State 07/2021 Version 1.0

Technical Manual

MDT
Object Controller
Room Temperature/Humidity Sensor

SCN-RTR55O.01
SCN-RTR63O.01
SCN-TFS55.01
SCN-TFS63.01

Further Documents:

Datasheets:

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

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2 Overview

2.1 Overview Devices

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

- **SCN-RTR55O.01**, Object controller 55, white glossy finish
  - With temperature/humidity sensor and 4 binary inputs
- **SCN-TFS55.01,** Room Temperature/Humidity Sensor 55, white glossy finish

- **SCN-RTR63O.01**, Object controller 63, studio white glossy finish
  - With temperature/humidity sensor and 4 binary inputs
- **SCN-TFS63.01,** Room Temperature/Humidity Sensor 63, studio white glossy finish

	SCN-RTRxxO.01	**SCN-TFSxx.01**
Temperature/humidity measurement	X	X
Temperature controller	X	
Ventilation control	X	
Binary inputs	X	

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2.2 Special functions

Comfortable room temperature controller with temperature sensor (only Object Controller)
The functional scope of the room temperature controller ranges from simple heating control to complete air conditioning of a room. The operating modes heating, cooling and heating and cooling are available for this purpose. As control parameters, the 2-point control, a switching PI control (PWM) or continuous PI control can be selected. The room temperature controller supports single and dual-circuit systems in heating/cooling mode. 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 a temperature sensor hidden in the outer edge of the control panel, which detects the exact room temperature and sends it to the bus. With the parameter Sensor internal/external, an additional measurement extension unit can be activated. If, e.g. in large rooms, the average value of two temperatures is to be formed, the parameter is set to 50% internal / 50% external and an optimum room temperature value is obtained. If the external sensor fails, an error message is generated and the internal sensor is set to 100%. Likewise, an upper and lower alarm value can be activated, which outputs a 1-bit message if the value is exceeded or undershot. Furthermore, it is possible to carry out the setpoint specification either dependent on the basic comfort value or via independent setpoints.

Humidity sensor
In addition to the temperature sensor, the units have an integrated humidity sensor. This outputs the measured value for relative and absolute humidity.
It is also possible to output the measured value for the dew point temperature and to send a dew point alarm. Furthermore, min/max values as well as messages can be output when an upper or lower reporting value is reached. The internal/external sensor parameter can also be used to activate a measuring extension and thus form and output an average value.

Ventilation control (only Object Controller)
The integrated ventilation control enables fans to be controlled manually in up to 4 stages, via the control value of the temperature controller or by means of the temperature difference between setpoint and actual value. In addition, the day/night function ensures individual adjustment of the ventilation according to the time of day. For example, the ventilation control runs during the day in up to 4 stages depending on requirements, while a maximum of two stages are available in night operation to avoid disturbing noise levels and draughts. An anti-fixing function can be selected to protect the ventilation system. The behaviour of the locking function can be specifically adjusted.

Diagnosis (only Object Controller)
Der Objektregler verfügt über ein 14 Byte Objekt, mit welchem vielfältige Meldungen im Klartext als Status auf den Bus gesendet werden.

Binary inputs (only Object Controller)
The Object Controller also has 4 binary inputs for potential-free contacts.
Window contacts or external light/blind push-buttons can be connected here.
The inputs can be parameterised individually or grouped as different functions such as switching, short/long switching, dimming, blinds and sending values/states.

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2.3 Exemplary Circuit Diagram

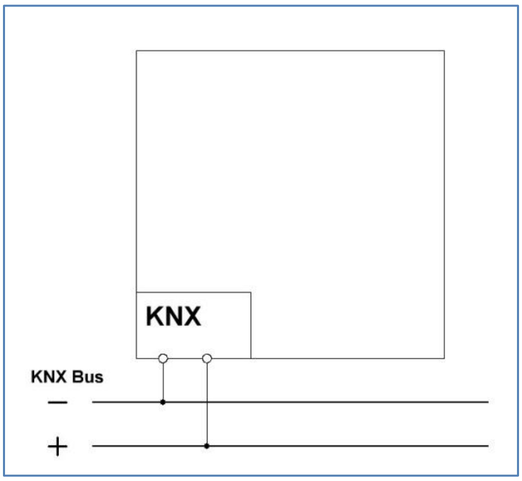

Figure 1: Exemplary circuit diagram

2.4 Structure & Handling

The following picture shows the structure of the Object Controller/Sensor (here: SCN-RTR55O.01):

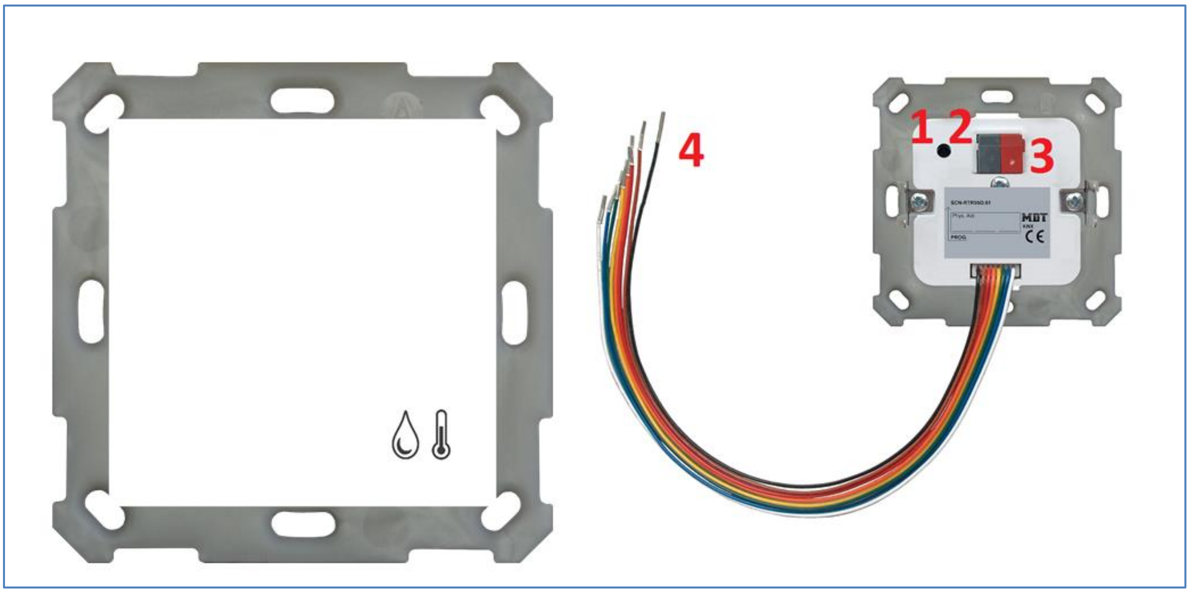

Figure 2: Structure & Handling

1, 2	=	Programming button and Programming LED
3	=	Bus connection terminal
4	=	Connection cable for binary inputs (only Object Controller)

Programming mode is indicated by the programming LED lighting up after pressing the programming button.

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2.5 Commissioning

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

(1) Connect the interface with the bus, e.g. MDT USB interface
(2) Switch on the bus voltage
(3) Press the programming button at the device >1s (red programming LED lights)
(4) Loading of the physical address out of the ETS-Software by using the interface(red LED goes out, as well this process was completed successful)
(5) Loading of the application, with requested parameterization
(6) If the device is enabled you can test the requested functions(also possible by using the ETS-Software)

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3 Communication objects

3.1 Standard settings of the communication objects

Standard settings - Temperature controller								
No.	**Name**	**Function**	**Length**	**C**	**R**	**W**	**T**	**U**
0	Setpoint setting	Set setpoint	2 Byte	X		X		
1	(Basic) Comfort setpoint	Set setpoint	2 Byte	X		X		
1	Comfort	Set setpoint	2 Byte	X		X		
1	Combination object (Heating)	Set setpoint	8 Byte	X		X		
1	Combination object	Set setpoint	8 Byte	X		X		
2	Standby	Set setpoint	2 Byte	X		X		
3	Night	Set setpoint	2 Byte	X		X		
4	Frost protection	Set setpoint	2 Byte	X		X		
4	Heat protection	Set setpoint	2 Byte	X		X		
5	Combination object (Cooling)	Set 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 value offset	Increase / Decrease (2Byte)	2 Byte	X		X		
7	Manual setpoint value offset	Increase / Decrease (1Byte)	1 Byte	X		X		
8	Manual setpoint value offset	Increase / Decrease (1Byte)	1 Byte	X		X		
8	Manual setpoint value offset	Increase / Decrease (1=+/0= -)	1 Bit	X		X		
9	Setpoint value offset	Send status	2 Byte	X	X		X	
9	Setpoint value offset	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	
15	Mode selection	Select mode	1 Byte	X		X		
15	Mode selection	Send mode	1 Byte	X			X	
16	Mode selection	Comfort extension	1 Bit	X		X		

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17	Mode Comfort	Switch mode	1 Bit	X		X		
18	Mode Night	Switch mode	1 Bit	X		X		
19	Mode Frost protection	Switch mode	1 Bit	X		X		
19	Mode Heat protection	Switch mode	1 Bit	X		X		
19	Mode Frost/Heat protection	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	14Byte	X	X		X	
27	Window contact input	0=closed / 1=open 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	Receive measured / reference value	2 Byte	X		X		

Table 1: Communication objects – Temperature controller

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Standard settings - Ventilation control								
No.	**Name**	**Function**	**Length**	**C**	**R**	**W**	**T**	**U**
37	Ventilation control	Lock	1 Bit	X		X		
38	Ventilation control	Level 1	1 Bit	X	X		X	
38	Ventilation control	Bit 0	1 Bit	X	X		X	
39	Ventilation control	Level 2	1 Bit	X	X		X	
39	Ventilation control	Bit 1	1 Bit	X	X		X	
39	Ventilation control	Level 1+2	1 Bit	X	X		X	
40	Ventilation control	Level 3	1 Bit	X	X		X	
40	Ventilation control	Bit 2	1 Bit	X	X		X	
40	Ventilation control	Level 1+2+3	1 Bit	X	X		X	
41	Ventilation control	Level 4	1 Bit	X	X		X	
41	Ventilation control	Level 1+2+3+4	1 Bit	X	X		X	
42	Ventilation control	1Byte status ventilation level	1 Byte	X	X		X	
42	Ventilation control	1Byte status ventilation level (Extension unit)	1 Byte	X	X		X	
43	Ventilation control	Control value	1 Byte	X	X	X		X
44	Ventilation control	Object Priority	1 Bit	X		X		
45	Ventilation control	Switch Automatic	1 Bit	X	X	X	X	
45	Ventilation control	Switch Automatic (Extension unit)	1 Bit	X	X	X	X	
46	Ventilation control	Change ventilation levels manually (+/-)	1 Bit	X		X	X	
47	Ventilation control	Manual ventilation control	1 Byte	X		X		
47	Ventilation control	Manual ventilation control (Extension unit)	1 Byte	X		X		
48	Ventilation control	Status ventilation active	1 Bit	X	X		X	
49	Ventilation control	Status Automatic	1 Bit	X	X		X	
49	Ventilation control	Status Automatic (Extension unit)	1 Bit	X	X		X	

Table 2: Communication objects – Ventilation control

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Standard settings - Temperature and humidity measurement								
No.	**Name**	**Function**	**Length**	**C**	**R**	**W**	**T**	**U**
53	Temperature	Transmit temperature value	2 Byte	X	X		X	
54	Temperature	External sensor	2 Byte	X		X	X	X
55	Temperature	Max. value exceeded	1 Bit	X	X		X	
56	Temperature	Min. fallen below	1 Bit	X	X		X	
57	Temperature	Read out maximum temperature value	2 Byte	X	X		X	
58	Temperature	Read out minimum temperature value	2 Byte	X	X		X	
59	Temperature	Reset memory min/max value	1 Bit	X		X		
60	Temperature	Error external sensor	1 Bit	X	X		X	
61	Relative air humidity	Transmit temperature value	2 Byte	X	X		X	
62	Relative air humidity	External humidity sensor	2 Byte	X		X	X	X
63	Relative air humidity	Max. value exceeded	1 Bit	X	X		X	
64	Relative air humidity	Min. fallen below	1 Bit	X	X		X	
65	Relative air humidity	Read out maximum relative humidity	2 Byte	X	X		X	
66	Relative air humidity	Read out minimum relative humidity	2 Byte	X	X		X	
67	Relative air humidity	Reset memory min/max value	1 Bit	X		X		
68	Relative air humidity	Error external sensor	1 Bit	X	X		X	
69	Absolute air humidity	Transmit temperature value	2 Byte	X	X		X	
70	Dew point temperature	Transmit temperature value	2 Byte	X	X		X	
71	Dew point temperature	Comparison value	2 Byte	X		X		
72	Dew point temperature	Send alarm	1 Bit	X	X		X	
73	Comfort	Send status	1 Bit	X	X		X	

