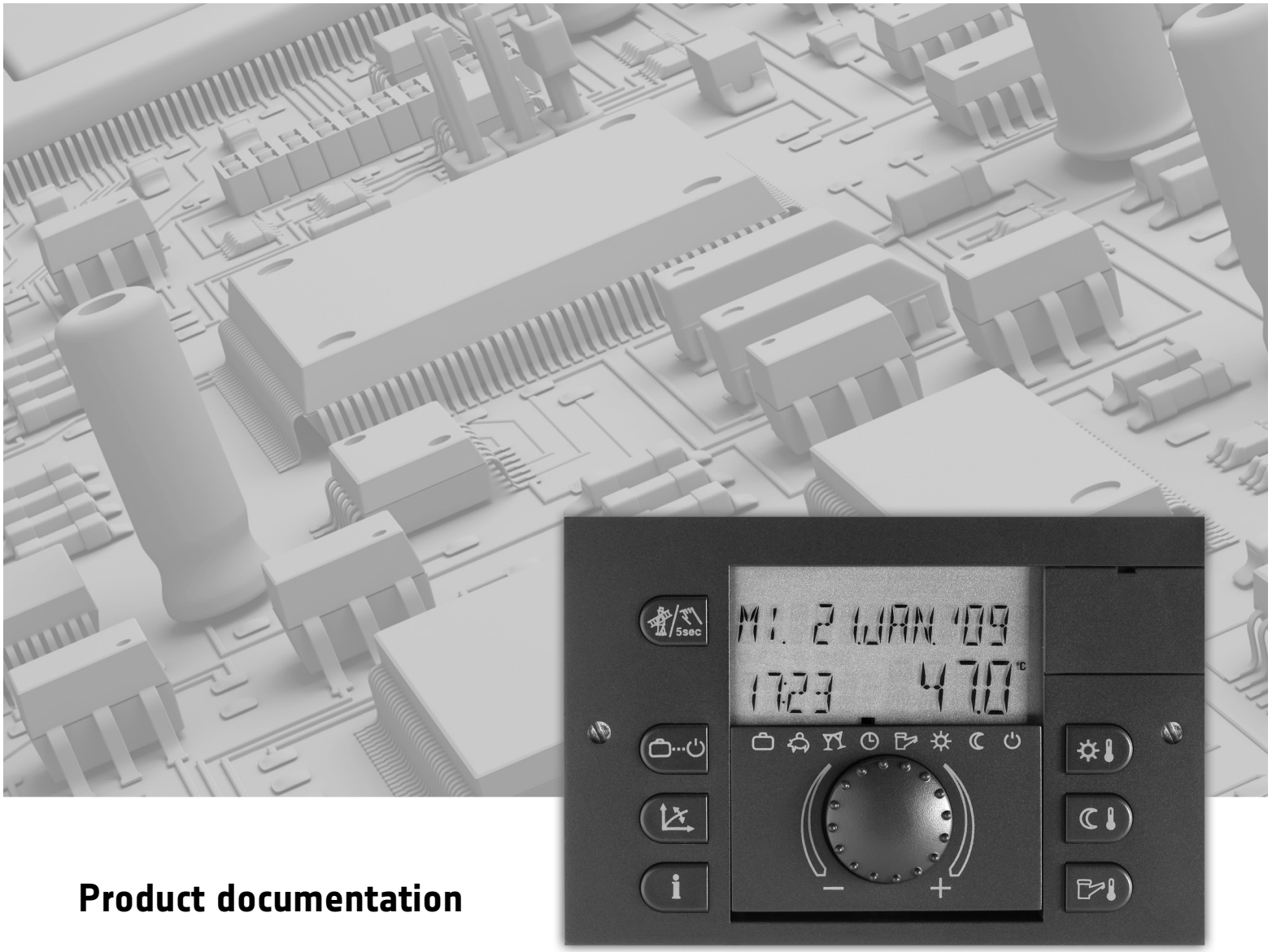
EbV elektronik
always a bit more



Product documentation

Controller series THETA

NORM, UNIT, RS and RFF types
Standing: Software version 3.1

- Product documentation THETA

1 Softwareversion

Please use this documentation in conjunction with softwareversion **V 3.1** of your controller. The version will be displayed for about 8 s when the controller is connected to the mains. If you are using an older version, please contact your heating specialist.

2 General safety instructions

2.1 Application

The controller family THETA is designed exclusively for the control of warm water heating and district heating systems including domestic hot water control. These systems should not exceed a flow temperature of 120 °C.

2.2 Conditions for start-up

⚠ CAUTION The heating installation must be completed and filled with water in order to prevent the pumps from running dry and to avoid damage of the boiler.

⚠ CAUTION Switch off plant completely before opening boiler control panel! Do not plug or unplug electrical connectors under voltage. This may damage the controller or cause dangerous electrical shock.

The controller must be installed according to the installation instructions.

All electrical connections and safety measures have to be carried out by a specialist according to the valid norms and VDE-guidelines as well as the local instructions.

The electrical connection must be a fixed connection according to VDE 0100.

The electrical connection has to be done according to the wiring diagram of the respective boiler control panel.

If a floor heating system is connected, a limiting thermostat must switch off the pump if the flow temperatures are too high.

The heating specialist must check all the above mentioned requirements before switching on the controller.

IMPORTANT NOTE! The current time and date are already set by the factory and backed up by a battery.

The timer has a basic time program already activated and the control functions for standard heating systems with low temperature boilers are pre-adjusted.

During longer periods of absence, the heating system should not be removed from operation using the heating emergency switch, but the operating modes STANDBY or HOLIDAY TIL on the controller should be used instead, as the battery for backing up all individual pieces of data will otherwise be used. In addition, the controller's frost protection function is out of operation.

All electrical connections must be carried out by qualified personnel.

2.3 Safety measures for EMC - conform installation

- Cables with mains voltage must generally be installed separately from sensor and data bus cables. In this case a minimum distance of 2 cm between the cables must be observed. Crossing of lines is permitted.

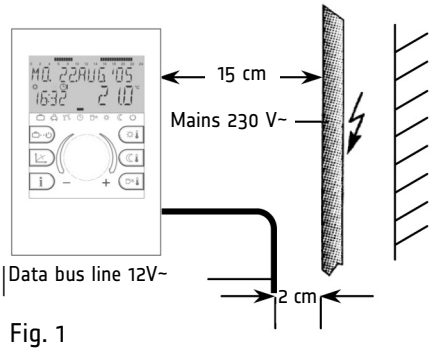


Fig. 1

- Controls with own mains connections require a separate installation of mains and sensor or data bus cable. When using cable ducts, types with internal separators are recommended.
- When installing control or remote units close to other components with electro magnetic emission such as solid state relays, motors, transformers, dimmers, micro wave ovens, TV-sets, loudspeakers, computers, radio telephones etc. a minimum distance of 40 cm must be observed.

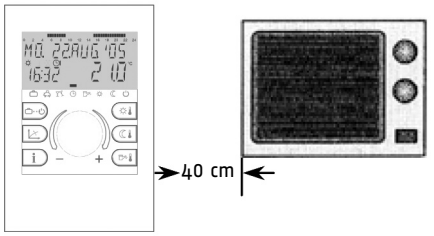


Fig. 2

- Between remote units and standard units, a minimum distance of 40 cm has to be observed. Several standard units in a data bus connection may be installed side by side.
- The mains connection of the heating plant (standard unit or boiler control panel) must be carried out as an independent electric circuit. It is not permitted to install fluorescent tubes or other machines that could produce interferences to the same electrical circuit.

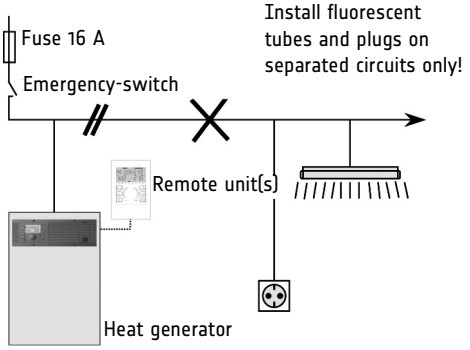


Fig. 3

- All data bus cables must be carried out in shielded version.
  Suggested version, see technical specifications on page 15-1
- The shielding of the cable has to be connected with earth potential, i.e. boiler covering, connecting terminals for earth potential etc. Multiple grounding is not permitted (humming loop).

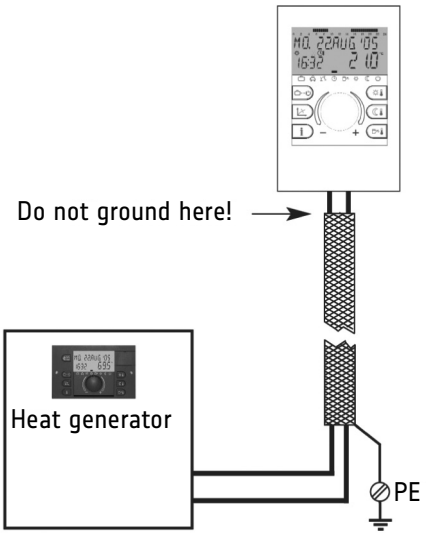


Fig. 4: Single grounding of shielding

- In star shaped networks it is not permitted to ground cables on both sides. They should be grounded in the centre.

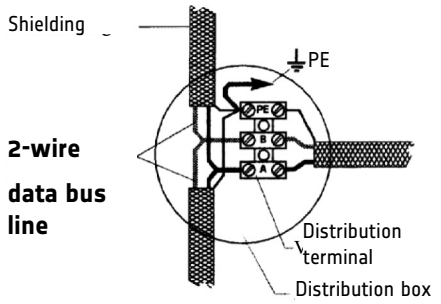


Fig. 5

- The outside sensor may not be installed close to transmitter- or receiver-equipment (on garage walls close to receivers for radio-controlled garage door openers, ham operator antennas, radio controlled alert systems or close to big radio transmission plants).

2.4 Cable dimensions and maximum cable length

- For all 230V~ cables such as power supply, burner, pumps, actuators: 1.5 mm^2
  Maximum cable length:
  Unlimited cable length within house installation.
- Data bus connections: 0.6 mm^2
  Recommended cables:
  J-Y(St)Y 2 x 0.6 mm^2
  Maximum cable length: 100 m
  Longer distances should be avoided to decrease the risk of interferences.

- For all low voltage cables such as sensors, extern selectors, bus and analogue in- and outputs, heat requiring by means of extern contact, modem connection cables, etc.: 0.5 mm^2
  Maximum cable length: 100 m
  Longer distances should be avoided to decrease the risk of interferences.

2.5 Maximum cable lengths

Sensor, selector and analogue inputs

- A maximum cable length of 100 m is recommended. Longer cables are possible but increase the risk of interferences.

Relay outputs

- Unlimited cable length.

Bus lines

- Maximum length 100 m

2.6 Grounding and neutralizing

- Always observe local guidelines when installing the devices!

2.7 Domestic hot water higher than 60 °C

Please note that in the following cases there is a danger of scalding due to hot water taps (kitchen, bath). In order to avoid scalding please mix enough cold water.

Anti legionella automatic

If the *anti legionella automatic* is activated, the domestic hot water will automatically be heated up to a temperature of 65 °C in order to kill legionella bacteria in the hot water system on the selected day and at the selected time.

Manual operation / Emission measurement

In the *manual mode / emission measurement mode* the domestic hot water can be heated up to the maximum possible boiler temperature because the burner and all pumps are switched on and the valves will be completely opened. In this case, there is the danger of scalding at all connected warm water taps in the building. Please mix enough cold water or switch the domestic hot water loading pump off manually (if there is a switch at the pump). Heating and domestic hot water are not temperature controlled in these modes. These modes are especially used by the emission measurement specialist or by the installer in case the controller is defective. However, the high water temperatures can be avoided if the boiler thermostat is adjusted to a max. boiler tmepertaure of 60 °C.

2.8 Connecting accessories

⚠ WARNING According to VDE 0730 the power supply for the controller must have a separate main switch for life and neutral. Please observe local guidelines for grounding and neutralizing!

As soon as there is power supply at the terminals 21, 22, 2, 6, 12 and 18 al-so the terminal rows X3 and X4 will carry 230 V connections!

If a manual switch function is desired for pumps, even though the DHW charging pump does not have on/off switches, external switches must be installed. All accessories (sensors, selectors, etc.) must be connected according to the attached wiring diagram.

2.9 Service and cleaning

The controller is service free. The unit can be cleaned on the outside with a moist (not dripping) cloth.

3 Overview

If the described function is practicable in combination with the controller type, can be seen in the type key. The description refers to this key. Example: In the description, it says: "(Type ..VV..)". This means that this function is implemented in controller types that have the designation "VV" in the type key. The following types can be selected:

Controller for conventional heat generators (oil/gas).

Type	2. Burner stage	1. Burner stage	Unmixed circuit	MC 1	MC 2	DHW charging pump	Variable outputs 1+2	H-GEN-bus RS 485	HG-bus OpenTherm	Variable input 1	Variable input 2+3	Inputs for solar
2B		X	X			X				X		
23B		X	X	X		X				X		
233B		X	X	X	X	X				X		
2233BVV	X	X	X	X	X	X	X			X	X	X
23BC		X	X	X		X		X		X		
23BVVC-OT		X	X	X		X	X		X	X	X	X
233BVVC		X	X	X	X	X	X	X		X	X	X
2233BVVC	X	X	X	X	X	X	X	X		X	X	X
2233BVVC-OT	X	X	X	X	X	X	X		X	X	X	X
3				X						X		

Controller for heat pumps:

Type	2. Burner stage	1. Burner stage	Unmixed circuit	MC 1	MC 2	DHW charging pump	Variable outputs 1+2	H-GEN-bus RS 485	HG-bus OpenTherm	Variable input 1	Variable input 2+3	Inputs for solar
2B		X	X			X				X		
23B		X	X	X		X				X		
233B		X	X	X	X	X				X		
2233BVV	X	X	X	X	X	X	X			X	X	X
23BC		X	X	X		X		X		X		
23BVVC-OT		X	X	X		X	X		X	X	X	X
233BVVC		X	X	X	X	X	X	X		X	X	X
2233BVVC	X	X	X	X	X	X	X	X		X	X	X
2233BVVC-OT	X	X	X	X	X	X	X		X	X	X	X
2233BVVC-WP	X	X	X	X	X	X	X	X		X	X	X
3				X						X		

4 List of abbreviations

AF	Outdoor sensor
AF 2	Outdoor sensor 2
BCP	Boiler circuit pump
BS	Boiler sensor (solid fuel)
BU	Buffer sensor (top)
BU 2	Buffer sensor 2 (bottom)
BULP	Buffer charging pump
BURN1	Burner stage 1
BURN2	Burner stage 2
BUS	System databus (T2B)
BUS A	THETA system bus connection A
BUS B	THETA system bus connection B
BUSF	Buffer sensor (solid fuel)
BZ	Operating hours counter
BZ1	Operating hours counter Burner stage 1
BZ2	Operating hours counter Burner stage 2
CB	Cooling buffer
CB_{max}	Maximum temperature limit cooling buffer
CB_{offset}	H-GEN offset cooling buffer
CBS	Cooling buffer sensor (on KSPF)
CB_{SD}	Cooling buffer switching differential
$CB_{setp.}$	Cooling buffer setpoint (lowest value from HC setpoint and $CCB_{setp.}$)
CC	Constant control
$CCB_{setp.}$	Constant cooling buffer setpoint (parameter)
CCC	Constant control cooling
CHC	Changeover heat pump - cooling
CHP	Charging pump
CIR.	DHW circulation pump
CP	Condenser pump / HP main pump
DHW	DHW

DKP	Unmixed circuit pump (HC-P)
ECO	Eco mode
ELH	DHW electrical heating element
EM	Extra Module
EW/EVU-HP	EW-block heat pump ON/OFF low tariff
FGS	Flue gas sensor
FS	Flow sensor
$FT_{cooling\ offset}$	Correction flow setpoint cooling
GND	Ground (mass) for sensor inputs
HG-BUS	Heat generator-data bus (RS485)
HC	Unmixed circuit
HC	Heating circuit (general)
H-GEN	Abbreviation for classic heat generator (oil/gas).
$H\text{-}GEN_{cool\text{-}SD}$	Switching differential heat generator in cooling mode
$H\text{-}GEN_{setp.\text{-}cool}$	Cooling setpoint heat generator
HPRS	Heat pump return flow sensor
HPUMP	Heat pump
HSS	Heat source sensor
IMP	Pulse input
KSPF	Solar panel tank / buffer sensor (SBUS)
KVLF	Solar panel flow sensor (SPFS)
L1	Phase
M1	Motor compressor
M1(2)	2. Compressor stage / 2nd compressor / E-use
MC	Mixing circuit
MCP	Mixing circuit pump
MHS	Motor heat source
MIMO	Mixer motor
N	Neutral power supply
OT	Outside Temperature
P1	Time program

P2	Time program
P3	Time program
PHR	Parallel H-GEN clearance
RED	Reduced mode
REQ_{cool}	Requirement contact cooling (at SPFS)
RP	Return pump
RS	Return flow sensor
RS1	Return flow sensor mixing circuit 1
RS2	Return flow sensor mixing circuit 2
RT_{actual}	Actual room temperature
$RT_{Cooling\ correctionDay}$	Correction of room setpoint temperature cooling day
$RT_{Cooling\ correctionDev}$	Correction of room setpoint temperature cooling, resulting from room influence factor
$RT_{Cooling\ correctionNight}$	Correction of room setpoint temperature cooling night
$RT_{Cooling\ offset}$	Correction of room setpoint temperature cooling
$RT_{setp.\ cool\ 1}$	Room temperature setpoint from curve
$RT_{setp.\ cool\ 2}$	$RT_{setp.\ cool1}$ + correction value for day or night
$RT_{setp.\ cool\ 3}$	Cooling setpoint to be adjusted (day or night), under consideration of all correction values (incl. room factor
SCP	DHW shift charging pump
SD I	Switching differential I
SD II	Switching differential II
$SD_{thermostat}$	Set value thermostat function heating circuit
SF	DHW sensor (DHWS)
SFP	Solid fuel pump
SLP	DHW charging pump (DHW-P)
SLV	Solar load switch
SLVF	Sensor solar load switch
SOP	Solar pump (collector pump)
SPRS	Solar panel return sensor (return level 3)
VE1	Variable input 1
VE2	Variable input 2
VE3	Variable input 3
VF1	Flow sensor MC1 (FS1)
VF2	Flow sensor MC2 (FS2)
VI	Variable input (general)
VO	Variable output
WE BUS A	Heat generator-data bus connection A (HG-BUS)
WE BUS B	Heat generator-data bus connection B (HG-BUS)
WF/KF	Heat generator sensor, flow

5 Operation

5.1 User interface

Display and operating instruments

1 – Key for emission measurement and manual mode (different key labelling for ..HP..)

2 – "Operating mode" key for all heating and set back modes

3 – "Heating curve" key

4 – "Information" key for the display of temperatures and operating modes

5 – Multi-functional Display

6 – Cover clip for the service jack with labelling

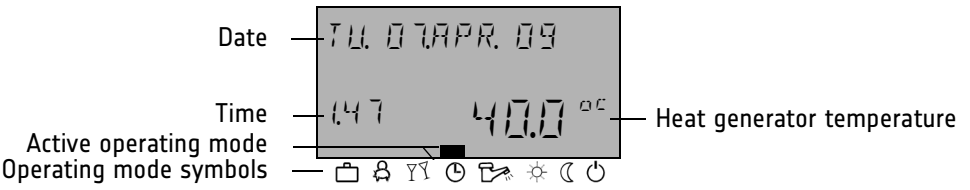
7 – Daytime Room Temperature

8 – Night-time Room Temperature

9 – DHW daytime temperature setpoint

10 – Rotary pushbutton (push - turn)

5.1.1 Basic display



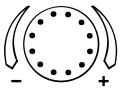
The display illumination is activated by any key or the rotary pushbutton and switches off after a longer period of inactivity (2 min.).

When the plant is started or after a power cut, a segment test + fault diagnosis is carried out. After this test, the software version and the device type are displayed briefly.

In the **automatic mode** the basic display shows the weekday, the date, the time and the heat generator temperature. Depending on the set operating mode (automatic, party etc.), other information will be displayed in the basic display. In the operation mode "Holiday", the note HOLIDAY TIL is displayed instead of the date and the return date is displayed instead of the temperature. Active summer switch-offs will be shown by the "sunshade" icon ⛱, frost protection by the "ice crystal" icon ❄.

5.1.2 Operating elements

5.1.2.1 Rotary Pushbutton (Press/Turn)



By pressing the rotary pushbutton once, you can:

- Confirm inputs/values

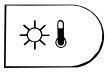
By pressing the rotary pushbutton longer (approx. 3 s), you can:

- Go to the menu selection level
- Go one menu level higher

By turning the rotary pushbutton, you can:

- Change values (clockwise increases values, counter-clockwise decreases values)
- Browse through menus

5.1.2.2 "Daytime Room Temperature" Key



This key sets the room temperature setpoint in the *AUTOMATIC MODE* during the heating cycles as well as during the *PARTY* and *HEATING* operating modes. In control mode 1 the set point is identical for all the heating circuits. In control mode 2 the setpoint is individual for the circuits concerned.

NOTE!

These setpoints are the starting values for the individual temperature settings during the heating cycles (= cycle temperatures) in the "time programs" menu. If these values differ from the starting value, they are corrected with the requisite amount of the adjustment if a subsequent adjustment of the setpoint is made.

Setting:

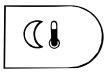
- ► Press the key
- ► Set the flashing specified room temperature by turning the rotary pushbutton to the desired value.
- ► Confirm the set value by pressing either the key or the rotary pushbutton.
- ► Alternatively: Automatic assumption of the value as per the set automatic exit time (system parameter 11)

Factory setting	20 °C
Setting range	5 ... 30 °C

Special function cooling mode:

If cooling mode has been activated, operation is automatically performed in separate operating mode. In addition to the setting for the heating setpoint ROOM DAY, the setting for the correction of the cooling setpoint (COOLING-DAY) appears. When calculating the current cooling setpoint, the set correction value is taken into account (see Page 8-41).

5.1.2.3 "Night-time Room Temperature" Key



This key sets the reduced room temperature setpoint in the *AUTOMATIC MODE* between the heating cycles as well as during the *ABSENT* and *RED.HEATING* operating modes.

In control mode 1 the set point is identical for all the heating circuits. In control mode 2 the setpoint is individual for the circuits concerned.

NOTE

The set temperature is the starting value for the individually adjustable temperature parameters during the the heating cycles (= cycle temperatures) in the "time programs" menu. If these values differ from the starting value, they are corrected with the requisite amount of the adjustment if a subsequent adjustment of the setpoint is made.

Setting:

- ► Press the key
- ► Set the flashing specified room temperature by turning the rotary pushbutton to the desired value.
- ► Confirm the set value by pressing either the key or the rotary pushbutton.
- ► Alternatively: Automatic assumption of the value as per the set automatic exit time (system parameter 11)

Factory setting	16 °C
Setting range	5 ... 30 °C

Special function cooling mode:

If cooling mode has been activated, operation is automatically performed in separate operating mode. In addition to the setting for the heating setpoint ROOM NIGHT, the setting for the correction of the cooling setpoint (COOLING-NGT) appears. When calculating the current cooling setpoint, the set correction value is taken into account (see Page 8-41).

5.1.2.4 "Daytime DHW Temperature" Key

This key sets the daytime DHW temperature in the *AUTOMATIC MODE* as well as during the *PARTY* and *HEATING* operating modes. This setting value also applies to domestic hot water only mode (manual summer mode).

NOTE!

This setpoint is the starting value for the individual temperature setting during the DHW cycles (= cycle temperatures) in the "time programs" menu.

If these values differ from the starting value, they are corrected with the requisite amount of the adjustment if a subsequent adjustment of the setpoint is made.

Setting:

- ► Press the key
- ► Set the flashing specified domestic hot water temperature by turning the rotary pushbutton to the desired value.
- ► Confirm the set value by pressing either the key or the rotary pushbutton.
- ► Alternatively: Automatic assumption of the value as per the set automatic exit time (system parameter 11)

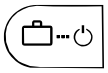
Factory setting 50 °C

Setting range:
5 °C ... water heater maximum temperature limit (service setting)

Single DHW Charging Function

Pushing the key for approx. 3 s will lead to the charging function, in which the charging time is set in min. If a charging time of 0 min is set, the charging function is started and the DHW-tank is charged up to the DHW setpoint. The time interval for the overlapping DHW charging mode can be adjusted between 0 and 240 min. The current weekly program is overlapped.

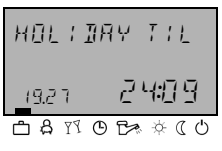
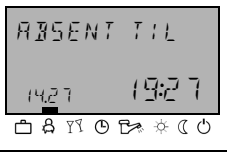
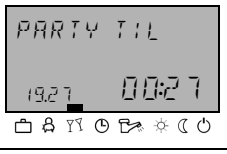
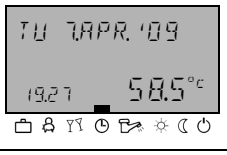
5.1.2.5 "Operating Mode" Key (Basic Display)

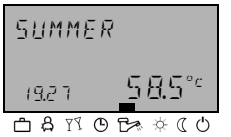
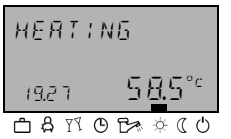
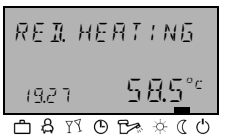
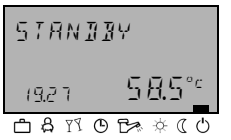


Sets the operating mode and jumps back to the basic display from any control level.

The operating mode appears in plain text, while at the same time a cursor at the bottom of the display indicates the relevant operating mode symbol. In control mode 1 the setpoint is identical for all the heating circuits. In control mode 2 the setpoint is individual for the circuits concerned.

The following operating modes can be selected:

Overview of the Operating Modes			
Arrow on the Symbol	**Operating mode**	**Basic display**	**Individual setting**
	Holiday		Return Date
	Absent		P1(2,3), Return time
	Party		P1(2,3), Party End Time
	Automatic		P1(2,3)

Overview of the Operating Modes			
Arrow on the Symbol	**Operating mode**	**Basic display**	**Individual setting**
	Summer		P1(2,3)
☼	Heating*		
☾	Red. heating		
⏻	Standby		

***** If cooling function is active, the following text appears: HEAT-COOLING

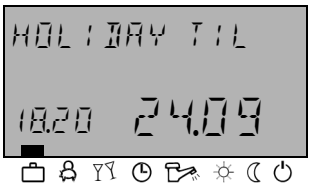
Setting:

- ► Press the key
  Set the flashing operating mode by turning the rotary pushbutton (the bar points simultaneously to the according operating mode symbol)
- ► Confirm the set value by pressing either the key or the rotary pushbutton .
- ► In case of short-term operating modes (Holiday, Absent, Party) set the desired target value by turning the rotary pushbutton and confirming with the key or the rotary pushbutton .
- ► Alternatively: Automatic assumption of the value as per the set automatic exit time (system parameter 11)

Back to Basic display

Return to the basic display from any control level by pressing the key.

5.1.2.5.1 Holiday Mode (short-term program)



In holiday mode the heating circuits can be switched off with frost protection for the duration of the holiday, depending on presetting (heating circuit parameter 25), or operated using the settings for RED.HEATING operating mode. Warm water is switched off with frost protection.

Application Long absence during the heating season

Control during the holiday time

If outdoor temperatures are below the frost limit (see menu "System-parameter - parameter 5 = plant frost protection"), the heating circuits

without wall modules
are regulated in accordance with the weather-controlled frost protection limit (as per system parameter 05) of 3°C.

with wall modules
are controlled according to their individual frost protection limit of the heating circuit (see menu "Unmixed or mixed circuit -Parameter 8 = Room frost protection limit") of 10 °C.

Setting see 5.1.2.5 key "Operating mode" (basic display)

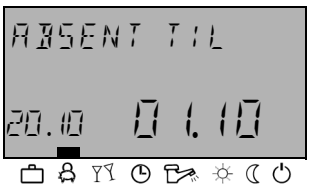
Earlier termination An active holiday mode can be terminated after an early return. To do so, press the "Operating mode" key and switch to automatic mode by tgurning the input knob or pressing and holding the "Operating mode" key for 3 seconds until the text "Automatic" appears.

Factory setting Current date

Setting range Current date ... Current date + 250 days

Display An active holiday program appears on the basic display with the indication of the return date.

5.1.2.5.2 Absent Mode (Short-term Program)



The operating mode *ABSENT* causes the heating operation to be switched off temporarily with frost protection. During the absence, all heating circuits are controlled according to the set reduced room temperature. After the set time period, the heating circuits automatically switch back to the operating mode which was active before the absence. Short-term programs such as *PARTY* or *HOLIDAY* are skipped.

Application Short absence during the heating season

Setting see 5.1.2.5 key "Operating mode" (basic display)

Earlier termination An active absence mode can be terminated after an early return. To do so, press the "Operating mode" key and switch to automatic mode by tgurning the input knob or pressing and holding the "Operating mode" key for 3 seconds until the text "Automatic" appears.

Factory setting P1 after activation

Setting range P1(P2, P3) / 0.5 ... 24 h from the current time

P1 (P2, P3)
Program-controlled restart of the heating operation. After activating the absent mode the heating mode is interrupted until the next switch-on time of the current automatic program P1 (as well as P2 or P3 if enabled).

0.5 ... 24 h
The set value is added to the current time and represents the return time. When activating the absent mode again, the last set value (in relation to current time) is saved and set as the new default value.

Display An active absent mode appears on the basic display with the indication of the return time.

5.1.2.5.3 Party Mode (Short-term Program)

This program provides for a one-time intermediate heating of all the heating circuits up to a specified time and skips a forthcoming or an active absent cycle completely or partially. After the set time period, the heating circuits automatically switch back to the operating mode which was active before the party mode. Short-term programs such as *ABSENT* or *HOLIDAY* are skipped.

Application One-time unscheduled extension of the heating or intermediate heating during reduced mode

Setting see 5.1.2.5 key "Operating mode" (basic display)

Earlier termination An active party mode can be terminated prematurely. To do so, press the "Operating mode" key and switch to automatic mode by tgurning the input knob or pressing and holding the "Operating mode" key for 3 seconds until the text "Automatic" appears.

Factory setting P1 after activation

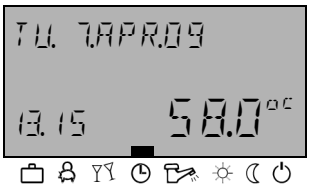
Setting range P1(P2, P3) / 0.5 ... 24 h from the current time

P1 (P2, P3)
Program-controlled restart of the heating operation. After activating the party mode the heating mode is continued until the next switch-on time of the current automatic program P1 (as well as P2 or P3 if enabled).

0.5 ... 24 h
The set value is added to the current time and represents the end of the party time. When activating the party mode again, the last set value (in relation to current time) is saved and set as the new default value.

Display An active party mode appears on the basic display with the indication of the duration of the party.

5.1.2.5.4 Automatic mode



In automatic mode, a maximum of 3 automatic time programs with various heating times are available. The standard time programs P1, P2 or P3 set at the factory can be overwritten if necessary with one's own switching times in the time program level (see menu "Time programs").

All standard programs have up to three heating cycles per circuit for each weekday with their own switch-on time, switch-off time and cycle temperature. For heating circuits, the latter refers to the room temperature, for domestic hot water circuits, it refers to the water heater temperature. Standard programs are preset at the factory with one or two heating cycles, corresponding to the programs P1, P2 or P3.

NOTE

The automatic programs P2 or P3 can be selected only if they were enabled in the "System Paramete Menu - Time Program = P1-P3". If they are not enabled, only Program P1 is active.

Application

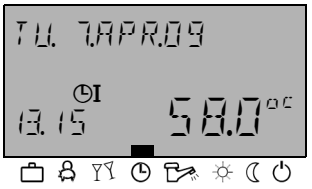
Municipial buildings (schools, offices etc.), heating and domestic hot water frostprotected in weekends, program changes in case of shift operation.

Setting

see 5.1.2.5 key "Operating mode" (basic display)

Disable/Enable Standard Programs P2-P3

Disable
"System Parameter menu- Time Program = P1"
All the heating circuits as well as the hot water circuit work exclusively according to the standard or personalized programmed switching times in time program P1. The P1 program does not appear on the display in this operating mode.



Enable
"System Parameter menu": Time Program = P1 - P3.

Display

An active automatic program appears on the standard display with the current time and date. If automatic programs P2 and P3 are enabled, the relevant symbol 1, 2 or 3 is displayed. The symbols are only displayed if time program P1 - P3 is displayed.

5.1.2.5.5 Manual Summer Mode (only DHW mode)

In this program only the domestic hot water circuit remains active and the DHW temperature is controlled according to the DHW setpoint and the DHW time program. The heating operation is interrupted and frost protected.

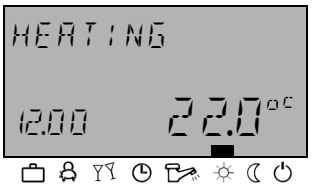
Display The manual summer mode appears on the standard display: *SUMMER*.

NOTE The automatic programs P2 or P3 can be selected only if they were enabled in the "System Parameter Menu - Time Program = P1-P3". If they are not enabled, only Program P1 is active.

Setting see 5.1.2.5 key "Operating mode" (basic display)

Display The manual summer mode appears on the standard display: SUMMER. If standard programs P2 and P3 are enabled, the relevant symbol ◷ 1, ◷ 2, or ◷ 3 is displayed. The symbols are only displayed if time program P1 - P3 is displayed.

5.1.2.5.6 Permanent heating operation



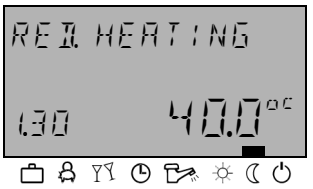
The operating mode *HEATING* provides for uninterrupted heating according to the specified daytime room temperature. The DHW heating works continuously according to the specified DHW setpoint.

Setting see 5.1.2.5 key "Operating mode" (basic display)

NOTE The operating mode *HEATING* is maintained until another operating mode is activated.

Display The heating mode appears on the standard display: *HEATING*.

5.1.2.5.7 Constant reduced mode



The operating mode *RED.HEATING* provides for a constant reduced heating mode according to the specified reduced room temperature corresponding to the ECO (frost protected switch-off mode) or ABS (reduced mode) reduced operating mode set at a heating circuit level in compliance with the minimum temperature limitof the relevant heating circuit.
See the parameter menu "Unmixed circuit or mixed circuit-1 or mixed circuit-2 - Parameter 1 = Reduced mode" and "- Parameter 12 = minimum temperature limit".

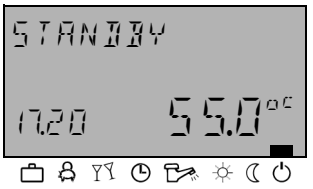
The DHW heating works constantly according to the specified DHW economy temperature (see the menu DHW /Parameter 1- DHW Economy Temperature).

Setting — see 5.1.2.5 key "Operating mode" (standard display)

NOTE — The operating mode *RED.HEATING* is maintained until another operating mode is activated.

Display — The reduced mode appears on the standard display: *RED.HEATING*.

5.1.2.5.8 Standby mode



In *STANDBY* mode, the entire system is switched off and provided with frost protection (all frost protection functions are active).

The DHW heating is blocked and has frost protection. At tank temperatures of below 5 °C the water, is reheated to 8 °C.

Application — Complete switch-off of the heating and hot water including a complete building frost protection

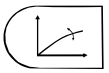
Setting — see 5.1.2.5 key "Operating mode" (basic display)

NOTE — The heat generator and hot water heating remain active upon external request or upon the request of other heating circuits connected via bus. The heating circuit pumps are switched on briefly every day (pump anti-blocking protection).

The standby mode is maintained until another operating mode is activated.

Display — The standby mode appears on the standard display: *STANDBY*.

5.1.2.6 "Heating curve" key

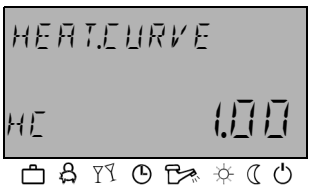


Determines the heating curve for the heating circuits (diagram, see detailed description in chapter "Controller functions")

The slope of the heating characteristic describes the relation between the change in the flow temperature and the change in the outside temperature. In case of large heating surfaces (and therefore low flow temperatures) like floor heating systems, the heating characteristic curve is less steep compared to smaller heating surfaces (e. g. radiators).

The setting value refers to the lowest outside temperature used for heat demand calculation.

⚠ CAUTION This parameter is to be set by the heating technician and should not be altered afterwards.



Setting:

- ► Press the key
- ► Turn the rotary pushbutton to set the heating curve type and push the rotary pushbutton to confirm
- ► Turn the rotary pushbutton to set the flashing curve value and push the rotary pushbutton to confirm
- ► Alternatively: Automatic assumption of the value as per the set automatic exit time (system parameter 11)
- ► Push to return to the standard display.

Setting range OFF, 0.05 ... 3.50

Factory Setting Unmixed circuit (HC):= 1.50
Mixed circuit 1 (MC1):= 1.00
Mixed circuit 2 (MC2):= 1.00

5.1.2.7 "Plant information" key

Function:

After entering of the information level by means of the information key, a query of all available plant and system temperatures can be made using the rotary pushbutton.

The first data item to appear is always the outside temperature. By turning the rotary pushbutton clockwise the system temperatures and the counter and consumption statuses appear; by turning the rotary pushbutton counter-clockwise the operating statuses of the connected system components appear.

Provided that a nominal value is listed in the following table under the column *Nominal Value*, it will appear when pressing the rotary push-button.

Manual exit:

The information key allows the user to return to the standard display at any time.

5.1.2.7.1 Temperature displays

The following information appear only under the indicated display conditions. Some displays are not available and are skipped according to the respective type of control.

INFORMATION	Displayed value	Remarks	Application
Outdoor temp. (1)	Average value / current value	Outside sensor connected	
Outdoor temp. (1)	Min-max-value (0.00 to 24.00 h)	Outside sensor connected	
Outdoor temp. 2	Average value / current value	Outdoor sensor 2 at variable input	
Outdoor temp. 2	Min-max-value (0.00 to 24.00 h)	Outdoor sensor 2 at variable input	
EM-SET (Energy management setpoint)	Maximum warm water and maximum heating circuit setpoint value in the system	Installer level	
Heat generator (1)	Nominal/actual value	Only if heat generator is defined	(..2..)
Heat generator St. 2	Nominal/actual value	Sensor BS 2 at variable input	(..2..)
Return flow (b. contr.)	Actual value	Return flow sensor connected at boiler control	(..C..)
Flue gas (b. contr.)	Actual value	Flue gas sensor connceted at boiler control	(..C..)
Return flow	Nominal/actual value	Return flow sensor at var. input and return temp. increasing activated	
External blocking	Block mode ON/OFF	Ext. blocking at variable input	
Flue gas	Limit value/ Actual value	Flue gas sensor at variable input	(..2..)
Hot water tank (1)	Nominal/actual value	Only with hot water tank	(..B..)
Hot water tank 2	Nominal/actual value	Hot water sensor 2 at var. input	(..B..)
Hot water thermostat	Charging status ON/OFF	Instead of an electronic sensor	(..B..)
Demand via contact (VI1)	Demand ON/OFF	Switching contact at variable input	
Demand via contact (VI2)	Demand ON/OFF	Switching contact at variable input	
Demand via contact (VI3)	Demand ON/OFF	Switching contact at variable input	
Flow Mixing circuit 1	Nominal/actual value	Flow sensor mix. heating circuit 1 connected	(..3..)

INFORMATION	Displayed value	Remarks	Application
Flow Mixing circuit 2	Nominal/actual value	Flow sensor mix. heating circuit 1 connected	(..33..)
Ambient temper. Unmixed circuit	Nominal/actual value	Remote control necessary	(..2..)
Ambient temper. Mixing circuit 1	Nominal/actual value	Remote control necessary	(..3..)
Ambient temper. Mixing circuit 2	Nominal/actual value	Remote control necessary	(..33..)
Thermostat function Unmixed circuit	THERMOSTAT HC	Room thermostat function activated OFF = no room temperature limit	(..2..)
Thermostat function Mixing circuit 1	THERMOSTAT MC-1	Room thermostat function activated OFF = no room temperature limit	(..3..)
Thermostat function Mixing circuit 2	THERMOSTAT MC-2	Room thermostat function activated OFF = no room temperature limit	(..33..)
Boiler temp. solid fuel	Actual value	Solid fuel charging pump at variable output	(..VV..)
Buffer temp. solid fuel boiler	Actual value	Solid fuel charging pump at variable output, corresponds to SBUS or BUSF, according to configuration.	(..VV..)
Upper buffer sensor	Nominal/actual value	Buffer charging pump at var. output	(..VV..)
Lower buffer sensor	Nominal/actual value	Buffer sensor 2 at var. Input	(..VV..)
Solar panel sensor	Actual value	Solar pump at var. output	(..VV..) (..VV..)
Solar tank	Actual value	Solar pump at var. output	(..VV..)
Solar panel return flow sensor	Actual value	Solar pump at var. Output Return flow sensor at var. Input	(..VV..)
Solar tank Changeover	Actual value	Solar valve activated	(..VV..)

5.1.2.7.2 Operating states

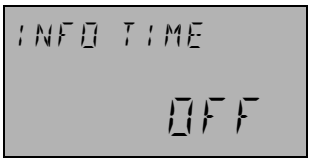
After entering of the information level by means of the information key ⓘ, a query of all available operating statuses such as counter numbers, capacities etc. can be made by turning the rotary pushbutton anti-clockwise.

Information	Display (Example)	Function	Application
Status Unmixed circuit	*AUTO-P1 ECO* *HC ON*	Operating mode/◷-program/mode status of heating pump	(..2..)
Status Mixing circuit 1	*AUTO-P1 ECO* *MC-1 ON*	Operating mode/◷-program/mode status of heating pump	(..3..)
Status actuator Mix. valve 1	*MIX.VALVE-1* *OPEN*	Display of direction OPEN-STOP-CLOS	(..3..)
Status Mixing circuit 2	*AUTO-P1 ECO* *MC-2 ON*	Operating mode/◷-program/mode status of heating pump	(..33..)

Information	Display (Example)	Function	Application
Status actuator Mix. valve 2	*MIX.VALVE-2* *STOP*	Display of direction OPEN-STOP-CLOS	(..33..)
Status heat generator stage 1	*HEAT GENER.* *ON*	Switching state of heat generator Single stage or stage 1 (2-stage)	(..2..)
Status heat gener. stage 2	*HEAT GENER.* *ST-2 OFF*	Switching state of heat generator Stage 2	(..22..)
Status modulating heat gener.	*MODULATION* *57% 60%*	Modulating single stage heat generator, nominal and actual value	(..VV..)
Status Hot water circuit	*AUTO-P1 ECO* *DHW ON*	Operating mode/◷-program/mode status of DHW charging pump	(..B..)
Function & status Direct circuit pump	*OUTPUT HC-P* *EO ON*	Information about the assigned function and switching state of pump	(..2..)
Function and status variable output 1	*OUTPUT VO-1 SOP* *OFF*	Information about the assigned function and switching state of var. output 1	(..VV..)
Function and status variable output 2	*OUTPUT VO-2 SOP* *OFF*	Information about the assigned function and switching state of var. output 1	(..VV..)
Starts heat generator (1)	*NR OF STARTS* *1234 (ST-1)*	Accumulated number of starts Single stage or stage 1 (2-stage)	(..2..,..22..)
Operating hours heat generator (1)	*OPER. HOURS* *246*	Accumulated operating hours Single stage or stage 1 (2-stage)	(..3..)
Starts heat generator 2	*NR OF STARTS* *268*	Accumulated number of starts Stage 2	(..3..)
Operating hours heat generator 2	*OPER. HOURS* *45 ST-2*	Accumulated operating hours Stage 2	(..33..)
Test temp. sensor for test purpose	*INFO-TEMP.* *50°C*	Ext. sensor for test purpose at Input	(..33..)
Operating mode external switching modem	*MODEM* *AUTO*	Actual operating mode of external modem at var. Input	(..2..)
Solar heating power	*HEAT POWER* *43 KW SOL*	Curr. heating power of solar plant in KW	(..VV..)
Solar energy balance	*HEAT CONS.* *2468 KWh SOL*	Accumulated thermal capacity of solar plant in KWh	(..VV..)
Activations solar panel pump	*NO. OF STARTS* *296 SOL*	Accumulated number of solar panel pump starts	(..VV..)
Operating hours solar panel pump	*OPER. HOURS* *478 SOL*	Info on accumulated operating hours of solar panel pump	(..VV..)

NOTE: Depending on controller type, the information display can differ in detail.

Automatic return



If the "information key" ⓘ is pressed for approx. 3 s upon accessing the information level, the *INFO TIME* parameter appears.

This parameter determines the time for the automatic return from the info display to the standard display.

Factory preset:	OFF
Setting range	OFF, 1...10 min
OFF	No exit, the last information displayed remains until the next setting on the display.
1...10min	Automatic exit from the information level after the specified time, settable in 0.5 minute steps.

5.1.2.8 "Emission Measurement / Manual Mode" Key

5.1.2.8.1 Emission Measurement (may only be carried out by the heating specialist).

⚠ CAUTION **Emission Measurement has to be carried out by a technician.**

By pressing this key, the heat generator runs for 20 minutes at the set maximum temperature limit. The remaining time is displayed as it passes.

Both stages of two-stage heat generators are in operation (measurement with nominal capacity).

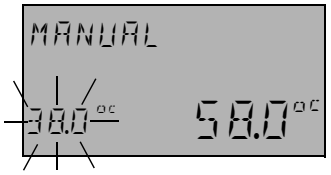
⚠ CAUTION **Danger of scalding because the DHW temperature may exceed the defined DHW setpoint.**

Function: The heat generator is adjusted to the maximum H-GEN temperature. All heating circuits and DHW heating adjust their nominal value to the corresponding maximum temperature.

Application: Emission measurement by the technician

Termination: The emission measurement can be terminated prematurely at any moment using the key.

5.1.2.8.2 Manual mode



Function:

If the key is pressed for more than 5 s while the standard display is on, the controller is switched to manual mode. In this operating mode the heat generator temperature is set manually with the rotary pushbutton according to the desired setpoint (does not have any effect if operated as extension of heating circuits). All the pumps are active, while the available mixing valves are de-energized and can be actuated by hand if required for the heat demand.

The heat generator setpoint can be set from heat generator minimum - ... heat generator maximum temperature and flashes on the left side; the current heat generator temperature is statically displayed on the right side.

The switching differential corresponds to the set differential for automatic control and is symmetrical to the setpoint.

Note: The heat generator high limit prevails over the heat generator switching differential and deactivates the heat generator in case it is exceeded.

In controllers that operate purely as an extension of the heating circuits, setting the temperature has no effect.

The last value appears as a suggested value after the controller has adjusted to the heat generator temperature.

Note: If a manual mode is activated, a possible cooling is deactivated. "Heating emergency mode" is performed.

Application: Controller malfunctions (emergency mode)
Malfunctions

Termination: The return to the previously selected operating mode is carried out by pressing key  .

5.2 Code-Input

5.2.1 Installer code and OEM code

- After entering the specialist code the parameters which are certain for the heating specialist are released and can be processed according to the heating plant design.
- To enter the specialist code the buttons and have to be pressed simultaneously for approx. 3 seconds until the request to enter the code is displayed.
- Every flashing digit can be modified with the rotary knob according to the code number and confirmed by pressing the knob once. The further digits are treated in same way.
- After entering all digits correctly and confirming the last digit, the specialist code is accepted: *INSTALLER OK*, with wrong entry the message *CODE ERROR* will appear.

-The installer code is: ☐☐☐☐

-The OEM code is: ☐☐☐☐

Caution: Released parameters are locked again if for the duration of no further service occurs. In this case the specialist code must be entered again.

Change code: Setting options:

OFF:	The access protection is switched off, the installer parameters are always accessible
0001...9999	The factory preset access code is exchanged for a value between 1 and 9999.

Operation:

Note on operation	Key / parameter tree	Parameter
Locking code for heating specialist	SYSTEM	PARAMETER 15

5.2.2 User code

By entering a separate code, the operation of the controller can be blocked completely against unauthorized access. Operation is only possible after entering this code.

This function can be activated in the SYSTEM parameter.

The user code is: ☐☐☐☐

Operation:

Note on operation	Key / parameter tree	Parameter
Locking code for user level	SYSTEM	PARAMETER 23

5.2.3 Automatic exit time

When work with the control unit has finished, the unit automatically returns to the standard display after a factory-set time of 2 minutes. The exit time can be changed by setting a system parameter (see Page 5-40).

The exit time applies to keys , , , and , operation at selection level, and code entering. For the exit time for key see Page 5-15.

5.3 Menu selection level

The controller has a parameter menu which varies according to the different controller types.

Entry into the Parameter Menu Level

To enter the menu, the rotary pushbutton is to be pressed for approx. 3 s. The parameter menu always starts with the time programs menu; all the other available menus can be selected using the rotary pushbutton. Press the rotary pushbutton to enter the selected menu.

