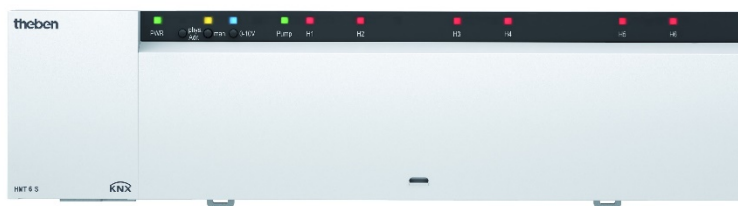


KNX manual HMT 6 S / HMT 12 S heating actuator



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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

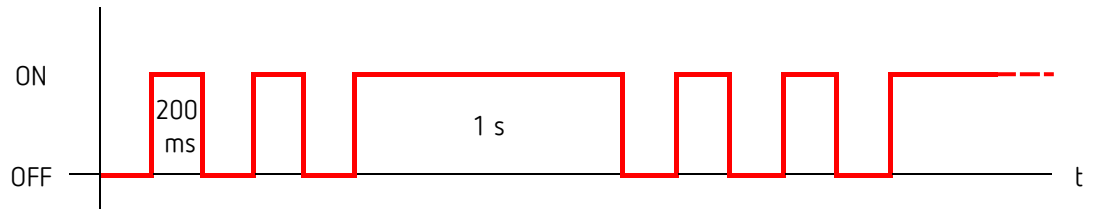


Designation	Function	Description
PWR	24 V - LED	LED lights green if 24 V available, flashes red in case of an error.
Phys. addr.	Button and LED for programming the physical address.	For ETS programming.
man.	Button and LED for manual operation	<p>Starting manual mode: Short press of the button, the yellow LED lights up, bus communication is blocked. Channel 1 is selected first, and the corresponding LED flashes. After channel 6 or 12, 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: <ol style="list-style-type: none"> 1. Changing the output status. 2. Changing the type of valve control 	<p>Only in manual mode:</p> <ol style="list-style-type: none"> 1. A short press of the button changes the status of the selected output (toggle On/Off). 2. A long press of the button changes the mode of the output from 24 V switching to 0-10 V, and vice versa. <hr/> <p>i 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-H12	Channel LEDs	Shows the status of the outputs.

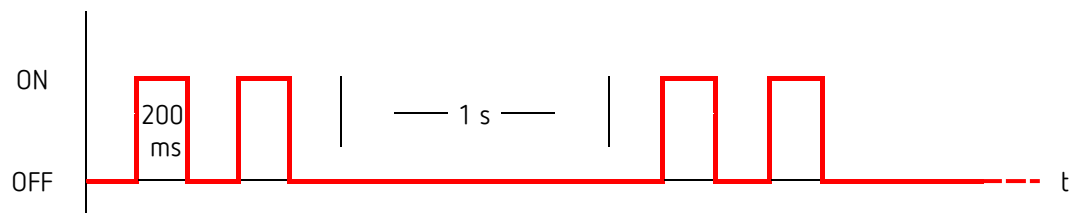
2.1 Flashing behaviour in manual mode:

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

KNX operating voltage	Bus voltage, $I_{BUS} \leq 7.5 \text{ mA}$
Operating voltage	230–240 V AC
Frequency	50-60 Hz
Standby output	< 1 W
Drives	1 per channel (HMT 12 S) 2 per channel (HMT 6 S)
Valve output	24 V SELV; 0.4 A peak; 0.12 A permanent or 0-10 V at at least 1250 ohm
Switch output (pump)	5 A, 240 V AC floating, μ contact
24 V output terminal	Max. 1.4 A
Max. wire cross-sections	0.2 – 1.5 mm ²
Ambient temperature	–5 °C ... +50 °C
Type of installation	DIN-rail
Protection rating	IP 20 in accordance with EN 60529
Protection class	II in accordance with EN 60730-1 subject to designated installation

i 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 if thermal actuators (24 V switching) are connected at the same time.¹

i 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.

¹ The available current is reduced by approx. 0.1 A per connected 24 V/2 W actuator.

4 The HMT 6 S / HMT 12 S application program

4.1 Selection in the product database

Manufacturer	Theben AG
Product family	Heating, ventilation, air conditioning
Product type	Heating actuators
Program name	HMT 6 S, HMT 12 S

Number of communication objects	92 ² , 176 ³
Number of group addresses	254
Number of associations	255



The ETS database can be found on our website: www.theben.de/en/downloads_en

² HMT 6 S

³ HMT 12 S

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 mode	1 bit	R	W	C	-	1.003
14	Channel H1	Overcurrent/short circuit	1 bit	R	-	C	T	1.005

4.2.2 Common objects

No.	Object name	Function	Length	R	W	C	T	DPT
241	H1 - H12	Summer mode ON/OFF	1 bit	R	W	C	-	1.003
242	H1 - H12	Highest actuating value	1 byte	R	-	C	T	5.001
244	H1 - H12	Pump ON/OFF	1 bit	R	-	C	T	1.001
245	H1 - H12	Pump relay status	1 bit	R	-	C	T	1.001
246	H1 - H12	Outside temperature	2 bytes	R	W	C	-	9.001
247	H1 - H12	Outside temperature failure	1 bit	R	-	C	T	1.005
248	H1 - H12	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.

In case of restoration of the mains supply, 100% will be sent.

In case of restoration of the bus supply, 0% will be sent

In case of simultaneous restoration of the mains and bus supply, 100% will be sent.

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: *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.

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	Operating 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*.
In case of restoration of the mains or bus supply, 0% will be sent.
In case of simultaneous restoration of the mains and bus supply, 100% will be sent.

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.



- 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).

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
<i>DPT1.100</i>	Heating = 1, cooling = 0
<i>Inverted</i>	Heating = 0, cooling = 1

Object 11 "Current setpoint"

Sends the current temperature setpoint as DPT 9.001.

Object 12 "Actual value failure"

Sends a 1 if no valid actual value was received during the monitoring time.

Object 13 "Forced mode"

The direction of action of the forced telegram is adjustable.

Standard:

1 = activate forced

0 = end forced.



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



After download, forced mode is always deactivated.

Object 14 "Overcurrent/short circuit"

Reports overload, short circuit, or defect at output.

1 = Error

0 = No error

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.

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

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 Vzxx

Code	Meaning
xxx	Version of the bootloader
yyy	Version of channels 1-3 (HMT6S) or 1-6 (HMT12S)
zzz	Version of channels 4-6 (HMT6S) or 7-12 (HMT12S)

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 4 main functional blocks.