Table 3: Communication objects – Temperature-/Humidity measurement

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Standard settings - Binary inputs								
No.	**Name**	**Function**	**Length**	**C**	**R**	**W**	**T**	**U**
84	Input 1: Inputs 1/2:	Switch On/Off	1 Bit	X	X		X	
84	Input 1: Inputs 1/2:	Dimming On/Off	1 Bit	X	X		X	
84	Input 1: Inputs 1/2:	Blinds Up/Down	1 Bit	X	X		X	
84	Input 1:	Switch	1 Bit	X	X		X	
84	Input 1:	Toggle	1 Bit	X	X		X	
84	Input 1:	Send status	1 Bit	X	X		X	
84	Input 1:	Send value	1 Byte	X	X		X	
84	Input 1:	Send percent value	1 Byte	X	X		X	
84	Input 1:	Send scene	1 Byte	X	X		X	
84	Input 1 short:	Switch	1 Bit	X	X		X	
84	Input 1 short:	Toggle	1 Bit	X	X		X	
84	Input 1 short:	Send value	1 Byte	X	X		X	
84	Input 1 short:	Send percent value	1 Byte	X	X		X	
84	Input 1 short:	Send scene	1 Byte	X	X		X	
85	Input 1: Inputs 1/2:	Dimming relative	4 Bit	X	X		X	
85	Input 1: Inputs 1/2:	Slat adjustment / Stop	1 Bit	X	X		X	
85	Input 1:	Status for toggle	1 Bit	X		X	X	X
85	Input 1 short:	Status for toggle	1 Bit	X		X	X	X
86	Input 1:	Status for toggle	1 Bit	X		X	X	X
86	Input 1:	Status for change of direction	1 Bit	X		X	X	X
86	Input 1 long:	Switch	1 Bit	X	X		X	
86	Input 1 long:	Toggle	1 Bit	X	X		X	
86	Input 1 long:	Send value	1 Byte	X	X		X	
86	Input 1 long:	Send percent value	1 Byte	X	X		X	
86	Input 1 long:	Send scene	1 Byte	X	X		X	
87	Input 1 long:	Status for toggle	1 Bit	X		X	X	X
88	Input 1: Inputs 1/2:	Lock object	1 Bit	X		X		
+5	**next Input**							

Table 4: Communication objects – Binary inputs

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Standard settings - General objects								
No.	**Name**	**Function**	**Length**	**C**	**R**	**W**	**T**	**U**
105	Operating	Output	1 Bit	X	X		X	
106	Day/Night	Day = 1 / Night = 0 Night = 1 / Day = 0	1 Bit	X		X	X	X

Table 5: 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.

4 Reference ETS-Parameter

4.1 General Settings

☑ Object Controller
☑ Temperature/Humidity Sensor

The following figure shows the menu for the general settings (here: Object Controller):

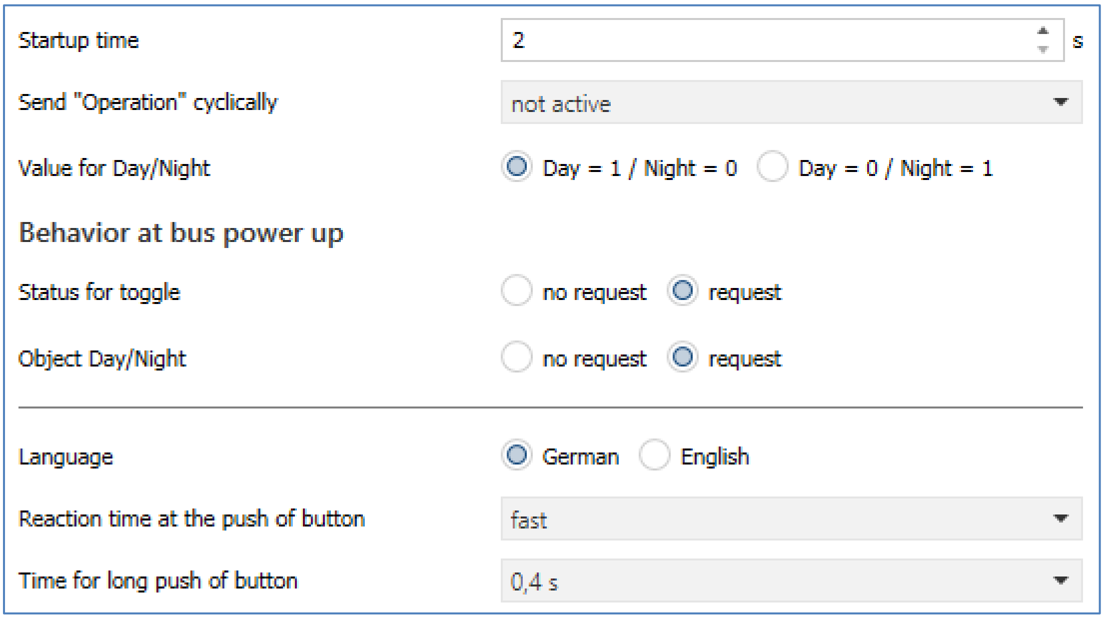

Figure 3: General settings

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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
Behavior at bus power up		
Status for toggle	▪ not request ▪ **request**	Setting whether the values/objects are to be automatically requested when the bus voltage returns. **Only visible for object controller**
Object Day/Night	▪ not request ▪ **request**	
Language	▪ **German** ▪ English	Setting the language of the diagnostic text. **Only visible for object controller**
Reaction time at the push of button	▪ **fast** ▪ medium ▪ slow	Defines the debounce time for a keystroke **Only visible for object controller**
Time for long push of button	0,1 s – 30 s **[0,4 s]**	Defines the time for detecting a long keystroke **Only visible for object controller**

Table 6: General settings

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
Here you can set whether the diagnosis text is displayed in German or English.

The table shows the general communications objects:

Number	Name	Length	Usage
105	Operation	1 Bit	Sending a cyclic "In operation" telegram
106	Day/Night	1 Bit	Receiving the status for day/night

Table 7: General communication objects

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4.2 Temperature/Ventilation

4.2.1 Temperature- and air humidity measurement

4.2.1.1 Temperature measurement

☑ Object Controller
☑ Temperature/Humidity Sensor

The following picture shows the menu for temperature measurement:

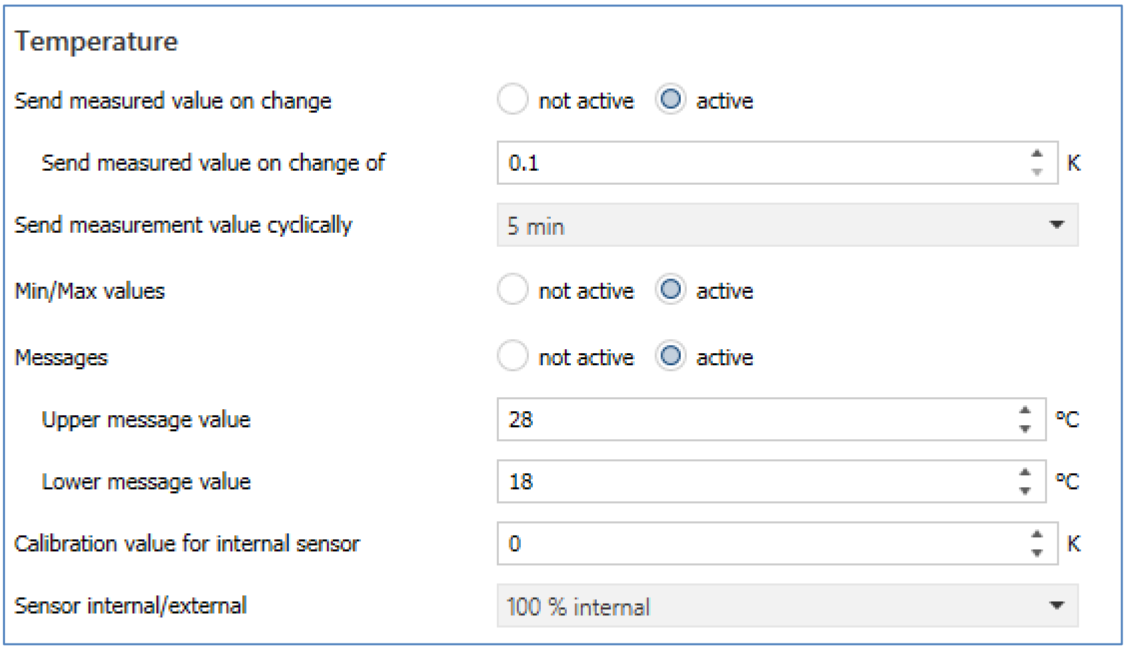

Figure 4: Settings – Temperature measurement

The table shows the possible settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Send measured value on change	▪ **not active** ▪ active	Setting whether the measured value should be sent on change
Send measured value on change of	0.1 … 2 K **[0.1 K]**	Setting at which change the measured value should be sent. **Only visible if "Send measured value on change" is activated**
Send measured value cyclically	not send, 1 min – 60 min **[5 min]**	Cyclic sending of the measured value
Min/Max values	▪ **not active** ▪ active	Activation for min/max values
Messages	▪ **not active** ▪ active	Activation of the message function
Upper message value	20 … 45 °C **[28 °C]**	Setting range of the upper/lower message value. **Only visible when parameter "Messages" is activated**
Lower message value	3 … 30 °C **[18 °C]**	

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Calibration value for internal sensor	-5 … 5 K **[0 K]**	Adjustment for internal sensor
Sensor internal/external	▪ **100% internal** ▪ 90% internal/ 10% external ▪ 80% internal/ 20% external ▪ … ▪ 100% external	Setting the weighting between internal and external sensor

Table 8: Settings – Temperature measurement

The setting "**Send measured value on change**" can be used to set the change on which the sensor sends its current temperature value. If set to "do not send", 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.
In addition, a correction value can be parameterised for the internal sensor under the setting "**Calibration value for internal sensor**". This correction value serves to increase/decrease the actual measured value. The adjustment range is from -5 to 5 K, i.e. the measured value can be lowered by -5 Kelvin and raised 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 is 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/programming the measured values are stable after approx. 30 minutes.

The associated communication object is shown in the table:

Number	Name	Length	Usage
53	Temperature – Send measured value	2 Byte	Sends the current temperature

Table 9: Communication object – Temperature measurement

When the "**Min/Max values**" function is activated, the sensor saves min/max values once they have been reached. As soon as a new minimum or maximum value is registered, the sensor sends it via the corresponding communication object. The stored values are reset via the "Min/Max values reset" communication object. The reset function is triggered with a "1". If the "Min/Max values" function is deactivated, no minimum and maximum values are saved by the temperature sensor.
The corresponding communication objects are shown in the table:

Number	Name	Length	Usage
57	Temperature – Read out maximum temperature value	2 Byte	Sends and stores the maximum measured temperature value
58	Temperature – Read out minimum temperature value	2 Byte	Sends and stores the minimum measured temperature value
59	Temperature – Reset memory min/max values	1 Bit	Resets the memory for min/max values

Table 10: Communication objects – Temperature / Min/Max values

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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 53.
Example:
Weighting: 50% internal / 50% external, internal sensor 25°C, external temperature 15°C
=> sent temperature value 20°C.
The communication object 60 "Error external sensor" is used for feedback if the external sensor does not send a value for more than 30 minutes. In this case, a "1" is sent for alarm. As soon as an external temperature is received again, the object sends a "0" and the alarm is cancelled.
The external temperature sensor is monitored with a time of 30 min. In case of an error only the internal sensor is used!

The following table shows the available communication objects:

Number	Name	Length	Usage
54	Temperature – External sensor	2 Byte	Receives the temperature of the external sensor
60	Temperature – Error external sensor	1 Bit	Sends an error message if the sensor does not send a value for a certain time.

