# RESOL DeltaSol® ES

## Mounting
## Connection
## Handling
## Fault localization
## Examples


DeltaSol® ES

GB

manual

48000770

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

www.resol.de

## Contents



Errors an technical changes excepted.

### Security advice

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

This product is to be used in accordance with its intended use only (see page 3).

### Instructions

Attention should be paid

- to the statutory provisions for prevention of industrial accidents,
- to the statutory provisions for environmental protection,
- to the Health and Safety at Work Act 1974
- to Part P of the Building Regulations 2005
- to BS7671 Requirements for electrical installations and relevant safety regulations of DIN, EN, DVGW, TRGI, TRF and VDE.

This instruction is exclusively addressed to authorised skilled personnel.

- Only qualified electricians should carry out electrical works.
- Initial installation should be effected by named qualified personnel

### Declaration of conformity

We, RESOL Elektronische Regelungen GmbH, D-45527 Hattingen, declare under our sole responsibility that our product DeltaSol ES complies with the following standards:

EN 55 014-1
EN 60 730-1

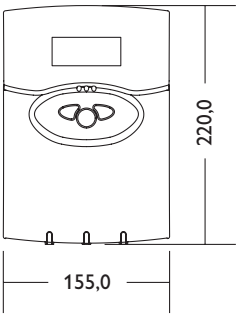
According to the regulations of the above directives, the product is labelled with CE:

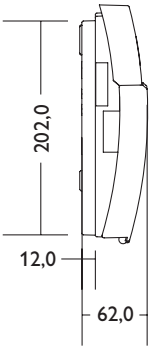
89/336/EWG
73/ 23/EWG

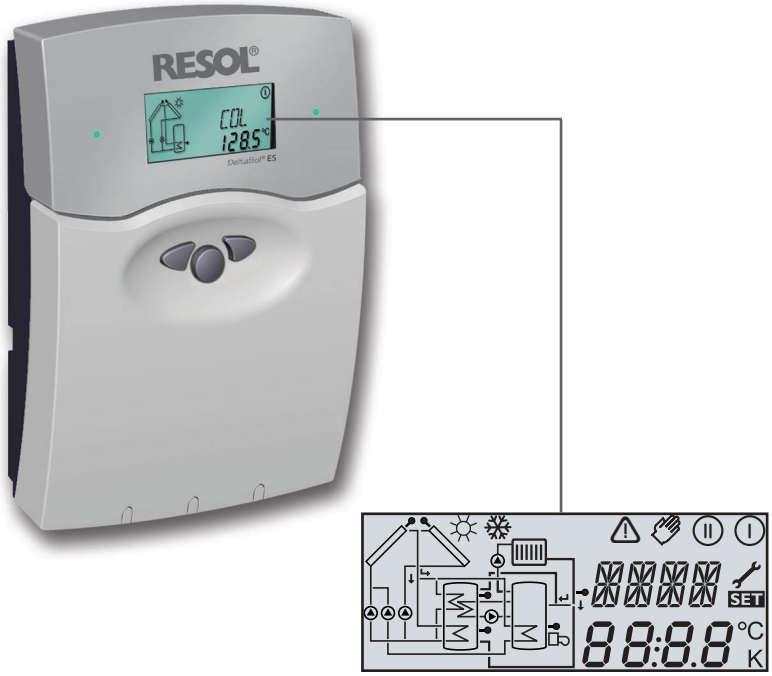
Hattingen, 07.07.2006
RESOL Elektronische Regelungen GmbH,

ppa. Gerald Neuse

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




**Scope of delivery:**

1 x DeltaSol® ES

1 x accessory bag
- 2 x screws and dowels
- 4 x strain-relief and screws
- 1 x capacitor 4,7 nF

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

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 newly developed system-monitoring display allows 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.

## Technical data

**Housing:** plastic, PC-ABS and PMMA

**Protection type:**
IP 20 / DIN 40 050

**Environmental-temp.:** 0...40 °C

**Size:** 220 x 155 x 62 mm

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

**Display:** multi-functional combined display with illuminated background, stored system sketches and pictograms, a 4-digit alpha-numerical 16-segment display and a 4-digit numerical 7-segment display as well as a 2 coloured LED. The controller can be equipped optionally with an illuminated 4-digit LC-text display.

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

**Functions:** solar- and heating controller with pre-programmed and selectable system schemes, just as: standard solar system, 2-store systems, east-/west collectors, heating circuit back-up, heat exchange regulation, thermostatic after-heating, solid hot fuel boilers, add-on functions and options just as heat quantity measurement, collector cooling function, tube collector special function, anti-freeze function, minimum temperature limitation, pump speed control, balancing of heat quantity output, function control according to BAW-guidelines.

**Sensor inputs:** 10 sensor inputs for Pt1000, CS10, V40

**Relay outputs:** 6 relay outputs, 3 of them for pump speed control

**Bus:** VBus®

**Power supply:** 220 … 240V~

**Breaking capacity:**
4 (1)A (220 … 240) V~

**Dimensioning surge voltage:**
2,5 kV

**Effectiveness:** Typ 1.b / Typ 1.y

**Degree of pollution** 2

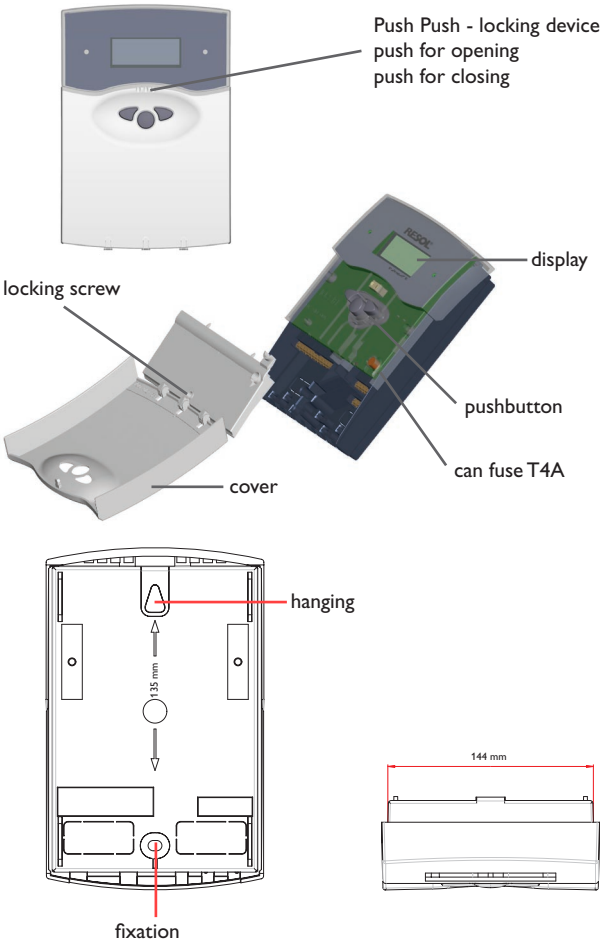
Electrostatic discharge can cause damages of electronic components

