BASIC controller

Solar controller

Manual for the
specialised craftsman

Installation
Operation
Functions and options
Troubleshooting

COL
76.3℃

BASIC controller

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

en

Manual

Safety advice

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

Instructions

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

Information about the product

Proper usage

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

Improper use excludes all liability claims.

CE Declaration of conformity

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

Note
Strong electromagnetic fields can impair the function of the controller.
➔ Make sure the controller as well as the system are not exposed to strong electromagnetic fields.

Subject to technical change. Errors excepted.

Target group

These instructions are exclusively addressed to authorised skilled personnel.

Only qualified electricians should carry out electrical works.

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

Description of symbols

WARNING!   Warnings are indicated with a warning triangle!
➔ **They contain information on how to avoid the danger described.**

Signal words describe the danger that may occur, when it is not avoided.
• **WARNING** means that injury, possibly life-threatening injury, can occur.
• **ATTENTION** means that damage to the appliance can occur.

Note
Notes are indicated with an information symbol.

➔ Arrows indicate instruction steps that should be carried out.

Disposal

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

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BASIC controller

With its versatile software, the BASIC controller can control even complex systems easily and reliably. 3 pre-configured system layouts facilitate the commissioning. The operation via 2 main buttons and 1 adjustment dial, the Lightwheel®, still follows the well-known operating concept. The multicoloured LED, integrated in the Light-wheel®, offers many possibilities to signal different system states. 2 microbuttons for quick access to the manual mode and the holiday function are located underneath the slidable housing cover, the slider.

Contents

1 Overview

- **2 relay outputs (incl. 1 potential-free extra-low voltage relay)**
- **4 inputs for Pt1000, Pt500 or KTY temperature sensors**
- **1 V40 impulse input**
- **1 PWM output for speed control of high-efficiency pumps**
- **3 systems**
- **Automatic function control according to VDI 2169**
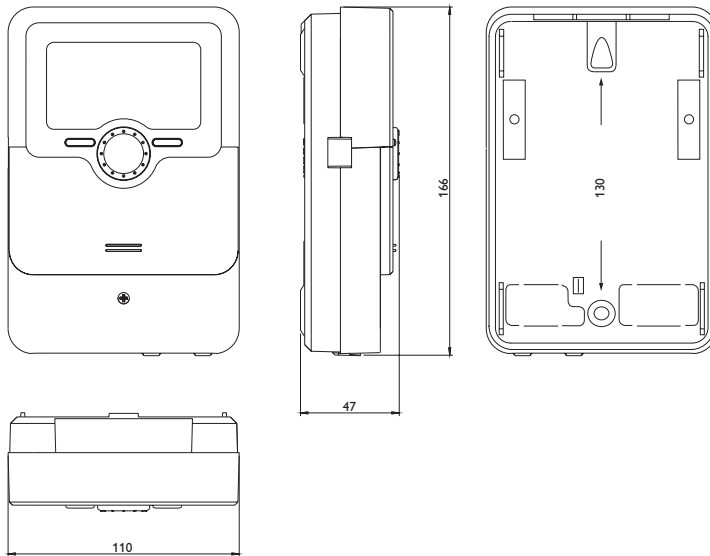
Technical data

Inputs: 4 inputs for Pt1000, Pt500 or KTY temperature sensors, 1 V40 impulse input

Outputs: 1 semiconductor relay, 1 potential-free extra-low voltage relay, 1 PWM output (switchable to 0-10 V)

Switching capacity:
1 (1) A 240 V~ (semiconductor relay)
1 (1) A 30 V ⎓ (potential-free relay)

Total switching capacity: 2 A 240 V~

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

Supply connection: type Y attachment

Power consumption < 1 W (standby)

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

Rated impulse voltage: 2.5 kV

Data interface: VBus®

VBus® current supply: 60 mA

Functions: operating hours counter, tube collector function, pump speed control, heat quantity measurement, adjustable system parameters and optional functions (menu-driven), balance and diagnostics function, function control according to VDI 2169

Housing: plastic, PC-ABS and PMMA

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

Indication/Display: System-Monitoring-Display, for visualisation of the systems, 16-segment-display, 8 symbols for indication of the system status, Lightwheel® (adjustment dial) and background illumination

Operation: 4 push buttons and 1 Lightwheel®

Protection type: IP 20/DIN EN 60529

Protection class: I

Ambient temperature: 0 … 40 °C

Degree of pollution: 2

Dimensions: 110 x 166 x 47 mm

2 Installation

2.1 Montage

> **Note**
> Strong electromagnetic fields can impair the function of the controller.
> ➔ Make sure the controller as well as the system are not exposed to strong electromagnetic fields.

The device must only be located in dry interior rooms.

The controller must additionally be supplied from a double pole switch with contact gap of at least 3 mm.

Please pay attention to separate routing of sensor cables and mains cables.

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

➔ Unscrew the crosshead screw from the cover and remove it along with the cover from the housing.

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

➔ Hang the housing from the upper fastening point and mark the lower fastening points (centres 130 mm).

➔ Insert lower wall plugs.

➔ Fasten the housing to the wall with the lower fastening screw and tighten.

➔ Carry out the electrical wiring in accordance with the terminal allocation (see page 5).

➔ Put the cover on the housing.

➔ Attach with the fastening screw.

2.2 Electrical connection

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

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

The controller is supplied with power via a mains cable. The power supply of the device must be 100 … 240 V~ (50 … 60 Hz).

The controller is equipped with 2 relays in total to which loads such as pumps, valves, etc. can be connected:

- Relay 1 is a semiconductor relay, designed for pump speed control:

 Conductor R1
 Neutral conductor N
 Protective conductor ⊕

- Relay 2 is a potential-free extra-low voltage relay

Depending on the product version, mains cables and sensor cables are already connected to the device. If that is not the case, please proceed as follows:

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

S1 = Sensor 1 (collector sensor)
S2 = Sensor 2 (store sensor base)
S3 = Sensor 3 (e. g. store sensor top)
S4 = Sensor 4 (e. g. washing machine)

A **V40** flowmeter can be connected to the terminals V40 and GND (either polarity).

The terminal marked **PWM** is a control output for a high-efficiency pump (convertible to 0-10 V signal outputs, see page 10).

The **mains connection** is at the terminals:
Neutral conductor N
Conductor L
Protective conductor ⏚

i **Note**
The connection depends on the system layout selected (see page 6).

i **Note**
For more details about the commissioning procedure see page 15.

2.3 Data communication / Bus

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

One or more **VBus®** modules can be connected via this data bus, such as:
• DL2 Datalogger
• DL3 Datalogger

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

i **Note**
More accessories on page 40.

2.4 System overview
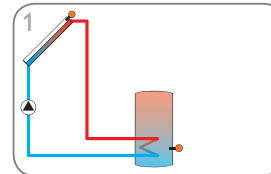
Solar system with 1 store (7)
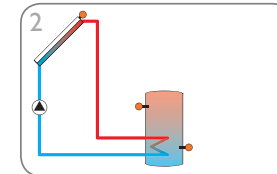
Solar system with 1 store and after-heating (8)
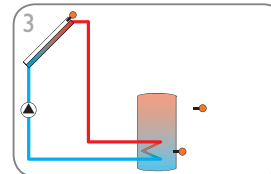
Solar system with 1 store (9)

2.5 Systems

System 1: Standard solar system with 1 store
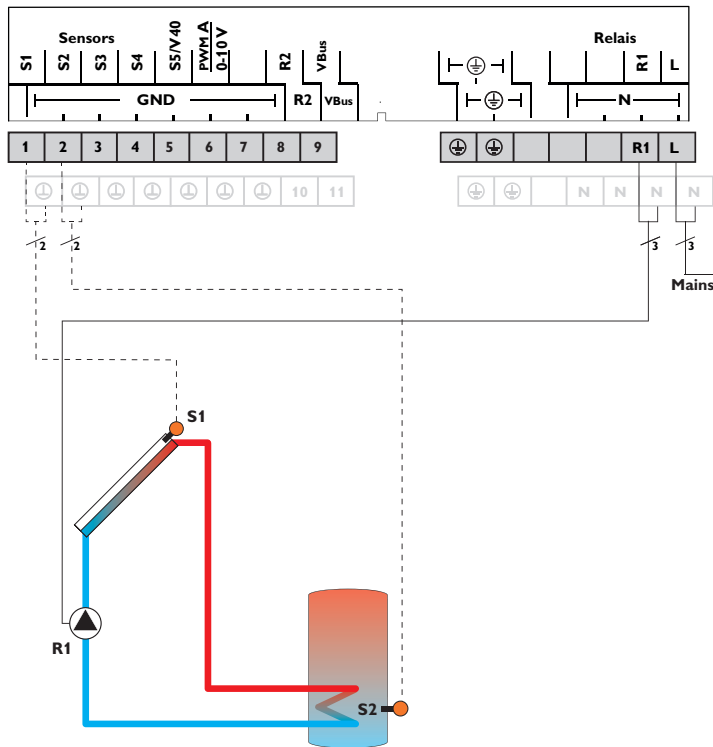
Sensors		
S1	Temperature collector	1 / GND
S2	Temperature store base	2 / GND
S3	Free	3 / GND
S4	Free	4 / GND
V40	Free	V40 / GND

Relay		
R1	Solar pump	R1 / N / PE
R2	Free	R2 / R2

The controller calculates the temperature difference between collector sensor S1 and store sensor S2. If the difference is larger than or identical to the adjusted switch-on temperature difference, the pump (R1) will be switched on and the store will be loaded until the switch-off temperature difference or the maximum store temperature is reached.

System 2: Solar system with 1 store and afterheating
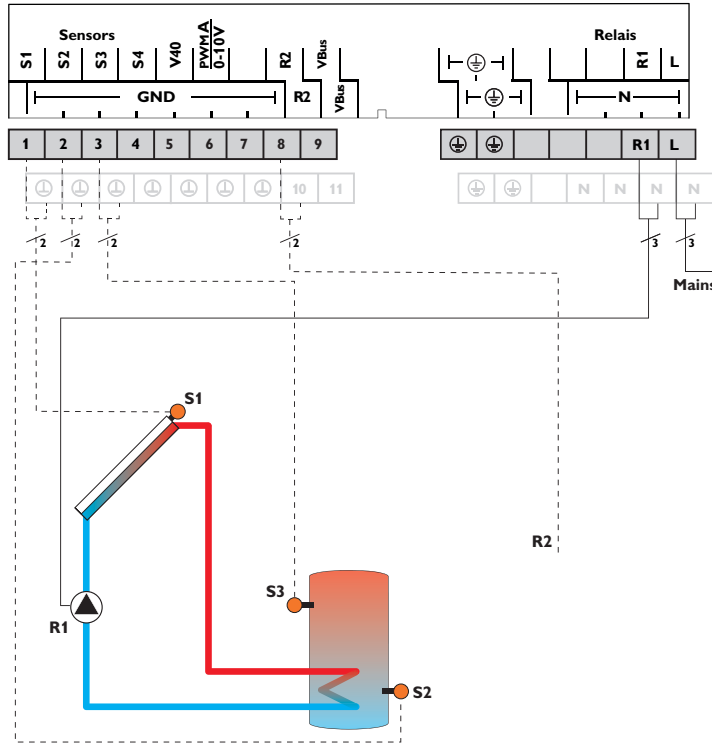
Sensors		
S1	Temperature collector	1 / GND
S2	Temperature store base	2 / GND
S3	Temperature afterheating	3 / GND
S4	Free	4 / GND
V40	Free	5 / GND

Relay		
R1	Solar pump	R1 / N / PE
R2	Afterheating	R2 / R2

The controller calculates the temperature difference between collector sensor S1 and store sensor S2. If the difference is larger than or identical to the adjusted switch-on temperature difference, the pump (R1) will be switched on and the store will be loaded until the switch-off temperature difference or the maximum store temperature is reached.

