State 05/2022 Version V1.0

Technical Manual

MDT
Glass Room Temperature Controller Smart

SCN-RTRGW.02

SCN-RTRGS.02

Further Documents:

Datasheet:

https://www.mdt.de/EN_Downloads_Datasheets.html

Assembly and Operation Instructions:

https://www.mdt.de/EN_Downloads_Instructions.html

Solution Proposals for MDT products:

https://www.mdt.de/EN_Downloads_Solutions.html

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

1 Content

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

2 Overview

2.1 Overview devices

The description refers to the following devices (order number in bold):

- **SCN-RTRGW.02**, Glass Room Temperature Controller Smart, white
  - with colour display, temperature sensor and 4 sensor areas

- **SCN-RTRGS.02**, Glass Room Temperature Controller Smart, black
  - with colour display, temperature sensor and 4 sensor areas

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

2.2 Special functions

Comfortable room temperature controller with temperature sensor
The range of functions of the Glass Room Temperature Controller Smart extends from simple heating control to the complete air-conditioning of a room. The operating modes "Heating", "Cooling" and "Heating and Cooling" are available for this purpose. The 2-point control, a switching PI control (PWM) or the continuous PI control can be selected. The Glass Room Temperature Controller Smart supports single- and dual-circuit systems. This makes it possible to control air-conditioning systems with a common pipe system as well as systems with two separate pipe systems for Heating/Cooling. The temperature is measured by an integrated temperature sensor.

The parameter "Sensor internal/external" can be used to activate an additional measuring extension. This makes it possible to form an average value from an internal and an external sensor. If the external sensor fails, the internal sensor is set to 100%. It is also possible to activate an upper and a lower message value, which emits a 1-bit message if the value exceeds or falls below the setpoint. Furthermore, it is possible to set the setpoint either depending on the basic Comfort value or via independent setpoints.

Extension operation
In extension unit operation, the Glass Room Temperature Controller Smart can be used, for example, in combination with the MDT Heating Actuator, or as an additional secondary unit at a different position. The display can be used to show all relevant functions and the internal buttons can be used for control (operating mode changeover, setpoint shift).

Ventilation control
The integrated ventilation control enables fans to be controlled manually in up to 4 levels, via the control value of the temperature controller, by means of the temperature difference between the setpoint and actual value or via the relative humidity. Furthermore, the "Day/Night" function provides for the individual setting of the ventilation according to the time of day. For example, the ventilation control runs in up to 4 levels during "Day", depending on the requirements, and a maximum of two levels are available in "Night" mode, to avoid disturbing noises and draughts. A sticking protection function is available to protect the ventilation system. The behaviour of the lock function can be set specifically.

Plain text diagnosis
The unit has a 14-byte object with which a variety of messages can be sent in plain text as status on the bus.

Active colour display
The brightness adjusts automatically to the environment or can be changed continuously via a 1-byte (%) object. In addition, the current display brightness can be sent to the bus as a 1-byte (%) object and made available to other devices. The display (white text on black background or inverted) can be set individually for "Day" and "Night" and the colours of the symbols can be changed.

Info-Display
Up to 4 status elements can be displayed for standby mode. These status elements can visualise any values of the KNX bus as well as the time or 14-byte status texts.

Direct operating functions via buttons on the unit
Four buttons are available on each unit. The buttons 1/2 can be configured both individually and in pairs. Here, internal functions relating to temperature control or ventilation control as well as external functions such as "Switching", "Dimming", "Blind/Shutter" or "Send value" can be executed directly. Buttons 3/4 are permanently set to "Temperature shift".

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

RGB Status LEDs
Each of the 4 status LEDs can react to the operation, an internal or external object. The display behaviour can be set separately for "Day" and "Night".

Long Frame Support
Support of sending longer telegrams and thus the integration of more user data per telegram. This significantly shortens the programming time (from ETS5).
Requirement: The use of a programming interface which supports the transmission of long frames, e.g., MDT SCN-USBR.02 or SCN-IP000.03/SCN-IP100.03.

Updateable via DCA
With the help of the MDT Update Tool, the devices can be updated if necessary.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

2.3 Exemplary Circuit Diagram

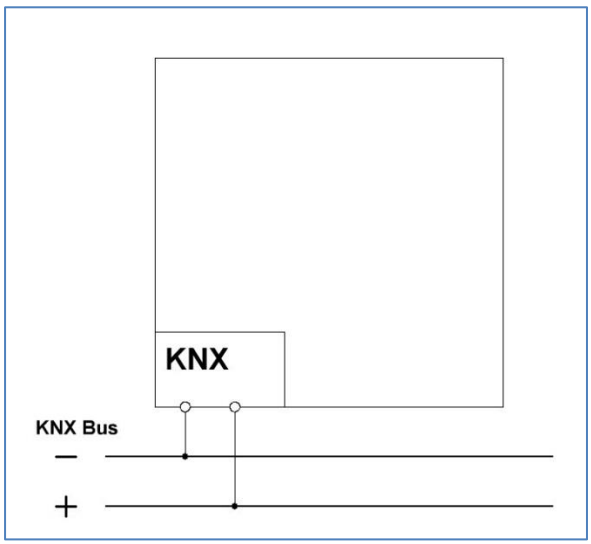


Figure 1: Exemplary circuit diagram

2.4 Structure & Handling

The following picture shows the structure of the Glass Room Temperature Controller Smart:

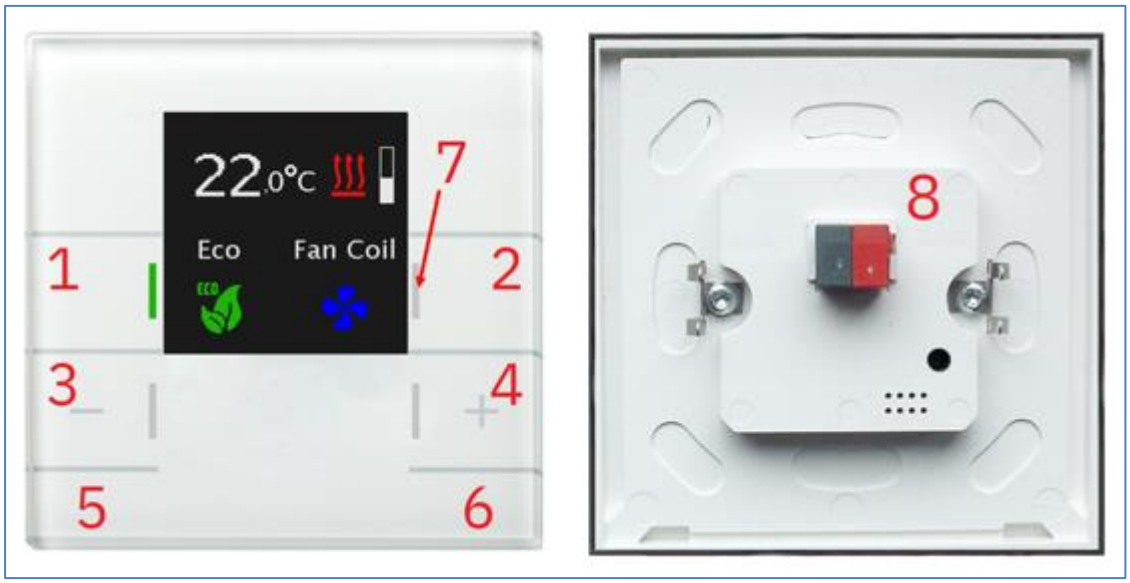


Figure 2: Structure & Handling

1, 2, 3, 4	=	Sensor areas for operating the button functions
5, 6	=	Hidden sensor areas (to enter programming mode)
7	=	RGB status display
8	=	Bus connection terminal

After pressing the sensor buttons 5 and 6, programming mode is indicated by information in the display and by the status LEDs flashing red.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

2.5 Commissioning

After wiring the unit, the physical address is assigned, and the application is programmed:

(1) Connect the programming interface with the bus, e.g. with MDT USB Interface.
(2) Switch-on bus voltage.
(3) Activate programming mode by actuating the sensor areas 5 and 6 on the unit simultaneously (as soon as the unit is in programming mode, this is shown in the display. Status LEDs on the right and left of the unit light up red alternately).
(4) Loading of the physical address out of the ETS-Software by using the interface (The display changes to normal mode as soon as this is successfully completed).
(5) Loads the application with the desired parameterization (programming progress is shown in the display). Switches to normal operation as soon as this has been successfully completed.
(6) If the device is enabled, you can test the requested functions (also possible by using the ETS-Software).

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

3 Communication objects

3.1 Standard settings of the communication objects

Standard settings – Temperature controller								
No.	**Name**	**Object function**	**Length**	**C**	**R**	**W**	**T**	**U**
0	Setpoint setting	Preset setpoint	2 Byte	X		X		
0	Setpoint setting	Preset setpoint	2 Byte	X	X		X	
1	(Basic) Comfort setpoint	Preset setpoint	2 Byte	X		X		
1	Comfort	Preset setpoint	2 Byte	X		X		
1	Combination object (Heating)	Preset setpoint	8 Byte	X		X		
1	Combination object	Preset setpoint	8 Byte	X		X		
2	Standby	Preset setpoint	2 Byte	X		X		
3	Night	Preset setpoint	2 Byte	X		X		
4	Frost protection	Preset setpoint	2 Byte	X		X		
4	Heat protection	Preset setpoint	2 Byte	X		X		
5	Combination object (Cooling)	Preset setpoint	8 Byte	X		X		
6	Current setpoint	Send setpoint	2 Byte	X	X		X	
6	Current setpoint	Receive setpoint	2 Byte	X		X	X	X
7	Manual setpoint shift	Increase / Decrease (2Byte)	2 Byte	X		X		
7	Manual setpoint shift	Increase / Decrease (2Byte)	2 Byte	X	X		X	
7	Manual setpoint shift	Increase / Decrease (1Byte)	1 Byte	X	X		X	
8	Manual setpoint shift	Increase / Decrease (1Byte)	1 Byte	X		X		
8	Manual setpoint shift	Increase / Decrease (1=+/0=-)	1 Bit	X		X		
8	Manual setpoint shift	Increase / Decrease (1=+/0=-)	1 Bit	X			X	
9	Setpoint shift	Send status	2 Byte	X	X		X	
9	Setpoint shift	Receive status	2 Byte	X		X	X	X
10	Control value Heating	Send control value	1 Byte	X	X		X	
10	Control value Heating	Send control value	1 Bit	X	X		X	
10	Control value Heating/Cooling	Send control value	1 Byte	X	X		X	
10	Control value Heating/Cooling	Send control value	1 Bit	X	X		X	
11	Control value Cooling	Send control value	1 Byte	X	X		X	
11	Control value Cooling	Send control value	1 Bit	X	X		X	
12	Control value Heating/Cooling	Send status	1 Byte	X	X		X	
12	Control value Heating	Send status	1 Byte	X	X		X	
12	Control value Heating/Cooling	Receive status	1 Byte	X		X	X	X
12	Control value Heating	Receive status	1 Byte	X		X	X	X
13	Control value Cooling	Send status	1 Byte	X	X	X		X
13	Control value Cooling	Receive status	1 Byte	X	X	X	X	X
14	Control value additional Heating	Send control value	1 Bit	X			X	

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

15	Mode selection	Select mode	1 Byte	X		X		
15	Mode selection	Send mode	1 Byte	X			X	
16	Comfort mode	Comfort extension	1 Bit	X		X		
17	Comfort mode	Switch mode	1 Bit	X		X		
18	Night mode	Switch mode	1 Bit	X		X		
19	Frost protection mode	Switch mode	1 Bit	X		X		
19	Heat protection mode	Switch mode	1 Bit	X		X		
19	Frost/Heat protection mode	Switch mode	1 Bit	X		X		
20	DPT_HVAC Mode	Send controller status	1 Byte	X	X		X	
20	DPT_HVAC Status	Send controller status	1 Byte	X	X		X	
20	DPT_HVAC Mode	Receive controller status	1 Byte	X		X	X	X
20	DPT_HVAC Status	Receive controller status	1 Byte	X		X	X	X
21	DPT_HVAC Status	Send controller status	1 Byte	X	X		X	
21	DPT_HVAC Mode	Send controller status	1 Byte	X	X		X	
21	RHCC Status	Send controller status	2 Byte	X	X		X	
21	DPT_RTC combination status	Send controller status	2 Byte	X	X		X	
21	DPT_RTSM combination status	Send controller status	1 Byte	X	X		X	
22	Frost alarm	Send alarm	1 Bit	X	X		X	
23	Heat alarm	Send alarm	1 Bit	X	X		X	
24	Flow temperature Heating	Receive measured value	2 Byte	X	X		X	
25	Surface temperature Cooling	Receive measured value	2 Byte	X	X		X	
25	Dew point alarm	Receive alarm	1 Bit	X		X	X	
26	Diagnosis	Status	14 Byte	X	X		X	
27	Window contact input	0=closed / 1=open	1 Bit	X		X	X	X
27	Window contact input	1=closed / 0=open	1 Bit	X		X	X	X
28	Lock object Heating	Lock control value	1 Bit	X	X	X	X	X
29	Lock object Cooling	Lock control value	1 Bit	X	X	X	X	X
30	Dummy							
31	Dummy							
32	Toggle Heating/Cooling	0=Cooling / 1=Heating	1 Bit	X		X		
33	Status Heating/Cooling	0=Cooling / 1=Heating	1 Bit	X	X		X	
34	Heating request	Send request	1 Bit	X	X		X	
35	Cooling request	Send request	1 Bit	X	X		X	
36	Outside temperature / Reference value	Receive measured value	2 Byte	X		X		
37	Reference control	Reference value in Lux	2 Byte					
37	Reference control	Reference value in percent	1 Byte					
38	Reference control	Status	1 Bit	X	X		X	
39	Reference control	Lock	1 Bit	X		X		

Table 1: Communication objects – Temperature controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Standard settings - Ventilation control								
No.	**Name**	**Object function**	**Length**	**C**	**R**	**W**	**T**	**U**
42	Ventilation control	Lock	1 Bit	X		X		
43	Ventilation control	Level 1	1 Bit	X	X		X	
43	Ventilation control	Bit 0	1 Bit	X	X		X	
44	Ventilation control	Level 2	1 Bit	X	X		X	
44	Ventilation control	Bit 1	1 Bit	X	X		X	
44	Ventilation control	Level 1+2	1 Bit	X	X		X	
45	Ventilation control	Level 3	1 Bit	X	X		X	
45	Ventilation control	Bit 2	1 Bit	X	X		X	
45	Ventilation control	Level 1+2+3	1 Bit	X	X		X	
46	Ventilation control	Level 4	1 Bit	X	X		X	
46	Ventilation control	Level 1+2+3+4	1 Bit	X	X		X	
47	Ventilation control	1Byte status ventilation level	1 Byte	X	X		X	
48	Ventilation control	Control value	1 Byte	X	X	X		X
49	Ventilation control	Object Priority	1 Bit	X		X		
50	Ventilation control	Switch Automatic	1 Bit	X	X	X	X	
51	Ventilation control	Change ventilation levels manually (+/-)	1 Bit	X		X	X	
52	Ventilation control	Manual ventilation control	1 Byte	X		X		
53	Ventilation control	Status ventilation active	1 Bit	X	X		X	
54	Ventilation control	Status Automatic	1 Bit	X	X		X	
55	Ventilation control	Relative air humidity input	2 Byte	X		X	X	X

Table 2: Communication objects – Ventilation control

Standard settings - Temperature measurement								
No.	**Name**	**Object function**	**Length**	**C**	**R**	**W**	**T**	**U**
58	Temperature	Send measured value	2 Byte	X	X		X	
59	Temperature	External sensor input	2 Byte	X		X	X	X
60	Temperature	Maximum value exceeded	1 Bit	X	X		X	
61	Temperature	Minimum value fallen below	1 Bit	X	X		X	

Table 3: Communication objects – Temperature measurement

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Standard settings - Buttons								
No.	**Name**	**Object function**	**Length**	**C**	**R**	**W**	**T**	**U**
62	Button 1:	Switch	1 Bit	X	X		X	
62	Button 1: Buttons 1/2:	Dimming On/Off	1 Bit	X	X		X	
62	Button 1: Buttons 1/2:	Blinds Up/Down	1 Bit	X	X		X	
62	Buttons 1/2:	Switch On/Off	1 Bit	X	X		X	
62	Button 1:	Toggle	1 Bit	X	X		X	
62	Button 1:	Send status	1 Bit	X	X		X	
62	Button 1:	Send value	1 Byte	X	X		X	
62	Button 1:	Send percent value	1 Byte	X	X		X	
62	Button 1:	Send scene	1 Byte	X	X		X	
62	Button 1 short:	Switch	1 Bit	X	X		X	
62	Button 1 short:	Toggle	1 Bit	X	X		X	
62	Button 1 short:	Send value	1 Byte	X	X		X	
62	Button 1 short:	Send percent value	1 Byte	X	X		X	
62	Button 1 short:	Send scene	1 Byte	X	X		X	
63	Button 1: Buttons 1/2:	Dimming relative	4 Bit	X	X		X	
63	Button 1: Buttons 1/2:	Slat adjustment / Stop	1 Bit	X	X		X	
63	Button 1:	Status for toggle	1 Bit	X		X	X	X
63	Button 1 short:	Status for toggle	1 Bit	X		X	X	X
63	Button 1 short:	Status for display	1 Bit	X		X	X	X
63	Button 1 short:	Status for display	1 Byte	X		X	X	X
64	Button 1 long:	Switch	1 Bit	X	X		X	
64	Button 1 long:	Toggle	1 Bit	X	X		X	
64	Button 1 long:	Send value	1 Byte	X	X		X	
64	Button 1 long:	Send percent value	1 Byte	X	X		X	
64	Button 1 long:	Send scene	1 Byte	X	X		X	
64	Button 1:	Status for toggle	1 Bit	X		X	X	X
64	Button 1:	Status for change of direction	1 Bit	X		X	X	X
65	Button 1: Buttons 1/2:	Status for display	1 Bit	X		X	X	X
65	Button 1: Buttons 1/2:	Status for display	1 Byte	X		X	X	X
65	Button 1 long:	Status for toggle	1 Bit	X		X	X	X
66	Button 1: Buttons 1/2:	Lock object	1 Bit	X		X		
66	Button 1: Operating mode switchover	Lock object	1 Bit	X		X		

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

66	Button 1: Ventilation control	Lock object	1 Bit	X		X		
66	Button 1: Control value = 0%	Lock object	1 Bit	X		X		
66	Button 1: Heating / Cooling	Lock object	1 Bit	X		X		
+5	**next button**							
72	Buttons 3/4: Setpoint shift	Lock object	1 Bit	X		X		

Table 4: Communication objects – Buttons

Standard settings – Status LEDs								
No.	**Name**	**Object function**	**Length**	**C**	**R**	**W**	**T**	**U**
73	LED 1	Switch	1 Bit	X		X	X	X
73	LED 1	Percent value	1 Byte	X		X	X	X
73	LED 1	Decimal value	1 Byte	X		X	X	X
+1	**next LED**							
77	LED 1 Priority	Switch	1 Bit	X		X	X	X
+1	**next LED Priority**							
81	LED 1	Lock object	1 Bit	X		X	X	X
92	LED	Flashing status	1 Bit	X		X		
92	LED	Flashing status	1 Bit	X			X	

Table 5: Communication objects – Status LEDs

Standard settings – Info display								
No.	**Name**	**Object function**	**Length**	**C**	**R**	**W**	**T**	**U**
82	Status text 1	Input	14 Byte	X		X	X	X
83	Status text 2	Input	14 Byte	X		X	X	X
84	Status value 1	Switch On/Off	1 Bit	X		X	X	X
84	Status value 1	Percent value 0...100% Value 0...255	1 Byte	X		X	X	X
84	Status value 1	Value in m/s Value in Lux Value in °C Value in % Value in ppm Value in mA	2 Byte	X		X	X	X
+1	**next Status value**							
91	Display	Brightness	1 Byte	X		X		
91	Display	Brightness	1 Byte	X	X		X	

Table 6: Communication objects – Info display

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Standard settings - General objects								
No.	**Name**	**Object function**	**Length**	**C**	**R**	**W**	**T**	**U**
87	Operating	Output	1 Bit	X	X		X	
88	Day/Night	Day = 1 / Night = 0	1 Bit	X		X	X	X
88	Day/Night	Night = 1 / Day = 0	1 Bit	X		X	X	X
89	Presence	Input	1 Bit	X		X	X	X
90	Button operation	Output	1 Bit	X	X		X	
93	Time	Receive current value	3 Byte	X		X	X	X
94	Date	Receive current value	3 Byte	X		X	X	X
95	Time/Date	Receive current value	8 Byte	X		X	X	X

Table 7: Communication objects – General objects

The table above shows the preset default settings. The priority of the individual communications objects and the flags can be adjusted by the user as required. The flags assign the communication objects their respective tasks in programming, where C stands for communication, R for read, W for write, T for transmit and U for update.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4 Reference ETS-Parameter

4.1 General Settings

The following figure shows the menu for the general settings:

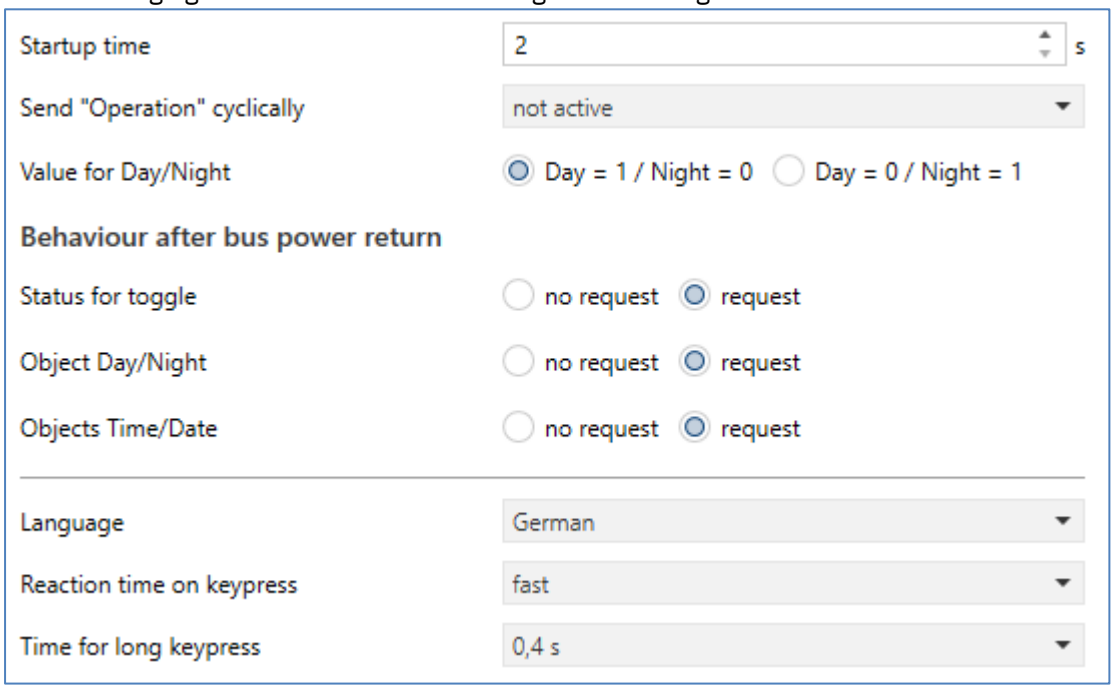


Figure 3: General settings

The following table shows the possible settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Startup time	2 – 240 s **[2 s]**	Sets the time between restart and functional start-up of the device.
Send „Operation“ cyclically	**not active** 1 min – 24 h	Activation of a cyclic "in operation" telegram.
Value for Day/Night	▪ **Day = 1 / Night = 0** ▪ Day = 0 / Night = 1	Sets the polarity for day / night switching.
Behaviour after bus power return		
Status for toggle	▪ no request ▪ **request**	Setting whether the values/objects are to be automatically requested when the bus voltage returns.
Object Day/Night	▪ no request ▪ **request**	
Objects Time/Date	▪ no request ▪ **request**	

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Language	▪ **German** ▪ English ▪ French ▪ Spanish	Setting the language of the diagnostic text.
Reaction time on keypress	▪ **fast** ▪ medium ▪ slow	Defines the debounce time for a keystroke.
Time for long push of button	0,1 s – 30 s **[0,4 s]**	Defines the time for detecting a long keystroke.

Table 8: General settings

Startup time
This time defines when the unit "boots up" after a restart (reset, reprogramming, bus voltage recovery). This can be important if - example 1 - a bus reset is carried out. If there are many units on a line, all units would start at the same time and load the bus. With a variable time, the units can thus start differently.
Example 2: If Time/Date, values for changeover or Day/Night object are queried, it makes sense that the units responsible for them start up first, this unit only a little later. This ensures that all values are available and correct.

„Operation“
"In operation" is used to show on the bus that the unit is "alive". If activated, an ON telegram is sent cyclically.

Value for Day/Night:
Here the polarity for day/night is defined. Regardless of this polarity, the device always starts in day mode after reprogramming.

Language
The language for the display and the diagnostic text is set here.

Important: As of 05/2022: The diagnosis text is only displayed in German (setting: German) or English (setting: English, French, Spanish).

The table shows the general communications objects:

Number	Name/Function	Length	Usage
87	Operation	1 Bit	Sending a cyclic "In operation" telegram
88	Day/Night	1 Bit	Receiving the status for Day/Night
90	Button activation	1 Bit	Sending a 1 when a button is pressed, e.g. for switching on an orientation light
93	Time	3 Byte	Receiving the time
94	Date	3 Byte	Receiving the date
95	Time / Date	8 Byte	Receiving time and date via a common combination object

Table 9: General communication objects

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.2 Display settings

4.2.1 Representation

The following settings can be used to adjust the display:

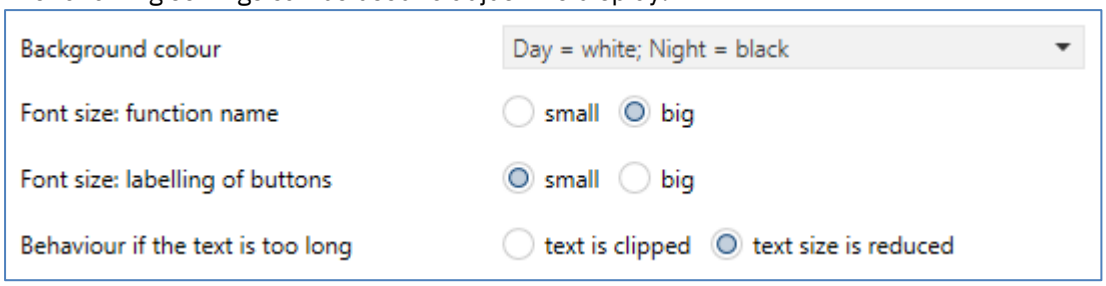


Figure 4: Display settings – Representation

The following table shows the possible settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Background colour	▪ Day = black; Night = black ▪ **Day = white; Night = black** ▪ Day = black; Night = white ▪ Day = white; Night = white	Sets the background colour of the display
Font size: function name	▪ small ▪ **big**	Setting the font size for the function name.
Font size: labelling of buttons	▪ **small** ▪ big	Setting the font size for the button labelling.
Behaviour if the text is too long	▪ text is clipped ▪ **text size is reduced**	Setting the behaviour when the text cannot be displayed completely.

Table 10: Display settings – Representation

4.2.2 Adaption to ambience

The following settings can be used to adjust the representation in the display:

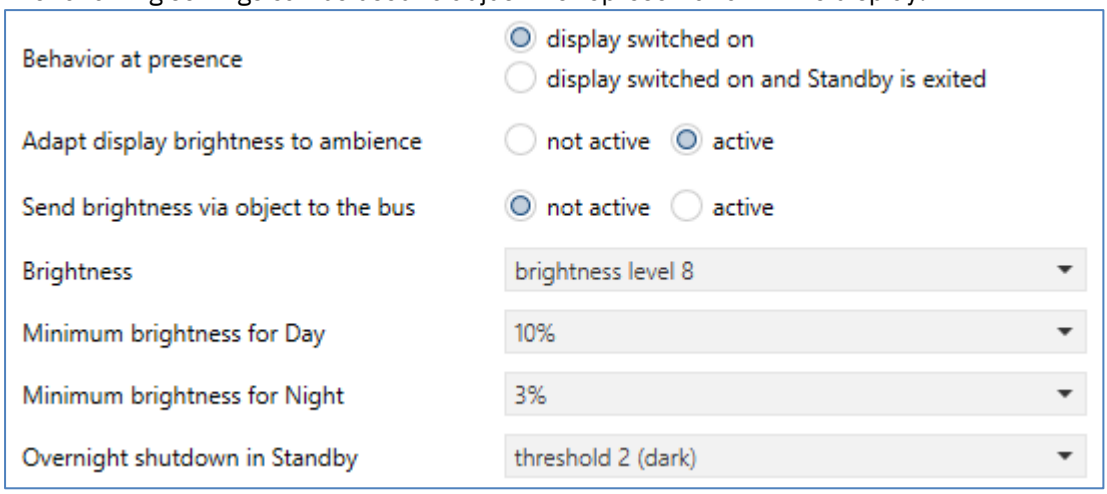


Figure 5: Display settings – Adaption to ambience

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The following table shows the possible settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Behaviour at presence	▪ **Display is switched on** ▪ Display is switched on and Standby is exited	Setting the behaviour for a "1" telegram to the presence object.
Adapt display brightness to ambience	▪ not active ▪ **active**	Setting whether the brightness is dynamically adapted to the ambience.
Adapt display brightness to ambience**: not active**		
	Brightness can be received via object 91 to synchronize multiple displays.	Fixed text. For details see description below*.
Brightness at Day	0 – 100% **[100%]**	Setting a fixed brightness value in Day mode.
Brightness at Night	0 – 100% **[50%]**	Setting a fixed brightness value in Night mode.
Adapt display brightness to ambience**: active**		
Send brightness via object to the bus	▪ **not active** ▪ active	Setting whether the current display brightness is sent.
Brightness	Brightness level 1 – 10 **[Brightness level 8]**	Setting the basic brightness of the display.
Minimum Brightness for Day	1 – 100 % **[10 %]**	Setting of the brightness that cannot be undercut during dimming in “Day” operation.
Minimum Brightness for Night	1 – 100 % **[3 %]**	Setting of the brightness that cannot be undercut during dimming in “Night” mode.
Valid for both settings:		
Overnight shutdown in Standby	▪ not active ▪ Threshold 1 (moderately dark) ▪ **Threshold 2 (dark)** ▪ Threshold 3 (very dark)	Setting of the display behaviour for the Night shut-off in Standby mode.

