

DeltaSol[®] CS Plus bidirectional

RESOL[®]

beginning with version 2.00

Solar controller

Manual for the
specialised craftsman

Installation

Operation

Functions and options

Troubleshooting



11210333



The Internet portal for easy and secure access to
your system data – www.vbus.net

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

en

Manual
www.resol.com

Safety advice

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

Instructions

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

Information about the product

Proper usage

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

Improper use excludes all liability claims.

CE Declaration of conformity

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



Note

Strong electromagnetic fields can impair the function of the controller.

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

Subject to technical change. Errors excepted.

Target group

These instructions are exclusively addressed to authorised skilled personnel.

Only qualified electricians should carry out electrical works.

Initial installation must be effected by the system owner or qualified personnel named by the system owner.

Description of symbols

WARNING! Warnings are indicated with a warning triangle!



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

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

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



Note

Notes are indicated with an information symbol.

- Arrows indicate instruction steps that should be carried out.

Disposal

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

The DeltaSol® CS Plus bidirectional has been especially developed for the speed control of high-efficiency pumps in standard solar and heating systems.

It is equipped with two PWM outputs and an additional input for a VFD Grundfos Direct Sensor™ that enables a precise heat quantity measurement.

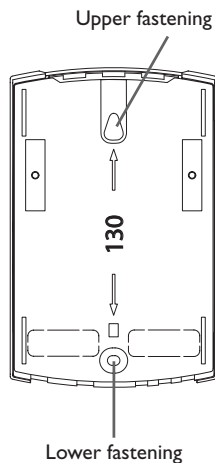
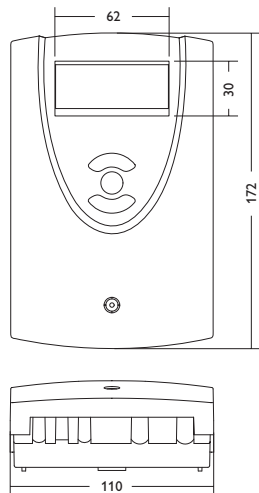
The DeltaSol® CS Plus bidirectional has 2 PWM feedback inputs and a status display for a bidirectional pump.

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1 Overview

- For the speed control of high-efficiency pumps
- Status display for a bidirectional HE pump
- Especially suited for solar pump stations
- 2 PWM feedback inputs
- 1 input for a VFD Grundfos Direct Sensor™
- Heat quantity measurement
- Commissioning menu
- 10 basic systems to choose from
- Function control
- Optional thermal disinfection function
- Drainback option



Technical data

Inputs: 4 Pt1000 temperature sensors, 1 VFD Grundfos Direct Sensor™, 2 PWM feedback inputs

Outputs: 2 semiconductor relays, 2 PWM outputs

PWM frequency: 512 Hz

PWM voltage: 10.5 V

Switching capacity: 1 (1) A 240 V~ (semiconductor relay)

Total switching capacity: 2 A 240 V~

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

Supply connection: type Y attachment

Standby: 0.61 W

Mode of operation: type 1.C.Y action

Rated impulse voltage: 2.5 kV

Data interface: RESOL VBus®

VBus® current supply: 35 mA

Functions: function control, operating hours counter, tube collector function, thermostat function, speed control and heat quantity measurement

Housing: plastic, PC-ABS and PMMA

Mounting: wall mounting, also suitable for mounting into patch panels

Indication/Display: System-Monitoring-Display for visualisation of systems, 16-segment and 7-segment display, 8 symbols for indication of system status

Operation: 3 buttons at the front of the housing

Protection type: IP 20/DIN EN 60529

Protection class: I

Ambient temperature: 0 ... 40 °C

Degree of pollution: 2

Dimensions: 172 x 110 x 46 mm

2 Installation

2.1 Mounting

WARNING! Electric shock!



Upon opening the housing, live parts are exposed!

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



Note

Strong electromagnetic fields can impair the function of the device.

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

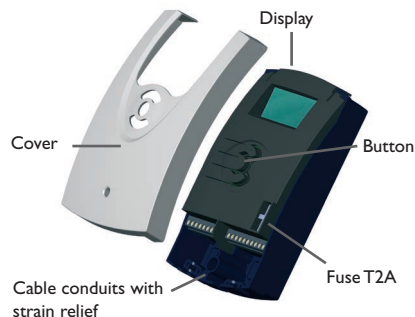
The unit must only be located in dry interior rooms.

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.

In order to mount the device to the wall, carry out the following steps:

- Unscrew the crosshead screw from the cover and remove it along with the cover from the housing.
- Mark the upper fastening point on the wall. Drill and fasten the enclosed wall plug and screw leaving the head protruding.
- Hang the housing from the upper fastening point and mark the lower fastening point (centres 130 mm).
- Insert lower wall plug.
- Fasten the housing to the wall with the lower fastening screw and tighten.
- Carry out the electrical wiring in accordance with the terminal allocation (see chapter 2.2).
- Put the cover on the housing.
- Attach with the fastening screw.



2.2 Electrical connection

WARNING! Electric shock!



Upon opening the housing, live parts are exposed!

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

ATTENTION! ESD damage!



Electrostatic discharge can lead to damage to electronic components!

→ **Take care to discharge properly before touching the inside of the device!**



Note

The mains connection must be carried out with the common ground of the building to which the pipework of the solar circuit is connected.



Note

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



Note

The pump speed must be set to 100% when auxiliary relays or valves are connected.



Note

It must be possible to disconnect the device from the mains at any time.

→ Install the mains plug such that it is accessible at any time.

→ If this is not possible, install a switch that can be accessed.

Do not use the device if it is visibly damaged!

The power supply of the device must be 100 ... 240 V~ (50 ... 60 Hz). Attach flexible cables 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 = Protective earth conductor ⊕

Relay 2

16 = Conductor R2

15 = Neutral conductor N

14 = Protective earth conductor ⊕

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

19 = Neutral conductor N

20 = Conductor L

12 = Protective earth conductor ⊕

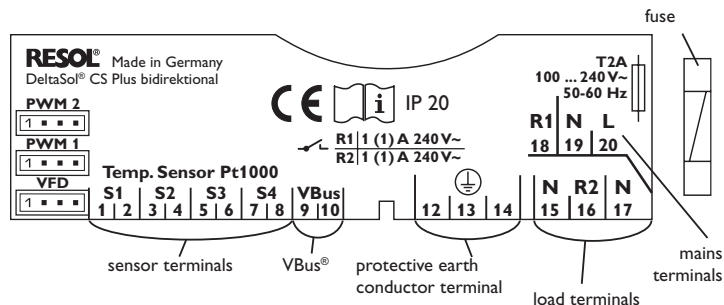
Connect the **temperature sensors** (S1 to S4) to the corresponding terminals with either polarity:

1/2 = Sensor 1 (e.g. collector sensor 1)

3/4 = Sensor 2 (e.g. store sensor 1)

5/6 = Sensor 3 (e.g. store sensor top)

7/8 = Sensor 4 (e.g. return sensor)



2.3 VFD Grundfos Direct Sensor™

The controller is equipped with 1 input for a digital VFD Grundfos Direct Sensor™ for measuring the flow rate and the temperature. Connection is made at the VFD terminal (bottom left).

2.4 PWM interfaces

Speed control of a HE pump is possible via a PWM signal. The pump has to be connected to the relay as well as to one of the PWM outputs of the controller. Power is supplied to the HE pump by switching the corresponding relay on or off.

The terminals marked PWM 1 and 2 are interfaces for bidirectional HE pumps.

PWM 2



PWM1:

1 = PWM output 1, control signal

2 = PWM output 1, GND

3 = PWM input 1, feedback signal

4 = not assigned

PWM2:

1 = PWM output 2, control signal

2 = PWM output 2, GND

3 = PWM input 2, feedback signal

4 = not assigned

PWM 1



1 2 3 4

2.5 Data communication/Bus

The controller is equipped with the **RESOL VBus®** for data transfer and energy supply to external modules. The connection is to be carried out at the terminals marked **VBus** (either polarity).

One or more RESOL VBus® modules can be connected via this data bus, such as:

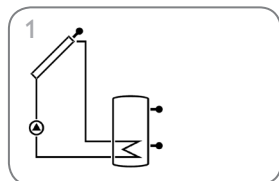
- DL2/DL3 Datalogger
- KM1 Communication module

Furthermore, the controller can be connected to a PC or integrated into a network via the RESOL VBus®/USB or VBus®/LAN interface adapter (not included). Different solutions for visualisation and remote parameterisation are available on the RESOL website www.resol.com.

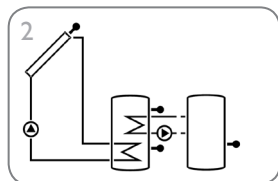


Note

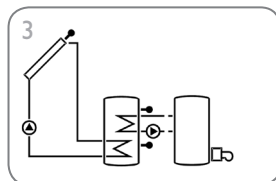
More accessories on page 69.



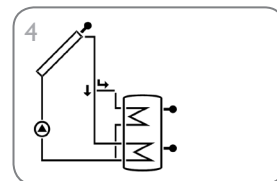
Standard solar system (page 8)



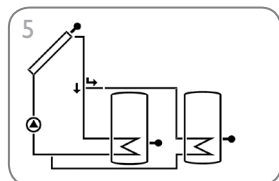
Solar system with heat exchange (page 11)



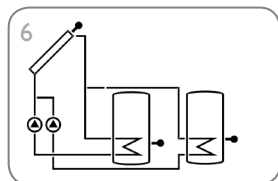
Solar system with backup heating (page 17)



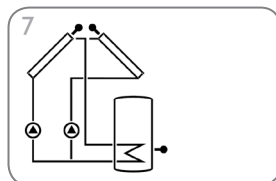
Solar system with store loading in layers (page 22)



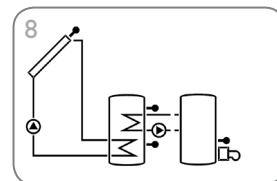
Solar system with 2 stores and valve logic (page 25)



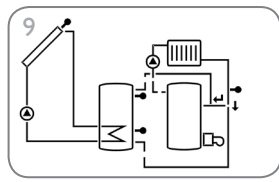
Solar system with 2 stores and pump logic (page 28)



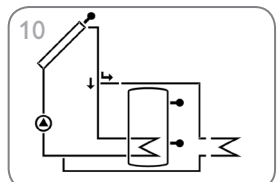
Solar system with east-/west collectors and 1 store (page 31)



Solar system with backup heating by solid fuel boiler (page 34)



Solar system with heating circuit return preheating (page 40)



Standard solar system with heat dump (page 43)

Display channels				
Channel		Description	Connection terminal	Page
INIT	x*	ODB initialisation active	-	50
FLL	x*	ODB filling time active	-	50
STAB	x*	ODB stabilisation in progress	-	50
COL	x	Temperature collector	S1	51
TST	x	Temperature store	S2	51
S3	x	Temperature sensor 3	S3	51
TSTT	x*	Temperature store top	S3	51
S4	x	Temperature sensor 4	S4	51
TFL	x*	Temperature flow sensor	S1 / S4 / VFD	51
TR	x*	Temperature return sensor	S4 / VFD	51
VFD	x*	Temperature Grundfos Direct Sensor™	VFD	51
L/h	x*	Flow rate Grundfos Direct Sensor™ / PWM feedback signal	VFD / PWM1	52
n %	x	Speed R1	R1	52
hP	x	Operating hours R1	R1	53
hP1	x*	Operating hours R1 (if OBST is activated)	R1	53
hP2	x*	Operating hours R2 (if OBST is activated)	R2	53
kWh	x*	Heat quantity in kWh	-	52
MWh	x*	Heat quantity in MWh	-	52
TIME	x	Time	-	53

Adjustment channels				
Channel		Description	Factory setting	Page
Arr	x	System	1	54
DT O	x	Switch-on temperature difference R1	6.0 K [12.0 °Ra]	54
DT F	x	Switch-off temperature difference R1	4.0 K [8.0 °Ra]	54
DT S	x	Set temperature difference R1	10.0 K [20.0 °Ra]	54
RIS	x	Rise R1	2 K [4 °Ra]	55
PUM1	x	Pump control type R1	PSOL	55
nMN	x	Minimum speed R1	30 %	55
nMX	x	Maximum speed R1	100 %	55
PFB1	x*	PWM feedback signal input 1	OFF	56
S MX	x	Maximum store temperature	60 °C [140 °F]	56
OSEM	x	Store emergency shutdown option	OFF	56
EM	x	Collector emergency temperature	130 °C [270 °F]	57
		Collector emergency temperature if ODB is activated:	95 °C [200 °F]	57
OCC	x	Collector cooling option	OFF	57
CMX	x*	Maximum collector temperature	110 °C [230 °F]	57
OSYC	x	System cooling option	OFF	58

Adjustment channels

Channel		Description	Factory setting	Page
DTCO	x*	Switch-on temperature difference cooling	20.0 K [40.0 °Ra]	58
DTCF	x*	Switch-off temperature difference cooling	15.0 K [30.0 °Ra]	58
OSTC	x	Store cooling option	OFF	58
OHOL	x*	Holiday cooling option	OFF	58
THOL	x*	Holiday cooling temperature	40 °C [110 °F]	58
OCN	x	Collector minimum limitation option	OFF	59
CMN	x*	Collector minimum temperature	10 °C [50 °F]	59
OCF	x	Antifreeze option	OFF	59
CFR	x*	Antifreeze temperature	4.0 °C [40.0 °F]	59
OTC	x	Tube collector option	OFF	60
TCST	x*	OTC starting time	07:00	60
TCEN	x*	OTC ending time	19:00	61
TCRU	x*	OTC runtime	30 s	61
TCIN	x*	OTC standstill interval	30 min	61
GFD	x	Grundfos Direct Sensor™	OFF	61
OHQM	x	Heat quantity measurement option	OFF	61
SEN	x*	VFD allocation	2	62
FMAX	x*	Maximum flow rate	6.0 l/min	62
MEDT	x*	Antifreeze type	1	63
MED%	x*	Antifreeze concentration (only if MEDT = propylene or ethylene glycol)	45 %	63
ODB	x	Drainback option	OFF	63
tDTO	x*	ODB switch-on condition - time period	60 s	64
tFLL	x*	ODB filling time	5.0 min	64
tSTB	x*	ODB stabilisation time	2.0 min	64
OBST	s*	Option booster function	OFF	64
MAN1	x	Manual mode R1	Auto	64
MAN2	x	Manual mode R2	Auto	64
LANG	x	Language	dE	65
UNIT	x	Temperature unit	°C	65
RESE	x	Reset - back to factory settings		65
#####		Version number		

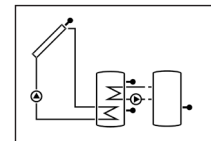
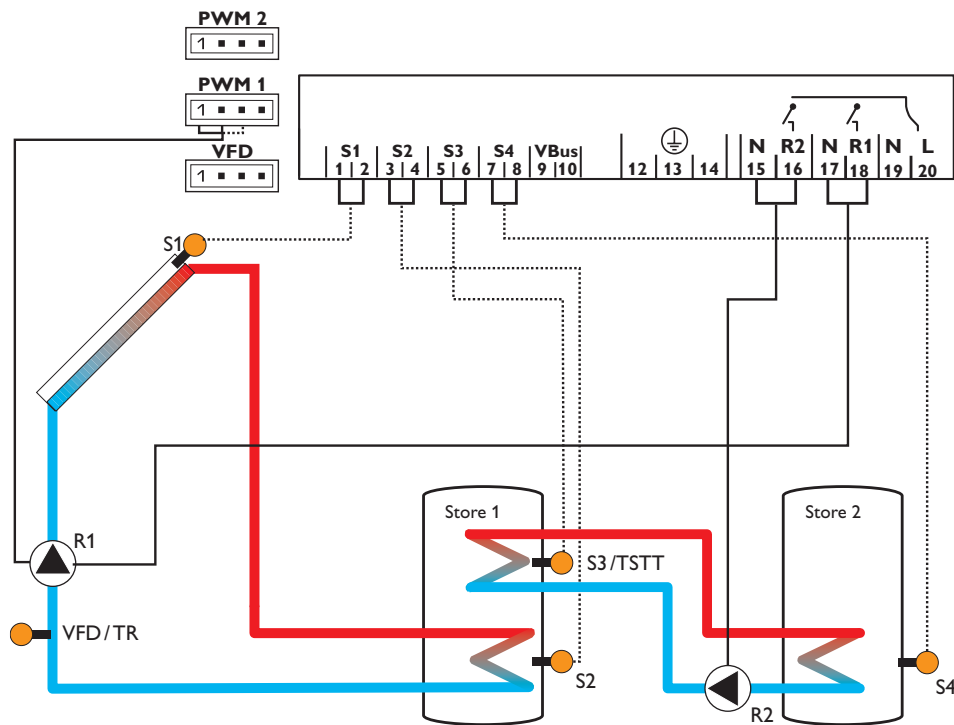
Legend:

Symbol	Description
x	Channel is available
x*	Channel is available, if the corresponding option is activated.
s*	System-specific channel, only available if the corresponding option is activated

Arrangement 2: Solar system with heat exchange

The controller calculates the temperature difference between collector sensor S1 and store sensor S2. If the difference is larger than or identical to the adjusted switch-on temperature difference (DT O), the solar pump will be activated by relay 1, and the store will be loaded until the switch-off temperature difference (DT F) or the maximum store temperature (S MX) is reached.

Heat exchange from store 1 to store 2 will be operated by relay 2, if the temperature difference between sensors S3 and S4 is larger than or identical to the adjusted switch-on temperature difference (DT3O), until the adjusted minimum (MN3O) and maximum (MX3O) temperature thresholds of the respective stores are reached. S3 can optionally be used as the reference sensor for the store emergency shutdown option (OSEM). If the heat quantity measurement option (OHQM) is activated, S1 or VFD can be used for measuring the temperature (see table on p. 63).