Table 11: Communication objects – External temperature sensor

If the "**Messages**" function is activated, two messages can be configured. One is the message function for the lower response value, the "lower message value ", and the other is the upper response value, the "upper message 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 following table shows the available communication objects:

Number	Name	Length	Usage
55	Temperature – Max. value exceeded	1 Bit	Sends a message if the upper message value is exceeded
56	Temperature – Min. value fallen below	1 Bit	Sends a message when the value falls below the lower message value

Table 12: Communication objects – Temperature measurement / Messages

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4.2.1.2 Relative Air Humidity

☑ Object Controller
☑ Temperature/Humidity Sensor

The relative humidity indicates how much the air is saturated with water (%).
The following picture shows the menu for the relative humidity:

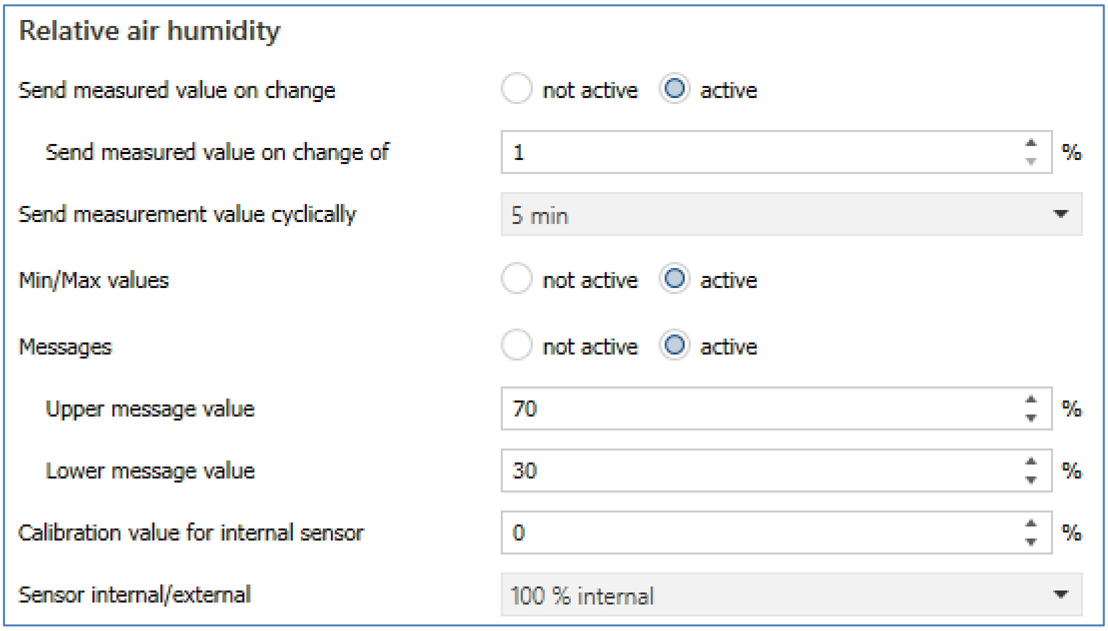

Figure 5: Settings – Relative air humidity

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Send measured value on change	▪ **not active** ▪ active	Setting whether the measured value should be sent on change
Send measured value on change of	1 … 10 % **[1 %]**	Setting at which change the measured value should be sent. **Visible if "Send measured value on change" is activated**
Send measurement value cyclically	not send, 1 min – 60 min **[5 min]**	Cyclic sending of the measured value
Min/Max values	▪ **not active** ▪ active	Activation for min/max values
Messages	▪ **not active** ▪ active	Activation of the message function
Upper message value	25 … 100 % **[70 %]**	Setting range of the upper/lower message value. **Only visible when parameter "Messages" is activated**
Lower message value	0 … 75 % **[30 %]**	
Calibration value for internal sensor	-20 … 20 % **[0 %]**	Adjustment for internal sensor
Sensor internal/external	▪ **100% intern** ▪ 90% intern/ 10% extern ▪ 80 % intern/ 20% extern ▪ … ▪ 100% extern	Setting the weighting between internal and external sensor

Table 13: Settings – Relative air humidity

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The setting "**Send measured value on change**" can be used to set the change on which the sensor sends its current relative humidity measured value. If the setting is "do not send", the sensor does not send a value, regardless of the size of the change.
The setting "**Send measurement value cyclically**" can be used to set the intervals at which the sensor sends its current relative humidity measurement value. The cyclical sending 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, no value is ever sent.
In addition, a correction value can be parameterised for the internal sensor under the setting "**Calibration value for internal sensor**". This correction value serves to increase/decrease the actual measured value. The adjustment range is from -20 to 20 %, i.e. the measured value can be lowered by -20 % and raised to a maximum of 20 %. For example, if a value of 10 is set, the measured humidity value is increased by 10 %. The humidity sensor sends the corrected humidity value when this function is activated.
Important: After initial installation/programming, the measured values are stable after approx. 30 minutes.

The associated communication object is shown in the table:

Number	Name	Length	Usage
61	Relative air humidity – Send measured value	2 Byte	Sends the currently measured relative humidity

Table 14: Communication object – Relative air humidity / Measured value

When the "**Min/Max values**" function is activated, the sensor saves min/max values once they have been reached. As soon as a new minimum or maximum value is registered, the sensor sends it via the corresponding communication object. The stored values are reset via the "Min/Max values reset" communication object. The reset function is triggered with a "1". If the "Min/Max values" function is deactivated, no minimum and maximum values are saved by the temperature sensor.
The corresponding communication objects are shown in the table:

Number	Name	Length	Usage
65	Relative air humidity – Read out maximum relative humidity	2 Byte	Sends and stores the maximum measured relative humidity value
66	Relative air humidity – Read out minimum relative humidity	2 Byte	Sends and stores the minimum measured relative humidity value
67	Relative air humidity – Reset memory min/max values	1 Bit	Resets the memory for min/max values

Table 15: Communication objects – Relative air humidity / Min/Max values

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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 humidity sensor" communication object receives the relative humidity currently measured by the sensor. The "mixed" relative humidity is shown in the display and this humidity value is transmitted via object 61.
Example:
Weighting: 50% internal / 50% external, internal sensor 40%, external relative humidity 20%.
=> transmitted relative humidity 30 %.
The communication object 60 "**Error external sensor**" is used for feedback if the external sensor does not send a value for more than 30 minutes. In this case, a "1" is sent for alarm. As soon as external humidity is received again, the object sends a "0" and the alarm is cancelled.
The external humidity sensor is monitored with a time of 30 min. In the event of an error, only the internal sensor is used!

The associated communication objects are shown in the table:

Number	Name	Length	Usage
62	Relative air humidity – External sensor	2 Byte	Receives the humidity of the external sensor
68	Relative air humidity – Error external sensor	1 Bit	Sends an error message if the sensor does not send a value for a certain time.

Table 16: Communication objects – Relative air humidity / External sensor

If the function "**Messages**" is activated, two messages can be parameterised. One is the message function for the lower response value, the "minimum message value", and the other the upper response value, the "maximum message 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 associated communication objects are shown in the table:

Number	Name	Length	Usage
63	Relative air humidity – Max. value exceeded	1 Bit	Sends a message if the upper message value is exceeded
64	Relative air humidity – Min. value fallen below	1 Bit	Sends a message when the value falls below the lower message value

Table 17: Communication objects – Relative air humidity / Messages

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4.2.1.3 Absolute Air Humidity

☑ Object Controller
☑ Temperature/Humidity Sensor

The absolute humidity provides information about how much water is in the air (g/m³).

The following picture shows the settings for the absolute humidity:

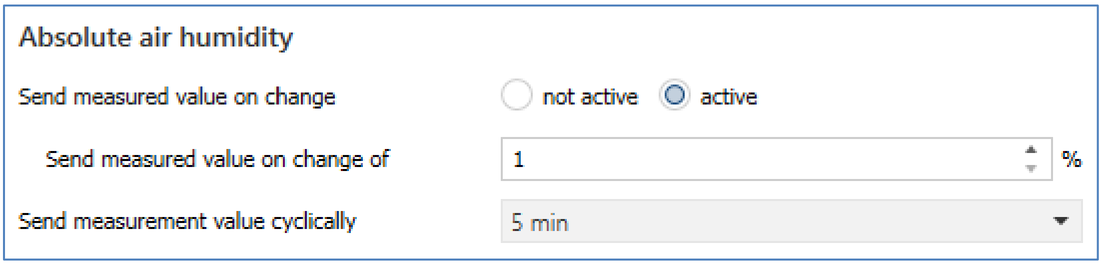

Figure 6: Settings – Absolute air humidity

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Send measured value on change	▪ **not active** ▪ active	Setting whether the measured value should be sent on change
Send measured value on change of	1 … 10 % **[1 %]**	Setting for which change the measured value is to be sent. **Only visible if "Send measured value on change" is activated.**
Send measurement value cyclically	not send, 1 min – 60 min **[5 min]**	Cyclic sending of the measured value

Table 18: Settings – Absolute air humidity

The setting "**Send measured value on change**" can be used to set the change on which the sensor sends its current relative humidity measured value. If the setting is "do not send", the sensor does not send a value, regardless of the size of the change.
The setting "**Send measurement value cyclically**" can be used to set the intervals at which the sensor sends its current absolute humidity measurement value. The cyclical sending 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, no value is ever sent.
Important: After initial installation/programming, the measured values are stable after approx. 30 minutes.

The following table shows the available communication object:

Number	Name	Length	Usage
69	Absolute air humidity – Send measured value	2 Byte	Sends the currently measured absolute air humidity

Table 19: Communication objects – Absolute air humidity

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4.2.1.4 Dew point temperature

☑ Object Controller
☑ Temperature/Humidity Sensor

The following figure shows the available settings:

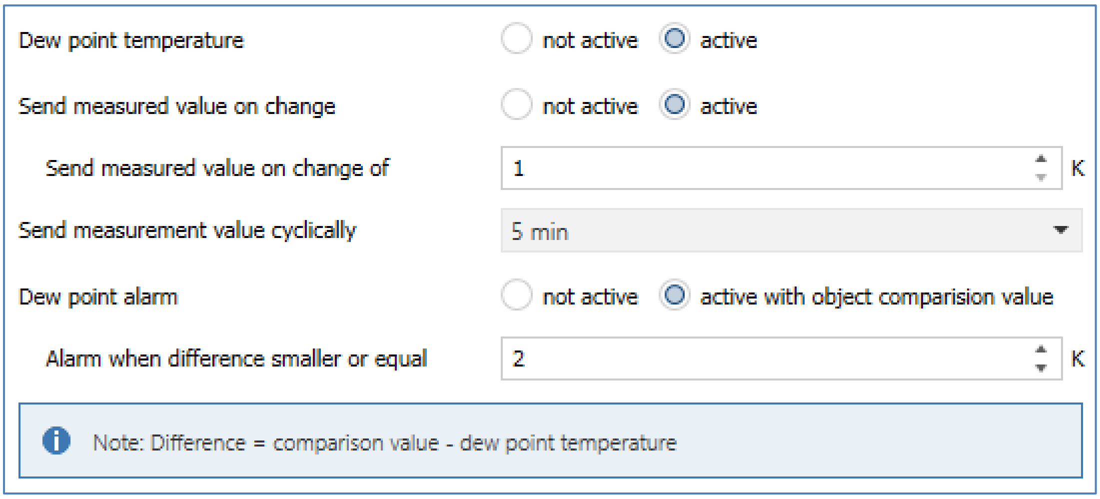

Figure 7: Settings – Dew point temperature

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Dew point temperature	▪ **not active** ▪ active	Setting to activate the dew point temperature
Send measured value on change	▪ **not active** ▪ active	Setting whether the measured value should be sent on change
Send measured value on change of	1 … 10 K **[1 K]**	Setting at which change the measured value should be sent.
Send measurement value cyclically	not send, 1 min – 60 min **[5 min]**	Cyclic sending of the measured value
Dew point alarm	▪ **not active** ▪ active with object comparison value	Setting to activate a dew point alarm using a comparison value
Alarm when difference smaller or equal	-10 … 10 K **[2 K]**	Setting the difference when to send an alarm

Table 20: Settings – Dew point temperature

Dew point temperature
The dew point temperature is calculated from the absolute air humidity and describes the temperature at which the air is completely saturated with water.
Condensation may form on surfaces that are colder than the dew point temperature.

Dew point alarm / Comparison value
The dew point alarm is the threshold result of the comparison value <-> dew point temperature.
The temperature of the cooling medium of an air-conditioning system or the temperature of an exterior wall, which tends to be colder than other walls, can be used as a reference value.
With the dew point alarm, condensation can be avoided at these points. This can be achieved, for example, by reducing the cooling capacity or reducing the air humidity (ventilation).

