

# Technical Manual



## MDT Temperature Controller 8-fold

SCN-RT8REG.02

### **Further Documents:**

#### **Datasheets:**

[https://www.mdt.de/EN\\_Downloads\\_Datasheets.html](https://www.mdt.de/EN_Downloads_Datasheets.html)

#### **Assembly and Operation Instructions:**

[https://www.mdt.de/EN\\_Downloads\\_Instructions.html](https://www.mdt.de/EN_Downloads_Instructions.html)

#### **Solution Proposals for MDT products:**

[https://www.mdt.de/EN\\_Downloads\\_Solutions.html](https://www.mdt.de/EN_Downloads_Solutions.html)

## 1 Content

<b>1 Content.....</b>	<b>2</b>
<b>2 Overview .....</b>	<b>4</b>
2.1 Overview Devices .....	4
2.2 Special features.....	5
2.3 Exemplary circuit diagram .....	5
2.4 Structure & Handling .....	6
2.5 Commissioning.....	7
<b>3 Communication objects .....</b>	<b>8</b>
3.1 Standard settings of the communication objects .....	8
<b>4 Reference ETS-Parameter.....</b>	<b>10</b>
4.1 General settings .....	10
4.2 Channel Settings.....	12
4.2.1 Temperature, Alarms, Messages .....	12
4.2.2 Temperature Controller .....	15
4.2.2.1 Controller type.....	16
4.2.2.2 Setpoints, Operating Modes & Priorities.....	16
4.2.2.2.1 Depending on Setpoint Comfort (basic).....	17
4.2.2.2.2 Independent setpoints .....	20
4.2.2.2.3 Priority of the operating modes .....	21
4.2.2.3 Operating mode switchover (Mode selection).....	21
4.2.2.4 HVAC Status objects.....	23
4.2.2.5 Operating mode after reset .....	25
4.2.2.6 Setpoint shift.....	26
4.2.2.7 Comfort extension with time .....	29
4.2.2.8 Lock objects .....	30
4.2.2.9 Object for Heating/Cooling request.....	30
4.2.2.10 Reference control via outside temperature .....	31
4.2.2.11 Flow temperature limitation .....	33
4.2.2.12 Limit temperature of cooling medium via dew point monitoring .....	34
4.2.2.13 Window contact.....	34
4.2.2.14 Diagnosis .....	36

4.2.3 Controller settings .....	37
4.2.3.1 PI-control continuous .....	38
4.2.3.2 PI control switching (PWM) .....	40
4.2.3.3 2-step control (switching).....	42
4.2.3.4 Direction of controller .....	43
4.2.3.5 Additional settings for Heating & Cooling mode.....	43
4.2.3.6 Additional level .....	45
4.2.3.7 Emergency mode .....	46
<b>5 Index .....</b>	<b>47</b>
5.1 Register of illustrations .....	47
5.2 List of tables .....	48
<b>6 Attachment.....</b>	<b>50</b>
6.1 Statutory requirements .....	50
6.2 Disposal routine.....	50
6.3 Assemblage .....	50
6.4 Revision History .....	50

## 2 Overview

### 2.1 Overview Devices

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

- **SCN-RT8REG.02**, Temperature Controller 8-fold, 2 SU, MDRC
  - 8 channels, version as MDRC device

## 2.2 Special features

### Comfortable temperature controller

The actual temperature of the room is sufficient for each of the up to eight controllers to start controlling. This is provided, for example, by the MDT Push Buttons with temperature sensor. Each channel can be configured as an independent system. The controller types "Heating", "Cooling" and "Heating and Cooling" are available for this. The 2-step control, switching PI control (PWM) or the continuous PI control can be selected as operating modes. The temperature controller supports single-circuit 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 setpoints for "Comfort", "Standby" and "Night" can be individually configured independently of the "Basic Comfort" setpoint. This ensures a high level of compatibility with many visualisations. The setpoint shift can be carried out classically via 1 bit (step), 1 byte (counter pulses) and via 2 bytes (temperature difference and absolute values). This also provides a high compatibility with a wide variety of visualisations. Set values are saved in the event of a bus voltage failure and are retained.