Display channels

Channel		Description	Connection terminal	Page
INIT	x*	ODB initialisation active	-	50
FLL	x*	ODB filling time active	-	50
STAB	x*	ODB stabilisation in progress	-	50
COL	x	Temperature collector	S1	51
TST1	x	Temperature store 1 base	S2	51
TSTT	x	Temperature store 1 top	S3	51
TST2	x	Temperature store 2 base	S4	51
TFL	x*	Temperature flow sensor	S1	51
TR	x*	Temperature return sensor	VFD	51
VFD	x*	Temperature Grundfos Direct Sensor™	VFD	51
L/h	x*	Flow rate Grundfos Direct Sensor™ / PWM feedback signal	VFD / PWM1	52
n1%	x	Speed R1	R1	52
n2%	x	Speed R2	R2	52
h P1	x	Operating hours R1	R1	53
h P2	x	Operating hours R2	R2	53
kWh	x*	Heat quantity in kWh	-	52
MWh	x*	Heat quantity in MWh	-	52
TIME	x	Time	-	53

Adjustment channels

Channel		Description	Factory setting	Page
Arr	x	System	2	54
DT O	x	Switch-on temperature difference R1	6.0 K [12.0 °Ra]	54
DT F	x	Switch-off temperature difference R1	4.0 K [8.0 °Ra]	54
DT S	x	Set temperature difference R1	10.0 K [20.0 °Ra]	54
RIS	x	Rise R1	2 K [4 °Ra]	55
PUM1	x	Pump control type R1	PSOL	55
n1MN	x	Minimum speed R1	30%	55
n1MX	x	Maximum speed R1	100%	55
PFB1	x*	PWM feedback signal input 1	OFF	56
S MX	x	Maximum store temperature	60 °C [140 °F]	56
OSEM	x	Store emergency shutdown option	OFF	56
PUM2	x	Pump control type R2	OnOF	55
n2MN	x*	Minimum speed R2	30%	55
n2MX	x*	Maximum speed R2	100%	55
EM	x	Collector emergency temperature	130 °C [270 °F]	57
		Collector emergency temperature if ODB is activated:	95 °C [200 °F]	57
OCC	x	Collector cooling option	OFF	57
CMX	x*	Maximum collector temperature	110 °C [230 °F]	57
OSYC	x	System cooling option	OFF	58
DTCO	x*	Switch-on temperature difference cooling	20.0 K [40.0 °Ra]	58
DTCF	x*	Switch-off temperature difference cooling	15.0 K [30.0 °Ra]	58

Adjustment channels				
Channel		Description	Factory setting	Page
OSTC	x	Store cooling option	OFF	58
OHOL	x*	Holiday cooling option	OFF	58
THOL	x*	Holiday cooling temperature	40 °C [110 °F]	58
OCN	x	Collector minimum limitation option	OFF	59
CMN	x*	Collector minimum temperature	10 °C [50 °F]	59
OCF	x	Antifreeze option	OFF	59
CFR	x*	Antifreeze temperature	4.0 °C [40.0 °F]	59
OTC	x	Tube collector option	OFF	60
TCST	x*	OTC starting time	07:00	60
TCEN	x*	OTC ending time	19:00	61
TCRU	x*	OTC runtime	30 s	61
TCIN	x*	OTC standstill interval	30 min	61
GFD	x	Grundfos Direct Sensor™	OFF	61
OHQM	x	Heat quantity measurement option	OFF	61
MEDT	x*	Antifreeze type	1	63
MED%	x*	Antifreeze concentration (only if MEDT = propylene or ethylene glycol)	45 %	63
DT3O	s	Switch-on temperature difference R2	6.0 K [12.0 °Ra]	54
DT3F	s	Switch-off temperature difference R2	4.0 K [8.0 °Ra]	54
DT3S	s	Set temperature difference R2	10.0 K [20.0 °Ra]	54
RIS3	s	Rise R2	2 K [4 °Ra]	55
MX3O	s	Switch-on threshold for maximum temperature	60.0 °C [140.0 °F]	39
MX3F	s	Switch-off threshold for maximum temperature	58.0 °C [136.0 °F]	39
MN3O	s	Switch-on threshold for minimum temperature	5.0 °C [40.0 °F]	39
MN3F	s	Switch-off threshold for minimum temperature	10.0 °C [50.0 °F]	39
ODB	x	Drainback option	OFF	63
tDTO	x*	ODB switch-on condition - time period	60 s	64
tFLL	x*	ODB filling time	5.0 min	64
tSTB	x*	ODB stabilisation time	2.0 min	64
MAN1	x	Manual mode R1	Auto	64
MAN2	x	Manual mode R2	Auto	64
LANG	x	Language	dE	65
UNIT	x	Temperature unit	°C	65
RESE	x	Reset - back to factory settings		65
#####		Version number		

Legend:

Symbol	Description
x	Channel is available
x*	Channel is available, if the corresponding option is activated.
s	System-specific channel

System-specific functions

The following adjustments are used for the specific functions in system 2.

ΔT control for the heat exchange between 2 stores

The display shows 'DT3O' in large digits with 'SET' in small letters to the right, and '6.0' in smaller digits below it.

DT3O

Switch-on temperature difference

Adjustment range: 1.0 ... 20.0 K [2.0 ... 40.0 °Ra]

Factory setting: 6.0 K [12.0 °Ra]

The display shows 'DT3F' in large digits with 'SET' in small letters to the right, and '4.0' in smaller digits below it.

DT3F

Switch-off temperature difference

Adjustment range: 0.5 ... 19.5 K [1.0 ... 39.0 °Ra]

Factory setting: 4.0 K [8.0 °Ra]

S3 and S4 are used as the reference sensors for this function.

In system 2 the controller is equipped with an additional differential control for heat exchange between two stores. The basic differential function is adjusted using the switch-on (**DT3O**) and switch-off (**DT3F**) temperature differences.

When the temperature difference exceeds the adjusted switch-on temperature difference, relay 2 switches on. When the temperature difference falls below the adjusted switch-off temperature difference, relay 2 switches off.



Note

The switch-on temperature difference must be at least 0.5 K [1 °Ra] higher than the switch-off temperature difference.

Speed control

The display shows 'DT3S' in large digits with 'SET' in small letters to the right, and '10.0' in smaller digits below it. Below this, the text 'K' is visible.

DT3S

Set temperature difference

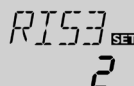
Adjustment range: 1.5 ... 30.0 K [3.0 ... 60.0 °Ra]

Factory setting: 10.0 K [20.0 °Ra]



Note

For pump speed control of the heat exchange pump, the operating mode of relay 2 must be set to **Auto** in the adjustment channel **MAN2**.

The display shows 'RIS3' in large digits with 'SET' in small letters to the right, and '2' in smaller digits below it.

RIS3

Rise

Adjustment range: 1 ... 20 K [2 ... 40 °Ra]

Factory setting: 2 K [4 °Ra]

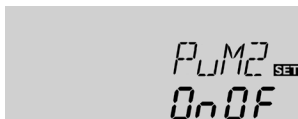
If the switch-on difference is reached, the pump switches on at full speed for 10 s. Then, the speed is reduced to the minimum pump speed value (n2MN).

If the temperature difference reaches the adjusted set value (DT3S), the pump speed increases by one step (10 %). Each time the difference increases by the adjustable rise value RIS3, the pump speed increases by 10 % until the maximum pump speed of 100 % is reached.



Note

The set temperature difference must be at least 0.5 K [1 °Ra] higher than the switch-on temperature difference.



PUM2

Pump control type R2

Selection: OnOF, PULS, PSOL, PHEA

Factory setting: OnOF

With this parameter, the pump control type can be adjusted. The following types can be selected:

Adjustment for standard pump without speed control

- OnOF (pump on/pump off)

Adjustment for standard pump with speed control

- PULS (burst control via semiconductor relay)

Adjustment for high-efficiency pump (HE pump)

- PSOL (PWM profile for a HE solar pump)
- PHEA (PWM profile for a HE heating pump)



n2MN

Minimum speed R2

Adjustment range: (10) 30 ... 100 %

Factory setting: 30 %

In the adjustment channel **n2MN** a relative minimum speed for a pump connected can be allocated to the output R2.



Note

The pump speed must be set to 100 % when auxiliary relays or valves are connected.



n2MX

Maximum speed R2

Adjustment range: (10) 30 ... 100 %

Factory setting: 100 %

In the adjustment channel **n2MX** a relative maximum speed for a pump connected can be allocated to the output R2.



Note

The pump speed must be set to 100 % when auxiliary relays or valves are connected.

Maximum temperature limitation heat exchange



MX30 SET
60.0



MX3F SET
58.0

MX30/MX3F

Maximum temperature limitation

Adjustment range: 0.0 ... 95.0 °C [30.0 ... 200.0 °F]

Factory setting:

MX30: 60.0 °C [140.0 °F]

MX3F: 58.0 °C [136.0 °F]

S4 is used as the reference sensor for the maximum temperature limitation.

The maximum temperature limitation function provides a maximum temperature setting, usually to reduce scald risk in a store. If **MX30** is exceeded, relay 2 is switched off until the temperature at sensor 4 falls below **MX3F**.

Minimum temperature limitation heat exchange



MN30 SET
5.0



MN3F SET
10.0

MN30/MN3F

Minimum temperature limitation

Adjustment range: 0.0 ... 90.0 °C [30.0 ... 190.0 °F]

Factory setting (only if Arr = 2):

MN30: 5.0 °C [40.0 °F]

MN3F: 10.0 °C [50.0 °F]

S3 is used as the reference sensor for the minimum temperature limitation.

The minimum temperature limitation function provides a minimum temperature setting for the heat source in system 2. If the temperature at sensor 3 falls below **MN30**, relay 2 is switched off until the temperature at sensor 3 exceeds **MN3F**. Both switch-on and switch-off temperature differences **DT30** and **DT3F** are valid for the maximum and minimum temperature limitation.

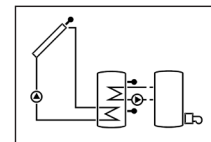
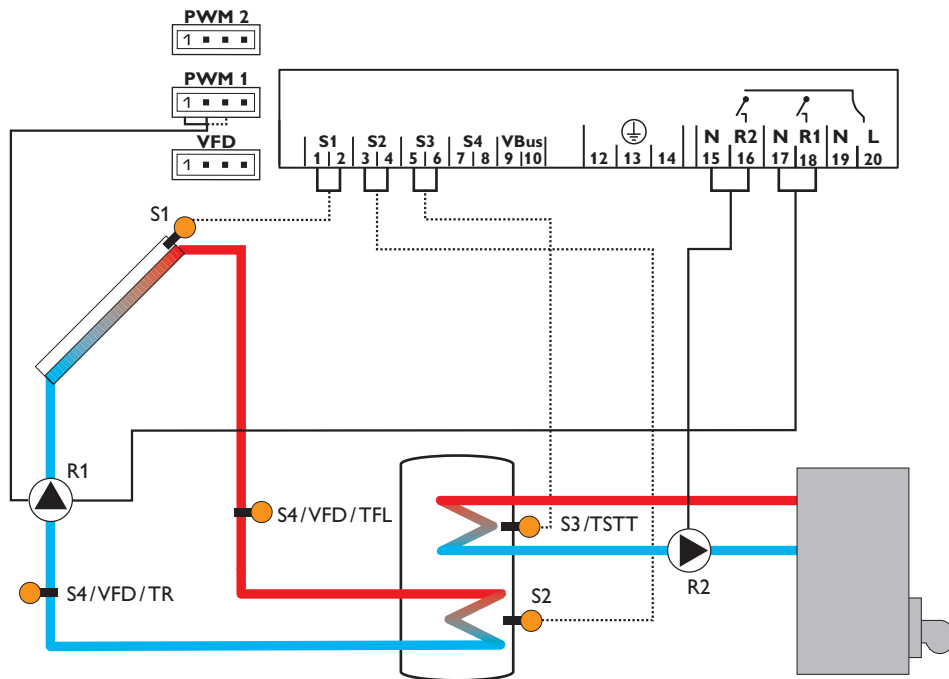
Arrangement 3: Solar system with backup heating

The controller calculates the temperature difference between collector sensor S1 and store sensor S2. If the difference is larger than or identical to the adjusted switch-on temperature difference (DT O), the solar pump will be activated by relay 1, and the store will be loaded until the switch-off temperature difference (DT F) or the maximum store temperature (S MX) is reached.

Sensor S3 is used for a thermostat function, which operates relay 2 for backup heating or heat dump purposes, when the adjusted thermostat switch-on temperature (AH O) is reached. This function can optionally be combined with up to three adjustable time frames.

Sensor S3 can optionally be used as the reference sensor for the thermal disinfection function (OTD) or the store emergency shutdown option (OSEM).

Sensor S4 can optionally be connected. If the heat quantity measurement option (OHQM) is activated, S1, S4 or VFD can be used for measuring the temperature (see table on p. 63).



Display channels

Channel		Description	Connection terminal	Page
INIT	x*	ODB initialisation active	-	50
FLL	x*	ODB filling time active	-	50
STAB	x*	ODB stabilisation in progress	-	50
COL	x	Temperature collector	S1	51
TSTB	x	Temperature store 1 base	S2	51
TSTT	x	Temperature store 1 top	S3	51
TDIS	s*	Thermal disinfection temperature (thermal disinfection)	S3	51
S4	x	Temperature sensor 4	S4	51
TFL	x*	Temperature flow sensor	S1/S4/VFD	51
TR	x*	Temperature return sensor	S4/VFD	51
VFD	x*	Temperature Grundfos Direct Sensor™	VFD	51
L/h	x*	Flow rate Grundfos Direct Sensor™ / PWM feedback signal	VFD/PWM1	52
n1%	x	Speed R1	R1	52
h P1	x	Operating hours R1	R1	53
h P2	x	Operating hours R2	R2	53
kWh	x*	Heat quantity in kWh	-	52
MWh	x*	Heat quantity in MWh	-	52
CDIS	s*	Countdown of monitoring period (thermal disinfection)	-	52
SDIS	s*	Starting time display (thermal disinfection)	-	53
DDIS	s*	Disinfection period display (thermal disinfection)	-	53
TIME	x	Time	-	53

Adjustment channels

Channel		Description	Factory setting	Page
Arr	x	System	3	54
DT O	x	Switch-on temperature difference R1	6.0 K [12.0 °Ra]	54
DT F	x	Switch-off temperature difference R1	4.0 K [8.0 °Ra]	54
DT S	x	Set temperature difference R1	10.0 K [20.0 °Ra]	54
RIS	x	Rise R1	2 K [4 °Ra]	55
PUM1	x	Pump control type R1	PSOL	55
n1MN	x	Minimum speed R1	30%	55
n1MX	x	Maximum speed R1	100%	55
PFB1	x*	PWM feedback signal input 1	OFF	56
S MX	x	Maximum store temperature	60 °C [140 °F]	56
OSEM	x	Store emergency shutdown option	OFF	56
EM	x	Collector emergency temperature	130 °C [270 °F]	57
		Collector emergency temperature if ODB is activated:	95 °C [200 °F]	57
OCC	x	Collector cooling option	OFF	57
CMX	x*	Maximum collector temperature	110 °C [230 °F]	57
OSYC	x	System cooling option	OFF	58
DTCO	x*	Switch-on temperature difference cooling	20.0 K [40.0 °Ra]	58
DTCF	x*	Switch-off temperature difference cooling	15.0 K [30.0 °Ra]	58
OSTC	x	Store cooling option	OFF	58
OHOL	x*	Holiday cooling option	OFF	58
THOL	x*	Holiday cooling temperature	40 °C [110 °F]	58

Adjustment channels				
Channel		Description	Factory setting	Page
OCN	x	Collector minimum limitation option	OFF	59
CMN	x*	Collector minimum temperature	10 °C [50 °F]	59
OCF	x	Antifreeze option	OFF	59
CFR	x*	Antifreeze temperature	4.0 °C [40.0 °F]	59
OTC	x	Tube collector option	OFF	60
TCST	x*	OTC starting time	07:00	60
TCEN	x*	OTC ending time	19:00	61
TCRU	x*	OTC runtime	30 s	61
TCIN	x*	OTC standstill interval	30 min	61
GFD	x	Grundfos Direct Sensor™	OFF	61
OHQM	x	Heat quantity measurement option	OFF	61
SEN	x*	VFD allocation	2	62
FMAX	x*	Maximum flow rate	6.0 l/min	62
MEDT	x*	Antifreeze type	1	63
MED%	x*	Antifreeze concentration	45 %	63
AH O	s	Switch-on temperature for thermostat	40 °C [110 °F]	20
AH F	s	Switch-off temperature for thermostat	45 °C [120 °F]	20
t1 O	s	Thermostat switch-on time 1	00:00	20
t1 F	s	Thermostat switch-off time 1	00:00	20
t2 O	s	Thermostat switch-on time 2	00:00	20
t2 F	s	Thermostat switch-off time 2	00:00	20
t3 O	s	Thermostat switch-on time 3	00:00	20
t3 F	s	Thermostat switch-off time 3	00:00	20
ODB	x	Drainback option	OFF	63
tDTO	x*	ODB switch-on condition - time period	60 s	64
tFLL	x*	ODB filling time	5.0 min	64
tSTB	x*	ODB stabilisation time	2.0 min	64
OTD	s	Thermal disinfection option	OFF	21
PDIS	s*	Monitoring period	01:00	21
DDIS	s*	Disinfection period	01:00	21
TDIS	s*	Disinfection temperature	60 °C [140 °F]	21
SDIS	s*	Starting time	00:00	21
MAN1	x	Manual mode R1	Auto	64
MAN2	x	Manual mode R2	Auto	64
LANG	x	Language	dE	65
UNIT	x	Temperature unit	°C	65
RESE	x	Reset - back to factory settings		65
#####		Version number		

Legend:

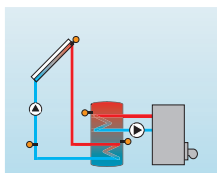
Symbol	Description
x	Channel is available
x*	Channel is available, if the corresponding option is activated.
s	System-specific channel
s*	System-specific channel, only available if the corresponding option is activated

System-specific functions

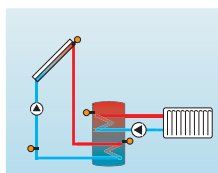
The following adjustments are used for the specific functions in system 3. The channels described are not available in any other system.

Thermostat function

Backup heating



Use of surplus energy



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

- **AH O < AH F**

thermostat function for backup heating

- **AH O > AH F**

thermostat function for using surplus energy

The symbol  will be shown on the display, if the second relay output is activated.

S3 is used as the reference sensor for the thermostat function!