The following table shows the available communication objects:

Number	Name	Length	Usage
70	Dew point temperature – Send measured value	2 Byte	Sends the current dew point temperature
71	Dew point temperature – Comparison value	2 Byte	Receipt of the comparison value for calculation
72	Dew point temperature – Send alarm	1 Bit	Sends the Dew point alarm

Table 21: Communication objects – Dew point temperature

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4.2.1.5 Comfort

☑ Object Controller
☑ Temperature/Humidity Sensor

The following picture shows the settings for comfort:

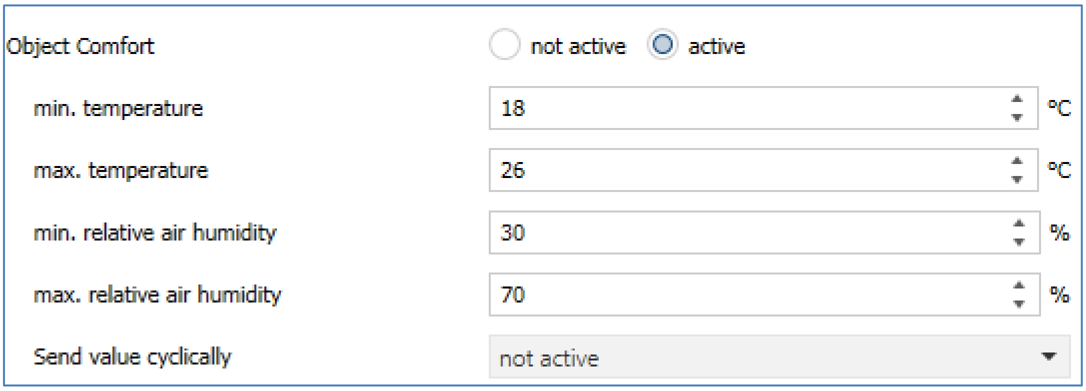

Figure 8: Settings – Object Comfort

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Object Comfort	▪ **not active** ▪ active	Activation of the object Comfort
min. temperature	10 … 45 °C **[18 °C]**	Setting the minimum "feel-good" temperature
max. temperature	10 … 45 °C **[26 °C]**	Setting the maximum "feel-good" temperature
min. relative air humidity	0 … 100 % **[30 %]**	Setting the minimum relative "feel-good" air humidity
max. relative air humidity	0 … 100 % **[70 %]**	Setting the maximum relative "feel-good" air humidity
Send value cyclically	**not active** 1 min – 60 min	Cyclic sending of the value

Table 22: Settings – Object Comfort

The **object "Comfort"** can be used to display whether the temperature and the relative humidity in a room are within or outside an adjustable range.
With the parameters "**min./max. temperature"** a temperature range is defined within which one "feels comfortable". The same is set for the relative air humidity with the "**min./max. relative air humidity"** parameters.
As soon as at least one value is outside these defined ranges, a "1" is sent via the "Comfort" communication object. This can be used, for example, as an alarm message to initiate appropriate actions. If all values are within the defined ranges, a "0" is sent.
The associated communication object is shown in the table:

Number	Name	Length	Usage
73	Comfort – Send status	2 Byte	Sends the current status

Table 23: Communication object – Object Comfort

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4.2.2 Temperature Controller

☑ Object Controller

The table shows the setting options for the controller type:

ETS-Text	Dynamic range **[Default value]**	Comment
Controller type	▪ Controller off ▪ **Heating** ▪ Cooling ▪ Heating and Cooling	Setting the control mode. The further parameterization possibilities depend on the set control mode

Table 24: Setting – Controller type

If the setting "Controller off" is set for controller type, 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 "Control 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, a number of 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 taking into account 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 following figure shows the setting options in the temperature controller menu:

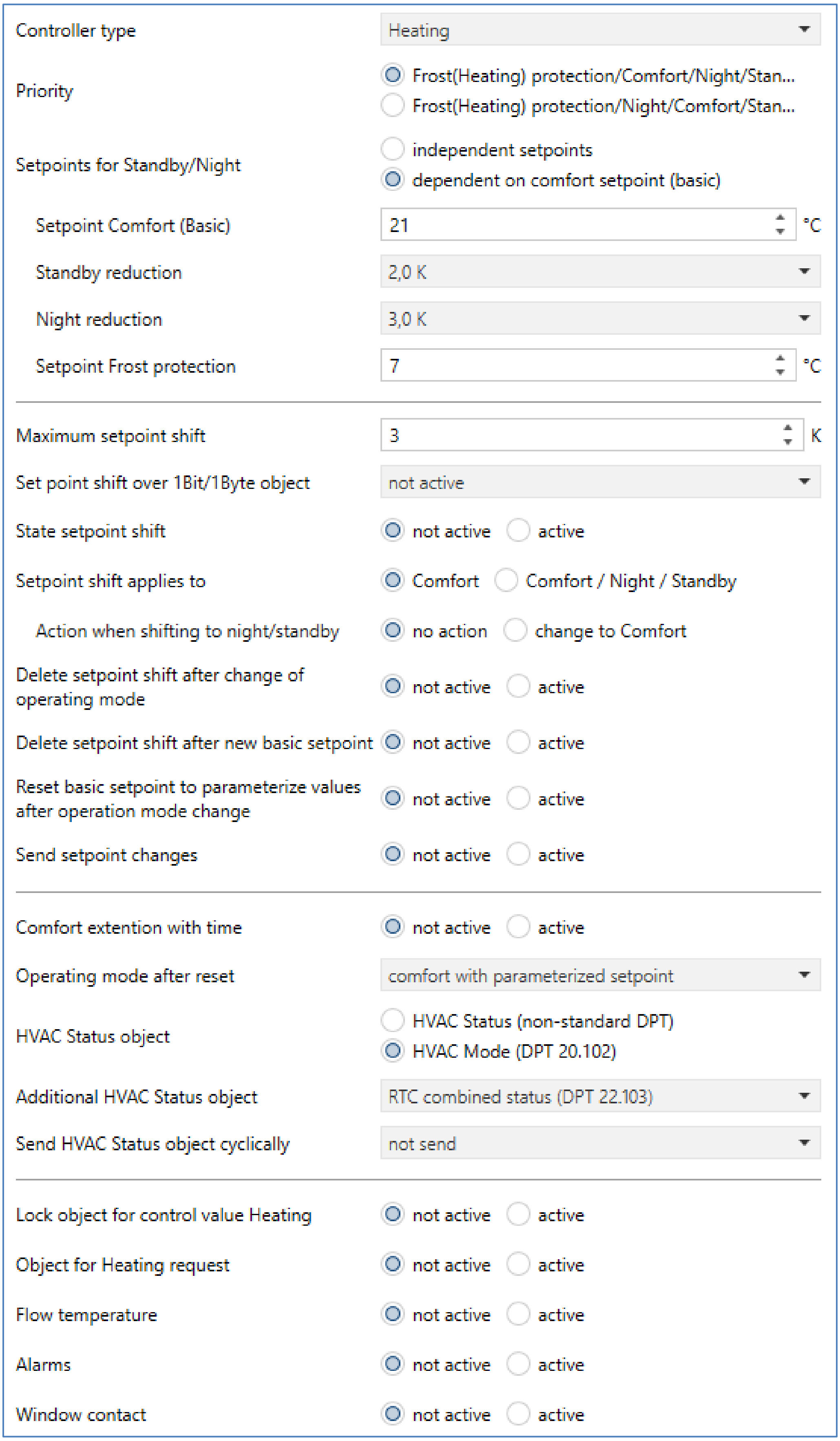

Figure 9: Settings – Temperature Controller

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4.2.2.1 Setpoints, Operating Modes & Priorities

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

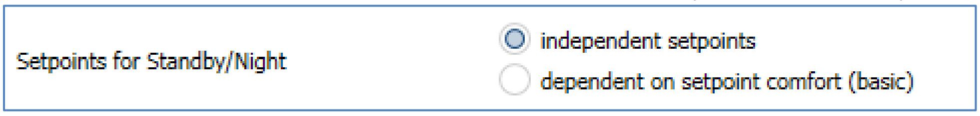

Figure 10: Settings – Setpoints for Standby/Night

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

4.2.2.1.1 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 parameterised 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. Standby is activated when no other operating mode is active.
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).

Table 25: Settings – Setpoints: depending on Comfort setpoint (basic)

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

Number	Name	Length	Usage
17	Mode comfort	1 Bit	Activating the comfort operating mode

Table 26: Communication object – Comfort mode 1bit

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

Number	Name	Length	Usage
18	Mode Night	1 Bit	Activation of the operating mode night

Table 27: Communication object – Night mode 1bit

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

Number	Name	Length	Usage
19	Mode Frost protection	1 Bit	Activates the Frost protection mode
19	Mode Heat protection	1 Bit	Activates the Heat protection mode
19	Mode Frost/Heat protection	1 Bit	Activates the Frost/heat protection mode

Table 28: Communication objects – Frost/Heat protection 1bit

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4.2.2.1.2 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 29: 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 area of 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

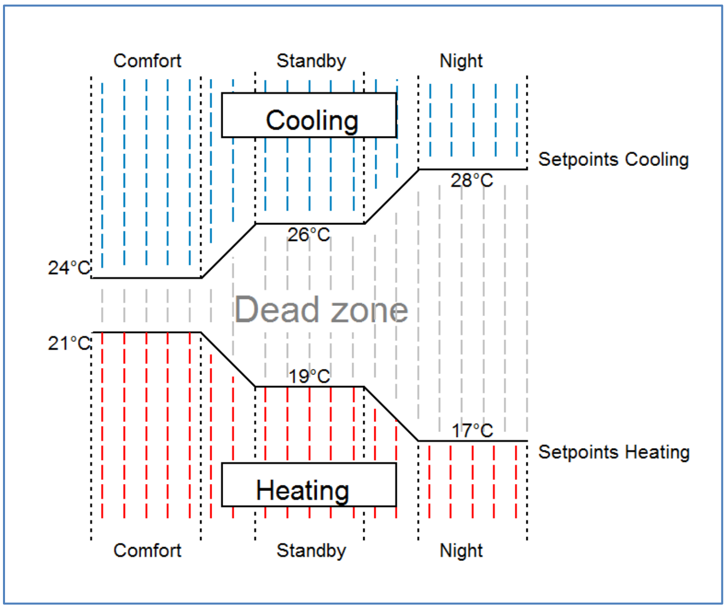

Figure 11: Example – Dead zone and corresponding setpoints

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4.2.2.1.3 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]**	Setpoint for Comfort operating mode
Setpoint Standby	7 … 35 °C **[19 °C]** **[23 °C]**	Setpoint for Standby operating mode. Default values corresponding to Heating or Cooling. Standby is activated when no other operating mode is active.
Setpoint Night	7 … 35 °C **[18 °C]** **[24 °C]**	Setpoint for Night operating mode. Default values according to Heating or Cooling.
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 30: Settings – 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.

4.2.2.1.4 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 priorities of the operating modes

Table 31: 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.

4.2.2.2 Operating mode switchover (Mode selection)

There are 2 possibilities for operating mode switching: 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. Taking into account 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 has to be deactivated with a logical 0. If all operation modes are switched off, the controller switches to Standby mode.

Example (set priority: Frost(Heat) protection /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 32: 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.

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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 33: 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(Heat) protection/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 34: 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.

There is no priority between switching over 1 Bit and 1 Byte!

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

Number	Name	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 35: Communication objects – Mode selection

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4.2.2.3 HVAC Status objects

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

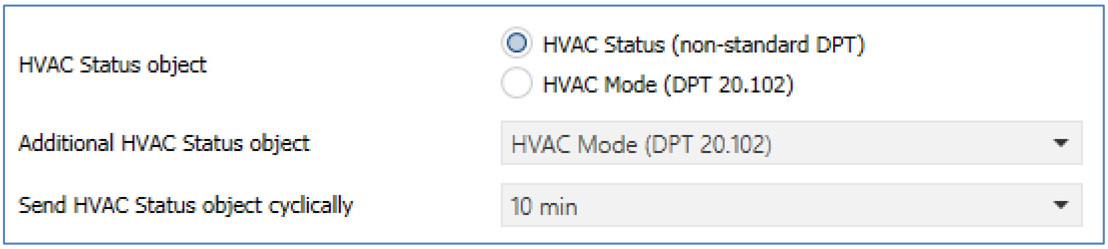

Figure 12: Settings – HVAC status objects

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)	Selection of 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)	Setting an additional HVAC status object
Send HVAC Status object cyclically	**Not send** 5 min – 4 h	Setting whether and at what intervals the object is to be sent cyclically

Table 36: 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 visualisation.
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=Nacht	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 37: Assignment – DPT HVAC Status

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The object is used exclusively for status/diagnostic purposes. Furthermore, it is well suited for visualisation purposes. To visualise 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 38: 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 39: Assignment – RTC combined status DPT 22.103

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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 40: Assignment – RTSM combined status DPT 22.107

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4.2.2.4 Operating mode after reset

The following table shows all available settings:

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

Table 41: Settings – Operating mode after reset

- **Comfort with parameterized setpoint**
  After a bus voltage return, the comfort is activated with the setpoint that was specified by the ETS.
- **Standby with parameterized 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 old state and setpoint**
  The temperature controller recalls the setpoint and mode that was set before the bus was switched off.
  - **Operating mode after reprogramming**
    This setting can be used to define the operating mode after a reset.