Parameter page	Description
General	LED settings, activation of the temperature sensor inputs.
<i>Channel H1, H2..H12</i>	
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.
Forced mode	Response in forced mode.
<i>Monitoring</i>	
Actuating value, actual value, outside temperature	Settings of the monitoring function.
<i>Pump control</i>	
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	HMT 6 S HMT 12 S	Selection between 6 and 12 channel device
Function of the manual button	<i>applies for 24 hours or until reset via object blocked</i> applies until reset via object <i>applies for 30 minutes or until reset via object</i> <i>applies for 1 hour or until reset via object</i> <i>applies for 2 hours or until reset via object</i> <i>applies for 4 hours or until reset via object</i> <i>applies for 8 hours or until reset via object</i> <i>applies for 12 hours or until reset via object</i>	Determines how long the device works manually and how this is ended. In manual mode, the channels can only be switched on and off via the buttons on the device. See also: <u>Object Manual</u>
Manual operation of the channels	enabled <i>blocked</i>	The channels can be operated via the buttons on the device. No manual operation, the buttons on the device are blocked.
Send highest actuating value ⁴ cyclically (if continuous actuating value is used)	no, only in the event of change <i>in the event of change and cyclically</i>	Do not send cyclically. Send in the event of change (ON-OFF, OFF-ON) and cyclically.
Cycle time	<i>every 2 min, every 3 min</i> <i>every 5 min, every 10 min,</i> <i>every 15 min, every 20 min,</i> every 30 min	At what interval should the highest actuating value be sent?

⁴ See in the Appendix: Highest actuating value

4.6 Parameters for the heating actuator

4.6.1 Configuration options

Designation	Values	Description
<i>Channel function</i>	Heating actuator <i>Heating controller</i>	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. See chapter: Parameters for the heating actuator
<i>Type of actuating value</i>	<i>switching..</i> continuous..	The channel processes: ON/OFF telegrams. Percent telegrams 0-100%
<i>Include in summer mode</i>	No <i>Yes</i>	Should the channel remain off in summer mode?
<i>Activate valve protection</i>	<i>No</i> Yes	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. ⁵ No valve protection. Valve protection is active.
<i>Monitor actuating value</i>	No <i>Yes..</i>	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.
<i>Activate Forced mode</i>	No <i>Yes..</i>	No Forced mode. Opens the Force parameter page.

⁵ Valve protection is not included in the calculation of the current actuating value.

4.6.2 Channel characteristics

Designation	Values	Description
Type of valve control	Switch output <i>0-10 V</i>	For standard 24 V actuators. For actuators with 0-10 V control.
Actuator direction of operation	Standard: 1 (or 10 V) = Open valve <i>Inverted: 0 (or 0 V) = Open valve</i>	Standard. Valve closed when de-energised. Special inverted valve types. Valve open when de-energised.
Output voltage at 0% ⁶	0 V <i>1 V</i> <i>2 V</i>	Standard use. For special applications: Here, the voltage range can have a lower limit.
Output voltage at 100% ⁷	<i>3 V, 3.5 V, 4 V</i> <i>4.5 V, 5 V, 5.5 V</i> <i>6 V, 6.5 V, 7 V</i> <i>7.5 V, 8 V, 8.5 V</i> <i>9 V, 9.5 V</i> 10 V	For special applications: Here, the voltage range can have an upper limit. Standard use.
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.
Actuating value when value violates the min./max. actuating value		Restriction when a room thermostat receives an actuating value that is less than the minimum actuating value:

⁶ Parameter for 0-10 V valve control. With inverted direction of action, the output voltage is set to 100%, here.

⁷ Parameter for 0-10 V valve control. With inverted direction of action, the output voltage is set to 0%, here.

Designation	Values	Description
	<p>0% or 100%</p> <p>Use set actuating values</p> <p>0 = 0%, otherwise use set actuating values</p> <p>< min. actuating val. = 0%, otherwise scale.</p>	<p>Actuate channel with 0% or 100%</p> <p>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.</p> <p>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.</p> <p>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%.</p>
Send current actuating value	at change of 1%, 2%, 3%, 5%, 7%, 10%, 15%	After what percentage change ⁸ in the actuating value is the new value to be transmitted?
Send current actuating value cyclically	not cyclically, 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	Send when or at what interval?
Take channel into account for highest actuating value	No Yes	Should the actuating value for channel 1 be included for determining the highest actuating value of all channels?


⁸ Change since last transmission.

Designation	Values	Description
<i>Control pump</i>	<i>No</i>	Do not take channel for pump control into account
	<i>via object</i>	Channel controls a pump via bus
	<i>via relay</i>	Channel controls the locally connected pump
	<i>via object and relay</i>	Channel controls both.
<i>Time for one actuation cycle⁹ (PWM period)</i>	<i>2 min</i> <i>3 min</i> <i>5 min</i> <i>7 min</i> <i>10 min</i> <i>15 min</i> <i>20 min</i> <i>30 min</i>	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: PWM cycle

⁹ Also applies to emergency program and forced mode.

4.6.3 Emergency program

Designation	Values	Description
Actuating value for emergency program is	fixed <i>Outside temperature dependent</i>	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.
Actuating value for emergency program is fixed		
Fixed emergency program in winter mode	0%, 10%, 20% 30%, 40%, 50%	Fixed actuating value that should replace the actuating value of the thermostat until it is available again.
Actuating value for emergency program is temperature-dependent		
Emergency program active when outside temperature below	5 °C 10 °C 15 °C	If the outside temperature drops below the set value, the valve opens.
Max. actuating value in emergency program	10%, 20% 30%, 40% , 50%	What should be the maximum heating level in the emergency program?
Fixed emergency program in case of failure of outside temperature.	0%, 10%, 20% 30%, 40%, 50%	Fixed valve setting if neither actuating value nor outside temperature can be received.

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

4.6.4 Force

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

4.6.5 Monitoring of actuating value, actual value, outside temperature

See below: *Common parameters*.

4.6.6 Pump control

See below: *Common parameters*.