Afterheating (R2) can be carried out with a thermostat function (S3). If the value at S3 reaches the switch-on temperature for the afterheating, the relay is switched on. If the value exceeds the switch-off temperature for the afterheating, the relay is switched off again.

System 3: Standard solar system with 1 store
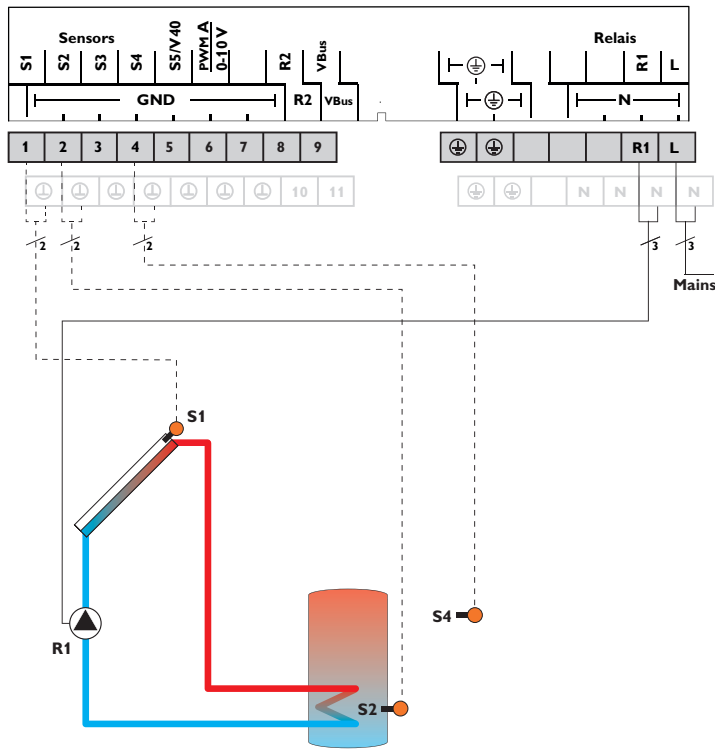
Sensors		
S1	Temperature collector	1 / GND
S2	Temperature store base	2 / GND
S3	Free	3 / GND
S4	Temperature washing machine inlet	4 / GND
V40	Free	V40 / GND

Relay		
R1	Solar pump	R1 / N / PE
R2	Valve washing machine	R2 / R2

The controller calculates the temperature difference between collector sensor S1 and store sensor S2. If the difference is larger than or identical to the adjusted switch-on temperature difference, the pump (R1) will be switched on and the store will be loaded until the switch-off temperature difference or the maximum store temperature is reached.

Preheating of the washing machine inlet (R2) can be carried out with a thermostat function. If the value at S4 reaches the switch-on temperature for the washing machine function, the function will be switched on and the temperature will be maintained at the desired value for the adjusted time by means of the valve. After the adjusted time has elapsed, the relay will be deactivated for the same duration.

Electrical connection of a high-efficiency pump (HE pump)

Speed control of a HE pump is possible via a PWM signal / 0-10 V control. The pump has to be connected to the relay (power supply) as well as to one of the PWM A/B outputs of the controller. In the **REL** adjustment channel one of the PWM control types as well as a relay have to be selected (see page 28).
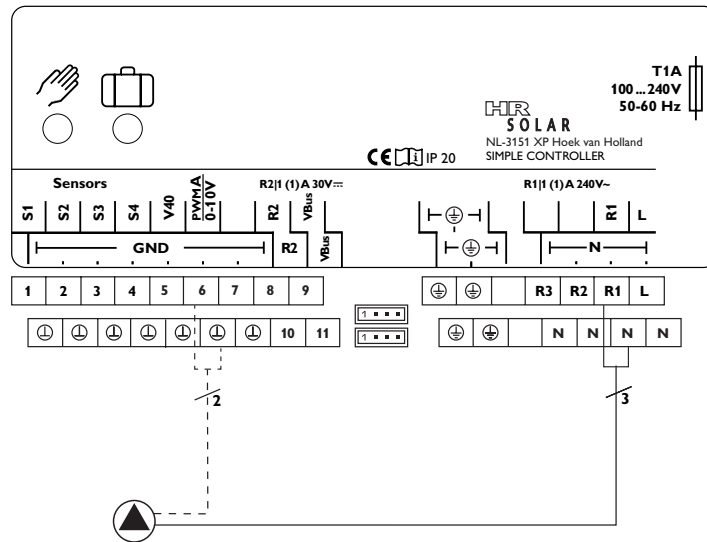
Note

For more information about relay control, see page 28.

3   Operation and function

3.1   Buttons and adjustment dial

The controller is operated via 2 buttons and 1 adjustment dial (Lightwheel®) below the display:

Left button (⤺) - escape button for changing into the previous menu

Right button (✓) - confirming / selecting

Lightwheel®   - scrolling upwards / scrolling downwards, increasing adjustment values / reducing adjustment values

3.2   Microbuttons for manual mode and holiday mode

The controller is equipped with two microbuttons for quick access to the manual mode and the holiday function. The microbuttons are located underneath the slidable housing cover, the slider.

Mircobutton ✍: If the microbutton ✍ is briefly pressed, relay 1 will be set to the manual mode for 1 minute

Microbutton 🛄: The microbutton 🛄 is used for activating the holiday function (see 29). If the microbutton is pressed and held down for approx. 3 s, the adjustment channel **DAYS** appears, allowing to enter the number of days for an absence. If the parameter is set to a value higher than 0, the function becomes active using the adjustments that have previously been made in the **H-DAY** menu. The days will be counted backwards at 00:00. If the value is set to 0, the function is deactivated.

3.3 Control lamp

The controller is equipped with a multicolour LED in the centre of the Lightwheel®, indicating the following states:

Colour	Permanently shown	Flashing
Green	Everything OK	Manual mode: at least one relay HAND ON / minimum speed / maximum speed
Red		Sensor line break, sensor short circuit, flow rate monitoring, overpressure, low pressure
Yellow	Holiday function active	ΔT too high, night circulation, FL/RE interchanged, store emergency temperature exceeded

3.4 Menu structure

Status level
TCOL
TSTB
TSTT
…

Menu level
BALAN
Adjustment level
SYS
LOAD
COL
…

Balance values
h R1
h R2
DAYS
MAXS1
MINS1
…

Configuration
DT O
DT F
DT S
S SET
S MAX
SMAXS
…
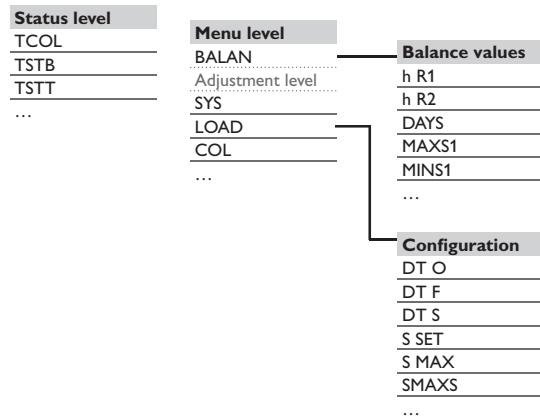
The menu structure of the controller consists of 2 levels: the status level and the menu level.

The status level consists of different display channels which indicate display values and messages.

The menu level consists of the balance value menu and several menu items each of which consist of sub-menus and adjustment channels. In order to activate or deactivate a function, it must be selected in the menu level. The display changes to the adjustment menu in which all adjustments required can be carried out.

> **i** **Note**
> Some of the menu items depend on the selected system and the adjusted options. Therefore, they are only displayed if they are available.

> **i** **Note**
> The abstract from the menu structure is for information on the structure of the controller menu and is therefore not complete.

3.5 Selecting menu points and adjusting values

During normal operation of the controller, the display shows the status level with the indication channels. If no button is pressed for 1 min, the display illumination goes out. If no button is pressed for further 3 min, the display indicates the status level.

➔ Press any key to reactivate the display illumination.
➔ In order to scroll through the display channels, turn the Lightwheel®.

Accessing the adjustment level:

➔ Press the right button (✓) for approx. 3 s.

The display changes to the adjustment level. All menus contain adjustment channels and are marked with **PUSH** below the the menu item.

➔ In order to access the desired menu, press the right button (✓).

Selecting and adjusting options / functions

An option or function containing adjustment values are marked with **PUSH**.

➜ In order to access the sub-menu of the option, select the option by turning the Lightwheel® and press the right button (✔).

➜ In order to activate an option, select ON. In order to deactivate it, select OFF.

The adjustment channels are characterised by the indication **SET**.

➜ Select the desired adjustment channel by turning the Lightwheel®.

➜ Confirm your selection with the right button (✔). **SET** starts flashing (adjustment mode).

➜ Adjust the value by turning the Lightwheel®.

➜ Confirm your selection with the right button (✔). **SET** permanently appears, the adjustment has been saved.

BACK PUSH appears as the last display.

➜ In order to get back to the menu selection, press the right button (✔).

If no button has been pressed within a couple of minutes, the adjustment is cancelled and the previous value is retained.

3.6 Resetting balance values

Heat quantity, operating hours of the relays as well as minimum and maximum temperatures can be set back to zero. In order to reset a value, proceed as follows:

➜ Select the desired value and press the right button (✔). **SET** starts flashing.

➜ Turn the Lightwheel® anticlockwise.

The value is set back to 0.

➜ Press the right button (✔).

The message DEL will be displayed.

➜ Turn the Lightwheel® clockwise.

YES instead of NO will be displayed.

➜ Confirm your selection with the right button (✔).

The value will be set back to zero and the symbol will be permanently displayed.

In order to interrupt this process, press the left button (↰).

4 System-Monitoring-Display

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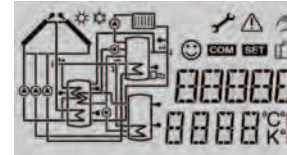
The System-Monitoring-Display consists of 3 blocks: channel display, tool bar and system screen.

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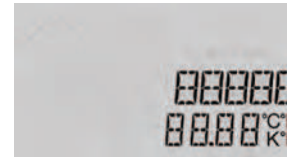
The channel display consists of 2 lines. The upper display line is an alphanumeric 16-segment display. In this line, mainly channel names and menu items are displayed. In the lower 16-segment display, values are displayed.

Tool bar

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

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4.1 System screen
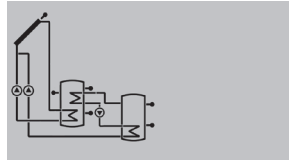
The system selected is indicated in the System-Monitoring-Display. It consists of several system component symbols which are – depending on the current status of the system – either flashing, permanently shown or hidden.