### Comfort extension

The temperature controller can be switched back to "Comfort" mode by object for a configurable time if it was already in "Night" mode.

### Reference control via outdoor temperature

In "Cooling" mode it is possible to guide the setpoint via the outdoor temperature. This raises the setpoint linearly to limit the temperature differences between the outdoor and indoor temperatures.

### Lock Heating/Cooling Mode with opened windows

If the window of a room is opened, the controller locks the heating operation and goes into "Frost protection" mode. As soon as the window is closed, the "Heating" mode is activated again.

### Additional level heating

In "Heating" mode, an additional stage can be activated for each channel. This can be used in sluggish systems to shorten the heating phase. For example, in the case of underfloor heating (as the basic level), a radiator or an electric heater (as the additional level) could be used to shorten the longer heating phase of the sluggish underfloor heating.

### Emergency mode

If the cyclically sent temperature values fail, the control channel can automatically switch to emergency mode. The control values of the emergency mode can be configured separately for "Heating" and "Cooling".

### Plain text diagnosis via 14 byte object

The temperature controller has a 14-byte object with which a variety of messages are sent in plain text as status on the bus.

### Long Frame Support

Device supports the sending of longer telegrams and thus the storage of more user data per telegram. This significantly shortens the programming time (from ETS5).

Requirements: Use of a programming interface which supports the transmission of long frames, e.g. MDT SCN-USBR.02 or SCN-IP000.03 / SCN-IP100.03.

### Updateable via DCA

With the help of the MDT Update Tool, the units can be updated if necessary. The download is available free of charge at [www.mdt.de](http://www.mdt.de) and [www.knx.org](http://www.knx.org).

## 2.3 Exemplary circuit diagram

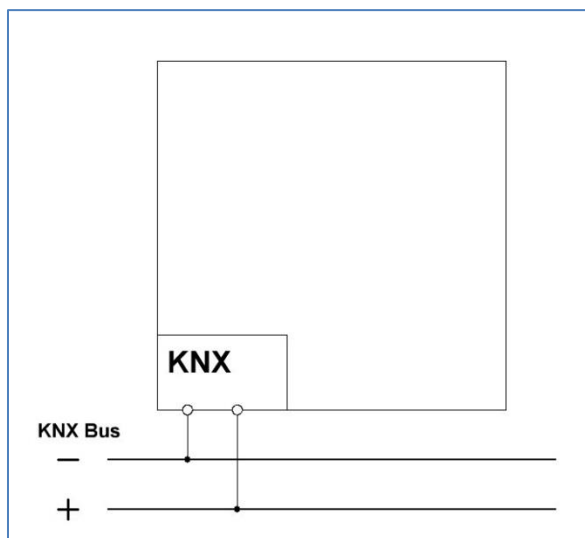


Figure 1: Exemplary circuit diagram

## 2.4 Structure & Handling

The following picture shows the structure of the Temperature Controller:



Figure 2: Structure & Handling

- 1 = KNX bus connection terminal
- 2 = Programming button
- 3 = Red programming LED

## 2.5 Commissioning

After wiring, the allocation of the physical address and the parameterization of every channel follow:

- (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 configuration.
- (6) If the device is enabled you can test the requested functions (also possible by using the ETS-Software).