AH O

Thermostat switch-on temperature

Adjustment range: 0.0 ... 95.0 °C [30.0 ... 200.0 °F]

Factory setting: 40.0 °C [110.0 °F]

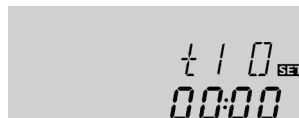


AH F

Thermostat switch-off temperature

Adjustment range: 0.0 ... 95.0 °C [30.0 ... 200.0 °F]

Factory setting: 45.0 °C [120.0 °F]

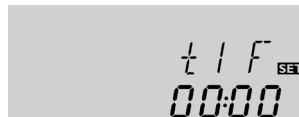


t1 O, t2 O, t3 O

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

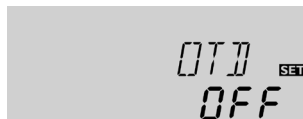
Factory setting: 00:00

In order to run the thermostat function for a certain period, there are 3 time frames t1 ... t3.

If the thermostat function is supposed to run from 06:00 a.m. to 09:00 a.m. only, adjust **t1 O** to 06:00 a.m. and **t1 F** to 09:00 a.m.

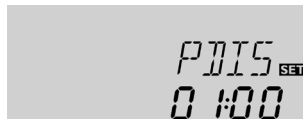
If the switch-on and switch-off times of a time frame are set to an identical value, the time frame will be inactive. If all time frames are set to 00:00, the thermostat function is solely temperature dependent (factory setting).

Thermal disinfection of the upper DHW zone



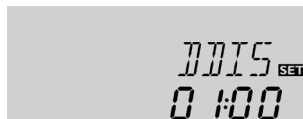
OTD

Therm. disinfection function
Adjustment range: OFF/ON
Factory setting: OFF



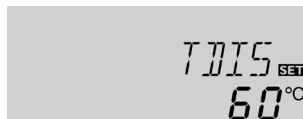
PDIS

Monitoring period
Adjustment range: 0 ... 30:0 ... 24 h (dd:hh)
Factory setting: 01:00



DDIS

Disinfection period
Adjustment range: 0:00 ... 23:59 (hh:mm)
Factory setting: 01:00



TDIS

Disinfection temperature
Adjustment range: 0 ... 95 °C [30 ... 200 °F]
Factory setting: 60 °C [140 °F]

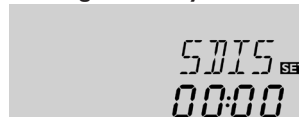
This function helps to contain the spread of Legionella in DHW stores by systematically activating the backup heating.

For thermal disinfection, the temperature at the reference sensor will be monitored. Protection is ensured when, during the monitoring period, the disinfection temperature is continuously exceeded for the entire disinfection period.

The monitoring period starts as soon as the temperature at the reference sensor falls below the disinfection temperature. When the monitoring period ends, the allocated reference relay activates the backup heating. The disinfection period starts, if the temperature at the allocated sensor exceeds the disinfection temperature.

Thermal disinfection can only be completed when the disinfection temperature is exceeded for the duration of the disinfection period without any interruption.

Starting time delay



SDIS

Starting time
Adjustment range: 0:00 ... 24:00 (time)
Factory setting: 00:00

If the starting delay option is activated, a starting time for the thermal disinfection with starting delay can be adjusted. The activation of the backup heating is then delayed until that starting time after the monitoring period has ended.

If the monitoring period ends, for example, at 12:00 o'clock, and the starting time has been set to 18:00, the reference relay will be energised with a delay of 6 hours at 18:00 instead of 12:00 o'clock.



Note

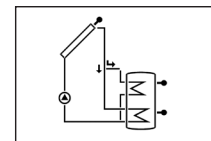
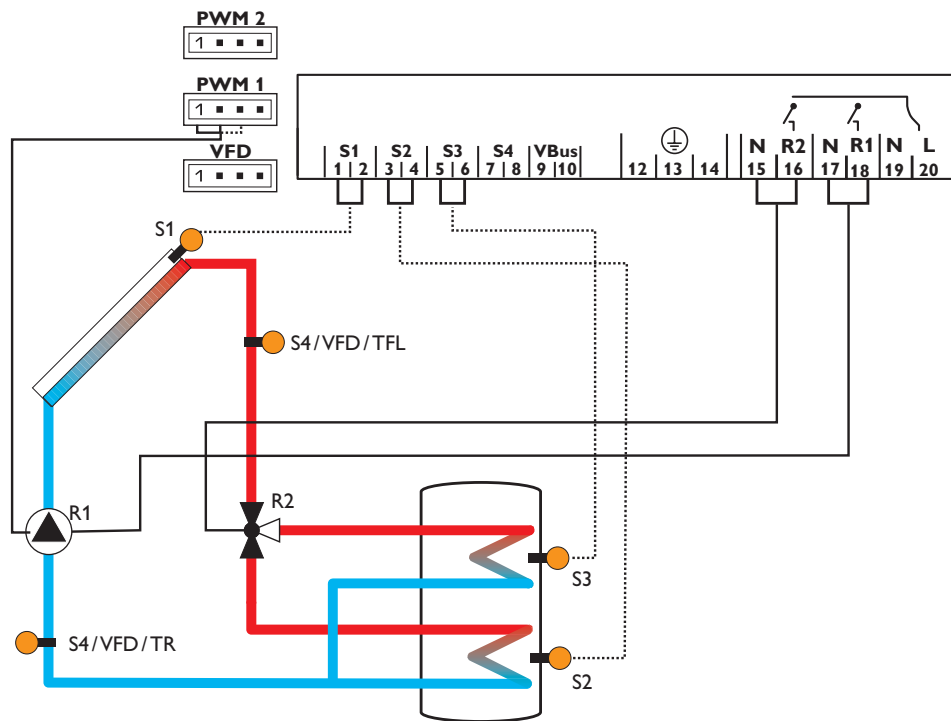
If the thermal disinfection option is activated, the display channels **TDIS**, **CDIS**, **SDIS** and **DDIS** will be displayed.

Arrangement 4: Solar system with stratified store

The controller calculates the temperature difference between collector sensor S1 and store sensors S2 and S3. If the difference is larger than or identical to the corresponding adjusted switch-on temperature differences (DT1O/DT2O), the solar pump will be activated by relay 1, and the corresponding store zone will be loaded until the switch-off temperature difference (DT1F/DT2F) or the maximum

store temperature (S1MX/S2MX) is reached. The priority logic causes priority loading of the upper store zone, if possible. In that case, the 3-port valve will be operated by relay 2.

If the heat quantity measurement option (OHQM) is activated, S1, S4 or VFD can be used for measuring the temperature (see table on p. 63).



Display channels				
Channel		Description	Connection terminal	Page
COL	x	Temperature collector	S1	51
TSTB	x	Temperature store 1 base	S2	51
TSTT	x	Temperature store 1 top	S3	51
S4	x	Temperature sensor 4	S4	51
TFL	x*	Temperature flow sensor	S1/S4/VFD	51
TR	x*	Temperature return sensor	S4/VFD	51
VFD	x*	Temperature Grundfos Direct Sensor™	VFD	51
L/h	x*	Flow rate Grundfos Direct Sensor™ / PWM feedback signal	VFD / PWM1	52
n %	x	Speed relay	R1	52
hP1	x	Operating hours R1	R1	53
hP2	x	Operating hours R2	R2	53
kWh	x*	Heat quantity in kWh	-	52
MWh	x*	Heat quantity in MWh	-	52
TIME	x	Time	-	53

Adjustment channels				
Channel		Description	Factory setting	Page
Arr	x	System	4	54
PUM1	x	Pump control type R1	PSOL	55
nMN	x	Minimum speed R1	30 %	55
nMX	x	Maximum speed R1	100 %	55
PFB1	x*	PWM feedback signal input 1	OFF	56
DT1O	x	Switch-on temperature difference R1	6.0 K [12.0 °Ra]	54
DT1F	x	Switch-off temperature difference R1	4.0 K [8.0 °Ra]	54
DT1S	x	Set temperature difference R1	10.0 K [20.0 °Ra]	54
RIS1	x	Rise R1	2 K [4 °Ra]	55
S1 MX	x	Maximum store temperature 1	60 °C [140 °F]	54
DT2O	x	Switch-on temperature difference R2	6.0 K [12.0 °Ra]	54
DT2F	x	Switch-off temperature difference R2	4.0 K [8.0 °Ra]	54
DT2S	x	Set temperature difference R2	10.0 K [20.0 °Ra]	54
RIS2	x	Rise R2	2 K [4 °Ra]	55
S2MX	x	Maximum store temperature 2	60 °C [140 °F]	54
EM	x	Collector emergency temperature	130 °C [270 °F]	55
OCC	x	Collector cooling option	OFF	57
CMX	x*	Maximum collector temperature	110 °C [230 °F]	57
OSYC	x	System cooling option	OFF	58
DTCO	x*	Switch-on temperature difference cooling	20.0 K [40.0 °Ra]	58
DTCF	x*	Switch-off temperature difference cooling	15.0 K [30.0 °Ra]	58

en	Adjustment channels				
	Channel		Description	Factory setting	Page
Installation	OSTC	x	Store cooling option	OFF	58
	OHOL	x*	Holiday cooling option	OFF	58
	THOL	x*	Holiday cooling temperature	40 °C [110 °F]	58
	OCN	x	Collector minimum limitation option	OFF	59
	CMN	x*	Collector minimum temperature	10 °C [50 °F]	59
	OCF	x	Antifreeze option	OFF	59
	CFR	x*	Antifreeze temperature	4.0 °C [40.0 °F]	59
	PRIO	x	Priority	2	59
	tLB	x	Loading break (store sequence control)	2 min	60
	tRUN	x	Circulation time (store sequence control)	15 min	60
Operation and function	OTC	x	Tube collector option	OFF	60
	TCST	x*	OTC starting time	07:00	60
	TCEN	x*	OTC ending time	19:00	61
	TCRU	x*	OTC runtime	30 s	61
	TCIN	x*	OTC standstill interval	30 min	61
	GFD	x	Grundfos Direct Sensor™	OFF	61
	OHQM	x	Heat quantity measurement option	OFF	61
	SEN	x*	VFD allocation	2	62
	FMAX	x*	Maximum flow rate	6.0 l/min	62
	MEDT	x*	Antifreeze type	1	63
Commissioning	MED%	x*	Antifreeze concentration (only if MEDT = propylene or ethylene glycol)	45 %	63
	MAN1	x	Manual mode R1	Auto	64
	MAN2	x	Manual mode R2	Auto	64
	LANG	x	Language	dE	65
	UNIT	x	Temperature unit	°C	65
	RESE	x	Reset - back to factory settings		65
	#####		Version number		
Indications, functions and options					
Messages					

Legend:

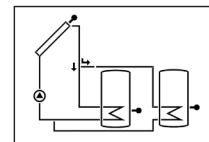
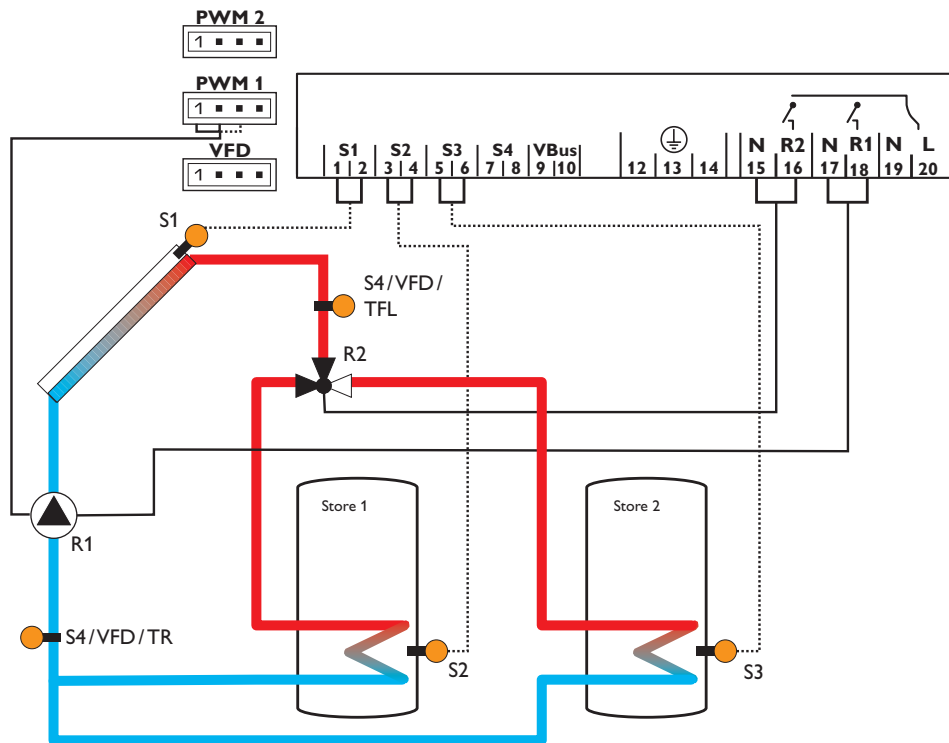
Symbol	Description
x	Channel is available
x*	Channel is available, if the corresponding option is activated.

Arrangement 5: Solar system with 2 stores and valve logic

The controller calculates the temperature difference between collector sensor S1 and store sensors S2 and S3. If the difference is larger than or identical to the corresponding adjusted switch-on temperature differences (DT1O/DT2O), the solar pump will be activated by relay 1, and the corresponding store will be loaded until the switch-off temperature difference (DT1F/DT2F) or the maximum store

temperature (S1MX/S2MX) is reached. The priority logic causes priority loading of store 1. If store 2 is being loaded, relay 2 switches the 3-port valve.

If the heat quantity measurement option (OHQM) is activated, S1, S4 or VFD can be used for measuring the temperature (see table on p. 63).



Display channels

Channel		Description	Connection terminal	Page
COL	x	Temperature collector	S1	51
TST1	x	Temperature store 1 base	S2	51
TST2	x	Temperature store 2 base	S3	51
S4	x	Temperature sensor 4	S4	51
TFL	x*	Temperature flow sensor	S1/S4/VFD	51
TR	x*	Temperature return sensor	S4/VFD	51
VFD	x*	Temperature Grundfos Direct Sensor™	VFD	51
L/h	x*	Flow rate Grundfos Direct Sensor™ / PWM feedback signal	VFD/PWM1	52
n%	x	Speed relay R1	R1	52
hP1	x	Operating hours R1	R1	53
hP2	x	Operating hours R2	R2	53
kWh	x*	Heat quantity in kWh	-	52
MWh	x*	Heat quantity in MWh	-	52
TIME	x	Time	-	53

Adjustment channels

Channel		Description	Factory setting	Page
Arr	x	System	5	54
PUM1	x	Pump control type R1	PSOL	55
nMN	x	Minimum speed R1	30%	55
nMX	x	Maximum speed R1	100%	55
PFB1	x*	PWM feedback signal input 1	OFF	56
DT1O	x	Switch-on temperature difference R1	6.0 K [12.0 °Ra]	54
DT1F	x	Switch-off temperature difference R1	4.0 K [8.0 °Ra]	54
DT1S	x	Set temperature difference R1	10.0 K [20.0 °Ra]	54
RI1	x	Rise R1	2 K [4 °Ra]	55
S1 MX	x	Maximum store temperature 1	60 °C [140 °F]	54
DT2O	x	Switch-on temperature difference R2	6.0 K [12.0 °Ra]	54
DT2F	x	Switch-off temperature difference R2	4.0 K [8.0 °Ra]	54
DT2S	x	Set temperature difference R2	10.0 K [20.0 °Ra]	54
RI2	x	Rise R2	2 K [4 °Ra]	55
S2MX	x	Maximum store temperature 2	60 °C [140 °F]	54
EM	x	Collector emergency temperature	130 °C [270 °F]	55
OCC	x	Collector cooling option	OFF	57
CMX	x*	Maximum collector temperature	110 °C [230 °F]	57
OSYC	x	System cooling option	OFF	58
DTCO	x*	Switch-on temperature difference cooling	20.0 K [40.0 °Ra]	58
DTCF	x*	Switch-off temperature difference cooling	15.0 K [30.0 °Ra]	58

Adjustment channels				
Channel		Description	Factory setting	Page
OSTC	x	Store cooling option	OFF	58
OHOL	x*	Holiday cooling option	OFF	58
THOL	x*	Holiday cooling temperature	40 °C [110 °F]	58
OCN	x	Collector minimum limitation option	OFF	59
CMN	x*	Collector minimum temperature	10 °C [50 °F]	59
OCF	x	Antifreeze option	OFF	59
CFR	x*	Antifreeze temperature	4.0 °C [40.0 °F]	59
PRIO	x	Priority	1	59
tLB	x	Loading break (store sequence control)	2 min	60
tRUN	x	Circulation time (store sequence control)	15 min	60
OTC	x	Tube collector option	OFF	60
TCST	x*	OTC starting time	07:00	60
TCEN	x*	OTC ending time	19:00	61
TCRU	x*	OTC runtime	30 s	61
TCIN	x*	OTC standstill interval	30 min	61
GFD	x	Grundfos Direct Sensor™	OFF	61
OHQM	x	Heat quantity measurement option	OFF	61
SEN	x*	VFD allocation	2	62
FMAX	x*	Maximum flow rate	6.0 l/min	62
MEDT	x*	Antifreeze type	1	63
MED%	x*	Antifreeze concentration (only if MEDT = propylene or ethylene glycol)	45 %	63
MAN1	x	Manual mode R1	Auto	64
MAN2	x	Manual mode R2	Auto	64
LANG	x	Language	dE	65
UNIT	x	Temperature unit	°C	65
RESE	x	Reset - back to factory settings		65
#####		Version number		

Legend:

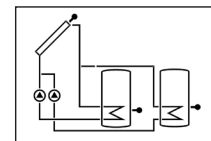
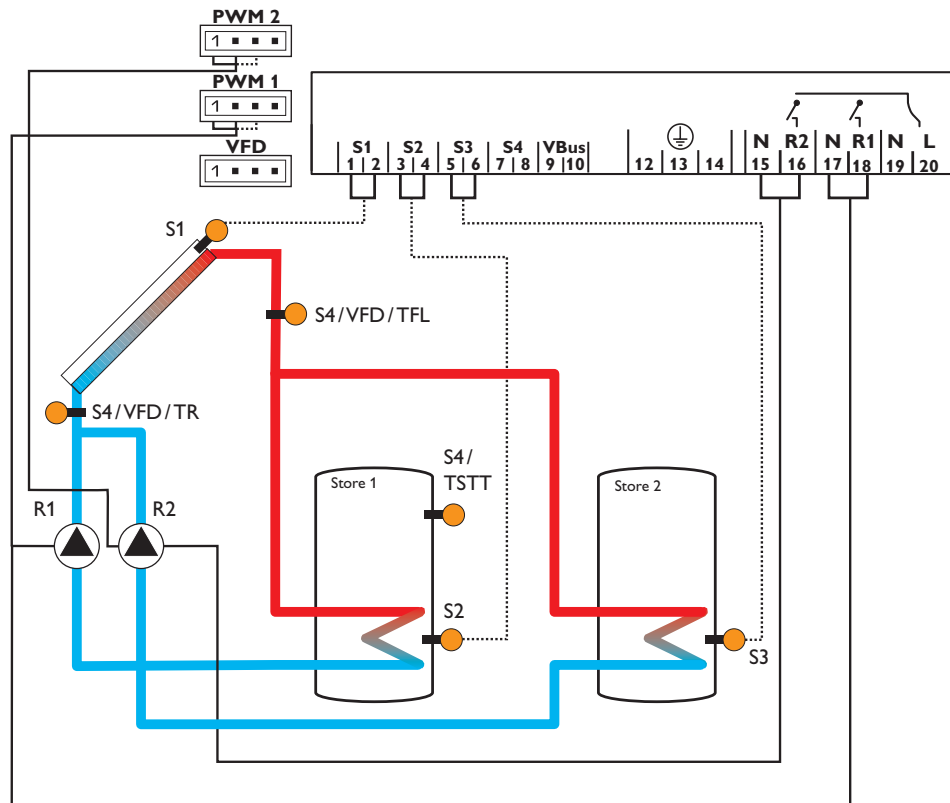
Symbol	Description
x	Channel is available
x*	Channel is available, if the corresponding option is activated.

