



Barilla Solar

DeltaSol[®] C Plus

Mounting

Connection

Operation

Troubleshooting

Examples



49014580

Thank you for buying this product.

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

DeltaSol[®] C Plus

en

Manual



Table of contents

Safety advice..... 2

Overview of functions and technical data..... 3

1. Installation..... 4

1.1 Mounting..... 4

1.2 Electrical connection 4

1.2.1 Data communication / bus 5

1.2.2-9 Terminal allocation Arrangements 1-9..... 6

2. Operation and function..... 10

2.1 Buttons for adjustment 10

2.2 System-Monitoring display..... 10

2.2.1 Channel display 10

2.2.2 Toolbar 10

2.2.3 System-Screen 11

2.3 Flashing codes..... 11

3. Commissioning 12

4. Control parameters and and display channels 13

4.1 Overview of channels..... 13

4.1.1-7 Display channels..... 15

4.1.6-22 Adjustment channels..... 16

5. Troubleshooting 21

5.1 Various 22

6. Accessory 24

Imprint 24

Safety advice

Please pay attention to:

- safety advice in order to avoid danger and damage to people and property.
- the valid local standards, regulations and directives!

Description of symbols

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

➔ 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 solar thermal and heating systems in compliance with the technical data specified in these instructions.

Improper use excludes all liability claims.

CE-Declaration of conformity

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



Note

Strong electromagnetic fields can impair the function of the controller.

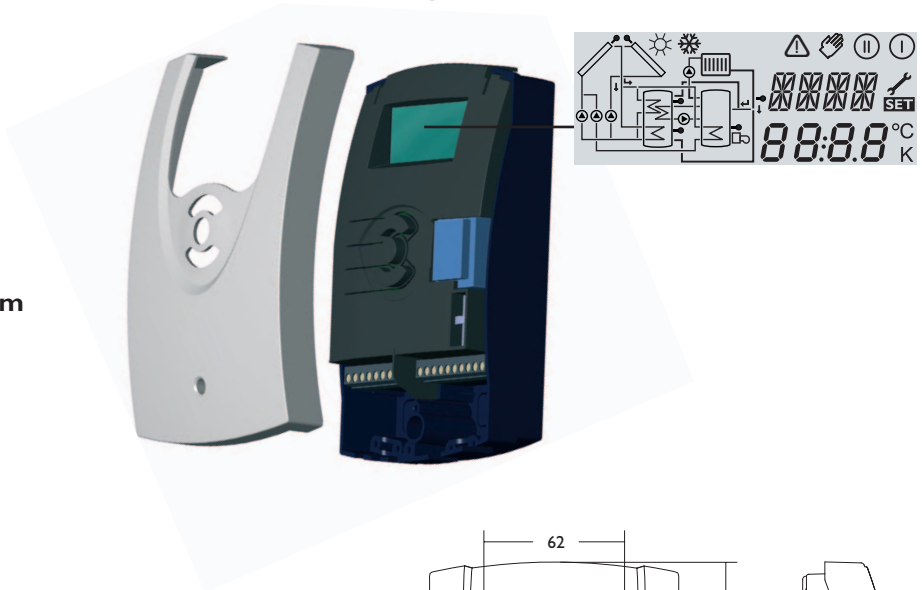
➔ Make sure the controller as well as the system are not exposed to strong electromagnetic fields.

Subject to technical change. Errors excepted.



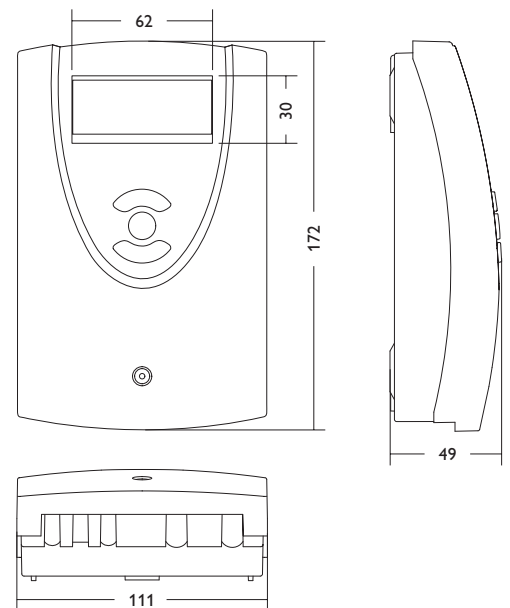
Functional overview

- System-Monitoring display
- up to 4 temperature sensors Pt1000
- 2 semiconductor relays for pump speed control
- 9 basic systems to choose from
- heat quantity measurement
- VBus®
- function control
- thermostat function
- real time clock
- user-friendly operation
- easy-to-mount housing and outstanding design



Delivery scope:

- 1 x DeltaSol® C Plus
- 1 x accessory bag
 - 1 x spare fuse T2A
 - 2 x screws and dowels
 - 4 x strain relief and screws



Technical data

Housing:

plastic, PC-ABS and PMMA

Protection type: IP 20 / DIN 40050

Ambient temp.: 0 ... 40 °C

Dimensions: 172 x 111 x 49 mm

Mounting:

wall mounting, mounting into patch panels is possible

Display: system monitor for systems visualisation, 16-segment display, 7-segment display, pictograms

Operation: 3 push buttons at the front of the housing

Functions: Differential temperature controller with optional add-on system functions. Function control according to BAW-guidelines, operating hours counter, tube collector function, pump speed control, thermostat function and heat quantity measurement

Inputs: for 4 temperature sensors Pt1000

Outputs: 2 semiconductor relays

Bus: VBus®

Power supply:
100 ... 240V~

Total switching capacity:

2 (2) A (100 ... 240) V~

Switching capacity per relay:

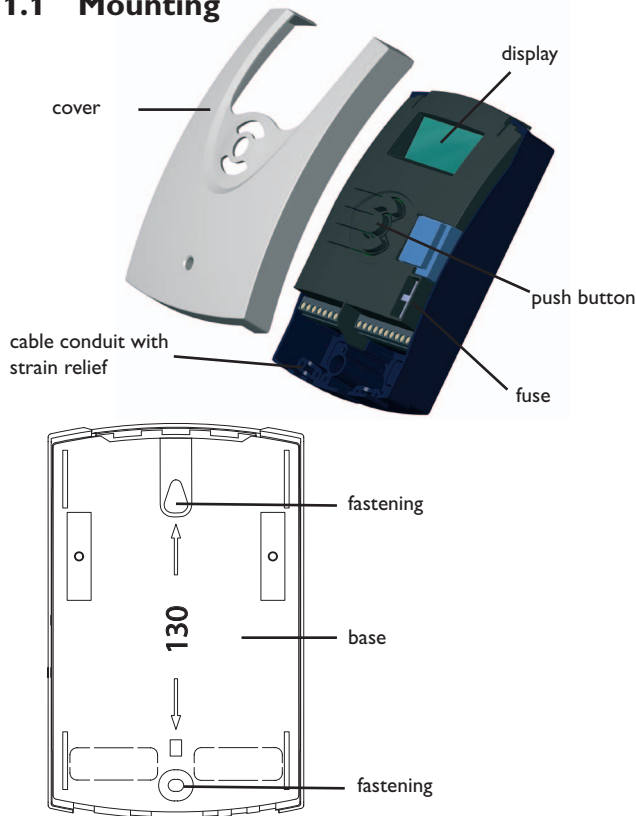
semiconductor relay:

1 (1) A (100 ... 240) V~



1. Installation

1.1 Mounting



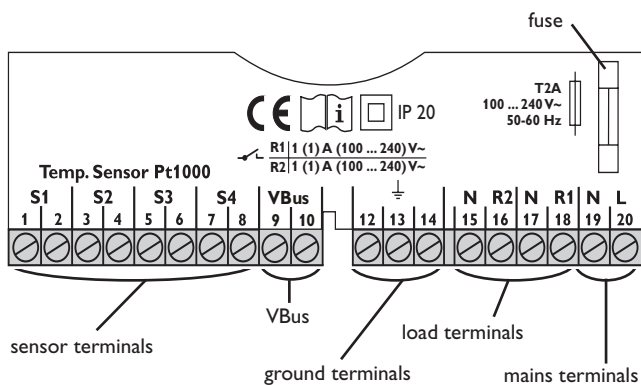
WARNING!

Always disconnect the controller 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 3 mm. Please pay attention to separate routing of sensor cables and mains 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. Hang the housing from the upper fastening point and tighten lower fastening screw.

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 100...240 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 relays to which **loads** such as pumps, valves etc. can be connected:

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

The **temperature sensors** (S1 to S4) have to be connected to the following terminals (either 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 TRF)

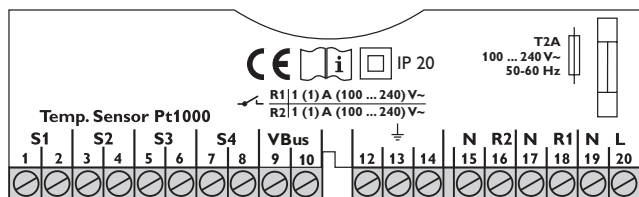
The **mains connection** is at the terminals:

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

- Electrostatic discharge can cause damage of electronic components!
- High-voltage components!

