DeltaSol® ES

RESOL®

Manual for the
specialised craftsman

Mounting
Connection
Operation
Troubleshooting
Application examples

VBus.net

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 safe.

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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

This product is to be used to control a solar thermal / heating unit 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 the manufacturer.

Note

Strong electromagnetic fields can impair the function of the controller.

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

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.

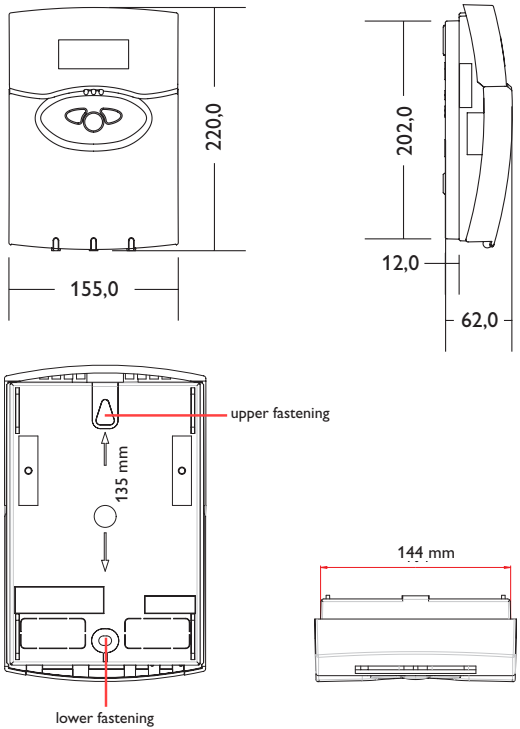
Subject to technical change. Errors excepted.

The controller is pre-programmed for 36 solar and heating systems, the individual installation configuration can be selected via the menu and represented graphically via the system-monitoring display. An integrated heat quantity measurement, operating hours counter and the system-monitoring display allow a clear visualisation of the system. For data communication and remote service, the controller is equipped with RESOL VBus® which opens the bi-directional way to modules, PCs or for data logging.

Contents

Overview

- **36 basic solar systems selectable**
- **illuminated system-monitoring display**
- **pump speed control, solar operating hours counter and heat quantity measurement**
- **10 sensor inputs**
- **7 relay outputs**
- **function control**
- **VBus®**



Technical data

Inputs: 8 sensor inputs for Pt1000, 1 CS10, 1 V40

Outputs: 6 semiconductor relays, 3 of them for pump speed control and 1 potential-free relay

Switching capacity:

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

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

Total switching capacity: 4 A 240 V~

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

Supply connection: type Y attachment

Standby: 0.48 W

Temperature controls class: I

Energy effi ciency contribution: 1 %

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

Rated impulse voltage: 2.5 kV

Data interface: RESOL VBus®

VBus® current supply: 30 mA

Functions: 2-store systems, east-/west collectors, heating circuit backup, heat exchange control, thermostatic backup heating, solid fuel boilers, adjustable functions and options as heat quantity measurement, collector cooling function, tube collector function, antifreeze function, minimum temperature limitation, pump speed control, balance and diagnostics functions, function control

Housing: plastic, PC-ABS and PMMA

Mounting: wall mounting, mounting into patch panels is possible

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

Operation: 3 push buttons

Ingress protection: IP 20 / EN 60529

Protection class: II

Ambient temperature: 0 … 40 °C

Pollution degree: 2

Dimensions: 227 x 156 x 62 mm

1 Installation

1.1 Mounting

WARNING! Electric shock!

Upon opening the housing, live parts are exposed!

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

Note:

Strong electromagnetic fields can impair the function of the controller.

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

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

➔ Open the front cover by pushing it. Unscrew the cross-head screw from the cover and remove it along with the front cover from the housing.

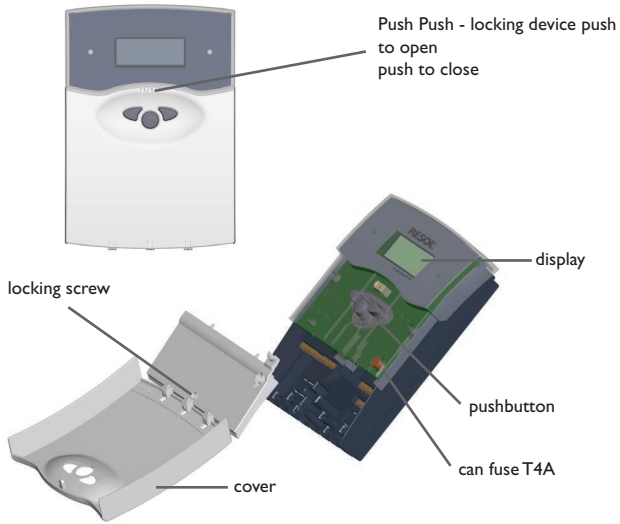
➔ Mark the upper fastening point on the wall and drill and fasten the enclosed wall plug and screw leaving the head protruding.

➔ Hang the housing from the upper fastening point and mark the lower fastening point through the hole in the terminal box (centres 135 mm). Drill and insert the lower wall plug.

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

➔ Carry out connection in accordance with the terminal allocation.

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



1.1.1 Connection survey

ATTENTION! ESD damage!

Electrostatic discharge can lead to damage to electronic components!

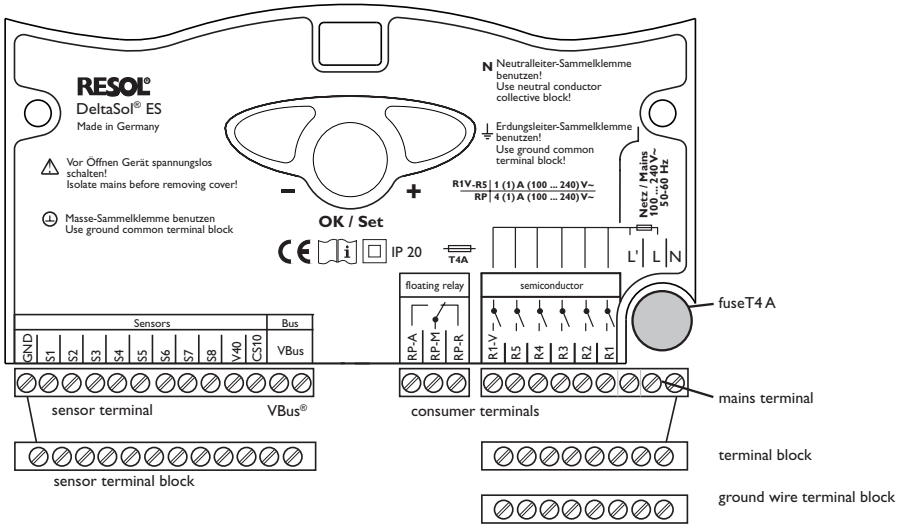
➔ **Take care to discharge properly before touching the inside of the device! To do so, touch a grounded surface such as a radiator or tap!**

WARNING! Electric shock!

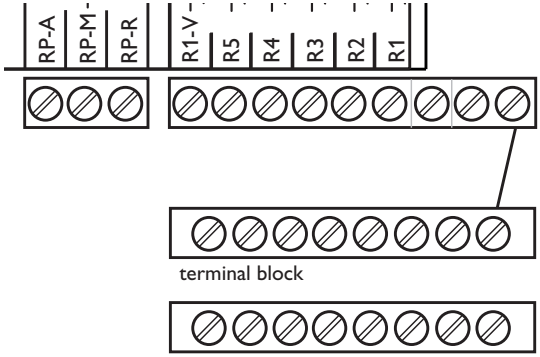
Upon opening the housing, live parts are exposed!

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

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



1.1.2 Actuators (pumps, valves, etc.)



The controller is equipped with 7 relays in total, to which **loads** (actuators) such as pumps, valves, mixers and auxiliary relays can be connected:

- **Relays R1 … R5** are semiconductor relays, R1 … R3 are designed for pump speed control.
  R1 … R5 = normally open R1 … R5
  N = neutral conductor N (terminal block)
  GND = ground conductor (terminal block)
- **Relay R1-V** is a semiconductor relay, designed for the connection of a valve.
  R1-V = normally open R1-V
  N = neutral conductor N (terminal block)
  GND = ground conductor (terminal block)

R1-V switches in parallel to R1 in all systems.