Arrangement 6: Solar system with 2 stores and pump logic

The controller calculates the temperature difference between collector sensor S1 and store sensors S2 and S3. If the difference is larger than or identical to the corresponding adjusted switch-on temperature differences (DT1O/DT2O), one or both solar pumps will be activated by relay 1 and/or relay 2, and the corresponding store will be loaded until the switch-off temperature difference (DT1F/DT2F) or the maximum store temperature (S1MX/S2MX) is reached. The priority logic causes

priority loading of the store selected in the PRIO channel, if possible. If PRIO = 0, both stores will be loaded simultaneously.

Sensor S4 can optionally be used as the reference sensor for the store emergency shutdown option (OSEM). If the heat quantity measurement option (OHQM) is activated, S4 or VFD can be used for measuring the temperature (see table on p. 63).



Display channels				
Channel		Description	Connection terminal	Page
COL	x	Temperature collector	S1	51
TST1	x	Temperature store 1 base	S2	51
TST2	x	Temperature store 2 base	S3	51
S4	x	Temperature sensor 4	S4	51
TSTT	x*	Temperature store top	S4	51
TFL	x*	Temperature flow sensor	S4/VFD	51
TR	x*	Temperature return sensor	S4/VFD	51
VFD	x*	Temperature Grundfos Direct Sensor™	VFD	51
L/h	x*	Flow rate Grundfos Direct Sensor™ /PWM feedback signal	VFD /PWM1	52
L/h2	x*	PWM feedback signal	PWM2	52
n1 %	x	Speed R1	R1	52
n2 %	x	Speed R2	R2	52
h P1	x	Operating hours R1	R1	53
h P2	x	Operating hours R2	R2	53
kWh	x*	Heat quantity in kWh	-	52
MWh	x*	Heat quantity in MWh	-	52
TIME	x	Time	-	53

Adjustment channels				
Channel		Description	Factory setting	Page
Arr	x	System	6	54
DT1O	x	Switch-on temperature difference R1	6.0 K [12.0 °Ra]	54
DT1F	x	Switch-off temperature difference R1	4.0 K [8.0 °Ra]	54
DT1S	x	Set temperature difference R1	10.0 K [20.0 °Ra]	54
RIS1	x	Rise R1	2 K [4 °Ra]	55
PUM1	x	Pump control type R1	PSOL	55
n1MN	x	Minimum speed R1	30 %	55
n1MX	x	Maximum speed R1	100 %	55
PFB1	x*	PWM feedback signal input 1	OFF	56
S1 MX	x	Maximum store temperature 1	60 °C [140 °F]	54
OSEM	x	Store emergency shutdown option	OFF	54
DT2O	x	Switch-on temperature difference R2	6.0 K [12.0 °Ra]	54
DT2F	x	Switch-off temperature difference R2	4.0 K [8.0 °Ra]	54
DT2S	x	Set temperature difference R2	10.0 K [20.0 °Ra]	54
RIS2	x	Rise R2	2 K [4 °Ra]	55
PUM2	x	Pump control type R2	PSOL	55
n2MN	x	Minimum speed R2	30 %	55
n2MX	x	Maximum speed R2	100 %	55
PFB2	x*	PWM feedback signal input 2	OFF	56

Adjustment channels

Channel		Description	Factory setting	Page
S2MX	x	Maximum store temperature 2	60 °C [140 °F]	54
EM	x	Collector emergency temperature	130 °C [270 °F]	55
OCC	x	Collector cooling option	OFF	57
CMX	x*	Maximum collector temperature	110 °C [230 °F]	57
OSYC	x	System cooling option	OFF	58
DTCO	x*	Switch-on temperature difference cooling	20.0 K [40.0 °Ra]	58
DTCF	x*	Switch-off temperature difference cooling	15.0 K [30.0 °Ra]	58
OSTC	x	Store cooling option	OFF	58
OHOL	x*	Holiday cooling option	OFF	58
THOL	x*	Holiday cooling temperature	40 °C [110 °F]	58
OCN	x	Collector minimum limitation option	OFF	59
CMN	x*	Collector minimum temperature	10 °C [50 °F]	59
OCF	x	Antifreeze option	OFF	59
CFR	x*	Antifreeze temperature	4.0 °C [40.0 °F]	59
PRIO	x	Priority	1	59
tLB	x	Loading break (store sequence control)	2 min	60
tRUN	x	Circulation time (store sequence control)	15 min	60
DTSE	x*	Spread temperature difference	40 K [70 °Ra]	60
OTC	x	Tube collector option	OFF	60
TCST	x*	OTC starting time	07:00	60
TCEN	x*	OTC ending time	19:00	61
TCRU	x*	OTC runtime	30 s	61
TCIN	x*	OTC standstill interval	30 min	61
GFD	x	Grundfos Direct Sensor™	OFF	61
OHQM	x	Heat quantity measurement option	OFF	61
SEN	x*	VFD allocation	2	62
MEDT	x*	Antifreeze type	1	63
MED%	x*	Antifreeze concentration (only if MEDT = propylene or ethylene glycol)	45 %	63
MAN1	x	Manual mode R1	Auto	64
MAN2	x	Manual mode R2	Auto	64
LANG	x	Language	dE	65
UNIT	x	Temperature unit	°C	65
RESE	x	Reset - back to factory settings		65
#####		Version number		

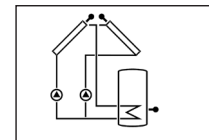
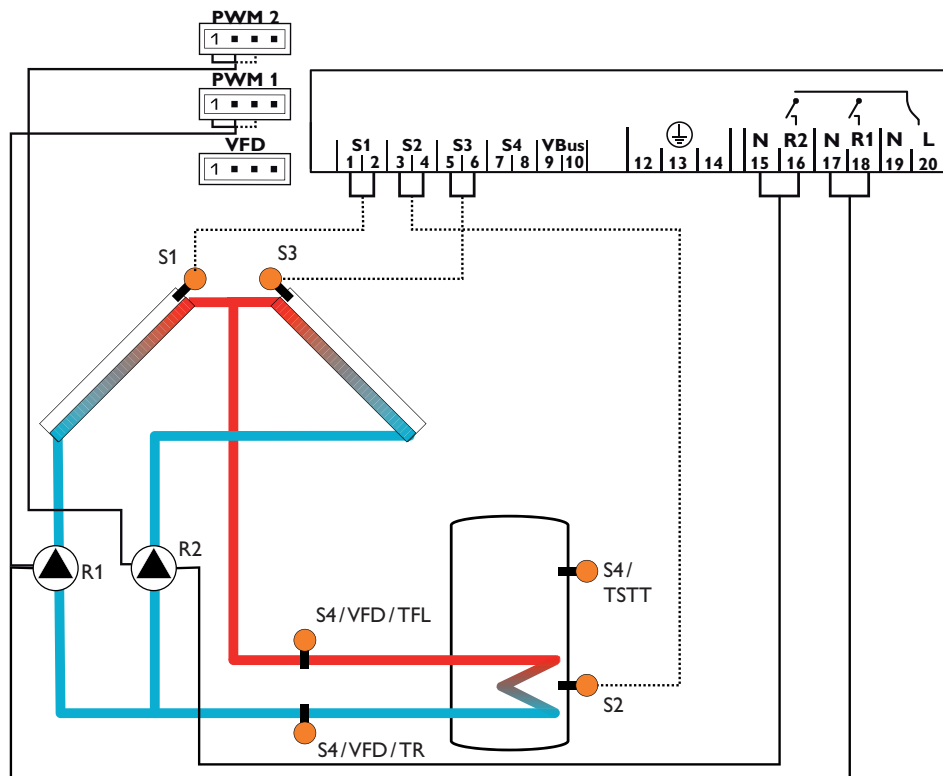
Legend:

Symbol	Description
x	Channel is available
x*	Channel is available, if the corresponding option is activated.

Arrangement 7: Solar system with east-/west collectors and 1 store

The controller calculates the temperature difference between collector sensors S1 and S3 and store sensor S2. If the differences are larger than or identical to the adjusted switch-on temperature difference (DT O), one or both pumps will be activated by relay 1 and /or relay 2, and the store will be loaded until the switch-off temperature difference (DT F) or the maximum store temperature (S MX) is reached.

Sensor S4 can optionally be used as the reference sensor for the store emergency shutdown option (OSEM). If the heat quantity measurement option (OHQM) is activated, S4 or VFD can be used for measuring the temperature (see table on p. 63).



Display channels

Channel		Description	Connection terminal	Page
COL1	x	Temperature collector 1	S1	51
TST	x	Temperature store	S2	51
COL2	x	Temperature collector 2	S3	51
S4	x	Temperature sensor 4	S4	51
TSTT	x*	Temperature store top	S4	51
TFL	x*	Temperature flow sensor	S4/VFD	51
TR	x*	Temperature return sensor	S4/VFD	51
VFD	x*	Temperature Grundfos Direct Sensor™	VFD	51
L/h	x*	Flow rate Grundfos Direct Sensor™ / PWM feedback signal	VFD/PWM1	52
L/h2	x*	PWM feedback signal	PWM2	<?>
n1%	x	Speed R1	R1	52
n2%	x	Speed R2	R2	52
h P1	x	Operating hours R1	R1	53
h P2	x	Operating hours R2	R2	53
kWh	x*	Heat quantity in kWh	-	52
MWh	x*	Heat quantity in MWh	-	52
TIME	x	Time	-	53

Adjustment channels

Channel		Description	Factory setting	Page
Arr	x	System	7	54
DT O	x	Switch-on temperature difference R1/R2	6.0 K [12.0 °Ra]	54
DT F	x	Switch-off temperature difference R1/R2	4.0 K [8.0 °Ra]	54
DT S	x	Set temperature difference R1/R2	10.0 K [20.0 °Ra]	54
RIS	x	Rise R1/R2	2 K [4 °Ra]	55
PUM1	x	Pump control type R1	PSOL	55
n1MN	x	Minimum speed R1	30%	55
n1MX	x	Maximum speed R1	100%	55
PFB1	x*	PWM feedback signal input 1	OFF	56
S MX	x	Maximum store temperature	60 °C [140 °F]	54
OSEM	x	Store emergency shutdown option	OFF	54
PUM2	x	Pump control type R2	PSOL	55
n2MN	x	Minimum speed R2	30%	55
n2MX	x	Maximum speed R2	100%	55
PFB2	x*	PWM feedback signal input 2	OFF	56
EM1	x	Collector emergency temperature 1	130 °C [270 °F]	54
EM2	x	Collector emergency temperature 2	130 °C [270 °F]	55
OCC1	x	Collector cooling option collector 1	OFF	57
CMX1	x*	Maximum collector temperature 1	110 °C [230 °F]	57

Adjustment channels				
Channel		Description	Factory setting	Page
OCC2	x	Collector cooling option collector 2	OFF	57
CMX2	x*	Maximum collector temperature 2	110 °C [230 °F]	57
OSYC	x	System cooling option	OFF	58
DTCO	x*	Switch-on temperature difference cooling	20.0 K [40.0 °Ra]	58
DTCF	x*	Switch-off temperature difference cooling	15.0 K [30.0 °Ra]	58
OSTC	x	Store cooling option	OFF	58
OHOL	x*	Holiday cooling option	OFF	58
THOL	x*	Holiday cooling temperature	40 °C [110 °F]	58
OCN1	x	Collector minimum limitation collector 1	OFF	59
CMN1	x*	Minimum collector temperature 1	10 °C [50 °F]	59
OCN2	x	Collector minimum limitation collector 2	OFF	59
CMN2	x*	Minimum collector temperature 2	10 °C [50 °F]	59
OCF1	x	Antifreeze option collector 1	OFF	59
CFR1	x*	Antifreeze temperature collector 1	4.0 °C [40.0 °F]	59
OCF2	x	Antifreeze option collector 2	OFF	59
CFR2	x*	Antifreeze temperature collector 2	4.0 °C [40.0 °F]	59
OTC	x	Tube collector option	OFF	60
TCST	x*	OTC starting time	07:00	60
TCEN	x*	OTC ending time	19:00	61
TCRU	x*	OTC runtime	30 s	61
TCIN	x*	OTC standstill interval	30 min	61
GFD	x	Grundfos Direct Sensor™	OFF	61
OHQM	x	Heat quantity measurement option	OFF	61
SEN	x*	VFD allocation	2	62
MEDT	x*	Antifreeze type	1	63
MED%	x*	Antifreeze concentration (only if MEDT = propylene or ethylene glycol)	45 %	63
MAN1	x	Manual mode R1	Auto	64
MAN2	x	Manual mode R2	Auto	64
LANG	x	Language	dE	65
UNIT	x	Temperature unit	°C	65
RESE	x	Reset - back to factory settings		65
#####		Version number		

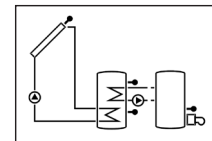
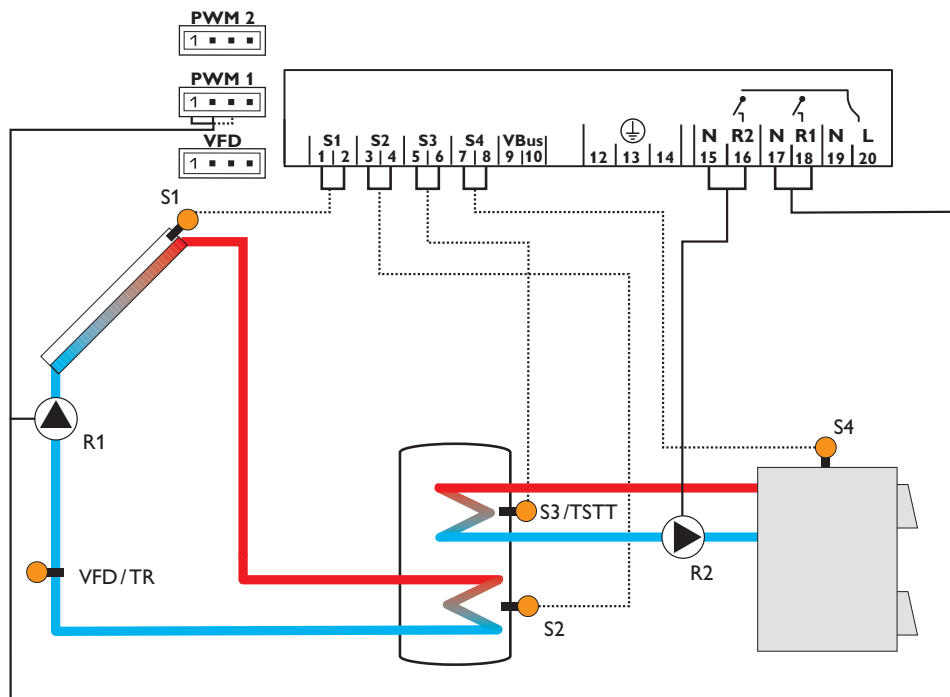
Legend:

Symbol	Description
x	Channel is available
x*	Channel is available, if the corresponding option is activated.

Arrangement 8: Solar system with backup heating by solid fuel boiler

The controller calculates the temperature difference between collector sensor S1 and store sensor S2. If the difference is larger than or identical to the adjusted switch-on temperature difference (DT O), the solar pump will be activated by relay 1, and the store will be loaded until the switch-off temperature difference (DT F) or the maximum store temperature (S MX) is reached.

A solid fuel boiler will be controlled by relay 2, if the temperature difference between sensors S4 and S3 is larger than or identical to the adjusted switch-on temperature difference (DT3O), until the adjusted minimum (MN3O) and maximum (MX3O) temperature thresholds of the solid fuel boiler and the store are reached. S3 can optionally be used as the reference sensor for the store emergency shut-down option (OSEM). If the heat quantity measurement option (OHQM) is activated, S1 or VFD can be used for measuring the temperature (see table on p.63).