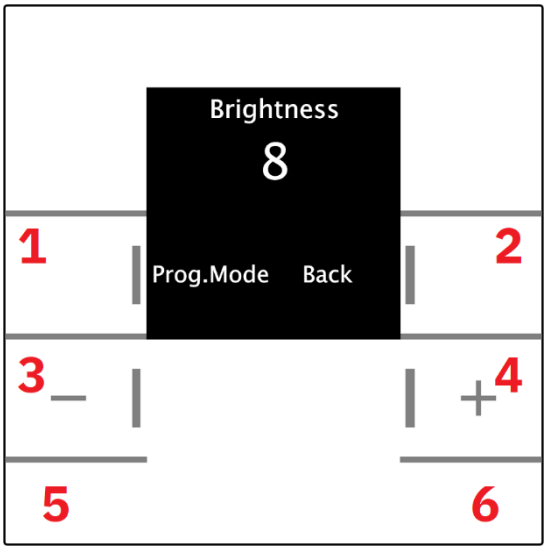
Table 11: Display settings – Adaption to ambience

With the parameter "**Behaviour at presence**" it is possible to switch on the display via an object, for example, by sending a "1" when motion is detected via a presence/motion detector. It is possible to select whether the display is only switched on or whether the Standby mode is also exited at the same time.

Principle of brightness adjustment:
The Glass Room Temperature Controller Smart has an internal brightness sensor and can dynamically adjust the display brightness to the environment. The "Brightness" parameter influences the dimming behaviour and the threshold from which the display is dimmed. The parameter for the minimum brightness defines the absolute lowest threshold up to which the display is dimmed.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

In the programmed state, the menu for setting the brightness can be called up by simultaneously actuating the sensor areas 5 and 6. The brightness is set by actuating the sensor areas 3 (-) or 4 (+):



In this menu, the end user can adjust the brightness settings independently (without ETS). The settings made are permanently stored in the unit until the next time the database is transferred.

If the parameter "**Adapt display brightness to ambience**" is set to "**active**", the following settings are available:
If the parameter "**Send brightness via object to the bus**" is activated, the current brightness value can be sent via object 91. This allows, for example, the brightness to be synchronised with other devices.
Brightness: Defines the basic brightness of the display and influences the dimming behaviour of the display according to the measured value for the ambient brightness.
Minimum brightness: Defines the brightness that the display has in any case. This brightness can be set separately for "Day" mode and for "Night" mode.

***** If the parameter "**Adapt display brightness to ambience**" is set to "**not active**", the following settings are available:
Brightness at Day/Night: Defines the absolute, fixed brightness of the display in "Day" mode or in "Night" mode.
In addition, the **brightness** can be controlled via the bus here. In this case, a brightness value is received via object 91, with which, for example, the brightness is synchronised with other devices.
Application example: Several units are installed in the building. One unit serves as the "master" and sends its current brightness value to the bus. The other devices behave like "slaves" and receive this brightness value.

The table shows the general communication objects:

Number	Name/Function	Length	Usage
89	Presence – Input	1 Bit	Input for presence active, e.g. from a presence detector
88	Display – Brightness	1 Byte	Receiving/sending the brightness for the display

Table 12: Communication objects – Adaption to ambience

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.2.3 Representation of the controller

The following settings for the representation of the controller are available:

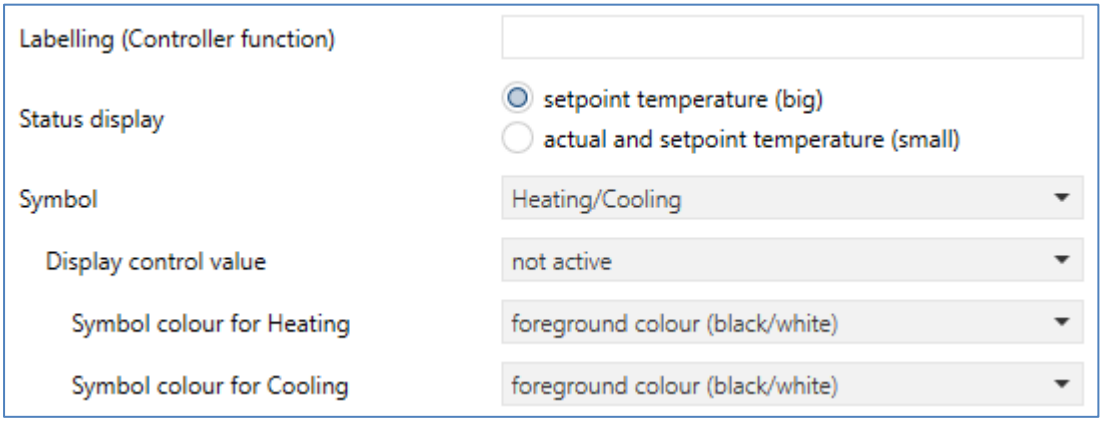


Figure 6: Display settings – Representation of the controller

The following table shows the possible settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Labelling	Free input [up to 15 bytes allowed]	Enter a text to describe the controller.
Status display	▪ **setpoint temperature (big)** ▪ actual and setpoint temperature (small)g	Defines how the status of the controller is to be shown in the display.
Symbol	▪ **Heating/Cooling** ▪ HVAC-Mode ▪ not active	Determines how the setpoint temperature is to be displayed.
Symbol: **Heating/Cooling**		
Display control value	▪ **not active** ▪ via bar ▪ via symbol colour	Setting for how the control value is to be shown in the display.
Symbol colour for Heating/Cooling	any colour **[according to selection]**	Setting the colour with which the symbols are displayed.
Symbol colour for control value = 0% (Heating)/(Cooling) > 0% (Heating)/(Cooling)	any colour **[according to selection]**	Setting of the colour with which the symbols are displayed. **Only for "Display control value" via "Colour of symbol".**
Symbol: **HVAC-Mode**		
Display control value	▪ **not active** ▪ via bar	Setting for how the control value is to be shown in the display.
Symbol for Eco/Night mode	▪ **Eco symbol** ▪ Night symbol	Setting the symbol for the operating mode.
Symbol colour for Comfort/Standby/Eco/Night/ Frost/Heat protection	any colour **[according to selection]**	Setting the colour with which the symbols are displayed.
Symbol: **not active**		
Display control value	▪ **not active** ▪ via bar	Setting for how the control value is to be shown in the display.

Table 13: Display settings – Representation of the controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

In the upper half of the display, there are different ways to show the controller function.

A text describing the controller, for example, can be entered in the "**Labelling (control function)**" field.

Status display
Here you determine whether only the current setpoint (in large letters) or the setpoint and actual value (in small letters) are to be displayed.

Symbol
With this selection, either the "Heating/Cooling" operation or a "HVAC" operation mode can be displayed. All symbols can also be individually set in colour.

Display control value
When activated, the current setting value can be displayed here via a bar symbol. This is a purely visual display, not a numerical value. On the other hand, the control value can be shown via the colour of the "Heating" or "Cooling" symbol.

Symbol für Eco/Night mode
According to the KNX specification, this is the same operating mode. It is defined here which symbol is displayed for this operating mode. According to the selection, the displayed text for "Symbol colour for Eco" or "Symbol colour for Night" changes in the parameters below.

4.2.4 User-defined colours

Up to 3 user-defined colours can be mixed:

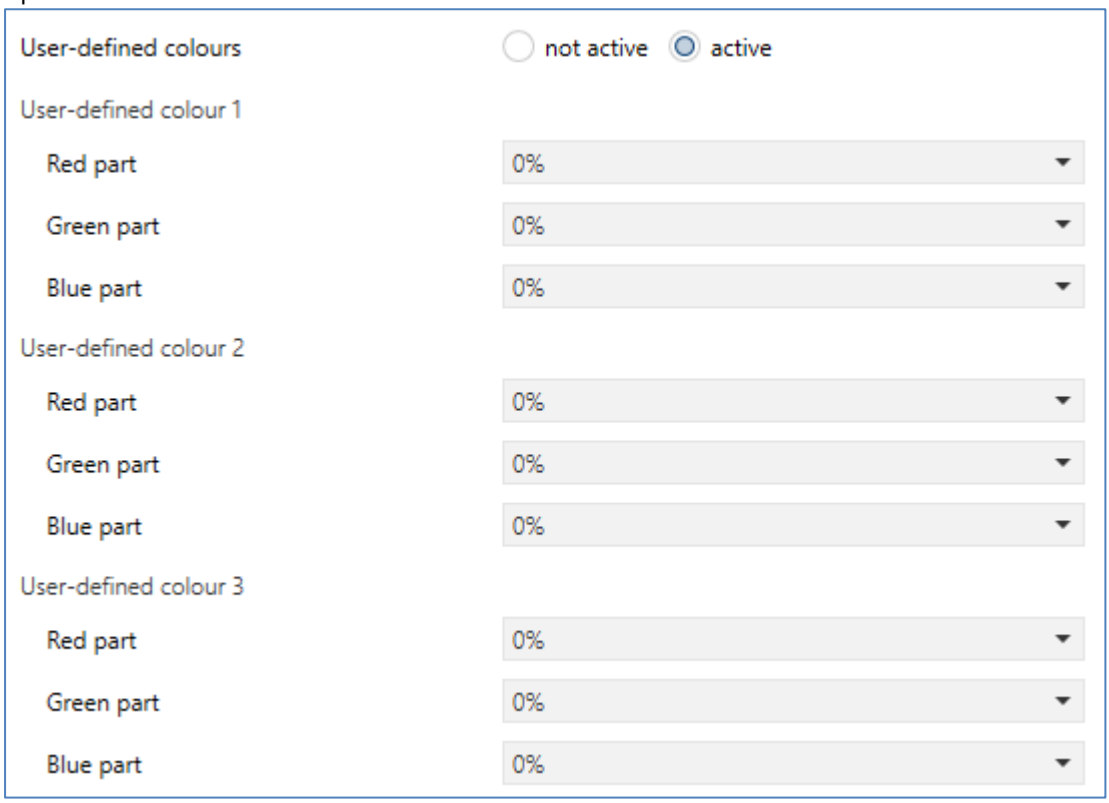


Figure 7: Display settings – User-defined colours

The user-defined colours can be mixed with the corresponding red / green / blue share and then be used for the display of the symbols.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.3 Info display

4.3.1 Representation in Standby

The following picture shows the basic settings for the display:

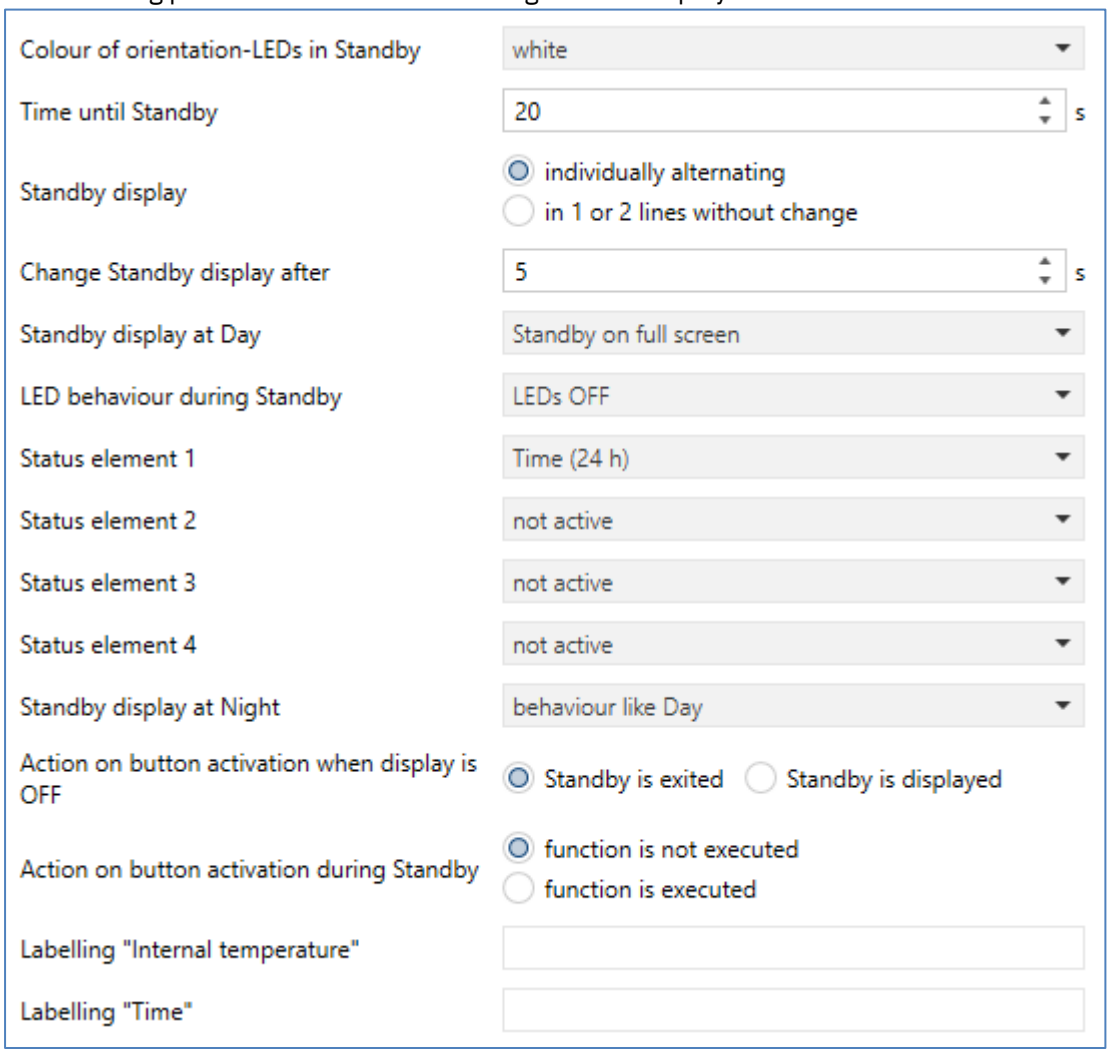


Figure 8: Settings – Info display: Representation in Standby

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Colour of orientation LEDs in standby	Any colour **[White]**	Setting the LED colour when used as an orientation display.
Time until standby	1 ... 60 s **[20 s]**	Sets the time between the last touch of a button and switching to “Standby” mode.
Standby display	▪ **Individually alternating** ▪ In 1 or 2 lines without change	Setting the display during “Standby”.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Standby display at Day	▪ no Standby ▪ **Standby in upper screen** ▪ Standby on full screen ▪ Display OFF	Setting the display behaviour of the information screen during “Day” mode.
LED behaviour during Standby	▪ **LEDs OFF** ▪ Button-LEDs ▪ Orientation-LEDs	Setting for how the status LEDs should behave during Standby.
Displayed parameters when selecting "**Standby display - individually alternating**".		
Change Standby display after	1 ... 60 s **[5 s]**	Setting the changeover time between the activated status elements.
Status element 1 – 4 *(for Day and Night)*	▪ not active ▪ **Time (24 h)** ▪ Time (12 h AM/PM) ▪ Internal Temperature ▪ Status value 1 - 3 ▪ Status text 1 (via object 82) ▪ Status text 2 (via object 83)	Activation of up to 4 status elements and what they should display. **Selection "not active" only with Status element 2-4!**
Displayed parameters when selecting "**Standby display - In 1 or 2 lines without change ".**		
Line 1 / 2	▪ not active ▪ **one status element** ▪ two status elements (left/right) ▪ two status texts (top/bottom)	Setting how the standby display is represented. **"not active" only for selection with “Line 2”**
Status element	▪ **Time (24 h)** ▪ Time (12 h AM/PM) ▪ Internal Temperature ▪ Status value 1 - 3 ▪ Status text 1 (via object 82) ▪ Status text 2 (via object 83)	Setting of what is to be displayed as a status element. **If "one status element" is selected.**
Status element left/right	▪ **Time (24 h)** ▪ Time (12 h AM/PM) ▪ Internal Temperature ▪ Status value 1 - 3	Setting of what is to be displayed as a status element. **If "two status elements (left/right)" is selected.**
Status element top/bottom	▪ Status text 1 (via object 82) ▪ Status text 2 (via object 83)	Setting of what is to be displayed as a status element. **If "two status texts (top/bottom)" is selected.**
Description „Internal temperature“	Free input [up to 15 bytes allowed]	Enter a text. Appears above the elements in the display.
Description „Time“	Free input [up to 15 bytes allowed]	

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The following parameters are available for both settings:		
Standby display at Night	▪ no Standby ▪ **Standby in upper screen** ▪ Standby on full screen ▪ behaviour like Day ▪ Display OFF	Setting of the display behaviour of the info display during “Night” mode. With the setting "Behaviour like Day", the settings of the “Day” mode are taken over and there are no further settings.
Action on button activation when display is OFF	▪ **Standby is exited** ▪ Standby is displayed	Setting the behaviour when a button is actuated during the display is off (e.g. via presence object).
Action on button activation during Standby	▪ Function is not executed ▪ **Function is executed**	Setting whether the button function is to be executed with the first button actuation while being in Standby.

Table 14: Settings – Info display: Representation in Standby

The menu "**Info display**" defines what is shown in the display while it is in "Standby".
Up to 4 **status elements** can be displayed - either individually in alternation or in 1 or 2 lines without alternation. These can be internal values such as temperature and time, as well as definable status values and texts.
If 'Status value 1-3' is selected, the status values are defined, see 4.3.2 Status value 1-3.
Fixed status texts can be received via objects 82 and 83.

For the values "**Internal temperature**" and "**Time**", additional **labels** can be defined via text fields. If selected as a status element, these appear above the elements in the display.

Important: The parameter "**Colour of the orientation LEDs in Standby**" only has an effect if the setting "Standby display at Day/Night" is active ("in the upper screen or over the entire screen") **and** "LED behaviour in Standby" is set to "Orientation LEDs".

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.3.2 Status value 1-3

The following settings are available:

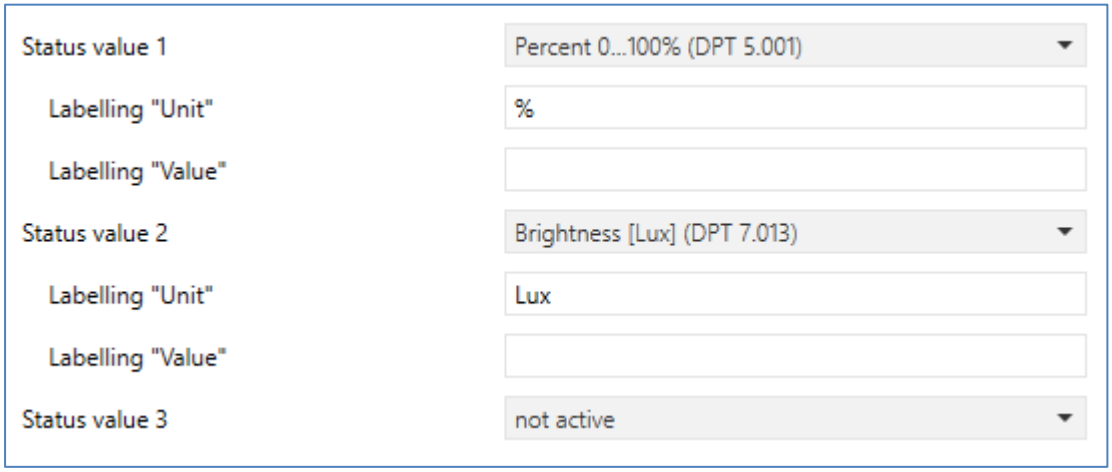


Figure 9: Settings – Info display: Status values 1-3

The following table shows the possible settings:

ETS-Text	Dynamic range **[Default value]**	Comment
State values 1 - 3	▪ **not active** ▪ On/Off (DPT 1.001) ▪ Percent 0...100% (DPT 5.001) ▪ Value 0...255 (DPT 5.005) ▪ Current (mA) (DPT 7.012) ▪ Brightness (Lux) (DPT 7.013) ▪ Temperature (°C) (DPT 9.001) ▪ Brightness (Lux) (DPT 9.004) ▪ Wind speed (m/s) (DPT 9.005) ▪ Humidity (%) (DPT 9.007) ▪ Air quality (ppm) (DPT 9.008) ▪ Current (mA) (DPT 9.021)	Setting the DPT to be displayed as status value.
Labelling “Unit”	any text [up to 5 bytes allowed]	Enter the text describing the unit.
Labelling “Value”	any text [up to 15 bytes allowed]	Enter the text describing the measurement.

Table 15: Settings – Info display: Status values 1-3

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
82	Status text 1	14 Byte	Receiving a status text
83	Status text 2	14 Byte	Receiving a status text
84	Status value 1		Receiving a status value. DPT according to parameter setting
85	Status value 2		Receiving a status value. DPT according to parameter setting
86	Status value 3		Receiving a status value. DPT according to parameter setting

Table 16: Communication objects – Info display: Status values 1-3

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4 Temperature/Ventilation

4.4.1 Temperature measurement

The following picture shows the menu for temperature measurement:

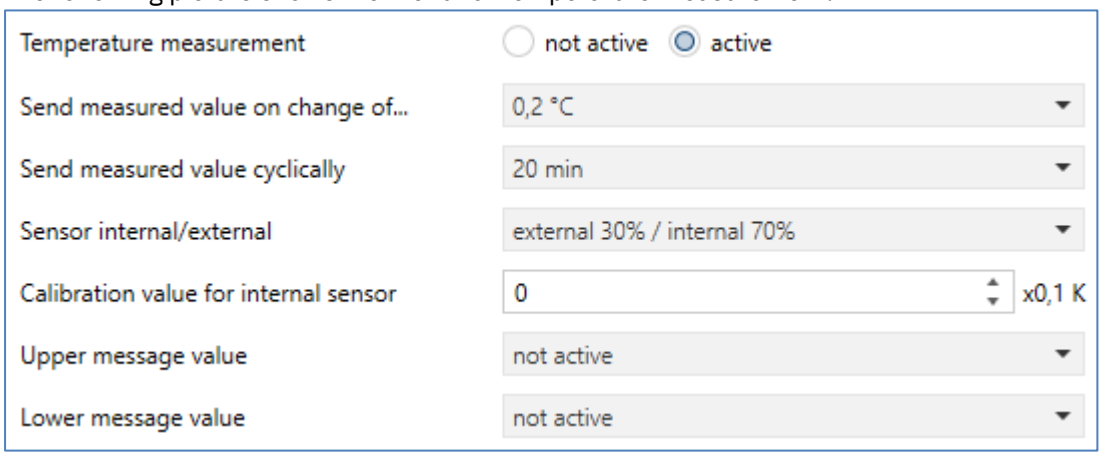


Figure 10: Settings – Temperature measurement

The table shows the possible settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Temperature measurement	▪ **not active** ▪ active	Activation/deactivation of the temperature measurement.
Send measured value on change of...	not active 0,1 °C – 5,0 °C **[0,2 °C]**	Setting at which change the measured value should be sent.
Send measured value cyclically	not active 1 – 60 min **[20 min]**	Cyclic sending of the measured value.
Sensor internal/external	▪ **100% internal** ▪ 90% internal/ 10% external ▪ 80% internal/ 20% external ▪ ... ▪ 100% external	Setting the weighting between internal and external sensor.
Calibration value for internal sensor	-50 ... 50 K x0,1 K **[0 K]**	Adjustment for internal sensor.
Upper message value	**not active** 20 – 45 °C	Setting range of the upper/lower message value.
Lower message value	**not active** 3 – 30 °C	

Table 17: Settings – Temperature measurement

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The setting "**Send measured value on change of...**" can be used to set the change on which the sensor sends its current temperature value. If set to "not active", the sensor does not send a value, regardless of the size of the change.

The setting "**Send measured value cyclically**" can be used to set the intervals at which the sensor sends its current temperature value. The cyclical transmission function can be activated or deactivated independently of the setting "Send measured value on change". Measured values are also sent if the sensor has not detected a change. If both parameters are deactivated, a value is never sent.

An external sensor can be activated or deactivated via the weighting "**Sensor internal/external**". If the weighting is set to 100% internal, no external sensor is activated, and no communication objects appear for the external sensor. With any other weighting, an external sensor is activated, and the associated communication objects are also displayed. The "External temperature sensor" object receives the temperature currently measured by the sensor. The "mixed" temperature is shown in the display, and this measured temperature value is transmitted via object 58.
Example:
Weighting: 50% internal / 50% external, internal sensor 25°C, external temperature 15°C
=> sent temperature value 20°C.

Important: The external sensor is monitored with a time of 30 minutes. If no new value is received within this time, only the internal sensor is used!

A correction value can be set via the parameter "**Calibration value for internal sensor**". This is used to increase/decrease the actual measured value. The setting range is from -5 to 5 K, i.e. the measured value can be lowered by up to -5 Kelvin and raised by up to a maximum of 5 Kelvin. For example, if a value of 2 is set, the measured temperature value is raised by 2 Kelvin. This setting makes sense if the sensor was installed in an unfavourable location, such as above a radiator or in a draught area. The temperature sensor sends the corrected temperature value when this function is activated.
Important: After initial installation or programming, the measured values are stable after about 30 minutes.

Two signalling objects can be activated with the parameters "**Upper/Lower message value**". One is the function for the upper message value, the other for the lower response value. The two message functions each have a separate communication object.
Principle:
If the maximum value is exceeded, a "1" is transmitted. If the value falls below it, a "0" is transmitted.
If the value falls below the minimum value, a "1" is transmitted. If it is exceeded, a "0" is transmitted.

The corresponding communication objects are shown in the table:

Number	Name/Function	Length	Usage
58	Temperature – Send measured value	2 Byte	Sends the current temperature.
59	Temperature – External sensor input	2 Byte	Receives the temperature of the external sensor.
60	Temperature – Maximum value exceeded	1 Bit	Sends a message if the upper message value is exceeded.
61	Temperature – Minimum value fallen below	1 Bit	Sends a message when the value falls below the lower message value.

Table 18: Communication object – Temperature measurement

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2 Temperature Controller

The Glass Room Temperature Controller Smart can be used both as a controller and as an extension unit. Settings as a controller are as follows:

Figure 11: Settings – Use device as controller

Important: The following describes the use as a "controller". The use as "extension unit" is described in chapter 4.4.3 Extension unit.

The table shows the setting options for the controller type:

ETS-Text	Dynamic range **[Default value]**	Comment
Operating mode	▪ not active ▪ **Heating** ▪ Cooling ▪ Heating and Cooling	Setting the control mode. The further parameterization possibilities depend on the set control mode

Table 19: Setting – Operating mode

If the setting "not active" is set for operating mode, the controller is deactivated and there are no further configuration options for the controller. As soon as the controller has been assigned a specific function, “Heating”, “Cooling” or “Heating & Cooling”, depending on the application, further settings can be made, and the "Controller parameters" menu also appears on the left-hand side.

The task of the control system is to adjust the actual temperature as close as possible to the specified setpoint. To realize this, several setting options are available to the user. The controller can influence the control value via 3 different control modes (PI control, 2-point control, PWM control). In addition, an additional stage can be assigned to the controller.

In addition, the controller has 4 different operating modes (Frost/Heat protection, Night, Comfort, Standby) for differentiated control of various requirement ranges.
Further functions of the controller are the manual setpoint adjustment, the dynamic setpoint adjustment considering the measured outdoor temperature, the setpoint specification via independent setpoints (as absolute values) as well as the operating mode selection after reset and integration of blocking objects.

