

PRODUKTHANDBUCH

# ABB i-bus<sup>®</sup> KNX

## VAA/A 6.24.2

### Floor heating-Controller, 6-fold, MDRC





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## Function description

### 1 **Function description**

- Heating actuator for controlling thermal actuators, switching 24 V DC or permanently 0–10 V DC
- Integration of up to 2 heating circuit pumps for integrating boiler control
- Flow temperature adjustment to meet requirements: Automatic calculation of the maximum actuating value for adjustment of the flow temperature to actual requirements
- No KNX room thermostat needed: Flexible use of each channel as a heating actuator or heating controller
- Can be installed directly in the heating circuit distributor
- Screwless terminal technology
- Integrated power supply for max. 12 thermal actuators
- Silent semiconductor switch
- Continuous or switching actuating value selectable



## 2 Operation



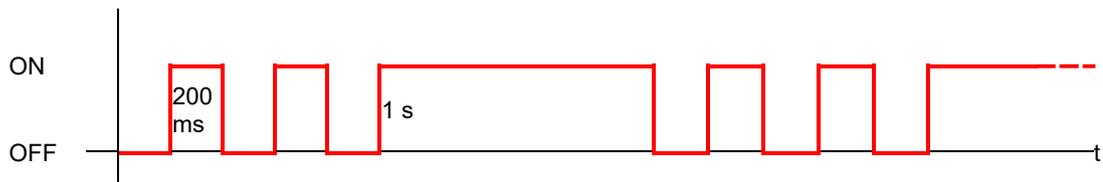
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Designation	Function	Description
PWR	24 V - LED	LED lights green if 24 V available, flashes red in case of an error.
Phys. Adr.	LED lights green if 24 V available, flashes red in case of an error.	For ETS programming.
man.	Button and LED for manual operation	<p>Starting manual mode: Short press of the button, the yellow LED lights up, bus communication is blocked. Channel 1 is selected first, and the corresponding LED flashes. After channel 6, the output of the pump relay follows. See below, flashing behaviour in manual mode.</p> <p>Each subsequent press on the man. button selects the next output (H1..H6/12, pump, H1). A long press on the man. button finishes manual mode: Then, all channels are controlled again according to their parameters settings and bus telegrams.</p>
0-10 V	Button with double function: 1. Changing the output status. 2. Changing the type of valve control.	<p>Only in manual mode:</p> <ol style="list-style-type: none"> <li>1. A short press of the button changes the status of the selected output (toggle On/Off).</li> <li>2. A long press of the button changes the mode of the output from 24 V switching to 0-10 V, and vice versa.</li> </ol> <p>The LED lights up blue if the selected channel is in 0-10 V mode.</p>
Pump	Pump-LED	Shows the pump relay status..
H1-H6	Chanel-LEDs	Shows the status of the outputs.

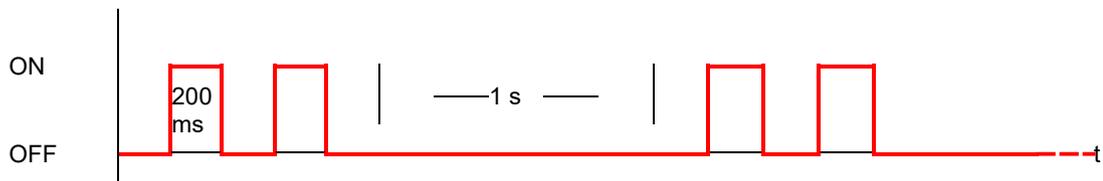
## 2.1 Flashing behaviour in manual mode

In manual mode, the switching status of the channels is displayed after a short double flash.

### Output is switched on (active)



### Output is switched off (inactive)



### 3 Technical data

<b>KNX operating voltage</b>	Bus voltage, $I_{Bus} \leq 7,5 \text{ mA}$
<b>Operating voltage</b>	230–240 V AC
<b>Frequency</b>	50-60 Hz
<b>Standby output</b>	< 1 W
<b>Drives</b>	2 per channel
<b>Valve output</b>	24 V DC...SELV; 0.4 A peak; 0.12 A permanent or 0-10 V at at least 1250 ohm
<b>Switch output (pump)</b>	5 A, 240 V AC floating, $\mu$ contact
<b>24 V output terminal</b>	Max. 1,4 A
<b>Max. wire cross-sections</b>	0,2 – 1,5 mm <sup>2</sup>
<b>Ambient temperature</b>	–5 °C ... +50 °C
<b>Type of installation</b>	DIN-rail
<b>Protection rating</b>	IP 20 in accordance with EN 60529
<b>Protection class</b>	II in accordance with EN 60730-1 subject to designated installation

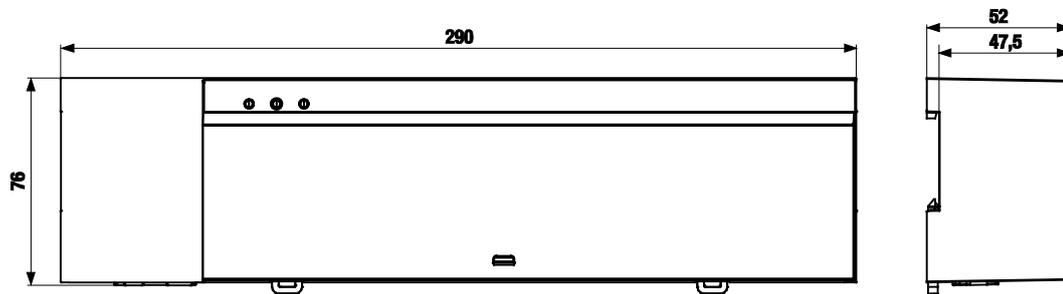
**ⓘ Note**

Comment concerning the installed 24 V power unit:  
 The 24 V output terminal supplies the operating voltage for 0-10 V valves, which are connected to the device.  
 The current available at this terminal is reduced by approx. 0.1 A per connected 24 V/2 W actuator, if thermal actuators (24 V switching) are connected at the same time.

**ⓘ Note**

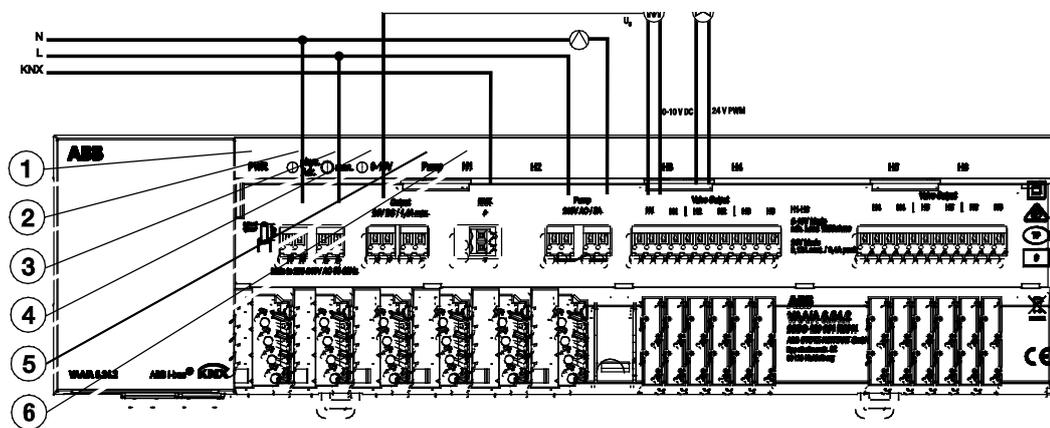
In order to reduce the inrush peaks typical for thermal actuators, the power unit can supply 2.7 A for a short time.  
 The power unit is inherently short-circuit proof and over temperature resistant. However, a permanent operation outside the specified characteristics can reduce the service life of the device.

### 3.1 Dimension drawing



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### 3.2 Connection diagram



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#### Legend

- |   |  |   |  |
|---|--|---|--|
| 1 | Power LED for operating status:<br>green = ok; red = error                                   | 4 | LED and button for manual operation and<br>channel mode: on = 0 – 10 V |
| 2 | Programming button and LED<br>for the physical address                                       | 5 | LED shows the status of the integrated<br>pump relay                   |
| 3 | LED and button for manual operation<br>of the outputs (manual mode and channel<br>selection) | 6 | LED shows the status of the respective<br>output                       |

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## Application program

### 4 Application program

#### 4.1 Selection in the product database

The application *Floor heating-Controller* is available for the Floor heating-Controller VAA/A 6.24.2. ETS from version 4 is required to parameterize the device.

<b>Number of communication objects</b>	92
<b>Number of group addresses</b>	254
<b>Number of associations</b>	255

 **Note**

The ETS database can be found on our website [www.ABB.com/KNX](http://www.ABB.com/KNX)

## 4.2 Overview of communication objects

### 4.2.1 Channel-related objects

No.	Object name	Function	Length	R	W	C	T	DPT
1	Channel H1	Base setpoint	2 bytes	R	W	C	-	9.001
1	Channel H1	Continuous actuating value	1 byte	R	W	C	-	5.001
		Switching actuating value	1 bit	R	W	C	-	1.001
2	Channel H1	Manual setpoint offset	2 bytes	R	W	C	-	9.002
3	Channel H1	Actual value	2 bytes	R	W	C	-	9.001
4	Channel H1	Operating mode preset	1 byte	R	W	C	-	20,102
		Current actuating value	1 byte	R	-	C	T	5.001
5	Channel H1	Presence	1 bit	R	W	C	-	1.018
6	Channel H1	Window setting	1 bit	R	W	C	-	1.019
7	Channel H1	Current operating mode	1 byte	R	-	C	T	20,102
8	Channel H1	Heating and cooling actuating value	1 byte	R	-	C	T	5.001
		Heating actuating value	1 byte	R	-	C	T	5.001
9	Channel H1	Cooling actuating value	1 byte	R	-	C	T	5.001
10	Channel H1	Heating = 0, cooling = 1	1 bit	R	W	C	-	1.001
		Heating = 1, cooling = 0	1 bit	R	W	C	-	1.100
11	Channel H1	current setpoint	2 bytes	R	W	C	T	9.001
12	Channel H1	Report actual value failure	1 bit	R	-	C	T	1.005
		Report actuating value failure	1 bit	R	-	C	T	1.005
13	Channel H1	Forced operation	1 bit	R	W	C	-	1.003
14	Channel H1	Overcurrent/short circuit	1 bit	R	-	C	T	1.005

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### 4.2.2 Common Objects

No.	Object name	Function	Length	R	W	C	T	DPT
241	H1 – H6	Summer mode ON/OFF	1 bit	R	W	C	-	1.003
242	H1 – H6	Highest actuating value	1 byte	R	-	C	T	5.001
244	H1 – H6	Pump ON/OFF	1 bit	R	-	C	T	1.001
245	H1 – H6	Pump relay status	1 bit	R	-	C	T	1.001
246	H1 – H6	Outside temperature	2 bytes	R	W	C	-	9.001
247	H1 – H6	Outside temperature failure	1 bit	R	-	C	T	1.005
248	H1 – H6	Manual	1 bit	R	W	C	T	1.001
249	Software version of bus coupling unit	Send	14 bytes	R	-	C	T	16.001
250	Software version of firmware	Send	14 bytes	R	-	C	T	16.001

## 4.3 Description of communication objects

### 4.3.1 Objects for the heating actuator function

#### Object 1 "Continuous actuating value, switching actuating value"

The actuating value receives data from the room thermostat for the corresponding valve. It can either be continuous (0-100%) or switching (ON/OFF) depending on the configuration.