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4.2.2.5 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 over 1Bit/1Byte object	▪ **not active** ▪ 1 Bit ▪ 1 Byte	Setting whether setpoint shift is to be activated via 1 bit or 1 byte
Step range	0,1 K – 1 K **[0,5 K]**	Setting of the step width for the setpoint shift over 1 Bit/1 Byte. **Only visible if setpoint shift over 1 Bit/1 Byte is active**.
Status setpoint shift	▪ **not active** ▪ active	Activation of an object to send the current status of the setpoint shift
Setpoint shift applies to	▪ **Comfort** ▪ Comfort/Night/Standby	Validity range of the setpoint shift
Action when shift 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 absolute 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 parameterized value after operation mode change	▪ not active ▪ **active**	Setting whether or not the base setpoint should be reset to the parameterised base 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 send** 5 min – 4 h	Setting whether and at what intervals the object is to be sent cyclically

Table 42: Settings – Setpoint shift

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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, and on the other hand, the preset setpoint can be raised or lowered manually. This can be done 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 2 byte 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 parameterised 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 maximum 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 visualisations 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.

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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 visualisations 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	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 43: Communication objects – Setpoint changes

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4.2.2.6 Comfort extension with time

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

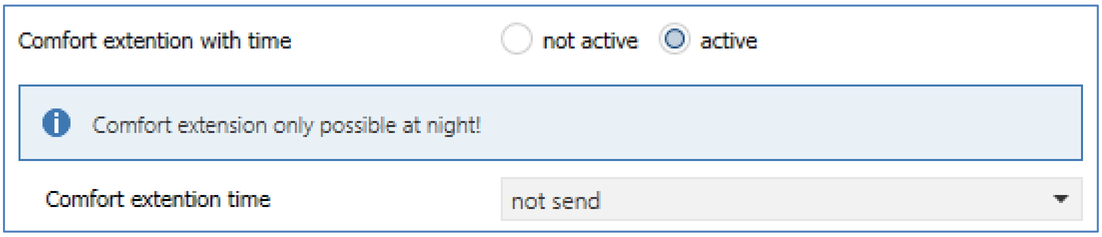

Figure 13: Settings – Comfort extension with time

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 send** 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 44: Settings – Comfort extension with time

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

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

Table 45: 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 Comfort extension object 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!

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4.2.2.7 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 46: 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 of the lock object is, for example, manual locking, e.g. via a push-button, in the event of a cleaning process. The lock object locks the control value as soon as a 1 is sent to the associated 1-bit communication object. The lock is cancelled with a 0.
The following table shows the available communication objects:

Number	Name	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 47: 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 48: 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 visualisation, for example. 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	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 49: Communication objects – Objects for Heating/Cooling request

4.2.2.9 Reference control via outside temperature

The following settings are available:

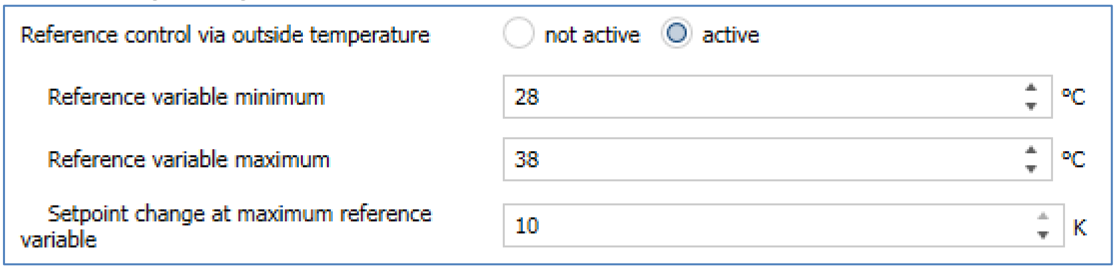

Figure 14: Settings – Reference control via outside temperature

The following table shows the setting options for this parameter:

ETS-Text	Dynamic range **[Default value]**	Comment
Reference control via outside temperature	▪ **not active** ▪ active	Activation of the parameter. **This parameter is only available in Cooling mode!**
Reference variable minimum	10 … 60 °C **[28°C]**	Lower response value for reference control
Reference variable maximum	10 … 60 °C **[38°C]**	Upper response value for reference control
Setpoint change at maximum reference variable	1 … 10 K **[10 K]**	Setpoint shift when max. reference variable is reached

Table 50: Settings – Reference control via outside temperature

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.
Three settings have to be made to determine the extent to which the command has an effect on the setpoint: 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 has to 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" has to be set to a negative value.
The setpoint change $\triangle X$ is then added to the basic comfort value.

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

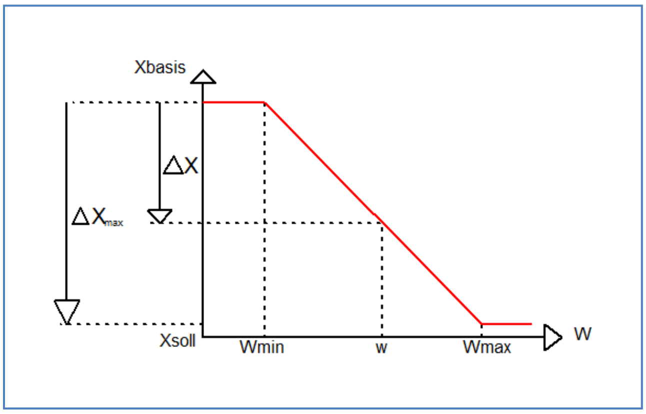

Figure 15: Example – Reference control/decrease

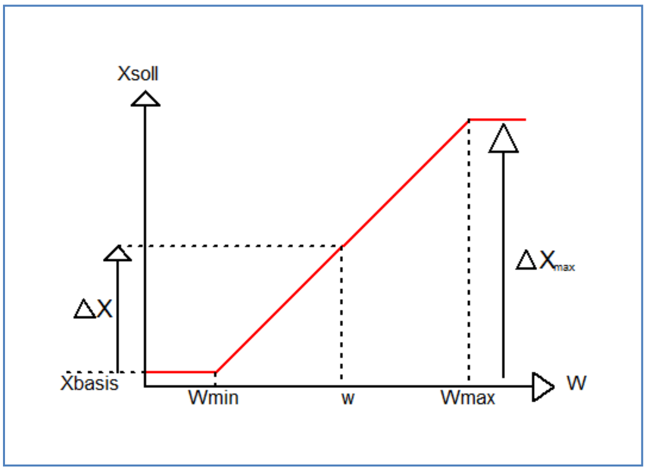

Figure 16: Example – Reference control/increase

With the communication object of the reference value, the current temperature of the external sensor can be read out. The communication object does not have to be linked with the communication object of the setpoints to activate the command, but is only used to request the control temperature.

The following table shows the corresponding object:

Number	Name	Length	Usage
36	Outside temperature – Receive measured/reference value	1 Byte	Receiving an external measured value as a reference variable

Table 51: Communication object – Reference control via outside temperature

Example of use:
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.

4.2.2.10 Flow temperature limitation

The following parameter activates the flow temperature limitation:

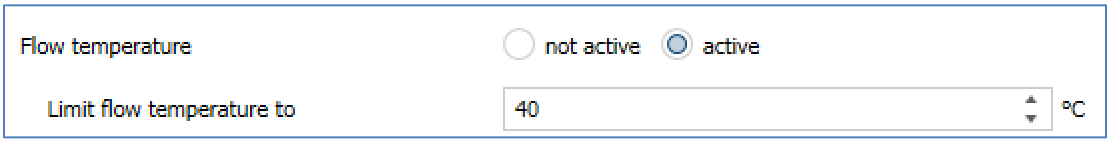

Figure 17: Settings – Flow temperature limitation

Once the flow temperature has been activated, the following setting is possible:

ETS-Text	Dynamic range **[Default value]**	Comment
Limit flow temperature to	10 … 60 °C **[40 °C]**	Setting of the value to which the flow temperature is to be limited. **This parameter is only available in Heating mode!**

Table 52: 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	Length	Usage
24	Flow temperature Heating – Receive measured value	2 Byte	Receiving the measured flow temperature

Table 53: Communication object – Flow temperature limitation

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4.2.2.11 Limit temperature of cooling medium via dew point monitoring

The following settings are available for this parameter:

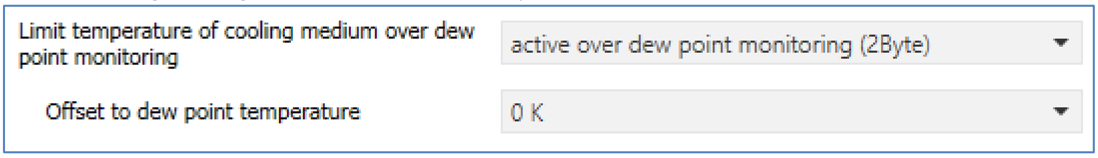

Figure 18: Settings – Limit temperature of cooling medium via dew point monitoring

The following table shows the setting options for this parameter:

ETS-Text	Dynamic range **[Default value]**	Comment
Limit temperature of cooling medium via dew point monitoring	▪ **not active** ▪ active over dew point monitoring (2Byte) ▪ active over dew point alarm (1Bit)	Selection of how the temperature is to be limited. **This parameter is only available in Cooling mode!**
Offset to dew point temperature	0 K – 10 K **[0 K]**	Setting of an offset value. **Only visible with selection via 2Byte object**

Table 54: Settings – Limit temperature of cooling medium via dew point monitoring

With monitoring "**active over dew point alarm (1Bit)**", 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 over dew point monitoring (2Byte)**", the control value for Cooling mode can be limited. For this purpose, a second sensor is required 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 dew point temperature (measured value visible via object 70), the control value is successively reduced. This ensures that less cooling takes place to prevent condensation from forming on the surface.

Offset to dew point temperature
The offset is used to adjust the temperature at which the lowering of the control value begins in comparison to the dew point temperature.
<u>Example:</u>
Dew point temperature = 15°C
Offset = 5K
Start lowering the control value from 20°C

The following table shows the corresponding objects:

Number	Name	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 55: Communication object – Limit temperature of cooling medium via dew point monitoring

4.2.2.12 Alarms

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

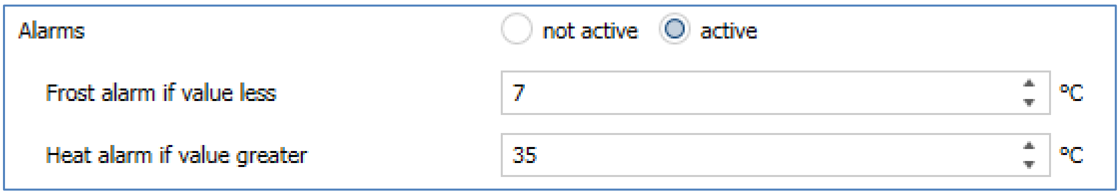

Figure 19: Settings – Alarms

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 range of the lower indication value. **Setting available when alarms are activated**
Heat alarm if value greater	25 … 40 °C **[35°C]**	Setting range of the upper indication value. **Setting available when alarms are activated**

Table 56: Settings – Alarms

The alarm function reports the falling below or exceeding of an adjustable temperature via the associated object. Falling below the lower detection value is reported via the Frost alarm object. Exceeding the upper detection 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 detection value is exceeded again or the upper detection 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	Length	Usage
22	Frost alarm – Send alarm	1 Bit	Reports falling below the lower reporting value
23	Heat alarm – Send alarm	1 Bit	Reports the exceeding of the upper reporting value

Table 57: Communication objects – Alarms

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4.2.2.13 Window contact

The following settings are available for this parameter:

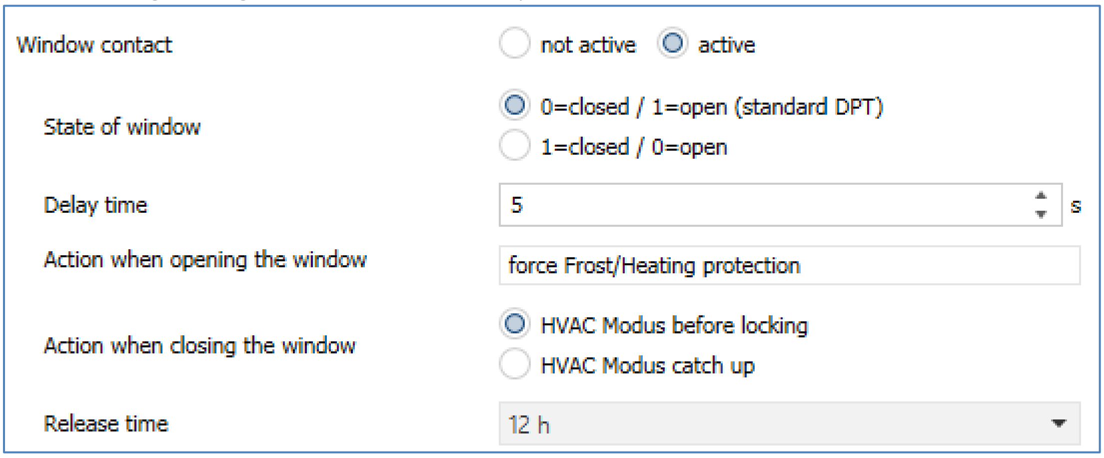

Figure 20: Settings – Window contact

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 58: Settings – Window contact

With this function, the control in a room can be forced into Frost or Heat protection after a window has been opened. Normal heating/cooling operation is interrupted for this time. In this way, it can be avoided, for example, that unnecessary energy is consumed for heating after opening a window in winter. After closing the window it is then possible to switch back to normal operation.