The picture on the following page shows the setting options (here for operating mode "Heating"):

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

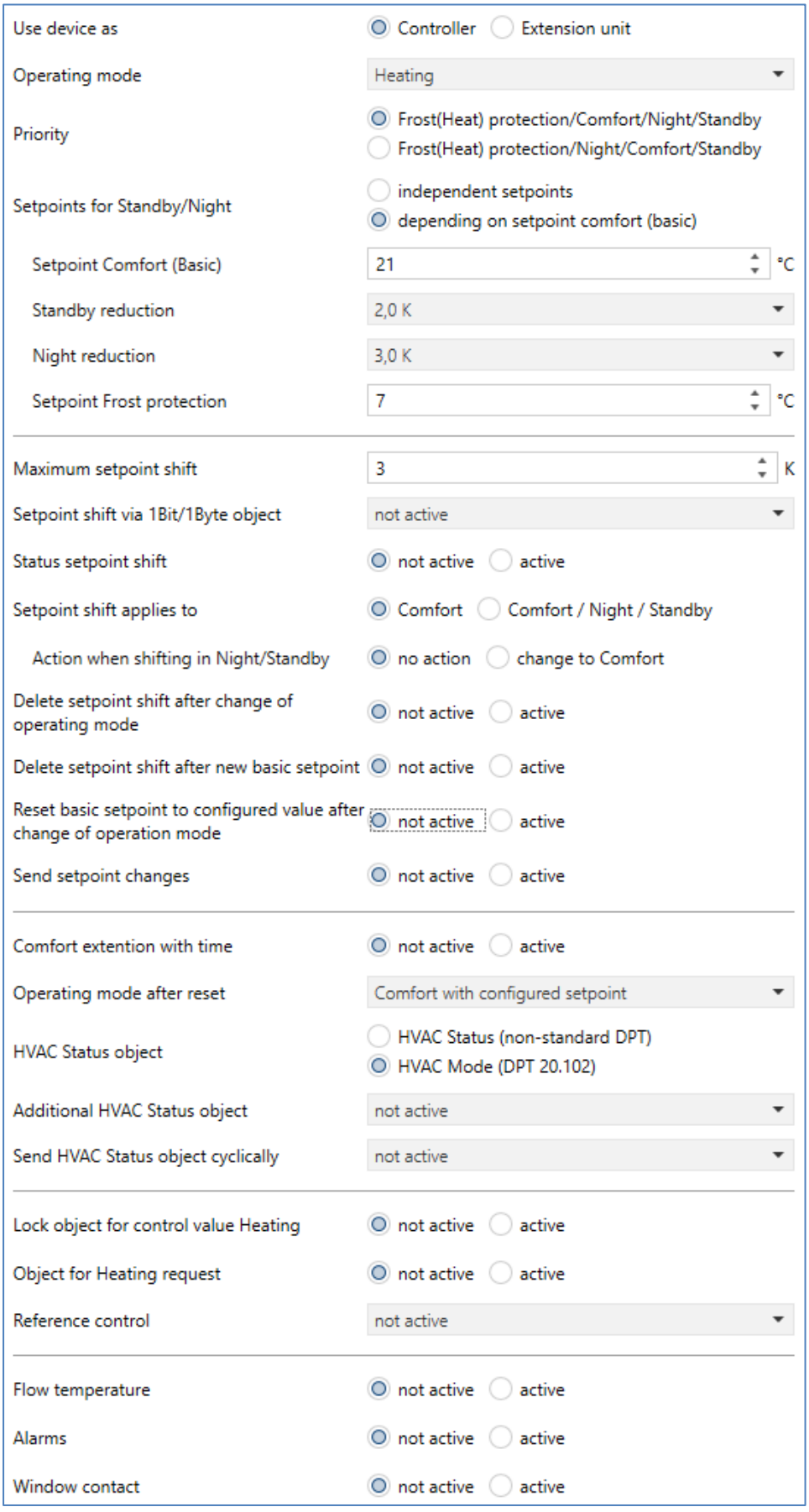


Figure 12: Settings – Temperature Controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.1 Setpoints, Operating Modes & Priorities

As a basis, it must be determined in advance how the setpoints are specified:

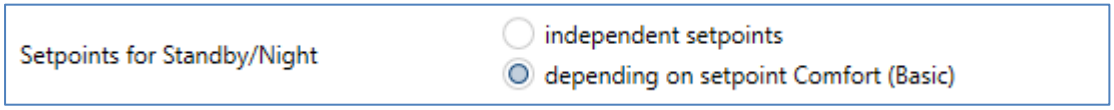


Figure 13: Settings – Setpoints for Standby/Night

The two options are described in detail in the next two chapters.

4.4.2.1.1 Dependent on comfort setpoint (basic)

With the setting "dependent on comfort setpoint (basis)", the operating modes Standby and Night are always relative to the basic comfort setpoint. If this changes due to a setpoint specification, the values for Standby and Night also change. Therefore, the values for decrease and increase are given as a temperature difference in "K" (Kelvin). Frost/Heat protection does not change here and always remains at the parameterized value.

The following table shows the individual operating modes and their setting ranges:

ETS-Text	Dynamic range **[Default value]**	Comment
Setpoint Comfort (Basic)	7 ... 35 °C **[21 °C]**	**The basic Comfort value is the reference point of the control**.
Standby reduction/increase	0 K – 10,0 K **[2,0 K]**	Reduction (for "Heating") or increase (for "Cooling") of the temperature when the operating mode Standby is selected. Is indicated relative to the basic comfort value.
Night reduction/increase	0 K – 10,0 K **[3,0 K]**	Reduction (for " Heating") or increase (for "Cooling") of the temperature when the Night operating mode is selected. Is indicated relative to the basic comfort value.
Setpoint Frost protection	3 ... 12 °C **[7 °C]**	Setpoint of the Frost protection mode is set as absolute value. **Visible when "Heating" is active.**
Setpoint Heat protection	24 ... 40 °C **[35 °C]**	Setpoint of the Heat protection operating mode is set as absolute value. **Visible when "Cooling" is active.**
Dead zone between Heating and Cooling	1 K – 10,0 K **[2,0 K]**	Setting range for the dead zone (range in which the controller activates neither the heating nor the cooling process). **Visible when "Heating and Cooling" is active.**

Table 20: Settings – Operating modes and Setpoints (depending on Comfort setpoint)

A new setpoint is specified via object 1 "(Basic) Comfort setpoint".
In addition, there is a general object for the setpoint specification, the object "0 - Setpoint setting". If a value is sent via this, it also changes the basic Comfort value. The special feature is that a setpoint setting automatically switches to the "Comfort" operating mode. This applies to a setpoint in "Standby" or "Night" mode.

Important: A setpoint setting is ignored in the "Frost-" or "Heat protection" operating mode! Background: Some visualisations send fixed values in "Comfort" and need this value to be reported back. This is only possible for the controller if it is also in "Comfort" mode.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Comfort mode
"Comfort" mode is the controller's reference mode. The values in the "Night" and "Standby" operating modes are based on this. The "Comfort" operation mode should be activated when the room is used. The basic comfort value is parameterised as the setpoint.
If the controller mode is set to "Heating & Cooling", the basic Comfort value applies for the heating process. In "Cooling" mode, the value of the dead zone between "Heating" and "Cooling" is added.

The communication object for this operating mode is shown in the following table:

Number	Name/Function	Length	Usage
17	Comfort mode – Switch mode	1 Bit	Activating the Comfort operating mode.

Table 21: Communication object – Comfort mode

Night mode
The "Night" operating mode should cause a significant temperature reduction/increase, e.g. at night or on weekends. The value can be freely parameterised and refers to the basic comfort value. So, if a 5K reduction has been parameterised and a basic Comfort value of 21°C has been set, the setpoint for "Night" operation mode is 16°C. In "Cooling" mode, there is a respective increase in the value.

The communication object for this operation mode is shown in the following table:

Number	Name/Function	Length	Usage
18	Night mode – Switch mode	1 Bit	Activating the Night operating mode.

Table 22: Communication object – Night mode

Standby mode
The "Standby" mode is used when nobody is using the room. It should cause a slight reduction/increase in the temperature. This value should be set considerably lower than that of the "Night" operating mode to enable the room to heat up/cool down more quickly.
The value is freely configurable and refers to the basic Comfort value. So, if a setback of 2K has been parameterised and a basic Comfort value of 21°C has been set, the setpoint for "Standby" operation mode is 19°C. In "Cooling" mode there is a corresponding increase in the value.
The "Standby" operating mode is then activated as soon as all other operating modes are deactivated. This operation mode therefore also has no communication object.

Frost-/Heat protection mode
The "Frost protection" operating mode is activated as soon as the controller has been assigned the "Heating" function. The "Heat protection" operating mode is activated as soon as the controller has been assigned the "Cooling" function. If the controller is assigned the "Heating & Cooling" function, a combined operating mode called "Frost/Heat protection" is activated.
The "Frost/Heat protection" operating mode automatically switches on "Heating" or "Cooling" when the temperature falls below or exceeds the parameterised temperature. The temperature is parameterised here as an absolute value. If, for example, the temperature must not fall below a certain value during a longer absence, the "Frost protection" mode should be activated.

The communication object for this operation mode is shown in the following table:

Number	Name/Function	Length	Usage
19	Frost protection mode – Switch mode	1 Bit	Activates the Frost protection mode
19	Heat protection mode – Switch mode	1 Bit	Activates the Heat protection mode
19	Frost-/Heat protection mode – Switch mode	1 Bit	Activates the Frost/heat protection mode

Table 23: Communication objects – Frost/Heat protection

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Dead zone

If the control mode is set to "Heating and Cooling", the following parameter is displayed:

ETS-Text	Dynamic range **[Default value]**	Comment
Dead zone between Heating and Cooling	1,0 K – 10,0 K **[2,0 K]**	Setting range for the dead zone (range in which the controller activates neither the heating nor the cooling process):

Table 24: Setting – Dead zone

The settings for the dead zone are only possible if the controller type is set to “Heating and Cooling”. As soon as this setting is made, the dead zone can be parameterised.
The dead zone is the area in which the controller does not activate either the heating or cooling process. Consequently, the controller does not send any value to the control value in the dead zone and therefore the control value remains switched-off. When setting the dead zone, please note that a low value leads to frequent switching between heating and cooling, whereas a high value leads to a large fluctuation of the actual room temperature.
If the controller is set to “Heating and Cooling”, the basic comfort value always forms the setpoint for the heating process. **The setpoint for cooling is calculated by adding the base comfort value and the dead zone**. So, if the base comfort value is set to 21°C and the dead zone to 3K, the setpoint for the heating process is 21°C and the setpoint for the cooling process is 24°C.
The dependent setpoints for “Heating and Cooling”, i.e. those for the “Standby” and “Night” operating modes, can again be parameterised independently of each other in the controller mode “Heating and Cooling”. The setpoints are then calculated as a function of the basic Comfort value, the setpoint for the “Comfort” operating mode, for the heating and cooling process.
The setpoints for “Heat”- and “Frost protection” are independent of the settings for the dead zone and the other setpoints.

The following diagram shows again the relationship between dead zone and the setpoints for the individual operating modes:
The following settings were selected for this example:
Basic comfort value: 21°C. Dead zone between heating and cooling: 3K
Increase and reduction Standby: 2K. Increase and reduction Night: 4K

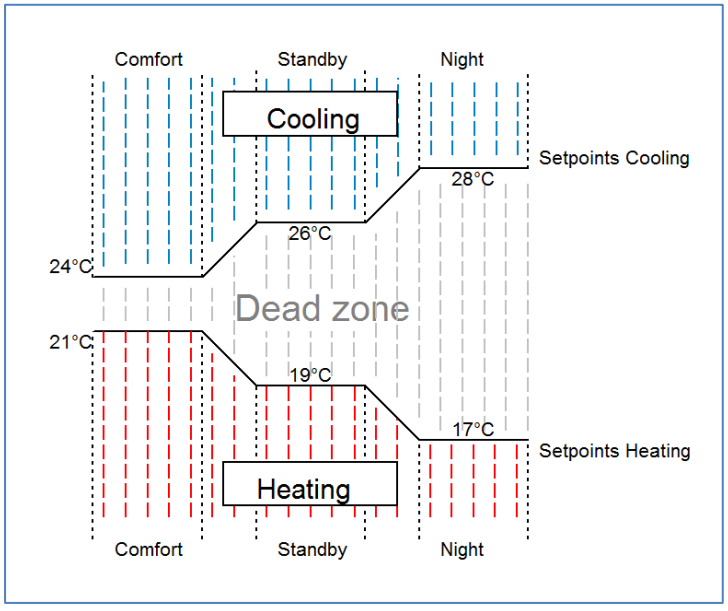


Figure 14: Example – Dead zone and corresponding setpoints

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.1.2 Independent setpoints

With the "Independent setpoints" setting it is possible to specify the values for “Comfort”, “Night”, “Standby” and “Frost” (when in Heating mode) or “Heat protection” (in Cooling mode) independently of each other as absolute values in "°C". This means that there is no longer a reference to the Comfort setpoint.

The following table shows the corresponding settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Setpoint Heating/Cooling: Setpoint Comfort (Basic)	7 ... 35 °C **[21 °C]** **[23 °C]**	Adjustable setpoints for the operating mode described in each case. [Default values in each case Heating (top) and Cooling (bottom)]
Setpoint Standby	7 ... 35 °C **[19 °C]** **[24 °C]**	
Setpoint Night	7 ... 35 °C **[18 °C]** **[25 °C]**	
Setpoint Frost protection	3 ... 12 °C **[7 °C]**	Setpoint for Frost protection mode. **Visible when "Heating" is active.**
Setpoint Heat protection	24 ... 40 °C **[35 °C]**	Setpoint of the Heat Protection mode. **Visible when "Cooling" is active.**
Separate objects for setpoints Comfort/Standby/Night/ Frost protection/Heat protection	▪ **not active** ▪ active, single objects ▪ active, combination object (DPT 275.100)	Setting of how the setpoint value is to be specified. **Single objects are only possible for the "Heating" or "Cooling" mode!**

Table 25: Settings – Operating modes and Setpoints (independent setpoints)

Functional description:
The values for each operating mode are defined by the configuration in the ETS.
Now a new setpoint can be specified for each operating mode without affecting any other operating mode.
The setting can be done via single objects (only “Heating” or only “Cooling”) for each operating mode or as 8-byte combination object (Heating, Cooling, Heating and Cooling).
In addition, there is a general object for the setpoint setting. The setpoint that is currently active is changed via the general communication object "0 - Setpoint setting" (except for Frost/Heat protection!).

Sent values are always reported back in the same way. There is no longer a difference when switching between “Heating” and “Cooling” (no shift due to dead zone) or reduction/increase between the operating modes.

Description of the operating modes, see 4.4.2.1.1 Dependent on comfort setpoint (basic)

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
0	Setpoint setting	2 Byte	General object for setpoint setting
1	Comfort	2 Byte	Setpoint setting in comfort mode
1	Combination object	8 Byte	Setpoint setting via combined object. **Visible when "Heating" or "Cooling"**
1	Combination object (Heating)	8 Byte	Setpoint setting via combined object. **Visible when "Heating and Cooling"**
2	Standby	2 Byte	Setpoint setting in Standby Mode
3	Night	2 Byte	Setpoint setting in Night Mode
4	Frost protection	2 Byte	Setpoint setting in Frost protection mode.
4	Heat protection	2 Byte	Setpoint setting in Heat protection mode
5	Combination object (Cooling)	8 Byte	Setpoint setting via combined object. **Visible when "Heating and Cooling "**

Table 26: Communication objects – Setpoint setting (independent setpoints)

4.4.2.1.3 Priority of the operating modes

The following table shows the possible settings for this parameter:

ETS-Text	Dynamic range **[Default value]**	Comment
Priority	▪ **Frost(Heat) protection/Comfort/Night/Standby** ▪ Frost(Heat) protection/Night/Comfort/Standby	Setting the priority order of the operating modes.

Table 27: Setting – Priority of the operating modes

The priority setting of the operating modes can be used to determine which operating mode is switched on with priority if several operating modes are selected. If, for example, comfort and night are switched on at the same time in the Frost/Comfort/Night/Standby priority, the controller remains in comfort mode until it is switched off. Then the controller automatically switches to night mode.

4.4.2.2 Operating mode switchover (Mode selection)

There are 2 possibilities for operating mode switchover: On the one hand, the operating mode can be controlled via the associated 1-bit communications objects and on the other hand, the operating mode can be controlled via a 1-byte object.
The selection of operating modes via 1 bit is done by direct control of the individual communication object. Considering the set priority, the operating mode controlled via its communication object is switched on or off. To switch the controller from an operation mode with higher priority to one with lower priority, the previous operation mode first must be deactivated with a logical "0". If all operation modes are switched off, the controller switches to "Standby" mode.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Example (set priority: Frost/Comfort/Night/Standby):

Operating mode				Set operating mode
Comfort	Night	Frost/Heat protection		
1	0	0		Comfort
0	1	0		Night
0	0	1		Frost/Heat protection
0	0	0		Standby
1	0	1		Frost/Heat protection
1	1	0		Comfort

Table 28: Example – Mode selection via 1 Bit

The mode selection via 1 byte is done via only one object, the DPT HVAC Mode 20.102 according to the KNX specification. For mode selection, a hex value is sent to the " mode selection" object. The object evaluates the received hex value and thus switches the associated operating mode on and the previously active operating mode off. If all operating modes are switched off (hex value = 0), the “Standby” operating mode is switched on.

The hex values for the individual operating modes can be taken from the following table:

Mode selection (HVAC Mode)	Hex-Value
Comfort	0x01
Standby	0x02
Night	0x03
Frost/Heat protection	0x04

Table 29: Hex values of HVAC Modes

The following example illustrates how the controller processes received hex values and thus switches operating modes on or off. The table is based on each other from top to bottom.

Example (set priority: Frost/Comfort/Night/Standby):

Received Hex value		Processing		Set operating mode
0x01		Comfort = 1		Comfort
0x03		Comfort = 0 Night = 1		Night
0x02		Night = 0 Standby = 1		Standby
0x04		Standby = 0 Frost/Heat protection = 1		Frost/Heat protection

Table 30: Example – Mode selection via 1 Byte

The controller always reacts to the last value sent. If, for example, an operating mode was last selected via a 1-bit command, the controller reacts to the switchover via 1 bit. If a hex value was last sent via the 1-byte object, the controller reacts to the switchover via 1 byte.

Important: There is no priority between switching over 1bit and 1byte!

The communication objects for the operating mode switchover are as follows:

Number	Name/Function	Length	Usage
15	Mode selection – Select mode	1 Byte	Selection of operating modes
17	Comfort mode – Switch mode	1 Bit	Activating the Comfort mode
18	Night mode – Switch mode	1 Bit	Activating the Night mode
19	Frost/Heat protection mode – Switch mode	1 Bit	Activating the Frost/Heat protection mode

Table 31: Communication objects – Mode selection

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.3 HVAC Status objects

There are several options for visualizing the operating modes.
The following settings are available for the HVAC status objects:

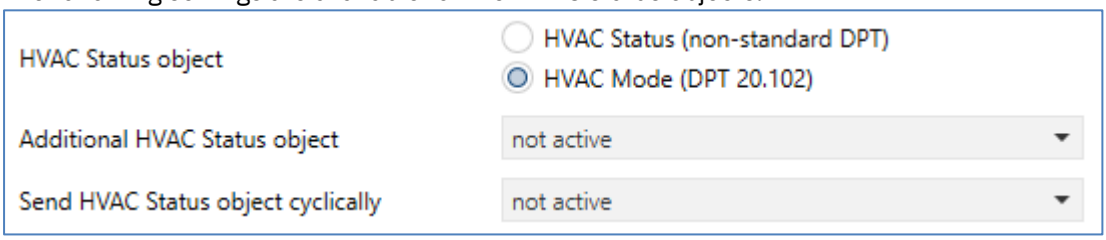


Figure 15: Settings – HVAC Status objects

The following table shows all available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
HVAC-Status object	▪ HVAC Status (non-standard DPT) ▪ **HVAC Mode (DPT 20.102)**	Specify whether the status is to be output as HVAC Status or HVAC Mode.
Additional HVAC Status object	▪ HVAC Status (non-standard DPT) ▪ HVAC Mode (DPT 20.102) ▪ RHCC Status (DPT 22.101) ▪ RTC combined status (DPT 22.103) ▪ RTSM combined status (DPT 22.107) ▪ **not active**	Setting an additional HVAC status object.
Send HVAC Status object cyclically	**not active** 5 min – 4 h	Setting whether and at what intervals the object is to be sent cyclically.

Table 32: Settings – HVAC status objects

The **HVAC Status (non-standard DPT)** according to the KNX specification sends the corresponding hex value for the currently set operating mode. If several statements apply, the hex values are added, and the status symbol then outputs the added hex value. The hex values can then be read out by a visualization.

The following table shows the hex values associated with the individual messages:

Bit	DPT HVAC Status		Hex-value
0	Comfort	1=Comfort	0x01
1	Standby	1=Standby	0x02
2	Night	1=Night	0x04
3	Frost/Heat protection	1= Frost/Heat protection	0x08
4			
5	Heating/Cooling	0=Cooling/1=Heating	0x20
6			
7	Frost alarm	1=Frost alarm	0x80

Table 33: Assignment – DPT HVAC Status

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The object is used exclusively for status/diagnostic purposes. Furthermore, it is well suited for visualization purposes. To visualize the object, it is easiest to evaluate the object bit by bit.
The object outputs the following values, for example:
0x21 = Controller in Heating mode with Comfort mode activated
0x01 = Controller in Cooling mode with Comfort mode activated
0x24 = Controller in Heating mode with Night mode activated

The **RHCC Status (DPT 22.101)** is an additional 2byte status object. It contains additional status messages. Here again, as with the HVAC object, the hex values are added for several messages and the added value is output.

The following table shows the hex values associated with the individual messages:

Bit	DPT RHCC Status		Hex-value
0	Error measuring sensor	1=Error	0x01
7	Heating/Cooling	0=Cooling/1=Heating	0x80
13	Frost alarm	1=Frost alarm	0x2000
14	Heat alarm	1=Heat alarm	0x4000

Table 34: Assignment – DPT RHCC Status

With the RHCC Status, various error messages or basic settings can therefore be displayed or requested.

RTC combined status (DPT 22.103)

This is a combined status according to DPT 22.103.
The assignment is as follows:

Bit	Beschreibung / Description	Codierung / Encoding
0	Allgemeiner Fehler General failure information	0=kein Fehler/no failure 1=Fehler/failure
1	Aktiver Mode Active mode	0=Kühlen/Cool mode 1=Heizen/Heat mode
2	Taupunkt Status Dew point status	0=kein Alarm/no alarm 1=Alarm (RTC gesperrt)/alarm (RTC locked)
3	Frost Alarm Frost Alarm	0=kein Alarm/no alarm 1=Alarm/alarm
4	Hitze Alarm Overheat-Alarm	0=kein Alarm/no alarm 1=Alarm/alarm
6	Zusätzliche Heiz-/Kühlstufe (2. Stufe) Additional heating/cooling stage (2. Stage)	0=Inaktiv/inactive 1=Aktiv/active
7	Heizmodus aktiviert Heating mode enabled	0=Falsch/false 1=Wahr/true
8	Kühlmodus aktiviert Cooling mode enabled	0=Falsch/false 1=Wahr/true

Table 35: Assignment – RTC combined status DPT 22.103

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

RTSM combined status (DPT 22.107)

This is a combined status according to DPT 22.107. The assignment is as follows:

Bit	Beschreibung / Description	Codierung / Encoding
0	Effektiver Wert des Fensterstatus Effective value of the window status	0 = alle Fenster geschlossen/ all windows closed 1 = mindestens ein Fenster geöffnet/ at least one window opened
1	Effektiver Wert des Präsenzstatus Effective value of the presence status	0 = keine Meldung einer Präsenz/ no occupancy from presence detectors 1 = mindestens ein Melder belegt/ occupancy at least from one presence detector
3	Status der Komfortverlängerung Status of comfort prolongation User	0 = Komfortverlängerung nicht aktiv/ comfort prolongation User not active 1 = Komfortverlängerung aktiv/ comfort prolongation User not active

Table 36: Assignment – RTSM combined status DPT 22.107

4.4.2.4 Operating mode after reset

The following table shows all available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Operating mode after reset	▪ **Comfort with configured setpoint** ▪ Standby with configured setpoint ▪ Hold previous state and setpoint	Setting which operating mode or behaviour is to be activated after a bus voltage return.
Operating mode after reprogramming	▪ **Comfort** ▪ Standby	Setting the operating mode after reprogramming. **Only with the setting "Hold previous state and setpoint".**

Table 37: Settings – Operating mode after reset

- **Comfort with configured setpoint**
  After a bus voltage return, the comfort is activated with the setpoint that was specified by the ETS.
- **Standby with configured setpoint**
  After a bus voltage return, the Standby mode is activated with the setpoint that was specified by the ETS (Comfort setpoint minus Standby reduction).
- **Hold previous state and setpoint**
  The temperature controller recalls the setpoint and mode that was set before the bus was switched off. With this selection, the parameter "**Operating mode after reprogramming**" can be used to additionally set which operating mode is active after reprogramming.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.5 Setpoint shift

The following table shows all available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Maximum setpoint shift	0 ... 10 K **[3 K]**	Setting the maximum setpoint shift.
Setpoint shift via 1Bit/1Byte object	▪ **not active** ▪ 1 Bit ▪ 1 Byte	Setting whether setpoint shift is to be activated via 1 bit or 1 byte.
Step width	0,1 K – 1 K **[0,5 K]**	Setting of the step width for the setpoint shift via 1 Bit/1 Byte. **Only visible if setpoint shift via 1 Bit/1 Byte is active**.
Status setpoint shift	▪ **not active** ▪ active	Activation of an object to send the current state of the setpoint shift.
Setpoint shift applies to	▪ **Comfort** ▪ Comfort/Night/Standby	Validity range of the setpoint shift.
Action when shifting in Night/Standby	▪ **no action** ▪ change to Comfort	Setting whether to switch back to comfort after a shift during Night/Standby. **Only visible if setpoint shift is only active for Comfort**.
Delete setpoint shift after change of operating mode	▪ **not active** ▪ active	Setting whether the current setpoint shift is to be deleted after a change of operating mode or not.
Delete setpoint shift after new basic setpoint	▪ not active ▪ **active**	Setting whether the current setpoint shift should be deleted or not after a new absolute setpoint has been specified. **Only visible when "independent setpoints" is selected.**
Delete setpoint shift after new basic setpoint	▪ not active ▪ **active**	Setting whether the current setpoint shift should be deleted or not after a new basic setpoint has been specified. **Only visible if "dependent on comfort setpoint (basic)" is selected.**
Reset basic setpoint to configured value after operation mode change	▪ not active ▪ **active**	Setting whether the base setpoint should be reset to the configured basic setpoint after an operating mode change. **Only visible if "dependent on comfort setpoint (basic)" is selected**.
Send setpoint change	▪ not active ▪ **active**	Setting whether a change of the setpoint value should be sent.
Send current setpoint cyclically	**not active** 5 min – 4 h	Setting whether and at what intervals the object is to be sent cyclically.

Table 38: Settings – Setpoint shift

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Setpoint shift
The basic comfort setpoint is permanently configured via the ETS. This setpoint can be changed in two ways. On the one hand, a new absolute setpoint can be specified for the controller - this is done via the communication object "(Basic) Comfort setpoint" as a 2-byte absolute value. On the other hand, you can manually raise or lower the preset setpoint. This can be done either via the buttons 3/4 on the unit, see chapter 4.5.4 Buttons 3/4, or via the communication objects "manual setpoint shift", either via 1 bit, 1 byte or 2 bytes.
With the setpoint shift, the currently set setpoint is shifted as a temperature difference. The "manual setpoint shift" object is used for this. With the 1-byte / 2-byte object, a positive Kelvin value is sent to the controller to increase the temperature or a negative Kelvin value to decrease it. With the manual setpoint shift via the 1-bit object, only on/off commands are sent, and the controller raises the setpoint by the set increment when it receives a "1" and lowers the setpoint by the set increment when it receives a "0".
The setpoint shift over 2byte is automatically active for the controller, the corresponding communication object 7 is permanently displayed. The shift over 1 bit/1 byte can be activated via parameters.
When the setpoint is shifted, the configured basic comfort value is not changed as a reference value for the other operating modes!

The maximum manual shift of the setpoint can be limited via the "**Maximum setpoint shift**" setting. If, for example, the controller is set to a basic comfort value of 21°C and a max. setpoint shift of 3K, the basic comfort value can only be manually shifted within the limits of 18°C to 24°C.
Activating the "**Status setpoint shift**" creates a further object. This can be used to send the current status of the setpoint shift. This is important for some visualizations for their correct function.
The "**Setpoint shift applies to**" setting can be used to set whether the shift only applies to the comfort mode or whether the setting should also be adopted for the Night and Standby operating modes. The Frost/Heat protection operating modes are in any case independent of the setpoint shift.
The setting "**Delete setpoint shift after change of operating mode**" can be used to set whether the new setpoint should be retained after a change of operating mode or whether the controller should return to the value configured in the ETS software after a change of operating mode.
Delete setpoint shift after new absolute setpoint means that the setpoint shift is always deleted as soon as a new setpoint is assigned via object.
Delete setpoint shift after new basic setpoint value has the effect that after a new basic setpoint value has been specified as an absolute value, the setpoint shift that has taken place is deleted and is started with the new setpoint value.
Reset basic setpoint to configuration after change of operating mode causes the setpoint to be reset to the configured basic value after each change of operating mode.
If the parameter "**Send setpoint changes**" is activated, the new, now valid setpoint is sent on the bus via the communication object "Current setpoint" with each change.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

When a new absolute comfort setpoint is read in, a new basic comfort value is assigned to the controller. There is a significant difference in the Smart room temperature controller between the settings "dependent on comfort setpoint (basic)" and "independent setpoints".

