

**Automation System 5400  
Heating and District Heating Controller  
TROVIS 5476**



## **Mounting and Operating Instructions**

### **EB 5476 EN**

Firmware version 2.3x

Edition December 2004



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- ▶ The controller has been designed for use in electrical power systems. For wiring and maintenance, you are required to observe the relevant safety regulations.

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# 1 Operation

The controller is ready for use with the temperatures and operating schedules preset by the manufacturer.

On start-up, the **current time and date** need to be set at the controller (-> section 1.5).

## 1.1 Operating elements

The operating controls are located in the front panel of the controller and protected by a Plexiglas door.

### 1.1.1 Operating keys



**Changeover key** (-> Fig. 11 on page 112)

- Press to switch between operating level and configuration level and from configuration level to the parameter level



**Reset key**

- Press to reset accessible parameters to their default settings; the controller must be in the parameter level



**Arrow keys** (-> Fig. 11 on page 112)

- To scroll within levels
- To change values
- To switch from the parameter level into the configuration level (press both arrow keys simultaneously)

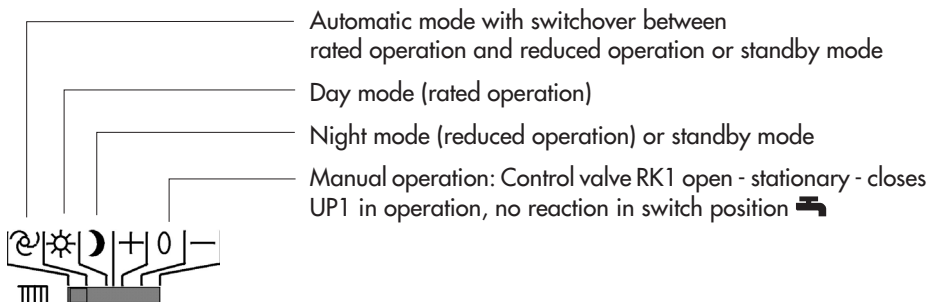


**Enter key**

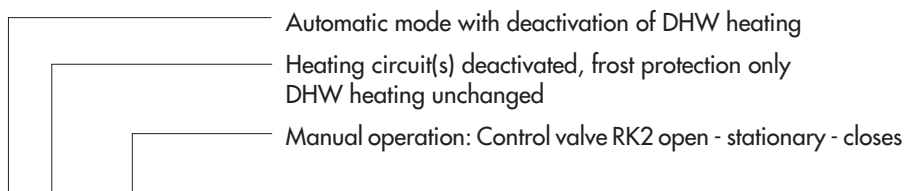
- To access levels
- Access parameters and functions to edit them
- Confirm settings
- Display set points in the info level

## 1.1.2 Operating switches

### Heating circuit mode selector switch



### DHW circuit mode selector switch · Underfloor heating circuit (Anl 9)



### Correction switch



Correction of flow temperature set point in times-of-use to become warmer (+) or colder (-)

$\Delta T_{\text{Flow max}} = \pm 4 \text{ } ^\circ\text{C} \times \text{Gradient of the heating characteristic}$  ( $\pm 10 \text{ } ^\circ\text{C}$  for 4-point characteristic)

Adaptation operation only when switch position is at 0

### 1.2 Operating modes

#### Day mode (rated operation) ☀

Regardless of the programmed times-of-use, the set points relevant for rated operation are used by the controller.

#### Night mode (reduced operation) 🌙

Regardless of the programmed times-of-use, the set points relevant for reduced operation are used by the controller.

#### Automatic mode 🔄

During the programmed times-of-use, the controller works in rated operation. Outside these times-of-use, the controller is in reduced operation, unless control operation is deactivated depending on the outdoor temperature. The controller switches automatically between both operating modes.

#### Manual operation + 0 -

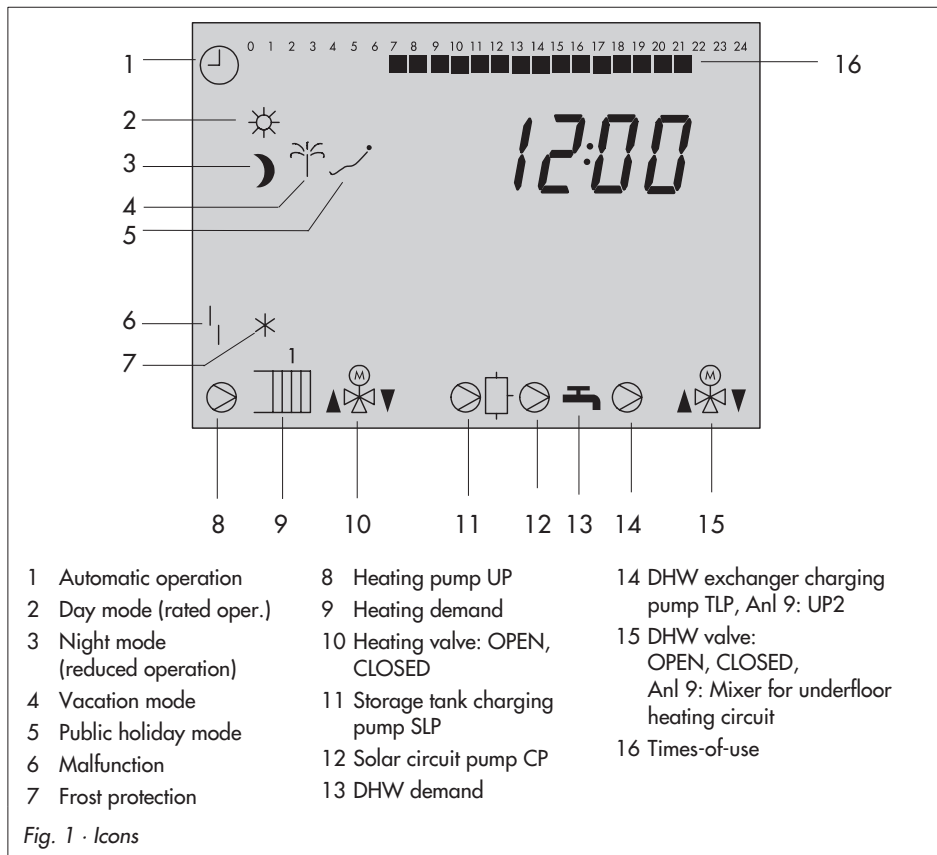
Valves and pumps can be controlled manually (-> section 3).

The default setting of the circulation pumps (for the heating circuit) is set for constant operation.



### 1.3 Display

During operation, the display indicates the current time as well as information about the operation of the controller. The times-of-use are represented by black squares below the row of numbers at the top of the display. Icons indicate the operating status of the controller.




The controller status can be displayed in the operating level (-> section 1.4).

## 1.4 Displaying data


Measured values, set points, times-of-use, public holidays and vacation periods as well as temperatures of the connected sensors and their set points can be retrieved and displayed in the operating level.


### Proceed as follows:


-  Select value.  
The various datapoints appear one after the other on the display depending on the configuration (-> Fig. 11 on page 112).


 Outdoor temperature

 Temperature at flow sensor VF in heating circuit 1, 2

 Temperature at return flow sensor RüF1

 Room temperature

 Temperature at flow sensor VF1 while DHW is active  
Temperature at flow sensor in DHW circuit VF2 – VF3

 Temperature at DHW sensor VF2

 Temperature at storage tank sensors SF1–SF2

 Temperature at return flow sensor in DHW circuit RüF2


 Temperature at solar collector sensor CF

 Time schedule for heating

 Time schedule for DHW circuit

 Public holidays

 Vacation periods

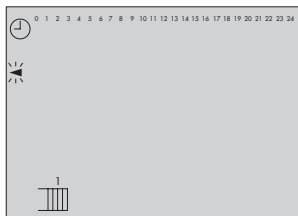
-  Compare the set point or limit with the actual measured temperature.  
By pressing the enter key when the time appears on the display, a status alarm of the system bus interface appears when the Modbus operation is active.  
If the system bus interface is not used accordingly, *PAUSE* appears on the display.

## 1.5 Setting the controller time

The current time and date need to be set immediately after start-up and after a power failure lasting longer than 24 hours.

The time is set in the parameter level.

### Proceed as follows:



- ⇒ Switch to the parameter level.  
Display: Time, ◀ blinks
- ⊠ Activate editing mode for the controller time.  
⌚ blinks.
- ▽ Change controller time.
- ⊠ Confirm controller time.  
Display: Date (day.month)
- ▽ Change date setting.
- ⊠ Confirm date.  
Display: Year.
- ▽ Change year setting.
- ⊠ Confirm year.
- ⇒ Return to the operating level.

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### Note!





The controller automatically returns to the operating level if the keys are left unpressed for five minutes.

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## 1.6 Setting the times-of-use

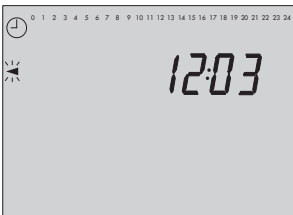
Two times-of-use can be set for each day of the week. If only one time-of-use is required, the start and stop times of the second time-of-use must be programmed to identical times.

The times schedules are set for the required control circuits one after the other in the parameter level.

Time schedule	Display
Heating circuit 1	
Heating circuit 2 (Anl 9: underfloor heating circuit) (second set of parameters after datapoint for vacation mode)	
DHW circuit	
Circulation pump	

Parameters of the heating circuit	WE	Range of values
Period/day	1-7	1-7, 1-5, 5-6, 1, 2, 3, 4, 5, 6, 7 with 1-7 = daily, 1-5 = Monday to Friday 6-7 = Saturday to Sunday 1 = Monday, 2 = Tuesday, ..., 7 = Sunday
Start first time-of-use	7:00	00:00 to 24:00h; in steps of 30 minutes
Stop first time-of-use	12:00	00:00 to 24:00h; in steps of 30 minutes
Start second time-of-use	12:00	00:00 to 24:00h; in steps of 30 minutes
Stop second time-of-use	22:00	00:00 to 24:00h; in steps of 30 minutes

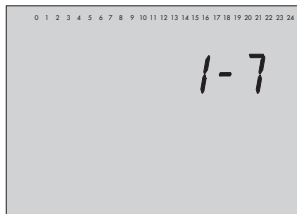
Proceed as follows:



⇒ Switch to the parameter level.  
Display: Time, ◀ blinks

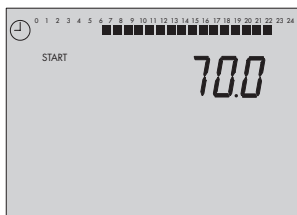


- ⏴ Select datapoint for times-of-use.  
Display:



- ⊗ Activate editing mode for times-of-use.  
Display: 1-7

- ⏴ Select period/day for which the times-of-use are to be valid:  
1-7 = Monday to Sunday  
1-5 = Monday to Friday  
6-7 = Saturday to Sunday  
1 = Monday, 2 = Tuesday, ..., 7 = Sunday



- ⊗ Activate editing mode for period/day.  
Display: START; ⏴ blinks.
- ⏴ Edit start time (steps of 30 minutes).
- ⊗ Confirm start time. Display: STOP
- ⏴ Edit stop time (steps of 30 minutes).
- ⊗ Confirm stop time. Display: START  
The second time-of-use is set like the first time-of-use.

To set the times-of-use for each day, repeat the instructions in the fields highlighted in gray.

- ⏴ Exit the datapoint for times-of-use.
- ⏴ Return to the operating level.

**Note!**

Do not use the 1-7, 1-5 und 6-7 menus to check the programmed times-of-use. On opening this period, the times-of-use are reset to their default settings.

**Note!**

The controller automatically returns to the operating level if the keys are left unpressed for five minutes.

### 1.6.1 Entering public holidays

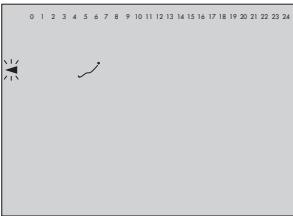
On public holidays, the times-of-use specified for Sunday apply. A maximum of 20 public holidays may be entered.

The public holidays are set in the parameter level.

Set the function block FB6 = ON to make the programmed public holidays also apply to the DHW heating.

Parameter	WE	Range of value
Public holidays	-	Configurable as required

**Proceed as follows:**



- ⇒ Switch to the parameter level.  
Display: Time, ◀ blinks
- ⏴ Select datapoint for public holidays.  
Display: ↷
- ⊗ Open data point for public holidays.
- ⏴ If applicable, select - - - -.
- ⊗ Activate editing mode for public holiday.  
↷ blinks.
- ⏴ Edit public holiday.
- ⊗ Confirm public holiday.

To enter additional public holidays, re-select - - - - (between 31.12 and 01.01) and repeat the steps in the fields highlighted in gray.

- ⇒ Return to the operating level.

**Note!**

Public holidays that are not assigned to a specific date should be deleted by the end of the year so that they are not carried on into the following year.

**Deleting a public holiday:**

- ⏴ Select the holiday you wish to delete in the datapoint for public holidays.
- ⊗ Confirm selection.
- ⏴ Select - - - - .
- ⊗ Delete the public holiday.

## 1.6.2 Entering vacation periods

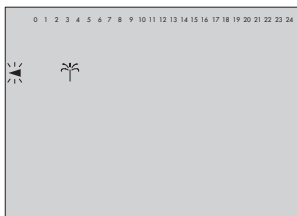
During vacation periods, the controller constantly remains in the reduced operating mode. The system is monitored for frost. A maximum of 10 vacation periods can be entered.

The vacation periods are set in the parameter level.

Set the function block FB6 = ON to make the programmed vacations also apply to the DHW heating.

Parameter	WE	Range of value
Vacation period	-	Configurable as required

Proceed as follows:



- ⇒ Switch to the parameter level.  
Display: Time, ◀ blinks
- ⏴ Select datapoint for vacation periods.  
Display: ☀
- ⊗ Open datapoint for vacation periods.  
Display: START
- ⏴ If applicable, select - - - -.
- ⊗ Activate editing mode for vacation periods.  
☀ blinks.
- ⏴ Set start date of vacation period.
- ⊗ Confirm start date of the vacation period.  
Display: STOP
- ⏴ Set end of vacation period.
- ⊗ Confirm end of the vacation period.

To enter additional vacation periods, re-select - - - - (between 31.12 and 01.01) and repeat the steps in the fields highlighted in gray.

- ⇒ Return to the operating level.

### Note!

Vacation periods that are not assigned to a specific date should be deleted by the end of the year so that they are not carried on into the following year.

### Deleting vacation periods:

- ⏴ Select the vacation period you wish to delete in the datapoint for vacation periods.
- ⊗ Confirm selection.
- ⏴ Select - - - - .
- ⊗ Delete vacation period.

## 1.7 Correcting temperature set points

The room temperature for the heating circuit can be adapted to the actually valid conditions at the correction switch:

- ▶ Slide correction switch in + direction:  
The flow temperature is increased and the room temperature becomes **warmer**.
- ▶ Slide correction switch in - direction:  
The flow temperature is reduced and the room temperature becomes **cooler**.

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### **Note!**

*The operation of the underfloor heating in system Anl 9 remains unaffected.*

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## 2 Start-up

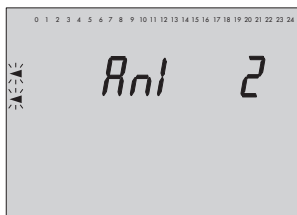
### 2.1 Setting the system code number

10 different hydraulic schematics are available. Each system configuration is represented by a system code number (AnI). The different schematics are dealt with in section 4. Available controller functions are described in sections 5, 6 and 7.

Changing the system code number resets previously adjusted function blocks to their default settings (WE). Function block parameters and settings in the parameter level remain unchanged.

The system code number is set in the configuration level.

#### Proceed as follows:



- ⇒ Switch to the parameter level.  
Display shows: Time, ◀ blinks
- ⬆ ⬇ Switch to the configuration level.  
Display shows: Current system code number, ◀ blink
- ⊗ Activate editing mode for system code number.  
"AnI" blinks on the display.
- ⬇ Set system code number.
- ⊗ Confirm system code number.
- ⇒ Exit the configuration level.
- ⇒ Return to the operating level.

### 2.2 Activating and deactivating functions

A function is activated or deactivated in the associated function block. The numbers 0 to 24 in the top row of the display represent the respective function block numbers. When a configuration level is opened, the activated function blocks are indicated by a black square on the right-hand side below the function block number. The first level of the display shows the function blocks 0 to 23 and the second level shows the status of function blocks 24 to 47.

The function blocks are described in section 12.1.

**Proceed as follows:**

- ⇒ Switch to the parameter level.  
Display shows: Time, ◀ blinks
  - ⬆ ⬇ Switch to the configuration level.  
Display shows: Current system code number, ▶ blink.
  - ⬆ Select level displaying function blocks 0 to 23 **or**
  - ⬇ Select level displaying function blocks 24 to 47.
  - ⬇ Select function block.
  - ⊗ Activate editing mode for function block.  
The function block number starts to blink.  
If **0 0 0 0** appears on the display, the key number needs to be entered first. Refer to section 2.4
  - ⬆ Activate function block (FB = ON).  
An activated function block is indicated by a black square below (right) the function block number in the top row of the controller display.
- or:**
- ⬇ Deactivate function block (FB = OFF).
  - ⊗ Confirm setting.  
If the function block is not closed, further function block parameters can be adjusted.  
Proceed as follows:  
Make the desired changes and confirm.  
If applicable, the next function block parameter is displayed.  
Confirm all parameters to exit the opened function block.

To adjust additional function blocks within the configuration level, repeat the steps in the fields highlighted in gray.

- ⇒ Exit the configuration level.
- ⇒ Return to the operating level.

**Note!**

*The controller automatically returns to the operating level if the keys are left unpressed for five minutes.*

## 2.3 Changing parameters

Depending on the set system code number and the activated functions, not all parameters listed in the parameter list in the Appendix (-> section 12.2) might be available.

### Proceed as follows:

- ⇒ Switch to the parameter level. Display shows: Time, ◀ blinks
- ⏴ Select parameter.
- ⊗ Activate editing mode for parameter.  
Parameters which do not allow the editing mode to activated are protected by a key number. These parameters can only be altered as long as the key number is active after selecting a protected function block (e.g. FB20) (-> section 2.4).
- ⏴ Change parameter.
- ⊗ Confirm parameter setting.

To adjust additional parameters, repeat the steps in the fields highlighted in gray.

- ⇒ Return to the operating level.

---

**Note!** The controller automatically returns to the operating level if the keys are left unpressed for five minutes.

---

## 2.4 Enter key number

Some functions are protected against unintentional or unauthorized access. These functions can only be activated or deactivated after the valid key number has been entered. The valid key number for initial start-up can be found on page 106. To avoid unauthorized use of the key number, remove the page or make the key number unreadable.

### Proceed as follows:

0 0 0 0 blinks on the display.

- ⏴ Set valid key number.
- ⊗ Confirm key number.  
When the correct key number is entered, the function block to be changed blinks on the display, whereas the display does not blink when an incorrect key number is entered. The key number remains active for approx. 5 minutes if the keys are left unpressed during this time.

## 2.5 Calibrating sensors

The connected sensors are calibrated in the configuration level. The following applies:

- ▶ FB16 = ON, select "P1000": Pt 1000 and Pt 100 sensors
- ▶ FB16 = ON, select "ntc": NTC and Pt 100 sensors
- ▶ FB16 = OFF: PTC and Pt 100 sensors (default setting)






The resistance values of the sensors can be found on page 98.




If the temperature values displayed at the controller differ from the actual temperatures, the measured values of all connected sensors can be changed or readjusted. To calibrate a sensor, the currently displayed sensor value must be changed such that it matches the temperature (reference temperature) measured directly at the point of measurement.

Perform the calibration in function block FB33. The function block FB33 always remains activated.



### Proceed as follows:

- ⇒ Switch to the parameter level.  
Display: Time, ◀ blinks
- ⬆️⬇️ Switch to the configuration level.  
Display: Current system code number (AnI), ▶️ blink
- ⬇️ Select function block level 24 to 47.
- ⬆️ Select function block FB33.
- ⊠ Activate function block FB33.  
Display: **0 0 0 0**  
Enter currently valid key number.  
Display: Flow sensor, measured temperature  
⬆️  
Flow sensor (VF1)
- ⬇️ If necessary, select other sensors that you want to calibrate.
  - ⬆️ Outdoor sensor (AF)
  - ⬆️ Room sensor (RF)
  - ⬆️ Return flow sensor (RüF1)

-  Return flow sensor (RüF2)
-  Solar circuit collector sensor (CF)
-  Flow sensor (VF2)
-  Storage tank sensor (SF1–SF2)
-  Flow sensor in DHW circuit (VF3)

-  Activate editing mode for sensor.
-  Correct measured temperature.  
Read the actual temperature directly from the thermometer at the point of measurement and enter this value as the reference temperature.
-  Confirm corrected measured temperature.


Additional sensors are calibrated similarly.

-  Exit the configuration level.
-  Return to the operating level.

## 2.6 Resetting to default values

All parameters and function blocks from any parameter level can be reset to their default settings (WE).

### Proceed as follows:

-  Reset to default settings.  
Function blocks and parameters are reset to their default settings (WE).

### **Note!**

Resetting protected parameters to their default settings is only possible when the key number is still active. The function block settings are kept.


### **Note!**

The controller is ready for operation with its default settings. You just need to set the correct date and current time.

### 3 Manual operation

Heating circuit and DHW circuit (Anl 9: underfloor heating circuit) can be set to manual mode at their operating mode selector switches.

#### Heating circuit mode selector switch

The heating circuit can only be set to manual mode when the DHW/underfloor heating circuit mode selector switch is not positioned at .