5.3.1 Level and Parameter overview

Category	Tree designation	Available on controller types	Available on parameter settings	Automatic display conditions
Programming	Time/date			
	Time programs			
Configuration	Hydraulic			
	System			
Parameterization (heating circuit, controlled system)	Domestic hot water	..B..		
	Unmixed circuit	..2..	Hydraulics: Parameter 05 = 2	
	MC 1	..3..	Hydraulics: Parameter 03 = 2, 3, 6, 7	
	MC 2	..33..	Hydraulics: Parameter 04 = 2, 3, 6, 7	
	Heat generator (conventional)	..2.., ..22..		
	Heat generator (heat pump)	..HP..		
	Return control		Hydraulics: Parameter 03, 04 = 8 or parameter 06, 07 = 9	
	Solar	..VV..	Hydraulics: Parameter 05, 06, 07 = 15	
	Solid fuel	..VV..	Hydraulics: Parameter 06, 07 = 17	
	Buffer	..VV..	Hydraulics: Parameter 06, 07 = 16 or parameter 08, 09, 10 = 19	
	Cooling buffer		Hydraulics: Parameter 13 = ON	
	Cascading			At least two heat generators in controller bus system and controller with address 10
Communication	Data bus			
Remote unit	WEBcontrol			WEBcontrol connected
Service	Relay test			
	Alarm messages			
	Alarm messages 2		System: Parameter 28 = ON	
	Sensor calibration			

5.3.2 "Time - Date" Menu

The following current daytime values can be set in this menu:

- Time
- Year
- Date
- Daylight-savings time (summer-winter time)

All the listed values are preset at the factory and do not usually need to be updated. If corrections are necessary in exceptional cases, the values can be adjusted to the current conditions.

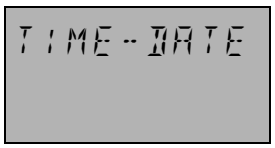
The internal pre-programmed calendar provides for an automatic time change at the annually occurring change of daylight saving time. If required, the automatic change of daylight saving time can be disabled.

The current weekday from Mon. to Sun. is determined from the calendar data and does not require setting.

Entry: see menu selection level (Page 5-19)

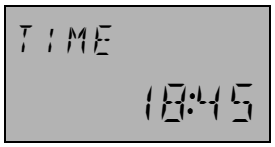
Change: A flashing day value in the display can bet set by pushing the rotary pushbutton and can also be corrected by using the rotary pushbutton. After saving by pushing the rotary pushbutton again, the other current day values can be selected and corrected if necessary.

Exit: Push the key to return to the standard display or wait until the automatic exit occurs.

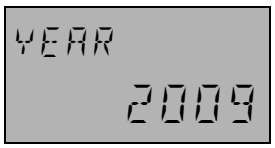


press

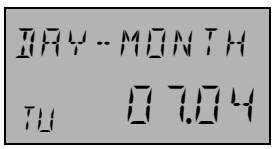
TIME-DATE menu



current time (00:00 to 23:59 o' clock)



Year (2001 to 2099)



Date / month / weekday
(MO-SU / 01.01. to 31.12)

Time reset mode
(Automatic: last Sunday in Oct./March)
(Manually: no change / winter time)

5.3.3 "Time program" menu

In this menu the time programs can be set individually for the heating and DHW modes.

The P1 standard program set at the factory (also P2 and P3, if enabled) for each heating or DHW circuit can be overwritten with individual switching times and temperature values. This is particularly useful if specific personalized heating programs are to be created in case of periodically recurring events with varying times (e.g. work shifts, etc.).

For the programming of timeprograms a maximum of three heating cycles with a switch-on and switch-off time each is available for each weekday. Each heating cycle can also be combined with a freely selectable temperature setpoint.

Caution: The standard programs are not lost if they are overwritten with personalized programs. Personalized programs will be deleted if the standard program is reloaded and hence need to be created again. For this reason the personalized switch-on and switch-off times as well as the temperature values should be entered in the tables envisaged for this purpose.

Entry: see menu selection level (Page 5-19)

5.3.3.1 Control Circuit Selection

After accessing the time program menu, the desired control circuits can be selected using the rotary pushbutton in the following sequence

- Unmixed circuit (HC)
- Mixed circuit 1 (MC-1)
- Mixed circuit 2 (MC-2)
- Domestic hot water circuit (DHW)
- Access to the selected circuit is carried out by pressing the rotary pushbutton.

5.3.3.2 Program Selection

If time programs P2 and P3 are enabled (see "System parameter menu time program = P1 – P3"), the program selection appears.

If time programs P2 and P3 are disabled ("System parameter menu time program = P1"), the program selection is skipped automatically.

5.3.3.3 Weekday and Cycle Selection

After selecting the program the first cycle of the first weekday (MO-1) appears as well as the relevant section flashing in the upper time bar. The other cycles are set by turning the rotary pushbutton clockwise in crescent order according to the cycles and week day (e.g. MO-1, MO-2, MO-3, TU-1, TU-2, TU-3, etc.), while after setting these are to be selected by turning the rotary pushbutton counter-clockwise and confirmed by pressing the rotary pushbutton. The third programmed time (e.g. MO-3) is only displayed if the second programmed time (e.g. MO-2) is in use.

5.3.3.4 Programming Time Programs and Cycle Temperatures

5.3.3.4.1 Switch-on time

The switch-on time defines the start of heating or the occupancy start time if the optimization is enabled.

After selecting the weekday and the corresponding cycle the relevant switch-on time starts to flash on the display and can be set with the rotary pushbutton. The time bar in the upper part of the display provides an overview of all the programmed cycles between 00:00 and 24:00 of the selected weekday.

IMPORTANT

NOTE! The switch-on time can not be set earlier than the switch-off timer of a previous cycle and not earlier than 0:00 of the selected weekday.

When the switch-on time is changed, the relevant time bar display on the left is adjusted.

If the switch-on time coincides with the switch-off time, the relevant cycle is deleted. A following cycle automatically replaces the deleted cycle when confirmed.

When subsequently adding an earlier cycle the relevant weekday needs to be reprogrammed.

A flashing switch-on time is acquired by pressing the rotary pushbutton.

5.3.3.4.2 Switch-off time

The switch-off time determines the end of heating.

After confirming the switch-on time the relevant switch-off time starts to flash on the display and can be set using the rotary pushbutton. The time bar in the upper part of the display provides an overview of all the programmed cycles between 00:00 and 24:00 of the selected weekday.

IMPORTANT

NOTE! The switch-off time cannot be later than the switch-on time of a following cycle.

When the switch-on time is changed, the relevant time bar display on the right is adjusted.

If the switch-off time coincides with the switch-on time, the relevant cycle is deleted. A following cycle automatically replaces the deleted cycle when confirmed.

When subsequently adding an earlier cycle the relevant weekday needs to be reprogrammed.

A flashing switch-off time is confirmed by pressing the rotary pushbutton.

5.3.3.4.3 Cycle temperature

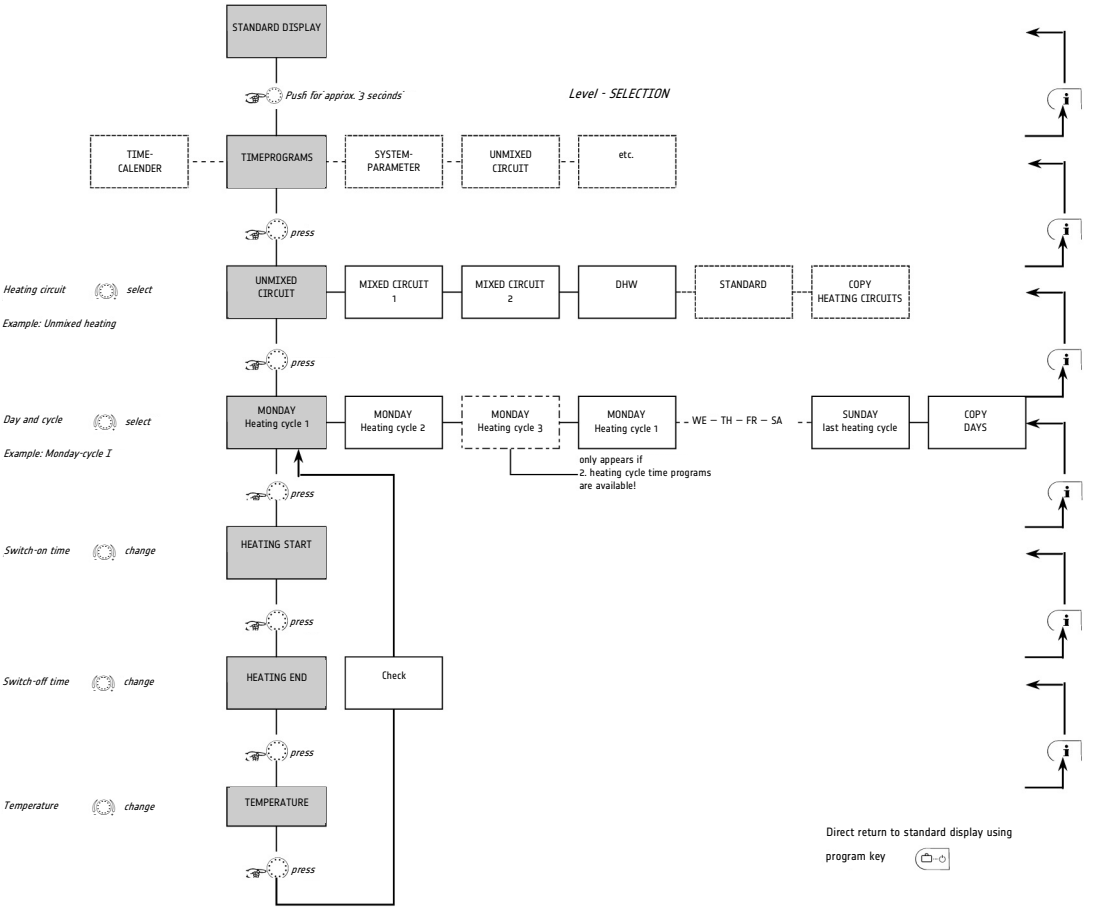
After confirming the switch-off time the relevant cycle temperature starts to flash on the display and can be set using the rotary pushbutton. In the case of heating circuits the displayed cycle temperature always refers to the desired room temperature, while in the case of the DHW circuit it refers to the desired water heater normal temperature in the selected cycle.

A flashing cycle temperature is confirmed by pressing the rotary pushbutton.

At the same time the last cycle called starts to flash on the display so that it can be checked. Further cycles can be selected directly and processed in the following order: SWITCH-ON TIME – SWITCH-OFF TIME – CYCLE TEMPERATURE.

Time program programming (Program P2 and P3 disabled)

After entry into the level selection, the time program is always displayed first. Enabling programs P2 and P3 in level - *SYSTEM* (Page 5-40) - (see level selection Page 5-19)



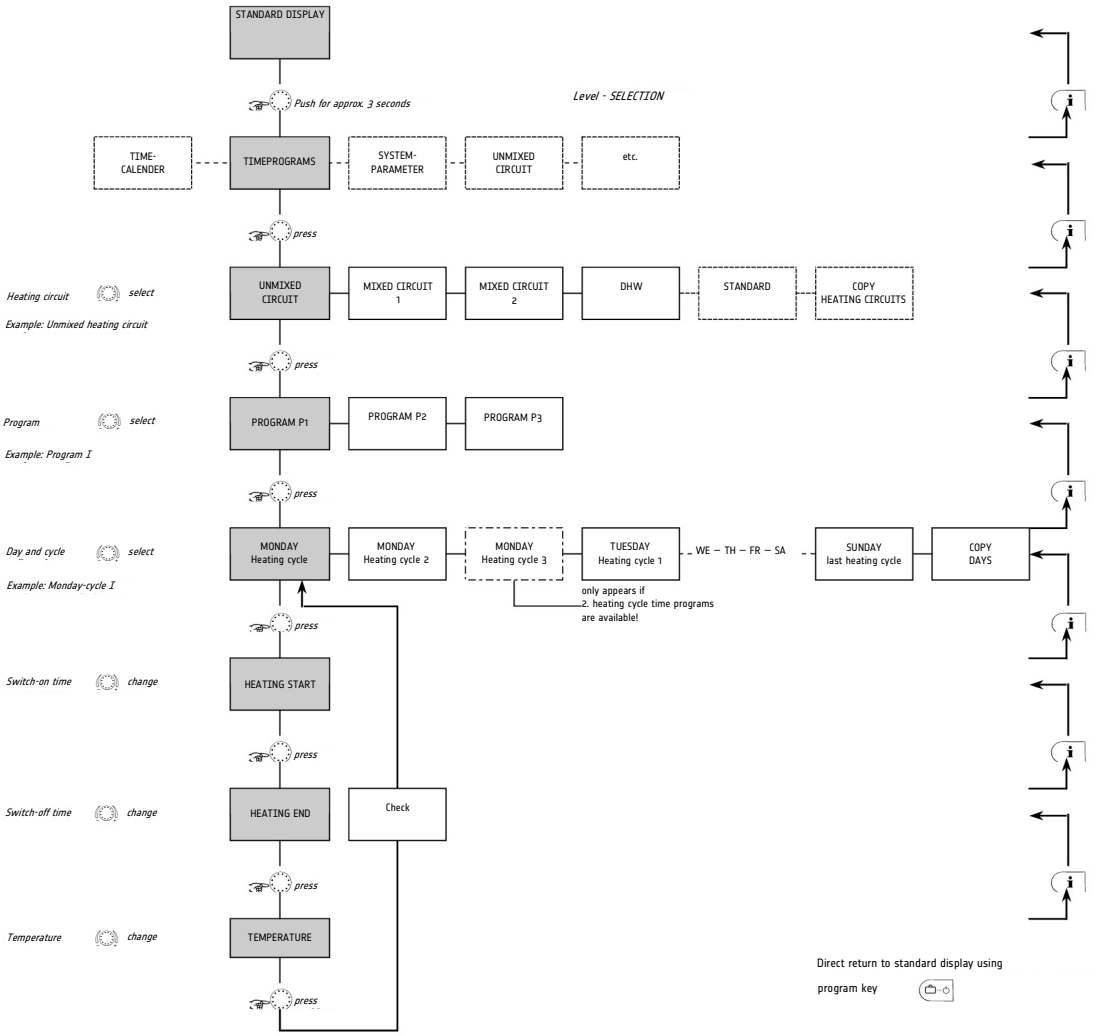
Standard program P1		
Heating circuit	**DAY**	**Heating operation from to**
Boiler heating circuit	Mo - Su	6.00 - 22.00
DHW circuit	Mo - Su	5.00 - 22.00
Mixed circuit 1	Mo - Su	6.00 - 22.00
Mixed circuit 2	Mo - Su	6.00 - 22.00

Standard time program (P1) for heating and DHW

Uniform, constant heating and DHW on every weekday

Time program programming (Program P2 and P3 enabled)

After entry into the level selection, the time program is always displayed first. Enabling programs P2 and P3 in level - *SYSTEM* (Page 5-40) - (see level selection Page 5-19)



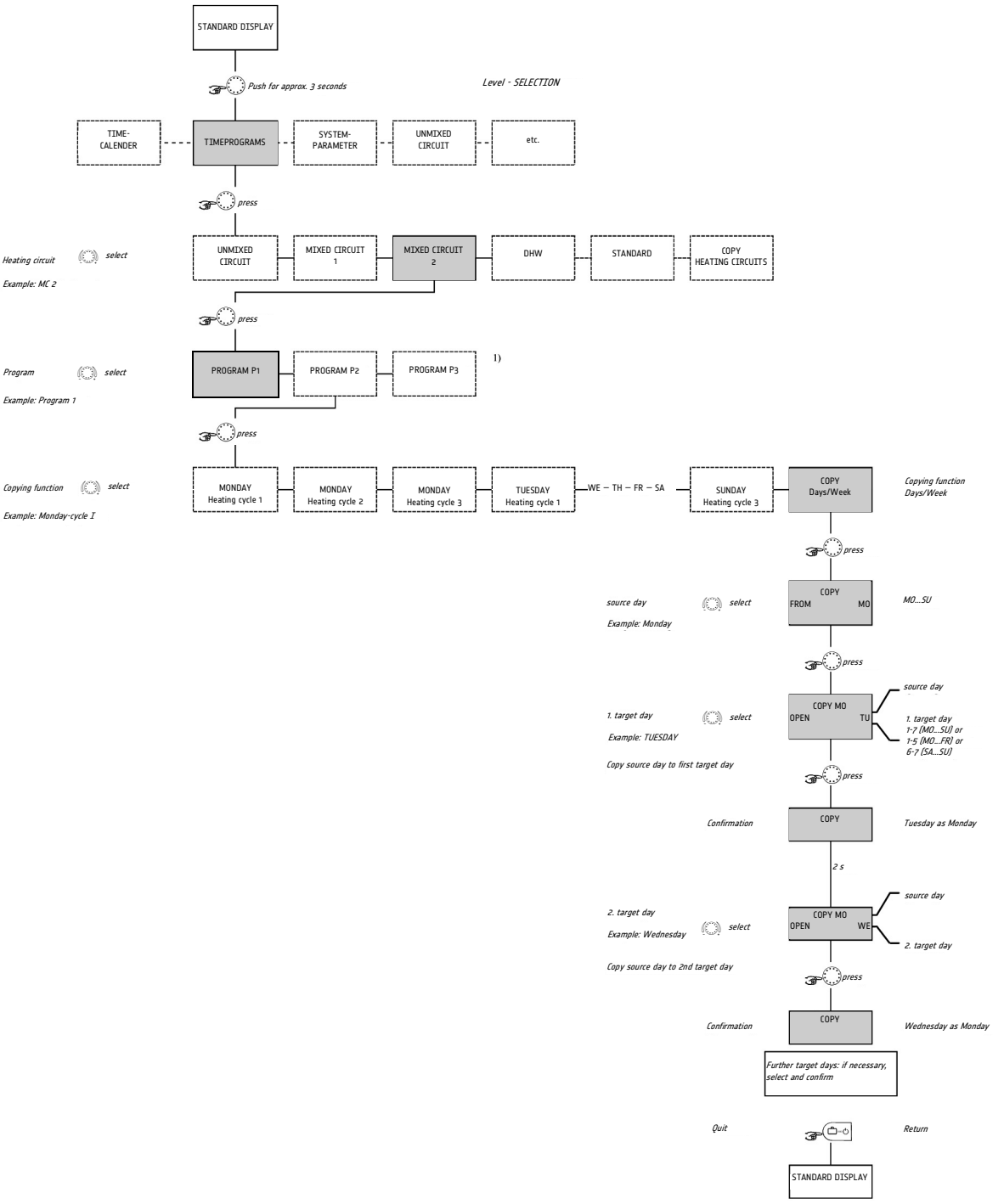
Standard program P1		
Heating circuit	DAY	Heating operation from to
Boiler heating circuit	Mo - Su	6.00 - 22.00
DHW circuit	Mo - Su	5.00 - 22.00
Mixed circuit 1	Mo - Su	6.00 - 22.00
Mixed circuit 2	Mo - Su	6.00 - 22.00

Standard program P2		
Heating circuit	DAY	Heating operation from to from..to
Boiler heating circuit	MO - TH Fr Sa-Su	6.00-8.00 16.00-22.00 6.00-8.00 13.00-22.00 7.00-23.00
DHW circuit	MO - TH Fr Sa-Su	5.00-8.00 15.30-22.00 5.00-8.00 12.30-22.00 6.00-23.00
Mixed circuit 1	MO - TH Fr Sa-Su	6.00-8.00 16.00-22.00 6.00-8.00 13.00-22.00 7.00-23.00
Mixed circuit 2	MO - TH Fr Sa-Su	6.00-8.00 16.00-22.00 6.00-8.00 13.00-22.00 7.00-23.00

Standard program P3		
Heating circuit	DAY	Heating operation from to
Boiler heating circuit	Mo - Fr Sa-Su	7.00 - 18.00 red. heating
DHW circuit	Mo - Fr Sa-Su	6.00 - 18.00 red. heating
Mixed circuit 1	Mo - Fr Sa-Su	7.00 - 18.00 red. heating
Mixed circuit 2	Mo - Fr Sa-Su	7.00 - 18.00 red. heating

Block-programming

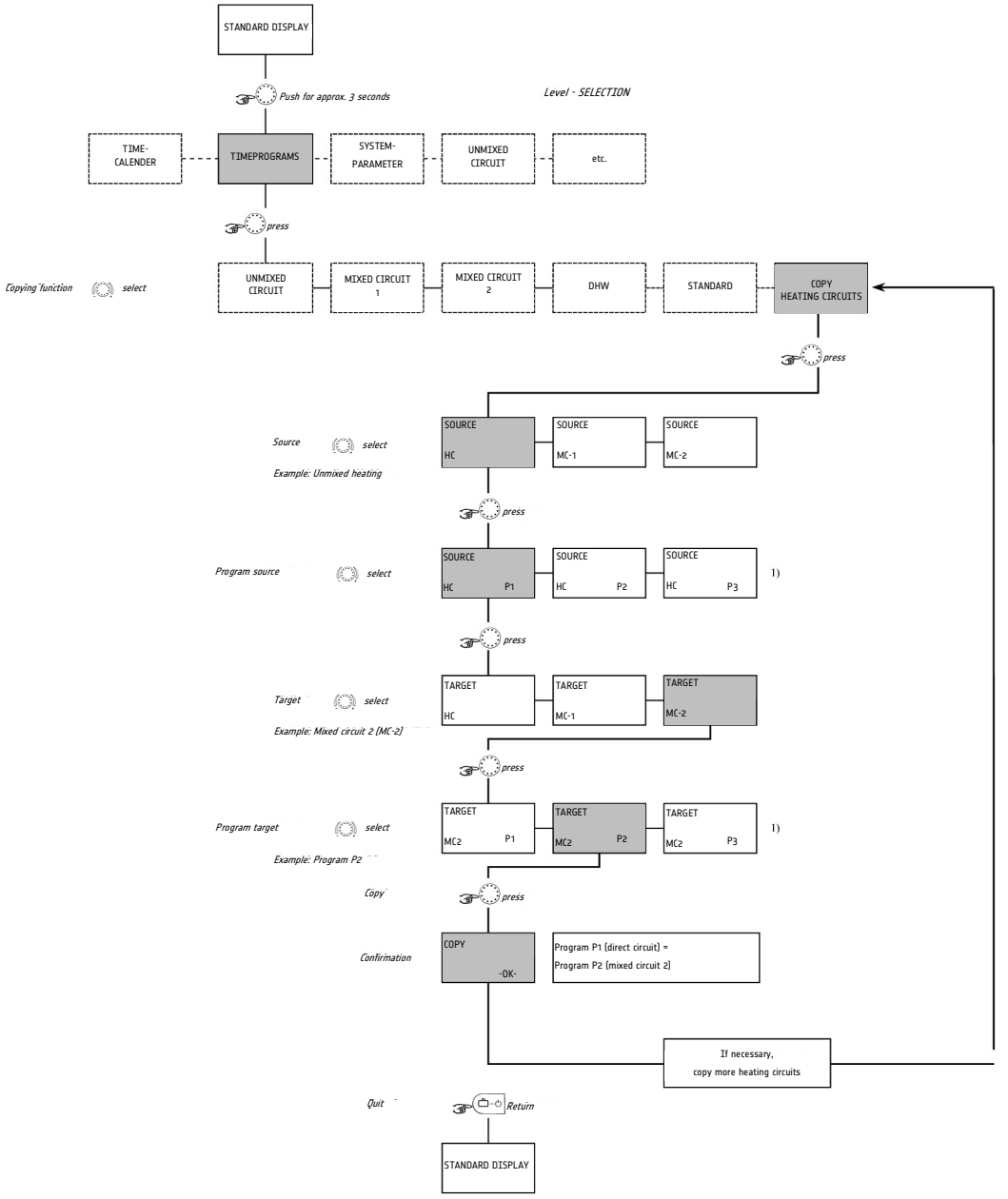
The copy function makes it possible to copy a source day to the desired target day or to all weekdays (week programming). All the cycles of the source day are copied. Single heating cycles cannot be copied.



1) The program selection is skipped if programs P2 and P3 were disabled in the *System Parameter* menu. (Page 5-30)

Copying complete programs

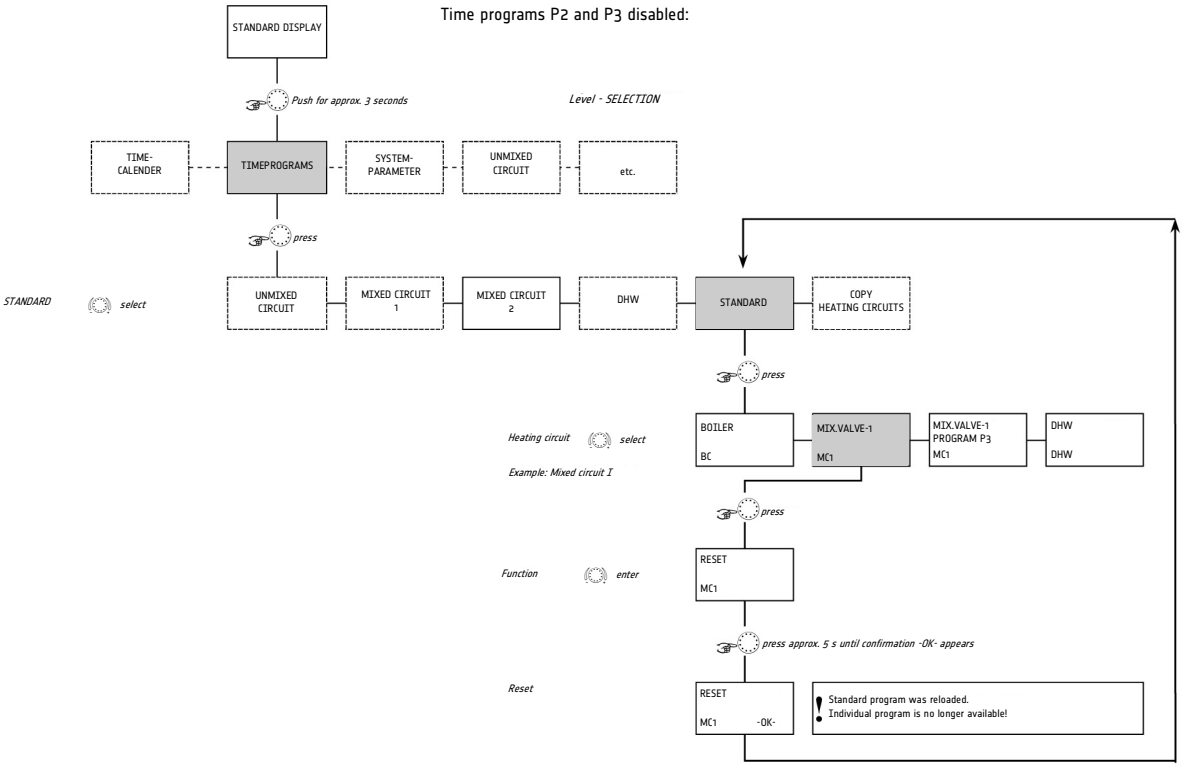
Note: Heating circuits cannot be copied to DHW circuits, as these have different cycle temperatures: if a heating circuit is selected as a source circuit, the DHW circuit can no longer be used as a target circuit.



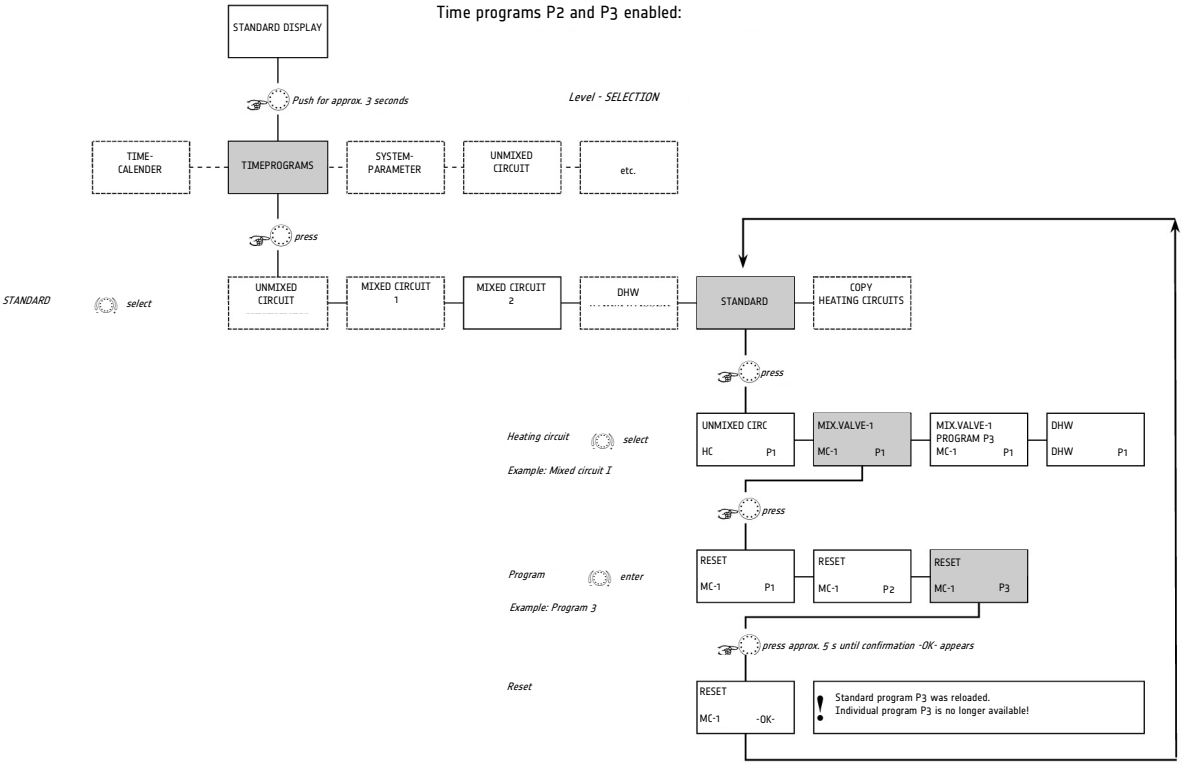
1) The program selection for source and target circuits is skipped if programs P2 and P3 were disabled in the System Parameter menu (see Page 5-30).

Reloading Standard Programs

Time programs P2 and P3 disabled:



Time programs P2 and P3 enabled:



5.3.4 SYSTEM level (Parameter)

The parameters in this level refer to the general set values and limiting parameters in the heating system to be used.

5.3.4.1 Language

Factory preset: GERMAN

Setting range: DE, GB, FR, IT, NL, ES, PT, HU, CZ, PL, RO, RU, TR, SE, NE, BG

Function:

Several languages can be chosen for all the information appearing on the display.

Set value: DE: German, GB: English, FR: French, IT: Italian, NL: Dutch,
ES: Spanish, PT: Portuguese, HU: Hungarian, CZ: Czech, PL: Polish,
RO: Romanian, RU: Russian, TR: Turkish, SE: Swedish, NE: Norwegian, BG: Bulgarian

5.3.4.2 Time programs

Factory preset: P1

Setting range: P1, P1-P3

Function:

This parameter determines the enabling of the time programs for the program selection and for the individual time program programming. When supplied, only one time program is enabled. The use of only a single switching time program for a wide range of applications makes it possible to simplify operating.

Setting values: P1:Program 1 enabled,
Programs 2 and 3 = disabled

P1-P3:All three programs enabled

Effects: Besides the settings described above, the enabling of programs P1 to P3 enables for the following settings:

5.3.4.2.1 Operating mode adjustment

The time programs P1, P2 or P3 can be selected in the operating modes automatic and summer.

5.3.4.2.2 Time programming

When programming, each heating circuit can be assigned one of the three time programs P1-P3.

5.3.4.3 Control mode

Factory preset: 1

Setting range 1, 2

This parameter determines the control mode and has effects on the:

- Operating mode selected with the operating mode key
- Daytime temperature selected with the "daytime temperature" key
- Nighttime temperature selected with the "night-time temperature" key

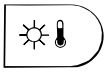
concerning the effect on the different heating circuits.

Setting values: 1:The selected setting (operating mode, daytime temperature, night-time temperature) applies for all the heating circuits

2:Each heating circuit can be assigned its own setting (operating mode, daytime temperature, night-time temperature).

Note: Once a room device is connected and registered on the basic unit via the data bus, the basic unit automatically switches to separate operating mode (2) and system paramter 3 (operating mode) is faded out! If you switch to common operating mode using the RS, the bus rights for the respective circuit have to be set to owner status in the data bus menu. System parameter 3 is then available again.
System parameter 3 is generally not available when unsing RFF!
If cooling mode has been activated, operation is automatically performed in separate operating mode.

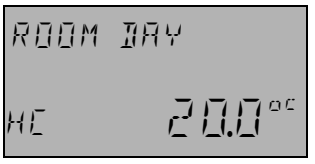
5.3.4.3.1 Separate control mode Daytime Temperature



Function:

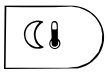
In this operating mode, the relevant setpoint applies only to the selected HC (= unmixed circuit), MC 1 (= mixed circuit 1) or MC 2 (= mixed circuit 2)

Setting:



- Press key
- Select the desired heating circuit, HC, MC-1 or MC-2, using the rotary pushbutton
- Confirm the selected circuit by pressing the rotary pushbutton
- Set the flashing room temperature value by turning the rotary pushbutton to the desired value.
- Confirm set value by pressing or , press again: return to⟶ standard display
- Alternatively the value can be confirmed by automatic exit after the set time.

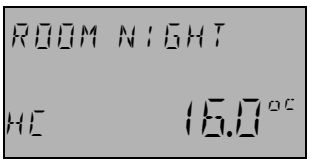
5.3.4.3.2 Separate Control Mode Nighttime Temperature



Function:

In this operating mode, the relevant setpoint applies only to the selected HC (= unmixed circuit), MC 1 (= mixed circuit 1) or MC 2 (= mixed circuit 2)

Setting:



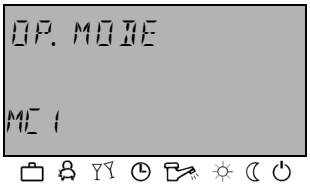
- Press key
- Select the desired heating circuit, HC, MC-1 or MC-2, using the rotary pushbutton
- Confirm the selected circuit by pressing the rotary pushbutton
- Set the flashing room temperature value by turning the rotary pushbutton to the desired value.
- Confirm set value by pressing or , press again: return to⟶ standard display
- Alternatively the value can be confirmed by automatic exit after the set time.

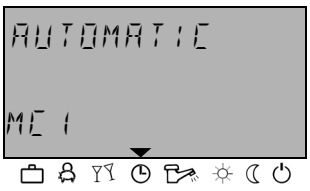
5.3.4.3.3 Separate Control Mode Operating Mode Selection

Function:

In separate operating mode, the selected program only applies to the previously specified heating circuit.
Hence each heating circuit can be assigned its own operating mode.

Setting:





- Press key
- Select the desired heating circuit, HC, MC-1, MC-2 or DHW using the rotary pushbutton
- Confirm the selected circuit by pressing the rotary pushbutton
- Set the flashing operating mode by turning the rotary pushbutton to the desired value.
- Confirm set value by pressing or .
- In short-term operating modes (Holiday, Absence, Party) set the desired target value by turning the rotary pushbutton and confirm the set value as described above.
- Alternatively the value can be confirmed by automatic exit after the set time.

5.3.4.4 Summer switch-off

Factory preset: 20°C

Setting range OFF, system frost protection ...30°C

Note: This function is only effective in operating mode automatic.

Function:

This parameter determines the end of the heating season based on the outside temperature.

When the summer switch-off mode is active, it is indicated on the basic display by a sunshade symbol.

5.3.4.5 Reset Parameter

With the Parameter RESET you can restore the factory settings in case of settings made by mistake in the parameter menus.

Caution: Reset is to be performed only if all the personalized set values are to be replaced by the factory settings!

Reset: With the reset indicator flashing (RESET) the reset-ready indicator (SET) will flash when the rotary-push button is pressed briefly.
A reset will be performed when the rotary-push button is pressed for approx. 5 seconds.

Once the parameter settings have been reset, the device will jump back to the first parameter on menu level SYSTEM.

5.3.5 DHW level

This level comprises all parameters which are necessary to program the DHW circuit with the exception of the operating time programs.

Notes: This level can only be accessed if in the level **Hydraulic** the Parameter 2 (DHW charging pump) was et to OFF by the heating specialist.

5.3.5.1 Hot water economy temperature

Factory preset: 40°C

Setting range: 5°C...set value DHW normal temperature () from V2.3 REV 03 to DHW maximum.

Function: This parameter determines the temperature in the domestic hot water heater between the heating cycles in automatic mode.

Note: If a DHW thermostat is used to determine the water heater temperature, this parameter is skipped.

5.3.5.2 Legionella protection day

Factory preset: OFF

Setting range: OFF, MO...SU, ALL

Setting values:

OFF: The legionella protection function is not active.

MO...SU: The legionella protection is activated on the selected weekday at the Llegionella protection time set by the heating specialist with a different parameter.

ALL: The legionella protection function is activated every day at the Legionella protection time.

Function:

This parameter serves to prevent a Legionella outbreak in the hot water tank and is activated on the selected weekday or every day at 02:00 hrs (time can be set using DHW parameter 03). If the DHW temperature is below 65°C, the hot water tank is reloaded. The legionella protection function is activated for 1 hour.

Note: If a DHW thermostat is used to determine the water heater temperature, this parameter is skipped.

5.3.6 Unmixed Circuit / Mixed Circuit 1 / Mixed Circuit 2 Menu

This level comprises all parameters which are necessary to program the heating circuits with the exception of the time programs. A maximum of 1 unmixed circuit and 2 mixed circuits (mixed circuit 1 and mixed circuit 2) are available per controller as heating circuits.

The heating circuit parameters described below are available for each heating circuit and are to be set separately.

5.3.6.1 Reduced Mode

Access code: No access restriction

Factory preset: ECO

Setting range ECO, RED

Function:

During reduced mode you can choose between two operating modes:

Setting values:

RED reduced mode

The direct heating circuit's heating circuit pump remains active during reduced mode (see Switching Time Program). The flow temperature is determined by the relevant reduced heating characteristic according to the decreased room setpoint. The set minimum temperature will be maintained.

Application: Buildings with low insulation values and high heat losses.

ECO switch-off mode

During reduced mode the direct heating circuit is completely switched off if the outside temperature exceeds the set frost protection limit. The heat generator minimum temperature limit is deactivated. The heating circuit pump is switched off with a short delay in order to avoid a safety switch-off owing to the post heating of the heat generator (extended pump running time).

If the outside temperature falls below the specified frost protection limit, the controller switches from switch-off mode (ECO) to reduced mode (RED) and the heating circuit temperature is adjusted according to the set reduced setpoint considering the low limit of the heat generator.

Application: Buildings with high insulation values.

Caution: The mode set here also applies to the short operating modes ***ABSENCE*** and ***RED.HEATING***

5.3.6.2 Heating system

Access code: No access restriction

Factory setting: 1.30 (Radiator systems) for direct circuit
1.10 (Floor heating systems) for mixed circuits

Setting range: 1.00...10.00

Function:

This parameter refers to the type of heating system (floor, radiator, convector heating) and can be compared to the exponent of the relevant heat exchanger. The setting determines the curvature of the heating characteristic of the direct heating circuit and compensates the performance losses at low temperatures by means of its progressive characteristic.

Depending on the type of heating system the following settings are recommended:

1.10 Slightly progressive heating characteristic for floor or other panel heating systems.

1.30 Progressive standard characteristic for all radiator heating systems with m-values comprised between 1.25 and 1.35.

2.00 Progressive heating characteristic for convector and baseboard heating systems

>3.00 Very progressive heating characteristic curves for general ventilator application with high start temperatures.

5.3.6.3 Heating circuit name

Access code: No access restriction

Factory preset: empty

Setting range: 00000 ... ZZZZZ

Function:

The maximum of three heating circuits available on a controller are given the standard abbreviations HC (heating circuit), MC1 (mixed heating circuit 1) and MC2 (mixed heating circuit 2). Thus the heating circuits are clearly named.

In order to enable the end customer to assign the heating circuits easily in the domestic environment, each of these three heating circuits can be give an individual 5-digit short designation.

Operation: By using the setting "empty", no individual name is assigned. The default abbreviated name appears.

- Every flashing digit can be modified with the rotary knob according to the code number and confirmed by pressing the knob once. The further digits are treated in same way.
- The individual heating circuit name display appears
  - in the menu
  - in the paramater tree
  - in the info level

5.4 Malfunction messages

The controller is equipped with an extensive built-in alarm reporting logic, which displays the type of alarm according to its priority.

The alarm messages alternate with the standard display as they appear. Several alarms occurring at the same time will appear one after the other in the temporal order in which they occur.

The heating technician is to be informed of any alarm message.

5.5 Parameter Settings

5.5.1 HYDRAULIC Level

PARAMETER	Designation	Factory settings	Setting range / Setting values		Cross reference
02	DHW charging pump output (Type ..B..)	**1**	OFF	No function	
			1	DHW charging pump	8-46
			4	DHW circulation pump	8-51
			5	DHW electrical heating element	8-52
03	Mixing circuit 1 (MC1) output (Type ..3..)	**3**	OFF	No function	
			2	Direct circuit (outdoor temp. contr.)	8-28
			3	Mixed circuit (outdoor temp. contr.)	8-28
			6	Constant temp. contr.	8-71
			7	Fixed value contr.	8-72
			8	Raising return temp.	8-13
			40	Constant control cooling	8-71
04	Mixing circuit 2 (MC1) output (Type ..3.3..)	**3**	Setting range and assignment see parameter 03		
05	Direct circuit 1 (HC) output	**2**	OFF	No function	
			2	Direct circuit pump	8-28
			4	DHW circulation pump	8-51
			5	DHW electrical heating element	8-52
			6	Constant control	8-71
			10	Feed pump	8-51
			11	Boiler circuit pump 1	8-12
			12	Boiler circuit pump 2	8-12
			13	Alarm output	8-73
			14	Timer	8-74
			15	Solar charging pump (..VV..)	8-53
			21	Parall. H-GEN enable	8-13
			25	Changeover HP cooling active CHCA (..HP..)	8-25
			27	Hydraulic buffer release	8-70
			41	HC changeover heating/cooling	8-75
			42	Heat source pump MHS (..HP..)	8-23
			43	Condenser pump CP (..HP..)	8-24
			44	Changeover HP cooling passive CHCP (..HP..)	8-27
06/07	Function assignment of variable outputs 1-2	**OFF**	OFF	No function	
			4	DHW circulation pump	8-51
			5	DHW electrical heating element	8-52
			9	Return pump	8-13
			10	Feed pump	8-51
			11	Boiler circuit pump 1	8-12
			12	Boiler circuit pump 2	8-12
			13	Alarm output	8-73
			15	Solar charging pump	8-53
			16	Buffer charging pump	8-57
			17	Solid fuel boiler pump	8-68
			19	Solar changeover charging valve	8-56
			20	Solar forced heat removal	8-56
			21	Parall. H-GEN enable	8-13
			25	Changeover HP cooling active CHC (..HP..)	8-25
			26	Priority pump	8-12
			27	Hydraulic buffer release	8-70
			41	HC changeover heating/cooling	8-75
			42	Heat source pump MHS (..HP..)	8-23
			43	Condenser pump CP (..HP..)	8-24
			44	Changeover HP cooling passive CHCP (..HP..)	8-27

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
08	Function assignment of variable inputs 1-3)	**OFF**	OFF No function 1 Outdoor sensor 2 2 Heat generator sensor 2 3 DHW tank sensor 2 4 Buffer sensor 2 5 Demand contact 6 External alarm input 7 Return flow sensor 1 (RS1) 8 Return flow sensor 2 (RS2) 9 Return flow sensor (RS) 10 External blocking (heat generator) 11 External switching modem 12 External information 13 Common flow sensor 14 Solar panel return sensor 16 Flue gas sensor 18 Solid fuel buffer sensor 19 Buffer sensor 1 33 EW/EVU block (..HP..) 34 Return flow sensor HPRS (..HP..) 35 Heat source sensor HSS (..HP..) 36 Alarm HP (HPS) (..HP..)	 7-1 8-15 8-46 8-57 8-72 8-73 8-13 8-13 8-13 8-16 8-74 8-75 8-16 8-53 8-10 8-68 8-57 8-27 8-22 8-23 12-6
09	Variable input 2 (..VV..)	**OFF**	Setting range and assignment see parameter 08 without parameter 16 (flue gas sensor)	
10	Variable input 3 (.. VV..)	**OFF**	Setting range and assignment see parameter 08 without parameter 16 (flue gas sensor)	
11	Indirect raising of return temperature via mixing valve	**OFF**	OFF, ON (only Type ..3.., ..33..)	8-15
13	Activation cooling buffer	**OFF**	OFF/ON (..HP..)	8-65

5.5.2 SYSTEM level

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
LANGUAGE	Language selection	**DE**	DE, GB, FR, IT, NL, ES, PT, HU, CZ, PL, RO, RU, TR, SE, NE, BG	5-30
TIME PROGRAM	Number of enabled time programs	**P1**	P1 Only one time program enabled P1-P3 Three time programs enabled	5-30
CONTROL MODE	Enabling of separate control mode setting (room temp. specific. and operat. modes)	**1**	1 Common setting for all Heating circuits 2 Separate setting for every individual heating circuit	5-31
SUMMER	Limit temperature for summer switch-off	**20 °C**	OFF no function System frost protection...30°C Switch-off at set value	7-3
05	System frost protection	**3 °C**	OFF no function -20...Summer switch-off Frost protection at set value	7-4
06	Heat requiring contact at VE 1 (variable input)	**1**	1 Unmixed circuit 2 Mixed circuit 1 3 Mixed circuit 2 4 DHW ALL All circuits	8-72 8-74
07	Heat requiring contact at VE-2 (Type .. VV..)	**1**	Settings see parameter 06	
08	Heat requiring contact at VE-3 (Type .. VV..)	**1**	Settings see parameter 06	
09	Climate zone	**-12 °C**	-20...0°C	7-2
10	Building type	**2**	1 light construction 2 medium construction 3 heavy construction	7-1
11	Time for automatic exit	**2 min**	OFF No automatic exit 0.5...5 min Automatic return to standard after set time	5-18
12	Pump and mix valve forced operation (Anti-blocking protection)	**ON**	ON active OFF not active	7-6
13	Logical malfunction messages	**OFF**	OFF no display EIN Display active	12-4
14	Automatic Set-Function	**OFF**	OFF automat. sensor recognition deactivated ON automat. sensor recognition activated	12-1
15*	Locking code for heating specialist	**1234**	OFF (0000) no lock ON (0001...9999) locked	5-17
16*	Type code	**Type**	Controller type according to type code table	6-6
18	Release cycle temperature	**ON**	OFF cycle temperatures blocked ON cycle temperatures enabled	6-2
19	Frost protection mode	**OFF**	OFF permafrost protection according to adjustment in Parameter 05 – system frost protection 0.5...60 min Cycle operation	7-7
21*	RTC-adjustment	**0 s**	-10 ... -1, 0, 1 ... 10 s	12-7
23	Anti-blocking for protection	**OFF**	OFF (0000) no lock ON (0001...9999) locked	5-17

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
24	Temperature display in °Fahrenheit	**OFF**	OFF display in °C and K ON display in °F	6-6
27**	System handling alarm messages boilercontrol	**OFF**	1 Shown on display only 2 Message from interlocks into the system 3 Message from interlocks and blockages into the system 4 Message from interlocks, blockages and warnings into the system	
28	Malfunction message memory 2	**OFF**	OFF, ON	
29*	Curve for emergency mode without OS	**0 °C**	-50...30 °C	
RESET	Reset to factory preset		in dependence on access code only to released parameters	

* only OEM
** Function dependent on support from boiler control system

5.5.3 Domestic hot water (Type ..B..) level

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
HOT WATER NIGHT	Hot water economy temperature	**40 °C**	5 °C ... Hot water maximum temperature	8-46
LEGION. DAY	Day for legionella protection	**OFF**	OFF No legionella protection Mo...Su Legionella protection on the specified weekday ALL daily legionella protection	8-46
03	Time for legionella protection	**02:00**	00:00...23:00 hour	8-46
04	Temperature for legionella protection	**65°C** **..HP..:** **50°C**	10 °C ... DHW maximum temperature	8-46
05	Type of DHW temperature measurement	**1**	1 DHW temperature sensor 2 DHW temperature controller (thermostat)	8-46
06	DHW-temperature limit	**65°C** **..HP..:** **50°C**	20 °C ... Maximum boiler temperature	8-46
07	DHW operating mode	**2**	1 Parallel mode 2 Priority mode 3 Conditional priority 4 Weather responsive parallel mode 5 Priority mode with intermediate heating 6 Priority-separation circuit 7 External operation	8-46
08	DHW tank discharge protection	**ON** **..HP..:** **OFF**	OFF - No discharge protection ON - Discharge protection activated	8-46

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
09	Boiler parallel shift during DHW charging	**15 K**	0 ... 50 K; Difference between DHW charging temperature and DHW setpoint	8-46
10	DHW switching differential	**5 K**	2 ... 20 K; Amount of DHW switching differential, symmetrical to the DHW setpoint	8-46
11	DHW charging pump extended running time	**5 min**	0 ... 60 min	8-46
12	Time programm circulation pump	**AUTO**	AUTO - Active DHW time program 1 - P1, direct circuit 2 - P2, direct circuit 3 - P3, direct circuit 4 - P1, mixed circuit 1 5 - P2, mixed circuit 1 6 - P3, mixed circuit 1 7 - P1, mixed circuit 2 8 - P2, mixed circuit 2 9 - P3, mixed circuit 2 10 - P1, DHW circuit 11 - P2, DHW circuit 12 - P3, DHW circuit	8-51
13	Economy intervall - cir. pump (no pulse period)	**5 min**	0 min ... Setting parameter 14; time of circulation pump stop)	8-51
14	Economy intervall - cir. pump (Period duration)	**20 min**	1... 60 min Duration = shutdown time + operating time	8-51
17	Behaviour of heat generator during extended run time	**AUTO**	AUTO - Setpoint value to H-GEN as required OFF - H-GEN off	