Setting "depending on comfort setpoint (basic)".
This new basic comfort value (object “1”) also automatically causes an adjustment of the dependent setpoints in the other operating modes, as these are relative to the basic comfort value. All settings for setpoint shifting do not apply here, as a completely new base value is assigned to the controller.
The specification of a setpoint via the communication object "0 - Setpoint setting" offers a special feature. Here the new value is written to the basic comfort setpoint, a valid setpoint shift is deleted and the controller automatically jumps to comfort, regardless of which mode the controller was in before. This procedure is required for visualizations that make changes via absolute setpoints. This ensures that the new setpoint sent is also reported back.

Setting "Independent setpoints".
Here, an individual absolute value can be specified for each operating mode. If, for example, the setpoint is changed in Comfort mode (object "1"), the other setpoints remain unaffected.
A special feature is the common object "0 - setpoint setting". This always changes the setpoint in the currently valid mode. If, for example, the controller is currently in Standby mode and the value "20°C" is sent via object "0", the Standby setpoint is changed to "20°C" at this moment.

The following table shows the communication objects relevant for the setpoint change:

Number	Name/Function	Length	Usage
0	Setpoint setting	2 Byte	Specification of a new absolute setpoint
1	(Basic) Comfort setpoint	2 Byte	Specification of a new absolute setpoint
1	Combination object (Heating)	8 Byte	Setting for 4 HVAC modes via common combination object
1	Comfort	2 Byte	Specification of a new absolute setpoint
2	Standby	2 Byte	Specification of a new absolute setpoint
3	Night	2 Byte	Specification of a new absolute setpoint
4	Frost protection	2 Byte	Specification of a new absolute setpoint
4	Heat protection	2 Byte	Specification of a new absolute setpoint
5	Combination object (Cooling)	8 Byte	Setting for 4 HVAC modes via common combination object
6	Current setpoint – Send setpoint	2 Byte	Outputs the currently valid setpoint
7	Manual setpoint value offset – Increase/decrease (2Byte)	2 Byte	Shift of the setpoint relative to the preset comfort setpoint. Object is permanently displayed
8	Manual setpoint value offset – Increase/decrease (1=+ / 0=-)	1 Bit	Increase/decrease the setpoint relative to the preset comfort setpoints by the set step width
8	Manual setpoint value offset – Increase/decrease (1Byte)	1 Byte	Increase/decrease the setpoint relative to the preset comfort setpoints by the set step width
9	Status setpoint value offset – Send status	2 Byte	Sending the current status of the setpoint shift

Table 39: Communication objects – Setpoint changes

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.6 Comfort extension with time

The comfort extension causes a temporary switching to comfort mode.
The following parameters are available for this:

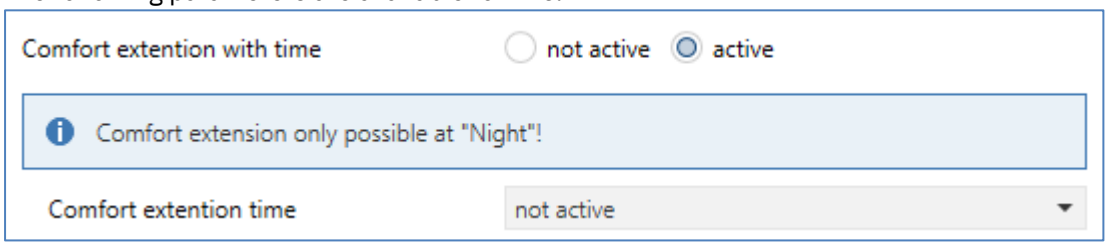


Figure 16: Settings – Comfort extension with time

The following table shows the setting options for this parameter:

ETS-Text	Dynamic range **[Default value]**	Comment
Comfort extension with time	▪ **not active** ▪ active	Activation of the Comfort extension via time-dependent object.
Comfort extension time	**not active** 30 min, 1 h, 1,5 h, 2 h, 2,5 h, 3 h, 3,5 h, 4 h	Adjustable time for Comfort Extension.

Table 40: Settings – Comfort extension with time

If the comfort extension is activated, the following communication object appears:

Number	Name/Function	Length	Usage
16	Comfort mode – Comfort extension	1 Bit	Temporary switching to Comfort mode via object for the duration of a predefined time

Table 41: Communication object – Comfort extension with time

The comfort extension can be used, for example, to extend the “Comfort” mode for visits, parties, etc. If, for example, a timer switches the channel to “Night” mode at a certain time, it can be switched back to “Comfort” mode for a certain time by means of the Comfort extension. When a “1” is sent to the object “Comfort extension”, the channel switches from “Night” mode back to “Comfort” mode for the set "Comfort extension time". After the "Comfort extension time" has elapsed, the channel automatically switches back to “Night” mode. If the “Comfort extension” is to be ended before the time has expired, this can be achieved by sending a “0” to the object.
If a “1” is sent to the object again during the Comfort extension, the set time is restarted.
If the mode is changed during the extension, the time is stopped.

The Comfort extension only works for switching from “Night” to “Comfort” mode and back!

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.7 Lock objects

The following table shows all available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Lock object for control value Heating	▪ **not active** ▪ active	Activates the lock object for the heating process.
Lock object for control value Cooling	▪ **not active** ▪ active	Activates the lock object for the cooling process.

Table 42: Settings – Lock objects for control value

By activating the lock objects, the user has one or two lock objects available for locking the control value, depending on the setting of the controller type. These lock objects serve to prevent the actuators (heating device or cooling device) from starting up undesirably. For example, if the heating is not to start in certain situations, e.g. when the window is open, the lock object can be used to lock the control value. Another application would be manual locking, for example in the event of a cleaning process. The lock object locks the control value as soon as a “1” is sent to the associated communication object. The lock is cancelled with a “0”.

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
28	Lock object Heating – Lock control value	1 Bit	Locking the control value heating
29	Lock object Cooling – Lock control value	1 Bit	Locking the control value cooling

Table 43: Communication objects – Lock objects for control value

4.4.2.8 Object for Heating/Cooling request

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Object for Heating request	▪ **not active** ▪ active	Activates an object to indicate whether a heating request is present or not.
Object for Cooling request	▪ **not active** ▪ active	Activates an object to indicate whether a cooling request is present or not.

Table 44: Settings –Objects for Heating/Cooling request

The setting "Object for request Heating/Cooling" allows objects to be displayed that indicate an active heating or cooling process. These are status objects.
The objects can be used for a visualisation. For example, a red LED could indicate an ongoing heating process and a blue LED could indicate an ongoing cooling process. Another possible application is the central switching on of a heating or cooling process. For example, it can be realised via an additional logic that all heaters of a building/area are switched on as soon as a controller issues the request for heating. The object outputs a “1” as long as the respective process continues. When the process is finished, a “0” is output.

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
34	Heating request – send request	1 Bit	Indicates an active/inactive heating process
35	Cooling request – send request	1 Bit	Indicates an active/inactive cooling process

Table 45: Communication objects – Objects for Heating/Cooling request

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.9 Reference control

The following settings are available:

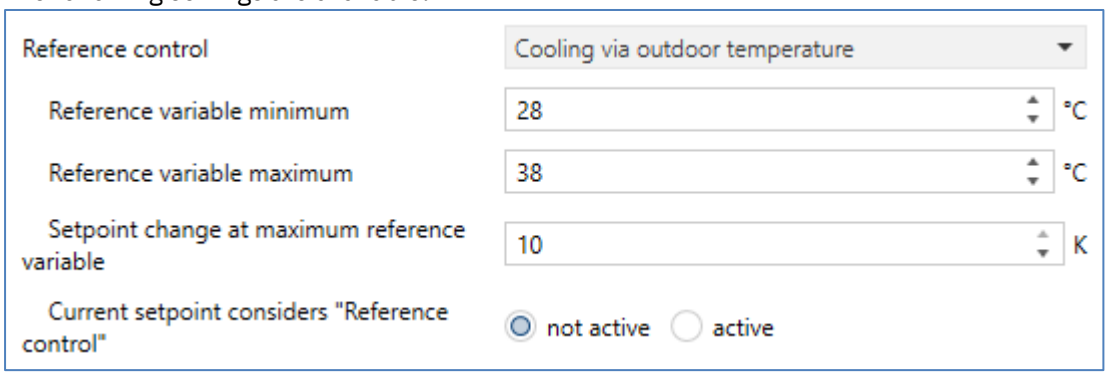


Figure 17: Settings – Reference control

The following table shows the setting options for this parameter:

ETS-Text	Dynamic range **[Default value]**	Comment
Reference control	▪ **not active** ▪ Cooling via outdoor temperature ▪ Cooling via percent value ▪ Heating via outdoor temperature ▪ Heating via percent value ▪ Heating via Lux value	Activation of the parameter and selection of which value is used to control the reference control. *"Cooling via..." and "Heating via..." only in operating mode "Heating and Cooling".*
Cooling / Heating via outdoor temperature		
Reference variable minimum	10 ... 60 °C **[28°C] [18°C]**	Lower respectively upper response value of the reference control. [Cooling] [Heating]
Reference variable maximum	10 ... 60 °C **[38°C] [28°C]**	
Setpoint change at maximum reference variable	1 ... 10 K **[10 K]**	Change of the setpoint when the maximum reference variable is reached (when Cooling...).
Setpoint change at maximum reference variable	-5 ... -0,5 K **[-2 K]**	Change of the setpoint when the maximum reference variable is reached (when Heating...).
Cooling / Heating via percent value		
Reference variable minimum	0 – 100 % **[0%]**	Lower respectively upper response value of the reference control.
Reference variable maximum	0 – 100 % **[100%]**	
Setpoint change at maximum reference variable	1 ... 10 K **[10 K]**	Change of the setpoint when the maximum reference variable is reached (when Cooling...).
Setpoint change at maximum reference variable	-5 ... -0,5 K **[-2 K]**	Change of the setpoint when the maximum reference variable is reached (when Heating...).
Threshold outdoor temperature	▪ **not active** ▪ active	Activation of a threshold. **Only available with "Heating..."**
Reference control released from	5 ... 35 °C **[15°C]**	Setting at which temperature the reference control takes effect. **Only for "Threshold... - active".**

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Heating via Lux value		
Reference variable minimum	20000 – 100000 Lux **[30000 Lux]**	Lower respectively upper response value of the reference control.
Reference variable maximum	20000 – 100000 Lux **[80000 Lux]**	
Setpoint change at maximum reference variable	-5 ... -0,5 K **[-2 K]**	Change of the setpoint when the maximum reference variable is reached.
Threshold outdoor temperature	▪ **not active** ▪ active	Activation of a threshold. **Only available with "Heating..."**
Reference control released from	5 ... 35 °C **[15°C]**	Setting at which temperature the reference control takes effect. **Only for "Threshold... - active".**
Available for all settings:		
Current setpoint considers "Reference control"	▪ **not active** ▪ active	Setting whether the current setpoint is to be considered for the reference control.

Table 46: Settings – Reference control

General description of the functionality of the "Reference control":

The "**Reference control**" parameter makes it possible to linearly track the setpoint as a function of any reference variable, which is recorded via an external sensor. With appropriate configuration, a continuous increase or decrease of the setpoint can be achieved.
To determine the extent to which reference control affects the setpoint, three settings must be made: **Minimum reference variable** (w_{min}), **maximum reference variable** (w_{max}), and the **setpoint change at maximum reference variable** ($\triangle X$).
The settings for the reference variable maximum (w_{max}) and minimum (w_{min}) describe the temperature range in which the reference variable begins and ends to influence the setpoint. The setpoint change at maximum reference variable ($\triangle X_{max}$) describes the ratio of how strongly an increase in the reference temperature affects the setpoint. The actual setpoint change then results from the following relationship:

$$\triangle X = \triangle X_{max} * [(w - w_{min})/(w_{max} - w_{min})]$$

If the reference control is to be increased, a positive value must be set for the "setpoint change at maximum reference variable". If, on the other hand, a setpoint reduction is desired, the "setpoint change at maximum command value" must be set to a negative value.
The setpoint change $\triangle X$ is then added to the basic comfort value.

A value above or below the reference value has no effect on the setpoint change. As soon as the value is within the reference variable (i.e. between w_{max} & w_{min}), the setpoint is lowered or raised.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The following graphics are intended to illustrate the influence of the reference variable on the setpoint:
(Xsoll=new setpoint; Xbasis=base setpoint)

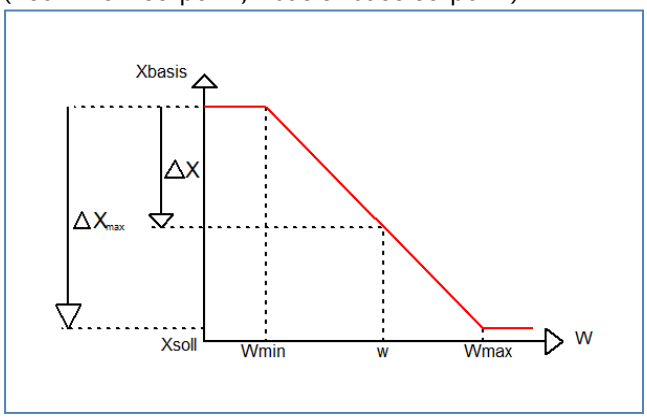


Figure 18: Example – Reference control/decrease

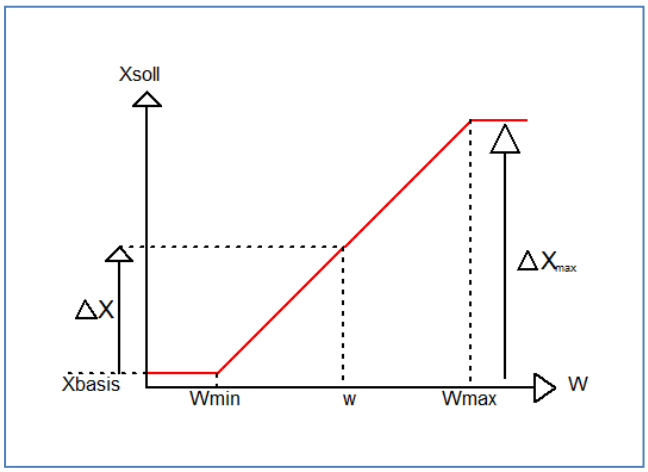


Figure 19: Example – Reference control/increase

The guidance can be implemented via different variables:

Outdoor temperature
The reference variable is defined via temperature values in "°C". The function is possible for "Cooling" as well as for "Heating".

Percent values
The reference variable is defined via percent values in "%". The function is possible for "Cooling" as well as for "Heating".
In "Heating" mode, an additional "Outdoor temperature threshold" can be activated. In this case, a temperature value is defined from which the reference control is released.

Lux values
The reference variable is set via brightness values in "Lux". This is **only possible for "Heating"**.
A "Threshold value for outside temperature" can also be activated here. In this case, a temperature value is defined from which the reference control is released.

The parameter "**Current setpoint considers "Reference control**" can be activated for all settings. This has the effect that the current setpoint, which has been changed by the reference control, is always updated in the display.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The following table shows the corresponding object:

Number	Name/Function	Length	Usage
36	Outdoor temperature – Receive measured/reference value	1 Byte	Receiving an external measured value as a reference variable
37	Reference control – Reference value in percent	1 Byte	Receiving an external percentage value as a reference variable
37	Reference control – Reference value in Lux	2 Byte	Receiving an external brightness value as a reference variable

Table 47: Communication object – Reference control

Example of use (guided via outdoor temperature):
For the temperature control of a room, the setpoint (22°C) should be raised so that in an outdoor temperature range of 28°C to 38°C the temperature difference between outdoor and indoor temperature does not exceed 6K.

Settings to be made:
Basic comfort value: 22°C
Reference control: active
Minimum reference variable: 28°C
Maximum reference variable: 38°C
Setpoint change at maximum reference variable: 10°C

If the outdoor temperature were to rise to 32°C, the setpoint would be increased by the following value: △X = 10°C * [(32°C-28°C)/(38°C-28°C)] = 4°C.
This would result in a new setpoint of 22°C+4°C=26°C.
If the outdoor temperature reaches the set maximum value of 38°C, the setpoint would be 32°C and would not increase any further if the temperature continues to rise.

Example of use (guided via Lux value):
A high lux value signals high solar radiation. As this contributes to heating the room, the heating output can be reduced via the controller at the same time. Heating up too quickly in the room is avoided and contributes to increasing energy efficiency.

Example of use (guided via percent value):
The guidance via percentage values offers a universal possibility to influence the control. For example, with the help of a logic module, a percentage value can be output as the result of several factors that have an influence on the control.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.10 Flow temperature limitation

Important: This parameter is only available in the "Heating" mode!

The following parameter activates the flow temperature limitation:

Figure 20: Settings – Flow temperature limitation

The following settings are available:

ETS-Text	Dynamic range **[Default value]**	Comment
Flow temperature	▪ **not active** ▪ active	Activation of the flow temperature limitation.
Limit flow temperature to	10 ... 60 °C **[40 °C]**	Setting of the value to which the flow temperature is to be limited.

Table 48: Settings – Flow temperature limitation

With this setting, the current flow temperature can be limited. This makes it possible to limit the heating temperature as required in certain situations. If, for example, an underfloor heating system is not to heat above a certain value in order to protect the floor coverings, the heating temperature can be limited by the flow temperature limitation.
The flow temperature limitation requires a second sensor on the flow itself. This sensor measures the current flow temperature. The object that measures the flow temperature is then connected in a group address with the object for the flow temperature of the temperature controller. This then limits the flow temperature according to the set parameters.

The following communication object is available:

Number	Name/Function	Length	Usage
24	Flow temperature Heating – Receive measured value	2 Byte	Receiving the measured flow temperature

Table 49: Communication object – Flow temperature limitation

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.11 Limit temperature of cooling medium

Important: This parameter is only available in "Cooling" mode!

The following settings are available for this parameter:

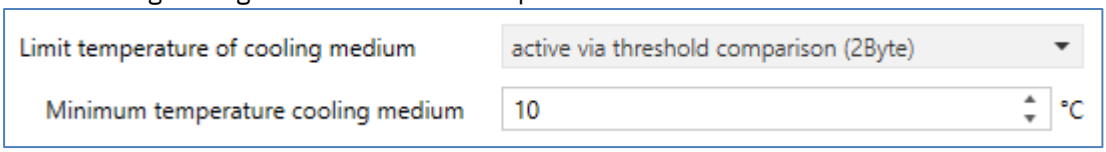


Figure 21: Settings – Limit temperature of cooling medium

The following table shows the setting options for this parameter:

ETS-Text	Dynamic range **[Default value]**	Comment
Limit temperature of cooling medium	▪ **not active** ▪ active via threshold comparison (2Byte) ▪ active via dew point alarm (1Bit)	Selection of how the temperature is to be limited.
Minimum temperature cooling medium	0 ... 60 °C **[10 °C]**	Definition of a minimum temperature. **Only visible with "threshold comparison 2byte"**

Table 50: Settings – Limit temperature of cooling medium

With monitoring "**active via dew point alarm (1 bit)**", the cooling control value is set to 0% when a "1" is received for the dew point alarm. If the alarm is cancelled when a "0" is received, the controller goes into normal operation and to the corresponding control value.

With the setting "**active via threshold value comparison (2 Byte)**", the control value for cooling mode can be limited. This requires a second sensor in the room where a lower temperature is expected than the room temperature. Its measured value is connected to object 25. If this measured value falls below the set "**Minimum temperature cooling medium**", the control value is successively reduced. This ensures that less cooling takes place to avoid condensation on the surface.

The following table shows the corresponding objects:

Number	Name/Function	Length	Usage
25	Surface temperature Cooling – Receive measured value	2 Byte	Receive an external measured value. **Displayed when active via 2Byte object**
25	Dew point alarm – Receive alarm	1 Bit	Receiving the dew point alarm. **Displayed if active over 1Bit object**

Table 51: Communication object – Limit temperature of cooling medium

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.12 Alarms

By means of the alarm function, the falling below or exceeding of a set temperature can be indicated via its associated communication objects:

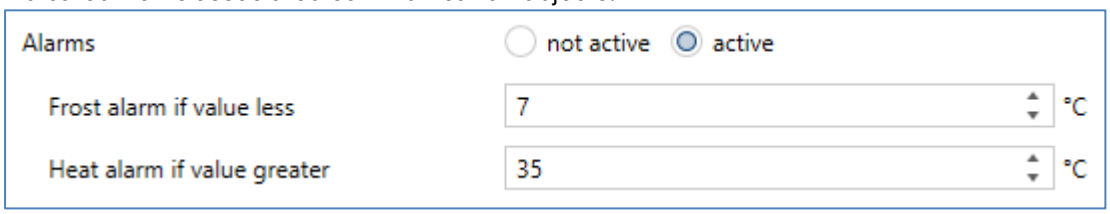


Figure 22: Settings – Alarms

The setting options for this parameter are shown in the table below:

ETS-Text	Dynamic range **[Default value]**	Comment
Alarms	▪ **not active** ▪ active	Activation of the alarms for Frost or Heat
Frost alarm if value less	3 ... 10°C **[7°C]**	Setting of the lower indication value. **Only available if "Alarms" is activated.**
Heat alarm if value greater	25 ... 40 °C **[35°C]**	Setting of the upper indication value. **Only available if "Alarms" is activated.**

Table 52: Settings – Alarms

The alarm function reports the falling below or exceeding of an adjustable temperature via the associated object. Falling below the lower indication value is reported via the Frost alarm object. Exceeding the upper indication value is reported via the heat alarm object. The two signalling objects of size 1 bit can be used for visualisation or for initiating countermeasures. If the lower indication value is exceeded again or the upper indication value is fallen short of again, a "0" is sent in each case and thus the alarm is cancelled.

The following table shows the two objects:

Number	Name/Function	Length	Usage
22	Frost alarm – Send alarm	1 Bit	Reports falling below the lower indication value
23	Heat alarm – Send alarm	1 Bit	Reports the exceeding of the upper indication value

Table 53: Communication objects – Alarms

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.13 Window contact

The following settings are available for this parameter:

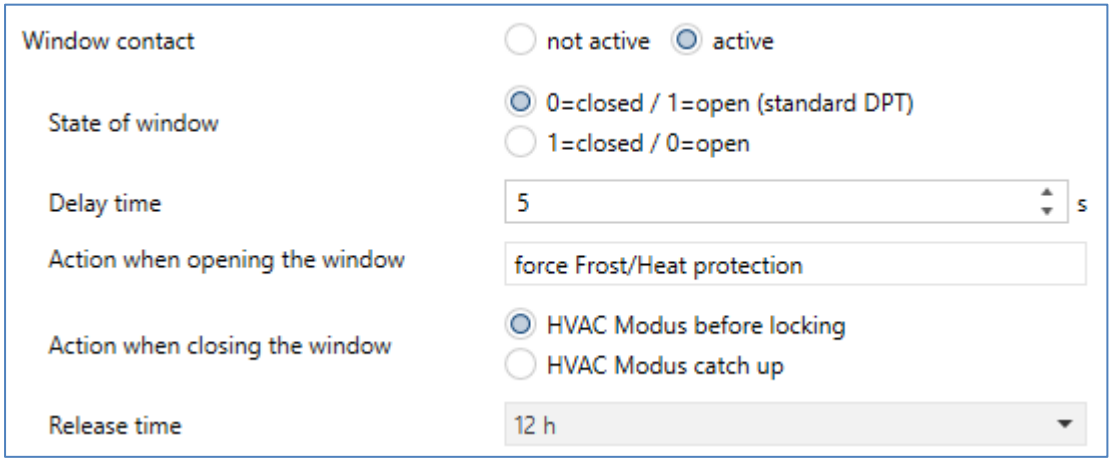


Figure 23: Settings – Window contact

The setting options for this parameter are shown in the table below:

ETS-Text	Dynamic range **[Default value]**	Comment
Window contact	▪ **not active** ▪ active	Setting whether window contact is monitored or not.
State of window	▪ **0=closed / 1=open (standard DPT)** ▪ 1=closed / 0=open	Setting the polarity with which value the window is open/closed.
Delay time	0 ... 240 s **[5 s]**	Setting of a time by which the switching is delayed after opening/closing the window.
Action when opening the window	force Frost-/Heat protection	Fixed text. Not changeable.
Action when closing the window	▪ **HVAC Mode before locking** ▪ HVAC Mode catch up	Specify whether to switch to the mode before the lock after closing the window or to a new mode changed during the lock.
Release time	not active (not recommended) 1 h – 24 h **[12 h)]**	Setting after which time the unit automatically switches back to the previous mode.

Table 54: Settings – Window contact

With this function, the control in a room can be forced into frost or heat protection after opening a window. Normal Heating/Cooling operation is thus interrupted for a long time. This prevents, for example, that energy is unnecessarily consumed for heating after opening a window in winter. After closing the window, it is then possible to switch back to normal operation.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The "**Delay time**" has the effect that the action to be carried out after opening/closing the window only takes place after a configurable time. This means that a short opening of the window can be carried out without influencing the control.

With "**Action when closing the window**" it can be set whether after closing, the window returns to the mode before the lock or in the mode that, for example, was sent during the lock as from a timer or a visualization.

The "**Release time**" defines the time after which the controller automatically returns to the previous operating mode after the window has been opened. This is useful if, for example, you forget to close the window again. In this case, the room would be prevented from cooling down in winter or overheating in summer.

The following table shows the associated communication object:

Number	Name/Function	Length	Usage
27	Window contact input – 0=closed / 1=open / 1=closed / 0=open	1 Bit	Receiving the current window status. Polarity depending on parameter setting.

Table 55: Communication object – Window contact

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.2.14 Diagnosis

The diagnosis function outputs the status of the controller in "plain text" and is used to quickly read out the current status.

Communication **object 26 "Diagnosis - Status"** is used for the output. This is permanently displayed and sends automatically with every change.

The following messages can be sent out by the diagnosis function:

	Byte 0-1	**Byte 3**	**Byte 5-11**	**Byte 13**
Info		Heating/Cooling	Operation mode	Control value > 0%, if „yes“: Value 1
Possible messages		Heating: H	Comfort	Control value = 0%: 0
		Cooling: C	Standby	Control value > 0%: 1
			Night	
			Frost	
			Heat	
			ComProl – Comfort prolongation active	
			Window - Window contact active	
			BIT – Channel operating mode switching 1 Bit	
			PWM BYTE – Channel operating mode continuous 1 Byte	
Special messages	Locked	Channel is locked		
	Contr Flowtemp	Control value reduced by flow temperature		
	Contr Dewpoint	Control value reduced by dew point		
	Setpoint Guide	Control value reduced by outdoor temperature/reference variable		
	Dew point alarm	The dew point alarm is active		

Table 56: Overview – Diagnosis text

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.3 Extension unit

The Glass Room Temperature Controller Smart can be used both as a controller or as an extension unit. Settings as an extension unit are as follows:

Figure 24: Settings – Use device as extension unit

In extension unit operation, the Glass Room Temperature Controller Smart can be used, for example, in combination with the MDT Heating Actuator, or as an additional second unit at a different position.

The display can be used to show all relevant functions and the internal buttons can be used for control (operating mode changeover, setpoint shift).

The following illustration shows the setting options:

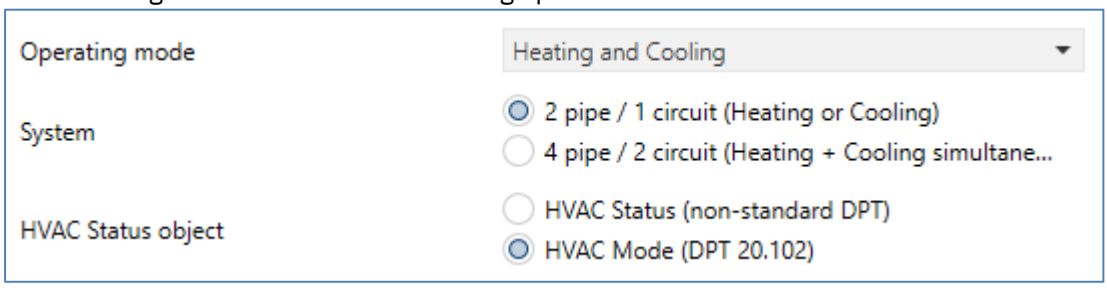


Figure 25: Settings – Extension unit

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Operating mode	▪ **Heating** ▪ Cooling ▪ Heating and Cooling	Setting the operating mode.
System	▪ **2 pipe / 1 circuit (Heating or Cooling)** ▪ 4 pipe / 2 circuit (Heating + Cooling simultaneously)	Setting for separate or combined Heating/Cooling circuits. **Only available for "Heating and Cooling".**
HVAC-Status object	▪ HVAC Status (non-standard DPT) ▪ **HVAC Mode (DPT 20.102)**	Setting whether the status is to be output as HVAC Status or HVAC Mode.