#### Objects 2-3

Not used.

#### Object 4 "Current actuating value"

Reports the actual value of the actuating value generated for the channel.

#### Objects 5-11

Not used.

#### Object 12 "Report actuating value loss"

Present only if, on the *Configuration options* parameter page, the parameter *Monitor the actuating value* = yes.

If monitoring is selected, the room thermostat must receive an actuating value telegram regularly.

Recommendation: To ensure trouble-free operation, the cyclical transmission time to the room thermostat should be no longer than half the monitoring time.

Example: Monitoring time 30 min, cyclical transmission time to thermostat less than or equal to 15 min.

If no new actuating value is received within the configured monitoring time, failure of the room thermostat is assumed and an emergency program is started. See *Emergency program* parameter page.

This function can be selected or deactivated individually for each channel.

The monitoring time is set jointly for all channels on the *Monitoring* page.

### 4.3.2 Objects for the heating controller function

#### Object 1 "Base setpoint"

The base setpoint is first specified via the application at start-up and stored in the *Base setpoint* object. It can be reset at any time using *Base setpoint* object (limited by minimum or maximum valid setpoint).

The object can be written to without restriction.

#### Object 2 "Manual setpoint offset"

Offsetting set temperature:

The object receives a temperature difference as DPT 9.002. The desired room temperature (current setpoint) can be adjusted against the base setpoint by this difference.

The following applies in comfort mode (heating):

Current setpoint = base setpoint + manual setpoint offset

Values beyond the configured range (maximum or minimum valid setpoint on the *Setpoints* parameter page) are limited to the highest or lowest value.

Note:

The offset always refers to the set base setpoint and not to the current setpoint.

See also [Chapter 6.4, Determination of the setpoint](#)

#### Object 3 "Actual value"

Receives the current room temperature for the control.

#### Object 4 "Operating mode preset"

1 byte object. Can be used to directly activate one of 4 operating modes.

1 = Comfort, 2 = Standby, 3 = Night,

4 = Frost protection (heat protection)

If another value is received (0 or >4), *Comfort* operating mode is activated.

The details in brackets refer to cooling mode.

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### Object 5 "Presence"

The status of a presence detector (e.g. push button, motion detector) can be received via this object.  
1 on this object activates *Comfort* operating mode.

### Object 6 "Window setting"

The status of a window contact can be received via this object.  
1 on this object activates *Frost/heat protection* operating mode.

### Object 7: "Current operating mode"

Transmits the current operating mode as a 1 byte value (see table).  
The transmission behaviour can be set on the *Operating mode* parameter page.

Value	Operation mode
1	Comfort
2	Standby
3	Night
4	Frost protection/heat protection

### Object 8 "Heating actuating value, heating and cooling actuating value"

Sends the current heating actuating value (0...100 %), or heating or cooling if the *Output of cooling actuating value* parameter has been set to *Together with heating actuating value*.

### Object 9 "Cooling actuating value"

Sends the *Cooling* actuating value or switch command to control a cooling surface, fan coil unit etc.  
The send format DPT 5.001 or DPT 1.001 depends on the selected *Type of control* (continuous or switching) on the *Cooling control* page.

#### Note

- The object is not available:
  - With the setting *Heating control only* (*Settings* parameter page), as cooling function is not available.
  - If *Changeover between heating and cooling = via object* is selected and *Output of cooling actuating value* is set to *Together with heating actuating value* (*Cooling control* parameter page).

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### Object 10 "Heating/cooling"

This object is used in 2-pipe heating/cooling systems or if automatic change over between heating and cooling is not desired.

The telegram format can be set on the *Cooling control* parameter page:

Parameter: <i>Format object heating/cooling</i>	Telegram format
DPT 1.100	Heating = 1, cooling = 0
Inverted	Heating = 0, cooling = 1

### Object 11 "Current setpoint"

Sends the current temperature setpoint as DPT 9.001.

### Object 12 "Actual value failure"

Sendet eine 1, wenn innerhalb der Überwachungszeit kein gültiger Istwert empfangen wurde.

### Object 13 "Forced operation"

The direction of action of the force telegram is adjustable.

Standard:

1 = Activate force

0 = End force

#### Hinweis

After reset, the last status of forced operation will be restored.

After download, forced operation is always deactivated.

### Object 14 "Overcurrent/short circuit"

Reports overload, short circuit, or defect at output.

1 = Error

0 = No error

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## Application program

### 4.3.3

#### Common objects

##### **Object 241 "Summer mode ON/OFF"**

When 1 is set for the object, all channels configured for it are switched over to summer mode, and heating no longer takes place.

During summer mode, a valve protection program can also be executed optionally.

##### **Object 242 "Highest actuating value"**

The actuating values for the channels are continuously compared with each other and only the currently highest value is sent to this object.

The current heat requirement of the system is thus constantly reported to the heating boiler, which then adapts its output to the actual requirement.

Whether a channel is taken into account for determining the highest actuating value can be selected individually for each channel. For example, insignificant rooms can be ignored for the heat requirement.

##### **Object 243**

Not used.

##### **Object 244 "Pump ON/OFF"**

Control of the supply pump. This object is used jointly for all channels. Whether a channel is taken into account for pump control can be selected individually for each channel.

This object is independent of the pump relay in the device.

##### **Object 245 "Pump relay status"**

Reports the current switching status of the pump relays.

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### Object 246 "Outside temperature"

Receives the outside temperature.

### Object 247 "Outside temperature failure"

0 = No error

1 = Error: Outside temperature can no longer be received.

### Object 248 "Manual"

Puts the device in manual mode or sends the status of manual mode.

Telegram	Meaning	Explanation
0	Auto	All channels can be operated via the bus as well as via the buttons.
1	Manual	The channels can only be operated via the buttons on the device. Bus telegrams will not work.

The duration of manual mode, i.e. the function of the *Manual* button is adjustable on the *General* parameter page.

After manual operation has been cancelled, already received bus events will not be executed again.

The "Manual" state will be reset in the event of a mains failure.

### Object 249

For diagnostic purposes only.

Sends the software version of the bus coupling unit after reset or download. Can also be read out directly via the ETS.

The version is issued as an ASCII character string.

Format: V x.y.z

Code	Meaning
x	Main-version
y	Sub-version
z	Revision

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### Object 250 "Firmware version"

For diagnostic purposes only.

Sends the firmware versions of the device software after reset or download.

Can also be read out directly via the ETS.

The version is issued as an ASCII character string.

Format: Bxxx Vyyy Vzzz

Code	Meaning
xxx	Version of the bootloader
yyy	Version of channels 1-3
zzz	Version of channels 4-6

If the object is not sent after a bus reset, maybe there is no mains voltage present.

### 4.4 Parameter pages overview

The device consists of one general block and four main functional blocks.

Parameter page	Description
General	LED settings, activation of the temperature sensor inputs.
<b>Channel H1, H2...H6</b>	
Configuration options	Selection as heating controller/heating actuator and activation of additional functions.
Channel characteristics	Parameters for actuator control.
Settings	Standard/user-defined control.
Operating mode	Operating mode after reset, presence sensor etc.
Heating control	Control parameters, installation type etc. for heating mode.
Heating setpoints	Base setpoint, lowering, frost protection etc.
Cooling control	Control parameters, installation type etc. for cooling mode.
Cooling setpoints	Dead zone, standby, heat protection etc.
Emergency program	Response to failure of actuating value or actual value.
Force	Response in forced operation.
<b>Monitoring</b>	
Actuating value, actual value, outside temperature	Settings of the monitoring function.
<b>Pump control</b>	
Relay	Settings for pump control via the integrated relay.
Object	Settings for pump control via object <i>Pump On/Off</i>

## 4.5 General parameters

Designation	Values	Description
Device type	<u>VAA/A 6.24.2</u>	
Function of the manual button	<p>applies for 24 hours or until reset via object blocked <u>applies until reset via object</u> applies for 30 minutes or until reset via object applies for 1 hour or until reset via object applies for 2 hours or until reset via object applies for 4 hours or until reset via object applies for 8 hours or until reset via object applies for 12 hours or until reset via object</p>	<p>Determines how long the device works manually and how this is ended.</p> <p>In manual mode, the channels can only be switched on and off via the buttons on the device.</p>
Manual operation of the channels	<p><u>enabled</u></p> <p>blocked</p>	<p>The channels can be operated via the buttons on the device.</p> <p>No manual operation, the buttons on the device are blocked.</p>
Send highest actuating value* cyclically (if continuous actuating value is used)	<p><u>no, only in the event of change</u></p> <p>in the event of change and cyclically</p>	<p>Do not send cyclically.</p> <p>Send in the event of change (ON-OFF, OFF-ON) and cyclically.</p>
Cycle time	<p>every 2 min, every 3 min every 5 min, every 10 min, every 15 min, every 20 min, <u>every 30 min</u></p>	<p>At what interval should the highest actuating value be sent?</p>

\* see Appendix: [Determining the maximum actuating value](#)