Collectors
with collector sensor

Store 1 and 2
with heat exchanger

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

Temperature sensor

Heating circuit
(return preheating)

Pump

Afterheating
with burner symbol

Installation

Operation and function

Commissioning

Indications, functions and options

Messages
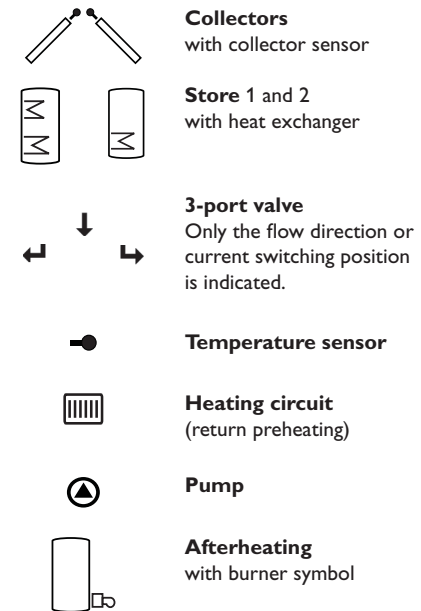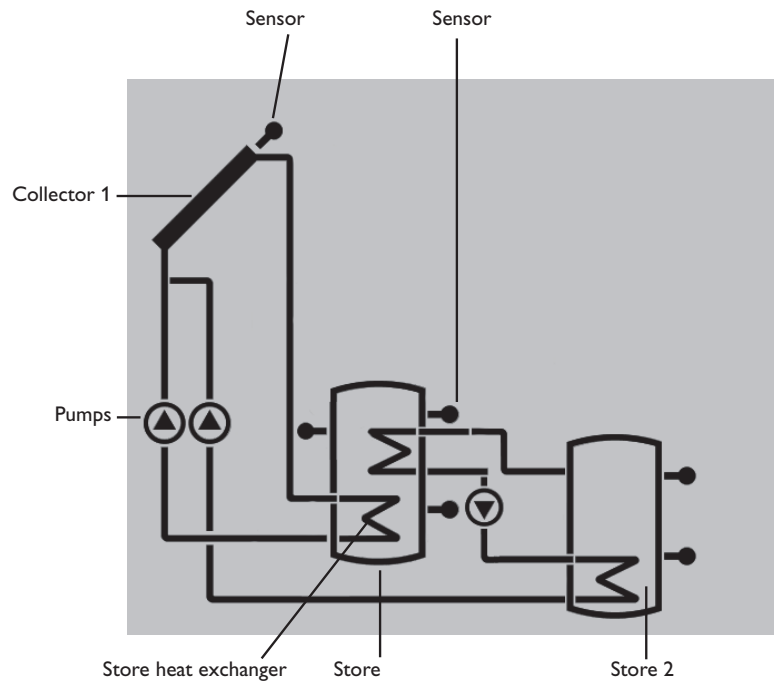
4.2 Further indications

Smiley

If the controller operates faultlessly (normal operation), a smiley ☺ is displayed.

Fault indication

If the controller detects a malfunction, the control LED flashes red and the symbols of the warning triangle ⚠ and the wrench ⚟ are additionally displayed.

Short text and ticker

Functions, options, measurement and balance values as well as messages are indicated as both short text and ticker. After the short text has been displayed, the corresponding long text will be indicated as a ticker from right to left.

Symbol	Permanently shown	Flashing
Status indications:		
☼	Store maximum limitation active (store maximum temperature has been exceeded)	Collector cooling function active, system cooling or store cooling active
❄	Antifreeze option activated	Collector temp. below minimum temp., antifreeze function active
⚠		Collector emergency shutdown active
⚠ + ✋		Manual mode active
⚠ + ☼		Store emergency shutdown active
SET		Adjustment mode
🧳	Holiday function active	
☺	Normal operation	
Fault indication:		
⚠ + ⚟		Sensor fault

5 Status level / Measurement values

During normal operation of the controller, the display is in the status menu indicating the values shown in the table (depending on the system selected).

In addition to the display values, possible error messages are indicated in the status menu (see page 36).

Display	Description (long text)
TCOL	Temperature collector
TSTB	Temperature store base
TSTT	Temperature store top
TAH	Temperature afterheating
S3	Temperature sensor 3
n1%	Speed relay 1
L/h	Flow rate sensor V40
TFHQM	Heat quantity measurement flow temperature
TRHQM	Heat quantity measurement return temperature
kWh	Heat quantity in kWh
MWh	Heat quantity in MWh
BLPR	Blocking protection relay 1
BLPR2	Blocking protection relay 2
INIT	Initialisation drainback
FLLT	Filling time drainback
STAB	Stabilisation drainback
TIME	
DATE	

6 Balance values

The balance value menu indicates the balance values.

Display	Description
h R1	Operating hours relay 1
h R2	Operating hours relay 2
DAYS	Operating days of the controller (cannot be set back to zero)
MAXS1	Maximum temperature sensor 1
MINS1	Minimum temperature sensor 1
MAXS2	Maximum temperature sensor 2
MINS2	Minimum temperature sensor 2
MAXS3	Maximum temperature sensor 3
MINS3	Minimum temperature sensor 3
MAXS4	Maximum temperature sensor 4
MIN S4	Maximum temperature sensor 4

7 Commissioning

When the hydraulic system is filled and ready for operation, connect the controller to the mains.

The controller runs an initialisation phase in which all symbols are indicated in the display. The Lightwheel® flashes red.

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

Commissioning menu

The commissioning menu consists of the channels described in the following. In order to make an adjustment, press the right button (✓). **SET** starts flashing and the adjustment can be made. Confirm the adjustment with the right button (✓). Turn the Lightwheel®, the next channel will appear on the screen.

Operation

Adjustment mode — **SET** flashing

Changing a value — **SET** flashing

Confirming a value — **SET** not flashing

to the next parameter
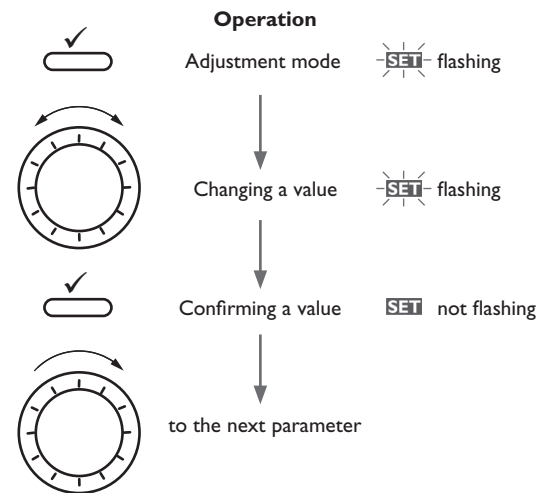
Commissioning

1. Time:
→ Adjust the clock time. First of all adjust the hours, then the minutes.

2. Daylight savings time adjustment:
→ Activate or deactivate the automatic daylight savings time adjustment.
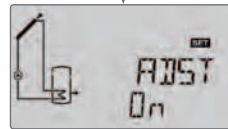
3. Date:
→ Adjust the date. First of all adjust the year, then the month and then the day.
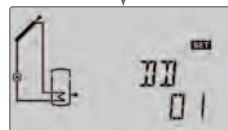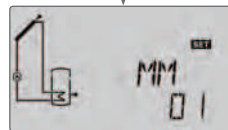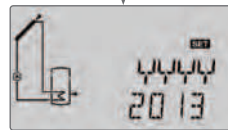
→ **Complete the commissioning menu by pressing the right button (✓).**

The controller is then ready for operation and normally the factory settings will give close to optimum operation.

Note
The adjustments carried out during commissioning can be changed anytime in the corresponding adjustment channel. Additional functions and options can also be activated or deactivated (see page 17).
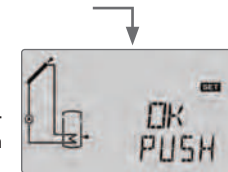
8 Indications, functions and options

8.1 Status level

Display of blocking protection time
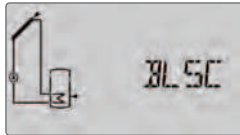
BLSC
BLSC(2, 3)
Blocking protection active

Display of drainback time periods
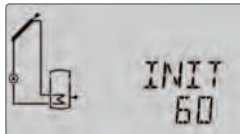
INIT
INIT
Initialisation active
Indicates the time adjusted in **tDTO**, running backwards.
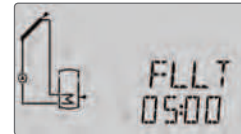
FLLT
FLLT
Filling time active
Indicates the time adjusted in **tFLL**, running backwards.
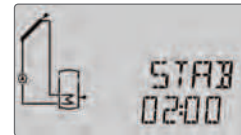
STAB
STAB
Stabilisation
Indicates the time adjusted in tSTB, running backwards.

Display of collector temperatures
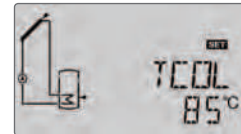
TCOL
TCOL
Collector temperature
Display range: -40 … +260 °C
Displays the current collector temperature.

Display of store temperatures
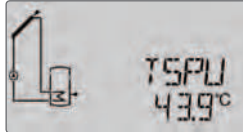
TSTB, etc.
Store temperatures
Display range: -40 … +260 °C
Displays the current store temperature.
• TSTB : Store temperature base
• TSTT : Store temperature top

Display of temperatures at S3
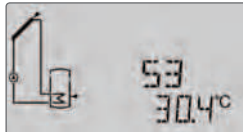
S3
Sensor temperatures
Display range: -40 … +260 °C
Indicates the current temperature at the corresponding additional sensor (without control function).
• S3 : Temperature sensor 3

Display of other temperatures
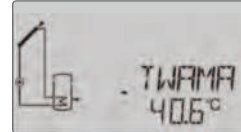
TWAMA, etc.
Other measured temperatures
Display range: -40 … +260 °C
Indicates the current temperature at the washing machine inlet. The display of this temperature depends on the system selected.
• Temperature, washing machine, inlet

Display of flow rate
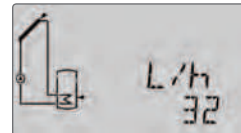
L/h, G/h
Flow rate
Display range: 0 … 9999 l/h
Indicates the currently measured flow rate. This value is used for calculating the heat quantity supplied (V40).

Display of speed

n1 %, n2 %
Current pump speed
Display range: 20 … 100 % (standard pump / HE pump)
Indicates the current speed of the corresponding pump.

Display of heat quantity

kWh/MWh

Heat quantity in kWh/MWh

Indicates the heat quantity produced in the system. For this purpose, the heat quantity measurement option has to be enabled. The flow rate as well as the values of the reference sensors fl ow and return are used for calculating the heat quantity supplied. It is shown in kWh in the **kWh** channel and in MWh in the **MWh channel.** The overall heat quantity results from the sum of both values.

The accumulated heat quantity can be set back to zero (see page 12).

Display of time

TIME

Time

Indicates the current clock time.

Display of date

DATE

Date

Indicates the current date.