4.7 Parameters for the heating controller

4.7.1 Configuration options

Designation	Values	Description
<i>Channel function</i>	<p><i>Heating actuator</i></p> <p>Heating controller</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>
<i>Include in summer mode</i>	<p>No</p> <p>Yes</p>	Should the channel remain off in summer mode?
<i>Activate valve protection</i>	<p>No</p> <p>Yes</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. Valve protection is active.</p>
<i>Execute valve protection</i>	<p>always</p> <p><i>Only in comfort mode</i></p> <p><i>Only in standby mode</i></p> <p><i>Only in night mode</i></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>
<i>Monitor actual value</i>	<p>No</p> <p>Yes</p>	<p>No monitoring.</p> <p>The actual value (room temperature) is monitored and an emergency program can be configured.</p>
<i>Activate forced mode</i>	<p>No</p> <p>Yes..</p>	<p>No forced mode.</p> <p>Activates the forced mode parameter page.</p>

4.7.2 Channel characteristics

Designation	Values	Description
Type of valve control	Switch output <i>0-10 V</i>	For standard 24 V actuators. For actuators with 0-10 V control.
Actuator direction of operation	Standard: 1 (or 10 V) = Open valve <i>Inverted: 0 (or 0 V) = Open valve</i>	Standard. Valve closed when de-energised. Special inverted valve types. Valve open when de-energised.
Output voltage at 0% ¹⁰	0 V <i>1 V</i> <i>2 V</i>	Standard use. For special applications: Here, the voltage range can have a lower limit.
Output voltage at 100% ¹¹	<i>3 V, 3.5 V, 4 V</i> <i>4.5 V, 5 V, 5.5 V</i> <i>6 V, 6.5 V, 7 V</i> <i>7.5 V, 8 V, 8.5 V</i> <i>9 V, 9.5 V</i> 10 V	For special applications: Here, the voltage range can have an upper limit. Standard use.
Channel processes actuating value for ¹²	Heating <i>Cooling</i>	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

¹⁰ Parameter for 0-10 V valve control. With inverted direction of action, the output voltage is set to 100%, here.

¹¹ Parameter for 0-10 V valve control. With inverted direction of action, the output voltage is set to 0%, here.

¹² Only for heating and cooling mode. Not available if *Output of cooling actuating value = together with heating actuating value.*

Designation	Values	Description
<i>Actuating value when value violates the min./max. actuating value</i>	<p><i>0% or 100%</i></p> <p><i>Use set actuating values</i></p> <p><i>0 = 0%, otherwise use set actuating values</i></p> <p><i>< min. actuating val. = 0%, otherwise scale.</i></p>	<p>Restriction when a room thermostat receives an actuating value that is less than the minimum actuating value:</p> <p>Actuate channel with 0% or 100%</p> <p>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.</p> <p>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.</p> <p>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%.</p>
<i>Take channel into account for highest actuating value</i>	<p><i>No</i></p> <p><i>Yes</i></p>	Should the actuating value for this channel be included for determining the highest actuating value of all channels?
<i>Control pump</i>	<p><i>No</i></p> <p><i>via object</i></p> <p><i>via relay</i></p> <p><i>via object and relay</i></p>	<p>Do not take channel for pump control into account.</p> <p>Channel controls a pump via bus.</p> <p>Channel controls the locally connected pump.</p> <p>Channel controls both.</p>

Designation	Values	Description
Time for one actuation cycle (PWM period) ¹³	2 min 3 min 5 min 7 min 10 min 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: PWM cycle

i 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.

¹³ Also applies to emergency program and forced mode.

4.7.3 Settings

Designation	Values	Description
<i>Control</i>	<i>Standard</i>	For simple applications (only heating control).
	<i>User-defined</i>	Enables selection of control functions.
<i>Control functions used¹⁴</i>	<i>only heating control</i>	Heating mode only.
	<i>Heating and cooling</i>	In addition, a cooling system has to be controlled.

¹⁴ Only for user-defined control.

4.7.4 Operating mode

Designation	Values	Description
<i>Operating mode after reset</i>	<i>Frost protection</i> <i>Temperature reduction at night</i> Standby <i>Comfort</i>	Operating mode after start-up or reprogramming
<i>Type of presence sensor</i>	Presence detectors <i>Presence button</i>	The presence sensor activates the comfort operating mode Comfort operating mode as long as the presence object is set. 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. If the presence object is set during night/frost mode, it is reset after the configured comfort extension has expired ¹⁵ (see below). The presence object is not reported back on the bus
<i>Comfort extension by presence button in night mode</i>	<i>none</i> <i>30 min</i> <i>1 hour</i> <i>1.5 hours</i> 2 hours <i>2.5 hours</i> <i>3 hours</i> <i>3.5 hours</i>	Telegrams from the presence button are not considered. 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. The time limit is omitted if the device was previously in standby mode. Comfort mode is only cleared with the next manual or bus controlled change of the operation mode.

¹⁵ Exception: If a window is opened (window object = 1), the room thermostat switches to frost protection mode

Designation	Values	Description
<i>Cycl. transmission of current operating mode</i>	<i>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</i>	How often should the current operating mode be sent?

4.7.5 Control (heating)

Designation	Values	Description
Setting the control parameters	<i>via installation type</i> <i>user-defined</i>	Standard application Professional use: Configure P/PI controller yourself
Installation type	Radiator heating system <i>Underfloor heating</i>	PI controller with: Integrated time = 90 minutes Bandwidth = 2.5 K Integrated time = 30 h Bandwidth = 4 K
transmission of heating actuating value	<i>at change by 1%</i> <i>at change by 2%</i> <i>at change by 3%</i> at change by 5% <i>at change by 7%</i> <i>at change by 10%</i> <i>at change by 15%</i>	After what percentage change ¹⁶ in the actuating value is the new value to be transmitted. Small values increase control accuracy, but also the bus load.
Cycl. transmission of heating actuating value	not cyclical, only in the event of change <i>every 2 min, every 3 min</i> <i>every 5 min, every 10 min</i> <i>every 15 min, every 20 min</i> <i>every 30 min, every 45 min</i> <i>every 60 min,</i>	How often is the current heating actuating value to be sent (regardless of changes)?
User-defined parameter		
Proportional band of heating controller	1 K, 1.5 K, 2 K, 2.5 K, 3 K 3.5 K, 4 K, 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	<i>pure P controller</i> <i>15 min, 30 min, 45 min</i> <i>60 min, 75 min, 90 min</i> <i>105 min, 120 min,</i> <i>135 min, 150 min,</i> <i>165 min, 180 min</i> <i>195 min, 210 min</i> <i>4 h, 5 h, 10 h, 15 h,</i> <i>20 h, 25 h, 30 h, 35 h</i>	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.