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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 a mode that, for example, was sent during the lock as from a timer or a visualisation.
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	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 59: Communication object – Window contact

4.2.2.14 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 60: Overwiew – Diagnosis text

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4.2.3 Controller parameters

☑ Object Controller

The output of the control value 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
Setpoint	▪ **PI control continuous** ▪ PI control switching (PWM) ▪ 2-step control (switching)	This setting determines the type of control used

Table 61: Settings – Operating mode of the controller

The controller has three different controller types that determine the control value. The further configuration options depend on the controller type used. The following controllers can be selected:

- PI control continuous
- PI control switching (PWM)
- 2-step control (switching)

The following table shows the available communication objects:

Number	Name	Length	Usage
10	Control value Heating – Send control value	1 Byte 1 Bit	Controlling the actuator for the heating process
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

Table 62: 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).

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4.2.3.1 PI-control continuous

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

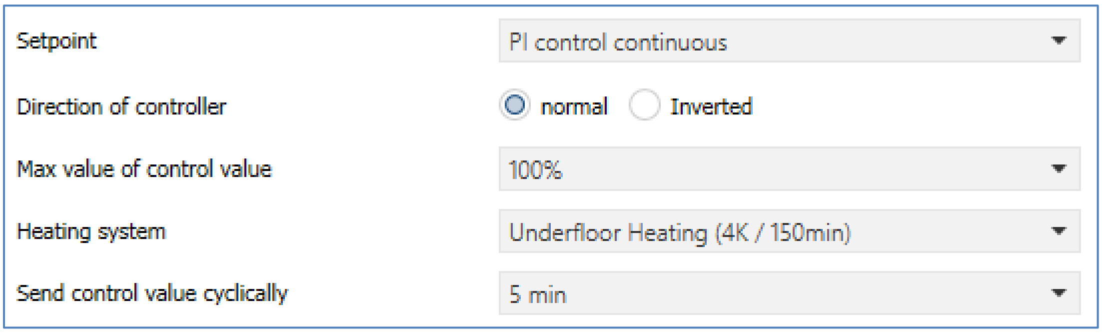

Figure 21: Settings – PI control continuous

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
Max 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 send**, 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 continuous

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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.

Max value of control value
The setting "Value of max. control value" can be used to set the maximum value the control value may assume. To prevent switching operations with large manipulated variables, the parameter "Value of the max. control value" can be set to a value so that the final control element 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.
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.

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4.2.3.2 PI control switching (PWM)

The following setting options are available (here: controller type “Heating”):

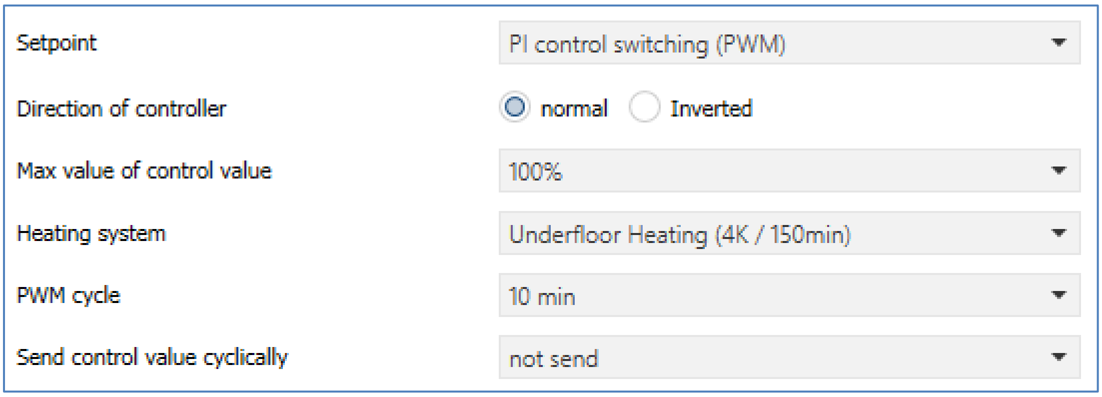

Figure 22: Settings – PI control switching (PWM)

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
Max 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 (K)	1 K - 20 K **[4 K]**	**Only visible with setting "Adjustment via control parameters"**. Here the proportional band can be set freely
Reset time (min)	15 min – 240 min **[150 min]**	**Only visible with setting "Adjustment via control parameters"**. The integral range can be freely adjusted here
PWM cycletime (min)	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 send**, 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 64: Settings – PI control switching (PWM)

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

PWM cycle time
The PWM cycle time 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	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 65: Communication objects – Status control value

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4.2.3.3 2-step control (switching)

The following setting options are available for this (here: controller type: “Heating”):

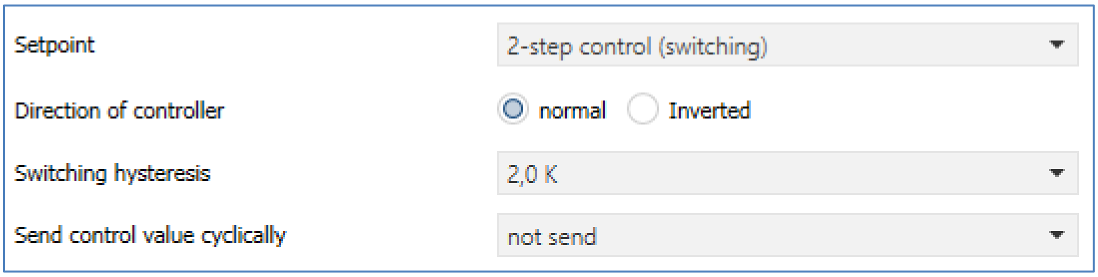

Figure 23: Settings – 2-step control (switching)

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
Hysteresis	0,5 K – 5,0 K **[2,0 K]**	Setting for upper and lower switch-on and switch-off point
Send control value cyclic or: Send control value for heating and cooling cyclic	Not send, 1 min – 60 min **[not send]**	**Visible when heating only or cooling only is set**. Setting whether and at what interval the control value is sent cyclically **Visible when heating and cooling is set**

Table 66: Settings – 2-step control (switching)

The 2-point 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-point controller is used when the control value can only assume two states, e.g. an electro-thermal valve.

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

> Example: In the controller, with controller type “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.

4.2.3.4 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 controller type 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.

4.2.3.5 Additional settings for Heating & Cooling mode

The picture shows the additional settings in heating & cooling mode:

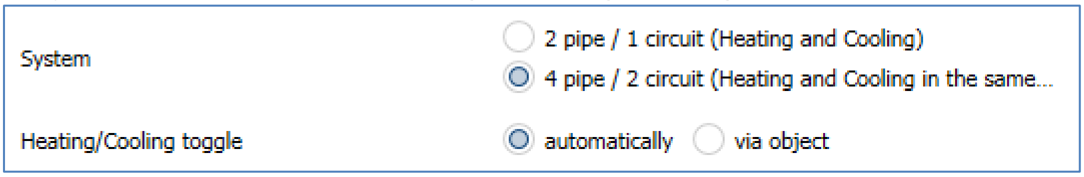

Figure 24: Additional settings – Heating and Cooling

The following table shows the additional settings in Heating & Cooling mode:

ETS-Text	Dynamic range **[Default value]**	Comment
System	▪ **2 pipe / 1 circuit** ▪ 4 pipe / 2 circuit	Setting for separate or combined heating / cooling circuits
Heating/Cooling toggle	▪ **automatically** ▪ via object	Setting whether the changeover is carried out automatically via the temperature or via a separate object. Only with setting " **Setpoints - dependent on Comfort setpoint"**
	via object	With setting "**Independent setpoints**" only via object!

Table 67: Additional settings – Heating and Cooling

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 "**Heating/Cooling toggle**" It is also possible to select between manual switching between heating and cooling via an object and automatically via the temperature (only valid if "Setpoints dependent on Comfort setpoint" is selected.

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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.

Toggle Heating/Cooling:
Using the "Toggle Heating/Cooling" 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	Length	Usage
32	Toggle 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 68: Communication objects – Heating/Cooling switchover

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4.2.3.6 Additional level

The additional level is only available in "Heating" mode. The picture shows the available settings:

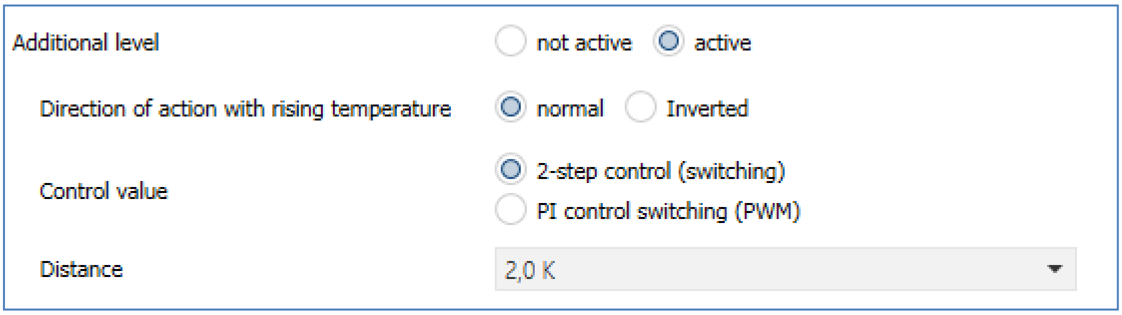

Figure 25: Settings – Additional level

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 69: 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.
An additional level can only be selected for a heating process. The **direction of action** of the control variable can also be set as normal or inverted for the additional level (see 4.2.3.4 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 **distance** (in K). 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	Length	Usage
14	Control value additional Heating – Send control value	1 Bit	Controlling the actuator for the additional level

Table 70: Communication object – Additional level

4.2.4 Ventilation control

☑ Object Controller

4.2.4.1 Step switch bit coded

The following figure shows the available settings:

Ventilation control	step switch bit coded (toggle switch)
Outputs cyclically send all	not send
Pause between individual levels [x100ms]	0
Type of thresholds	control value
Total number of steps	4
Minimum level at day	Level 0
Maximum level at day	Level 4
Minimum level at night	Level 0
Maximum level at night	Level 4
Threshold level 1	10%
Threshold level 2	30%
Threshold level 3	50%
Threshold level 4	70%
Hysteresis	5%
Behavior at lock	not use
Release time from manual control to automatic mode	not active
Behavior at init	Automatic mode
Sticking protection (highest level trigger after 24 hours at level 0)	◉ not active ○ Active
Priority	◉ not active ○ active

Figure 26: Settings – Step switch bit coded

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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 at day	Level 0 - Level 4 **[Level 0]**	Defines the minimum level in daytime operation
Maximum level at day	Level 0 - Level 4 **[Level 4]**	Defines the maximum level in daytime operation
Minimum level at night	Level 0 - Level 4 **[Level 0]**	Defines the minimum level in Night mode
Maximum level at night	Level 0 - Level 4 **[Level 4]**	Defines the maximum level in Night mode

Table 71: Settings – Min/Max levels for Day/Night

With the Day/Night switchover and the associated minimum/maximum output stage, the ventilation control can be limited. If, for example, the fan is only to run at level 2 in Night-mode in order 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	Length	Usage
106	Day/Night	1 Bit	Switching between Day/Night operation

Table 72: Communication object – Day/Night switchover

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Type of thresholds: Control value/Delta T

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 control 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 53 - temperature value, and the setpoint value, which is sent on object 6 - current setpoint value

In the "Type of thresholds: relative humidity" setting, the ventilation control refers to the current measured value of the controller, object 61 - relative humidity.