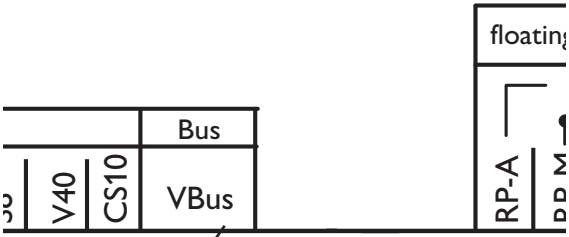
- **Relay RP** is a potential-free relay with change-over-contact:
  RP-M = centre contact RP
  RP-A = normally open RP
  RP-R = normally closed RP

RP switches in parallel to R3 in all systems with afterheating (Arr 3, 10, 12, 15, 19, 22, 25, 28) to provide a boiler demand if necessary.

Note

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

1.1.3 Data communication / Bus



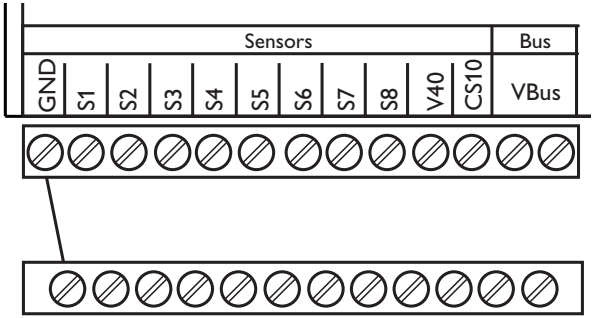
VBus®
connection terminals

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

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

Additionally, the controller can be connected to a PC with a RESOL RS-COM adapter. With the RESOL ServiceCenter Software (RSC) the controller parameters can be changed, measurements can be read out, processed and visualised. It allows easy function control and adjustment of the system. The software can be downloaded for free at www.resol.com

1.2.1 Sensors

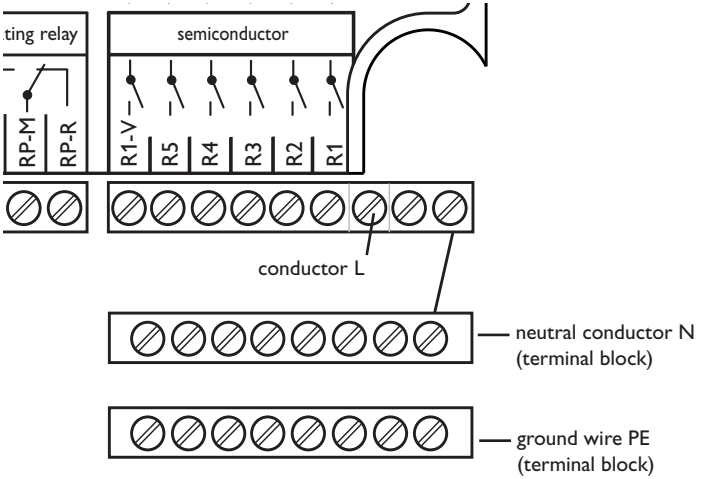


earth terminal block

The controller is equipped with 10 sensor inputs in total. The protective earth connection for sensors is effected by the protective earth terminal block (GND).

- The **temperature sensors** are connected to the terminals S1 … S8 and GND with either polarity.
- A **flowmeter** RESOL V40 can be connected to the terminals V40 and GND with either polarity.
- The **irradiation sensor (CS10)** is to be connected to the terminals CS10 and GND with correct polarity. Connect the terminal GND of the sensor to the terminal GND of the controller, and the terminal CS of the sensor to the terminal CS10 of the controller.

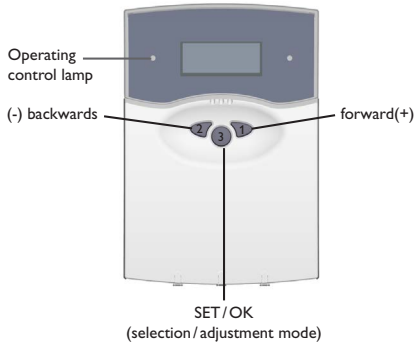
1.2.2 Mains supply



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

2 Operation and function

2.1 Pushbuttons for adjustment



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

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

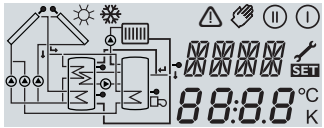
➔ Press buttons 1 and 2 in order to select a channel

➔ Briefly press button 3, „**SEt**" will flash

➔ Adjust the value by pressing buttons 1 and 2

➔ Briefly press button 3, so that **SEt** permanently appears, the adjusted value will be saved.

2.2 System monitoring display



total monitoring display

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

2.2.1 Channel display

channel display only

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

Temperatures and temperature differences are indicated in **°C** or **K** respectively.

2.2.2 Tool bar

tool bar only

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

Symbol	normal	flashing
⏀	relay 1 active	
⏁	relay 2 active	
☼	maximum store limitation active / maximum store temperature exceeded	collector cooling function active recooling function active
❄	antifreeze function active	collector minimum limitation active antifreeze function active
⚠		collector emergency shutdown active or store emergency shutdown active
⚠ + 🔧		sensor defective
⚠ + ✋		manual operation active
SET		SET-mode

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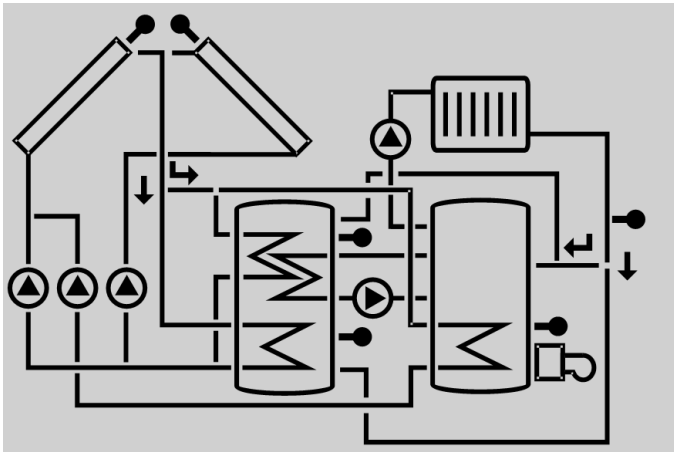
2.2.3 System screen

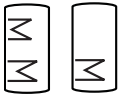
The system screen (active arrangement) displays the scheme which has been selected. The screen consists of several system component symbols, which are - depending on the current status of the system - either flashing, permanently shown or „hidden“.



Collectors
with collector sensor

Temperature sensor

Heating circuit



Store 1 and 2
with heat exchanger

Pump

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

After-heating
with burner symbol

2.3 Flashing codes

2.3.1 System screen flashing codes

- Pumps are flashing during starting phase
- Sensors are flashing if the respective sensor display channel is selected.
- Sensors are flashing quickly in the case of a sensor defect.
- Burner symbol is flashing if after-heating is activated.

2.3.2 Operating control lamp flashing codes

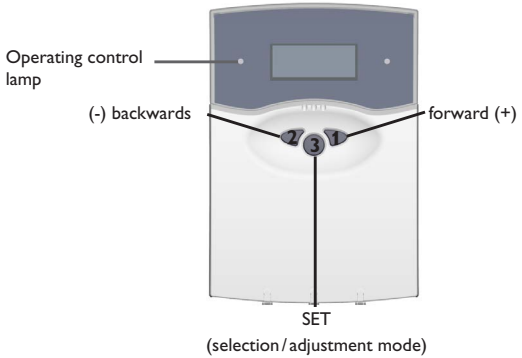
green:	everything OK
	manual operation
red flashing:	sensor fault (sensor symbol is flashing quickly)

3 Commissioning

Note

Select the system scheme when the controller is commissioned for the first time.

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



1. AC power supply must be activated. The controller passes an initialisation phase in which the operating control lamp flashes red and green. After having finished the initialisation, the controller is in automatic operation (factory setting). The pre-adjusted system scheme is Arr 1.

