RESOL DeltaSol® BS

Mounting
Connection
Handling
Fault localization
Examples

COL
128.5℃

DeltaSol® BS

DeltaSol® BS

Thanks for buying a RESOL.
Read this manual carefully to get the best perfomance from this unit.

DeltaSol® BS

RESOL®

Contents

Safety regulations:

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

DIN 4757, part 1
Solar heating systems with water and water mixtures as heat transfer medium; Demands to the safety realization.
DIN 4757, part 2
Solar heating systems with organic heat transfer medium; Demands to safety realization.
DIN 4757, part 3
Solar heating systems; solar collectors; Meanings; safety regulations; Testing of standstil temperature
DIN 4757, part 4
Solar thermal systems; solar collectors; determination of efficiency, heat capacity and pressure loss.
In addition to that European standards are worked out:
PrEN 12975-1
Thermal solar systems and their components; collectors, part 1: General demands.
PrEN 12975-2
Thermal solar systems and their components; collectors; part 2: Test processes
PrEN 12976-1
Thermal solar systems and their components; prefabricated systems, part 1: General demands.
PrEN 12976-2
Thermal solar systems and their components; prefabricated systems, part 2: Test processes
PrEN 12977-1
Thermal solar systems and their components; Customer-designed manufactured systems, part 1: General demands.
PrEN 12977-2
Thermal solar systems and their components; Customer-designed manufactured systems, part 2: Test processes
PrEN 12977-3
Thermal solar systems and their components; Customer-designed manufactured systems, part 3: Performance test of warm water stores.

Reprinting / copying

Important notice:

DeltaSol® BS

RESOL®

- **system-monitoring-display**

- **up to 4 temperature sensors Pt1000**

- **heat balancing**

- **function control**

- **user-friendly operation by simple handling**

- **pump speed control, solar operating hours counter and thermostat function optionally**
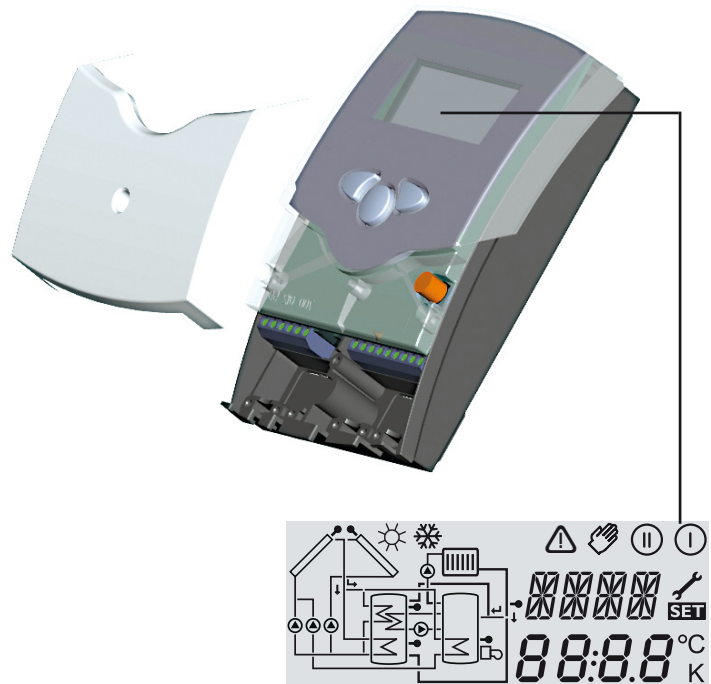
Scope of delivery:

1 x DeltaSol® BS

1 x accessory bag
    1 x spare fuse T4A
    2 x screws and dowels
    4 x strain relief and screws
    1 x condenser 4,7 nF

Additionally enclosed in the full kit:
    1 x sensor FKP6
    2 x sensor FRP6

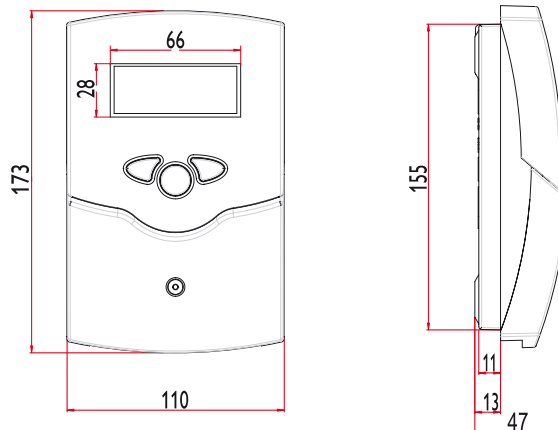| Controller version PG	Semiconductor relay	Standard relais	Operation hours counter	Speed control	Thermostat function	Heat balancing
66.30	0	1	yes	no	no	yes
67.30	1	0	yes	yes	no	yes
68.30	0	2	yes	no	yes	yes
69.30	1	1	yes	yes	yes	yes

Technical data

Housing:
plastic, PC-ABS and PMMA

Protection type: IP 20 / DIN 40050

Environmental temp.: 0 ... 40 °C

Size: 172 x 110 x 46 mm

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

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

Operation: by 3 pushbuttons in the front of the housing

Functions: Temperature differential controller with optional add-on system funtcions. Function control according to BAW-guidelines, operating hours counter for solar pump, tube collector special function, pump speed control (PG 67.30 and PG 69.30) as well as heat quantity balancing.