¹⁶ Change since last transmission

4.7.6 Setpoints (heating)

Designation	Values	Description
<i>Base setpoint after loading the application</i>	18 °C, 19 °C, 20 °C 21 °C , 22 °C, 23 °C, 24 °C, 25 °C	Output setpoint for temperature control.
<i>Minimum valid base setpoint</i>	5 °C, 6 °C, 7 °C, 8 °C, 9 °C, 10 °C , 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</i> object) is lower than the value set here, it will be limited to this value.
<i>Maximum valid base setpoint</i>	20 °C, 21 °C, 22 °C 23 °C, 24 °C, 25 °C 27 °C, 30 °C, 32 °C	If a received base setpoint (<i>base setpoint</i> object) is higher than the value set here, it will be limited to this value.
<i>Reduction in standby mode (during heating)</i>	0.5 K, 1 K, 1.5 K 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.
<i>Reduction in night mode (during heating)</i>	3 K, 4 K, 5 K 6 K, 7 K, 8 K	By what value should the temperature be reduced in night mode?
<i>Setpoint for frost protection mode (during heating)</i>	3 °C, 4 °C, 5 °C 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).
<i>Maximum valid setpoint offset</i>	+/- 1 K, +/- 2 K, +/- 3 K, +/- 4 K, +/- 5 K	Limits the possible setting range for the setpoint offset function. Applies to values received via <i>Manual setpoint value offset</i> object.
<i>Setpoint offset applies</i>	<i>only in comfort mode</i> <i>with comfort and standby mode</i> <i>with comfort, standby and night mode</i>	The setpoint offset: is only considered in the selected modes, and is ineffective in all other modes.
<i>current setpoint in comfort mode</i>		Feedback of current setpoint via the bus:

Designation	Values	Description
	<p><i>Sends actual value (heating < > cooling)</i></p> <p><i>Send average value between heating and cooling</i></p>	<p>the setpoint actually being used for control has always to be sent (= current setpoint). 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. 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>
<i>cycl. transmission of current setpoint</i>	<p><i>not cyclically, only in the event of change</i></p> <p><i>every 2 min</i> <i>every 3 min</i> <i>every 5 min</i> <i>every 10 min</i> <i>every 15 min</i> <i>every 20 min</i> <i>every 30 min</i> <i>every 45 min</i> <i>every 60 min</i></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>

4.7.7 Cooling control

Designation	Values	Description
<i>Setting the control parameters</i>	via installation type <i>user-defined</i>	Standard application Professional use: Configure P/PI controller yourself
<i>Installation type</i>	Cooling surface <i>Fan coil unit</i>	PI controller with: Integrated time = 240 minutes Bandwidth = 5 K Integrated time = 180 minutes Bandwidth = 4 K
User-defined control parameter		
<i>Proportional band of the cooling controller</i>	1 K, 1.5 K, 2 K, 2.5 K, 3 K 3.5 K, 4 K , 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.
<i>Integrated time of the cooling controller</i>	<i>pure P controller</i> <i>pure P controller</i> 15 min, 30 min, 45 min 60 min, 75 min, 90 min 105 min, 120 min, 135 min, 150 min, 165 min, 180 min 195 min, 210 min 4 h, 5 h, 10 h, 15 h, 20 h, 25 h, 30 h, 35 h	See in the Appendix temperature control 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.
<i>Sends cooling actuating value</i>	<i>at change by 1%</i> <i>at change by 2%</i> <i>at change by 3%</i> <i>at change by 5%</i> <i>at change by 7%</i> <i>at change by 10%</i> <i>at change by 15%</i>	After what percentage change ¹⁷ in the actuating value is the new value to be transmitted. Small values increase the control accuracy, but also the bus load.

¹⁷ Change since last transmission.

Designation	Values	Description
<i>Cycl. Sends cooling actuating value</i>	not cyclical, only in the event of change <i>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</i>	How often is the current cooling actuating value to be sent (regardless of changes)?
<i>Switchover between heating and cooling</i>	automatic <i>via object</i>	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.
<i>Format object heating/cooling</i>	DPT1.100 (heating=1/cooling=0) <i>inverted (heating=0/cooling=1)</i>	Standard format. Compatible with RAM 713 S, VARIA etc.
<i>Output of the cooling actuating value¹⁸</i>	<i>on separate object</i> <i>together with heating actuating value</i>	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 <i>actuating value heating/cooling</i> object, independent of whether heating or cooling mode is active.

¹⁸ Only when changeover between heating and cooling via object.


4.7.8 Cooling setpoints

Designation	Values	Description
<i>Dead zone between heating and cooling</i>	(0 K) ¹⁹ 1 K 2 K 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 glossary: dead zone
<i>Increase in standby mode (during cooling)</i>	0 K, 0.5 K, 1 K, 1.5 K 2 K, 2.5 K, 3 K 3.5 K, 4 K, 5 K	The standby temperature is increased in cooling mode
<i>Increase in night mode (during cooling)</i>	3 K, 4 K, 5 K 6 K, 7 K, 8 K	See increase in standby mode
<i>Setpoint for heat protection mode (during cooling)</i>	42 °C (i.e. virtually no heat protection) 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.

¹⁹ 0 K: Only for 2-pipe systems, i.e. parameter: *switchover between heating and cooling = via object* and *output of cooling actuating value = together with heating actuating value*.

4.7.9 Emergency program

Designation	Values	Description
Actuating value for emergency program is	fixed <i>Outside temperature dependent</i>	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.
Actuating value for emergency program is fixed		
Fixed emergency program in winter mode	0%, 10%, 20% 30%, 40%, 50%	Fixed actuating value that should replace the actuating value of the thermostat until it is available again.
Actuating value for emergency program is temperature-dependent		
Emergency program active when outside temperature below	5 °C 10 °C 15 °C	If the outside temperature drops below the set value, the valve opens.
Max. actuating value in emergency program	10%, 20% 30%, 40% , 50%	What should be the maximum heating level in the emergency program?
Fixed emergency program in case of failure of outside temperature.	0%, 10%, 20% 30%, 40%, 50%	Fixed valve setting if neither actuating value nor outside temperature can be received.

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

4.7.10 Force

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

4.7.11 Monitoring of actuating value, actual value, outside temperature

See below: [Common parameters](#).

4.7.12 Pump control

See below: [Common parameters](#).

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
<i>Monitoring time</i>	5 min 10 min 20 min 30 min 60 min	Start emergency program if the relevant data were not received within the configured time.
<i>Status of monitoring</i>	Report only in the event of malfunction 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.
<i>Send status cyclically</i>	No Yes	Send status messages cyclically?
<i>Cycle time</i>	every 2 min every 3 min every 5 min every 10 min every 15 min every 20 min every 30 min	At what interval should the status be sent?

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
<i>Only switch on relay when at least (only for switch output)²⁰</i>	<i>one input variable > 0%</i> <i>a valve is really open</i>	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.
<i>Switch-off delay</i>	<i>No switch-off delay</i> <i>2 min, 3 min, 5 min, 7 min, 10 min, 15 min, 20 min, 30 min</i>	Switch off pump immediately continue running for a set length of time.
<i>Send relay status cyclically</i>	<i>no, only in the event of change</i> <i>in the event of change and cyclically</i>	How should the current relay status be sent?
<i>Cycle time</i>	<i>every 2 min, every 3 min every 5 min, every 10 min, every 15 min, every 20 min, every 30 min</i>	At what interval should the switch telegram for the pump be sent?

²⁰ This parameter only applies to those channels which are configured with *type of valve control = switch output*. For channels controlling 0-10 V valves, this setting is not relevant.