Attention: high-voltaged components

CE

# 1. Installation

## 1.1 Mounting



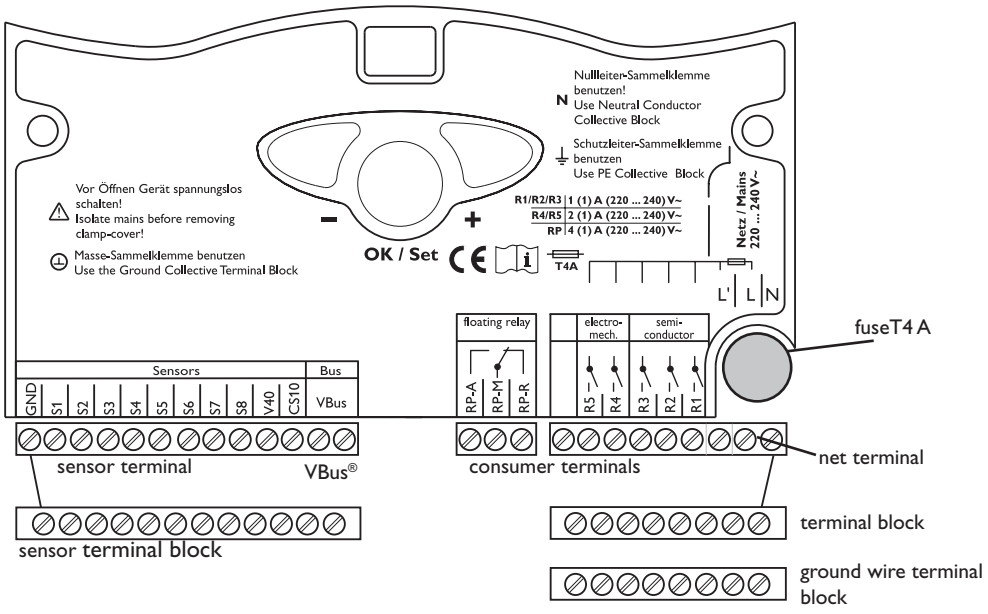

**Warning!**
**Switch-off power supply before opening the housing.**

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

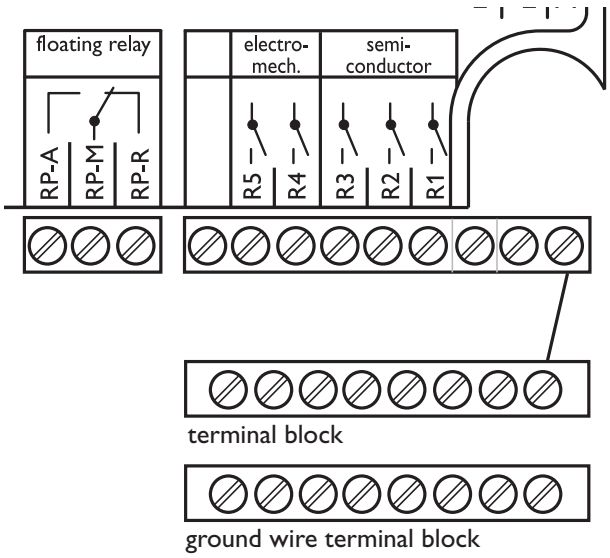
1. Unscrew the cross-recessed screw of the cover and remove it from the housing.
2. Mark the upper fastening point on the underground and preassemble the enclosed dowel and screw.
3. Hang up the housing at the upper fastening point and mark the lower fastening point on the underground (hole pitch 135 mm), afterwards put the lower dowel.
4. Fasten the housing at the underground.
5. Connection is to be effected according to terminal allocation.
6. The housing is to be closed properly.

## 1.2 Electrical connection

### 1.2.1 Survey of electrical connections



### 1.2.2 Actuators
(pumps, valves, etc.)




The controller is equipped with 6 relays totally, to which the **consumers** (actuators), just as pumps, valves and auxiliary relays are to be connected:

- **The relays R1 ...R3** are semi-conductor relays, appropriated for pump speed control as well:
  R1 ...R3 = normally open contact R1 ...R3
  N = neutral conductor N (terminal block)
  PE = ground wire PE (terminal block)
- **The relays R4 and R5** are electro-mechanic relays with 1 shutter:
  R4, R5 = normally open contacts R4, R5
  N = neutral conductor N (terminal block )
  PE = ground wire PE (terminal block)
- **The relay RP** is a potential-free relay with change-over-contact:
  RP-M = middle contact RP
  RP-A = normaly open contact RP
  RP-R = break contact RP

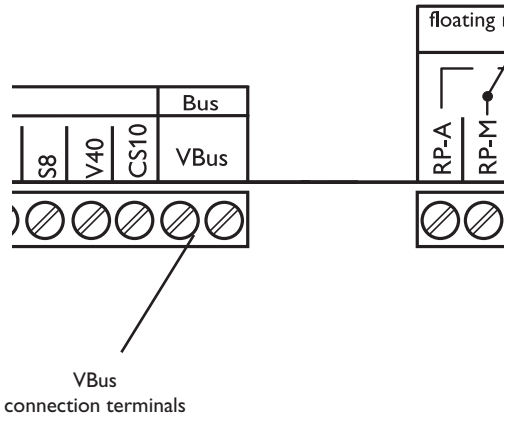
RP switches parallel to R3 in all systems with afterheating (SYS 3, 10, 12, 15, 19, 22, 25, 28) to provide a boiler demand if necessary.

Please note:

the relays R1 up to R3 are designed for pump speed control as semi-conductor relays. They need a minimum load of 20W (power consumption of the consumer) for perfect functioning. In case that auxiliary relays, motor valves, etc. are connected, the enclosed condensor must be parallely conntected to the corresponding relay output.

Attention: in case that auxiliary relays or valves are connected, the minimum pump speed is to be adjusted to 100 %.

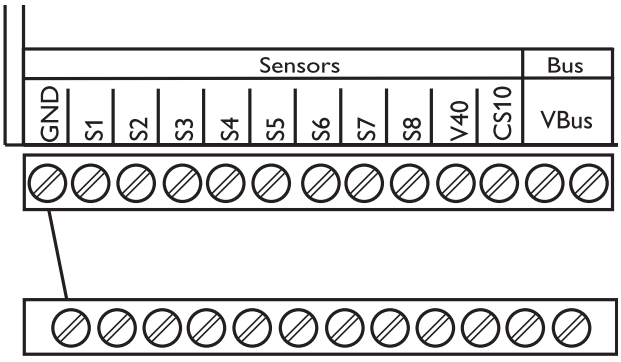
### 1.2.3 Data communication / Bus




The controller is equipped with the RESOL **VBus®** for data communication with or without power supply of external modules. Connection is effected without any polarity to both terminals marked „VBus“. One or more RESOL VBus modules can be connected by this data-bus, e.g.:

- RESOL WMZ-M1, calorimeter module
- RESOL large displays
- RESOL data logger

### 1.2.4 Sensors

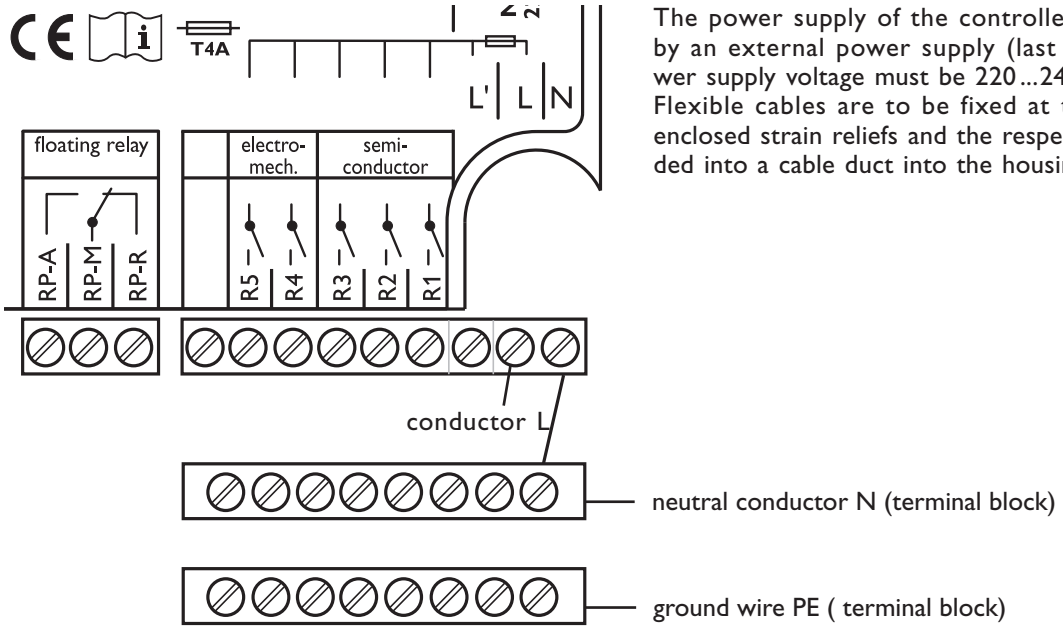



earth terminal block

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

- The **temperature sensors** are connected to the terminals S1 ...S8 and GND regardless of the polarity.
- A **flowmeter** RESOL V40 can be connected to the terminals V40 and GND regardless of the polarity.
- The **irradiation sensor (CS10)** is to be connected to the terminals CS10 and GND with respect to 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.

### 1.2.5 Power connection




The power supply of the controller must be effected by an external power supply (last step!) and the power supply voltage must be 220...240 Volt (50...60 Hz). Flexible cables are to be fixed at the housing by the enclosed strain reliefs and the respective screws or leaded into a cable duct into the housing of the controller.

# 2. Operation and function

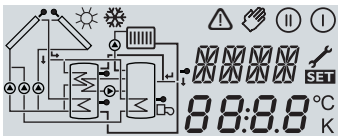
## 2.1 Pushbuttons for adjustment


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 1pressed 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.

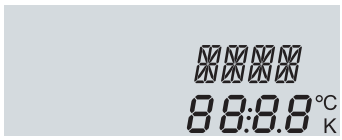
## 2.2 System-Monitoring-Display




Total 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.

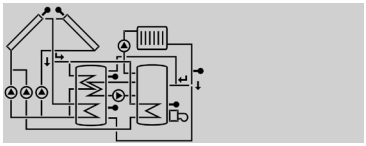
### 2.2.2 Tool bar


only tool bar

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

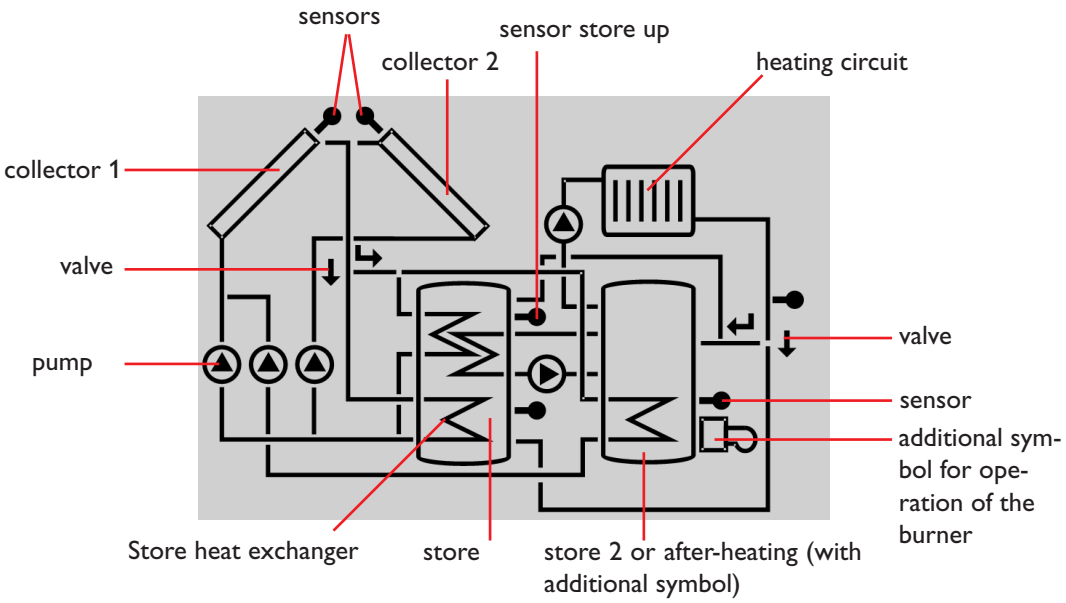
| Symbol | normal | flashing |
|---|---|---|
| ⏻ | Relais 1 activated | |
| ⏻ | Relais 2 activated | |
| ☼ | Store maximum limitation activated / store maximum temperature exceeded | Collector cooling function activated<br>recooling function activated |
| ❄ | Option antifreeze activated | Collector minimum function activated<br>Antifreeze function activated |
| ⚠ | | Collector emergency shutdown activated or store shutdown |
| ⚠ + 🔧 | | Sensor defect |
| ⚠ + ✋ | | Manual operation |
| SET | At adjustment mode | An adjustment channel is changed<br>SET-Modus |

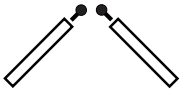
### 2.2.3 System-Screen



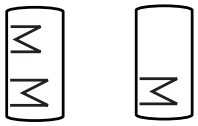
only system screen

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.