Inputs: for 4 temperature sensors Pt1000

Outputs: depending on version, see survey „controller versions"

Power supply:
210 ... 250V~

Total power supply:
4 (2) A 250 V~

Mode of operation:
Typ 1.b (version 66.30, 68.30)
Typ 1.y (version 67.30, 69.30)

Breaking capacity per relay:
semi-conductor relay:
1,6 (1) A 250 V~
electromechanical relay:
4 (2) A 250 V~

CE

3 |

RESOL®

1.2.1 Allocation of clamps for system 1

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

Arr 1
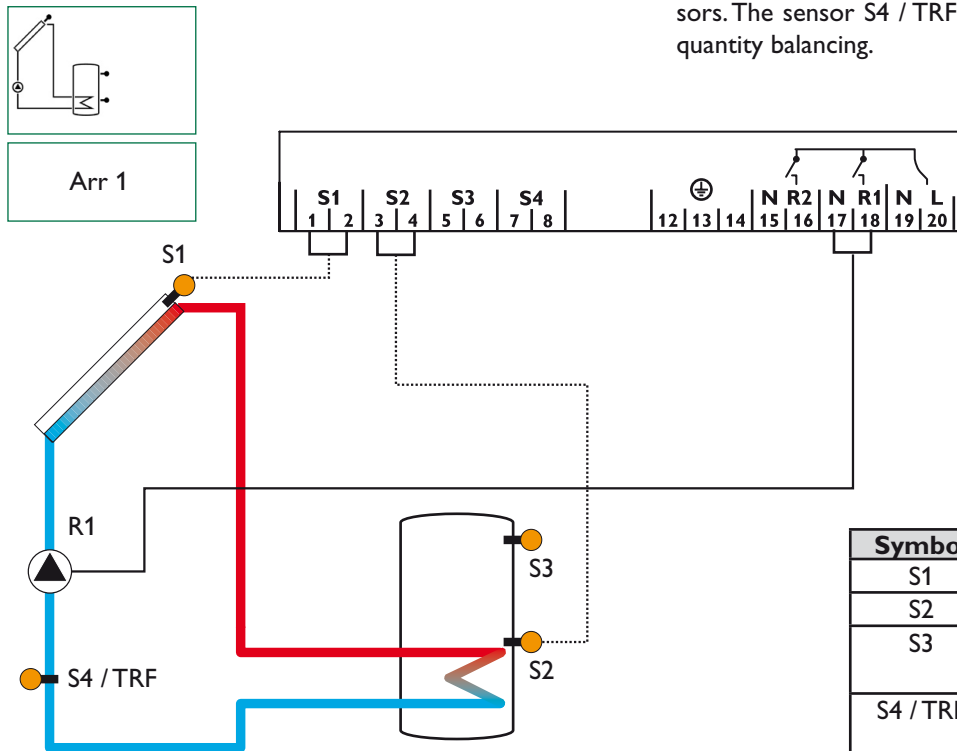
Symbol	Specification
S1	Collector sensor
S2	Store sensor below
S3	Store sensor at the top (optionally)
S4 / TRF	Sensor for heat quantity measurement (optionally)
R1	Solar pump

1.2.2 Allocation of clamps for system 2
(PG 68.30 and PG 69.30)

Solars ystem and after-heating with 1 store, 3 sensors and after-heating. The sensor S4 / TRF can optionally be used for heat quantity balancing.

Arr 2
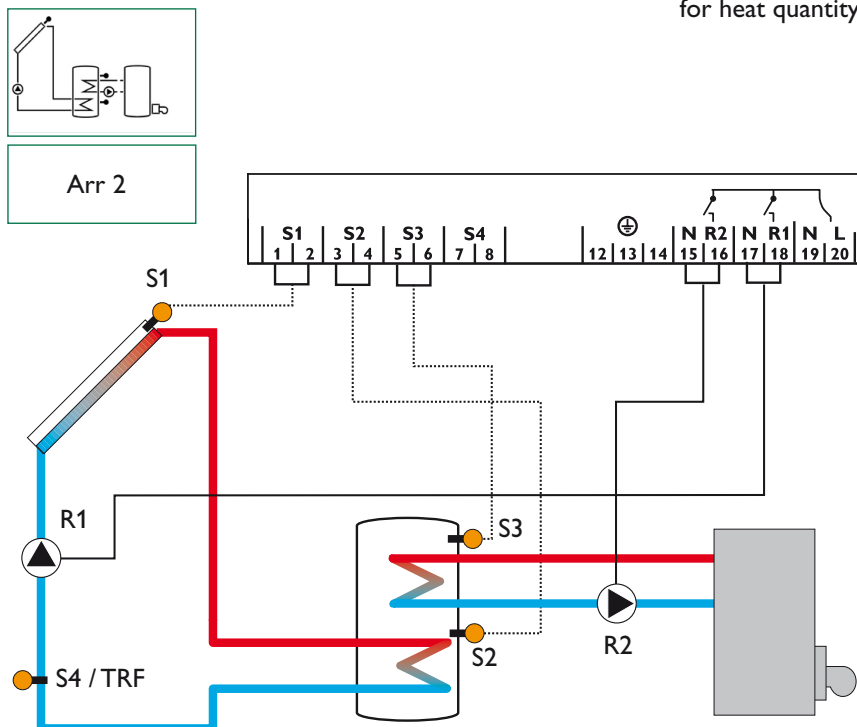
Symbol	Specification
S1	collector sensor
S2	store sensor below
S3	store sensor at the top
S4 / TRF	sensor for heat quantity balancing (optionally)
R1	solar pump
R2	pump for heat exchange

Examples DeltaSol® BS

Standard solar systems

Solar systems with
after-heating
(68.30/69.30)
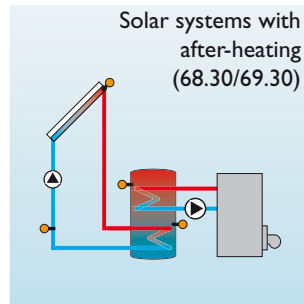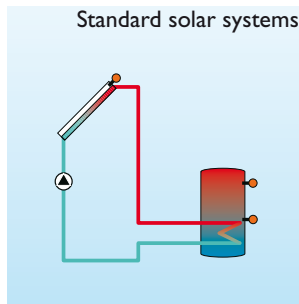
**Please find detailed con-
nection schemes for the
shown systems in chap-
ter 1.**

Order indication

- **Version 66.30: 1 standard relay, operation hours counter**
  RESOL DeltaSol® BS / 1   **115 410 10**
  RESOL DeltaSol® BS / 1 - full kit
  incl. 3 Temperature sensors Pt1000 (1 x FKP6, 2 x FRP6)   **115 410 20**

- **Version 67.30: 1 semiconductor relay, speed control,
  operation hours counter**
  RESOL DeltaSol® BS / 2   **115 410 30**
  RESOL DeltaSol® BS / 2 - full kit
  incl. 3 Temperature sensors Pt1000 (1 x FKP6, 2 x FRP6)   **115 410 40**