Object:

Designation	Values	Description
Switch-on telegram only if at least (only for switch output) ²¹	one input variable > 0% <i>a valve is really open</i>	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	<i>No switch-off delay</i> <i>2 min, 3 min, 5 min, 7 min, 10 min, 15 min, 20 min, 30 min</i>	Switch off pump immediately continue running for a set length of time.
Send pump control cyclically	no, only in the event of change <i>in the event of change and cyclically</i>	How should the current relay status be sent?
Cycle time	<i>every 2 min, every 3 min every 5 min, every 10 min, every 15 min, every 20 min, every 30 min</i>	At what interval should the switch telegram for the pump be sent?

²¹ This parameter only applies to those channels which are configured with *type of valve control = switch output*. For channels controlling 0-10 V valves, this setting is not relevant.

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.

For detailed comfort and control functions, the RAMSES 718 P KNX manual can be consulted.

5.1 Simple control with one channel as heating actuator

Channel H1 is configured as heating actuator.

Control is accomplished by a RAMSES 718 P room thermostat.

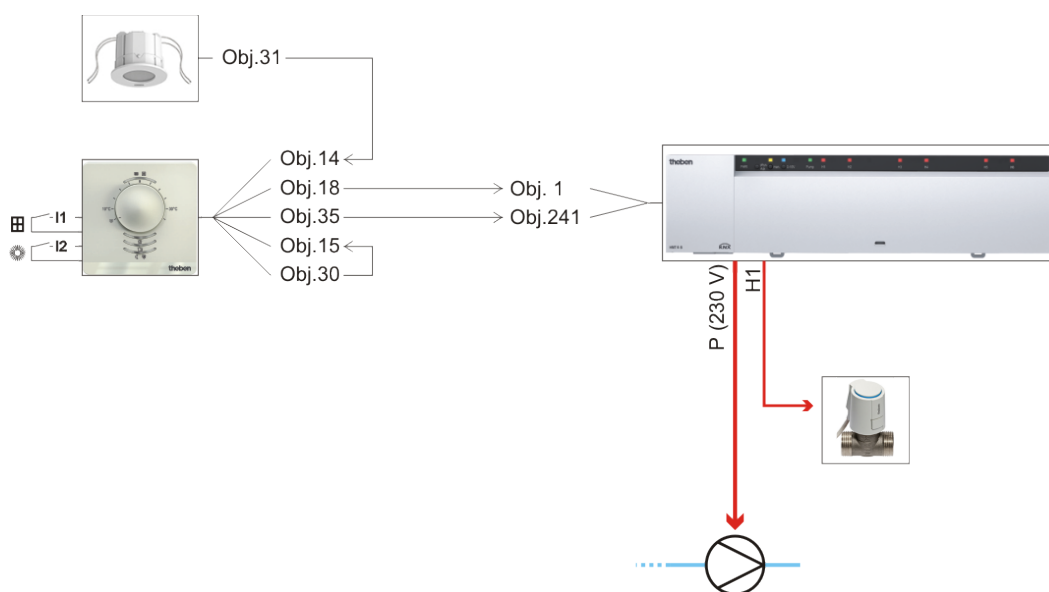
Summer mode is triggered manually with a switch; presence and window status are sensed by a presence detector and a window contact.

For the window contact and the switch for summer/winter mode, 2 external inputs of the RAMSES 718 P are used.

5.1.1 Devices

- HMT 6 S (Order No. 4900373)
- RAMSES 718 P (Order No. 7189210)
- PlanoSpot 360 KNX (Order No. 2039101)

5.1.2 Overview



5.1.3 Objects and links

No.	PlanoSpot 360 Object name	No.	RAMSES 718 P Object name	Comment
31	Channel C4.1 - presence	14	Presence	Presence signal. Starts comfort mode.

No.	RAMSES 718 P Object name	No.	HMT 6 S Object name	Comment
18	Heating actuating value	1	Continuous actuating value	Actuating value for channel H1
35	Channel I2.1 – switching	241	Summer mode ON/OFF	Changeover between summer/winter mode.

No.	RAMSES 718 P Object name	No.	RAMSES 718 P Object name	Comment
30	Channel I1.1 switching	15	Window status	Connect status of window contact at I1 with RTC window status input object.

5.1.4 Important parameter settings

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

PlanoSpot 360

Parameter page	Parameter	Setting
<i>General</i>	<i>Channel C4 function - Presence</i>	<i>active..</i>
<i>Channel C4 - presence - objects</i>	<i>Telegram type C4.1</i>	<i>Switch command</i>

RAMSES 718 P

Parameter page	Parameter	Setting
<i>Parameter block RTC</i>		
<i>RTC setting</i>	<i>Control</i>	<i>Only heating control</i>
<i>Heating control</i>	<i>Type of control</i>	<i>continuous</i>
<i>Parameter block External inputs</i>		
<i>Channel 1</i>	<i>Activate channel</i>	<i>On</i>
	<i>Channel function</i>	<i>Switch</i>
<i>Switch object 1</i>	<i>Object type</i>	<i>Switching (1 bit)</i>
	<i>Send if input = 1</i>	<i>Yes</i>
	<i>Telegram</i>	<i>On</i>
	<i>Send if input = 0</i>	<i>Yes</i>
<i>Channel 2</i>	<i>Activate channel</i>	<i>On</i>
	<i>Channel function</i>	<i>Switch</i>
<i>Switch object 1</i>	<i>Object type</i>	<i>Switching (1 bit)</i>
	<i>Send if input = 1</i>	<i>Yes</i>
	<i>Telegram</i>	<i>On</i>
	<i>Send if input = 0</i>	<i>Yes</i>
	<i>Telegram</i>	<i>Off</i>

HMT 6 S, channel H1

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

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 RAMSES 718 S RTC.

The setpoint is sent from a TR 648 top2 time switch.