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

1.2.1 Data communication / bus

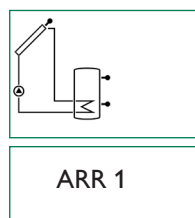


The controller is equipped with the **VBus[®]** for data transfer with and energy supply to external modules. The connection is carried out at the two terminals 9 and 10 marked "VBus[®]" (either polarity). One or more VBus[®] modules can be connected via this data bus:

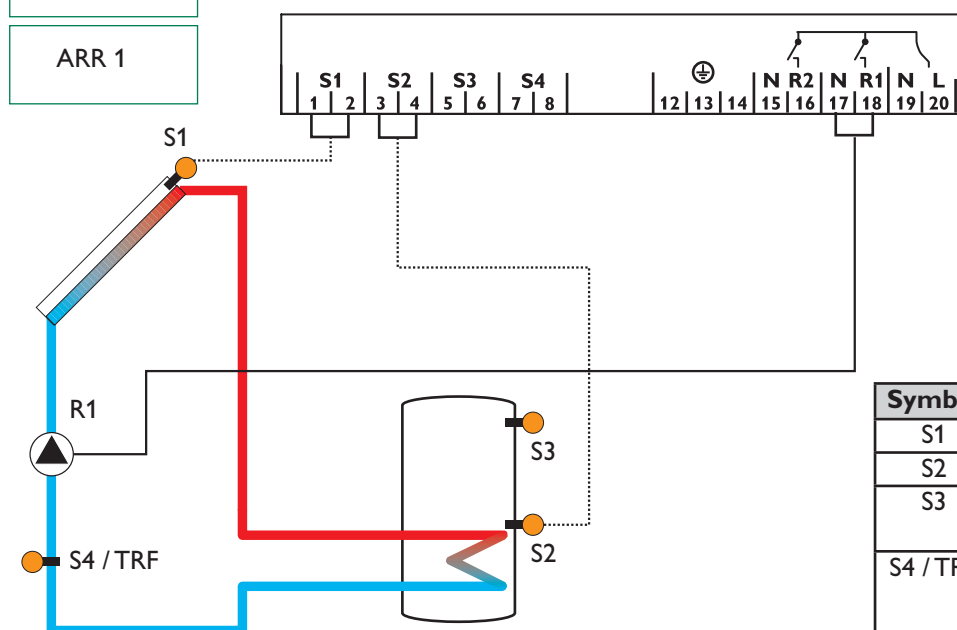
- GA3 large display, SD3 smart display
- DL2 datalogger
- VBus[®]/USB or VBus[®]/LAN interface adapter
- VBus[®]/PWM interface adapter
- AM1 alarm module
- WMZ calorimeter module

By means of a DL2 datalogger or an interface adapter, the controller can be connected to a PC or a computer network. With the ServiceCenter Software (RSC) the controller measurements can be read out, processed and visualised. The software allows easy function control of the system. For the remote parametrisation of the controller, a special software tool will be available for download, soon.

1.2.2 Terminal allocation Arr 1



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

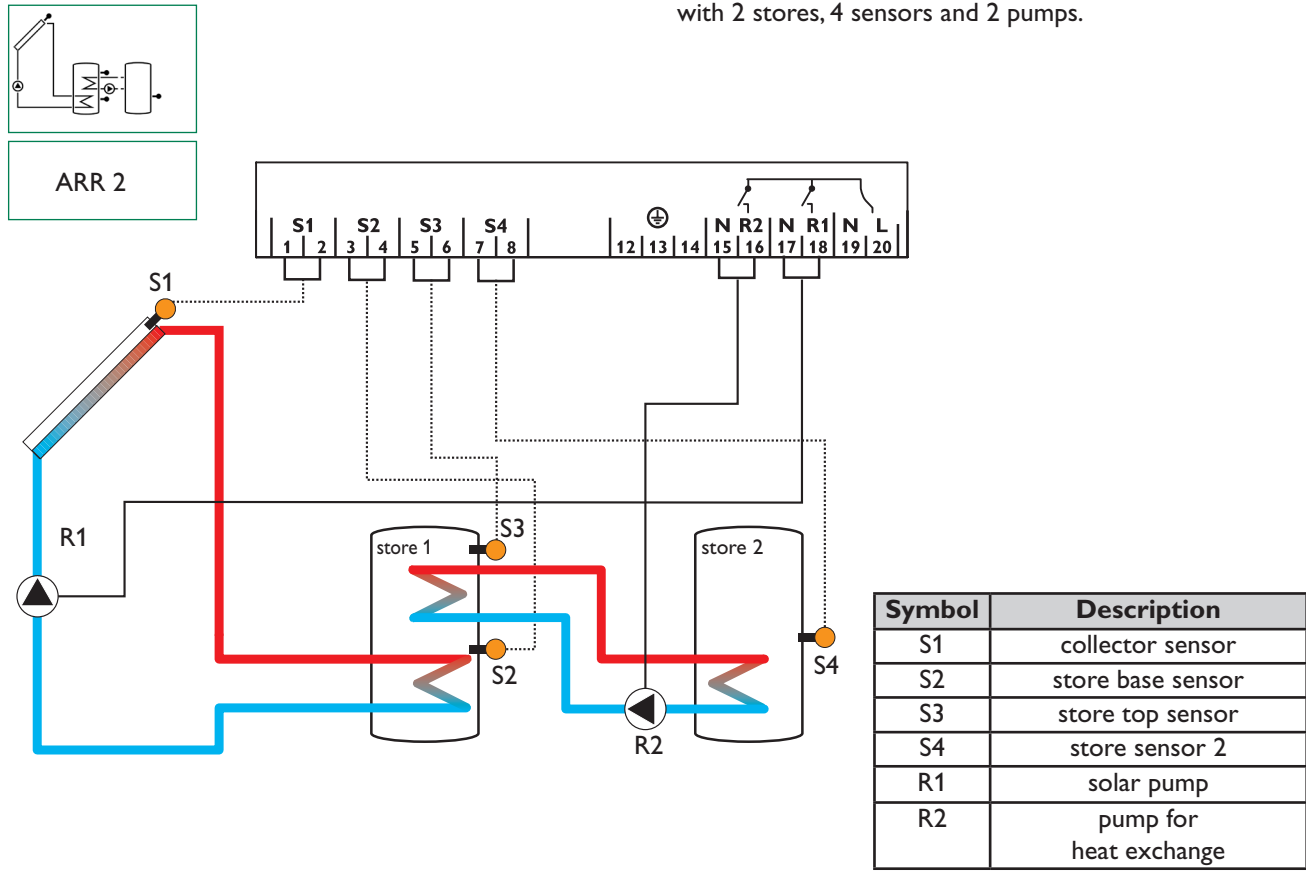


Symbol	Description
S1	collector sensor
S2	store sensor base
S3	store sensor top / (optional)
S4 / TRF	sensor for heat quantity measurement (optional)
R1	solar pump



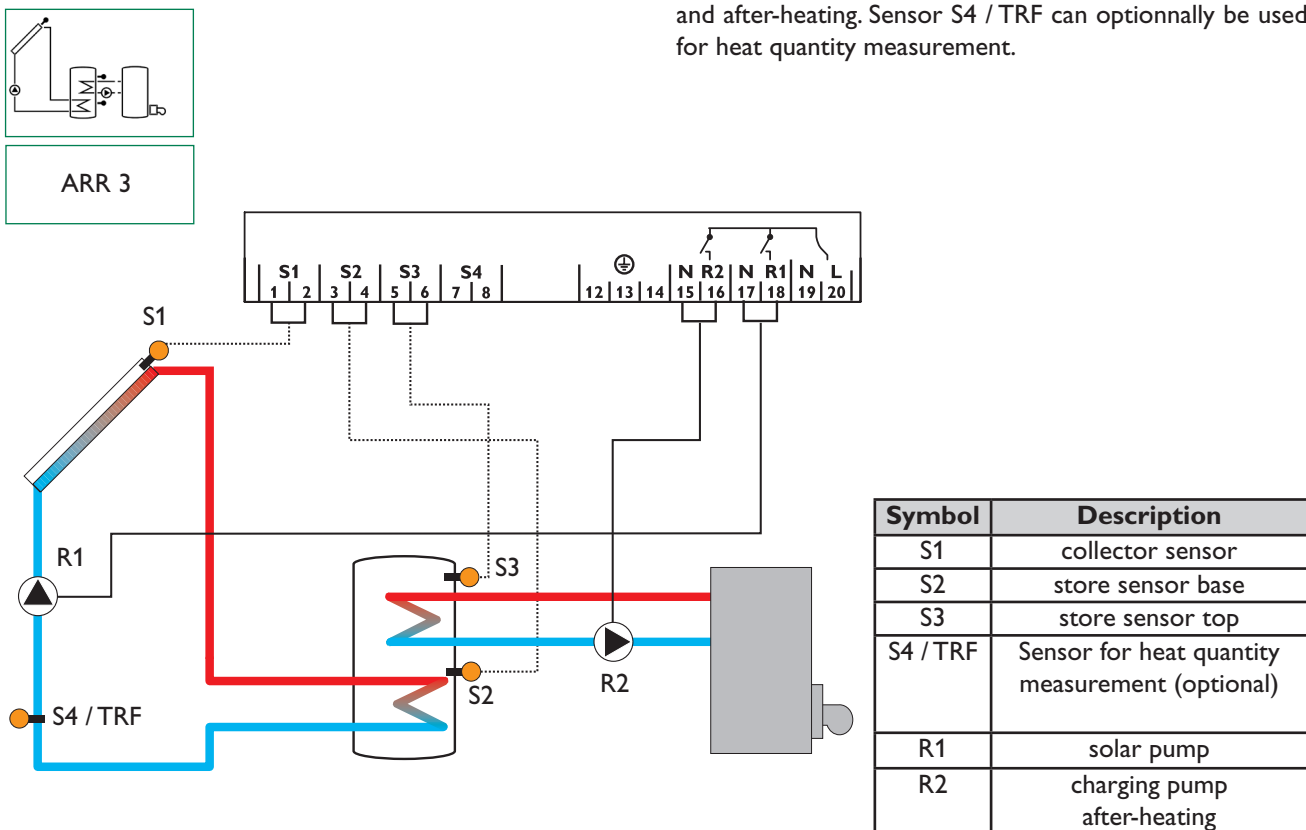
1.2.3 Terminal allocation Arr 2

Solar system and heat exchange to existant store with 2 stores, 4 sensors and 2 pumps.