2. Adjust the time in the adjustment channel **TIME**. By pressing once the pushbutton **SET** the hours are shown (flashing), by pressing again the minutes are shown (flashing). The time can be adjusted by pushbuttons 1 and 2 and be stored by a last pressing of the pushbutton **SET**.

3. Adjustment of the system scheme

➔ select **Arr**

➔ change into the **SET**-mode (see 2.1)

➔ select system scheme by Arr-characteristics

➔ adjustments are stored by pressing **SET**

4. If the solar sensor CS10 is used

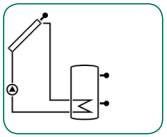
➔ change into the **SET**-mode (see 2.1)

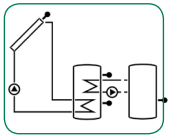
➔ select **CS10** type by characteristics

➔ adjustments are stored by pressing **SET**

➔ After the CS type has been set, carry out the CS adjustment. For this purpose, select the measured value SOL. Press button 3 and hold it for 5 seconds. The adjustment has to be carried out when it is dark or when the solar cell is not connected.

Now the controller is ready for operation and should enable an optimum operation of the solar system.


System 1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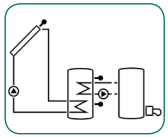
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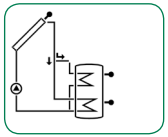
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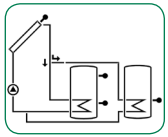
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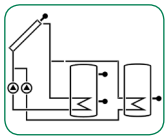
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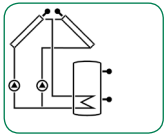
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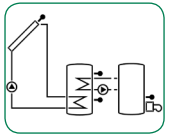
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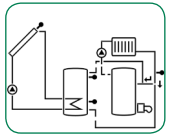
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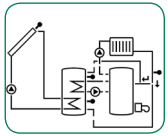
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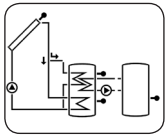
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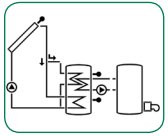
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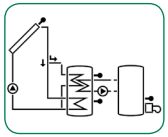
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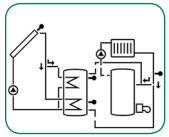
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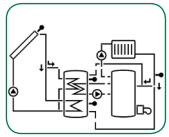
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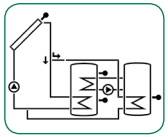
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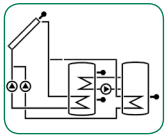
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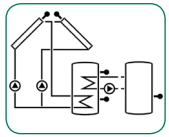
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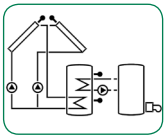
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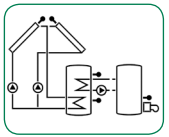
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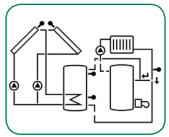
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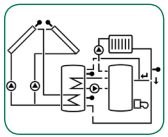
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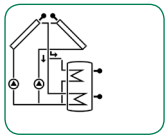
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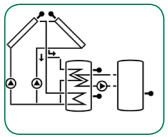
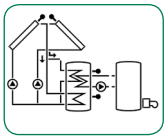
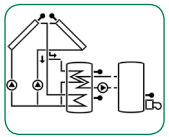
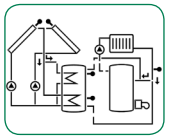
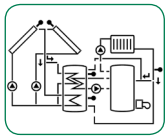
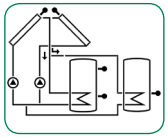

System 24

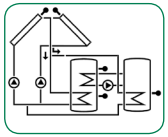

System 25

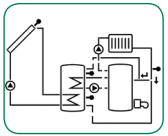

System 26

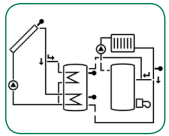

System 27

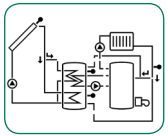

System 28

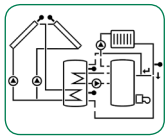

System 29

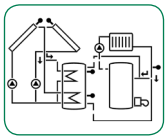

System 30

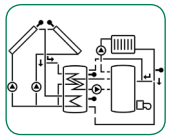

System 31


System 32


System 33


System 34


System 35


System 36

4 Controller parameters and adjustment channels

4.1 Channel overview

Legend:

x — Corresponding channel is available.

x* — Corresponding channel is available if the corresponding option is activated.

① — Corresponding channel is only available if the option heat quantity measurement is **activated** (OHQM).

MEDT — Only if an antifreeze type (MEDT) other than water or **Tyfocor LS/G-LS (MEDT 0 or 3)** is used, will the channel antifreeze concentration (MED%) be displayed

Note
The channels S3 and S4 are only displayed when there are sensors connected to the respective terminals.

Channel survey: Systems Arr 1 ... 10

Channel	Arr										Description
	1	2	3	4	5	6	7	8	9	10	
COL	x	x	x	x	x	x		x	x	x	Collector temperature 1
COL 1							x				Collector temperature 1
TSTL	x		x	x			x	x	x	x	Store temperature lower
TST1		x			x	x					Store temperature 1 lower
TSTU	x	x	x	x	x	x	x	x	x	x	Store temperature 1 at the top
S4											Store temperature at the middle
TST2		x			x	x					Store temperature 2 lower
TFSB								x			Temperature solid fuel boiler
TRET									x	x	Temperature heating curcuit
COL2							x				Collector temperature 2
TFL	①	①	①	①	①	①	①	①	①	①	Temperature flow sensor
TRF	①	①	①	①	①	①	①	①	①	①	Temperature return sensor
IRR	x	x	x	x	x	x	x	x	x	x	Solar irradiation intensity
n %	x			x	x				x		Pump speed relay
n1 %		x	x			x	x	x		x	Pump speed relay 1
n2 %						x	x				Pump speed relay 2
n3%		x	x					x		x	Pump speed relay 3
hP	x			x	x				x		Hours of operation relay 1
h P1		x	x			x	x	x		x	Hours of operation relay 1
h P2						x	x				Hours of operation relay 2
h P3		x	x					x		x	Hours of operation relay 3

Channel	Arr										Description
	1	2	3	4	5	6	7	8	9	10	
FLOW	①	①	①	①	①	①	①	①	①	①	Flow rate
kWh	①	①	①	①	①	①	①	①	①	①	Heat quantity kWh
MWh	①	①	①	①	①	①	①	①	①	①	Heat quantity MWh
TIME	x										Time
Arr	1-36										System
DT O	x	x	x				x	x	x	x	Switch-on temperature difference
DT1O				x	x	x					Switch-on temperature difference 1
DT F	x	x	x				x	x	x	x	Switch-off temperature difference 1
DT1F				x	x	x					Switch-off temperature difference 1
DT S	x	x	x				x	x	x	x	Set temperature difference
DT1S				x	x	x					Set temperature difference 1
RIS	x	x	x				x	x	x	x	Rise
RIS1				x	x	x					Rise 1
S MX	x	x	x				x	x	x	x	Maximum store temperature 1
S1 MX				x	x	x					Maximum store temperature 1
DT2O				x	x	x					Switch-on temperature difference 2
DT2F				x	x	x					Set temperature difference 2
DT2S				x	x	x					Set temperature difference 2
RIS2				x	x	x					Rise 2
S2MX				x	x	x					Maximum store temperature 2
EM	x	x	x	x	x	x		x	x	x	Emergency collector temperature 1
EM1							x				Emergency collector temperature 1
OCX	x	x	x	x	x	x		x	x	x	Option Collector cooling collector 1
OCX1							x				Option Collector cooling collector 1
CMX	x*	x*	x*	x*	x*	x*		x*	x*	x*	Maximum collector temperature 1
CMX1							x*				Maximum collector temperature 1
OCN	x	x	x	x	x	x		x	x	x	Option min. limitation collector 1
OCN1							x				Option min. limitation collector 1
CMN	x*	x*	x*	x*	x*	x*		x*	x*		Minimum temperature collector 1
CMN1							x*				Minimum temperature collector 1
OCF	x	x	x	x	x	x		x	x	x	Option antifreeze collector 1
OCF1							x				Option antifreeze collector 1
CFR	x*	x*	x*	x*	x*	x*		x*	x*	x*	Antifreeze temperature collector 1
CFR1							x*				Antifreeze temperature collector1
EM2							x				Emergency temperature collector 2
OCX2							x				Option collector cooling collector 2
CMX2							x*				Maximum temperature collector 2
OCN2							x				Option min. limitation collector 2
CMN2							x*				Minimum temperature collector 2
OCF2							x				Option antifreeze collector 2
CFR2							x*				Antifreeze temperature collector 2