### 4.6 Parameters for the heating actuator

#### 4.6.1 Configuration options

Designation	Values	Description
Channel function	<u>Heating actuator</u>  Heating controller	Should the channel be used as an actuator or controller?  The channel receives its actuating value from an external room thermostat.  The channel receives the room temperature over the bus and generates the actuating value independently by means of an internal controller.
Type of actuating value	switching.. <u>continuous..</u>	The channel processes: ON/OFF telegrams. Percent telegrams 0-100 %
Include in summer mode	<u>no</u> yes	Should the channel remain off in summer mode?
Activate valve protection  <b>Note</b> Valve protection is not included in the calculation of the current actuating value.	no <u>yes</u>	This function prevents the valve from seizing and is executed if the valve position has not changed for 7 days. When this function is executed, the valve is moved to the opposite position for 6 minutes.  No valve protection. Valve protection is active.
Monitor actuating value	<u>no</u> yes	Should be monitored whether the room thermostat regularly transmits an actuating value? In this way, a thermostat malfunction will be detected quickly and an emergency program will be started.
Activate force function	<u>no</u> yes	No force function. Opens the <i>Force</i> parameter page

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### 4.6.2 Channel characteristics

Designation	Values	Description
Type of valve control	<u>Switch output</u>  0-10 V	For standard 24 V actuators.  For actuators with 0-10 V control.
Actuator direction of operation	<u>Standard: 1 (or 10 V) = Open valve</u>  Inverted: 0 (or 0 V) = Open valve	Standard. Valve closed when de-energised.  Special inverted valve types. Valve open when de-energised.
Output voltage at 0%  <b>i Note</b> Parameter for 0-10 V valve control. With inverted direction of action, the output voltage is set to 100 %, here.	<u>0 V</u>  1 V 2 V	Standard use.  For special applications: Here, the voltage range can have a lower limit.
Output voltage at 100%  <b>i Note</b> Parameter for 0-10 V valve control. With inverted direction of action, the output voltage is set to 0 %, here.	3 V, 3.5 V, 4 V 4.5 V, 5 V, 5.5 V 6 V, 6.5 V, 7 V 7.5 V, 8 V, 8.5 V 9 V, 9.5 V  <u>10 V</u>	For special applications: Here, the voltage range can have an upper limit.  Standard use.
Minimum actuating value	<u>0 %</u> , 5 %, 10 %, 20 %, 30 %	Lowest permissible actuating value
Maximum actuating value	50 %, 60 %, 70 %, 80 %, <u>90 %</u> , 100 %	Highest permissible actuating value. A maximum value of 90% extends the service life of thermal actuators. A maximum value of 100% reduces the number of switching cycles.

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Designation	Values	Description
Actuating value when value violates the min/max. actuating value	0 % or 100 %	Restriction when a room thermostat receives an actuating value that is less than the minimum actuating value:  Actuate channel with 0 % or 100 %
	Use set actuating values	Restrict values to maximum and minimum actuating value. For example, maintaining a minimum actuating value of 10 % can be practical for the correct base temperature of an underfloor heating.
	<u>0 = 0 %, otherwise use set actuating values</u>	If the received actuating value is = 0, accept this value and close the valve. Other values are restricted according to the configured minimum and maximum actuating value: Received values > 0 % and < min. actuating value are replaced by the minimum actuating value. In the same way, values > max. actuating value are replaced by the set maximum actuating value.
	< min. actuating val. = 0 %, otherwise scale.	Actuating values below the minimum actuating value are executed at 0 %. Values above are scaled in proportion to the range between min. actuating value and 100 %.

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## Application program

Designation	Values	Description
Send current actuating value	at change of 1 %, 2 %, 3 %, <u>5 %</u> , 7 %, 10 %, 15 %	After what percentage change in the actuating value since last transmission is the new value to be transmitted?
Send current actuating value cyclically	<u>not cyclically, only in the event of change,</u> every 2 min, every 3 min every 5 min, every 10 min, every 15 min, every 20 min, every 30 min, every 45 min, every 60 min	Send when or at what interval?
Take channel into account for highest actuating value	No <u>Yes</u>	Should the actuating value for channel 1 be included for determining the highest actuating value of all channels?
Control pump	No  via object  <u>via relay</u>  via object and relay	Do not take channel for pump control into account Channel controls a pump via bus  Channel controls the locally connected pump  Channel controls both.
Time for one actuation cycle (PWM period)  <b>① Note</b> Also applies to emergency program and forced operation.	2 min 3 min 5 min 7 min <u>10 min</u> 15 min 20 min 30 min	With "continuous" actuating value. One actuation cycle comprises one ON and one OFF process and forms a PWM period.  Examples: - Actuating value 20 %, - Time = 10 min means: switched on for 2 min during the actuating cycle of 10 min  (i.e. 20 % of actuating cycle) and switched off for 8 min.  - Actuating value = 70 %, time = 10 min means: 7 min on / 3 min off. See Appendix: <a href="#">PWM cycle</a>

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## Application program

### 4.6.3 Emergency program

Designation	Values	Description
Actuating value for emergency program is	<u>fixed</u>  Outside temperature dependent	The valve is continuously energised by a fixed actuating value. See below: <i>Fixed emergency program in winter mode.</i>  Energy saving setting: The valve is energised depending on the outside temperature and only opened if it is really necessary.
<b>Actuating value for emergency program is fixed</b>		
Fixed emergency program in winter mode	0 %, 10 %, <u>20 %</u> 30 %, 40 %, 50 %	Fixed actuating value that should replace the actuating value of the thermostat until it is available again.
<b>Actuating value for emergency program is temperature-dependent</b>		
Emergency program active when outside temperature below	5 °C <u>10 °C</u> 15 °C	If the outside temperature drops below the set value, the valve opens.
Max. actuating value in emergency program	10 %, 20 % 30 %, <u>40 %</u> , 50 %	What should be the maximum heating level in the emergency program?
Fixed emergency program in case of failure of outside temperature.	0 %, 10 %, <u>20 %</u> 30 %, 40 %, 50 %	Fixed valve setting if neither actuating value nor outside temperature can be received.

#### Note

Also here, the setting on the *Channel characteristics* parameter page applies to the PWM period

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## Application program

### 4.6.4 Force

Designation	Values	Description
Actuating value in the forced operation	0 % to 100 % in increments of 10 %	Fixed actuating value to control the valve in forced operation. This is not restricted by the minimum or the maximum actuating value.
Forced telegram	1 = Force (standard)  0 = Force	Forced operation is activated with an ON telegram.  Inverted: Forced operation is activated with an OFF telegram.

### 4.6.5 Monitoring of actuating value, actual value, outside temperature

See [Chapter 4.8, Common parameters](#).

### 4.6.6 Pump control

See [Chapter 4.8, Common parameters](#).

### 4.7 Parameters for the heating controller

#### 4.7.1 Configuration options

Designation	Values	Description
Channel function	<p>Heating actuator</p> <p><u>Heating controller</u></p>	<p>Should the channel be used as an actuator or controller?</p> <p>The channel receives its actuating value from an external room thermostat.</p> <p>The channel receives the room temperature over the bus and generates the actuating value independently by means of an internal controller. See chapter: Parameters for the heating actuator</p>
Include in summer mode	<p><u>No</u></p> <p>Yes</p>	Should the channel remain off in summer mode?
Activate valve protection	<p>No</p> <p><u>Yes</u></p>	<p>This function prevents the valve from seizing and is executed if the valve position has not changed for 7 days. When this function is executed, the valve is moved to the opposite position for 6 minutes.</p> <p>No valve protection.</p> <p>Valve protection is active.</p>

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## Application program

Designation	Values	Description
Execute valve protection	<p><u>always</u></p> <p>Only in comfort mode Only in standby mode Only in night mode</p>	<p>This function prevents the valve from seizing and is executed if the valve position has not changed for 7 days. When this function is executed, the valve is moved to the opposite position for 6 minutes.</p> <p>Valve protection is permitted at any time.</p> <p>Valve protection is permitted only during the operating mode selected here.</p>
Monitor actual value	<p><u>No</u></p> <p>Yes</p>	<p>No monitoring.</p> <p>The actual value (room temperature) is monitored and an emergency program can be configured.</p>
Activate force function	<p><u>No</u></p> <p>Yes</p>	<p>No force function.</p> <p>Activates the Force parameter page.</p>

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## Application program

### 4.7.2

#### Channel characteristics

Designation	Values	Description
Type of valve control	<u>Switch output</u>  0-10 V	For standard 24 V actuators.  For actuators with 0-10 V control.
Actuator direction of operation	<u>Standard: 1 (or 10 V) = Open valve</u>  Inverted: 0 (or 0 V) = Open valve	Standard. Valve closed when de-energised.  Special inverted valve types. Valve open when de-energised.
Output Voltage at 0 %  <b>ⓘ Note</b> Parameter for 0-10 V valve control. With inverted direction of action, the output voltage is set to 100 %, here.	<u>0 V</u>  1 V 2 V	Standard use.  For special applications: Here, the voltage range can have a lower limit.
Output Voltage at 100 %  <b>ⓘ Note</b> Parameter for 0-10 V valve control. With inverted direction of action, the output voltage is set to 0 %, here.	3 V, 3,5 V, 4 V 4,5 V, 5 V, 5,5 V 6 V, 6,5 V, 7 V 7,5 V, 8 V, 8,5 V 9 V, 9,5 V  <u>10 V</u>	For special applications: Here, the voltage range can have an upper limit.      Standard use.

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## Application program

Designation	Values	Description
Channel processes actuating value for  <b>i Note</b> Only for heating and cooling mode. Not available if <i>Output of cooling actuating value = together with heating actuating value.</i>	Heating  Cooling	Channel responds to the heating actuating value  Channel responds to the cooling actuating value
Minimum actuating value	0%, 5%, 10%, 20%, 30%	Lowest permissible actuating value
Maximum actuating value	50%, 60%, 70%, 80%, 90%, 100%	Highest permissible actuating value. A maximum value of 90 % extends the service life of thermal actuators. A maximum value of 100 % reduces the number of switching cycles

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## Application program

Designation	Values	Description
Actuating value when value violates the min/max. actuating value	0 % or 100 %	Restriction when a room thermostat receives an actuating value that is less than the minimum actuating value:  Actuate channel with 0 % or 100 %
	Use set actuating values	Restrict values to maximum and minimum actuating value. For example, maintaining a minimum actuating value of 10 % can be practical for the correct base temperature of an underfloor heating.
	<u>0 = 0 %, otherwise use set actuating values</u>	If the received actuating value is = 0, accept this value and close the valve. Other values are restricted according to the configured minimum and maximum actuating value: Received values > 0 % and < min. actuating value are replaced by the minimum actuating value. In the same way, values > max. actuating value are replaced by the set maximum actuating value.
	< min. actuating val. = 0 %, otherwise scale.	Actuating values below the minimum actuating value are executed at 0 %. Values above are scaled in proportion to the range between min. actuating value and 100 %.