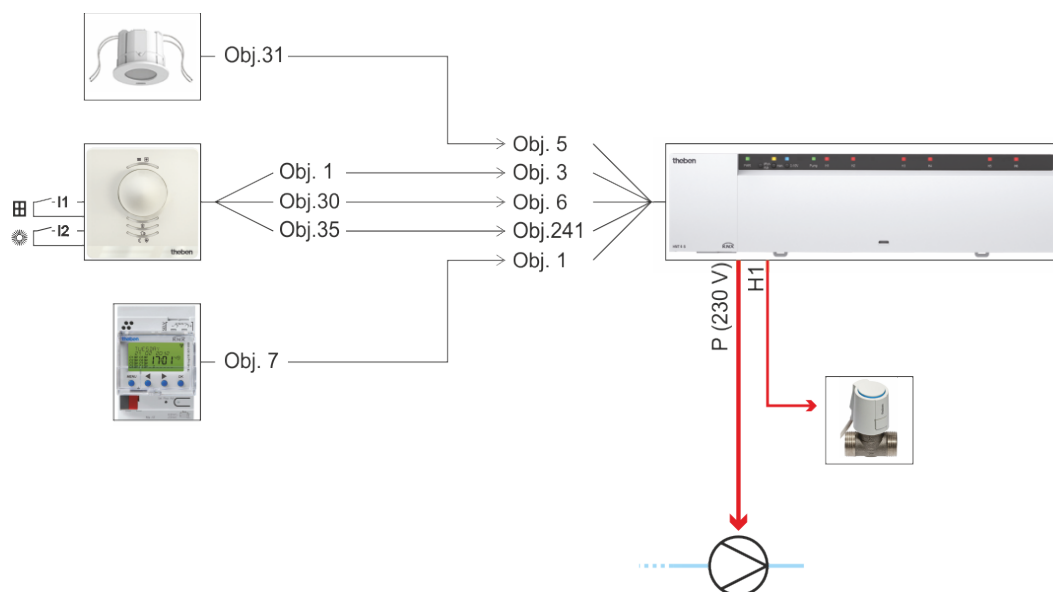
Summer mode is triggered manually with a switch; presence and window status are sensed by a presence detector and a window contact.

For the window contact and the switch for summer/winter mode, 2 external inputs of the RAMSES 718 S are used.

5.2.1 Devices

- HMT 6 S (Order No. 4900373)
- RAMSES 718 S (Order No. 7189200)
- PlanoSpot 360 KNX (Order No. 2039101)
- TR 648 top2 RC-DCF (Order No. 6489210)

5.2.2 Overview



5.2.3 Objects and links

No.	PlanoSpot 360 Object name	No.	HMT 6 S Object name	Comment
31	Channel C4.1 - presence	5	Presence	Presence signal. Starts comfort mode.

No.	RAMSES 718 S Object name	No.	HMT 6 S Object name	Comment
1	Temperature value	3	Actual value	Current room temperature for the controller in H1.
30	Channel I1.1 - switching	6	Window setting	Status of window contact at I1 for the controller in H1.
35	Channel I2.1 - switching	241	Summer mode ON/OFF	Changeover between summer/winter mode.

No.	TR 648 top2 Object name	No.	HMT 6 S Object name	Comment
7	C1.1 switching channel - Temperature in °C	1	Base setpoint value	Base setpoint value

5.2.4 Important parameter settings

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

PlanoSpot 360

Parameter page	Parameter	Setting
<i>General</i>	<i>Channel C4 function - Presence</i>	<i>active..</i>
<i>Channel C4 - presence - objects</i>	<i>Telegram type C4.1</i>	<i>Switch command</i>

RAMSES 718 S

Parameter page	Parameter	Setting
<i>Parameter block General</i>		
<i>Measurement values</i>	<i>Transmit temperature in the event of change of</i>	<i>0.3 K</i>
<i>Parameter block External inputs</i>		
<i>Channel 1</i>	<i>Activate channel</i>	<i>On</i>
	<i>Channel function</i>	<i>Switch</i>
<i>Switch object 1</i>	<i>Object type</i>	<i>Switching (1 bit)</i>
	<i>Send if input = 1</i>	<i>Yes</i>
	<i>Telegram</i>	<i>On</i>
	<i>Send if input = 0</i>	<i>Yes</i>
<i>Channel 2</i>	<i>Activate channel</i>	<i>On</i>
	<i>Channel function</i>	<i>Switch</i>
<i>Switch object 1</i>	<i>Object type</i>	<i>Switching (1 bit)</i>
	<i>Send if input = 1</i>	<i>Yes</i>
	<i>Telegram</i>	<i>On</i>
	<i>Send if input = 0</i>	<i>Yes</i>
	<i>Telegram</i>	<i>Off</i>

HMT 6 S

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

TR 648 top2

Parameter page	Parameter	Setting
<i>Switching channel C1</i>	<i>Telegram type C1.1</i>	<i>Temperature [°C]</i>
	<i>When clock -> ON</i>	<i>20 °C</i>
	<i>When clock -> OFF</i>	<i>16 °C</i>

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 Alpha 5 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 thermostat RAMSES 718 P.

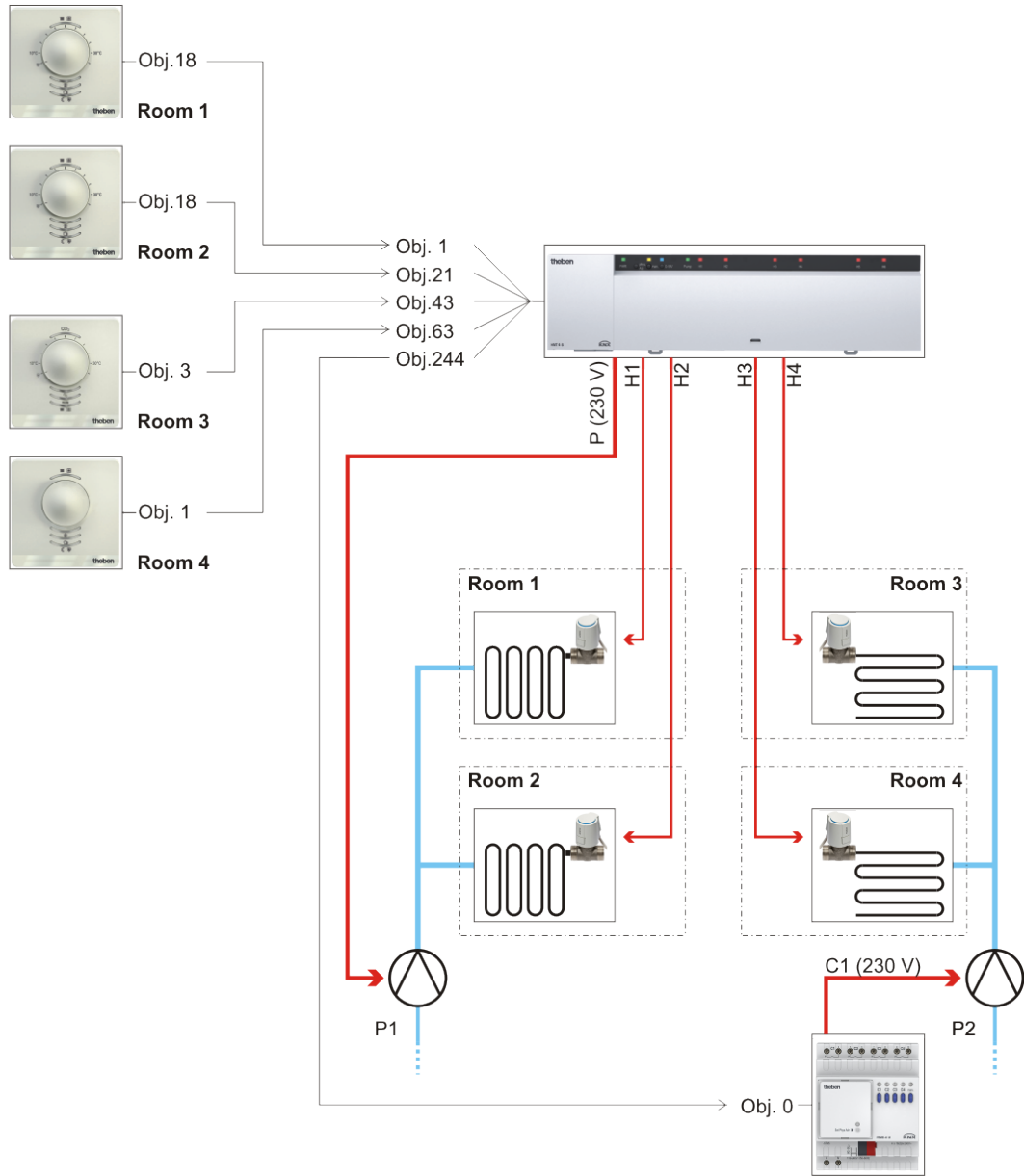
Channels H3 and H4 are used as heating actuators with integrated room thermostat and receive their temperature actual value from a CO2 sensor Amun 716 S (H3, room 3) and from a RTC RAMSES 718 S (H4, room 4).

