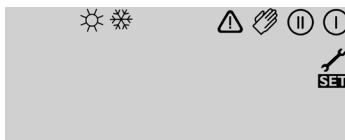


channel display

The **channel display** consists of two lines. The upper line is an alpha-numeric 16-segment display (text display) for displaying channel names and menu items. In the lower 7-segment display, the channel values and the adjustment parameters are displayed. Temperatures and temperature differences are displayed.

Temperatures are either indicated in °F or °C, whereas temperature differences are indicated in K or °Ra respectively.

#### 2.2.2 Tool bar

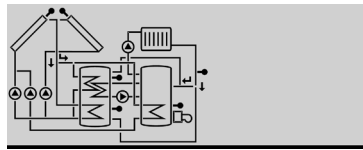


tool bar

The additional symbols of the **tool bar** indicate the current system status.

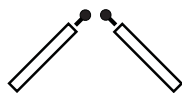
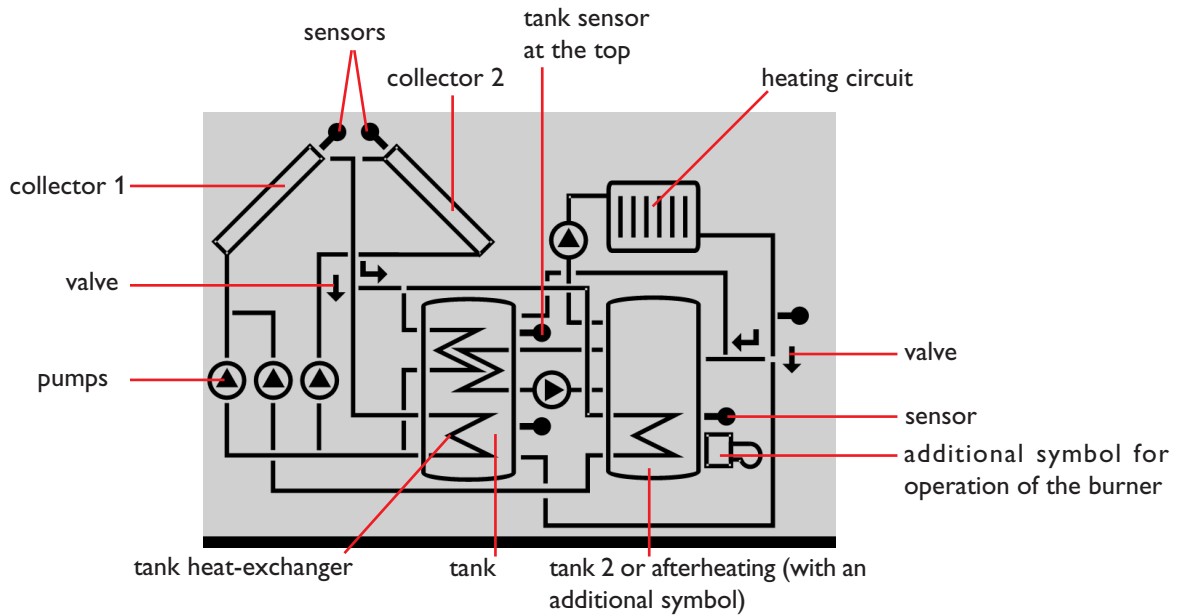
| Symbol | standard   | blinking   |
|--------|--|--|
| ⓘ      | relay 1 active   |  |
| Ⓜ      | relay 2 active   |  |
| ☀      | maximum tank limitation active / maximum tank temperature exceeded | collector cooling function or recolling function active        |
| ❄      | antifreeze function activated                                      | collector minimum limitation or antifreeze function active     |
| ⚠      |  | collector emergency shutdown or tank emergency shutdown active |
| ⚠ + 🔧  |  | sensor defective   |
| ⚠ + 🧤  |  | manual operation active  |
| SET    |  | an adjustment channel is being changed SET-mode                |

### 2.2.3 System screen

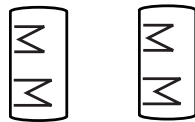


system screen

The system screen (active system scheme) shows the schemes selected on the controller. It consists of several system component symbols, which are - depending on the current status of the system - either flashing, permanently shown or hidden.



**Collectors**  
with collector sensor



**Tanks 1 and 2**  
with heat-exchanger



**3-way-valve**  
The flow direction or the actual switching position is shown.



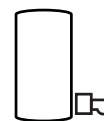
**Temperature sensor**



**Heating circuit**



**Pump**



**Afterheating**  
with burner symbol

## 2.3 Flashing codes

### 2.3.1 System screen flashing codes

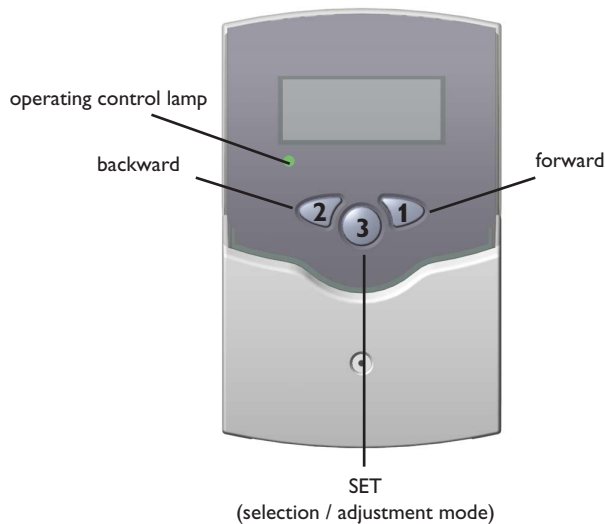
- Pumps are flashing during initialization phase
- Sensor symbols are flashing if the corresponding sensor display channel is selected.
- Sensors are flashing in the case of a sensor fault.
- Burner symbol is flashing if the after-heating is active

### 2.3.2 LED flashing codes

- |                    |                                     |
|--------------------|-------------------------------------|
| green:             | everything OK                       |
| red/green flashing | initialization phase                |
|                    | manual operation                    |
| red flashing:      | sensor fault                        |
|                    | (sensor symbol is flashing quickly) |

### 3. Commissioning

When the controller is commissioned for the first time, the arrangement has to be selected first

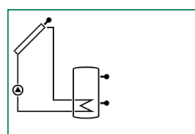


1. Switch on power supply. During the initialization phase, the operating control lamp flashes red and green. After initialization, the controller is in the automatic mode with typical settings. The pre-programmed system scheme is Arr 1.