Channel	Arr										Description
	1	2	3	4	5	6	7	8	9	10	
PRIO				x	x	x					Priority
tSP				x	x	x					Stop time
tRUN				x	x	x					Circulation
OREC	x	x	x	x	x	x	x	x	x	x	Option recooling
O TC	x	x	x	x	x	x	x	x	x	x	Option tube collector
DT3O		x					x			x	Switch-on temperature difference 3
DT3F		x					x			x	Switch-off temperature difference 3
DT3S		x					x				Set temperature DT3
RIS3		x					x				Rise DT3
MX3O		x					x				Switch-on step max. temperature
MX3F		x					x				Switch-off step max. temperature
MN3O		x					x				Switch-on step min. temperature
MN3F		x					x				Switch-off step min. temperature
AH O			x							x	Switch-on temperature thermostat
AH F			x							x	Switch-off temperature thermostat
t1 E			x							x	Switch-on time 1 thermostat
t1 A			x							x	Switch-off time 1 thermostat
t2 E			x							x	Switch-on time 2 thermostat
t2 A			x							x	Switch-off time 2 thermostat
t3 E			x							x	Switch-on time 3 thermostat
t3 A			x							x	Switch-off time 3 thermostat
OHQM	x	x	x	x	x	x	x	x	x	x	Option HQM
VIMP	①	①	①	①	①	①	①	①	①	①	Impulse rate flowmeter
MEDT	①	①	①	①	①	①	①	①	①	①	Antifreeze
MED %	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	Antifreeze concentration
CS 10	x	x	x	x	x	x	x	x	x	x	Solar cell
n MN	x			x	x				x		Minimum pump speed relay 1
n1MN		x	x			x	x	x		x	Minimum pump speed relay 1
n2MN						x	x				Minimum pump speed relay 2
n3MN		x						x			Minimum pump speed relay 3
MAN1	x	x	x	x	x	x	x	x	x	x	Manual operation relay 1
MAN2	x	x	x	x	x	x	x	x	x	x	Manual operation relay 2
MAN3	x	x	x	x	x	x	x	x	x	x	Manual operation relay 3
MAN4	x	x	x	x	x	x	x	x	x	x	Manual operation relay 4
MAN5	x	x	x	x	x	x	x	x	x	x	Manual operation relay 5
MAN6	x	x	x	x	x	x	x	x	x	x	Manual operation relay 6
LANG	x	x	x	x	x	x	x	x	x	x	Language
PROG	XX.XX										Programme version
VERS	X.XX										Version

Channel survey: Systems Arr 11 … 20

Channel	Arr										Description
	11	12	13	14		16	17	18	19	20	
COL	x	x	x	x	x	x	x				Collector temperature 1
COL 1								x	x	x	Collector temperature 1
TSTL		x	x	x	x				x	x	Store temperature lower
TST1	x										Store temperature 1 lower
TSTU	x	x	x	x	x	x	x	x	x	x	Store temperature 1 at the top
S4											Store temperature at the middle
TST2	x					x	x	x			Store temperature 2 lower
TFSB			x							x	Temperature solid fuel boiler
TRET				x	x						Temperature heating circuit
COL2								x	x	x	Collector temperature 2
TFL	①	①	①	①	①	①	①	①	①	①	Temperature flow sensor
TRF	①	①	①	①	①	①	①	①	①	①	Temperature return sensor
IRR	x	x	x	x	x	x	x	x	x	x	Solar irradiation intensity
n %				x							Pump speed relay
n1 %	x	x	x		x	x	x	x	x	x	Pump speed relay 1
n2 %							x	x	x	x	Pump speed relay 2
n3%	x	x	x		x	x	x	x	x	x	Pump speed relay 3
hP				x							Hours of operation relay 1
h P1	x	x	x		x	x	x	x	x	x	Hours of operation relay 1
h P2							x	x	x	x	Hours of operation relay 2
h P3	x	x	x		x	x	x	x	x	x	Hours of operation relay 3
FLOW	①	①	①	①	①	①	①	①	①	①	Flow rate
kWh	①	①	①	①	①	①	①	①	①	①	Heat quantity kWh
MWh	①	①	①	①	①	①	①	①	①	①	Heat quantity MWh
TIME	x										Time
Arr	1-36										System
DT O								x	x	x	Switch-on temperature difference
DT1O	x	x	x	x	x	x	x				Switch-on temperature difference 1
DT F								x	x	x	Switch-off temperature difference 1
DT1F	x	x	x	x	x	x	x				Switch-off temperature difference 1
DT S								x	x	x	Set temperature difference
DT1S	x	x	x	x	x	x	x				Set temperature difference 1
RIS								x	x	x	Rise
RIS1	x	x	x	x	x	x	x				Rise 1
S MX								x	x	x	Maximum store temperature 1
S1 MX	x	x	x	x	x	x	x				Maximum store temperature 1
DT2O	x	x	x	x	x	x	x				Switch-on temperature difference 2
DT2F	x	x	x	x	x	x	x				Set temperature difference 2
DT2S	x	x	x	x	x	x	x				Set temperature difference 2
RIS2	x	x	x	x	x	x	x				Rise 2

Channel	Arr										Description
	11	12	13	14		16	17	18	19	20	
S2MX	x	x	x	x	x	x	x				Maximum store temperature 2
EM	x	x	x	x	x	x	x				Emergency collector temperature 1
EM1								x	x	x	Emergency collector temperature 1
OCX	x	x	x	x	x	x	x				Option Collector cooling collector 1
OCX1								x	x	x	Option Collector cooling collector 1
CMX	x*	x*	x*	x*	x*	x*	x*				Maximum collector temperature 1
CMX1								x*	x*	x*	Maximum collector temperature 1
OCN	x	x	x	x	x	x	x				Option min. limitation collector 1
OCN1								x	x	x	Option min. limitation collector 1
CMN	x*	x*	x*	x*	x*	x*	x*				Minimum temperature collector 1
CMN1								x*	x*	x*	Minimum temperature collector 1
OCF	x	x	x	x	x	x	x				Option antifreeze collector 1
OCF1								x	x	x	Option antifreeze collector 1
CFR	x*	x*	x*	x*	x*	x*	x*				Antifreeze temperature collector 1
CFR1								x*	x*	x*	Antifreeze temperature collector1
EM2								x	x	x	Emergency temperature collector 2
OCX2								x	x	x	Option collector cooling collector 2
CMX2								x*	x*	x*	Maximum temperature collector 2
OCN2								x	x	x	Option min. limitation collector 2
CMN2								x*	x*	x*	Minimum temperature collector 2
OCF2								x	x	x	Option antifreeze collector 2
CFR2								x*	x*	x*	Antifreeze temperature collector 2
PRIO	x	x	x	x	x	x	x				Priority
tSP	x	x	x	x	x	x	x				Stop time
tRUN	x	x	x	x	x	x	x				Circulation
OREC	x	x	x	x	x	x	x	x	x	x	Option recooling
O TC	x	x	x	x	x	x	x	x	x	x	Option tube collector
DT3O	x		x	x	x	x	x	x		x	Switch-on temperature difference 3
DT3F	x		x	x	x	x	x	x		x	Switch-off temperature difference 3
DT3S	x		x			x	x	x		x	Set temperature DT3
RIS3	x		x			x	x	x		x	Rise DT3
MX3O	x		x			x	x	x		x	Switch-on step max. temperature
MX3F	x		x			x	x	x		x	Switch-off step max. temperature
MN3O	x		x			x	x	x		x	Switch-on step min. temperature
MN3F	x		x			x	x	x		x	Switch-off step min. temperature
AH O		x			x				x		Switch-on temperature thermostat
AH F		x			x				x		Switch-off temperature thermostat
t1 E		x			x				x		Switch-on time 1 thermostat
t1 A		x			x				x		Switch-off time 1 thermostat