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

- HMT 6 S (Order No. 4900373)
- RAMSES 718 P (Order No. 7189210)
- RAMSES 718 S (Order No. 7189200)
- AMUN 716 S (Order No. 7169230)
- RMG 4 U (Order No. 4930223)

5.3.2 Overview



5.3.3 Objects and links

No.	RAMSES 718 P Room 1	No.	HMT 6 S	Comment
	Object name		Object name	
18	Heating actuating value	1	Continuous actuating value	Heating actuating value for channel H1

No.	RAMSES 718 P Room 2	No.	HMT 6 S	Comment
	Object name		Object name	
18	Heating actuating value	21	Continuous actuating value	Heating actuating value for channel H2

No.	AMUN 716 S Room 3	No.	HMT 6 S	Comment
	Object name		Object name	
3	Temperature value	43	Actual value	Current room temperature for controller channel H3

No.	RAMSES 718 S Room 4	No.	HMT 6 S	Comment
	Object name		Object name	
1	Temperature value	63	Actual value	Current room temperature for controller channel H4

No.	HMT 6 S	No.	RMG 4 U	Comment
	Object name		Object name	
244	Pump ON/OFF	0	C1 switch object	Switch command for pump P2

5.4 Important parameter settings

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

RAMSES 718 P (room 1 and 2)

Parameter page (RTC)	Parameter	Setting
<i>Setting</i>	<i>Control</i>	<i>Only heating control</i>
<i>Heating control</i>	<i>Type of control</i>	<i>continuous</i>
	<i>Number of heating stages</i>	<i>Only one heating stage</i>

HMT 6 S, channel H1 (for room 1) and H2 (for room 2)

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

AMUN 716 S (room 3) / RAMSES 718 S (room 4)

Parameter page	Parameter	Setting
<i>Measurement values</i>	<i>Transmit temperature in the event of change of</i>	<i>0.3 K</i>

HMT 6 S, channel H3 (for room 3) and H4 (for room 4)

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

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.

i **Exception:** 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.

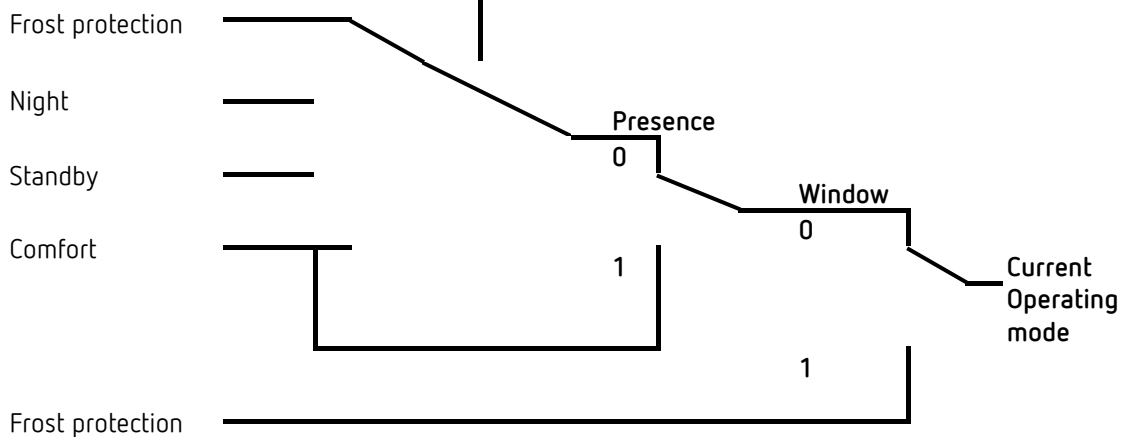
Determining the operating mode when using a presence detector

Specifying the operating mode via..

Object *Operating mode preset*
Operating mode after download

Last command applies

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: $22\text{ °C} - 4\text{ K} = 18\text{ °C}$.

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	<i>Base setpoint after loading the application</i>	21 °C
	<i>Reduction in standby mode (during heating)</i>	2 K
	<i>Maximum valid setpoint offset</i>	+/- 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	<i>Base setpoint after loading the application</i>	21 °C
	<i>Maximum valid setpoint offset</i>	+/- 2 K
Cooling setpoints	<i>Dead zone between heating and cooling</i>	2 K
	<i>Increase in standby mode (during cooling)</i>	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:

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

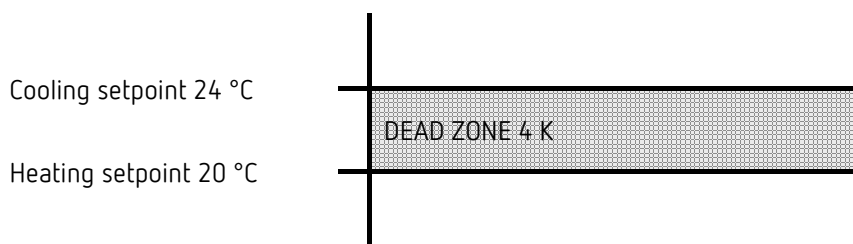
In order to afterwards bring the setpoint to 22 °C, the difference to the programmed base setpoint (here 21 °C) is resent, in this case 1 K (21 °C + 1 K = 22 °C)

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 In a 2-pipe system, i.e. if the changeover between heating and cooling is done via object²² and the actuating values for heating and cooling are output on a common object²³, the dead zone can be set to 0 K.