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 send** 1 min – 60 min	Parameter activates the cyclic sending of all 4 output objects

Table 73: Settings – Output step controller

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

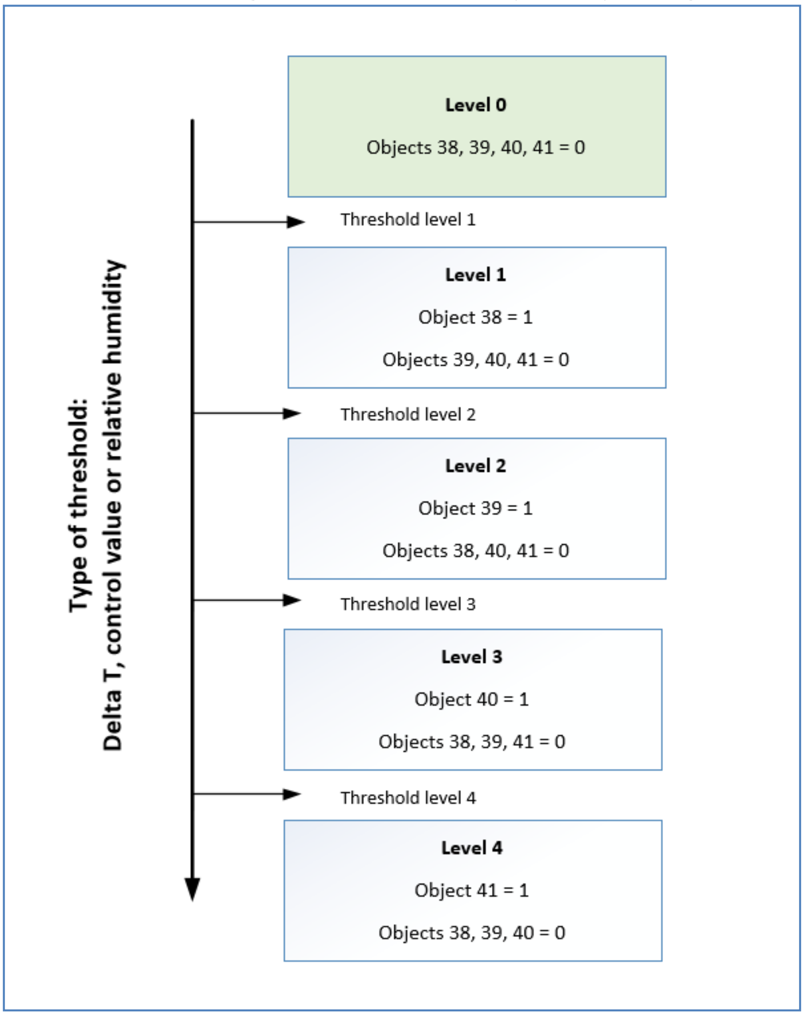

Figure 27: Switching behaviour – Step controller

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
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	Length	Usage
38	Ventilation control - Level 1	1 Bit	Switching the output level 1
39	Ventilation control - Level 2	1 Bit	Switching the output level 2
40	Ventilation control - Level 3	1 Bit	Switching the output level 3
41	Ventilation control - Level 4	1 Bit	Switching the output level 4

Table 74: Communication objects – Step switch bit coded

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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:

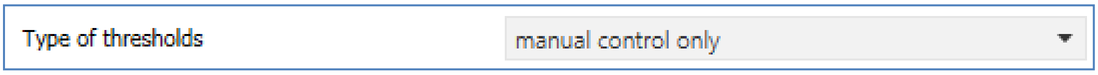

Figure 28: Setting – Manual control only

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

Behavior at lock

The following settings are available:

- **Not used**
  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 **behavior when unlocking** can be set:

- **no action**
  The controller remains in the former state.
- **send a certain value**
  The controller sets the adjusted level.
- **Automatic mode**
  The controller switches to automatic mode
  This behavior 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	Length	Usage
37	Ventilation control – Lock	1 Bit	Locks the ventilation control

Table 75: Communication object – Lock Ventilation

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Behavior at init

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

Figure 29: Ventilation control – Behaviour at Init

The behaviour in the Init 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:

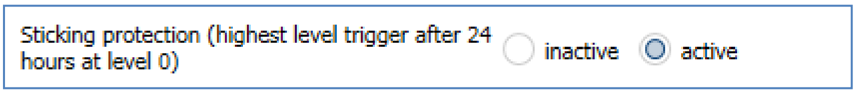

Figure 30: Ventilation control – Sticking protection

In order to protect the ventilation system from getting stuck, an anti-sticking protection can be activated. This allows the ventilation to run at the highest level for a short time, provided that it has not been moved for 24 hours (= level 0).

Priority

The priority can call a certain state:

Figure 31: Ventilation control – Priority

At activating the polarity (value = 1) a certain state is called. The following table shows the communication object for the priority control:

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

Table 76: Communication object – Ventilation control: Priority

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.

Number	Name	Length	Usage
42	Ventilation control – 1Byte status ventilation level	1 Byte	Output of the current status, which level is active
48	Ventilation control – Status for ventilation active	1 Bit	Output of the status whether active or not

Table 77: Communication object – Status of ventilation control

4.2.4.2 Step Switch – binary coded

The functionality of the binary coded step switch is identical to that of the normal step switch as described under "4.2.4.1 Step switch bit coded". Only the output level is already sent in binary code. Object 38 is bit 0, object 39 is bit 1 and object 40 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 38, 39, 40 = 0
Level 1	001	Object 38 = 1, Objects 39 & 40 = 0
Level 2	010	Object 39 = 1, Objects 38 & 40 = 0
Level 3	011	Objects 38 & 39 = 1, Object 40 = 0
Level 4	100	Object 40 = 1, Objects 38 & 39 = 0

Table 78: Settings – Step-switch binary coded

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

Number	Name	Length	Usage
38	Ventilation control – Bit 0	1 Bit	Setting the bit 0
39	Ventilation control – Bit 1	1 Bit	Setting the bit 1
40	Ventilation control – Bit 2	1 Bit	Setting the bit 2

Table 79: Communication objects – Step switch binary coded

4.2.4.3 Step switch simple

The functionality of the step switch simple is identical to that of the normal step switch as described under "4.2.4.1 Step switch bit coded". Only the output level is constructed differently. With each increase of the step, the previous and the new one are switched on, which is also clear from the communication objects:

Number	Name	Length	Usage
38	Ventilation control – Level 1	1 Bit	Switching level 1
39	Ventilation control – Level 1+2	1 Bit	Switching level 1+2
40	Ventilation control – Level 1+2+3	1 Bit	Switching level 1+2+3
41	Ventilation control – Level 1+2+3+4	1 Bit	Switching level 1+2+3+4

Table 80: Communication objects – Step switch simple

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4.2.4.4 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:

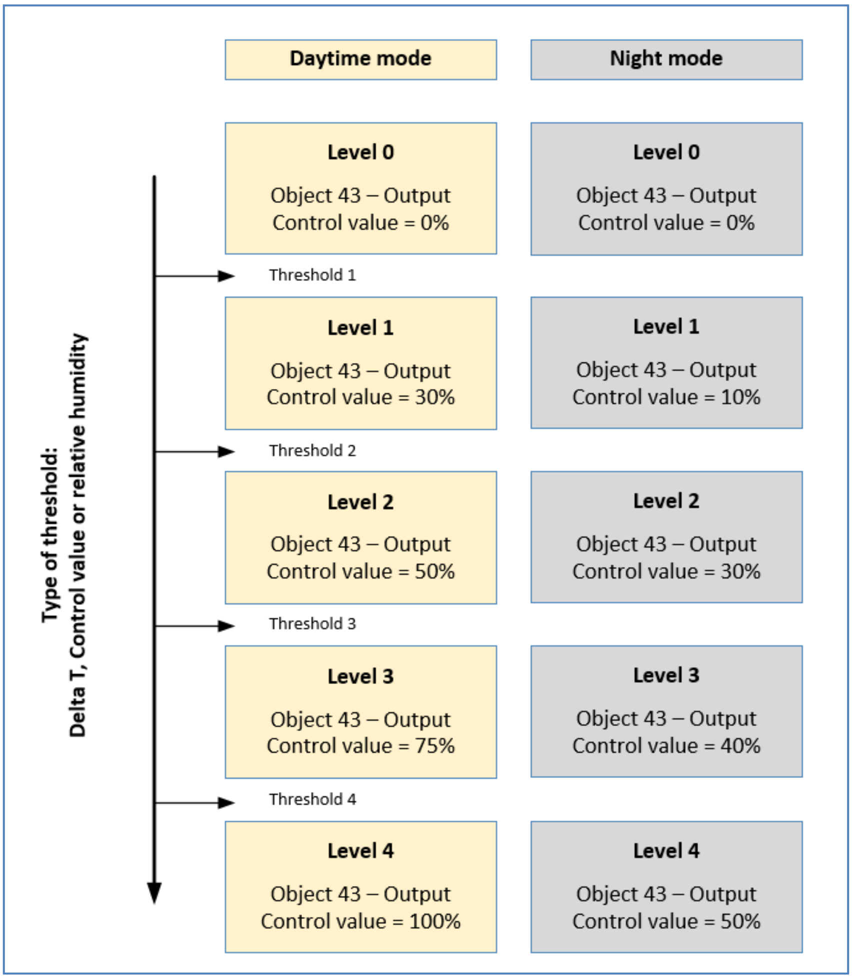

Figure 32: Example – Output: Step switch as Byte

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	Length	Usage
43	Ventilation control – Control value	1 Byte	Control value for an actuator

Table 81: Communication object – Step switch as Byte

All other functions are identical to those described under "4.2.4.1 Step switch bit coded”

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4.3 Binary inputs

☑ Object Controller

The Room Temperature Controller Smart has 4 binary inputs for potential-free contacts. These are freely programmable via ETS as individual channels (single-button function) or as grouped channels (two-button function).

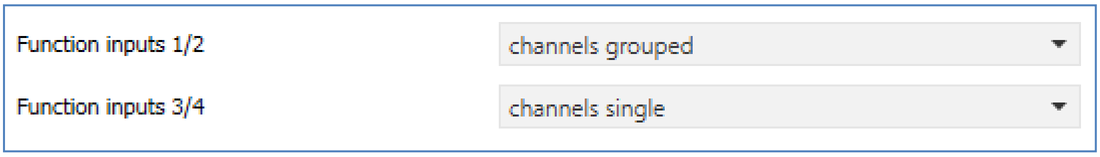

Figure 33: Settings – Binary inputs

Identical parameters:
A lock object can be defined for each input function. The lock object locks the operation of the inputs when a logical 1 is received and releases them again as soon as a logical 0 is received..

ETS-Text	Dynamic range **[Default value]**	Comment
Lock object	▪ **not active** ▪ active	Activating/deactivating the lock object for this input function

Table 82: Identical Parameters – Binary inputs

The following table shows the available communication objects:

Number	Name	Length	Usage
88	Input 1 Inputs 1/2 – Lock object	1 Bit	Activation/deactivation of the lock object
93	Input 2 – Lock object	1 Bit	Activation/deactivation of the lock object
98	Input 3 Inputs 3/4 – Lock object	1 Bit	Activation/deactivation of the lock object
103	Input 4 – Lock object	1 Bit	Activation/deactivation of the lock object

Table 83: Identical communication objects – Binary inputs

The following parameters are available for selecting the basic functions:

ETS-Text	Dynamic range **[Default value]**	Comment
Basic function	▪ not active ▪ **switch** ▪ switch short/long ▪ one-button dimming ▪ one-button blinds ▪ send state ▪ send value	**Setting only available for the single channels.** Defines the basic function of the inputs.
Basic function	▪ **switch** ▪ dimming ▪ shutter	**Setting only available for the grouped channels.** Defines the basic function of the inputs.

Table 84: Basic settings – Binary inputs

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4.3.1 Basic function – Switch
☑ Single channels
☑ Grouped channels

4.3.1.1 Switching with grouped channels
☑ Grouped channels

With the "switch" function for grouped channels it is possible to determine which value the respective input is to send.
The following picture shows the available settings:

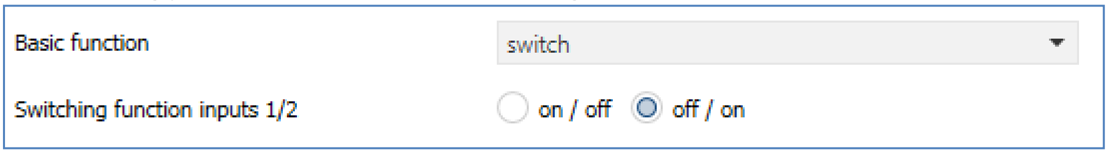

Figure 34: Settings – Grouped channels: Switch

With the grouped switching function, simple functions such as a toggle switch can be easily programmed. The channel pair sends, via the 1 bit communication object, a 1 signal for the operation of the first channel and a 0 signal for the operation of the second channel. However, this assignment can also be reversed in the configuration.