**Collectors**
with collector sensor



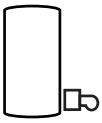
**Store** 1 and 2
with heat exchanger

**3-way-valve**
Just the current flow direction respectively the curcuit direction is 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 blinking quickly 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<br>manual operation |
| Red blinking: | Sensor defect<br>(sensor symbol is quickly blinking) |

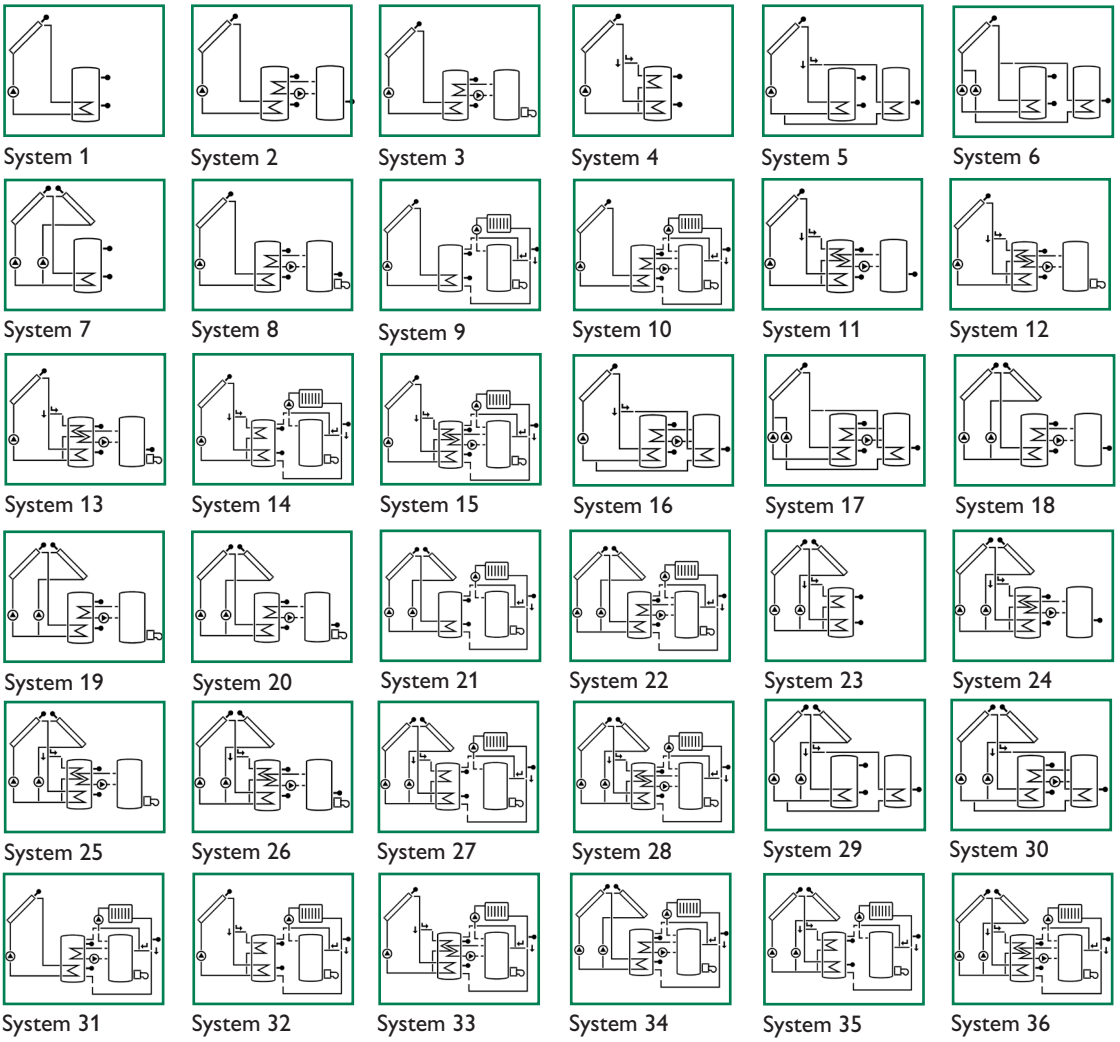
## 3. Commissioning

### On commissioning you have to adjust primarily the system scheme!


**PLEASE NOTE:**
**System status is reset to factory settings by modification of the system!**

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 settings). 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 (blinking), by pressing again the minutes are shown (blinking). The time can be adjusted by pushbuttons 1 and 2 and be stored by a last pressing of the pushbutton **SET**.
3. - Select **Arr**
   - change into **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 **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.



# 4. Controller parameter and adjustment channels

## 4.1 Channel overview

### Legend:

| x |
|---|

Corresponding channel is available.

| x* |
|---|

Corresponding channel is available if the appropriate option is activated.

**Please note:**
S3 and S4 are only indicated in case of sensors connected (shown)

| ① |
|---|

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

| MEDT |
|---|

The channel antifreeze function (MED%) is only shown if there is **not used water or Tyfocor LS / G-LS (MEDT 0 or 3)**. The adjustment of the content of antifreeze does only make sense when using antifreeze components in the solar circuit.

### Channel survey: Systems Arr 1 ...10

| Chan-nel | 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 Relais |
| n1 % | | x | x | | | x | x | x | | x | Pump speed Relais 1 |
| n2 % | | | | | | x | x | | | | Pump speed Relais 2 |
| n3% | | x | x | | | | | x | | x | Pump speed Relais 3 |
| hP | x | | | x | x | | | | x | | Hours of operation relais 1 |
| h P1 | | x | x | | | x | x | x | | x | Hours of operation relais 1 |
| h P2 | | | | | | x | x | | | | Hours of operation relais 2 |
| h P3 | | x | x | | | | | x | | x | Hours of operation relais 3 |
| FLOW | ① | ① | ① | ① | ① | ① | ① | ① | ① | ① | Volume flow |
| 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 |

| Chan-nel | Arr | | | | | | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
| 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 |
| 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 volume flow counter |
| 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 relais 1 |
| n1MN | | x | x | | | x | x | x | | x | Minimum pump speed relais 1 |
| n2MN | | | | | | x | x | | | | Minimum pump speed relais 2 |
| n3MN | | x | | | | | | x | | | Minimum pump speed relais 3 |
| MAN1 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 1 |
| MAN2 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 2 |
| MAN3 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 3 |
| MAN4 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 4 |
| MAN5 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 5 |
| MAN6 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 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

| Chan-nel | Arr | | | | | | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 11 | 12 | 13 | 14 | 15 | 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 Relais |
| n1 % | x | x | x | | x | x | x | x | x | x | Pump speed Relais 1 |
| n2 % | | | | | | | x | x | x | x | Pump speed Relais 2 |
| n3% | x | x | x | | x | x | x | x | x | x | Pump speed Relais 3 |
| hP | | | | x | | | | | | | Hours of operation relais 1 |
| h P1 | x | x | x | | x | x | x | x | x | x | Hours of operation relais 1 |
| h P2 | | | | | | | x | x | x | x | Hours of operation relais 2 |
| h P3 | x | x | x | | x | x | x | x | x | x | Hours of operation relais 3 |
| FLOW | ① | ① | ① | ① | ① | ① | ① | ① | ① | ① | Volume flow |
| 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 |
| 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 |

| Chan-nel | Arr 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 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 volume flow counter |
| 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 relais 1 |
| n1MN | x | x | x | | x | x | x | x | x | x | Minimum pump speed relais 1 |
| n2MN | | | | | | | x | x | x | x | Minimum pump speed relais 2 |
| n3MN | x | | x | | | x | x | x | | x | Minimum pump speed relais 3 |
| MAN1 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 1 |
| MAN2 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 2 |
| MAN3 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 3 |
| MAN4 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 4 |
| MAN5 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 5 |
| MAN6 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 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