Table 57: Settings – Extension unit

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The selection of the “**operating mode”** determines whether only heating, only cooling or simultaneous heating and cooling is used.
Select this setting according to the setting on the controller.

The system used can be selected via the "**System**" setting. If there is a common system for the cooling & heating process, the setting 2 pipe/1 circuit must be selected. If the cooling process and heating process are controlled by two individual units, the setting 4 pipe/2 circuit must be selected.

2 pipe / 1 circuit:
In the case of a common pipe system for the cooling and heating process, there is also only one communication object that receives the control value from the controller.

4 pipe / 2 circuit:
If there is a separate pipe system for the heating and cooling process, both processes can also be carried out separately from each other. Consequently, there are also separate communication objects for both control values.

The following communication objects are available for this parameter:

Number	Name/Function	Length	Usage
12	Control value Heating – Receive status	1 Bit	Receiving the control value for Heating.
12	Control value Heating/Cooling – Receive status	1 Bit	Receiving the common control value for Heating/Cooling. **Only with setting: "Heating + Cooling" and "2 pipe/1 circuit".**
13	Control value Cooling – Receive status	1 Bit	Receiving the control value for Cooling.

Table 58: Communication Objects – Control values Heating/Cooling

The "**HVAC Status object**" parameter determines whether the received controller status is to be displayed as HVAC Status or HVAC Mode.

The following communication object is available:

Number	Name/Function	Length	Usage
20	DPT_HVAC Mode	1 Byte	Receiving the controller status as "Mode”
20	DPT_HVAC Status	1 Byte	Receiving the controller status as "Status”

Table 59: Communication objects – HVAC Status object

The setpoint shift is carried out via the buttons 3/4.
For settings see:
4.5.4.2 Buttons 3/4 – Temperature shift as extension unit

The operating mode selection, the OFF function (control value=0%) and the Heating/Cooling selection are carried out via buttons 1 and 2 (Single-button function). For the settings, see:

4.5.3.1 Mode selection (internal connection)

4.5.3.3 OFF (control value = 0%) (internal connection)

4.5.3.4 Switchover Heating/Cooling (internal connection)

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.4 Controller parameter

This menu only appears for "Use unit as: controller"!

The output of the control variable is defined with the setting of the control value. Depending on this setting, the other setting options are displayed.

The following table shows the setting options for this parameter:

ETS-Text	Dynamic range **[Default value]**	Comment
Control value	▪ **PI control continuous** ▪ PI control switching (PWM) ▪ 2-step control (switching)	Defines the control after which the control value is output.

Table 60: Settings – Control value (Type of controller)

The temperature controller has three different types of controllers that determine the control value. The further configuration options depend on the controller type used.

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
10	Control value Heating – Send control value	1 Byte 1 Bit	Controlling the actuator for the heating process. DPT depending on the set parameter.
10	Control value Heating/Cooling – Send control value	1 Byte 1 Bit	Controlling the actuator for the heating and cooling process
11	Control value Cooling – Send control value	1 Byte 1 Bit	Controlling the actuator for the cooling process. DPT depending on the set parameter.

Table 61: Communication objects – Control value

Depending on the controller type set, the control value controls the heating and/or cooling process. If the control value is selected as a continuous PI control, the communication object for the control value is a 1 byte object, as the control value can assume several states. If the control value is selected as 2-point control or as PWM control, the communication object is a 1-bit object, as the control value can only assume 2 states (0; 1).

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.4.1 PI-control continuous

If the control value is selected as continuous PI control, the following setting options are available (here: operating mode “Heating”):

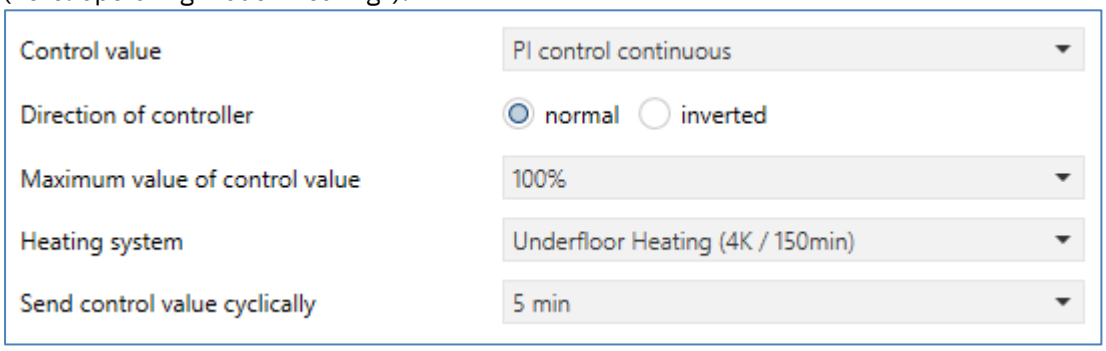


Figure 26: Settings – PI control continuous

The following table shows the possible settings for continuous PI control:

ETS-Text	Dynamic range **[Default value]**	Comment
Direction of controller	▪ **normal** ▪ inverted	Specifies the control behaviour with rising temperature.
Maximum value of control value	**100%**; 90%; 80%; 75%; 70%; 60%; 50%; 40%; 30%; 25%; 20%; 10%; 0%	Specifies the output power of the control value in maximum operation.
Heating system	▪ **Water heating (4K / 120 min)** ▪ Underfloor heating (4K / 150 min) ▪ Split Unit (4K / 60min) ▪ Adjustment via control parameter	Setting of the heating system used. Individual parameterization possible via setting 4.
Cooling system	▪ **Split Unit (4K / 60 min)** ▪ Cooling ceiling (4K / 150 min) ▪ Adjustment via control parameter	Setting of the cooling system used. Individual parameterization possible via setting 3.
Proportional range	1 K - 20 K **[4 K]**	**Only visible with setting "Adjustment via control parameters"**. Here the proportional band can be set freely.
Reset time	15 min – 240 min **[150 min]**	**Only visible with setting "Adjustment via control parameters"**. The integral range can be freely adjusted here.
Send control value cyclically	not active, 1 min, 2 min, 3 min, 4 min, **5 min**, 10 min, 15 min, 20 min, 30 min, 40 min, 50 min, 60 min	Activation of cyclical sending of the control value with setting of the cycle time.

Table 62: Settings – PI control continuous

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

PI control is a continuous control with a proportional component, the “P component” and an integral component, the “I component”. The size of the P component is specified in K (Kelvin).
The I component is referred to as reset time and is specified in min (minutes).
The control value for continuous PI control is controlled in steps from 0% up to the set maximum value of the control value.

Maximum value of control value
With this setting, the control value to be output can be limited. To prevent switching operations with too high control values, the parameter can be set to a fixed value so that the actuator does not exceed this maximum value.

Heating/ Cooling system
The individual control parameters, P-component and I-component are set by adjusting the heating/cooling system used. It is possible to use preset values which are suitable for certain heating or cooling systems or to freely parameterize the P-controller and I-controller components. The preset values for the respective heating or cooling system are based on empirical values proven in practice and usually lead to good control results.
If a free "**adjustment via control parameters**" is selected, the proportional band and reset time can be freely set.
Important: This setting requires sufficient knowledge in the field of control engineering!

Proportional range
The proportional band stands for the P-component of a control. The P-component of a control system leads to a proportional increase of the control value to the system deviation.
A small proportional band leads to a fast correction of the system deviation. With a small proportional band, the controller reacts almost abruptly and sets the control value almost to the maximum value (100%) even with small control differences. However, if the proportional band is selected too small, the risk of overshooting is very high.
A proportional band of 4K sets the control value to 100% with a control deviation (difference between setpoint and current temperature) of 4°C. Thus, with this setting, a control deviation of 1°C would result in a control value of 25%.

Reset time
The reset time represents the I-component of a regulation. The I-component of a regulation leads to an integral approximation of the process value to the setpoint. A short reset time means that the controller has a large I-component.
A small reset time causes the control value to quickly approach the control value set according to the proportional band. A large reset time, on the other hand, causes the output variable to approach this value slowly.
When making the setting, please note that a reset time that is set too small could cause overshooting. In principle, the larger the reset time, the slower the system.

Send control value cyclically
With the aid of the parameter "Send control value cyclically" it can be set whether the channel should send its current status at certain intervals. The time intervals between two transmissions can also be parameterised.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.4.2 PI control switching (PWM)

The following setting options are available (here: operating mode “Heating”):

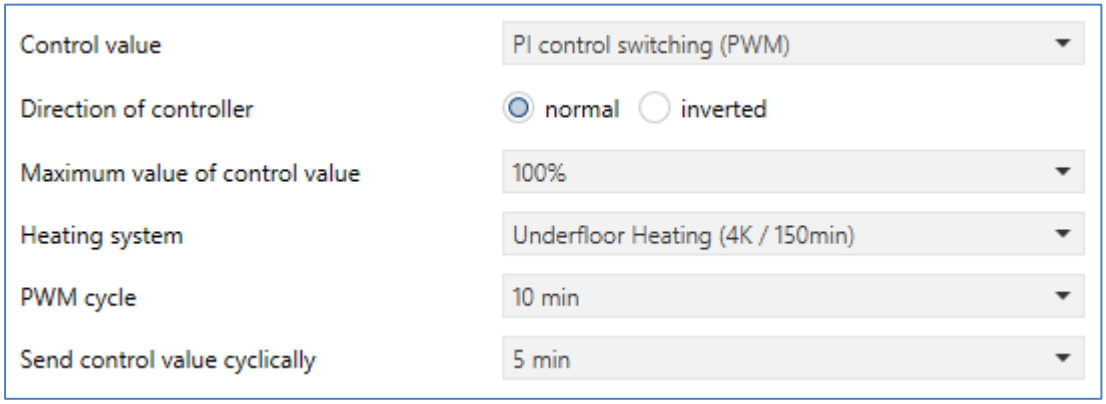


Figure 27: Settings – PI control switching (PWM)

The PWM control is a further development of the PI control. All settings possible for PI control can also be made here. In addition, the PWM cycle time can be set.

The following table shows the settings for switching PI control:

ETS-Text	Dynamic range **[Default value]**	Comment
Direction of controller	▪ **normal** ▪ inverted	Specifies the control behaviour with rising temperature.
Maximum value of control value	**100%**; 90%; 80%; 75%; 70%; 60%; 50%; 40%; 30%; 25%; 20%; 10%; 0%	Specifies the output power of the control value in maximum operation.
Heating system	▪ **Water heating (4K / 120 min)** ▪ Underfloor heating (4K / 150 min) ▪ Split Unit (4K / 60min) ▪ Adjustment via control parameter	Setting the heating system used. Individual configuration possible via setting 4.
Cooling system	▪ **Split Unit (4K / 60 min)** ▪ Cooling ceiling (4K / 150 min) ▪ Adjustment via control parameter	Setting of the cooling system used. Individual configuration possible via setting 3.
Proportional range	1 K - 20 K **[4 K]**	**Only with setting "Adjustment via control parameters**". Here the proportional band can be set freely.
Reset time	15 min – 240 min **[150 min]**	**Only with setting "Adjustment via control parameters**". The integral range can be freely adjusted here.
PWM cycle	1 – 30 min **[10 min]**	Setting the PWM cycle time. Includes the total time of a switch-on and switch-off pulse.
Send control value cyclically	not active, 1 min, 2 min, 3 min, 4 min, **5 min**, 10 min, 15 min, 20 min, 30 min, 40 min, 50 min, 60 min	Activation of cyclical sending of the control value with setting of the cycle time.

Table 63: Settings – PI control switching (PWM)

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

In PWM control, the controller switches the control value according to the value calculated in PI control, considering the cycle time. The control value is thus converted into pulse width modulation (PWM).

PWM cycle
The PWM cycle is used for PWM control to calculate the switch-on and switch-off pulse of the control value. This calculation is based on the calculated control value. A PWM cycle comprises the total time from the switch-on point to the new switch-on point.

Example:
If a control value of 75% is calculated with a set cycle time of 10 minutes, the control value is switched on for 7.5 minutes and switched off for 2.5 minutes.

In principle, the slower the overall system, the longer the cycle time can be set.

For PI control switching (PWM), the status can also be output as a percentage value.
The following communication objects are available for this:

Number	Name/Function	Length	Usage
12	Control value Heating – Send status	1 Byte	Sends the status as a percentage value
12	Control value Heating/Cooling – Send status	1 Byte	Sends the status as a percentage value
13	Control value Cooling – Send status	1 Byte	Sends the status as a percentage value

Table 64: Communication objects – Status control value

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.4.3 2-step control (switching)

The following setting options are available for this (here: operating mode “Heating”):

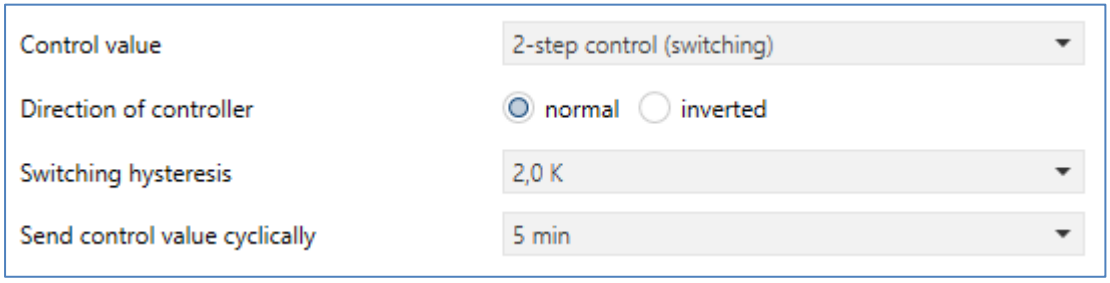


Figure 28: Settings – 2-step control (switching)

The following table shows the possible settings for 2-step control:

ETS-Text	Dynamic range **[Default value]**	Comment
Direction of controller	▪ **normal** ▪ inverted	Specifies the control behaviour when the temperature rises. Adaptation to normally open valves
Switching hysteresis	0,5 K – 5,0 K **[2,0 K]**	Setting for upper and lower switch-on and switch-off point
Send control value cyclically	not active, 1 min – 60 min **[5 min]**	Setting whether and at what interval the control value is sent cyclically

Table 65: Settings – 2-step control (switching)

The 2-step controller is the simplest type of control. Only the two states ON or OFF are sent to the control value.
The controller switches the control value (e.g. heating process) on when the temperature falls below a certain reference temperature and switches it off again when the temperature exceeds a certain reference temperature.
The switch-on and switch-off points, i.e. where the reference temperature is, depend on the currently adjusted set point and the adjusted switching hysteresis.
The 2-step controller is used when the control value can only assume two states, e.g. an electro-thermal valve.

Switching hysteresis
The setting of the switching hysteresis is used by the controller to calculate the switch-on and switch-off point. This is done considering the currently valid setpoint.

Example: In the controller, with mode “Heating”, a basic comfort value of 21°C and a hysteresis of 2K are set. In the Comfort mode, this results in an activation temperature of 20°C and a deactivation temperature of 22°C.

When making the setting, please note that a large hysteresis leads to a large fluctuation of the actual room temperature. However, a small hysteresis can cause the control value to be switched on and off permanently, as the switch-on and switch-off points are close together.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.4.4 Direction of controller

The direction of controller describes the response of the control value to a change in the system deviation as the temperature rises. The control value can exhibit normal control response to a rising temperature or inverted control response. The direction of action is available for all settings of the control value (PI control; PWM; 2-step).
In PWM and 2-step control, an inverted control value is used for adaptation to valves that are open when no current is applied.
For the individual controllers, an inverted correcting variable, here in the example for operating mode “Heating”, means:

- **PI-controller**
  The control value decreases with increasing system deviation and increases with decreasing system deviation.
- **PWM-controller**
  The ratio of the duty cycle to the total PWM cycle increases with rising temperature and decreases with falling temperature.
- **2-step-controller**
  The controller switches itself on at the actual switch-off point and off at the actual switch-on point.

4.4.4.5 Additional settings for Heating & Cooling mode

The picture shows the additional settings in “Heating and Cooling” mode:

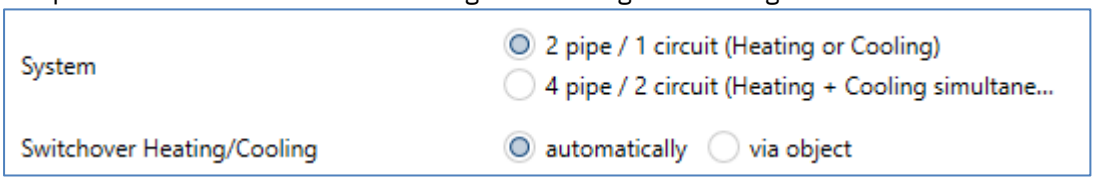


Figure 29: Additional settings – Heating and Cooling

The following table shows the additional settings in the "Heating and Cooling" operating mode:

ETS-Text	Dynamic range **[Default value]**	Comment
System	▪ **2 pipe / 1 circuit (Heating or Cooling)** ▪ 4 pipe / 2 circuit (Heating + Cooling simultaneously)	Setting for separate or combined heating / cooling circuits.
Switchover Heating/Cooling	▪ **automatically** ▪ via object	Setting whether the switchover is carried out automatically via the temperature or via a separate object. Only with controller setting "**Setpoints - dependent on setpoint Comfort (Basic)”.**
	via object	Fixed text, not changeable. Only with controller setting "**Setpoints - independent setpoints**".

Table 66: Additional settings – Heating and Cooling

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The system used can be selected via the "**System**" setting. If there is a common system for the cooling & heating process, the setting 2 pipe/1 circuit is to be selected. If the cooling process and heating process are controlled by two individual units, the setting 4 pipe/2 circuit is to be selected. With the setting "**Switchover Heating/Cooling**" It is also possible to select between manual switching between "Heating" and "Cooling" via an object and automatically via the temperature.

2 Pipe system (2 pipe/1 circuit):
In a common pipe system for the cooling and heating process, there is only one communication object that controls the control value. The change from "Heating" to "Cooling" or from "Cooling to Heating" is made by a changeover. This can also be used simultaneously for changing between heating and cooling medium in the system. This ensures, for example, that warm water flows in a heating/cooling ceiling during "Heating" and cold water during "Cooling". In this case only one common controller (PI, PWM or 2-point) can be selected for the control value. The direction of action can also only be defined identically for both processes. However, the individual control parameters for the selected controller can be parameterized independently of each other.

4 Pipe system (4 pipe/2 circuit):
If there is a separate pipe system for the heating and cooling process, both processes can also be parameterized separately. Consequently, separate communication objects exist for both control values. This makes it possible to control the heating process e.g. via a PI control and the cooling process e.g. via a 2-step control, as both processes can be controlled by different devices. For each of the two individual processes, completely individual settings for the control value and the heating/cooling system are therefore possible.

Switchover Heating/Cooling:
Using this setting, it is possible to set whether the controller automatically switches between "Heating" and "Cooling" or whether this process is to be carried out manually via a communication object. With automatic switchover, the controller evaluates the setpoints and knows which mode it is currently in based on the set values and the current actual temperature. If, for example, "Heating" was previously active, the controller switches over as soon as the setpoint for the cooling process is reached. As long as the controller is in the dead zone, the controller remains set to "Heating", but does not heat as long as the setpoint for the heating process is not exceeded.
If the switchover "via object" is selected, an additional communication object is displayed via which the switchover can be made. With this setting, the controller remains in the selected mode until it receives a signal via the communication object. As long as the controller is in "Heating" mode, for example, only the setpoint for the heating process is considered, even if the controller is actually already in "Cooling" mode from the setpoints. A start of the cooling process is therefore only possible when the controller receives a signal via the communication object that it should switch to the cooling process. If the controller receives a 1 via the communication object, the heating process is switched on, with a 0 the cooling process.

The following table shows the associated communication objects:

Number	Name/Function	Length	Usage
32	Switchover Heating/Cooling – 0=Cooling / 1=Heating	1 Bit	Switching between "Heating" and "Cooling" Mode:
33	Status Heating/Cooling – 0=Cooling / 1=Heating	1 Bit	Sending the status whether "Heating" or "Cooling" mode.

Table 67: Communication objects – Heating/Cooling switchover

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.4.6 Additional level

Important: The additional level is only available in "Heating" mode.

The picture shows the available settings:

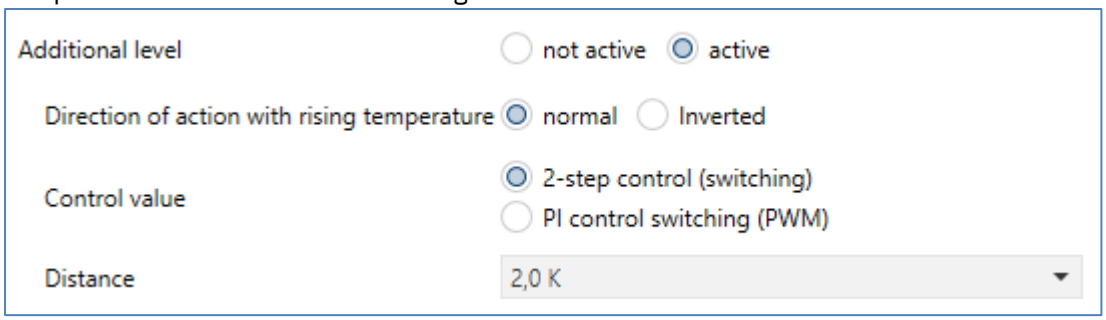


Figure 30: Settings – Additional level

The following table shows the setting options for additional level:

ETS-Text	Dynamic range **[Default value]**	Comment
Additional level	▪ **not active** ▪ active	Activation of the additional level.
Direction of action with rising temperature	▪ **normal** ▪ inverted	Indicates the control behaviour with increasing temperature.
Control value	▪ **2-step control (switching)** ▪ PI control switching (PWM)	Setting the type of controller that is used.
Distance	0,5 – 5,0 K **[2,0 K]**	Defining the setpoint of the additional stage as the difference to the current setpoint.

Table 68: Settings – Additional level

The additional level can be used in slow systems to shorten the heating phase. For example, in the case of underfloor heating (as the basic stage) a radiator or an electric heater could be used as an additional level to shorten the longer heating phase of the slow underfloor heating.
The **direction of action** of the control variable can be set as "normal" or "inverted": For details, see chapter 4.4.4.4 Direction of controller).
For setting the controller type of the **control value**, the user can choose between 2-step control and PWM control. The communication object of the additional level is therefore always a 1-bit object and only switches the control value ON or OFF.
The setpoint of the additional level can be configured with the parameter "**Distance"**. The set distance is subtracted from the setpoint of the basic level, which then results in the setpoint for the additional level.
Example: The controller is in Comfort mode for which a basic comfort value of 21°C has been set. The distance of the additional level has been set to 2.0K. This results in the following for the setpoint of the additional level: 21°C - 2.0K = 19°C

The table shows the communication object for the additional level:

Number	Name/Function	Length	Usage
14	Control value additional Heating – Send control value	1 Bit	Controlling the actuator for the additional level

Table 69: Communication object – Additional level

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.5 Ventilation control

4.4.5.1 Step switch bit coded

The following figure shows the available settings:

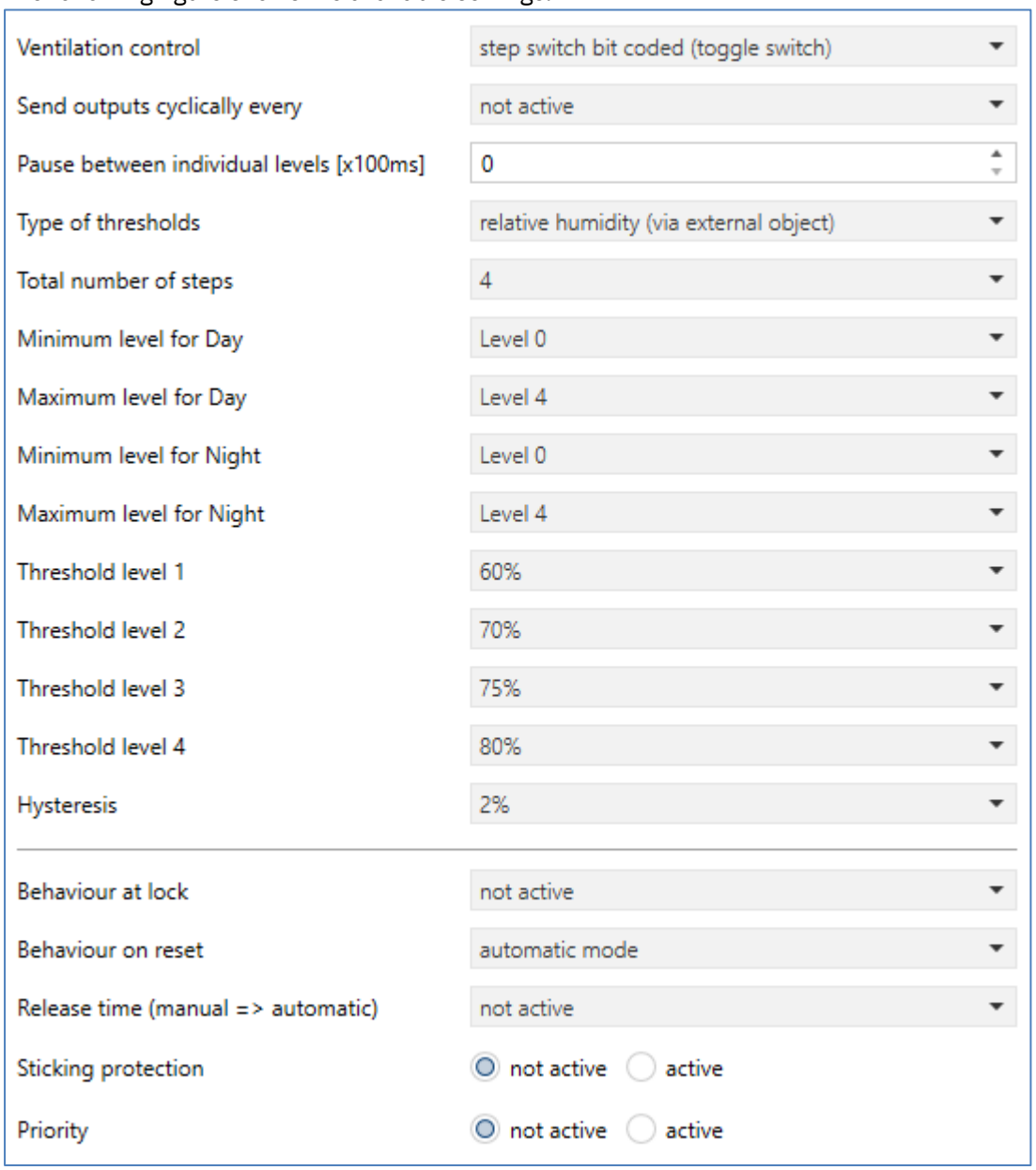


Figure 31: Settings – Step switch bit coded

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Minimum/Maximum levels for Day/Night

The setting for Day/Night switchover is in the "General Settings" menu.

The following parameter settings are available:

ETS-Text	Dynamic range **[Default value]**	Comment
Minimum level for Day	Level 0 - Level 4 **[Level 0]**	Defines the minimum level in daytime operation.
Maximum level for Day	Level 0 - Level 4 **[Level 4]**	Defines the maximum level in daytime operation.
Minimum level for Night	Level 0 - Level 4 **[Level 0]**	Defines the minimum level in Night mode.
Maximum level for Night	Level 0 - Level 4 **[Level 4]**	Defines the maximum level in Night mode.

Table 70: Settings – Minimum/Maximum levels for Day/Night

With the Day/Night switchover and the associated minimum/maximum output level, the ventilation control can be limited. If, for example, the fan is only to run at level 2 in “Night”-mode to keep the noise level of the ventilation low or to avoid draughts, this can be realised with this parameter.

The following table shows the communication objects for Day/Night switching:

Number	Name/Function	Length	Usage
88	Day/Night	1 Bit	Switching between Day/Night operation

Table 71: Communication object – Day/Night switchover

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Type of thresholds: Control value/Delta T/Relative humidity

The ventilation control refers in the setting "Type of thresholds: Control value" to the current control value of the temperature controller. If the temperature controller is active in heating mode, the ventilation stages are switched according to object 10 - Control value heating. If the temperature controller is active in cooling mode, the ventilation stages are switched according to object 11 - Control value cooling. In the operation mode “Heating and Cooling”, the control value of the currently active mode is used.

In the setting "Type of thresholds: Delta T", the delta is formed from the currently measured temperature value, which is output on object 58 - "Send measured value", and the setpoint value, which is sent on object 6 - "Current setpoint".

In the setting "Type of thresholds: relative humidity (via external object)", the ventilation control refers to the received measured value, object 55 - "Relative air humidity input".