The following table shows the available communication object:

Number	Name	Length	Usage
84	Inputs 1/2: – Switch On/Off	1 Bit	Switching function of the channels

Table 85: Communication objects – Grouped channels: Switch

Description of "lock object", see identical parameters under 4.3 Binary inputs

4.3.1.2 Switching with single channels
☑ Single channels

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

The following figure shows the available settings:

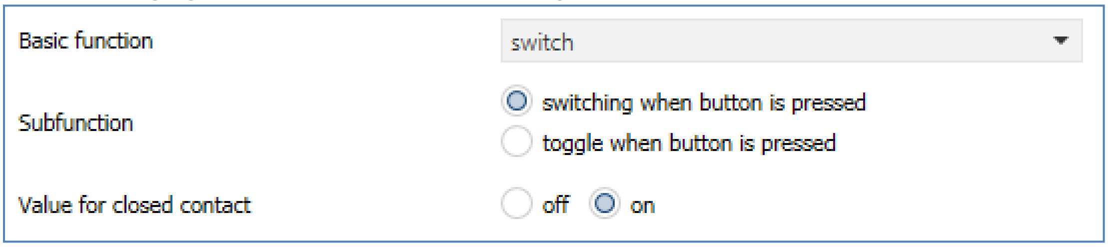

Figure 35: Settings – Single-channel: Switch

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The following table shows the available communication objects:

Number	Name	Length	Usage
84	Input 1 – Switch	1 Bit	Switching function of the input (for sub-function "Switch when button is pressed").
84	Input 1 – Toggle	1 Bit	Toggle function of the input (for sub-function "Toggle when button is pressed")
85	Input 1 – Status for toggle	1 Bit	Status to update current status. Has to be connected to the status of the actuator to be switched (for sub-function "Switching when button is pressed").

Table 86: Communication objects – Single channel: Switch

Description of "lock object", see identical parameters under 4.3 Binary inputs.

4.3.2 Basic function – Switch short/long

☑ Single channels

The following figure shows the available settings:

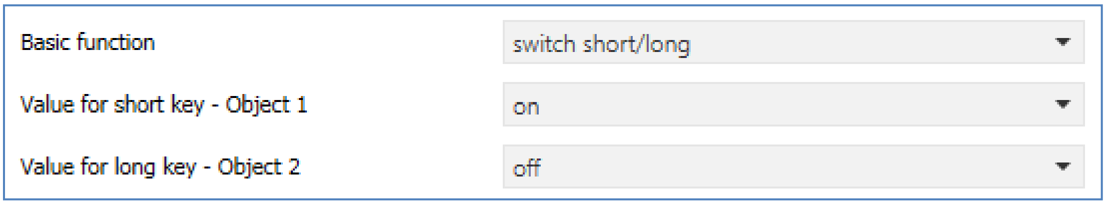

Figure 36: Settings – Switch short/long

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Value for short/long button – Object 1/2	▪ OFF ▪ **ON** ▪ toggle ▪ send value ▪ nothing	Setting the function for the short/long button
Send value	▪ **1Byte value** ▪ 1Byte percent value ▪ scene number	Setting of the data point type for the value to be sent. **Setting only available if "Value for short/long button" is set to "Send value".**

Table 87: Settings – Switch short/long

With the basic function "**Switch short/long**", 2 different values can be sent for the short and long buttons. The short and long buttons have different objects, so it is also possible to send different types of data points.
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).

The following table shows the available communication objects:

Number	Name	Length	Usage
84	Input 1 short: – Switch, toggle, send value…		Sending the value for the short button. DPT depending on the parameter setting
85	Input 1 short: – Status for toggle	1 Bit	**Only for "Value for short button - toggle".** Receive the status for the short button. Has to be connected with the status of the actuator to be switched.
86	Input 1 long: – Switch, toggle, send value…		Sending the value for the long button. DPT depending on the parameter setting
87	Input 1 long: – Status for toggle	1 Bit	**Only for "Value for long button - toggle".** Receive the status for the long button. Has to be connected with the status of the actuator to be switched.

Table 88: Communication objects – Switch short/long

Description of "lock object", see identical parameters under 4.3 Binary inputs.

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4.3.3 Basic function – Dimming

☑ Single channels
☑ Grouped channels

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

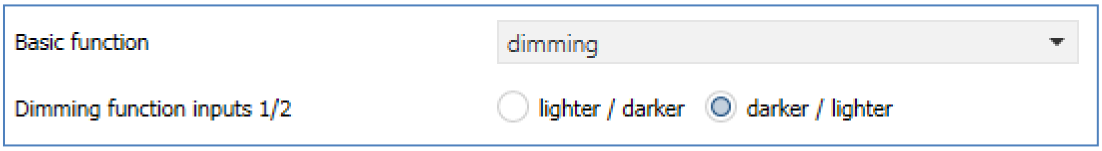

Figure 37: Settings – Dimming

The following table shows the available settings:

ETS-Text	Dynamic range [Default value]	Comment
Dimming function inputs 1/2	▪ **brighter/darker** ▪ darker/brighter	**Only for grouped channels.** Setting the channels for direction (bright/dark)

Table 89: Settings – Dimming

If a single channel is configured as "dimming", two communication objects appear. On the one hand, the function for the short button press, the "Dimming On/Off" switch object and on the other hand, the function for the long button press, the "Dimming relative" dimming object.
With grouped channels "dimming" can be configured either as brighter/darker or as darker/brighter. The relationships are shown in the following table:

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

Table 90: Functionality – Dimming with grouped channels

With the single channel 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.

The following table shows the available communication objects:

Number	Name	Length	Usage
84	Input 1 Inputs 1/2 – Dimming On/Off	1 Bit	Switching command for the dimming function
85	Input 1 Inputs 1/2 – Dimming relative	4 Bit	Command for relative dimming
86	Input 1 – Status for toggle	1 Bit	**Only for single channels.** Receipt of the status with current information about the status of the actuator to be controlled

Table 91: Communication objects – Dimming

Description of "lock object", see identical parameters under 4.3 Binary inputs.

4.3.4 Basic function – Shutter

☑ Single channels
☑ Grouped channels

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: Grouped channels):

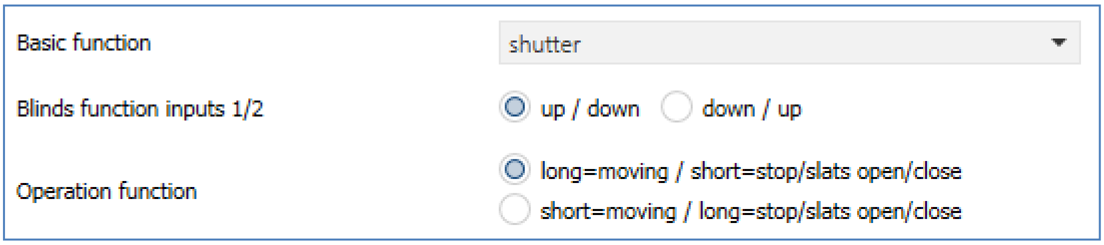

Figure 38: Settings – Blinds/Shutter

The following table shows all available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Blinds function inputs 1/2	▪ Up/Down ▪ **Down/Up**	**Only for grouped channels.** Setting the inputs for the up/down function
Operation 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 92: Settings – Blinds/Shutter

Two communication objects are displayed for the "blind/shutter" function: the object "Stop/slat 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.
With the function for grouped channels, the assignment can be set.
The table below shows the relationships:

	Function Up/Down			**Function Down/Up**	
Input	Input 1	Input 2		Input 1	Input 2
Moving object	Up	Down		Down	Up
Stop/Step object	Stop/slats open	Stop/slats close		Stop/slats close	Stop/slats open

Table 93: Functional principle – Blinds with grouped channels

The single-button function is used to toggle between the up and down movement after each keystroke.
As blind actuators always use a 1 signal for down movement and a 0 signal for up movement, the push-button also outputs this signal.
It is also possible to swap the action for the long and short button action. Thus, it is possible to select whether a long or a short keystroke is to be used. The stop/step object then adopts the other operating concept.

The following table shows the available communication objects:

Number	Name	Length	Usage
84	Input 1 Inputs 1/2 – Blinds Up/Down	1 Bit	Up/down command for the shutter actuator
85	Input 1 Inputs 1/2 – Slat adjustment / Stop	1 Bit	Open/close slats and stop command
86	Input 1 – Status for change of direction	1 Bit	**Only with single channel!** Receipt of the status with current information about the direction of the blind actuator

Table 94: Communication objects – Blinds/Shutter

Description of "lock object", see identical parameters under 4.3 Binary inputs.

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4.3.5 Basic function – Send Status

☑ Single channels

With the basic function "Send status", fixed values can be sent for a closed contact (rising edge) and a opened contact (falling edge). This function can be used to realise triggering applications.
The following picture shows the available settings:

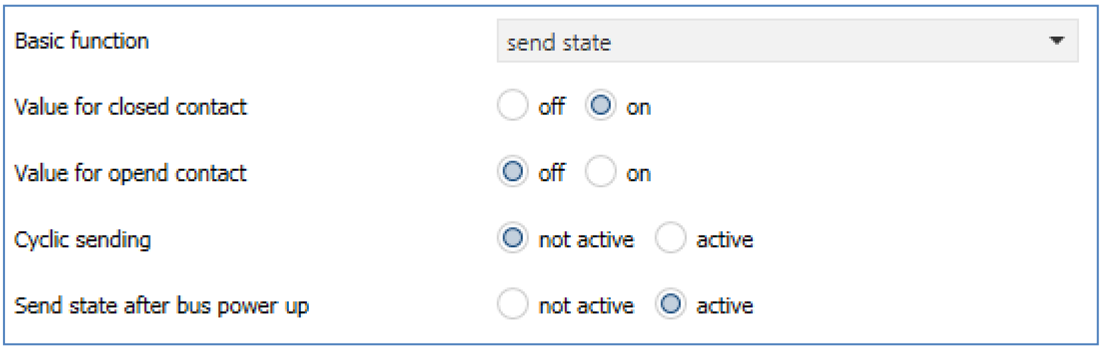

Figure 39: Settings – Send Status

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Value for closed/open contact	▪ Off ▪ On	Defines the sending behaviour of the button
Cyclical sending	▪ **not active** ▪ active	Determining whether values are to be sent cyclically
Send distance cyclically	1 … 3000 s **[1 s]**	**Only if cyclical sending is active.** Defining the distance between two telegrams
Send status after bus power return	▪ not active ▪ **active**	Determine whether the current status is to be sent after bus power recovery.

Table 95: Settings – Send Status

The following table shows the available communication object:

Number	Name	Length	Usage
74	Input 1 – Send status	1 Bit	Sends the respective value for closed and open contact

Table 96: Communication object – Send status

Description of "lock object", see identical parameters under 4.3 Binary inputs.

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4.3.6 Basic function – Send value

☑ Single channels

The following figure shows the available settings:

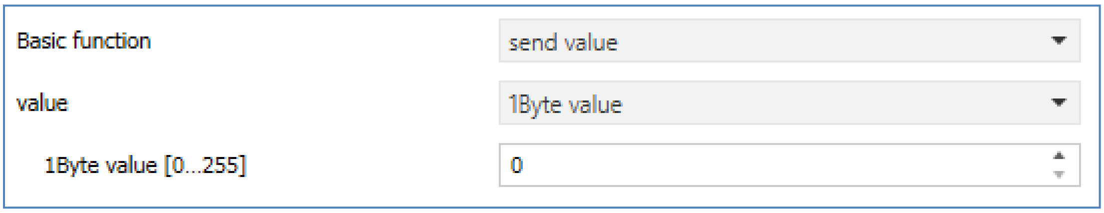

Figure 40: Settings – Send value

Each time the contact closes, the set value is always sent, either as a percentage value, decimal value or scene.

The following table shows the available settings:

ETS-Text	Dynamic range **[Default value]**	Comment
Value	▪ **1Byte value** ▪ 1Byte percent value ▪ Scene number	Setting the data point type for the value to be sent

Table 97: Settings – Send value

The adjustable values are 0 - 100% (percentage value), 0 - 255 (value) or 1 - 64 (scene).

The value to be sent can be set according to the set data point type.
The following table shows the available communication objects:

Number	Name	Length	Usage
84	Input 1 – Send value, Send percent value, Send scene	1 Byte	Sending the value. DPT depending on the parameter setting

Table 98: Communication objects – Send value

Description of "lock object", see identical parameters under 4.3 Binary inputs.

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6 Attachment

6.1 Statutory requirements

The above-described devices must not be used with devices, which serve directly or indirectly the purpose of human, health- or lifesaving. Further the devices must not be used if their usage can occur danger for humans, animals or material assets.
Do not let the packaging lying around careless, plastic foil/ -bags etc. can be a dangerous toy for kids.

6.2 Disposal routine

Do not throw the waste equipment in the household rubbish. The device contains electrical devices, which must be disposed as electronic scrap. The casing contains of recyclable synthetic material.

6.3 Assemblage

Danger to life from electric current!

All activities on the device should only be done by an electrical specialist. The county specific regulations and the applicable KNX-directives have to be observed.

The devices are approved for operation in the EU and bear the CE mark. Use in the USA and Canada is not permitted.

6.4 Revision History

V1.0	First Version of Technical Manual	DB V1.1	07/2021

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