	+	0	-
Anl 1, 2, 3	UP1 on, SLP/TLP off, valve RK1 opens	UP1 on, SLP/TLP off, valve RK1 stationary	UP1 off, SLP/TLP off, valve RK1 closes
Anl 4, 5, 6, 11	UP1 on, valve RK1 opens	UP1 on, valve RK1 stationary	UP1 on, valve RK1 closes
Anl 7, 8	UP1 on, valve RK2 stationary, valve RK1 opens	UP1 on, valve RK2 stationary, valve RK1 stationary	UP1 on, valve RK2 stationary, valve RK1 closes
Anl 9	UP1 on, SLP off, valve RK2 stationary, valve RK1 opens	UP1 on, SLP off, valve RK2 stationary, valve RK1 stationary	UP1 on, SLP off, valve RK2 stationary, valve RK1 closes

#### DHW circuit mode selector switch (system Anl 9: underfloor heating circuit)

	+	0	-
Anl 2, 3	UP1 off, SLP/TLP on, charging temp. control	DHW heating inactive	DHW heating inactive
Anl 4, 5, 6, 11	SLP/TLP on, valve RK2 opens	SLP/TLP on, valve RK2 stationary	SLP/TLP on, valve RK2 closes
Anl 7, 8	SLP/TLP on, valve RK1 stationary, valve RK2 opens	SLP/TLP on, valve RK1 stationary, valve RK2 stationary	SLP/TLP on, valve RK1 stationary, valve RK2 closes
Anl 9	UP1 on, SLP on, valve RK1 stationary, valve RK2 opens	UP2 on, SLP off, valve RK1 stationary, valve RK2 stationary	UP2 on, SLP off, valve RK1 stationary, valve RK2 closes

**Note!**

In manual mode, **frost protection** is not guaranteed (-> section 7.2).

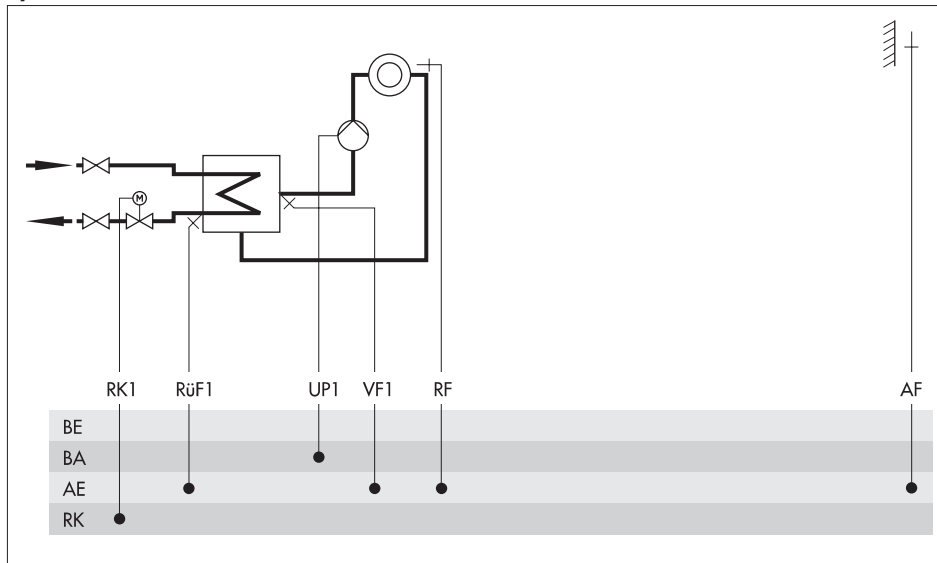
## 4 Systems

10 hydraulic schematics are available.

System code number (Anl)		1	2	3	4	5	6	7	8	9*	11
Heating		Outdoor temperature dependent flow temperature control with variable return flow temperature limitation									
	Mixing control							•	•	•	
DHW heating	From the primary circuit				•	•	•				•
	From the secondary circuit		•	•				•	•	•	
	in storage tank system		•		•			•		•	
	in st. tank charging system			•		•			•		•
	in instantaneous heating sys.						•				
	Mixing control										
	Solar system possible**		•	•	•	•				•	

- \* The system Anl 9 is designed for the control a radiator in conjunction with an underfloor heating circuit.
- \*\* The solar circuit is activated with the function block setting FB15 = ON, select "CF". Further parameters (*Solar circuit pump ON*, *Solar circuit pump OFF* and *Solar charging OFF*) are available to influence the solar-operated DHW heating.

System Anl 1

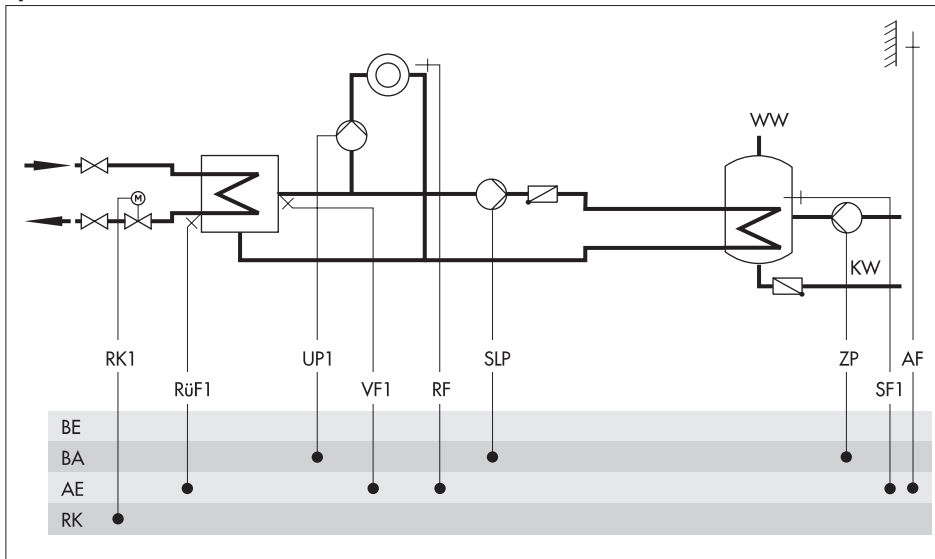


Default settings

FB13 = OFF	Without RF
FB20 = ON	With RüF1



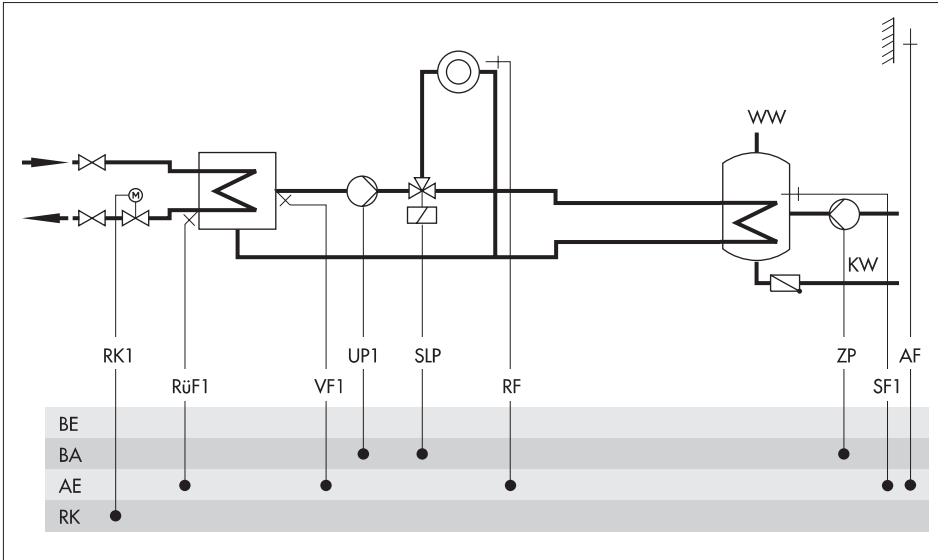
### System Anl 2



#### Default settings

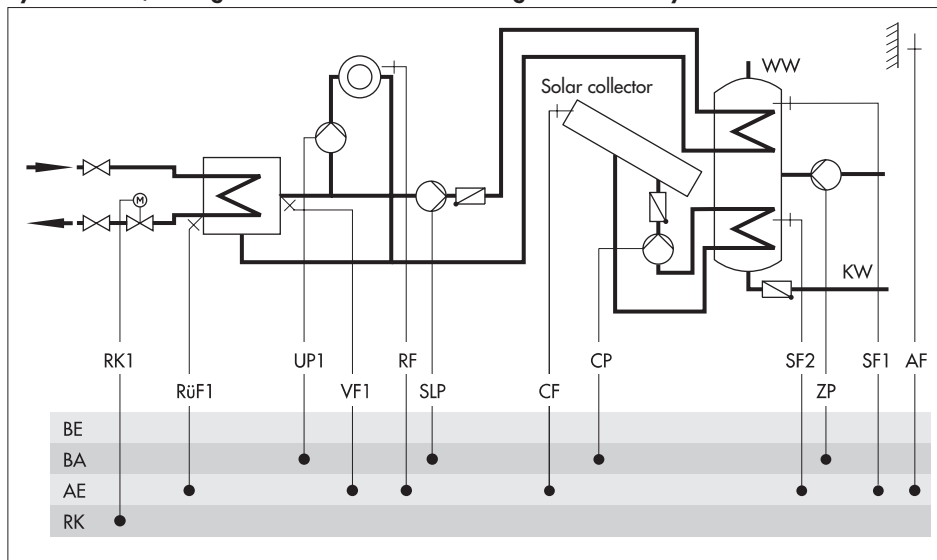
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = OFF	Without SF2

System Anl 2, setting different from default setting · With switch valve



Setting different from default setting: FB9 = ON, select "US"	
FB13 = OFF	Without RF
FB20 = ON	With RUF1
FB14 = ON	With SF1
FB15 = OFF	Without SF2

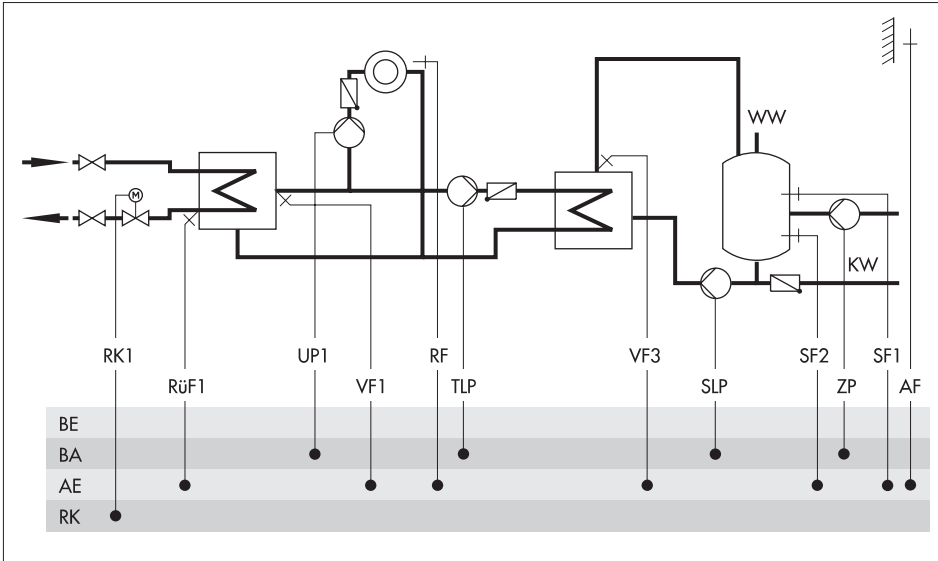
## System Anl 2, setting different from default setting · With solar system



## Setting different from default setting: FB15 = ON, select "CF"

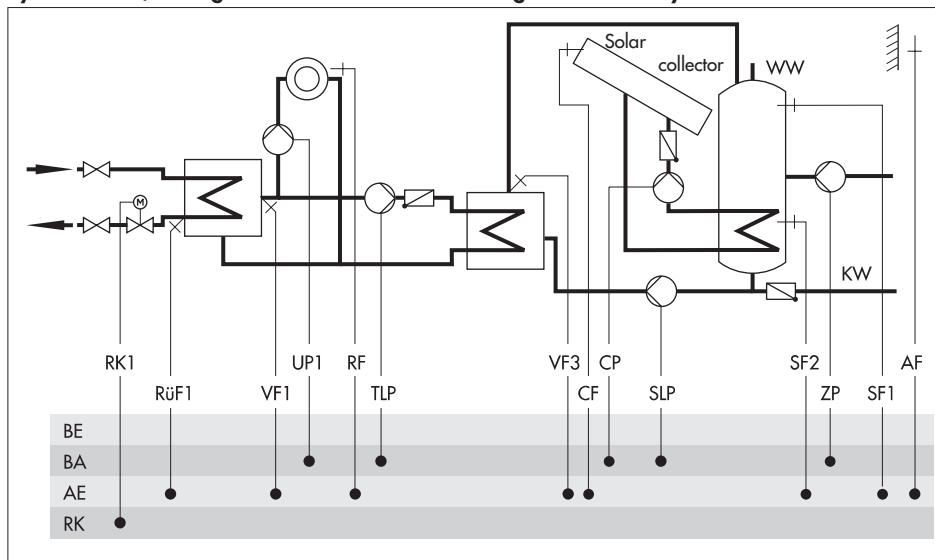
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = ON, select "CF"	With SF2

System Anl 3



Default settings	
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = ON, select "---"	With SF2
FB27 = OFF	Without VF3

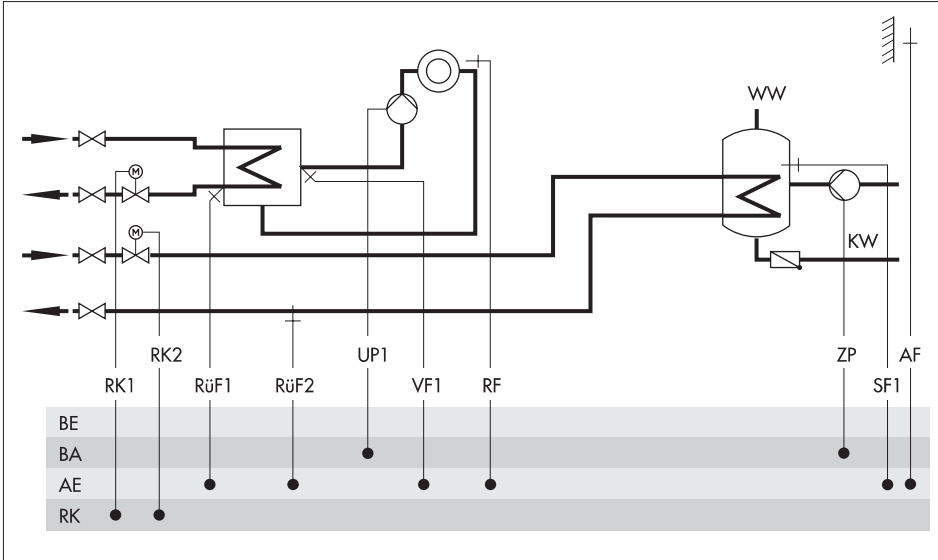
## System Anl 3, setting different from default setting · With solar system



## Setting different from default setting: FB15 = ON, select "CF"

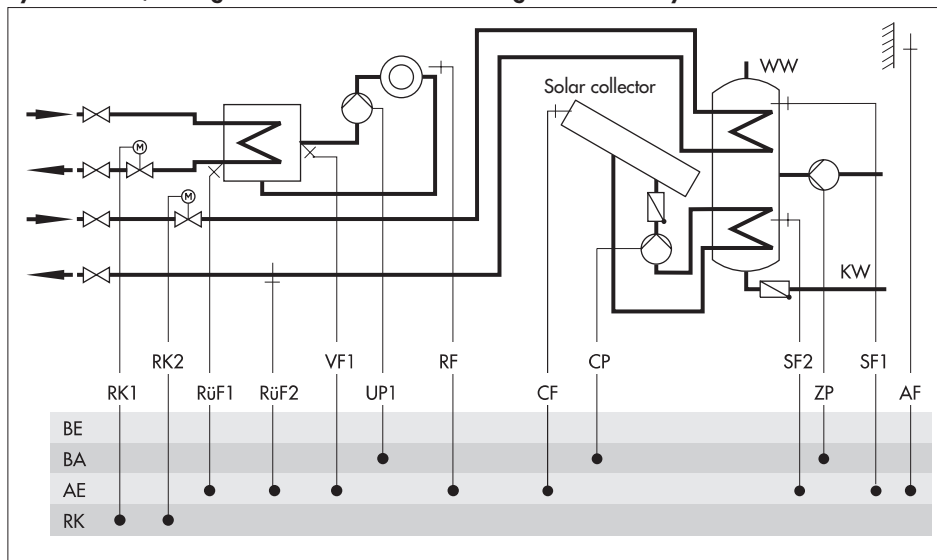
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = ON, select "CF"	With SF2
FB27 = OFF	Without VF3

System Anl 4



Default settings	
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB21 = OFF	Without RüF2

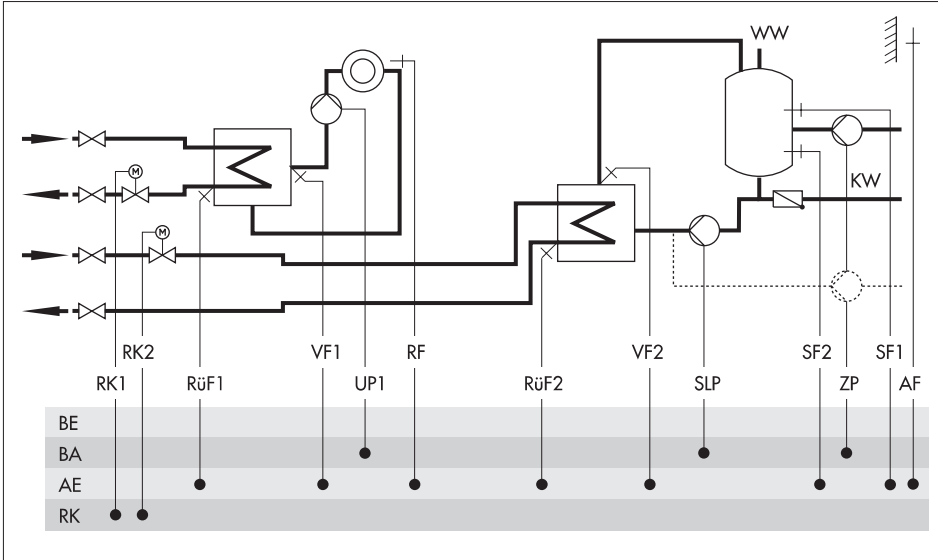
## System Anl 4, setting different from default setting · With solar system



## Setting different from default setting: FB15 = ON

FB13 = OFF	Without RF
FB15 = ON	With SF2
FB20 = ON	With RüF1
FB21 = OFF	Without RüF2

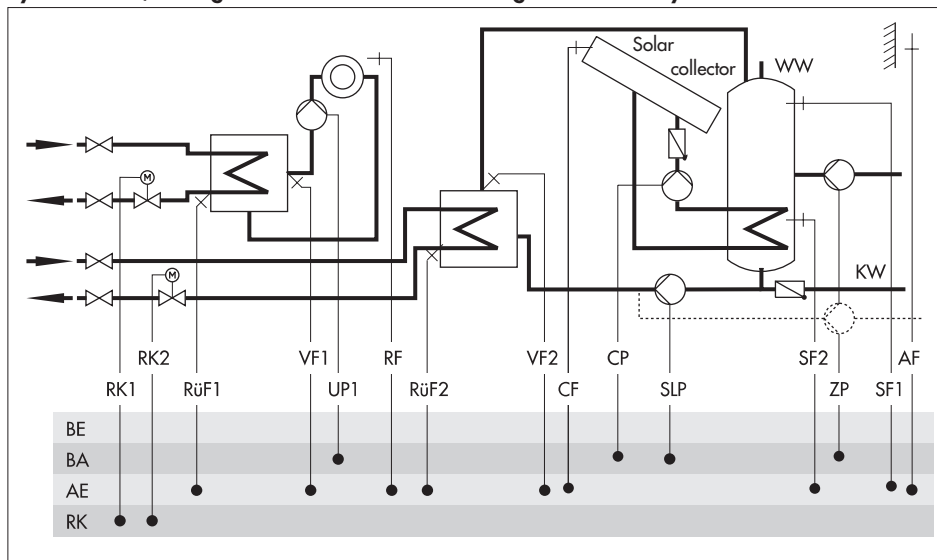
System Anl 5



Default settings	
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = ON, select "---"	With SF2
FB21 = OFF	Without RüF2



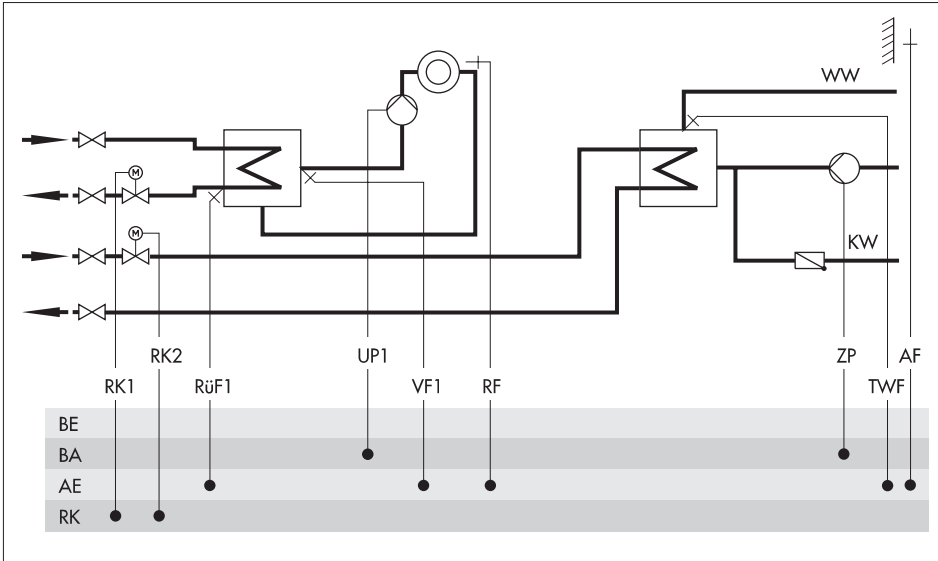
## System An1 5, setting different from default setting · With solar system