- **Version 68.30: 2 standard relay, thermostat function,
  operation hours counter**
  RESOL DeltaSol® BS / 3   **115 420 60**
  RESOL DeltaSol® BS / 3 - full kit
  incl. 3 Temperature sensors Pt1000 (1 x FKP6, 2 x FRP6)   **115 410 70**

- **Version 69.30: 1 standard relay,1 standard relay,
  speed control, operation hours counter, thermostat function**
  RESOL DeltaSol® BS / 4   **115 420 80**
  RESOL DeltaSol® BS / 4 - full kit
  incl. 3 Temperature sensors Pt1000 (1 x FKP6, 2 x FRP6)   **115 420 90**
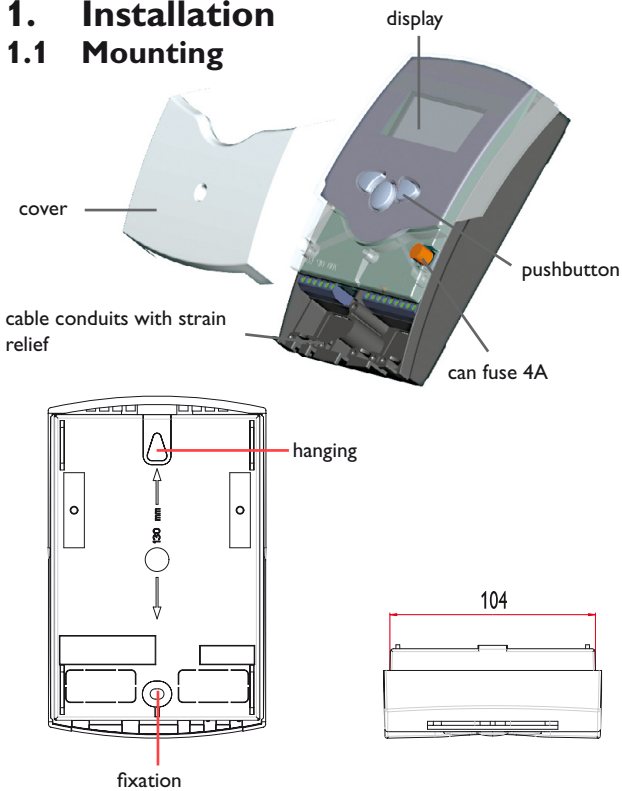
Accessory
Overvoltage protection

It is highly recommended to connect this RESOL overvoltage protection SP1 to all collector
sensors in order to avoid overvoltages (e.g. by lightning).

RESOL SP1   Art.-No.:   **180 110 10**

1. Installation
1.1 Mounting

display

cover

pushbutton

cable conduits with strain relief
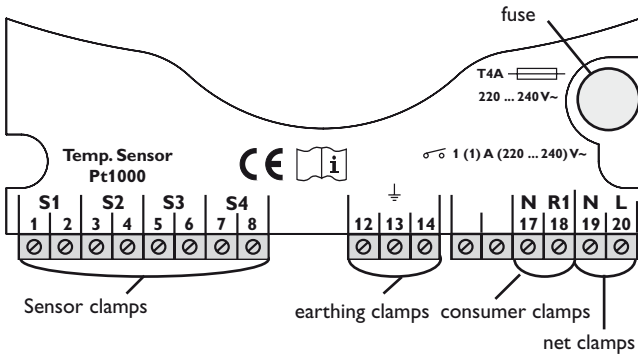
can fuse 4A

hanging

104

fixation

⚠️ **Warning!**
Switch-off power supply before opening the housing.

The unit must only be located internally. It is not suitable for installation in hazardous locations and should not be sited near to any electromagnetic field. The controller must additionally be equipped with an all-polar gap of at least 3 mm or with a gap according to the valid installaton regulations, e.g. LS-switches or fuses. Please pay attention to a separate laying of the cable lines and installation of ac power supply.

1. Unscrew the cross-recessed screw of the cover and remove it from the housing.
2. Mark the upper fastening point on the wall and premount the enclosed dowel and screw.
3. Hang up the housing at the upper fastening point and mark the lower fastening point on the underground (hole pitch 130 mm), afterwards put the lower dowel.
4. Fasten the housing at the underground.

1.2 Electrical wiring

PG 66.30 and 67.30

fuse

T4A
220 ... 240 V~

Temp. Sensor Pt1000

1 (1) A (220 ... 240) V~

S1		S2		S3		S4										N	R1	N	L
1	2	3	4	5	6	7	8			12	13	14				17	18	19	20

Sensor clamps

earthing clamps   consumer clamps

net clamps

PG 68.30 and 69.30

fuse

T4A
220 ... 240 V~

Temp. Sensor Pt1000

R1 | 2 (1) A (220 ... 240) V~
R2 | 2 (1) A (220 ... 240) V~

S1		S2		S3		S4							N	R2	N	R1	N	L
1	2	3	4	5	6	7	8			12	13	14	15	16	17	18	19	20

Sensor clamps

earthing clamps   consumer clamps

net clamps

Please note:

The relays are semi-conductor-relays for pump speed control - they need a minimum load of 20 W (power consumption of the consumer) for faultless function. If auxiliary relays, motor valves, etc. are connected, the condenser which is enclosed in the mounting material, must be connected parallely to the relevant relay output.
Attention: for connection of auxiliary relays or valves, the minimum pump speed must be adjusted to 100 %.

The power supply to the controller must only be made by an external power supply switch (last step of installation!) and the line voltage must be 210 ... 250 Volt (50...60 Hz). Flexible lines are to be fixed at the housing by enclosed strain relief supports and screws.