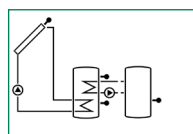
2. Adjust the clock time in the TIME channel. Pressing the **SET** button once for adjusting the hours, and press it once again for adjusting the minutes. The time can be adjusted using buttons 1 and 2 and saved by pressing the **SET** button.

- 3. - Select the adjustment channel Arr
  - Change to the **SET**-mode (see 2.1)
  - Select the arrangement via the Arr-index number
  - Save the adjustment by pressing the **SET** button

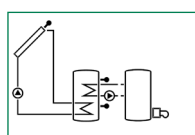
Now the controller is ready for operation with typical settings to suit that system and normally the factory settings will give close to optimum operation.



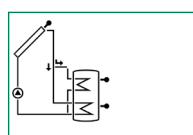
Arr 1



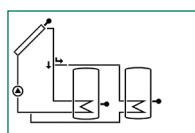
Arr 2



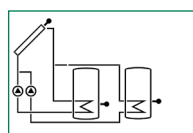
Arr 3



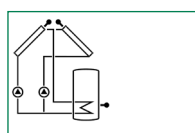
Arr 4



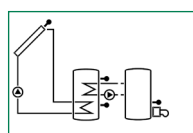
Arr 5



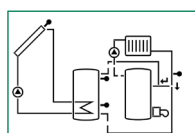
Arr 6



Arr 7



Arr 8



Arr 9

#### System survey:

- Arr 1 : standard solar system
- Arr 2 : solar system with heat exchange
- Arr 3 : solar system with after-heating
- Arr 4 : solar system with vertical tank charging
- Arr 5 : 2-tank solar system with valve logic
- Arr 6 : 2-tank solar system with pump logic
- Arr 7 : solar system with 2 collectors and 1 tank
- Arr 8 : solar system with after-heating by solid fuel boiler
- Arr 9 : solar system with heating circuit return preheating

## 4. Control parameters and display channels

### 4.1 Overview of channels

#### Legend:

x

Corresponding channel is available.

x\*

Corresponding channel is available if the appropriate option is activated.

①

Corresponding channel is only available if the option heat quantity measurement is **activated** (OHQM).

②

Corresponding channel is only available if the option heat quantity measurement is **deactivated** (OHQM).

MEDT

The channel antifreeze content (MED%) is only shown if **the antifreeze is not water or Tyfocor LS / G-LS (MEDT 0 or 3)**. Adjustments concerning the antifreeze content will only make sense if the antifreeze is used in the solar circuit.



#### Please note:

Only if temperature sensors are connected, will S3 and S4 be displayed.

| Channel | Arr |   |   |   |     |   |   |   |   | Description                         | Page |
|---------|-----|---|---|---|-----|---|---|---|---|-------------------------------------|------|
|         | 1   | 2 | 3 | 4 | 5   | 6 | 7 | 8 | 9 |                                     |      |
| COL     | x   | x | x | x | x   | x |   | x | x | Temperature collector 1             | 15   |
| COL 1   |     |   |   |   |     |   | x |   |   | Temperature collector 1             | 15   |
| TST     | x   |   |   |   |     |   | x |   |   | Temperature tank 1                  | 15   |
| TSTL    |     |   | x | x |     |   |   | x | x | Temperature tank 1 bottom           | 15   |
| TST1    |     | x |   |   | x   | x |   |   |   | Temperature tank 1 bottom           | 15   |
| TSTU    |     | x | x | x |     |   |   | x | x | Temperature tank 1 at the top       | 15   |
| TST2    |     | x |   |   | x   | x |   |   |   | Temperature tank 2 bottom           | 15   |
| TFSB    |     |   |   |   |     |   |   | x |   | Temperature solid fuel boiler       | 15   |
| TRET    |     |   |   |   |     |   |   |   | x | Temperature heating circuit         | 15   |
| COL2    |     |   |   |   |     |   | x |   |   | Temperature collector 2             | 15   |
| S3      | x   |   |   |   |     |   |   |   |   | Temperature sensor 3                | 15   |
| TRF     | ①   |   | ① |   | ①   |   |   |   |   | Temperature return sensor           | 15   |
| S4      | ②   |   | ② | ② | ②   | x | x |   |   | Temperature sensor 4                | 15   |
| hP      | x   |   |   | x | x   |   |   |   | x | Operating hours relay 1             | 16   |
| h P1    |     | x | x |   |     | x | x | x |   | Operating hours relay 1             | 16   |
| h P2    |     | x | x |   |     | x | x | x |   | Operating hours relay 2             | 16   |
| kWh     | ①   |   | ① | ① | ①   |   |   |   |   | Heat quantity kWh                   | 16   |
| MWh     | ①   |   | ① | ① | ①   |   |   |   |   | Heat quantity MWh                   | 16   |
| time    |     |   |   |   | x   |   |   |   |   | Time                                | 15   |
| Arr     |     |   |   |   | 1-9 |   |   |   |   | System                              | 12   |
| DT O    | x   | x | x |   |     |   | x | x | x | Switch-on temperature diff          | 17   |
| DT1O    |     |   |   | x | x   | x |   |   |   | Switch-on temperature diff 1        | 17   |
| DT F    | x   | x | x |   |     |   | x | x | x | Switch-off temperature diff 1       | 17   |
| DT1F    |     |   |   | x | x   | x |   |   |   | Switch-off temperature difference   | 17   |
| S MX    | x   | x | x |   |     |   | x | x | x | Maximum temperature tank 1          | 17   |
| S1 MX   |     |   |   | x | x   | x |   |   |   | Maximum temperature tank 1          | 17   |
| DT2O    |     |   |   | x | x   | x |   |   |   | Switch-on temperature difference 2  | 17   |
| DT2F    |     |   |   | x | x   | x |   |   |   | Switch-off temperature difference 2 | 17   |
| S2MX    |     |   |   | x | x   | x |   |   |   | Maximum temperature tank 2          | 17   |
| EM      | x   | x | x | x | x   | x |   | x | x | Emergency temperature collector 1   | 18   |
| EM1     |     |   |   |   |     |   | x |   |   | Emergency temperature collector 1   | 18   |