²² Parameter: *Change over between heating and cooling = via object*

²³ Parameter: *Output of cooling actuating value = together with heating actuating value*

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 General 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 or H12) will be determined.

At the same time, the heating actuators (HMT 6 S/HMT 12 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/HMT 12 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/HMT 12 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*.

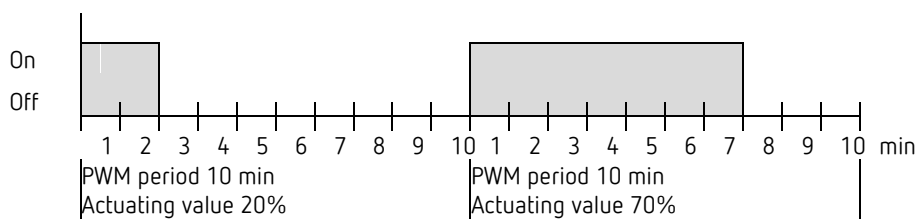
6.10 PWM cycle

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.

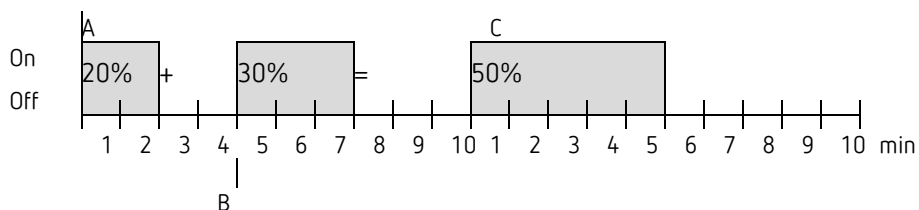
Example 1:

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).



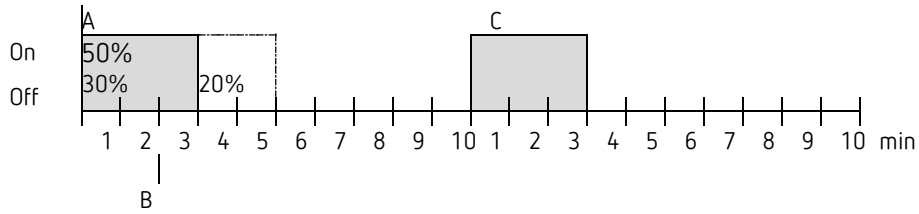
If the rated switch-on time for the current cycle has already exceeded while receiving the new actuating value, the output is immediately switched off and the new actuating value is executed during the next cycle.

Example 2:

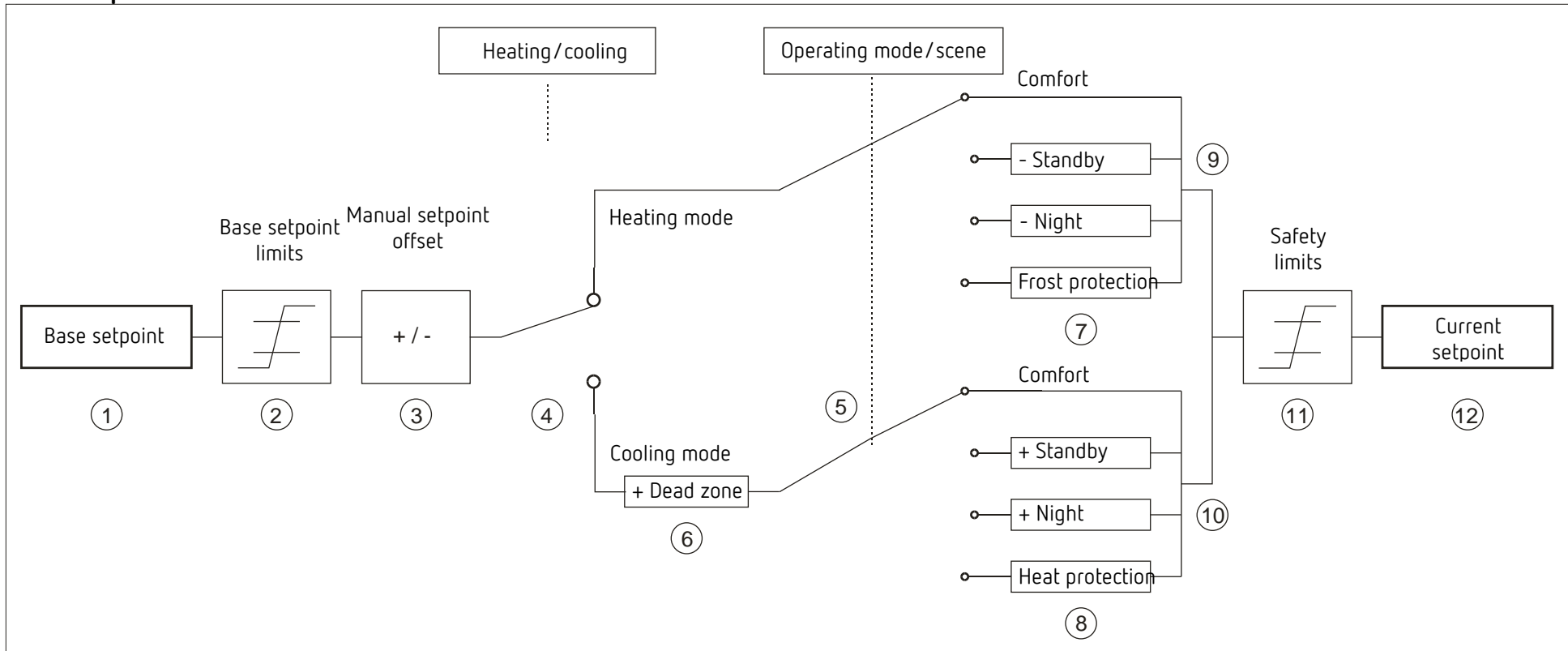
The last actuating value was 50% (A)

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



- 1 Preset base setpoint
- 2 Max. and min. valid base setpoints
- 3 Manual setpoint offset
- 4 Change between heating and cooling: Automatically or via object
- 5 Selection of operating mode by object
- 6 In cooling mode, the setpoint is increased by the amount of the dead zone

- 7 The setpoint is replaced by the setpoint for frost protection mode
- 8 The setpoint is replaced by the setpoint for heat protection mode
- 9 Set point after reductions caused by the operating mode
- 10 Setpoint after increases caused by the operating mode
- 11 The limits for frost and heat protection must be adhered to
- 12 Current setpoint after increases, reductions and limits caused by the operation