| Chan-nel | 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 Relais |
| n1 % | x | x | x | x | x | x | x | x | x | x | Pump speed Relais 1 |
| n2 % | x | x | x | x | x | x | x | x | x | x | Pump speed Relais 2 |
| n3% | | x | | x | x | x | | x | | x | Pump speed Relais 3 |
| hP | | | | | | | | | | | Hours of operation relais 1 |
| h P1 | x | x | x | x | x | x | x | x | x | x | Hours of operation relais 1 |
| h P2 | x | x | x | x | x | x | x | x | x | x | Hours of operation relais 2 |
| h P3 | x | x | | x | x | x | | x | | x | Hours of operation relais 3 |
| FLOW | ① | ① | ① | ① | ① | ① | ① | ① | ① | ① | Volume flow |
| 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 |
| 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 |

| Chan-nel | Arr 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 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 volume flow counter |
| 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 relais 1 |
| n1MN | x | x | x | x | x | x | x | x | x | x | Minimum pump speed relais 1 |
| n2MN | x | x | x | x | x | x | x | x | x | x | Minimum pump speed relais 2 |
| n3MN | | | | x | | x | | | | x | Minimum pump speed relais 3 |
| MAN1 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 1 |
| MAN2 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 2 |
| MAN3 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 3 |
| MAN4 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 4 |
| MAN5 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 5 |
| MAN6 | x | x | x | x | x | x | x | x | x | x | Manual operation relais 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

| Chan-nel | 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 Relais |
| n1 % | x | | | | | | | | | | Pump speed Relais 1 |
| n2 % | | x | x | x | x | x | | | | | Pump speed Relais 2 |
| n3% | x | | | | | | | | | | Pump speed Relais 3 |
| hP | | | | | | | | | | | Hours of operation relais 1 |
| h P1 | x | x | x | x | x | x | | | | | Hours of operation relais 1 |
| h P2 | | x | x | x | x | x | | | | | Hours of operation relais 2 |
| h P3 | x | x | | x | x | x | | | | | Hours of operation relais 3 |
| FLOW | ① | ① | ① | ① | ① | ① | | | | | Volume flow |
| 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 |
| 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 |

| Chan-nel | Arr | | | | | | | | | | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 31 | 32 | 33 | 34 | 35 | 36 | | | | | |
| 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 | x | | | | Priority |
| tSP | x | x | x | | x | x | x | | | | Stop time |
| tRUN | x | x | x | | x | x | x | | | | Circulation |
| OREC | x | x | x | x | x | x | x | | | | Option recooling |
| O TC | 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 |
| MN3F | x | | | | | 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 | | | | Option HQM |
| VIMP | ① | ① | ① | ① | ① | ① | ① | | | | Impulse rate volume flow counter |
| MEDT | ① | ① | ① | ① | ① | ① | ① | | | | Antifreeze |
| MED % | MEDT | MEDT | MEDT | MEDT | MEDT | MEDT | MEDT | | | | Antifreeze concentration |
| CS 10 | x | x | x | x | x | x | x | | | | Solar cell |
| n MN | | x | | | | | | | | | Minimum pump speed relais 1 |
| n1MN | x | | x | x | x | x | x | | | | Minimum pump speed relais 1 |
| n2MN | | | | x | x | x | x | | | | Minimum pump speed relais 2 |
| n3MN | x | | | | | x | x | | | | Minimum pump speed relais 3 |
| MAN1 | x | x | x | x | x | x | x | | | | Manual operation relais 1 |
| MAN2 | x | x | x | x | x | x | x | | | | Manual operation relais 2 |
| MAN3 | x | x | x | x | x | x | x | | | | Manual operation relais 3 |
| MAN4 | x | x | x | x | x | x | x | | | | Manual operation relais 4 |
| MAN5 | x | x | x | x | x | x | x | | | | Manual operation relais 5 |
| MAN6 | x | x | x | x | x | x | x | | | | Manual operation relais 6 |
| LANG | x | x | x | x | x | x | x | | | | Language |
| PROG | XX.XX | | | | | | | | | | Programme version |
| VERS | X.XX | | | | | | | | | | Version |

## 4.2 Indication channels

**Please note:**
**The indication channels are system dependant. Only the values necessary for the adjusted systems Arr 1...36 (see channel overview pages 10 ff) are shown.**

### 4.2.1 Indication of collector temperatures

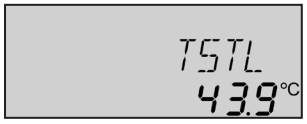
**COL, COL1, COL2:**
collector temperature
Display range: -40...+250 °C


Shows current collector temperature.

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

### 4.2.2 Indication of store temperatures

**TSTL, TSTU,**
**TST1, TST2, S4:**
Store temperatures
Display range: -40...+250 °C

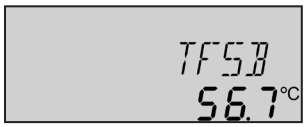



Shows current store temperature.

**TSTL**: Store temperature below
**TSTU**: Store temperature above
**TST1**: Temperature store 1
**TST2**: Temperature store 2
**S4**: Temperature store middle

### 4.2.3 Indication of other temperatures

**TFSB, TRET, TRF, TFL:**
other measuring temperatures
Display channel:
-40...+250 °C

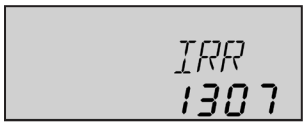



Shows current temperature of the corresponding sensor.

**TFSB**: Temperature solid hot fuel boiler
**TRET**: Temperature heating circuit reverse raising
**TRF**: Temperature return flow
**TFL**: Temperature feed flow

### 4.2.4 Indication of solar irradiation intensity

**IRR** current irradiation
Display channel:
0...1350W/m²

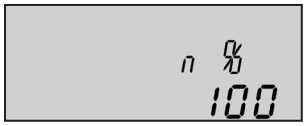



Shows current solar irradiation intensity.

**IRR**: solar irradiation intensity

### 4.2.5 Indication of current pump speed

**n %, n1 %, n2 %, n3%:**
current pump speed
Display channel: 30...100%

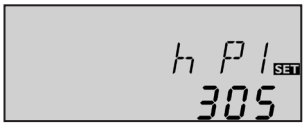



Shows current pump speed of the corresponding pump.

**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 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 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 is flashing and the operating hours will be set to 0. In order to finish the RESET-procedure, the button 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 indication mode.

#### 4.2.7 Volume flow

**FLOW**:Volume flow
Adjustment range
0,00 ...99,99 m³/h


The volume flow of the solar system measured by the V40 to determine the transported heat amount.

## 4.3 Adjustment channels

**Please note:**
**The adjustment channels are system dependent as well as the indication channels. Only that values necessary for the adjusted systems Arr 1 ...36 (see channel overview from page 10 ff) can be modified.**

#### 4.3.1 Heat quantity balancing

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


**In general** a heat quantity balancing is possible in conjunction with a V40 in all selectable channels. You only have to activate the option heat quantity measurement in the channel **OHQM.**

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


The volume flow measured at V40 (see indication channel VSTR) enables in conjunction with type and content of antifreeze of the heating medium the heat balancing.