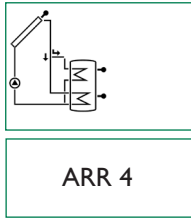
1.2.4 Terminal allocation Arr 3

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

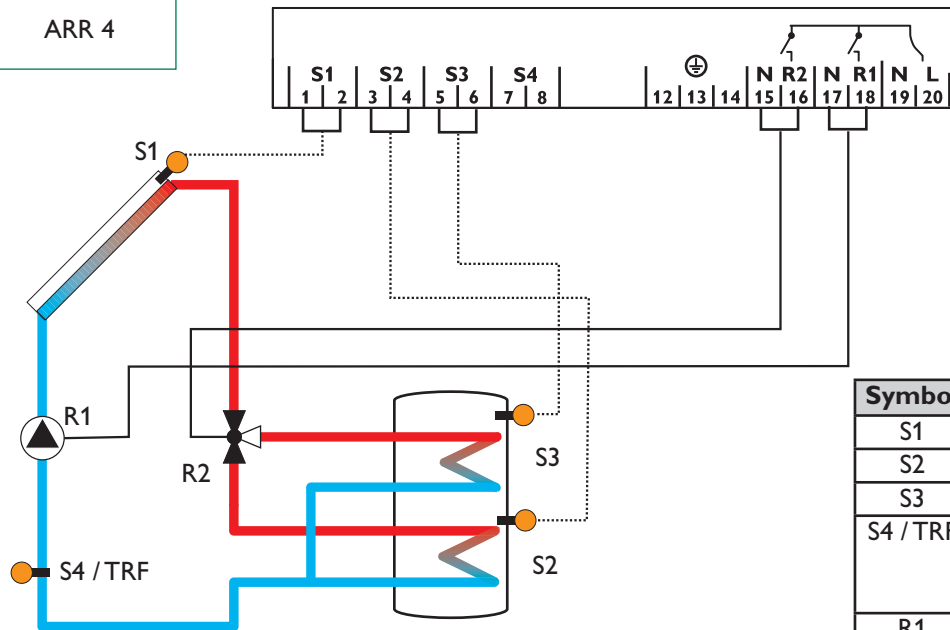




1.2.5 Terminal allocation Arr 4

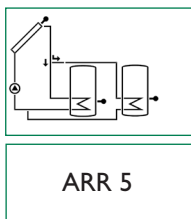


Solar system and vertical store charging with 1 store, 3 sensors, 1 solar pump and 3-port valve for vertical store charging. Sensor S4 / TRF can optionally be used for heat quantity measurement.

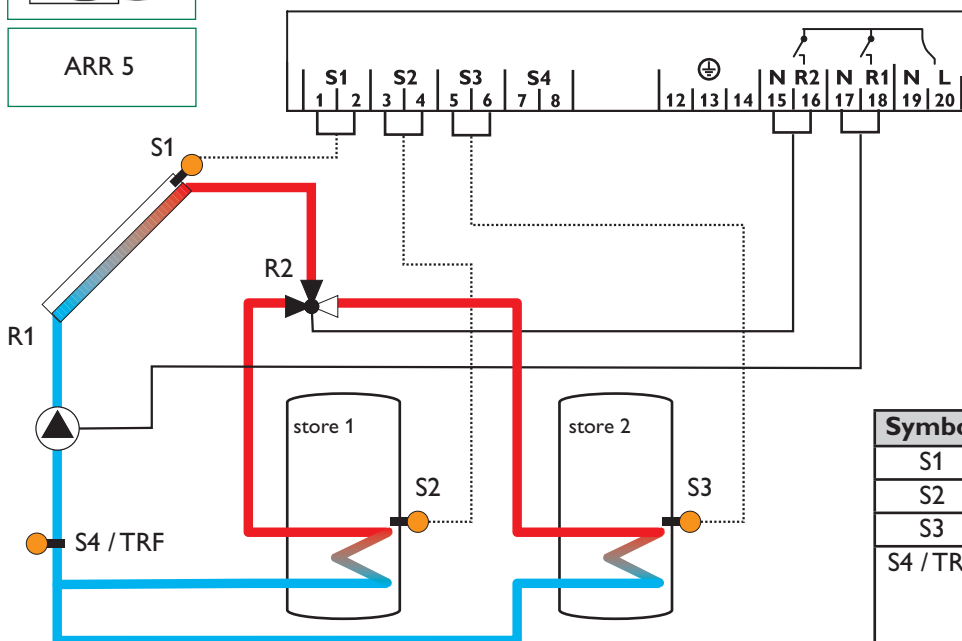


Symbol	Description
S1	collector sensor
S2	store sensor base
S3	store sensor top
S4 / TRF	sensor for heat quantity measurement (optional)
R1	solar pump
R2	3-port valve

1.2.6 Terminal allocation Arr 5



2-store solar system with valve control with 2 stores, 3 sensors, 1 solar pump and 1 3-port valve. Sensor S4 / TRF can optionally be used for heat quantity measurement.

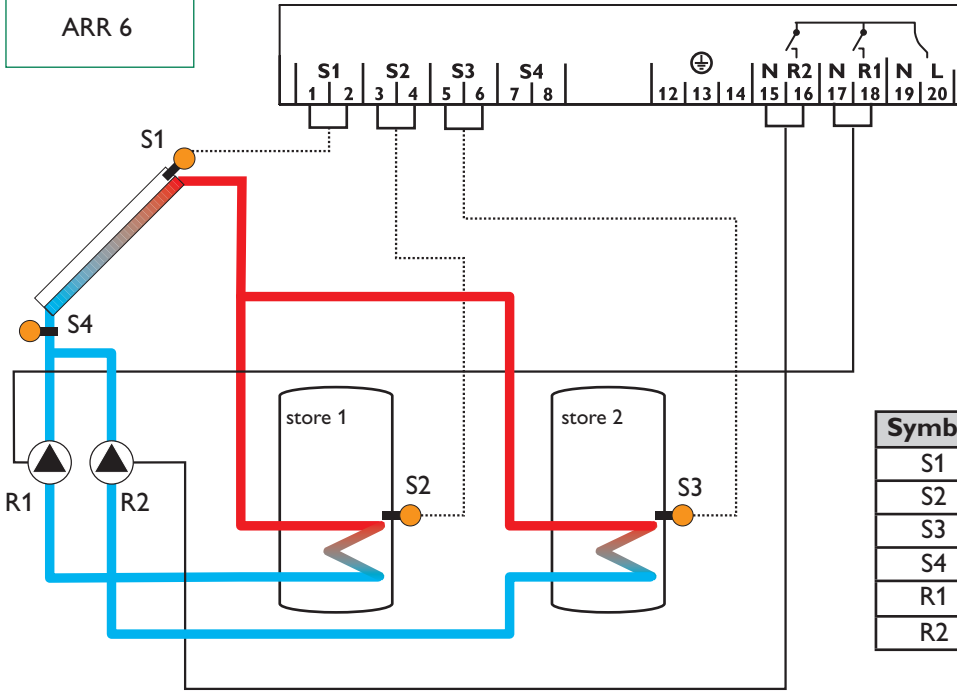
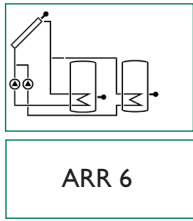


Symbol	Description
S1	collector sensor
S2	store sensor 1
S3	store sensor 2
S4 / TRF	sensor for heat quantity measurement (optional)
R1	solar pump
R2	3-port valve



1.2.6 Terminal allocation Arr 6

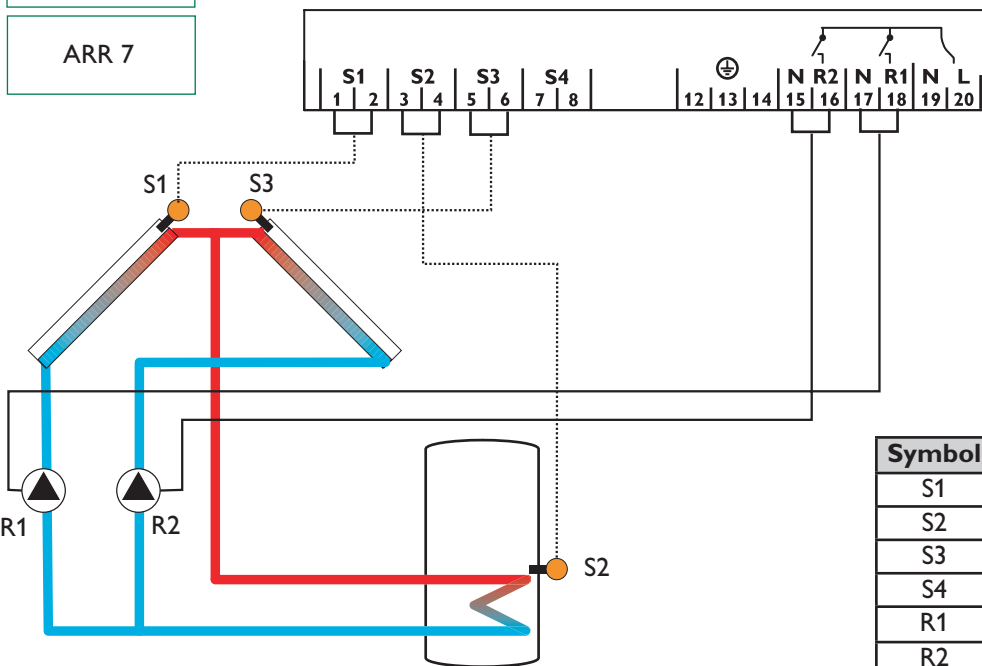
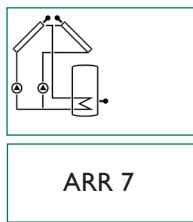
2-store solar system with pump control with 2 stores, 3 sensors and 2 solar pumps.