## Setting different from default setting: FB15 = ON, select "CF"

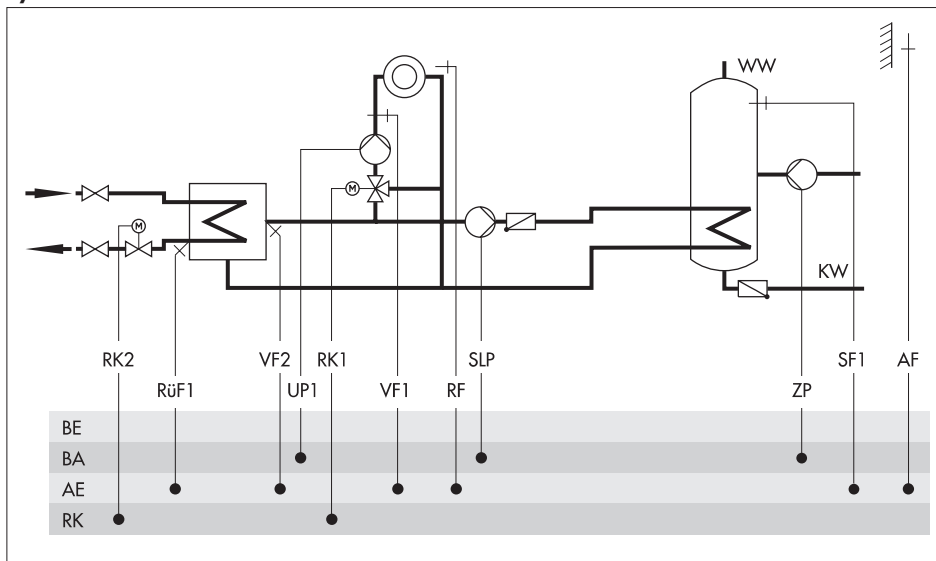
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = ON, select "CF"	With SF2
FB21 = OFF	Without RüF2

System Anl 6



Default settings	
FB13 = OFF	Without RF
FB20 = ON	With RüF1

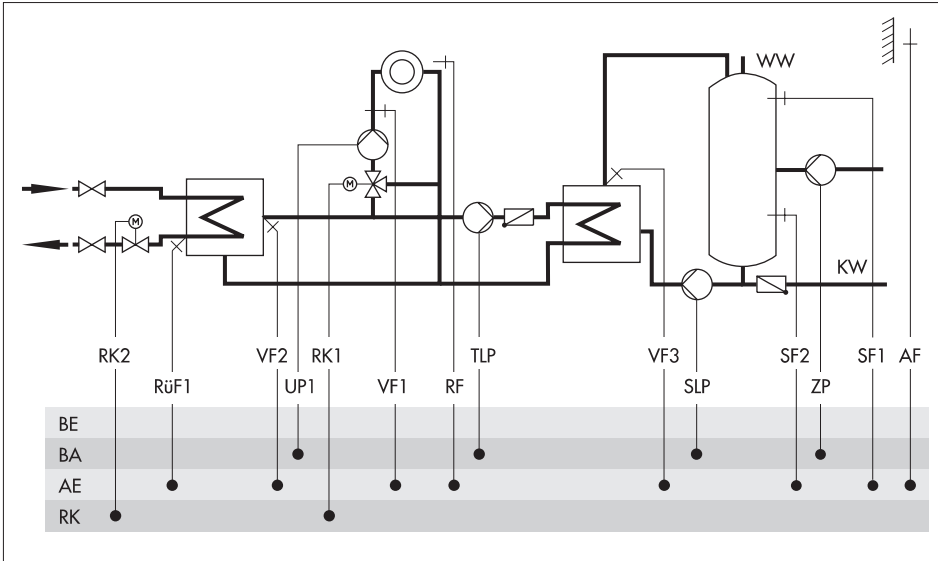
### System Anl 7



#### Default settings

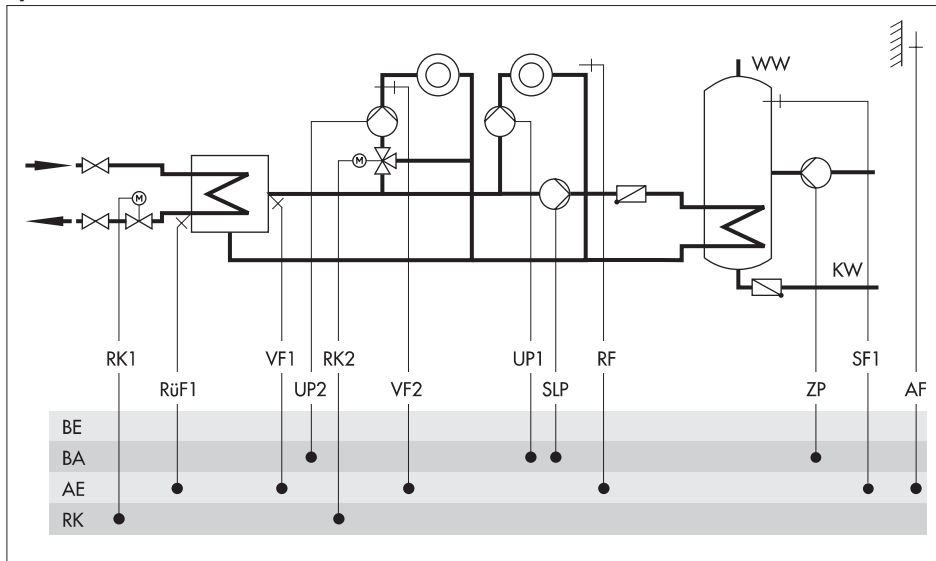
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = OFF	Without SF2

System Anl 8



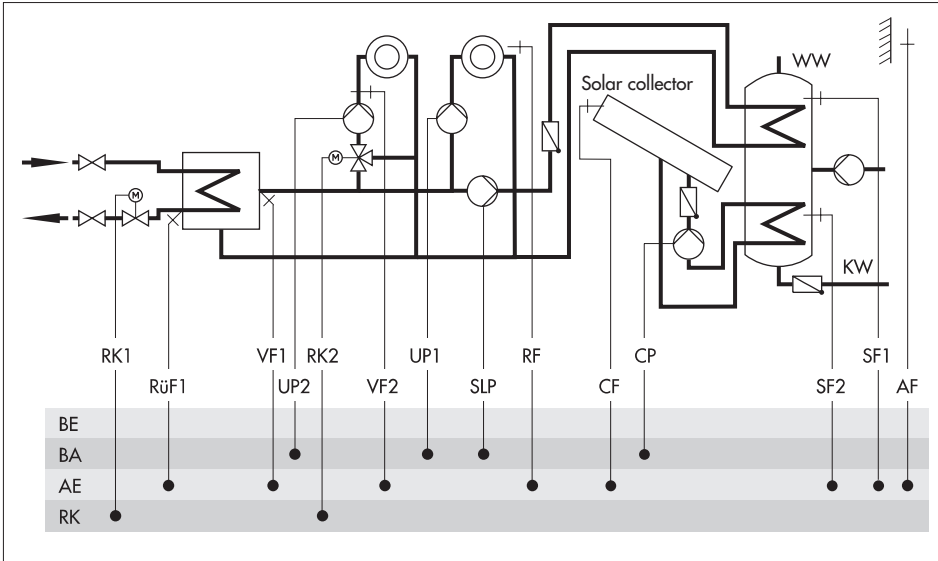
Default settings	
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = ON	With SF2
FB27 = OFF	Without VF3

System Anl 9



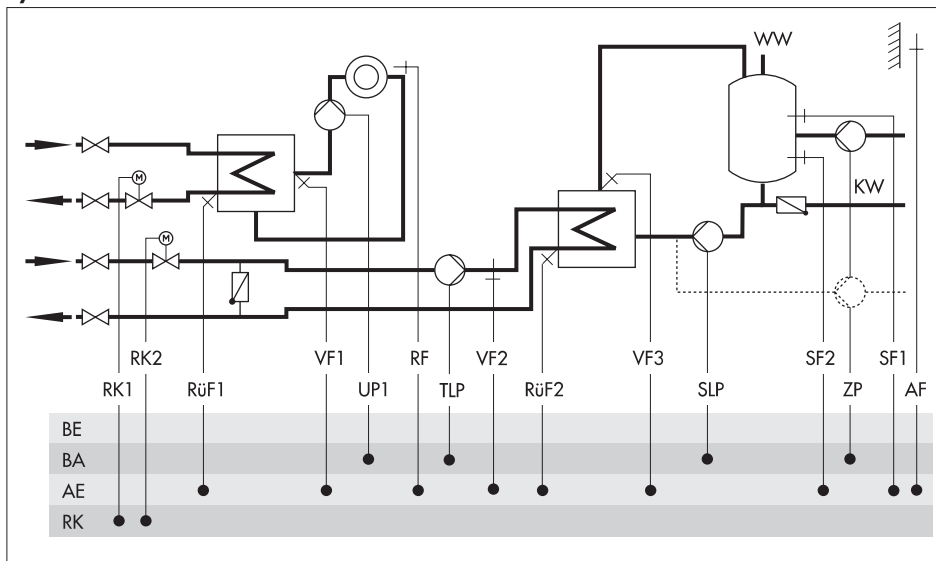
Default settings	
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = OFF	Without SF2

System Anl 9, setting different from default setting · With solar system



Setting different from default setting: FB15 = ON, select "CF"	
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = ON, select "CF"	With SF2

System Anl 11



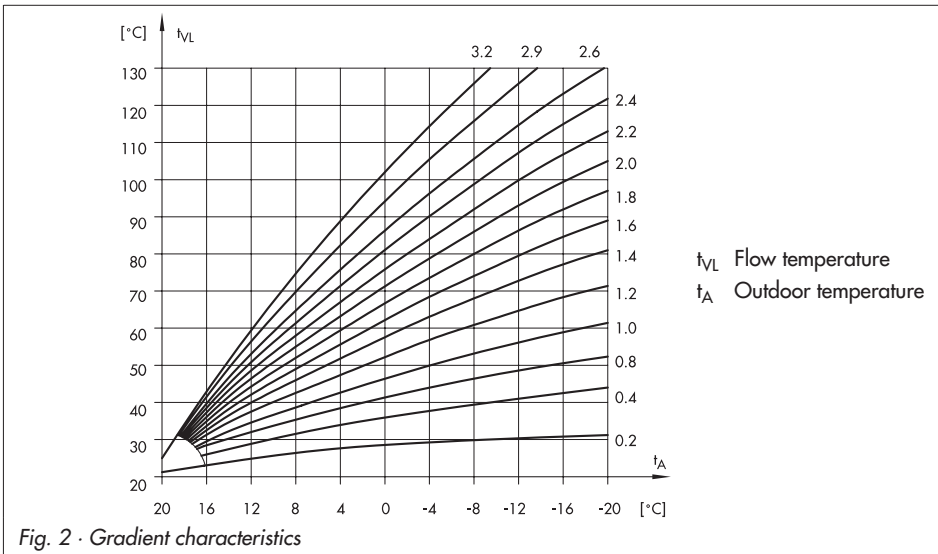
Default settings	
FB13 = OFF	Without RF
FB20 = ON	With RüF1
FB14 = ON	With SF1
FB15 = ON	With SF2
FB21 = OFF	Without RüF2
FB27 = OFF	Without VF3

## 5 Functions of the heating circuit

Which controller functions are available depends on the selected system code number (AnI).

### 5.1 Weather-compensated control

When weather-compensated control is used, the flow temperature is controlled according to the outdoor temperature. The heating characteristic in the controller defines the flow temperature set point as a function of the outdoor temperature (→ Fig. 2). The outdoor temperature required for weather-compensated control is measured at the outdoor sensor or received over a current input.



#### Measured at the outdoor sensor

Function	WE	Configuration
Outdoor temperature – Current input	OFF	FB18 = OFF

**Received over (0)4 to 20 mA current input** (a 50 Ω resistor must be connect to terminals 7(+) and GND (terminals ½) parallel to the current signal)



Function	WE	Configuration
Outdoor temperature – Current input	OFF	FB18 = ON 0: 0 to 20 mA = –20 to 50 °C 4: 4 to 20 mA = –20 to 50 °C

### 5.1.1 Gradient characteristic

Basically, the following rule applies: a decrease in the outdoor temperature causes the flow temperature to increase. By varying the *Gradient* and *Level* parameters, you can adapt the characteristic to your individual requirements. Increasing *Gradient* results in a higher flow temperature, decreasing *Gradient* in a lower flow temperature. The *Level* parameter performs a parallel transport of the heating characteristic in an upward or downward direction.

Outside the times-of-use, reduced set points are used for control:

Reduced flow set point = *Flow set point* – *Set-back difference*.

The *Max. flow temperature* and *Min. flow temperature* parameters mark the upper and lower limits of the flow temperature. A separate gradient characteristic can be selected for the limitation of the return flow temperature.

#### Examples for adjusting the characteristic:

- ▶ Old building, radiator design 90/70: Gradient approx. 1.8
- ▶ New building, radiator design 70/55: Gradient approx. 1.4
- ▶ New building, radiator design 55/45: Gradient approx. 1.0
- ▶ Underfloor heating depending on arrangement: Gradient smaller 0.5

Function	WE	Configuration	
Characteristics	OFF	FB19 = OFF	
Parameters	WE	WE*	Range of values
Gradient, flow	1.8	0.8	0.2 to 3.2
Level, flow	0 °C	–5 °C	–30 to 30 °C
Set-back difference	15 °C	5 °C	0 to 50 °C
Min. flow temperature	20 °C	20 °C	20 to 130 °C
Max. flow temperature	90 °C	50 °C	20 to 130 °C

\* Default setting applies to system Anl 9, floor heating

### 5.1.2 4-point characteristic

The 4-point characteristic allows you to define your own heating characteristic. It is defined by 4 points for the *Outdoor temperature*, the *Flow temperature* and the *Return flow temperature*. The *Set-back difference* at points 2 and 3 indicates how much the flow temperature is reduced outside the times-of-use. The *Max. flow temperature* and *Min. flow temperature* parameters mark the upper and lower limits of the flow temperature.

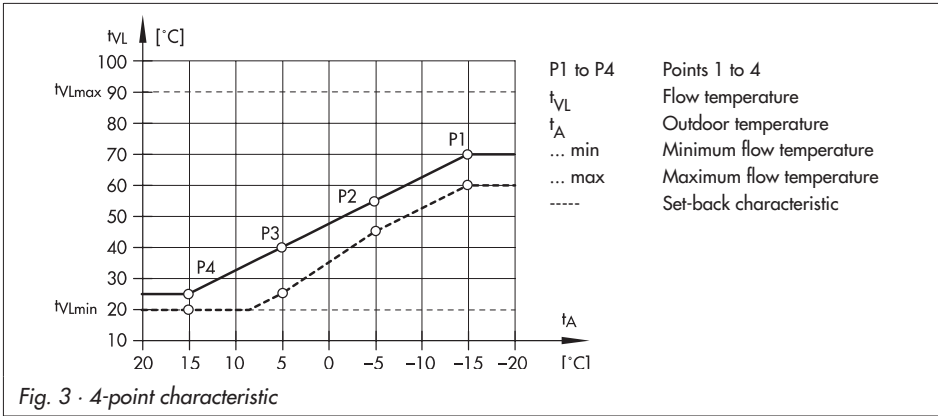


Fig. 3 · 4-point characteristic

Function	WE	Configuration	
Characteristic	OFF	FB19 = ON	
Parameters	WE	WE*	Range of values
Outdoor temperature, point 1	-15 °C	-15 °C	-30 to 20 °C
Outdoor temperature, point 2	-5 °C	-5 °C	
Outdoor temperature, point 3	5 °C	5 °C	
Outdoor temperature, point 4	15 °C	15 °C	
Flow temperature, point 1	70 °C	50 °C	20 to 130 °C
Flow temperature, point 2	55 °C	40 °C	
Flow temperature, point 3	40 °C	35 °C	
Flow temperature, point 4	25 °C	20 °C	
Return flow temperature, point 1	65 °C	-	20 to 90 °C
Return flow temperature, point 2	50 °C	-	
Return flow temperature, point 3	35 °C	-	
Return flow temperature, point 4	20 °C	-	
Set-back difference, points 2, 3	20 °C	5 °C	0 to 50 °C
Max. flow temperature	90 °C	50 °C	20 to 130 °C

Parameters	WE	WE*	Range of values
Min. flow temperature	20 °C	20 °C	20 to 130 °C
* Default setting applies to system Anl 9, floor heating			

## 5.2 Fixed set point control

During the times-of-use, the flow temperature can be controlled according to a fixed set point. Outside the times-of-use, this set point is reduced by the *Set-back difference*. Both *Minimum flow temperature* and *Maximum flow temperature* parameters are set to identical values.

Parameters	WE	WE*	Range of values
Max. flow temperature	90 °C	50 °C	20 to 130 °C
Min. flow temperature	20 °C	20 °C	20 to 130 °C
* Default setting applies to system Anl 9, underfloor heating			

## 5.3 Underfloor heating

The system Anl 9 is designed for radiator heating in conjunction with an underfloor heating circuit.

The maximum flow temperature of the radiator circuit is only available to the underfloor heating circuit. If the radiator circuit is in rated operation, its flow temperature is only reduced so far to ensure that the flow temperature of the underfloor heating circuit does not fall below the temperature according to the heating characteristic for the control circuit RK2. If the radiator circuit is switched off due to the outside temperature, the controller still continues to regulate a flow temperature according to the heating characteristic for the control circuit RK1 at the flow sensor VF1 despite of the deactivated circulation pump UP1.

Functions such as **Optimization**, **Adaptation** or **Flash adaptation** are only available for the radiator circuit after regulating the temperature according to the room temperature. A connected remote operation also only has an influence on the operation of the radiator circuit.

The summer mode causes both heating circuits to be switched off. The *OT deactivation value in rated operation* parameter relates to both heating circuits, whereas the *OT deactivation value in reduced operation* parameter only effects the radiator circuit.

## 5.4 Deactivation depending on outdoor temperature

### 5.4.1 OT deactivation value in rated operation

If the outdoor temperature during rated operation exceeds the limit *OT deactivation value in rated operation*, the affected heating circuit is put out of service immediately. The valve is closed and the pump is switched off after a lag time. When the outdoor temperature falls below this value (less 0.5 °C hysteresis), heating operation is restarted immediately.

With the default settings, this means that, during the warm season, the system is switched off at an outdoor temperature of 22 °C.

Parameter	WE	Range of values
OT deactivation value in rated operation	22 °C	0 to 50 °C

### 5.4.2 OT deactivation value in reduced operation

If the outdoor temperature during reduced operation exceeds the limit *OT deactivation value in reduced operation*, the affected heating circuit is put out of service immediately. The valve is closed and the pump is switched off after a lag time. When the outdoor temperature falls below this value (less 0.5 °C hysteresis), heating operation is restarted immediately.

With the default settings, this means that, at night, the system is switched off at an outdoor temperature of 15°C to save energy. Nevertheless, remember that the system requires some time in the morning to heat up the building

Parameter	WE	Range of values
OT deactivation value in reduced operation	15 °C	-10 to 50 °C

### 5.4.3 Summer mode

Summer mode is activated depending on the mean daytime temperature (measured between 7.00h and 22.00h) during the desired period.

If the mean daytime temperature exceeds the *Outdoor temperature limit in summer mode* on two consecutive days, summer mode is activated on the following day: the heating is switched off. If the mean daytime temperature remains below the *Outdoor temperature limit in summer mode* on the next day, summer mode is deactivated on the following day.

Function	WE	Configuration
Summer mode	OFF	FB3 = ON
	01.06	Start summer mode / 01.01 to 31.12
	30.09	Stop summer mode / 01.01 to 31.12
	18 °C	Outdoor temperature limit / 0 to 30 °C

## 5.5 Delayed outdoor temperature adaptation

The calculated outdoor temperature is used to determine the flow temperature set point. The heat response is delayed when the outdoor temperature either decreases, or increases and decreases. If the outdoor temperature varies by, for example, 12 °C within a very short period of time, the calculated outdoor temperature is adapted to the actual outdoor temperature in small steps. Assuming a *Delay* of 3 °C/h, the adaptation would take  $t = \frac{12^{\circ}\text{C}}{3^{\circ}\text{C/h}} = 4 \text{ h}$ .

### Note!

*The delayed outdoor temperature adaptation helps avoid unnecessary overloads of central heating stations in combination with either overheated buildings occurring, for example, due to warm winds, or temporarily insufficient heating due to the outdoor sensor being exposed to direct sunshine.*

Function	WE	Configuration
Delayed outdoor temperature adaptation	OFF	FB4 = ON
		Ab/AufAb (Delay on decreasing/decreasing and increasing temperature)
	3 °C/h	Delay / 0.2 to 6.0 °C/h

## 5.6 Remote operation

Apart from measuring the room temperature, the Type 5244 Room Sensor (PTC sensor) and Type 5257-5 Room Sensor (Pt 1000 sensor) offer the following opportunities of influencing the control process:

- ▶ Selection of the operating mode:
  - Automatic mode
  - Day mode
  - Night mode
- ▶ Set point correction: during rated operation, the room temperature set point can be increased or reduced by up to 5 °C using a continuously adjustable rotary knob.

When the room sensor is activated, the measured room temperature is displayed. Nevertheless, it is not used for control unless the **Optimization**, **Adaptation**, or **Flash adaptation** functions

have been activated.

Refer to page 78 onwards for the wiring diagrams of the room panels.

Functions	WE	Configuration
Room sensor RF	OFF	FB13 = ON
Potentiometer input 1 to 2 kΩ	OFF	FB24 = OFF

## 5.7 Optimization

This function requires the use of a room sensor. Depending on the building characteristics, the controller determines and adapts the required preheating time (maximum 6 hours) to ensure that the desired *Room set point* (rated room temperature) has been reached in the reference room when the time-of-use starts. During the preheating period, the controller heats with the max. flow temperature. This temperature is built up in steps of 10 °C. As soon as the *Room set point* has been reached, weather-compensated control is activated.

Depending on the room sensor, the controller switches off the heating system up to two hours before the time-of-use ends. The controller chooses the deactivation time such that the room temperature does not drop significantly below the desired value until the time-of-use ends. If two times-of-use are programmed for one day, the controller monitors the *Reduced room set point* in the time between these times-of-use. Outside the times-of-use, the controller monitors the *Sustained temperature*. Should the temperature fall below the *Sustained temperature*, the controller heats with the max. flow temperature until the measured room temperature exceeds the adjusted value by 1 °C.