| Channel | Arr   |    |      |      |      |    |    |    |    | Description                            | Page |
|---------|-------|----|------|------|------|----|----|----|----|--|------|
|         | 1     | 2  | 3    | 4    | 5    | 6  | 7  | 8  | 9  |  |      |
| OCX     | x     | x  | x    | x    | x    | x  |    | x  | x  | Option collector cooling collector 1   | 18   |
| OCX1    |       |    |      |      |      |    | x  |    |    | Option collector cooling collector 1   | 18   |
| CMX     | x*    | x* | x*   | x*   | x*   | x* |    | x* | x* | Maximum temperature collector 1        | 18   |
| CMX1    |       |    |      |      |      |    | x* |    |    | Maximum temperature collector 1        | 18   |
| OCN     | x     | x  | x    | x    | x    | x  |    | x  | x  | Option minimum limitation collector 1  | 18   |
| OCN1    |       |    |      |      |      |    | x  |    |    | Option minimum limitation collector 1  | 18   |
| CMN     | x*    | x* | x*   | x*   | x*   | x* |    | x* | x* | Minimum temperature collector 1        | 18   |
| CMN1    |       |    |      |      |      |    | x* |    |    | Minimum temperature collector 1        | 18   |
| OCF     | x     | x  | x    | x    | x    | x  |    | x  | x  | Option antifreeze collector 1          | 18   |
| OCF1    |       |    |      |      |      |    | x  |    |    | Option antifreeze collector 1          | 18   |
| CFR     | x*    | x* | x*   | x*   | x*   | x* |    | x* | x* | Antifreeze temperature collector 1     | 18   |
| CFR1    |       |    |      |      |      |    | x* |    |    | Antifreeze temperature collector 1     | 18   |
| EM2     |       |    |      |      |      |    | x  |    |    | Emergency temperature collector 2      | 18   |
| OCX2    |       |    |      |      |      |    | x  |    |    | Option collector cooling collector 2   | 18   |
| CMX2    |       |    |      |      |      |    | x* |    |    | Maximum temperature collector 2        | 18   |
| OCN2    |       |    |      |      |      |    | x  |    |    | Option minimum limitation collector 2  | 18   |
| CMN2    |       |    |      |      |      |    | x* |    |    | Minimum temperature collector 2        | 18   |
| OCF2    |       |    |      |      |      |    | x  |    |    | Option antifreeze collector 2          | 18   |
| CFR2    |       |    |      |      |      |    | x* |    |    | Antifreeze temperature collector 2     | 18   |
| PRIO    |       |    |      | x    | x    | x  |    |    |    | Priority                               | 19   |
| tST     |       |    |      | x    | x    | x  |    |    |    | Break time                             | 19   |
| tRUN    |       |    |      | x    | x    | x  |    |    |    | Circulation runtime                    | 19   |
| OREC    | x     | x  | x    | x    | x    | x  | x  | x  | x  | Option recolling                       | 19   |
| OTC     | x     | x  | x    | x    | x    | x  | x  | x  | x  | Option tube collector                  | 19   |
| DT3O    |       | x  |      |      |      |    |    | x  | x  | Switch-on temperature difference 3     | 17   |
| DT3F    |       | x  |      |      |      |    |    | x  | x  | Switch-off temperature difference 3    | 17   |
| MX3O    |       | x  |      |      |      |    |    | x  |    | Switch-on threshold for maximum temp.  | 17   |
| MX3F    |       | x  |      |      |      |    |    | x  |    | Switch-off threshold for maximum temp. | 17   |
| MN3O    |       | x  |      |      |      |    |    | x  |    | Switch-on threshold for minimum temp.  | 17   |
| MN3F    |       | x  |      |      |      |    |    | x  |    | Switch-off threshold for minimum temp. | 17   |
| AH O    |       |    | x    |      |      |    |    |    |    | Switch-on temp. for thermostat 1       | 20   |
| AH F    |       |    | x    |      |      |    |    |    |    | Switch-off temp. for thermostat 1      | 20   |
| OHQM    | x     |    | x    | x    | x    |    |    |    |    | Option WMZ                             | 16   |
| FMAX    | ①     |    | ①    | ①    | ①    |    |    |    |    | Maximum flow                           | 16   |
| MEDT    | ①     |    | ①    | ①    | ①    |    |    |    |    | Antifreeze type                        | 16   |
| MED%    | MEDT  |    | MEDT | MEDT | MEDT |    |    |    |    | Antifreeze concentration               | 16   |
| t1 on   |       |    | x    |      |      |    |    |    |    | Switch on time 1 thermostat            | 20   |
| t1 off  |       |    | x    |      |      |    |    |    |    | Switch off time 1 thermostat           | 20   |
| t2 on   |       |    | x    |      |      |    |    |    |    | Switch on time 2 thermostat            | 20   |
| t2 off  |       |    | x    |      |      |    |    |    |    | Switch off time 2 thermostat           | 20   |
| t3 on   |       |    | x    |      |      |    |    |    |    | Switch on time 3 thermostat            | 20   |
| t3 off  |       |    | x    |      |      |    |    |    |    | Switch off time 3 thermostat           | 20   |
| HND1    | x     | x  | x    | x    | x    | x  | x  | x  | x  | Manual operation relay 1               | 20   |
| HND2    | x     | x  | x    | x    | x    | x  | x  | x  | x  | Manual operation relay 2               | 20   |
| LANG    | x     | x  | x    | x    | x    | x  | x  | x  | x  | Language                               | 20   |
| UNIT    | x     | x  | x    | x    | x    | x  | x  | x  | x  | Selection: °FAH / °CEL                 | 20   |
| PROG    | XX.XX |    |      |      |      |    |    |    |    | Program number                         |      |
| VERS    | X.XX  |    |      |      |      |    |    |    |    | Version number                         |      |

#### 4.1.1 Indication of collector temperatures

**COL, COL1, COL2:**

Collector temperature  
display range: -40...+480°F



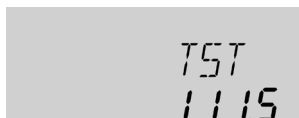
Shows the current collector temperature.

- COL : collector temperature (1-collector system)
- COL1: collector temperature 1
- COL2: collector temperature 2

#### 4.1.2 Indication of tank temperatures

**TST, TSTL, TSTU,  
TST1, TST2:**

Tank temperatures  
Display range: -40...+480 °F



Shows the current tank temperature.

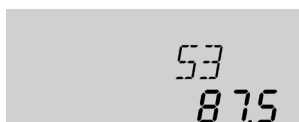
- TST : tank temperature (1-tank system)
- TSTL : tank temperature bottom
- TSTU: tank temperature top
- TST1 : temperature tank 1
- TST2 : temperature tank 2

#### 4.1.3 Indication of sensors 3 and 4

**S3, S4:**

**S3, S4:**

Sensor temperatures  
Display range: -40...+480 °F



Shows the current temperature of the corresponding additional sensor (without control function).

- S3 : temperature sensor 3
- S4 : temperature sensor 4



**Note:**

S3 and S4 will only be indicated if the temperature sensors are connected.

#### 4.1.4 Indication of other temperatures

**TFSB, TRET, TRF:**

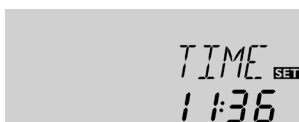
Other measured temperatures  
Display range: -40...+480 °F



Shows the current temperature of the corresponding sensor.