The following parameter settings are available:

ETS-Text	Dynamic range **[Default value]**	Comment
Threshold level 1 **(Type of threshold: control value)** **(Type of threshold: rel. humidity)**	0% – 100% **[10%]** **[60%]**	Threshold value below which all stages are switched off, above which level 1 is switched on.
Threshold level 1 **(Type of threshold: Delta T)**	1,0K-10,0K **[2,0K]**	Delta T below which all stages are switched off, above which level 1 is switched on.
Threshold level 2 **(Type of threshold: control value)** **(Type of threshold: rel. humidity)**	0% – 100% **[30%]** **[70%]**	Threshold value below which level 1 is switched on and above which level 2 is switched on.
Threshold level 2 **(Type of threshold: Delta T)**	1,0K-10,0K **[4,0K]**	Delta T below which level 1 is switched on and above which level 2 is switched on.
Threshold level 3 **(Type of threshold: control value)** **(Type of threshold: rel. humidity)**	0% – 100% **[50%]** **[75%]**	Threshold value below which level 2 is switched on and above which level 3 is switched on.
Threshold level 3 **(Type of threshold: Delta T)**	1,0K-10,0K **[6,0K]**	Delta T below which level 2 is switched on and above which level 3 is switched on.
Threshold level 4 **(Type of threshold: control value)** **(Type of threshold: rel. humidity)**	0% – 100% **[70%]** **[80%]**	Threshold value below which level 3 is switched on and above which level 4 is switched on.
Threshold level 4 **(Type of threshold: Delta T)**	1,0K-10,0K **[8,0K]**	Delta T below which level 3 is switched on and above which level 4 is switched on.
Hysteresis **(Type of threshold: control value)** **(Type of threshold: rel. humidity)**	0%-20% **[5%]** **[2%]**	Hysteresis for switching the output levels.
Hysteresis **(Type of threshold: Delta T)**	0,1K-2,0K **[0,5K]**	Hysteresis for switching the output levels.
Send outputs cyclically every	**not active** 1 min – 60 min	Parameter activates the cyclic sending of all 4 output objects.

Table 72: Settings – Output step controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The figure below shows the switching behaviour of the outputs depending on the threshold values:

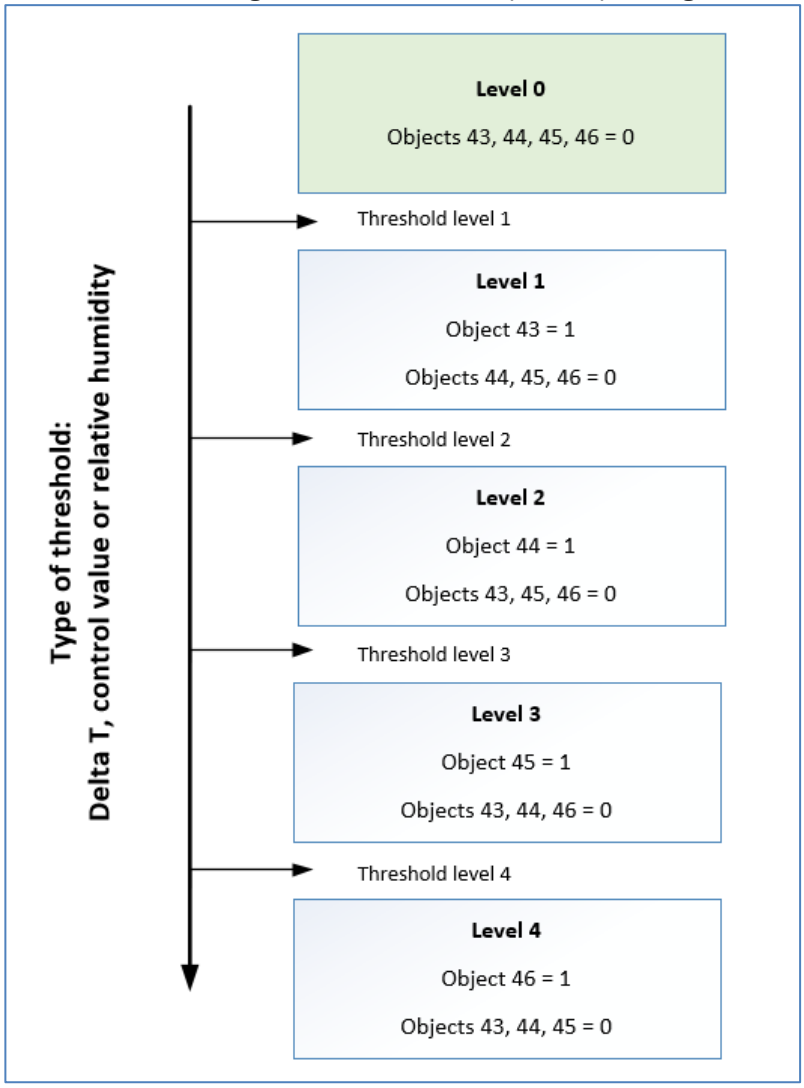


Figure 32: Switching behaviour – Step controller

Hysteresis
The hysteresis serves to avoid too frequent switching. For example, a hysteresis of 5% and a threshold of 50% would switch on at 55% and switch off at 45%. If the thresholds are determined via Delta T, the hysteresis is also given in Kelvin. However, the effect remains the same.

Send outputs cyclically every
With this parameter the cyclical sending of the output can be activated. All output states are sent cyclically according to the set time.

The following table shows the communication objects for the output of the step switch bit-coded:

Number	Name/Function	Length	Usage
43	Ventilation control - Level 1	1 Bit	Switching the output level 1
44	Ventilation control - Level 2	1 Bit	Switching the output level 2
45	Ventilation control - Level 3	1 Bit	Switching the output level 3
46	Ventilation control - Level 4	1 Bit	Switching the output level 4

Table 73: Communication objects – Step switch bit coded

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Type of thresholds: Manual control only

If the “Type of threshold” parameter is set as follows, the levels are only activated or deactivated manually via their communications objects:

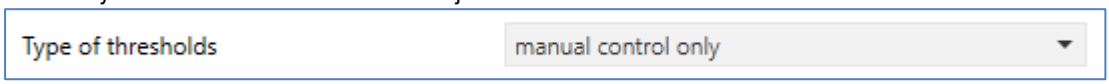


Figure 33: Setting – Manual control only

This setting disables any automatic control of the steps. The fan levels can therefore only be controlled via the objects or via the display.

Behaviour at lock

The following settings are available:

- **not active**
  The lock function is disabled, and no communication object is shown.
- **hold level**
  The controller holds the current level, and the ventilation control is blocked due to further control as long the object has the value 1.
- **send a certain level**
  The controller sets the adjusted level and locks the ventilation control due to further control as long the object has the value 1.

As soon as the lock function is activated, the “**Behaviour when unlocking”** can be set:

- **not active**
  The controller remains in the former state.
- **send a certain value**
  The controller sets the adjusted “Level at lock”.
- **automatic mode**
  The controller switches to automatic mode
  Note: This behaviour is not available for "Step switch bit coded" and "Step switch binary coded" if "Type of thresholds: manual control only" is active.
- **restore the old state**
  The controller restores the level, which was active before locking.

The following table shows the communication object for the blocking function:

Number	Name/Function	Length	Usage
37	Ventilation control – Lock	1 Bit	Locks the ventilation control

Table 74: Communication object – Lock Ventilation

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Behaviour on reset

The following parameter defines the behaviour at the initialization of the device:

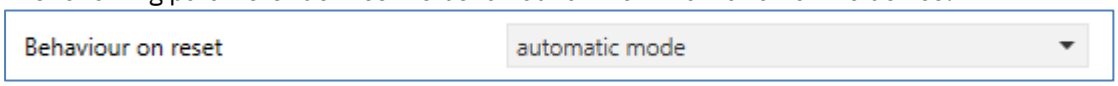


Figure 34: Ventilation control – Behaviour on reset

“Behaviour on reset” defines the level to be called after a reset if the controller has no value yet. This can be “automatic mode” or “Levels 0 – 4”.

Sticking protection

The following parameter activates a sticking protection:

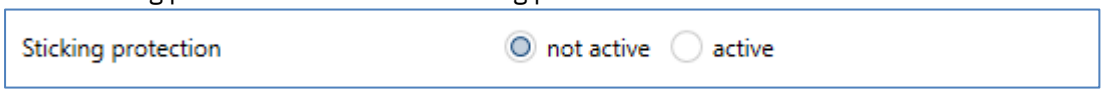


Figure 35: Ventilation control – Sticking protection

To protect the ventilation from getting stuck, a sticking protection can be activated. This lets the ventilation run briefly at the highest level if it has not been moved for 24 hours (= level 0).

Priority

The priority can call a certain state:

Figure 36: Ventilation control – Priority

When the polarity is set (value = 1), the set state is called up. With "Value 0" the priority is taken back again.

The following table shows the communication objects for priority control:

Number	Name/Function	Length	Usage
44	Ventilation control – Object priority	1 Bit	Value 1 calls the adjusted level

Table 75: Communication object – Ventilation control: Priority

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Status object

The following status objects are available for the ventilation control (are permanently visible):

- **1 Byte output**
  If the state object is parameterized as 1 Byte, the object sends the current level as value, e.g. value 1 for level 1, value 2 for level 2...
  With the setting “step-switch as byte”, the current control value is sent.
- **1 Bit – Ventilation active**
  In this case, the value 1 is sent when the ventilation is active and the value 0 when the ventilation is inactive.

The following table shows the associated communication objects:

Number	Name/Function	Length	Usage
47	Ventilation control – 1Byte status ventilation level	1 Byte	Output of the current status, which level is active
53	Ventilation control – Status ventilation active	1 Bit	Output of the status whether active or not

Table 76: Communication object – Status of ventilation control

4.4.5.2 Step Switch – binary coded

The functionality of the binary coded step switch is identical to that of the normal step switch as described under "4.4.5.1 Step switch bit coded". Only the output stage is already transmitted in binary code. Object 43 is bit 0, object 44 is bit 1 and object 44 is bit 2.

The following table shows the binary-coded switching of the output level:

Normal step-switch	Binary value	Step-switch binary coded
Level 0	000	Objects 43, 44, 45 = 0
Level 1	001	Object 43 = 1, Objects 44& 45 = 0
Level 2	010	Object 44 = 1, Objects 43 & 45 = 0
Level 3	011	Objects 43 & 44 = 1, Object 45 = 0
Level 4	100	Object 45 = 1, Objects 43 & 44 = 0

Table 77: Settings – Step-switch binary coded

The following table shows the communication objects for the step switch binary coded:

Number	Name/Function	Length	Usage
43	Ventilation control – Bit 0	1 Bit	Setting the bit 0
44	Ventilation control – Bit 1	1 Bit	Setting the bit 1
45	Ventilation control – Bit 2	1 Bit	Setting the bit 2

Table 78: Communication objects – Step switch binary coded

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.5.3 Step switch simple

The functionality of the step switch simple is identical to that of the normal step switch as described under "4.4.5.1 Step switch bit coded". Only the output level is constructed differently. With each increase of the step, the previous and the new one is switched on, which is also clear from the communication objects:

Number	Name/Function	Length	Usage
43	Ventilation control – Level 1	1 Bit	Switching level 1
44	Ventilation control – Level 1+2	1 Bit	Switching level 1+2
45	Ventilation control – Level 1+2+3	1 Bit	Switching level 1+2+3
46	Ventilation control – Level 1+2+3+4	1 Bit	Switching level 1+2+3+4

Table 79: Communication objects – Step switch simple

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.4.5.4 Step switch as Byte

The "Step switch as Byte" has a continuous output value. Four levels can be defined for each of which an absolute percentage value can be specified. In addition, there is the Off state as the 5th level.

The following picture shows an example of the output of the step switch as byte:

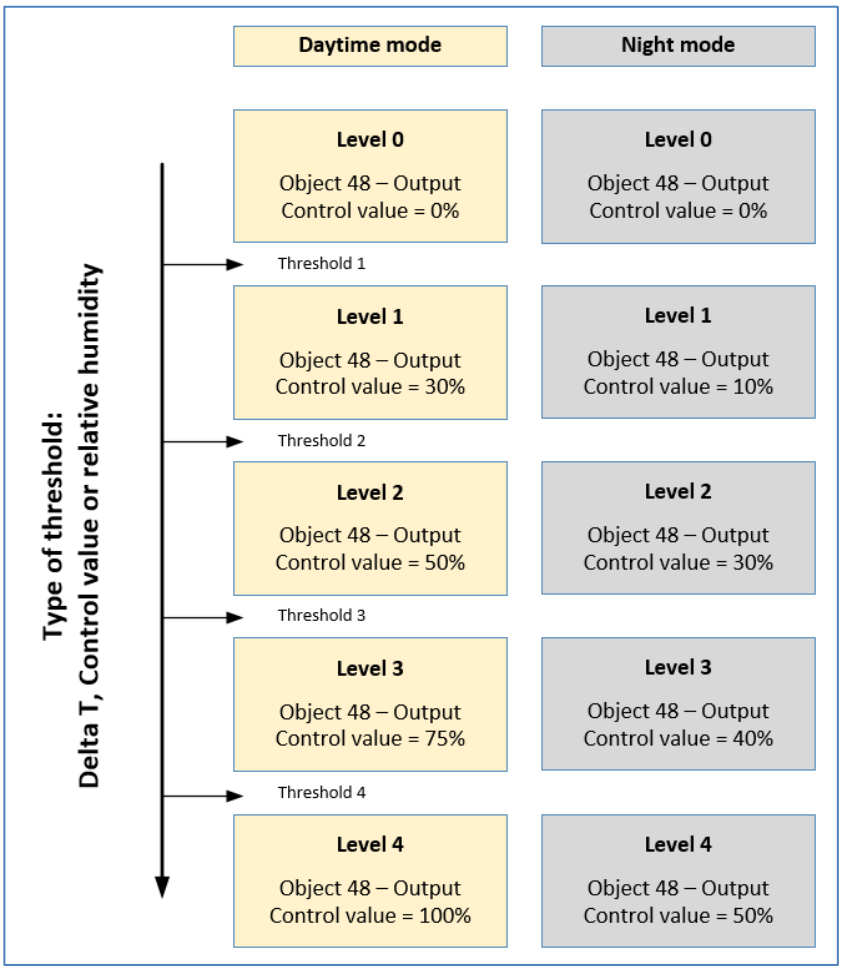


Figure 37: Example – Output: Step switch as Byte

However, it should be noted that the settings for the minimum/maximum value have priority for Day/Night operation and may limit the settings for the output.

The following table shows the communication objects for the step switch as byte:

Number	Name/Function	Length	Usage
48	Ventilation control – Control value output	1 Byte	Sending a control value

Table 80: Communication object – Step switch as Byte

All other functions are identical to those described under "4.4.5.1 Step switch bit coded".

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5 Buttons

4.5.1 Button settings

The following settings are available:

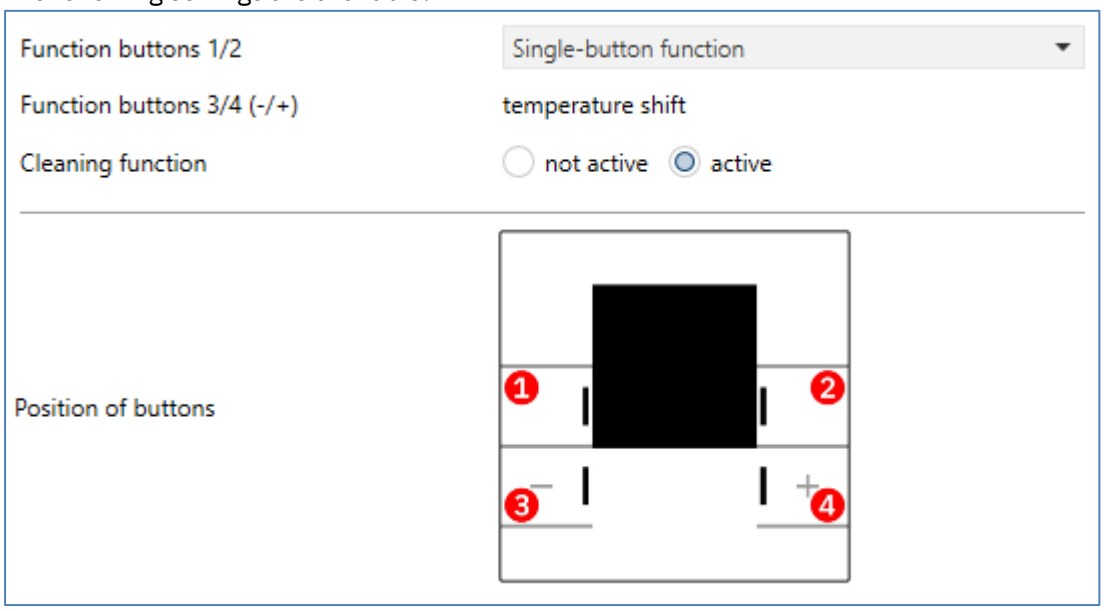


Figure 38: Settings – Button functions

The unit has 4 directly operable buttons. The two upper buttons 1 and 2 are freely programmable as single-button or two-button functions. The two lower buttons 3 and 4 are used internally for temperature shifting and cannot be configured otherwise.
If the temperature controller is set for "independent setpoints", the parameter "Function buttons 3/4 (-/+)" additionally provides the option of shifting the setpoints via "2Byte temperature setting". Details, see chapter 4.5.4 Buttons 3/4.

By activating the **cleaning function**, it is possible to clean the glass surface without triggering any functions. If at least 3 buttons are pressed simultaneously for more than 2 seconds, the 4 status LEDs flash black and white evenly for 10 seconds. Now the buttons have no function. After the time has elapsed, the unit returns to normal operation.

4.5.2 Identical parameters

4.5.2.1 Identical parameter – Lock object

A **lock object** can be defined for each button function. If the lock object is active, a communication object is displayed in each case. The lock object locks the operation of the button(s) when a logical "1" is received and releases it again when a logical "0" is received.

The following table shows the associated communication objects:

Number	Name/Function	Length	Usage
66	Button 1: Buttons 1/2: – Lock object	1 Bit	Activation/deactivation of the lock object
71	Button2: – Lock object	1 Bit	Activation/deactivation of the lock object
72	Buttons 1/2: – Lock object	1 Bit	Activation/deactivation of the lock object

Table 81: Identical communication objects – Buttons

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.2.2 Identical parameter – Button/Object description

Important: These settings only apply to buttons 1 and 2.

A text field is available for free labelling for buttons 1 and 2:

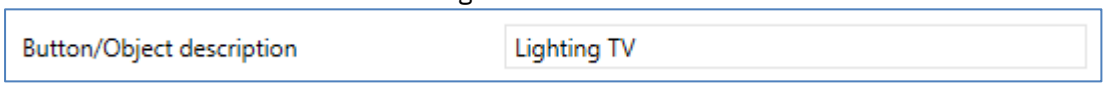


Figure 39: Settings – Button/Object description

Texts with up to 30 characters can be stored for the field.
The text entered for the "**Button/Object description**" appears both in the menu behind the corresponding buttons and with the communication objects of the buttons.

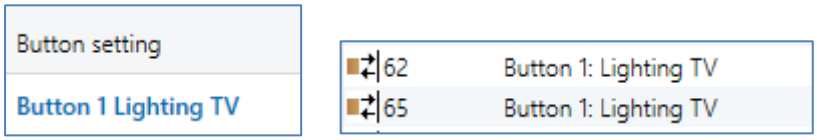


Figure 40: Example – Button/Object description

4.5.2.3 Identical parameter – Representation on the display

Important: These settings only apply to buttons 1 and 2.

The display can be defined for buttons 1 and 2. The indication for the respective button appears in the lower half of the display. A symbol is always available for selection. A text can be displayed optionally.

Parameters that are identical for the display are:

ETS-Text	Dynamic range **[Default value]**	Comment
For button setting: Single-button function		
Display	▪ fixed text ▪ text/value by Status	Setting whether a function is to be displayed with a fixed text or dynamically according to status.
Text/ Text for...	free text [up to 15 bytes allowed]	Enter the function name.
Symbol for ...	free selection [Selection in drop-down field]	Setting of the symbol according to the function. **Special feature: When switching operating modes (internal connection), the symbols are predefined and cannot be changed!**
Colour of symbol for ...	free selection [Selection in drop-down field]	Setting the colour for the symbol.
Display status value as text under symbol	▪ not active ▪ in percent (%)	Setting whether the status value is to be displayed in %.
For button setting: Two-button function		
Function name	free text [up to 15 bytes allowed]	Enter the function name.
Symbol for ...	free selection [Selection in drop-down field]	Setting of the symbol according to the function.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Colour of symbol for ...	free selection [Selection in drop-down field]	Setting the colour for the symbol.
Button labelling left/right	▪ Text entry ▪ Symbol - ▪ Symbol + ▪ Symbol Up ▪ Symbol Down	Defining the button labelling, as a symbol or text.
Text	Free text [up to 6 bytes allowed]	Enter the function name for the left/right button. **Only when "Text entry" is selected.**
Display status value as text under symbol	▪ not active ▪ in percent (%)	Setting whether the status value is to be displayed in %. **Only for "Dimming" and " Blind/Shutter".**

Table 82: Identical parameter – Representation on the display

Single-button function:

Fixed text: A fixed text is stored here. This remains independent of the status and is displayed above the symbol.

Text/value by status: Either a text or a value corresponding to the current status can be displayed here. For functions with 2 possible states, the text for "ON" or "OFF" is displayed above the symbol. For functions with 3 possible states, the status can be displayed in percent (%) below the symbol. To do this, the parameter "Display status value as text under symbol" must be activated!

Two-button function:

Function name: A fixed text is stored here. This remains independent of the status and is displayed centrally above the symbol.

Button labelling left/right: Both buttons can either be freely labelled or a fixed symbol is assigned for " /+/Up/Down". Text or symbol appears to the left or right of the buttons.

Display status value as text under symbol: Here you can determine whether the current status should be displayed as a percentage value (%) under the symbol.

Display of symbols by status:
Symbols are always displayed. A corresponding symbol can be stored here for each possible status. This changes according to the status.

Important: If the status object for a function is not connected, the current switching status is visualised, otherwise the value of the status object!

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3 Buttons 1/2

The two upper buttons on the unit can be configured in the "Button settings" menu either as a single-button function or as a two-button function.

As a pair of buttons, simple functions such as switching ON/OFF, dimming bright/dark and blind Up/Down can be set.

As single buttons, several functions are available as internal functions (related to the internal controller for temperature and ventilation) or external functions. The display for the buttons is in the lower half of the display.

The following settings are available (example here for the single button function):

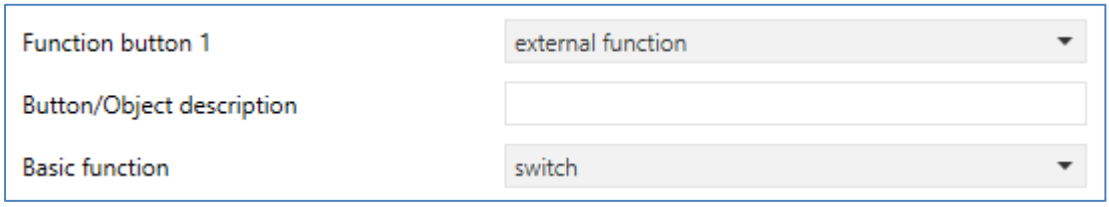


Figure 41: Basic settings – Buttons 1/2

The following parameters are available for selecting the functions and basic functions:

ETS-Text	Dynamic range **[Default value]**	Comment
Function button 1/2	▪ not active ▪ **mode selection (internal connection)** ▪ ventilation control direct operation (internal connection) ▪ OFF (control value = 0%) (internal connection) ▪ Heating/Cooling (internal connection) ▪ external function	**Setting only available for the single-button function.** Setting of the function for button 1 or button 2.
Basic function	▪ not active ▪ **switch** ▪ switch/send values short/long (with 2 objects) ▪ dimming ▪ blinds/shutter ▪ send status ▪ send value	**Setting only available for the single-button function and if function button 1 or 2 is set to "external function".** Defines the basic function of the buttons.
Basic function	▪ **switch** ▪ dimming ▪ blinds/shutter	**Setting only available for the two-button function.** Defines the function of the buttons.

Table 83: Basic settings – Buttons 1/2

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.1 Mode selection (internal connection)

☑ Single-button function

The "mode selection" function can be used to switch the HVAC mode in the internal temperature controller. No communication objects are available for this.
When operating as an extension unit, the mode selection is sent to an external controller and the current controller status is received.

The following picture shows the available settings:

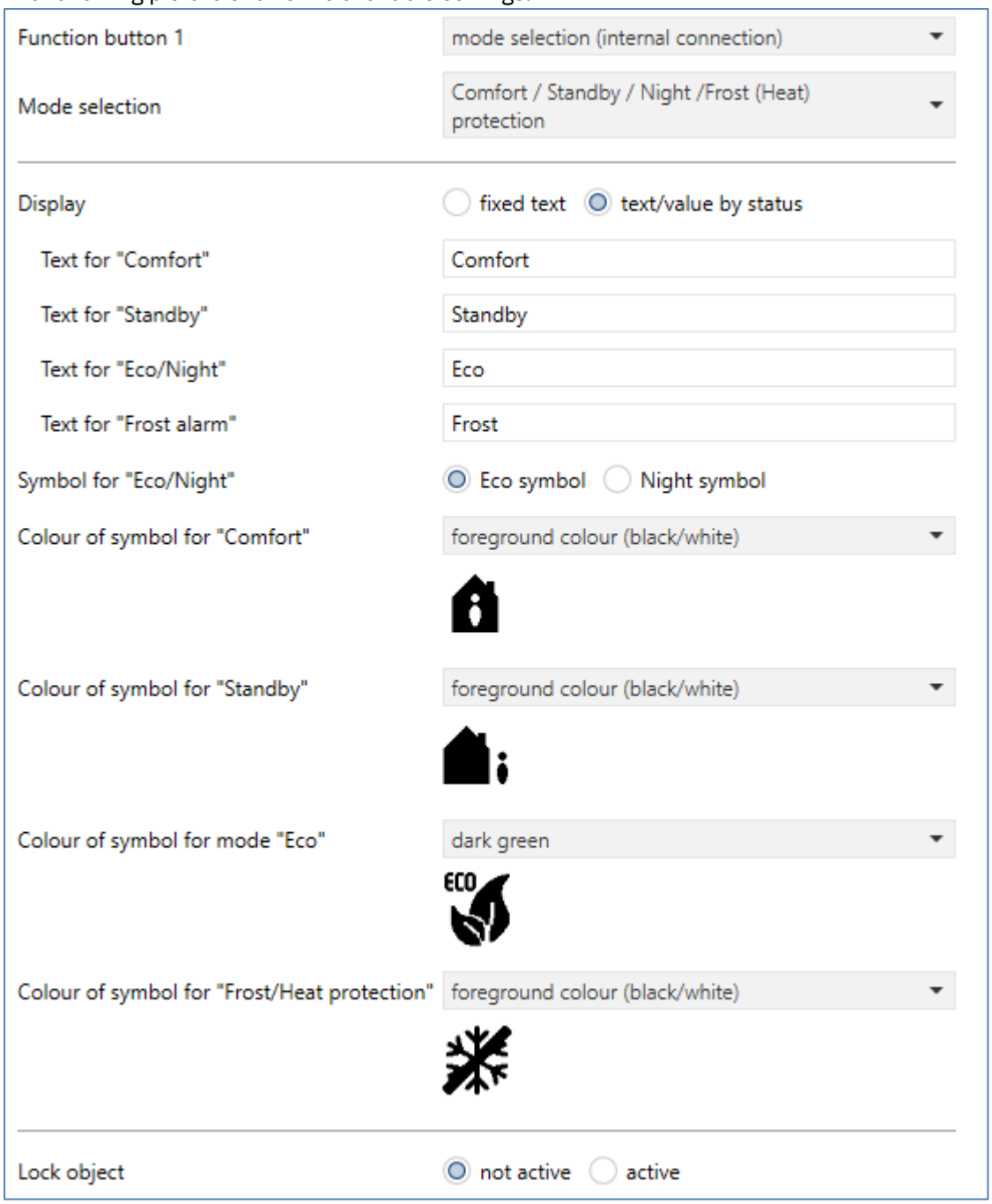


Figure 42: Settings – Mode selection (internal connection)

Special feature for the indication in the display:
The symbols for this function are fixed and cannot be changed.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

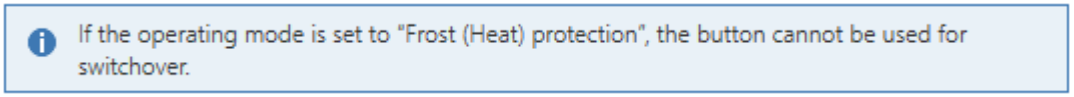
The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Mode selection	▪ **Comfort / Standby / Night / Frost (Heat) protection)** ▪ Comfort / Standby / Night ▪ Comfort / Standby / Frost (Heat) protection ▪ Comfort / Night / Frost (Heat) protection ▪ Comfort / Standby ▪ Comfort / Night ▪ Comfort / Frost (Heat) protection ▪ Comfort ▪ Standby ▪ Eco/ Night ▪ Frost (Heat) protection	Setting between which operating modes can be switched.
No switchover when other operating mode	☑ If checked, then note text in blue box	**Only visible if 2 or 3 operating modes are selected.** Activation locks a switchover if another operating mode than the selected one is active.