Channel	Arr										Description
	11	12	13	14	15	16	17	18	19	20	
t2 E		x			x				x		Switch-on time 2 thermostat
t2 A		x			x				x		Switch-off time 2 thermostat
t3 E		x			x				x		Switch-on time 3 thermostat
t3 A		x			x				x		Switch-off time 3 thermostat
OHQM	x	x	x	x	x	x	x	x	x	x	Option HQM
VIMP	①	①	①	①	①	①	①	①	①	①	Impulse rate flowmeter
MEDT	①	①	①	①	①	①	①	①	①	①	Antifreeze
MED %	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	Antifreeze concentration
CS 10	x	x	x	x	x	x	x	x	x	x	Solar cell
n MN				x							Minimum pump speed relay 1
n1MN	x	x	x		x	x	x	x	x	x	Minimum pump speed relay 1
n2MN							x	x	x	x	Minimum pump speed relay 2
n3MN	x		x			x	x	x		x	Minimum pump speed relay 3
MAN1	x	x	x	x	x	x	x	x	x	x	Manual operation relay 1
MAN2	x	x	x	x	x	x	x	x	x	x	Manual operation relay 2
MAN3	x	x	x	x	x	x	x	x	x	x	Manual operation relay 3
MAN4	x	x	x	x	x	x	x	x	x	x	Manual operation relay 4
MAN5	x	x	x	x	x	x	x	x	x	x	Manual operation relay 5
MAN6	x	x	x	x	x	x	x	x	x	x	Manual operation relay 6
LANG	x	x	x	x	x	x	x	x	x	x	Language
PROG	XX.XX										Programme version
VERS	X.XX										Version

Channel survey: Systems Arr 21 … 30

Channel	Arr										Description
	21	22	23	24	25	26	27	28	29	30	
COL											Collector temperature 1
COL 1	x	x	x	x	x	x	x	x	x	x	Collector temperature 1
TSTL	x	x	x		x	x	x	x			Store temperature lower
TST1									x	x	Store temperature 1 lower
TSTU	x	x	x	x	x	x	x	x	x	x	Store temperature 1 at the top
S4											Store temperature at the middle
TST2									x	x	Store temperature 2 lower
TFSB						x					Temperature solid fuel boiler
TRET	x	x					x	x			Temperature heating circuit
COL2	x	x	x	x	x	x	x	x	x	x	Collector temperature 2
TFL	①	①	①	①	①	①	①	①	①	①	Temperature flow sensor
TRF	①	①	①	①	①	①	①	①	①	①	Temperature return sensor
IRR	x	x	x	x	x	x	x	x	x	x	Solar irradiation intensity
n %											Pump speed relay
n1 %	x	x	x	x	x	x	x	x	x	x	Pump speed relay 1
n2 %	x	x	x	x	x	x	x	x	x	x	Pump speed relay 2
n3%		x		x	x	x		x		x	Pump speed relay 3
hP											Hours of operation relay 1
h P1	x	x	x	x	x	x	x	x	x	x	Hours of operation relay 1
h P2	x	x	x	x	x	x	x	x	x	x	Hours of operation relay 2
h P3	x	x		x	x	x		x		x	Hours of operation relay 3
FLOW	①	①	①	①	①	①	①	①	①	①	Flow rate
kWh	①	①	①	①	①	①	①	①	①	①	Heat quantity kWh
MWh	①	①	①	①	①	①	①	①	①	①	Heat quantity MWh
TIME	x										Time
Arr	1-36										System
DT O	x	x									Switch-on temperature difference
DT1O			x	x	x	x	x	x	x	x	Switch-on temperature difference 1
DT F	x	x									Switch-off temperature difference 1
DT1F			x	x	x	x	x	x	x	x	Switch-off temperature difference 1
DT S	x	x									Set temperature difference
DT1S			x	x	x	x	x	x	x	x	Set temperature difference 1
RIS	x	x									Rise
RIS1			x	x	x	x	x	x	x	x	Rise 1
S MX	x	x							x		Maximum store temperature 1
S1 MX			x	x	x	x	x	x	x	x	Maximum store temperature 1
DT2O			x	x	x	x	x	x	x	x	Switch-on temperature difference 2

Channel	Arr										Description
	21	22	23	24	25	26	27	28	29	30	
DT2F			x	x	x	x	x	x	x	x	Set temperature difference 2
DT2S			x	x	x	x	x	x	x	x	Set temperature difference 2
RIS2			x	x	x	x	x	x	x	x	Rise 2
S2MX			x	x	x	x	x	x	x	x	Maximum store temperature 2
EM											Emergency collector temperature 1
EM1	x	x	x	x	x	x	x	x	x	x	Emergency collector temperature 1
OCX											Option Collector cooling collector 1
OCX1	x	x	x	x	x	x	x	x	x	x	Option Collector cooling collector 1
CMX											Maximum collector temperature 1
CMX1	x*	x*	x*	x*	x*	x*	x*	x*	x*	x*	Maximum collector temperature 1
OCN											Option min. limitation collector 1
OCN1	x	x	x	x	x	x	x	x	x	x	Option min. limitation collector 1
CMN											Minimum temperature collector 1
CMN1	x*	x*	x*	x*	x*	x*	x*	x*	x*	x*	Minimum temperature collector 1
OCF											Option antifreeze collector 1
OCF1	x	x	x	x	x	x	x	x	x	x	Option antifreeze collector 1
CFR											Antifreeze temperature collector 1
CFR1	x*	x*	x*	x*	x*	x*	x*	x*	x*	x*	Antifreeze temperature collector1
EM2	x	x	x	x	x	x	x	x	x	x	Emergency temperature collector 2
OCX2	x	x	x	x	x	x	x	x	x	x	Option collector cooling collector 2
CMX2	x*	x*	x*	x*	x*	x*	x*	x*	x*	x*	Maximum temperature collector 2
OCN2	x	x	x	x	x	x	x	x	x	x	Option min. limitation collector 2
CMN2	x*	x*	x*	x*	x*	x*	x*	x*	x*	x*	Minimum temperature collector 2
OCF2	x	x	x	x	x	x	x	x	x	x	Option antifreeze collector 2
CFR2	x*	x*	x*	x*	x*	x*	x*	x*	x*	x*	Antifreeze temperature collector 2
PRIO			x	x	x	x	x	x	x	x	Priority
tSP			x	x	x	x	x	x	x	x	Stop time
tRUN			x	x	x	x	x	x	x	x	Circulation
OREC	x	x	x	x	x	x	x	x	x	x	Option recooling
O TC	x	x	x	x	x	x	x	x	x	x	Option tube collector
DT3O	x	x		x		x	x	x			Switch-on temperature difference 3
DT3F	x	x		x		x	x	x		x	Switch-off temperature difference 3
DT3S				x		x				x	Set temperature DT3
RIS3				x		x				x	Rise DT3
MX3O				x		x				x	Switch-on step max. temperature
MX3F				x		x				x	Switch-off step max. temperature
MN3O				x		x				x	Switch-on step min. temperature

en

Channel	Arr										Description
	21	22	23	24	25	26	27	28	29	30	
MN3F				x		x				x	Switch-off step min. temperature
AH O		x			x			x			Switch-on temperature thermostat
AH F		x			x			x			Switch-off temperature thermostat
t1 E		x			x			x			Switch-on time 1 thermostat
t1 A		x			x			x			Switch-off time 1 thermostat
t2 E		x			x			x			Switch-on time 2 thermostat
t2 A		x			x			x			Switch-off time 2 thermostat
t3 E		x			x			x			Switch-on time 3 thermostat
t3 A		x			x			x			Switch-off time 3 thermostat
OHQM	x	x	x	x	x	x	x	x	x	x	Option HQM
VIMP	①	①	①	①	①	①	①	①	①	①	Impulse rate flowmeter
MEDT	①	①	①	①	①	①	①	①	①	①	Antifreeze
MED %	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	Antifreeze concentration
CS 10	x	x	x	x	x	x	x	x	x	x	Solar cell
n MN											Minimum pump speed relay 1
n1MN	x	x	x	x	x	x	x	x	x	x	Minimum pump speed relay 1
n2MN	x	x	x	x	x	x	x	x	x	x	Minimum pump speed relay 2
n3MN				x		x				x	Minimum pump speed relay 3
MAN1	x	x	x	x	x	x	x	x	x	x	Manual operation relay 1
MAN2	x	x	x	x	x	x	x	x	x	x	Manual operation relay 2
MAN3	x	x	x	x	x	x	x	x	x	x	Manual operation relay 3
MAN4	x	x	x	x	x	x	x	x	x	x	Manual operation relay 4
MAN5	x	x	x	x	x	x	x	x	x	x	Manual operation relay 5
MAN6	x	x	x	x	x	x	x	x	x	x	Manual operation relay 6
LANG	x	x	x	x	x	x	x	x	x	x	Language
PROG	XX.XX										Programme version
VERS	X.XX										Version