- TFSB : temperature solid fuel boiler
- TRET : temperature heating return preheating
- TRF : temperature return

#### 4.1.5 Time

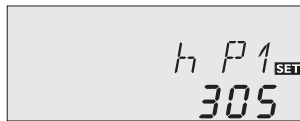


Indicates the actual time.

Press the **SET** button for 2 seconds in order to adjust the hours and press it again in order to adjust the minutes (flashing). The time can be set using buttons 1 and 2 and saved by pressing the **SET** button.

#### 4.1.6 Operating hours counter

**h P / h P1 / h P2:**  
Operating hours counter  
Display channel



The operating hours counter accumulates the solar operating hours of the respective relay (**h P / h P1 / h P2**). Full hours are displayed.

The accumulated operating hours can be set back to zero. As soon as one operating hours channel is selected, the symbol **SET** is displayed. Press the SET (3) button for approx. 2 seconds in order to access the RESET-mode of the counter. The display symbol **SET** will flash and the operating hours will be set to 0. Confirm the reset with the **SET** button in order to finish the reset.

In order to interrupt the RESET-process, do not press a button for about 5 seconds. The display returns to the display mode.

#### 4.1.7 Heat quantity balancing

**OHQM:**Heat quantity measurement  
Adjustment range: OFF...ON  
Factory setting: OFF



Heat quantity measurement is possible in Arr 1, 3, 4, and 5 if a flowmeter is used. For this purpose, the heat quantity measurement option (**OHQM**) has to be enabled.

**FMAX:** Flow rate in l/min  
Adjustment range 0 ... 20  
in steps 0,1-steps  
Factory setting 6,0



The flow rate should be read from the flowmeter (l/min) and has to be adjusted in the channel **FMAX**. Antifreeze type and concentration of the heat transfer fluid have to be adjusted in the channels **MEDT** and **MED%**.

**MEDT:** antifreeze  
Adjustment range 0...3  
Factory setting 1



**Antifreeze type:**

- 0 : water
- 1 : propylene glycol
- 2 : ethylene glycol
- 3 : Tyfocor® LS / G-LS

**MED%:** Concentration of antifreeze in Vol-%  
MED% is hidden when MEDT 0 or 3 is used.  
Adjustment range 20...70  
Factory setting 45



**kWh/MWh:**Heat quantity in kWh / MWh  
Display channel



The flow rate as well as the reference sensors S1 (flow) and S4 (return) are used for calculating the heat quantity supplied. It is shown in kWh in the channel **kWh** and in MWh in the channel **MWh**. The overall heat quantity results from the sum of both values.

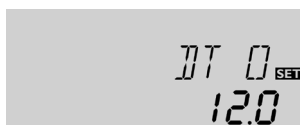
The accumulated heat quantity can be reset. As soon as one of the display channels of the heat quantity is selected, the **SET** symbol is permanently shown on the display. Press button SET (3) for about 2 seconds in order to access the RESET mode of the counter. The display symbol **SET** will flash and the heat quantity value will be set to 0. In order to finish this process, press the **SET** button to confirm.

In order to interrupt the RESET process, no button should be pressed for about 5 seconds. The controller automatically returns to the display mode.

#### 4.1.8 ΔT-regulation

##### DT O / DT1O / DT2O / DT3O:

Switch on temperature diff.  
Adjustment range 2,0 ... 40,0°Ra  
Factory setting 12,0°Ra



##### DT F / DT1F / DT2F / DT3F:

Switch-off temperature diff.  
Adjustment range 1,0 ... 39,0°Ra  
Factory setting 8,0°Ra



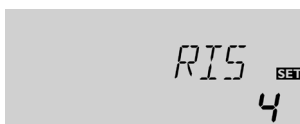
##### DT S / DT1S / DT2S / DT3S:

Nominal temperature difference  
Adjustment range 3,0 ... 60,0°Ra  
Factory setting 20,0°Ra



##### RIS / RIS1 / RIS2 / RIS3:

Rise  
Adjustment range 2 ... 40°Ra  
Factory setting 4°Ra



First the controller works as a standard differential controller. If the switch-on difference (**DT O / DT1O / DT2O**) is reached, the pump is activated at full speed for 10 seconds. The speed is then reduced to the minimum pump speed value (nMN / nMN1 / nMN2 = 30 %). If the temperature difference reaches the adjusted set value (**DT S / DT1S / DT2S / DT3S**), the pump speed increases by one step (10%). If the difference increases by 4°Ra (**RIS / RIS1 / RIS2 / RIS3**), the pump speed increases by 10 % respectively until the maximum pump speed of 100 % is reached. The response of the controller can be adapted via the parameter „Rise“. If the temperature difference falls below the adjusted switch-off temperature difference (**DT F / DT1F / DT2F**), the controller switches off.

**DT O** and **DT S** are locked against each other. **DT S** must be at least 1°Ra higher than **DT O**.



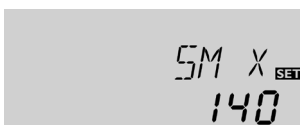
**Please note:**

The switch-on temperature difference must be at least 2°Ra higher than the switch-off temperature difference.

#### 4.1.9 Maximum tank temperature

##### S MX / S1MX / S2MX:

Maximum tank temp.  
Adjustment range 40...205°F  
Factory setting 140°F



Once the adjusted maximum temperature is exceeded, the solar pump is switched off and further loading of the tank is prevented to reduce scald risk or system damage. The ☀ symbol is shown on the display.



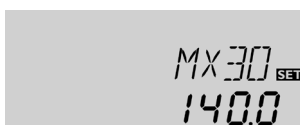
**Please note:** The controller is also equipped with a non-adjustable emergency switch-off if the tank reaches 205°F.

#### 4.1.10 ΔT-control (solid fuel boiler and heat exchange)

##### Maximum temperature limitation

##### MX3O / MX3F:

Maximum temperature limitation  
Adjustment range 30...205°F  
Factory setting  
MX3O 140°F  
MX3F 136°F



In arrangements 2 and 8, the controller is equipped with an additional differential control for heat exchange between two tanks or from a solid fuel back boiler (e.g. wood-stove). Minimum and maximum temperature limits can be set. The basic differential function is adjusted using the switch on (**DT3 O**) and switch off (**DT3 F**) temperature differences.

The **MX3O / MX3F** function provides a maximum temperature setting, usually to reduce scald risk in a storage tank. If **MX3O** is exceeded, relay 2 is switched off until the sensor falls below **MX3F**. This function uses sensor 3 in Arr. 8 and sensor 4 in Arr.2.