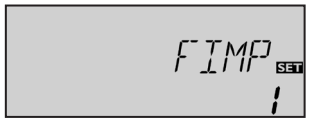
**Antifreeze:**
**0**: water
**1**: propylene glycol
**2**: ethylene glycol
**3**: Tyfocor® LS / G-LS

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


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


The heat quantity transported is measured by the indication of the volume flow and the reference sensor of feed flow S7 and return flow sensor S8. 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 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 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 indication mode.

**FIMP**:Volume per impulse
Adjustment range 1 ... 99
Factory setting 1




**Please 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
Indication channel

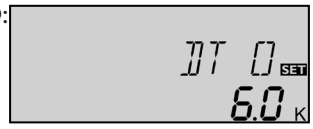
**CS10**: Solar cell
Adjustment range 1 ...10
Factory setting 5

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

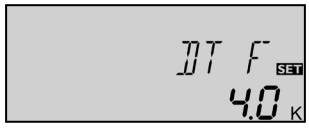

The current solar irradiation intensity is measured in W/m² by the sensor CS10.
The sensor is divided into different types (see imprint on packaging) and must be adjusted in channel CS10 with the corresponding code number (see commissioning). The current irradiation is now shown in channel **SOL.**

### 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

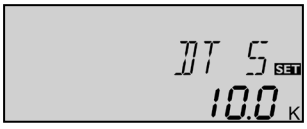



**DT F / DT1F / DT2F / DT3F**:
Switch-off temp.- diff. adjust-
mentrange 0,5 ... 19,5 K
Factory settng 4.0 K




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

**DT S / DT1S / DT2S / DT3S**:
Nominal temp. diff.
adjustment range 1,5 ... 30,0 K
Factory setting 10.0

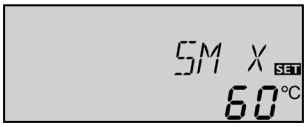



**RIS / RIS1 / RIS2 / RIS3**:
Rise
Adjustment range 1 ... 20 K
Factory setting 2 K


Primarily the controller works in the same way like a standard differential controller. If the switch-on difference (**DT O** / **DT1O** / **DT2O** / **DT3O**) is reached, the pump is activated and after having got an impulse (10 s) a minimum pump speed (nMN = 30 %) will be run. If the adjusted nominal vaue of the temperature difference is reached (**DT S** / **DT1S** / **DT2S** / **DT3S**), the pumps speed will be increased by one step (10 %). If the difference increases by 2 K (**RIS** / **RIS1** / **RIS2** / **RIS3**), the pump speed will be 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 rise. If the adjusted switch-off temperature is underrun (**DT F** / **DT1F** / **DT2F** / **DT3F**), the controller switches-OFF.

### 4.3.3 Maximum store temperature

**S MX / S1MX / S2MX**:
Maximum store temp.
adjustment range 2 ... 95 °C
Factory setting 60 °C




If the adjusted maximum store temperature is exceeded, a further loading of the store will be stopped so that a damaging overheating can be avoided. If the maximum store temperature is exceeded, in the display is shown ☀.

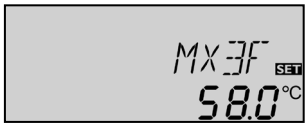
**Please note:** The controller is equipped with a security switch-off of the store, which avoids a further loading of the store if 95 °C is reached at the store.

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

**Maximum temperature limitation**

**MX3O / MX3F:**
Maximum temperature
limitation
Adjustment range
0,0 ... 95,0 °C

Factory setting:
MX3O 60,0 °C
MX3F 58,0 °C


**Minimum temperature limitation**

**MN3O / MN3F:**
Minimum temperature limi-
tation
Adjustment range
0,0 ... 90,0 °C

Factory setting:
Arr = 2
MN3O 5,0 °C
MN3F 10,0 °C
Arr = 8
MN3O 60,0 °C
MN3F 65,0 °C



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 hot fuel boilers or heat exchange regulation.)
If the adjusted value **MX3O** is exceeded, the realis 3 would be deactivated. By falling under the parameter **MX3F** the relais switches on again.
Reference sensor:
**S3** at Arr 8, 13, 20, 26 (TSTU)
**S4** at Arr 2, 11, 16, 17, 18, 24, 30 (TST2, TFSB)
If the the temperature is fallen below the adjusted value **MN3O,** the relais 3 would be deactivated. By exceeding the parameter **MN3F** the relais switches on again.
Reference sensor:
**S4** at Arr 8, 13, 20, 26 (TST2, TFSB)
**S3** at Arr 2, 11, 16, 17, 18, 24, 30 (TSTU)
Both apply for the maximum temperature limitation and the minimum temperature limitation as well as the switch-on and -off temperature differences **DT3O** and **DT3F**.

### 4.3.5 Collector-limit temperature collector emergency shutdown

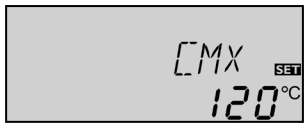
**EM EM1** / **EM2**:
collector limitation temperature
adjustment range:
110 ... 200 °C,
factory setting 140 °C


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. In the display is shown ⚠ (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

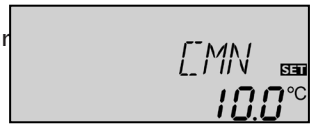



If the adjusted maximum store temperature is reached, the solar system switches-off. If now the collector temperature raises to the adjusted maximum collector temperature (**CMX** /**CMX1** / **CMX2**) the solar pump remains activated until this limit temperature value is again underrun. The store temperature 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** / **S1MX** / **S2MX**) and the collector temperature is by at least 5K lower than the store temperature, the solar system remains activated until the store is again cooled down (- 2 K) by the collector and the tubes under the adjusted maximum temperature (**S MX** / **S1MX** / **S2MX**). 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.

### 4.3.7 Option minimum collector limitation

**OCN** / **OCN1** / **OCN2:**
Minimum collector limitation
Adjustment range OFF / ON
Factory setting OFF

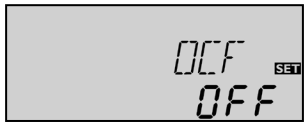

**CMN** / **CMN1** / **CMN2**:
Minimum collector temperatur
adjustment range10 ... 90 °C
factory setting 10 °C




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 under-run, in the display is shown ❄ (flashing).

### 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 that it will not freeze or „get thick“. If the adjusted frost protection 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 anti freeze function should only be used in regions with few days of temperatures around freezing point.

### 4.3.9 Oscillating charge

**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. |

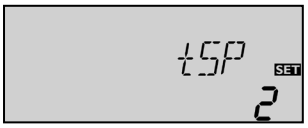
DeltaSol® ES **priority logic:**

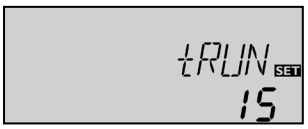
The above-mentioned options and parameters are only relevant for multi-store systems.