Symbol	Description
S1	collector sensor
S2	store sensor 1
S3	store sensor 2
S4	sensor (optional)
R1	solar pump store 1
R2	solar pump store 2

1.2.7 Terminal allocation Arr 7

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

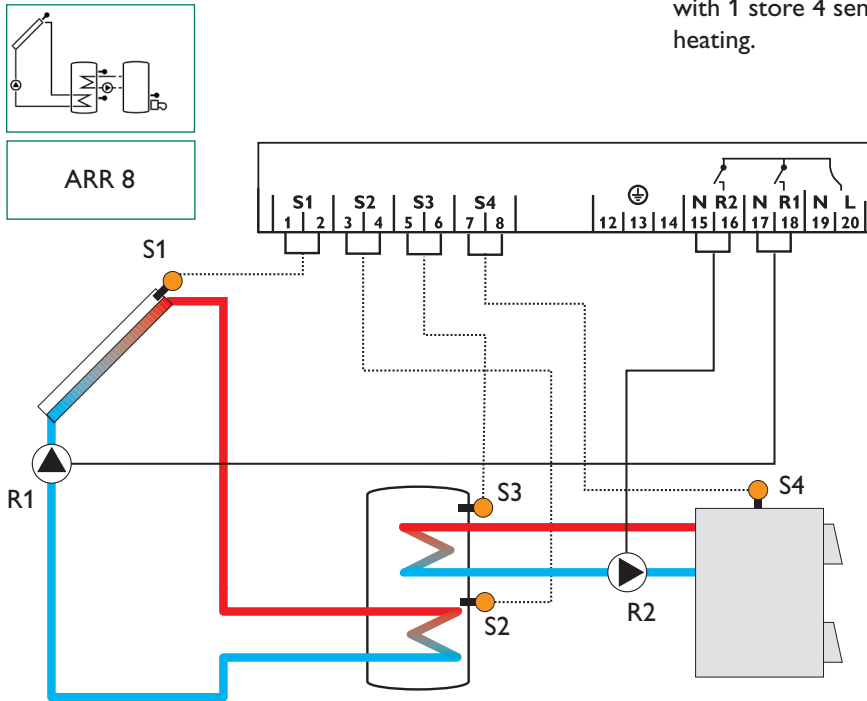


Symbol	Description
S1	collector sensor 1
S2	store sensor
S3	collector sensor 2
S4	sensor (optional)
R1	solar pump collector 1
R2	solar pump collector 2



1.2.8 Terminal allocation Arr 8

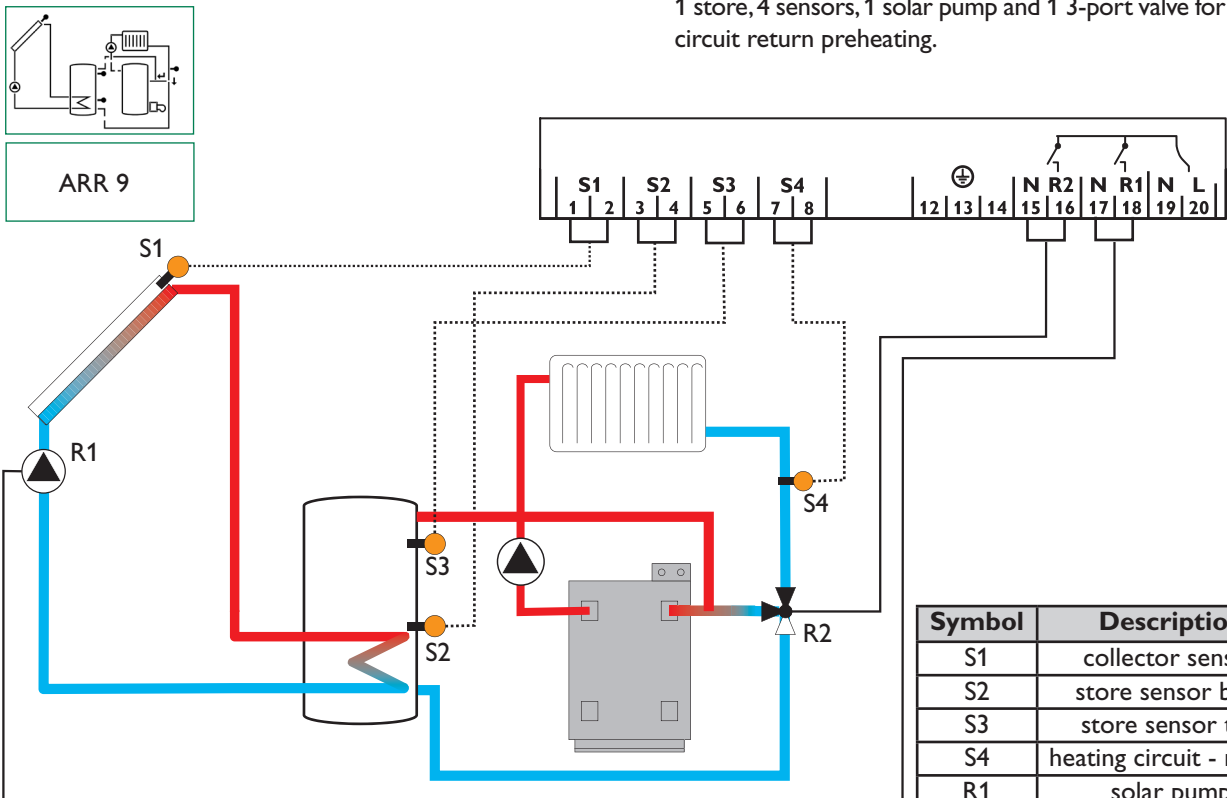
Solar system with after-heating with solid fuel boiler with 1 store 4 sensors, 1 solar pump and 1 pump for after-heating.



Symbol	Description
S1	collector sensor
S2	store sensor base
S3	store sensor top
S4	sensor for solid fuel boiler
R1	solar pump
R2	pump for solid fuel boiler

1.2.9 Terminal allocation Arr 9

Solar system and heating circuit return preheating with 1 store, 4 sensors, 1 solar pump and 1 3-port valve for heating circuit return preheating.

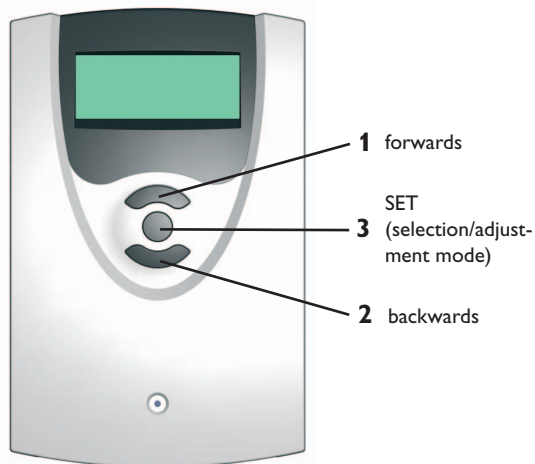


Symbol	Description
S1	collector sensor
S2	store sensor base
S3	store sensor top
S4	heating circuit - return
R1	solar pump
R2	3-port valve



2. Operation and function

2.1 Buttons for adjustment



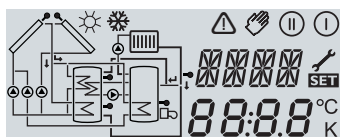
Connect the controller to the mains. The controller is in an initialisation phase. After this phase, the controller is in automatic operation with factory settings.

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

In order to access the adjustment mode, scroll down in the display menu and press the forward button (1) for approx. 2 seconds after you have reached the last display item. If an adjustment value is shown on the display, the **SET** icon is displayed. Now, you can access the adjustment mode by using button 3.

- Press buttons 1 and 2 in order to select a channel
- Briefly press button 3, **SET** appears (flashing) (**SET**-mode)
- adjust the requested value by pressing the buttons 1 and 2
- Briefly press button 3, so that **SET** permanently appears, the adjusted value will be saved.

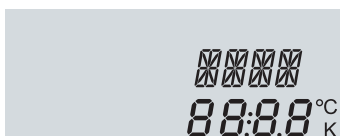
2.2 System-Monitoring display



Monitoring-Display

The system monitoring display consists of 3 ranges: The **channel display**, the **toolbar** and the **system-screen** (active arrangement).

2.2.1 Channel display

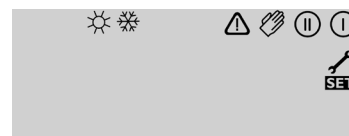


channel display

The **channel display** consists of 2 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 indicated in °C or K.

2.2.2 Toolbar

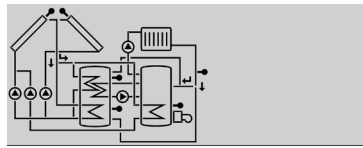


toolbar

The additional symbols in the **toolbar** indicate the actual system status.