##### Minimum temperature limitation

##### MN3O / MN3F:

Minimum temperature limitation  
Adjustment range 30...195°F  
Factory setting:



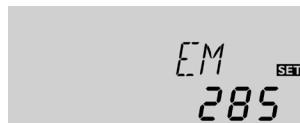
Arr = 2  
MN3O 40°F  
MN3F 50°F  
Arr = 8  
MN3O 140°F  
MN3F 150°F

The **MN3O / MN3F** function provides a minimum temperature setting and aims to provide frost protection in Arr.2, and back boiler protection in Arr.8. If the sensor temperature falls below **MN3O**, relay 2 is switched off until the temperature exceeds **MN3F**. This function uses sensor 4 in Arr.8 and sensor 3 in Arr.2.

Both switch-on and switch-off temperature differences **DT3O** and **DT3F** are valid for the maximum and minimum temperature limitation.

**4.1.11 Collector temperature limitation  
Emergency shutdown of the collector**

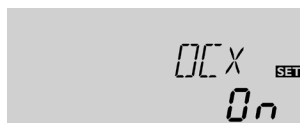
**EM / EM1 / EM2:**  
Collector temperature limitation  
Adjustment range 230...400°F  
Factory setting 285°F



If the adjusted collector emergency shutdown temperature (**EM / EM1 / EM2**) is exceeded, the controller switches off the solar pump (R1 / R2) in order to protect the system against overheating (collector emergency shutdown). The factory setting is 285°F but it can be changed within the adjustment range of 230...400°F. Δ (flashing) is shown.

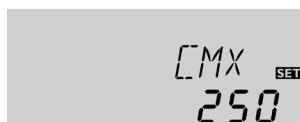
**4.1.12 System cooling**

**OCX / OCX1 / OCX2:**  
Option System cooling  
Adjustment range OFF...ON  
Factory setting ON



When the adjusted maximum tank temperature is reached, the system stagnates. If the collector temperature increases to the adjusted maximum collector temperature (**CMX / CMX1 / CMX2**), the solar pump is activated until the collector temperature falls below the maximum collector temperature. The tank temperature may increase (subordinate active maximum tank temperature), but only up to 400°F (emergency shutdown of the tank). If the tank temperature is higher than the maximum tank temperature (**SMX / S1MX / S2MX**) and if the collector temperature is at least 10°Ra below the tank temperature, the solar system remains activated until the tank is cooled down below the adjusted maximum temperature (**SMX / S1MX / S2MX**) via the collector and the pipework.

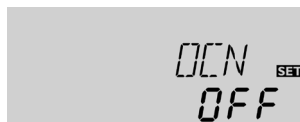
**CMX / CMX1 / CMX2:**  
Maximum collector temp.  
Adjustment range 210...380°F  
Factory setting 250°F



If the system cooling function is enabled, ☀ (flashing) is shown on the display. Due to the cooling function, the system will have a longer operation time on hot summer days and guarantees thermal relief of the collector field and the heat transfer fluid.

**4.1.13 Collector minimum limitation option**

**OCN / OCN1 / OCN2:**  
Collector minimum limitation  
OFF / ON  
Factory setting OFF



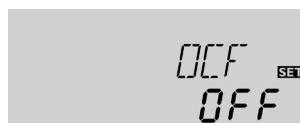
The minimum collector temperature is the minimum temperature which must be exceeded for the solar pump (R1 / R2) to switch on. The minimum temperature prevents the pump from being switched on too often at low collector temperatures. If the temperature falls below the minimum temperature, ❄ (flashing) is shown on the display.

**CMN / CMN1 / CMN2:**  
Collector minimum temp.  
Adjustment range 50...195°F  
Factory setting 50°F



**4.1.14 Antifreeze option**

**OCF / OCF1 / OCF2:**  
Antifreeze function  
Adjustment range OFF / ON  
Factory setting OFF



The antifreeze function activates the loading circuit between the collector and the tank when the temperature falls below the adjusted antifreeze temperature. This will protect the fluid against freezing or coagulating. If the adjusted antifreeze temperature is exceeded by 2 °F, the loading circuit will be deactivated.

**CFR / CFR1 / CFR2:**  
Antifreeze temperature  
Adjustment range 15...50°F  
Factory setting 40°F



**Note:**  
Since this function uses the limited heat quantity of the tank, the antifreeze function should be used in regions with few days of temperatures around the freezing point.

## 4.1.15 Tank sequence control

Corresponding adjustment values:

priority [PRIO]

break-time [tST]

loading runtime [tRUN]

**Factory setting**

(1 / Arr 5,6) (2 / Arr 4)

2 min.

15 min.

**Adjustment range**

0-2

1-30 min.

1-30 min.

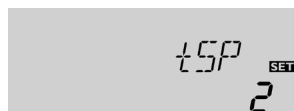
The DeltaSol® BS Plus priority logic

Priority:



The above-mentioned options and parameters are used in multi-tank systems only (system Arr = 4, 5, 6). If **priority 0** is adjusted, the tanks with a temperature difference to the collector are loaded in numerical order (tank 1 or tank 2). Usually the tanks are loaded one after the other. **Parallel loading** is also possible in Arr = 5, 6..

Oscillating break time / oscillating loading time / collector rise temperature



This function aims to extract the maximum solar gain in 2 tank systems. If the first priority tank cannot be loaded, the second priority is checked. If useful heat can be added, it will be loaded for the „oscillating loading time“ („t-run“ - factory default 15 min.) After this, the loading process stops and the controller monitors the increase in collector temperature during the break time „t-st“. If it increases by 4 °Ra, the break time timer starts again to allow the collector to gain more heat. If it does not, but useful heat can be added to the second priority tank, the second tank will be loaded again for the „t-run“ time as before.

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

## 4.1.16 Recooling function

**OREC:**

Option recooling  
adjustment range OFF...ON

Factory setting: OFF



If the adjusted maximum tank temperature (**S MX / S1MX / S2MX**) is reached, the controller keeps the solar pump running in order to prevent the collector from being overheated. The tank temperature may increase but only up to 205 °F (emergency shutdown of the tank).

In the evening, the solar thermal system remains switched on until the tank is cooled down to the adjusted maximum temperature via the collector and the pipework.