During the preheating period, DHW heating does not take place in systems with DHW circuits linked in the secondary side.

### Note!

*Direct sunshine can cause the room temperature to increase and thus result in the premature deactivation of the heating system.*

Function	WE	Configuration
Optimization	OFF	FB0 = ON
Parameter	WE	Range of values
Room set point	20 °C	0 to 40 °C
Reduced room set point	17 °C	0 to 40 °C
Sustained temperature	15 °C	0 to 40 °C

## 5.8 Flash adaptation

The function is only active in automatic mode (🌀).

Direct reactions to deviations in room temperature can be achieved using the function block setting: FB2 = ON. A gradient characteristic (FB19 = OFF) must be configured.

Flash adaptation counteracts room temperature deviations by increasing or decreasing the level of the heating characteristic by up to 5 °C. The corrections are made after 10 minutes by 1 °C. The corrected value is indicated in the parameter level under the datapoint for *Level, flow*.

### Note!

*Cooling loads, such as drafts or open windows, affect the control process!*

*Rooms may be temporarily overheated when the cooling load has been eliminated!*

Functions	WE	Configuration
Flash adaptation	OFF	FB2 = ON
Characteristic	OFF	FB19 = OFF
Parameter	WE	Range of values
Room set point	20 °C	0 to 40 °C

## 5.9 Adaptation

The function is only active in automatic mode (🌀).

The controller is capable of automatically adapting the heating characteristic to the building characteristics, provided a gradient characteristic has been set (FB19 = OFF). The reference room, where the room sensor is located, represents the entire building and is monitored to ensure that the *Room set point* is maintained. When the mean measured room temperature in rated operation deviates from the adjusted set point, the heating characteristic is modified accordingly for the following time-of-use. The corrected value is displayed in the parameter level under *Gradient, flow*.

Function	WE	Configuration
Adaptation	OFF	FB1 = ON
Characteristics	OFF	FB19 = OFF
Parameter	WE	Range of values
Room set point	20 °C	0 to 40 °C

## 5.10 Pump management

The **Pump management** function can be used for the heating circuit (circulation pump UP1). The binary outputs BA8 and BA9 should always be used to control the operation of this pump whenever a speed-controlled pump is implemented in the heating circuit:

- ▶ BA8 switches the pump on/off
- ▶ BA9 releases the speed control in rated operation or sets the pump to minimum speed operation during reduced operation

BA8 is closed if the circulation pump is to be switched on. The binary output BA9 can be configured with function block FB28:

- ▶ FB28 = ON: BA9 = OFF outside times-of-use
- ▶ FB28 = OFF: BA9 = ON outside times-of-use

Function	WE	Configuration
Pump management	OFF	FB28

## 5.11 Potentiometer input

Terminal 12 can be used for the connection of a potentiometer, e.g. to indicate the valve position in percent on the controller display or at the control station.

Function	WE	Configuration
Potentiometer input 1 to 2 k $\Omega$	OFF	FB24 = ON



## 6 Functions of the DHW circuit

### 6.1 DHW heating in the storage tank system

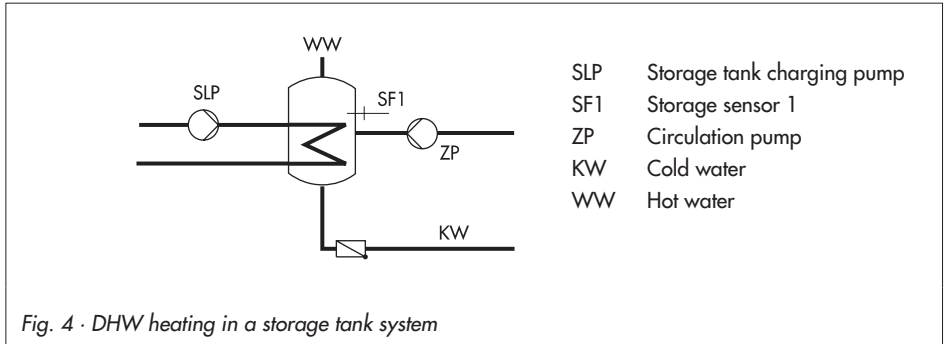


Fig. 4 · DHW heating in a storage tank system

#### Start storage tank charging

The controller begins charging the storage tank when the water temperature measured at sensor SF1 falls below the set point *DHW heating ON* or the temperature adjusted at the storage tank thermostat:

#### DHW heating from the secondary circuit (Anl 2, 7, 9):

If the flow temperature of the system (in system Anl 9: of the radiator circuit) is higher than the required charging temperature, the controller tries to reduce the temperature in the heating circuit side for three minutes at the maximum before the storage tank charging pump starts to operate.

If the flow temperature of the system is lower than the required charging temperature, the charging pump first start to run when the temperature at the affected flow sensor reaches the temperature currently measured at sensor SF1 or the flow temperature could be raised at least by 10 K.

If heating operation is not taking place, the storage tank charging pump is switched on immediately.

#### Note!

The function block setting *FB20 = ON* provides two switching conditions for the storage tank charging pump (SLP) that can be selected (→ section 7.4) when the heating circuits are switched off:

- (1) SLP switched on regardless of the return flow temperature
- (2) SLP switched on depending on the return flow temperature

### DHW heating from the primary circuit (Anl 4):

The control valve opens depending on the *DHW temperature* from its closed position.

### Stop storage tank charging

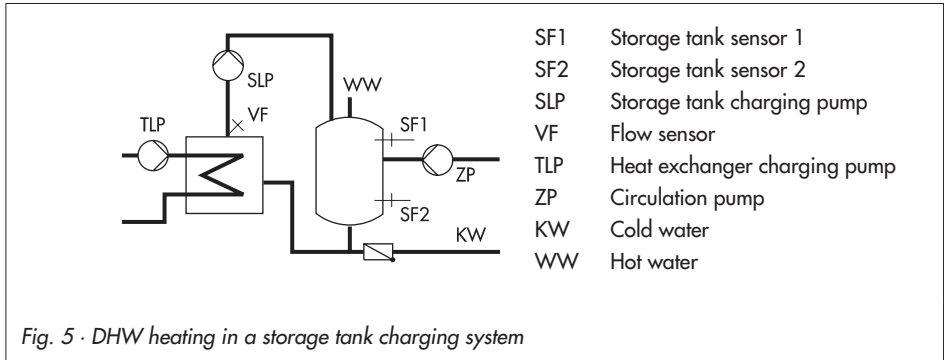
The controller stops charging the storage tank when the water temperature in the storage tank measured at sensor SF1 reaches the value  $T = \text{DHW heating ON} + \text{Hysteresis}$ . In systems with two storage tank sensors, the controller stops charging the storage tank when the water temperature in the storage tank measured at sensor SF2 reaches the value *DHW heating OFF*. In systems with storage tank thermostat, the *Hysteresis* of the thermostat determines when the storage tank charging is finished.

When a high flow temperature is required by the system, the storage tank charging pump is immediately switched off. If no heating is taking place or if the flow temperature demand in the system is lower, the *End charging process* parameter applies for switching off the storage tank charging pump.

The storage tank charging pump is switched off at the latest after two transit time periods of the control valve ( $2 \times T_Y$ ).

Functions	WE	Configuration
Storage sensor SF1	ON	FB14
Storage sensor SF2	OFF	FB15
Return flow sensor RÜF1	ON	FB20
Parameters	WE	Range of values
DHW heating ON	45 °C	20 to 90 °C
DHW heating OFF	50 °C	20 to 90 °C
Hysteresis	5 °C	0 to 30 °C
Charging temperature	55 °C	20 to 90 °C
Stop charging	53 °C	20 to 90 °C
DHW temperature	55 °C	20 to 90 °C

## 6.2 DHW heating in the storage tank charging system



### Start storage tank charging

The controller begins charging the storage tank when the water temperature measured at sensor SF1 falls below the set point *DHW heating ON* or the temperature adjusted at the storage tank thermostat:

#### DHW heating from the secondary circuit (Anl 3, 8):

If the flow temperature of the system is higher than the required charging temperature, the controller tries to reduce the temperature on the heating circuit side three minutes at the maximum before the storage tank charging pump starts. If heating operation is not taking place or the flow temperature in the system is lower, the storage tank charging pump is switched on immediately. If the currently measured temperature at sensor VF is reached, the storage tank charging pump is switched on.

#### DHW heating from the primary circuit (Anl 5, 11):

The storage tank charging pump (Anl 5) or the heat exchanger charging pump (Anl 11) is started immediately. The controller regulates the temperature to the *Charging temperature*.

#### **Note!**

*In systems Anl 3, 8 and 11, the charging temperature in the storage tank charging circuit is regulated over the flow sensor VF3 when it is activated on switching on the storage tank charging pump.*

*The heat exchanger inlet temperature is monitored at sensor VF1 (Anl 3) or VF2. If it reaches the Heat exchanger inlet temperature limit, the limit is used as the basis for the set point for the following heat exchanger inlet temperature control.*

### Stop storage tank charging

The controller stops charging the storage tank when the water temperature in the storage tank measured at sensor SF1 reaches the value  $T = \text{DHW heating ON} + \text{Hysteresis}$ . In systems with two storage tank sensors, the controller stops charging the storage tank when the water temperature in the storage tank measured at sensor SF2 reaches the value *DHW heating OFF*. In systems with storage tank thermostat, the *Hysteresis* of the thermostat determines when the storage tank charging is finished.

### DHW heating from the secondary circuit (Anl 3, 8):

When a high flow temperature is required by the system, the heat exchanger charging pump is immediately switched off. If no heating is taking place or if the flow temperature demand in the system is lower, the *End charging process* parameter applies for switching off the heat exchanger charging pump.

The heat exchanger charging pump is switched off at the latest after two transit time periods of the control valve ( $2 \times T_Y$ ); 15 seconds after the heat exchanger charging pump has been switched off, the storage tank charging pump stops operating.

### DHW heating from the primary circuit (Anl 5, 11):

The storage tank charging pump (Anl 5) or the heat exchanger charging pump (Anl 11) is switched off when the temperature reaches *End charging process* parameter, at the latest, however, two transit time periods of the DHW control valve ( $2 \times T_Y$ ).

In system Anl 11, 15 seconds after the heat exchanger charging pump has been switched off, the storage tank charging pump stops operating.

Functions	WE	Configuration
Storage tank sensor SF1	ON	FB14
Storage tank sensor SF2	ON	FB15
Flow sensor VF3	OFF	FB27
Parameters	WE	Range of values
DHW heating ON	45 °C	20 to 90 °C
DHW heating OFF	50 °C	20 to 90 °C
Hysteresis	5 °C	0 to 30 °C
Charging temperature	55 °C	20 to 90 °C
End charging process	53 °C	20 to 90 °C
Heat exchanger inlet temperature limit	120 °C	20 to 130 °C

### 6.3 DHW heating with solar system (Anl 2, 3, 4, 5 und 9)

The systems Anl 2, 3, 4, 5 and 9 include a solar system for DHW heating. In these systems, the difference between the temperatures measured at storage sensor SF2 and the sensor at the solar collector CF is determined. The *Solar pump ON* parameter determines the minimum temperature difference between sensors SF2 and CF required to activate the solar pump. If the temperature difference falls below the value of *Solar pump OFF*, the solar pump is switched off. Basically, the solar pump is also switched off when the water temperature measured at sensor SF2 has reached the *Solar charging OFF* parameter.

The times-of-use of the DHW circuit do not have any influence on the operation of the solar system. After the key number 1990 has been set, the operating hours of the solar pump are displayed in extended operating level.

Function	WE	Configuration
Storage tank sensor SF2		FB15 = ON, select "CF"
Parameters	WE	Range of values
Solar circuit pump ON	10 °C	0 to 30 °C
Solar circuit pump OFF	2 °C	0 to 30 °C
Solar charging OFF	70 °C	20 to 90 °C

### 6.4 DHW heating in instantaneous heating system (Anl 6)

The controller regulates the DHW outlet temperature of the heat exchanger according to the adjusted *DHW temperature*.

The circulation pump works according to the time schedule. We strongly recommend to operate the circulation pump during times-of-use of the DHW circuit (→ section 6.5).

To keep temperature peaks caused by load changes as small as possible, it is absolutely necessary that a temperature sensor with short response times (e.g. Type 5207-xx6x Pt 1000 Sensor) to measure the DHW outlet temperature. In addition, an actuator with a transit time of around 20 seconds should be used.

**Note!**

*The control parameter setting has great influence on the control accuracy in the case of DHW heating in instantaneous heating systems.*

Parameter	WE	Range of values
DHW temperature	55 °C	20 to 90 °C

## 6.5 Circulation pump operation during storage tank charging

With the setting FB26 = ON, the circulation pump continues operation according to the programmed time schedule even during storage tank charging.

With the setting FB26 = OFF, the circulation pump is switched off as soon as the storage tank charging pump is activated. The circulation pump returns to operate according to the time schedule when the storage tank charging pump has been switched off again.

Function	WE	Configuration
Circulation pump	OFF	FB26

## 6.6 Circulation over the heat exchanger

In systems, in which the DHW heating takes place in the storage tank charging system from the primary circuit (Anl 5, 11), it is possible to keep the control of the charging temperature even when the active storage tank charges are finished.

Function	WE	Configuration
Circulation over the heat exchanger	OFF	FB32 = ON

## 6.7 Intermediate heating operation (Anl 2, 3 and 9)

With the setting FB9 = OFF, heating operation of the UP1 heating circuit is reactivated for a period of 10 minutes after 20 minutes of priority (heating deactivated during DHW heating). During this time, DHW heating is interrupted.

Function	WE	Configuration
Parallel pump operation	OFF	FB9 = OFF, select "20"

### Note!

*In system Anl 2 with circulation pump and switchover valve, the **Intermediate heating operation** function, set FB9 = ON and select "US" and "20".*

## 6.8 Parallel pump operation (Anl 2, 3 and 9)

When the **Parallel pump operation** function is activated, the circulation pump UP1 remains switched on during DHW heating unless certain operating situations occur. These situations include, for example, those when the boost of the flow temperature exceeds 10 °C, or when the maximum flow temperature is exceeded. In this case, the controller applies priority operation, if necessary with intermediate heating.

Once a parallel pump operation cycle has been activated and the time for *Stop parallel operation* has elapsed, system deviations greater than 5 °C cause the controller to suspend parallel operation for 10 minutes and to apply priority operation.

Function	WE	Configuration
Parallel pump operation	OFF	FB9 = ON, PU
	10 min	Stop parallel operation / 2 to 10 min

**Note!**

*In system Anl 9, the control valve of the underfloor heating circuit is always closed with the function block setting FB9 = OFF. With the setting FB9 = ON, select "PU" to ensure it remains in control operation even the parallel operation has been interrupted due to system deviations.*

## 6.9 Priority circuit (Anl 4, 5, 6, 7, 8 and 11)

In many district heating systems with primary DHW heating, the allotted amount of water is only intended to supply the heating system. As a result, the capacity required for DHW heating needs to be taken from the heating system when great heating loads occur; and this, until DHW heating has been concluded.

Nevertheless, heating operation is not simply to be interrupted. Only the amount of energy required for DHW heating is to be deducted. This can be achieved by using the priority functions **Reverse control** and **Set-back operation**.

### 6.9.1 Reverse control

The capacity demand of the heating circuit is reduced when there is a system deviation of more than 5 °C in the DHW circuit. This is achieved by the three-step output of the DHW circuit working in the opposite direction compared to the heating circuit control valve.

The amount of time in which the priority for the DHW circuit is given is set in the *Priority in case of deviation* parameter.

Function	WE	Configuration
Priority for DHW circuit	OFF	FB8 = ON, select "In"
	10 min	Priority in case of deviation / 2 to 10 min

### 6.9.2 Set-back operation

The heating circuit is set back to reduced operation for 20 minutes when a system deviation of more than 5 °C arises in the DHW circuit. Its capacity demand is reduced by the value in

*Set-back difference* by set-back of the current flow temperature.

The amount of time in which the priority for the DHW circuit is given is set in the *Priority in case of deviation* parameter.

Function	WE	Configuration
Priority for DHW circuit	OFF 10 min	FB8 = ON, Ab Priority in case of deviation / 2 to 10 min

### 6.10 Forced charging of the DHW storage tank (Anl 2, 3, 5, 7, 8 and 9)

This function is always configured when the system has at least one storage tank sensor. To provide the full room heating performance when the time-of-use of the heating circuits begins, existing storage tanks are charged one hour before the time-of-use of the heating circuits starts.

### 6.11 Thermal disinfection of the DHW storage tank

In all systems with DHW heating, the DHW storage tank is thermally disinfected on a selected day of the week or every day. The storage tank is heated up to 70 °C. Thermal disinfection starts at 0.00h and finishes at 4.00h at the latest.

Thermal disinfection for preventing legionella infection causes

- ▶ high return flow temperatures during the disinfection cycle (return flow temperature limitation suspended),
- ▶ high storage temperatures after thermal disinfection has been concluded,
- ▶ lime scale (possibly), which can have a negative effect on heat exchanger performance.

#### **Note!**

*This function is not available when a storage tank thermostat is used.*

Function	WE	Configuration
Thermal disinfection	OFF 3 (Mi)	FB7 = ON Day of the week / 1-7 = daily, 1, 2 to 7 = Mon, Tue to Sun



## 7 System-wide functions

### 7.1 Automatic summer time/winter time changeover

The clock is automatically adjusted on the last Sunday in March at 2.00h and on the last Sunday in October at 3.00h.

Function	WE	Configuration
Summer time/winter time changeover	ON	FB5 = ON

### 7.2 Frost protection

When outdoor temperatures below 3 °C occur, the heating circulation pumps UP1 and UP2 are switched on. The controllers regulates the temperature to a flow temperature set point of 20 °C. The circulation pump for the DHW circuit is likewise switched on. Outside the DHW heating times-of-use, the temperature in the DHW storage tank is additionally kept at 5 °C, provided a storage tank thermostat is not used. In conjunction with a storage tank thermostat, the frost protection function does not work outside the times-of-use.

#### **Note!**

*The frost protection function is not activated when manual mode is selected at the mode switch.*

### 7.3 Forced operation of the pumps

When the heating circuit pumps have not been activated for 24 hours, forced operation of the pumps is started between 00.00h and 00.01h. This is done to avoid that the pumps get stuck when they are not operated for a longer period of time. The forced operation of the storage tank or heat exchanger charging pump is operated between 00.01h and 00.02h.

### 7.4 Return flow temperature limitation

The temperature difference between the flow and return flow indicates how well the energy is used: the greater the difference, the higher the efficiency. A return flow sensor is sufficient to evaluate the temperature difference when the flow temperatures are preset. The return flow temperature can be limited either to a value depending on the outdoor temperature (variable) or to a fixed set point. When the temperature measured at return flow sensor RüF exceeds the limit value, the set point of the flow temperature (flow temperature of the heating system, charging temperature) is reduced. As a result, the primary flow rate is reduced and the return flow temperature falls. The *Limiting factor* determines how strongly the controller responds when the limit values are exceeded in either direction.

## System-wide functions

The measured temperature reading (return flow temperature) and the set point reading (flow temperature of the heating, charging temperature) blink to indicate that a return flow limitation is active in the control circuit concerned. In systems Anl 2, 3, 7, 8 and 9, the *Return flow limitation temperature* parameter during DHW heating is used for limitation in the primary circuit while the DHW heating is active. The systems Anl 4, 5, 6 and 11 allow a separate return flow sensor to be installed in the DHW circuit.

To ensure that the preset *Return flow temperature limit temperature during DHW heating* can be met, make sure that:

- the heating characteristic is not adjusted to ascend too steeply,
- the speed of the circulation pumps is not set too high,
- the heating systems have been calibrated.

### Note!

*For outdoor temperature dependent control with gradient characteristic, the return flow temperature is limited to fixed set point by entering the same value for both Maximum return flow temperature and Minimum return flow temperature parameters.*

Functions	WE	Configuration
Return flow sensor RüF1	ON	FB20 = ON 1 Limiting factor / 0.1 to 10
Return flow sensor RüF2	OFF	FB21 = ON 1 Limiting factor / 0.1 to 10
Parameters	WE	Range of values
Gradient, return flow	1.2	0.2 to 3.2
Level, return flow	0 °C	-30 to 30 °C
Maximum return flow temperature	65 °C	20 to 90 °C
Minimum return flow temperature	65 °C	20 to 90 °C
Return flow temperature limit temperature during DHW heating	65 °C	20 to 90 °C

### Note!

*In systems Anl 2, 5, 7 and 9 The function block setting FB20 = ON or FB21 = ON provides two switching conditions for the storage tank charging pump (SLP) that can be selected when the heating circuits are switched off:*

- (1) SLP switched on regardless of the return flow temperature
- (2) SLP switched on depending on the return flow temperature

## 7.5 Condensate accumulation control

Activate the **Limitation of the system deviation for OPEN signal** function to start up condensate accumulation plants, in particular to avoid problematic excess temperatures. The controller response to set point deviations which cause the primary valve to open is attenuated. The controller response to set point deviations which cause the control valve to close remains unaffected.

Function	WE	Configuration
Limitation of the system deviation for OPEN signal RK1/RK2	OFF 2 °C	FB11/FB12 = ON Maximum system deviation / 2 to 10 °C

### Note!

The condensate accumulation control function can only be activated when no on/off control has been configured, i.e. when FB10 = ON or FB17 = ON.

## 7.6 Three-step control

The flow temperature can be controlled using a PI algorithm. The valve reacts to pulses that the controller emits when a system deviation occurs. The length of the first pulse, in particular, depends on the extent of the system deviation and the selected *Proportional gain*  $K_P$  (the pulse length increases as  $K_P$  increases). The pulse and pause lengths change continuously until the system deviation has been eliminated. The pause length between the single pulses is greatly influenced by the *Reset time*  $T_N$  (the pause length increases as  $T_N$  increases).

The *Transit time*  $T_Y$  specifies the time required by the valve to travel through the range of 0 to 100 %.