5.5.4 Selection level unmixed circuit / mixing circuit 1 / mixing circuit 2

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
RED. HEATING	Type of reduced mode	**ECO**	ECO - Switch-off mode (frost protection) RED - Reduced mode	8-29
HEAT. SYSTEM	Heating system (exponent)	**HC =1,30** **MC =1.10**	1.00 ... 10.00	8-30
03	Room influence (with room unit)	**OFF**	OFF Room sensor deactivated 1 Room sensor enabled 2 Room sensor enabled, operation for remote unit disabled 3 only display mode (room temp.)	8-34
04	Room factor	**OFF**	OFF, 10 ... 500 %, RC (only room control)	8-35
05	Adaptation heating curve	**OFF**	OFF, ON	8-36
06	Switch-ON optimization	**OFF**	OFF, 1 ... 16 h	8-38
07	Heating limit	**OFF**	OFF, 0.5..0.40 K	8-41
08	Room frost protection limit	**10 °C**	5 ... 30 °C	8-37
09	Room thermostat function	**OFF**	OFF, 0.5 ... 5 K	8-37
10	Outdoor sensor assignment (only if VI n = OS 2)	**0**	0 Control to mean value of OS 1 + OS 2 1 Control to OS 1 2 Control to OS 2	7-2
11	Constant temperature setpoint	**20 °C**	7... 105 °C (only if output has been set at constant (CC) or fixed value control (FC) or constant control cooling (CCC)	8-71
12	Minimum temperature limit	**20 °C**	5 °C ... HC_{max}	8-15
13	Maximum temperature limit	**75 °C** **..HP..:** **55 °C**	Minimum temperature limit (Parameter 12) ... Setting value maximum temperature limit heat generator	8-15
14	Heating circuit parallel shift	**HC=0** **MC=4** **..HP..:** **MC=0**	-5 ... 20 K	8-31
15	Extended pump running time	**5 min**	0 ... 60 min	8-31
16	Screed function (profile drying) (With direct HC only if the relevant circuit is enabled exclusively)	**OFF**	OFF Function switched off 1 Function heating 2 Occupation suitable heating 3 Function and occupation suitable heating	8-31
18*	P-band Xp	**5.0**	1 ... 50 %/K	8-39
19*	Sampling time Ta	**20**	1 ... 600 s	8-39
20*	I-band Tn	**180**	1 ... 600 s	8-39
21*	Actuator running time (only mixer circuits)	**120**	10 ... 600 s	8-39
22*	Limit stops function actuator	**2**	1 Continuous actuator signal at limit stop 2 Actuator signal suppressed at limit stop (Actuator de-energized)	8-39
23**	P-band room control	**8**	1...100 %/K	8-36
24**	I-band Tn room control	**35**	5...240 min.	8-36
25	Operating mode Holiday	**STBY**	STBY, RED	
50	Switch-on point cooling, OT	**OFF**	OFF, 15 ... 45 °C	8-41
51	Cooling max. point, OT	**35 °C**	15 ... 45 °C	8-41

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
52	Cooling FT setpoint temperature heating circuit at switch-on point	**18 °C**	7 ... 30°C	8-41
53	Cooling FT setpoint temperature heating at max. point	**24 °C**	7 ... 30 °C	8-41
54	Cooling room setpoint temperature heating circuit at switch-on point	**23 °C**	15 ... 30°C	8-41
55	Cooling room setpoint temperature heating at max. point	**28 °C**	15 ... 30 °C	8-41 5-2
56*	Min. temp. cooling (lower limit)	**18 °C**	7 ... 24 °C	8-41
HC NAME	Heating circuit name	**empty**	00000 ... ZZZZZ	

* only OEM

** only if remote unit is room controller (PARAMETER 04 = RC)

5.5.5 Heat generator level (..2.., ..22..)

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Heat generator type	**1**	OFF without heat generator 1 Oil/Gas 1 stage (..2..) 2 Oil/Gas 2 stage (..22..) 3 Oil/Gas 2 x 1 stage (..22..) 4 variable burner 5 Boiler control units (..C../..OT..)	
02**	Start-up protection H-GEN	**1**	OFF no start-up protection 1 Start-up protection on minimum limit 2 Start-up protection on outdoor reference 3 Separate start-up protection	8-1
03**	Minimum temperature limit H-GEN	**38 °C**	5 °C ... Maximum temperature limit	8-2
04**	Maximum temperature limit H-GEN	**80 °C**	Setting range: Minimum limit H-GEN ... OEM maximum limit	8-3
05**	Heat generator minimum temperature limiting mode	**1**	1 Minimum temperature limit at heat demand 2 Restricted minimum temp. limit 3 Unrestricted minimum temp. limit	8-2
06**	Heat generator sensor mode	**1**	1 Burner switch off in case of defect 2 External burner switch off 3 Burner enabling in case of defect !!!Consider warnings!!!	8-3
07**	Minimum burner run time	**2 min**	0 ... 20 min	8-4
08**	Burner switching differential I (SD I)	**6 K**	1-stage: 2 ... 30 K 2-stage: 2 ... (SDII - 0.5K)	8-3
09**	Burner switching differential II (SD II) (..22..)	**8 K**	(SD I + 0.5 K) ... 30 K	8-4
10**	Time delay stage 2 (..22..)	**0**	0 ... 60 min (0 = 10 Sec)	8-4
11**	Enabling mode stage II (..22..)	**2**	1 Unlimited enabling during start-up release 2 Delay during start-up release	8-4

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
12**	DHW charging mode 1- or 2-stage (..22..)	**1**	1 unlimited DHW charging stage 2 2 unlimited DHW charging stage 2 3 DHW charging with stage 1 only	8-4
13**	Flow time boiler circuit pump/ parall. heat generator release	**2 min**	0 ... 10 min	8-12
14**	Extended run time boiler circuit pump	**2 min**	0 ... 60 min	8-12
15**	Extended run time feed pump or primary pump	**2 min**	0 ... 60 min	8-11
16**	Flue gas temperature monitoring	**OFF**	OFF only displays flue gas temperature 0...60 min Heat generator locking in case of exceeding limit for the set time SLT Heat generator locking in case of exceeding limit	8-10
17**	Flue gas temperature limit	**200°C**	50 ... 500 °C	8-10
19*	Modulation P-band Xp	**5 %/K**	0.1...50 %/K	
20*	Modulation sample time Ta	**20 s**	1...600 s	
21*	Modulation reset time Tn	**180 s/°C**	1...600 s/°C	
22*	Modulation running time	**12 s**	5...600 s	8-8
23*	Modulation starting time	**60 s**	0...900 s	8-8
24*	Modulation starting load	**70%**	0...100 %	8-8
25	Outdoor temp. locking	**OFF**	OFF, -20...+30 °C	8-4
26	Basic load parallel shift (only when used in cascade mode)	**10 K**	0...60 K	10-3
27**	Heat circuits minimum temperature limit	**36 °C**	5 °C...BT_{min} (only if start up release is separated - Parameter 02 = 3)	8-2
28**	Switching difference minimum temperature limit heating circuits	**4 K**	2 K...20 K (only if start-up release is separated - Parameter 02 = 3)	8-2
29	H-GEN forced discharge	**OFF**	Off no function 1 Into DHW tank 2 Into heating circuits 3 Discharge in buffer tank	8-19
30*	OEM maximum temperature limit	**110 °C**	Minimum temperature limit ... 110 °C	8-3
31*	Minimal load control	**OFF**	OFF, 1...10 min	
34**	Heating power limiting	**100%**	50 ... 50 ... 100%	
35**	Hot water power limiting	**100%**	50 ... 100%	
37	Operating hours counter	**AUTO**	OFF AUTO 1 feedback only 2 free counter	8-20
38	Enable DHW cascade operation	**ON**	OFF On cascade H-GEN, disabled for DHW charging mode ON On cascade H-GEN, enabled for DHW	10-8
39	Emergency mode temperature heat generator	**65 °C**	OFF, BT_{min} ... BT_{max}	10-10
RESET ST-1	Reset oper. hours / starts stage 1	**-**	SET	8-20
RESET ST-2	Reset oper. hours / starts stage 2	**-**	SET	8-20

* only OEM

** Settings available depend up the type of intelligent boiler control or are preset according to the limit values of the boiler control system.

5.5.6 Heat pump temperature level (..HP..).

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Heat generator type	**6**	OFF without heat generator 6 Heat pump one-stage 7 Heat pump two-stage 8 Heat pump 2xone-stage (sensor optional) 9 Modulating heat pump 10 Modulating heat pump + 1-stage H-GEN	
02	Start-up protection H-GEN	**OFF**	OFF no start-up protection 1 absolute start-up protection 2 weather-guided start-up protection	8-1
03	Heat generator minimum temperature limit	**6 °C**	5 °C ... Maximum temperature limit	8-2
05	Limit mode minimum temperature limit H-GEN	**1**	1 Requirement-specific minimum limit 2 Restricted minimum temp. limit	8-2
06*	H-GEN sensor mode	**1**	1 H-GEN switch-off in case of defect 2 External H-GEN switch-off 3 H-GEN switch-off in case of defect !!!Consider warnings!!!	8-3
07	Minimum running time I	**1 min**	0 ... 60 min	8-4
08	HP switching difference I	**6 K**	One-stage: 2 ... 30 K Two-stage: 2 ... (SDII - 0.5K)	8-3
09	HP switching difference I	**8 K**	(SD I + 0.5 K) ... 30 K	8-4
10	Time delay stage II	**30 min**	0 ... 60 min (0 = 10 sec)	8-4
11	Enabling mode stage II	**2**	1 Unlimited enabling during start-up release 2 Delay during start-up release	8-4
12	DHW charging mode 1-2-stage	**1**	1 two-stage DHW charging with delayed full load stage 2 two-stage unlimited DHW charging 3 DHW charging with stage 1 only 4 DHW charging only with second stage	8-4
13	Flow time heat generator pump / condenser pump (previously BCP)	**1 min**	0 ... 10 min	8-24
14	Extended run time heat generator pump / condenser pump (previously BCP)	**2 min**	0 ... 10 min	8-24
15	Extended run time feed pump / primary pump	**2 min**	0 ... 60 min	8-11
19*	Modulation P-band Xp	**5%/K**	0.1 ... 50%/K	
20*	Modulation sample time Ta	**20 sec**	1 ... 600 sec	
21*	Module Reset time Tn	**180 sec/ °C**	1 ... 600 sec/°C	
22	Modulation running time	**12 sec**	5 ... 600 sec	8-8
23	Modulation starting time	**60 sec**	0 ... 900 sec	8-8
24	Modulation starting load	**70%**	0 ... 100 %	8-8
25	Outdoor temperature lock I	**OFF**	OFF, -20 ... +30°C	8-6
26	Basic load excess (cascade)	**6 K**	0 ... 60 K	10-3
27	Minimum temperature limit heating circuit	**36 °C**	5 °C...BT_{min} (only if start up release is separated - Parameter 02 = 3)	8-2
28	Switching difference minimum temperature limit heating circuit	**4 K**	2 K...20 K (only if start-up release is separated - Parameter 02 = 3)	8-2
29	H-GEN forced discharge	**OFF**	Off no function 1 Into DHW tank 2 Into heating circuits 3 Discharge in buffer tank	8-19

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
30*	OEM maximum temperature limit	**95 °C**	Minimum temperature limit ... 110 °C	8-3
36	Outdoor temperature lock II	**OFF**	OFF, -20 ... 30 °C	8-6
37	Operating hours counter	**AUTO**	OFF AUTO 1 feedback only 2 free counter	8-20
38	Enable DHW cascade operation	**ON**	OFF, ON	10-8
39	Emergency mode temperature heat generator	**45 °C**	OFF, BT_{min} ... BT_{max}	10-10
40	Minimum switch-off time heat generator I (..W..)	**10 min**	0 ... 60 min	8-20
41	Maximum temperature limit H-GEN I	**50 °C**	Minimum temperature limit ... 95 °C	8-20
42	Outdoor temperature lock I (Bivalence alternative point)	**OFF**	OFF, -20 ... 30°C	8-20
43	Minimum run time II	**0 min**	0 ... 60 min	8-20
44	Minimum switch-off time heat generator II	**10 min**	0 ... 60 min	8-20
45	Maximum temperature limit H-GEN II	**50 °C**	Minimum temperature limit ... OEM max.	8-20
46-FOLD	Outdoor temperature lock II (Bivalence parallel point)	**OFF**	1 OFF, -20 ... 30 °C	8-20
47-FOLD	HP-stage 1	**1**	1, 2	8-21
48-FOLD	Stage reversal time	**OFF**	2 OFF, 1 ... 250 h	8-21
49-FOLD	EVU lock stage II	**ON**	3 OFF, ON	8-27
50-FOLD	Cooling loading mode (only on H-GEN Type 7 = HP two-stage)	**1**	1 one-stage cooling 2 two-stage cooling with delayed 2nd stage	8-26
51-FOLD	Cooling lock period stage II	**30 min**	0 ... 60 min	8-26
52-FOLD	Heat generator priority	**1**	1 Prio1=DHW, Prio2=HC-heat, Prio3=HC-cool 2 Prio1=HC-cool, Prio2=DHW, Prio3=HC-heat 3 Prio2=DHW, Prio2=HC-cool, Prio3=HC-heat	8-22
53-FOLD	Minimum run time operating mode	**5 min**	0 ... 60 min	8-23
54-FOLD	Switching differential cooling mode ($H\text{-}GEN_{cool\text{-}SD}$)	**4 K**	1K ... 10K under setpoint temperature H-GEN	8-26
55-FOLD	Return flow minimum limit	**45 °C**	OFF, 5 ... 70°C	8-25
56-FOLD	Return flow maximum limit	**45 °C**	OFF, 5 ... 70 °C	8-25
57-FOLD	Switch-off time H-GEN during WEW changeover	**2 min**	OFF, 0 ... 60 min	8-25
58-FOLD	Flow time heat source pump MHS	**2 min**	0 ... 10 min	8-23
59-FOLD	Extended run time heat source pump MHS	**2 min**	0 ... 10 min	8-23
60-FOLD	Heat source minimum temperature	**5 °C**	-20 ... 50°C	8-23
61-FOLD	Heat source maximum temperature	**20 °C**	-10 ... 50°C	8-23
62-FOLD	CP-release during DHW charging	**ON**	OFF: CP during DHW charging OFF ON: CP during DHW charging in operatin	8-25

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
H-GEN RESET ST-1	Reset counter HP starts and operating hours stage 1			8-20
H-GEN RESET ST-2	Reset counter HP starts and operating hours stage 2			8-20

* only OEM

5.5.7 Raising Return Temperature Level

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Return flow limiting setpoint	**20 °C**	10 ... 95 °C	8-13
02	Switch-off differential	**2 K**	1 ... 20 K (only if RP in operation)	8-13
03	Extended pump run time	**1 min**	0 ... 60 min (only if RP in operation)	8-13

5.5.8 Solar Level (..VV..)

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Switch-on difference	**10 K**	(Switch-off difference + 3 K) ... 30 K	8-53
02	Switch-off difference	**5 K**	2 K ... (Switch-on differential -3 K)	8-53
03	Minimum run time SOP	**3 min**	0 ... 60 min	8-53
04	Maximum temperature limit of solar panel	**120 °C**	Setting range: 70 ... 210 °C	8-53
05	Solar storage cistern max. temp. limit	**75 °C**	20 ... 110 °C	8-53
06	Solar operating mode	**2**	1 Priority mode 2 Parallel mode 3 Priority mode DHW (nominal value control) 4 Priority mode buffer (nominal value control)	8-53
07	Inhibition heat generator	**OFF**	OFF, 0.5 ... 24 h (Only in priority mode - Parameter 6 = 1, 3, 4)	8-53
08	Sol. Prior./parallel mode	**OFF**	OFF, 1...30 K (only in priority mode and act. inhibition)	8-53
09	Solar energy balance	**OFF**	OFF no heat balancing 1 Balance via flow calculation 2 Balance via pulse processing	8-53
RESET SOLAR	Reset solar energy balance	**-**	Reset: SET by pushing the rotary push-button (only if solar heat balance is enabled)	8-53
11	Volume flow	**0.0 l/Min**	0.0 ... 30 l/min or l/impulse (only if solar heat balance is enabled)	8-53
12	Fluid density	**1.05 kg/l**	0.8 ... 1.2 kg/l (only if solar heat balance is enabled)	8-53

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
13	Fluid heat capacity	**3.6 KJ/ kgK**	2.0 ... 5.0 KJ/kgK (only if solar heat balance is enabled)	8-53
14	Final switch-off temperature	**150°C**	OFF, 90... 210 °C	8-53
15	Test cycle solar load switch	**10 min**	1...60 min	8-53
16	Switch-over temperature	**75°C**	20...110°C	8-53

5.5.9 Solid Fuel Level (..VV..)

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Minimum temperature	**60 °C**	20 ... 80 °C	8-68
02	Maximum temperature	**90 °C**	30 ... 100 °C	8-68
03	Switch-on difference	**10 K**	(Switch-off difference + 3K) ... 20 K	8-68
04	Switch-off difference	**5 K**	2 K ... (Switch-on differential -3 K)	8-68
05	Inhibition heat generator	**OFF**	OFF, 2...180 min	8-68

5.5.10 Buffer Level (..VV..)

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Minimum temperature buffer	**20 °C**	5 °C ... Maximum temperature buffer	8-57
02	Maximum temperature buffer	**80 °C**	Minimum temperature buffer ... 95 °C	8-57
03	Excess temperature H-GEN	**8 K**	-10 ... 80 K	8-57
04	Switching differential	**2 K**	1 ... 70 K	8-57
05	Forced heat dissipation	**OFF**	OFF 1 Into DHW tank 2 Into heating circuits	8-57
06	Drain function switch-on differential	**10 K**	(Switch-off difference + 2 K) ... 30 K	8-57
07	Drain function Switch-off differential	**50 K**	OFF (Switch-off differential + 2 K) ... 50 K	8-57
08	Buffer start-up protection	**ON**	OFF no start-up protection ON Start-up protection active	8-57
09	Buffer discharge protection	**ON**	OFF no discharge protection ON Discharge protection enabled	8-57
10	Buffer operating mode	**1**	1 Charging control for HC and DHW 2 Charging control for HC without DHW 3 Discharging control for HC and DHW 4 Discharging control HC without DHW 5 Charging control (change over to DHW) 6 Discharging control (to heat generator)	8-57
11	Buffer loading pump extended run time	**0 min.**	0 ... 60 min.	

5.5.11 Buffer-cool level (..HP..).

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01-FOLD	Maximum temperature cooling buffer	**30 °C**	5...40°C	8-65
02-FOLD	Switching differential cooling buffer (CB_{SD})	**4 K**	1 ... 20K	8-65
03-FOLD	H-GEN offset (CB_{offset})	**6 K**	0 ... 30K	8-65
04-FOLD	Constant cooling buffer setpoint ($CCB_{setp.}$)	**OFF**	OFF, 5 ... 25°C	8-65
05-FOLD	Start-up protection cooling buffer	**ON**	OFF, ON	8-65

5.5.12 Summation flow control

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	P-band Xp SFS control	**5%/K**	0.0 ... 50.0 %/K	8-16
02	Sample time Ta SFS control	**20 sec**	1 ... 600 sec	8-16
03	I-band Tn SFS control	**180 sec**	1 ... 600 sec	8-16

5.5.13 Cascade level

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Switching differential	**8 K**	0.5...30.0 K	10-1
02	Switch-on delay	**0 min**	0...200 min	10-1
03	Switch-off delay	**0 min**	0...60 min	10-1
04	Switch-over power stage sequence	**65%**	10...100%	10-1
05	Reverse boiler sequence	**OFF**	OFF, 1...240 h	10-1
06	Leading stage	**1**	1...n (switchable stages)	10-1
07	Peak load boiler from adress...	**OFF**	OFF 2...(max.stages) all heat generators in cascade numbered	10-1
08	Changeover basis power at group formation	**OFF**	OFF no changeover ON changeover	10-1
09	Hot water quick activation	**OFF**	OFF 1...maximum number of stages	

5.5.14 Bus level

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Bus address basic unit	**10**	10, 20, 30, 40, 50	9-1
02	Bus access room unit HC	**2**	1 Advanced access (owner status) 2 Simple access (Tenant status)	9-6
03	Bus access room unit MC1	**2**	1 Advanced access (owner status) 2 Simple access (Tenant status)	9-6
04	Bus access room unit MC2	**2**	1 Advanced access (owner status) 2 Simple access (Tenant status)	9-6

5.5.15 Operation of additional modules (e.g. WEBcontrol)

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
See documentation add-on module				

5.5.16 Relay test level

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Heat generator test	**OFF**	Different relay sequence according to type of boiler (one or tow level)	12-3
02	Direct heating circuit pump test	**OFF**	OFF-ON-OFF -...	12-3
03	Mixing circuit pump 1 test	**OFF**	OFF-ON-OFF -...	12-3
04	Mixer actuator 1 test	**STOP**	STOP-OPEN-STOP-CLOSED-STOP...	12-3
05	Mixing circuit pump 2 test	**OFF**	OFF-ON-OFF -...	12-3
06	Mixer actuator 2 test	**STOP**	STOP-OPEN-STOP-CLOSED-STOP...	12-3
07	DHW charging pump test	**OFF**	OFF-ON-OFF -...	12-3
08	Variable output 1 test	**OFF**	OFF-ON-OFF -...	12-3
09	Variable output 2 test	**OFF**	OFF-ON-OFF -...	12-3

5.5.17 Alarm level

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Alarm message 1		Last alarm message	12-4
02	Alarm message 2		Next to last alarm message	12-4
...	...		...	12-4

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
20	Alarm message 20		First alarm message	12-4
PARA RESET*	Resets the error message memory		First alarm message	12-4

* only OEM

5.5.18 Alarm level 2 (..C..)**

PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Alarm message 1		Last alarm message	12-4
02	Alarm message 2		Next to last alarm message	12-4
...	...		...	12-4
20	Alarm message 20		First alarm message	12-4
PARA RESET*	Resets the error message memory		First alarm message	12-4

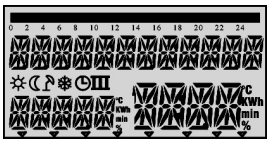
* only OEM
**only in connection with H-GEN interface and SYSTEM parameter 28=ON

5.5.19 Sensor calibration level

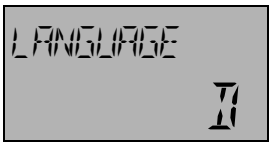
PARAMETER	Designation	Factory settings	Setting range / Setting values	Cross reference
01	Outdoor sensor		- 5 K ... + 5 K	12-8
02	Heat generator sensor		- 5 K ... + 5 K	12-8
03	Domestic hot water sensor		- 5 K ... + 5 K	12-8
04	Flow sensor mixing circuit 1		- 5 K ... + 5 K	12-8
05	Flow sensor mixing circuit 2		- 5 K ... + 5 K	12-8
06	Solar panel sensor		- 5 K ... + 5 K	12-8
07	Solar buffer sensor		- 5 K ... + 5 K	12-8
08	Variable input 1 (VI 3)		- 5 K ... + 5 K	12-8
09	Variable input 2 (VI 3)		- 5 K ... + 5 K	12-8
10	Variable input 3 (VI 3)		- 5 K ... + 5 K	12-8

6 General functions

6.1 Starting up

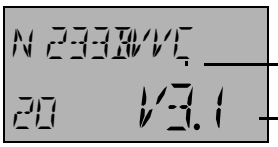


During the first switch-on of the control unit or at return of voltage after power failure all available display segments will appear temporarily:



Next, the desired language (DE, GB, FR, IT, NL, ES, PT, HU, CZ, PL, RO, RU, TR, SE, NE, BG) can be selected.

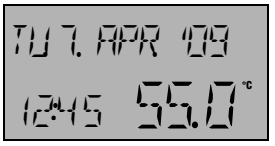
The display only appears on the day of commissioning.



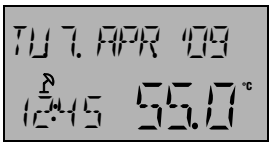
After that, device identification follows:

Device type

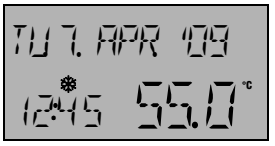
Maxcode and version number



Provided that there is not any error message, the basic display with date, time and current boiler temperature will appear in the display.



An active summer switch-off is represented by a sunshade symbol (⛱)



With acting frost protection function an ice crystal symbol appears in the display (❄).

6.2 Controller configuration

6.2.1 Complete reset

To reset all settings, the device can be reset completely.

Press the , , and keys simultaneously until the controller boots again.

6.2.2 Basic settings and parameter preselection

⚠ CAUTION The setting options deacribed below affect the operation. After the adaptation, the end user must be informed about the changed operation.

6.2.2.1 Switching Time Program Enabling

Description: This controller family has three separate switching time programs for each heating circuit.

When supplied, only one switching time program is enabled. The use of only a single switching time program for a wide range of applications makes it possible to simplify operating.

Operation:

Note on operation	Key / parameter tree	Parameter
Time programming	TIMEPROGRAMS	
Enabling separate programs	SYSTEM	PROGRAM

6.2.2.2 Suppressing the cycle temperature on Time program level

When programming switching times, the specialist can set a system parameter to suppress the cycle temperature.

Function: If the setting is "ON", the operation is not changed. If the setting is "OFF", the following reaction occurs:

- All cycle temperatures are suppressed during switching time programming
- Any offset will not affect the set temperature to be corrected
- All connected room devices react identically to parameter changes in the central device

Operation:

Note on operation	Key / parameter tree	Parameter
Time program cycle temperature	SYSTEM	PARAMETER 10

6.2.2.3 Eanbling separate operating modes and temperature changes

Description: In order to make the operation as easy as possible for most of the applications, a common control mode is set for all heating circuits when supplied. For those rare cases in which separate control modes are necessary (e. g. in case of separate control mode selection for tenants and landlords) it must be enabled by means of the "Control Mode" parameter in the "System" menu.

Effect: This parameter determines the control mode and affects the

- **Operating mode selected with the operating mode key**
- **Daytime temperature selected with the temperature selection key**
- **Night-time temperature selected with the temperature selection key**

concerning the effect on the different heating circuits.

Operation:

Note on operation	Key / parameter tree	Parameter
Effect on operating mode selection		
Effect on daytime temperature selection		
Effect on night-time temperature selection		
Enabling separate settings	SYSTEM	CONTROL MODE

6.2.2.4 Variable adaptation of hydraulic parameters (variable inputs and outputs)

The hydraulic settings preselected via the parameter hydraulic selection for the variable inputs and outputs can be adapted individually. To this end, the preselected hydraulic parameters can be changed individually.

This enables hydraulics, which are not covered by the automatic factory settings, to be realized.

⚠ **Caution** **The plant is defined by the hydraulic parameter. A change can have profound effects on the operation of the controller. Preselected parameter settings can be lost at other locations.**

Therefore, individual adaptations must be carried out carefully!

Description: Only the inputs and outputs in the hydraulic level which can be accessed via the controller are available for these settings.

The **setting** of the hydraulic parameter determines the **function** of the corresponding output.

Example: PARAMETER 05 determines the output for the unmixed circuit pump. The factory presetting for this output is HC.

If this output is assigned the function "circulation pump", the function HC is no longer available.

The **operation of a function** is only possible, if the corresponding function is also available hydraulically.

Example: The parameter for the setting of the circulation pump function is only available after the function "circulation pump", for example, is assigned to the output HC.

If a variable function **requires** an **input value** (sensor) then it is assigned to the corresponding variable input. Afterwards, this input can not be changed manually.

If settings were already assigned to the corresponding input, these will be replaced and the corresponding functions will be reset.

Example: A second outdoor sensor has been assigned to variable input 1. Then the function "buffer charging pump" is assigned to variable output 1. The variable input is initially reset automatically (AF 2 is no longer active). Subsequently, the buffer sensor is assigned to it, this is required for the correction.

Connections and settings table:

No.	Function	Adjustable at output	Inputs		Notes
			Assigned permanently	Optional (VI1/2)	
1	DHW charging	SOL-P	DHWS	---	Fixed sensor input
2	Unmixed circuit, weather controlled	HC-P, MC1, MC2	---	---	
3	Mixed circuit, weather controlled	MC1, MC2	VF1, VF2	---	Fixed sensor input for corresponding mixed circuit
4	DHW circulation pump	SOL-P, HC-P, VO1, VO2	---	---	
5	DHW electrical heating element	SOL-P, HC-P, VO1, VO2	---	---	
6	Constant control	HC-P, MC1, MC2	VF1, VF2	---	Sensor at connection to MC
7	Fixed value control	MC1, MC2	VF1, VF2	---	Sensor at connection to MC
8	Raising return temp.	MC1, MC2	VF1, VF2	---	
9	Return pump (..VV..)	VO1, VO2	RS	---	
10	Feed pump	HC-P, VO1, VO2	---	---	
11	Boiler circuit pump 1	HC-P, VO1, VO2	---	---	
12	Boiler circuit pump 2	HC-P, VO1, VO2	---	---	
13	Alarm output	HC-P, VO1, VO2	---	---	
14	Timer	HC-P	---	---	
15	Solar charging pump (Type ..VV..)	HC-P, VO1, VO2	SPFS, SPBU	SPRS (14)	Return flow sensor option
16	Buffer charging pump (..VV..)	VO1, VO2	BU	BU1 (19)	If BULP is set, BU is assigned to VI permanently. Otherwise, BU1 can be set at a free VI (activation of buffer management)
17	Solid fuel boiler pump (..VV..)	VO1, VO2	BOSF	BUSF (18)	BOSF fixed on corresponding VI, standard buffer sensor is SBUS, own solid fuel buffer sensor BUSF can be configured (option)
18	DHW shift charging pump (..F..)	VO1, VO2	SCP	---	
19	Solar charge valve	VO1, VO2	SSLS	----	SSLS in DHW tank, SBUS in buffer. Only when solar is activated.
20	Solar forced heat removal	VO1, VO2	---	---	Only when solar is activated.
21	Parallel H-GEN release	HC-P, VO1, VO2	---	---	
26	Primary pump	VO1,VO2	---	---	
27	Hydraulic buffer release	HC-P, VO1, VO2	---	---	

Operation:

Note on operation	Key / parameter tree	Parameter
Function of DHW charging pump	HYDRAULIC	PARAMETER 02
Function mixed circuit 1	HYDRAULIC	PARAMETER 03
Function mixed circuit 2	HYDRAULIC	PARAMETER 04
Function direct circuit pump	HYDRAULIC	PARAMETER 05
Function variable output 1	HYDRAULIC	PARAMETER 06
Function variable output 2	HYDRAULIC	PARAMETER 07
Function variable input 1	HYDRAULIC	PARAMETER 08
Function variable input 2	HYDRAULIC	PARAMETER 09
Function variable input 3	HYDRAULIC	PARAMETER 10

6.2.2.5 Temperature display in Fahrenheit

Apart from the °C (Celsius) temperature scale, the °F (Fahrenheit) scale is common in the UK and North America. The conversion formula is:

$$T[°F] = \frac{T[°C] * 9}{5} + 32$$

Every device in the control system can be switched separately to temperature display in °F. The control system as such continues to operate in °C. The conversion to °F only acts on the displayed temperatures.

The temperature display is in full degrees only (no decimals).

Operation:

Note on operation	Key / parameter tree	Parameter
Activate Fahrenheit display	SYSTEM	PARAMETER 24

6.2.2.6 Controller type code

Function:

The controller series THETA offers the option of reducing the scope of service of the supplied device. The scope of service set in the factory is based on the controller type (see overview on page 1).

The setting options in the following table are accessible via a parameter. After the functionality is reduced, the controller functions according to the set controller type designation.

After the type code is changed, the standard unit is reset automatically. Subsequently, the device functions according to the changed type code.

Example: Controller THETA NORM 233BVVC

The controller has inputs and outputs for a single stage or fuel value heat generator (..2.. and ..C..), via two mixed circuits (..33..), DHW circuit (..B..) and inputs and outputs for variable functions (..VV..).

The following type codes can be set according to this "hardware":
1, 2, 3, 6, 7, 8, 11, 12, 13, 16, 17, 18, 21, 22

Operation:

Note on operation	Key / parameter tree	Parameter
Type code	SYSTEM	PARAMETER 16

	Meaning	C	VI1	VI2	VI3	Distr. heat.	Stage 2	Burner	HC-P	MC1	MC2	SOL-P	VO1	VO2
Type code	Device type													
1	2B		X	X	X			X	X			X		
2	23B		X	X	X			X	X	X		X		
3	233B		X	X	X			X	X	X	X	X		
4	223B		X	X	X		X	X	X	X		X		
5	2233B		X	X	X		X	X	X	X	X	X		
6	2BC	X	X	X	X			X	X			X		
7	23BC	X	X	X	X			X	X	X		X		
8	233BC	X	X	X	X			X	X	X	X	X		
9	223BC	X	X	X	X		X	X	X	X		X		
10	2233BC	X	X	X	X		X	X	X	X	X	X		
11	2BVV		X	X	X			X	X			X	X	X
12	23BVV		X	X	X			X	X	X		X	X	X
13	233BVV		X	X	X			X	X	X	X	X	X	X
14	223BVV		X	X	X		X	X	X	X		X	X	X
15	2233BVV		X	X	X		X	X	X	X	X	X	X	X
16	2BVVC	X	X	X	X			X	X			X	X	X
17	23BVVC	X	X	X	X			X	X	X		X	X	X
18	233BVVC	X	X	X	X			X	X	X	X	X	X	X
19	223BVVC	X	X	X	X		X	X	X	X		X	X	X
20	2233BVVC	X	X	X	X		X	X	X	X	X	X	X	X
21	3		X	X	X					X				
22	33		X	X	X					X	X			
23	F23B		X	X	X	X			X	X		X	X	X
24	F23BVV		X	X	X	X			X	X		X	X	X

7 General controller functions

7.1 Outside Temperature Measurement

7.1.1 Determination of long-time value and mean value

Function: Three values are used to calculate the effect of the outside temperature on the heating behavior of the plant.

Current outside temperature:
Value of sensor at time of measurement

Long-time value outside temperature:

- Is required for summer switch-off and for mean value
- Is the mean value of the outside temperature during the time period set for the building type
- Every 20 minutes, a new, current value is entered into the mean value calculation

Mean value outside temperature:

- Is required for the calculation of the required flow temperature of the heating circuits
- Is the mathematical mean value of the current outside temperature and the long-time value

7.1.2 Building type

Function: This parameter considers the building type by adapting the calculation of the outside temperature mean value according to the setting.

Light construction The mean value is obtained over a period of 6 hours.
Application: *wooden houses, lightweight brick buildings*

Medium construction The mean value is obtained over a period of 24 hours.
Application: *medium-weight masonry with hollow blocks or bricks*

Heavy construction The mean value is obtained over a period of 72 hours.
Application: *heavy masonry in tuff or natural stone*

Operation:

Note on operation	Key / parameter tree	Parameter
Setting building type	SYSTEM	PARAMETER 10

7.1.3 Heating Circuit Outside Temperature Assignment (Outdoor Sensor 2)

Note: Function active only when using a second outdoor sensor!

Function: If a second outdoor sensor (OS2) is connected to a vari-able input in the central unit, the heating circuit can be assigned either to external sensor 1, 2 or to the mean value of both sensors.

The following applies to each external sensor:
In case of a defect of one of the sensors, there is an automatic switchover to the remaining outdoor sensor and a simultaneous malfunction message. In case of a defect affecting both sensors, the heating circuit is regulated on the basis of a set heating curve and heating program corre-sponding to a fictitious external temperature of 0 °C with regard to the set minimum temperature.

Operation:

Note on operation	Key / parameter tree	Parameter
Set to AF 2	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10
Assignment unmixed circuit	UNMIXED CIRCUIT	PARAMETER 10
Assignment mixed circuit 1	MIXVALVE- 1	PARAMETER 10
Assignment mixed circuit 2	MIXVALVE- 2	PARAMETER 10

7.1.4 Alternative connection of the outdoor sensor to the boiler control (..C..)

Function: Condensing boilers with boiler controls have a connection for an outdoor sensor. For more information, see "Features of fuel value heat generator via data bus (..C..)", Page 8-17.

7.2 Climate zone

Function: The climate zone is the coldest outside temperature value to be expected.

For the heat demand coverage, this value is used as the basis for the design of the heating system

This parameter defines the corresponding steepness value of the heating curve of the heating circuit with regard to the set climate zone.

Operation:

Note on operation	Key / parameter tree	Parameter
Set climate zone	SYSTEM	PARAMETER 09

7.3 Summer switch-off

Note: This function is only effective in operating mode Automatic.

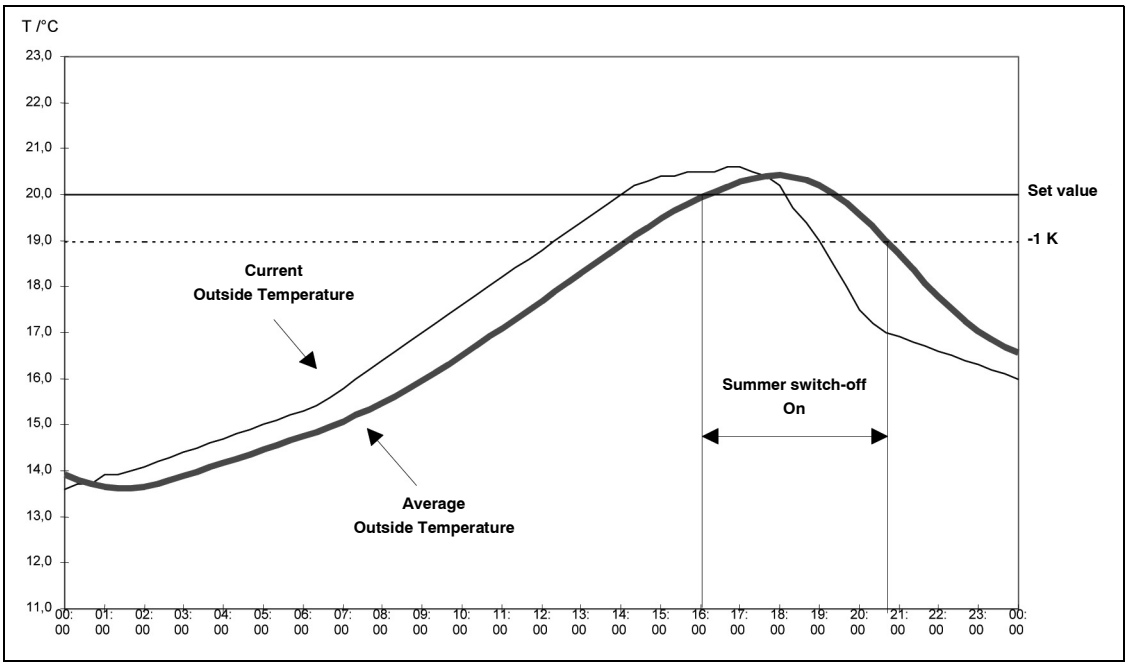
Function: Switches off the heating operation at outside temperatures above the set outside temperature.

Switch-off

- if the long-term outdoor temperature value (made up of the current OT+ mean OT and building type) exceeds the setting value.

Deactivating the switch-off

- if the long-term outdoor temperature value (made up of the current OT+ mean OT and building type) exceeds the setting value by 1K.
- in case of an outdoor sensor fault
- when frost protection is active



The summer switch-off function is deactivated:
A - In case of an external sensor defect
B - In case of active frost protection

Note: The HEATING LIMIT parameter can be used to assist the summer switch-off function during the transitional seasons (see selection levels unmixed circuit, mixed circuit 1 or mixed circuit 2 - Parameter 7). This function allows setting non-heating periods on warm days during the transitional seasons for each individual heating circuit.

Note: In conjunction with a 2nd outdoor sensor, in accordance with the outdoor sensor assignment, the following summer switch-off is in place:

HC parameter 10 = 0:

- Switch-off is performed when on **both OS** the long-term outdoor temperature exceeds the setting value.
- Switch-off is deactivated when the long-term outdoor temperature value on **both OS** drops elow the setting value by 1 K.

HC parameter 10 = 1

- Switch-off is performed when on **OS1** the long-term outdoor temperature value exceeds the setting value.
- The switch-off is deactivated when the long-term outdoor temperature value on **OS1** drops below the setting value by 1 K.

HC parameter 10 = 2

- Switch-off is performed when on **OS2** the long-term outdoor temperature value exceeds the setting value.
- The switch-off is deactivated when the long-term outdoor temperature value on **OS2** drops below the setting value by 1 K.

When the summer switch-off mode is active, it is indicated on the basic display by a sunshade symbol. If two outdoor sensors are connected and these are assigned to different heating circuits, the symbol is only displayed if both sensors fulfil the conditions for summer switch-off.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting limit temperature	SYSTEM	SUMMER

7.4 System Frost Protection

Function: To keep the heating system from freezing in switch-off mode, the controller is equipped with electronic frost protection.

Operation without Room Temperature Measurement

If the outside temperature (current value) drops below the set limit, the heat-ing is turned on again. The heating is interrupted if the outside temperature exceeds the set limit by 1 K.

Operation with Room Temperature Measurement

If the room temperature is above the room setpoint, the heating circuit pumps activate at outside temperatures below the set freezing limit. In operating modes STANDBY and HOLIDAY, the mixed circuits regulate the respective minimum heating circuit temperature. In all other operating modes, regulation is performed in line with OS and room temperature.

When operating using an active RS, the room frost protection is also active.

Note: If not every heating circuit is operated with room temperature measurement, different frost protection functions can be assigned to the individual heating circuits. If, for example, a mixed circuit is operated with room temperature measurement and the boiler heating circuit is not, the latter's heating curve and room temperature setpoint are to be set as low as possible.

In connection with a 2nd outdoor sensor, the frost protection function is acti-vated, as soon as one of the two outside temperatures drops below the frost protection limit.

In case of a faulty outdoor sensor, the frost protection is constantly activated.

⚠ CAUTION In connection with a room sensor, the thermostat function is not active with active frost protection.

Cycle Operation

The frost protection function is activated as soon as the temperature drops below the set frost protection limit (SYSTEM-PARAMETER 5), in the same way as before. The frost protection function becomes effective when frost protection is active and there is no request from the heating circuit.

- With the frost protection setting "Cycle operation", there is no continuous request for the heat generator, in contrast to continu-ous operation.
- With active system frost protection, the heating circuit pumps are switched on and the mixer valves closed.
- As long as the measured flow temperature of the mixed circuits or the heat generator temperature in the direct heating circuit, re-spectively, does not drop below the current set room tempera-ture (RT_{Frost} or RT_{Night}), no demand value is sent to the heat generator.
- When the flow temperature drops below the set value, heating is activated.
- Once the set flow temperature has reached the set room temperature and the set time (SYSTEM-PARAMETER 19) has expired, the demand value to the heat generator is retracted and the mixer valve closes while the pumps continue operation.
- If no measurements are detected from the outdoor sensor (e.g. because the sensor is defective), only the pumps are switched on while heat-ing is disabled.
- The set minimum and maximum limits are taken into account in heating operation.
- When the heat generator is activated, the set start-up protection conditions of the heat generator are applied. This means that the heating circuit pumps may be switched off temporarily.

Operation:

Note on operation	Key / parameter tree	Parameter
System frost protection	SYSTEM	PARAMETER 05
Frost protection cycle operation	SYSTEM	PARAMETER 19

Frost protection function in case of heat generator fault

If system error message 30-3 or 31-3 occurs (e.g. switch-on failure of the burner(s) due to fuel shortage or burner malfunction), priority pump switch-off functions such as boiler start-up protection, hot-water priority etc. are dis-abled if frost protection is active. The heating water circulated in the heating circuits adopts the overall mean room temperature and reduces or delays any freezing.

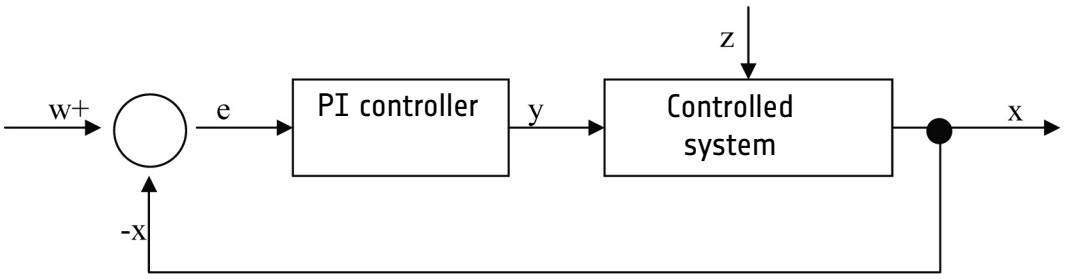
7.5 Pump and mix valve forced operation (Anti-blocking protection)

Function: With this function activated all the pumps are switched on every day for approx. 20 seconds to protect against blocking owing to corrosion in case of long switch-off periods (> 24h) and the mixers are opened temporarily during this period. This is the case during summer switch-off, for example. The pump and mix valve forced operation is performed 24h after the last deactivation.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation forced pump operation	SYSTEM	PARAMETER 12

7.6 PI control algorithm



PI controller: Is the section of the control circuit which performs the corrective measures for regulating, taking into account the dynamic properties of the controlled system from the deviation.

Controlled system: Is the section of the control circuit which is to be regulated by the controller.

Setpoint w: Preset value at which the control variable is to be held by the controller. It is an external variable which cannot be influenced by the controller.

Actual value x: Is the output variable from the controlled system, which is recorded for regulating and fed back for comparison.

Control deviation e: Difference between setpoint variable and actual variable e = w-x, forms the actual input variable for the controller.

Correcting value y: Output variable of the controller and also the input variable of the controlled system. It transfers the controlling effect of the controller to the system.

Disturbance variable z: An external variable which causes the actual value of the control variable to change and triggers a control procedure.

The controller is a combination of a P controller and an I controller. The P band (proportional band Xp) has an immediate reaction to an abrupt changed to the difference between the setpoint value and the actual value. The I band is for exact regulation of the setpoint value and actual value.

Parameterisation: There are three influential parameters for the PI controller:
Xp = proportional band of the controller
Ta = sample time of the controller
Tn = adjustment time of the controller

The proportional band of the PI control algorithm is set directly by the Xp.

The integral band is a result of the ratio $Ki = Xp\frac{Ta}{Tn}$ (Ki = Integral band).

8 Hydraulic components and their functions

8.1 Heat Generator: Boiler

8.1.1 Heat Generator Start-up Protection (..2.., ..22.., ..C..)

Start-up protection prevents the deposit of condensate during heating up.

H-GEN

Start-up protection: There are three different modes of start-up protection that can be set:

Unlimited start-up protection

When the temperature in the heat generator drops to 2 K below the set minimum limit, all heating circuits are separated, at the water side, from the heat generator (pumps off, mixing valves closed) to pass through the dew point as quickly as possible. The heating circuits are enabled as soon as the temperature in the heat generator has reached the minimum limit plus half of the burner switching differential 1.

Weather-dependent start-up protection

The heating-up characteristic is the same as for unlimited start-up protection, meaning the heat generator remains in operation until the set minimum temperature plus half of burner switching differential is crossed. Below the minimum temperature the pumps remain switched off and the mixing valves closed.

Once the heat generator has been switched off, the start-up protection becomes active again only when the boiler temperature drops below the weather-responsive demand value (acc. to heating curve setting).

The subsequent heating-up follows the same scheme as for unlimited start-up protection.

Separate start-up protection for H-GEN and heating circuits

This function allows separating the temperatures for switching on the burner and switching off the heating circuit when the boiler temperature falls below the boiler minimum temperature limit.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation of start-up protection	HEAT GENER	PARAMETER 02

8.1.2 Heat Generator Minimum Temperature Limit (..2.., ..22.., ..C..)

Function:

In order to protect the heat generator against agressive condensate the minimum temperature limit documented by the manufacturer of the heat generator is to be set.

The heat generator switches on when the temperature falls below the set value, while it switches off when the set value plus the burner switching differential is exceeded. During heating the limit temperature will be maintained

This setting is used only for the reaction of the heat generator (burner) to reaching the set minimum temperature ($BT_{min\ H\text{-}GEN}$). The function for the H-GEN remains unchanged.

The mode of operation of the set limit is defined via the heat generator parameter "H-GEN start-up protection".

Function

Minimum temperature limit H-GEN:

There are three different modes of operation for the minimum temperature limit:

Minimum temperature limit at heat requirement

If there is no demand from the heating or DHW, the boiler will be switched off. The minimum limit is deactivated. If the temperature in the heat generator drops below the heat generator frost protection temperature of +5°C, the burner will be switched on and the heat generator is heated to the minimum temperature limit.

Conditional minimum limit

The boiler minimum temperature serves as the lower limit value and is also maintained without demand. The boiler is only switched off when summer switch-off is activated.

Permanent minimum limit

The boiler temperature is limited according to the set minimum temperature regardless of the demand or the switched off operating mode.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting minimum temperature	HEAT GENER	PARAMETER 03
Function minimum temperature limit	HEAT GENER	PARAMETER 05

8.1.3 Heat circuits minimum temperature limit

- If the boiler temperature BT_{act} <= parameter 27 ($BT_{min\ HC}$) the heating circuit pumps (HC-P, SOL-P, MC-P) are switched off. The mixer valves are closed.
- If $BT_{act} > BT_{min\text{-}HC} + SD_{min\text{-}HC}$ (H-GEN parameter 28) the heating circuit pumps and mixer valves are enabled again.