Depending on the version the controller is equipped with 1 relay (PG 66.30 and PG 67.30) or 2 relays (PG 68.30 and PG 69.30) to which the **consumers** e.g. pumps, valves etc. can be connected:

- Relay 1
  - 18 = conductor R1
  - 17 = neutral conductor N
  - 13 = ground clamp ⏚
- Relay 2 (PG 68.30 and 69.30)
  - 16 = conductor R2
  - 15 = neutral conductor N
  - 14 = ground clamp ⏚
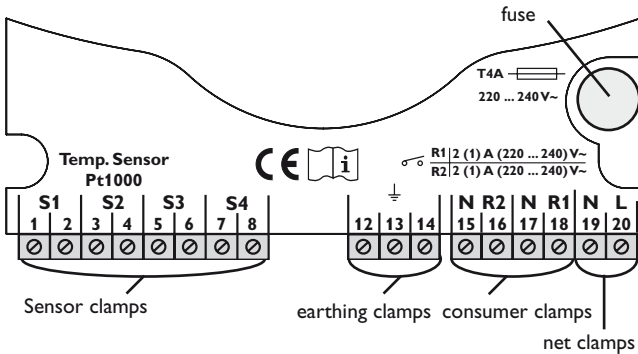
The **temperature sensors** (S1 up to S4) will be connected to the following terminals independently of the polarity:

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

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

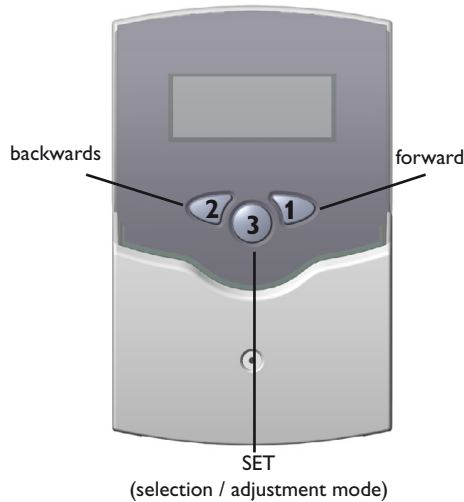19 = neutral conductor N
20 = conductor L
12 = ground clamp ⏚

⚠️ Electrostatic discharge can lead to damages of electronic components!

⚡ Dangerous voltage on contact!

2. Operation and function

2.1 Pushbuttons for adjustment

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

For adjustment of last indication channel, keep button 1 pressed for 2 seconds. If an **adjustment value** is shown on the display, **SEt** is indicated. In this case you can press the key „Set" (3) in order to change into input mode.

Select a channel by keys 1 and 2
Shortly press key 3, so that „SEt" flashes
Adjust the value by keys 1 and 2
Shortly press key 3, so that „SEt" permanently appears, the adjusted value is now saved.

backwards   forward
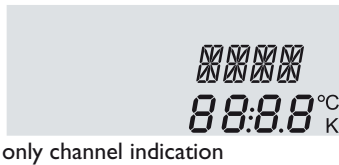
SET
(selection / adjustment mode)

2.2 System monitoring display
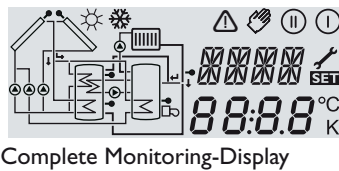
Complete Monitoring-Display

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

2.2.1 Channel indication

only channel indication

The **indication channel** consists of two lines. The upper line is an alphanumeric 16-segment indication, in which mainly the channel names / menu items are shown. In the lower 7-segment indication, the channel values and the adjustment parameter are indicated.
Temperatures and temperature differences are indicated in °C or K.

2.2.2 Tool bar

only tool bar

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

Symbol	standard	flashing
Ⓘ	relay 1 active	
Ⓘ (II)	relay 2 active	
☼	maximum store limitation active / maximum store temperature exceeded	collector cooling function or reccoling function active
❄	antifreeze- function activated	collector minimum limitation or antifreeze function active
⚠		collector security shutdown or store securtiy shutdown active
⚠ + 🔧		sensor defect
⚠ + ✍		manual operation active
SET		an adjustment channel is changed SET-mode

2.2.3 System screen
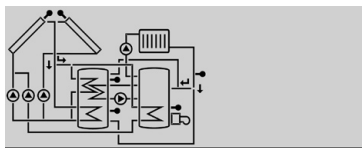
only system screen

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

- Sensoren
- Sensor store top
- Heating
- Collector 2
- Collector 1
- Valves
- Pumps
- Valves
- Sensor
- Additional symbol for operation of the burner
- Store heat exchanger
- Store
- Store 2 or after-heating (with additional symbol)
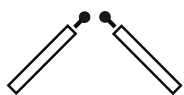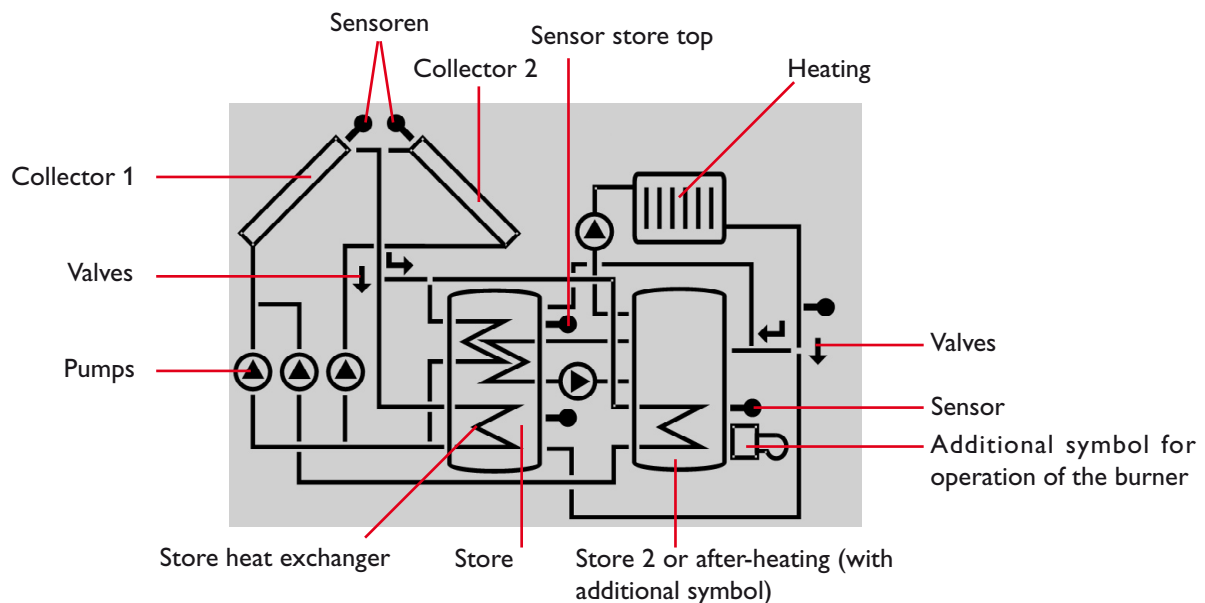
Collectors
with collector sensor
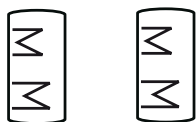
Store 1 and 2
with heat exchanger

3-way-valves
The flow direction or the current breaking capacity are always shown.