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## Application program

Designation	Values	Description
Take channel into account for highest actuating value	No <u>Yes</u>	Should the actuating value for this channel be included for determining the highest actuating value of all channels?
Control pump	No  via object  <u>via relay</u>  via object and relay	Do not take channel for pump control into account.  Channel controls a pump via bus.  Channel controls the locally connected pump.  Channel controls both.
Time for one actuation cycle (PWM period)  <b>i Note</b> Also applies to emergency program and forced operation.	2 min 3 min 5 min 7 min <u>10 min</u> 15 min 20 min 30 min	With "continuous" actuating value. An actuation cycle consists of a switch-on and a switch-off process and forms a PWM period.  Examples: - Actuating value 20 %, - Time = 10 min means: switched on for 2 min during the actuating cycle of 10 min  (i.e. 20 % of actuating cycle) and switched off for 8 min.  - Actuating value = 70 %, time = 10 min means: 7 min on / 3 min off. See Appendix: <a href="#">PWM cycle</a>

### **i Note**

If the actuating value is limited by the parameters *Minimum* or *Maximum Actuating Value*, then these limitations are only effective on the outputs.

The objects send the actuating value that was actually requested by the controller.

Example:

Minimum actuating value 30 %

Maximum actuating value 60 %

Current heating actuating value e.g. 80 %: The outputs are limited to 60 %.

80 % will be sent to the bus.

This behaviour applies to the switching as well as to the 0-10 V outputs.

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## Application program

### 4.7.3

#### Settings

Designation	Values	Description
Control	<u>Standard</u>	For simple applications (only heating control).
	User-defined	Enables selection of control functions.
Control functions used (Only for user-defined control)	<u>only heating control</u>	Heating mode only.
	Heating and cooling	In addition, a cooling system has to be controlled.

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## Application program

### 4.7.4

#### Operating Mode

Designation	Values	Description
Operating mode after reset	Frost protection Temperature reduction at night <u>Standby</u> Comfort	Operating mode after start-up or reprogramming
Type of presence sensor	<u>Presence detectors</u>  Presence button	<p>The presence sensor activates the comfort operating mode</p> <p>Comfort operating mode as long as the presence object is set.</p> <p>If the operation mode object is called up again after setting the presence object, the new operating mode will be accepted and the state of the presence object ignored.</p> <p>If the presence object is set during night/frost mode, it is reset after the configured comfort extension has expired. Exception: If a window is opened (window object = 1), the room thermostat switches to frost protection mode.</p> <p>The presence object is not reported back on the bus</p>

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## Application program

Designation	Values	Description
Comfort extension by presence button in night mode	none  30 min 1 hour 1.5 hours <u>2 hours</u> 2.5 hours 3 hours 3.5 hours	<p>Telegrams from the presence button are not considered.</p> <p>Party switching: This allows the controller to change from night/frost mode to comfort mode for a limited time by means of the presence object.</p> <p>The time limit is omitted if the device was previously in standby mode.</p> <p>Comfort mode is only cleared with the next manual or bus controlled change of the operation mode.</p>
Cycl. transmission of current operating mode	not cyclical, only in the event of change every 2 min, every 3 min every 5 min, every 10 min every 15 min, every 20 min every 30 min, every 45 min every 60 min	How often should the current operating mode be sent?

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## Application program

### 4.7.5

#### Control (heating)

Designation	Values	Description
Setting the control parameters	<u>via installation type</u>  user-defined	Standard application  Professional use: Configure P/PI controller yourself
Installation type	<u>Radiator heating system</u>  Underfloor heating	PI controller with: Integrated time = 90 minutes Bandwidth = 2.5 K  Integrated time = 30 h Bandwidth = 4 K
transmission of heating actuating value	at change by 1 % at change by 2 % at change by 3 % <u>at change by 5 %</u> at change by 7 % at change by 10 % at change by 15 %	After what percentage change in the actuating value since last transmission is the new value to be transmitted.  Small values increase control accuracy, but also the bus load.
Cycl. transmission of heating actuating value	<u>not cyclical, only in the event of change</u> every 2 min, every 3 min every 5 min, every 10 min every 15 min, every 20 min every 30 min, every 45 min every 60 min,	How often is the current heating actuating value to be sent (regardless of changes)?

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## Application program

Designation	Values	Description
<b>User-defined parameter</b>		
Proportional band of heating controller	1 K, 1,5 K, 2 K, 2,5 K, 3 K 3,5 K, <u>4 K</u> , 4,5 K 5 K, 5,5 K, 6 K 6,5 K, 7 K, 7,5 K 8 K, 8,5 K	Professional setting for adapting the control response to the room. Small values cause large changes in actuating values, larger values cause finer actuating value adjustment.
Integrated time of the heating controller	pure P-Controller 15 min, 30 min, 45 min 60 min, 75 min, 90 min 105 min, 120 min, 135 min, 150 min, <u>165 min</u> , <u>180 min</u> 195 min, 210 min 4 h, 5 h, 10 h, 15 h, 20 h, 25 h, 30 h, 35 h	The integrated time determines the response time of the control. It establishes the increase by which the output actuating value is raised in addition to the P share. The I share remains active for as long as there is a control deviation. The I share is added to the P share.

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## Application program

### 4.7.6

#### Setpoints (heating)

Designation	Values	Description
Base setpoint after loading the application	18 °C, 19 °C, 20 °C, <u>21 °C</u> , 22 °C, 23 °C, 24 °C, 25 °C	Output setpoint for temperature control.
Minimum valid base setpoint	5 °C, 6 °C, 7 °C, 8 °C, 9 °C, <u>10 °C</u> , 11 °C, 12 °C, 13 °C, 14 °C, 15 °C, 16 °C, 17 °C, 18 °C, 19 °C, 20 °C	If a received base setpoint ( <i>base setpoint object</i> ) is lower than the value set here, it will be limited to this value.
Maximum valid base setpoint	20 °C, 21 °C, 22 °C, 23 °C, 24 °C, 25 °C, 27 °C, 30 °C, <u>32 °C</u>	If a received base setpoint ( <i>base setpoint object</i> ) is higher than the value set here, it will be limited to this value.
Reduction in standby mode (during heating)	0,5 K, 1 K, <u>1,5 K</u> , 2 K, 2,5 K, 3 K, 3,5 K, 4 K	Example: With a base setpoint value of 21°C in heating operation and a reduction of 2 K, the device controls with a setpoint of 21 – 2 = 19 °C.
Reduction in night mode (during heating)	3 K, 4 K, <u>5 K</u> , 6 K, 7 K, 8 K	By what value should the temperature be reduced in night mode?
Setpoint for frost protection mode (during heating)	3 °C, 4 °C, <u>5 °C</u> , 6 °C, 7 °C, 8 °C, 9 °C, 10 °C	Preset temperature for frost protection mode in heating mode (Heat protection applies in cooling mode).
Maximum valid setpoint offset	+/- 1 K, +/- 2 K, +/- 3 K, +/- 4 K, <u>+/- 5 K</u>	Limits the possible setting range for the setpoint offset function.  Applies to values received via <i>Manual setpoint value offset</i> object.

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## Application program

Designation	Values	Description
Setpoint offset applies	<p>only in comfort mode</p> <p>with comfort and standby mode</p> <p><u>with comfort, standby and night mode</u></p>	<p>The setpoint offset: is only considered in the selected modes, and is ineffective in all other modes.</p>
current setpoint in comfort mode	<p>Sends actual value (heating &lt; &gt; cooling)</p> <p>Send average value between heating and cooling</p>	<p>Feedback of current setpoint via the bus:</p> <p>the setpoint actually being used for control has always to be sent (= current setpoint).</p> <p>Example with base setpoint of 21 °C and dead zone of 2 K:            During heating, 21 °C is sent, and during cooling, base setpoint + dead zone is sent (21 °C + 2 K = 23 °C)</p> <p>Same value in comfort mode during both heating and cooling mode, i.e.:            Base setpoint + half dead zone is sent, to prevent occupants from being confused.</p> <p>Example with base setpoint of 21 °C and dead zone of 2 K:            Mean value = 21°+1 K =22 °C            Although control takes place at 21 °C or 23 °C</p>

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## Application program

Designation	Values	Description
cycl. transmission of current setpoint	<p>not cyclically, only in the event of change</p> <p>every 2 min</p> <p>every 3 min</p> <p>every 5 min</p> <p>every 10 min</p> <p>every 15 min</p> <p>every 20 min</p> <p>every 30 min</p> <p>every 45 min</p> <p>every 60 min</p>	<p>How often should the currently valid setpoint be sent?</p> <p>Only send in the event of a change.</p> <p>Send cyclically</p>

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## Application program

### 4.7.7 Cooling Control

Designation	Values	Description
Setting the control parameters	<u>via installation type</u>  user-defined	Standard application  Professional use: Configure P/PI controller yourself
Installation type	<u>Cooling surface</u>  Fan coil unit	PI controller with: Integrated time = 240 minutes Bandwidth = 5 K  Integrated time = 180 minutes Bandwidth = 4 K
<b>User-defined control parameter</b>		
Proportional band of the cooling controller	1 K, 1,5 K, 2 K, 2,5 K, 3 K, 3,5 K, <u>4 K</u> , 4,5 K, 5 K, 5,5 K, 6 K, 6,5 K, 7 K, 7,5 K, 8 K, 8,5 K	Professional setting for adapting the control response to the room. Large values cause finer changes to the actuating value with the same control deviation and more precise control than smaller values.
Integrated time of the cooling controller	pure P-Controller  pure P-Controller 15 min, 30 min, 45 min, 60 min, 75 min, 90 min, 105 min, 120 min, 135 min, 150 min, 165 min, <u>180 min</u> , 195 min, 210 min, 4 h, 5 h, 10 h, 15 h, 20 h, 25 h, 30 h, 35 h	Only for PI controller: The integrated time determines the response time of the control. It establishes the increase by which the output actuating value is raised in addition to the P share. The I share remains active for as long as there is a control deviation. The I share is added to the P share.