8.1.4 Heat Generator Maximum Temperature Limit (..2.., ..22.., ..C..)

Function: In order to protect the heat generator against overheating, the controller is equipped with an electronic maximum temperature limit. It shuts off the burner if the temperature in the heat generator exceeds the limit value.

The burner is switched on again if the temperature in the heat generator falls below the limit value by half of the burner switching differential 1 plus a reserve of 2 K below the set limit value.

The setting range, which can be set by the installer, can be limited by an extra parameter (maximum top limit).

Operation:

Note on operation	Key / parameter tree	Parameter
Setting maximum temperature	HEAT GENER	PARAMETER 04
Maximum temperature limit	HEAT GENERATOR	PARAMETER 30

8.1.5 Heat Generator Sensor Mode (..2.., ..22..)

Function: There are various ways in which the heat generator can react to a malfunction of the H-GEN sensor:

Burner switch-off in case of a faulty H-GEN sensor

A message appears in case of a short circuit or the break of the sensor; the burner will be switched off.

External Burner switch off

In case of the interruption of the sensor the burner is switched off without a malfunction message. Application for example as external burner switch-off or enabling in case of the interruption of the H-GEN sensor.

Caution: Only Ag (hard silver), Au (gold) or Ni (nickel) are to be used for the contacts.

In case of a sensor short circuit a relevant malfunction message appears and the burner is blocked.

Burner enabling in case of a faulty H-GEN sensor

A message appears in case of a short circuit or the break of the sensor and the burner is enabled without limitations.

The control of the heat generator is carried out only manually by means of the mechanical boiler temperature controller (boiler thermostat) on the boiler panel according to the set value.

Caution: **Activating this setting is only permitted if an electromechanic boiler temperature controller is in series with the burner phase and the boiler temperature is limited by this BTC. Otherwise, there is the danger of boiler overheating.**

Operation:

Note on operation	Key / parameter tree	Parameter
Select sensor mode	HEAT GENER	PARAMETER 06

8.1.6 Minimum Burner Run Time (..2.., ..22..)

Function: This function extends the burner run times and reduces the standby losses. After starting the burner, at least the set time must lapse before the burner is deactivated again.

Note: If the temperature in the heat generator exceeds the set H-GEN maximum temperature limit, the minimum burner run time is stopped and the burner is switched off in advance.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting minimum burner run time	HEAT GENER	PARAMETER 07

8.1.7 Multi-stage Heat Generators / Switching Differential (..2.., ..22..)

Function: The controller is provided with two separately settable switching differentials related to the same setpoint.

Switching Differential I Switching differential I controls the required heat generator temperature according to the demand by switching on and off the required stage for the current heat demand within the set value. The switch-on and switch-off is carried out symmetrically to the setpoint with half the value of the switching differential.

Switching differential II

(..22..) Switching differential II determines how many stages are necessary to cover the current demand (partial load - stage I, full load - stage II). This switching differential is superimposed symmetrically to switching differential I and must always be set at a higher value.

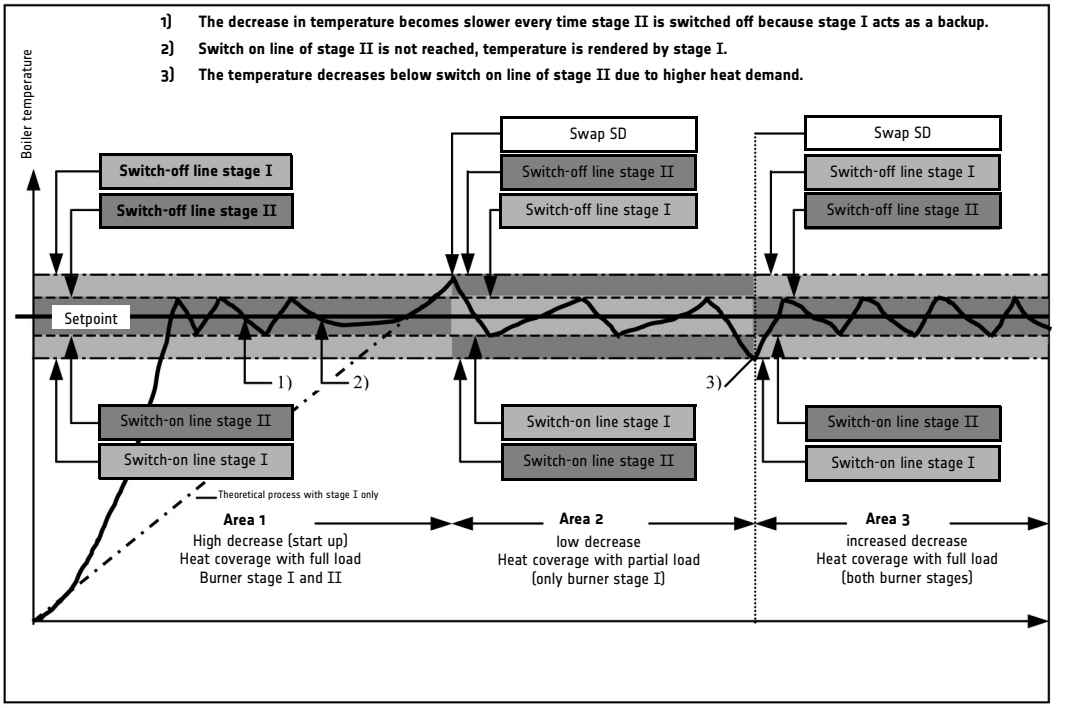
Note: This setting is overlapped by the cascade setting during cascade mode and is not available.

Function switching differential II

- If the H-GEN temperature is lower than switching differential II, stage I is switched on immediately. The enabling of stage II occurs after the time delay stage II.
- If the heat generator temperature reaches the required set point plus half the value of switching differential I, stage II is switched off.
- If the heat generator temperature is lower than the required set point minus half the value of switching differential I, stage II is switched on again.
- If the heat generator temperature exceeds the required set point plus half the value of switching differential I, stage II is switched off.

Cooperation in 2-stage heat generators:

- As long as one stage can cover the heat demand (stage II is off), stage I is switched according to switching differential I.
- As soon as the second stage is needed for covering the heat demand, switching differential I switches stage II on and off and switching differential II switches stage I on and off.



Time delay stage II

(..22..)

The enabling of stage II (full load stage) is determined not only by the switching differentials, but also by a time delay. This measure blocks the second stage within the set time and hence provides for a longer stage I run time. This function is active only during the start-up phase (i.e. during simultaneous request of both stages). If stage I is in basic load mode and stage II is in the control phase (residual heat coverage), the latter is switched on immediately for each request.

Note: **This setting is overlapped by the cascade setting during cascade mode and is not available.**

Enabling mode

Stage II (..22..)

The effect of a set stage II time delay can be modified during the start-up phase **below** the heat generator minimum temperature limit with the parameter "Enabling mode stage II.

Unlimited enabling during start-up release

During the start-up phase both stages operate without limitations.

Time out during start-up release

Stage II is switched on according to the set time delay.

Note: This setting is overlapped by the cascade setting during cascade mode and is not available.

WW Loading Mode

Stage II (..22..) By means of the "1 or 2-stage Domestic Hot Water Loading Mode" the loading mode for the hot water heater can be determined for 2 one stage or two-stage heat generators. The following options are available:

- 2-stage DHW loading with delayed enabling of stage II according to the stage II time delay.
- Unlimited two-stage DHW loading
- DHW loading with only stage I, stage II blocked
- DHW charging only with second stage (..HP..)
  A DHW request os only performed by the 2nd stage.
  During DHW charging, the 1st stage remains swichted off, regardless of DHW operating mode.

Note: This setting is overlapped by the cascade setting during cascade mode and is not available.

Outside temperature

block: If the current outdoor temperature exceeds the set temperature limit, all demands of one device to the heat generator are blocked. The heating circuits continue operation, but the heat generator will not be switched on. Preset minimum burner run times are fulfilled. Only when the outside temperature drops to the AT-disable level minus 2K, the heat generator is enabled again. If several heat generators are controlled though one device (condensing burners, 2-stage burners), all stages of the device will be disabled.

Note: If a fault occurs on a heat generator, all outside temperature blocks in the system are removed.

Basic load

offset: This setting becomes effective only if several heat generators are operated in cascade mode.

Burner stages operating as basic load are given a higher setpoint than the modulating stage, which is switched on last. This higher value is composed of the setpoint plus the set basic load offset. If several condensing boilers are switched through one control, the setting applies to every heat generator.

Heat generator

Reset: With 2-stage heat generators, the counters for operating hours and burner starts can be reset separately for stage 1 (ST- 1) and stage 2 (ST-2).

Reset: With the reset indicator flashing (RESET) the reset-ready indicator (SET) will flash when the rotary-push button is pressed briefly. A reset will be performed when the rotary-push button is pressed for approx. 5 seconds.

Once the parameter settings have been reset, the device will jump back to the first parameter on menu level HEAT GENER.

Operation:

Note on operation	Key / parameter tree	Parameter
..2.., ..22.., ..C..		
Selection of heat generator type (depends on controller type)	HEAT GENER	PARAMETER 01
Select sensor mode	HEAT GENER	PARAMETER 05
Outdoor temp. locking	HEAT GENER	PARAMETER 25
Basic load offset	HEAT GENER	PARAMETER 26
..2.., ..22..		
Switching differential I (not at H-GEN setting 5)	HEAT GENER	PARAMETER 08
Reset stage I	HEAT GENER	RESET ST-1
..22..		
Switching differential II (only for 2-stage H-GEN)	HEAT GENER	PARAMETER 09
Time delay stage II (only for 2-stage H-GEN)	HEAT GENER	PARAMETER 10
Enabling mode stage II (only for 2-stage H-GEN)	HEAT GENER	PARAMETER 11
DHW charging mode stage II (only for 2-stage H-GEN)	HEAT GENER	PARAMETER 12
Reset stage II	HEAT GENER	RESET ST-2

8.1.8 Switching for modulating burners

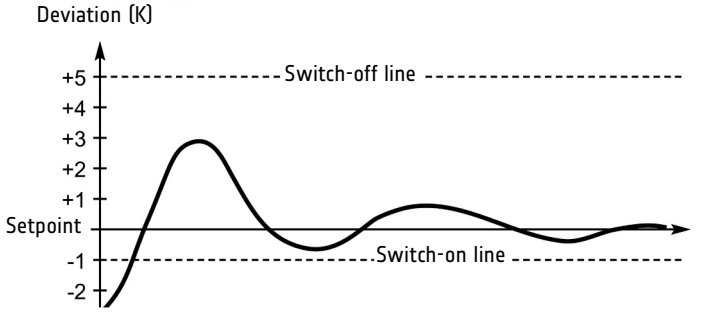
Modulating burners are controlled in a way similar, by a PI control algorithm, since in this case an actuator integrated in the burner regulates the air/fuel ratio according to the heating power. However, in contrast to the control of conventional burners, control of modulating burners is subject to the following criteria:

Switching differential

In contrast to conventional ON/OFF burner control systems with their switching differentials symmetrical around the respective setpoint, the switching differential for modulating burners is an asymmetric interval where the switch-on value is always 1K below the setpoint. This offers the advantage that, in case of a possible overshoot through the P-band, the burner is not switched off, because the switch-off point lies ***above*** the setpoint by a wider margin than the switch-on point is ***below*** the setpoint (overshoot reserve). Also, when the heat demand is low (especially in the low-load range) the temperature will drop only slightly because the burner is switched on again as soon as there is a deviation of more than 1 K.

Example:

Current setpoint = 50 K
Switching differential = 6 K
Switch-on at (50°C - 1K) = 49 °C
Switch-off at (49°C +6K) = 55°C



Activation of modulation

The modulating burner stage is activated when the heat generator temperature has dropped below the setpoint by more than 1K. The burner is enabled through the burner relay. As soon as the heat generator temperature exceeds the switch-off line, the burner is deactivated. In contrast to the mixer parameters.

Adjustment

Adjustment to the setpoint is realized through the conventional 2-point output (activating the burner) and an additional 3-point output for modulating the actuator in the burner. The control algorithm described in chapter 7.6 is used for the common flow control.

Control variables for this application:

Controlled system: The burner controlled by a 3-point output

Setwpoint w: Heat generator setpoint for the boiler

Actual value x: Boiler temperature on the boiler H-GEN/BS

Correcting variable: Action time OPEN or action time CLOSED for the 3-way actuator

In contrast to mixer control, no end position function is assigned to this actuator. The control mechanism is running continuously.

Minimum burner run time

Independent of temperature-related switch-off conditions, the burner is kept running for the duration of the set minimum burner run time.

Minimum and maximum temperature limits

The same functions as for conventional heat generators apply when the heat generator maximum temperature is exceeded or the heat generator minimum temperature is not reached.

8.1.8.1 Modulation running time

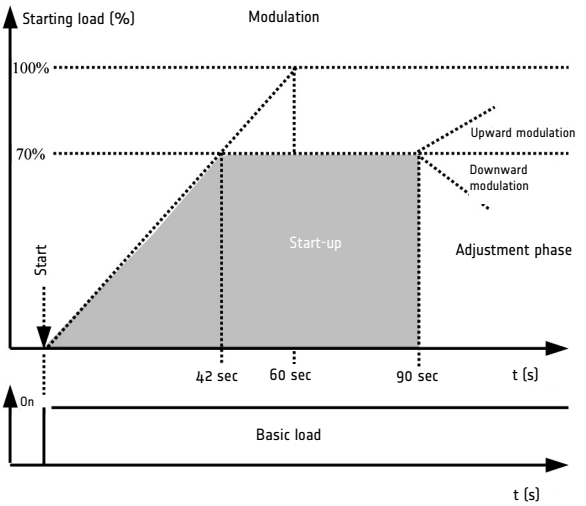
This function allows adjusting the actuator, with regard to its finite running time, to the control characteristics, meaning that actuators with different running times react to the same deviation by readjusting by the same amount through adapting the action times. The integral action time Tn remains unchanged in this. However, care must be taken that the latter must always exceed the running time of the respective actuator.

8.1.8.2 Modulation starting time

The starting time parameter determines the length of the start-up phase in modulation mode so that a stable start-up is ensured. As soon as the set starting time has expired, the modulation switches to its normal control characteristics defined by the modulation parameters.

8.1.8.3 Modulation starting load

The starting load parameter determines a percentage setting for a fraction of the modulation running time during the start-up phase. At a setting of 0%, the actuator valve remains closed continually during the start-up. As soon as the set starting time has expired, the modulation switches to its normal control characteristics defined by the modulation parameters.



Operation:

Note on operation	Key / parameter tree	Parameter
Modulation P-band Xp (%/K)	HEAT GENER	PARAMETER 19
Modulation sample time Ta	HEAT GENER	PARAMETER 20
Modulation I-band Tn (Reset time)	HEAT GENER	PARAMETER 21
Modulation running time actuator	HEAT GENER	PARAMETER 22
Modulation starting time	HEAT GENER	PARAMETER 23
Modulation starting load	HEAT GENER	PARAMETER 24

8.1.8.4 Connection

Connecting THETA UNIT

If installing the THETA UNIT type, connect as follows:

- Connection burner ON to T2 of burner 1 (see 13.2.3, connection 4)
- Connection modulation OPEN to T8 of burner 2 (see Chapter 13.2.3, connection 5)
- Connection modulation CLOSE to T7 of burner 2 (see Chapter 13.2.3, connection 5)

Connecting THETA NORM

If installing the THETA NORM type, connect as follows:

- Connection burner ON to connection of burner 1 (see Chapter 13.1.2, X3 - 1 and 2)
- Connection modulation OPEN to connection of burner 2 (see Chapter 13.1.2, X4 -17 and 18)
- Connection modulation CLOS to connection VO1 (see Chapter 13.1.2, X4 -10 and 12)
  !!! VO1 must be switched potential-free !!!

8.1.9 Control of communicating heat generators (H-GEN type 5)

When operating communicating heat generators of type 5 in combination with the common flow sensor, the setpoint for the heat generator from the standard deviation at the common flow sensor is calculated using a PI-algorithm.

The same PI-controller is used for this as for the adjustment in H-GEN type 4 (same parameters).

Operation:

Note on operation	Key / parameter tree	Parameter
Modulation P-band Xp (%/K)	HEAT GENER	PARAMETER 19
Modulation sample time Ta	HEAT GENER	PARAMETER 20
Modulation I-band Tn (Reset time)	HEAT GENER	PARAMETER 21

8.1.10 Flue Gas Temperature Monitoring

Note: A flue gas sensor can only be connected to the variable sensor input VI 1. Due to the high temperatures, a PT 1000-sensor is used. The evaluation of the deviating sensors compared to the standard sensors is carried out automatically by the controller.

Note: If a sensor error is detected while a flue gas sensor is active and a block was set for a limited time (safety function), an error message is sent and the heat generator is turned off.

Function: This function regulates the necessary measures when the permitted flue gas temperature is exceeded.

Displays only flue gas temperature

No function for control; the current flue gas temperature appears on the information display.

Heat generator locking in case of exceeding limit for the set time

If the limit value is exceeded, the heat generator is blocked for the set time and a malfunction message is triggered.

Heat generator blockage in case of exceeding limit

If the limit value is exceeded, the burner is blocked. The block can be deactivated by switching the controller off and on.

Flue Gas temperature limit: With the corresponding parameter the permitted limit for the flue gas temperature can be entered according to the default values of the heat generator manufacturer and serves as the reference value for the sequential functions described above.

Recommended Setting:

Nominal flue gas temperature as per manufacturer plus 10 ... 20 K.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation of the function	HYDRAULIC	PARAMETER 08
Effect of flue gas temperature monitoring	HEAT GENER	PARAMETER 16
Setting temperature flue gas temperature limit	HEAT GENER	PARAMETER 17

8.1.11 Charging pump (CHP)

Note: Function active only if the function "charging pump" was assigned in the "Hydraulic" menu to one of the outputs "Direct circuit pump", "Variable output 1" or "Variable output 2".

Function: For each heating and DHW demand a charging pump is active with the heat generator for the supply of the remote heat consumers.

Bus system: A charging pump with bus address 10 connected to the standard unit runs as soon as there is demand for the data bus (all heating and DHW circuits included).

A charging pump connected to an add-on controller (address 20, 30,...) only runs on demand by the heating circuits of the corresponding controller.

CHP extended running time: If there is no longer a demand to the heat generator the charging pump switches off with time delay in order to avoid a safety switch-off of the heat generator at high temperatures.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation of the function	HYDRAULIC	PARAMETER 05 PARAMETER 06 PARAMETER 07
Setting extended run time	HEAT GENER	PARAMETER 15

8.1.12 Primary pump (PP)

The primary pump is the functional equivalent of a CHP, with the following exceptions:

- Activation via V01 or 2 only
- DHW demand does not go to PP (charging pump only for heating circuits)
- The extended run time is the same as for CHP (same parameters)
- The PP must be connected to the standard unit with address 10 so that all heating circuit demands (even for multiple controllers) are detected.
- If connected to a subsequent controller, only demands by heating circuits of the corresponding controller are effective (see CHP).
- The PP operates in parallel mode in every DHW mode (no priority switch-off).
- The PP is only switched off if there is no demand by heating circuits.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation PP (type 26)	HYDRAULIC	PARAMETER 06 or PARAMETER 07

8.1.13 Boiler circuit pump

Note: Function active only if the function "Boiler circuit pump" was assigned in the "Hydraulic" menu to one of the outputs "Direct circuit pump", "Variable output 1" or "Variable output 2".

Function: This function is used primarily in multiple boiler plants with thermohydraulic distributors and serves as a waterside barrier for heat generators which are not in operation. The variable output controls a boiler circuit pump with spring non-return valve or an engine driven butterfly valve. The function is activated directly when there is a demand for the heat generator. The heat generator is only enabled after the set flow time. After the heat generator is turned off, the variable output is still active for the period of the set extended run time.

BCP2: Two boiler circuit pumps can be connected to plants with two single boilers or a double boiler. The second output controls the boiler circuit pump of the sequential boiler.

BCP flow time: The setting of a flow time is only relevant if a shut-off device (e.g. motorized valve) is used at a variable output instead of a boiler circuit pump.

By setting the flow time, the run time of the used shut-off device (motorized valve) is considered. The switch-on delay of the heat generator will ensure proper circulation inside the heat generator when the burner is switched on.

Actuators with a reversible motor must be operated by means of a slave relay with double throw contact (separated control phases L_{open}/L_{closed}).

BCP extended running time:

If there is no longer a demand to the heat generator the boiler circuit pump switches off with time delay in order to avoid a safety switch-off of the heat generator at high temperatures.

The extended run time depends on the type of heat generator and must be set accordingly.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation of the function	HYDRAULIC	PARAMETER 05 PARAMETER 06 PARAMETER 07
Flow time boiler circuit pump	HEAT GENER	PARAMETER 13
Extended run time boiler circuit pump	HEAT GENER	PARAMETER 14
Activation second boiler circuit pump	HYDRAULIC	PARAMETER 05 PARAMETER 06 PARAMETER 07
Assignment of second boiler sensor	HYDRAULIC	PARAMETER 08 PARAMETER 09 PARAMETER 10

Note: An external heat generator block influences the BCP output.

8.1.14 Parallel heat generator release (PHR)

Note: Function active only if the function "Parallel heat generator release" was assigned in the "Hydraulic" menu to one of the outputs "Direct circuit pump", "Variable output 1" or "Variable output 2".

Function: Regardless of a request to the heat generator, the output programmed accordingly (HC, VO-1, VO-2) is activated immediately when the burner relay is activated (no flow time). When the burner relay is deactivated the programmed output is switched off after a delay time. The switch-off duration depends on the setting of parameter 14 (extended run time) in the *Heat generator* menu.

NOTE: A parallel setting of boiler circuit pump and parallel heat generator release is allowed.

The temporary interruption (Solar/Solid fuel) and the external heat generator block influence the PHR output.

8.1.15 Return flow sensor, mixer circuit 1/2

The return flow sensors RS1 and RS2 affect the mixer heating circuits as actual value transmitters for the maximum return flow limit of the corresponding mixer heating circuits.

When a return flow sensor is activated, it is blocked for the other parameter.

The return flow limit closes the mixer valve when the measured return flow temperature exceeds the preset return flow target value.

8.1.16 Return control

To prevent the return flow temperature from dropping below the minimum return temperature required by some heat generators, the control system features various options for raising the return temperature. Once one of these return control options is active, a parameter tree is activated where the appropriate settings can be entered.

The parameter "Boiler return control" determines the lowest allowable return flow temperature for systems with direct or indirect return control. When the heat generator return temperature drops below the set limit, the respective return control device is activated and raises the return temperature until the set temperature is reached or exceeded.

8.1.16.1 Bypass pump (return pump) (..VV..)

Function: The return control with a bypass pump (RP) represents a simple method for a return temperature control.

If the return temperature of the heat generator falls below the set return low limit the bypass pump, which is installed parallel to the heat generator, is switched on for flow temperature addition.

If the return temperature increases above the setpoint plus switching differential, the bypass pump will be switched off after the time delay (extended run time) has elapsed. Because the mixing is not controlled, the diameters of the bypasses should be considered during construction.

Note: In order to avoid frequent switching of the bypass pump, the sensor should be mounted on the consumer side of the mixing point.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting bypass pump	HYDRAULIC	PARAMETER 06 PARAMETER 07
Return flow minimum limit	RETURN CONTR	PARAMETER 01
Switch-off difference	RETURN CONTR	PARAMETER 02
Extended pump run time	RETURN CONTR	PARAMETER 03

Note: With activation of the bypass pump (RP) to the V0, the return sensor is automatically assigned to the respective VI (e.g. V01 = RP → = VI1 = RS)

8.1.16.2 Return control through controlled flow mixing (..3..)

Function: If the control unit is equipped with a mixer output, this output can be programmed for controlled flow mixing.

In this mode of return control the programmed mixing circuit adjusts the return temperature to the return temperature setpoint. The return sensor for this function is connected at the sensor input of the respective mixing circuit (e.g. VF 1 for mixed circuit 1).

The mixing circuit operates like a boiler circuit pump without boiler start-up protection for this purpose (see Page 8-12).

Operation:

Note on operation	Key / parameter tree	Parameter
Setting controlled flow mixing	HYDRAULIC	PARAMETER 03 PARAMETER 04
Return flow minimum limit	RETURN CONTR	PARAMETER 01
Flow time boiler circuit pump	RETURN CONTR	PARAMETER 02
Extended run time boiler circuit pump	RETURN CONTR	PARAMETER 03

8.1.16.3 Indirect return control

Function:

Indirect return control is realized by means of the mixer valves in the heating circuits. It only works for heating systems without a bypass pump and without controlled flow mixing.

When this function is active, two values are calculated independently for regulating each mixing circuit. The first value is the control variable for the flow setpoint of the heating circuit; the second is the control variable for the return setpoint.

The control variable used for mixer control (mixer control variable) results from the superimposition of both values. In this the adjustment of the return temperature is treated with priority.

Indirect return control is only active with mixing circuits that are in heating operation as well. It does not affect a heating circuit in reduced operation.

To avoid excessive pulsing, we recommend enabling the connected consumers (heating and DHW circuits) with delayed switch-on times.

This function does not affect unmixed circuits.

Note:

Even if no return flow sensor is connected, a parameterised return flow temperature is transferred to the heat generator as a demand.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting of indirect return control	HYDRAULIC	PARAMETER 11
Return flow minimum limit	RETURN CONTR	PARAMETER 01
Flow time boiler circuit pump	RETURN CONTR	PARAMETER 02
Extended run time boiler circuit pump	RETURN CONTR	PARAMETER 03

8.1.17 When to activate boiler sensor 2

Function:

A second heat generator can be connected to a variable input (VI1-VI3) optionally. This is necessary:

- When using *two single stage heat generators*
  The second heat generator is required for monitoring the temperature in the second heat generator with two boilers or in two single stage heat generators (see heat generator parameters "Heat generator type").

- When using *two measuring points in the combustion chamber*
  In order to reduce standby losses by increasing the burner running times. The measured value of the warmer sensor (BS-1 or BS-2) is used as the trigger for switching on the heat generator. Charging stops according to the measured value of the colder sensor. The set heat generator parameters are still active.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation heat generator 2	HYDRAULIC	PARAMETER 08 PARAMETER 09 PARAMETER 10

8.1.18 External heat generator disable

Function: If the corresponding variable input has a short circuit because of a switching contact, the heat generator is switched off after all demands are blocked. The logical error monitoring is switched off. After the short circuit is repaired, the heat generator is enabled directly.
The H-GEN is not disabled if the H-GEN is currently running and has not reached the minimum temperature (+ ½ SD). The block is not applied until this value has been exceeded.

⚠ CAUTION This function is meant exclusively for external override signals and not for safety switch off of the heat generator!

Operation:

Note on operation	Key / parameter tree	Parameter
Activation of external boiler block	HYDRAULIC	PARAMETER 08 PARAMETER 09 PARAMETER 10

8.1.19 Adjustment of the heat generator according to the common flow temperature

common

flow sensor: The sensor connected to the variable input VI-1(2,3) registers the total flow temperature in thermohydraulic distributors or in the common flow.

The adjustment of the boiler temperature is no longer dependent on the measured boiler temperature, but on the common flow sensor. The boiler sensor keeps monitoring the minimum and maximum boiler temperature of the heat generator.

The reaction of the heat generator(s) to a deviation of the common flow setpoint temperature from the total flow actual temperature can be influenced by using a PI control algorithm.

The control algorithm described in chapter 7.6 is used for the common flow control.

Control variables for this application:

Controlled system: The heat generators in the cascade for generating the required temperature.

Setwpoint w: Common flow setpoint value of cascade

Actual value x: Common flow actual value on Sensor SFS

Correcting variable y: Change of the heat generator setpoint value of the regulating stage

Example:

Output values:

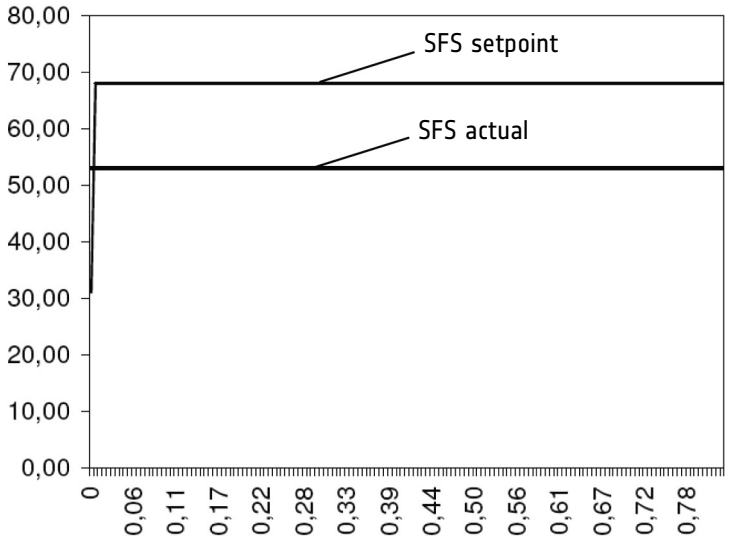
P band = 0.5 %/K

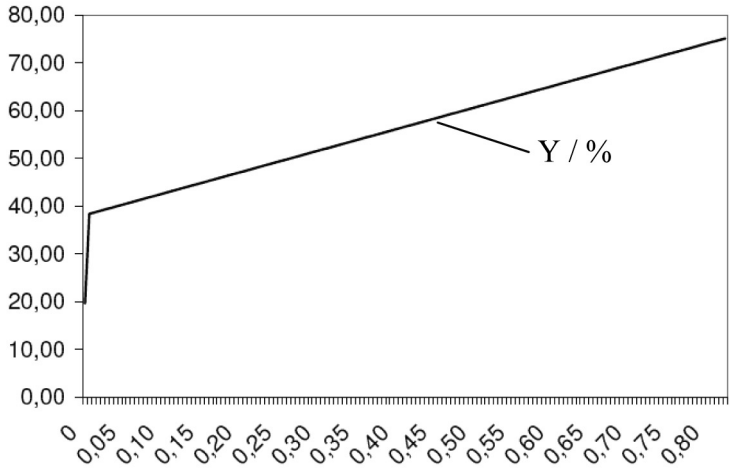
Sample time = 20 sec.

Adjustment time = 600 sec.

Common flow setpoint value (w) = 68°C

Common flow actual value (x) = 53°C





Operation:

Note on operation	Key / parameter tree	Parameter
Activation common flow sensor	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10

8.1.20 Features of fuel value heat generator via data bus (..C..)

8.1.20.1 DHW charging in boiler control

Due to the possibility of separate switching hysteresis settings for DHW on automatic boiler controls and the THETA, it is possible that the DHW charging mode will not end (remains stuck in DHW charging mode). When operating using automatic boiler controls, the switching differential is no longer adjustable; DHW charging is performed in accordance with the parameterisation of the automatic boiler control.

8.1.20.2 DHW operation in combined devices

If a combined device with a communicating automatic boiler control is connected to a controller (RSC, N/U), the display and operation of the DHW temperatures in the switching times is blocked because the setpoint cannot be set on the controller.

Note: The operation of a controller in combination with a boiler control is a special case. The MCBA boiler control has its own control, which adjusts the heat generator setpoint automatically. This way, the adjustment of the heat generator temperature by a superordinate controller is not necessary. The digital type of boiler control enables communication with the controller via an interface. The connection to the interface is on the back of the controller and is designated "HG-BUS".

Function: If the H-GEN bus RS485 is used, up to 8 condensing boilers with automatic boiler controls can be controlled from a basic unit. The different condensing boilers are recognised because of their separate addresses on the interface of the automatic boiler control.

Effective parameters heat generator:

PARAMETER	Designation:
01	Heat generator type
03	Heat generator minimum temperature limit
04	Maximum temperature limit H-GEN
05	Heat generator minimum temperature limiting mode
25	Outdoor temp. locking
26	Basic load offset
29	H-GEN forced discharge
30	OEM maximum temperature limit
	Reset statistics 1

Effective parameters via boiler control for unmixed circuit:

PARAMETER	Designation:
RED. HEATING	Type of reduced mode
HEAT. SYSTEM	Heating system (exponent)
03	Room influence (with room unit)
04	Room factor
06	Switch-ON optimization
08	Room frost protection limit
09	Room thermostat function
10	Heating circuit outside temperature
11	Constant temperature setpoint
12	Minimum temperature limit
13	Maximum temperature limit
14	Heating circuit parallel shift
15	Extended pump running time
17	Return flow maximum temperature limit (not for unmixed circuit)

Effective parameters via boiler control for hot water operation:

PARAMETER	Designation:
DHW NIGHT	Hot water economy temperature
LEGION.PROT. DAY	Day for legionella-protection
03	Time for legionella protection
04	Temperature for legionella protection
06	DHW maximum temperature limit

All other necessary settings are done at the boiler control. A boiler frost protection function is not activated by the controller. This is done independently by the boiler control.

Sensor connection: Condensing boilers with communicating boiler controls have a connection for an outdoor and hot water tank sensor by Honeywell. In combination with the controller series THETA, the outdoor and hot water sensors of the standard unit as well as the Honeywell sensors can be used. It is important to make sure that the controller sensors are connected to the standard unit and the Honeywell sensors are connected to the boiler control.

The following applies to both the outdoor as well as the tank sensors:

- If a sensor is connected to the standard unit, this sensor value is used for control.
- If no sensor is connected to the standard unit, a check takes place, if the Honeywell sensor is connected to the boiler control. If so, then this sensor value is automatically used for control.
- If a sensor is neither connected to the standard unit nor to the boiler control, an error message is sent.

8.1.21 Heat generator forced dissipation

Forced discharge Forced discharge to the subsequent heating circuits takes place when the DHW maximum temperature is exceeded (necessary because e.g. pellet boilers are controlled in the same way as single stage H-GEN).

Function: The function description should be the same as for the buffer forced dissipation.

- If the current temperature of the heat generator exceeds the heat generator maximum temperature limit, forced dissipation according to the setting of this parameter will take place in
  the DHW circuit or
  the heating circuits or
  a buffer tank
- The heating circuits adjust to thier maximum temperature.
- If the temperature in the heat generator decreases to 2 K under the heat generator maximum temperature limit, forced dissipation is stopped.
- Forced dissipation is effective for multiple controllers (BUS system).

Operation:

Note on operation	Key / parameter tree	Parameter
H-GEN forced dissipation	HEAT GENER	PARAMETER 29

8.1.22 Operating hours counter

The system has two operating hours and burner start-up counters (each for the first and second stage). The display is in the INFO-level of the controller.

The function of the operating hours counter can be set using a parameter.

OFF: This parameter setting deactivates the operating hours counter.

AUTO: If an operating hours counter is connected to the corresponding inputs of the controller (OHC inputs), this value is used for calculation.

Otherwise, theoretical values are determined and registered (time programs and switching frequency of outputs).

If a signal is recognized at a OHC input and the OHC signal does not arrive after demand by the burner, an error message is sent.

Feedback only: Same function as AUTO but no theoretical value is determined. Only burner signals are processed.

Free counter: The operating hours counter input can be used as a free counting input. No error message is issued if there is no signal.

Note: Because the counter values are only saved in the fixed memory once a day, the counter values of the current day may be lost if a blackout occurs.

Reset: The operating hours and starts of stage 1 and 2 can be reset separately using two parameters in the HEAT GENER. menu

Operation:

Note on operation	Key / parameter tree	Parameter
Operating hours counter	HEAT GENER	PARAMETER 37
Reset stage 1	HEAT GENER	RESET ST-1
Reset stage 2	HEAT GENER	RESET ST-2

8.2 Heat generator heat pump

8.2.1 General features of heat generator heat pump

Due to the different behaviour of the heat pumps toward conventional boilers, additional parameterisations are required. For example, minimum shutdown times must be observed (all H-GEN types) and on two-stage HP, different limit –value monitoring for 1st and 2nd stage must be performed.

- Maximum temperature limit stage I and stage II:
  Monitoring of maximum temperature is performed separately for stage I and II (additional paramter).
- Minimum runtime stage I and stage II:
  Since the stages work independently, different minimum burner run times must be taken into account.
- Outdoor temperature lock stage 1 and stage II (bivalence alternative point):
  In addition to the classic OT lock, which activates the H-GEN only after temperature drops below set value (separately for stage I and II), a reverse-acting OT lock has been introduced as "Bivalence alternative point". It acts in reverse order to the previous OT lock, i.e. the heat generator will not be switched on as long as the outdoor temperature is below the set value. Setting can be performed separately for stage I and II.
- Minimum switch-off time stage I and stage II:
  If the H-GEN switches off due to ist switching differential, it remains out of operation for at least the minimum switch-off time (separately adjustable for stage I and II).
- On two-stage H-GEN types a stage reversal is possible. The changeover takes place via a separate function within the heat pump.

Note: The reversal of the heat pump stages is performed secondary to system cascade. For this purpose, there are two new parameters in heat pump parameter tree.

Note: H-Gen type 7 is used on HPs that are equipped with two compressors in a HP. If they work at same temperature level, a stage reversal must be possible to ensure uniform wear. In this case, the HP cannot be operated with H-GEN type 8, since both stages must be locked if a malfunction occurs. On type 8 and 10, however, the 2nd stage must continue working in case of a stage 1 alarm.

- On H-GEN type 8 (2 x one-stage H-GEN) there are two hydraulic applications:
  1. Application: 2. Stage is a heating rod. No 2nd sensor is required for this!
  2. Application: 2. Stage is additional H-GEN. For this application, a 2nd boiler sensor can be parameterised via a variable input. In this case, the maximum temperature limit stage II acts on BS2.
- Modulating H-GEN type 9:
  It shall also be possible to control modulating heat pumps. For this purpose, an additional 0-10V module is used. The module converts the output signal into a power setpoint (currently output 2 on 0-10V-module). The modulation via relay outputs as on H-GEN type 4 (see classic heat generator) does not take place.
- There are two hydraulic applications for modulating + 1-stage H-GEN type 10 (similar to H-GEN type 8, 2 x single-stage H-GEN):
  1. Application: 2. Stage is a heating rod. No 2nd sensor is required for this!
  2. Application: 2. Stage is additional H-GEN. For this application, a 2nd boiler sensor can be parameterised via a variable input. In this case, the maximum temperature limit stage II acts on BS2.

Note: Two-stage heat generators have no switching dependency of stages among each other; thus allowing the 2nd stage to switch on before the 1st stage, and also the 1st stage to switch off before the 2nd stage (in contrast to H-GEN type 2) due to switching conditions.

Operation:

Note on operation	Key / parameter tree	Parameter
Operating hours counter	HEAT GENER	PARAMETER 37
Reset stage 1	HEAT GENER	RESET ST-1
Reset stage 2	HEAT GENER	RESET ST-2

Overview heat generator types heat pump controller:

Heat generator type number	6	7	8		9	10	
1. Stage	HP	HP	HP	HP	HP module	HP module	HP module
2. Stage	-	HP	Heating rod	Oil/gas	-	Heating rod	Oil/gas
Single stage control with BS on VO (optional)	-	no	no	yes	-	no	yes
BT_{min} / BT_{max} for stage r Stufe (separately adjustable)	1	1 / 2	1 / 2	1 / 2	1	1 / 2	1 / 2
Minimum run time of stage (separately adjustable)	1	1 / 2	1 / 2	1 / 2	1	1 / 2	1 / 2
Minimum switch-off time of stage (separately adjustable)	1	1 / 2	1 / 2	1 / 2	1	1 / 2	1 / 2
OT lock (bivalence point) of stage (separately adjustable)	1	1 / 2	1 / (2)	1 / (2)	1	1 / (2)	1 / (2)
Stage reversal function for internal mode	-	yes	yes	yes	yes	-	yes
HSS minimum switch-off influences stage	1	1 / 2	1	1	1	1	1
HSS maximum switch-off in cooling mode influences stage	1	1 / 2	1	1	1	1	1
HSS defect blocks stage	1	1 / 2	1	1	1	1	1
RF minimum switch-off influences stage	1	1 / 2	1	1	1	1	1
RF maximum switch-off in heating mode influences stage	1	1 / 2	1	1	1	1	1
EW-EVUlock influences (also in cooling mode)	1	1 / 2	P48	P48	1	P48	P48
Deactivating OT lock in case of HP malfunction	1	1 / 2	1	1	1	1	1
BCP/ASO can also be used for stage 1	-	no	no	yes	-	no	yes
Condenser pump (CP) switches at stage	1	1 / 2	1	1	1	1	1
2-stage cooling mode	-	yes	no	no	-	no	no

8.2.1.1 Monitoring return flow temperature heat pump (RS)

The function of the heat pump return sensor can be assigned to a variable input VI1, 2 or 3. Separate min/max temperatures can be programmed for the return temperature.

- Max.temp.: Active during heating mode; if value is exceeded, heating mode is interrupted. The switch-off condition is deactivated if temperature drops below the set value – 2K.
- Min.temp.: Is always active. Heat pump is switched off if dropping below this value. If temperature exceeds the set value +2K, the switch-off condition is deactivated.
- The function influences all heat pump stages, i.e. stage 1 on H-GEN type 6, 8, 9, 10, and stage 1 and 2 on H-GEN type 7.

Operation:

Note on operation	Key / parameter tree	Parameter
Return flow sensor	HYDRAULIC	PARAMETER 08 09 10
Return flow minimum limit heat pump	HEAT PUMP	PARAMETER 55
Return flow maximum limit heat pump	HEAT PUMP	PARAMETER 56

8.2.1.2 Heat generator priority

It must be possible to set controls in regard to priority of HC cooling, HC heating and DHW via parameters:

- Priority setting 1:
  - Prio.1: DHW request
  - Prio.2: Heating request
  - Prio.3: Cooling request
- Priority setting 2:
  - Prio.1: Cooling request
  - Prio.2: DHW request
  - Prio.3: Heating request
- Priority setting 3:
  - Prio.1: DHW request
  - Prio.2: Cooling request
  - Prio.3: Heating request

Changeover in case of malfunction via return sensor monitoring

When heating or cooling mode is interrupted due to return temperature monitoring (RS), it is possible to switch to a different priority if a request is available (e.g. RS exceeds max. temp. during cooling. As a result, a switch to heating mode can be performed).

If a changeover to a lower priority operating mode takes place, it must stay in this mode at least as long as indicated in par. 53 (minimum run time operating mode) before a changeover to the priority operating mode can be performed. This does not apply if the upcoming request has already been met.

Example: Priority setting 3, Prio is on 3, minimum run time operating mode has not yet expired, but the heating buffer is charged. Then, if the cooling buffer has a request, the minimum run time of the operating mode is prematurely interrupted.

If the HP follows a heating request (cooling request) due to the priority setting, circuits with heating request (cooling request) that are not hydraulically disconnected via a heating buffer (cooling buffer) must be locked, pumps off, mixers on.

Standby

In absence of a cooling request and heating request, the heating mode becomes active in standby mode for the stage.

Operation:

Note on operation	Key / parameter tree	Parameter
Heat generator priority	HEAT PUMP	PARAMETER 52
Minimum run time operating mode	HEAT PUMP	PARAMETER 53

8.2.2 Heat source pump MHS

- The activation of a heat source pump MHS is carried out via VO or HC-P.
- The pump continues running until a request has been made to the heat generator. A request exists also when temperature drops below the fix heat generator frost protection temperature of 5°C on H-GEN/BS. The HP is only enabled after the set flow time.

8.2.2.1 Heat source sensor HSS

Optionally, a heat source sensor HSS can be activated on a VI.

If the heat source temperature drops below the set heat source minimum temperature, the heat pump is locked.

Error message: Below heat source minimum temperature

If H-GEN version = 8 (2x1-stage), 2nd stage remains enabled (e.g. E-set).

If heat source sensor is defective, the heat generator is locked and MHS switched off.

Error message: Error heat source sensor HSS

Note: Locking the heat generator in case of a sensor error interrupts minimum run time that still might be active.

8.2.2.2 Features of MHS function in cooling mode

- If cooling mode is passive, heat source pump is switched on.
- During active and passive cooling, a maximum temperature monitoring of heat source temperature is performed. After reaching or exceeding this temperature, cooling mode is locked (M1, M1(2)) until the heat source temperature has dropped to maximum temperature -5K. MHS continues running during this period. An error message is generated for the time the temperature is exceeded.

Error message: Excess temperature heat source sensor HSS in cooling mode

Operation:

Note on operation	Key / parameter tree	Parameter
Activation heat source pump	HYDRAULIC	PARAMETER 05 06 07
Activation heat source sensor	HYDRAULIC	PARAMETER 08 09 0
Flow time heat source pump MHS	HEAT PUMP	PARAMETER 58
Extended run time heat source pump MHS	HEAT PUMP	PARAMETER 59
Heat source minimum temperature	HEAT PUMP	PARAMETER 60
Heat source maximum temperature (e.g. during active cooling)	HEAT PUMP	PARAMETER 61

Note: The source sensor must be parameterised separately on a free VI!

8.2.2.3 Manual mode of heat source pump

- Instead of emission measurement, only the heat source pump is to be switched on when pressing the corresponding button (continuous operation).
- All other heat pump and heat circuit functions are switched off.
- Exiting the function is performed analogously to exiting the emission measurement function.
- The function ends automatically when a 180-minute counter has expired (not 20 minutes, like in case of emission measurement).

8.2.3 Variable input malfunction heat pump

- Connecting additional alarm messages to control system (display, message via data bus, ...)
- Can be activated up to three times (on each VI)
- If stage 2 is locked on heat generator type 8 and 10 due to an outdoor temperature lock, then this lock is deactivated (2nd H-GEN stage is not a HP).

8.2.4 HP main pump / condenser pump (CP)

- If a condenser pump is activated, then the CP is switched on first in case of a request from H-GEN.
- After expiration of an adjustable flow time, the H-GEN is released.
- If H-GEN switches off, then CP is also switched off after an adjustable extended run time.
- Output assignment takes place in hydraulic parameter tree HC-P, VO1, or VO2.
- By means of parameters it should be possible to select whether the CP is to be switched on or off during DHW charging.

Operation:

Note on operation	Key / parameter tree	Parameter
Condenser pump	HYDRAULIC	PARAMETER 05 06 07
Heat pump return flow sensor	HYDRAULIC	PARAMETER 08 09 10
Return flow minimum limit heat pump (during cooling)	HEAT PUMP	PARAMETER 55
Flow time H-GEN pump / condenser pump	HEAT PUMP	PARAMETER 13
Extended run time H-GEN pump / condenser pump	HEAT PUMP	PARAMETER 14
Enable condenser pump during DHW charging	HEAT PUMP	PARAMETER 62

8.2.5 DHW charging via diverter valve

During changeover of a diverter valve, the flow is temporarily interrupted in part and the HP can switch to alarm mode. To prevent this, compressor (M1, M1(2)) should be switched off for an adjustable time interval during the changeover.

This function is only in effect if the according stage is enabled for DHW charging.

Switch-off time starts with onset of changeover signal for diverter valve. The function is activated at the beginning of DHW charging as well as at the completion of DHW charging.

Note: The diverter valve must be parameterised within the HP control (DHW operating mode diverter valve).

Note: The shutdown periods during changeover have priority over minimum run times. It interrupts an active minimum run time.

Operation:

Note on operation	Key / parameter tree	Parameter
Switch-off time H-GEN during DHW changeover	HEAT PUMP	PARAMETER 57

8.2.6 Cooling function diverter valve cooling active (CHC)

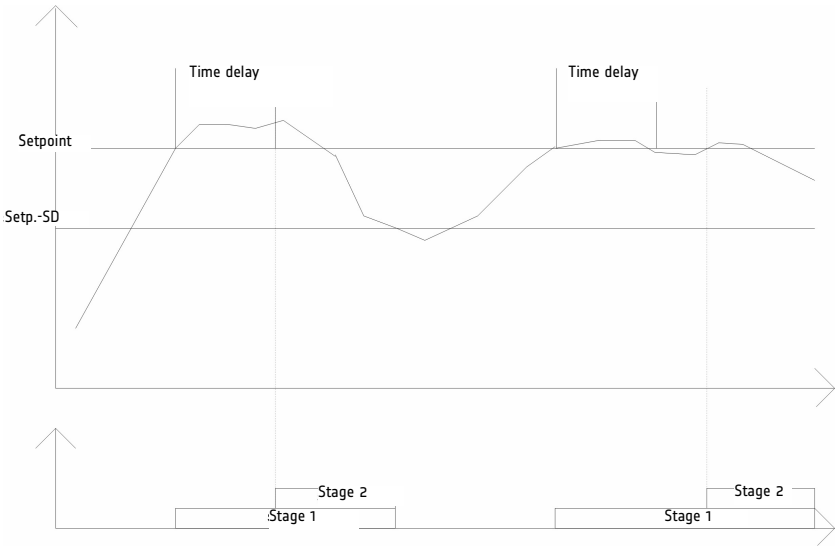
In the summer, the use of heat pumps makes it possible to transport heat from the building due to inverse heat pump operation. This requires an active intervention in the heat pump control.

- Active cooling is a VO function.
- The CHC output switches on when the heat pump receives a cooling setpoint.
- If in addition to the cooling setpoint a heating setpoint exists with higher priority due to heat generator priority parameterisation, the CHC output remains switched off (see parameter "Heat generator priority").
- The output for the cooling function (CHC) works without pump kick circuit.

Note: The cooling function must be separately activated for each heating circuit via the parameter "Cooling switch-on point, OT". The cooling function for the according heating circuit becomes only active after a setpoint temperature has been parameterised here (<> OFF).