### 3 Communication objects

#### 3.1 Standard settings of the communication objects

Standard settings									
No.	Name	Function	Length	C	R	W	T	U	
1	Channel A	Receive temperature value	2 Byte	X		X	X	X	
2	Channel A	Read out minimum temperature value	2 Byte	X	X		X		
3	Channel A	Read out maximum temperature value	2 Byte	X	X		X		
4	Channel A	Reset memory min/max value	1 Bit	X		X			
5	Channel A	Min. value fallen below	1 Bit	X	X		X		
6	Channel A	Max. value exceeded	1 Bit	X	X		X		
7	Channel A	Setpoint setting	2 Byte	X		X			
8	Channel A	Setpoint Comfort	2 Byte	X		X			
8	Channel A	Setpoint Comfort (Basic)	2 Byte	X		X			
8	Channel A	Setpoint combination object	8 Byte	X		X			
8	Channel A	Setpoint combination object (Heating)	8 Byte	X		X			
9	Channel A	Setpoint Standby	2 Byte	X		X			
10	Channel A	Setpoint Night	2 Byte	X		X			
11	Channel A	Setpoint Heat protection	2 Byte	X		X			
11	Channel A	Setpoint Frost protection	2 Byte	X		X			
12	Channel A	Combination object (Cooling) setpoint	8 Byte	X		X			
13	Channel A	Current setpoint	2 Byte	X	X		X		
14	Channel A	Manual setpoint shift (2 Byte)	2 Byte	X		X			
15	Channel A	Manual setpoint shift (1=+ / 0=-)	1 Bit	X		X			
15	Channel A	Manual setpoint shift (1 Byte)	1 Byte	X		X			
16	Channel A	Status setpoint shift	2 Byte	X	X		X		
17	Channel A	Control value Heating	1 Bit	X	X		X		
17	Channel A	Control value Heating	1 Byte	X	X		X		
17	Channel A	Control value Heating/Cooling	1 Bit	X	X		X		
17	Channel A	Control value Heating/Cooling	1 Byte	X	X		X		
18	Channel A	Control value Cooling	1 Bit	X	X		X		
18	Channel A	Control value Cooling	1 Byte	X	X		X		
19	Channel A	Status control value Heating	1 Byte	X	X		X		
19	Channel A	Status control value Heating/Cooling	1 Byte	X	X		X		
20	Channel A	Status control value Cooling	1 Byte	X	X		X		
21	Channel A	Control value additional level	1 Bit	X			X		
22	Channel A	Mode selection	1 Byte	X		X			
23	Channel A	Comfort extension	1 Bit	X		X			
24	Channel A	Switch Comfort operating mode	1 Bit	X		X			



25	Channel A	Switch Night operating mode	1 Bit	X		X		
26	Channel A	Switch Frost protection operating mode	1 Bit	X		X		
26	Channel A	Switch Heat protection operating mode	1 Bit	X		X		
26	Channel A	Switch Frost/Heat protection operating mode	1 Bit	X		X		
27	Channel A	DPT_HVAC Status	1 Byte	X	X		X	
27	Channel A	DPT_HVAC Mode, Status	1 Byte	X	X		X	
28	Channel A	DPT_HVAC Mode, additional object	1 Byte	X	X		X	
28	Channel A	DPT_HVAC Status, additional object	1 Byte	X	X		X	
28	Channel A	DPT_RHCC Status, additional object	2 Byte	X	X		X	
28	Channel A	DPT_RTSM combination status, additional object	1 Byte	X	X		X	
28	Channel A	DPT_RTC combination status, additional object	2 Byte	X	X		X	
29	Channel A	Frost alarm	1 Bit	X	X		X	
30	Channel A	Heat alarm	1 Bit	X	X		X	
31	Channel A	Flow temperature Heating	2 Byte	X		X	X	X
32	Channel A	Dew point alarm	1 Bit	X		X	X	
33	Channel A	Diagnosis	14Byte	X	X		X	
34	Channel A	Window contact input: 1=closed / 0=opened	1 Bit	X	X		X	
34	Channel A	Window contact input: 0=closed / 1=opened	1 Bit	X	X		X	
35	Channel A	Lock object Heating	1 Bit	X	X	X	X	X
36	Channel A	Lock object Cooling	1 Bit	X	X	X	X	X
39	Channel A	Switchover 1=Heating / 0=Cooling	1 Bit	X		X		
40	Channel A	Status Heating / Cooling	1 Bit	X	X		X	
41	Channel A	Heating request	1 Bit	X	X		X	
42	Channel A	Cooling request	1 Bit	X	X		X	
43	Channel A	Outdoor temperature/Reference value	2 Byte	X		X	X	X
<b>+43</b>	<b>next channel</b>							

Table 1: Communication objects – Temperature controller

Standard settings – General objects								
No.	Name	Function	Length	C	R	W	T	U
345	Operating	Output	1 Bit	X	X		X	

Table 2: Communication objects – General objects

The tables above show the default settings. The priority of the individual communication objects and the flags can be adjusted by the user as required. The flags assign the communication objects their respective tasks in the programming. "C" stands for communication, "R" for reading, "W" for writing, "T" for transmitting and "U" for updating.