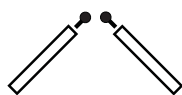
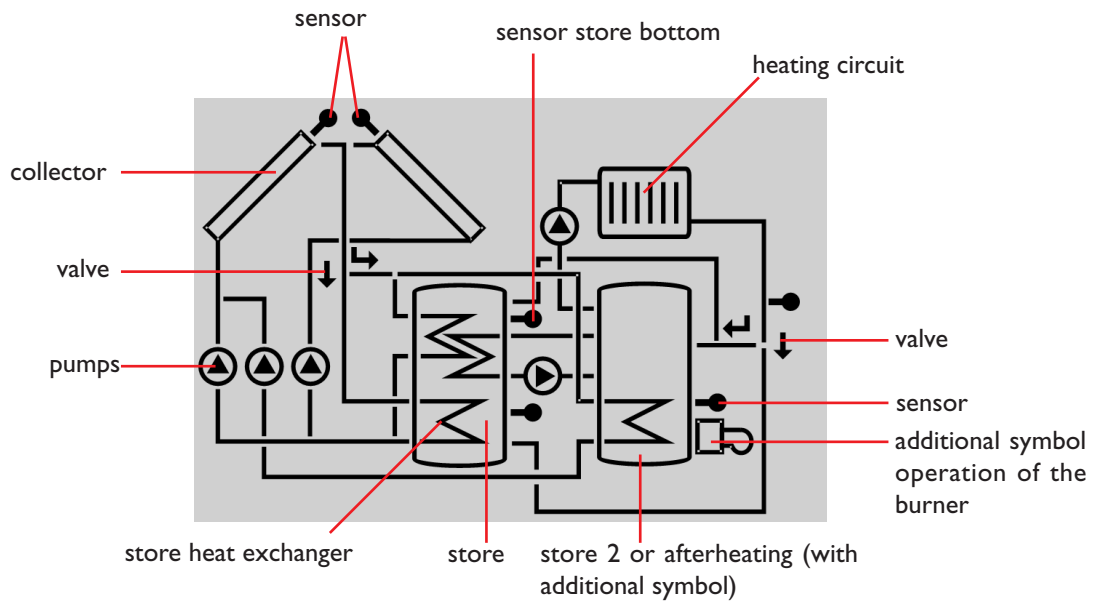
symbol	normal	flashing
ⓘ	relay 1 active	
Ⓜ	relay 2 active	
☀	store maximum limitation active / maximum store temperature exceeded	collector cooling function active recooling function active
❄	antifreeze function active	collector minimum limitation active antifreeze function active
⚠		collector emergency shut-down active or store emergency shutdown active
⚠ + 🔧		sensor fault
⚠ + 🖐		manual mode
SET		change of adjustment channel SET-mode

2.2.3 System-Screen

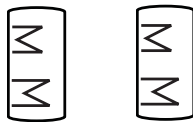


System screen

The system screen (active arrangement) shows the scheme which has been selected. The screen 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



store 1 and 2
with heat exchanger



3-port valve
indicates the flow direction bzw. momentane Schaltstellung angezeigt.



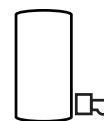
temperature sensor



heating circuit



pump



after-heating
with burner symbol

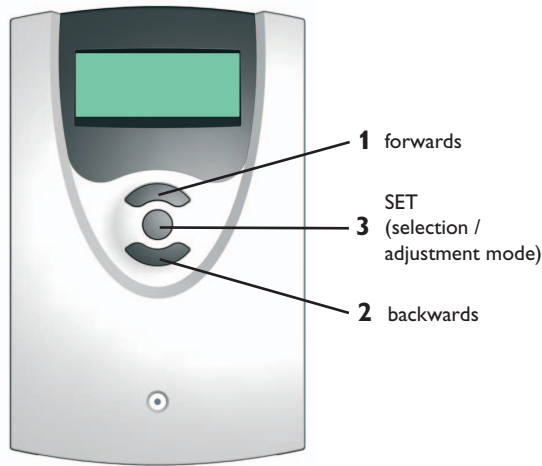
2.3 Flashing codes

- Pump symbols are flashing during the initialisation phase
- Sensor symbols are flashing when the corresponding sensor display channel is selected.
- Sensor symbols are flashing in the case of a sensor fault
- Burner symbol is flashing when the after-heating is active.



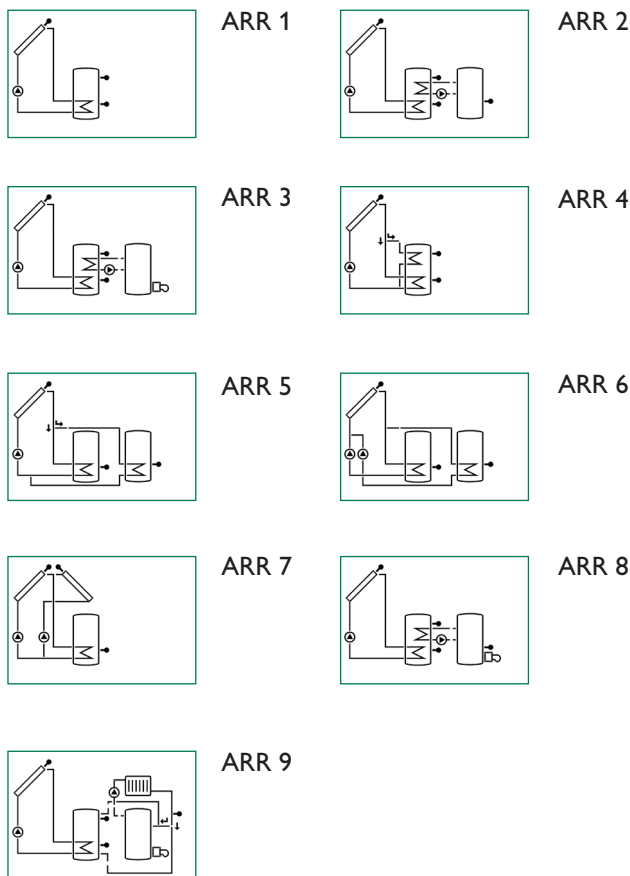
3. Commissioning

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



1. Switch on power supply. After initialisation, the controller is in the automatic mode with typical settings. The pre-programmed system scheme is Arr 1.
2. Adjust the actual clock time in the **TIME** channel. Pressing the **SET**-key for 2 seconds will display the hours, pressing the button again will display the minutes (flashing). Time can be adjusted using buttons 1 and 2. Save the changes by pressing the **SET**-key.
3. - Select the ARR channel
 - Change into the **SET**-mode (see 2.1)
 - Select the system arrangement via the ARR number
 - Save adjustments by pressing the **SET**-key

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.



Overview of arrangements:

- ARR 1 : standard solar thermal system
- ARR 2 : solar thermal system with heat exchange
- ARR 3 : solar thermal system with after-heating
- ARR 4 : solar thermal system with vertical store charging
- ARR 5 : 2-store solar thermal system with valve control
- ARR 6 : 2-store solar thermal system with pump control
- ARR 7 : solar thermal system with 2 collectors and 1 store
- ARR 8 : solar thermal system with after-heating with solid fuel boiler
- ARR 9 : solar thermal system heating circuit return pre-heating



4. Regelparameter und Anzeigekanäle

4.1 Kanal-Übersicht

Legende:

x

Corresponding channel is available.

x*

Corresponding channel is available when the corresponding option is enabled

Note:

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

①

Only if the option heat quantity measurement is **activated** (OHQM), will the corresponding channel be available.

②

Only if the option heat quantity measurement is **deactivated** (OHQM), will the corresponding channel be available.

MEDT

Only if an antifreeze (MEDT) **other than water or Tyfocor LS / G-LS (MEDT 0 or 3)** is used, will the channel antifreeze concentration (MED%) be displayed. The adjustment of the antifreeze concentration has only to be carried out when an antifreeze is used in the solar circuit.

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 store 1	15
TSTU			x	x				x	x	temperature store 1 base	15
TST1		x			x	x				temperature store 1 base	15
TSTO		x	x	x				x	x	temperature store 1 top	15
TST2		x			x	x				temperature store 2 base	15
TFSK								x		temperature solid fuel boiler	15
TREC									x	temperature heating circuit	15
COL2							x			temperature collector 2	15
S3	x									temperature sensor 3	15
TRF	①		①	①	①					temperature return temperature sensor	15
S4	②		②	②	②	x	x			temperature sensor 4	15
n %	x			x	x				x	speed relay 1	15
n1 %		x	x			x	x	x		speed relay 1	15
n2 %		x				x	x	x		speed relay 2	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					arrangement	12
DT O	x	x	x				x	x	x	switch-on temperature difference	17
DT1O				x	x	x				switch-on temperature difference 1	17
DT F	x	x	x				x	x	x	switch-off temperature difference 1	17
DT S	x	x	x				x	x	x	set temperature difference	17
RIS	x	x	x				x	x	x	rise	17
DT1F				x	x	x				switch-off temperature difference	17
RIS1				x	x	x				rise 1	17
DT1S				x	x	x				set temperature difference 1	17
S MX	x	x	x				x	x	x	maximum temperature store 1	17
S1 MX				x	x	x				maximum temperature store 1	17
DT2O				x	x	x				switch-off temperature difference 2	17
DT2F				x	x	x				switch-off temperature difference 2	17
DT2S				x	x	x				set temperature difference 2	17
RIS2				x	x	x				rise 2	17
S2MX				x	x	x				maximum temperature store 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
OKF	x	x	x	x	x	x		x	x	option frost protection collector 1	18
OKF1								x		option frost protection collector 1	18
CFR	x*	x*	x*	x*	x*	x*		x*	x*	frost protection temperature collector 1	18
CFR1								x*		frost protection 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 frost protection collector 2	18
CFR2								x*		frost protection temperature collector 2	18
PRIO				x	x	x				priority	19
tST				x	x	x				loading break time	19
tCIRC				x	x	x				oscillating loading time	19
OREC	x	x	x	x	x	x	x	x	x	option recooling	19
OTC	x	x	x	x	x	x	x	x	x	option tube collector	19
DT3O		x						x		switch-on temperature difference 3	17
DT3F		x						x		switch-off temperature difference 3	17
DT3S		x						x		set temperature DT3	17
RIS3		x						x		rise DT3	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 temperature thermostat 1	20
AH F			x							switch-off temperature thermostat 1	20
t1 O			x							switch-on time 1 thermostat	20
t1 F			x							switch-off time 1 thermostat	20
t2 O			x							switch-on time 2 thermostat	20
t2 F			x							switch-off time 2 thermostat	20
t3 O			x							switch-on time 3 thermostat	20
t3 F			x							switch-off time 3 thermostat	20
n2MN		x				x	x	x		minimum speed relay 2	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
PROG	XX.XX									program number	
VERS	X.XX									version number	