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## Application program

Designation	Values	Description
Sends cooling actuating value	at change by 1 % at change by 2 % at change by 3 % <u>at change by 5 %</u> at change by 7 % at change by 10 % at change by 15 %	After what percentage change in the actuating value since last transmission is the new value to be transmitted. Small values increase the control accuracy, but also the bus load.
Cycl. Sends cooling actuating value	<u>not cyclical, only in the event of change</u> every 2 min, every 3 min every 5 min, every 10 min every 15 min, every 20 min every 30 min, every 45 min every 60 min	How often is the current cooling actuating value to be sent (regardless of changes)?
Switchover between heating and cooling	<u>automatic</u>  via object	The controller automatically switches to cooling mode if the actual temperature is above the setpoint.  The cooling mode can only be activated on the bus via object (heating =./cooling =..). Cooling mode remains off, as long as this object is not set.
Format object heating/cooling	<u>DPT1.100</u> (heating=1/cooling=0)  inverted (heating=0/cooling=1)	Standard format.  Compatible with RAM 713 S, VARIA etc.
Output of the cooling actuating value (Only when changeover between heating and cooling via object)	on separate object  together with heating actuating value	For 4-pipe systems: The actuating values for heating and cooling are sent separately by means of 2 objects.  For 2-pipe systems: The actuating value is always sent to the actuating value heating/cooling object, independent of whether heating or cooling mode is active.

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## Application program

### 4.7.8 Cooling setpoints

Designation	Values	Description
Dead zone between heating and cooling	(0 K - only for 2-pipe systems) 1 K <u>2 K</u> 3 K 4 K 5 K 6 K	Specifies the buffer zone between setpoints for heating and cooling mode.  The dead zone is expanded through hysteresis in switching (2 point) control. See Appendix: <a href="#">dead zone</a>
Increase in standby mode (during cooling)	0 K, 0.5 K, 1 K, <u>1.5 K</u> 2 K, 2.5 K, 3 K 3.5 K, 4 K, 5 K	The standby temperature is increased in cooling mode
Increase in night mode (during cooling)	3 K, 4 K, <u>5 K</u> 6 K, 7 K, 8 K	See increase in standby mode
Setpoint for heat protection mode (during cooling)	<u>42 °C (i.e. virtually no heat protection)</u> 29 °C, 30 °C, 31 °C 32 °C, 33 °C, 34 °C 35 °C	Heat protection represents the maximum permitted temperature for the controlled room. It performs the same function during cooling as frost protection mode during heating, e.g. saves energy while prohibiting non-permitted temperatures.

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## Application program

### 4.7.9 Emergency program

Designation	Values	Description
Actuating value for emergency program is	<u>fixed</u>	The valve is continuously energised by a fixed actuating value. See below: <i>Fixed emergency program in winter mode</i> .
	Outside temperature dependent	Energy saving setting: The valve is energised depending on the outside temperature and only opened if it is really necessary.
<b>Actuating value for emergency program is fixed</b>		
Fixed emergency program in winter mode	0 %, 10 %, <u>20 %</u> 30 %, 40 %, 50 %	Fixed actuating value that should replace the actuating value of the thermostat until it is available again.
<b>Actuating value for emergency program is temperature-dependent</b>		
Emergency program active when outside temperature below	5 °C <u>10 °C</u> 15 °C	If the outside temperature drops below the set value, the valve opens.
Max. actuating value in emergency program	10 %, 20 % 30 %, <u>40 %</u> , 50 %	What should be the maximum heating level in the emergency program?
Fixed emergency program in case of failure of outside temperature.	0 %, 10 %, <u>20 %</u> 30 %, 40 %, 50 %	Fixed valve setting if neither actuating value nor outside temperature can be received.

**Note**

Also here, the setting on the *Channel characteristics* parameter page applies to the PWM period

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## Application program

### 4.7.10 Force

Designation	Values	Description
Actuating value in the forced operation	<u>0 %</u> to 100 % in increments of 10 %	Fixed actuating value to control the valve in forced operation. This is not restricted by the minimum or the maximum actuating value.
Forced telegram	<u>1 = Force (standard)</u>  0 = Force	Forced operation is activated with an ON telegram.  Inverted: Forced operation is activated with an OFF telegram.

### 4.7.11 Monitoring of actuating value, actual value, outside temperature

See Chapter [4.8, Common parameters](#).

### 4.7.12 Pump control

See Chapter [4.8, Common parameters](#).

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## Application program

### 4.8 Common parameters

These parameters apply to all controller and actuator channels.

#### 4.8.1 Monitoring of actuating value, actual value, outside temperature

Designation	Values	Description
Monitoring time	5 min 10 min 20 min <u>30 min</u> 60 min	Start emergency program if the relevant data were not received within the configured time.
Status of monitoring	<u>Report only in the event of malfunction</u>  Always report	Do not send any telegrams during normal operation, only in the event of failure.  Status will also be sent when there is no fault.
Send status cyclically	<u>No</u> Yes	Send status messages cyclically?
Cycle time	every 2 min every 3 min every 5 min every 10 min every 15 min every 20 min <u>every 30 min</u>	At what interval should the status be sent?

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## Application program

### 4.8.2 Pump control

A maximum of 2 pumps can be controlled:

One of them directly via the built-in relay, and the other one via pump object and suitable switch actuator.

The assigned pump can be defined individually for each channel (Control pump parameter).

In this way, the pumps of 2 heating circuits can be controlled with one actuator.

#### Relay:

Designation	Values	Description
Only switch on relay when at least  <b>ⓘ Note</b> This parameter only applies to those channels which are configured with <i>type of valve control = switch output</i> . For channels controlling 0-10 V valves, this setting is not relevant.	<u>one input variable &gt; 0 %</u>  a valve is really open	The pump relay is switched on as soon as the input variable of a channel is above 0 %.  As above, however, the pump will always be switched off when, due to the PWM cycle, all valves are closed.
Switch-off delay	No switch-off delay  2 min, 3 min, 5 min, 7 min, <u>10 min</u> , 15 min, 20 min, 30 min	Switch off pump immediately  continue running for a set length of time.
Send relay status cyclically	<u>no, only in the event of change</u>  in the event of change and cyclically	How should the current relay status be sent?
Cycle time	every 2 min, every 3 min every 5 min, every 10 min, every 15 min, every 20 min, <u>every 30 min</u>	At what interval should the switch telegram for the pump be sent?

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## Application program

### Object:

Designation	Values	Description
Switch-on telegram only if at least  <b>Note</b> This parameter only applies to those channels which are configured with <i>type of valve control = switch output</i> . For channels controlling 0-10 V valves, this setting is not relevant.	<u>one input variable &gt; 0 %</u>  a valve is really open	The pump object sends switch-on telegrams as soon as the input variable of a channel is above 0 %.  As above, however, the pump will always be switched off when, due to the PWM cycle, all valves are closed.
Switch-off delay	No switch-off delay  2 min, 3 min, 5 min, 7 min, <u>10 min</u> , 15 min, 20 min, 30 min	Switch off pump immediately  continue running for a set length of time.
Send relay status cyclically	<u>no, only in the event of change</u>  in the event of change and cyclically	How should the current relay status be sent?
Cycle time	every 2 min, every 3 min every 5 min, every 10 min, every 15 min, every 20 min, <u>every 30 min</u>	At what interval should the switch telegram for the pump be sent?



### 5 Typical applications

These typical applications are designed to aid planning and are not to be considered an exhaustive list. It can be extended and updated as required.

#### 5.1 Simple control with one channel as heating actuator

Channel H1 is configured as heating actuator.

Control is accomplished by a room temperature controller with 5-fold universal input (6109/18-500).

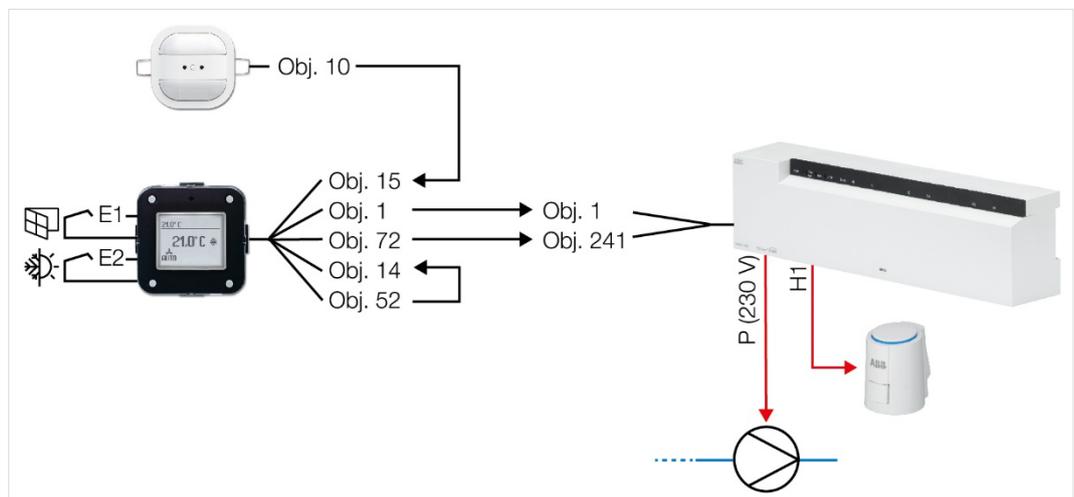
Summer mode is triggered manually with a switch; presence and window status are sensed by a presence detector and a window contact.

For the window contact and the switch for summer/winter mode, 2 external inputs of the room temperature controller with 5-fold universal input (6109/18-500) are used.

##### 5.1.1 Devices

- Floor heating controller, 6-fold (VAA/A 6.24.2)
- Room temperature controller with 5-fold universal input (6109/18-500)
- Busch-Presence detector mini KNX (6131/20-500)

##### 5.1.2 Overview



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## Typical applications

### 5.1.3 Objects and links

No.	6131/20-500	No.	6109/18-500	Comment
	Object name		Object name	
10	P1: Movement (Master)	15	RTC: Presence Detector	Presence signal. Starts comfort mode.