## 4 Reference ETS-Parameter

### 4.1 General settings

The following picture shows the general settings:

The screenshot displays the 'General settings' window. It includes the following settings:

- Startup time:** A numeric input field set to '2' with a unit dropdown set to 's'.
- Send "Operation" cyclically:** A dropdown menu currently showing 'not active'.
- Setpoint Frost protection for all channels:** A numeric input field set to '7' with a unit dropdown set to '°C'.
- Setpoint Heat protection for all channels:** A numeric input field set to '35' with a unit dropdown set to '°C'.
- Language:** Two radio buttons, 'German' (selected) and 'English'.
- Channel Activation:** A list of channels from A to H. Each channel has two radio buttons: 'not active' and 'active'. For Channel A, 'active' is selected. For Channels B through H, 'not active' is selected.

Figure 3: General settings

The following table shows the possible settings:

ETS-Text	Dynamic range [Default value]	Comment
Startup time	2 – 240 s [2 s]	Sets the time between restart and functional start-up of the device
Send „operation“ cyclically	<b>not active</b> 1 min – 24 h	Activation of a cyclic "Operation" telegram
Setpoint Frost protection for all channels	3 ... 12 °C [7 °C]	Setting the general setpoint for Frost protection
Setpoint Heat protection for all channels	15 – 40 °C [35°C]	Setting the general setpoint for Heat protection
Language	<ul style="list-style-type: none"> <li>German</li> <li>English</li> </ul>	Setting the language of the diagnostic text.
Channel A - H	<ul style="list-style-type: none"> <li>not active</li> <li>active</li> </ul>	Activation of the respective channels.

Table 3: General settings

**Startup time**

This time defines when the unit "boots up" after a restart (reset, reprogramming, bus voltage recovery). This can be important if, for example, a bus reset is carried out. If there are many units on a line, all units would start at the same time and load the bus. With a variable time, the units can start differently.

**„Operation“**

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

**Setpoint Frost/Heat protection for all channels**

The setpoints defined here basically apply to all channels. In the channels, it is then possible to refer to this setpoint or to set an individual setpoint in the corresponding channel.

**Language**

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

**Channel A - H**

The individual channels can be activated here. A new submenu appears for each activated channel, in which the individual settings for control are then made.

The table shows the general communication objects:

Number	Name/Object Function	Length	Usage
345	Operation – Output	1 Bit	Sending a cyclic "In operation" telegram

Table 4: General communication object

## 4.2 Channel Settings

### 4.2.1 Temperature, Alarms, Messages

The following figure shows the available settings:

The screenshot shows a settings window with the following elements:

- Channel/Object description:** A text input field.
- Min/Max values:** Two radio buttons, 'not active' and 'active'. The 'active' button is selected.
- Alarms:** Two radio buttons, 'not active' and 'active'. The 'active' button is selected.
- Frost alarm if value less:** A numeric input field with the value '7' and a unit '°C'.
- Heat alarm if value greater:** A numeric input field with the value '35' and a unit '°C'.
- Messages:** Two radio buttons, 'not active' and 'active'. The 'active' button is selected.
- Upper message value:** A numeric input field with the value '26' and a unit '°C'.
- Lower message value:** A numeric input field with the value '13' and a unit '°C'.

Figure 4: Settings – Temperature, Alarms, Messages

The following table shows the possible settings:

ETS-Text	Dynamic range [Default value]	Comment
Channel-/Object description	Free Text [up to 30 Bytes allowed]	Entering a text to describe the channel/objects
Min/Max values	<ul style="list-style-type: none"> <li>not active</li> <li>active</li> </ul>	Activation for min/max values
Alarms	<ul style="list-style-type: none"> <li>not active</li> <li>active</li> </ul>	Activation of the alarms for Frost and Heat
Frost alarm if value less	3 ... 10 °C [7 °C]	Setting range for the frost alarm and heat alarm. <b>Only visible when "Alarms" is active.</b>
Heat alarm if value greater	25 ... 40 °C [35 °C]	
Messages	<ul style="list-style-type: none"> <li>not active</li> <li>active</li> </ul>	Activation of the message function
Upper message value	18 ... 60 °C [26 °C]	Setting range of the upper/lower message value. <b>Only visible when parameter "Messages" is activated</b>
Lower message value	1 ... 40 °C [13 °C]	

Table 5: Settings – Temperature, Alarms, Messages

For each channel, a text field is available for free labelling:

Channel/Object description	Kitchen, ground floor
----------------------------	-----------------------

Figure 5: Settings – Channel/Object description

Text with up to 30 characters can be entered for the "**Channel/object description**" field.