Temperature sensor

Heating circuit

Pump
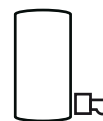
After-heating
with burner symbol

2.3 Blinking codes

2.3.1 System screen blinking codes

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

2.3.2 LED blinking codes

Constantly green: everything all right
Red/green blinking: initialisation phase
                      manual operation
Red blinking: sensor defect
                (sensor symbol is quickly blinking)

3. Commissioning

On commissioning you have to adjust primarily the matching system

Operation cont-
rol lamp

backwards

forward

SET
(Selection / Adjustment mode)
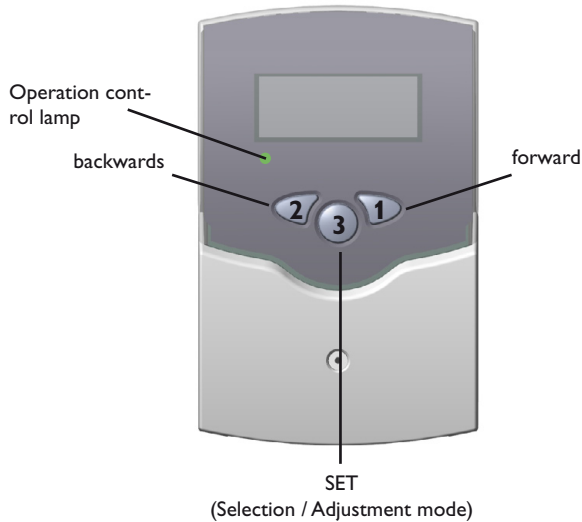
1. Ac power supply must be activated. The controller passes an initialisation phase in which the operating control lamp flashes red and green. After having finished the initialisation, the controller is in automatic operation with factory settings. The preadjusted system scheme is Arr 1.

2. - select Arr

   - change into SET-mode (see 2.1)

   - select the system scheme by Arr-characteristics

   - adjustment is saved by pressing button SET

Now the controller is ready for operation and should enable an optimum operation of the solar system by the factory settings made.
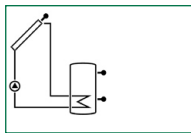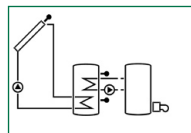
Arr 1   Arr 2

System survey:

Arr 1 :   standard solar system

Arr 2 :   solar system with after-heating
         (PG 68.30 and PG 69.30)

4. Controller parameter and indication channels

4.1 Channel-overview

Legend:

x

Corresponding channel is available.

x*

Corresponding channel is available if the appropriate option is activated.

Only by PG 67.30 and 69.30

Please note:
S3 and S4 are only indicated if sensors are connected.

①

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

②

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

MEDT

The channel antifreeze content (MED%) is only shown if a medium other than **water or Tyfocor LS / G-LS (MEDT 0 or 3)** is used. The adjustment is only appropriate when using other types of antifreeze.

channel	Arr 1	Arr 2*	specification	page
COL	x	x	Temperature collector 1	11
TST	x		Temperature store 1	11
TSTL		x	Temperature store 1 below	11
TSTU		x	Temperature store 1 above	11
S3	x		Temperature sensor 3	11
TRF	①	①	Temperature return sensor	11
S4	②	②	Temperature sensor 4	11
n %	x		Pump speed relay 1	11
n1 %		x	Pump speed relay 1	11
h P	x		Operating hours relay 1	11
h P1		x	Operating hours relay 1	11
h P2		x	Operating hours relay 2	11
kWh	①	①	Heat quantity kWh	12
MWh	①	①	Heat quantity MWh	12
Arr	1-2		System	9
DT O	x	x	Switch-on temperature difference	13
DT F	x	x	Switch-off temperature difference	13
DT S	x	x	Nominal temperature difference	13
RIS	x	x	Increase	13
S MX	x	x	Maximum temperature store 1	13
EM	x	x	emergency temperature collector 1	14

channel	Arr 1	Arr 2	specification	page
OCX	x	x	Option collector cooling collector 1	14
CMX	x*	x*	Maximum temperature collector 1	14
OCN	x	x	Option minimum limitation collector 1	14
CMN	x*	x*	Minimun temperature collector 1	14
OCF	x	x	Option antifreeze collector 1	14
CFR	x*	x*	Antifreeze temperature collector 1	14
OREC	x	x	Option reccoling	15
O TC	x	x	Option tube collector	15
AH O		x	Switch-on temp. for thermostat 1	15
AH F		x	Switch-off temp. for thermostat 1	15
OHQM		x	Option WMZ	12
FMAX	①	①	Maximum flow	12
MEDT	①	①	Antifreeze type	12
MED%	MEDT	MEDT	Antifreeze content	12
nMN	x		Minimum pump speed relay 1	16
n1MN		x	Minimum pump speed relay 1	16
HND	x	x	Manual operation relay 1	16
HND2	x	x	Manual operation relay 2	16
LANG	x	x	Language	16
PROG	XX.XX		Program number	
VERS	X.XX		Version number	

* System 2 applys only for the version 68.30 and 69.30

4.1.1 Indicataion of collector temperatures

COL:
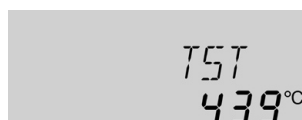Collector temperature
display range: -40 ... +250 °C

COL
85 °C

Shows the current collector temperature.

- COL : collector temperature (1-collector-system)

4.1.2 Indication of store temperatures

TST, TSTL, TSTU:
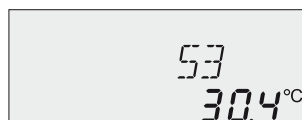Store temperatures
Display range: -40 ... +250 °C

TST
43.9 °C

Shows the current store temperature.