## 4.1.17 Evacuated tube collector function

**OTC:**

Evacuated tube collector  
function

Adjustment range: OFF...ON

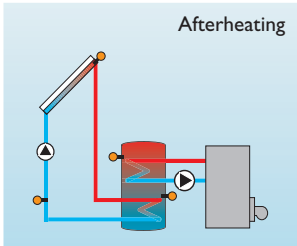
Factory setting: OFF



If the controller detects an increase in collector temperature by 4 °Ra compared to the previously stored collector temperature, the solar pump will be switched-on at 100 % for about 30 seconds in order to detect the fluid temperature. The current collector temperature will be saved as a new reference value. If the measured temperature (new reference value) is exceeded by 4 °Ra, the solar pump will run for 30 seconds. If the switch-on difference between the collector and the tank is exceeded during the runtime of the solar pump or the standstill of the system, the controller will automatically switch to solar loading.

If the collector temperature decreases by 4 °Ra during standstill, the switch-on value for the evacuated tube collector function will be recalculated.

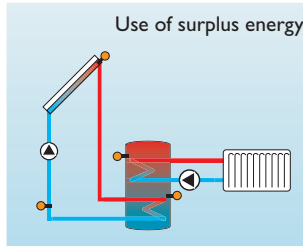
**4.1.18 Thermostat function (Arr = 3)**



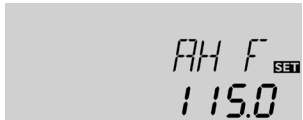
Afterheating



**AH O:**  
Thermostat switch-on temp.  
Adjustment range 30...205°F  
Factory setting 105°F



Use of surplus energy



**AH F:**  
Thermostat switch-off temp.  
Adjustment range 30...205°F  
Factory setting 115°F

The thermostat function works independently from the solar operation and can be used for using surplus energy or for after-heating.

- **AH O < AH F**  
thermostat function for after-heating
- **AH O > AH F**  
thermostat function for using surplus energy

Symbol ⓘ will be shown on the display if the second relay output is activated.



**Note:**  
Reference sensor for the thermostat function is S3.



**t1 O, t2 O, t3 O:**  
Thermostat switch-on time  
Adjustment range:  
00:00...23:45  
Factory setting: 00:00



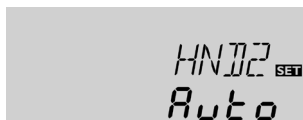
**t1 F, t2 F, t3 F:**  
Thermostat switch-off time  
Adjustment range:  
00:00...23:45  
Factory setting: 00:00

In order to block the thermostat function for a certain period, there are 3 time frames t1 ... t3. If the function should be active between 6:00 and 9:00, set t1 O to 6:00 and t1 F to 9:00. The thermostat function is factory set to continuous operation.

If all time frames stop at 00:00 o'clock, the thermostat function is continuously activated (factory setting).

**4.1.19 Operating mode**

**HND1/HND2:**  
Operating mode  
Adjustment range:  
OFF, Auto, ON  
Factory setting: Auto

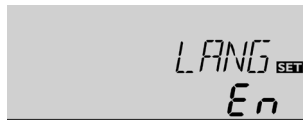


For control and service work, the operating mode of the controller can be manually adjusted. For this purpose, select the adjustment value **HND1, HND2** in which the following adjustments can be made:

- **HND1 / HND2**  
Operating mode  
OFF : relay off ⓘ (flashing) + ⚠️  
Auto : relay in automatic operation  
ON : relay on ⓘ (flashing) + ⚠️

**4.1.20 Language**

**LANG:**  
Language choice  
Adjustment range: dE, En, It, Fr  
Factory setting: En



The menu language can be adjusted in this channel.

- dE : German
- En : English
- It : Italiano
- Fr : French

**4.1.21 Unit**

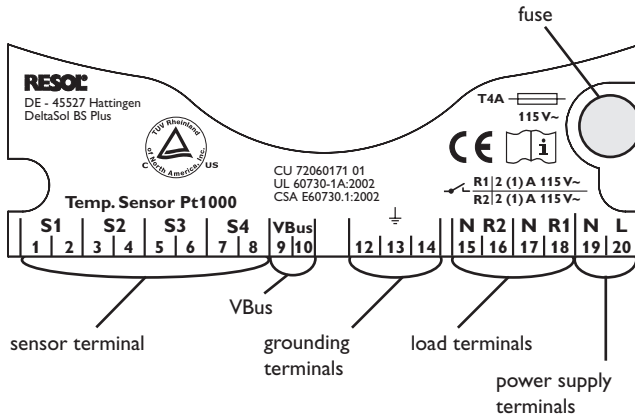
**UNIT:**  
Unit choice  
Adjustment range: FAH, °C  
Factory setting: FAH



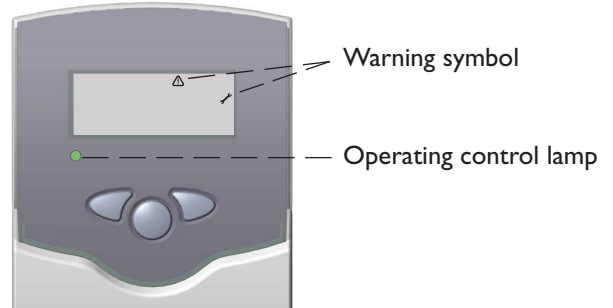
The menu unit can be adjusted:

- °FAH
- °CEL

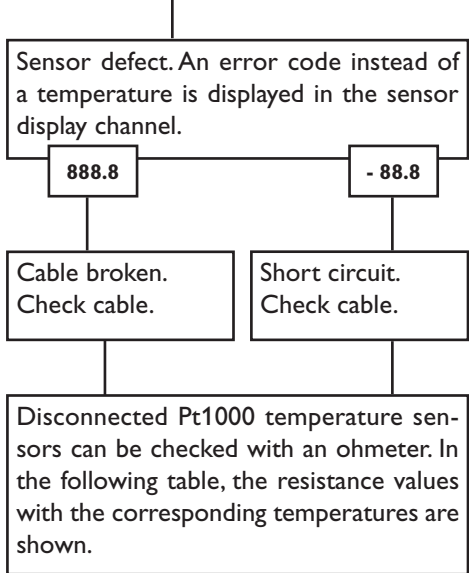
### 5. Troubleshooting



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



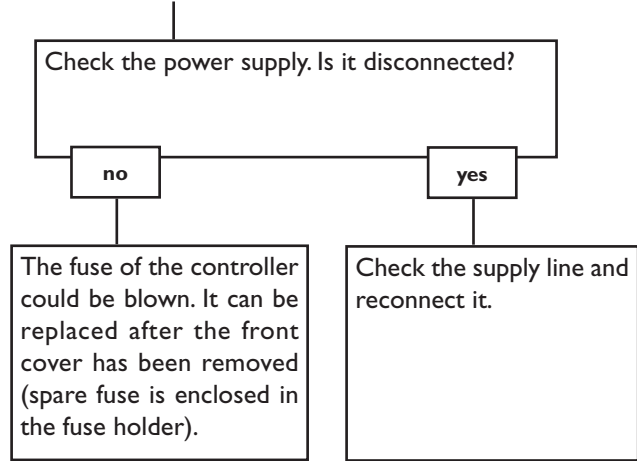
Operating control lamp flashes red. On the display the symbols and appear.