8.2 Menu overview

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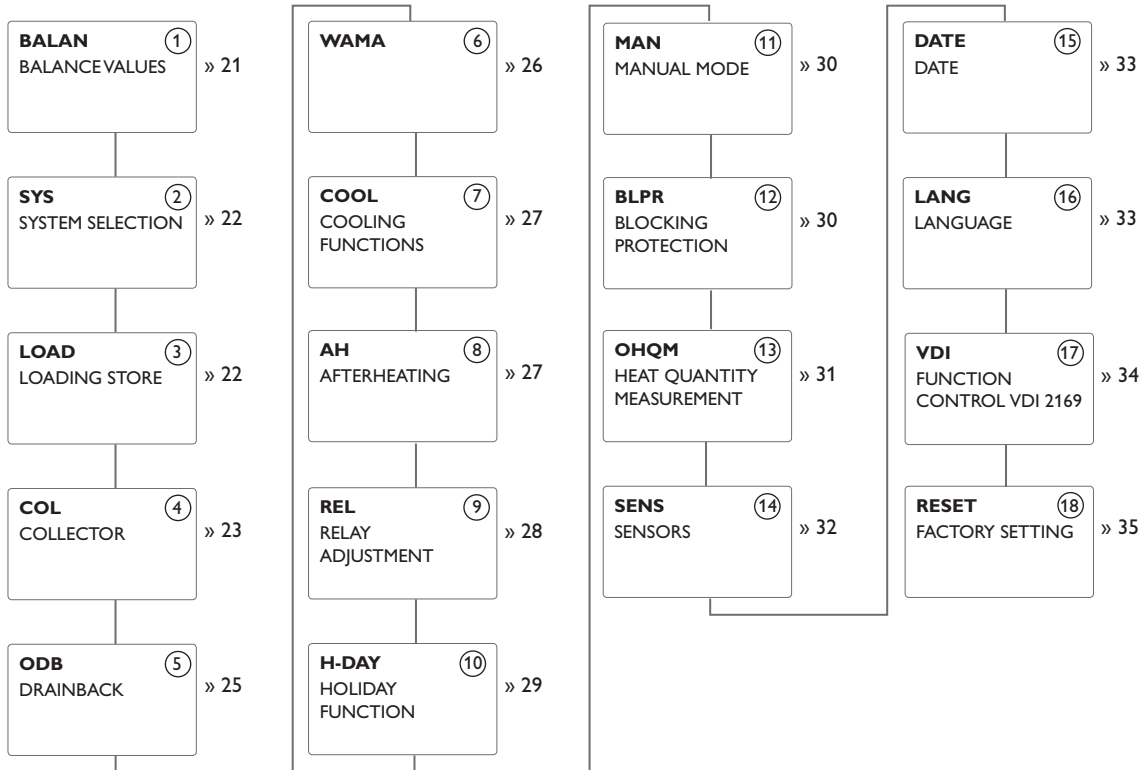
Balance values
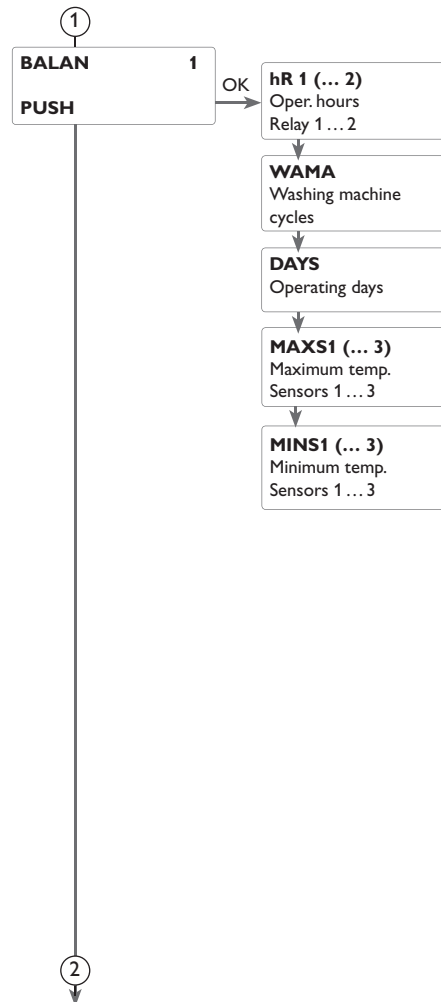
① **Operating hours counter**

h R (1, 2)
Operating hours counter

The operating hours counter accumulates the operating hours of the relay (**h R1** / **h R2**). Full hours are displayed.

The accumulated operating hours can be set back to zero (see page 12).

Washing machine cycles
WAMA

Indicates the number of washing machine cycles.

Operating days
DAYS

Display of operating days since commissioning or last reset. The operating days cannot be set back to zero.

Minimum and maximum temperatures

MAXS1(2, 3)
Maximum temperatures at S1 … S3

MINS1(2, 3)
Minimum temperatures at S1 … S3

Indication of the minimum and maximum temperatures at S1…S3.

The temperature indication can be set back to zero (see page 12).

Adjustment level

②

SYS 2	SYS
PUSH	Basic system Adjustment range: 1 … 3 Factory setting: 1

BACK

PUSH

③

LOAD 3	DTO	SMAX
PUSH	Switch-on temperature diff. Adjustment range: 1.0 … 50.0 K in steps of 0.5 K Factory setting: 6.0 K	Maximum store tempera- ture Adjustment range: 4 … 95 °C in steps of 1 °C Factory setting: 85 °C

DTF
Switch-off temperature diff.
Adjustment range:
0.5 … 49.5 K
in steps of 0.5 K
Factory setting: 4.0 K

SMAXS
Sensor store maximum
temp.
Adjustment range: S2, S3
Factory setting: S2

DTS
Set temperature difference
Adjustment range:
1.5 … 50.0 K
in steps of 0.5 K
Factory setting: 10.0 K

HYST
Adjustment range: 0.1 … 10°
in steps of 0.1 K
Factory setting 2K

BACK

PUSH

④

22

② **System**

Selecting the system

Each system has pre-programmed options and adjustments which can be activated or changed respectively if necessary. Select the system first (see page 10).

③ **ΔT control**

The controller works as a standard differential controller. If the temperature reaches or exceeds the switch-on temperature difference, the pump switches on. When the temperature difference reaches or falls below the adjusted switch-off temperature difference, the respective relay switches off.

Note

The switch-on temperature difference must be 0.5 K higher than the switch-off temperature difference. The set temperature difference must be at least 0.5 K higher than the switch-on temperature difference.

Speed control

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

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

Note

To enable speed control, the corresponding relay has to be set to **AUTO**, **MIN**, **MAX** or **ADAP** (adjustment channel **MAN**) and relay control to **PULS, PSOL, PHEA** or **0-10 V** (adjustment channel **REL**).

④

COL   4
PUSH

→ | **CEM** |
| Collector emergency temperature |
| Adjustment range: 80 … 200 °C |
| in steps of 1 °C |
| Factory setting: 140 °C |
| Switch-on hysteresis: -10 K |

| **OCCO** |
| PUSH |

OK →

| **OCCO** |
| Selection: OFF / ON |
| Factory setting: ON |

OFF   ON

| **CMAX** |
| Collector maximum temp. |
| Adjustment range: 70 … 160 °C |
| in steps of 1 °C |
| Factory setting: 105 °C |
| Switch-on hysteresis: -5K |

| **BACK** |
| PUSH |

a   b   c
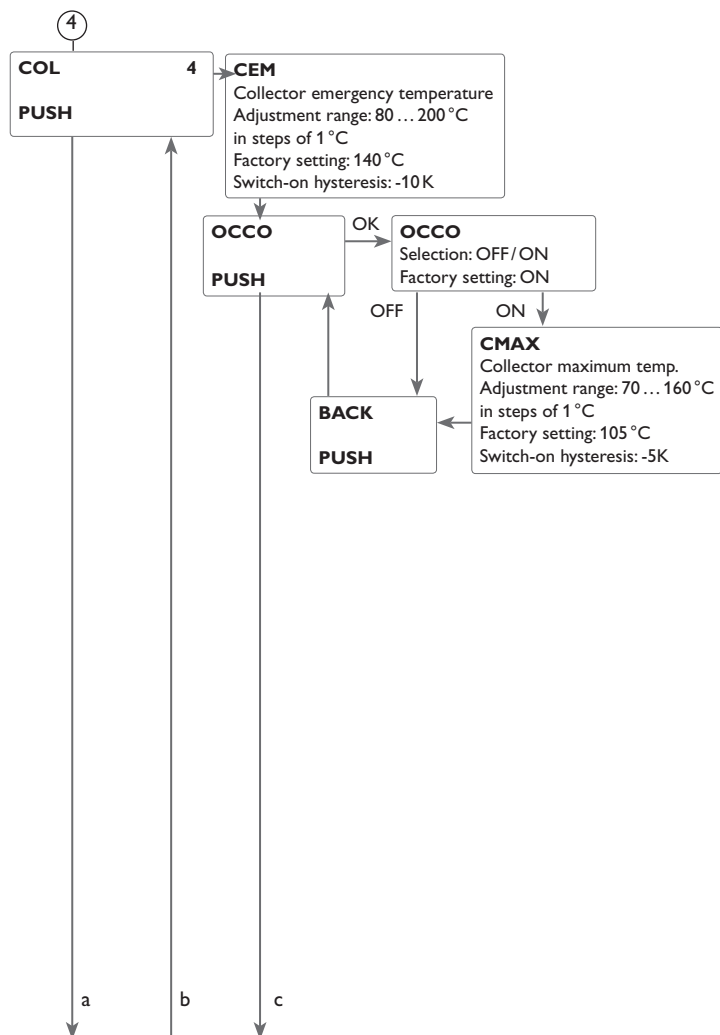
④ **Collector emergency shutdown**

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

ℹ Note

If the drainback option is activated, the adjustment range of the collector emergency temperature is changed to 80 … 95 °C. Factory setting will be 95 °C.

WARNING! **Risk of injury! Risk of system damage by pressure surge!**

⚠ If water is used as the heat transfer fluid in pressureless systems, water will boil at 100 °C.

➔ **In pressureless systems with water as the heat transfer fluid, do not set the collector limit temperature higher than 95 °C.**

Collector cooling

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

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

If the collector cooling is active, ☼ is displayed (flashing).

ℹ Note

This function is only available if the system cooling function and the heat dump function are not activated.

4

a   b   c

OTCO

PUSH

OK

OTCO (2)
Tube collector function
Selection: ON / OFF
Factory setting: OFF

BACK

PUSH

OFF

ON

TCST (2)
Starting time
Adjustment range:
00:00 … 23:00
Factory setting: 07:00

TCEN (2)
Ending time
Adjustment range:
00:30 … 23:30
in steps of 00:30
Factory setting: 19:00

TCRU (2)
Runtime
Adjustment range: 30 … 600 s
in steps of 5 s
Factory setting: 30 s

TCIN (2)
Standstill intervall
Adjustment range: 5 … 60 min
in steps of 00:01
Factory setting: 30 min

BACK

PUSH

5

Tube collector function

This function is used for improving the switch-on behaviour in systems with non-ideal sensor positions (e. g. with some tube collectors).

This function operates within an adjusted time frame. It activates the collector circuit pump for an adjustable runtime between adjustable pauses in order to compensate for the delayed temperature measurement.

If the runtime is set to more than 10 s, the pump will be run at 100 % for the first 10 s of the runtime. For the remaining runtime, the pump will be run at the adjusted minimum speed.

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

2-collector systems

In 2-collector systems, the tube collector function is available for each individual collector field.