No.	6109/18-500	No.	VAA/A 6.24.2	Comment
	Object name		Object name	
1	RTC: Heating actuating value	1	Continuous actuating value	Actuating value for channel H1
72	E2 Switching sensor	241	Summer mode ON/OFF	Changeover between summer/winter mode.

No.	6109/18-500	No.	6109/18-500	Comment
	Object name		Object name	
52	E1 Switching Sensor	14	RTC: Window contact	Connect status of window contact at I1 with RTC window contact input object.

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## Typical applications

### 5.1.4 Important parameter settings

Standard or customer-defined parameter settings apply to unlisted parameters.

#### 6131/20-500

Parameter page	Parameter	Setting
Common parameter	Application	Sensor
Common parameter	Type of output	1 Bit

#### 6109/18-500

Parameter page	Parameter	Setting
<b>Parameter block RTC</b>		
General	Control function	Heat
General	Additional functions/objects	yes
Heating control	Control value tyoe	PI continoues, 0- 100%
<b>Parameter block External inputs</b>		
E1 General	Function	Binary input
	Binary function	Switching/Alarm
E1 Switching/alarm	Switching/alarm sensor	Switch
	Reaction in case of event 0	Off/Alarm
	Reaction in case of event 1	On/no alarm
E2 General	Function	Binary input
	Binary function	Switching/Alarm
E2 Switching/alarm	Switching/alarm sensor	Switch
	Reaction in case of event 0	Off/Alarm
	Reaction in case of event 1	On/no alarm

#### VAA/A 6.24.2, channel H1

Parameter page	Parameter	Setting
Configuration options	Channel function	Heating actuator
	Type of actuating value	continuous
Channel characteristics	Type of valve control	Switch output
	Actuator direction of operation	Standard

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## Typical applications

### 5.2 Simple control with one channel as heating controller

Channel H1 is configured as heating controller.

The channel is used as a heating actuator with integrated room thermostat and receives its temperature actual value from a room temperature controller with 5-fold universal input (6109/18-500).

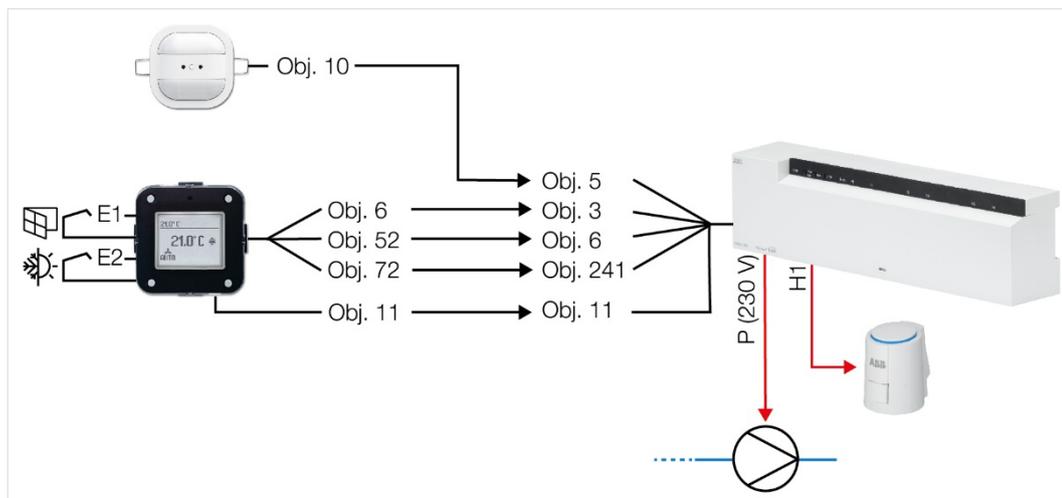
Summer mode is triggered manually with a switch; presence and window status are sensed by a presence detector and a window contact.

For the window contact and the switch for summer/winter mode, 2 external inputs of the room temperature controller with 5-fold universal input (6109/18-500) are used.

#### 5.2.1 Devices

- Floor heating controller, 6-fold (VAA/A 6.24.2)
- Room temperature controller with 5-fold universal input (6109/18-500)
- Busch-Presence detector mini KNX (6131/20-500)

#### 5.2.2 Overview



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## Typical applications

### 5.2.3

#### Objects and links

No.	6131/20-500	No.	6109/18-500	Comment
	Object name		Object name	
10	P1: Movement (Master)	15	RTC: Presence Detector	Presence signal. Starts comfort mode.

No.	6109/18-500	No.	VAA/A 6.24.2	Comment
	Object name		Object name	
6	RTC: Actual temperature	3	Actual value	Current room temperature for the controller in H1.
11	Current set-point	11	Current setpoint value	Transfers the current set point from the user operation device to the controller in H1
52	E1 Switching sensor	6	Window setting	Status of window contact at I1 for the controller in H1.
72	E2 Switching sensor	241	Summer mode ON/OFF	Changeover between summer/winter mode.

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## Typical applications

### 5.2.4 Important parameter settings

Standard or customer-defined parameter settings apply to unlisted parameters.

#### 6131/20-500

Parameter page	Parameter	Setting
Common parameter	Application	Sensor
Common parameter	Type of output	1 Bit

#### 6109/18-500

Parameter page	Parameter	Setting
<b>Parameter block external inputs</b>		
E1 General	Function	Binary input
	Binary function	Switching/Alarm
E1 Switching/alarm	Switching/alarm sensor	Switch
	Reaction in case of event 0	Off/Alarm
	Reaction in case of event 1	On/no alarm
E2 General	Function	Binary input
	Binary function	Switching/Alarm
E2 Switchng/alarm	Switching/alarm sensor	Switch
	Reaction in case of event 0	Off/Alarm
	Reaction in case of event 1	On/no alarm

#### VAA/A 6.24.2

Parameter page	Parameter	Setting
Configuration options	Channel function	Heating controller
Settings	Control	Standard
Channel characteristics	Type of valve control	Switch output
	Actuator direction of operation	Standard

### 5.3 Mixed system with radiators, underfloor heating and 2 supply pumps

4 rooms have to be heated. To do so, the heating actuator controls always one TSA/K 24.2 actuator via the 24 V outputs H1, H2, H3 and H4.

Rooms 1 and 2 are equipped with a radiator, rooms 3 and 4 with an underfloor heating.

Pump P1 (standard) is switched directly via the relay contact of the device.

In order to optimally allow for the different requirements of a radiator and an underfloor heating, a second supply pump for the underfloor heating can be controlled, if desired. This one (P2) will be switched by telegram via a KNX switch actuator.

Channels H1 and H2 are configured as heating actuators and receive their actuating value each from one room temperature controller with 5-fold universal input (6109/18-500).

Channels H3 and H4 are used as heating actuators with integrated room thermostat and receive their temperature actual value from a room temperature controller with CO<sub>2</sub>/moisture sensor (6109/28-500) or an air quality sensor with RTC (LGS/A 1.2) (H3, room 3) and from a room temperature controller with 5-fold universal input (6109/18) (H4, room 4).

For better clarity, functions as change of operating mode, summer mode and frost protection via window contact are not mentioned in this example.

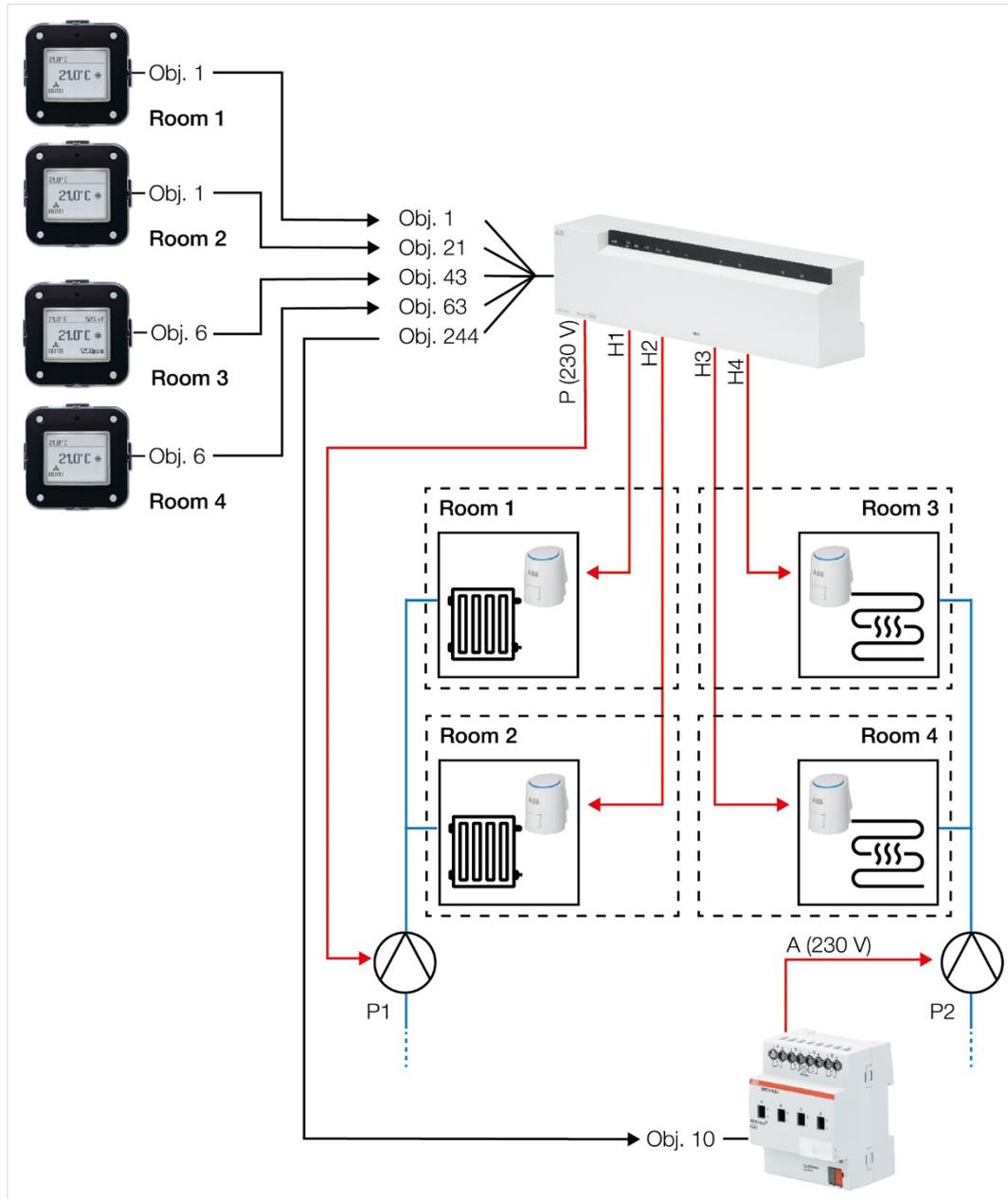
#### 5.3.1 Devices

- Floor heating controller, 6-fold (VAA/A 6.24.2)
- Room temperature controller with 5-fold universal input (6109/18-500)
- Room temperature controller with CO<sub>2</sub>/moisture sensor (6109/28-500) or Air quality sensor with RTC (LGS/A 1.2)
- Switch Actuator, 16A, AC1, 4-fold, REG (SA/S 4.16.2.1)