Channel survey: Systems Arr 30 … 36

Channel	Arr						Description
	31	32	33	34	35	36	
COL	x	x	x	x	x	x	Collector temperature 1
COL 1							Collector temperature 1
TSTL	x	x	x	x	x	x	Store temperature lower
TST1							Store temperature 1 lower
TSTU	x	x	x	x	x	x	Store temperature 1 at the top
S4							Store temperature at the middle
TST2		x	x	x	x	x	Store temperature 2 lower
TFSB							Temperature solid fuel boiler
TRET	x	x	x	x	x	x	Temperature heating circuit
COL2							Collector temperature 2
TFL	①						Temperature flow sensor
TRF	①						Temperature return sensor
IRR	x						Solar irradiation intensity
n %							Pump speed relay
n1 %	x						Pump speed relay 1
n2 %		x	x	x	x	x	Pump speed relay 2
n3%	x						Pump speed relay 3
hP							Hours of operation relay 1
h P1	x	x	x	x	x	x	Hours of operation relay 1
h P2		x	x	x	x	x	Hours of operation relay 2
h P3	x	x		x	x	x	Hours of operation relay 3
FLOW	①	①	①	①	①	①	Flow rate
kWh	①	①	①	①	①	①	Heat quantity kWh
MWh	①	①	①	①	①	①	Heat quantity MWh
TIME	x						Time
Arr	1-36						System
DT O	x	x					Switch-on temperature difference
DT1O			x	x	x	x	Switch-on temperature difference 1
DT F	x	x					Switch-off temperature difference 1
DT1F			x	x	x	x	Switch-off temperature difference 1
DT S	x	x					Set temperature difference
DT1S			x	x	x	x	Set temperature difference 1
RIS	x	x					Rise
RIS1			x	x	x	x	Rise 1
S MX	x	x					Maximum store temperature 1
S1 MX			x	x	x	x	Maximum store temperature 1

Channel	Arr						Description
	31	32	33	34	35	36	
DT2O			x	x	x	x	Switch-on temperature difference 2
DT2F			x	x	x	x	Set temperature difference 2
DT2S			x	x	x	x	Set temperature difference 2
RIS2			x	x	x	x	Rise 2
S2MX			x	x	x	x	Maximum store temperature 2
EM	x						Emergency collector temperature 1
NOT1		x	x	x	x	x	Emergency collector temperature 1
OCX	x	x	x				Option Collector cooling collector 1
OCX1				x	x	x	Option Collector cooling collector 1
CMX	x*	x*	x*				Maximum collector temperature 1
CMX1				x*	x*	x*	Maximum collector temperature 1
OCN	x	x	x				Option min. limitation collector 1
OCN1				x	x	x	Option min. limitation collector 1
CMN	x*	x*	x*				Minimum temperature collector 1
CMN1				x*	x*	x*	Minimum temperature collector 1
OCF	x	x	x				Option antifreeze collector 1
OCF1				x	x	x	Option antifreeze collector 1
CFR	x*	x*	x*				Antifreeze temperature collector 1
CFR1				x*	x*	x*	Antifreeze temperature collector1
EM2				x	x	x	Emergency temperature collector 2
OCX2				x	x	x	Option collector cooling collector 2
CMX2				x*	x*	x*	Maximum temperature collector 2
OCN2				x	x	x	Option min. limitation collector 2
CMN2				x*	x*	x*	Minimum temperature collector 2
OCF2				x	x	x	Option antifreeze collector 2
CFR2				x*	x*	x*	Antifreeze temperature collector 2
PRIO	x	x	x		x	x	Priority
tSP	x	x	x		x	x	Stop time
tRUN	x	x	x		x	x	Circulation
OREC	x	x	x	x	x	x	Option recooling
O TC	x	x	x	x	x	x	Option tube collector
DT3O	x	x	x	x	x	x	Switch-on temperature difference 3
DT3F	x	x	x	x	x	x	Switch-off temperature difference 3
DT3S	x					x	Set temperature DT3
RIS3	x					x	Rise DT3

Channel	Arr						Description
	31	32	33	34	35	36	
MX3O	x					x	Switch-on step max. temperature
MX3F	x					x	Switch-off step max. temperature
MN3O	x					x	Switch-on step min. temperature
MN3F	x					x	Switch-off step min. temperature
AH O			x	x			Switch-on temperature thermostat
AH F			x	x			Switch-off temperature thermostat
t1 E			x	x			Switch-on time 1 thermostat
t1 A			x	x			Switch-off time 1 thermostat
t2 E			x	x			Switch-on time 2 thermostat
t2 A			x	x			Switch-off time 2 thermostat
t3 E			x	x			Switch-on time 3 thermostat
t3 A			x	x			Switch-off time 3 thermostat
OHQM	x	x	x	x	x	x	Option HQM
VIMP	①	①	①	①	①	①	Impulse rate flowmeter
MEDT	①	①	①	①	①	①	Antifreeze
MED %	MEDT	MEDT	MEDT	MEDT	MEDT	MEDT	Antifreeze concentration
CS 10	x	x	x	x	x	x	Solar cell
n MN		x					Minimum pump speed relay 1
n1MN	x		x	x	x	x	Minimum pump speed relay 1
n2MN				x	x	x	Minimum pump speed relay 2
n3MN	x					x	Minimum pump speed relay 3
MAN1	x	x	x	x	x	x	Manual operation relay 1
MAN2	x	x	x	x	x	x	Manual operation relay 2
MAN3	x	x	x	x	x	x	Manual operation relay 3
MAN4	x	x	x	x	x	x	Manual operation relay 4
MAN5	x	x	x	x	x	x	Manual operation relay 5
MAN6	x	x	x	x	x	x	Manual operation relay 6
LANG	x	x	x	x	x	x	Language
PROG	XX.XX						Programme version
VERS	X.XX						Version

4.2 Display channels

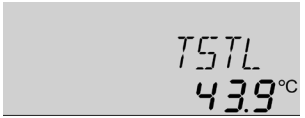
Note

The number and types of display channels depend on the selected system. Only the values necessary for the selected system (Arr 1 … 36, see channel overview pages 10ff) are shown.

4.2.1 Display of collector temperatures

COL, COL1, COL2:
collector temperature
display range: -40 … +250 °C
Displays current collector temperature.
COL: Collector temperature (1-collector-system)
COL1: Collector temperature 1
COL2: Collector temperature 2

4.2.2 Display of store temperatures



TSTL, TSTU, TST1, TST2, S4:
store temperatures
display range: -40 … +250 °C
Displays current store temperature.
TSTL: Store temperature below
TSTU: Store temperature above
TST1: Temperature store 1
TST2: Temperature store 2
S4: Temperature store middle

4.2.3 Display of other temperatures

TFSB, TRET, TRF, TFL:
other measuring temperatures
display range: -40 … +250 °C

Displays current temperature of the corresponding sensor.

TFSB: Temperature solid fuel boiler
TRET: Temperature heating circuit
TRF: Temperature return
TFL: Temperature flow

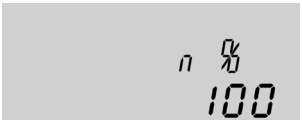
4.2.4 Display of solar irradiation intensity

IRR current irradiation
display range: 0 … 1350W/m²

Displays current solar irradiation intensity.