Switching condition for heat generator during active cooling

- When cooling function is active, output "Changeover heat pump cooling (CHC)" = ON. In doing so, the heat pump is inversely switched on via a heat pump input, and the water flow hydraulically diverted, if necessary.
- If the maximum temperature of the heat source has been reached or exceeded, an active cooling function is interrupted (see 8.2.2.2).
- Switching conditions:
  When H-GEN/BS < $H\text{-}GEN_{setp.\text{-}cool}$ - $H\text{-}GEN_{cool\text{-}SD}$ then H-GEN = OFF
  When H-GEN/BS > $H\text{-}GEN_{setp.\text{-}cool}$ then H-GEN = ON
- On H-GEN setting 7 (2-stage HP) it can be selected whether one or both stages shall be connected for cooling (parameter).
  Connection 2nd stage for cooling: Switch-on delay is started once, when 1st stage is switched on; after setpoint has expired or is exceeded, 2nd stage is connected without delay.



- On H-GEN setting 8 (2x1stage HP), only the 1st stage shall be connected to cooling. (2-stage, e.g. E-set or boiler 2)
- The set H-GEN parameterisation (minimum run times, minimum pause times, etc.) must also be observed during cooling.
- If heat pump is in frost protection state, then cooling mode is prematurely finished.
- If H-GEN temperature drops below minimum during cooling, H-GEN is switched off until temperature exceeds the set value +2K.
- If changeover is performed between cooling/heating modes, then H-GEN must always be switched off. After flow times of heat source/condenser pump expire, the compressor can be switched on again. In this case, the H-GEN minimum run time is not effective.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting output active (CHC) or passive cooling	HYDRAULIC	PARAMETER 05 06 07
Cooling charging mode	HEAT PUMP	PARAMETER 50
Heat generator priority	HEAT PUMP	PARAMETER 52
Switching differential cooling mode ($H\text{-}GEN_{cool\text{-}SD}$)	HEAT PUMP	PARAMETER 54

8.2.7 Cooling / diverter valve cooling passive (CHC)

- Passive cooling is a VO function.
- Passive cooling functions analogous to active cooling, with the difference that H-GEN stages are not controlled. (Discharge of heat from heating circuit via heat exchanger in brine circuit and further into ground).
- In case of heating request HC or DHW during passive cooling, the cooling is not interrupted (CHC remains connected).
- During passive cooling, the heat source pump MHS must switch on
- The output for the cooling function (CHC) works without pump kick circuit.

Note: The cooling function must be separately activated for each heating circuit via the parameter "Cooling switch-on point, OT" in the heating circuit tree. The cooling function for the according heating circuit becomes active only after a setpoint temperature has been parameterised here (<> OFF).

Operation:

Note on operation	Key / parameter tree	Parameter
Changeover heat pump – cooling CHC	HYDRAULIC	PARAMETER 05 or PARAMETER 06 or PARAMETER 07

8.2.8 Operating hours counter

The operating hours for cooling mode are calculated on the same operating hour counters as for heating mode.

8.2.9 EW/EVU lock (EW/EVU-HP)

- The energy supplier can lock the heat pump via a signal. In addition to HP, the SOL-P is also locked. (DHW discharge protection is Off; thus, SOL-P would start even though H-GEN is not running).
  The lock is performed by opening a bridge on one of the variable inputs VI1, VI2 or VI3. (Lock inversely to H-GEN lock, contact open HP/DHW locked) Input assignment is performed in hydraulic parameter tree.
  During the EVU lock, the CP may also not be in operation.

Operation:

Note on operation	Key / parameter tree	Parameter
EW/EVU lock HP	HYDRAULIC	PARAMETER 08 09 10

8.3 Heating circuit heating mode

8.3.1 Weather controlled heating operation

8.3.1.1 Heating Characteristic Curve

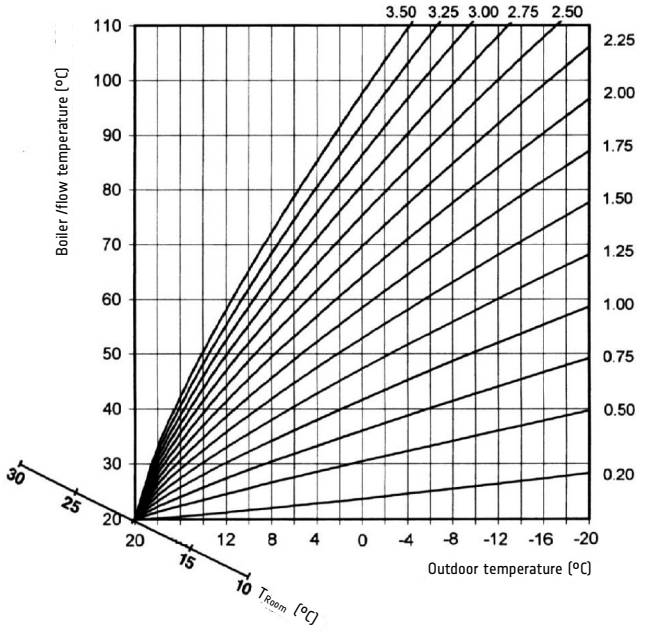
The prerequisite for a constant room temperature is the exact setting of the heating characteristic curve (see also the Heating Characteristic Curve section) of the relevant heating circuit as well as a correct design of the heating system on the part of the heating technician according to the heat demand calculation.

If adjustments are necessary, these should be made in small steps at an interval of a few seconds to assure that a steady state condition is obtained.

Differences that can be balanced by installing a room device (see available accessories) may occur between the measured room temperature in the inhabited area and the desired room temperature.

The slope of the heating characteristic describes the relation between the change in the flow temperature and the change in the outside temperature. In case of large heating surfaces (and therefore low flow temperatures) like floor heating systems, the heating characteristic curve is less steep compared to smaller heating surfaces (e. g. radiators).

The setting value refers to the lowest outside temperature used for heat demand calculation.



⚠ CAUTION

In order to measure the room temperature the heating circuit of the most occupied room is to be used.

Radiator thermostats are used together with correctly designed radiators to control the external heat gain and should hence be almost completely open. During the adjustment phase additional external heat sources like fireplaces, majolica stoves, etc. should not be used. Furthermore, during the measurement period excessive ventilation is to be avoided.

The measurement period covers basically the heating phases. If the heating characteristic is correctly set, the room temperature remains constant according to the set daytime setpoint regardless of the changes in the outside temperature.

Note: The heating characteristics are limited by the minimum and maximum temperature limits. With activated limits the relevant flow temperature is controlled exclusively according to the set limit values.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting Heating curve slope		

8.3.1.2 Heating Circuit Reduced Mode

Function: During reduced mode you can choose between two operating modes:

RED: **reduced mode**

The direct heating circuit's heating circuit pump remains active during reduced mode (see Switching Time Program). The flow temperature is determined by the relevant reduced heating characteristic according to the decreased room setpoint. The set minimum temperature will be maintained.

Application:

Buildings with low insulation values and high heat losses.

ECO: **switch-off mode:**

During reduced mode the direct heating circuit is completely switched off if the outside temperature exceeds the set frost protection limit. The heat generator minimum temperature limit is deactivated. The heating circuit pump is switched off with a short delay in order to avoid a safety switch-off owing to the post heating of the heat generator (extended pump running time).

If the outside temperature falls below the specified frost protection limit, the controller switches from switch-off mode (ECO) to reduced mode (RED) and the heating circuit temperature is adjusted according to the set reduced characteristic considering the set heat generator minimum temperature settings.

Application:

Buildings with high insulation values.

Caution:

The set mode also applies to selecting the operating mode: AUTOMATIC, ABSENT TIL and RED. HEATING.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting reduced mode	UNMIXED CIRCUIT or MIX.VALVE-1 or MIX.VALVE-2	RED HEATING

8.3.1.3 Heating system (exponent)

Function: This parameter refers to the type of heating system (floor, radiator, convector heating) and can be compared to the exponent of the relevant heat exchanger. The setting determines the curvature of the heating characteristic of the direct heating circuit and compensates the performance losses at low temperatures by means of its progressive characteristic.

Depending on the type of heating system the following settings are recommended:

1.10 Slightly progressive heating characteristic for floor or other panel heating systems.

1.30 Progressive standard characteristic for all radiator heating systems with m-values comprised between 1.25 and 1.35.

2.00 Progressive heating characteristic for convector and baseboard heating systems

3.00 - 5.00 Very progressive heating characteristic curves for general ventilator application with high start temperatures.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting heating system	UNMIXED CIRCUIT or MIX.VALVE-1 or MIX.VALVE-2	HEATING SYSTEM

8.3.1.4 Heating Circuit Temperature Limitation

Note: This function is not active if the heating circuit control is set at constant control (CC).

Function: This function limits the flow temperature of a heating circuit. The minimum and maximum temperatures set in the relevant parameters of a heating circuit must not exceed or fall below the setpoints.

Minimum temperature limitation is not active:

- in case of switch-off in standby mode above the frost protection limit
- in case of switch-off in reduced automatic mode with the activated ECO function above the frost protection limit
- in case of switch-off in constant reduced mode with activated ECO function
- in case of automatic summer switch-off

Application:
- Floor minimum limitation
- Ventilation pre-adjustment (warm air curtain)
- Convector heating

⚠ CAUTION To protect the floor heating systems against accidental overheating (malfunction – manual mode) a controller-independent maximum temperature limit must be provided. In this case a contact thermostat is recommended. By means of its switching contact the control phase of the relevant heating circuit pump is looped. The thermostat is to be set at the maximum permissible system temperature.

Operation:

Note on operation	Key / parameter tree	Parameter
Minimum temperature limit	UNMIXED CIRCUIT or MIX.VALVE-1 or MIX.VALVE-2 (HC / MC-1 / MC-2)	PARAMETER 12
Maximum temperature limit	HC / MC-1 / MC-2	PARAMETER 13

8.3.1.5 Heating Circuit Parallel Shift

Function: For special applications this function offers the possibility to admit the heating characteristic curve of the direct heating circuit with a constant shift value. The demand value plus the shift value is transmitted to the heat generator.

The displacement of the heating characteristic curve is carried out in parallel with the flow temperature.

Application: Base correction of the heating characteristic for adjustment to the desired room temperature without changing the room setpoint.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting Parallel Shift	UNMIXED CIRCUIT or MIX.VALVE-1 or MIX.VALVE-2	PARAMETER 14

8.3.1.6 Heating Circuit Pump extended running time

Function: If there is no heat demand from the heating circuit, the heating circuit pump is switched off after the time set in the relevant heating circuit menu to avoid a safety switch-off of the heat generators at high temperatures.

During an active extended pump running time on a mixed circuit pump (MC1 and MC2 only), the mixed circuit continues to regulate its setpoint value without transmitting a requested value to the heat generator.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting pump extended running time	UNMIXED CIRCUIT or MIX.VALVE-1 or MIX.VALVE-2	PARAMETER 15

8.3.1.7 Screed function

Note: This function is not active if the heating circuit control is set at constant control (CC).

Function: The screed function is used exclusively for the required drying of newly applied screed on floor heating systems. The process is based on recommendations of the German Bundesverbandes Flächenheizungen (Federal Association for Surface Heating) concerning the heating of fresh floor covers (heating according to a mandatory temperature profile).

This is a special function that will not be interrupted by any other operating mode (including manual operation or emission measurement)!

The screed function can be activated for mixer circuits and, in special cases (e.g. in conjunction with a condensing boiler) also for an unmixed circuit.

When the screed function is active, all weather-dependent control functions of the heating circuit concerned are switched off. The respective heating circuit operates independent of the operating mode (switching times) as a constant temperature controller.

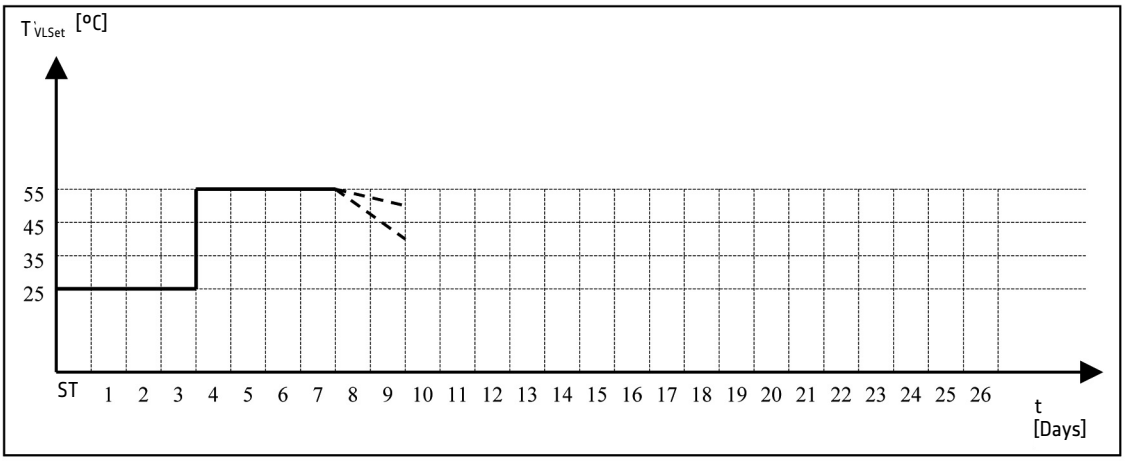
An active screed function can be deactivated at any time (parameter setting screed function = OFF).

On completion of the screed function, the heating circuit returns to operation according the actual operating mode setting.

The screed function consists of two steps:

Step 1: Function heating acc. to DIN 4725 Part 4 (setting 1)

- Constant heating at 25 °C on the start day and for the following three days.
- Heating at set maximum flow temperature, limited to 55 °C.



Time profile of the screed function for function heating

Step 2: Heating function for floor covering (setting 2)

The heating of the floor covering follows a preset temperature profile.

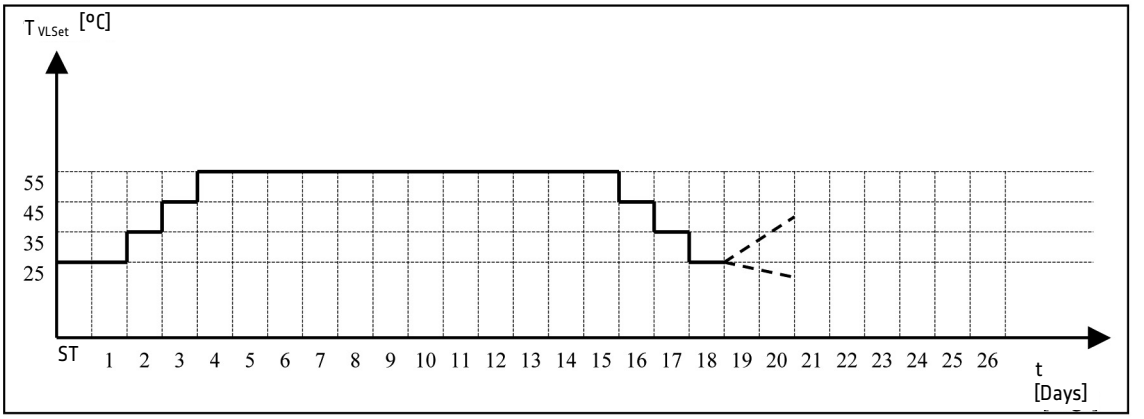
Starting with 25°C on the first day, the requested temperature rises by 5° C per day over the following days until the maximum temperature of the heating circuit is reached. After that the nominal temperature is reduced with the same stepping until the base point of 25°C is reached again.

Example:

Maximum temperature setting for the heating circuit = 40 °C

1. Day:	constant heating at 25 °C
2. Day:	constant heating at 30 °C
3. Day:	constant heating at 35 °C
4. Day:	constant heating at 40 °C
5.-15. Day:	constant heating at maximum flow temperature
16. Day:	reduced heating at 35 °C
17. Day:	reduced heating at 30 °C
18. Day:	reduced heating at 25 °C

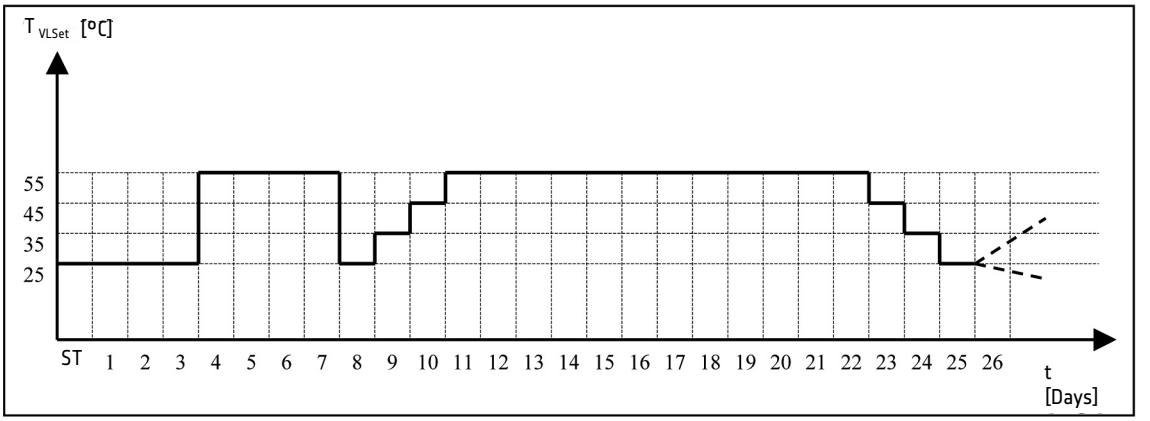
On the start day heating at 25 °C is maintained till midnight. The heating function for floor covering sets in at 00:00 h on the following day.



Time profile of the screed function for floor cover heating

Step 1+2: Function heating with subsequent floor cover heating (setting 3)

Both steps are carried out subsequently.



Time profile of the screed function for function heating and heating for floor covering

Prior to activation of the screed function it must be ensured that the screed to be heated has dried appropriately.

Cement screed: 21 days

Calcium sulfate (anhydride) screed: 7 days

Note: The maximum profile temperature is determined by the respective maximum flow temperature limit.

After a short power failure of restart, a previously activated screed function is continued where it was interrupted.

The Screed function parameter is automatically set to OFF when the function is completed. The screed function can be activated again if necessary.

Note: If the screed function is active for a direct heating circuit, only the requests from this heating circuit are transmitted to the heat generator. Requirements of other heating circuits are suppressed.

The screed function for a non-mixed heating circuit can only be activated for the direct heating circuit on the basic unit with the address 10 (CU1 - DC), and only if there are no other basic units in the bus system.

If another controller (addr. 20...50) is connected to the HC-P whilst the screed function is active, the screed function is automatically cancelled for the HC-P.

All other heating circuits are disabled apart from the direct heating circuit with address 10. These heating circuits do not have frost protection monitoring for example during this time.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting screed function	UNMIXED CIRCUIT or MIX.VALVE-1 or MIX.VALVE-2	PARAMETER 16

8.3.2 Assessment of the Room Temperature / Room Influence

8.3.2.1 Heating Circuit with Room influence

Function: This function activates the room sensor of a room device (RS or RFF) which is assigned to the corresponding heating circuit via the data bus address. The corresponding room parameters are enabled for operation.

No room sensor in the following situations:

- No room sensor influence when mounting the room units outside the occupied area (e.g. in unheated rooms like cellars, etc.).
- No room sensor influence in multi family buildings which have different room temperatures.
- No display of the current room temperature is provided in the system information if the room influence is off.
- The feed temperature is corrected purely by atmospheric conditions.

Room sensor enabled room influence with outside sensor:

- If the room sensor is switched on, the heating circuit is controlled in a weather-responsive manner on the basis of the current room temperature.
- If an THETA RS room device is connected, the actual room temperature is indicated in the basic display instead of the heat generator temperature.
- If the actual room temperature drops below the current room setpoint temperature + 1 K, any summer deactivation which may be active is cancelled. This is necessary in order to allow correction of the actual room temperature by the set room influence.

Room sensor enabled, operation blocked:

With this setting, the functions influenced by the room temperature are enabled, however, operation via the remote unit is blocked.
Application: Public buildings (offices, schools, etc.) in which only room temperature monitoring is desired.

Room sensor off, operation active

If these settings are active, the room sensor only has a display character and does not influence the functions. Operation of the room device is possible.

Application: All plant types that do not allow for room influence but (in contrast to the setting *OFF*) display of the current room temperature is desired.

Operation:

Para-meter	Designation	Factory setting	Setting range / Setting values	
03	Room influence (with room unit)	OFF	OFF	Display of H-GEN temperature, room sensor off, operation enabled
			1	Display room temp., room sensor active, operation active
			2	Display room temp., room sensor active, operation blocked
			3	Display room temp., room sensor off, operation active

8.3.2.2 Room factor heating circuit

Function: This function determines to what extent a deviation of the room temperature from the setpoint affects the control of boiler flow temperature.

If there is no difference between the desired (NOM) and the current (ACT) room temperature, the direct heating circuit's flow temperature is controlled according to the set heating characteristic.

If there is a difference between the room temperature and the setpoint, the heating characteristic is shifted parallel to the room temperature axis so that the deviation is compensated. The amount of the displacement depends on the setting of the room factor.

The following relation applies:
Corrected room setpoint =
adjusted room setpoint $-\frac{\text{(Deviation x Room Factor)}}{100}$

Example: Adjusted room setpoint = 21°C
Current room temperature = 20°C
Deviation = -1K
For a room influence of 100%:
Corrected room setpoint = 21°C $-\left(\frac{-1K \cdot 100}{100}\right)$ = 22°C.

The boiler temperature is controlled according to a heating characteristic which corresponds to a room temperature setpoint of 22 °C.

High settings lead to a quicker adjustment of the control deviation, while they reduce the stability of the control circuit and can lead with excessively high setpoints to the oscillating of the control value (= room temperature).

8.3.2.3 Room Controller Heating Circuit

At this setting the heating circuit concerned can be controlled through a room controller. This requires a room device THETA RS with room control function. The room controller directly determines the required flow setpoint and transmits this information to the central device.

At this setting the control of the respective heating circuit is completely room-guided. Weather-dependence is inactive. However, the parameters for weather response (heating characteristic curve settings) can still be entered.

8.3.2.4 Heating curve adaptation heating circuit

Function:

Adaptation means the automatic adjustment of the heating curve slope to the building characteristics under continuous measurement of outside, flow and room temperatures. The determination of the optimum heating curve requires prolonged heating periods so that a balance between heat supply and heat reduction is ensured. The adaptation causes a targeted readjustment of the heating curve, depending on the control deviation.

The value found through adaptation is not stored. The larger the deviations, the larger the correction steps; the smaller the deviations, the smaller the corrections. The heating curve is newly adapted whenever the heating curve slope parameter setting is changed at a later stage.

An active adaptation is indicated by a flashing symbol in the user menu.

Adaptation is a useful tool for determining the correct building characteristic curve. We recommend switching off this parameter once the adaptation is complete, and to set manually, in the user menu, the slope value found though adaptation.

Note:

An adaptation is allowed under the following conditions:

- Room sensor switched on (Room influence = ON)
- Heating curve adaptation switched on
- Heating operating under any automatic program
- Continuous heating
- Mean outside temperatures below 16°C
- Room temperature deviations from present setpoint > ±1K.

The adaptation will not be initiated:

- if the heating circuit is switched off
- during the optimization phases
- if heating curve adaptation is switched off
- if the room sensor is disabled (Room influence = OFF)
- if the outdoors sensor is defective or disconnected
- during reduced operation under any automatic program
- during permanently reduced operation
- when the boiler maximum temperature is reached

8.3.2.5 Heating Circuit Room Frost Protection Limit

Function: This function determines the room setpoint of the corresponding heating circuit during switch-off mode with frost protection activated.

- during holiday mode
- in automatic mode between the heating cycles with active ECO function.
- in constant reduced mode with active ECO function.

In connection with a room unit the heating circuit is controlled according to the room frost protection temperature.

Without a room unit the setting serves a default value for the reduced room temperature and is controlled on the basis of the latter.

Note: With lasting frost protection mode and sensitive objects in the house like antiques, plants, etc. the setting value is to be duly adjusted.

8.3.2.6 Room Thermostat Function (Room Temperature Maximum Limit)

Function: This function determines a room temperature-related limit with adjustable switching differential. If the room temperature of the relevant heating circuit exceeds the current daytime or reduced room setpoint by the set switching differential, the heating mode is temporarily stopped (heating circuit pump switched off).

The heating mode is resumed if the room temperature of the relevant heating circuit drops below the current room setpoint – 0.5K.

Example: Day room setpoint = 22 °C setting thermostat function = 4K

Interruption of heating operation: T_{Room} > (22°C + 4K) > 26.0°C

Restart of heating operation: T_{Room} < (26°C - 0.5K) < 25.5°C

With setting OFF summer thermostat function is not in effect.

NOTE: The thermostat function is operative both in heating and reduced mode.

With active frost protection the thermostat function is not operative.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation room function	UNMIXED CIRCUIT or MIX.VALVE-1 or MIX.VALVE-2 (HC /MC-1/MC-2)	PARAMETER 03
Setting room factor	HC / MC-1 / MC-2	PARAMETER 04
Activation room controller	HC / MC-1 / MC-2	PARAMETER 04
Setting room frost protection limit	HC / MC-1 / MC-2	PARAMETER 08
Setting room thermostat function	HC / MC-1 / MC-2	PARAMETER 09

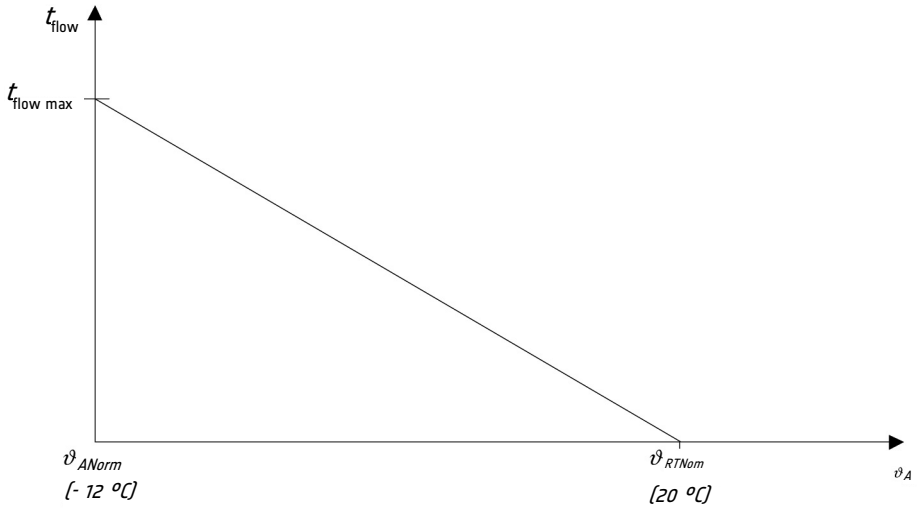
8.3.2.7 Heating Circuit Switch-on Optimisation

Function:

With this function the latest heating up time is calculated considering the outside and room temperature (heat loss) to assure the desired room temperature at the set occupancy start time.

The switch-on times saved in the switching time programs for the relevant heating circuit do not refer any longer to the heating start time but to the occupancy start time (i.e. the time when the desired room temperature is reached).

Calculation of the advanced switch-on time



ϑ_{RTNom} = room setpoint at the start time (adjusted switch on time)

$t_{flow\ max}$ = max. optimization time (setting parameter)

ϑ_{ANorm} = design outside temperature (climate zone)

t_{flow} = current optimization time

ϑ_A = outside temperature

This function can be complemented by an activation of the room influence if a room device is connected (see description of room influence).

Operation:

Note on operation	Key / parameter tree	Parameter
Maximum advance time	UNMIXED CIRCUIT or MIXVALVE-1 or MIXVALVE-2 (HC / MC-1 / MC-2)	PARAMETER 06
Room Influence	UNMIXED CIRCUIT or MIXVALVE-1 or MIXVALVE-2 (HC / MC-1 / MC-2)	PARAMETER 04

8.3.2.8 Switch-on optimisation for room controller (RC)

The advance time is determined adaptively by the room controller. To this end, a room station THETA RS must be connected and parameterised as a room controller in the corresponding heating circuit level (parameter 4 = RC). This function is not available in the room device THETA RFF.

Function: In the transfer from reduced mode to heating operation, if the optimization is switched off, a certain period of time elapses before the room temperature reaches the day setpoint.

An advance factor is determined by measuring this time. This determines, how much time is necessary for heating per Kelvin temperature rise. It is calculated with the measured time of the last x heating cycles, whereby x is used as a buffer number in the calculation.

The maximum advance time is calculated with the parameter setting for the optimization (unmixed circuit or MIX. VALVE-1 or 2 - Parameter 06).

A setpoint adjustment from the advance time is not carried out because the complete control algorithm is based on erratic setpoint changes.

Marginal conditions: Switch-on optimisation only takes place if:

- the controller is in automatic mode.
- the controller is in reduced mode, which means no advance takes place between 2 consecutive heating cycles with different room setpoints.
- the new room setpoint temperature is higher than the setback temperature.

8.3.3 Mixer control

The control algorithm described un chapter 7.6 is used.

Control variables for this application:

Controlled system: The mixing valve installed in a mixed heating circuit

Setpoint w: Flow setpoint

Actual value x: Flow actual value on flow sensor FS

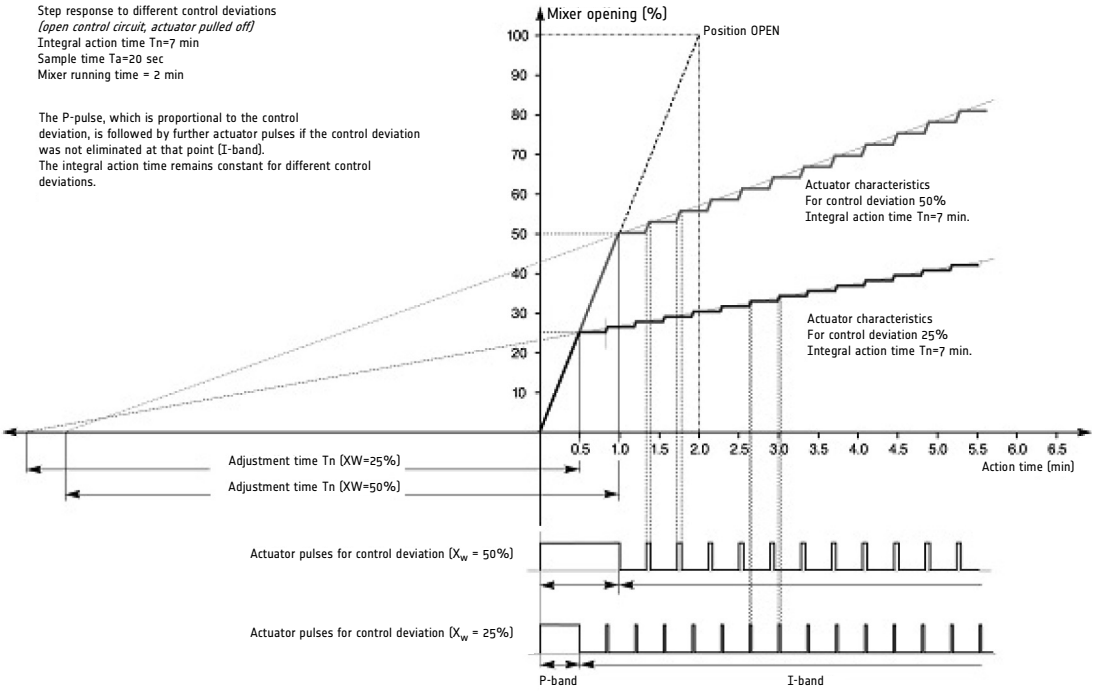
Correcting variable y: Run time OFF or CLOSED for mixing valve outputs

The influential variables described in the following are also included in regulation.

8.3.3.1 Actuator run time

This function allows adjusting the actuator, with regard to its finite run time, to the control characteristics, meaning that actuators with different running times (e.g. 1 min, 2 min, 4 min) react to the same deviation by readjusting by the same amount through adapting the action times. The integral action time Tn remains unchanged in this. However, care must be taken that the latter must always exceed the running time of the respective actuator. If necessary, actuators with other running times should be used.

Example of the coaction of P-band, I-band, adjustment time and sample time



8.3.3.1.1 End position function actuator

This function determines the type of control signal in the end positions OPEN and CLOS of each actuator.

1 = Continuous voltage signal at connector OPEN or CLOS at the respective end position

2 = De-energized in end position OPEN or CLOS respectively

When the limit stop of the actuator is reached (0 / 100 %), the actuator is in idle state (STOP). To balance the running time tolerancies, a drain function of 100 % of the set mixer running time takes place after reaching the limit stop.

Operation:

Note on operation	Key / parameter tree	Parameter
Proportional band Xp	MIXVALVE-1/2	PARAMETER 18
Sampling time Ta	MIXVALVE-1/2	PARAMETER 19
Integral action time Tn	MIXVALVE-1/2	PARAMETER 20
Actuator run time	MIXVALVE-1/2	PARAMETER 21
End position function actuator	MIXVALVE-1/2	PARAMETER 22

8.3.4 Function Heating Limit

This parameter supplements the summer switch-off function. It deactivates the respective heating circuit as soon as the computed flow temperature setpoint approaches the present room temperature setpoint.

The parameter *heating limit* can be activated separately for each heating circuit.

Function: Switch-off: Flow-set < (room-set + heating limit setting)
Switch-on: Flow-set > (room-set + heating limit setting + 2K)

Example: Room setpoint = 22 °C, heating limit setting = 2 K
Switch-off at flow setpoint 24 °C (22°C + 2K)
Switch-on at flow setpoint 26°C (22°C + 2K + 2K)

Conditions: The *SUMMER SWITCH-OFF* function (menu SYSTEM - parameter 04) has priority over the *HEATING LIMIT* function.

The *FROST PROTECTION* function (menu SYSTEM - parameter 05) has priority over the *HEATING LIMIT* function.

Operation:

Note on operation	Key / parameter tree	Parameter
Offset heating limit	UNMIXED CIRCUIT or MIXVALVE-1 or MIXVALVE-2	PARAMETER 07

8.4 Heating circuit cooling mode (..3..)

For a mixed heating circuit, cooling mode function can be activated. An inverse control of the mixer based on a cooling setpoint takes place above an adjustable outside temperature limit.

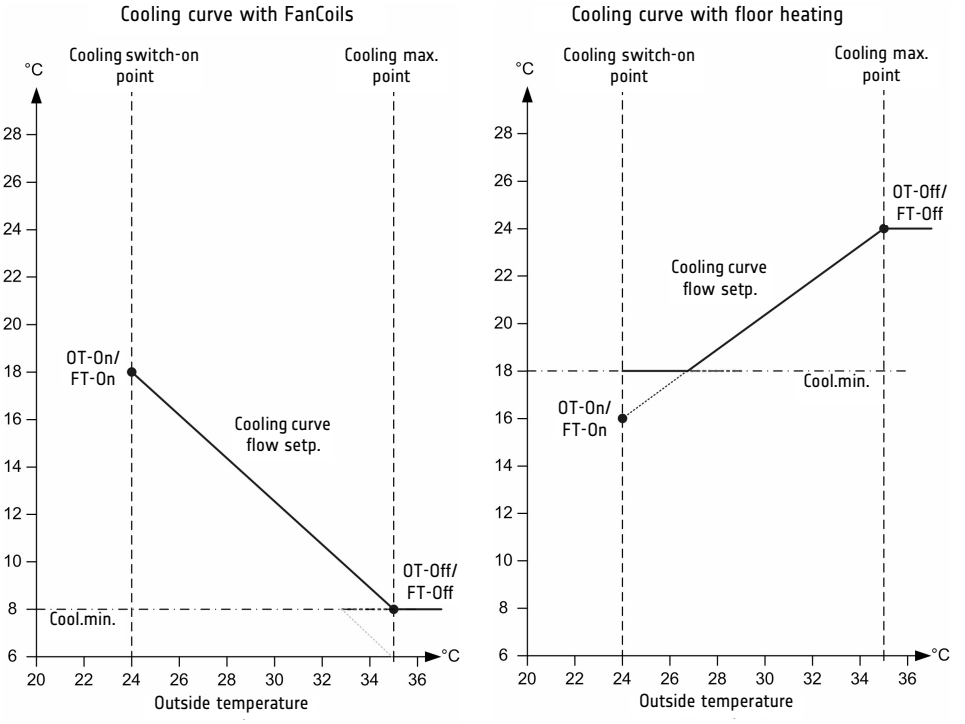
The following conditions must be observed when using the cooling function:

- The cooling mode for the according heating circuit is activated via the setting <> OFF on heating circuit parameter "Cooling switch-on point".
- The function is available in the heating circuit regardless of parameterisation of a cooling source (e.g. heat pump function heating circuit changeover heating/cooling, CHC).
- This activation results in the folowing:
  - Additional cooling parameters are displayed in the heating circuit tree
  - Operation is switched to a separate operating mode
- If outside temperature > cooling switch-on point, then cooling function is active (the cooling switch-on point uses the same mean value calculation as the summer switch-off, but requires its own setpoint)
- If outside temperature < cooling switch-on point -1K, then cooling function is not active.
- An active cooling mode has priority over a possibly parallel parameterised heating mode (example: Summer switch-off not yet reached, and cooling condition met).
- For calculation in cooling curve, the OT mean value assigned to the according heating circuit is applied.
- If flow sensor of a mixer heating circuit is defective, the "CLOSE" instead of "STOP" command is issued in cooling mode. The mixer circuit pump (MCP) is switched off.

8.4.1 Cooling curve

- Depending on outside temperature, the cooling temperature can be changed. For this purpose, a cooling curve is generated.
- The flow cooling curve is always limited by the set minimum cooling temperature (parameter).

Examples:

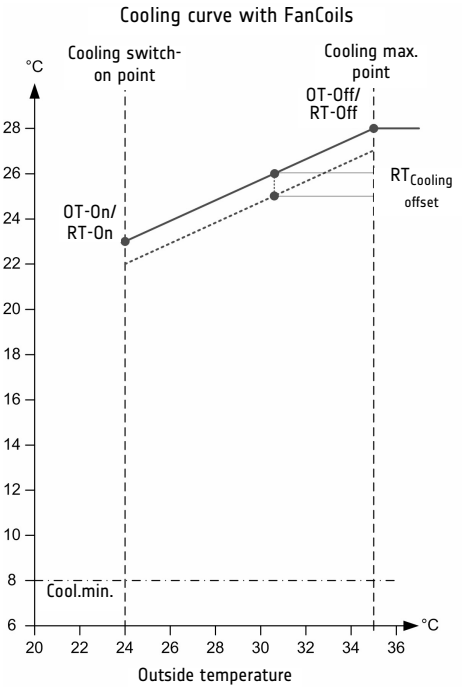


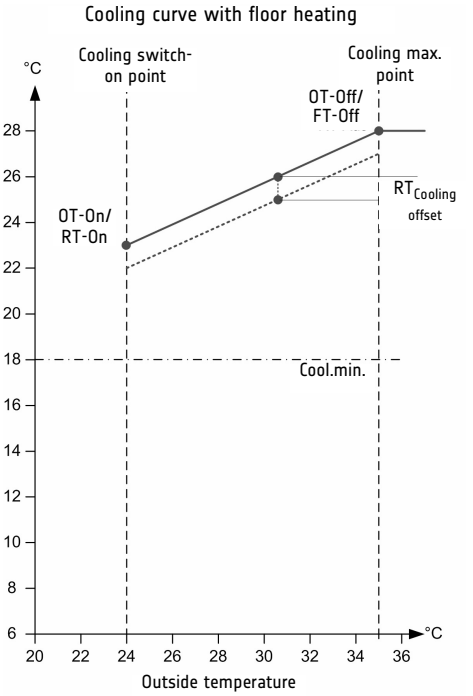
Point 1 of curve (OT-On / FT-On):
Cooling FT setp.temperature for switch-on point / cooling switch-on point OT

Point 2 of curve (OT-Off / FT-Off):
Cooling FT setp. temperature for max. point / cooling switch-off point OT

8.4.2 Calculating room setp. temperature

- The room setpoint temperature to be adjusted, similar to flow temperature, is based on a linear curve, which is determined by two parameters. The current operating point, depending on outside temperature, is the base temperature ($RT_{setp.-cool}$)
- The end user can set a correction value, which is added to the operating point (see Page 8-44).
- $RT_{setp.-cool2} = RT_{setp.-cool1} + (RT_{cool.correc.day}$ or $RT_{cool.correc.night})$
- A room factor can be parameterised via a possibly activated room sensor (see Page 8-45). This results in $RT_{setp.-cool3} = RT_{setp.-cool2} + RT_{cool.correct.dev.}$





Point 1 of curve (OT-On / RT-On):
Cooling room setp.temperature for switch-on point / cooling switch-on point OT

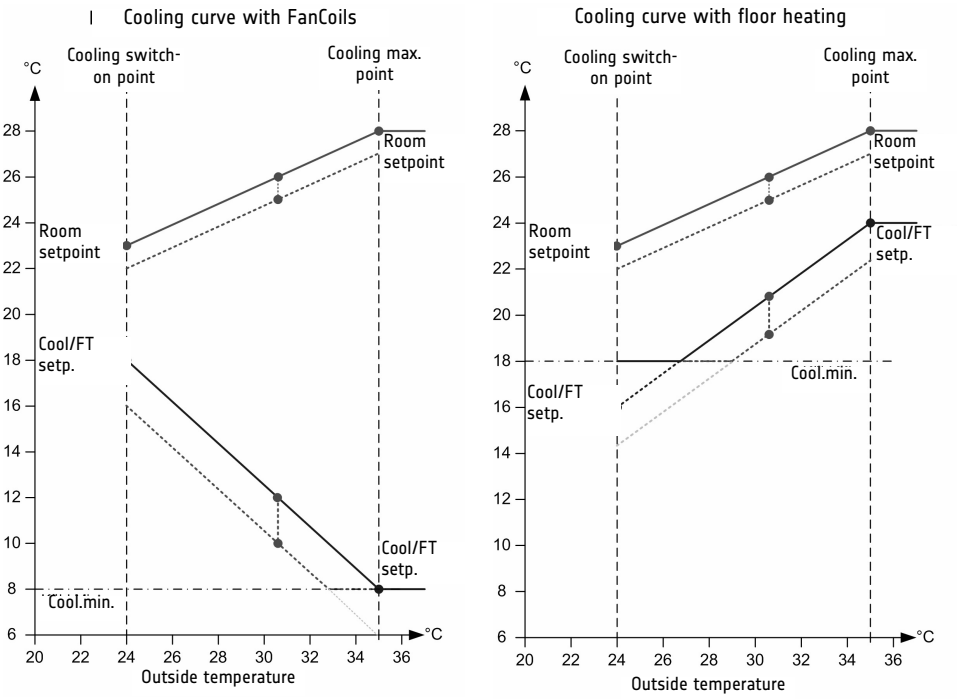
Point 2 of curve (OT-Off / RT-Off):
Cooling room setp.temperature for max. point / cooling switch-off point OT

$RT_{cooloffset} = RT_{setp.-cool3} - RT_{setp.-cool1}$

8.4.3 Connection room setpoint temperature ⇔ flow temperature

- Without the influence of a correction value, the flow setpoint temperature results directly from the flow temperature curve.
- Effective correction values ($RT_{cooloffset}$ <> 0) result in a parallel shift of the flow setpoint temperature curve according to the room setpoint temperature to be adjusted based on the deviation from the setpoint temperature curve.

$$VT_{cooloffset} = RT_{cooloffset} * \left| \frac{FT_{off} - FT_{on}}{RT_{off} - RT_{on}} \right|$$



Dotted line = example: Room correction -1K

Operation:

Note on operation	Key / parameter tree	Parameter	Page
Correction Cooling setp.	Key DAY COOL.-DAY		
Room factor	MIX VALVE-1 or MIX VALVE-2	PARAMETER 04	
Switch-on point cooling, OT	MIX VALVE-1 or MIX VALVE-2	PARAMETER 50	
Cooling max. point, OT	MIX VALVE-1 or MIX VALVE-2	PARAMETER 51	
Cooling FT setpoint temperature heating circuit at switch-on point	MIX VALVE-1 or MIX VALVE-2	PARAMETER 52	
Cooling FT setpoint temperature heating at max. point	MIX VALVE-1 or MIX VALVE-2	PARAMETER 53	
Cooling room setpoint temperature heating circuit at switch-on point	MIX VALVE-1 or MIX VALVE-2	PARAMETER 54	
Cooling room setpoint temperature heating at max. point	MIX VALVE-1 or MIX VALVE-2	PARAMETER 55	
Min. temp. cooling (lower limit)	MIX VALVE-1 or MIX VALVE-2	PARAMETER 55	

8.4.4 Functionality of room unit

If a room unit is connected to a heating circuit, the room influence factors are considered as follows during active cooling:

- Room controller:
  no function during cooling mode. An active room control is interrupted.
- Correction room setpoint ($RT_{cooling\ correct.Dev}$):
  Analog to heating mode, the setpoint-actual deviation is added opposite to the cooling setpoint of the room temperature. The same room factor values apply as in heating mode.
- Thermostat function:
  By setting the thermostat function the cooling mode – analog to heating mode – is interrupted if value drops below limit:
  $RT_{act.} < RT_{setp.-cool2} - SD_{thermostat}$ => Interruption cooling mode
  $RT_{act.} >= RT_{setp.-cool2} - SD_{thermostat} + 0{,}5K$ => Cooling mode is resumed

Adjustment heating circuit: The mixing valve adjusts to setpoint temperature for cooling mode (see parameter "Cooling setpoint temperature heating circuit", heating circuit menu) at flow sensor and – contrary to its usual operation – functions as heating controller.

Emergency mode heating circuit: Emergency mode heating circuit in active cooling mode and senser defect on FS:
Pump off, mix.valve closed.

Temperature rise Heat generator: A parameterised temperature rise heat generator (HC parameter 14)
during active cooling mode is **subtracted** from cooling setpoint.

Screed function: Cooling mode is not activated when screed function is active.

8.4.5 INFO display

Active cooling mode is identified as follows in info displays:

- FLOW: Display of frost symbol and flow setpoint cooling
- ROOMTEMP: Display of frost symbol and room setpoint cooling (setpoint of curve + correction value).
- ACTUATOR: Display of frost symbol
- THERMOSTAT: Display of frost symbol

8.4.6 Extension of operating modes / setpoints

If cooling mode has been activated at a heating circuit in the controller (parameter "Cooling switch-on point" <> OFF), the following operating-specific changes become active.

8.4.6.1 Changeover of joint / separate operating mode

- Automatic changeover of operation to separate operating mode.
- The parameter SYSTEM-CONTROL MODE is hidden.

8.4.6.2 Operating modes

AUTOMATIC Active cooling takes place depending on switching times according to parameterised ROOM-DAY cooling setpoint or ROOM-NIGHT cooling setpoint (depending on ECO/RED setting). An offset of setpoint temperature, parameterised in switching times, has no influence in cooling mode.

HEATING Instead of HEATING, the words HEATING/COOL appear.

- Switching times are disregarded, i.e. heating circuit heats up to set ROOM-DAY setpoint.
- Above the cooling switch-on point, cooling is performed according to ROOM-DAY cooling setpoint.

REDUCED Above the cooling switch-on point, cooling is performed according to ROOM-NIGHT cooling setpoint (depending on ECO/RED setting).

STANDBY Cooling is switched off

HOLIDAY TIL Cooling mode is same as heating mode for holiday period, according to parameterisation (REDUCED or STANDBY)

ABSENT TIL Cooling mode is same as heating mode for the time set at reduced operation (see REDUCED)

PARTY TIL Cooling mode is same as heating mode for the time set at heating mode (see HEATING)

8.4.6.3 Special operating modes Manual / Emission measurement / SLT check

When activating one of the special operating modes Manual, Emission measurement or SLT check, the entire cooling mode is interrupted in the system. Cooling setpoints are no longer transmitted to the energy management.

8.5 Domestic hot water control (..B..)

8.5.1 DHW Tank Loading (DHW)

Function: The output controls at request a DHW loading pump during the relevant operating times.

DHW Day: ***Domestic Hot Water-daytime temperature***

The DHW (Domestic Hot Water-) daytime temperature is set with a key on the user interface. The DHW daytime temperature provides for the desired hot water temperature during DHW operating times in the AUTOMATIC and SUMMER and during the PARTY and HEATING operating modes.

This setting is the initial value for the nominal temperatures that can be set for each heating cycle in the switching-time programs. The temperature settings in the switching time programs are automatically adjusted when the DHW daytime temperature is changed.

Example:

Before: Temperature setting hot water daytime temperature: 50 °C

Temperatures in switching-time program:

5:00	-	8:00	60 °C
08:00	-	16:00	50 °C
16:00	-	22:00	60 °C

After: Temperature setting hot water daytime temperature: 52 °C

Temperatures in switching-time program:

05:00	-	08:00	62 °C
8:00	-	16:00	52 °C
16:00	-	22:00	62 °C

Changed settings are stored when key or is briefly pressed again or after automatic return at a preset time. Once the settings are stored, the unit automatically switches to Basic display.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting DHW night temperature		

DHW Night:

Domestic Hot Water-nighttime temperature

Hot water economy temperature is the setpoint for the DHW tank between the active operating mode times in automatic mode.

If a DHW thermostat is used to determine the water heater temperature, the parameter for the setting of the economy temperature is skipped.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting DHW night temperature	DHW	DHW NIGHT

Legionella protection:

Legionella protection

A legionella protection function can be activated to eliminate the legionella germs in the tank.

In order to completely kill all germs, the Legionella protection temperature should be set at least at 60-65°C.