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## 5.3.2

### Overview



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## Typical applications

### 5.3.3

#### Objects and links

No.	6109/18-500 Room 1	No.	VAA/A 6.24.2	Comment
	Object name		Object name	
1	RTC: Heating control value	1	Continuous actuating value	Heating actuating value for channel H1

No.	6109/18-500 Room 2	No.	VAA/A 6.24.2	Comment
	Object name		Object name	
1	Heating control value	21	Continuous actuating value	Heating actuating value for channel H2

No.	6109/28-500 or LGS/A 1.2 Room 3	No.	VAA/A 6.24.2	Comment
	Object name		Object name	
6	RTC: Actual temperature	43	Actual value	Current room temperature for controller channel H3

No.	6109/18-500 Room 4	No.	VAA/A 6.24.2	Comment
	Object name		Object name	
6	RTC: Actual temperature	63	Actual value	Current room temperature for controller channel H4

No.	VAA/A 6.24.2	No.	RMG 4 U	Comment
	Object name		Object name	
244	Pump ON/OFF	10	Switching	Switch command for pump P2

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## Typical applications

### 5.3.4 Important parameter settings

Standard or customer-defined parameter settings apply to unlisted parameters.

#### 6109/18-500 (room 1 and 2)

Parameter page	Parameter	Setting
General	Control function	Heat
General	Additional functions/objects	yes
Heating control	Control value type	PI continuous, 0- 100%

#### VAA/A 6.24.2 (for room 1) and H2 (for room 2)

Parameter page	Parameter	Setting
Configuration options	Channel function	Heating actuator
	Type of actuating value	continuous
Channel characteristics	Type of valve control	Switch output
	Actuator direction of operation	Standard

#### 6109/28-500 or LGS/A 1.2 (room 3) / 6109/18-500 (room 4)

Parameter page	Parameter	Setting
RTC temperature reading	Difference of value for sending the actual temperature	0,3

#### VAA/A 6.24.2, channel H3 (for room 3) and H4 (for room 4)

Parameter page	Parameter	Setting
Configuration options	Channel function	Heating controller
Settings	Control	Standard
Channel characteristics	Type of valve control	Switch output
	Actuator direction of operation	Standard

## 6 Appendix

### 6.1 Determining the current operation mode

The current setpoint can be adjusted to the relevant requirements by selecting the operating mode.

The operating mode can be specified via the objects *operating mode preset*, *presence*, and *window setting*.

The current operating mode can be specified as follows:

Object <i>Operating mode preset</i>	Object <i>Presence</i>	Object <i>Window setting</i>	current operating mode
any	any	1	Frost/heat protection
any	1	0	Comfort
Comfort	0	0	Comfort
Standby	0	0	Standby
Night	0	0	Night
Frost/heat protection	0	0	Frost/heat protection

### 6.2 Priorities for operating mode selection

In principle the following applies: The last instruction overwrites the previous one.

#### Hinweis

Frost mode via window contact has priority over all other operating modes.

Upon selection of the presence button parameter, the following also applies:

If a new operating mode is received on the object with the presence object set (operating mode preset), it will be accepted and the presence object will be reset (only with presence button).

Reception of the same operating mode as prior to the presence status (e.g. via cycl. sending) is ignored.

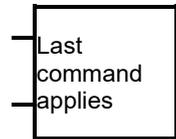
If the presence object is set during night/frost mode, it will be reset after the configured comfort extension finishes.

If the presence object is set during standby mode, the comfort operating mode is accepted without time restriction.

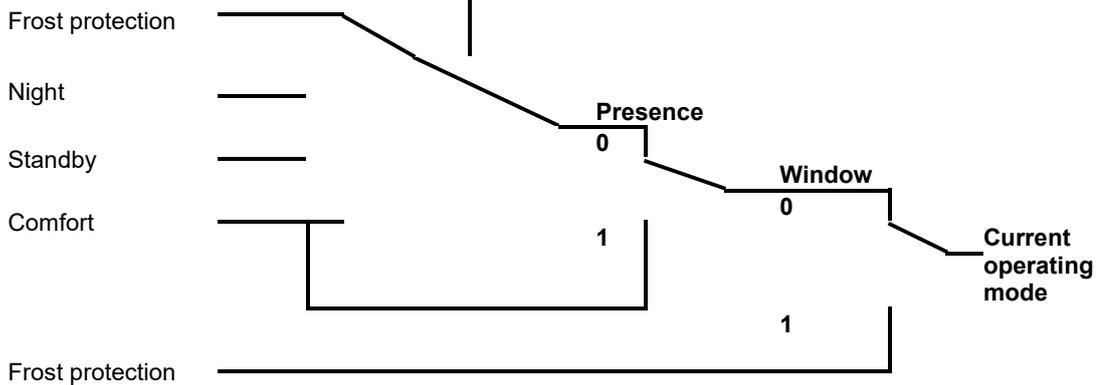
**Determining the operating mode when using a presence detector**

**Specifying the operating mode via..**

Object *Operating mode preset*  
Operating mode after download



**Results in..**



**6.3 Base setpoint and current setpoint**

The base setpoint is the standard temperature for comfort mode and the reference temperature for reduction in standby and night modes.

The programmed base setpoint (see base setpoint after downloading the application) is stored in object base setpoint and can be changed via the bus at any time.

The current setpoint is the setpoint that is actually used for control. It is the result of all the reductions or increases associated with the operating mode and control function.

Example:

At a base setpoint of 22 °C and a reduction in night mode of 4 K, the current setpoint (in night mode) is:  
22 °C – 4 K = 18 °C.

During the day (in comfort mode), the current setpoint is 22 °C (provided that cooling mode is not active).

The current setpoint depends on the operating mode and on the selected control function.

If the setpoint, because of a setpoint offset, is outside the programmed values for frost and heat protection, it is restricted to these values by the safety limits.

## 6.4 Determination of the setpoint

### 6.4.1 Setpoint calculation in heating mode

#### Current set point during heating

Operating mode	Current setpoint
Comfort	Base setpoint +/- setpoint offset
Standby	Base setpoint +/- setpoint offset – reduction in standby mode
Night	Base setpoint +/- setpoint offset – reduction in night mode
Frost/heat protection	Configured setpoint for frost protection mode

Example:

Heating in comfort mode.

Parameter page	Parameter	Setting
Setpoints	Base setpoint after loading the application	21 °C
	Reduction in standby mode (during heating)	2 K
	Maximum valid setpoint offset	+/- 2 K

The setpoint was previously increased by 1 K via object *Set point offset*.

Calculation:

Current setpoint

= base setpoint +/- setpoint offset

= 21 °C + 1 K

= 22 °C

If operation is switched to standby mode, the current setpoint is calculated as follows:

Current setpoint

= base setpoint +/- setpoint offset – reduction in standby mode

= 21 °C + 1 K – 2 K

= 20 °C

### 6.4.2 Setpoint calculation in cooling mode

#### Current set point during cooling

Operating mode	Current setpoint
Comfort	Base setpoint + setpoint offset + dead zone
Standby	Base setpoint + setpoint offset + dead zone+ increase in standby mode
Night	Base setpoint + setpoint offset + dead zone + increase in night mode
Frost/heat protection	Configured setpoint for heat protection mode

Example:

Cooling in comfort mode.

The room temperature is too high, the controller has switched to cooling mode

Parameter page	Parameter	Setting
Setpoints	Base setpoint after loading the application	21 °C
	Maximum valid setpoint offset	+/- 2 K
Cooling setpoints	Dead zone between heating and cooling	2 K
	Increase in standby mode (during cooling)	2 K

The setpoint was previously lowered via object setpoint offset by 1 K.

Calculation:

Current setpoint

= base setpoint + setpoint offset + dead zone

= 21 °C – 1 K + 2 K

= 22 °C

Changing to standby mode causes a further increase of the setpoint (energy saving), which results in the following setpoint:

Setpoint

= base setpoint + setpoint offset + dead zone + increase in standby mode

= 21 °C – 1 K + 2 K + 2 K

= 24 °C

### 6.5 Setpoint offset

The current setpoint can be adjusted via object manual setpoint offset. In this case, the setpoint is changed by sending the desired offset to the object. For this, the difference (may be preceded by a minus sign) is sent as DPT 9.002 to the object manual setpoint offset.

The offset limits are defined on the setpoints parameter page via the Maximum valid setpoint offset parameter.

The offset is always in relation to the Base setpoint and not to the current setpoint.

Example Base setpoint of 21 °C:

If a value of 2 is received by object manual setpoint offset, the new setpoint is calculated as follows:

$$21\text{ °C} + 2\text{ K} = 23\text{ °C}.$$

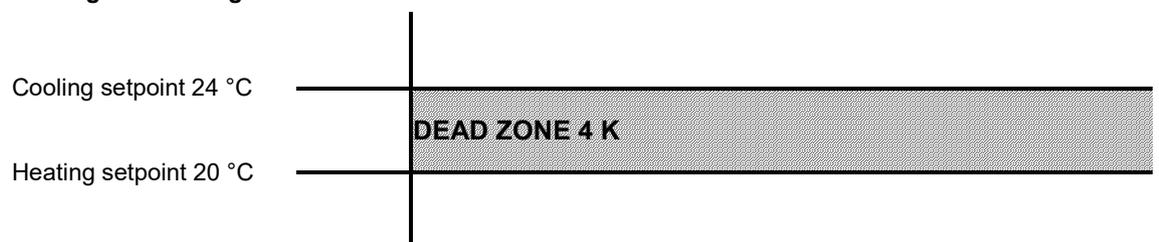
In order to afterwards bring the setpoint to 22 °C, the difference to the programmed base setpoint (here 21 °C) is resent, in this case 1 K ( $21\text{ °C} + 1\text{ K} = 22\text{ °C}$ ).