Functions	WE	Configuration
Three-step control for RK1	ON	FB10 = ON
	0.5	$K_P$ (proportional gain) / 0.1 to 50
	200 s	$T_N$ (reset time) / 1 to 999 s
	90 s	$T_Y$ (valve transit time) / 15 to 240 s
Three-step control for RK2	ON	FB17 = ON
	0.5	$K_P$ (proportional gain) / 0.1 to 50
	60 s*	$T_N$ (reset time) / 1 to 999 s
	30 s*	$T_Y$ (valve transit time) / 15 to 240 s


\* WE applies to systems An1 5, 6;  $T_N = 200$  s,  $T_Y = 90$  s applies for system An1 4

## 7.7 On/off control

The flow temperature can be controlled by an on/off signal. The controlled valve is opened when the flow temperature falls below the set point by  $T = 0.5 \times \text{Hysteresis}$ . When the flow temperature exceeds the set point by  $T = 0.5 \times \text{Hysteresis}$ , the control valve is closed. The greater the *Hysteresis* selected, the lower the switching frequency.

Function	WE	Configuration
On/off control for RK1/RK2	ON	FB10/FB17 = OFF
	5 °C	Hysteresis / 1 to 30 °C

## 7.8 Releasing a control circuit over the binary input

The release of a control circuit using the binary output only becomes effective when the respective control circuit is in automatic mode (icon ) .

The released control circuits always work in automatic mode; the deactivated control circuit behaves as if it were in frost protection mode if the outdoor temperature requires it. The control circuit can be released via the binary input when the binary input is open (BE = ON).

Function	WE	Configuration
Releasing a control circuit	OFF	FB25 = ON, FErn

### Note!

*The function cannot be selected in systems Anl 4, 5 and 9 with solar system and in system Anl 11 with VF3.*

## 7.9 Processing of external demand in RK1

Regardless of the operating mode, except form manual mode, of the control circuit RK1, the controller uses the *Minimum flow temperature for external demand* when the binary input is closed (BE1 = ON). The DHW heating from the secondary circuit and demands of the heating circuit which are higher than the *Minimum flow temperature for external demand* have priority. In systems Anl 7 and 8, a mixing control is not active, just the set point of the heating circuit changes.

The deactivated binary input (BE1 = OFF) does not have any effect on the control.

Function	WE	Configuration
External demand over BE1	OFF	FB25 = ON, bed
	20 °C	Minimum flow temperature for external demand / 20 to 130 °C

**Note!**

The function cannot be selected in systems Anl 4, 5 and 9 with solar system and in system Anl 11 with VF3.

## 7.10 Flow rate/capacity limitation

Flow rate/capacity limitation can be implemented based on a pulse or standardized signal of 0/4 to 20 mA provided by the heat meter. This only applies in plants without solar system. Particularly when a standardized signal is applied, a heat meter (flow meter) with high measuring accuracy is required.

It must be ensured that the controller is supplied with updated measured values in intervals of max. 5 seconds.

In system Anl 1, just the maximum limit for the flow rate or capacity can be entered.

### 7.10.1 Limitation using pulse input

A connected heat meter (terminals GND/15) with pulse output can be used to limit either the flow rate or the capacity in the system.

Two different maximum limits can be set:

- ▶ *Maximum limit*
- ▶ *Maximum limit for DHW* exclusively for DHW heating

All limit values are given in the unit "pulses per hour" [pulse/h]. As a result, the controller does not distinguish between a flow rate pulse signal or a capacity pulse signal. As the displayed current pulse rate P [pulse/h] is calculated depending on the interval between the received pulses, it is natural that the controller cannot react immediately to all rapid flow rate or capacity changes which occur in the system.

When the pulse rate reaches the current *Max. limit*, the current flow set point is reduced. How strongly the controller responds is determined by the *Limiting factor*.

In systems Anl 4 to 6 and 11, the control circuit with lowest set limit in the set point is always reduced.

#### Example to determine the limit:

If a capacity of 30 kW is to be limited, the following limit value must be set for a heat meter with an output of one pulse per kilowatt-hour:

$$P = \frac{30 \text{ kW}}{1 \text{ kWh} / \text{pulse}} = 30 \text{ pulse} / \text{h}$$

Functions	WE	Configuration
Current input for flow rate measurement	OFF	FB22 = OFF
Flow rate or capacity limitation	OFF	FB23 = ON
	500 pulse/h	Max. limit / 3 to 500 pulse/h
	1.0	Limiting factor / 0.1 to 10
	500 pulse/h	Max. limit for DHW / 3 to 500 pulse/h
	1.0	Limiting factor / 0.1 to 10

### 7.10.2 Limitation using 0/4 to 20 mA signal

A connected heat meter (terminals GND/15 with a 50  $\Omega$  resistor connected in parallel) with a 0/4 to 20 mA output can be used to limit the flow rate in the system. All limit values are given in the unit "cubic meters per hour" [m<sup>3</sup>/h]. As a result, it is necessary to set in addition to *Lower measuring range value* 0 or 4 mA also an *Upper measuring range value* (flow rate at which the 20 mA signal is issued) in unit [m<sup>3</sup>/h]. When the flow rate reaches the current *Maximum limit*, the controller switches in control circuit RK1 to flow rate control with the *Maximum limit* acting as the set point. If the flow temperature exceeds its normal set point by more than 5 °C during this time, the flow temperature control is started again. If the flow rate falls below the set *Minimum limit*, the control valve of control circuit RK1 is temporarily closed. The normal control operation is started again when the flow temperature falls below its normal set point by 5 °C.

#### Note!

In systems Anl 4 to 6 and 11, the valve of the heating circuit is affected during an active flow rate limitation.

Functions	WE	Configuration
Current input for flow rate measurement	OFF	FB22 = ON, select "Lower measuring range"
Flow rate or capacity limitation	OFF	FB23 = ON
	10.00 m <sup>3</sup> /h	Upper measuring range / 0.1 to 650 m <sup>3</sup> /h
	0.01 m <sup>3</sup> /h	Minimum limit/ 0.01 to 650 m <sup>3</sup> /h
	9.00 m <sup>3</sup> /h	Maximum limit / 0.01 to 650 m <sup>3</sup> /h

### 7.11 Locking manual levels

The number of access options to the controller can be restricted by locking the manual level. When the locking is active, the mode switches positioned at the manual mode do not have any effect concerning manual activation of the valves. Merely, reactions occur as if the mode

switches were set to "Night mode" or Heating circuit(s) deactivated" or "DHW heating unchanged".

Function	WE	Configuration
Locking manual levels	OFF	FB34 = ON

## 7.12 Setting a customized key number

- ↻ Switch to the parameter level.  
Display shows: Time, ◀ blinks
- ⬆ ⬇ Switch to the configuration level.  
Display shows: Currently valid system code number, ▶ blink
- ⬆ Select a function block (e.g. FB20) protected by the key number.
- ⊗ Open the function block.  
**0000** appears on the display.
- ⬇ Set 01995 as the key number.
- ⊗ Confirm the key number.  
Display shows: 00100
- ⬇ Enter current key number.
- ⊗ Confirm current key number.
- ⬇ Set new key number between 00100 and 01900.
- ⊗ Confirm new key number.  
This new key number is now the active key number.

## 8 Operational faults

Malfunctions or faults are indicated by the  icon blinking on the display.

### 8.1 Sensor failure

The following list explains how the controller responds to the failure of the different sensors. Safety functions such as frost protection and excess temperature protection no longer work when a sensor fails.

- ▶ **Outdoor sensor AF:** When the outdoor sensor fails, the controller uses a flow temperature set point of 50 °C or the *Max. flow temperature* (when the *Max. flow temperature* is smaller than 50 °C).
- ▶ **Flow sensor in heating circuit VF1/VF2:** When the flow sensor is defective, the controller continues to work with the associated valve in the 30 % valve position. DHW heating which uses such a sensor to measure the charging temperature is interrupted. In systems Anl 4, 5, 6 and 11, the failure of flow sensor VF2 cause the DHW control valve to close.
- ▶ **Flow sensor in DHW circuit VF3:** When the flow sensor VF3 is defective, the DHW heating takes place without change in lag/lead sequence.
- ▶ **Return flow sensor RÜF1/RÜF2:** The controller continues to function without the return temperature limitation when the return flow sensor fails.
- ▶ **Room sensor RF:** The controller functions using the settings for operation without room sensor when the room sensor fails. For example, optimization mode switches to the reduced operation mode. Adaptation mode is interrupted. The last defined heating characteristic is not changed anymore.
- ▶ **Storage tank sensor SF1/SF 2:** When one of the sensors fail, DHW heating no longer takes place.
- ▶ **Solar circuit sensor SF2/CF:** When one of the sensors fails, the solar circuit pump is switched off.

### 8.2 Collective error alarm

As an alternative to the **Pump management** function, a fault alarm can be indicated over the binary output BA8. Should the error status register FSr indicate a fault, the binary output BA8 is activated.

Function	WE	Configuration
Fault alarm output BA8	OFF	FB47 = ON



### 8.3 Temperature monitoring

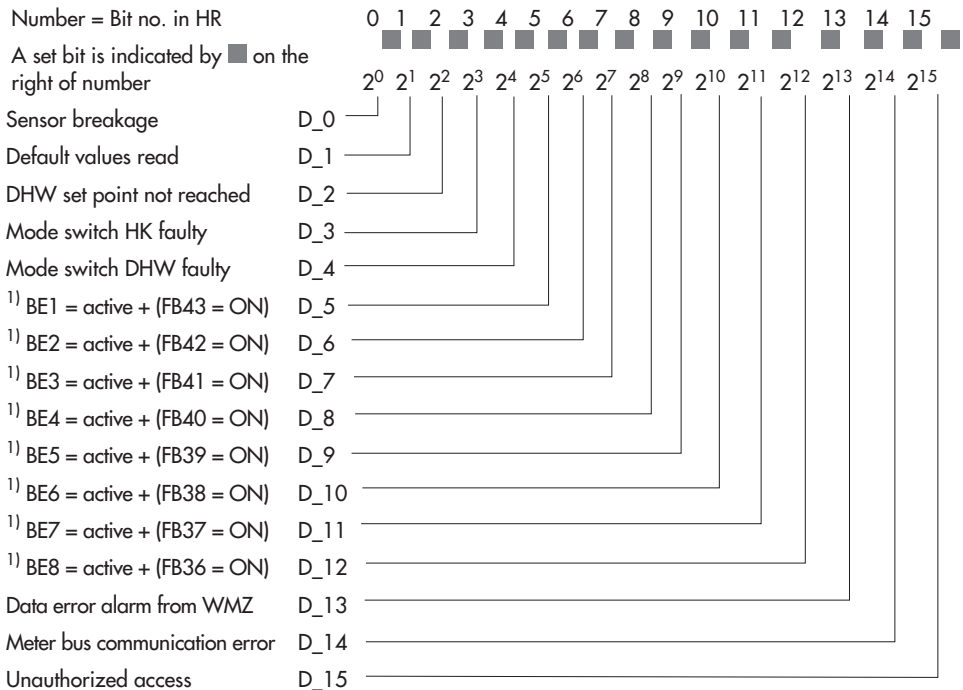
Should a deviation arise in a control circuit that is greater than 10 °C for longer than 30 minutes, the bit D12 is automatically set in the error status register.

If this function is not required, configure FB36 = ON, select "steig" and leave the input BE8 unswitched.

### 8.4 Error status register

The error status register is used to indicate controller or system errors. In modem operation with *Dial-up also upon corrected fault* function, any change in state of the error status register causes the building control station to be dialed.

#### BITMAP error status register (FSr)



<sup>1)</sup> The binary inputs BE1 to BE8 appear in the error status register whenever the associated function block FB\_ = ON

**Example of a transfer to the control system:**

The error status register is transferred as a word <w> in a holding register (HR) whose value is calculated as follows:  $\langle w \rangle = D_0 + D_1 + \dots + D_{15} = 2^0 + 2^1 + \dots + 2^{15}$

**9 Communication**

Using the serial system bus interface, the TROVIS 5476 Heating Controller can communicate with a building control system. In combination with a suitable software for process visualization and communication, a complete control system can be implemented.

The following communication settings are possible:

**– Operation with a dial-up modem at the RS-232-C system bus interface**

Basically, communication is only established automatically when errors occur. The controller works autonomously. Nevertheless, the modem can dial up to the controller at any time to read data from it or otherwise influence it, if necessary. We recommend to use the modem connecting cable (1400-7139).

**– Operation with a four-wire bus at the RS-485 system bus interface**

To establish the link between computer and bus line, the signal level needs to be converted by a converter (SAMSON's TROVIS 5484 Converter).

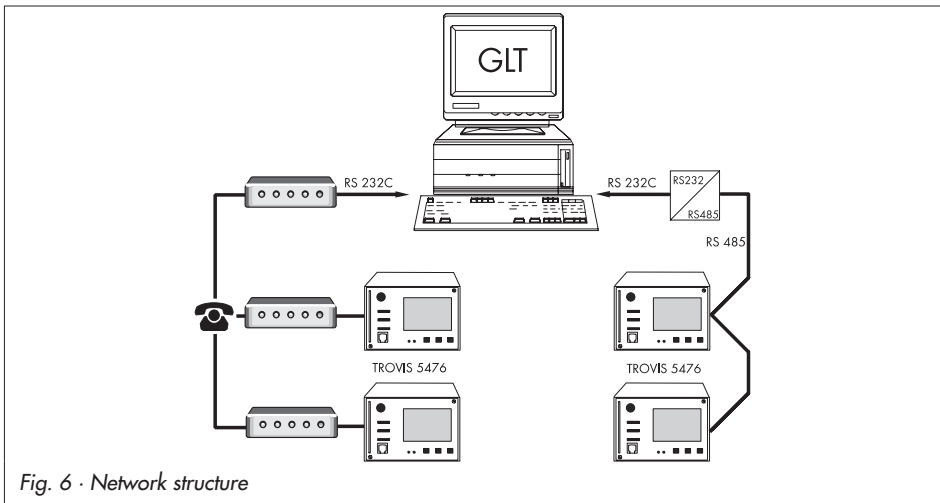


Fig. 6 · Network structure

The TROVIS 5476 Controller is fitted with either a RS-485 port or a RS-232-C port depending on the order. The optional operation between both versions or a conversion to a different port version is not possible.

## 9.1 Controller with RS-232-C port

The system bus connection is located at the back of the controller housing (RJ-12 jack). In this case, the controller can be connected either directly to the serial interface of a PC (point-to-point connection) or to a (dial-up) modem. A dial-up modem is required if the controller is to be connected to the telecommunications network. In this case, the controller works autonomously and can issue an alarm call to the building control station when errors occur. By pressing the enter key when the time appears on the display, the following status information is shown:

- ▶ FrEE: No communication, but the modem is ready
- ▶ PAUSE: Interval between dialing has not yet elapsed since the last attempt
- ▶ Conn: Connection currently established
- ▶ RinG: Incoming call
- ▶ Init: Modem is initialized  
(appears only briefly, if it appears for longer period, the modem has not responded with "OK" and ATZ (→ page 70) is repeated)
- ▶ CALL: Controller dialing control
- ▶ EndE: Connection is cut

Additionally, the building control station can dial the controller, poll it and send it new data after writing to the holding register no. 92 with valid key number.

The **Alternative recipient** function is used by the controller after a programmable number of dialing attempts to the building control station has been completed.

### **Note!**

*If a wrong key number has been written to holding register no. 92 for the third consecutive time, the controller immediately interrupts the modem connection and generates an alarm (Unauthorized access occurred). As a result, the call to the configured control system is triggered. Bit D15 is deleted as soon as the error status register has been read by the control system and the connection has been terminated.*

In special cases, the **Lock dial-up** function can be selected to stop dial-up in case an error occurs. Using the **Dial-up also upon corrected error** function, the controller additionally informs the building control station when a previously signaled error no longer persists.

Functions	WE	Configuration
Modem operation	OFF	FB44 = ON
	8 bit	8 bit/16 bit
	30 min	Cyclical initialization In* / 0 to 255 min
	5 min	Dialing pause to GLT PA* / 0 to 255 min
	5 min	Modem timeout t <sub>0</sub> * / 0 to 99 min
	PULS	Dial procedure / PULS/ton
	-	Phone no. of control station GLT*
Alternative recipient	OFF	FB46
	5	Number of dialing attempts An* / 0 to 99
	-	Phone number of alternative recipient*
Lock dial-up	OFF	FB35
Dial-up also upon corrected error	OFF	FB45
Parameters*	WE	Range of values
Station address (ST-NO)	255	1 to 247 ( 8 bit)
		1 to 999 (16 bit)
Baud rate (BAUD)	9600	150 to 9600

\* -> Section 9.3 ("Description of communication parameters to be adjusted")

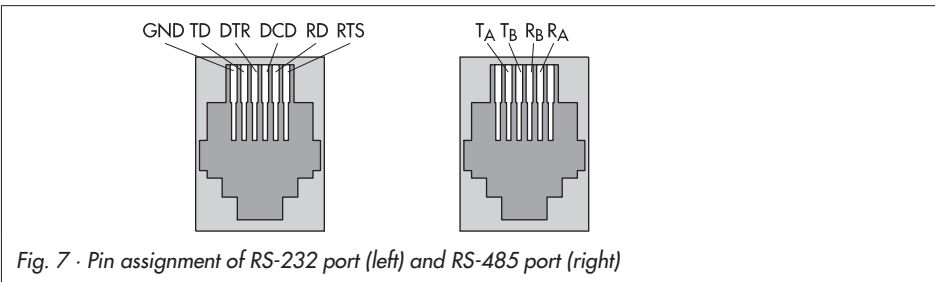


Fig. 7 · Pin assignment of RS-232 port (left) and RS-485 port (right)

## 9.2 Controller with serial RS-485 interface

A constant bus connection is required (data cable) for the operation of the controller with serial RS-485 interface. The bus line links the control units/devices in an open ring. At the end of the bus line, the data cable is connected to the control station using an RS-485/RS-232 converter (e.g. TROVIS 5484).

The maximum range of the bus connection (cable length) is 1,200 meters. A maximum of 32 devices can be connected to such a segment.

If you wish to use more than 32 devices in line or need to bridge greater distances, make sure repeaters (e.g. TROVIS 5482) are installed to replicate the signal. With 8-bit addressing, a maximum of 246 devices can be addressed and connected to a bus.

### **⚠ Warning!**

You are required to follow the relevant standards and regulations concerning lightning and overvoltage protection on installation.

Function	WE	Configuration
Modem operation	OFF	FB44 = OFF
	8 bit	8 bit/16 bit
Parameters*	WE	Range of values
Station address	255	1 to 247 ( 8 bit)
		1 to 999 (16 bit)
Baud rate	9600	150 to 9600

\* -> Section 9.3 ("Description of communication parameters to be adjusted")

## 9.3 Description of communication parameters to be adjusted

### **Station address (ST.-NO)**

This address is used to identify the controller in bus or modem mode. In a system, each controller needs to be assigned a unique address.

### **Baud rate (BAUD)**

In a bus system, baud rate refers to the transfer speed between control system and controller. In modem mode, baud rate refers to the transfer speed between controller and modem. The baud rate adjusted at the controller must correspond with the baud rate of the control system, otherwise no communication can be established.

### **Cyclical initialization (In)**

This parameter defines the period of time for a cyclical issue of the initialization command "ATZ". The command is not issued during dial-up or when connected. "ATZ" causes the profile 0 to be copied to the active profile, provided the modem parameters have been set and saved in profile 0 using a suitable terminal program.

### **Dialing pause to the control station (PA)**

It is recommendable to pause for approx. 3 to 5 minutes between dialing up to the control system to avoid a permanent overloading of the telecommunications network. The *Dialing pause to the control station* defines the interval between 2 dialing attempts.

### Modem time-out ( $t_0$ )

When the controller connects to the GLT but without addressing a Modbus data point, the connection is closed after the time specified for *Modem time-out* has elapsed. If the error status register has not been read during the GLT connection, the controller dials up to the GLT again after the *Dialing pause to the control station* (PA) has elapsed.

### Number of redialing attempts (An)

The controller tries to dial up to the control system again, observing the *Dialing pause to the control station*, in case the GLT is busy or the function that triggered the call has not been reset by the controller. After the specified number of redialing attempts have failed, the controller dials the alternative recipient.

### Phone number of control station/alternative recipient

Enter the phone number of the control system modem/alternative recipient including the dialing code, if necessary. Short pauses between the numbers can be entered using P (= 1 second); the end of the string is to be marked by "-". The phone number may include a maximum of 23 characters.

Example: "069, 2 sec. pause, 4009, 1 sec. pause, 0": 0 6 9 P P 4 0 0 9 P 0 - (= 11 characters)

## 9.4 Meter bus interface

The TROVIS 5476 Heating and District Heating Controller can communicate with up to 3 heat and water meters according to EN 1434-3. A flow rate or capacity limitation is possible on the basis of the values measured at heat meter WMZ1.

Details on the use of the different heat or water meters can be found in the technical documentation TV-SK 6311.

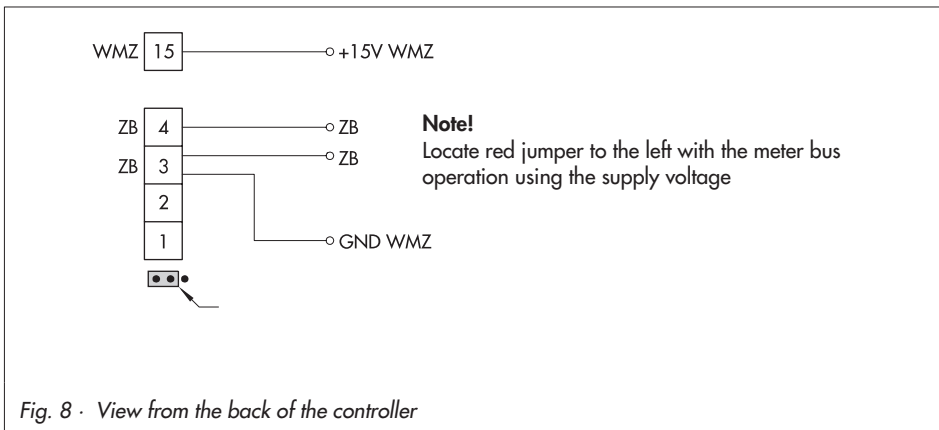


Fig. 8 · View from the back of the controller

**Note!**

A 15 V DC supply voltage (+15 V at terminal 15 connected to the meter bus connection terminal 3) can be used at the WMZ connection of TROVIS 5476 Controller when the red jumper on the back of the controller is located pointing towards the edge of the controller (Fig. 8). Otherwise, the meter bus module in the heat meter is supplied. Furthermore, the heat meter is galvanically connected with controller input side (pulse and current input at terminal 15) resulting it being connected to the Modbus interface as well which can lead to the communication coming to a standstill.