4.1.1 Collector temperatures

COL, COL1, COL2:

Collector temperatures
display range: -40...+250 °C



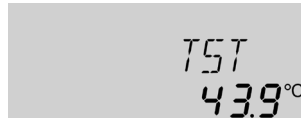
Displays the actual collector temperature.

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

4.1.2 Store temperatures

TST, TSTL, TSTU, TST1, TST2:

Store temperatures
Display range: -40...+250 °C



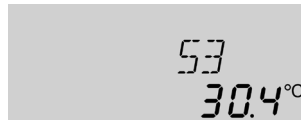
Displays the actual store temperature.

- TST : store temperature (1-store system)
- TSTL : store temperature base
- TSTU: store temperature top
- TST1 : temperature store 1
- TST2 : temperature store 2

4.1.3 Sensors 3 and 4

S3, S4:

Sensor temperatures
Display range: -40...+250 °C



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

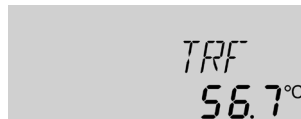
- S3 : temperature sensor 3
- S4 : temperature sensor 4

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

4.1.4 Other temperatures

TSFB, TREC, TRF:

Other measured temperatures
Display range: -40...+250 °C



Display of the current temperature at the corresponding sensor.

- TSFB : temperature solid fuel boiler
- TREC: temperature heating return
- TRF : temperature return

4.1.5 Pump speed

n %, n1 %, n2 %:

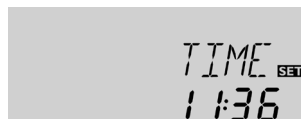
Actual pump speed
Display range: 30...100 %



Display of the actual speed of the corresponding pump.

- n % : actual pump speed (1-pump system)
- n1 % : actual speed pump 1
- n2 % : actual speed pump 2

4.1.6 Time



In this channel the current time is indicated.

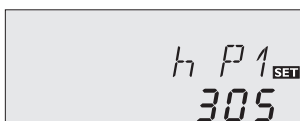
Press button **SET** for 2 seconds, the hours will then be displayed. Press the button again, the minutes will then be displayed (flashing). The time can be set using buttons 1 and 2 and saved by pressing the **SET** button.



4.1.7 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.

4.1.8 Heat quantity measurement

OHQM: Heat quantity measurement

Adjustment range: OFF...ON-
Factory setting: OFF



Heat quantity measurement is possible in systems (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 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 medium have to be adjusted in the channels **MEDT** and **MED%**.

MEDT: Antifreeze type

Adjustment range: 0...3
Factory setting: 1



Frostschutzart:

Antifreeze type:

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

MED%: Antifreeze concentration in (Vol-) %

When MEDT 0 or 3 is used, the parameter MED% is 'hidden'.

Adjustment range: 20...70
Factory setting: 45



kWh/MWh: Heat quantity

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 operating hours can be set back to zero. As soon as one of the display channels of the heat quantity 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 heat quantity value 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, no button should be pressed for about 5 seconds. The display returns to the display mode.



4.1.9 Δ T-control

DT O / DT1O / DT2O / DT3O:

Switch-on temperature difference
Adjustment range: 1,0 ... 20,0 K
Factory setting: 6.0

DT F / DT1F / DT2F / DT3F:

Switch-off temperature difference
Adjustment range: 0,5 ... 19,5 K
Factory setting: 4.0 K

DT S / DT1S / DT2S / DT3S:

Set temperature difference
Adjustment range: 1,5 ... 30,0 K
Factory setting: 10.0

RIS / RIS1 / RIS2 / RIS3:

Rise
Adjustment range: 1 ... 20 K
Factory setting: 2 K

4.1.10 Maximum store temperature

S MX / S1MX / S2MX:

Maximum store temperature
Adjustment range: 2 ... 95 °C
Factory setting: 60 °C

4.1.11 Δ T-control (solid fuel boiler and heat exchange)

Maximum temperature limitation

MX3O / MX3F:

Maximum temperature limitation
Adjustment range: 0,0 ... 95,0 °C
Factory setting:
MX3E 60,0 °C
MX3A 58,0 °C

Minimum temperature limitation

MN3O / MN3F:

Minimum temperature limitation
Adjustment range: 0,0 ... 90,0 °C
Factory setting:
ARR = 2
MN3O 5,0 °C
MN3F 10,0 °C
ARR = 8
MN3O 60,0 °C
MN3F 65,0 °C

This function is a standard differential control. If the switch-on differential is reached (**DT O / DT1O / DT2O**) the pump is operated. The pump runs at 100% speed for 10 seconds. After this period, the pump runs at minimum pump speed (nMN = 30 %) gefahren. If the temperature difference reaches the adjusted set value (**DT S / DT1S / DT2S / DT3S**), pump speed will increase by one step (10 %). If the difference increases by 2 K (**RIS / RIS1 / RIS2 / RIS3**) pump speed will increase 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 blocked against each other. **DT S** must be at least 0,5 K higher than **DT O**.

Please note: Switch-on temperature difference must be at least 1 K higher than the switch-off temperature difference.

If the adjusted maximum temperature is exceeded, the store will no longer be loaded in order to avoid damage caused by overheating. If the maximum store temperature is exceeded, ✨ (flashing) is shown on the display.

Note: The controller is equipped with a store emergency shutdown function, which prevents the store from being loaded when the store temperature exceeds 95 °C.

The controller is equipped with an independent temperature differential control function for which minimum and maximum temperature limitations as well as the corresponding switch-on and -off temperatures can be separately adjusted. For ARR = 2 and 8 only (solid fuel boiler and heat exchange control).

If the adjusted value **MX3O** is exceeded, relay 2 will be switched off. If the temperature falls below the value **MX3F**, the relay will be energised.

Reference sensors:
S3 for ARR 8 (TSTU)
S4 for ARR 2 (TST2).

If the temperature falls below **MN3O**, relay 2 will be switched off. If the value **MN3F** is exceeded, the relay will be energised.

Reference sensors:
S4 for ARR 8 (TSFB)
S3 for ARR 2 (TSTU).

The switch on- and switch off temperature differences **DT3O** and **DT3F** also apply to the maximum- and minimum temperature limitation.



4.1.12 Collector-limit temperature Collector emergency shutdown

EM / EM1 / EM2:

Collector emergency shutdown temperature
Adjustment range: 110 ... 200 °C
Factory setting: 140 °C

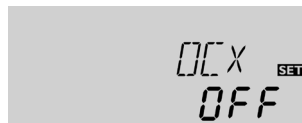


If the adjusted collector emergency shutdown temperature (**NOT** / **NOT1** / **NOT2**) is exceeded, the controller will switch off the solar pump (R1 / R2) in order to protect the system against overheating (collector emergency shutdown). The factoring setting is 140 °C but it can be changed within the adjustment range of 110...200 °C. If the temperature is exceeded, Δ (flashing) is shown on the display.

4.1.13 System cooling

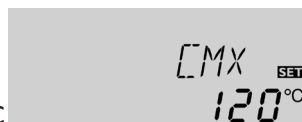
OCX / OCX1 / OCX2:

System cooling option
Adjustment range: OFF ... ON
Factory setting: OFF



CMX / CMX1 / CMX2:

Maximum collector temperature
Adjustment range: 100... 190 °C
Factory setting: 120 °C



When the adjusted maximum store 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 store temperature may increase (subordinate active maximum store temperature), but only up to 95 °C (emergency shutdown of the store). If the store temperature is higher than the maximum store temperature (**SMX** / **S1MX** / **S2MX**) and if the collector temperature is at least 5 K below the store temperature, the solar system remains activated until the store is cooled down below the adjusted maximum temperature (**SMX** / **S1MX** / **S2MX**) via the collector and the pipework (only if the **OREC function** is activated).

If the system cooling function is enabled, \star (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.

4.1.14 Collector minimum limitation option

OCN / OCN1 / OCN2:

Collector minimum limitation
Adjustment range: OFF / ON
Factory setting: OFF



CMN / CMN1 / CMN2:

Collector minimum temperature
Adjustment range: 10 ... 90 °C
Factory setting: 10 °C



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, \star (flashing) is shown on the display.