IRR: solar irradiation intensity

4.2.5 Display of current pump speed

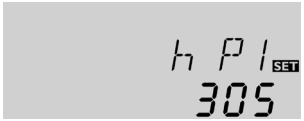


n %, n1 %, n2 %, n3%:
current pump speed
display range: 30 … 100 %

Displays current pump speed of the corresponding pump.

n %: current pump speed (1-pump-system)
n1 %: current pump speed of pump 1
n2 %: current pump speed of pump 2
n3 %: current pump speed of pump 3

4.2.6 Operating hours counter



h P / h P1 / h P2 / h P3:
operating hours counter
display channel

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

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

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

4.2.7 Flow rate

FLOW: Flow rate
display range: 0.00 … 99.99 m³/h

The flow rate of the solar system measured by the V40 to determine the heat quantity delivered.

4.3 Adjustment channels

Note

The number and types of adjustment channels depend on the selected system. Only the values necessary for the selected system (Arr 1 … 36, see channel overview from page 10 ff) can be modified.

4.3.1 Heat quantity measurement

OHQM:
Heat quantity measurement
adjustment range: OFF, ON
factory setting: OFF

MEDT: Type of antifreeze
adjustment range: 0 … 3
factory setting: "1"

Antifreeze type:

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

MED%: Content of antifreeze in (Vol-) %
MED% is hidden at MEDT "0" and "3"
adjustment range: 20 … 70
factory setting: 45

kWh/MWh: Heat quantity in kWh / MWh
display channel

FIMP: Volume per impulse
adjustment range: 1 … 99
factory setting: 1

Heat quantity measurement is possible if a flowmeter is used. For this purpose, the heat quantity measurement option (**OHQM)** has to be enabled.

The flow rate is measured at V40 (see display channel VSTR). Antifreeze type and concentration of the heat transfer medium have to be adjusted in the channels **MEDT** and **MED%.**

The flow rate as well as the reference sensors S7 (flow) S8 (return) are used for calculating the heat quantity supplied. It is shown in kWh in the channel **kWh** and in MWh in the channel **MWh**. The overall heat quantity results from the sum of both values.

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

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

Note
You can find the l/imp of your flowmeter printed on a flag that is attached to its cable.

IRR: Solar irradiation intensity in W/m²
Display channel

CS10: Solar cell
adjustment range: 1 … 10
factory setting: 5
The current solar irradiation intensity is measured in W/m² by the sensor CS10.

The sensor is available in different types (see imprint on packaging) and must be adjusted in channel CS10 with the corresponding code number (see commissioning). The current irradiation is now shown in channel **SOL.**

Type	Indicator
A	1
B	2
C	3
D	4
E	5
F	6
G	7
H	8
I	9
K	10

4.3.2 ΔT-regulation

DT O/**DT1O**/**DT2O**/**DT3O**:
switch-on temp.diff.
adjustment range: 1.0 … 20.0 K
factory setting: 6.0

DT F/**DT1F**/**DT2F**/**DT3F**:
switch-off temp.- diff.
adjustmentrange: 0.5 … 19.5 K
factory setting: 4.0 K

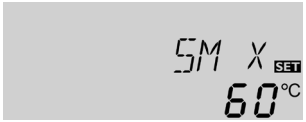
DT S/**DT1S**/**DT2S**/**DT3S**:
nominal temp. diff.
adjustment range: 1.5 … 30.0 K
factory setting: 10.0

RIS/**RIS1**/**RIS2**/**RIS3**:
rise
adjustment range: 1 … 20 K
factory setting: 2 K

First the controller works as a standard differential controller. If the switch-on difference (**DT O**/**DT1O**/**DT2O**) is reached, the pump is activated at full speed for 10 seconds. The speed is then reduced to the minimum pump speed value (nMN / nMN1 / nMN2 = 30 %). If the temperature difference reaches the adjusted set value (**DT S**/**DT1S**/**DT2S**/**DT3S**), the pump speed increases by one step (10%). If the difference increases by 2 K (**RIS**/**RIS1**/**RIS2**/**RIS3**), the pump speed increases by 10% respectively until the maximum pump speed of 100% is reached. The response of the controller can be adapted via the parameter „Rise". If the temperature difference falls below the adjusted switch-off temperature difference (**DT F**/**DT1F**/**DT2F**), the controller switches off.
DT O and **DT S** are locked against each other. **DT S** must be at least 0,5 K higher than **DT O**.

Note
The switch-on temperature difference must be at least 1 K higher than the switch-off temperature difference.

4.3.3 Maximum store temperature



S MX/**S1MX**/**S2MX**:
maximum store temp.
adjustment range: 2 … 95 °C
factory setting: 60 °C
Once the adjusted maximum temperature is exceeded, the solar pump is switched off and further loading of the store is prevented to reduce scald risk or system damage. The ✷ symbol is shown on the display.

Note
The controller is also equipped with a non-adjustable emergency switch-off if the store reaches 95 °C. The reference sensor is S2 (or S3 for two store systems).

4.3.4 ΔT-regulation (solid fuel boiler and heat exchange)

Maximum temperature limitation

MX3O:
maximum temperature limitation
adjustment range: 0.0 … 95.0 °C
factory setting: 60.0 °C

MX3F:
maximum temperature limitation
adjustment range: 0.0 … 95.0 °C
factory setting: 58.0 °C

The controller is equipped with an independent temperature differential regulation for which minimum and maximum temperature limitations as well as corresponding switch-on and -off temperatures can be separately adjusted. Only possible for Arr = 2, 8, 11, 13, 16, 17, 18, 20, 24, 26 and 30 (e.g. for solid fuel boilers or heat exchange regulation.)
If **MX3O** is exceeded, relay 2 is switched off until the sensor falls below **MX3F.**
Reference sensor for this function:
S3 at Arr 8, 13, 20, 26 (TSTU)
S4 at Arr 2, 11, 16, 17, 18, 24, 30 (TST2, TFSB)

If the sensor temperature falls below **MN3O**, relay 3 is switched off until the temperature exceeds **MN3F**.
Reference sensor for this function:
S4 at Arr 8, 13, 20, 26 (TST2, TFSB)
S3 at Arr 2, 11, 16, 17, 18, 24, 30 (TSTU)
Both switch-on and switch-off temperature differences **DT3O** and **DT3F** are valid for the maximum and minimum temperature limitation.

Minimum temperature limitation

MN3O:
minimum temperature limitation
adjustment range: 0.0 … 90.0 °C
factory setting: Arr = 2: 5.0 °C
Arr = 8: 60.0 °C

MN3F:
minimum temperature limitation
adjustment range: 0.0 … 90.0 °C
factory setting: Arr = 2: 10.0 °C
Arr = 8: 65.0 °C

4.3.5 Collector limit temperature collector emergency shutdown

EM EM1 / EM2:
collector limit temperature
adjustment range: 110 … 200 °C
factory setting: 140 °C
If the adjusted collector limit temperature (**EM** / **EM1** / **EM2**) is exceeded the solar pump (R1 / R2) is deactivated in order to avoid a damaging overheating of the solar components (collector emergency shutdown). The limit temperature is set to 140 °C by but it can be changed within the adjustment range of 110 … 200 °C. The symbol ⚠ is shown on the display (flashing).

4.3.6 System cooling

OCX / OCX1 / OCX2:
option system cooling
adjustment range: OFF, ON
factory setting: OFF

CMX / CMX1 / CMX2:
collector maximum temperature
adjustment range: 100 … 190 °C
factory setting: 120 °C

When the adjusted maximum store temperature is reached, the system stagnates. If the collector temperature increases to the adjusted maximum collector temperature (**CMX / CMX1 / CMX2**), the solar pump is activated until the collector temperature falls below the maximum collector temperature. The store temperature may increase (subordinate active maximum store temperature), but only up to 95 °C (emergency shutdown of the store). If the store temperature is higher than the maximum store temperature (**S MX / S1MX / S2MX**) and if the collector temperature is at least 5 K below the store temperature, the solar system remains activated until the store is cooled down below the adjusted maximum temperature (**S MX / S1MX / S2MX**) via the collector and the pipework.