Table 84: Settings – Mode selection (internal connection)

No switchover when other operating mode:
If the function is activated by setting the check mark, the button can only be used to switch between the set operating modes if one of these operating modes is active. If, for example, "Operating mode switchover - Comfort/Night" was set and "Frost protection mode" was triggered by another event, e.g. by opening a window, the button cannot be used to switch any further. Only when the operating mode is set to "Comfort" or "Night" again can you switch over with the button.

Note: According to the setting in the "Mode selection" parameter, a message appears in a blue box indicating the operating mode that cannot be switched over.
Example:
Mode section: “Comfort/Standby/Night”
No switchover when other operating mode: marked



Operation as extension unit:
Mode selection is sent to an external controller by object 15. The status is received by object 20.

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
15	Mode selection – Send mode	1 Byte	Sending the operating mode
20	DPT_HVAC Status – Receive controller status	1 Byte	Receiving the controller status

Table 85: Communication objects – Mode selection (extension unit)

For a description of "Display" and "Lock object", see chapter 4.5.2 Identical parameters

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.2 Ventilation control direct operation (internal connection)

☑ Single-button function

This function can be used to switch the levels of the internal ventilation control. No communication objects are available for this.

The following image shows the available settings:

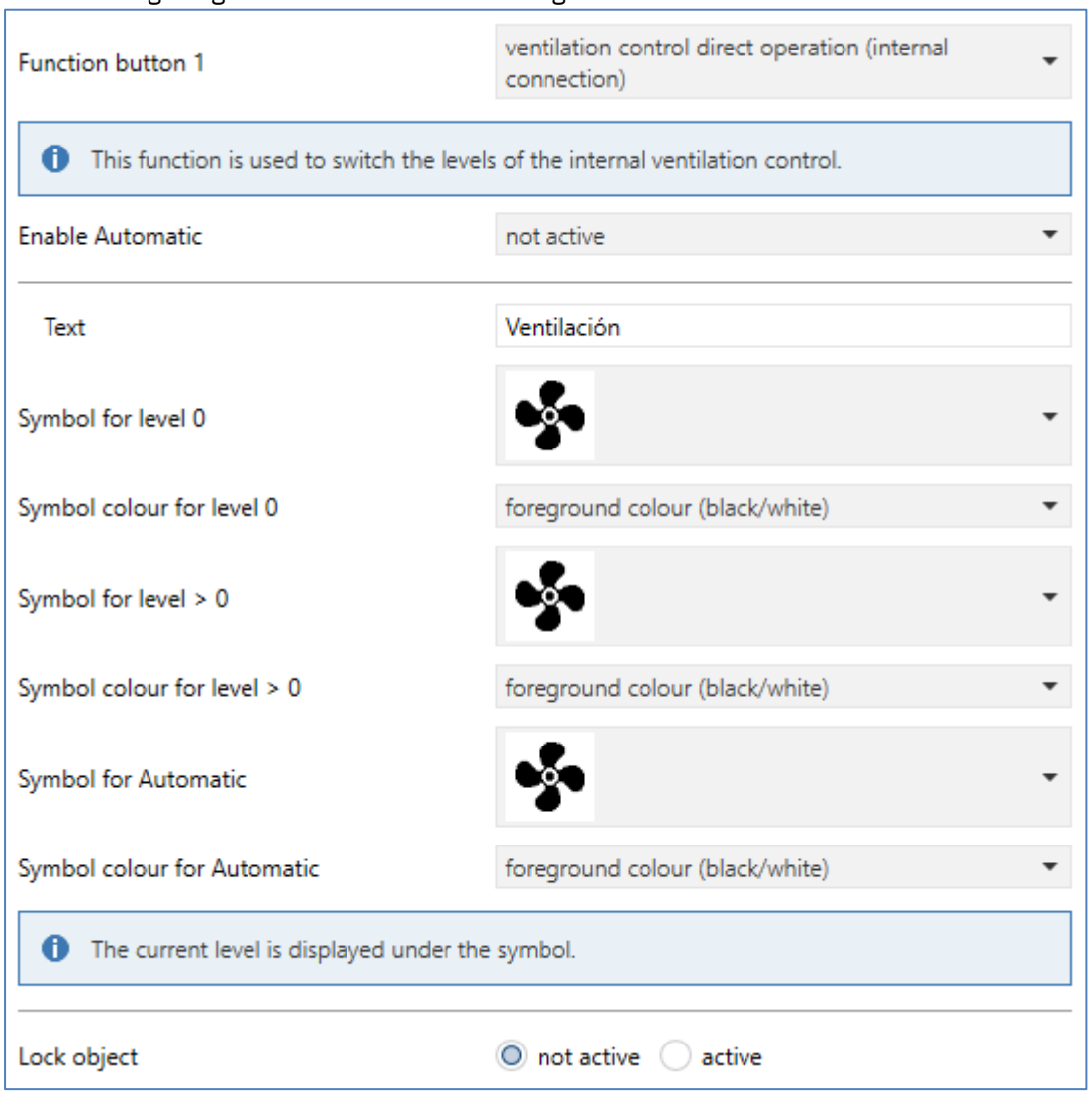


Figure 43: Settings – Ventilation control direct operation (internal connection)

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Enable Automatic	▪ **not active** ▪ on overflow ▪ with long keypress	Setting whether and when the automatic can be activated.
Control as extension unit	▪ **not active** ▪ active	Setting whether control as an extension unit is possible. **Only visible if internal ventilation control is not active!**
Total number of levels	▪ 2 ▪ 3 ▪ **4**	Setting the number of ventilation levels. **Only visible when „Control as extension unit“ is activated!**

Table 86: Settings – Ventilation control direct operation (internal connection)

Enable Automatic:
Automatic mode can be activated here. With the setting "**on overflow**", the system switches to automatic mode after switching through twice. The next time the button is pressed, automatic mode is deactivated again, and the fan levels can be switched through again.
With the setting "**with long keypress**", a long press of the button switches to automatic mode. The next short press of the button exits automatic mode again and the ventilation control starts with the first level.

Control as extension unit:
If the internal ventilation control is not active, the ventilation control of an extension unit can be used. Communication is then carried out via objects.

The following communication objects are available for the use as Extension unit:

Number	Name/Function	Length	Usage
47	Ventilation control – 1Byte status ventilation level (Extension unit)	1 Byte	Receive the status of which fan level is active in the extension unit.
50	Ventilation control – Switch Automatic (Extension unit)	1 Bit	Activating/deactivating the Automatic in the extension unit.
52	Ventilation control – Manual ventilation control (Extension unit)	1 Byte	Manual control of the fan levels in the extension unit.
54	Ventilation control – Status Automatic (Extension unit)	1 Bit	Feedback from the extension unit whether Automatic is active.

Table 87: Communication objects – Ventilation control direct operation (internal connection)

For a description of "Display" and "Lock object", see chapter 4.5.2 Identical parameters

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.3 OFF (control value = 0%) (internal connection)

☑ Single-button function

This function can be used to activate the locks for the Heating/Cooling control values on the internal controller. With the setting "Use device as: Controller", no communication objects are available.

The following picture shows the available settings:

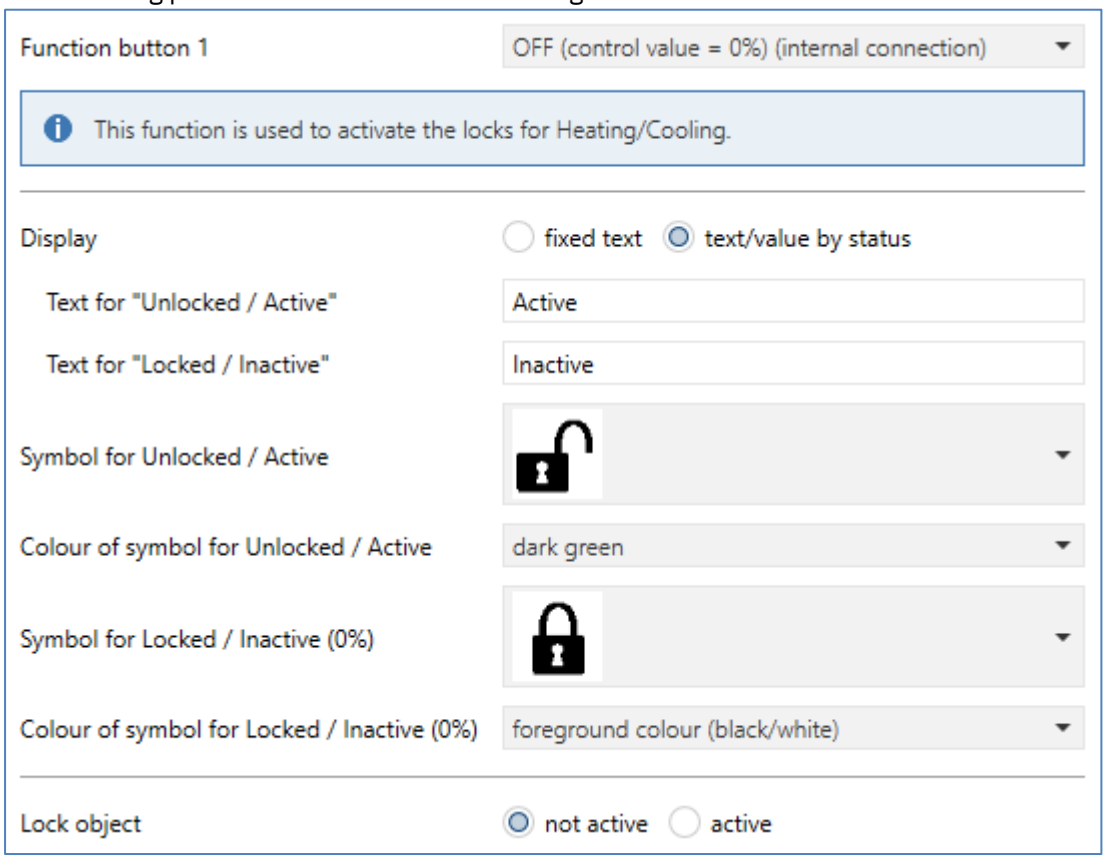


Figure 44: Settings – OFF (control value = 0%) (internal connection)

A lock is sent to the internal controller via the button. This sets the control value to 0%. When reset, the controller returns to normal operation.

Use as Extension unit:
A lock is sent via communication objects 28 and/or 29, depending on the set controller type, when the button is pressed.

The following communication objects are available for the use as Extension unit:

Number	Name/Function	Length	Usage
28	Lock object Heating – Lock control value	1 Bit	Activating/deactivating the lock for the control value input
29	Lock object Cooling – Lock control value	1 Bit	Activating/deactivating the lock for the control value input

Table 88: Communication objects – Lock control value (Extension unit)

For a description of "Display" and "Lock object", see chapter 4.5.2 Identical parameters

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.4 Switchover Heating/Cooling (internal connection)

☑ Single-button function

Th This function can be used to switch between “Heating” and “Cooling” on the internal controller. With the setting "Use device as: Controller", no communication objects are available.

The following picture shows the available settings:

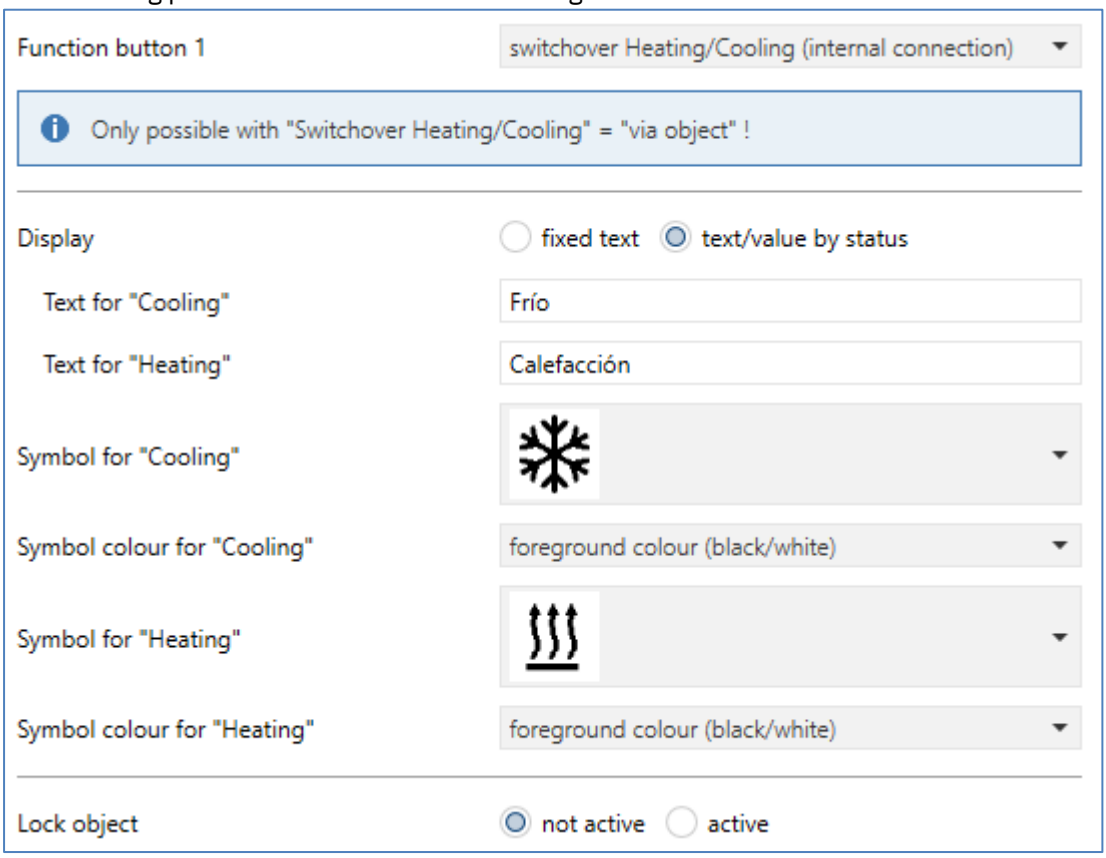


Figure 45: Settings – Switchover Heating/Cooling (internal connection)

Switchover is only possible if "Switchover Heating/Cooling → via Object" is activated on the internal controller.

Use as Extension unit:
When the button is pressed, the switchover is sent to an external controller and the status is received.

The following communication objects are available for the use as Extension unit:

Number	Name/Function	Length	Usage
32	Switchover Heating/Cooling – 0=Cooling 1=Heating	1 Bit	Sending the command for toggling Heating/Cooling
33	Status Heating/Cooling – 0=Cooling 1=Heating	1 Bit	Receive the current status of the controller

Table 89: Communication objects – Switchover Heating/Cooling (Extension unit)

For a description of "Display" and "Lock object", see chapter 4.5.2 Identical parameters.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.5 Basic function – Switch

☑ Single-button function
☑ Two- button function

Important: Basic functions for the single-button function are available for selection if the function of buttons 1 or 2 is set to "external function"!

4.5.3.5.1 Switch with the Two-button function

☑ Two- button function

With the two-button function, the respective value (ON/OFF) can be assigned to the left and the right button. Thus, the left or the right button sends the set, fixed value.

The following picture shows the available settings:

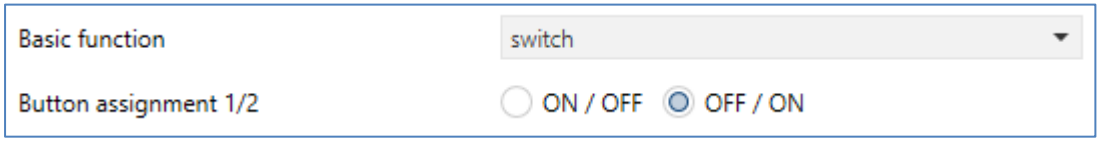


Figure 46: Settings – Two-button function: Switch

Button assignment ON/OFF:
The left button sends the value ON and the right button sends the value OFF.

Button assignment OFF/ON:
The left button sends the value OFF and the right button sends the value ON.

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
62	Buttons 1/2– Switch On/Off	1 Bit	Switching function of the buttons.
65	Buttons 1/2– Status for display	1 Bit	Status to update display/symbol on the unit. Needs to be connected to the status of the actuator to be switched.

Table 90: Communication objects – Two-button function: Switch

For a description of "Representation on the display", " Button/Object description" and " Lock object", see chapter 4.5.2 Identical parameters.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.5.2 Switch with the Single-button function

☑ Single-button function

The following figure shows the available settings:

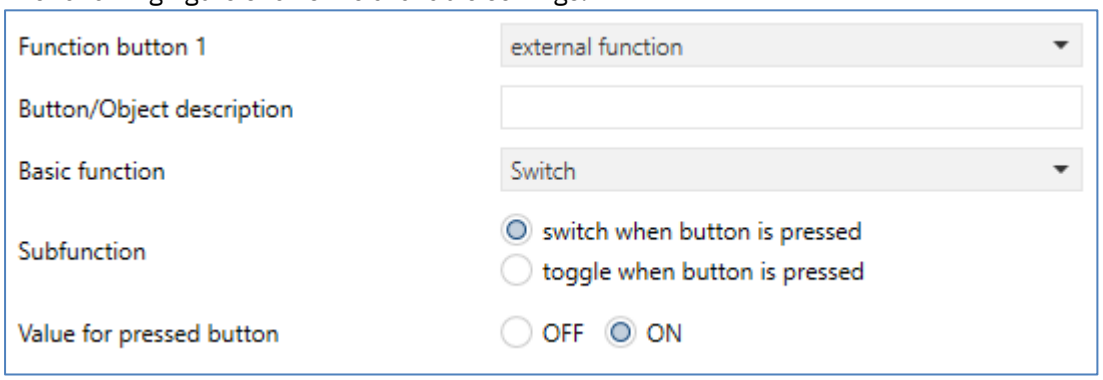


Figure 47: Settings – Single-button function: Switch

With the basic function "Switch - Sub-function: **switch when button is pressed**", the button sends the respective fixed value when pressed.
With the "Sub-function - **toggle when button is pressed**", the button sends the respective inverted value in relation to the last received status value. For this purpose, the status object "**Value for toggle**" is connected to the status of the actuator to be controlled. If an ON signal was received as the last value, the button sends an OFF command the next time it is pressed.

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
62	Button 1: – Switch	1 Bit	Switching function of the button (for sub-function "Switch when button is pressed").
62	Button 1: – Toggle	1 Bit	Toggle function of the button (for sub-function "Toggle when button is pressed")
63	Button 1: – Status for toggle	1 Bit	Status to update display/symbol on the unit. Must be connected to the status of the actuator to be switched (for sub-function "Toggle when button is pressed").
65	Button 1: – Status for display	1 Bit	Status to update display/symbol on the unit. Must be connected to the status of the actuator to be switched (for sub-function "Switch when button is pressed").

Table 91: Communication objects – Single-button function: Switch

For a description of "Representation on the display", " Button/Object description" and " Lock object", see chapter 4.5.2 Identical parameters

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.6 Basic function – Switch/Send values short/long (with 2 objects)

☑ Single-button function

Important: Basic functions for the single-button function are available for selection if the function of buttons 1 or 2 is set to "external function"!

The following figure shows the available settings:

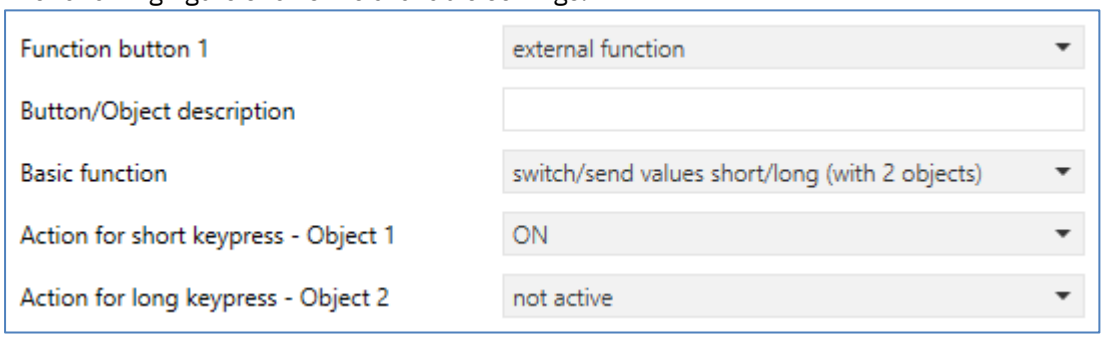


Figure 48: Settings – Switch/Send values short/long (with 2 objects)

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Action for short/long keypress – Object 1/2	▪ OFF ▪ **ON** ▪ toggle ▪ send value ▪ **not active**	Setting the action for the short/long button.
Datapoint type	▪ **1Byte DPT 5.005 Decimal factor (0...255)** ▪ 1Byte DPT 5.001 Percent value (0...100%) ▪ 1Byte DPT 17.001 Scene number	Setting of the datapoint type for the value to be sent. **Setting only available if "Action for short/long keypress" is set to "send value".**

Table 92: Settings – Switch/Send values short/long (with 2 objects)

With the basic function "**Switch/Send values short/long (with 2 objects)**", 2 different values can be sent for a short and long keypress. The objects can be different. This makes it possible to send different types of datapoints.

With "**value: ON**" or "**value: OFF**", the same fixed value is always sent.

When "**toggle**" is set, On/Off is sent alternately.

With "**send value**", the set value is always sent, either as a percentage value, decimal value, or scene. The adjustable values are: 0 - 100% (percent value), 0 - 255 (value) or 1 - 64 (scene).

Important: The status display always applies to the "short button"/object 1!

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
62	Button 1 short: – Switch, toggle, send value...		Sending the value for the short button. DPT depending on the parameter setting.
63	Button 1 short: – Status for toggle, Status for display		Receiving the status for the short button. DPT depending on the parameter setting.
64	Button 1 long: – Switch, toggle, send value...		Sending the value for the long button. DPT depending on the parameter setting.
65	Button 1 long: – Status for toggle	1 Bit	**Only for "Action for long keypress - toggle".** Receiving the status for the long button. Must be connected to the status of the actuator to be switched.

Table 93: Communication objects – Switch/Send values short/long (with 2 objects)

For a description of "Representation on the display", " Button/Object description" and " Lock object", see chapter 4.5.2 Identical parameters

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.7 Basic function – Dimming

☑ Single-button function
☑ Two- button function

Important: Basic functions for the single-button function are available for selection if the function of buttons 1 or 2 is set to "external function"!

The following figure shows the available settings (here with the two-button function):

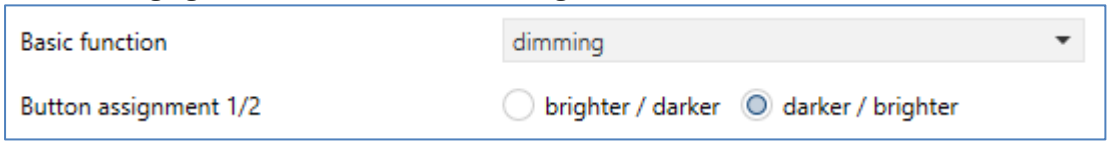


Figure 49: Settings – Dimming

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Button assignment 1/2	▪ **brighter/darker** ▪ darker/brighter	**Only with two-button function!** Setting the button assignment for the direction (brighter/darker).

Table 94: Settings – Dimming

With the single-button function "Dimming", two communication objects appear for this button. Firstly, the function for a short button action, the "Dimming On/Off" switch object, and secondly the function for a long button action, the dimming object "Dimming relative".
The two-button function “dimming” can be set either as brighter/darker or as darker/brighter. The relationships are shown in the following table:

	Function brighter/darker			**Function darker/brighter**	
Input	Button 1	Button 2		Button 1	Button 2
Dimming function	brighter	darker		darker	brighter
Switching function	ON	OFF		OFF	ON

Table 95: Functionality – Two-button Dimming

With the single-button function “dimming”, the direction (brighter/darker) is reversed depending on the communication object "Status for toggle".
The dimming function is a start-stop dimming function, i.e. as soon as the dimming function becomes active, a brighter or darker command is assigned to the input until it is released. After the command is released, a stop telegram is sent which ends the dimming process.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
62	Button 1: Buttons 1/2 – Dimming On/Off	1 Bit	Switching command for the dimming function
63	Button 1: Buttons 1/2 – Dimming relative	4 Bit	Command for relative dimming
64	Button 1 – Status for toggle	1 Bit	**Only for single button function.** Receipt of the status with current information about the status of the actuator to be controlled
65	Button 1: Buttons 1/2 – Status for display	1 Byte	Receiving the status of the current absolute brightness

Table 96: Communication objects – Dimming

For a description of "Representation on the display", " Button/Object description" and " Lock object", see chapter 4.5.2 Identical parameters

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.8 Basic function – Blinds/Shutter

☑ Single-button function
☑ Two- button function

Important: Basic functions for the single-button function are available for selection if the function of buttons 1 or 2 is set to "external function"!

The blinds/shutter function is used to control shutter actuators, which can be used for the adjustment and control of blinds/shutters.

The following figure shows the available settings (here: Two-button function):

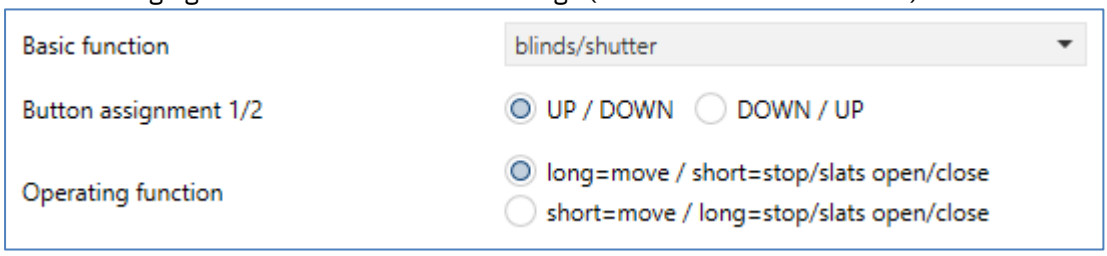


Figure 50: Settings – Blinds/Shutter

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Button assignment 1/2	▪ UP/DOWN ▪ **DOWN/UP**	**Only with two-button function!** Setting the button assignment for the up/down function.
Operating function	▪ **long=move / short=stop/slats open/close** ▪ short=move / long=stop/slats open/close	Setting the concept of how to operate with long/short buttons.

Table 97: Settings – Blinds/Shutter

Two communication objects are displayed for the "blinds/shutter" function: the object "stop/slats open/close" and the object "blinds up/down ".The moving object is used to move the blinds/shutters up and down. The stop/step object is used to adjust the slats. In addition, this function stops the up/down movement as far as the end position has not yet been reached.

In the case of the **two-button function**, the button assignment can be set.
The table below shows the relationships:

	Function Up/Down			**Function Down/Up**	
Input	Button 3	Button 4		Button 3	Button 4
Moving object	UP	DOWN		DOWN	UP
Stop/Step object	Stop/slats open	Stop/slats close		Stop/slats close	Stop/slats open

Table 98: Functionality – Two-button movement blinds/shutter

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The **single button operation** is a "toggle" function. This means that it is switched between “UP” and "DOWN" after each keystroke. This can be influenced via the "**Status for change of direction**" object. If, for example, the direction of movement is changed from another location, the shutter actuator sends the current direction to the "Status for change of direction" object and the device sends the opposite direction the next time the button is pressed.

It is also possible to swap the action for the long and short button press. In this way, it is possible to select whether to move via a long or a short button press. The stop/step object then adopts the other operating concept in each case.

Only one object is available as "**status for display**". It refers to the height position. A position for the slat cannot be visualised.

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
62	Button 1: Buttons 1/2 – Blinds Up/Down	1 Bit	Up/down command for the shutter actuator
63	Button 1: Buttons 1/2 – Slat adjustment / Stop	1 Bit	Open/close slats and stop command
64	Button 1 – Status for change of direction	1 Bit	**Only with single button function!** Receipt of the status with current information about the direction of the blind actuator
65	Button 1: Buttons 1/2 – Status for display	1 Byte	Receive the status of the current blind/shutter position.

Table 99: Communication objects – Blinds/Shutter

For a description of "Representation on the display", " Button/Object description" and " Lock object", see chapter 4.5.2 Identical parameters

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.9 Basic function – Send Status

☑ Single-button function

Important: Basic functions for the single-button function are available for selection if the function of buttons 1 or 2 is set to "external function"!

With the basic function "Send status", fixed values can be sent for a pressed button (rising edge) and a released button (falling edge).