| °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 |

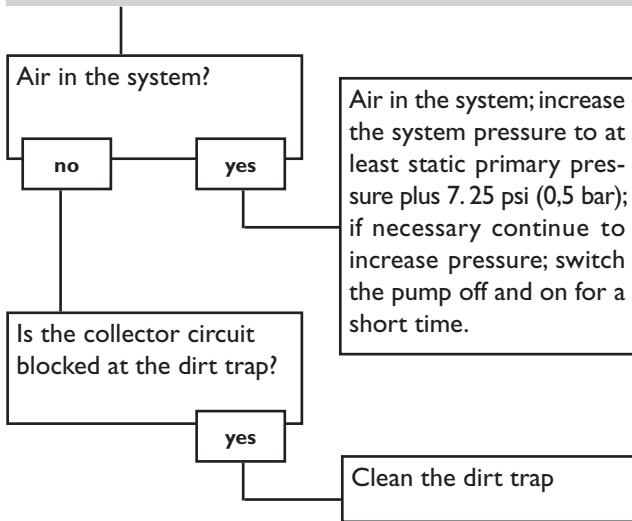
resistance of the Pt1000 sensors

Operating control lamp off

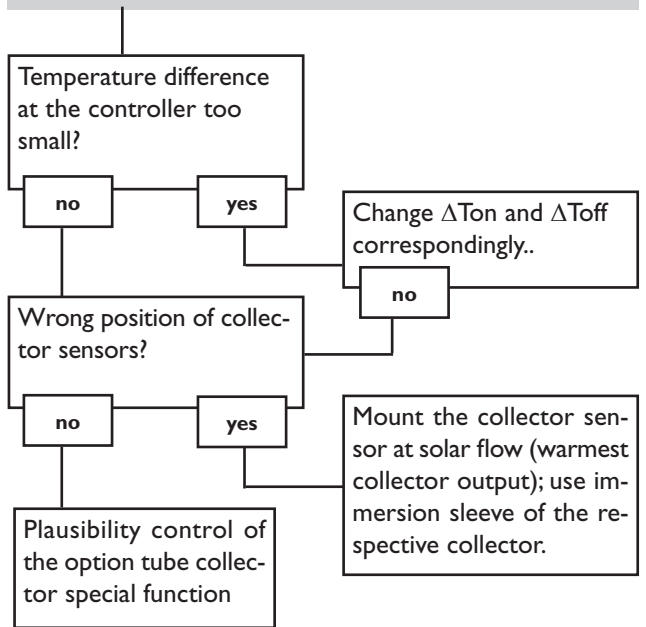


5.1 Various:

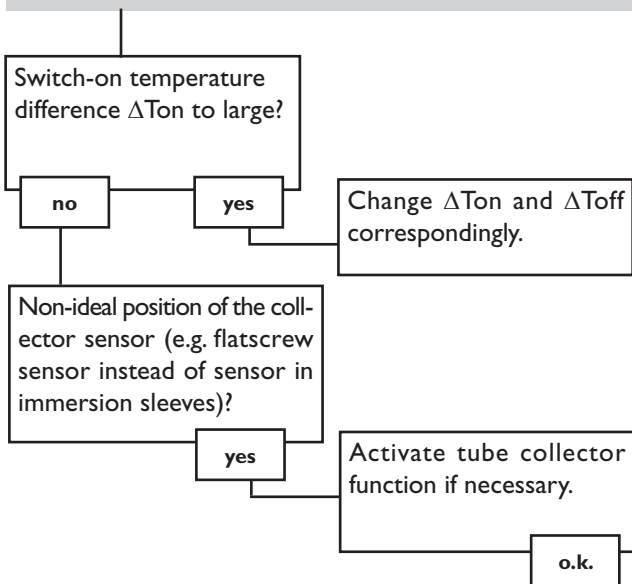
Pump is overheated, but no heat transfer from the collector to the tank, flow and return have the same temperature; perhaps also bubble in the lines.



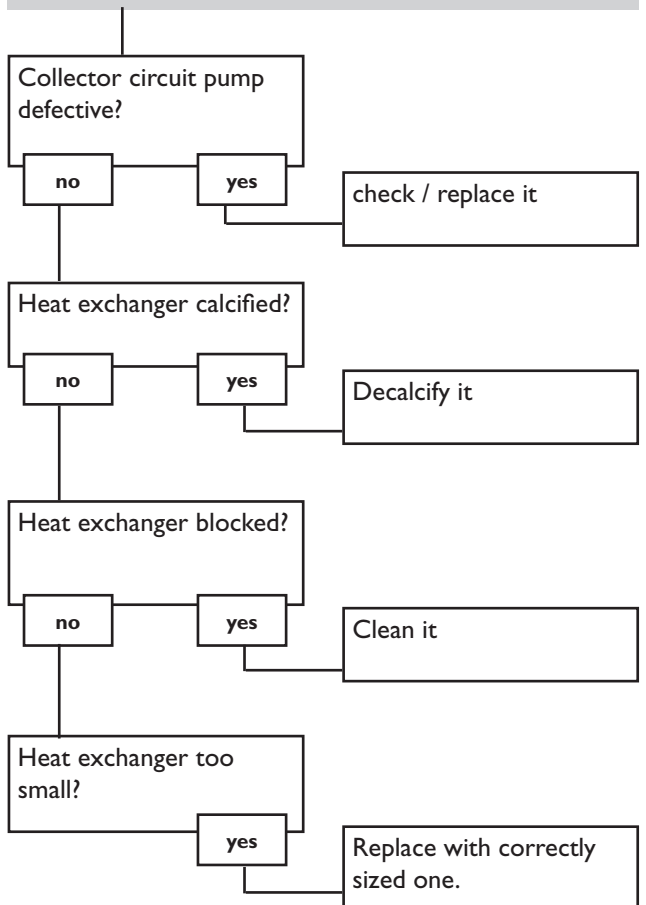
Pump starts for a short moment, switches-off, switches-on again, etc.