The setting is carried out with two parameters. The weekday for Legionella protection can be selected by the end user with a freely accessible parameter. With additional parameters the time and temperature can be set by the heating technician.The legionella protection function is activated for 1 hour.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting weekday for legionella protection / activating function	DHW	LEGION PROT. DAY
Setting the time (only if function is active)	DHW	PARAMETER 03
Setting the temperature (only if function is active)	DHW	PARAMETER 04

Temperature assessment:

Mode of temperature assessment

This function determines the type of temperature assessment in the DHW tank.

Usually an electronic **temperature probe** (immersion sensor in the hot water tank) is used for this purpose. The temperature-dependent electric resistance of the probe is utilized.

Alternatively, hot water provision can also be controlled by a mechanical temperature controller (**Thermostat** switching contact). A hot-water thermostat is connected to tank sensor input DHWS and set to the required nominal temperature. When the thermostat request energy via the tank sensor input (contact closed), the tank is loaded with hot water at the set hot water maximum temperature until the contact opens again.

Note: In case of DHW control via thermostat the current water heater temperature can no longer be detected and hence does not appear in the system information. Only the status of the thermostats is displayed. The desired water heater daytime temperature is not callable at the user level.

Operation:

Note on operation	Key / parameter tree	Parameter
Mode of temperature assessment	DHW	PARAMETER 05

Maximum Temperature: ***Domestic Hot Water-maximum temperature:***
This function limits the temperature in the DHW tank according to the aforementioned set value. The desired water heater daytime temperature to be set at the user level is limited by this parameter.

⚠ CAUTION Hot water maximum temperature limitation is function protecting the tank and terminates hot water loading into the tank. The tank loading pump is switched off immediately when the maximum temperature is exceeded. In this case it cannot be ensured that the set extended running time is adhered to.

Note: If a DHW thermostat is used to determine the water heater temperature, this function is not active.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting DHW Maximum temperature	DHW	PARAMETER 06

Operating Mode: ***DHW Operating Mode***
With this function it is set how the heating system reacts to a heat demand from the DHW tank. There are 7 different settings.

Parallel mode (setting = 1):
During tank loading the heating circuits remain operative.

Priority mode (setting = 2):
During tank loading the heating circuits are put out of function. They are restarted as soon as the DHW loading pump extended running time is over.

If the DHW setpoint is not reached after 4 hours, an alarm is indicated on the display.

Conditional priority (setting = 3):
The heating circuits are enabled when the temperature in the heat generator exceeds the current DHW target value. The heating circuits will be enabled according to the following criteria:

Enabling the heating circuits:
H-GEN actual temperature> DHW setpoint + DHW switching differential/2 + 10 K

Disabling the heating circuits:
H-GEN actual temperature< DHW setpoint + DHW switching differential/2 + 5 K

Note:
In this operating mode the loading temperature increase for the tank is to be selected so that the heat generator does not switch off before the heating circuits are enabled. A parallel shift of at least 10K should be set so that this function can operate correctly.

Weather-guided parallel mode (setting = 4):
Above the set outside frost protection limit DHW heating is carried out in priority mode; in case of active frost protection there is a switchover to parallel mode.

Priority mode with intermediate heating (setting = 5):
With this setting DHW loading is limited to a maximum of 20 minutes in order to provide for a 10-minute long intermediate heating. The loading procedure is continued at the end of the intermediate heating. DHW loading and intermediate heating are carried out in an alternating order until DHW tank loading is finished.

Priority separation circuit (setting = 6):
Tank loading is carried by means of a three-way changeover valve; the heating circuit pump is also the DHW loading pump. At the end of the DHW loading and at the expiry of the extended time the three-way valve is changed back to heating mode.

The heating circuit pump is connected at output HC-P and the three-way valve to output DHW in this case.

Note: If there is no hot water request (idling), the valve is switched to the hot water tank (relay output closed).

External operation (Request does not act on heating generator and HC) (Setting = 7)
In external operation hot-water loading is switched only according to the set switching differentials. There is no heat request to the heat generator. There is no accumulator priority mode to the heating circuits. The parameters Boiler parallel shift, Tank Discharge Protection, Pump Extended Running Time and Boiler Start-up Protection do not act on the DHW loading pump.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting DHW Operational mode	DHW	PARAMETER 07

Discharge Protection: ***Tank Discharge Protection***
With discharge protection activated and a DHW request present, the DHW loading pump enabled only when the temperature in the heat generator rises by more than 5 K above the actual temperature in the hot water tank.

This measure prevents any rear tank discharge through the heat generator. The DHW loading pump is disabled again as soon as the temperature difference between the heat generator and the DHW tank has dropped to less than 2 K.

Note: The heat generator minimum temperature limit operates continuously to protect the heat generator and blocks the DHW loading pump in case of temperatures below the set value.

⚠ CAUTION In case of DHW temperature settings above 60°C this function should not be activated to avoid safety switch-off (in particular for heat generators with a low water capacity).

Operation:

Note on operation	Key / parameter tree	Parameter
Activation tank discharge protection	DHW	PARAMETER 08

Boiler Temperature parallel shift:

Boiler Temperature parallel shift

This function determines the default setting for the tank loading temperature through the H-GEN, compared to the set DHW setpoint.

In case of several controllers connected via bus and several DHW circuits the tank loading temperature depends on the highest setpoint if several tanks are loaded simultaneously.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting boiler temperature parallel shift	DHW	PARAMETER 09

Switching differential: **DHW Tank Switching Differential**

This function determines the size of the DHW switching differential. The switching differential affects the relevant DHW setpoint symmetrically.

Loading enabling: The current DHW temperature is lower than the DHW setpoint by half the amount of the DHW switching differential.

Loading abort: The current DHW temperature exceeds the DHW setpoint by half the amount of the DHW switching differential.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting switching difference	DHW	PARAMETER 10

Extended Pump running time:

DHW-loading pump extended running time

After switching off the heat generator the tank loading pump is stopped only after a time delay to prevent a safety switch-off in case of high temperatures. The setting can be adjusted to the capacity of the DHW tank.

Note: Excessively long overtravel times interrupt unnecessarily the heating mode and increase the temperature in the hot water tank.

Note: Depending on the parameter setting, an existing setpoint value in the system is either transmitted to the heat generator during the extended run time, or not.

The boiler continues to operate according to the following rules during a extended tank pump run time:

	Hot water parallel mode	Hot water priority mode	Conditional hot water priority mode	
	HC setpoint	HC setpoint	HC setpoint	MC setpoint
AUTO	Active	OFF	OFF	Active
OFF	OFF	OFF	OFF	OFF

Operation:

Note on operation	Key / parameter tree	Parameter
Setting loading pump extended running time	DHW	PARAMETER 11
Behaviour of heat generator during extended run time	DHW	PARAMETER 17

Tank sensor 2: For complete loading of a hot-water tank by means of automatic measuring point changeover between tank sensors 1 and 2 (layer loading). The measured value of the hotter sensor (DHWS1 or DHWS2) is evaluated for the activation of the loading pump. Termination of the loading is carried out on the basis of the measured value of the colder sensor. The set values for the hot-water setpoint temperature and the specified hot-water switching difference continue to apply.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation tank sensor	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10

8.5.2 DHW reloading

Reloading is activated by pressing and holding key ⏎ for 3 sec. The reloading time can be changed by turning the rotary push button. Note: In hot water thermostat mode it is sufficient to press the ⏎ once briefly

An activate reload remains active at the hot water DAY value (basic value) for the preset reloading time.

A current request from the time programme is overlapped by reloading. The reloading temperature has priority over the time programme temperature. If the reloading time is 0 min, reloading is started once and remains active until the setpoint value has been reached.

If the operating mode for the DHW circuit is set using the modem function, a DHW reload is not performed as the modem function has priority 1.

8.5.3 Circulation pump (CIR.)

Note: This function is callable only if a variable output is defined for a circulation pump.

Function: The output controls a hot water circulation pump.

Impulse: ***Economy interval (pause)***

The use of the economy interval minimizes the usual circulation losses owing to adjustable switch-on intervals during operating and determines the run time of the DHW circulation pump within an adjustable period (economy interval).

Period duration: **Economy interval (cycle duration)**

The cycle duration determines the length of the cycle and thus the duration of the circulation pump pulse operating mode minus the set economy interval pause time.

Economy interval $_{pulse}$ = economy interval $_{cycle\ duration}$ - economy interval $_{pause}$

Example: If the economy interval cycle time is 20 minutes and the economy interval pause time is 5 minutes, the subsequent economy interval pulse is 15 minutes.

Switching Times: **Switching times circulation pump**

In this function a DHW circulation pump can be coupled to an existing automatic program of a control circuit with regard to the switch-on and switch-off times. The DHW circulation pump is in function during the heating or DHW cycles of the selected circuit and program.

Note: If operation of the time programs P2 and P3 were not enabled (see parameter PROGRAM on parameter level SYSTEM) and the circulation pump is assigned to one of these programs, the pump will operate according to the stored standard times. The same applies if a switching-time program was selected that does not exist for the controller in use (e.g. an MC 2 for THETA 23B).

Operation:

Note on operation	Key / parameter tree	Parameter
Activation circulation pump	HYDRAULIC	PARAMETER 02 or PARAMETER 05 or PARAMETER 06 or PARAMETER 07
Assignment time program	DHW	PARAMETER 12
Econ. interval running time	DHW	PARAMETER 13
Econ. interval period duration	DHW	PARAMETER 14

8.5.4 Electrical Heating Element (ELH)

Function: The function controls indirectly (via circuit breaker) an electrical water heater if the automatic summer switch-off is active.

An external DHW thermostat including the necessary safety installation will take care of the switch off function.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation electrical heating element	HYDRAULIC	PARAMETER 02 or PARAMETER 05 or PARAMETER 06 or PARAMETER 07

8.6 Solar function (..VV..)

Note: This function can only be accessed if a variable output is assigned to a solar loading pump.

Two separate sensor inputs are available for this function:

- SPFS for the solar panel flow temperature and
- SPBU for the solar buffer tank

For heat metering a variable input (VI1..VI3) can be assigned for the solar panel return sensor SPRS.

If the solar panel flow sensor is defect, the loading pump wiil be switched off.

Function: The solar function makes it possible to combine solar panels with heating and DHW systems in order to support the economy of the system. The Solar loading pump can be controlled according to various conditions.

Operation: **Activation of the function and sensor assignment:**

Note on operation	Key / parameter tree	Parameter
Activation solar charging pump	HYDRAULIC	PARAMETER 05 or PARAMETER 06 or PARAMETER 07
Solar panel return sensor	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10

Switch-on differential: **Solar switch-on differential**(SD ON)

With sufficient solar heat energy the temperature difference between panel flow and solar buffer tank will become bigger than the adjusted value and the solar panel pump is switched on to load the buffer tank. The **minimum** value is 3K above the switch off differential.

Switch-off differential: **Solar switch-off differential** (SD OFF)

If the temperature difference between panel flow and buffer tank falls below this adjusted differential, the pump will be switched off and the loading terminated. The **maximum** value is always 3K below the switch on differential.

Minimum running time: **Minimum running time solar charging pump (SOP)**

The solar pump remains running for this adjusted time. The minimum running time has **priority** over the switch off differential.

Solar panel max: **Solar panel maximum limit**

This limit serves for the thermical protection of the solar panel/s. It activates the panel pump if the adjusted temperature is exceeded. If the panel temperature falls below the adjusted value −5K again, then all solar functions and settings will be active again.

Tank max: **Solar tank maximum limit**

If the temperature in the buffer tank exceeds this limit, then even the solar panel maximum limit function will be deactivated so that the pump switches off. This function can be activated again as soon as the buffer tank temperature falls more than 10K below its maximum limit.

Solar operating mode: **Solar operating mode**

This function defines the loading mode.

- **Solar priority mode**

During solar loading the heat demand is not sent to the heat generator when it is not active. An active heat generator stays in operation until the next switch off cycle.

- **Solar parallel mode:**
During solar loading the demand to the heat generator is permitted.

- **Solar priority mode DHW (setpoint control)**
During solar loading the demand of DHW control to the heat generator is blocked.

- **Solar priority mode buffer (setpoint control):**
During solar loading the demand of buffer control to the heat generator is blocked.

Inhibition H-GEN: **Inhibition heat generator (noly during solar operating mode = priority mode)**

The temporary interruption serves to prevent frequent switching between solar loading and loading by the heat generator. After a solar pump switch-off the set time has to pass before the solar buffer tank can be loaded again by the heat generator (boiler).

Changeover parallel: **Solar priority / parallel switchover** (only with solar operating mode = priority mode)

Priority mode
When the temperature in the solar tank drops below the nominal value by this temperature setting during priority solar loading, the system is automatically switched to parallel operation (temporary interruption disabled, heat generator enabled). Priority mode is activated again as soon as the tank temperature rises above the actual setpoint plus the DHW switching differential.

Priority mode DHW

If the temperature in the DHW tank (DHWS) sinks under the nominal DHW-value by the set value during priority solar loading, the solar priority mode is switched off until the nominal DHW-value is reached.

Example:
DHW setpoint 50°C
Set value changeover: 10K
=> The heat generator is only required when the actual DHW temperature drops below 40°C.

Priority mode buffer

If the temperature in the buffer tank (BU) sinks under the nominal buffer value by the set value during priority solar loading, the solar priority mode is switched off until the nominal buffer value is reached.

Example:
Nominal value to buffer of HCs: 45°C
Buffer parallel shift: 10K
Set value changeover: 20K
=> The heat generator is only required when the buffer temperature drops below 35°C.

Heat balance: Heat balancing is activated through this parameter setting. The user can select between flow calculation via the pump running time and determination of the flow volume via the pulse signal input of the device, if such input is available. Any commercial flow meter can be connected to the pulse input.

Reset heat balance: **Reset heat balance** (only if heat balancing is activated)
If the heat balancing is active, the counter can be reset with this parameter.

Volume flow: Volume flow (only with heat balancing enabled)
This setting allows choosing between volume flow computed in

- liters/minute for calculating the flow volume or
- liters / pulse when using the pulse input

corresponding to the respective pumping capacity of the solar loading pump.

Note: If the adjustment is 0, there is no heat balance!

Fluid density: Density medium (only if heat balancing is activated)
This parameter defines the fluid density according to the manufacturers data.

Fluid heat capacity: Specific heat capacity medium (only if heat balancing is activated)

This parameter defines the specific heat capacity for the correct calculation of the heat balance. The data is supplied by the fluid manufacturer.

Note: The physical data **Volume flow**, **density** and **specific heat capacity** form the basis for the calculation of the solar energy balance and the solar capacity, and are calculated according to the mathematical correlation.

W = (V / t) ·rw · cw · Du · t_{SOP}

The results can be seen in the information level.

Anti-blocking protection: This is an automatic function of the controller. If the solar loading pump was switched off for longer than 24 hours, then it will be started for 20 seconds in order to prevent blocking through corrosion.

Operation of solar parameters:

Note on operation	Key / parameter tree	Parameter
Switch-on difference	SOLAR	PARAMETER 01
Switch-off difference	SOLAR	PARAMETER 02
Minimum run time SOP	SOLAR	PARAMETER 03
Collector's maximum temperature	SOLAR	PARAMETER 04
Tank's maximum temperature	SOLAR	PARAMETER 05
Operating mode	SOLAR	PARAMETER 06
Solar priority parallel switchover	SOLAR	PARAMETER 08
Heat balance	SOLAR	PARAMETER 09
Reset sol. energy balance	SOLAR	PARAMETER 10
Volume flow	SOLAR	PARAMETER 11
Density medium	SOLAR	PARAMETER 12
Specific heat capacity medium	SOLAR	PARAMETER 13

8.6.1 Final switch-off temperature

The final switch-off, i.e. maximum limitation, functions even if the SZV function is not activated.

The SOP is switched on if the maximum temperature limit is exceeded. The SOP is switched off when the final switch-off temperature is exceeded. The final switch-of temperature has priority of the maximum temperature limit.

The final switch-off temperature is at least 10.5K higher than the maximum solar temperature because the SOP would otherwise not be activated.

8.6.2 Tank loading changeover (via solar laoding valve SLV) (..VV..)

In systems that have both an external hot water tank and a buffer tank, a diverter valve can be used to switch between loading the hot water tank and loading the buffer tank from solar equipment.

Description: The use of a changeover delay (Parameter 15 solar tree) sometimes causes problems. To ensure that the solar collector in priority operation can be loaded, checks are performed at regular intervals whether a sufficient temperature is reached for charging the tank.

Changeover requirements: If the changeover temperature in the primary tank is not reached and the solar charge in the secondary tank is active, then:
After a set time of 30 minutes, the SOP is switched of for the time of the set value (Parameter 15) and the temperature difference between SPFS (solar panel flow sensor) and SCVS (solar tank charge valve sensor) is checked to see if it fulfills the switch-on requirement. If, in the meantime, the switch-on requirement for charging the primary tank is fulfilled, the charging in the primary tank is started immediately.

This check does not take place if the actual temperature of the primary tank + switch-on differential >= final switch-off temperature.

Function: This function allows switching a diverter valve according to the load condition of two heat storage tanks (2-point output).

The solar energy charging of the DHW tank is prioritised according to the settings of the solar control. In this case, the SCVS (solar tank charge valve sensor) is used instead of the SBUS and the changeover temperature is used for charging instead of the solar tank maximum limit.

If the set changeover temperature in the DHW tank is reached or the switching differential between SPFS and SCVS is insufficient for charging the DHW tank, the solar charge control changes over to the buffer tank.

Operation Solar load switch:
Setting only possible if an SOP is set.

Note on operation	Key / parameter tree	Parameter
Solar charge valve	HYDRAULIC	PARAMETER 06 or PARAMETER 07
Solar tank charge valve sensor	HYDRAULIC	Automatic assignment
Switch delay	SOLAR	PARAMETER 15
Switch-over temperature	SOLAR	PARAMETER 16

8.6.3 Forced heat dissipation valve (Solar forced dissipation valve SFDV) (.. VV..)

Function: This function allows preventing the degassing of the medium at high solar panel temperatures in solar power systems. Such degassing can occur when the solar heat tank is full (maximum temperature exceeded) and, consequently, forced dissipation into the heat tank is impossible. In this case, the solar pump is switched off and the solar panel temperature rises.

Description: The function of the solar forced heat dissipation valve involves a forced switch-off of the SOP when the final switch-off temperature is exceeded.

This function is independent of the assignment of a forced-dissipation valve to a variable output. The setting OFF will be added.

The final switch-off setting is independent of the preset solar panel maximum temperature and can be lower than the latter. In this way there are independent forced switch-on and forced switch-off functions for the SOP.

The solar forced heat dissipation output is energized under the following conditions:

- Function enabled for solar tank temperatures in excess of the maximum temperature.
- When the solar panel temperature rises above the set solar panel maximum temperature the output is switched on while the solar loading pump continues running.
- When the solar panel temperature rises above the set final switch-off temperature the SZV output and the solar loading pump are switched off.

Operation: This function can be selected only if an SOP has been set.

⚠ CAUTION When this function is active, the solar loading pump continues running even when the solar panel temperature exceeds the set solar panel maximum temperature.

8.7 Buffer tank function heating buffer (..VV..)

Note: The function is only activated if a variable output is assigned to a buffer loading pump.

For stratified discharge, an optional second buffer tank sensor (BU 2) can be connected at a variable input (VI1 to VI3).

The temperature of the heat generator is internally supplied.

Function: Buffer tanks are energy storages used to store energy which is supplied without control from either a solar system or a solid fuel boiler. The energyconsumption of heat consumers can be covered by the energy from the buffer tank.

Controlled heat generators (boilers) can be used in a supporting function, which cover the extra energy demand.

The function of the buffer charging pump ensures that a controlled heat generator supplies the buffer or heating or DHW circuits with the necessary extra energy.

If no controlled heat generator is used (e.g. heating by wood boilers only), buffer functions such as forced dissipation into the heating circuits can be used by connecting and activating buffer tank sensor 1 at a variable input.

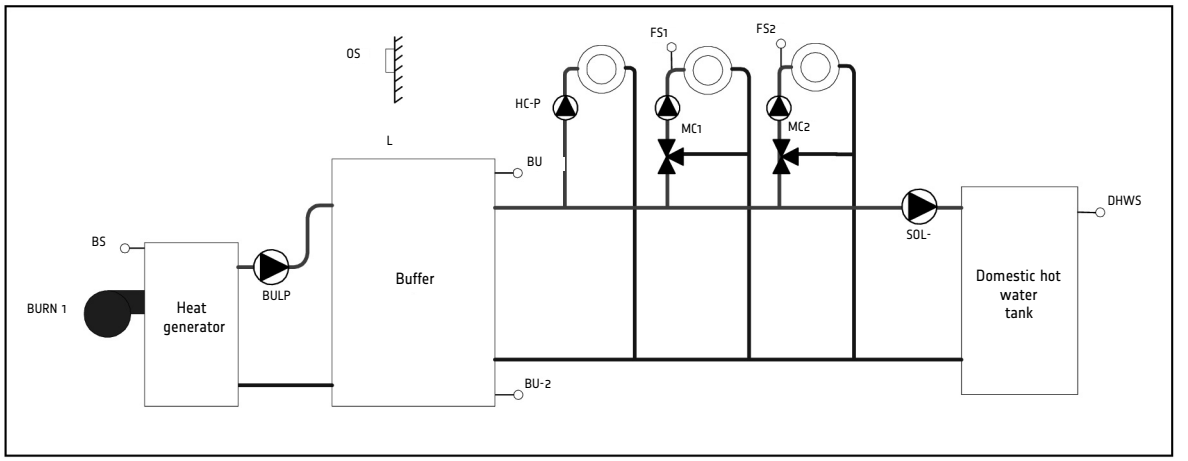
Operation: Activation of the function and sensor assignment:

Note on operation	Key / parameter tree	Parameter
Activation buffer charging pump	HYDRAULIC	PARAMETER 06 or PARAMETER 07
BU is assigned if BULP is active, otherwise, it can be set	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10

Operating modes: To support the full range of available combination options in multivalent heating systems with buffer support, the control system offers the possibility to set various operating modes for buffer operation. The different settings cause different processing sequences of heat requests for heating circuits and hot water. In the following, the different operating modes are illustrated using exemplary hydraulics layouts.

Operating mode 1 – Charging control HC and DHW requests

System hydraulics:

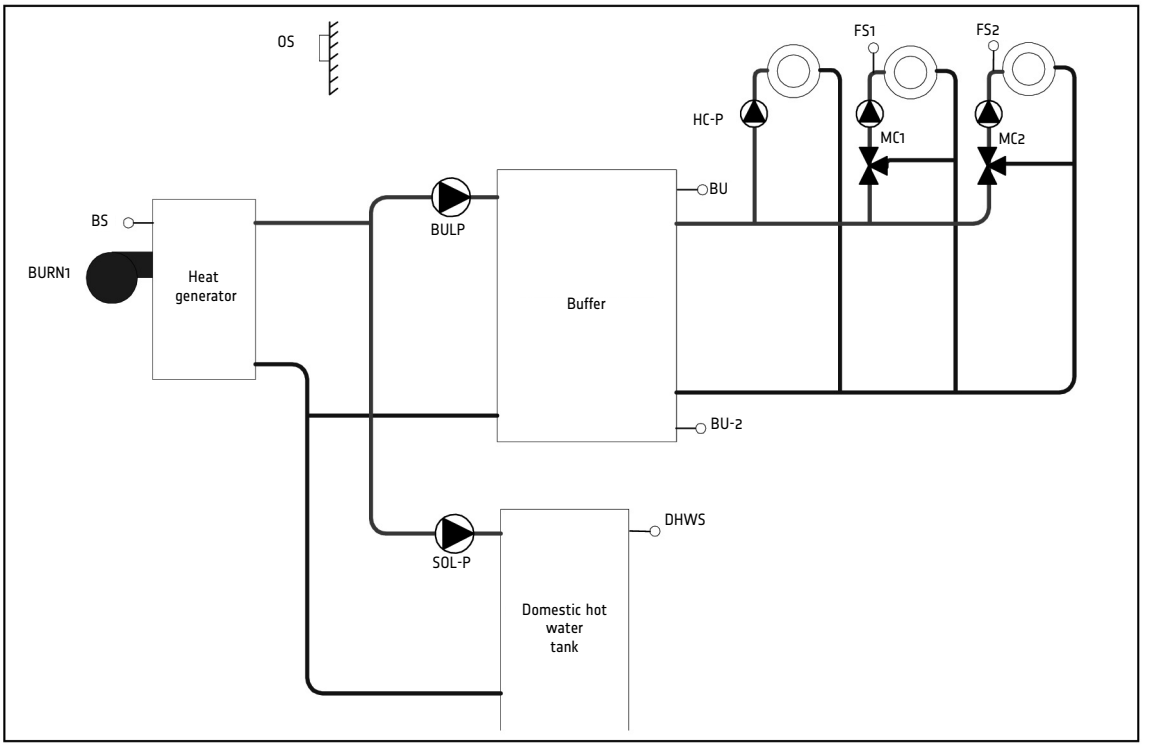


Heating-circuit and hot-water control send their demand value to buffer control. Buffer control requests additional energy from the heat generator via the buffer loading pump.

See the table below for detailed correlations.

Operating mode 2 – Loading control for HC request only

System hydraulics:



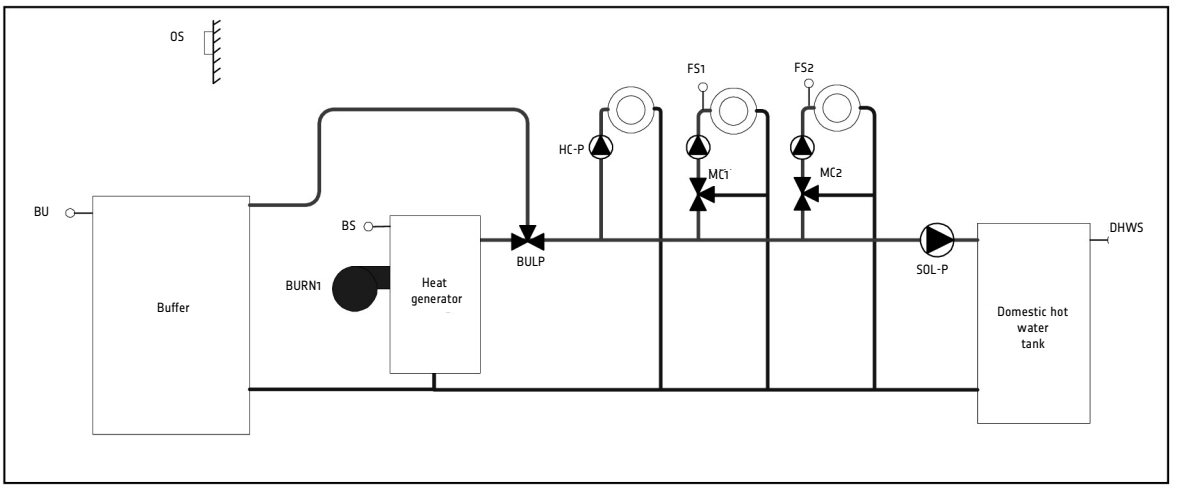
The heating circuit controls send their demand value to buffer control. Hot-water and buffer control request energy from the heat generator when required.

With hot-water priority activated, this function acts on the buffer loading pump but not on the heating circuits.

See the table below for detailed correlations.

Operating mode 3 – Discharge control HC and DHW requests

System hydraulics:



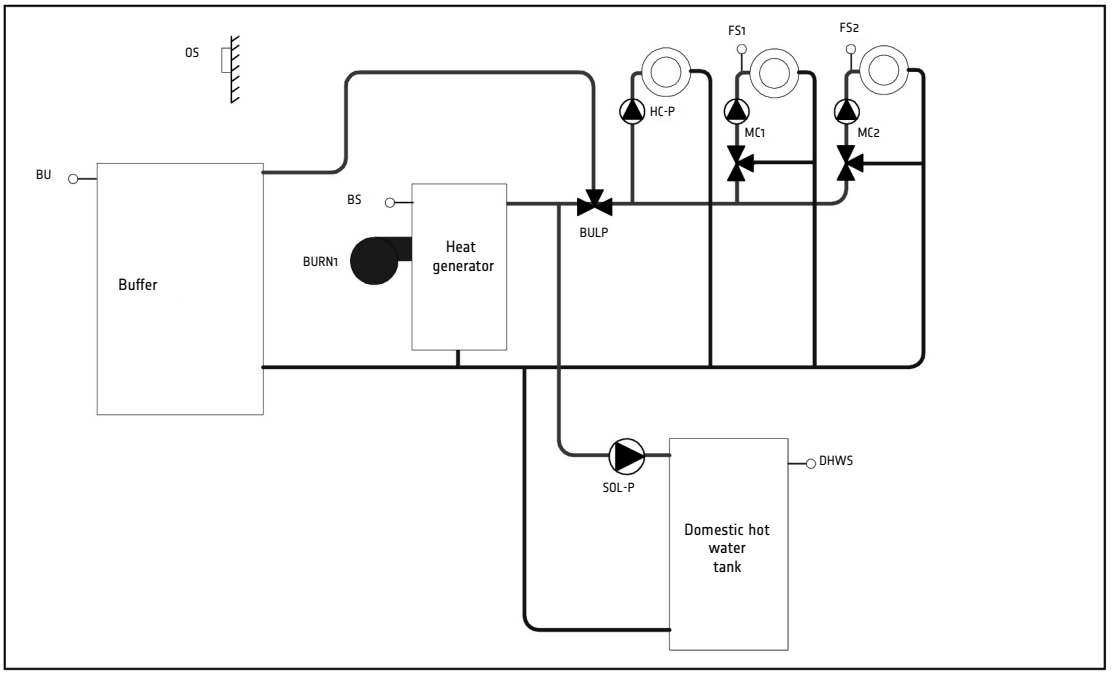
Heating-circuit and hot-water control send their demand value to buffer control. The BULP (PLP) input switches ON when the energy demand can be met by the buffer. If the energy in the buffer is insufficient, buffer control requests additional energy from the heat generator and BULP (PLP) switches OFF.

BULP (PLP) is switched off when there is no request from the heating circuits and from hot-water loading.

See the table below for detailed correlations.

Operating mode 4 – Discharge control for HC requests only

System hydraulics:



Controller function:
Buffer demand HC

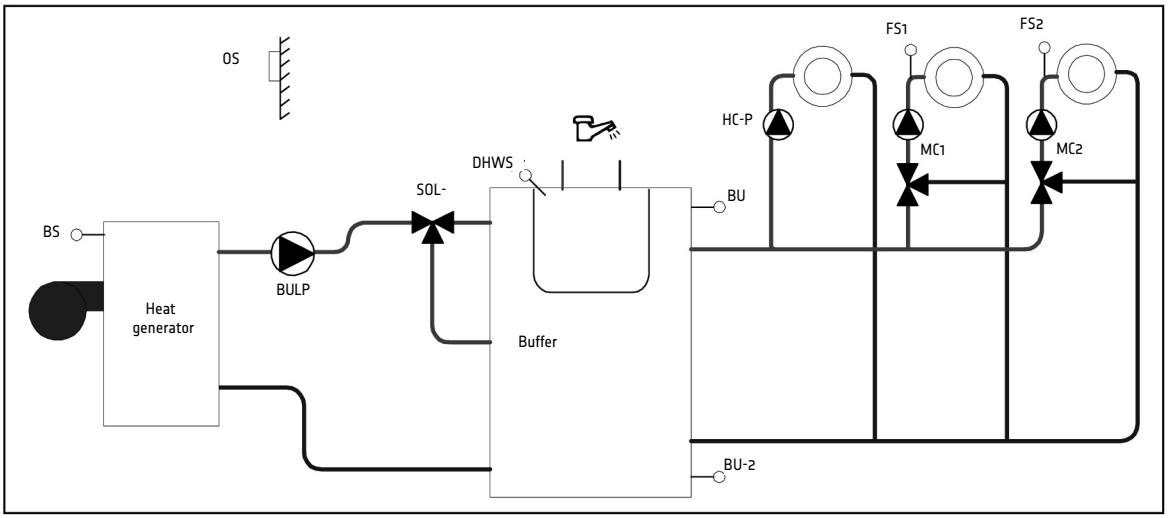
As operating mode 3, except that the requests from DHW control are sent directly to the heat generator.

An active hot-water priority only acts on the heating circuits when there is no buffer discharge in progress.

See the table below for detailed correlations.

Operating mode 5 – Loading control with DHW switchover

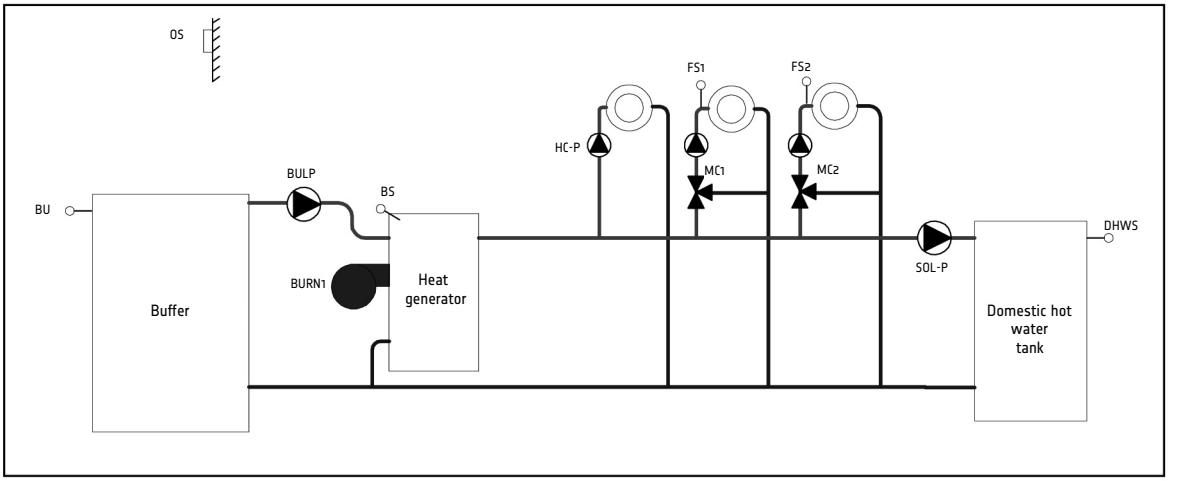
System hydraulics:



The heating circuit controls send their demand value to buffer control. Hot-water and buffer control request energy from the heat generator when required. The BULP (PLP) output is ON during buffer discharge and DHW loading.
The set DHW operating mode is active.

Operating mode 6 – Discharge control to heat generator

System hydraulics:



This hydraulic layout is used when an alternative-energy buffer tank is added to an existing system. In such systems there are often existing unit boilers with integrated DHW tank and DHW loading.

All heat requests are sent to the heat generator.

When the buffer tank can cover the energy demand, the heat generator nominal temperature is maintained by the buffer, via BULP (PLP), instead of the burner.

In this way the heat generator always operates at its nominal temperature and can not be exposed to excessive buffer temperatures.

See the table below for detailed correlations.

	Buffer operating mode					
	1	**2**	**3**	**4**	**5**	**6**
Buffer request from	HC/DHW	HC	HC/DHW	HC	HC	---
H-GEN request from	BUFFER	BUFFER/DHW	BUFFER	BUFFER/DHW	BUFFER/DHW	HC/DHW
Buffer control type	Charge	Charge	Discharge 1	Discharge 1	Charge	Discharge 2
Buffer start-up protection acts on	HC/DHW	HC	HC/DHW	HC	HC	---
Buffer discharge protection	X	X	---	---	X	---
Buffer frost protection monitoring	X	X	---	---	X	---
Buffer minimum temperature monitoring	X	X	---	---	X	---
Buffer maximum temperature monitoring	X	X	X	X	X	X
Buffer forced dissipation into	HC/DHW	HC	HC/DHW	HC	HC	HC/DHW
Buffer skimming function	X	X*	---	---	X*	---
Loading temperature control from	HC/DHW	HC	---	---	HC	---
H-GEN start-up protection on BULP	X	X	---	---	X	---
Function BULP without request	OFF	OFF	OFF	OFF	OFF	OFF
Function BULP for manual operation	ON	ON	OFF	OFF	ON	OFF
Function BULP for sensor defect	ON	ON	OFF	OFF	ON	OFF
Function BULP for heat generator disabled	---	---	ON	ON	---	---
Function BULP if H-GEN not available and buffer start-up protection is active**	---	---	OFF	OFF	---	---
Function BULP if H-GEN available and buffer start-up protection is not active**	---	---	ON	ON	---	---
Effect of H-GEN start-up protection on	BULP	DHW/BULP	HC/DHW	HC/DHW	BULP	HC/DHW
Tank discharge protection / H-GEN in system	BULP	H-GEN	H-GEN	H-GEN	H-GEN	H-GEN
Tank discharge protection / no H-GEN in system	BULP	H-GEN	BULP	H-GEN	H-GEN	H-GEN

* only if hot water loading is not active

** H-GEN is not available if

- an external heat generator disable is connected to a VI
- inhibition H-GEN by parameterisation in solid fuel menu tree is active
- inhibition H-GEN by parameterisation in solar menu tree is active
- no H-GEN is in the system

Table 1: Correlations between operating mode and buffer functions

Loading control

The supply of energy from a controlled heat generator to the heating circuits is realized **through loading the buffer tank**. The buffer control ensures that the buffer is supplied with sufficient energy from the heat generator, via the buffer loading pump.

Discharge control 1

The heating circuits are supplied with energy **either** from the buffer **through discharging the buffer tank** via BULP, provided the buffer tank contains sufficient energy, **or through** direct supply from the heat generator.

Discharge control 2

The heating circuits are **always** supplied with energy from the heat generator. As long as the buffer contains sufficient energy, the heat generator will be heated via the buffer loading pump instead of the burner. If the energy in the buffer is not sufficient, the burner will be started.

Operation buffer parameters:

Note on operation	Key / parameter tree	Parameter
Buffer operating mode	BUFFER	PARAMETER 10

Set temperature: **Buffer set temperature**

The buffer set temperature is the temperature which the buffer tank must supply for the connected heating circuits. This is the temperature of the highest demand in the heating system.

Example:

- Demand value MC-1 = 45 °C
- Demand value MC-2 = 55 °C
- Demand value DHW = 65 °C

=> Buffer set temperature = 65 °C

A required excess value (e.g. hot-water load temperature excess) has already been taken into consideration in the demand value of the heating circuits.

Minimum temperature limit: **Buffer minimum temperature limit**

If there is a heat demand from heating circuits or DHW then the buffer tank temperature is maintained on this adjustable limit. If the temperature drops below this limit, the buffer tank is loaded again by the heat generator.

Maximum temperature limit:

Buffer tank maximum temperature limit

If the temperature in the buffer tank exceeds the adjusted value, then the loading pump is switched off. The excessive heat energy will be dissipated in preselected circuits (see forced discharge).
The dissipation will be disabled if the temperature in the buffer tank drops 2 K below the maximum limit.

H-GEN parallel shift:

Buffer H-GEN parallel shift

In order to have sufficient heat energy stored for the heat consumers, the demand value sent to the heat generator (H-GEN) can be increased by an additional parallel shift.

Switching differential:

Buffer switching differential

If the buffer temperature exceeds the demand value plus the switching differential, then the loading pump stops. It switched on again if the temperature falls below the demand value.

Forced dissipation:

Buffer forced dissipation

When the set buffer maximum temperature limit is exceeded, the excess energy can be dissipated into the heating circuits and the hot-water tank. The heating circuits into which the forced dissipation is routed are determined by the respective parameter.

Adjustments:

- **OFF**

no heat dissipation

- **DHW charging pump**(only with additional tank)

excess energy is pumped into a DHW tank

⚠ CAUTION Strongly recommended: Thermal mixing valve for DHW tank to avoid scalding.

- **Heating pump**(s)

Excess energy is pumped into the heating circuit(s). The adjusted maximum temperature is not ecxeeded. The room temperature may be temporarily exceeded. If necessary, activate thermostat function with wall unit(s).

⚠ CAUTION Strongly recommended: Strap- on thermostat for floor heating in order to switch off the pump.

Drain function:

Buffer Drain function (only with charging control)

Outside of a buffer loading by heat generator (buffer setpoint is reached), the temperature difference between the heat generator temperature and the buffer tank temperature (BU) checked, if this has been parameterised. If the temperature difference rises above the set drain function switch-on differential, the buffer charging pump is switched on. If the temperature difference drops to the drain function switch-off differential, the buffer charging pump is switched off immediately.

This drain function ensures that excess energy in the heat generator (e.g. by post heating) is not lost.

Start-up protection: **Buffer start-up protection (only with charging control)**

In buffer operation there is no start-up protection for the heat generator acting on the heating circuits. The start-up protection only acts on the buffer loading pump. When buffer start-up protection is switched on and the buffer tank temperature drops below the minimum temperature limit, all consumer circuits are separated hydraulically (pumps are switched off). The buffer start-up protection is disabled (pumps are switched on again) when the buffer tank temperature exceeds the buffer minimum temperature plus half of he buffer switching differential. All consumer circuits remain in operation when buffer start-up protection is switched off.

Discharge protection: **Buffer discharge protection (only charging control)**

Buffer discharge protection disables the buffer loading pump until the heat generator temperature has risen to more than 5 K above the buffer nominal temperature.

This measure prevents any rear buffer discharge through the heat generator. The buffer loading pump is disabled again as soon as the temperature difference between the heat generator and the buffer tank has dropped to less than 2 K.

Buffer sensor 2: **Buffer sensor 2 (BU 2)**

The buffer tank can be equipped with a second sensor (BU-2) for unmixed storage tank loading and discharge. Loading starts if the highest of both temperatures falls below the setpoint. Loading is finished if the lowest of both temperatures exceeds the setpoint plus buffer switching differential. [stratified discharge]

Extended run time BULP:

If buffer loading has been completed on a buffer loading system, a parameter setting can be used to parameterise an extended run time for the buffer loading pump.

Operation buffer parameters:

Note on operation	Key / parameter tree	Parameter
Buffer sensor 2 (bottom)	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10
Minimum temperature	BUFFER	PARAMETER 01
Maximum temperature	BUFFER	PARAMETER 02
Excess temperature H-GEN	BUFFER	PARAMETER 03
Switching differential	BUFFER	PARAMETER 04
Forced heat dissipation	BUFFER	PARAMETER 05
Drain function switch-on differential	BUFFER	PARAMETER 06
Drain function switch-off differential	BUFFER	PARAMETER 07
Start-up protection	BUFFER	PARAMETER 08
Discharge protection	BUFFER	PARAMETER 09
BULP extend. time	BUFFER	PARAMETER 11

8.8 Cooling buffer control (..HP..)

8.8.1 General description

Optionally, a cooling buffer control can be activated. The SBUS input is a fixedly assigned as cooling buffer sensor. As a result, all other applications of the SBUS are no longer possible. (e.g. solar, fix, ...).

- The parameter tree BUFFER-COOL is available if the hydraulic parameter "Activation cooling buffer" is at ON.
- Switching conditions:
  - When CBS >= $CB_{setp.}$ then transfer $H\text{-}GEN_{setp.\text{-}cool}$ to H-GEN
  - When CBS >= $CB_{setp.}$ - CBSD) then no transfer $H\text{-}GEN_{setp.\text{-}cool}$ to H-GEN
  ($H\text{-}GEN_{setp.\text{-}cool} = CB_{setp.} - CB_{offset}$)
  $CBS_{setp.}$ is active as long as cooling is enabled by REQ_{cool}
- Explanation:
  The setpoint transfer functions analog to heating buffer, though with negative alignment (temperature offsets, deduction from offsets,...).
  To provide cooling capacity and allow intermediate heating, e.g. for DHW, the cooling buffer can be maintained at a set temperature via an additional constant setpoint. For transfer to H-GEN, the coldest value is always used (either coldest HC setpoint or constant setpoint cooling buffer).

8.8.2 Start-up protection cooling buffer

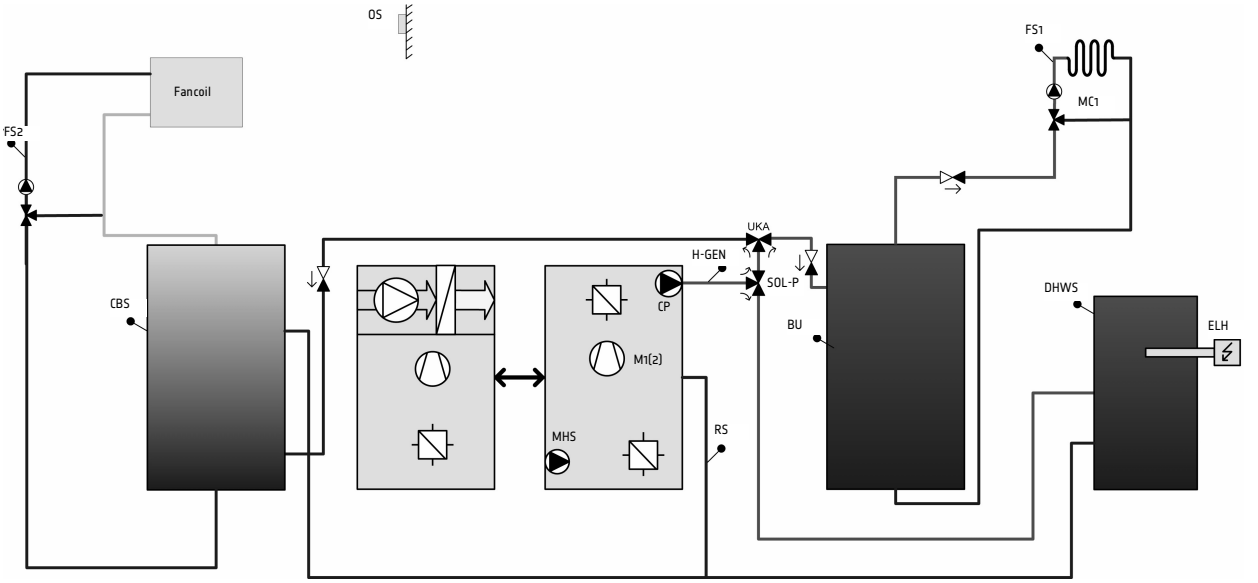
The start-up protection cooling buffer has the effect that the heating circuits are supplied with cooling energy only after temperature drops below maximum limit of cooling buffer.

Enable conditions:
Heating circuit locked for cooling: CBS > CB_{max}
Heating circuits enabled for cooling: CBS < CB_{max} - ½ CBSD

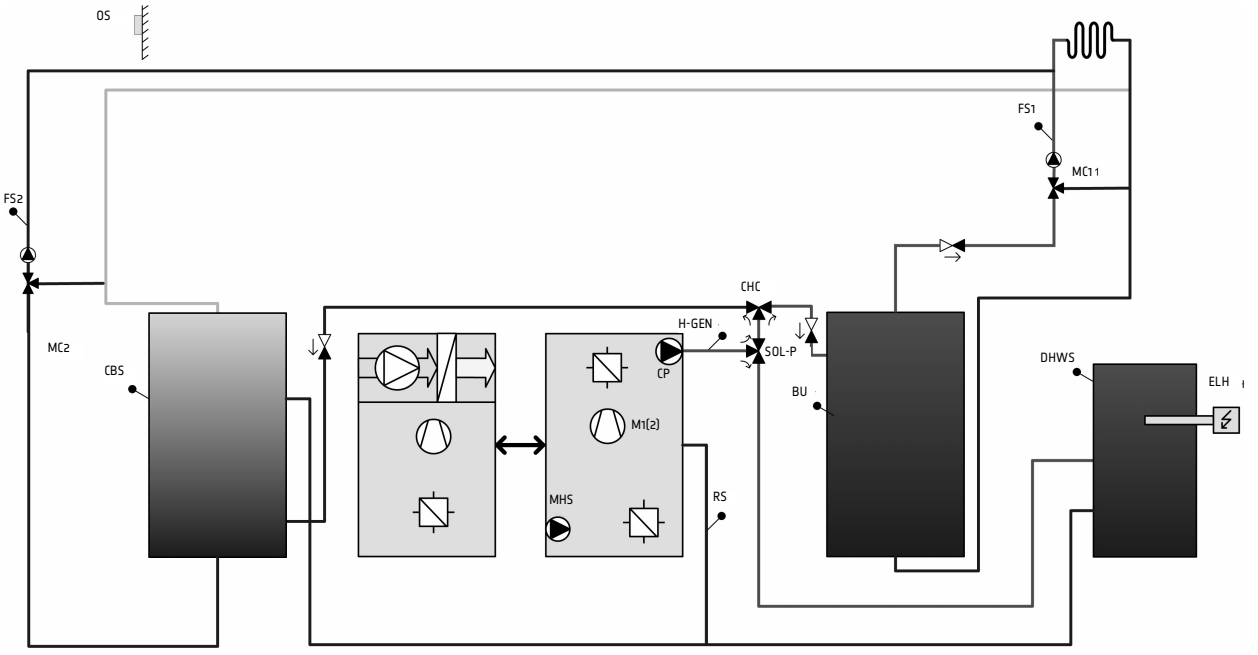
All consumer circuits remain in operation when cooling buffer start-up protection is switched off.