- TST : store temperature (1-store-system)
- TSTL : store temperature lower
- TSTU : store temperature upper

4.1.3 Indication of sensor 3 and sensor 4

S3, S4:
Sensor temperatures
Display range: -40 ... +250 °C

S3
30.4 °C

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

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

Please note:
S3 and S4 are only indicated if the temperature sensors are connected (shown).

4.1.4 Indication of other temperatures

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

TRF
56.7 °C
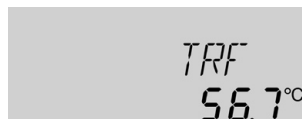
Shows the current temperature of the sensor.

- TRF : temperature return flow

4.1.5 Indication of current pump speed

n %, n1 %:
current pump speed
Display range:: 30 ... 100 %
(PG 67.30 and PG 69.30)

n %
100

Shows the current pump speed of the corresponding pump.

- n % : current pump speed (1-pump-system)
- n1 % : current pump speed pump 1

4.1.6 Operating hours counter

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

h P1 **SET**
305
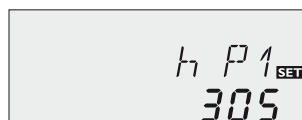
The operating hours counter adds up the solar operating hours of the respective relay (**h P** / **h P1** / **hP2**). Full hours are shown on the display.

The operating hours added up can be reset. As soon as one operating hours channel is selected, the symbol **SET** in permanently shown on the display. The button SET (3) must pressed for approx. 2 seconds in order to get back into the RESET-mode of the counter. The display-symbol **SET** is flashing and the operating hours will be set to 0. In order to finish the RESET-procedure, the button **SET** must be pressed in order to confirm.

In order to interrupt the RESET-procedure, no button should be pressed for about 5 seconds. The controller returns automatically into the indicaton mode.

4.1.7 Heat quantity balancing

OHQM:Heat quantity balancing
Adjustment range: OFF ...ON
Factory setting: OFF

OHQM SET
OFF

FMAX:
Volume flow in l/min
Adjustment range 0 ... 20
in steps of 0,1
Factory setting 6,0

FMAX SET
6.0

A heat quantity balancing is possible for all systems in conjunction with a flowmeter. You just have to activate the option heat quantity balancing in the channel **OHQM**.

The volume flow readable at the flowmeter (l/min) must be adjusted in the channel **FMAX**. Antifreeze type and concentration of the heat transfer medium are indicated on the channels **MEDT** and **MED%.**

MEDT: Type of antifreeze
Adjustment range 0 ...3
Factory setting 1

MEDT SET
1

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

MED%: Concentration of antifreeze in (Vol-) %
MED% is blinded out by MEDT 0 and 3.
Adjustment range 20 ...70
Factory setting 45

MED% SET
45

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

KWh SET
51

The heat quantity transported is measured by the indication of the volume flow and the reference sensor of feed flow S1 and return flow S4. It is shown in kWh-parts in the indication channel **kWh** and in MWh-parts in the indication channel **MWh**. The sum of both channels form the total heat output.

The heat quantity added up can be reset. As soon as one of the display channels of the heat quantity is selected, the symbol SET is permanently shown on the display. The button SET (3) must be pressed for approx. 2 seconds in order to get back into the RESET-mode of the counter. The display-symbol SET is flashing and the value for heat quantity will be set to 0. In order to finish the RESET-procedure, the button SET must be pressed for confirmation.

In order to interrupt the RESET-procedure, no button should be pressed for about 5 seconds. The controller returns automatically into indication mode.

4.1.8 ∆T-regulation

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

DT O SET
6.0 K
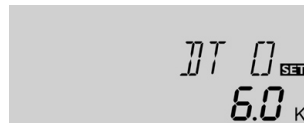
DT F:
Switch-off temperature diff.
Adjustment range
0,5 ... 19,5 K
Factory setting 4.0 K

DT F SET
4.0 K

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

DT S:
Nominal temperature diffe-rence
Adjustment range 1,5..30,0 K
Factory setting 10.0
(PG 67.30 and 69.30)

DT S SET
10.0 K

RIS:
Raise
Adjustment range 1 ... 20 K
Factory setting 2 K
(PG 67.30 and PG 69.30)

RIS SET
2.0 K

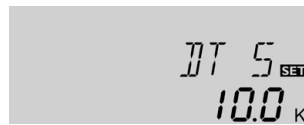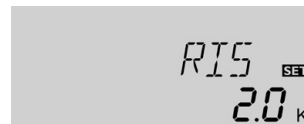Primarily the controller works in the same way as a standard differential controller. If the switch-on difference (**DT O**) is reached, the pump is activated and after having got an impulse (10 s) a minimum pump speed (nMN = 30 %) is run. If the adjusted nominal value of the temperature difference (**DT S**) (only PG 67.30 and PG 69.30) is reached, the pump speed is increased by one step (10%). If the difference increases by 2 K (**RIS**) (only PG 67.30 and PG 69.30), the pump speed is increased by 10 % respectively until the maximum pump speed of 100 % is reached. The response of the controller can be adapted by means of the parameter „Raise". If the adjusted switch-off temperature is underrun (**DT F**), the controller switches-off.

4.1.9 Maximum store temperature

S MX:
Maximum store temp.
Adjustment range 2..95 °C
Factory setting 60 °C

S MX SET
60 °C
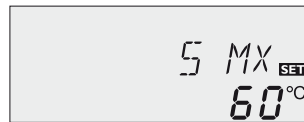
If the adjusted maximum temperature is exceeded, a further loading of the store is stopped so that a damaging overheating can be avoided. If the maximum store temperature is exceeded, on the display is shown and ☀.

Please note: The controller is equipped with a security-switch-off of the store, which avoids a further loading of the store if 95 °C are reached at the store.

4.1.10 Limit collector temperature
Collector emergency shutdown

EM:

Limit collector temperature
Adjustment range
110 ... 200 °C,
Factory setting 140 °C

```
EM    SET
 140°C
```

If the adjusted collector limit temperature (**EM**) 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 RESOL but it can be changed within the adjustment range of 110 ... 200 °C. In the display is shown ⚠ (flashing).