Display channels				
Channel		Description	Connection terminal	Page
INIT	x*	ODB initialisation active	-	50
FLL	x*	ODB filling time active	-	50
STAB	x*	ODB stabilisation in progress	-	50
COL	x	Temperature collector	S1	51
TSTB	x	Temperature store 1 base	S2	51
TSTT	x	Temperature store 1 top	S3	51
TFSB	x	Temperature solid fuel boiler	S4	51
TFL	x*	Temperature flow sensor	S1	51
TR	x*	Temperature return sensor	VFD	51
VFD	x*	Temperature Grundfos Direct Sensor™	VFD	51
L/h	x*	Flow rate Grundfos Direct Sensor™ / PWM feedback signal	VFD / PWM1	52
n1 %	x	Speed R1	R1	52
n2 %	x	Speed R2	R2	52
h P1	x	Operating hours R1	R1	53
h P2	x	Operating hours R2	R2	53
kWh	x*	Heat quantity in kWh	-	52
MWh	x*	Heat quantity in MWh	-	52
TIME	x	Time	-	53

Adjustment channels				
Channel		Description	Factory setting	Page
Arr	x	System	8	54
DT O	x	Switch-on temperature difference R1	6.0 K [12.0 °Ra]	54
DT F	x	Switch-off temperature difference R1	4.0 K [8.0 °Ra]	54
DT S	x	Set temperature difference R1	10.0 K [20.0 °Ra]	54
RIS	x	Rise R1	2 K [4 °Ra]	55
PUM1	x	Pump control type R1	PSOL	55
n1MN	x	Minimum speed R1	30 %	55
n1MX	x	Maximum speed R1	100 %	55
PFB1	x*	PWM feedback signal input 1	OFF	56
S MX	x	Maximum store temperature	60 °C [140 °F]	54
OSEM	x	Store emergency shutdown option	OFF	54
PUM2	x	Pump control type R2	OnOF	55
n2MN	x*	Minimum speed R2	30 %	55
n2MX	x*	Maximum speed R2	100 %	55
EM	x	Collector emergency temperature	130 °C [270 °F]	54
		Collector emergency temperature if ODB is activated:	95 °C [200 °F]	55
OCC	x	Collector cooling option	OFF	57
CMX	x*	Maximum collector temperature	110 °C [230 °F]	57
OSYC	x	System cooling option	OFF	58
DTCO	x*	Switch-on temperature difference cooling	20.0 K [40.0 °Ra]	58
DTCF	x*	Switch-off temperature difference cooling	15.0 K [30.0 °Ra]	58

Adjustment channels

Channel		Description	Factory setting	Page
OSTC	x	Store cooling option	OFF	58
OHOL	x*	Holiday cooling option	OFF	58
THOL	x*	Holiday cooling temperature	40 °C [110 °F]	58
OCN	x	Collector minimum limitation option	OFF	59
CMN	x*	Collector minimum temperature	10 °C [50 °F]	59
OCF	x	Antifreeze option	OFF	59
CFR	x*	Antifreeze temperature	4.0 °C [40.0 °F]	59
OTC	x	Tube collector option	OFF	60
TCST	x*	OTC starting time	07:00	60
TCEN	x*	OTC ending time	19:00	61
TCRU	x*	OTC runtime	30 s	61
TCIN	x*	OTC standstill interval	30 min	61
GFD	x	Grundfos Direct Sensor™	OFF	61
OHQM	x	Heat quantity measurement option	OFF	61
SEN	x*	VFD allocation	2	62
MEDT	x*	Antifreeze type	1	63
MED%	x*	Antifreeze concentration (only if MEDT = propylene or ethylene glycol)	45 %	63
DT3O	s	Switch-on temperature difference R2	6.0 K [12.0 °Ra]	54
DT3F	s	Switch-off temperature difference R2	4.0 K [8.0 °Ra]	54
DT3S	s	Set temperature difference R2	10.0 K [20.0 °Ra]	54
RIS3	s	Rise R2	2 K [4 °Ra]	55
MX3O	s	Switch-on threshold for maximum temperature	60.0 °C [140.0 °F]	39
MX3F	s	Switch-off threshold for maximum temperature	58.0 °C [136.0 °F]	39
MN3O	s	Switch-on threshold for minimum temperature	60.0 °C [140.0 °F]	39
MN3F	s	Switch-off threshold for minimum temperature	65.0 °C [150.0 °F]	39
ODB	x	Drainback option	OFF	63
tDTO	x*	ODB switch-on condition - time period	60 s	64
tFLL	x*	ODB filling time	5.0 min	64
tSTB	x*	ODB stabilisation time	2.0 min	64
MAN1	x	Manual mode R1	Auto	64
MAN2	x	Manual mode R2	Auto	64
LANG	x	Language	dE	65
UNIT	x	Temperature unit	°C	65
RESE	x	Reset - back to factory settings		65
#####		Version number		

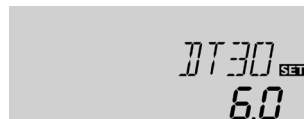
Legend:

Symbol	Description
x	Channel is available
x*	Channel is available, if the corresponding option is activated.
s	System-specific channel
s*	System-specific channel, only available if the corresponding option is activated

System-specific functions

The following adjustments are used for the specific functions in system 8.

ΔT control for the backup heating by a solid fuel boiler



DT30

Switch-on temperature difference

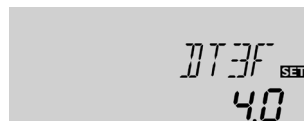
Adjustment range: 1.0 ... 20.0 K [2.0 ... 40.0 °Ra]

Factory setting: 6.0 K [12.0 °Ra]

S4 and S3 are used as the reference sensors for this function.

In system 8 the controller is equipped with an additional differential control for heat exchange from a solid fuel boiler (e. g. pellet stove). The basic differential function is adjusted using the switch-on (**DT30**) and switch-off (**DT3F**) temperature differences.

When the temperature difference exceeds the adjusted switch-on temperature difference, relay 2 switches on. When the temperature difference falls below the adjusted switch-off temperature difference, relay 2 switches off.



DT3F

Switch-off temperature difference

Adjustment range: 0.5 ... 19.5 K [1.0 ... 39.0 °Ra]

Factory setting: 4.0 K [8.0 °Ra]



Note

The switch-on temperature difference must be at least 0.5 K [1 °Ra] higher than the switch-off temperature difference.

Speed control



DT3S

Set temperature difference

Adjustment range: 1.5 ... 30.0 K [3.0 ... 60.0 °Ra]

Factory setting: 10.0 K [20.0 °Ra]



Note

For pump speed control of the heat exchange pump, the operating mode of relay 2 must be set to **Auto** in the adjustment channel **MAN2**.



RIS3

Rise

Adjustment range: 1 ... 20 K [2 ... 40 °Ra]

Factory setting: 2 K [4 °Ra]



Note

The set temperature difference must be at least 0.5 K [1 °Ra] higher than the switch-on temperature difference.

If the switch-on difference is reached, the pump switches on at full speed for 10 s. Then, the speed is reduced to the minimum pump speed value (n2MN).

If the temperature difference reaches the adjusted set value (**DT3S**), the pump speed increases by one step (10 %). Each time the difference increases by the adjustable rise value RIS3, the pump speed increases by 10 % until the maximum pump speed of 100 % is reached.

PUM2 SET
OnOF

PUM2

Pump control type R2

Selection: OnOF, PULS, PSOL, PHEA

Factory setting: OnOF

With this parameter, the pump control type can be adjusted. The following types can be selected:

Adjustment for standard pump without speed control

- OnOF (pump on/ pump off)

Adjustment for standard pump with speed control

- PULS (burst control via semiconductor relay)

Adjustment for high-efficiency pump (HE pump)

- PSOL (PWM profile for a HE solar pump)
- PHEA (PWM profile for a HE heating pump)

Minimum speed

n2MN SET
30

n2MN

Minimum speed R2

Adjustment range: (10) 30 ... 100

Factory setting: 30

In the adjustment channel **n2MN** a relative minimum speed for a pump connected can be allocated to the output R2.



Note

The pump speed must be set to 100% when auxiliary relays or valves are connected.

Maximum speed

n2MX SET
100

n2MX

Maximum speed R2

Adjustment range: (10) 30 ... 100 %

Factory setting: 100 %

In the adjustment channel **n2MX** a relative maximum speed for a pump connected can be allocated to the output R2.



Note

The pump speed must be set to 100% when auxiliary relays or valves are connected.

Maximum temperature limitation solid fuel boiler



MX30/MX3F

Maximum temperature limitation

Adjustment range: 0.0 ... 95.0 °C [30.0 ... 200.0 °F]

Factory setting:

MX30: 60.0 °C [140.0 °F]

MX3F: 58.0 °C [136.0 °F]

S3 is used as the reference sensor for the maximum temperature limitation.

The maximum temperature limitation function provides a maximum temperature setting, usually to reduce scald risk in a store. If **MX30** is exceeded, relay 2 is switched off until the temperature at sensor 3 falls below **MX3F**.

Minimum temperature limitation solid fuel boiler



MN30/MN3F

Minimum temperature limitation

Adjustment range: 0.0 ... 90.0 °C [30.0 ... 190.0 °F]

Factory setting (only if Arr = 8):

MN30: 60.0 °C [140.0 °F]

MN3F: 65.0 °C [150.0 °F]

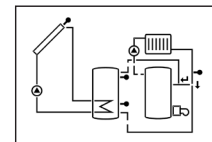
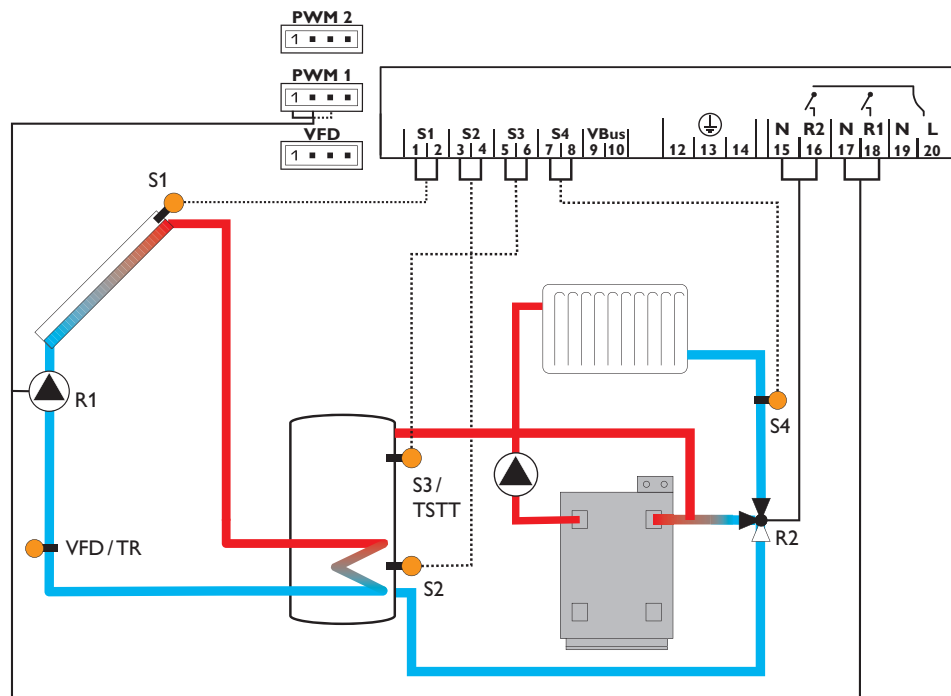
S4 is used as the reference sensor for the minimum temperature limitation.

The minimum temperature limitation function provides a minimum temperature setting for the solid fuel boiler in system 8. If the temperature at sensor 4 falls below **MN30**, relay 2 is switched off until the temperature at sensor 4 exceeds **MN3F**. Both switch-on and switch-off temperature differences **DT30** and **DT3F** are valid for the maximum and minimum temperature limitation.

Arrangement 9: Solar system with heating-circuit return preheating

The controller calculates the temperature difference between collector sensor S1 and store sensor S2. If the difference is larger than or identical to the adjusted switch-on temperature difference (DT O), the solar pump will be activated by relay 1, and the store will be loaded until the switch-off temperature difference (DT F) or the maximum store temperature (S MX) is reached.

Heating-circuit return preheating will be activated by relay 2, if the temperature difference between sensors S3 and S4 is larger or identical to the adjusted switch-on temperature difference (DT3O). For this purpose, relay 2 controls the 3-port valve. S3 can optionally be used as the reference sensor for the store emergency shut-down option (OSEM). If the heat quantity measurement option (OHQM) is activated, S1 or VFD can be used for measuring the temperature (see table on p. 63).



Display channels				
Channel		Description	Connection terminal	Page
INIT	x*	ODB initialisation active	-	50
FLL	x*	ODB filling time active	-	50
STAB	x*	ODB stabilisation in progress	-	50
COL	x	Temperature collector	S1	51
TSTB	x	Temperature store 1 base	S2	51
TSTT	x	Temperature store 1 top	S3	51
TRET	x	Heating circuit temperature	S4	51
TFL	x*	Temperature flow sensor	S1	51
TR	x*	Temperature return sensor	VFD	51
VFD	x*	Temperature Grundfos Direct Sensor™	VFD	51
L/h	x*	Flow rate Grundfos Direct Sensor™ / PWM feedback signal	VFD / PWM1	52
n%	x	Speed relay R1	R1	52
hP1	x	Operating hours R1	R1	53
hP2	x	Operating hours R2	R2	53
kWh	x*	Heat quantity in kWh	-	52
MWh	x*	Heat quantity in MWh	-	52
TIME	x	Time	-	53

Adjustment channels				
Channel		Description	Factory setting	Page
Arr	x	System	9	54
DT O	x	Switch-on temperature difference R1	6.0 K [12.0 °Ra]	54
DT F	x	Switch-off temperature difference R1	4.0 K [8.0 °Ra]	54
DT S	x	Set temperature difference R1	10.0 K [20.0 °Ra]	54
RIS	x	Rise R1	2 K [4 °Ra]	55
PUM1	x	Pump control type R1	PSOL	55
nMN	x	Minimum speed R1	30%	55
nMX	x	Maximum speed R1	100%	55
PFB1	x*	PWM feedback signal input 1	OFF	56
S MX	x	Maximum store temperature	60 °C [140 °F]	54
OSEM	x	Store emergency shutdown option	OFF	54
EM	x	Collector emergency temperature	130 °C [270 °F]	54
		Collector emergency temperature if ODB is activated:	95 °C [200 °F]	55
OCC	x	Collector cooling option	OFF	57
CMX	x*	Maximum collector temperature	110 °C [230 °F]	57
OSYC	x	System cooling option	OFF	58
DTCO	x*	Switch-on temperature difference cooling	20.0 K [40.0 °Ra]	58

Adjustment channels				
Channel		Description	Factory setting	Page
DTCF	x*	Switch-off temperature difference cooling	15.0 K [30.0 °Ra]	58
OSTC	x	Store cooling option	OFF	58
OHOL	x*	Holiday cooling option	OFF	58
THOL	x*	Holiday cooling temperature	40 °C [110 °F]	58
OCN	x	Collector minimum limitation option	OFF	59
CMN	x*	Collector minimum temperature	10 °C [50 °F]	59
OCF	x	Antifreeze option	OFF	59
CFR	x*	Antifreeze temperature	4.0 °C [40.0 °F]	59
OTC	x	Tube collector option	OFF	60
TCST	x*	OTC starting time	07:00	60
TCEN	x*	OTC ending time	19:00	61
TCRU	x*	OTC runtime	30 s	61
TCIN	x*	OTC standstill interval	30 min	61
GFD	x	Grundfos Direct Sensor™	OFF	61
OHQM	x	Heat quantity measurement option	OFF	61
SEN	x*	VFD allocation	2	62
MEDT	x*	Antifreeze type	1	63
MED%	x*	Antifreeze concentration (only if MEDT = propylene or ethylene glycol)	45 %	63
DT3O	s	Switch-on temperature difference R2	6.0 K [12.0 °Ra]	54
DT3F	s	Switch-off temperature difference R2	4.0 K [8.0 °Ra]	54
ODB	x	Drainback option	OFF	63
tDTO	x*	ODB switch-on condition - time period	60 s	64
tFLL	x*	ODB filling time	5.0 min	64
tSTB	x*	ODB stabilisation time	2.0 min	64
MAN1	x	Manual mode R1	Auto	64
MAN2	x	Manual mode R2	Auto	64
LANG	x	Language	dE	65
UNIT	x	Temperature unit	°C	65
RESE	x	Reset - back to factory settings		65
#####		Version number		

Legend:

Symbol	Description
x	Channel is available
x*	Channel is available, if the corresponding option is activated.
s	System-specific channel
s*	System-specific channel, only available if the corresponding option is activated

Arrangement 10: Standard solar system with heat dump

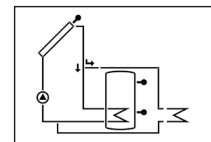
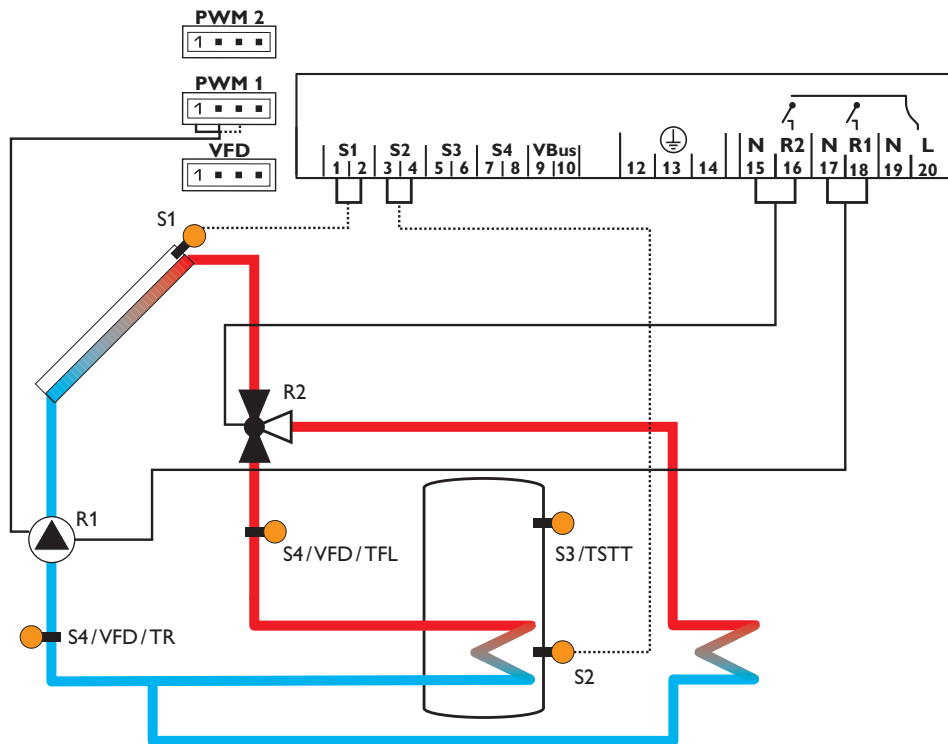
The controller calculates the temperature difference between collector sensor S1 and store sensor S2. If the difference is larger than or identical to the adjusted switch-on temperature difference (DT O), the solar pump will be activated by relay 1, and the store will be loaded until the switch-off temperature difference (DT F) or the maximum store temperature (S MX) is reached.

If the collector maximum temperature (CMX) is reached, the solar pump will be activated by R1 and the 3-port valve by R2 in order to divert excess heat to a heat

sink. For safety reasons, excess heat dump will only take place as long as the store temperature is below the non-adjustable shutdown temperature of 95 °C [200 °F].

Sensors S3 and S4 can optionally be connected. S3 can optionally be used as the reference sensor for the store emergency shutdown option (OSEM).