In 2-collector systems, the tube collector function will affect the inactive collector field only. The solar pump of the active collector field will remain switched on until the switch-off conditions are fulfilled.

i **Note**

If the drainback option is activated, the tube collector function will not be available.

```
      ⑤
┌──────────────────┐            ┌──────────────────────────┐
│ ODB          5   │     OK     │ ODB                      │
│                  │ ─────────▶ │ Drainback option         │
│ PUSH             │            │ Selection: OFF / ON      │
└──────────────────┘            │ Factory setting: OFF     │
         ▲    ▲                 └──────────────────────────┘
         │    │                           ON  │
    ┌──────────────┐                           ▼
    │ BACK         │ ◀───────   ┌──────────────────────────┐
    │              │            │ tDTO                     │
    │ PUSH         │            │ Time period – switch-on  │
    └──────────────┘            │ condition                │
                                │ Adjustment range: 1 … 100 s│
                                │ in steps of 1 s          │
                                │ Factory setting: 60 s    │
                                └──────────────────────────┘
                                            ▼
                                ┌──────────────────────────┐
                                │ tFLL / Filling time      │
                                │ Adjustment range:        │
                                │ 1.0 … 30.0 min           │
                                │ in steps of 0.5 min      │
                                │ Factory setting: 5.0 min │
                                └──────────────────────────┘
                                            ▼
                                ┌──────────────────────────┐
                                │ tSTB / Stabilisation     │
                                │ Adjustment range:        │
                                │ 1.0 … 15.0 min           │
                                │ in steps of 0.5 min      │
    ┌──────────────┐            │ Factory setting: 2.0 min │
    │ BACK         │ ◀───────   └──────────────────────────┘
    │              │
    │ PUSH         │
    └──────────────┘

      ⑤
```
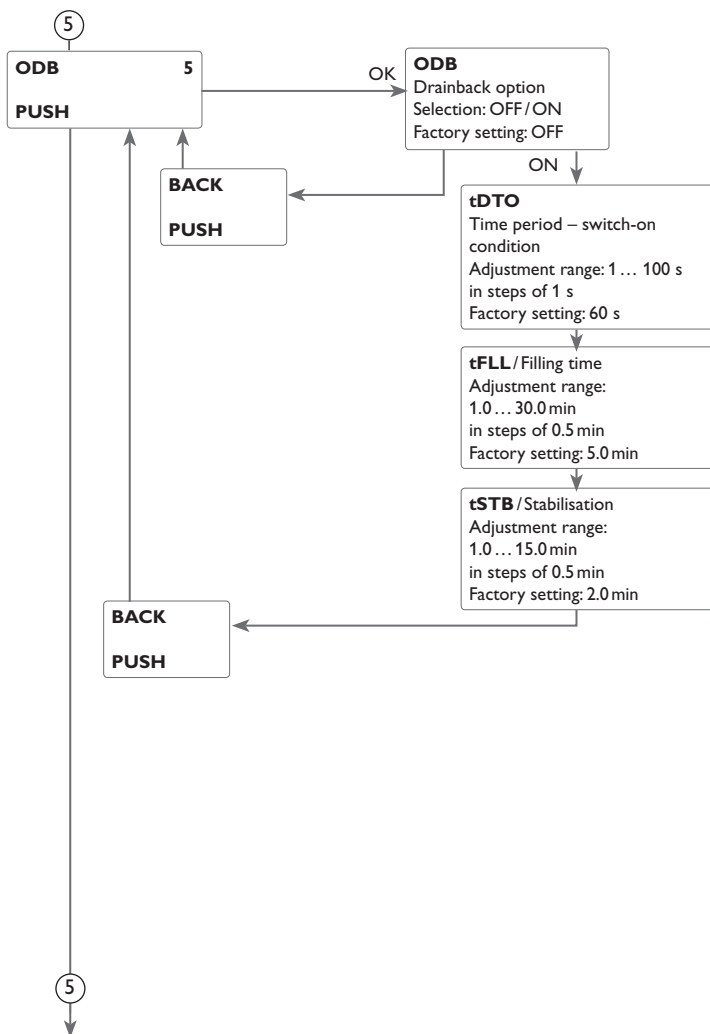
⑤ **Drainback option**

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

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

Time period – switch-on condition

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

Filling time

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

Stabilisation

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

> **ℹ Note**
> If the drainback option is activated, the cooling function and the antifreeze function will not be available.
> The **H-DAY** menu (holiday function) will also not be available and cannot be selected by means of the microbutton 🛄.

> **ℹ Note**
> The drainback option is only available, if the cooling function is deactivated.

⑤

⑥

```
┌─────────────────────┐        ┌──────────────────────────────────┐
│ WAMA            6   │───────▶│ TWAMA                              │
│                     │        │ Switch-on temperature              │
│ PUSH                │        │ Adjustment range: 20 … 90 °C       │
└─────────────────────┘        │ Factory setting: 40 °C             │
                               └──────────────────────────────────┘
                                               │
                                               ▼
                               ┌──────────────────────────────────┐
                               │ HYST                               │
                               │ Switch-on hysteresis               │
                               │ Adjustment range: 0.0 … 10 K       │
                               │ Factory setting: 1 K               │
                               └──────────────────────────────────┘
                                               │
                                               ▼
                               ┌──────────────────────────────────┐
                               │ TIMER                              │
                               │ Timer                              │
                               │ Adjustment range: 01:00 … 60:00    │
                               │ Factory setting: 45:00             │
                               └──────────────────────────────────┘
      ┌─────────────────────┐                  │
      │ BACK                │◀─────────────────┘
      │                     │
      │ PUSH                │
      └─────────────────────┘
```

⑦
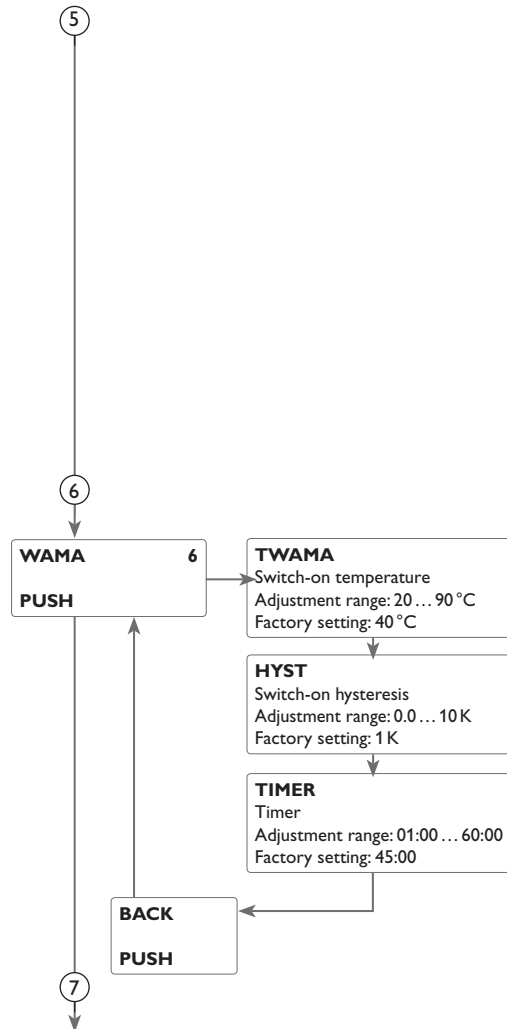
Note

If the drainback function **ODB** is activated, the factory settings of the parameters **DT O**, **DT F** und **DT S** will be adapted to values suiting drainback systems:
DT O = 10 K
DT F = 4 K
DT S = 15 K
Additionally, the adjustment range and the factory setting of the collector emergency shutdown **CEM** will change:
Adjustment range: 80 … 120°C; Factory setting: 95 °C
Adjustments previously made in these channels will be overridden and have to be entered again if the drainback option is deactivated later on.

Note

If the holiday function is activated, the drainback option will not be available.

⑥ **Washing machine water preheating**

Preheating of the washing machine inlet (R2) can be carried out with a thermostat function.
If the value at S4 reaches the switch-on temperature for the washing machine function, the function will be switched on and the temperature will be maintained at the desired value for the adjusted time by means of the valve. After the adjusted time has elapsed, the relay will be deactivated for the same duration.
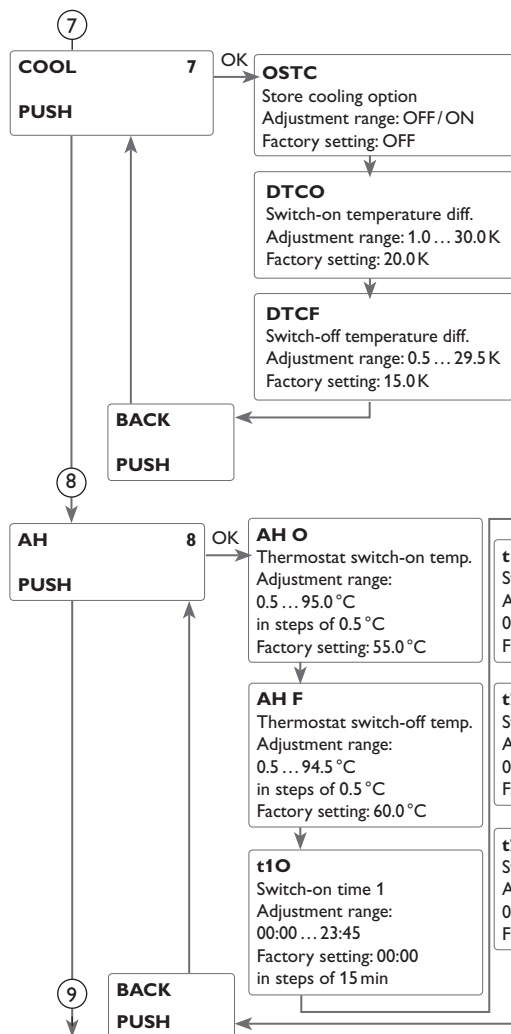
⑦ **Cooling function**

| **Note**
If the temperature at the store sensor reaches 95 °C, the cooling function will be blocked. The switch-on hysteresis is -5 K.

| **Note**
If the cooling function is activated, the drainback option will not be available.

Store cooling

When the store cooling function is activated, the controller aims to cool down the store during the night in order to prepare it for solar loading on the following day.

If the adjusted maximum store temperature is exceeded and the collector temperature falls below the store temperature, the system will be reactivated in order to cool down the store.

DTCO and **DTCF** are used as the reference temperature differences.

⑧ **Afterheating / Thermostat function**

The thermostat function works independently from the solar operation and can e. g. be used for using surplus energy or for afterheating.

• **AH O** < **AH F**

thermostat function for afterheating

• **AH O** > **AH F**

thermostat function for using surplus energy

In order to block the thermostat function for a certain period, there are 3 time frames t1 … t3. The switch-on and switch-off times can be adjusted in steps of 15 min. If the switch-on and the switch-off times are identical, the time frame is inactive.

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

If all time frames are set to 00:00, the thermostat function is solely temperature dependent.

Flowchart

COOL 7 PUSH → OK → **OSTC** Store cooling option / Adjustment range: OFF / ON / Factory setting: OFF → **DTCO** Switch-on temperature diff. / Adjustment range: 1.0 … 30.0 K / Factory setting: 20.0 K → **DTCF** Switch-off temperature diff. / Adjustment range: 0.5 … 29.5 K / Factory setting: 15.0 K → **BACK** PUSH

AH 8 PUSH → OK → **AH O** Thermostat switch-on temp. / Adjustment range: 0.5 … 95.0 °C in steps of 0.5 °C / Factory setting: 55.0 °C → **AH F** Thermostat switch-off temp. / Adjustment range: 0.5 … 94.5 °C in steps of 0.5 °C / Factory setting: 60.0 °C → **t1O** Switch-on time 1 / Adjustment range: 00:00 … 23:45 / Factory setting: 00:00 in steps of 15 min → **t1F** Switch-off time 1 / Adjustment range: 00:00 … 23:45 / Factory setting: 00:00 → **t2 (3) O** Switch-on time 2 (3) / Adjustment range: 00:00 … 23:45 / Factory setting: 00:00 → **t2 (3) F** Switch-off time 2 (3) / Adjustment range: 00:00 … 23:45 / Factory setting: 00:00 → **BACK** PUSH

⑨

REL	9	OK
PUSH		

REL / Relay control
Selection: ONOF, Puls,
PSOL, PHEA, 0-10, ADAP
Factory setting: PSOL

ONOF   Puls, PSOL,
PHEA,
0-10, ADAP

MIN / Minimum speed
Adjustment range: 15 … 100 %
Factory setting: 30 %

BACK

PUSH

MAX / Maximum speed
Adjustment range: 20 … 100 %
Factory setting: 100 %

⑩

⑨ **Relay control**

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

Adjustment for standard pump without speed control

• ONOF: Pump on / pump off

Adjustment for standard pump with speed control

• PULS   : Burst control via semiconductor relay

Adjustment for high-efficiency pump (HE pump)

• PSOL   : PWM profile solar pump

• PHEA   : PWM profile heating pump

• 0-10   : Speed control via a 0-10 V signal

• ADAP : Speed control signal via a VBus® / PWM interface adapter

i **Note**
For more information about connecting HE pumps see page 10.