### 6.6 Dead zone

The dead zone is a buffer area between heating and cooling mode. Within this dead zone, neither heating nor cooling occurs.

Without this buffer area, the system would permanently switch between heating and cooling. As soon as the setpoint was fallen below, the heating would be activated. After hardly reaching the setpoint, the cooling would immediately start, the temperature would fall below the setpoint and switch on the heating again.

#### Heating and cooling with continuous control



#### **i** Note

In a 2-pipe system, i.e. if the changeover between heating and cooling is done via object (parameter *Change over between heating and cooling = via object*) and the actuating values for heating and cooling are output on a common object (parameter *Output of cooling actuating value = together with heating actuating value*), the dead zone can be set to 0 K.

### 6.7 Valve protection

If configured, the valve protection will be active if there was no change at the output for 7 days.

#### 6.7.1 Channel has a switch output

The switching status will be inverted for 6 minutes. If there is a switching operation in this time, valve protection will be ended.

#### 6.7.2 Channel has a 0-10 V output

Starting from the current control value, the output value will be increased to 100 %, then decreased back to 0 %, and again increased to the current control value. This happens at a speed of 1 % per second.

During this, the parameters *minimum* and *maximum actuating value* are not taken into account, however, the parameters output voltage at 0 % and 100 % will be observed.

### 6.8 Short-circuit and overcurrent shutdown

The overcurrent monitoring is only active if the channel is configured as a switch output. As soon as an overcurrent is detected at an output, the affected channel will be switched off.

If the channel is still controlled, there will be another attempt to switch it on after 5 s. If an overcurrent is detected again, the channel finally switches off. If there is no overcurrent any more, the channel will be back in its normal state after 5 s.

If the channel is not controlled anymore, after it was switched off due to an overcurrent (e.g. due to PWM off period), it will be waited until the next switch-on. If there will be an overcurrent again, it will be finally switched off.

Switching off due to an overcurrent is indicated by flashing of the channel LED.

#### **Confirmation:**

The channels switched off due to overcurrent can only be reactivated by manual confirmation, with a short and simultaneous press on the two manual buttons.

Resetting is also done in case of mains failure and download.

### 6.9 Determining the maximum actuating value

#### 6.9.1 Application

If in a system all actuators are opened only slightly, e.g. one at 5 %, one at 12 %, another at 7 % etc., the boiler could decrease its output, because not much heating energy is needed.

In order to do so, the boiler has to be informed about the actual energy demand of the system. This task is performed by the *Detect maximum actuating value* function.

#### 6.9.2 Principle

First, within each heating actuator, the maximum actuating value of all channels (H1-H6) will be determined.

At the same time, the heating actuators (HMT 6 S devices) are permanently compared with each other. Those participants with a higher actuating value than the other heating actuators may send it; those with a smaller one do not send.

In order to accelerate this process: The greater the difference between its own and the received actuating value, the greater the speed at which the heating actuator sends.

Thus, the actuator with the highest actuating value sends first and outperforms all others.

#### 6.9.3 In practice

The actuating value comparison takes place via the object *maximum actuating value*. For this, all HMT 6 S will be connected via this object with a common group address.

In order to start the actuating value comparison among the participants, one of the participants must send a value to this group address cyclically. This task can be performed either by the boiler, or by one of the HMT 6 S.

If it is the boiler, it must send the minimum possible value, i.e. 0 %. If it is one of the heating actuators, on the parameter page *General*, the parameter *Send maximum actuating value* must be set to *cyclically*.

This actuator then regularly sends its own maximum actuating value and the others can respond accordingly.

Irrespective of which participant acts as a trigger, for all other actuators, the *Send maximum actuating value* parameter must be set to the default value of *Only if own actuating value is greater*.

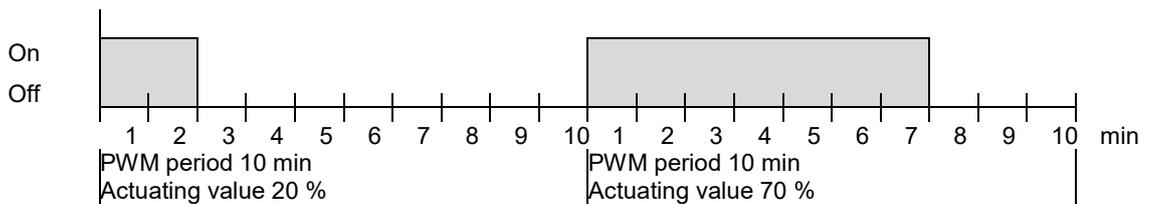
### 6.10 PWM cycle

#### 6.10.1 Basic principle

In order to achieve e.g. a heating output of 50 %, the 50 % actuating value is converted into switch-on/switch-off cycles.

The actuator is switched on for 50% of the time and switched off for 50% of the time over a fixed period (10 minutes in our example).

Example: 2 different turn-on times of 2 and 7 minutes indicate the implementation of 2 different actuating values, that is once 20 % and once 70 % during a PWM period of 10 minutes.



#### 6.10.2 Response to changes in the actuating value

Every change in the actuating value is immediately transferred to the PWM cycle, in order to respond to changes in the quickest possible time.

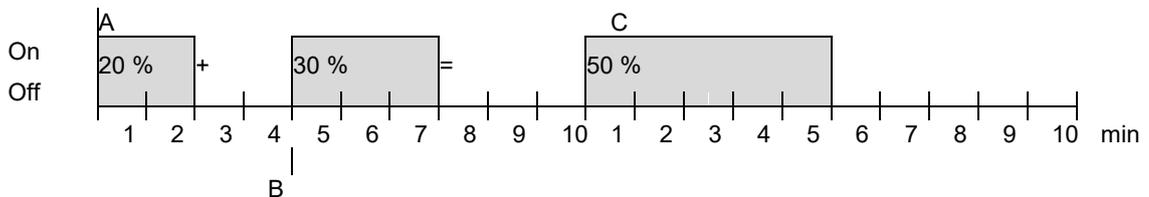
Example 1:

The last actuating value was 20 % (A).

A new actuating value of 50 % is received during the cycle (B).

The output is immediately switched on and the missing 30 % turn-on time is added.

The next cycle is executed with 50 % (C)



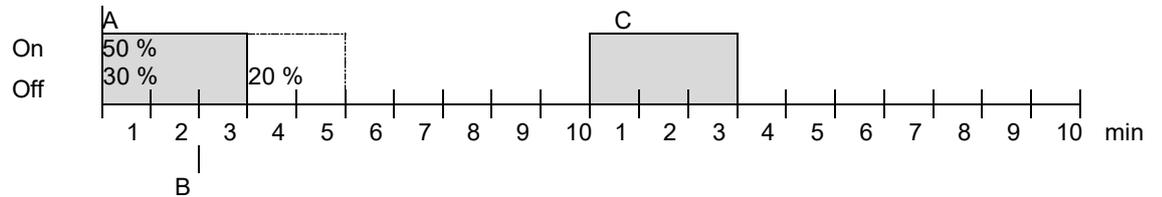
If the rated switch-on time for the current cycle has already exceeded while receiving the new actuating value, the output is immediately switched off and the new actuating value is executed during the next cycle.

Example 2:

The last actuating value was 50 % (A)

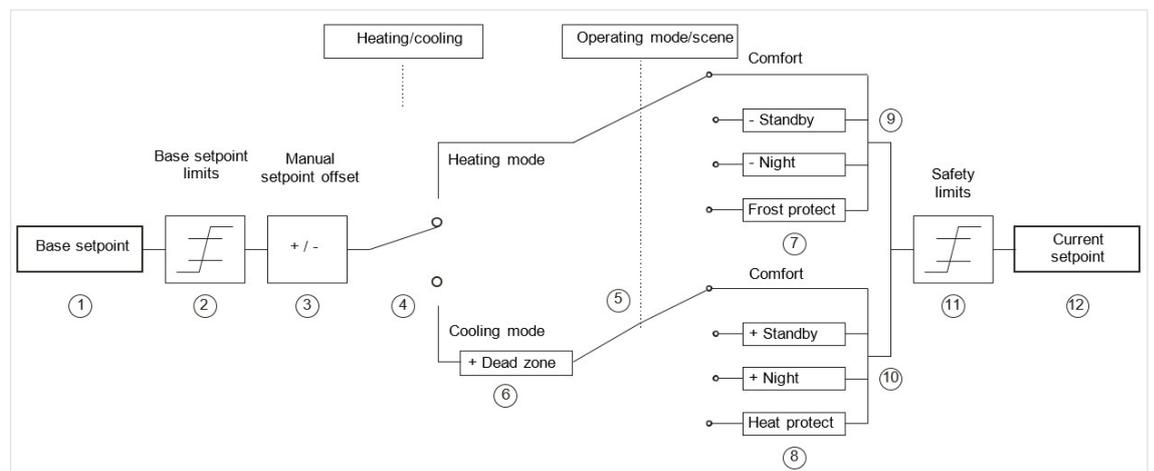
A new actuating value of 30 % is received during the cycle (B).

The output is switched off after completing 30 % of the PWM cycle and thus the new actuating value is already executed.



## 6.11

### Setpoint calculation



#### Legend

- |   |  |
|---|--|
| 1 Preset base setpoint  | 7 The setpoint is replaced by the setpoint for frost protection mode               |
| 2 Max. and min. valid base setpoints  | 8 The setpoint is replaced by the setpoint for heat protection mode                |
| 3 Manual setpoint offset  | 9 Set point after reductions caused by the operating mode                          |
| 4 Change between heating and cooling: Automatically or via object           | 10 Setpoint after increases caused by the operating mode                           |
| 5 Selection of operating mode by object                                     | 11 The limits for frost and heat protection must be adhered to                     |
| 6 In cooling mode, the setpoint is increased by the amount of the dead zone | 12 Current setpoint after increases, reductions and limits caused by the operation |

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## Appendix

### 6.12 Notes





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