4.1.15 Frost protection function option

OCF / OCF1 / OCF2:

Frost protection function
Adjustment range: OFF / ON
Factory setting: OFF



CFR / CFR1 / CFR2:

Frost protection temperature
Adjustment range: -10 ... 10 °C
Factory setting: 4,0 °C



The antifreeze function activates the loading circuit between the collector and the store 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 1 °C, the loading circuit will be deactivated.

Note:

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



4.1.16 Store sequence control

Corresponding adjustment values:

Priority [PRIO]

Loading break time [tSP]

Oscillating loading time [tUMW]

Factory setting

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

2 min.

15 min.

Adjustment range

0-2

1-30 min.

1-30 min.

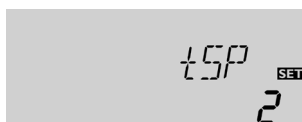
The DeltaSol® C Plus priority logic:

Priority:



The options and parameters mentioned above are used in multi-store systems only (system ARR = 4, 5, 6). If **priority** is set to **0**, the stores with a temperature difference to the collector are loaded in numerical order (store 1 or 2; ARR= 4, 5). Basically, only one store can be loaded at a time. In ARR the stores can be loaded in parallel.

Loading break time / store sequence control:/ collector rise temperature:



When the priority store cannot be loaded, the subordinate stores are checked. If a subordinate store can be loaded, it will be loaded for the "oscillating loading time" ("t-circ."). After this period of time, the loading process stops. The controller monitors the increase in collector temperature. If it increases by the "collector rise temperature (ΔT_{col} 2 K, software value) within the loading break time (t-st) the elapsed break time is set to 0. The break time starts again. the switch-on condition of the priority store is not fulfilled, loading of the subordinate store will be continued. If the priority store reaches its maximum temperature, oscillating loading will not be carried out.

4.1.17 Recooling function

OREC:

Recooling option

Adjustment range: OFF ...ON

Factory setting: OFF



If the adjusted maximum store temperature (S MX, S1MX, S2MX) is reached, the controller keeps the solar pump running in order to prevent the collector from being overheated. The store temperature may increase, but only up to 95 °C (emergency shutdown of the store).

The solar pump is switched on as soon as possible (depending on weather conditions). It is switched off when the store is cooled down to the adjusted maximum temperature via the collector and the pipework.

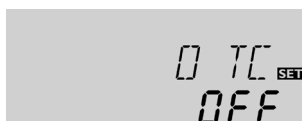
4.1.18 Tube collector function

OTC:

Tube collector function

Adjustment range: OFF ...ON

Factory setting: OFF

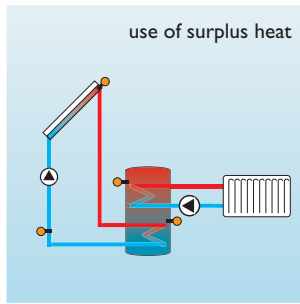
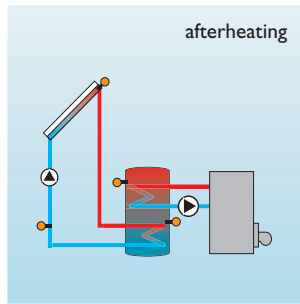


If the controller detects an increase in collector temperature by 2 K compared to the previously stored collector temperature, the solar pump will be switched-on for about 30 seconds in order to detect the fluid temperature. After this, the current collector temperature will be saved as a new reference value. If the measured temperature (new reference value) is exceeded by 2 K, the solar pump will run for 30 seconds. If the switch-on difference between the collector and the store 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 2 K during standstill, the switch-on value for the tube collector function will be recalculated.

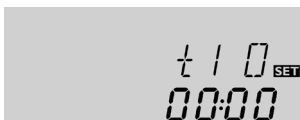


4.1.19 Thermostat function (ARR = 3)



AH O:
Thermostat switch-on temp.
Adjustment range:
0,0...95,0 °C
Factory setting: 40,0 °C

AH F:
Thermostat switch-off temp.
Adjustment range:
0,0...95,0 °C
Factory setting: 45,0 °C



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

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

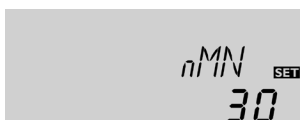
When the 2nd relay output is active, is displayed

In order to block the thermostat function for a certain period of time, there are 3 time frames t1 ...t3. If the function should be activated only between e.g. 6:00 and 9:00, set **t1 O** to 6:00 and **t1 F** to 09:00. The thermostat function is continuously activated (factory setting).

If all time frames are set to 00:00, the thermostat function is continuously activated (factory setting).

4.1.20 Pump speed control

nMN, n1MN, n2MN:
Pump speed control
Adjustment range: 30...100
Factory setting: 30

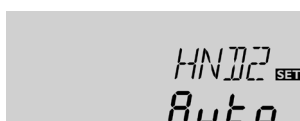
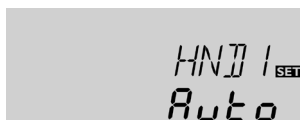


A relative minimum pump speed is allocated to the output R1 and R2 via the adjustment channel **nMN**, **n1MN**, and **n2MN**.

ATTENTION:
When loads which are not speed controlled (e.g. valves) are used, the value must be changed to 100% in order to deactivate pump speed control.

4.1.21 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, The following adjustments can be carried out:

- **HND1 / HND2**
operating mode
OFF : relay off (flashing) +
- AUTO : relay in automatic operation
- ON : relay on (flashing) +

4.1.22 Language (LANG)

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



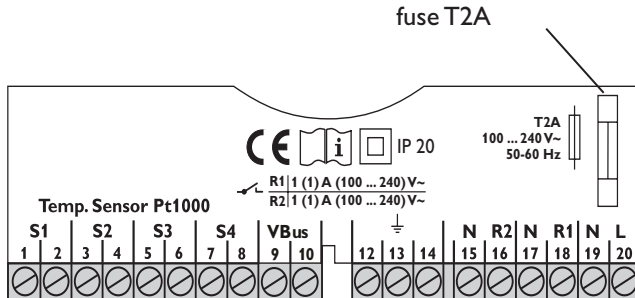
In this channel, different languages are available.

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



5. Troubleshooting

If a malfunction occurs, a notification is given on the display of the controller:



On the display appears the symbol and the symbol .

Sensor defect. An error code is shown on the relevant sensor indication channel instead of a temperature.

888.8

- 88.8

Line break. Check the line.

Short-circuit. Check the line.

Pt1000-temperature sensors pinched off can be checked with an ohmmeter. In the following the resistance values corresponding to different temperatures are listed.

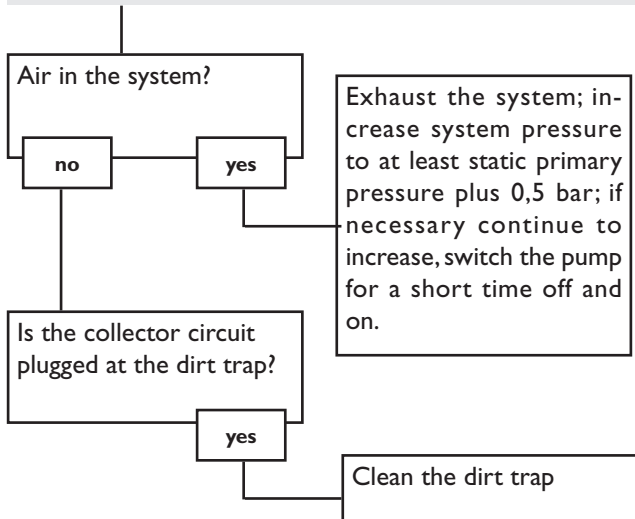
°C	Ω	°C	Ω
-10	961	55	1213
-5	980	60	1232
0	1000	65	1252
5	1019	70	1271
10	1039	75	1290
15	1058	80	1309
20	1078	85	1328
25	1097	90	1347
30	1117	95	1366
35	1136	100	1385
40	1155	105	1404
45	1175	110	1423
50	1194	115	1442

Resistance values of the Pt1000-sensors

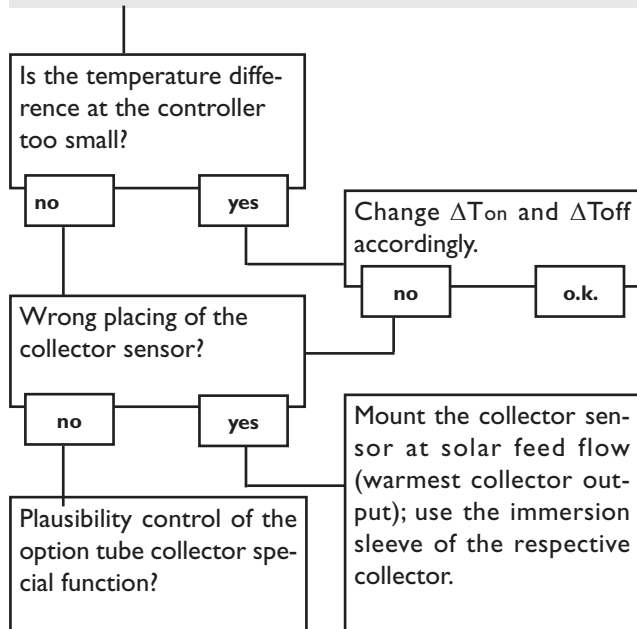


5.1 Various

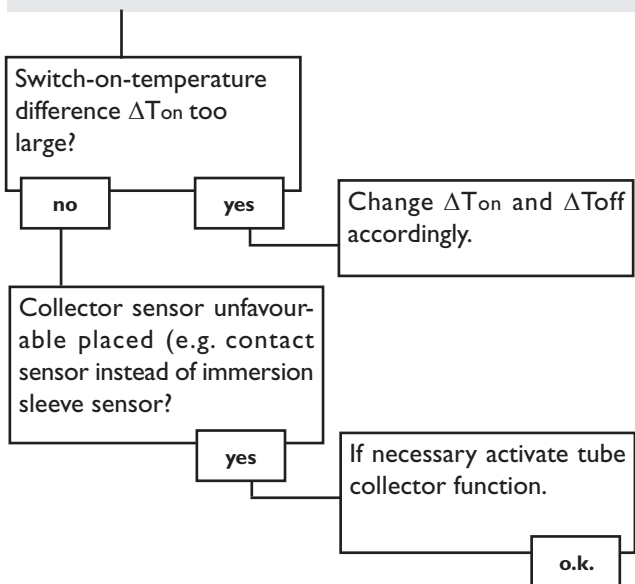
Pump is overheated, but no heat transfer from collector to the store, feed flow and return flow are equally warm, perhaps also bubble in the lines.