The text entered for the "Channel/Object description" appears both in the menu for the channel and in the communication objects of the channel:

General settings	
– Channel A: Kitchen, ground floor	

1	Channel A: Kitchen, ground floor	Receive temperature value
7	Channel A: Kitchen, ground floor	Setpoint setting
8	Channel A: Kitchen, ground floor	(Basic) Comfort setpoint
13	Channel A: Kitchen, ground floor	Current setpoint

Figure 6: Example – Channel/Object description

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/Object Function	Length	Usage
2	Read out minimum temperature value	2 Byte	Sends and stores the minimum measured temperature value
3	Read out maximum temperature value	2 Byte	Sends and stores the maximum measured temperature value
4	Reset memory min/max values	1 Bit	Resets the memory for min/max values

Table 6: Communication objects – Min/Max values

The function "**Alarms**" reports the falling below or exceeding of an adjustable temperature via the associated object. Falling below the lower detection value is reported via the object "Frost alarm". Exceeding the upper detection value is reported via the object "Heat alarm". The two message objects of size 1 bit send a "1" in these cases and can be used, for example, for visualisation or to initiate 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/Object Function	Length	Usage
29	Frost alarm	1 Bit	Sends Frost alarm when temperature is falling below the lower reporting value
30	Heat alarm	1 Bit	Sends a Heat alarm when temperature is exceeding the upper reporting value

Table 7: Communication objects – Alarms

The "**Messages**" function behaves similarly to the "Alarms" function. Two messages can be configured. One is the message function for the lower response value, the "minimum message value", and the other is the upper response value, the "maximum message value".

The signalling function has a much larger setting range than the alarm function and overlaps are also possible, so that a smooth switchover between the message for the minimum value and the maximum value can be realised.

The two signalling functions each have a separate communication object.

**Principle:**

If the maximum value is exceeded, a "1" is sent. If it is undercut again, a "0" is sent.

If the value falls below the minimum value, a "1" is sent. If it is exceeded again, a "0" is sent.

The following table shows the available communication objects:

Number	Name/Object Function	Length	Usage
5	Min. value fallen below	1 Bit	Sends a message when the value falls below the lower reporting value.
6	Max. value exceeded	1 Bit	Sends a message when the upper limit is exceeded.

Table 8: Communication objects – Messages

#### 4.2.2 Temperature Controller

The following picture shows the setting options (here with the example "Heating"):

Controller type	Heating
Priority	<input checked="" type="radio"/> Frost(Heat) protection/Comfort/Night/Standby <input type="radio"/> Frost(Heat) protection/Night/Comfort/Standby <input type="radio"/> independent setpoints <input checked="" type="radio"/> depending on Setpoint Comfort (Basic)
Setpoints for Standby/Night	<input checked="" type="radio"/> depending on Setpoint Comfort (Basic)
Setpoint Comfort (Basic)	21 °C
Standby reduction	2,0 K
Night reduction	3,0 K
Setpoint Frost protection setting	<input checked="" type="radio"/> general <input type="radio"/> individual
Maximum setpoint shift	3 K
Setpoint shift over 18Bit/1Byte object	not active
Status setpoint shift	<input type="radio"/> not active <input checked="" type="radio"/> active
Setpoint shift applies to	<input type="radio"/> Comfort <input checked="" type="radio"/> Comfort / Night / Standby
Delete setpoint shift after change of operating mode	<input checked="" type="radio"/> not active <input type="radio"/> active
Delete setpoint shift after new basic setpoint	<input checked="" type="radio"/> not active <input type="radio"/> active
Reset basic setpoint to configured value after change of operation mode	<input checked="" type="radio"/> not active <input type="radio"/> active
Send setpoint changes	<input checked="" type="radio"/> not active <input type="radio"/> active
Comfort extension with time	<input checked="" type="radio"/> not active <input type="radio"/> active
Operating mode after reset	Comfort with configured setpoint
HVAC Status object	<input checked="" type="radio"/> HVAC Status (non-standard DPT) <input type="radio"/> HVAC Mode (DPT 20.102)
Additional HVAC Status object	not active
Send HVAC Status object cyclically	not active
Lock object for control value Heating	<input checked="" type="radio"/> not active <input type="radio"/> active
Object for Heating request	<input checked="" type="radio"/> not active <input type="radio"/> active
Flow temperature	<input checked="" type="radio"/> not active <input type="radio"/> active
Window contact	<input checked="" type="radio"/> not active <input type="radio"/> active