**Priority:**


**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

**Oscillating break time / oscillating charge time / collector rising temperature:**




The controller checks the stores regarding loading facilities (switch-on difference). If the priority store cannot be loaded, the lower-ranking store is checked. If the lower-ranking store can be charged, this is effected by the so-called „oscillating charge time“ (**tRUN**) After termination of the oscillating charge time, loading is stopped. The controller controls the increase in collector temperature. If it increases by the collector rising temperature (ΔT-Kol 2 K, fixed software value), the expired break time is again reset to zero and the oscillating break time starts again. If the switch-on conditions of the priority store is not reached, the loading of the lower-ranking store is continued. If the priority switch has reached its maximum temperature, the oscillating charge is not effected.

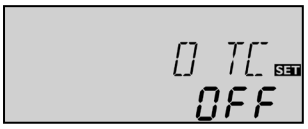
### 4.3.10 Recooling function

**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 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.

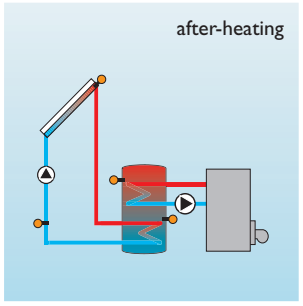
### 4.3.11 Tube collector special function

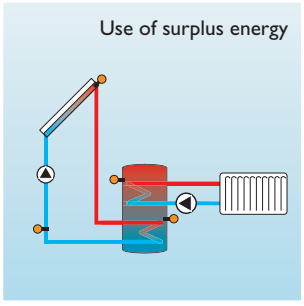
**OTC:**
tube collector special function
adjustment range
OFF ...ON
factory setting OFF




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 standstill 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.

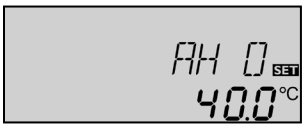
### 4.3.12Thermostat function



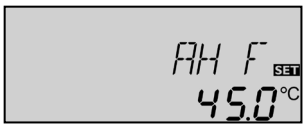




The thermostat function works independently from the solar operation and can e.g. be used for use of surplus energy or an after-heating.

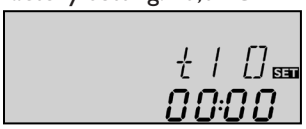
- **AH O** < **AH F**
  thermostat function is used for after-heating
- **AH F** > **AH O**
  thermostat function is used for use of surplus energy



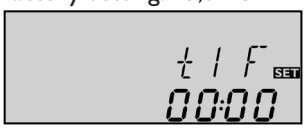

**AH O:**
Thermostat-switch-on temperature
adjustment range:
0,0 ...95,0 °C
factory setting: 40,0 °C




**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

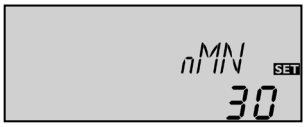



**t1 F, t2 F, t3 F:**
Thermostat switch-off time
adjustment range:
00:00 ...23:45
factory setting: 00:00

3 time slots t1 ...t3 are available for temporary blocking of thermostat function. If the thermostat function e. g. is only used between 6:00 and 9:00 a.m., the following adjustments have to be made: **t1 O** 6:00 and **t1 F** 9:00. Factory setting: thermostat function is permanently activated.
If all time slots stop at 00:00 a clock, the thermostat function is permanently activated (factory setting).

### 4.3.13 Pump speed control

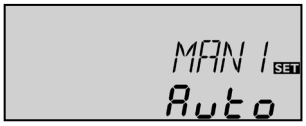
**nMN, n1MN, n2MN, n3MN:**
Minimum pump speed control
adjustment range: 30 ...100
factory setting: 30




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 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.**

### 4.3.14 Operating mode

**MAN1, MAN2, MAN3, MAN4, MAN5, MAN6:**
Operating mode
adjustment range:
OFF,AUTO,ON
factory setting: AUTO




| Channel | Relais |
|---|---|
| HNDx | 1-6 |

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) + ✋

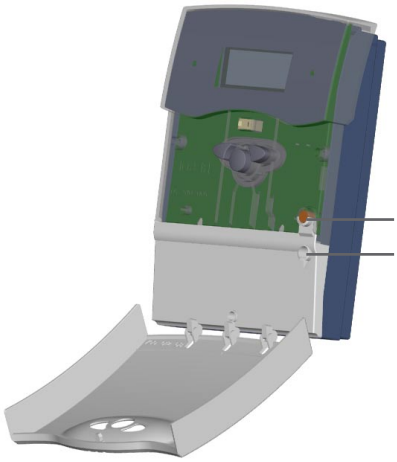
### 4.3.15 Language (LANG)

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

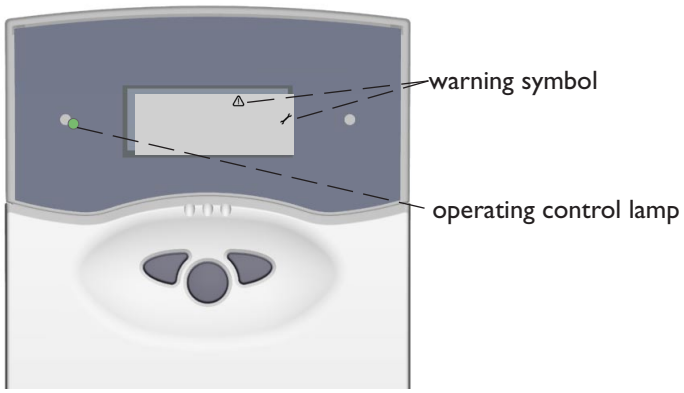

The menu language can be adjusted in this channel.

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

## 5. Tips for fault localization




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




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

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

**888.8** — Line break. Check the line.

**- 88.8** — 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 |

Resistances of Pt1000-sensors

Operating control lamp permanently expires.

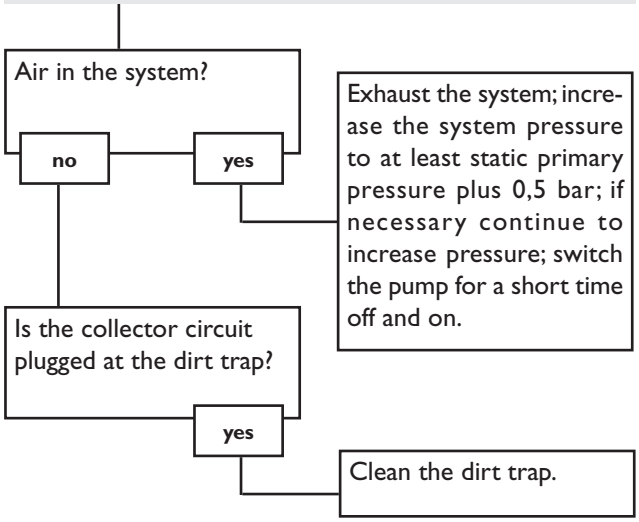
The power supply of the controller is to be checked if the control lamp goes out.

**no** — The can fuse of the controller is defective. It can be replaced after having dropped off the cover (spare fuse is enclosed in the accessory bag).