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

4.3.7 Option minimum collector limitation

OCN / OCN1 / OCN2:
minimum collector limitation
adjustment range: OFF, ON
factory setting: OFF

CMN / CMN1 / CMN2:
minimum collector temperature
adjustment range: 10 … 90 °C
factory setting: 10 °C

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

4.3.8 Option antifreeze function

OCF / OCF1 / OCF2:
antifreeze function
adjustment range: OFF, ON
factory setting: OFF

CFR / CFR1 / CFR2:
antifreeze temperature
adjustment range: -10 … +10 °C
factory setting: 4.0 °C

The antifreeze function activates the loading circuit between collector and store if the adjusted antifreeze function is under-run in order to protect the medium from freezing or coagulating. If the adjusted frost protection temperature is exceeded by 1 °C, the loading circuit will be deactivated.

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

4.3.9 Store sequence control

Respective adjustment values:

	Factory setting	Adjustment range
Priority [PRIO]	1 (2 / Layer store)	0-2
oscillating break-time [tSP]	2 min.	1-30 min.
oscillating charge time [tRUN]	15 min.	1-30 min.

DeltaSol® ES **priority logic:**

The above-mentioned options and parameters are used in multi-store systems only.

PRIO 0: in 2-store systems with pump logic (e.g. Arr 6 and 17) if possible, parallel loading is effected; in 2-store systems with valve logic (e.g. Arr 5) loading is effected in numerical order.

PRIO 1: priority loading of store 1
PRIO 2: priority loading of store 2

Priority:

Loading break time / store sequence control / collector rise temperature

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

4.3.10 Recooling function

OREC:
option recooling
adjustment range: OFF, ON
factory setting: OFF

If the adjusted maximum store temperature (SMAX, S1MX, S2MX) is reached, the solar pump remains activated in order to avoid an overheating of the collector. The store temperature might continue to increase but only up to 95 °C (emergency shut-down of the store). In the evening the solar system continues running until the store is cooled down to the adjusted maximum store temperature via collector and pipes.

4.3.11 Tube collector function

O TC:
tube collector function
adjustment range: OFF, ON
factory setting: OFF

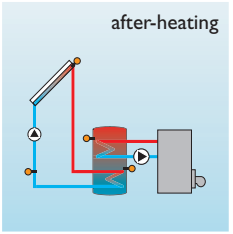
This function helps overcome the non-ideal sensor position with some tube collectors.

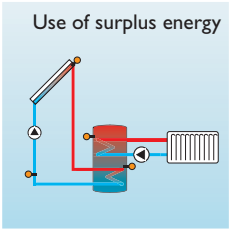
This function operates within a given time frame (06:00 - 22:00 o'clock). It activates the collector circuit pump for 30 seconds every 30 minutes in order to compensate for the delayed temperature measurement.

The collector circuit pump is operated at 100 % speed for 10 seconds, then at 30 % speed for another 20 seconds.

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

4.3.12 Thermostat function





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

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

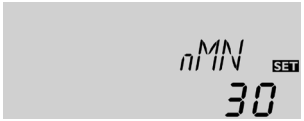
AH O:
thermostat-switch-on temperature
adjustment range: 0.0 … 95.0 °C
factory setting: 40.0 °C

AH F:
thermostat-switch-off temperature
adjustment range: 0,0 … 95.0 °C
factory setting: 45.0 °C

t1 O, t2 O, t3 O:
thermostat switch-on time
adjustment range: 00:00 … 23:45
factory setting: 00:00

t1 F, t2 F, t3 F:
thermostat switch-off time
adjustment range: 00:00 … 23:45
factory setting: 00:00

4.3.13 Pump speed control



nMN, **n1MN**, **n2MN, n3MN:**
minimum pump speed control
adjustment range: 30 … 100
factory setting: 30

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

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

A relative minimum pump speed is specified for pumps connected at the outputs R1 and R2 via adjustment channels **nMN, n1MN** and **n2MN**.

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

4.3.14 Operating mode

MAN1, MAN2, MAN3, MAN4, MAN5, MAN6:
operating mode
adjustment range: OFF, AUTO, ON
factory setting: AUTO
For control- and service work the operating mode of the controller can be manually adjusted by selecting the adjustment value MAN1 - 6, in which the following adjustments can be made:

- **MAN1, MAN2, MAN3, MAN4, MAN5, MAN6**
  Operating mode
  OFF : relay off ⚠ (flashing) + 🔧
  AUTO : relay in automatic operation
  ON : relay on ⚠ (flashing) + 🔧

Channel	Relay
HNDx	1-6

4.3.15 Language (LANG)

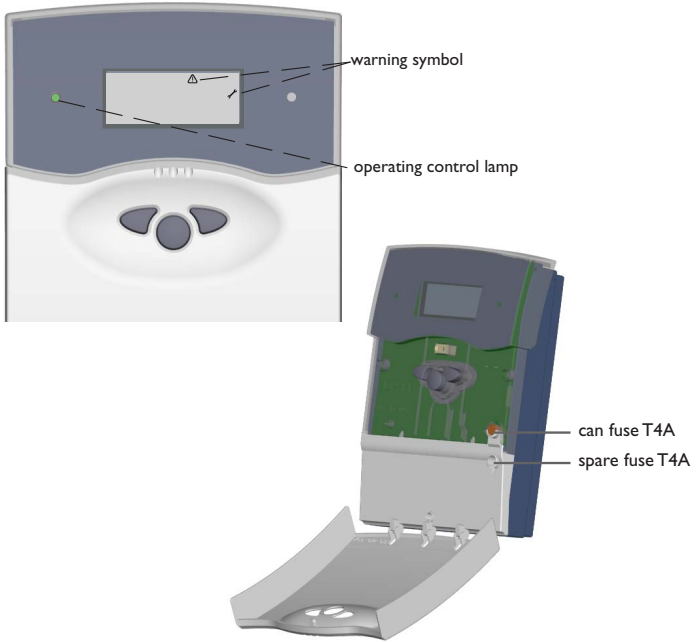
LANG:
adjustment of language
adjustment range: dE, En, It, Fr
factory setting: dE

The menu language can be adjusted in this channel.

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

5 Troubleshooting

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



Operating control lamp off.

Check the power supply. Is it disconnected?

- no → The fuse of the controller could be blown. It can be replaced after the front cover has been removed (spare fuse is enclosed in the accessory bag).
- yes → Check the supply line and reconnect it.

Operating control lamp flashes red. The symbol and the ⚠ are shown.

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

- **888.8** → Cable is broken. Check the cable.
- **-88.8** → Short-circuit. Check the cable.

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

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

Resistance values of the Pt1000-sensors

Pump is overheated, but no heat transfer from the colle- ctor to the store, flow and return have the same tempe- rature; perhaps also bubble in the lines

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

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

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

Pump starts up very late.

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

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

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

Stores cool down at night.

Does the collector circuit pump run in the night?
- no
- yes → Check controller.

At night, the collector temperature is higher than the outdoor temperature.
- no
- yes → Check the non-return valve in flow and return pipe with regard to the 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 flow upwards?
- no
- yes → Change connection and let the water flow sidewards or through a siphon (bow downwards); less store losses now?
  - no
  - yes → o.k.

Does warm water 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 → a
- no → Check whether the pumps of the after-heating circuit runs at night, check non-return valve; problem solved?
  - no → b

a

Check the non-return valve in warm water circulation- o.k.
- yes
- no → Clean or replace

The gravity circulation in the circulation line is too strong; insert a stronger valve in non-return valve or an electric 2-port valve behind the circulation pump; in pump operation, the 2-port valve is open, otherwise it is closed, conect pump and 2-port valve in parallel; activate circulation again!

b

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

The solar circuit pump does not run although the collector is significantly warmer than the store.

Does the operating control lamp flash?
- yes
- no → 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 to high; choose a value which makes more sense.

Is the pump current released by the controller?
- no
- yes → Is the pump stuck?
  - yes → Turn the pump shaft using a screwdriver; now passable?
    - no → Pump is defective - replace it

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

6 Accessories

Sensors

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

Overvoltage protection device

In order to avoid overvoltage damage at collector sensors (e.g. caused by local lightning storms), we recommend in- stalling the overvoltage protection RESOL SP1.

Flowmeter RESOL V40

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

RESOL ServiceCenter Software

The controller data can be read out for visualising and monitoring the system state. The software is availabe for free download at www.resol.com

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.

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Important note

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

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

Note

The design and the specifications can be changed without notice.

The illustrations may differ from the original product.

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