If the heat quantity measurement option (OHQM) is activated, S1, S4 or VFD can be used for measuring the temperature (see table on p. 63).



en	Display channels				
	Channel		Description	Connection terminal	Page
Installation	COL	x	Temperature collector	S1	51
	TST	x	Temperature store	S2	51
	S3	x	Temperature sensor 3	S3	51
	TSTT	x*	Temperature store top	S3	51
	S4	x	Temperature sensor 4	S4	51
	TFL	x*	Temperature flow sensor	S1/S4/VFD	51
	TR	x*	Temperature return sensor	S4/VFD	51
	VFD	x*	Temperature Grundfos Direct Sensor™	VFD	51
	L/h	x*	Flow rate Grundfos Direct Sensor™ /PWM feedback signal	VFD/PWM1	52
	n%	x	Speed relay R1	R1	52
Operation and function	h P1	x	Operating hours R1	R1	53
	h P2	x	Operating hours R2	R2	53
	kWh	x*	Heat quantity in kWh	-	52
	MWh	x*	Heat quantity in MWh	-	52
	TIME	x	Time	-	53
	Adjustment channels				
	Channel		Description	Factory setting	Page
Commissioning	Arr	x	System	10	54
	DT O	x	Switch-on temperature difference R1	6.0 K [12.0 °Ra]	54
	DT F	x	Switch-off temperature difference R1	4.0 K [8.0 °Ra]	54
	DT S	x	Set temperature difference R1	10.0 K [20.0 °Ra]	54
	RIS	x	Rise R1	2 K [4 °Ra]	55
	PUM1	x	Pump control type R1	PSOL	55
	nMN	x	Minimum speed R1	30%	55
	nMX	x	Maximum speed R1	100%	55
	PFB1	x*	PWM feedback signal input 1	OFF	56
	S MX	x	Maximum store temperature	60 °C [140 °F]	54
Indications, functions and options	OSEM	x	Store emergency shutdown option	OFF	54
	EM	x	Collector emergency temperature	130 °C [270 °F]	54
	CMX	s	Maximum collector temperature	110 °C [230 °F]	57
	OCN	x	Collector minimum limitation option	OFF	59
	CMN	x*	Collector minimum temperature	10 °C [50 °F]	59
	OCF	x	Antifreeze option	OFF	59
	CFR	x*	Antifreeze temperature	4.0 °C [40.0 °F]	59
	OTC	x	Tube collector option	OFF	60
	TCST	x*	OTC starting time	07:00	60
	TCEN	x*	OTC ending time	19:00	61

Adjustment channels				
Channel		Description	Factory setting	Page
TCRU	x*	OTC runtime	30 s	61
TCIN	x*	OTC standstill interval	30 min	61
GFD	x	Grundfos Direct Sensor™	OFF	61
OHQM	x	Heat quantity measurement option	OFF	61
SEN	x*	VFD allocation	2	62
FMAX	x*	Maximum flow rate	6.0 l/min	62
MEDT	x*	Antifreeze type	1	63
MED%	x*	Antifreeze concentration (only if MEDT = propylene or ethylene glycol)	45 %	63
MAN1	x	Manual mode R1	Auto	64
MAN2	x	Manual mode R2	Auto	64
LANG	x	Language	dE	65
UNIT	x	Temperature unit	°C	65
RESE	x	Reset - back to factory settings		65
#####		Version number		

Legend:

Symbol	Description
x	Channel is available
x*	Channel is available, if the corresponding option is activated.

3 Operation and function

3.1 Buttons



The controller is operated via the 3 push buttons below the display.

Button 1 (+) is used for scrolling forwards through the menu and increasing adjustment values. **Button 2 (-)** is used for scrolling backwards through the menu and reducing adjustment values. **Button 3 (OK)** is used for selecting channels and confirming adjustments.

During normal operation, display channels will be displayed.

→ In order to scroll between display channels, press buttons 1 and 2.

Access to adjustment channels:

→ Use button 1 in order to scroll to the last display channel, then press and hold down button 1 for approx. 2 s.

If an **adjustment channel** is shown on the screen, **SET** will be displayed on the right-hand side next to the channel name.

→ Press button 3 in order to select an adjustment channel.

SET starts flashing.

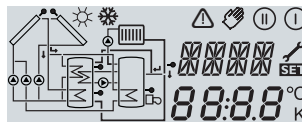
→ Adjust the desired value with buttons 1 and 2.

→ Briefly press button 3.

SET permanently appears, the adjusted value has been saved.

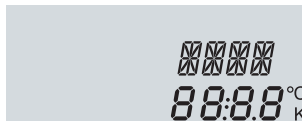
4 System-Monitoring-Display

System-Monitoring-Display



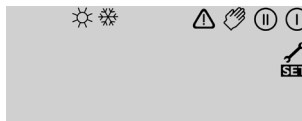
The System-Monitoring-Display consists of 3 blocks: channel display, tool bar and system screen.

Channel display



The channel display consists of 2 lines. The upper display line is an alphanumeric 16-segment display. In this line, mainly channel names and menu items are displayed. In the lower 16-segment display, values are displayed.

Tool bar



The additional symbols in the tool bar indicate the current system state.

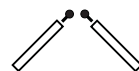
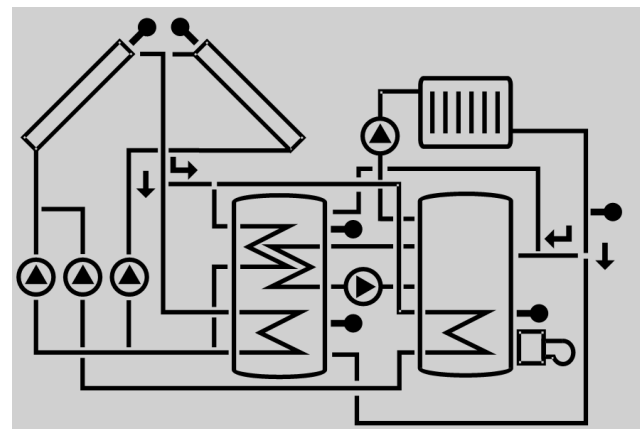
Permanently shown	Flashing	Status indications:
①		Relay 1 active
②		Relay 2 active
☀		Maximum store temperature exceeded
	⚠ + ☀	Store emergency shutdown active
	⚠	Collector emergency shutdown active
①	☀	Collector cooling active
①	☀	System cooling active
① + ☀		Store cooling active
☀	⚠	Holiday cooling option activated
① + ☀	⚠	Holiday cooling active
	❄	Collector minimum limitation active
❄		Antifreeze function activated
①/②	❄	Antifreeze function active
👤 + ①	⚠	Manual mode relay 1 ON
👤 + ②	⚠	Manual mode relay 2 ON
👤	⚠	Manual mode relay 1/2 OFF
🔧	⚠	Sensor fault
	🔧 + ⚠	PWM feedback error message

4.1 Flashing codes

- Pumps are flashing when the corresponding relay is switched on
- Sensor symbols are flashing, if the corresponding sensor display channel is selected
- Sensors are flashing quickly in the case of a sensor fault
- Burner symbol is flashing if the backup heating is active

System screen

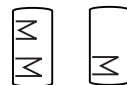
The system selected is indicated in the System-Monitoring-Display. It consists of several system component symbols which are – depending on the current status of the system – either flashing, permanently shown or not indicated.



Collectors
with collector sensor



Temperature sensor



Store
with heat exchanger



Heating circuit



Pump

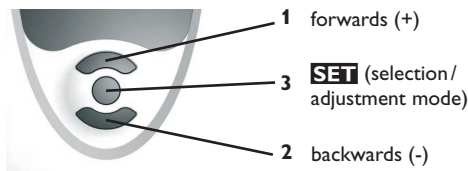


3-port valve
Only the flow direction or current switching position is indicated.



Backup heating
with burner symbol

5 Commissioning

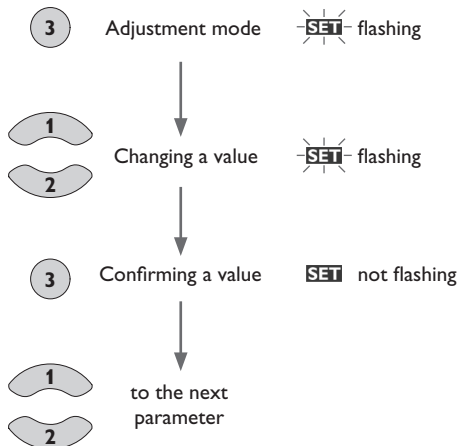


→ Connect the device to the mains.

The controller runs an initialisation phase.

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

Operation



Commissioning

1. Language

→ Adjust the desired menu language.

LANG

Language selection

Selection: dE, En, Fr, ES, It

Factory setting: dE



2. Temperature unit

→ Adjust the desired unit.

UNIT

Temperature unit

Selection: °F, °C

Factory setting: °C



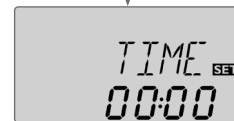
3. Time

→ Adjust the clock time.

First of all adjust the hours, then the minutes.

TIME

Real time clock



4. Arrangement

→ Adjust the desired system.

For a detailed description of the systems to choose from, see page 8.

Arr

System selection

Adjustment range: 1 ... 10

Factory setting: 1

If the system layout selection is changed later on, any previous adjustments which have been made in the other channels will be lost. Therefore, changing the system is always followed by a security enquiry.



Commissioning

Only confirm the security enquiry if you are sure that you wish to change the system selection.

Security enquiry:

→ In order to confirm the security enquiry, press button 3.

5. Maximum store temperature

→ Adjust the desired maximum store temperature.

SMX/S1MX/S2MX

Maximum store temperature

Adjustment range: 4...95 °C [40...200 °F]

Arr 10: 4...90 °C [40...190 °F]

Factory setting: 60 °C [140 °F]

i **Note**
The controller is also equipped with a non-adjustable emergency shutdown, deactivating the system if the store reaches 95 °C [200 °F].

6. Pump control type

→ Adjust the pump control type.

PUM1/PUM2

Pump control type

Selection: OnOF, PULS, PSOL, PHEA

Factory setting: PSOL

The following types can be selected:

Adjustment for standard pump without speed control

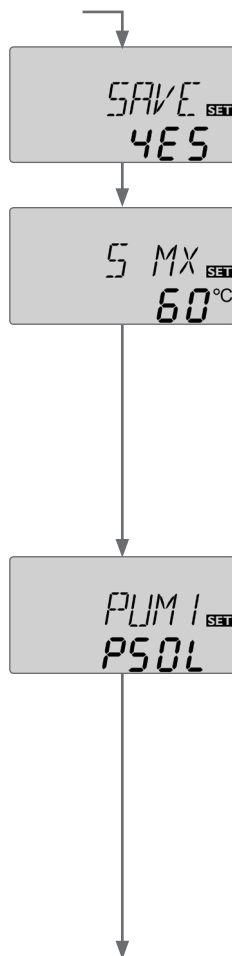
- OnOF (pump on/pump off)

Adjustment for standard pump with speed control

- PULS (burst control via semiconductor relay)

Adjustment for high-efficiency pump (HE pump)

- PSOL (PWM profile for a HE solar pump)
- PHEA (PWM profile for a HE heating pump)



Commissioning

7. Minimum speed

→ Adjust the minimum speed for the corresponding pump.

nMN, n1MN, n2MN

Minimum speed

Adjustment range: (10) 30...100%

Factory setting: 30%

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

8. Maximum speed

→ Adjust the maximum speed for the corresponding pump.

nMX, n1MX, n2MX

Maximum speed

Adjustment range: (10) 30...100%

Factory setting: 100%

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

9. PWM feedback signal

→ Adjust the PWM feedback signal type.

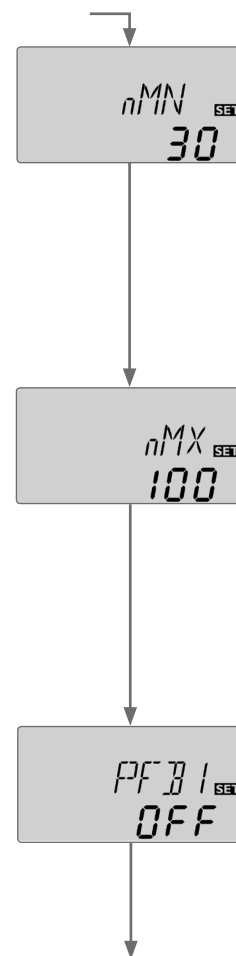
PFB1/PFB2

PWM feedback signal

Selection: OFF, A, b

Factory setting: OFF

(A = Wilo pump, b = Grundfos pump)



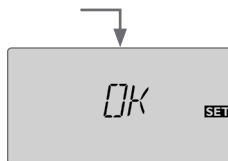
Confirmation

Completing the commissioning menu

After the last channel of the commissioning menu has been adjusted and confirmed, the controller asks for confirmation of the adjustments.

➔ In order to confirm the adjustments made in the commissioning menu, press button 3.

The controller is then ready for operation with the adjustments made for the selected system.



Note

The adjustments carried out during commissioning can be changed anytime in the corresponding adjustment channel. Additional functions and options can also be activated or deactivated (see page 46).

6 Channel overview

6.1 Display channels



Note

The display and adjustment channels as well as the adjustment ranges depend on the system selected, the functions and options as well as on the system components connected to the controller.

Display of drainback time periods

Initialisation

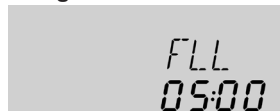


INIT

ODB initialisation active

Indicates the time adjusted in tD_{TO}, running backwards.

Filling time

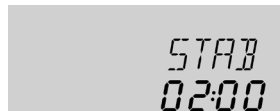


FLL

ODB filling time active

Indicates the time adjusted in tFLL, running backwards.

Stabilisation



STAB

ODB stabilisation in progress

Indicates the time adjusted in tSTB, running backwards.

Display of collector temperatures



COL, COL1, COL2

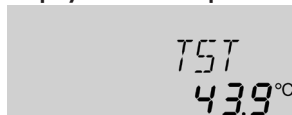
Collector temperature

Display range: -40 ... +260 °C [-40 ... +500 °F]

Indicates the collector temperatures.

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

Display of store temperatures



TST, TSTB, TSTT, TST1, TST2, TDIS

Store temperatures

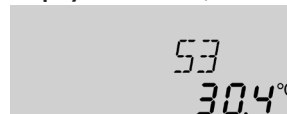
Display range: -40 ... +260 °C [-40 ... +500 °F]

Indicates the store temperatures.

- TST : Store temperature (1-store system)
- TSTB : Store temperature base
- TSTT : Store temperature top
- TST1 : Store temperature 1 (2-store system)
- TST2 : Store temperature 2 (2-store system)
- TDIS : Thermal disinfection temperature

(Arr = 3 only; replaces TSTT if, during thermal disinfection, the disinfection period DDIS is active)

Display of sensors 3, 4 and VFD



S3, S4, VFD

Sensor temperatures

Display range: -40 ... +260 °C [-40 ... +500 °F]

VFD: 0 ... 100 %

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

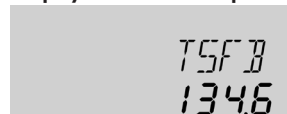
- S3 : Temperature at sensor 3
- S4 : Temperature at sensor 4
- VFD : Grundfos Direct Sensor™



Note

S3 and S4 will only be indicated if the temperature sensors are connected to the corresponding terminals. VFD will be indicated only if a Grundfos Direct Sensor™ has been connected and registered.

Display of further temperatures



TFSB, TRET, TFL, TR

Further measured temperatures

Display range: -40 ... +260 °C [-40 ... +500 °F]

Indicates the current temperature at the corresponding sensor. The display of these temperatures depends on the system selected.

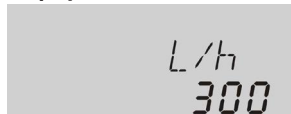
- TFSB : Temperature solid fuel boiler
- TRET : Temperature heating circuit return preheating
- TFL : Temperature flow
- TR : Temperature return



Note

TFL/TR will be indicated only if the heat quantity measurement option (OHQM) has been activated.

Display of flow rate/PWM feedback signal



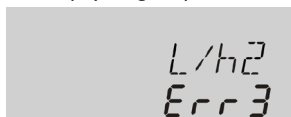
l/h

Flow rate/PWM feedback signal

Display range: depending on the sensor type used and the PWM feedback signal selected respectively

Indicates the current flow rate at the VFD flow rate sensor or of the bidirectional pump and its error messages respectively.

The display range depends on the sensor type selected.



l/h2

(Arr 6 and 7 only)

Flow rate/PWM feedback signal

Display range: depending on the PWM feedback signal selected

Indicates the current flow rate of the bidirectional pump and its error messages respectively.

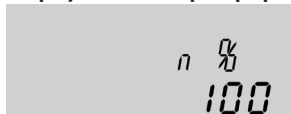
For information on error messages see page 56.



Note

If both the PWM feedback signal and the VFD Grundfos Direct Sensor™ are registered, the flow rate of the pump will be displayed.

Display of current pump speed



n %, n1 %, n2 %

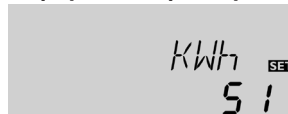
Current pump speed

Display range: 30 ... 100 %

Indicates the current pump speed of the corresponding pump.

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

Display of heat quantity



kWh/MWh

Heat quantity in kWh/MWh

Display channel

Indicates the energy gained in heat quantity – only available if heat quantity measurement (OHQM) is activated.

The heat quantity measurement can be carried out in 3 different ways (see page 62): with a fixed flow rate value, with a VFD Grundfos Direct Sensor™ or with a PWM feedback signal. 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 set back to zero. As soon as one of the display channels of the heat quantity is selected, the symbol **SET** is displayed.

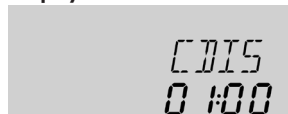
➔ In order to access the reset mode of the counter, press button 3 for approx. 2 s.

SET starts flashing and the heat quantity value will be set back to zero.

➔ In order to finish the reset process, press button 3.

In order to interrupt the reset process, do not press any button for about 5 s. The display returns to the display mode.

Display of thermal disinfection



CDIS

Countdown monitoring period

Display range: 0 ... 30:0 ... 24 (dd:hh)

If the thermal disinfection option (**OTD**) is activated and the monitoring period is in progress, the remaining time is displayed as **CDIS** (in hours and minutes), counting backwards.