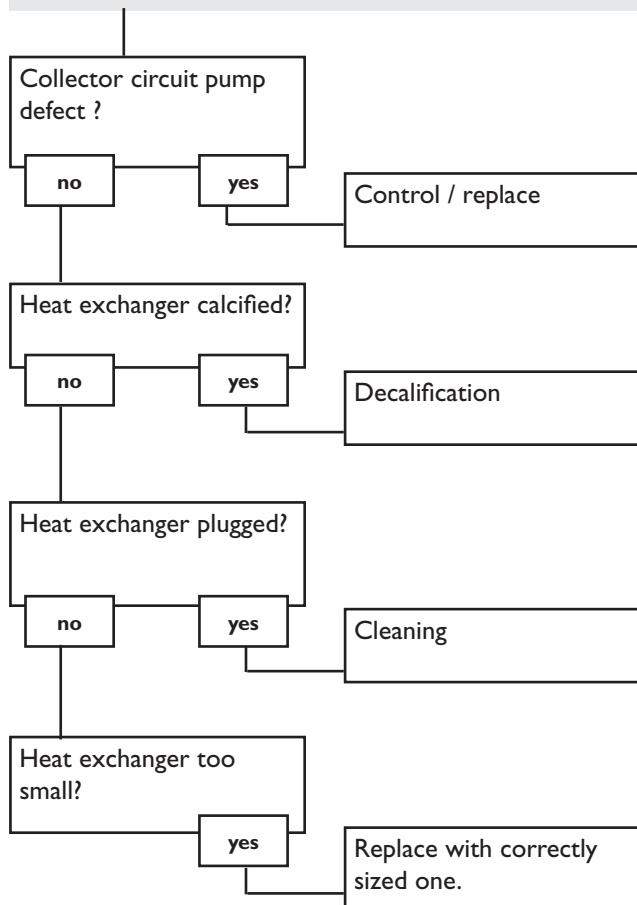
Pump starts for a short moment, switches-off, switches-on again, etc. („controller hunting“)



Pump starts up very late and soon stops working soon.

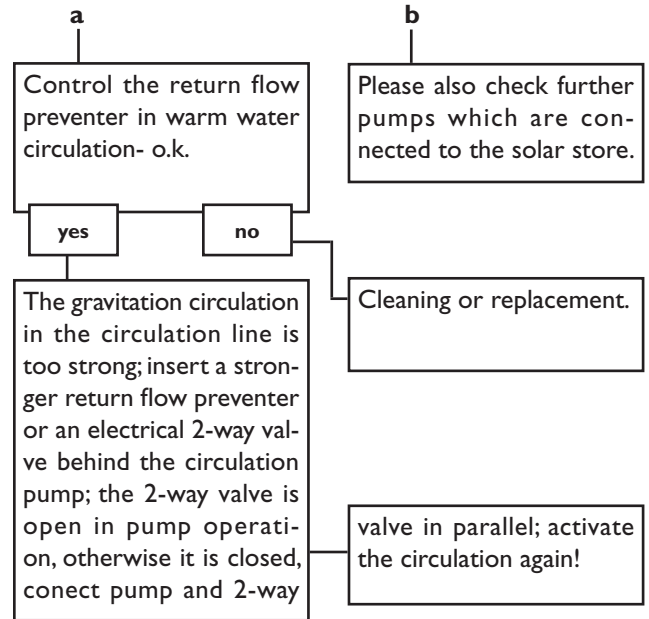
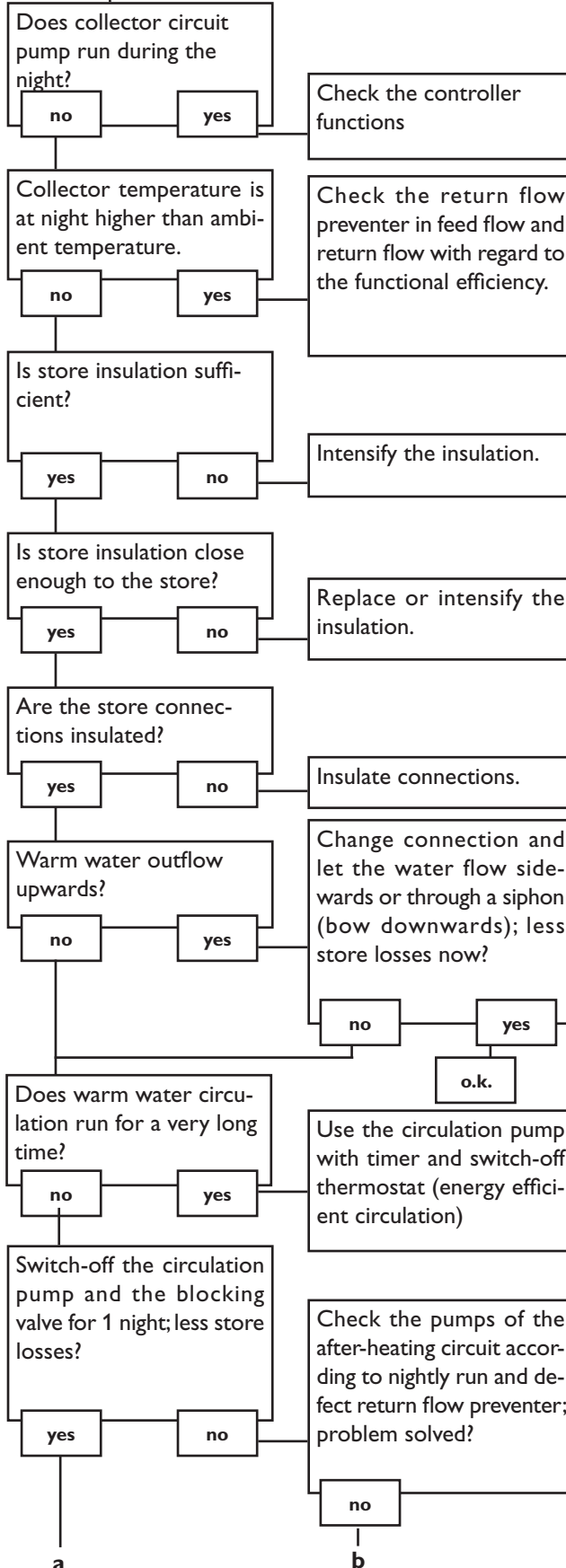


The temperature difference between store and collector increases enormously during operation; the collector circuit cannot dissipate the heat.

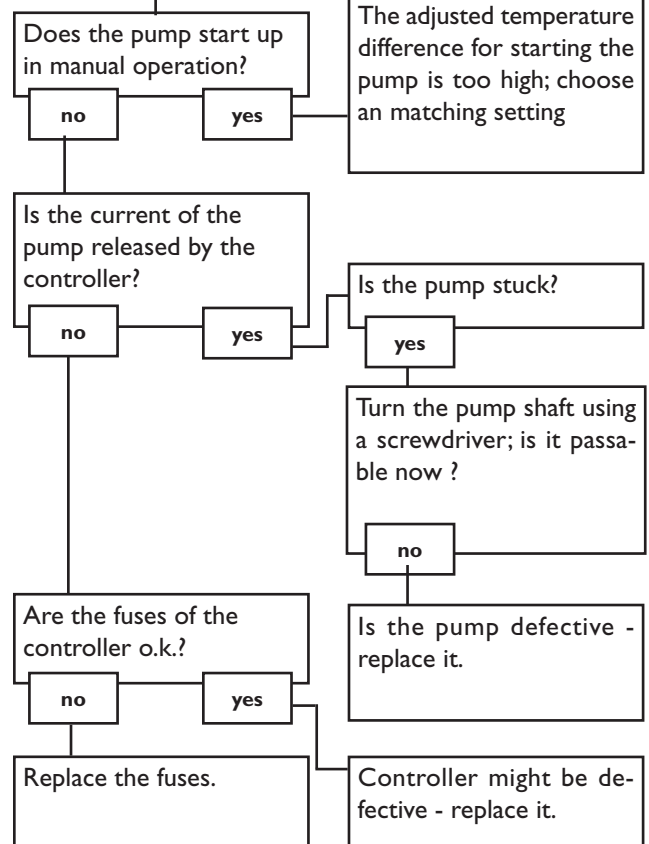




Stores are cooled during the night.



The solar circuit pump does not work although the collector is obviously warmer than the store.





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 SP10.



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 via the VBus® for processing, visualizing and archiving. A full version of the ServiceCenter software is included.



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