4.1.11 System cooling

OCX:

Option system cooling
Adjustment OFF ... ON
Factory setting OFF

```
OCX   SET
 OFF
```

CMX:

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

```
CMX   SET
 120°C
```

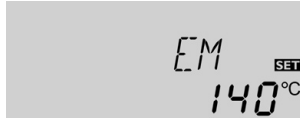If the adjusted maximum store temperature is reached, the solar system switches-off. If now the collector temperature raises to the adjusted maximum collector temperature (**CMX**), the solar pump remains activated until this limit temperature value is again underrun. The store temperature might continue to raise (subordinated active maximum store temperature), but only until 95 °C (emergency shutdown of the store). If the store temperature is higher than the maximum store temperature (**S MX**) and the collector temperature is lower by at least 5 K than the store temperature, the solar system remains activated until the store is again cooled down by the collector and the tubes under the adjusted maximum temperature (**S MX**).

In case of active system cooling on the display is shown ☀ (flashing). Due to the cooling function the solar system can be kept operable for a longer period on hot summer days and a thermal release of the collector and the heat transfer medium is ensured as well.

4.1.12 Option minimum collector limitation

OCN:

Mimimum collector limitation
Adjustment range OFF / ON
Factory setting OFF

```
OCN   SET
 OFF
```
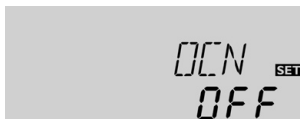
CMN:

Minimum collector temperature Adjustment range
-10 ... 90 °C
Factory setting 10 °C

```
CMN   SET
 10.0°C
```
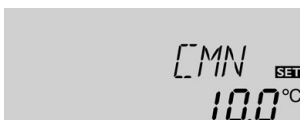
The minimum collector temperature is a minimum switching temperature, which must be exceeded so that the solar pump (R1/R2) is switched-on. The minimum temperature shall avoid a steady starting-up of the solar pump (or solid fuel boiler charging pumps) for low collector temperatures. If the minimum temperature is underrun, in the display is shown ❄ (flashing).

4.1.13 Option antifreeze function

OCF:

Antifreeze function
Adjustment range
OFF / ON
Factory setting OFF

```
OCF   SET
 OFF
```

CFR:

Antifreeze temperature
Adjustment range
-10 ... 10 °C
Factory setting 4,0 °C

```
    ❄
 CFR  SET
    4°C
```

The antifreeze function activates the loading circuit between collector and store if the adjusted antifreeze function is underrun in order to protect the medium that it will not freeze or „get thick". If the adjusted antifreeze temperature is exceeded by 1 °C, the loading circuit will be deactivated.

Please note:
As there is only a limited heat quantity of the store available for this function, the antifreeze function should only be used in regions with few days of temperatures around freezing point.

4.1.14 Recooling function

OREC:
option recooling
adjustment range
OFF...ON
Factory setting: OFF

```
OREC [SET]
OFF
```

If the adjustem maximum store temperature (**S MX**) 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 shutdown 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.

4.1.15 Tube collector special function

O TC:
Tube collector special function
Adjustment range:
OFF...ON
Factory setting: OFF

```
O TC [SET]
OFF
```

If the controller measures an increase of 2 K compared to the collector temperature stored at last, the solar pump is switched-on to 100 % for about 30 seconds. After expiration of the solar pump runtime the current collector temperature is stored as new reference value. If the measured temperature (new reference value) is again exceeded by 2 K, the solar pump again switches-on for 30 seconds. If the switch-on difference between collector and store is again exceeded during runtime of the solar pump or the standstil of the system, the controller automatically switches over to solar charging.
If the collector temperature drops by 2 K during standstill, the switch-on value for the special tube collector function will be recalculated.

4.1.16 Thermostat function
(Arr = 2)

after-heating

use of surpluse energy
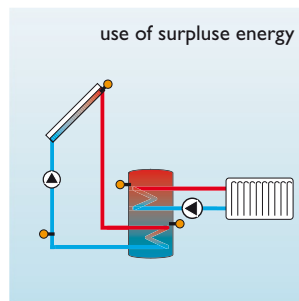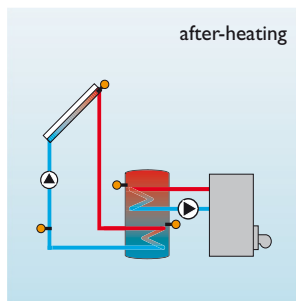
The thermostat function works independently from the solar operation and can e.g. be used for use of surplus energy or an after-heating.

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

On the display is shown ⏸ if the second relay output is activated.

```
AH O [SET]
40.0 °C
```

```
AH F [SET]
45.0 °C
```

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

4.1.17 Pump speed control

nMN:
Pump speed control
Adjustment range:
30...100
Factory setting: 30
(PG 67.30 and PG 69.30)
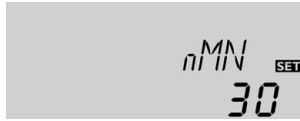
A relative minimum pump speed is specified for pumps connected at the outputs R1 and R2 via adjustment channel **nMN**.

Attention:

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

4.1.18 Operating mode

HAND / HND1 / HND2:
Operating mode
Adjustment range:
OFF, AUTO, ON
Factory setting: AUTO
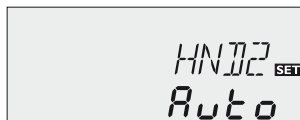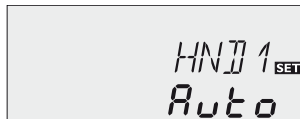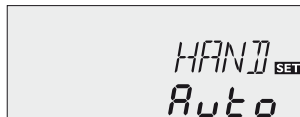
For control and service work the operating mode of the controller can be manually adjusted by selecting the adjustment value HAND / HND1 / HND2, in which the following adjustments can be made:

• **HAND / HND1 / HND2**
  Operating mode
  OFF   :   relay off ⚠ (flashing) + ✋
  AUTO :   relay in automatic operation
  ON   :   relay on ⚠ (flashing) + ✋

4.1.19 Language

LANG:
Adjustment of language
Adjustment range: dE, En, It
Factory setting: En

The menu language can be adjusted in this channel.