A digital display showing the text "SDIS" in a large, bold, sans-serif font. Below it, the time "17:30" is displayed in a smaller, standard digital font.

SDIS

Display of starting time

Display range: 00:00 ... 24:00 (hh:mm)

If the thermal disinfection option (**OTD**) is activated and a starting delay time has been adjusted, the adjusted starting time is displayed as **SDIS** (flashing).

A digital display showing the text "DDIS" in a large, bold, sans-serif font. Below it, the time "00:59" is displayed in a smaller, standard digital font.

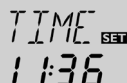
DDIS

Display of disinfection period

Display range: 00:00 ... 24:00 (hh:mm)

If the thermal disinfection option (**OTD**) is activated and the disinfection period is in progress, the remaining time is displayed as **CDIS** (in hours and minutes), counting backwards.

Display of time

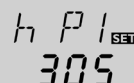
A digital display showing the text "TIME" in a large, bold, sans-serif font. Below it, the time "11:36" is displayed in a smaller, standard digital font. A small "SET" label is visible to the right of the "TIME" text.

TIME

Indicates the current clock time.

- ➔ In order to adjust the hours, press button 3 for approx. 2 s.
- ➔ Set the hours by pressing buttons 1 and 2.
- ➔ In order to adjust the minutes, press button 3.
- ➔ Set the minutes by pressing buttons 1 and 2.
- ➔ In order to save the adjustments, press button 3.

Operating hours counter

A digital display showing the text "h P1" in a large, bold, sans-serif font. Below it, the number "305" is displayed in a smaller, standard digital font. A small "SET" label is visible to the right of the "h P1" text.

hP/hP1/hP2

Operating hours counter

Display channel

The operating hours counter accumulates the operating hours of the corresponding relays (**hP/h P1/h P2**). Full hours are displayed.

The accumulated operating hours can be set back to zero. As soon as an operating hours channel is selected, the symbol **SET** is displayed.

➔ In order to access the reset mode of the counter, press button 3 for approx. 2 s.

SET starts flashing and the operating hours will be set back to zero.

➔ In order to finish the reset process, press button 3.

In order to interrupt the reset process, do not press any button for about 5 s. The display returns to the display mode.

6.2 Adjustment channels

System selection



Arr

System selection

Adjustment range: 1 ... 10

Factory setting: 1

In this channel, a pre-defined system can be selected. Each system has a set of pre-programmed settings that can be individually changed.

If the system selection is changed later on, any previous adjustments which have been made in the other channels will be lost. Therefore, changing the system is always followed by a security enquiry.

Only confirm the security enquiry if you are sure that you wish to change the system selection.



Security enquiry:

➔ In order to confirm the security enquiry, press button 3.

ΔT control



DT0/DT10/DT20/DT30

Switch-on temperature difference

Adjustment range: 1.0 ... 20.0 K [2.0 ... 40.0 °Ra]

Factory setting: 6.0 K [12.0 °Ra]

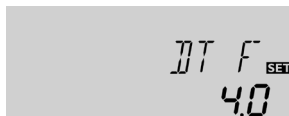
The controller works as a standard differential controller. If the temperature reaches or exceeds the switch-on temperature difference, the pump switches on.

When the temperature difference reaches or falls below the adjusted switch-off temperature difference, the respective relay switches off.



Note

The switch-on temperature difference must be at least 0.5 K [1 °Ra] higher than the switch-off temperature difference.



DTF/DT1F/DT2F/DT3F

Switch-off temperature difference

Adjustment range: 0.5 ... 19.5 K [1.0 ... 39.0 °Ra]

Factory setting: 4.0 K [8.0 °Ra]



Note

If the drainback option **ODB** is activated, the values of the parameters **DT0**, **DTF** and **DTS** will be adapted to values suiting drainback systems:

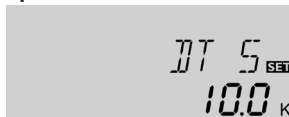
DT0 = 10 K [20 °Ra]

DT F = 4 K [8 °Ra]

DTS = 15 K [30 °Ra]

Adjustments that have been previously made in these channels will be overridden and have to be entered again if **ODB** is deactivated later on.

Speed control

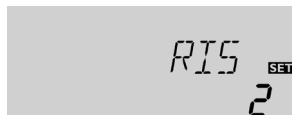


DT S/DT1S/DT2S/DT3S

Set temperature difference

Adjustment range: 1.5 ... 30.0 K [3.0 ... 60.0 °Ra]

Factory setting: 10.0 K [20.0 °Ra]



RIS/RIS1/RIS2/RIS3

Rise

Adjustment range: 1 ... 20 K [2 ... 40 °Ra]

Factory setting: 2 K [4 °Ra]



Note

For pump speed control, the operating mode of the corresponding relay must be set to Auto (adjustment channel **MAN1/MAN2**).

If the temperature difference reaches or exceeds the switch-on temperature difference, the pump switches on at 100% speed for 10 s. Then, the speed is reduced to the minimum pump speed value.

If the temperature difference reaches the adjusted set value, the pump speed increases by one step (10%). The response of the controller can be adapted via the parameter Rise. Each time the difference increases by the adjustable rise value, the pump speed increases by 10% until the maximum pump speed of 100% is reached. If the temperature difference decreases by the adjustable rise value, pump speed will be decreased by one step.



Note

The set temperature difference must be at least 0.5 K [1 °Ra] higher than the switch-on temperature difference.



PUM1/PUM2

Pump control type

Selection: OnOF, PULS, PSOL, PHEA

Factory setting: PSOL

With this parameter, the pump control type can be adjusted. The following types can be selected:

Adjustment for standard pump without speed control

- OnOF (pump on/pump off)

Adjustment for standard pump with speed control

- PULS (burst control via semiconductor relay)

Adjustment for high-efficiency pump (HE pump)

- PSOL (PWM profile for a HE solar pump)
- PHEA (PWM profile for a HE heating pump)

Minimum speed



nMN, n1MN, n2MN

Minimum speed

Adjustment range: (10) 30 ... 100%

Factory setting: 30%

nMN, n1MN, if ODB is activated: 50%

In the adjustment channel **nMN, n1MN, n2NM** a relative minimum speed for pumps connected can be allocated to the outputs R1 and R2.



Note

The pump speed must be set to 100% when auxiliary relays or valves are connected.



nMX, n1MX, n2MX

Maximum speed

Adjustment range: (10) 30 ... 100%

Factory setting: 100%

In the adjustment channel **nMX, n1MX, n2MX** a relative maximum speed for pumps connected can be allocated to the outputs R1 and R2.



Note

The pump speed must be set to 100% when auxiliary relays or valves are connected.

PWM feedback signal

PFB1 SET
OFF

PFB1, PFB2

PWM feedback signal

Adjustment range: OFF, A, b

Factory setting: OFF

(A = Wilo pump, b = Grundfos pump)

With this parameter, the type of the PWM feedback signal of a bidirectional HE pump can be adjusted. The signal transmits either a flow rate between 0 ... 2100 l/h or an error message.

The following messages can be displayed:

Err1: PWM interface of the pump defective

Err2: The pump is not running optimally, external cause electronics (e. g. overvoltage, low voltage)

Err3: The pump stops, but is operable, external cause electronics (e. g. overvoltage, low voltage)

Err4: The pump stops, but is operable, external cause installation/hydraulics

Err5: The pump stops, but is not operable, internal cause electronics/pump is stuck

Err6: PWM feedback signal connection defective



Note

If there is an error, the flow rate will not be indicated and the heat quantity measurement will not be carried out.

Maximum store temperature

S MX SET
60 °C

S MX/S1MX/S2MX

Maximum store temperature

Adjustment range: 4 ... 95 °C [40 ... 200 °F]

Arr 10: 4 ... 90 °C [40 ... 190 °F]

Factory setting: 60 °C [140 °F]

If the store temperature reaches the adjusted maximum temperature, the store will no longer be loaded in order to avoid damage caused by overheating. A non-adjustable hysteresis of 2 K [4 °Ra] is set for the maximum store temperature.

If the maximum store temperature is exceeded, ✱ is displayed.



Note

If the collector cooling or the system cooling function is activated, the adjusted maximum store temperature may be exceeded. In order to prevent system damage, the controller is also equipped with an integrated store emergency shutdown, deactivating the system if the store reaches 95 °C [200 °F].

Store emergency shutdown

OSEM SET
OFF

OSEM

Store emergency shutdown option

Adjustment range: ON, OFF

Factory setting: OFF

This option is used for activating the internal store emergency shutdown for an upper store sensor. If the temperature at the reference sensor exceeds 95 °C, store 1 will be blocked and loading will be stopped until the temperature falls below 90 °C.

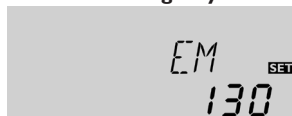


Note

Sensor S3 is used as the reference sensor in systems 1, 2, 3, 8, 9 and 10. In systems 6 and 7, sensor S4 is used as the reference sensor. The option is not available in systems 4 and 5 and it will only be available in systems 6 and 7 if the heat quantity measurement option is not activated.

Collector limit temperature

Collector emergency shutdown




EM/EM1/EM2

Collector limit temperature

Adjustment range: 80 ... 200 °C [170 ... 390 °F]

Factory setting: 130 °C [270 °F]

When the collector temperature exceeds the adjusted collector limit temperature, the solar pump (R1/R2) switches off in order to protect the system components against overheating (collector emergency shutdown). If the collector limit temperature is exceeded,  is displayed.



Note

If the drainback option **ODB** is activated, the adjustment range of **EM** is changed to 80 ... 120 °C [170 ... 250 °F]. The factory setting in that case is 95 °C [200 °F].

Cooling functions

In the following the 3 cooling functions – collector cooling, system cooling and store cooling – are described in detail. The following notes are valid for all 3 cooling functions:



Note

The cooling functions will not become active as long as solar loading is possible.



Note

In 2-store-systems, the cooling functions will only affect store 1, or the base area of the store respectively.

Collector cooling



OCC/OCC1/OCC2

Collector cooling option

Adjustment range: OFF/ON

Factory setting: OFF



CMX/CMX1/CMX2

Collector maximum temperature

Adjustment range:

70 ... 160 °C [150 ... 320 °F]

Factory setting: 110 °C [230 °F]

The collector cooling function keeps the collector temperature within the operating range by heating the store. If the store temperature reaches 95 °C [200 °F] the function will switch off for safety reasons.

If the store temperature exceeds the adjusted maximum store temperature, the solar system is switched off. If the collector temperature increases to the adjusted maximum collector temperature, the solar pump is activated until the collector temperature falls below the maximum collector temperature. The store temperature may then exceed the maximum store temperature, but only up to 95 °C [200 °F] (emergency shutdown of the store).

If the collector cooling function is active,  and  are displayed (flashing).



Note

This function will only be available if the system cooling function (**OSYC**) is deactivated.



Note



In system 10, the parameter **CMX** is available without the **OCC** function. In system 10, **CMX** is used for setting the activation temperature for the heat dump function. No other switch-on condition is needed in that case.

System cooling



OSYC

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

The system cooling function aims to keep the solar system operational for a longer time. The function overrides the maximum store temperature to provide thermal relief of the collector field and the heat transfer fluid on hot days. If the store temperature is higher than the adjusted maximum store temperature and the switch-on temperature difference **DTCO** is reached, the solar pump remains switched on or will be switched on. Solar loading is continued until either the temperature difference falls below the adjusted value **DTCF** or the collector limit temperature is reached. If the system cooling function is active,  and  are displayed (flashing).



DTCF

Switch-off temperature difference
Adjustment range: 0.5 ... 29.5 K [1.0 ... 59.0 °Ra]
Factory setting: 15.0 K [30.0 °Ra]



Note

This function will only be available, if the collector cooling function (**OCC**) is deactivated.



DTCO

Switch-on temperature difference
Adjustment range:
1.0 ... 30.0 K [2.0 ... 60.0 °Ra]
Factory setting: 20.0 K [40.0 °Ra]

Store cooling



OSTC

Store cooling option
Adjustment range: OFF/ON
Factory setting: OFF





THOL

Holiday cooling temperature
Adjustment range: 20 ... 80 °C [70 ... 175 °F]
Factory setting: 40 °C [110 °F]

When the store cooling function is activated, the controller aims to cool down the store during the night in order to prepare it for solar loading on the following day. If the adjusted maximum store temperature (**SMX/S1MX**) is exceeded and the collector temperature falls below the store temperature, the system will be reactivated in order to cool down the store. Cooling will continue until the store temperature has fallen below the adjusted maximum store temperature (**SMX/S1MX**) again. A hysteresis of 2 K [4 °Ra] is set for the store cooling function. Reference threshold temperature differences for the store cooling function are **DTO** and **DTF**.

If no DHW consumption is expected for a longer period of time, the additional holiday cooling option **OHOL** can be activated in order to extend the store cooling function. The adjustable temperature **THOL** then replaces the maximum store temperature (**SMX/S1MX**) as the switch-off temperature for the store cooling function.

When the holiday cooling function is activated,  and  (flashing) are shown on the display.

If the holiday cooling function is active, ,  and  are displayed (flashing).



OHOL

Holiday cooling option
Adjustment range: OFF/ON
Factory setting: OFF

Minimum collector limitation



OCN/OCN1/OCN2

Collector minimum limitation option

Adjustment range: OFF/ON

Factory setting: OFF



CMN/CMN1/CMN2

Minimum collector temperature

Adjustment range:

10.0 ... 90.0 °C [50.0 ... 190.0 °F]

Factory setting: 10.0 °C [50.0 °F]

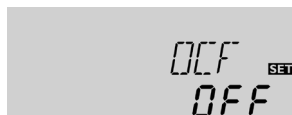
If the collector minimum limitation option is activated, the pump (R1/R2) will only be switched on, if the adjustable collector minimum temperature is exceeded. The minimum temperature prevents the pump from being switched on too often at low collector temperatures. A hysteresis of 5 K [10 °Ra] is set for this function. If the collector minimum limitation is active, ❄️ is displayed (flashing).



Note

If **OSTC** or **OCF** is active, the collector minimum limitation will be overridden. In this case, the collector temperature may fall below **CMN**.

Antifreeze function



OCF/OCF1/OCF2

Antifreeze function option

Adjustment range: OFF/ON

Factory setting: OFF



CFR/CFR1/CFR2

Antifreeze temperature

Adjustment range:

-40.0 ... +10.0 °C [-40.0 ... +50.0 °F]

Factory setting: +4.0 °C [+40.0 °F]

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 K [2 °Ra], the loading circuit will be deactivated.

If the antifreeze function is activated, ❄️ is displayed. If the antifreeze function is active, ⓪ and ❄️ are displayed (flashing).



Note

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

The antifreeze function will be suppressed if the store temperature falls below +5 °C [+40 °F] in order to protect the store from frost damage.

Priority logic



Note

Priority logic can be used in 2-store systems only (Arr = 4, 5, 6).



PRIO

Priority

Adjustment range: SE 1, SE 2, Su 1, Su 2, 0, 1, 2

Factory setting: Arr 4: 2; Arr 5, 6 1

If a 2-store system has been selected, the priority logic determines how the heat is divided between the stores. Different types of priority logic are adjustable:

- spreaded loading (SE 1 and SE 2)
- successive loading (Su 1 and Su 2)
- parallel loading (0)
- store sequence control (1 and 2)

If priority **PRIO SE 1** or **SE 2** (only available in Arr 6) is adjusted, the subordinate store will be loaded in parallel to the priority store if the temperature difference between the collector and the priority store (store 1 for SE 1, store 2 for SE 2) exceeds the adjusted value **DTSE** and the subordinate store has not reached its maximum temperature.

Parallel loading will stop as soon as the temperature difference between the collector and the priority store falls by 2 K [4 °Ra] below **DTSE** or the subordinate store reaches its maximum temperature.

If priority **PRIO Su 1** or **Su 2** is adjusted, the stores are loaded successively. The subordinate store will only be loaded if the priority store (store 1 for Su 1, store 2 for Su 2) has reached its adjusted maximum temperature (**S1MX** or **S2MX**).

If priority **PRIO 0** is adjusted and the switch-on conditions for both stores are fulfilled, the stores are loaded in parallel (Arr 6) or in store sequence control (Arr 4, 5) respectively, beginning with the store with the lowest temperature. In store sequence control, solar loading will switch from one store to the other in steps of 5 K [10 °Ra] temperature difference between the stores.

If **PRIO 1/2** is adjusted, store sequence control will be activated (see below) with the corresponding store as the priority store.

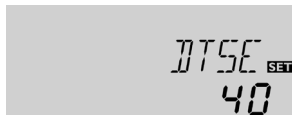


Note

If the priority is set to **PRIO Su 1** or **Su 2**, solar loading of the subordinate store will be stopped at once if the temperature in the priority store (store 1 for Su 1, store 2 for Su 2) falls below the adjusted maximum temperature. If, in that case, the temperature difference between the priority store and the collector is not sufficiently high, solar loading will be stopped completely.

Spreaded loading temperature difference

(only available if **PRIO** is set to SE 1 or SE 2)



DTSE

Spread temperature difference

Adjustment range: 20... 90 K [40... 160 °Ra]

Factory setting: 40 K [70 °Ra]

Store sequence control (only available if priority is set to **PRIO SE 1**, **SE 2**, 1 or 2)



tLB

Loading break store sequence control

Adjustment range: 1 ... 30 min

Factory setting: 2 min



tRUN

Circulation time store sequence control

Adjustment range: 1 ... 30 min

Factory setting: 15 min

Store sequence control will be activated when **PRIO** is set to SE1, SE2, 1 or 2.

If the priority store cannot be loaded, the subordinate store will be checked. If useful heat can be added to the subordinate store, it will be loaded for the circulation time (**tRUN** – factory setting 15 min). After this, the loading process stops and the controller monitors the increase in collector temperature during the loading break time **tLB**. If it increases by 2 K [4 °Ra], the break time timer starts again to allow the collector to gain more heat. If the collector temperature does not increase sufficiently, the subordinate store will be loaded again for the **tRUN** runtime as before.

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

If store sequence control is active and the system switches to load the priority store, the parameter **tLB** also acts as a stabilisation time, during which the switch-off condition **DTF** is ignored while the system operation is stabilising.