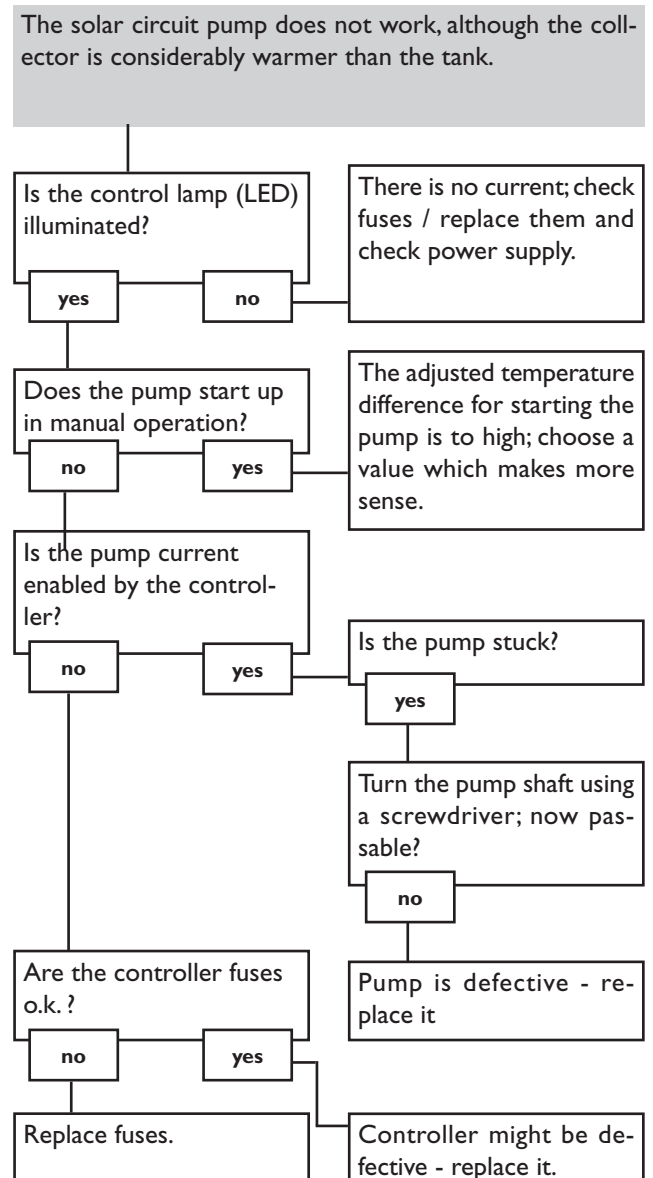
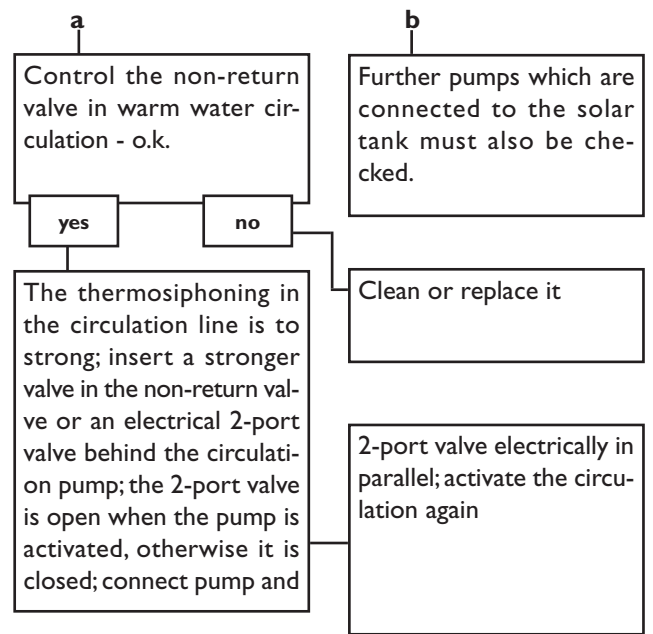
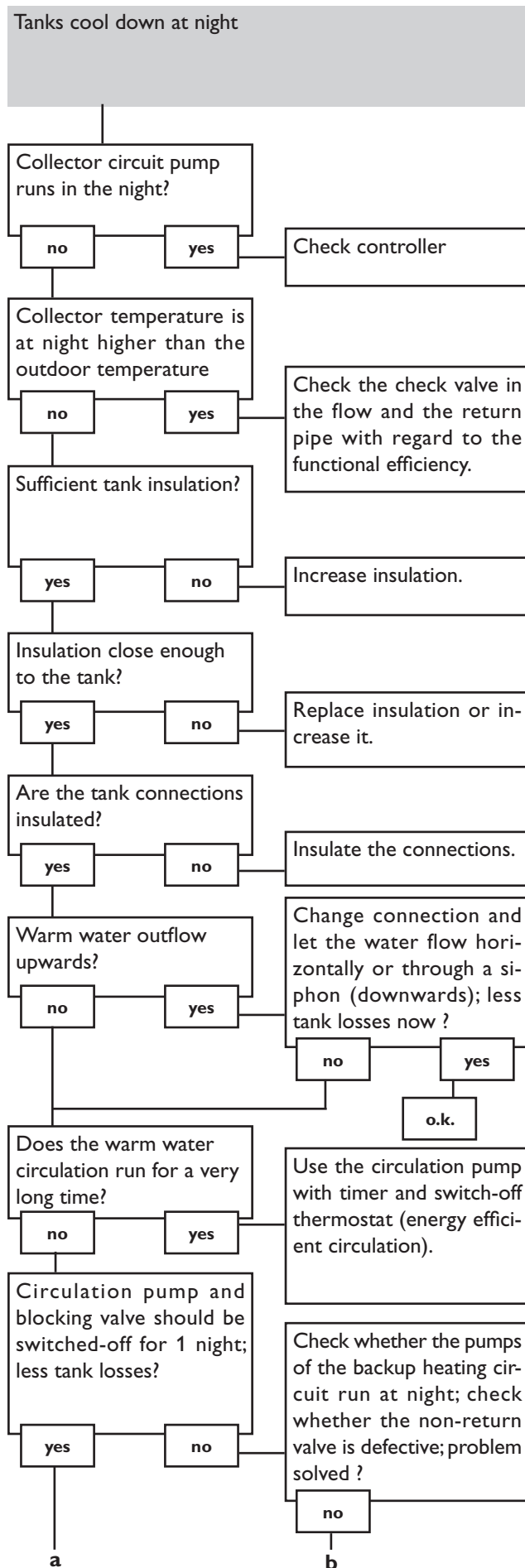


Pump starts up very late



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





## 6. Accessories

### Sensors

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



### Overvoltage protection

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



### Flowmeter

If you wish to carry out a heat quantity measurement, you need a flowmeter for measuring the flow rate in your system.



### RS-COM Adapter

By means of a RS-COM Adapters the controller can be connected to a PC.



### Service Center Software

The controller data can be read out for visualizing and monitoring the system state.

### Distributed by:

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