Minimum speed
In the adjustment channel **MIN** a relative minimum speed for a pump connected can be allocated to the output R1.

i **Note**
When loads which are not speed-controlled (e. g. valves) are used, the pump speed value of the corresponding relay must be set to 100 % or the control type must be set to ONOF in order to deactivate pump speed control.

Maximum speed
In the adjustment channel **MAX** a relative maximum speed for a pump connected can be allocated to the output R1.

i **Note**
When loads which are not speed-controlled (e. g. valves) are used, the pump speed value of the corresponding relay must be set to 100 % or the control type must be set to ONOF in order to deactivate pump speed control.

(10)

```
┌──────────────────┐
│ H-DAY        10  │──OK──┐
│                  │      │
│ PUSH             │      │
└──────────────────┘      ▼
```

┌────────────────────────────────┐
│ **OCCO**   │
│ Collector cooling option   │
│ Adjustment range: OFF / ON   │
│ Factory setting: OFF   │
└────────────────────────────────┘

┌────────────────────────────────┐
│ **CMAX**   │
│ Collector maximum temp.   │
│ Adjustment range: 70 … 130 °C │
│ Factory setting: 105 °C   │
└────────────────────────────────┘

┌────────────────────────────────┐
│ **OSTC**   │
│ Store cooling option   │
│ Adjustment range: OFF / ON   │
│ Factory setting: ON   │
└────────────────────────────────┘

┌────────────────────────────────┐
│ **THOL**   │
│ Temp. store cooling holiday   │
│ Adjustment range: 4 … 95 °C   │
│ Factory setting: 45 °C   │
└────────────────────────────────┘

┌────────────────────────────────┐
│ **DTCO**   │
│ Switch-on temperature diff.   │
│ Adjustment range: 1.0 … 30.0 K │
│ Factory setting: 20.0 K   │
└────────────────────────────────┘

┌────────────────────────────────┐
│ **DTCF**   │
│ Switch-off temperature diff.   │
│ Adjustment range: 0.5 … 29.5 K │
│ Factory setting: 15.0 K   │
└────────────────────────────────┘

system with
DHW heating

┌──────────────┐   ┌────────────────────────────┐
│ **BACK**   │◄─────│ **AHOFF**   │
│   │   │ Afterheating Holiday   │
│ **PUSH**   │   │ Selection: ON / OFF   │
└──────────────┘   │ Factory setting: OFF   │
                      └────────────────────────────┘

(10)
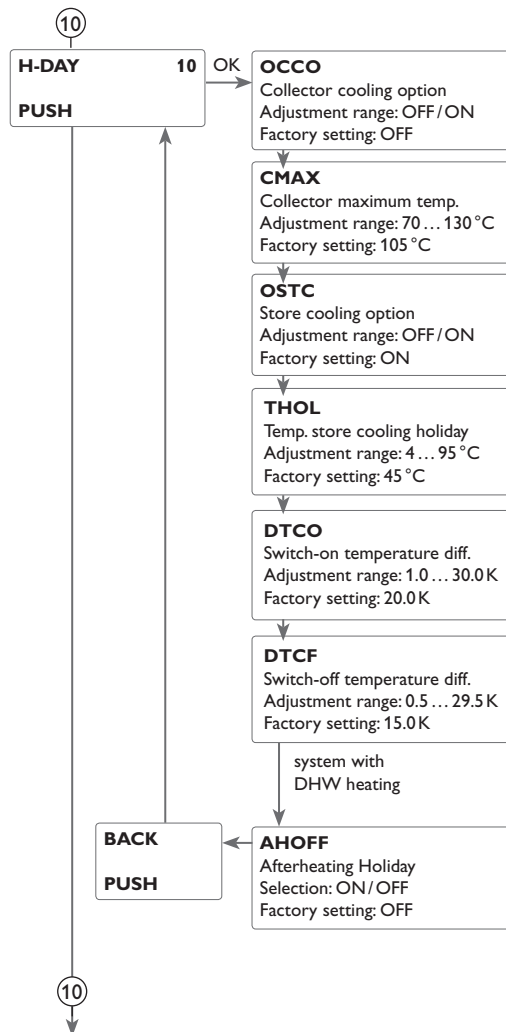
(10) **Holiday function**

The holiday function is used for operating the system when no water consumption is expected, e. g. during a holiday absence. This function cools down the system in order to reduce the thermal load.

Only if the holiday function has been activated with the parameter **DAYS** will the adjustments described in the following become active.

2 cooling functions are available: Collector cooling and store cooling

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

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

If the collector cooling is active, ☼ is displayed (flashing).

The store cooling option is activated by default and can be deactivated with the parameter **OSTC**. Store cooling starts when the store temperature exceeds the collector temperature by the adjustable value **DTCO**. It switches off if the store temperature reaches **THOL** or if the temperature difference falls below **DTCF**. The parameter **THOL** is used for adjusting the temperature for store cooling.

The parameter **DAYS** can be used for entering the number of days for a holiday absence. If the parameter is set to a value higher than 0, the function becomes active using the adjustments that have previously been made in the **H-DAY** menu. The days will be counted backwards at 00:00. If the value is set to 0, the function is deactivated.

i **Note**
The parameter **DAYS** can be accessed via the microbutton only (see

i **Note**
The adjustments described in this chapter are independent of those in the **COOL** menu, which are inactive during a holiday.

(10)

(11)

MAN	11	OK
PUSH		

→

MAN1
Adjustment range: AUTO, ON, OFF, MIN, MAX
Factory setting: AUTO

↓

MAN2
Adjustment range: AUTO, ON, OFF
Factory setting: AUTO

↓

BACK

PUSH

(12)

BLPR	12	OK
PUSH		

→

BLPR
Adjustment range: ON, OFF
Factory setting: OFF

↓

BACK

PUSH

(13)
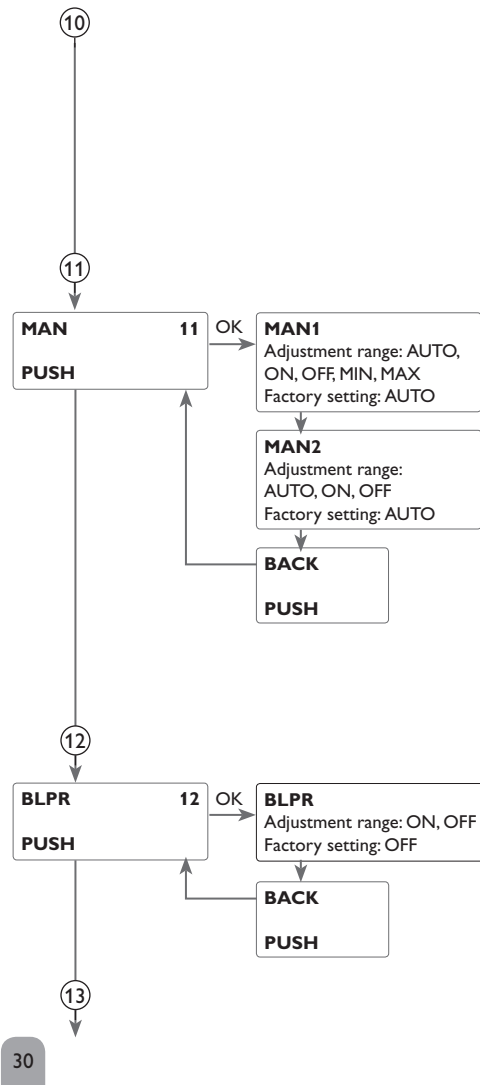
Note
When the drainback option is activated, the holiday function will not be available and cannot be selected by means of the microbutton ⌂.

Note
If the holiday function is activated, the drainback option will not be available.

(11) **Manual mode**
For control and service work, the operating mode of the relays can be manually adjusted. For this purpose, select the adjustment channel MAN1(2) (for R1, 2) in which the following adjustments can be made:

Operating mode
AUTO : relay in automatic mode
OFF   : relay is switched off
MIN   : relay is switched with adjusted minimum speed (not if REL = ONOF)
MAX   : relay is switched with adjusted maximum speed

Note
After service and maintenance work, set the relay mode back to AUTO. Normal operation is not possible in manual mode.

Note
For information about the control LED in the Lightwheel® see page 10.

(12) **Blocking protection**
In order to protect the pumps against blocking after standstill, the controller is equipped with a blocking protection function. This function switches on the relays one after another every day at 12:00 a.m. for 10 s at 100 %.

⑬

```
┌──────────────────┐       ┌──────────────────────────────────────┐
│ OHQM        13   │  OK   │ OHQM                                   │
│                  │ ────► │ Heat quantity measurement option       │
│ PUSH             │       │ Adjustment range: OFF / ON             │
└──────────────────┘       │ Factory setting: OFF                   │
                           └──────────────────────────────────────┘
                              OFF            ON
                                              │
                              ┌───────────────▼──────────────────────┐
                              │ FTYPE                                  │
                              │ Heat quantity measurement type         │
                              │ Selection: 1, 2, 3                     │
                              │ Factory setting: 1                     │
                              └────────────────────────────────────────┘
                                              │ FTYPE = 1
                              ┌───────────────▼──────────────────────┐
                              │ FMAX                                   │
                              │ Flow rate in l/min                     │
                              │ Adjustment range: 0.5 … 100.0          │
                              │ in steps of 0.1                        │
                              │ Factory setting: 6.0                   │
                              └────────────────────────────────────────┘
                              ┌────────────────────────────────────────┐
                              │ MEDT                                   │
                              │ Heat transfer fluid                    │
                              │ Adjustment range: 0 … 3                │
                              │ Factory setting: 3                     │
                              └────────────────────────────────────────┘
                              ┌────────────────────────────────────────┐
                              │ MED%                                   │
                              │ Antifreeze concentration in vol.       │
                              │ % (MED% will not be displayed          │
                              │ when MEDT 0 or 3 is used)              │
                              │ Adjustment range: 20 … 70 %            │
                              │ in steps of 1 %                        │
                              │ Factory setting: 45 %                  │
                              └────────────────────────────────────────┘

⑬          a          b          c
```
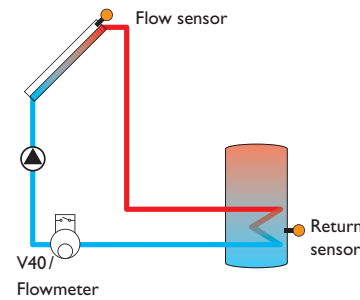
⑬ **Heat quantity measurement**

The heat quantity measurement can be carried out in 3 different ways: without V40 flowmeter, with V40 flowmeter or with Grundfos Direct Sensor™.

Example of flow and return sensor positions for heat quantity measurement with a fixed flow rate value (flowmeter) or a V40 flowmeter.

➔ Enable the heat quantity measurement option in the channel **OHQM**.
➔ Select the type of flow rate detection in the channel **FTYPE**.

Flow rate detection type:
1 : Fixed flow rate value
2 : V40 flowmeter
3 : Grundfos Direct Sensor™

Heat quantity measurement with fixed flow rate value

The heat quantity balancing (estimation) uses the difference between the flow and return temperatures and the entered flow rate (at 100 % pump speed).
➔ Adjust **1** in the channel **FTYPE**
➔ Read the flow rate (l/min) and adjust it in the **FMAX** channel.
➔ Adjust the antifreeze type and concentration of the heat transfer fluid in the channels **MEDT** and **MED%**.