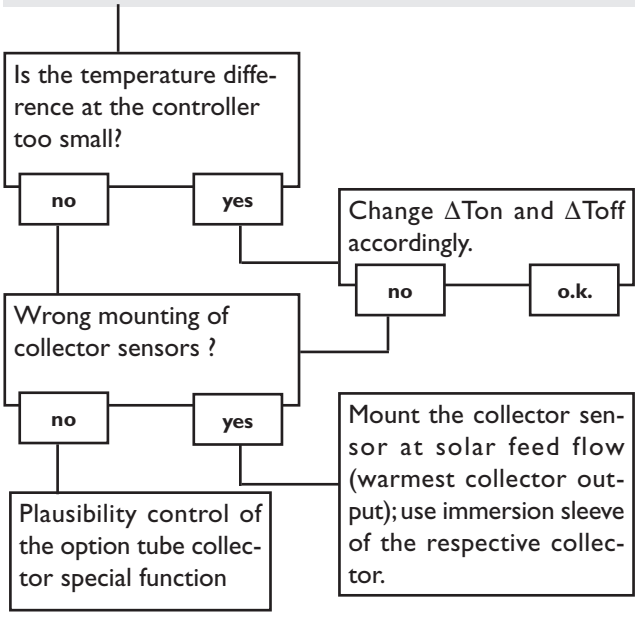
**o.k.**

### 5.1 Miscellaneous:

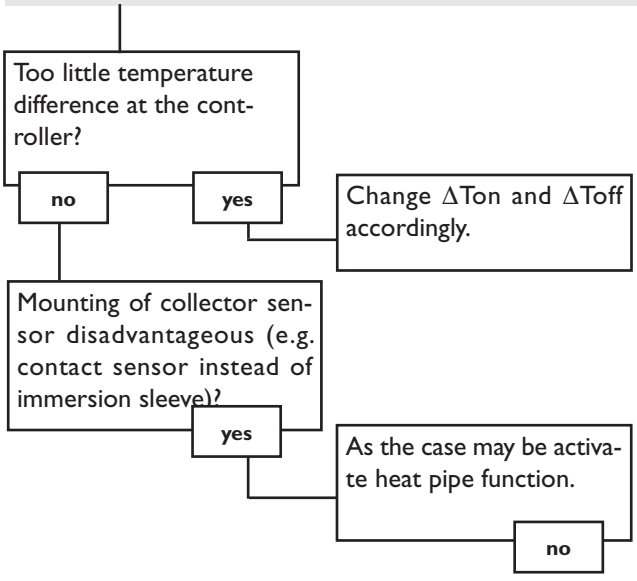
**Pump is overheated, but no heat transfer from collector to the store, feed flow and return flow are the same warm; perhaps also bubble in the lines.**



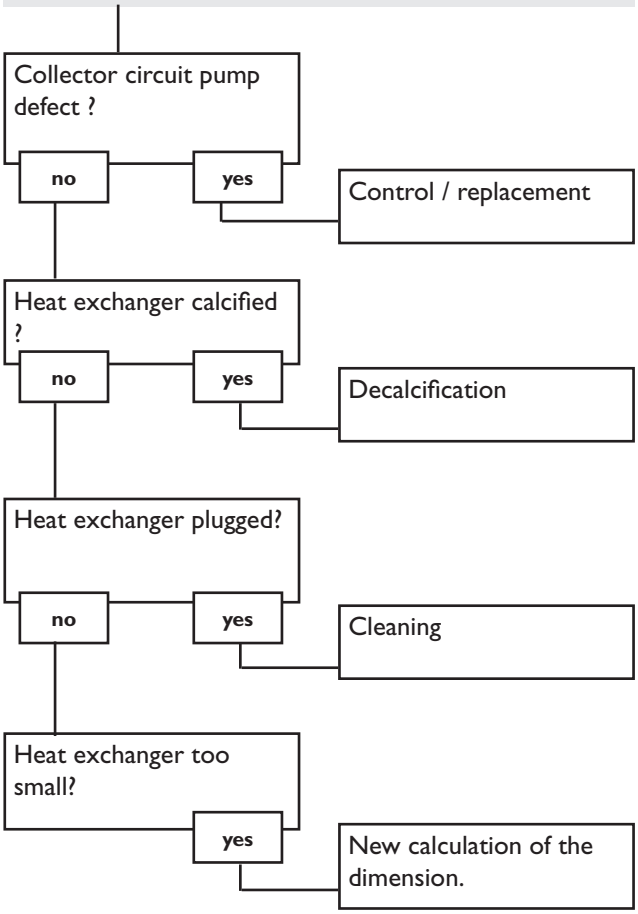

**Pump starts for a short moment, switches-on/off reapeatedly**




**Pump starts up very late and stops working soon.**




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



## Stores are cooling during the night

Collector circuit pump runs during the night ?
- no → Collector temperature is at night higher than ambient temperature.
  - no → Sufficient store insulation ?
    - yes → Insulation close enough to the store?
      - yes → Are the store connections insulated?
        - yes → Warm water outflow upwards?
          - no → Does the warm water circulation run for a very long time?
            - no → Circulation pump and blocking valve should be switched-off for 1 night; less store losses ?
              - yes → Control the return flow preventer in warm water circulation - o.k.
                - yes → The gravitation circulation in the circulation line is to strong; insert a stronger return flow preventer or en electrical 2-way valve behind the circulation pump; the 2-way valve is open in pump operation, otherwise it is closed, connect pump and
                - no → Clearing or replacement.
              - no → Check the pumps of the after-heating circuit according to nightly run and defect return flow preventer; problem solved ?
                - no → Further pumps, which are connected to the solar store must also be checked.
            - yes → Use the circulation pump with timer and switch-off thermostat (energy efficient circulation).
          - yes → Change connection and let the water flow sidewards or through a siphon (bow downwards); less store losses now ?
            - yes → o.k.
            - no → Does the warm water circulation run for a very long time?
        - no → Insulate the connections.
      - no → Replace insulation or increase it.
    - no → Increase insulation.
  - yes → Check the return flow preventer in feed flow and return flow with regard to the functional efficiency.
- yes → Check controller

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

Does the control lamp shine?
- yes → Does the pump starts up in manual operation ?
  - no → Is the current enabled by the controller?
    - no → Are the fuses at the controller o.k. ?
      - no → Replace fuses.
      - yes → Controller seems to be defect - replace it.
    - yes → Is the pump stuck?
      - yes → Put the pump into operation by screwdriver; now passable?
        - no → Pump is defect - replace it.
  - yes → The adjusted temperature difference for starting the pump is to high; choose a value which makes more sense.
- no → There is no current; check fuses / replace them and check power supply.

# 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.

### RESOL Overvoltage protection

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

### RESOL V40

If you are interested in realising a heat quantity balancing, a V40 is needed for measurement of the volume flow in the system.

### RESOL Service Center Software

The RSC light software enables a readout of the measured values of the controller for visualisation and control of the system. For free download of the software, please click on www.resol.de.

**Distributed by:**

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www.resol.de
info@resol.de

**Important notice**:
We took a lot of care with the texts and drawings of this manual and to the best of our knowledge and consent. As faults can never be excluded, please note: Your own calculations and plans, under consideration of the current standards and DIN-directions should only be basis for your projects. We don´t 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 the resulting damages.



**Please note:**
The design and the specifications are to be changed without notice.
The illustrations may differ from the original product.