Note on operation	Key / parameter tree	Parameter
Activation cooling buffer	HYDRAULIC ⓘ	PARAMETER 13
Maximum temp. Cooling buffer	BUFFER-COOL ⓘ	PARAMETER 01
SD Cooling buffer	BUFFER-COOL ⓘ	PARAMETER 02
H-GEN offset	BUFFER-COOL ⓘ	PARAMETER 03
Constant cooling buffer setpoint	BUFFER-COOL ⓘ	PARAMETER 04
Start-up protection cooling buffer	BUFFER-COOL ⓘ	PARAMETER 05

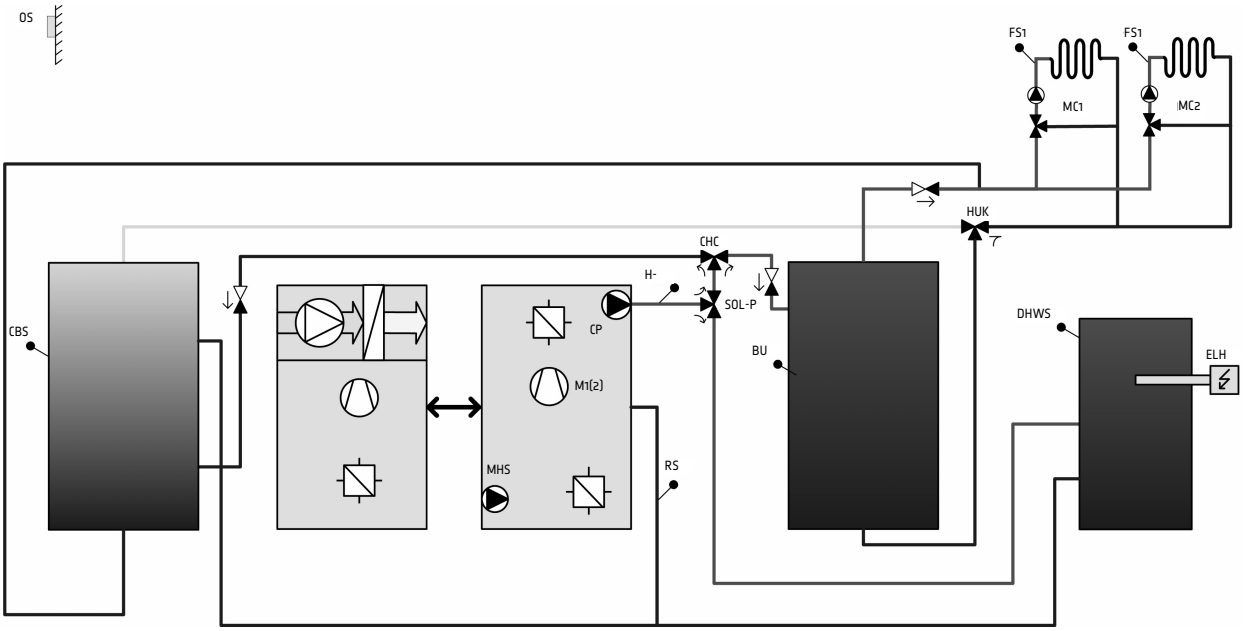
8.8.3 Example hydraulics



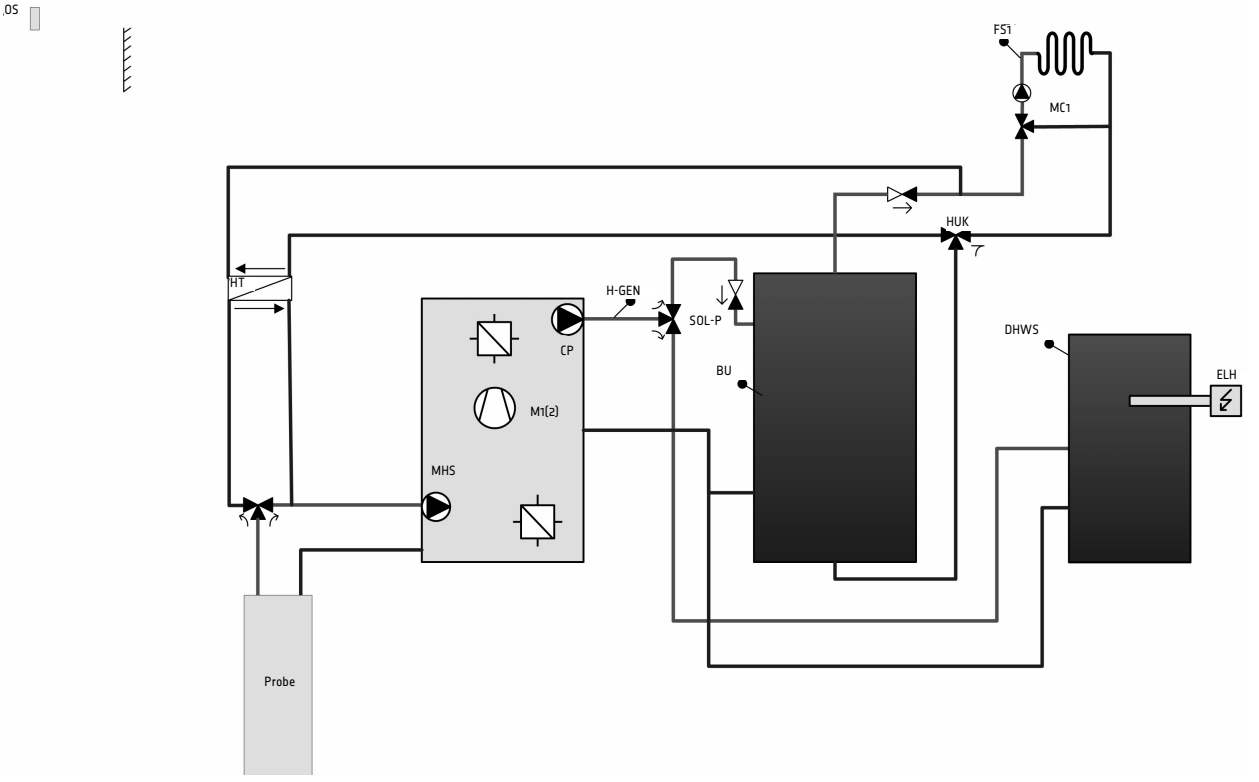
Variant 1



Variant 2



Variant 3



Variant 4

8.9 Solid fuel function (SFP) (..VV..)

Note: This function is only enabled, if a variable output is assigned to a solid fuel pump.

The following sensors can be used for this function:

- SFS for the solid fuel boiler sensor
  The connection is made according to the assignment to VI1 or VI2.
- BU for the buffer sensor (optional)
  The connection is made according to the assignment to a free variable input VI1 - VI3.
- If no BU is connected, the value of the SPBU (own sensor input) is accepted as a buffer sensor. In this way the SPBU input can be used as a sensor input for several uncontrolled heat generators (e.g. solar or solid-fuel).

If the solid fuel sensor is defective, the solid fuel loading pump is always ON.

Function: The solid fuel function enables the addition of a solid fuel boiler to the system in a supporting role (usually in combination with a buffer tank) and to control it according to the following different switching conditions.

Operation: **Activation of the function and sensor assignment:**

Note on operation	Key / parameter tree	Parameter
Activation solid fuel charging pump	HYDRAULIC	PARAMETER 08 or PARAMETER 07
Solid fuel boiler sensor is permanently assigned to corresponding VI		
Optional buffer sensor (solid fuel)	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10

Minimum temperature: **Minimum temperature limit solid fuel boiler**

If the temperature of the solid fuel boiler is 10 K higher than the low limit, the solid fuel loading pump will be switched on.
If it falls below the low limit, it will be switched off.

Maximum temperature: **Maximum temperature limit solid fuel boiler**

If the temperature of the solid fuel boiler is higher than the high limit, the solid fuel loading pump will be forced to switch on. The excess heat will then be dissipated into the selected (see menue buffer tank) circuits.
This forced operation will be finished and the temperature difference control enabled when the solid fuel boiler temperature falls more than 10K below the high limit.

Switch-on differential: **Switch-on differential solid fuel boiler buffer tank (SD ON)**

If the solid fuel boiler temperature increases above the buffertank plus adjusted switch on temperature difference, the normal buffertank loading process can start again.

Prerequisite: The temperature of the solid-fuel boiler is at least 10 K over the minimum temperature limit.

The **minimum** value is 3K above the switch off differential.

Switch-off differential: **Switch-off differential solid fuel boiler buffer tank** (SD OFF)

If the temperature difference is lower than the switch-off differential, the loading process is terminated and the pump is switched off. The maximum setting value is always 3 K under the selected switch-on differential in order to prevent rear discharge of the buffer tank.

Inhibition H-GEN: **Solid fuel inhibition H-GEN**

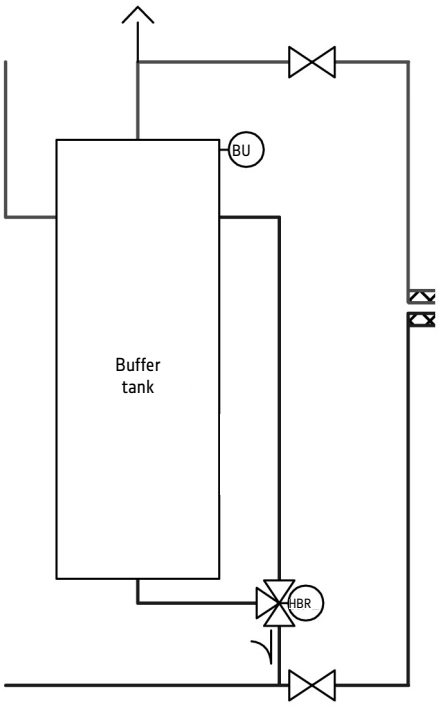
The solid fuel inhibition serves to prevent frequent switching between loading through the solid-fuel boiler and loading through a conventional oil/gas heat generator.
After the solid-fuel loading pump has been switched off, the set time must pass before loading of the buffer tank is continued through the conventional heat generator.

Anti-blocking protection: This is an automatic function of the controller. If the solid fuel loading pump was switched off for longer than 24 hours, then it will be started for 20 seconds in order to prevent blocking through corrosion.

Operation buffer parameters:

Note on operation	Key / parameter tree	Parameter
Buffer sensor 2 (bottom)	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10
Minimum temperature	BUFFER	PARAMETER 01
Maximum temperature	BUFFER	PARAMETER 02
Switch-on difference	BUFFER	PARAMETER 03
Switch-off difference	BUFFER	PARAMETER 04
Inhibition H-GEN	BUFFER	PARAMETER 05

8.10 Hydraulic buffer release (HBR) (..VV..)



In buffer charging systems (buffer operating modes 1, 2 and 5), the buffer tank is charged by the H-GEN without buffer release before the heating circuits can take up energy. First, the hydraulic buffer release charges the top buffer area and the heating circuits are switched on. Then the HBR valve switches over so that the whole buffer is loaded.

- If the output is unswitched, the buffer is loaded.
- If the output is switched, only part of the buffer is loaded (release active)
- The switching differential for switching the output is fixed at 5 K.
- If buffer act. >= buffer setp. + 5 K, the ouput switches off.
- If buffer act. <= buffer setp., the output switches on.

8.11 Heating Circuit Constant Temperature Control (..2.. or ..3..)

Note: This function must be activated in the HYDRAULIC menu for the corresponding heating circuit (Unmixed circuit, mixed circuit 1, mixed circuit 2).

Function: The control circuit is operated at a constant flow temperature value. The demand value is transmitted to the heat generator. The switching program of the corresponding heating circuit is active.

The constant temperature setting is carried out with the relevant parameter "Constant Temperature Setpoint".

If the function is activated at a mixer output, a flow sensor must be installed to adjust the flow temperature.

If priority DHW charging is active, the heating circuit is switched off.

If the H-GEN start-up protection is active, the heating circuit is switched off.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation constant temperature control	HYDRAULIC	PARAMETER 03 or PARAMETER 04 or PARAMETER 05
Setting constant temperature	UNMIXED CIRC or MIX.VALVE-1 or MIX.VALVE-2	PARAMETER 11

8.12 Constant control cooling circuit (..3..)

Function: The control circuit is operated at a constant flow temperature. Only a cooling request value is transferred to the energy management.

The operating mode of the corresponding heating circuit is active.

The mixer valve works **inverse** to heating mode (see cooling weather-guided heating circuit).

The constant temperature setting is carried out with the relevant parameter "Constant Temperature Setpoint".

A parameterised temperature rise heat generator (HC parameter 14) is **subtracted** from the cooling setpoint.

Emergency mode if sensor FS is defective: Mixer closed, pump off

In operating mode selection, the words "HEATING/COOLING" appear instead of "HEATING".

Operation:

Note on operation	Key / parameter tree	Parameter
Constant control cooling	HYDRAULIC	PARAMETER 03/ 04
Constant temperature setpoint	MIXVALVE-1 or MIXVALVE-2	PARAMETER 11

8.13 Fixed Value Control (..3..)

Note: This function must be activated in the HYDRAULIC menu for the corresponding heating circuit (mixed circuit 1, mixed circuit 2).

Function: As in the case of constant control, but the demand value is not transmitted to the heat generator. Switching time program not active.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation fixed value control	HYDRAULIC	PARAMETER 03 or PARAMETER 04
Setting fixed value temperature	UNMIXED CIRC or MIX.VALVE-1 or MIX.VALVE-2	PARAMETER 11

8.14 Demand contact

Note: This function is available if a variable input is defined as demand contact and the corresponding output is defined as heating circuit (mixed circuit, unmixed circuit, constant temperature control and fixed value control) in the HYDRAULIC menu.

Function: One demand contact can be assigned to every one of the three variable inputs (VI1 - VI3). If a variable contact (see note) has been defined as a demand contact, the corresponding parameter for allocating the contact to the respective heating circuit (i.e. the heating circuit to be addressed by the demand contact) is displayed in the *SYSTEM* menu. Each control circuit can be selected individually for assignment or, all control circuits of the respective basic unit can be activated by using the "All" setting.

Caution: No multi-controller function for data bus systems with several standard units!

- Operating modes and switching time settings are not effective when the demand contact is active. The heating circuit only reacts to requests from the demand contact.
- The operating modes Manual, Emission measurement with Limiter Test and Screed function are of higher priority.
- System information: An open demand contact is signaled by the string *DISABLE*, in the status display; a closed contact is identified by the string *DEMAND*.

Contact function: A variable input that has been defined as a demand contact acts on the heating circuit in the following way:

- Variable input open: <u>no demand</u>
  The heating circuit is switched off completely (no frost protection, no standby function).
  Caution! The respective control circuit requires protection against frost etc.

- Variable input shorted: Demand
  The heating circuit is in operating mode HEATING (continuous heating operation) and works according to its parameter settings.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation demand contact	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10
Assignment to heating circuits	SYSTEM	PARAMETER 06 or PARAMETER 07 or PARAMETER 08

8.15 Global Malfunction Message Output

Note: This function must be activated in the HYDRAULIC level for a variable output (VO1 or VO2).

Function: The function is activated during errors and serves as a common global malfunction message output for the connection of optical or acoustic signals.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation global malfunction message output	HYDRAULIC	PARAMETER 05 or PARAMETER 06 or PARAMETER 07

8.16 Global Malfunction Message Input

Note: This function must be activated in the HYDRAULIC level for a variable input (VI1 to VI3).

Funktion: When this function is activated, the corresponding input acts as a contact. If the contact is closed (shorted), the global malfunction message input is treated as an extra error in the control circuit. Activated malfunction messages can be transferred to the data bus or can be registered via a global malfunction message output.

Up to 3 different malfunction message inputs can be used via variable inputs.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation global malfunction message input	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10

8.17 Timer

Note: Only active if setting "timer" was selected in the "HYDRAULIC" level for the HC-P output.

Function: The function controls a consumer according to the current switching time program of the unmixed circuit.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation time program	HYDRAULIC	PARAMETER 05

8.18 External switching modem

Note: This function is available if a variable input (VI1...VI3) was defined as the switching modem in the *HYDRAULIC* menu.

Function: In this configuration, an external modem can be used in order to switch different operation modes (by telephone) remotely.

Assignment If a variable input (VI) is defined as an external modem, the corresponding parameter for the assignment of the contact to the respective heating circuit (i.e. the heating circuit to be addressed by the request contact) is displayed in the *SYSTEM* menu. Each control circuit on which the VI has been activated, can be selected individually for assignment or, all control circuits of all controllers in the heating system can be activated by using the "All" setting.

Caution: Universal controller function (with the "All" setting) for several basic units in the bus system!

Contact function: Depending on the value of the input the following modes for the controller are possible:

- **Variable input open:**
  Control according to current operating mode (AUTO, RED. HEATING, HEATING, STANDBY)
- **Variable input shorted:**
  Controller in STANDBY mode, heating and DHW frostprotected.
- **Variable input with resistance of 2.2 kOhm**
  Control according to continuous heating
- **Variable input with resistance of 3.0 kOhm**
  Control according to continuous reduced heating(in RED or ECO mode according to settings)

Switching the operating mode affects all heating circuits simultaneously. Only one modem can be connected to a controller.

⚠ CAUTION Only close contact or resistor against GND!

Note: The following rules apply in case of simultaneous access to a heating circuit:

- If more than one VI is parameterised to the same heating circuit, the inputs are prioritised in the order VI1, VI2, VI3.
- If a VI is assigned to ALL, it has a higher priority than a heating circuit assignment
- If more than one VI is parameterised to ALL, the inputs are prioritised in the order VI1, VI2, VI3.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation modem function	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10
Assignment to heating circuits	SYSTEM	PARAMETER 06 or PARAMETER 07 or PARAMETER 08

8.19 External information

Note: This function must be activated in the HYDRAULIC level for a variable input (VI1 to VI3).

Function: This function displays a temperature value in the information display as an info-value which is registered by a standard sensor (KTY10-6, as used in OS,BS,DHWS or FS). The function is not influenced by a controller and is only for your information.

Operation:

Note on operation	Key / parameter tree	Parameter
Activation function for external info-value	HYDRAULIC	PARAMETER 08 or PARAMETER 09 or PARAMETER 10

8.20 Heating circuit changeover heating/cooling

The heating circuit changeover heating/cooling is a VO function. It allows changeover from heating circuit to cooling circuit and back at the heating circuit.

Function if output on central unit has been parameterised with address 10:

- If a heating circuit in the system (AU 10...50) received a cooling request, the output switches ON
- If no cooling request exists in the heating circuit of the system, the output switches OFF

Function if output has been parameterized at a subsequent controller (address 20...50):

- If a heating circuit has a cooling request at the same controller, the output switches ON
- If no heating circuit has a cooling request at the same controller, the output switches OFF
- Cooling requests from heating circuits of other controllers are disregarded

A cooling request can come from a weather-guided heating circuit in cooling mode or from a constant control cooling.

-

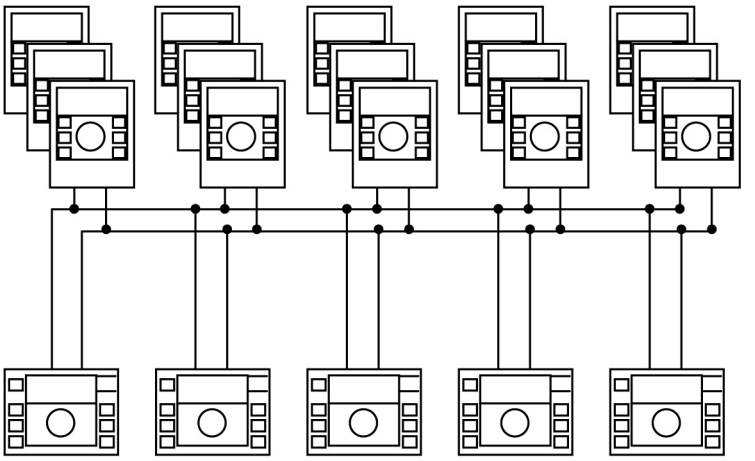
9 Data bus / Bus Communication / Room controllers

9.1 The data bus system

Function: The controllers THETA can be connected by a data bus. This enables

- controlling further heating circuits by adding up to four additional standard units
- connecting room sensors and remote units to the standard units and assigning them to heating circuits
- cascading several heat generators, each with integrated central unit.

The maximum possible expansion of the bus system is shown in the following image.



9.1.1 Data bus addresses

Function: The individual devices in the buss system are assigned precise addresses. This is set in the corresponding parameter in the parameter tree "BUS". The assignment occurs according to the following table.

Address	Device type	Assignment
10	Control unit	Standard unit 1 as central controller
20, 30, 40, 50	Control unit	Standard unit 2 to 5 as add-on controllers for extension of heating circuits or cascade
11,...,13	Extra units	Assigned to controller 1 or general
21,...,23	Extra units	Assigned to controller 2
31,...,33	Extra units	Assigned to controller 3
41,...,43	Extra units	Assigned to controller 4
51,...,53	Extra units	Assigned to controller 5

Note: Make sure that one controller is assigned bus address 10.

Note: Bus adresses may only be assigned once.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting bus address	DATA BUS	PARAMETER 01

9.1.2 Control functions via the bus

9.1.2.1 Boiler corrosion protection

If the heat generator is working with boiler corrosion protection, then this status is sent to all corresponding heating circuits. These will then block the energy supply for the time being (valves closed and pumps off).

9.1.2.2 Indirect return temperature control

The heat generator in the central controller (ADR 10) sends its current boiler data to each mixing circuit in the system which can then activate an indirect return control.

9.1.2.3 Accumulator mode (accumulator priority mode)

Every standard unit can charge the accumulator as long as the device type is suitable. While charging in priority mode, the charge blocks all other heating circuits and charging in the bus system. If the accumulator is charged in parallel mode, all heating circuits in the system can keep running and other charging can also be activated in parallel mode.

9.1.2.4 Heating demand

Each heating demand in the data bus system will be processed by the central controller (ADR 10). The highest demand is accepted and transferred to the heat generator as a setpoint. Manual operation with manual temperature settings is also regarded as demand.

9.1.2.5 Clock synchronisation

The time of the central controller (address 10) will be synchronized in the complete system. There is a system time.

9.1.2.6 Room temperature information

All wall units and room sensors send the current room temperature to their heating circuits regularly.

9.1.2.7 Alarms / status indications

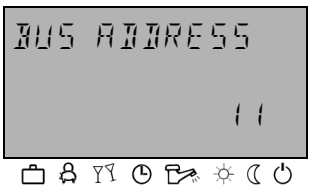
Alarms and status indications will be sent from every standard unit to the wall modules for display.

9.2 Operation of wall devices

9.2.1 Operation of wall devices RS

Function:

A wall device RS can be connected to the controller.



With a wall device, remote control for a standard unit (e.g. from a living room) is possible in addition to the room temperature detection. Settings can be carried out for all the existing heating circuits.

The bus address of the wall device is used to specify upon which heating circuit the ***room sensor*** (room influence) should act.

When an RS is connected for the first time to the bus system, the address is selected for the heating circuit to which the RS is to be assigned (bus address).

After the input has been confirmed, a feedback is output to which heating circuit (HC, MC1, MC2) and which standard unit (AU) the digital wall device has been assigned

Assignment is carried on the basis of the following table:

Address	Parameter
11	Unmixed circuit to standard unit 1
12	Mixed circuit 1 to standard unit 1
13	Mixed circuit 2 to standard unit 1
21	Unmixed circuit to standard unit 2
22	Mixed circuit 1 to standard unit 2
23	Mixed circuit 2 to standard unit 2
31	Unmixed circuit to standard unit 3
32	Mixed circuit 1 to standard unit 3
33	Mixed circuit 2 to standard unit 3
41	Unmixed circuit to standard unit 4
42	Mixed circuit 1 to standard unit 4
43	Mixed circuit 2 to standard unit 4
51	Unmixed circuit to standard unit 5
52	Mixed circuit 1 to standard unit 5
53	Mixed circuit 2 to standard unit 5

Caution:
Duplicated assignment of bus addresses are not permitted and cause an error message.

Changing a bus address

A bus address is can be changed at a later stage by the following procedure:

1 Disconnect wall devices from the data bus line (disconnect plug connection at the bottom of the device)

2 Reconnect the wall device, holding the rotary-push button pressed down until the address setting screen is displayed.

3 Set and confirm the new bus address.

9.2.2 Operation with wall device RFF

Function:

A wall device RFF can be connected to the controller.

With a wall device, it is possible to detect the room temperature, to remotely adjust the room setpoint temperature and to change the operating mode for a heating circuit. The settings only apply for the applicable heating circuit.

The bus address of the wall device is used to specify on which heating circuit the room sensor and the adjustment of the operating mode are to act.

The connection is carried out via the data bus.

Setting the bus address

The address of the RFF is set by means of the rotating encoding switch on the inside of the wall device in accordance with the subsequent table:

Address THETA	Address AU	Heating circuit
0	Undefined	Undefined
1	10	AU 1 - Unmixed circuit
2	10	AU 1 - Mixed circuit 1
3	10	AU 1 - Mixed circuit 2
4	20	AU 2 - Unmixed circuit
5	20	AU 2 - Mixed circuit 1
6	20	AU 2 - Mixed circuit 2
7	30	AU 3 - Unmixed circuit
8	30	AU 3 - Mixed circuit 1
9	30	AU 3 - Mixed circuit 2
A	40	AU 4 - Unmixed circuit
B	40	AU 4 - Mixed circuit 1
C	40	AU 4 - Mixed circuit 2
D	50	AU 5 - Unmixed circuit
E	50	AU 5 - Mixed circuit 1
F	50	AU 5 - Mixed circuit 2

Detection of the current room temperature (room sensor)

The integrated room sensor measures the current room temperature for all room temperature specific functions and transfers the measured values to the standard unit every 20 s.

Operation:

Note on operation	Key / parameter tree	Parameter
Setting room temperature specific functions	UNMIXED CIRC or MIXVALVE-1 or MIXVALVE-2	PARAMETER 03 PARAMETER 04 PARAMETER 06 PARAMETER 08 PARAMETER 09

Operating mode adjustment

The desired operating mode is selected with the key (keep pressed approx. 2 - 3 seconds) and indicated by the corresponding LED. As the key is pressed, the operating mode is adjusted in the following sequence:

AUTOMATIC MODE - HEATING – SET BACK - AUTOMATIC MODE -

.....

After the operating mode has been adjusted, the new operating mode is transferred to the standard unit. Only the operating mode of the heating circuit to which the RFF is assigned is adjusted.

Automatic mode: The heating circuit is controlled constantly in accordance with the specification of the automatic program P1 - P3 set in the standard unit plus or minus the room setpoint correction at the rotary button.

Heating: The heating circuit is controlled constantly in accordance with the desired daytime room temperature plus or minus the room setpoint correction at the rotary button.

Reduced: The heating circuit is controlled constantly in accordance with the desired reduced room temperature plus or minus the room setpoint correction at the rotary button. The function depends on the setting in the parameter selection for the heating circuit, REDUCED OPERATING MODE parameter.

Correction

Room setpoint: The rotary button can be used to modify the room temperature set at the standard unit by ± 6 K compared to the central position.

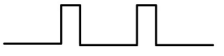
Turn clockwise: Temperature increase
Turn anti-clockwise: Temperature decrease

Status indication: The status indication is realized by three LEDs. The possible states are listed in the table below:

Operating mode/Function	**Moon LED**	**Clock LED**	**Sun LED**
Automatic	OFF	ON	OFF
Permanent heating	OFF	OFF	ON
Permanent set back	ON	OFF	OFF
Starting phase	BRIEF FLASHING	BRIEF FLASHING	BRIEF FLASHING
Error address setting	FLASHING	ON	ON
Bus fault as well as indication when parameters are blocked	ON	FLASHING	ON
Party (set via AU)	OFF	OFF	FLASHING
Absent (set via AU)	FLASHING	OFF	OFF
Holiday (set via AU)	OFF	FLASH	OFF

Definition:

Flashing:  0.8 s on and 0.8 s off

Brief flashing:  0.08 s on and 0.7 s off

Flash:  0.08 s on and 1.4 s off

The status indication is updated immediately after adjustment at the RFF and at the latest after about 20 s after adjustment when adjusted at the standard unit.

Note: In all the other operating modes not defined in the table above, all three LEDs are activated.

9.2.3 Bus priority heating circuit

Function: This setting serves to determine the privilege status of a room station connected to a heating circuit. One parameter per available heating circuit is available for this setting.

Possible setting: Simple access

Only switching times and parameters of the *own* heating circuit can be read and modified. When accessed, only the data for his own heating circuit is displayed for the respective user.

Application: Tenant status

Extended access

This access status allows access to ***all*** heating circuits and to the hot water circuit and their parameters and switching times within the respective standard unit.

Application: Landlord status

Note: Once a room device is connected and registered via the data bus to the standard unit, the standard unit automatically switches to separate operating mode! This is necessary to ensure clear operation of the system with connected room devices.

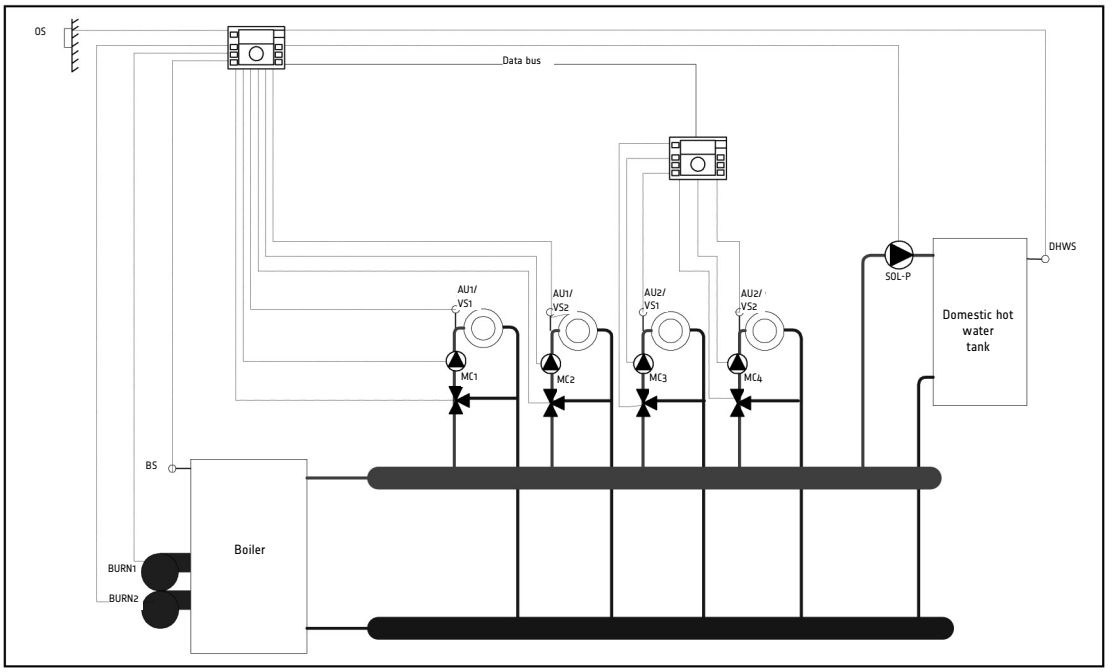
Operation:

Note on operation	Key / parameter tree	Parameter
Setting bus address	DATA BUS	PARAMETER 02 or PARAMETER 03 or PARAMETER 04
Control mode	SYSTEM	CONTROL MODE

9.3 Expanding the system by several standard units

9.3.1 Examples with several controllers

Example 1: Heating system with 2 stage heat generator, DHW control, and 4 mixed circuits. The following diagram shows the hydraulic system.



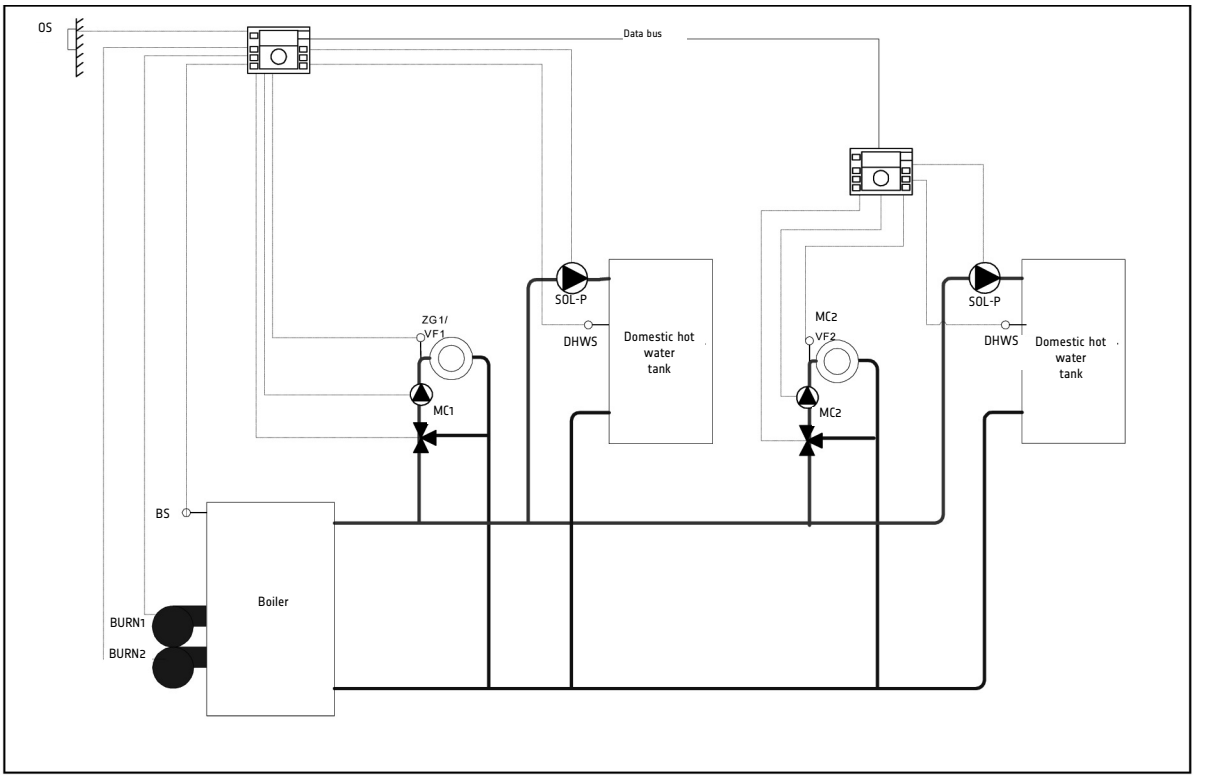
The following components will be connected to the first controller with busadress 10:

- Outdoor sensor
- Stage 1 and 2 of the burner
- Boiler sensor
- DHW sensor
- DHW charging pump
- Mixer pump, mixer open / closed and flow sensor of heating circuit 1
- Mixer pump, mixer open / closed and flow sensor of heating circuit 2

The following components will be connected to the second controller with busadress 20:

- Mixer pump, mixer open / closed and flow sensor of heating circuit 3
- Mixer pump, mixer open / closed and flow sensor of heating circuit 4

Example 2: Heating system with 2 stage heat generator, 2 mixed circuits and 2 DHW controls (e.g. for a semi detached house with one boiler only). The following diagram shows the hydraulic system.



9.4 Unrestricted use of Gateway GWK

Starting in software version 2.x, the Gateway Web (THETA GWK) will be available to the full extent. To this end, all standard units in the bus connection must be version 2.0 or higher.

If possible, the connected room units should also have a higher version. Versions older than 2.0 can lead to limited functionality.

In order to be able to ensure perfect operation, the version of the GWK should match the version of the basic device.

10 Cascading of heat generators in the bus system

10.1 General description of cascading of control devices

In heating applications, a cascade is the hydraulic connection of several heat generators of different types to create a complex of heat generators.

The advantage compared to a single heat generator of the same capacity is that only the necessary number of heat generators supply to the heat demand. Heat generators which are not required are not switched on. This way, losses are minimised and the running time of the individual heat generators is prolonged significantly, which leads to a large increase in efficiency.

This type of plant design is especially suitable for plants of middle and high capacities.

Function: In its standard version, the control system features the possibility to couple and cascade several boilers in a simple way. Also, the cascade control is independent of the type of heat generators to be combined. For instance, condensing boilers can be easily combined with atmospheric gas boilers.

The system automatically recognizes a cascade by checking if several central devices have programmed a heat generator, or if more than one condensing boiler is connected to a central device. In cascade operation, an additional cascade selection level is displayed for handling the parameters in the central device assigned to bus address 10.

Note: Cascade operation excludes 2-stage boiler control. All available stages are switched by the cascade management. Consequently, the respective parameters of the heat generator selection level are not available for settings. All controls are governed by cascade control.

10.2 Functions of the cascade parameter

Switching differential: Each heat generator has its own switching differential. The cascade switching differential must be set in such a way that it is always wider than the switching differential of any individual heat generator.

Switch-on delay: The afterheating characteristics of the boilers must be taken into account when rating the heating system. The cascade switch-on delay serves to adjust the system to start-up delays of the individual boilers. For instance when, after being enabled, the heat generator delivers its energy into the system (start-up phase, run-in period). The appropriate setting is the maximum delay time of the boilers in the system.

Switch-off delay: This parameter controls the run-down of the heat generators to avoid that all heat generators switch off at the same time when the set cascade switching differential is exceeded. The setting has to be adjusted to the afterheating characteristics of the heat generators.

Switch-over power

- The switch-over power set in the cascade level is only suitable for operating boiler controls. Until the last burner stage has been started, all active burner stages up to that moment are reduced to the set switch-over power (capacity limitation). When the last burner stage is activated, and after the dynamically calculated activation delay has elapsed again (at least 5 minutes), all further automatic controls are enabled for 100 % power (full load).
- If all available stages are active, the boiler control does not have a capacity limitation. If a stage is reduced, the set switch-over power is active for the boiler control.

Stage swap: To ensure the balanced utilization of the heat generators within a cascade, a running-time-dependent leading stage swap can be activated.

After the set operating time of the presently leading heat generator, the system switches to the heat generator with the next higher bus address.

Stage swap can be executed between several standard units or if several condensing boilers are switched by a single standard unit.

Leading stage: The leading stage can still be set manually to any existing stage even when automatic stage-sequence switching is disabled. During parameterization, the existing cascade stages are numbered according to their address in the data bus (example: see below).

Note: Changing the heat generator type within the central device under address 10 leads to an automatic reset of the leading stage setting to the first heat generator.

Peak load

from address: The cascading plant can be divided into two groups (basic and peak load).

To this end, parameterization is used to set the first cascade stage of the peak load group. During parameterization, the existing cascade stages are numbered according to their address in the data bus.

Example for addresses:

Address THETA N/U	H-GEN type	H-GEN address	Numbering Groups
10	Automatic boiler control	1	1
10	Automatic boiler control	2	2
10	Automatic boiler control	3	3
20	1-stage	---	4
30	1-stage	---	5

In the example, the three condensing boilers will be used as basic load boilers. The two atmospheric gas boilers will be used as peak load boilers. The peak load groups will start at stage 4.

Changeover basic load in group formation:

Wenn the group is formed by parameterization and the peak load boiler(s) are activated, the leading groups can be switched via a parameter. If this parameter is on ON, the group of peak load boilers, on demand, takes over the basic load and the basic load boilers take over the correction of the flow temperature. The stage switch-over is still only active for the actual basic load boilers.

Domestic hot water Quick load:

This parameter is used to determine how many stages of the cascade are required for hot water loading. A quick activation is also associated with this.

Operation:

Note on operation	Key / parameter tree	Parameter
Switching differential	CASCADING	PARAMETER 01
Switch-on delay	CASCADING	PARAMETER 02
Switch-off delay	CASCADING	PARAMETER 03
Sequential switch-over powerstage sequence	CASCADING	PARAMETER 04
Reverse boiler sequence	CASCADING	PARAMETER 05
Leading stage	CASCADING	PARAMETER 06
Peak load boiler from address	CASCADING	PARAMETER 07
Changeover basis power at group formation	CASCADING	PARAMETER 08
Hot water quick activation	CASCADING	PARAMETER 09

10.3 Mode of operation of cascade control

10.3.1 Switch-on characteristics

The switch-on characteristics of the boiler stages is determined by the set switching differential and the dynamic switch-on delay. The stage number is incremented only when the following criteria are fulfilled.

$BT_{ACT} < BT_{NOM} - SD/2$

$t >= t_{switch\text{-}on\ delay} * (100 - (dFT * 100 / FTnom)) / 100$

The boiler temperature of the leading boiler or the common flow sensor has to have been below the set boiler temperature minus half the switching differential, at least as long as the calculated switch-on delay.

The switch-on delay is reduced if the actual temperature decreases far below the switching differential. The reduction is proportional to the ratio

$$\frac{dFT - SD_{cascade} / 2}{FT_{nom} - SD_{cascade} / 2}$$

dFT = Difference nominal flow temperature and actual flow temperature

$VT_{Setp.}$ = Flow setpoint

$SD_{cascade}$ = 1/2 cascade switching differential

10.3.2 Switch-off behavior

The number of stages is reduced as soon as the boiler temperature of the leading boiler or the common flow sensor exceeds the current set boiler temperature plus half of the switching differential during the calculated switch-off delay.

The switch-off delay is reduced if the actual temperature is far above the switching differential. The reduction is proportional to the ratio

$$\frac{dFT - SD_{cascade} / 2}{FT_{nom} + SD_{cascade} / 2}$$

dFT = Difference nominal flow temperature and actual flow temperature

FT_{nom} = nominal flow value

$SD_{cascade}$ = 1/2 cascade switching differential

10.3.3 Operation with conventional heat generators (2-point)

Function:

Only the heat generator that was switched on last operates according to the setpoint (residual heat coverage). All other heat generators are switched on.

Only after the corrected stage has no more demands on the heat generator and the boiler temperature rises above the setpoint plus the set cascade switching differential, the boiler stage can be reduced by one.

Each heat generator displays the current demand value as setpoint.

If a heat generator is not available in the system (error, external blockage or OUT-lock), it is skipped in the stage control and the next available heat generator is controlled.

The minimum boiler temperature of all the burner stages enabled by the cascade management is checked. In such cases the highest minimum temperature of all the heat generators is set as the minimum requirement for the system.

The maximum boiler temperature is only monitored inside the heat generators. There is no limit to the setpoint!

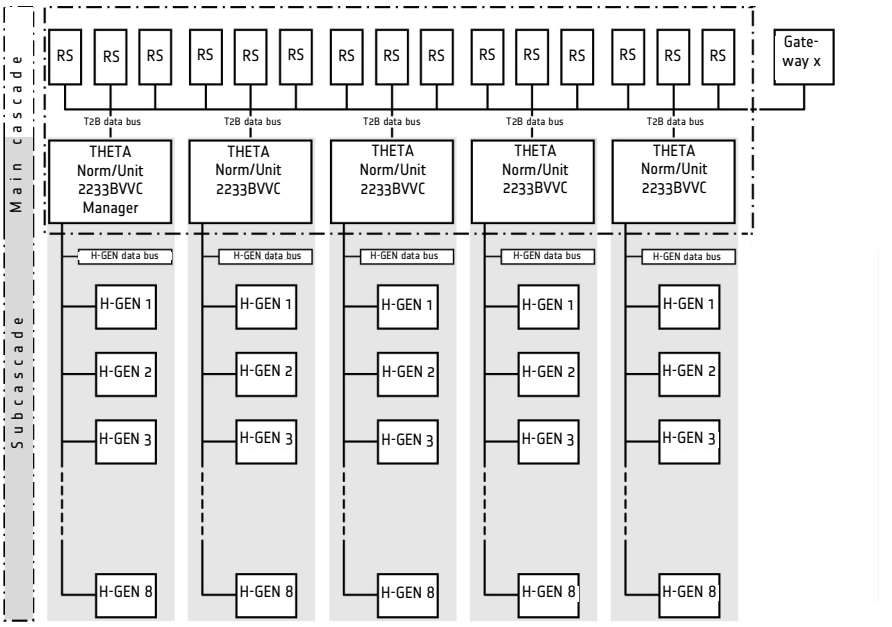
10.3.4 Operation with boiler control (new)

THETA controllers with communicative heat generator interfaces (..C..) enable connecting more than one heat generator per controller. The cascade control in the THETA system comprises a main cascade and, depending on the plant design, one or more subcascades.

The main cascade is controlled directly by the cascade manager (address 10) via the THETA system bus (T2B). Every participant in this cascade is a THETA controller NORM or UNIT. The parameterization of the cascade settings is carried out at the cascade manager. Specific settings for the heat generators are carried out at the corresponding standard unit NORM or UNIT.

The subcascade is controlled via the H-GEN bus (heat generator bus). Usually, several heat generators are addressed either via the interface (like on boiler control) or directly. Because only one parameterization is possible for heat generators in THETA, the settings are identical for all H-GEN in the subcascade.

System overview:



Example for addresses:

Address THETA N/U	H-GEN type	H-GEN address	Stage number cascade
10	Automatic boiler control	1	1
10	Automatic boiler control	2	2
10	Automatic boiler control	4	3
10	Automatic boiler control	5	4
10	Automatic boiler control	7	5
20	Automatic boiler control	1	6
20	Automatic boiler control	3	7
20	Automatic boiler control	5	8
20	Automatic boiler control	6	9
20	Automatic boiler control	7	10

Information display: If a subcascade is recognized, the standard unit shows a detailed information display.

Detailed temperature display heat generator:

INFORMATION	Display value	Notes
Heat generator temperature H-GEN address 1	HEAT GENER AUR- 1 *actual value*	Combined display of heat generator address and actual flow temperature of the boiler control with the address 1
Heat generator temperature H-GEN address 2	HEAT GENER AUR-2 *actual value*	Combined display of heat generator address and actual flow temperature of the boiler control with the address 2
....	....	....
Heat generator temperature H-GEN address n	HEAT GENER AUR-N *actual value*	Combined display of heat generator address and actual flow temperature of the boiler control with the address n

Additional display if the rotary pushbutton is pressed during the heat generator temperature display:

INFORMATION	Display value	Notes
Heat generator temperature H-GEN adddress n	HEAT GENER. *setpoint op.cond.*	· H-GEN setpoint displayed at bottom left · "%" display, if capacity limitation on, bottom left · Operating conditions displayed at bottom right: - SET (requirement present, no flame present) - ON (requirement present, flame present) - MANU (no requirement present, flame present) - OFF (no requirement present, no flame present)

Status display heat generator:

INFORMATION	Display values / -examples	Notes
Operating status heat generator	HEAT GENER ON/OFF	Information on the switching state of the multiple stage heat generator

Additional display if the rotary pushbutton is pressed during the operating status display:

INFORMATION	Display values / -examples	Notes
Operating status heat generator	HEAT GENER SG/SE SA/SV	Combined display with information on Cascade stages: SG=required stages SE=recognized stages SA=activated stages SV=available stages

Explanations:

Required stages
number of stages calculated by the energy management for controlling

Recognized stages
number of all heat generator stages (main cascade and subcascade, 2-stage boilers are counted as two stages) recognized via the data bus

Activated stages
number of active heat generator stages in cascade

Available stages
If individual stages are not available, e.g. due to an outdoor temperature lock or an external heat generator block, the number of available stages is different than the number of recognized stages.

Function:

The set switch-over power in the CASCADE level and the basic load excess in the HEAT GENER. level are only suitable for operation with a boiler control. Until the last burner stage has been started (basic load mode), all active burner stages up to that moment are reduced to the set switch-over power (ventilator rpm limitation).

Only the stage that was activated last operates according to the current requirement value.

If a flow sensor is installed, the setpoint of the stage that was activated last is calculated using a PI-algorithm.

If all stages are activated (full load mode), the capacity limitation is lifted and all condensing boilers are enabled 100 %. Then, all stages operate according to the current setpoint.

If a flow sensor is installed, the setpoint is calculated using the PI-algorithm.

The stages operating at basic load mode are also monitored concerning the required value. This may not become smaller than the required value.

If the capacity is reduced by one stage and the last stage is removed from the control network, then the basic load mode is activated. Then the set basic load excess and the capacity limitation of the stages operating at the basic load level are activated.

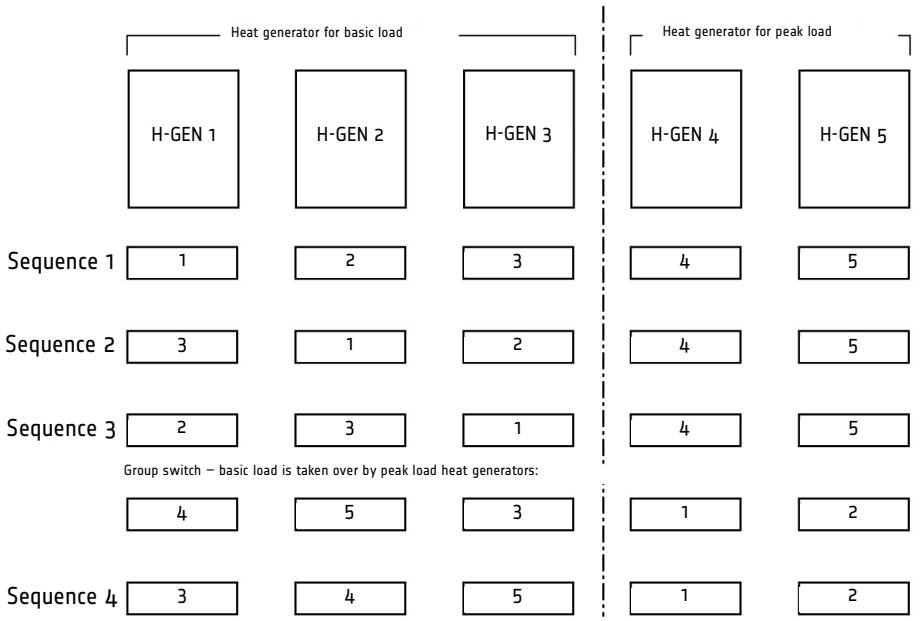
10.3.5 Operation with group reversal

High-end condensing technology is used especially in plants of large and middle capacities when high efficiency is required (municipal plants) , to cover a basic load of an average annual capacity. The peak load is covered by conventional low temperature boilers in the cold months.

In this technique, an activated stage reversal only affects the basic load heat generators, not the peak load heat generators.

The first peak load boiler is switched on after all basic load heat generators are activated and operating at 100 %, at full load.