Antifreeze type:
0 : Water
1 : Propylene glycol
2 : Ethylene glycol
3 : Tyfocor® LS / G-LS

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⑬

a   b   c

Tcold
Cold water temperature
Adjustment range: 0 … 20 °C
Factory setting: 10 °C

BACK

PUSH

⑭

SENS   **14**   OK   **SEN 1 (…4)** / Sensor type
PUSH

Selection: Pt1000, KTY, Pt500
(S5: Pt1000, KTY, Pt500, V40)
Factory setting: Pt1000

OFF   ON

BACK   **VIMP** / Impulse rate of the V40
PUSH   Adjustment range: OFF,
         0,5 … 100,0 l/imp
         Factory setting: OFF

⑮

⑬ **Heat quantity measurement with V40 flowmeter:**

The heat quantity measurement uses the difference between the flow temperature measured at S3 and the adjusted return temperature **Tcold** and the flow rate transmitted by the flowmeter.

➔ Adjust **2** in the channel **FTYPE**

Note
If the flow rate detection type V40 has been adjusted, the impulse rate of the corresponding sensor must be adjusted in the **SENS** menu (see page 32).

Heat quantity measurement with Grundfos Direct Sensor™:

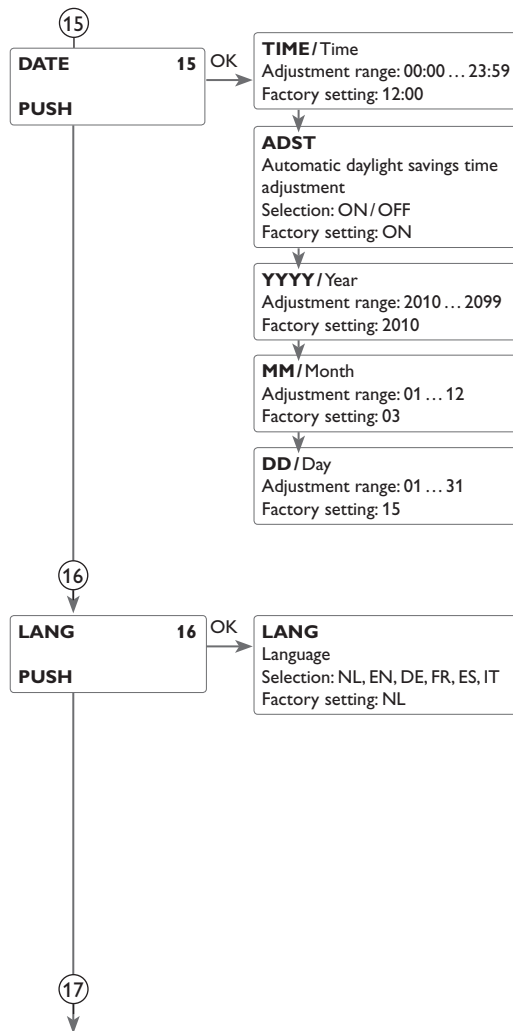The heat quantity measurement uses the difference between the flow temperature measured at the Grundfos Direct Sensor™ and the adjusted return temperature **Tcold** and the flow rate transmitted by the Grundfos Direct Sensor™.

➔ Adjust **3** in the channel **FTYPE**

⑭ **Sensors**

The sensor type can be selected for the sensor inputs S1 to S4.

The impulse rate of the sensor connected can be adjusted for the sensor input V40.

⑮

```
DATE          15 │ OK
PUSH
```

→

```
TIME / Time
Adjustment range: 00:00 … 23:59
Factory setting: 12:00
```
↓
```
ADST
Automatic daylight savings time
adjustment
Selection: ON / OFF
Factory setting: ON
```
↓
```
YYYY / Year
Adjustment range: 2010 … 2099
Factory setting: 2010
```
↓
```
MM / Month
Adjustment range: 01 … 12
Factory setting: 03
```
↓
```
DD / Day
Adjustment range: 01 … 31
Factory setting: 15
```

⑯

```
LANG          16 │ OK
PUSH
```

→

```
LANG
Language
Selection: NL, EN, DE, FR, ES, IT
Factory setting: NL
```
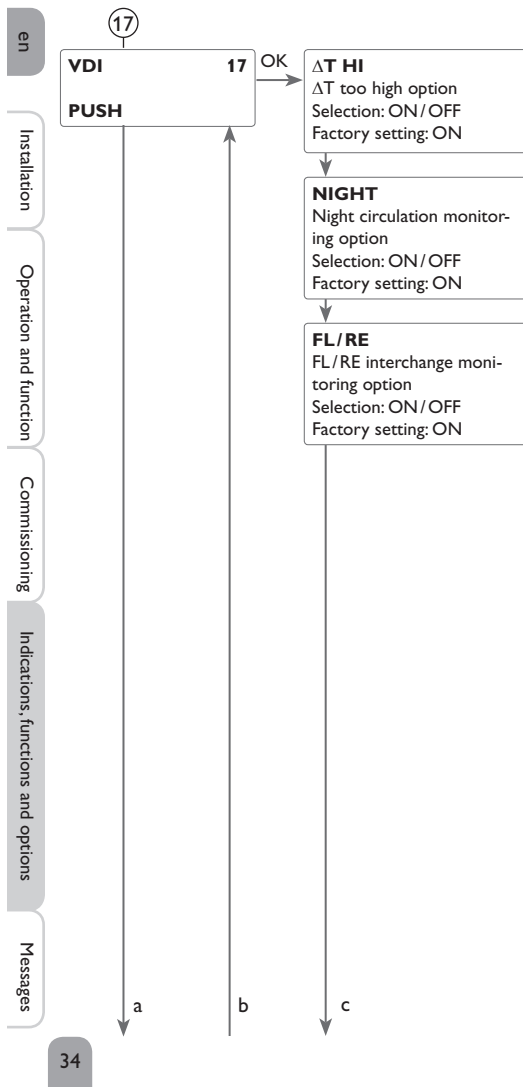
⑰

⑮ **Time and date**

The controller is equipped with a real time clock required e. g. for the thermostat function.

In the display, the lower line indicates the day followed by the month.

⑯ **Language**

In this adjustment channel the menu language can be chosen.

- NL : Dutch
- EN : English
- DE : German
- FR : French
- ES : Spanish
- IT : Italian

⑰

VDI 17	OK
PUSH	

ΔT HI
ΔT too high option
Selection: ON / OFF
Factory setting: ON

NIGHT
Night circulation monitor-
ing option
Selection: ON / OFF
Factory setting: ON

FL / RE
FL / RE interchange moni-
toring option
Selection: ON / OFF
Factory setting: ON

a   b   c

⑰ **Function control**

ΔT monitoring

This function is used for monitoring the temperature difference.. The message ΔT too high is shown, if solar loading has been carried out for a period of 20 min with a differential higher than 50 K. Normal operation is not aborted or inhibited, but the system should be checked for the cause of the warning.

Possible causes are:

- pump power too weak
- blocked system components
- circulation problems in the collector
- air inside the pipework
- defective valve/ defective pump

Night circulation

This function can be used for detecting thermal circulation inside the solar circuit that leads to an unwanted cooling of the store. A warning message will appear when the following condition has been detected for at least 1 min during the period between 11 p.m. and 5 a.m.:

- collector temperature exceeds 40 °C

The delay time of 1 min ensures that the message is not triggered by short-term fault conditions.

Possible causes are:

- defective non-return valves
- defective valve
- wrongly adjusted time

Flow and return interchanged

This function is used for detecting an interchange of the flow and return pipe or a badly placed collector sensor. For this purpose, the collector temperature is monitored for plausibility during the switch-on phases of the solar pump. An error message will appear, if the plausibility criteria have not been met 5 times in a row.

```
      ┌─ c
 (17)                  STMAX
  │                              ──── OK
  a      b              PUSH
                          │
                   ┌──────────────────────┐
                   │ STMAX                 │
                   │ Maximum store temperature
                   │ monitoring option     │
                   │ Selection: ON / OFF   │
                   │ Factory setting: ON   │
                   └──────────────────────┘
                    OFF            ON
                              ┌──────────────────────┐
                              │ ST1(2)               │
                              │ Maximum store temperature
                              │ monitoring store 1, 2 │
                              │ Selection: ON / OFF   │
                              │ Factory setting: ON   │
                              └──────────────────────┘
                    ┌─────────┐  ┌──────────────────────┐
                    │ BACK    │←─│ ST1(2)MX             │
                    │         │  │ Maximum store temperature
                    │ PUSH    │  │ exceedance counter    │
                    └─────────┘  └──────────────────────┘
              ┌─────────┐
              │ BACK    │
              │         │
              │ PUSH    │
              └─────────┘
 (18)
  │
 ┌──────────────────┐
 │ RESET        18   │
 │                   │
 │ PUSH              │
 └──────────────────┘
```
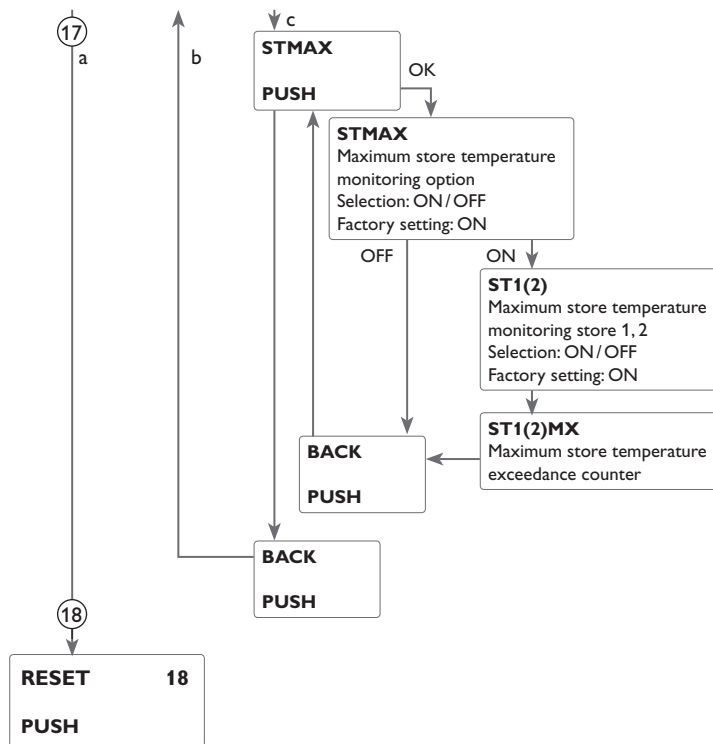
17 **Maximum store temperature**

This function is used for detecting and indicating if the adjusted maximum store temperature has been exceeded. The controller compares the current store temperature to the adjusted maximum store temperature, thus monitoring the store loading circuits.

The maximum store temperature is considered exceeded when the temperature measured at the store sensor exceeds the adjusted maximum store temperature by at least 5 K. The monitoring becomes active again as soon as the store temperature falls below the adjusted maximum store temperature.

The channels **ST1**, **ST2** can be used for selecting the stores to be monitored. The number of exceedances is displayed in the **ST(2)MX** channels. A possible cause for an unwanted exceedance of the maximum store temperature is a defective valve.

18 **Reset**

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

9 Messages

In the case of an error, the control LED starts flashing red and a message is indicated in the status display. A warning triangle is additionally indicated. If more than one error or fault condition has occurred, only the one with the highest priority will be displayed as a message in the status display.

In the case of a sensor error, the system switches off, and a message appears on the display. Additionally, a corresponding value for the error type assumed is indicated.

Error code display	Plain text display	Monitoring function	Cause
0001	!LINE BREAK SENSOR X!	Sensor line break	Sensor line broken
0002	!SHORT CIRCUIT SENSOR X!	Sensor short circuit	Sensor line short-circuited
0011	!ΔT TOO HIGH!	ΔT too high	Collector 50 K > than store to be loaded
0021	!NIGHT CIRCULATION!	Night circulation	Betw. 11 p.m. and 5 a.m. col. temp > 40 °C
0031	!FL/RE INTERCHANGED!	FL/RL interchanged	Col. temp. does not rise after switching on
0041	!FLOW RATE MONITORING!	Flow rate monitoring	No flow rate at sensor
0061	!DATA MEMORY DEFECTIVE!	Storing and changing adjustments not possible	
0081	STORE MAX EXCEEDED	Maximum store temperature	St. max has been exceeded
CODE	0000	0000/0262	User code

After the error has been removed and acknowledged, the error message disappears.