### 9.4.1 Activating the meter bus

To successfully transfer data from the heat meter to the controller, the heat meter must use a standardized protocol in accordance with EN 1434-3. It is not possible to make a general statement about which specific data can be accessed in each meter. For details on the different meter makes, refer to the technical documentation TV-SK 6311. All necessary function block parameters to set up the communication with heat or water meters are available in function block FB 29. The meter bus address, the model code and the reading mode must be specified for the heat meters WMZ1 to WMZ3.

A meter bus address must be unique and correspond with the address preset in the WMZ. If the preset meter bus address is unknown, a single heat meter connected to the controller can be assigned the meter bus address 254. The address 255 deactivates the communication with the respective WMZ. The model code to be set for the heat meter can be found in TV-SK 6311. In general, the default setting of 1434 can be used for most devices. The meters can be read either automatically every 24 hours (approx.), continuously or when the coils (= Modbus data points) assigned to the heat meters WMZ1 to WMZ3 are overwritten with the value 1 via the system bus interface.

Function	WE	Configuration
Meter bus	OFF	FB29 = ON
	254*	Meter bus address for WMZ 1 to 3 (ST.-NO) / 0 to 255
	1434	Model code WMZ 1 to 3 / 1434, CAL3, APAtO, SLS
	Cont	Reading mode WMZ 1 to 3 / 24h, Cont, Coil
* WE for WMZ 2 and 3: 255		

### 9.4.2 Flow rate and/or capacity limitation via meter bus

Similar to the flow rate limitation based on a standardized 0/4 to 20 mA signal, the update rate of the measured variable, flow rate and/or capacity, must be smaller than 5 seconds in meter bus operation to carry out a proper limitation. Refer to the technical documentation TV-SK 6311

for details on which listed heat meters fulfill this criterion and can be used for limitation purposes.

In case of battery-operated heat meters in particular, please note that some makes react with communication intervals if they are polled too frequently. Other makes could use up their batteries too quickly. The technical documentation TV-SK 6311 provides more details on these matters.

- ▶ A system with simultaneous room heating and DHW heating requires maximum energy.
- ▶ A system with a fully charged storage tank which performs only room heating requires less energy.
- ▶ A system which suspends room heating during DHW heating requires less energy.

As a result, three different maximum limit values can be specified:

- ▶ *Max. limit value* to determine the absolute upper limit
- ▶ *Max. limit value for heating* for exclusive operation of the room heating
- ▶ *Max. limit value for DHW* for exclusive operation of the DHW heating

In all systems without DHW heating or without heating circuit, only the *Max. limit value* for the flow rate or capacity can be set.

### Flow rate limitation

The settings which are to be made for the flow rate limitation are mainly contained in function block FB30 as function block parameters. Only after selecting the type of limitation "At" for outdoor temperature dependent limitation (which automatically means a 4-point characteristic), four outdoor temperature dependent maximum limits for heating need to be set in the 4-point characteristic menu. After selecting "- - -", set *Maximum limit for the system*, *Maximum limit for heating* and *Maximum limit for DHW*, *Minimum limit* and the *Limiting factor* that appear in this order. The *Limiting factor* determines how strongly the controller responds when the limit values are exceeded in either direction.

Function	WE	Configuration
Meter bus	OFF	FB29 = ON
	254**	Meter bus address for WMZ 1 to 3 (ST.-NO) / 0 to 255
	1434	Model code WMZ 1 to 3 / 1434, CAL3, APAtO, SLS
	Cont	Reading mode WMZ 1 to 3 / 24h, Cont, Coil
	** WE for WMZ2 and 3: 255	



Function	WE	Configuration
Flow rate limitation	OFF	FB30 = ON
		At/---
	2.0 m <sup>3</sup> /h	Maximum limit / 0.01 to 650 m <sup>3</sup> /h
	2.0 m <sup>3</sup> /h	Maximum limit for heating* / 0.01 to 650 m <sup>3</sup> /h
	2.0 m <sup>3</sup> /h	Maximum limit for DHW / 0.01 to 650 m <sup>3</sup> /h
	2.0 m <sup>3</sup> /h	Minimum limit / 0.01 to 650 m <sup>3</sup> /h
	1.0	Limiting factor / 0.1 to 10.0
* Does not need to be set on selecting "At"		
Parameter*	WE	Range of values
Maximum limit for heating, points 1 to 4	2.0 m <sup>3</sup> /h	0.01 to 100 m <sup>3</sup> /h
* Parameter only needs setting with FB30 = ON, select "At"		

### Capacity limitation

The settings which are to be made for the capacity limitation are mainly contained in function block FB31 as function block parameters. Only after selecting the type of limitation "At" for outdoor temperature dependent limitation (which automatically means a 4-point characteristic), four outdoor temperature dependent maximum limits for heating need to be set in the 4-point characteristic menu. After selecting "- - -", set *Maximum limit for the system*, *Maximum limit for heating* and *Maximum limit for DHW*, *Minimum limit* and the *Limiting factor* that appear in this order. The *Limiting factor* determines how strongly the controller responds when the limit values are exceeded in either direction.

Function	WE	Configuration
Meter bus	OFF	FB29 = ON
	254**	Meter bus address for WMZ 1 to 3 (ST.-NO) / 0 to 255
	1434	255
	Cont	Model code WMZ 1 to 3 / 1434, CAL3, APAtO, SLS
		Reading mode WMZ 1 to 3 / 24h, Cont, Coil
Capacity limitation	OFF	FB31 = ON
	15 kW	Maximum limit / 0.01 to 6000 kW
	15 kW	Maximum limit for heating* / 0.1 to 6000 kW
	15 kW	Maximum limit for DHW / 0.1 to 6000 kW
	1.0	Limiting factor / 0.1 to 10.0
* Does not need to be set on selecting "At"		
** WE for WMZ2 and 3: 255		
Parameter*	WE	Range of values
Maximum limit for heating, points 1 to 4	15 kW	0.1 to 6000 kW

Parameter*	WE	Range of values
------------	----	-----------------

\* Parameter only needs setting with FB31 = ON, select "At"

## 9.5 Memory module

The use of a memory module (accessory no. 1400-7142) is particularly useful to transfer all data from one TROVIS 5476 Controller to several other TROVIS 5476 Controllers. The memory module is plugged into the RJ-12 jack integrated into the front panel. Once the module has been connected, "76 SP" is displayed. If the memory module already contains data from a different TROVIS 5476 Controller, press the enter key until "SP 76" is displayed.

- ▶ Pressing the enter key to confirm "76 SP" causes the controller settings to be transferred to the memory module.
- ▶ Pressing the enter key to confirm "SP 76" causes the saved controller settings to be transferred from the memory module to the controller.

During the data transfer, the bars on the display indicate the progress. After the display stops, remove the memory module from the controller.

## 10 Installation

The controller consists of the housing with the electronics and the back panel with the terminals. It is suitable for panel, wall, and top hat rail mounting (Fig. 9). To connect the wiring, undo the fastening screw (1) at the front and separate the controller housing from the back of the controller.

### Panel mounting

1. Make a cut-out of 138 x 91 mm (width x height) in the control panel.
2. Insert the controller housing through the panel cut-out and turn the two plastic clamps (2) on the front panel by 90°.
3. Install the electrical connections at the back of the housing as described in section 11.
4. Fit the controller housing back on.

### Wall mounting

1. If necessary, bore holes with the specified dimensions in the appropriate places.
2. Fasten the back panel with four screws.

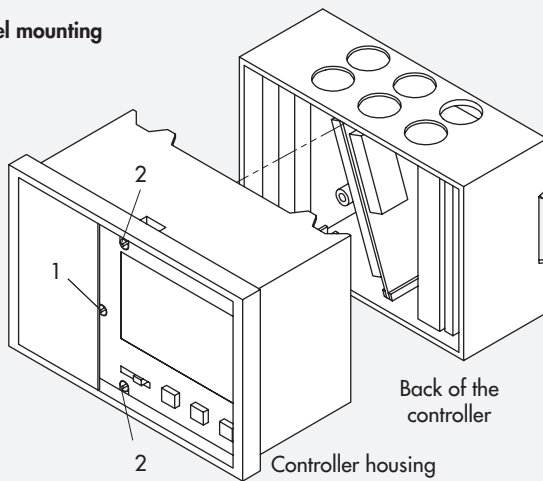
Perform steps 3. and 4. as describe for panel mounting

### Top hat rail mounting

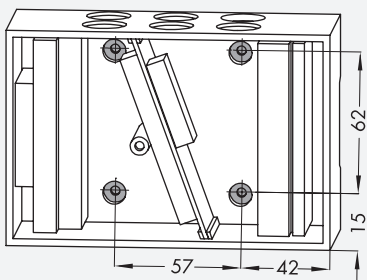
1. Fasten the spring-loaded hook (4) at the bottom of the top hat rail (3).
2. Slightly push the controller upwards and pull the upper hooks (5) over the top hat rail.

Perform steps 3. and 4. as describe for panel mounting

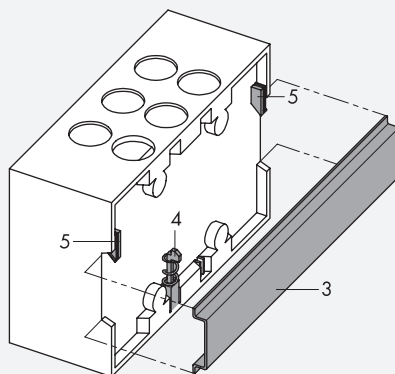
Panel mounting



Wall mounting



Top hat rail mounting



Dimensions in mm:  
 $W \times H \times D = 144 \times 96 \times 125$

Fig. 9 · Installation

## 11 Electrical connection

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### **⚠ Caution!**

*For electrical installation, you are required to observe the relevant electrotechnical regulations of the country of use as well as the regulations of the local power suppliers. Make sure all electrical work is performed by trained and experienced personnel!*

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### **Notes on installing the electrical connections**

- ▶ Install the 230 V power supply lines and the signal lines separately! To increase noise immunity, observe a minimum distance of 10 cm between the lines. Make sure the minimum distance is also observed when the lines are installed in a cabinet.
- ▶ The lines for digital signals (bus lines) and analog signals (sensor lines, analog outputs) must also be installed separately!
- ▶ In plants with a high electromagnetic noise level, we recommend to use shielded cables for the analog signal lines. Ground the shield at one side, either at the control cabinet inlet or outlet, using the largest possible cross-section. Connect the central grounding point and the PE grounding conductor with a cable  $\geq 10 \text{ mm}^2$  using the shortest route.
- ▶ Inductances in the control cabinet, e.g. contactor coils, are to be equipped with suitable interference suppressors (RC elements).
- ▶ Control cabinet elements with high field strength, e.g. transformers or frequency converters, should be shielded with separators providing a good ground connection.

### **Overvoltage protection**

- ▶ If signal lines are installed outside buildings or over large distances, make sure appropriate surge or overvoltage protection measures are taken. Such measures are indispensable for bus lines!
- ▶ The shield of signal lines installed outside buildings must have current conducting capacity and must be grounded on both sides.
- ▶ Surge diverters must be installed at the control cabinet inlet.

### **Connecting the controller**

The controller is connected as illustrated in the following wiring diagrams.

If individual inputs for other functions, e.g. for binary input, it must be configured in the configuration level. Refer to section 2.2 for details.

Open the housing to connect the cables. To connect the feeding cables, make holes in the marked locations at the top, bottom or back of the rear part of the housing and fit suitable cable glands.

### Connecting the sensors

Cables with a minimum cross-section of  $2 \times 0.5 \text{ mm}^2$  can be connected to the terminals at the back panel of the housing.

### Connecting the actuators

Connect cables with at least  $1.5 \text{ mm}^2$  suitable for damp locations to the terminals of the controller output. The direction of travel needs to be checked at start-up.

- ▶ Set slide switch to (+). Valves must open.
- ▶ Set slide switch to (-). Valves must close.

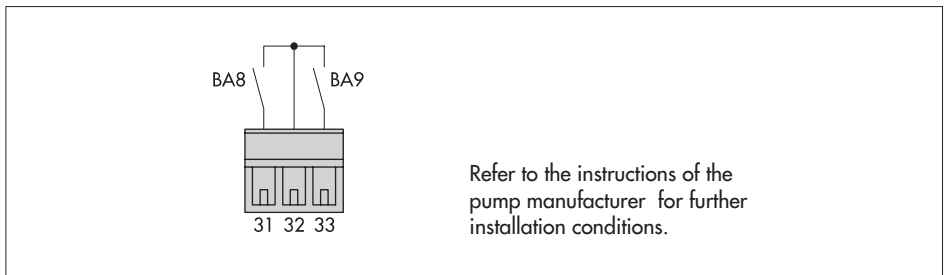
### Connecting the pumps

Connect all cables with at least  $1.5 \text{ mm}^2$  to the terminals of the controller as illustrated in the corresponding wiring diagram (→ page 78 to 80).

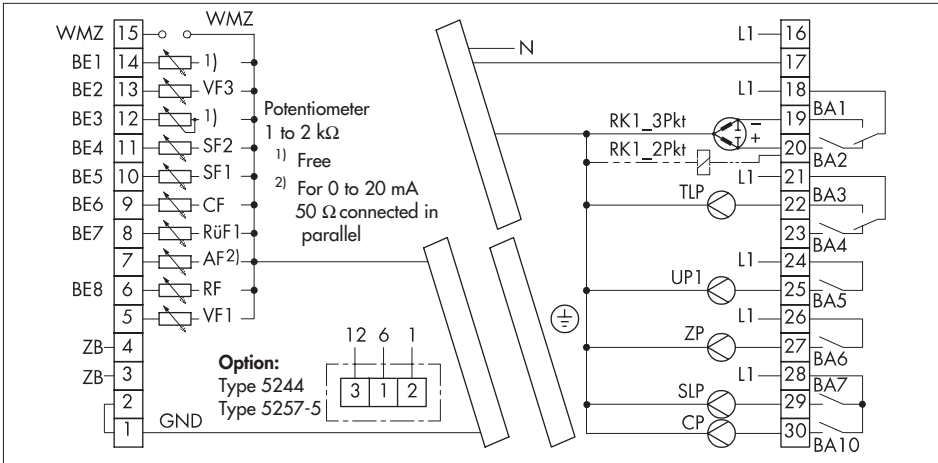
### Legend for wiring plans:

AF	Outdoor temperature sensor	SLP	Storage tank charging pump
RF	Room temperature sensor	TLP	Heat exchanger charging pump
VF	Flow temperature sensor	UP	Heating circulation pump
SF	Storage tank sensor	ZP	DHW circulation pump
RüF	Return flow temperature sensor	RK	Control circuit
TWF	DHW sensor	BE	Binary input
GND	Grounding of input signals	WMZ	Heat meter connection
L + N	Mains supply	ZB	Meter bus interface
CF	Solar circuit collector sensor	CP	Solar circuit pump

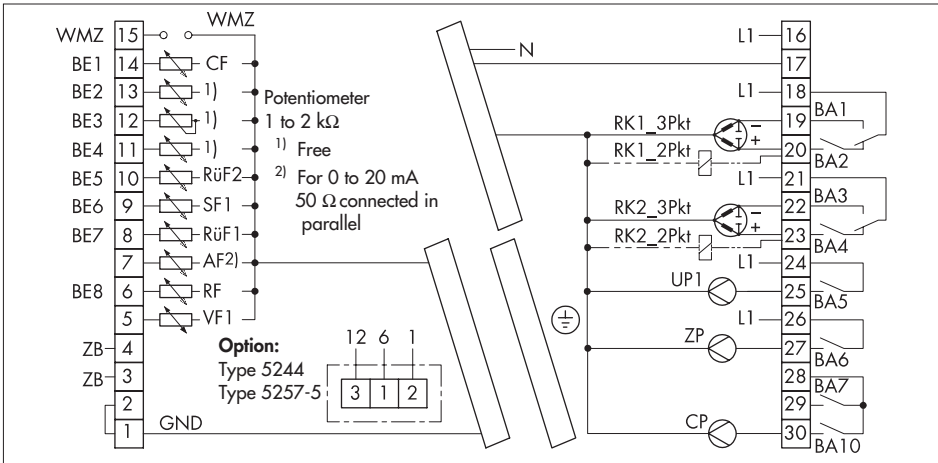
### Connections on the back of the controller, showing pump management as an example



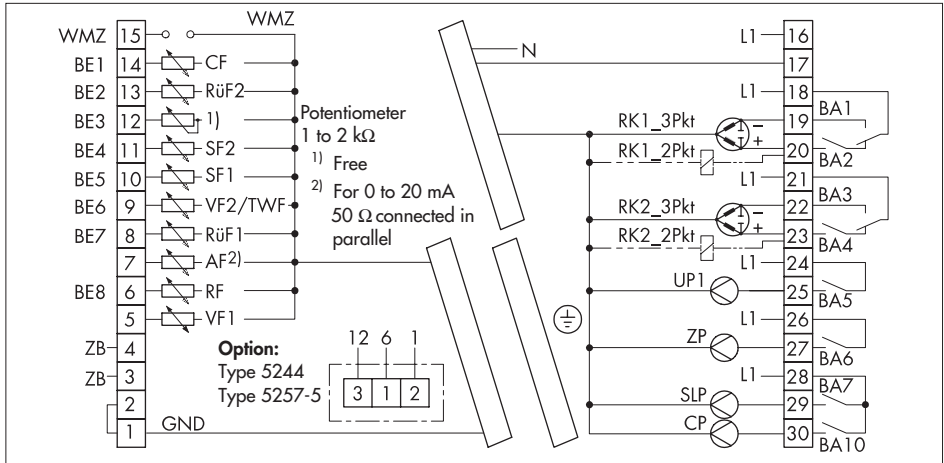
Systems An1 1 to 3



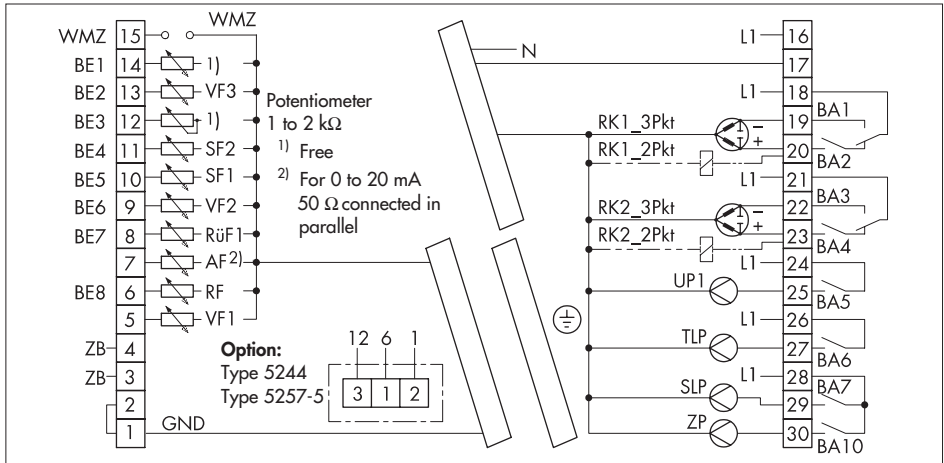
System An1 4



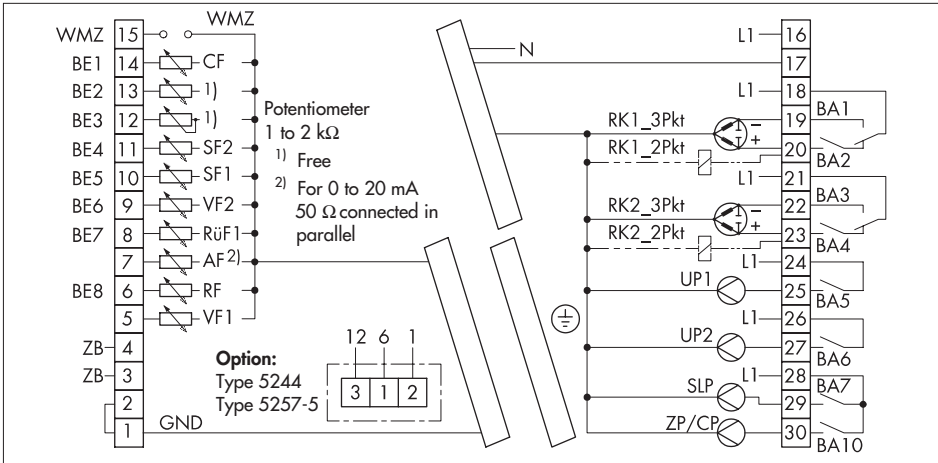
Systems An1 5 to 7



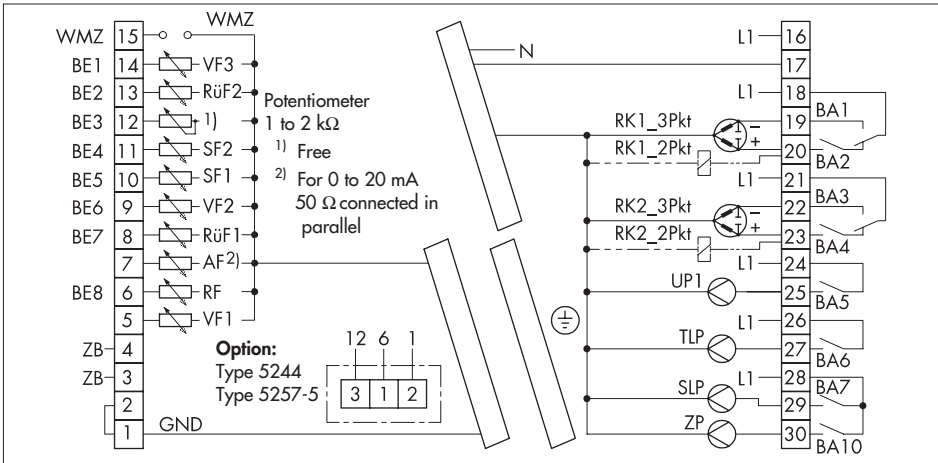
System An1 8



System An1 9



System An1 11





## 12 Appendix

### 12.1 Function block list

FB	Function	WE	Anl	Comments
0	Optimization	OFF		FB0 = ON: Optimization active; when FB0 = ON also FB13 = ON
1	Adaptation	OFF		FB1 = ON: Adaptation active; when FB1 = ON also FB13 = ON
2	Flash adaptation	OFF		FB2 = ON: Flash adaptation active; when FB2 = ON also FB13 = ON
3	Summer mode	OFF		FB3 = ON: Summer mode active <b>Function block parameters:</b> Start summer mode / 01.01 to 31.12 (01.06) End summer mode / 01.01 to 31.12 (30.09) Outdoor temperature limit / 0 to 30 °C (18 °C)
4	Delayed outdoor temperature adaptation	OFF		FB4 = ON: Temperature adaptation active Ab: Active when outdoor temperature drops AufAb: Active when outdoor temperature increases or drops <b>Function block parameter:</b> Delay / 0.2 to 6 °C/h (3 °C/h)
5	Automatic summer time/winter time changeover	ON		FB5 = ON: Changeover active
6	Public holidays/vacation data for DHW	OFF	2 to 11	FB6 = ON: Public holiday and vacation data entered also applies to DHW heating
7	Thermal disinfection	OFF	2, 3, 4, 5, 7, 8, 9, 11	FB7 = ON: Thermal disinfection active; when FB7 = ON also FB14 = ON <b>Function block parameter:</b> Day of week / 1 to 7 (Mon to Sun), 1–7 (3)
8	Priority for DHW circuit	OFF	4, 5, 6, 7, 8, 11	FB8 = ON: Priority active Ab: Priority through set-back operation In: Priority through reverse control <b>Function block parameter:</b> Activate priority in case of deviation / 2 to 10 min (10 min)