Tube collector function

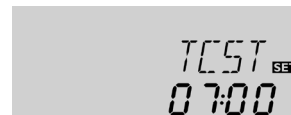


OTC

Tube collector option

Adjustment range: OFF/ON

Factory setting: OFF



TCST

Tube collector function starting time

Adjustment range: 00:00 ... 23:45

Factory setting: 07:00

This function is used for improving the switch-on behaviour in systems with non-ideal sensor positions (e.g. with some tube collectors). This function operates within an adjusted time frame. It activates the collector circuit pump for an adjustable runtime between adjustable standstill intervals in order to compensate for the delayed temperature measurement.

If the runtime is set to more than 10 s, the pump will be run at 100% for the first 10 s of the runtime. For the remaining runtime, the pump will be run at the adjusted minimum speed. If the collector sensor is defective or the collector is blocked, this function is suppressed or switched off.



TCEN

Tube collector function ending time
Adjustment range: 00:00 ... 23:45
Factory setting: 19:00



TRCU

Tube collector function runtime
Adjustment range: 5 ... 500 s
Factory setting: 30 s



TCIN

Tube collector function standstill interval
Adjustment range: 1 ... 60 min
Factory setting: 30 min

In system 7, both collectors are operated independently from each other by means of this function. If the store is being loaded by one collector, the other one is nevertheless operated.



Note

If the drainback option **ODB** is activated, **TRCU** will not be available. In this case, the runtime will be determined by the parameters **tFLL** and **tSTB**.

Grundfos Direct Sensor™ registration



GFD

Grundfos Direct Sensor™ registration

Selection: OFF, 12, 40, 40F

Factory setting: OFF

Registration of a digital flow rate sensor which can be used for heat quantity measurement.

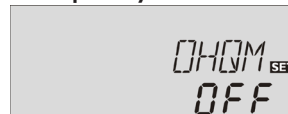
OFF : no Grundfos Direct Sensor™

12 : VFD 1 - 12 (water/propylene glycol mixture)

40 : VFD 2-40

40F : VFD 2-40 Fast (water only)

Heat quantity measurement



OHQM

Heat quantity measurement option

Adjustment range: OFF/ON

Factory setting: OFF

If OHQM is activated, the heat quantity gained can be calculated and displayed.

The heat quantity measurement can be carried out in 3 different ways (see below): with a fixed flow rate value, with a VFD Grundfos Direct Sensor™ or with a PWM feedback signal.

Heat quantity measurement with fixed flow rate value

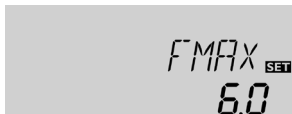
The heat quantity balancing (estimation) uses the difference between the flow and return temperatures and the entered flow rate (at 100 % pump speed).

- Read the flow rate (l/min) and adjust it in the **FMAX** channel.
- Adjust the antifreeze type and concentration of the heat transfer fluid in the channels **MEDT** and **MED%**.



Note

Heat quantity measurement with a fixed flow rate value is not possible in systems with 2 solar pumps.



FMAX

Flow rate in l/min

Adjustment range: 0.5 ... 100.0

Factory setting: 6.0



Note

The **FMAX** channel will be available only if the **SEN** channel has been set to **OFF** or if no VFD Grundfos Direct Sensor™ is activated.

Heat quantity measurement with a VFD Grundfos Direct Sensor™

Heat quantity measurement with a VFD Grundfos Direct Sensor™ is possible in all system layouts.

In order to use a VFD Grundfos Direct Sensor™ for heat quantity measurement, proceed as follows:

- Register the **VFD** Grundfos Direct Sensor™ in the **GFD** channel.
- Adjust the position of the VFD Grundfos Direct Sensor™ in the **SEN** channel.
- Adjust the antifreeze type and concentration of the heat transfer fluid in the channels **MEDT** and **MED%**.

Heat quantity measurement with a PWM feedback signal

Heat quantity measurement with a PWM feedback signal is possible in all system layouts. In systems 2, 6, 7, 8 and 9, and additional VFD Grundfos Direct Sensor™ is required for measuring the temperature.

- Register the PWM feedback signal of a bidirectional HE pump on the channels **PFB1/PFB2**.
- Adjust the antifreeze type and concentration of the heat transfer fluid in the channels **MEDT** and **MED%**.

The VFD Grundfos Direct Sensor™ can optionally be used for measuring the temperature:

- Register the **VFD** Grundfos Direct Sensor™ in the **GFD** channel.
- Adjust the position of the VFD Grundfos Direct Sensor™ in the **SEN** channel.



Note

If a VFD Grundfos Direct Sensor™ is optionally activated, it will not be used for measuring the flow rate but for measuring the flow and return temperature respectively.



Note

In systems 6 and 7, both flow rate values of the PWM feedback signals will be added together for heat quantity measurement.



Note

If the PWM feedback signal sends an error message, heat quantity measurement will not be carried out.



SEN

Digital flow rate sensor (only if GDF = 12, 40 or 40F)

Selection: OFF, 1, 2

Factory setting: 2

Flow rate detection type:

OFF : PWM feedback signal or fixed flow rate value (flowmeter)

- 1 : PWM feedback signal or Grundfos Direct Sensor™ in the flow pipe
- 2 : PWM feedback signal or Grundfos Direct Sensor™ in the return pipe

Sensor allocation for heat quantity measurement:

SEN Arrangement	1		2		OFF	
	SFL	SRET	SFL	SRET	SFL	SRET
1	GFD	S4	S4	GFD	S1	S4
2	---	---	S1	GFD	---	---
3	GFD	S4	S4	GFD	S1	S4
4	GFD	S4	S4	GFD	S1	S4
5	GFD	S4	S4	GFD	S1	S4
6	GFD	S4	S4	GFD	---	---
7	GFD	S4	S4	GFD	---	---
8	---	---	S1	GFD	---	---
9	---	---	S1	GFD	---	---
10	GFD	S4	S4	GFD	S1	S4



MEDT

Heat transfer fluid

Adjustment range: 0 ... 3

Factory setting: 1



MED%

Antifreeze concentr.

in Vol-% (MED% is not indicated when MEDT 0 or 3 is used.)

Adjustment range: 20 ... 70%

Factory setting: 45%

Heat transfer fluid:

0 : Water

1 : Propylene glycol

2 : Ethylene glycol

3 : Tyfocor® LS/G-LS



Note

If the system 10 has been selected and **OHQM** is activated, heat quantity measurement will be interrupted when the 3-port valve switches to the heat dump. Heat quantity measurement with a PWM feedback signal or VFD Grundfos Direct Sensor™ will continue independently.

Drainback option



Note

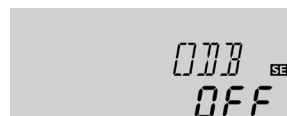
A drainback system requires additional components such as a holding tank. The drainback option should only be activated if all components required are properly installed.



Note

The drainback option is only available in system with one store and one collector (Arr 1, 2, 3, 8 and 9).

In a drainback system the heat transfer fluid will flow into a holding tank if solar loading does not take place. The drainback option initiates the filling process if solar loading is about to start. If the drainback option is activated, the following adjustment can be made.



ODB

Drainback option

Adjustment range: OFF/ON

Factory setting: OFF



Note

If the drainback option is activated, the cooling functions and the antifreeze function will not be available. If one or more than one of these functions have been activated before, they will be deactivated again as soon as **ODB** is activated. They will remain deactivated, even if **ODB** is deactivated later on.



Note

When the drainback option **ODB** is activated, the factory settings of the parameters **nMN/n1MN**, **DTO**, **DTF** and **DTS** will be adapted to values suiting drainback systems.

Additionally, the adjustment range and the factory setting of the collector emergency shutdown will change. Adjustments previously made in these channels will be overridden and have to be entered again if the drainback option is deactivated later on.

Time period – switch-on condition

tDTo

Time period – switch-on condition

Adjustment range: 1 ... 100 s

Factory setting: 60 s

The parameter **tDTo** is used for adjusting the time period during which the switch-on condition must be permanently fulfilled.

Filling time

tFLL

Filling time

Adjustment range: 1.0 ... 30.0 min

Factory setting: 5.0 min

The filling time can be adjusted using the parameter **tFLL**. During this period, the pump runs at 100% speed.

Stabilisation

tSTB

Stabilisation

Adjustment range: 1.0 ... 15.0 min

Factory setting: 2.0 min

The parameter **tSTB** is used for adjusting the time period during which the switch-off condition will be ignored after the filling time has ended.

Booster function

OBST option

Booster function

Adjustment range: ON/OFF

Factory setting: OFF

This function is used for switching on a second pump when filling the solar system. When solar loading starts, R2 is energised in parallel to R1. After the filling time has elapsed, R2 switches off.



Note

The booster function is available in system 1 only. The booster function will only be available if the drainback option has been activated.

Operating mode

MAN1/MAN2

Operating mode

Adjustment range: OFF, Auto, On

Factory setting: Auto

For control and service work, the operating mode of the relays can be manually adjusted. For this purpose, select the adjustment value **MAN1** (for R1) or **MAN2** (for R2) in which the following adjustments can be made:

• MAN1/MAN2

Operating mode

OFF : Relay off (flashing) +

Auto : Relay in automatic operation

ON : Relay on (flashing) + + /



Note

Always adjust the operating mode back to **Auto** when the control and service work is completed. Normal operation is not possible in manual mode.

Language



LANG

Language selection

Selection: dE, En, Fr, ES, It

Factory setting: dE

In this adjustment channel the menu language can be selected.

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

Unit



UNIT

Temperature unit selection

Selection: °F, °C

Factory setting: °C

In this adjustment channel, the display unit for temperatures and temperature differences can be selected. The unit can be switched between °C/K and °F/°Ra during operation.

Temperatures and temperature differences in °F and °Ra are displayed without units. If the indication is set to °C, the units are displayed with the values.

Reset



RESE

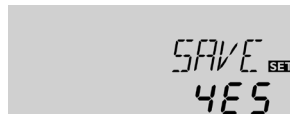
Reset function

By means of the reset function, all adjustments can be set back to their factory settings.

→ In order to carry out a reset, press button 3.

All adjustments that have previously been made will be lost! For this reason, a security enquiry will appear after the reset function has been selected.

Only confirm the security enquiry if you are sure you want to set back all adjustment to the factory setting.



Security enquiry

→ In order to confirm the security enquiry, press button 3.





Note

After a reset, the commissioning menu will start again (see page 48).

7 Troubleshooting

If a malfunction occurs, the display symbols will indicate an error code:

The symbol  is indicated on the display and the symbol  is flashing.

Sensor fault. An error code instead of a temperature is shown on the sensor display channel.

888.8

- 88.8



Cable is broken. Check the cable.

Short circuit. Check the cable.

Disconnected Pt1000 temperature sensors can be checked with an ohmmeter. Please check the resistance values correspond with the table.

°C	°F	Ω	°C	°F	Ω
-10	14	961	55	131	1213
-5	23	980	60	140	1232
0	32	1000	65	149	1252
5	41	1019	70	158	1271
10	50	1039	75	167	1290
15	59	1058	80	176	1309
20	68	1078	85	185	1328
25	77	1097	90	194	1347
30	86	1117	95	203	1366
35	95	1136	100	212	1385
40	104	1155	105	221	1404
45	113	1175	110	230	1423
50	122	1194	115	239	1442

Resistance values of Pt1000 sensors

The symbols  and  are flashing.

Error message of the bidirectional pump, see page 56.

The display is permanently off.

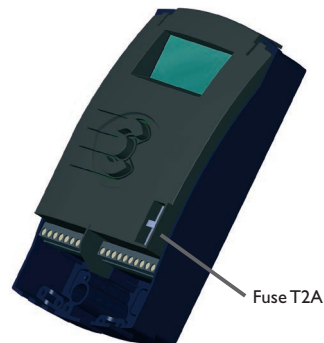
If the display is off, check the power supply of the controller. Is it disconnected?

no

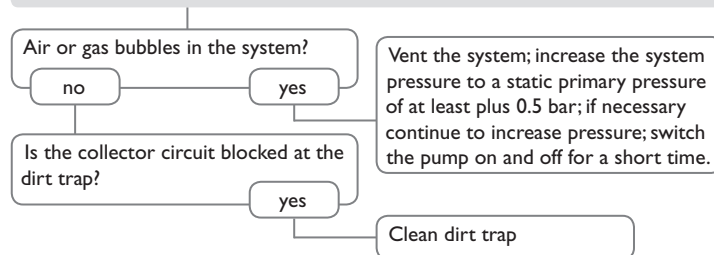
The fuse of the controller could be blown. The fuse holder (which holds the spare fuse) becomes accessible when the cover is removed. The fuse can then be replaced.

yes

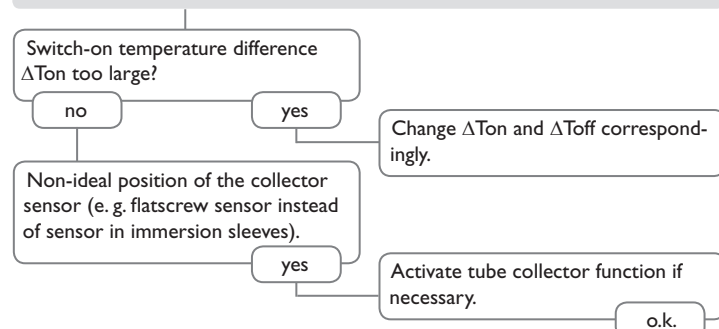
Check the supply line and reconnect it.



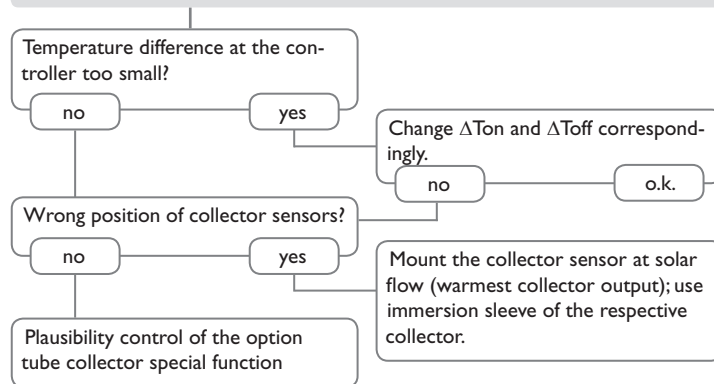
Pump is overheated, but no heat transfer from the collector to the store, flow and return have the same temperature; perhaps also bubbling in the lines.



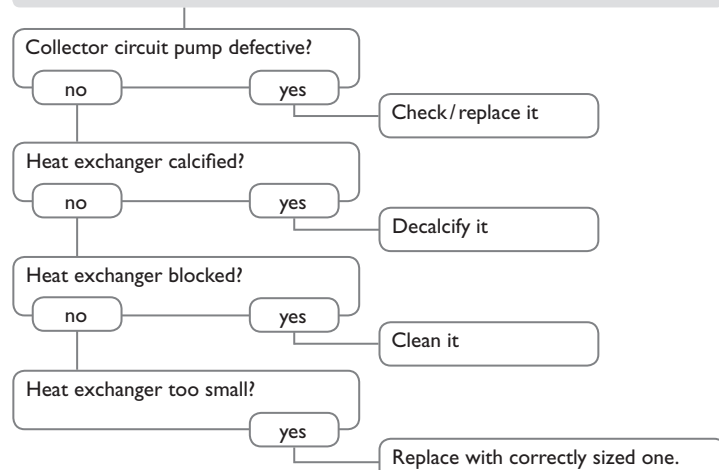
Pump starts up very late.



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



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



Note

For answers to frequently asked questions (FAQ) see www.resol.com.

Stores cool down at night.

Collector circuit pump runs during the night?

no

yes

Check controller

Collector temperature at night is higher than the outdoor temperature.

no

yes

Check the non-return valves in the flow and the return pipe for functional efficiency.

Sufficient store insulation?

yes

no

Increase insulation.

Insulation close enough to the store?

yes

no

Replace insulation or increase it.

Are the store connections insulated?

yes

no

Insulate the connections.

Warm water outflow upwards?

no

yes

Change connection and let the water flow sideways or through a siphon (downwards); less store losses now?

no

yes

o.k.

Does the DHW circulation run for a very long time?

no

yes

Use the circulation pump with timer and switch-off thermostat (energy-efficient circulation).

Circulation pump and blocking valve should be switched off for 1 night; less store losses?

yes

no

Check whether the pumps of the after-heating circuit run at night; check whether the non-return valve is defective; problem solved?

no

a

b

a

Check the non-return valve in warm water circulation - o.k.

yes

no

The gravitation circulation in the circulation line is too strong; insert a stronger valve in the non-return valve or an electrical 2-port valve behind the circulation pump; the 2-port valve is open when the pump

b

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

Clean or replace it.

is activated, otherwise it is closed; connect pump and 2-port valve electrically in parallel; activate the circulation again. Deactivate pump speed control!

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

Is the display working?

yes

no

There is no current; check fuses / replace them and check power supply.

Does the pump start up in manual operation?

no

yes

The adjusted temperature difference for starting the pump is too high; choose a value which makes more sense.

Is the pump current enabled by the controller?

no

yes

Is the pump stuck?

yes

Turn the pump shaft using a screwdriver; now passable?

no

Controller fuse ok?

no

yes

Pump is defective - replace it.

Replace fuse

Controller might be defective - replace it.



Sensors



SP10 Overvoltage protection device



VFD Grundfos Direct Sensor™



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



SD3 Smart Display /
GA3 Large Display



AM1 Alarm module



DL2 Datalogger



DL3 Datalogger



8.1 Sensors and measuring instruments

Temperature sensors

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

For more information see our catalogue and our website.

SP10 Overvoltage protection device

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

VFD Grundfos Direct Sensor™

The VFS Grundfos Direct Sensor™ is an digital sensor that measures both temperature and flow rate.

8.2 VBus® accessories

SD3 Smart Display

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

GA3 Large display module

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

AM1 Alarm module

The AM1 Alarm module is designed to signal system failures. It is to be connected to the VBus® of the controller and issues an optical signal via the red LED if a failure has occurred. The AM1 also has a relay output, which can e. g. be connected to a building management system (BMS). Thus, a collective error message can be issued in the case of a system failure.

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

DL2 Datalogger

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

DL3 Datalogger

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

VBus.net

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

8.3 Interface adapters

VBus®/USB interface adapter

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

VBus®/LAN interface adapter

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

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Distributed by:

RESOL – Elektronische Regelungen GmbH

Heiskampstraße 10
45527 Hattingen / Germany

Tel.: +49 (0) 23 24 / 96 48 - 0

Fax: +49 (0) 23 24 / 96 48 - 755

www.resol.com

info@resol.com

Important note

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

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

Note

The design and the specifications can be changed without notice.

The illustrations may differ from the original product.

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