• dE : German
• En : English
• It : Italiano

5. Tips for fault localization

can fuse T4A

T4A
220 ... 240 V~

Temp. Sensor
Pt1000

CE

R1 | 2 (1) A (220 ... 240) V~
R2 | 2 (1) A (220 ... 240) V~

| S1 | | S2 | | S3 | | S4 | | | | | | N R2 | | N R1 | | N | L |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
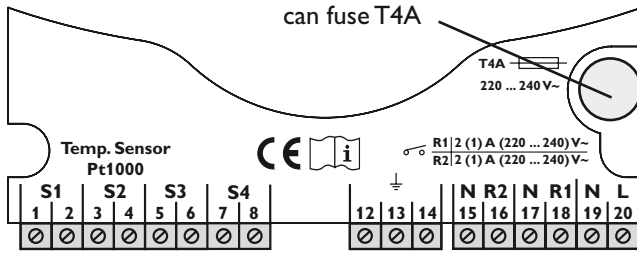
If a malfunction occurs, a notification is given on the display of the controller:

Warning symbol

Operating control lamp
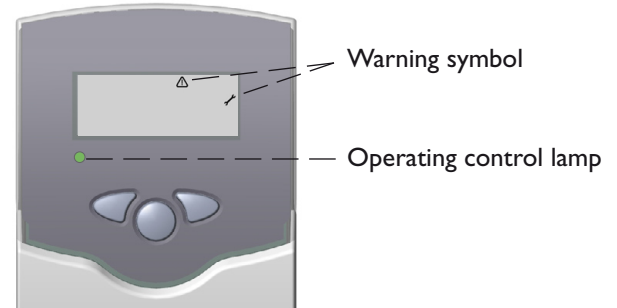
Operating control lamp flashes red. On the display appears the symbol ⚒ and the symbol ⚠.

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

| **888.8** | **- 88.8** |

Line break. Check the line.

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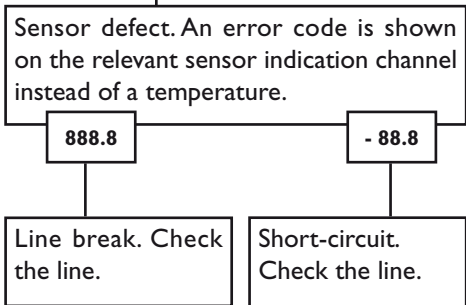
Pt1000-temperature sensors pinched off can be checked with an ohmmeter. In the following the resistance values corresponding to different temperatures are listed.

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

Resistance values of the Pt1000-sensors

Operating control lamp off

The power supply of the controller should be checked if the control lamp goes out.

| **no** | **o.k.** |

The can fuse of the controller is defective. It can be replaced after removal of the front cover (spare fuse is enclosed in the accessory bag).

5.1 Various:

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

Air in the system?

no | **yes**

Exhaust the system; increase system pressure to at least static primary pressure plus 0,5 bar; if necessary continue to increase, switch the pump for a short time off and on.

Is the collector circuit plugged at the dirt trap?

yes

Clean the dirt trap

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

Is the temperature difference at the controller too small?

no | **yes**

Change ΔT_{on} and ΔT_{off} accordingly.

no | **o.k.**

Wrong placing of the collector sensor?

no | **yes**

Mount the collector sensor at solar feed flow (warmest collector output); use the immersion sleeve of the respective collector.

Plausibility control of the option tube collector special function?

Pump starts up very late and soon stops working soon.

Switch-on-temperature difference ΔT_{on} too large?

no | **yes**

Change ΔT_{on} and ΔT_{off} accordingly.

Collector sensor unfavourable placed (e.g. contact sensor instead of immersion sleeve sensor?

yes

If necessary activate tube collector function.

o.k.

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

Collector circuit pump defect ?

no | **yes**

Control / replace

Heat exchanger calcified?

no | **yes**

Decalification

Heat exchanger plugged?

no | **yes**

Cleaning

Heat exchanger too small?

yes

New calculation of the dimension.

Stores are cooled during the night.

Does collector circuit pump run during the night?
- **no**
- **yes** → Check the controller functions

Collector temperature is at night higher than ambient temperature.
- **no**
- **yes** → Check the return flow preventer in feed flow and return flow with regard to the functional efficiency.

Is store insulation sufficient?
- **yes**
- **no** → Intensify the insulation.

Is store insulation close enough to the store?
- **yes**
- **no** → Replace or intensify the insulation.

Are the store connections insulated?
- **yes**
- **no** → Insulate connections.

Warm water outflow upwards?
- **no**
- **yes** → Change connection and let the water flow side-wards 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)

Switch-off the circulation pump and the blocking valve for 1 night; less store losses?
- **yes** → **a**
- **no**

Check the pumps of the after-heating circuit according to nightly run and defect return flow preventer; problem solved?
- **no** → **b**

---

a
Control the return flow preventer in warm water circulation- o.k.
- **yes**
- **no**

b
Please also check further pumps which are connected to the solar store.

The gravitation circulation in the circulation line is too strong; insert a stronger return flow preventer or an electrical 2-way valve behind the circulation pump; the 2-way valve is open in pump operation, otherwise it is closed, conect pump and 2-way

Cleaning or replacement.

valve in parallel; activate the circulation again!

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

Does the control LED flash?
- **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 an matching setting

Is the current of the pump released by the controller?
- **no**
- **yes** → Is the pump stuck?
  - **yes** → Put the pump into operation by means of a screwdriver; is it passable now ?
    - **no** → Is the pump defective - replace it.

Are the fuses of the controller o.k.?
- **no** → Replace the fuses.
- **yes** → Controller seems to be defective - replace it.

RESOL®

6. Accessory

Sensors

Our product range includes high-precision platin temperature sensors, flatscrew sensors, ambient temperature sensors, indoor temperature sensors, cylindrical clip-on sensors and irradiation sensors, also to be used as full sensors with sensor pocket.

Overvoltage protection

We highly recommend to install the RESOL overvoltage protection in order to avoid overvoltage damages at the collector (e.g. by lightening).

Flowmeter

If you are interested in realising a heat quantity balancing, you need a flowmeter for measuring the volume flow in your system.

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