FB	Function	WE	Anl	Comments
9	Parallel pump operation	OFF	2, 3, 9	<p>FB9 = ON: Parallel pump operation  <b>Select</b> (Anl 2 and 9):                      PU: Parallel pump operation                      US: Operation with switchover valve  <b>Function block parameter</b> (on selecting: US):                      Stop parallel oper. in case of deviation / 2 to 10 min (10 min)                      FB9 = OFF: Intermediate heating after 20 min  <b>Select</b> (FB9 = ON, US or FB9 = OFF):                      20: Intermediate heating after 20 min                      --: No intermediate heating</p>
10	Control mode three-step RK1	ON	All	<p>FB10 = ON: Three-step signal control mode  <b>Function block parameters</b>:                      K<sub>P</sub> (proportional gain) / 0,1 to 50 (0,5)                      T<sub>N</sub> (reset time) / 1 to 999 s (200 s)                      T<sub>Y</sub> (valve transit time) / 15, 30, 45 to 240 s (90 s)                      Pump lag time / 1 x T<sub>Y</sub> to 10 x T<sub>Y</sub> (2 x T<sub>Y</sub>)                      FB10 = OFF: On/off control; when FB10 = OFF also FB11 = OFF  <b>Function block parameter</b>:                      Hysteresis / 1 to 30 °C (5 °C)</p>
11	Limit deviation for OPEN signal RK1	OFF	All	<p>FB11 = ON, only when FB10 = ON: Limitation active  <b>Function block parameter</b>:                      Max. deviation / 2 to 10 °C (2 °C)</p>
12	Limit deviation for OPEN signal RK2	OFF	4 to 11	<p>FB12 = ON, only when FB17 = ON: Limitation active  <b>Function block parameter</b>:                      Max. deviation / 2 to 10 °C (2 °C)</p>
13	Room sensor RF	OFF	All	<p>FB13 = ON: Sensor/remote operation activated                      Cannot be selected when FBO, FB1 or FB2 = ON;                      when FBO, FB1 and FB2 = OFF the room temperature is only indicated and not used for the control</p>
14	Storage tank sensor SF1	ON	2, 3, 5, 7, 8, 9, 11	<p>FB14 = ON: Sensor SF1 activated                      Storage tank thermostat: FB14 = FB15 = OFF</p>
15	Storage tank sensor SF2	ON with 3, 5, 8, 11	2, 3, 4, 5, 7, 8, 9, 11	<p>FB15 = ON: Sensor SF2 activated  <b>Select</b>: --: Settings for plants with DHW heating in storage tank charging system with 2 storage tank sensors                      CF: Activated for solar circuit                      Storage tank thermostat: FB14 = FB15 = OFF</p>

FB	Function	WE	Anl	Comments
16	Sensor selection	OFF	All	<p>FB16 = ON; <b>select:</b> P1000: Pt 1000 and Pt 100 sensors*            ntc: NTC and Pt 100 sensors*</p> <p>FB16 = OFF: PTC and Pt 100 sensors*</p> <p>* A mixture of both types of sensor is possible</p>
17	Control mode three-step RK2	ON	4, 5, 6, 7, 8, 9, 11	<p>FB17 = ON: Three-step signal control mode</p> <p><b>Function block parameters:</b>  <math>K_p</math> (proportional gain) / 0.1 to 50 (0,5)  <math>T_N</math> (reset time) / 1 to 999 s (Anl 5, 6: 60 s; Anl 4: 200 s)  <math>T_Y</math> (val. transit time) / 15, 30 to 240 s (Anl 5, 6: 30 s; Anl 4: 90 s)</p> <p>FB17 = OFF: On/off control</p> <p><b>Function block parameter:</b>            Hysteresis / 1 to 30 °C (5 °C)</p>
18	Outdoor temperature – current input	OFF	All	<p>FB18 = ON: Current input to measure outdoor temperature activated</p> <p><b>Select:</b> 0: 0 to 20 mA = –20 to 50 °C            4: 4 to 20 mA = –20 to 50 °C</p> <p>A 50-Ω resistor must be connected to terminals 7 (+) and GND (terminals ½) in parallel to the current signal</p> <p>FB18 = OFF: Sensor input for measuring outdoor temperature</p>
19	4-point characteristic	OFF		<p>FB19 = ON: Characteristic according to four points</p> <p>FB19 = OFF: Characteristic according to gradient</p>
20	Return flow sensor RüF1	ON	All	<p>FB20 = ON: Return flow sensor activated</p> <p><b>Function block parameter:</b>            Limiting factor / 0.1 to 10 (1)</p> <p><b>Selection with systems Anl 2, 7 and 9:</b>            SLP (thermometer and heat exchanger icons) switched on depending on return flow temperature or SLP switched on irrelevant of return flow temperature</p> <p><b>Setting only possible after entering key number!</b></p>
21	Return flow sensor RüF2	OFF	4, 5, 11	<p>FB21 = ON: Return flow sensor RüF2 activated</p> <p><b>Function block parameter:</b>            Limiting factor / 0,1 to 10 (1)</p> <p><b>Selection with system Anl 5:</b>            SLP (thermometer and heat exchanger icons) switched on depending on return flow temperature or SLP switched on irrelevant of return flow temperature</p> <p><b>Setting only possible after entering key number!</b></p>

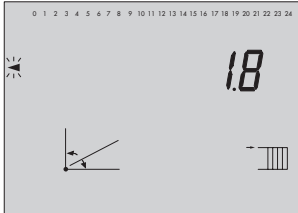
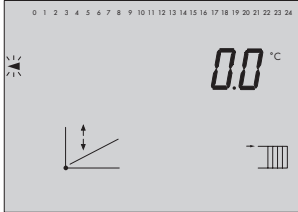
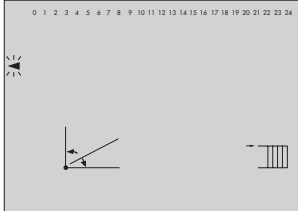
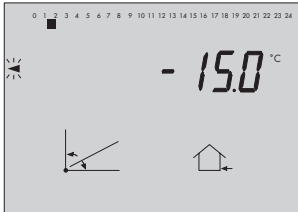
FB	Function	WE	Anl	Comments
22	Current input for flow rate measurement	OFF	All	<p>FB22 = ON: Current input active</p> <p><b>Select:</b> 0: 0 to 20 mA signal feedforwarding 4: 4 to 20 mA signal feedforwarding</p> <p>A 50-Ω resistor must be connected to terminals 15 (+) and GND (terminals ½) in parallel to the current signal</p> <p>FB22 = OFF: Pulse input active</p> <p><b>Setting only possible after entering key number!</b></p>
23	Flow rate or capacity limitation	OFF	All	<p>FB23 = ON and FB22 = OFF: Limitation with pulse input</p> <p><b>Function block parameters:</b></p> <p>Max. limit value / 3 to 500 pulse/h (500 pulse/h)</p> <p>Limiting factor / 0.1 to 10 (1)</p> <p>Max. limit value for DHW / 3 to 500 pulse/h (500 pulse/h)</p> <p>Limiting factor / 0,1 to 10 (1)</p> <p>FB23 = ON and FB22 = ON: Limitation with current input</p> <p><b>Function block parameters:</b></p> <p>Upper measuring range / 0.01 to 650 m<sup>3</sup>/h (10.00 m<sup>3</sup>/h)</p> <p>Min. limit value / 0.01 to 650 m<sup>3</sup>/h (0.01 m<sup>3</sup>/h)</p> <p>Max. limit value / 0.01 to 650 m<sup>3</sup>/h (9 m<sup>3</sup>/h)</p> <p><b>Setting only possible after entering key number!</b></p>
The following function blocks are in the second level				
24 (0)	Potentiometer input 1 to 2 kΩ	OFF		<p>FB24 = ON: Potentiometer input connected at terminal 12</p> <p>FB24 = OFF: Type 5244 or 5257-5 Room Panel connected</p>
25 (1)	Release for control/external demand over BE1	OFF	1 to 11*	<p>FB25= ON: Configuration of BE1</p> <p><b>Select:</b> FErn: Release for control bEd: Demand of a minimum flow temperature</p> <p><b>Function block parameter:</b></p> <p>Min. flow temperature for external demand / 20 to 130 °C (20 °C)</p> <p>* Not Anl 4, 5 and 9 with solar system or Anl 11 with VF3</p>
26 (2)	Circulation pump (ZP)	OFF	2 to 11	<p>FB26 = ON: Circulation pump operation acc. to time schedule</p> <p>FB26 = OFF: ZP operation switches off SLP</p>
27 (3)	Flow sensor VF3	OFF	3, 8, 11	FB27 = ON: Sensor activated
28 (4)	Pump management UP1	OFF	All	<p>FB28 = ON: BA9 not active outside times-of-use</p> <p>FB28 = AUS: BA9 active outside times-of-use</p>

FB	Function	WE	Anl	Comments
29 (5)	Meter bus	OFF	All	<p>FB29 = ON: Meter bus communication activated</p> <p><b>Function block parameters WMZ 1 to 3:</b>            Meter bus address / 0 to 255 (WMZ1: 254; WMZ2, 3: 255)            Model code / 1434, CAL3, APAT0, SLS (1434)            Reading mode / 24h, Cont Coil (Cont)</p> <p><b>Setting only possible after entering key number!</b></p>
30 (6)	Flow rate limitation	OFF	All	<p>FB30 = ON: Flow rate limitation activated</p> <p><b>Select:</b> At: Outdoor temperature dependent limitation,            FB19 = ON when "At" selected            ---: Fixed limitation</p> <p><b>Function block parameters:</b>            Max. limit / 0.01 to 650 m<sup>3</sup>/h (2 m<sup>3</sup>/h)            Max. limit for heating* / 0.01 to 650 m<sup>3</sup>/h (2 m<sup>3</sup>/h)            Max. limit for DHW / 0.01 to 650 m<sup>3</sup>/h (2 m<sup>3</sup>/h)            Min. limit / 0.01 to 100 m<sup>3</sup>/h (---)            Limiting factor / 0.1 to 10 (1)</p> <p>* Parameter does not need to be set when "At" selected</p> <p><b>Setting only possible after entering key number!</b></p>
31 (7)	Capacity limitation	OFF	All	<p>FB31 = ON: Capacity limitation activated</p> <p><b>Select:</b> At: Outdoor temperature dependent limitation,            FB19 = ON when "At" selected            ---: Fixed limitation</p> <p><b>Function block parameters:</b>            Max. limit / 0.1 to 6000 kW (15 kW)            Max. limit for heating* / 0.1 to 6000 kW (15 kW)            Max. limit for DHW / 0.1 to 6000 kW (15 kW)            Limiting factor / 0.1 to 10 (1)</p> <p>* Parameter does not need to be set when "At" selected</p> <p><b>Setting only possible after entering key number!</b></p>
32 (8)	Circulation over heat exchanger	OFF	5, 11	<p>FB32 = ON: Control of DHW circuit remains released after storage tank charging</p> <p><b>Setting only possible after entering key number!</b></p>
33 (9)	Sensor calibration	ON	All	<p>Cannot be deactivated</p> <p><b>Setting only possible after entering key number!</b></p>
34 (10)	Manual level locking	OFF	All	<p>FB34 = ON: Locking activated</p> <p><b>Setting only possible after entering key number!</b></p>
35 (11)	Lock dial-up	OFF	All	<p>FB35 = ON: No dial-up in case of fault</p> <p><b>Setting only possible after entering key number!</b></p>

FB	Function	WE	Anl	Comments
36 (12) to 43 (19)	BE8 to BE1		All	FB36 to 43 = ON: Binary input in error status register <b>Select:</b> StEIG: Fault indicated by rising edge/make contact FALL: Fault indicated by negative edge/break contact
44 (20)	Modem operation	OFF	All	<b>Select:</b> 8-bit: 8-bit addressing 16-bit: 16-bit addressing FB44 = ON: Modem function activated <b>Function block parameters:</b> Cyclical initialization In / 0 to 255 min (30 min) Intervals between dialing PA / 0 to 255 min (5 min) Modem timeout t <sub>0</sub> / 0 to 99 min (5 min) Dialing procedure/ PULS/ton (PULS) Phone number of station GLT / 0 to 9, P, -; max. 23 characters <b>Setting only possible after entering key number!</b>
45 (21)	Dial-up also upon corrected fault	OFF	All	FB45 = ON: Dial-up when faults exist/remedied FB45 = OFF: Dial up only when faults exist <b>Setting only possible after entering key number!</b>
46 (22)	Phone number of alternative recipient	OFF	All	FB46 = ON: Dialing an alternative recipient <b>Function block parameters:</b> Number of dialing attempts An / 0 to 99 (5) Phone number of alternative recipient / 0 to 9, P, -; max. 23 char. <b>Setting only possible after entering key number!</b>
47 (23)	Fault alarm output BA8	OFF	All	FB47 = ON and FSr > 0: BA8 = ON Pump management for UP1 no longer available <b>Setting only possible after entering key number!</b>

FB Function block, WE Default setting, Anl System code number

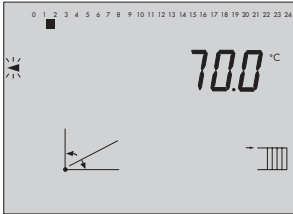
## 12.2 Parameter list

Display	Parameter designation Range of values (default values)
	Gradient, flow 0.2 to 3.2 (1.8)
	Level, flow -30 to 30 °C (0 °C)
	4-point characteristic <input checked="" type="checkbox"/> Press key to set parameters outdoor temperature, points 1 to 4 flow temperature, points 1 to 4 return flow temperature, points 1 to 4 flow rate, points 1 to 4, capacity, points 1 to 4.
	4-point characteristic, outdoor temperature Outdoor temperatures of the points 2, 3, 4 are marked by squares below the numbers 2, 3, 4. -30 to 20 °C ( point 1: -15 °C, point 2: -5 °C, point 3: 5 °C, point 4: 15 °C)

Display

Parameter designation

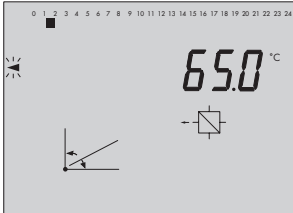
Range of values (default values)



4-point characteristic, flow temperature

Flow temperatures of the points 2, 3, 4 are marked by squares below the numbers 2, 3, 4

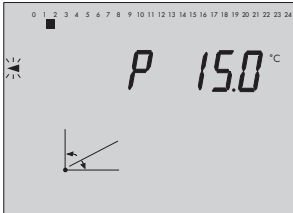
20 to 130 °C  
(point 1: 70 °C, point 2: 55 °C, point 3: 40 °C, point 4: 25 °C)



4-point characteristic, return flow temperature

Return flow temperatures of the points 2, 3, 4 are marked by squares below the numbers 2, 3, 4

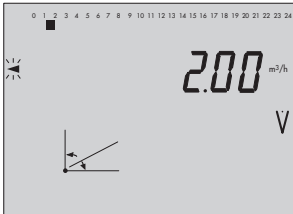
20 to 90 °C  
(point 1: 65 °C, point 2: 50 °C, point 3: 35 °C, point 4: 20 °C)



4-point characteristic, capacity

Capacity of the points 2, 3, 4 are marked by squares below the numbers 2, 3, 4

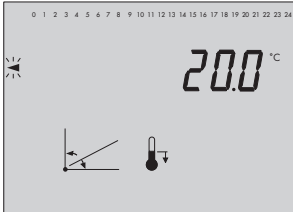
0.1 to 6000 kW  
(point 1 to 4: 15 kW)



4-point characteristic, flow rate

Flow rates of the points 2, 3, 4 are marked by squares below the numbers 2, 3, 4.

0.01 to 100 m³/h  
(point 1 to 4: 2 m³/h)



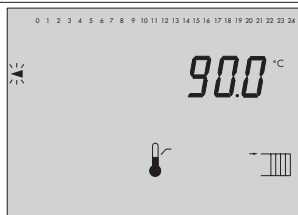
4-point characteristic, set-back difference

Set-back difference of point 3 is marked by the square below the number 3.

0 to 50 °C  
(point 2 and 3: 20 °C)

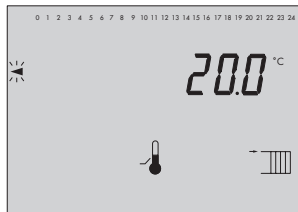


## Display

Parameter designation  
Range of values (default values)

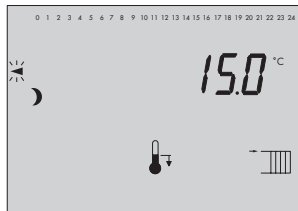
Maximum flow temperature

20 to 130 °C (90 °C)



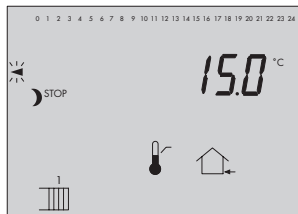
Minimum flow temperature

20 to 130 °C (20 °C)



Set-back difference

0 to 50 °C (15 °C)



OT deactivation value in reduced operation

-10 to 50 °C (15 °C)



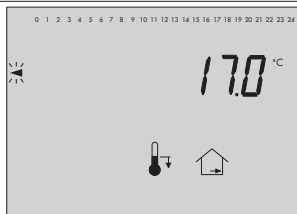
Room set point

0 to 40 °C (20 °C)

## Display

### Parameter designation

Range of values (default values)



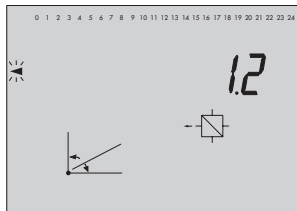
Reduced room set point

0 to 40 °C (17 °C)



Sustained temperature

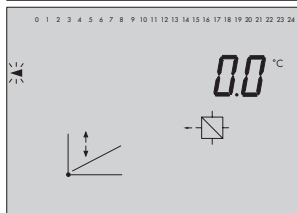
0 to 40 °C (15 °C)



Gradient of the heating characteristic, return flow

0.2 to 3.2 (1.2)

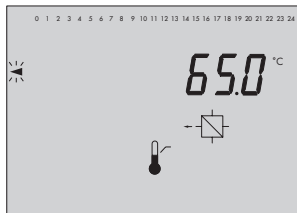
**Can only be set after entering the key number!**



Level, return flow

-30 to 30 °C (0 °C)

**Can only be set after entering the key number!**



Max. return flow temperature

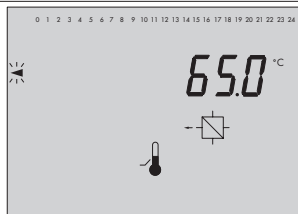
20 to 90 °C (65 °C)

**Can only be set after entering the key number!**

## Display

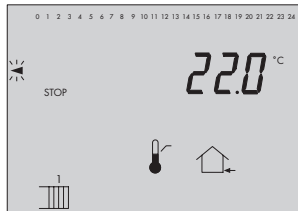
## Parameter designation

Range of values (default values)



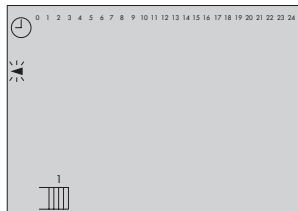
Min. return flow temperature

20 to 90 °C (65 °C)

***Can only be set after entering the key number!***

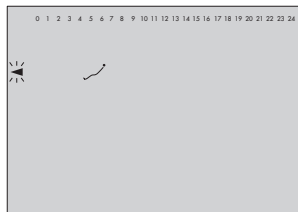
OT deactivation value in rated operation

0 to 50 °C (22 °C)



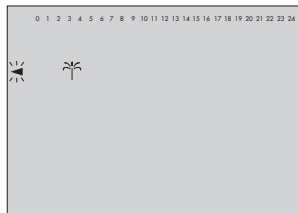
Times-of-use for heating circuit

→ section 1.6



Public holidays

→ section 1.6.1



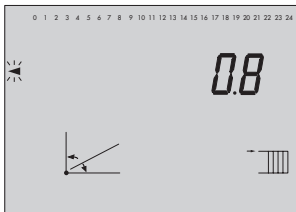
Vacations

→ section 1.6.2

Display

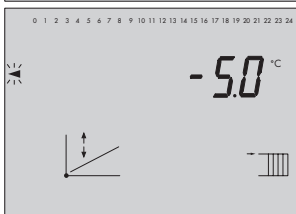
Parameter designation  
Range of values (default values)

*System Anl 9, underfloor heating circuit*



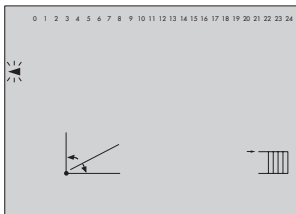
Gradient, flow

0.2 to 3.2 (0.8)



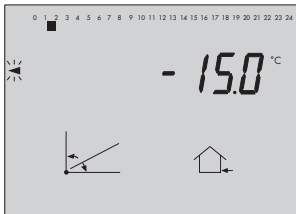
Level, flow

-30 to 30 °C (-5 °C)



4-point characteristic

☒ Press key to set parameters  
outdoor temperature, point 1 to 4  
flow temperature, point 1 to 4.