➔ In order to acknowledge an error message, select the message and press the left button (↰) for 2 s.

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10 Troubleshooting

Control LED in the Lightwheel® is flashing red. The symbol 🔧 is indicated on the display and the symbol ⚠ flashes.

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

| *888.8* | *- 88.8* |

| Cable is broken. Check the cable. | Short circuit. Check the cable. |

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

°C	°F	Ω Pt500	Ω Pt1000	Ω KTY	°C	°F	Ω Pt500	Ω Pt1000	Ω KTY
-10	14	481	961	1499	55	131	607	1213	2502
-5	23	490	980	1565	60	140	616	1232	2592
0	32	500	1000	1633	65	149	626	1252	2684
5	41	510	1019	1702	70	158	636	1271	2778
10	50	520	1039	1774	75	167	645	1290	2874
15	59	529	1058	1847	80	176	655	1309	2971
20	68	539	1078	1922	85	185	664	1328	3071
25	77	549	1097	2000	90	194	634	1347	3172
30	86	559	1117	2079	95	203	683	1366	3275
35	95	568	1136	2159	100	212	693	1385	3380
40	104	578	1155	2242	105	221	702	1404	3484
45	113	588	1175	2327	110	230	712	1423	3590
50	122	597	1194	2413	115	239	721	1442	3695

If a malfunction occurs, a message will appear on the display of the controller.

Lightwheel® or display are permanently off.

Press the right button (✔). Display illuminated?

| no | yes |

Controller has been in standby, everything o.k.

Check the power supply of the controller. Is it disconnected?

| no | yes |

The fuse of the controller could be blown. The fuse becomes accessible when the cover is removed. The fuse can then be replaced.
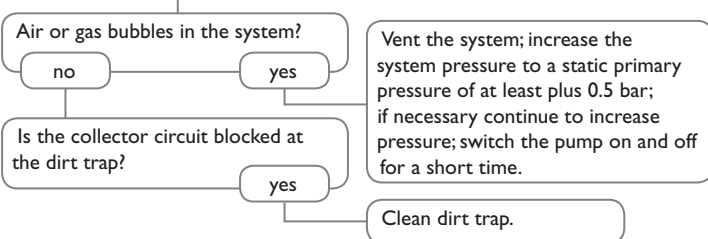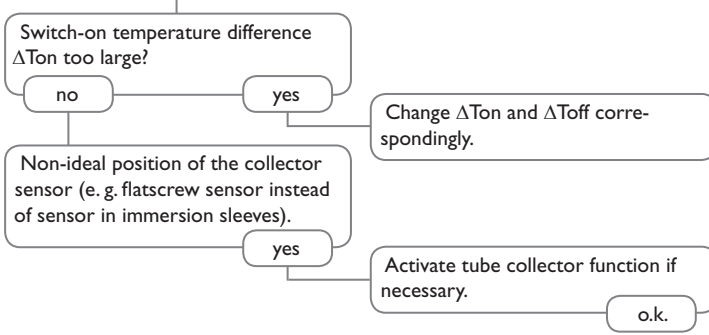
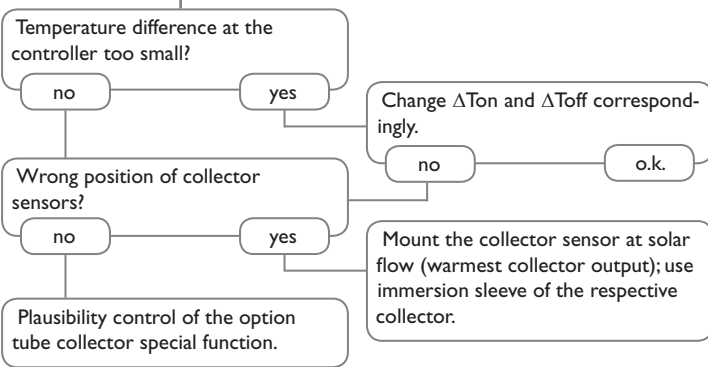Check the supply line and recon-nect it.

Fuse

Pump is overheated, but no heat transfer from the collector to the store, flow and return have the same temperature; perhaps also bubbling in the lines.
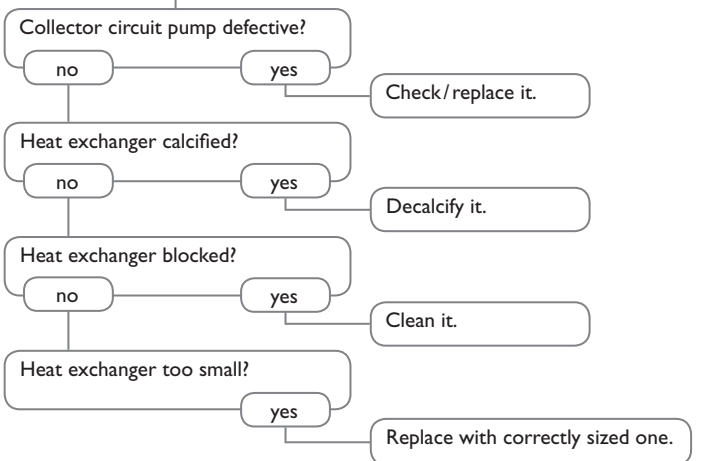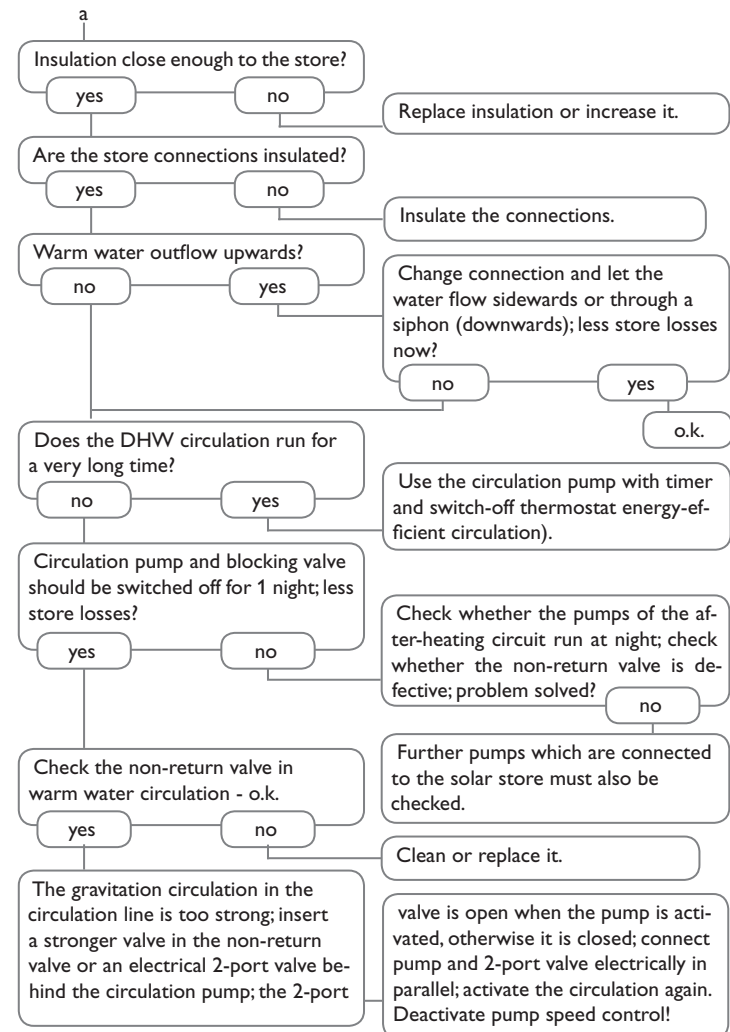
Air or gas bubbles in the system?
- no
- yes

Vent the system; increase the system pressure to a static primary pressure of at least plus 0.5 bar; if necessary continue to increase pressure; switch the pump on and off for a short time.

Is the collector circuit blocked at the dirt trap?
- yes

Clean dirt trap.

Pump starts up very late.

Switch-on temperature difference ΔTon too large?
- no
- yes

Change ΔTon and ΔToff correspondingly.

Non-ideal position of the collector sensor (e. g. flatscrew sensor instead of sensor in immersion sleeves).
- yes

Activate tube collector function if necessary.
- o.k.

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

Temperature difference at the controller too small?
- no
- yes

Change ΔTon and ΔToff correspondingly.
- no
- o.k.

Wrong position of collector sensors?
- no
- yes

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

Plausibility control of the option tube collector special function.

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

Collector circuit pump defective?
- no
- yes

Check / replace it.

Heat exchanger calcified?
- no
- yes

Decalcify it.

Heat exchanger blocked?
- no
- yes

Clean it.

Heat exchanger too small?
- yes

Replace with correctly sized one.

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

LED in Lightwheel® illuminated? If not, press the right button. Display illuminated again?
- yes
- no → There is no current; check fuses / replace them and check power supply.

Does the pump start up in manual operation?
- no
- yes → The adjusted temperature difference for starting the pump is too high; choose a value which makes more sense.

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

Controller might be defective - replace it.

Stores cool down at night.

Collector circuit pump runs during the night?
- no
- yes → Check controller.

Collector temperature at night is higher than the outdoor temperature.
- no
- yes → Check the non-return valves in the flow and the return pipe for functional efficiency.

Sufficient store insulation?
- yes → a
- no → Increase insulation.

---

a

Insulation close enough to the store?
- yes
- no → Replace insulation or increase it.

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

Warm water outflow upwards?
- no
- yes → Change connection and let the water flow sidewards or through a siphon (downwards); less store losses now?
  - no
  - yes → o.k.

Does the DHW circulation run for a very long time?
- no
- yes → Use the circulation pump with timer and switch-off thermostat energy-efficient circulation).

Circulation pump and blocking valve should be switched off for 1 night; less store losses?
- yes
- no → Check whether the pumps of the after-heating circuit run at night; check whether the non-return valve is defective; problem solved?
  - no → Further pumps which are connected to the solar store must also be checked.

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

The gravitation circulation in the circulation line is too strong; insert a stronger valve in the non-return valve or an electrical 2-port valve behind the circulation pump; the 2-port valve is open when the pump is activated, otherwise it is closed; connect pump and 2-port valve electrically in parallel; activate the circulation again. Deactivate pump speed control!

11 Accessories

Sensors

Overvoltage protection
device

V40 flowmeter

BASIC controller

VBus®/USB & VBus®/LAN
interface adapters

SD3 Smart Display /
GA3 Large Display

AM1 Alarm module

DL2 Datalogger

DL3 Datalogger

11.1 Sensors and measuring instruments

Sensors

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

Overvoltage protection device

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

V40 flowmeter

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

11.2 VBus® accessories

SD3 Smart Display / GA3 Large Display

The Smart Display is designed for simple connection to controllers with VBus®. It is used for visualising data issued by the controller: collector temperature, store temperature and energy yield of the solar thermal system. The use of high-efficiency LEDs and filter glass assures a high optical brilliance and good readability even in poor visibility conditions and from a larger distance. An additional power supply is not required. One module is required per controller.

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

AM1 Alarm module

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

DL3 Datalogger

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

DL2 Datalogger

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

11.3 Interface adapters

VBus® / USB & VBus® / LAN interface adapters

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

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

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