Example for switching sequence:



In some cases, it might be better to have the peak load boilers take over the basic load if they are necessary. This is possible by parameterization.

10.3.6 Controller (AU) enabled for DHW load

If controller for DHW loading is not enabled, the heat generator receives no DHW setpoint. Due to this, the stage and assigned organs (BCP, CP) are excluded from DHW loading.

In DHW parallel mode, the stage can continue operation according to heating circuit setpoint.

Operation:

Note on operation	Key / parameter tree	Parameter
Enable DHW cascade operation	H-GEN or HP.	PARAMETER 38

10.3.7 Hot water quick activation in cascade systems

Description: Often, on cascade systems, not all heat generators are required to prepare hot water. The required heat generators must also be activated more quickly than with the heating mode.

Function: If a hot water request is active, instead of the general activation delay (PARAMETER 02), a fixed value of 10 seconds is used for the activation of the subsequent stages up to the set maximum number of stages.

The further stages are activated in line with the set activation delay.

When loading hot water without heating mode (tank priority), the number of heat generators is limited by the setting the hot water quick activation parameter.

In parallel mode (heating circuit and hot water request simultaneously), the number of stages is not limited.

If hot water loading is active the stages are switched back taking into account the parameterised switch-off delay.

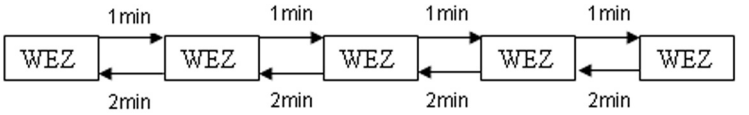
If a heating mode is active with more than the stages which are enabled for DHW mode, hot water loading is then performed in priority mode and the stages which are surplus to the number of stages enabled for hot water loading are switched off immediately. In parallel mode, the activated stages are not switched back.

A parameterised switch-over stage sequence has to be taken into account for activation of the next stage.

Example:

- Cascade system with 5 stages
- PARAMETER 02 = 1 min.
- PARAMETER 03 = 2 min.
- PARAMETER 09 = 3

Heating mode:

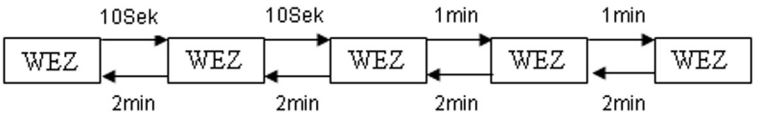


- Activation and deactivation with the parameterised delay from parameter 02 and parameter 03

Tank priority (no heating request):

- Activation immediate with minimum delay
- Switch back with parameterised delay P03

Tank parallel mode (combined hot water loading / heating mode)



- Activation up to stage parameter 09 with minimum delay for HG loading
- In case of further requirement through heating further activation with parameterised delay parameter 02
- Switch back with parameterised delay parameter 03

10.3.8 Behaviour during heat generator fault

- If a heat generator is not available in the system (error, external blockage or outdoor temperature lock), it is skipped in the stage control and the next available heat generator is controlled.
- If controller with address 10 fails on cascades (e.g. fuse is triggered), emergency mode is ensured.

Operation:

Note on operation	Key / parameter tree	Parameter
Emergency mode H-GEN	H-GEN or HP.	PARAMETER 39

10.3.9 Behaviour for special functions

Manual operation: The heating circuits of the control device in which manual operation was activated, operate according to the MANUAL function. The set request value is forwarded to the energy management module of cascade control, and adjusted by the available boiler stages.

Emission measurement: This function works as described under "Emission measurement", with the following extensions:

- The effect on heating circuits is extended to all heating circuits of the system.
- Enabling of the heat generators (burner) is initiated at the same devices where emission measurement was activated.

SLT: This function works as described under "SLT check", with the following extension:
As soon as an SLT function is detected within the BUS system, all consumers (heating circuits) are inhibited.

Emergency mode: The parameters of cascade control are determined in the central device with the bus address 10. If that controller becomes unavailable due to some defect, the remaining stages continue operating in an emergency mode. In this mode all heat generators adjust to the same boiler nominal temperature (parallel operation). As soon as the cascade manager comes back into operation, cascade control is reactivated automatically.

Data transmission: To enable the cascade function to process fast switching events (cascading with communicating boiler controls), the trans-mission of the cascade data was given a higher priority. Consequently, the data transmission from any device to the master device, and of the request values from the master to the slave devices, takes no longer than approx. 3 seconds.

11 Remote access / gateway

The control system is compatible for remote access via the internet. By connecting the GWK gateway, a connection can be established with the internet via a LAN and a router.

The internet portal www.controlyourhome.eu can be used to manage and monitor heating systems centrally.

With version V3.0 and above, the 2nd generation of GWK gateway can also be used. The GWK can be parameterised using the menu tree in the controller and control devices can also be remote controlled via the GWK.

The options for parameterisation depend on the type of gateway being used. Please see the respective documentation for information.

12 Help for commissioning, maintenance and problem solving

12.1 Automatic Set-Function

Function:

This function allows to remove heating or hot water circuits from operation.

The control circuits are registrated automatically, if their corresponding sensors are connected and provide acceptable measuring values. Control circuits without the corresponding sensors remain automatically without consideration.

The automatic set function will be activated after every switch-on.

Automatical activation

If the system parameter AUTO SET is set to ON and no change of day has been detected during current operation, the AUTO SET function is executed every time the controller is started. Once a change of day has been detected, the system parameter AUTO SET is automatically reset to OFF. The AUTO SET function can be enabled at any time again for a day (day change) using the parameter.

Manual activation

Manual call-up of the AUTO SET function is always possible. It is called up by pressing and holding the rotary push button when switching on (during the segment test) until the AUTO SET display appears. The basic display is activated after the function has been carried out.

The auto set function registers the following sensors:

Input		Is only activated if:	
Outdoor sensor	(OS)		
Flow sensor 1	(VF1)	MC1:	OFF / mixed circuit valve
Flow sensor 2	(VF2)	MC2:	OFF / mixed circuit valve
Hot water tank sensor	(DHWS)	SOL-P:	OFF / DHW charging pump
Boiler sensor	(BS)	BURN:	OFF / single stage

Furthermore the auto set function is carried out only, if the control circuits which are assigned to the corresponding sensors were parameterised in the respective levels.

For the hot water sensor:

HYDRAULIC Level
Parameter 2 - Function DHW charging pump Setting range OFF or 1 (DHW charging pump)

For the supply sensor 1:

HYDRAULIC Level
Parameter 3 - Function mix. heating circuit 1 Setting range OFF or 3 (mix. heating circuit)

For the supply sensor 2:

HYDRAULIC Level
Parameter 4 - Function mix. heating circuit 2 Setting range OFF or 3 (mix. heating circuit)

For the boiler sensor:

Level HEAT GENERATOR
Parameter 1 – Type of heat generator
Set-value OFF or 1 or 2 (single-stage operation or 1x two-stage operation), depending on type code.

With that a programmed parameterisation will not be changed again, the current values will be checked before. A modification is carried out only if one of the adjustments listed above is given. In this way the auto set function for example never can cancel a return flow increase of mixer heating circuit 2, or can function it to a mixer heating circuit.

Operation:

Note on operation	Key / parameter tree	Parameter
Activate automatic set function	SYSTEM	PARAMETER 14

12.2 Check safety temperature limiter

Note: This function may only be activated by the heating specialist.

Function: By keeping the rotary pushbutton pressed during an emission measurement the integrated heat generator maximum temperature limit is bypassed, the heat generator remains in function continuously until the triggering of the safety temperature limiter (SLT).

During the SLT check all the loads are separated from the heat generator, i.e. any available mixing valve is closed and all the heating and DHW loading pumps are shut down.

The emission measurement is continued with the remaining time.

Application: SLT test by the heating technician

Termination: Release the rotary pushbutton – the emission measurement still active is stopped with the key.

12.3 Relay / Function Test

Function:

Depending on the controller version various outputs can be tested. This is not only a relay test, but a function test by means of which the hydraulic components are tested. The partially compulsory sequence of the switching procedures is considered.

After selecting the test function the relevant relays can be switched one by one by pressing the rotary pushbutton in the specified switching sequence.

Heat generator:

Heat Generator Test

a **Single stage** heat generator
(Level ***heat generator*** Parameter 1 = 1)

Switching sequence: OFF, ON, OFF...

b **2-stage heat generator**
(Level ***heat generator*** Parameter 1 = 2)

Switching sequence: OFF, STAGE 1, STAGE 1+2, STAGE 1, OFF.....

c **2x1-stage heat generator**
(Level ***heat generator*** Parameter 1 = 3)

Switching sequence: OFF, HG 1, HG 1+2, HG 2, OFF.....

d **modulating mode**
(Level ***heat generator*** Parameter 1 = 4)

Switching sequence:OFF, ON, OPEN, STOP, CLOSED, OFF...

Pumps / VOs:

Test Pumps

(Unmixed circuit pump, mixed circuit pump, DHW loading pump, variable out-put 1, variable output 2)

Switching sequence: OFF, ON, OFF,...

MIMO:

Test Actuator Mixed Circuit

Switching sequence: STOP, OPEN, STOP, CLOSED; STOP....

Operation:

Note on operation	Key / parameter tree	Parameter
Relay test heat generator	RELAY TEST	HEAT GENER
Relay test unmixed circuit pump	RELAY TEST	OUTPUT MC-P
Relay test mixed circuit pump 1	RELAY TEST	OUTPUT MCP 1
Relay test actuator mixing valve 1	RELAY TEST	ACTUATOR MC- 1
Relay test mixed circuit pump 2	RELAY TEST	OUTPUT MCP-2
Relay test actuator mixing valve 2	RELAY TEST	ACTUATOR MC-2
Relay test DHW charging pump	RELAY TEST	OUTPUT SOL-P
Relay test variable output 1	RELAY TEST	OUTPUT VO- 1
Relay test variable output 2	RELAY TEST	OUTPUT VO-2

12.4 Alarm messages

In order to set up a precise diagnosis in the case of malfunction the control system is equipped with an extensive malfunction message system. An occurring alarm is always announced in the display of the corresponding basic control and stored.

There are five different categories of alarm messages:

1. **Sensor alarm messages**
   Sensor values which are not in their respective measuring range will either be sensor breaks or sensor short circuits. They appear with an error message according to their use.
2. **Heat generator alarm messages**
   These messages depend on the actual switching conditions. They appear with the corresponding error message, depending on the version and allocation.
3. **Logical alarm messages**
   These messages will react on the actual control result. They appear with the corresponding error message, depending on the version and allocation.
4. **Bus alarm messages**
   These messages display address problems such as double addresses or not recognizing addresses within the data bus system. They appear with the corresponding error message, depending on the version and allocation.
5. **Alarm messages from boiler control (high efficiency condensing boilers)**
   These error messages come from the automatic boiler control and are divided up into locks, blocks and warnings.

The displaying characters and further processing of the logical faults from the THETA system can be enabled or suppressed by a corresponding parameterisation (see SYSTEM level-parameter 13 (logical error message).

Display and further processing of alarm messages from a connected automatic boiler control can be controlled as follows.

SYSTEM parameter 27 can be used to determine which of the alarm messages transmitted from an automatic boiler control are forwarded to the THETA system.

System parameter 28 can be used to determine whether or not alarm messages from an automatic boiler control are written to a separate alarm memory. If parameter is set to ON, another tree appears inside the menu tree, with the designation ALARM 2. This alarm memory is used to store alarmmessages from automatic boiler controls only.

Further processing in case of alarm messages:

- Alarms will be indicated in the basic display of the control unit
- System errors appear in the information level beside the corresponding information
- Alarm messages are loaded into a malfunction message log (see description below)
- Alarm messages activate in case of corresponding parameterisation an alarm output for optical or audible signallers.
- With the appropriate parameterisation, alarms are forwarded to the respective gateways via the data bus.

Table of alarm messages:

Error jams	Designation	Alarm cause	Code	Note
System	Outdoor sensor	Break	10-0	
System	Outdoor sensor	Short circuit	10-1	
System	Boiler sensor	Break	11-0	
System	Boiler sensor	Short circuit	11-1	
System	Flow sensor 1	Break	12-0	MIMO Off
System	Flow sensor 1	Short circuit	12-1	MIMO Off
System	DHW sensor	Break	13-0	
System	DHW sensor	Short circuit	13-1	
System	Variable input 2	Break	14-0	
System	Variable input 2	Short circuit	14-1	
System	Variable input 2	Alarm	14-7	
System	Variable input 3	Break	15-0	
System	Variable input 3	Short circuit	15-1	
System	Variable input 3	Alarm	15-7	
System	Variable input 1	Break	16-0	
System	Variable input 1	Short circuit	16-1	
System	Variable input 1	Alarm	16-7	
System	Solar panel buffer sensor	Pause	17-0	
System	Solar panel buffer sensor	Short circuit	17-1	
System	Flow sensor 2	Break	18-0	MIMO Off
System	Flow sensor 2	Short circuit	18-1	MIMO Off
System	Solar panel flow sensor	Break	19-0	
System	Solar panel flow sensor	Short circuit	19-1	
System	Burner 1	Not OFF	30-2	After 10 min
System	Burner 1	Not ON	30-3	After 10 min
System	Burner 2	Not OFF	31-2	After 10 min
System	Burner 2	Not ON	31-3	After 10 min
System	Heat meter	No impulse	32-3	
System	Flue gas temperature	Exceeding	33-5	
System	Flue gas temperature	STL triggered	33-8	
Logical	Heat generator temperature	Not reached		After 90 min
Logical	DHW temperature	Not reached		After 4 hrs.
Logical	Flow temperature MC1	Not reached		After 1 hrs.
Logical	Flow temperature MC2	Not reached		After 1 hrs.
Logical	Room temperature HC	Not reached		After 3 hrs.
Logical	Room temperature MC1	Not reached		After 3 hrs.
Logical	Room temperature MC2	Not reached		After 3 hrs.
System	Activity	Case of collision	70-0	
System	Activity	No T2B	70-1	
System	Activity	No i2C	70-3	
System	Activity	No connection H-GEN bus	70-6	
System	Activity	No master	70-8	BU1 missing from cascade
System	Malfunction impuls input	No signal	90-0	Error message if no signal within 5 minutes

Alarm messages HP controller (..HP..)

Error jams	Designation	Alarm cause	Code	Note
System (locking)	HP return sensor	Cooling BT_{max} exceeded		
System (locking)	HP return sensor	Below return sensor min. temperature		
System (locking)	HSS	Below heat source minimum temperature		
System (locking)	HSS	Error heat source sensor HSS		Standard message "VI x"
System (locking)	HSS	Excess temperature heat source sensor HSS in cooling mode		
System (locking)	HPS	Variable input malfunction HP		

(Details, see applicable documents)
The alarm messages are stored in alarm message memory 1.

Alarm message 2

Error jams	Designation	Alarm cause	Code	Note
System	Malfunction	locking	EnXX	Error FA
System	Malfunction	blocking	BnXX	Error FA

If an automatic boiler control is connected, helpful warning messages may come from the boiler control which will be displayed as follows:

Error type	Error code	Field 1	Field 2	Field 3
Hydrau.press	80-1	HYDRAU PRESS		HIGH
Hydrau.press	80-6	HYDRAU PRESS		FILL
Hydrau.press	80-2	HYDRAU PRESS		MIN
Venting	81-0	VENTING		
Maintenance	82-0	MAINTENANCE		
Switch-off	-	HEATSYSTEM		OFF
Service	240-1	SERVICE		

Warning messages are not saved in the error stack.

Malfunction log:

The control unit has two malfunction logs (ERROR MESSAGE for system errors and ERROR 2 for errors from an automatic boiler control) in which a maximum of 20 error messages can be stored. The malfunction messages are displayed with date, time and malfunction type (error number). The query is carried out in the sequence of the entered malfunction messages in the level *ALARM*.

The last (= most recent) malfunction message is in first position (No. 01); the previous malfunction messages are shifted down by a position upon each new alarm message. The last error message is deleted when a new message appears.

Operation:

Note on operation	Key / parameter tree	Parameter
Display of logical alarm messages	SYSTEM	PARAMETER 13
Query error memory	ALARM	ERR- 1.ERR-5

Notes: The outdoor sensor input can be used to shut down the heating system in plants with boiler controls. A sensor short circuit of the outdoor sensor suppresses the error message and shuts down the plant. Instead of the error message, the message ***Heat.system off*** appears.

If there is a defect in the heat generator (error message 30-1 or 31-3) and the plant frost protection is active, the boiler corrosion protection is switched off and thus the heating circuit pumps are activated to lower the risk of the plant freezing.

Note: The error message register appears as always on a connected RS. The last 5 error messages are displayed. ALARM 2 is not shown in a RS.

12.4.1 OEM-Information for troubleshooting

12.4.1.1 Controller complete reset

A complete reset can be carried out to change the settings of the controller back to the settings at delivery. All parameters, values and counters accessible via the enabled code will be reset and the controller will be restarted.

Values not accessible via the enabled access code will not be affected.

Activation: Press the , , and keys simultaneously.

12.4.1.2 Controller time correction

In special cases, it may be necessary to correct the operating time of the clock in the controller. A parameter can be used for this purpose.

The set value determines the time correction every 24h. It takes place once at 01:01:10 hours.

Negative values stop the clock for that time period.

Positive values set the clock ahead for that time period.

Operation:

Note on operation	Key / parameter tree	Parameter
Time correction RTC	SYSTEM	PARAMETER 21

12.4.2 Behaviour in case of outdoor sensor malfunction

If, during weather-controlled mode, a connected outdoor sensor fails (sensor short-circuit or interruption), emergency mode comes into effect.

The weather control then regulates in accordance with an assumed fixed outdoor temperature which is preset in a parameter.

Operation:

Note on operation	Key / parameter tree	Parameter
Curve for emergency mode without OS	SYSTEM	PARAMETER 29

12.5 Sensor Calibration

Function:

If the measured values of the connected sensors do not match the actual temperatures, calibration of the sensor values is possible with the "Sensor Calibration" parameter menu. In this level all the sensors connected to the controller can be corrected by ± 5 K compared to the factory calibration value.

The current measured value plus or minus the specified correction as well as the new value appear on the display. The compensation steps amount to 0.5 K.

Caution:

The sensor inputs are adjusted at the factory with precise measurement instruments. An adjustment may only take place in exceptional cases and after a careful check of the actual deviation.

The changes are not affected by a parameter reset and are kept until new changes are made. They do not replace the factory calibration.

Application:

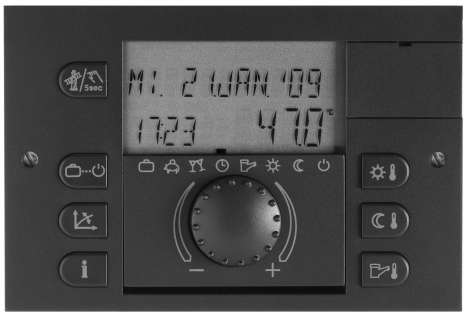
- Compensation for very long sensor lines
- Constant external temperature effect on the sensor

Operation:

Note on operation	Key / parameter tree	Parameter
Sensor calibration	SENSOR ADJ	Text display of available and activated sensors

13 Mounting

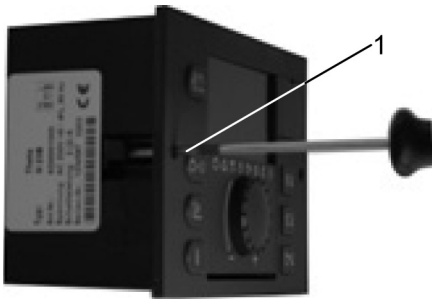
13.1 Mounting instructions for NORM type



All standard units are designed exclusively as units for incorporation and will be installed from the front side into the boiler panel after finishing the electrical wiring.

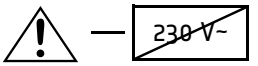
The instrument is fastened by a quarter turn clockwise of the quick clamping devices at the left and right side of the front panel (1).

Removal is done in opposite direction.



13.1.1 Electrical installation

The electrical installation to the control equipment is done at the back side of the instrument via the four enclosed connecting terminals X1, X2, X3 and X4 corresponding to the identification on the coloured-marked connection pads.



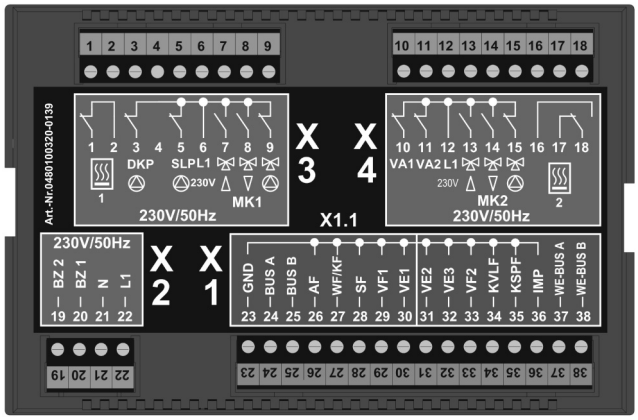
All blue marked connecting terminals (X1) work with safety low voltage and must not get into contact with the mains voltage. At non-observance the instrument will definitely be destroyed and the warranty is no longer valid!

Red marked connecting terminals (X2...X4) principally may work with mains voltage according to the current operation conditions.

For further information see documentation of the boiler manufacturer.

Note:
Cables with mains voltage must be installed **separate** from low voltage cables (data bus, sensors etc.). It is strictly prohibited to use **one cable** for both voltages. Sensor cables and data bus cables may not be installed **together** with mains voltage cables supplying electrical appliance which are **not** suppressed according to EN 60555-2.

13.1.2 Electrical installation



230 V~ Connections

1 - Floating exit for heat generator, output (stage 1)
2 - Floating exit for heat generator, input (stage 1)
3 - Unmixed circuit pump
4 - Coded plug
5 - Domestic hot water charging pump
6 - L 1 / 230 V
7 - Mixing valve 1 OPEN
8 - Mixing valve 1 CLOSED
9 - Pump for mixed heating circuit 1
10 - Variable output 1
11 - Variable output 2
12 - L 1 / 230 V
13 - Mixing valve 2 OPEN
14 - Mixing valve 2 CLOSED
15 - Pump for mixed heating circuit 2
16 -
17 - Floating exit for heat generator, output - (stage 2)
18 - Floating exit for heat generator, input - (stage 2)
19 - Operat. hours counter burner - (stage 2)
20 - Operat. hours counter burner - (stage 1)
21 - N / 230 V mains
22 - L 1 / 230 V mains

Sensor and data bus connections

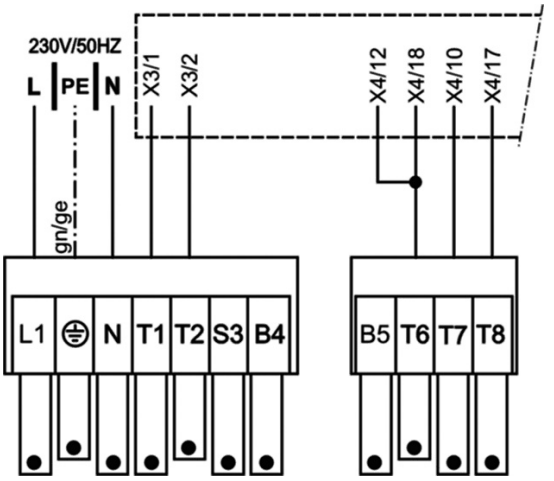
23 - Ground for data bus and sensors
24 - Data bus signal A
25 - Data bus signal B
26 - Outdoor sensor
27 - Heat generator sensor/boiler sensor
28 - DHW sensor
29 - Flow sensor for mixed heating circuit 1
30 - Variable input 1
31 - Variable input 2
32 - Variable input 3
33 - Flow sensor for mixed heating circuit 2
34 - Solar panel flow sensor [1)]
35 - Solar tank sensor
36 - Pulse input
37 - Heat generator-data bus A
38 - Heat generator-data bus B

Mounting into boilers
See technical documentation of boilermanufacturer

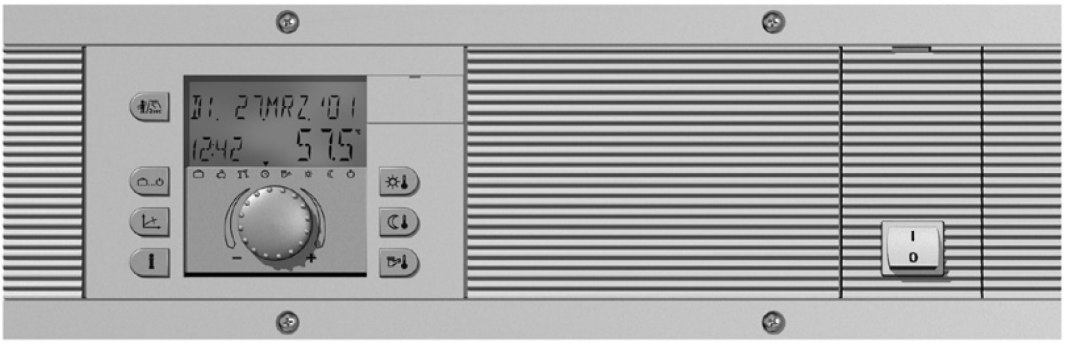
for wall mounting
See technical documentation wall mounting set THETA WG

[1)] Solar application only

Connecting modulating burners::



13.2 Mounting instructions for UNIT type



13.2.1 Mounting UNIT

The boiler control panel is completely prewired and will be mounted from the front side into the panel cut-out of the boiler after finishing the electrical wiring. The panel is fastened with the four enclosed screws.

Removal is done in opposite direction.

The sensor of the safety temperature limiter as well as the boiler sensor will be inserted into the sensor immersion pocket of the boiler.

Caution: Do not crease or damage the capillary tubing.

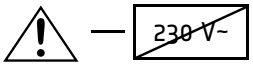
For further information see documentation of the boiler manufacturer.

Accessories on demand: For easier installation, optional swing-out aids can be ordered. These aids will be snapped into both left and right sides of the panel and prevent that the panel falls down when opening.

13.2.2 Electrical installation

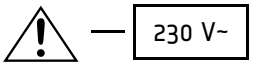
The electrical installation is done at the back side of the boiler control panel via the plugged-in connection terminals corresponding to the identification on the coloured-marked connection pads.

Caution: **Low voltage connecting terminals:**



All blue marked connecting terminals work with safety low voltage and must not get into contact with the mains voltage.
At non-observance the instrument will definitely be destroyed and the warranty is no longer valid!

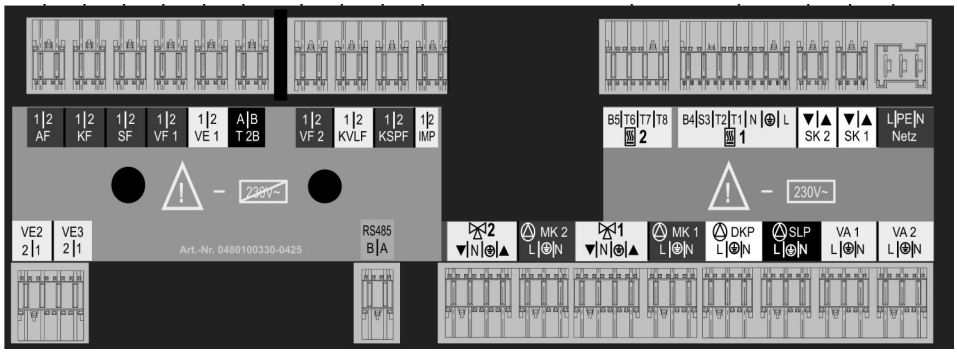
Caution: **Mains voltage connecting terminals:**



Red marked connecting terminals principally may work with mains voltage according to the current operation conditions.

Note: Cables with mains voltage must be installed separate from low voltage cables (data bus, sensors etc.). It is strictly prohibited to use one cable for both voltages. Sensor cables and data bus cables may not be installed together with mains voltage cables supplying electrical appliance which are not suppressed according to EN 60555-2.

13.2.3 Terminal assignment



230 V~ Connections

1 - Mains 230V~ +6/-10%, 50 Hz
2 - Safety circuit 1 (burner loop)
3 - Safety circuit 2 (burner loop)
4 - Burner 1 (single step boilers)
5 - Burner 2 (double step boilers)
6 - Unmixed circuit pump
7 - Domestic hot water charging pump
8 - Pump for mixed heating circuit 1
9 - Actuator mixing valve 1
10 - Pump for mixed heating circuit 2
11 - Actuator mixing valve 2
12 - Variable output 1
depending of programmation (see level HYDRAULIC)
13 - Variable output 2
depending of programmation (see level HYDRAULIC)

Sensor and data bus connections

14 - Outdoor sensor
15 - Heat generator sensor/boiler sensor
16 - DHW sensor
17 - Flow sensor for mixed heating circuit 1
18 - Flow sensor for mixed heating circuit 2
19 - Variable input 1
20 - Variable input 2
21 - Variable input 3
22 - Solar panel flow sensor [1)]
23 - Solar tank sensor[1)]
24 - Pulse input
25 - Data bus T2B
26 - Data bus RS 485 [2)]

[1)] Solar application only

[2)] high efficiency condensing boilers only

13.3 Mounting instructions for mounting with wall socket MS-K

Application: The wall socket MS-K is used for wall mounting application of all types of standard units.

Application: The wall-mounted connection base is intended for the sole purpose of housing the standard unit. After plugging the standard unit into the wall socket and after finishing the electrical wiring ready for start up.

13.3.1 Electrical installation

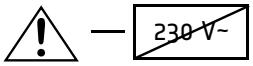
1- Break out the impressed cable inlets due to the required number and seize on top side or lower side of the wall socket according to the position of the cable channel.

Note:
Cable strain relief is prescribed if no cable duct is used.

2- Turn locking screws (1) horizontally and pull off terminal covers to the side.

3- Fix wall socket on a flat background using enclosed screws and plugs. Use the enclosed drill pattern.

4- Electrical installation has to be carried out according to plant and connectivity as shown on next page.



The connecting terminals of terminal blocks X5 and X6 at the left side work with safety low voltage and must not get into contact with the mains voltage. At non-observance the instrument will definitely be destroyed and the warranty is no longer valid!

The connecting terminals of terminal blocks X7 to X10 may work with mains voltage according to the device type and current operation conditions.

The wall socket is equipped completely with screwless terminals. Press lever before inserting stripped wire into terminal.

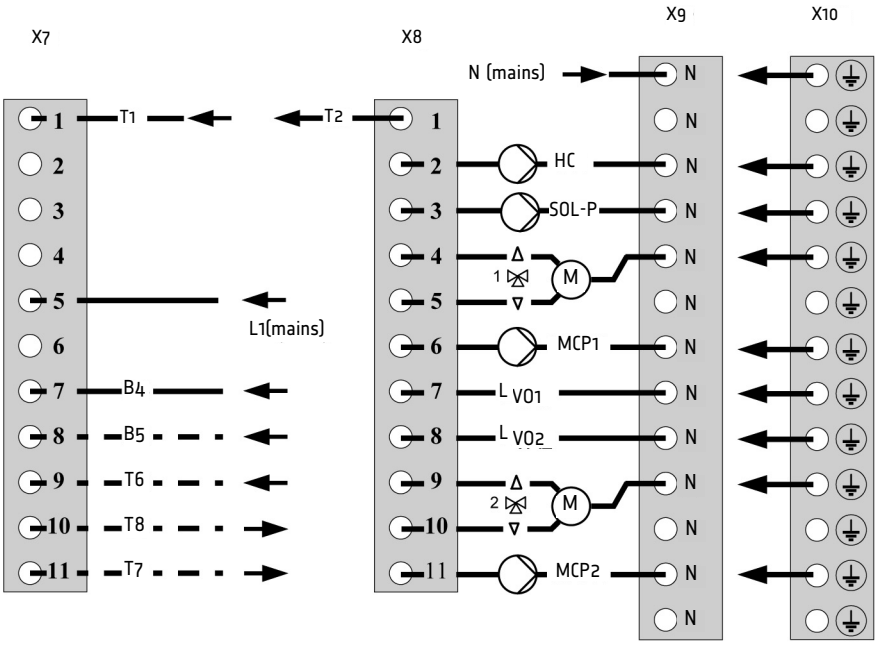
5- Attach and clamp the side terminal-covers.

6- Insert standard unit with evenly distributed pressure. The electrical connection is done by plugging the instrument into the terminals at the socket print. Lock standard unit with both quick clamping devices left and right.

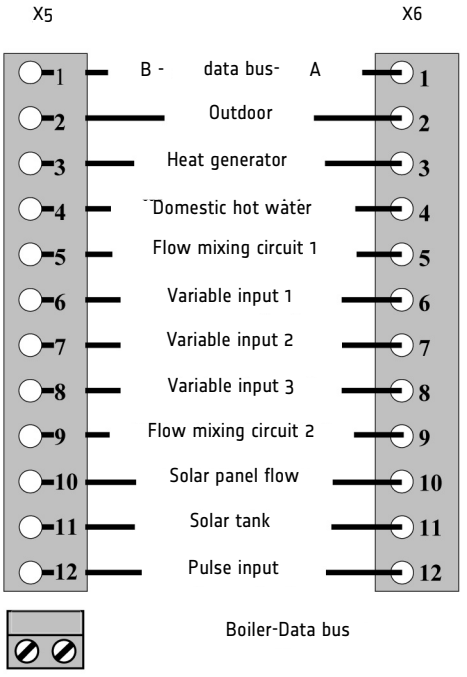
Note: Cables with mains voltage must be installed **separate** from low voltage cables (data bus, sensors etc.). It is strictly prohibited to use **one cable** for both voltages. Use cable ducts equipped with separators, if necessary.

13.3.2 Electrical connection in wall socket MS-K

230 V~ Connections



Sensor and data bus connections



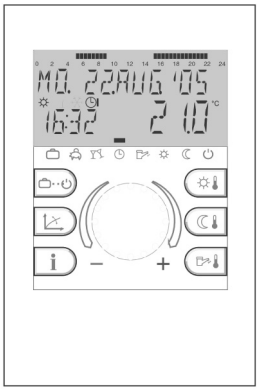
Burner connections

T1	Control terminal stage 1
T2	Control terminal stage 1
B4	Op. hours counter burner stage 1
B5	Op. hours counter burner stage 2
T6	Control terminal stage 2
T7	Control terminal stage 2
T8	Control terminal stage 2
L1	Mains 230 V~ (live)
N	Mains 230 V~ (neutre)

Pumps and actuators

HC-P	Unmixed circuit pump
DHW	DHW charging pump
MCP1	Pump for mixed heating circuit 1
MCP2	Pump for mixed heating circuit 2
1 ⊠ △	actuator mix. valve 1 (OPEN)
1 ⊠ ▽	actuator mix. valve 1 (CLOSED)
2 ⊠ △	actuator mix. valve 2 (OPEN)
2 ⊠ ▽	actuator mix. valve 2 (CLOSED)
L_{VO1}	Variable output 1 (live)
L_{VO2}	Variable output 2 (live)

13.4 Mounting instructions remote unit



13.4.1 Mounting location

- for applications without room sensor

  Without room sensor function the remote unit may be fixed at any place in the interior range.

- for applications with room sensor

  The remote unit should be fixed at a height of approx. 1.20 -1.50 m at a place most representative of all rooms. It is recommended to chose an interior wall of the coolest day room (such as entrance halls). In order to ensure sufficient air circulation at the room station, it must be mounted to the wall with a gap inbetween.

The remote unit must not be mounted

- at locations exposed to direct sunlight (seasonal variations should be taken into account)
- close to heat-producing appliances (televisions, refrigerators, wall lamps, radiators etc.)
- onto walls heated by under plaster heating pipes or chimneys
- onto outside walls
- in corners behind curtains or shelves (due to insufficient ventilation)
- close to doors of unheated rooms (due to the influence of low temperature)
- on unsealed underplaster wiring boxes (influence of external low temperatures due to the chimney effect of installation tubes)
- in rooms with radiators controlled by thermostatic valves (mutual influence).

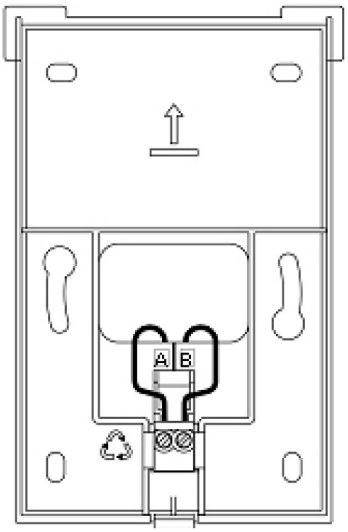
Mounting: After removing the front panel by pressing the locating lug at the lower side the socket can be mounted at the desired location using the enclosed dowel pins and screws. The cable for the bus connection has to be led through the lower cut-out of the socket.

Note: For new installations use an underplaster wiring box for perfect wiring.

Locating lug

13.4.2 Electrical connection

The wiring between remote unit and standard unit or boiler control panel has to be made by a shielded data bus cable at terminals A and B of both units. The connections may not be switched and must be installed according to the labelling of the terminals A/B in the wall socket. Changing the terminals causes.



Socket (unit removed)

After completing the electrical wiring hang remote unit conclusively on top side according figure on page 11 and turn down until it clicks into the wall socket.

13.4.3 Data bus addressing

To connect one or more room stations to the standard unit, use a two wire data bus. Because this connection is always parallel on the same line, the data transfer must be selected by corresponding assigned bus addresses (see also Page 9-1).

Caution:
Once a room device is connected and registered via the data bus to the standard unit, the standard unit automatically switches to separate operating mode! This is necessary to ensure clear operation of the system with connected room devices.

Operation

Note on operation	Key / parameter tree	Parameter
Setting the bus address	DATA BUS	PARAMETER 01
Control mode	SYSTEM	CONTROL MODE

13.5 Mounting instructions wall device RFF

A - Mounting location

The remote unit should be fixed at a height of approx. 1.20 -1.50 m at a place most representative of all rooms. It is recommended to chose an interior wall of the coolest day room (such as entrance halls).

The remote unit may not be installed:

- on places with direct sun influence (take wintertime position of sun into account)
- close to heat-producing appliances (televisions, refrigerators, wall lamps, radiators etc.)
- onto walls heated by under plaster heating pipes or chimneys
- onto exterior walls
- in corners or niches, shelves or behind curtains (insufficient circulation)
- close to doors of rooms which have no heating (influence of cold air)
- in leaky wall cavities (cold air influence caused by chimney effect in installation pipes)

B - Mounting

After removing the front cover the remote unit is fixed using supplied screws and plugs. The data bus line has to be lead through the lower cut-out.

Terminal assignment

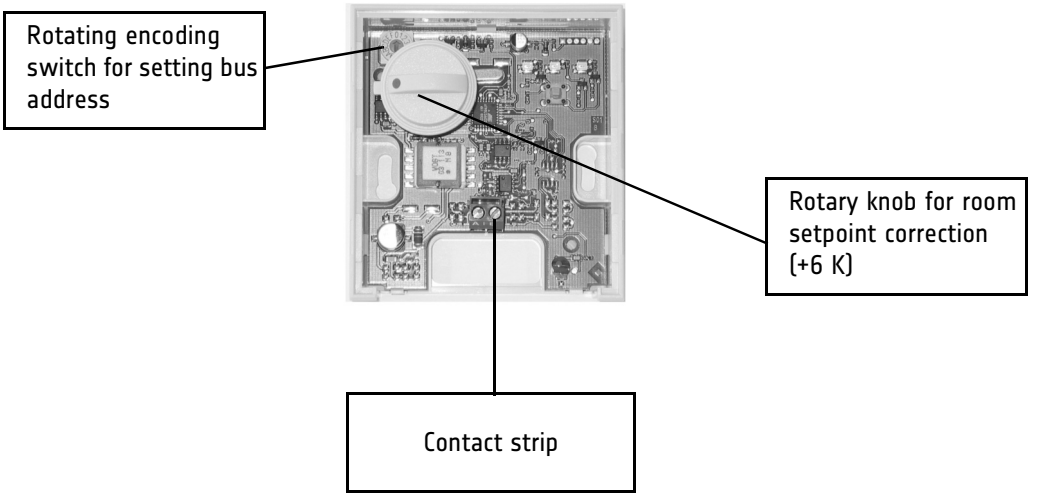
The electrical connection takes place at the 2-pole terminal strip.

Recommended connecting cable: J-Y(ST)Y 1 x 2 x 0.6 mm^2.

Caution: Do not change connecting terminals A and B!

After installing the data bus line and setting the data bus address (see left table) remount front cover.

Remote unit open (front cover removed)



14 Accessories

14.1 Outdoor sensor AF

Outdoor sensor AF

Mounting location The outdoor sensor should be installed on the coldest side of the building (north or north-east) at approx. one third of the building's height (minimum distance from the ground: 2 m).

Exception: Choose the corresponding side of building due to the direction of the preferential living area.

Never mount sensor onto external heat sources such as chimneys, hot air from air shafts, sunlight or black undergrounds etc. since this will falsify the measured values considerably. The cable outlet must be directed downwards in order to avoid the intrusion of moisture.

Electrical installation

1- Install sensor cable to the sensor location.

2- Loosen lid screws and remove top.

3- Mount open sensor case with enclosed central fixing screw. Use sealing ring! Cable outlet must be directed downwards!

4- Insert sensor cable. The cable insulation must be encircled by the sealing lips of cable entry.

5- Set up electrical connection. For the electrical installation preferably a 2-core cable with at least sectional view of 1 mm^2 is recommended. The connection is made at the screw terminal block inside the sensor case and may be changed.

6- Put on lid again an and screw it firmly with the case. Make sure that the cover is firmly in place.

14.2 Immersion sensor KVT

Immersion sensor KVT 20...

Types: KVT 20/2/6 cable length 2 m

Application:

Boiler sensor, hot water sensor (for boiler integrated hot water tanks), return flow sensor

KVT 20/5/6 cable length 5 m

Application:

Hot water sensor (for add-on tanks, buffer tanks, solar collector return flow sensor etc.)

Mounting location: In the immersion sleeve of the respective application.

Mounting into boilers or other heat sources

Bend clutch spring to sensor top and insert sensor together with the capillary sensors of boiler thermostat (KTR), safety temperature limiter (SLT) and boiler thermometer (KTA) into the immersion sleeve. Use spring clip if necessary.

Mounting into hot water or buffer tanks

Bend clutch spring to sensor top and insert sensor according to the instructions of the manufacturer into the dry immersion sleeve of the respective hot water tank.

Terminal assignment

Connect sensors at the corresponding terminals of the respective control unit (see terminal diagram). The terminals may be changed.

14.3 Flow sensor VF

Feeding sensor VF

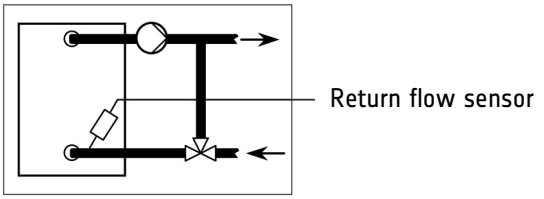
Types: VF 202 cable length 2 m

VF 204 cable length 4 m

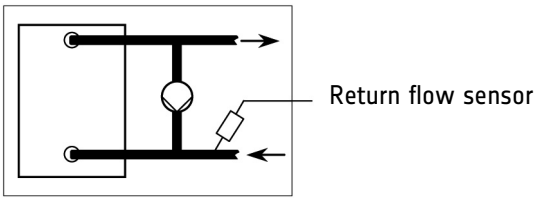
Application: Contact sensor for mixer controlled heating circuits onto flow- or return pipes

Mounting location: Used as mixer flow sensor:
Behind the mixer circuit pump, in the flow, at minimum distance of 50 cm.

In case of use as return flow sensors:



Controlled flow temperature addition by means of mixing valve



Bypass circuit by means of a bypass pump

Mounting:
- Clean flow or return pipe thoroughly and apply heat conduction paste.
- Attach sensor on the contact place in a flush way to the tube surface by means of the enclosed clamping band.
- Pay attention to firm seat!

Terminal assignment:

Connect sensors at the corresponding terminals of the respective control unit (see terminal diagram). The terminals may be changed.

14.4 Flue gas sensor / solar panel flow sensor

Types: PT1000/6 cable length 2.5 m
(2 versions with temperature resistance of up to 200 °C and 400 °C available)

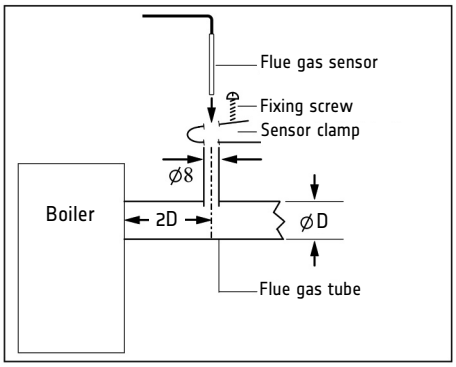
Application: Flue gas temperature

Collector flow temperature

Mounting location: - In the flue gas tube in the minimum distance of the double tube diameter.
- In the immersion sleeve of the solar collector.

Mounting in the

flue gas tube: **Mount sensor clamp according to illustration below. Determine immersion depth into the core flow of the flue gas and fix sensor.**



Terminal assignment:

Connect sensors at the corresponding terminals of the respective control unit (see terminal diagram). The terminals may be changed.

15 Technical Data

15.1 General

Power supply voltage:	230V +6%/ -10%
Rated frequency:	50...60Hz
Power input:	max. 5.8 VA
Recommended pre-fuse:	max. 6.3 A slow
Output relay contact load:	2 (2)A
Bus interface:	T2B to connect to external devices (remote station, PC, modem or gateway)
Power supply via T2B bus:	12 V/ 150 mA
Ambient temperature:	0....+50°C
Storage temperature:	-25....+60°C
Degree of protection:	IP 30
Protection class according to EN 60730:	II
Protection class according to EN 60529:	III
Software-class:	A
Radio protection:	EN 55014 (1993)
Interference immunity:	EN 55104 (1995)
CE compliance:	89/336/EEC
Casing dimensions:	144 x 96 x 75 mm (W x H x D)
Casing material:	ABS, antistatic
Electrical connections:	Plug-in terminal connections

Installation recommendations:

Cables with mains voltage (power supply, burner, pumps, actuators):	
Cross-section:	1.5 mm²
Maximum cable length:	Unlimited cable length within house installation
Low voltage cables (sensors, ext. switches, heat demand by means of contacts, modem connection cables, analogue signal lines etc.)	
Cross-section:	0.5 mm²
Maximum cable length:	100 m (double line); Longer distances should be avoided to decrease the risk of interferences.
Data bus connections	
Cross-section:	0.6 mm²
Maximum cable length:	50 m (double line, longest distance between a standard unit and a device to be supplied); longer distances should be avoided to decrease the risk of interferences.
Recommended cable:	J-Y(St)Y 1 x 2 x 0.6 mm²

15.2 Technical data for sensor and digital inputs

15.2.1 Sensor Resistance Values

Resistance value KTY sensor for OF, H-GEN/BS, DHWS, FS1, FS2, VI1 (not FGS setting), VI2, VI3, SPBU							
°C	kOhm	°C	kOhm	°C	kOhm	°C	kOhm
-20	1.386	0	1.630	20	1.922	70	2.786
-18	1.393	2	1.658	25	2.000	75	2.883
-16	1.418	4	1.686	30	2.080	80	2.982
-14	1.444	6	1.714	35	2.161	85	3.082
-12	1.469	8	1.743	40	2.245	90	3.185
-10	1.495	10	1.772	45	2.330	95	3.290
-8	1.522	12	1.802	50	2.418	100	3.396
-6	1.549	14	1.831	55	2.507		
-4	1.576	16	1.862	60	2.598		
-2	1.603	18	1.892	65	2.691		

Resistance values PT 1000-sensor for VI1 (setting FGS), SPFS							
°C	Ohm	°C	Ohm	°C	Ohm	°C	Ohm
0	1000.0	80	1308.93	140	1535.75	280	2048.76
10	1039.02	85	1327.99	150	1573.15	300	2120.19
20	1077.93	90	1347.02	160	1610.43	320	2191.15
25	1093.46	95	1366.03	170	1647.60	340	2261.66
30	1116.72	100	1385.00	180	1684.65	360	2331.69
40	1155.39	105	1403.95	190	1721.58	380	2401.27
50	1193.95	110	1422.86	200	1758.40	400	2470.38
60	1232.39	115	1441.75	220	1831.68	450	2641.12
70	1270.72	120	1460.61	240	1904.51	500	2811.00
75	1289.84	130	1498.24	260	1976.86		

15.2.2 Sensor measuring ranges

Designation	Abbreviation	Sensor type	Measuring range
Outdoor sensor	OS	KTY	-50°C...90°C
Boiler sensor	BS	KTY	-50°C...120°C
Flow sensor 1	FS1	KTY	-50°C...120°C
Flow sensor 2	FS2	KTY	-50°C...120°C
DHW sensor	DHWS	KTY	-50°C...120°C
Solar panel flow sensor	SPFS	PT1000	-50°C...210°C
Solar panel tank / buffer sensor	SPBU	KTY	-50°C...120°C
Variable input VI1 *)	VI1	KTY PT1000	-50°C...120°C -50°C...500°C
Variable input VI2	VI2	KTY	-50°C...120°C
Variable input VI3	VI3	KTY	-50°C...120°C

15.2.3 Digital inputs

Designation	Abbreviation	Sensor type	Measuring range
Impulse sensor	PIN	Low voltage	<= 10 Hz
Op. hours counter burner stage 1	OHC1	230V	OFF, ON
Op. hours counter burner stage 1	OHC2	230V	OFF, ON

*) According to selected function, PT 1000 can be used for flue gas sensor connection.

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