4-point characteristic, outdoor temperature

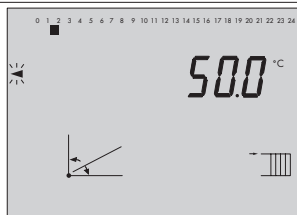
Outdoor temperatures of the points 2, 3, 4 are marked by squares below the numbers 2, 3, 4.

-30 to 20 °C  
( point 1: -15 °C, point 2: -5 °C, point 3: 5 °C, point 4: 15 °C)

## Display

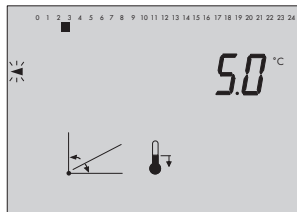
## Parameter designation

Range of values (default values)



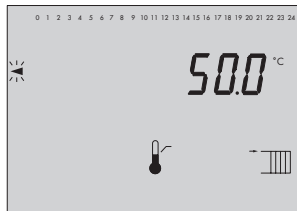
4-point characteristic, flow temperature

Flow temperatures of the points 2, 3, 4 are marked by squares below the numbers 2, 3, 4.

20 to 130 °C  
(point 1: 50 °C, point 2: 40 °C, point 3: 35 °C, point 4: 20 °C)

4-point characteristic, set-back difference

Set-back difference of point 3 is marked by the square below the number 3.

0 to 50 °C  
(point 2 and 3: 5 °C)

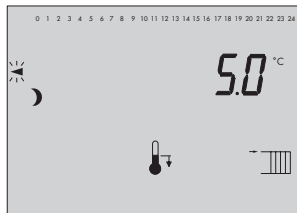
Max. flow temperature

20 to 130 °C (50 °C)



Min. flow temperature

20 to 130 °C (20 °C)



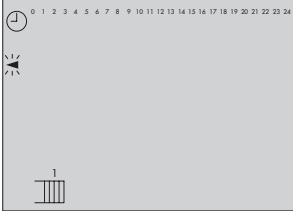
Set-back difference

0 to 50 °C (5 °C)

Display

Parameter designation

Range of values (default values)



Times-of-use for underfloor heating circuit

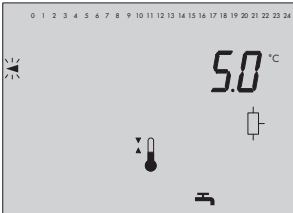
-> section 1.6



DHW heating ON

20 to 90 °C (45 °C)

With systems An1 2, 3, 5, 7, 8, 9 and 11  
without solar circuit with a storage tank sensor SF1



Hysteresis

0 to 30 °C (5 °C)



DHW heating ON

20 to 90 °C (45 °C)

With systems An1 2, 3, 5, 7, 8, 9 and 11  
with two storage tank sensors SF1 and SF2  
or in systems with solar circuit

## Display

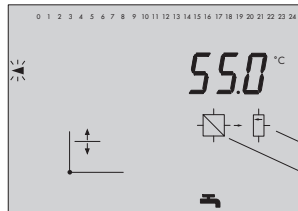
## Parameter designation

Range of values (default values)



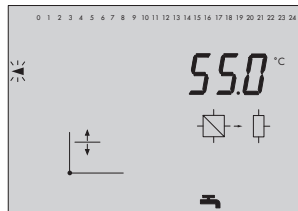
DHW heating OFF

20 to 90 °C (50 °C)

With systems Anl 2, 3, 5, 7, 8, 9 and 11  
with two storage tank sensors SF1 and SF2

DHW set point

20 to 90 °C (55 °C)

Anl 4  
Anl 6

Charging temperature

20 to 90 °C (55 °C)



End charging process

20 to 90 °C (53 °C)



Return flow limitation temperature during DHW heating

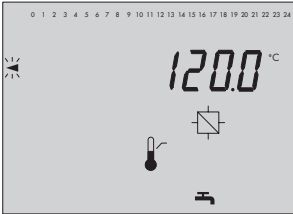
20 to 90 °C (65 °C)

**Can only be set after entering the key number!**

Display

Parameter designation

Range of values (default values)



Heat exchanger inlet temperature limit

20 to 130 °C (120 °C)



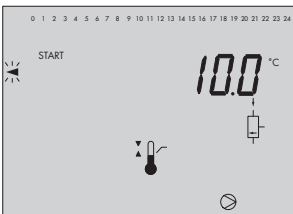
Time schedule for DHW heating

-> section 1.6



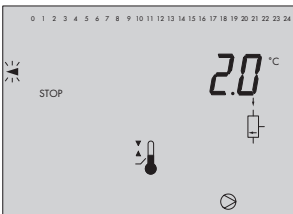
Time schedule for circulation pump

-> section 1.6



Solar circuit pump ON

0 to 30 °C (10 °C)



Solar circuit pump OFF

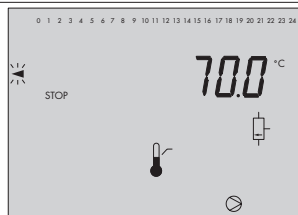
0 to 30 °C (2 °C)



## Display

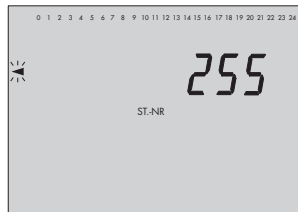
## Parameter designation

Range of values (default values)



Solar charging OFF

20 to 90 °C (70 °C)



Station address (ST-NO)

1 to 247, 8 bit (255)

1 to 999, 16 bit (255)



Baud rate (BAUD)

150 to 9600 (9600)


## 12.3 Sensor resistance tables

### Resistance values with PTC resistors

Type 5224 Outdoor Temperature Sensors, Type 5264 and Type 5265 Flow and Return Flow Temperature Sensors, Type 5264 Storage Tank Temperature Sensors

°C	-20	-10	0	10	20	25	30	40	50	60	70	80	90	100	110	120
Ω	694	757	825	896	971	1010	1050	1132	1219	1309	1402	1500	1601	1706	1815	1925

Type 5244 Room Sensor

Switch position , terminals 1 and 2

°C	10	15	20	25	30
Ω	679	699	720	741	762

### Resistance values with Pt 100 resistors

Suitable Pt 100 sensors include

- ▶ Outdoor temperature sensor: Type 5225
- ▶ Flow and return flow temperature sensors: Type 5204, Type 5205-47
- ▶ Storage tank temperature sensor: Type 5205
- ▶ Room temperature sensor: Type 5255

°C	-35	-30	-25	-20	-15	-10	-5	0	5	10
Ω	86.25	88.22	90.19	92.16	94.12	96.09	98.04	100.00	101.95	103.90

°C	15	20	25	30	35	40	45	50	55	60
Ω	105.85	107.79	109.73	111.67	113.61	115.54	117.74	119.40	121.32	123.24

°C	65	70	75	80	85	90	95	100	105	110
Ω	125.16	127.07	128.98	130.89	132.80	134.70	136.6	138.50	140.39	142.29

°C	115	120	125	130	135	140	145	150
Ω	144.17	146.06	147.94	149.82	151.70	153.58	155.45	157.31

### Resistance values with Pt 1000 resistors

Use the resistance values listed in the table for Pt 100 resistors and multiply them by 10. Suitable Pt 1000 sensors include:

- ▶ Outdoor temperature sensor: Type 5227-2
- ▶ Flow and return flow temperature sensors: Types 5207, 5277-2 (thermowell required) and 5267-2
- ▶ Storage tank temperature sensor: Types 5207, 5277-2 (thermowell required)
- ▶ Room temperature sensor: Type 5257-1, room temperature sensor with remote control: Type 5257-5

## 12.4 Technical data

<b>Inputs</b>	7 configurable inputs for sensors (Pt 100 and PTC or Pt 100 and Pt 1000 or Pt 100 and NTC) or binary alarms
Sensor inputs	1 outdoor temperature input for sensor or current signal 4 (0) to 20 mA 1 flow temperature sensor input
Binary inputs	BE1 optionally for releasing a control circuit or external demand BE5 configurable for storage tank thermostat
Other inputs	Pulse or current input for capacity or flow rate limitation Remote control to correct the room temperature and select the operating mode Alternatively, potentiometer input 1 to 2 k $\Omega$ or configurable for binary alarm
<b>Outputs</b>	Three-step signals: Load 250 V AC, max. 2 A, min. 10 mA
Control signal outputs	On-off signals: Load 250 V AC, max. 2 A, min. 10 mA Varistor suppression 300 V
Binary outputs	Max. 4 outputs to control pumps, load 250 V AC, max. 2 A, min. 10 mA, varistor suppression 300 V 2 reed relay outputs for controlling the speed of a circulation pump or for fault indication, load max. 24 V, 100 mA
Interfaces	Serial RS-485 interface for connection to four-wire bus, protocol: Modbus RTU, data format 8N1 or serial RS-232-C interface for connection to a modem; connection over RJ-12 jack Option: Meter bus interface
Operating voltage	230 V AC (+ 10 %/-15 %), 48 to 62 Hz Power supply failure: All parameter settings and configuration data are stored in an EEPROM in the case of power failure
Power consumption	Approx. 3 VA
Temperature range	Operation: 0 to 40 °C (avoid long periods of heat) Storage: -20 to 60 °C
Degree and class of protection	IP 40 according to IEC 529 and II according to VDE 0106
Degree of contamination	2 according to VDE 0110
Overvoltage category	II according to VDE 0110
Humidity rating	F according to VDE 40040
Noise immunity	According to EN 61000-6-1
Noise emission	According to EN 61000-6-3
Weight	Approx. 0.6 kg

## 12.5 Customer data

Station	
Operator	
Relevant SAMSON office	
System code number	

### Function block settings

0	1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31	32	33	34	35
36	37	38	39	40	41	42	43	44	45	46	47

### Function block parameter settings

Function block parameters	Range of values
Start summer mode (FB3 = ON)	Freely configurable
End summer mode (FB3 = ON)	Freely configurable
Outdoor temperature limit (FB3 = ON)	0 to 30 °C
Delay (FB4 = ON)	0.2 to 6 °C/h
Day of week (FB7 = ON)	1 to 7, 1-7
Priority in case of deviation (FB8 = ON)	2 to 10 min
Stop parallel operation in case of deviation (FB9 = ON)	2 to 10 min
Proportional gain $K_p$ (FB10 = ON)	0.1 to 50
Reset time $T_N$ (FB10 = ON)	1 to 999 s
Valve transit time $T_\gamma$ (FB10 = ON)	15 to 240 s

Function block parameters	Range of values
Pump lag time (FB10 = ON)	$1 \times T_Y$ to $10 \times T_Y$
Hysteresis (FB10 = AUS)	1 to 30 °C
Max. system deviation (FB11 = ON)	2 to 10 °C
Max. system deviation (FB12 = ON)	2 to 10 °C
Proportional gain $K_p$ (FB17 = ON)	0.1 to 50
Reset time $T_N$ (FB17 = ON)	1 to 999 s
Valve transit time $T_Y$ (FB17 = ON)	15 to 240 s
Hysteresis (FB17 = OFF)	1 to 30 °C
Limiting factor (FB20 = ON)	0.1 to 10
Limiting factor (FB21 = ON)	0.1 to 10
Maximum limit (FB22 = OFF and FB23 = ON)	3 to 500 $\frac{lm^3}{h}$
Limiting factor (FB22 = OFF and FB23 = ON)	0.1 to 10
Maximum limit for DHW (FB22 = OFF and FB23 = ON)	3 to 500 $\frac{lm^3}{h}$
Limiting factor (FB22 = OFF and FB23 = ON)	0.1 to 10
Upper measuring range (FB22 = FB23 = ON)	0.1 to 650 $\frac{m^3}{h}$
Minimum limit (FB22 = FB23 = ON)	0.1 to 650 $\frac{m^3}{h}$
Maximum limit (FB22 = FB23 = ON)	0.1 to 650 $\frac{m^3}{h}$
Meter bus address WMZ 1 (FB29 = ON)	0 to 255
Meter bus address WMZ 2 (FB29 = ON)	0 to 255
Meter bus address WMZ 3 (FB29 = ON)	0 to 255
Model code WMZ 1 (FB29 = ON)	1434, CAL3, APAIO, SLS
Model code WMZ 2 (FB29 = ON)	
Model code WMZ 3 (FB29 = ON)	
Reading mode WMZ 1 (FB29 = ON)	24h, CONT, Coil
Reading mode WMZ 2 (FB29 = ON)	
Reading mode WMZ 3 (FB29 = ON)	
Maximum limit (FB30 = ON)	0.01 to 650 $\frac{m^3}{h}$
Maximum limit for heating (FB30 = ON)	0.01 to 650 $\frac{m^3}{h}$
Maximum limit for DHW (FB30 = ON)	0.01 to 650 $\frac{m^3}{h}$
Minimum limit (FB30 = ON)	0.01 to 650 $\frac{m^3}{h}$
Limiting factor	0.1 to 10

Function block parameters		Range of values
Maximum limit (FB31 = ON)		0.1 to 6000 kW
Maximum limit for heating (FB31 = ON)		0.1 to 6000 kW
Maximum limit for DHW (FB31 = ON)		0.1 to 6000 kW
Limiting factor		0.1 to 10
Binary input BE8 in error status register (FB36 = ON)		Rising/negative
Binary input BE7 in error status register (FB37 = ON)		Rising/negative
Binary input BE6 in error status register (FB38 = ON)		Rising/negative
Binary input BE5 in error status register (FB39 = ON)		Rising/negative
Binary input BE4 in error status register (FB40 = ON)		Rising/negative
Binary input BE3 in error status register (FB41 = ON)		Rising/negative
Binary input BE2 in error status register (FB42 = ON)		Rising/negative
Binary input BE1 in error status register (FB43 = ON)		Rising/negative
Cyclic initialization In (FB44 = ON)		0 to 255 min
Modem dialing interval PA (FB44 = ON)		0 to 255 min
Modem timeout $t_0$ (FB44 = ON)		0 to 99 min
Phone number of control station		Freely configurable
Number of dialing attempts An (FB46 = ON)		0 to 99
Phone number of alternative recipient (FB46 = ON)		Freely configurable

### Parameter settings

Parameters					Range of values
Gradient, flow					0.2 to 3.2
Level, flow					-30 to 30 °C
4-point characteristic	Point 1	Point 2	Point 3	Point 4	
Outdoor temperature					-30 to 20 °C
Flow temperature					20 to 130 °C
Return flow temperature					20 to 90 °C
Capacity					0.1 to 6000 kW
Flow rate					0.01 to 100 $\frac{m^3}{h}$

Parameters					Range of values
Set-back difference	-			-	0 to 50 °C
Max. flow temperature					20 to 130 °C
Min. flow temperature					20 to 130 °C
Set-back difference					0 to 50 °C
OT deactivation value in red. operation					-10 to 50 °C
Room set point					0 to 40 °C
Reduced room set point					0 to 40 °C
Sustained temperature					0 to 40 °C
Gradient, return flow					0.2 to 3.2
Level, return flow					-30 to 30 °C
Max. return flow temperature					20 to 90 °C
Min. return flow temperature					20 to 90 °C
OT deactivation value in rated operation					0 to 50 °C
<b>Underfloor heating, system Anl 9</b>					
Gradient, flow					0,2 to 3,2
Level, flow					-30 to 30 °C
4-point characteristic	Point 1	Point 2	Point 3	Point 4	
Outdoor temperature					-30 to 20 °C
Flow temperature					20 to 130 °C
Set-back difference	-			-	0 to 50 °C
Max. flow temperature					20 to 130 °C
Min. flow temperature					20 to 130 °C
Set-back difference					0 to 50 °C
<b>DHW heating</b>					
DHW heating ON					20 to 90 °C
Hysteresis					0 to 30 °C
DHW heating OFF					20 to 90 °C
DHW set point					20 to 90 °C
Charging temperature					20 to 90 °C
End charging process					20 to 90 °C

## Appendix

Parameters		Range of values
Return flow limitation temperature during DHW heating		20 to 90 °C
Heat exchanger inlet temp. limit		20 to 130 °C
Solar circuit pump ON		0 to 30 °C
Solar circuit pump OFF		0 to 30 °C
Solar charging OFF		20 to 90 °C
Station address		1 to 247, 8 bit 1 to 999, 16 bit
Baud rate		150 to 9600

### Time schedules for heating circuit and underfloor heating circuit (system Anl 9)

	Heating circuit 1		Heating circuit 2 or underfloor heating circuit (Anl 9)	
	Start – Stop (1)	Start – Stop (2)	Start – Stop (1)	Start – Stop (2)
Monday (1)				
Tuesday (2)				
Wednesday (3)				
Thursday (4)				
Friday (5)				
Saturday (6)				
Sunday (7)				

### Public holidays and vacations

Public holidays										
Date										
Vacations										
Start – Stop										



### Time schedules for DHW circuit and circulation pump

	DHW circuit		Circulation pump	
	Start – Stop (1)	Start – Stop (2)	Start – Stop (1)	Start – Stop (2)
Monday (1)				
Tuesday (2)				
Wednesday (3)				
Thursday (4)				
Friday (5)				
Saturday (6)				
Sunday (7)				

### Frequently used abbreviations

AF	Outdoor sensor	RF	Room sensor
Anl	System	RüF	Return flow sensor
BA	Binary output	SF	Storage tank sensor
BE	Binary input	SLP	Storage tank charging pump
CF	Solar circuit collector sensor	TLP	Heat exchanger charging pump
CP	Solar circuit pump	TW/TWE	DHW (domestic hot water) heating
FB	Function block	UP	Circulation pump
GLT	Building control station	VF	Flow sensor
KW	Cold water	WW	Hot water
RK	Control circuit	ZB	Meter bus

<b>Key number</b>	<b>1732</b>
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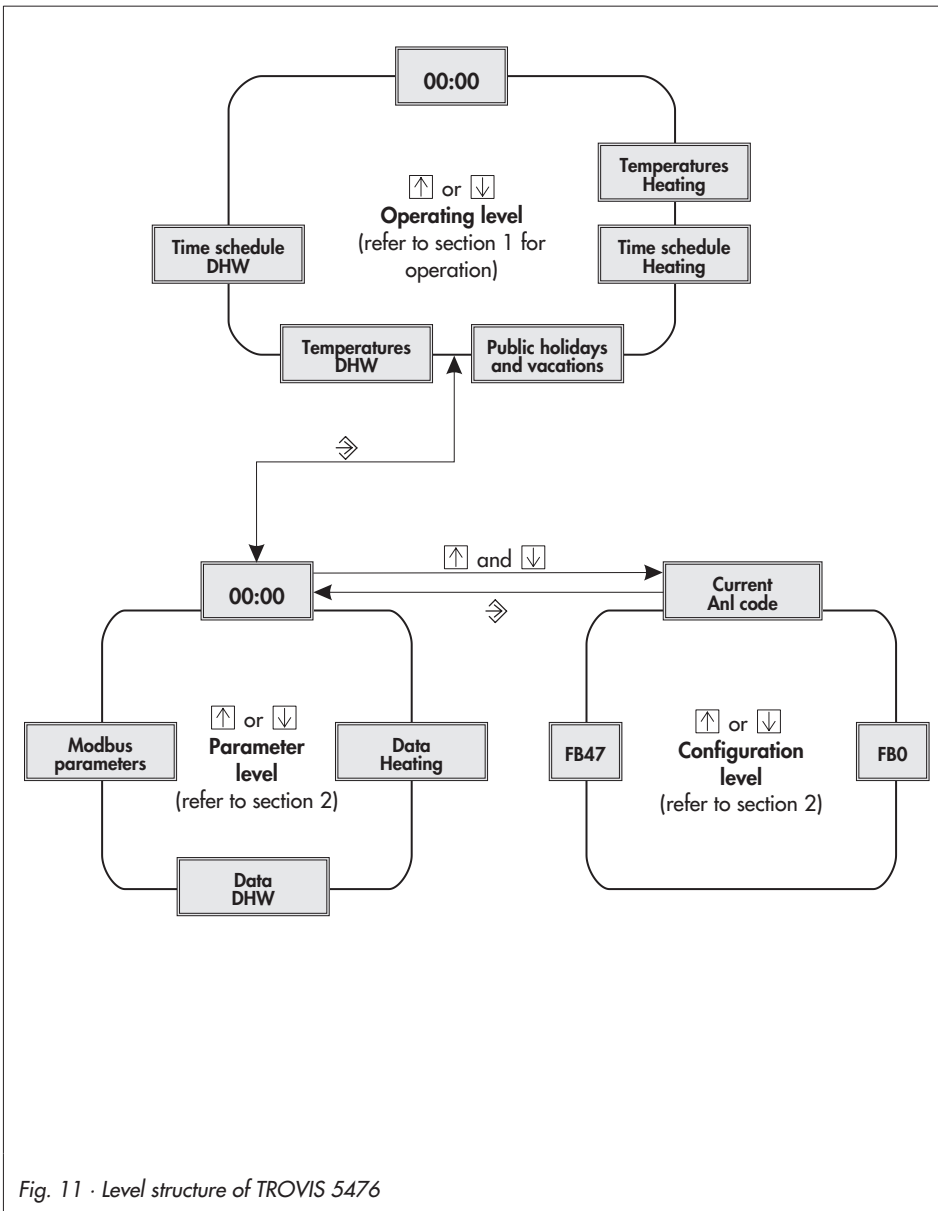


Fig. 11 · Level structure of TROVIS 5476







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