The following picture shows the available settings:

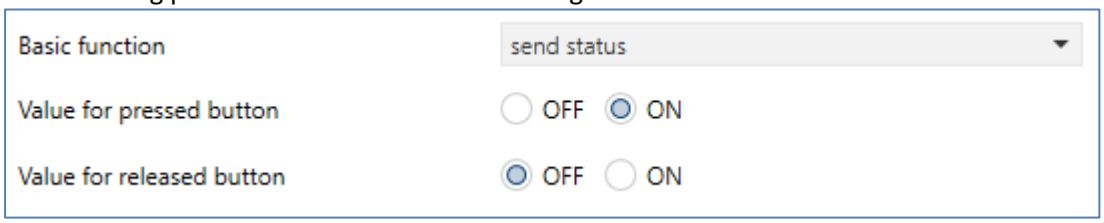


Figure 51: Settings – Send Status

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Value for pressed button	▪ OFF ▪ **ON**	Defines the sending behaviour when the button is pressed.
Value for released button	▪ **OFF** ▪ ON	Defines the sending behaviour when the button is released.

Table 100: Settings – Send Status

The following table shows the available communication object:

Number	Name/Function	Length	Usage
62	Button 3 – Send status	1 Bit	Sends the respective value when pressing and releasing the button

Table 101: Communication object – Send status

Important: No object for the status is available here. Display at "Symbol by status" shows the current value of the button.

For a description of "Representation on the display", " Button/Object description" and " Lock object", see chapter 4.5.2 Identical parameters

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.3.10 Basic function – Send value

☑ Single-button function

Important: Basic functions for the single-button function are available for selection if the function of buttons 1 or 2 is set to "external function"!

The following figure shows the available settings:

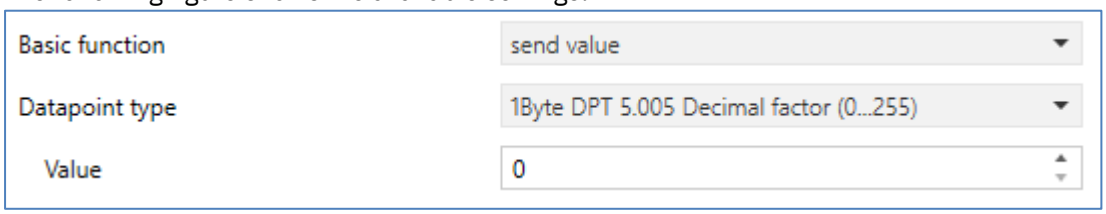


Figure 52: Settings – Send value

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Datapoint type	▪ **1Byte DPT 5.005 Decimal factor (0...255)** ▪ 1Byte DPT 5.001 Percent value (0...100%) ▪ 1Byte DPT 17.001 Scene number	Setting the datapoint type for the value to be sent.

Table 102: Settings – Send value

Each time the button is pressed, the set value is always sent.
The adjustable value ranges are 0 - 100% (percentage value), 0 - 255 (value) or 1 - 64 (scene).

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
62	Button 1 – send value, send percent value, send scene	1 Byte	Sending the value. DPT depending on the parameter setting
65	Button 1 – Status for display	1 Byte	Receiving the status. DPT depending on parameter setting. **Not available for scene number.**

Table 103: Communication objects – Send value

For a description of "Representation on the display", " Button/Object description" and " Lock object", see chapter 4.5.2 Identical parameters.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.4 Buttons 3/4

This pair of buttons is permanently preset to "**temperature shift**" and cannot be used for any other purpose. Depending on the use of the internal temperature controller (as "Controller" or "Extension unit"), there are differences in the settings.

4.5.4.1 Buttons 3/4 – Temperature shift as a controller

If the temperature controller is selected as "Controller", the setting "Setpoints for Standby/Night" has an effect on the type of temperature shift for buttons 3/4.

Important: The temperature shift refers to the controller in the unit. There are no communication objects for the buttons 3/4.

4.5.4.1.1 Controller: Depending on setpoint Comfort (basic)

With this selection, the "**Function button 3/4 (-/+)**" is fixed set to "Temperature shift".

The following settings are available:

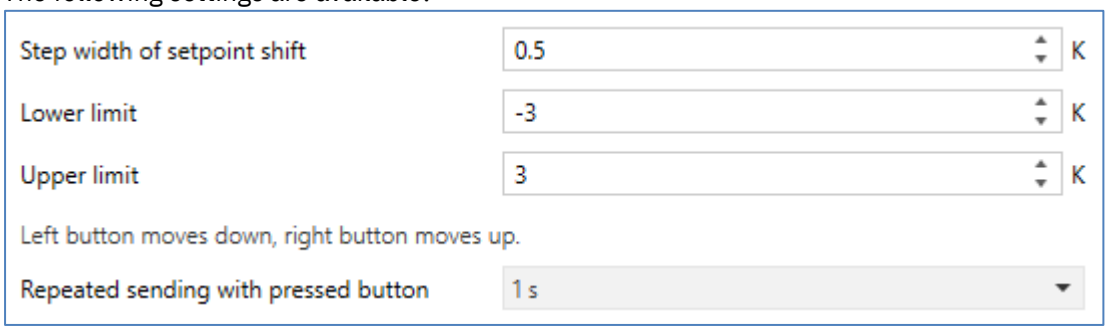


Figure 53: Settings – Buttons 3/4: Temperature shift as controller (1)

Here the range is limited to a difference (K) and is thus dependent on the current setpoint.

The following table shows all available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Step width of setpoint shift	0,1 ... 1 K **[0,5 K]**	Setting of the step size between two send commands.
Lower limit	-10 ... 10 K **[-3 K]**	Setting of the lower limit value for the setpoint shift.
Upper limit	-10 ... 10 K **[3 K]**	Setting of the upper limit value for the setpoint shift.
Repeated sending with pressed button	not active, 200 ms – 3 s **[1 s]**	Activating the send repetition while the button is pressed.

Table 104: Settings – Buttons 3/4: Temperature shift as controller (1)

Functional principle:
This function shifts the current setpoint within the set limits. When the “-“ button is pressed, the setpoint is sent subtracted from the last value by the set increment, and when the “+” button is pressed, it is sent added to the last value by the set increment.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Upper/lower limit:
The value is shifted within these limits. The function never falls below the lower limit value and never exceeds the upper limit value.

Step width:
The step width indicates the distance between two transmitted telegrams. For example, with a step size of 0.5 K and a setpoint value of 21°C, pressing the "-" button would cause 20.5°C and set to 21.5°C when the "+" button is pressed.

4.5.4.1.2 Controller: Independent setpoints

With this selection, two settings are possible in the "**Button setting**" menu for the "**Function buttons 3/4 (-/+)**":

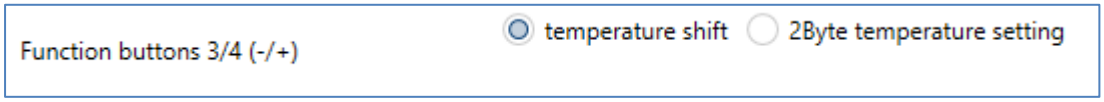


Figure 54: Settings – Buttons 3/4: Temperature shift/-setting

The settings for the "**Temperature shift**" selection are the same as in the previous chapter "4.5.4.1.1 Controller: Dependent on setpoint Comfort (basic)".

When selecting "**2Byte temperature setting**", the following settings are available:

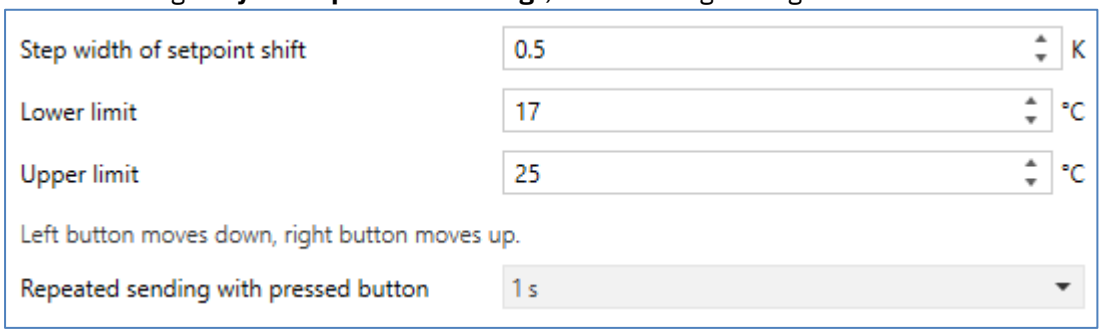


Figure 55: Settings – Buttons 3/4: Temperature shift as controller (2)

Here the range is limited to fixed values (°C), independent of the current setpoint.

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Step width of setpoint shift	0.1 ... 1 K **[0.5 K]**	Setting of the step size between two send commands.
Lower limit	0 ... 45 °C **[17 °C]**	Setting of the lower limit value for the setpoint shift.
Upper limit	0 ... 45 °C **[25 °C]**	Setting of the upper limit value for the setpoint shift.
Repeated sending with pressed button	not active 200 ms – 3 s **[1 s]**	Activating the send repetition while the button is pressed.

Table 105: Settings – Buttons 3/4: Temperature shift as controller (2)

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.5.4.2 Buttons 3/4 – Temperature shift as extension unit

If the internal controller is set as "extension unit", the type of temperature shift is set in the menu for buttons 3/4.

The following settings are available here (here for the shift over 2byte):

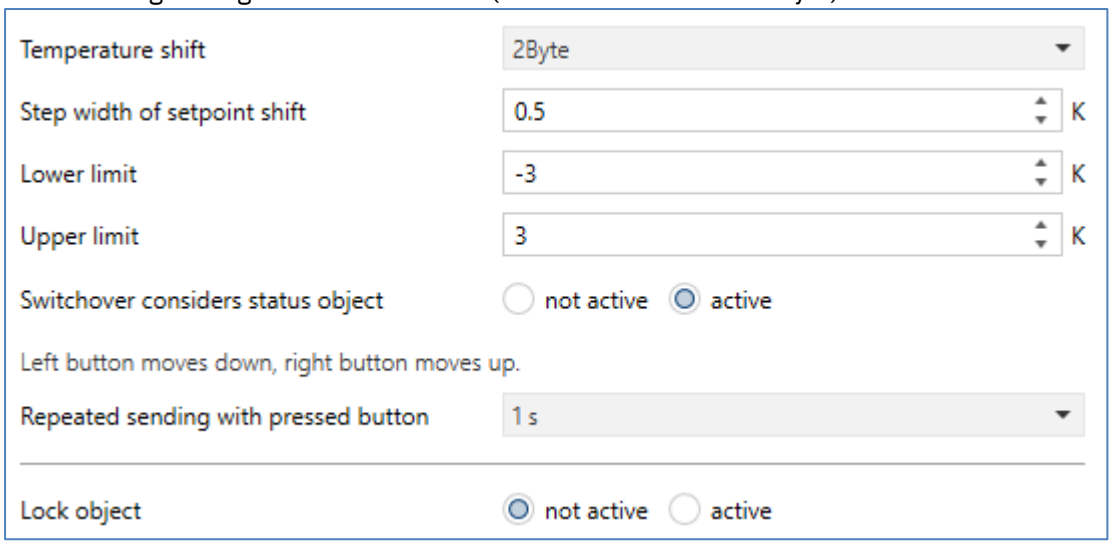


Figure 56: Settings – Buttons 3/4: Temperature shift as extension unit

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Temperature shift	▪ **1Bit** ▪ 1Byte ▪ 2Byte ▪ 2Byte temperature setting	Selection of the type of temperature shift
Step width of setpoint shift	0,1 ... 1 K **[0,5 K]**	Setting of the step size between two send commands. **Not displayed for shift via 1 bit**
Lower limit	-10 ... 10 K **[-3 K]**	Setting of the lower limit value for the setpoint shift. **Only for shift via 1byte/2byte**
Upper limit	-10 ... 10 K **[3 K]**	Setting of the upper limit value for the setpoint shift. **Only for shift via 1byte/2byte**
Lower limit	0 ... 45 °C **[17 °C]**	Setting of the lower limit value for the setpoint shift. **Only for shift via 2byte temperature setting.**
Upper limit	0 ... 45 °C **[25 °C]**	Setting of the upper limit value for the setpoint shift. **Only for shift via 2byte temperature setting.**

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

Switchover considers status object	▪ not active ▪ **active**	Setting whether to perform shifting according to the current status. **Not for shift via 1 bit.**
Repeated sending at pressed key	not active, 200 ms – 3 s **[1 s]**	Activating the send repetition while the button is pressed.

Table 106: Settings – Buttons 3/4: Temperature shift as extension unit

Functional principle:
This function shifts the current setpoint within the set limits. When the "-" button is pressed, the setpoint is sent subtracted from the last value by the set increment, and when the "+" button is pressed, it is sent added to the last value by the set increment.

Upper/lower limit:
The value is shifted within these limits. The function never falls below the lower limit value and never exceeds the upper limit value.

Step size:
The step size indicates the distance between two transmitted telegrams. For example, with a step size of 0.5 K and a setpoint value of 21°C, pressing the "-" key would cause 20.5°C and set to 21.5°C when the "+" key is pressed.

Switchover considers status object:
If the **status value is not considered** when switching over, the device remembers the last value sent and sends the next or previous value the next time it is pressed, regardless of whether another value has been sent to the object in the meantime.
If the **status value is considered** in the changeover, the device sends the next higher or next lower changeover value – with reference to the last received status value – the next time it is pressed. If, for example, the value "1K" was sent when the last key was pressed and then the value "2K" was sent from another location, the value "2.5K" is sent the next time the "+" key is pressed.

Important: The temperature shift is implemented via the objects of the controller. There are no communication objects for the buttons 3/4.

The following communication objects on the controller are available here:

Number	Name/Function	Length	Usage
0	Setpoint setting – Set setpoint	2 Byte	Setting of an absolute value. **Only with "2byte temperature setting"**
7	Manual setpoint shift	1 Byte	Increase/decrease (1Byte)
7	Manual setpoint shift	2 Byte	Increase/decrease (2Byte)
8	Manual setpoint shift	1 Bit	Increase/decrease (1=+ /0=-)
9	Status setpoint shift – Receive status	1 Byte 2 Byte	Receiving the current status. DPT depending on parameter setting.

Table 107: Communication objects – Buttons 3/4: Temperature shift as extension unit

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.6 Status LEDs

4 status LEDs can be freely configured on the unit. Each LED can react either to button actuation, internal objects or external objects.

4.6.1 LED basic settings

The LED basic settings affect all active status LEDs.

The following figure shows the available settings:

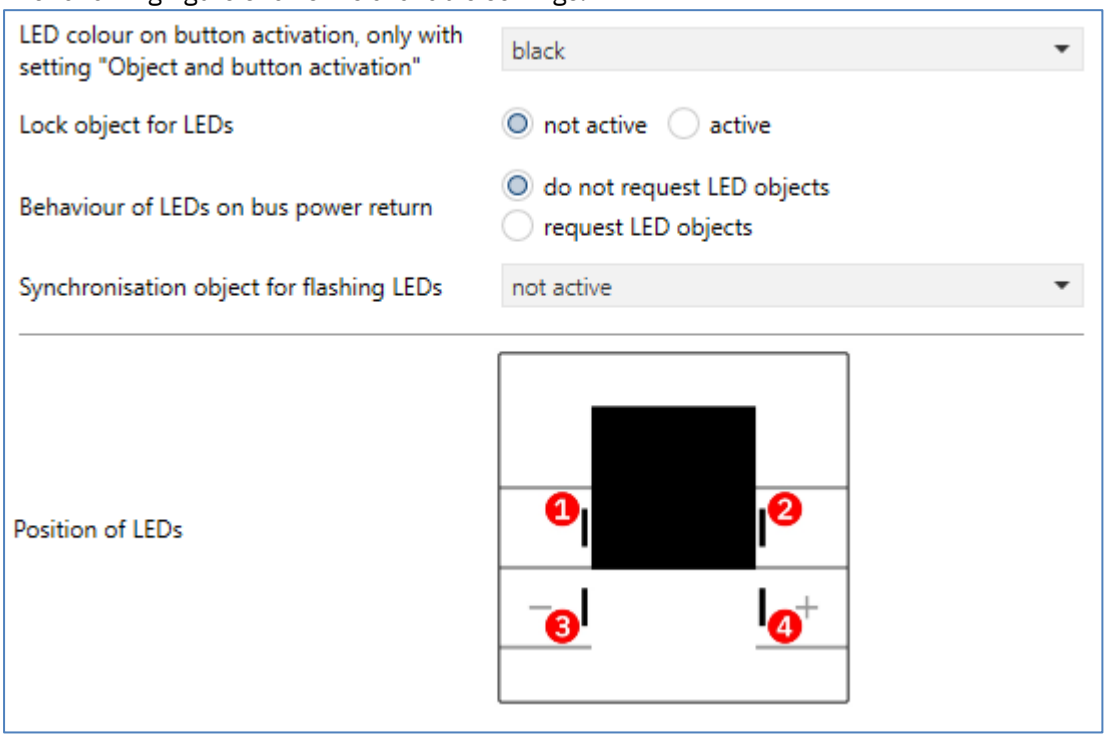


Figure 57: Basic settings – Status LEDs

The table below shows all available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
LED-colour on button activation, only with setting “Object and button activation”	Any colour	Parameter only has an effect with LED setting "LED x reacts to “external/internal object **and** button activation".
Lock object for LEDs	▪ **not active** ▪ active	Activates a lock object which can disable (= switch off) all LEDs
Behaviour of LEDs at bus power up	▪ **do not request LED objects** ▪ request LED objects	Setting whether to actively request the objects after a reset. **Only effective with "LED reacts to external object**"
Synchronization object for flashing LEDs	▪ **not active** ▪ active as master ▪ active as slave	Activating a synchronisation object for the LEDs

Table 108: Basic settings – Status LEDs

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The parameter "**LED colour on button activation**" defines the colour change (valid for all status LEDs) when a button is activated, if these are assigned twice by the setting "LED reacts to" "external/internal object and button activation". In this case, the colour settings in the menus "LED 1-4" refer to the control via the object. The global parameter "LED colour on button activation" defines the behaviour on button activation.

Example:
LED 1 reacts to external object with DTP "Switch". Colour "blue" with value “ON”.
"LED colour on button activation" is set to "orange".
If LED 1 now receives a "1" via the external object, LED 1 lights up blue. If key 1 is now pressed, LED 1 lights up orange for approx. 3 seconds. Then the colour changes back to blue.

Blinking status LEDs can be synchronised via the flashing status **synchronisation object**. In this way, it is possible to ensure that all LEDs in a room flash in the same rhythm. One push-button in the room is defined as master and all other push-buttons as slaves. The objects LED flashing status are linked together in a group address.

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
81	LED – Blocking object	1 Bit	Blocking of all LED´s
92	LED – Blinking status	1 Bit	Synchronising the flashing status

Table 109: Communication objects – LED basic settings

4.6.2 LED 1-4

The following figure shows the available settings for each of the active LEDs:

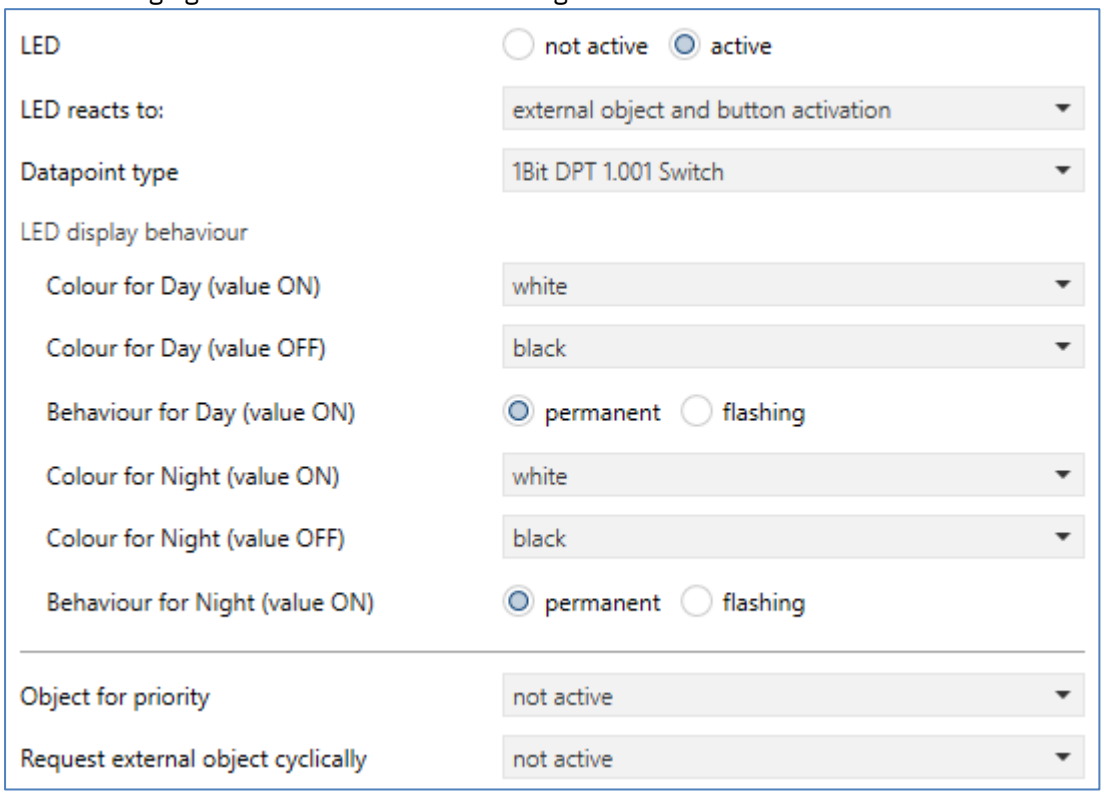


Figure 58: Settings – LED 1-4

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

The table below shows all available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
LED	▪ not active ▪ **active**	Activation of the respective LED.
LED reacts to	▪ external object ▪ internal object ▪ **button activation** ▪ external object and button activation ▪ internal object and button activation	Setting how LED is to be controlled.
Datapoint type	▪ **1Bit DPT 1.001 Switch** ▪ 1Byte DPT 5.001 Percent value (0...100%) ▪ 1 Byte DPT 5.005 Decimal factor (0...255)	Selection of the datapoint type for external object. **Only available if LED reacts to "external object".**
ON if greater than	0 – 99 % **[50 %]**	Setting of a value in %. **Only available with "DPT 5.001...".**
Note text	0 = Off (Black), 1 = White, 2 = Red, 3 = Green, 4 = Blue, 5 = Yellow, 6 = Pink, 7 = Cyan	Setting of a colour via object value. **Only available with "DPT 5.005...".**
Selection of object number	0 ... 100 **[0]**	Link to internal object. **Only available if LED reacts to internal object.**
LED display behaviour		
Colour for Day (value ON)	any colour	Colour for the object value ON when the button is pressed in Day mode.
Colour for Day (value OFF)	any colour	Colour for the object value OFF if no button is pressed in Day mode.
Behaviour for Day (value ON)	▪ **permanent** ▪ flashing	Setting the lighting behaviour when LED has the object value ON, or the button is pressed.
Colour for Night (value ON)	any colour	Colour for the object value ON when the button is pressed in Night mode.
Colour for Night (value OFF)	any colour	Colour for the object value OFF if no button is pressed in Night mode.
Behaviour for Night (value ON)	▪ **permanent** ▪ flashing	Setting the lighting behaviour when LED has the object value ON, or the button is pressed.

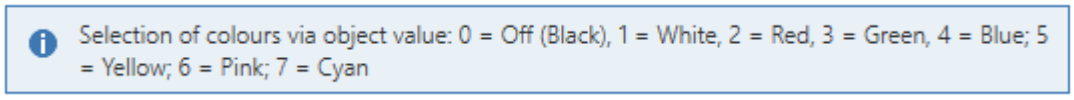
Table 110: Settings – LED 1-4

Each LED can react either to any external object **or** internal object **or** to button activation.
In addition, a LED can also react to an “external/internal object **and** the button activation”. With this setting, the adjustments in the menu LED 1-12/A/B refer to the control of the LEDs via the object. In this case, the behaviour of the button operation is set globally for all LEDs and is described in chapter 4.6.1 LED basic settings. The behaviour for the button activation has priority here.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

If the setting LED reacts to "**internal object**" is selected, the object number to which the LED is to be linked is selected. For example, if the LED is to switch when (with the setting "Button 1" to "toggle") the "Object 1 - Status for toggle" has the value "1", the object number "1" must be entered. In this case, the status LED would be switched on if the object has the value "1" and switched off if the object has the value "0".
If the LED is linked to an object that does not have the size 1 bit, the LED is switched off if the object has the value "0" and switched on if the value of the object is not equal to "0". For an object of the "DPT 5.001 - Percent", this means that the LED is switched off at 0% and switched on at all other values.

With the setting "LED reacts to: external object", the corresponding LED can be controlled either via a 1-bit object or 1-byte objects as a percentage value or decimal value. With **DPT "Switch"** the LED is switched on with a "1" and with a "0" the LED is switched off.
With **DPT "Percent value"**, the LED switches on with the set value and switches off again when the value falls below this value.
With **DPT "Decimal value"**, sending the following object values causes the corresponding colour:



Each LED can assume different colours and **behaviour for Day and Night operation** and switches depending on the object 88-Day/Night.

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
73	LED 1 – Switch, Percent value, Decimal value	1 Bit 1 Byte	Control of the LED. DPT depending on the parameter setting. **Only with "LED reacts to external object".**

Table 111: Communication object – LED

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.6.2.1 Priority

The LED priority can force the status LED into a defined state and thus exceed the control via an external / internal object or the button operation.

The following figure shows the available settings for each of the active LEDs:

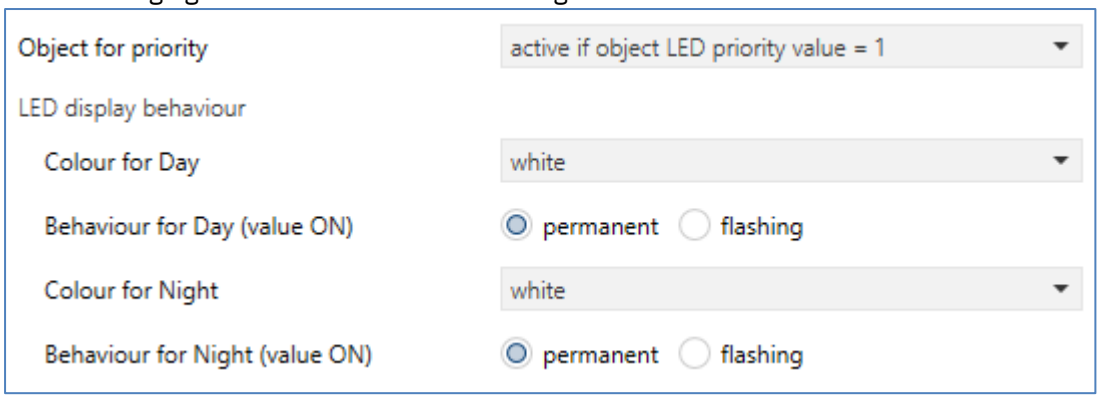


Figure 59: Settings – LED Priority

The following table shows all available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Object for priority	▪ **not active** ▪ active if object LED priority value = 1 ▪ active if object LED priority value = 0	Sets the polarity of the LED priority.
Colour for Day	any colour **[white]**	Colour for an active LED priority in Day mode.
Behaviour for Day (value ON)	▪ **permanent** ▪ flashing	Setting the lighting behaviour for an active LED priority in Day mode.
Colour for Night	any colour **[white]**	Colour for an active LED priority in Night mode.
Behaviour for Night (value ON)	▪ **permanent** ▪ flashing	Setting the lighting behaviour for an active LED priority in Night mode.

Table 112: Settings – LED Priority

As long as the LED priority is active, the parameterized state for the LED priority is kept and the LED does not react to the "normal" control as described in chapter 4.6.2 LED 1-4.

The following table shows the available communication objects:

Number	Name/Function	Length	Usage
77	LED 1 Priority – Switch	1 Bit	Controlling the LED priority

Table 113: Communication object – LED Priority

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

4.6.2.2 Request external object cyclically

The following picture shows the available setting for each of the active LEDs:

Figure 60: Setting – Request external object cyclically

The following table shows all available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Request external object cyclically	**not active** 1 min – 4 h	Setting whether to request and in which cycle.

Table 114: Setting – Request external object cyclically

Important: This parameter is only shown if the LED reacts to an external object.
On the one hand via the setting "LED reacts to: external object (and button activation)", and on the other hand by activating the priority object (see previous chapter).
The set time for cyclical sending applies to both objects.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

5 Index

5.1 Register of illustrations

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

5.2 List of tables

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de

6 Appendix

6.1 Statutory requirements

The devices described above must not be used in conjunction with devices which directly or indirectly serve human, health, or life-safety purposes. Furthermore, the devices described must not be used if their use may cause danger to people, animals, or property.
Do not leave the packaging material carelessly lying around. Plastic foils/ bags etc. can become a dangerous toy for children.

6.2 Disposal

Do not dispose of the old devices in the household waste. The device contains electrical components that must be disposed of as electronic waste. The housing is made of recyclable plastic.

6.3 Assembly

Danger to life from electric current!

The device may only be installed and connected by qualified electricians. Observe the country-specific regulations and the applicable KNX guidelines
The units are approved for operation in the EU and bear the CE mark. Use in the USA and Canada is not permitted!

6.4 History

V1.0	First Version of Technical Manual	DB V1.0	05/2022

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Germany
Phone: +49-2263-880 • knx@mdt.de • www.mdt.de