Figure 7: Settings – Temperature controller

#### 4.2.2.1 Controller type

The table shows the possible configuration options for the controller type:

ETS-Text	Dynamic range [Default value]	Comment
Controller type	<ul style="list-style-type: none"> <li>▪ Heating</li> <li>▪ Cooling</li> <li>▪ Heating and Cooling</li> </ul>	Setting the control mode. The further configuration possibilities depend on the set control mode.

Table 9: Settings – Controller type

This setting determines the type of control. Depending on the selection - only "heating", only "cooling" or "heating and cooling" - further settings can be made in the "Temperature controller" menu and in the "Control parameters" menu.

The task of the control is to adjust the actual temperature as close as possible to the specified setpoint. To achieve this, the user has a number of setting options at his disposal. These options are described in the following chapters.

#### 4.2.2.2 Setpoints, Operating Modes & Priorities

As a basis, it has to be determined in advance how the setpoints are to be specified. The following selection is available for this purpose:

Setpoints for Standby/Night
 ☐ independent setpoints
 ☒ depending on Setpoint Comfort (Basic)

Figure 8: Settings – Setpoints for Standby/Night

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



#### 4.2.2.2.1 Depending on Setpoint Comfort (basic)

With the setting "**depending on Setpoint Comfort (basic)**", the operating modes "Standby" and "Night" are always relative to the "Setpoint Comfort (Basic)". If this changes due to a setpoint specification, the values for "Standby" and "Night" also change. Therefore, the values for reduction and increase are specified as a temperature difference in "K" (Kelvin). "Frost/Heat protection" does not change here and always remains at the configured 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]	<b>The basic comfort value is the reference point of the control.</b>
Standby reduction/increase	0 K – 10,0 K [2,0 K]	Reduction (for "Heating") or increase (for "Cooling") of the temperature when "Standby" mode is selected. Is indicated relative to the basic comfort value.
Night reduction/increase	0 K – 10,0 K [3,0 K]	Reduction (for "Heating") or increase (for "Cooling") of the temperature when "Night" mode is selected. Is indicated relative to the basic comfort value.
Setpoint Frost protection setting	<ul style="list-style-type: none"> <li>▪ <b>general</b></li> <li>▪ individual</li> </ul>	Setting whether the setpoint for "Frost protection" refers to the value in "General setting" or is to be set individually. <b>Only shown for "Heating" or "Heating &amp; Cooling"</b>
Setpoint Frost protection	3 ... 12 °C [7 °C]	Setting of an individual setpoint for Frost protection. <b>Only shown for setting "individual".</b>
Setpoint Heat protection setting	<ul style="list-style-type: none"> <li>▪ <b>general</b></li> <li>▪ individual</li> </ul>	Setting whether the setpoint for "Heat protection" refers to the value in "General setting" or is to be set individually. <b>Only shown for "Cooling" or "Heating &amp; Cooling"</b>
Setpoint Heat protection	24 ... 40 °C [35 °C]	Setting of an individual setpoint for Heat protection. <b>Only shown for setting "individual".</b>
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). <b>Only shown for „Heating &amp; Cooling“.</b>

Table 10: Settings – Operating modes and Setpoints (depending on Setpoint Comfort)

A new setpoint is specified via object 8 "Setpoint Comfort (basic)".

In addition, there is a general object for the setpoint specification, the object "7 - Setpoint setting". If a value is sent via this, it also changes the basic Comfort setpoint. The special feature is that when a setpoint value is specified, the system automatically switches to the "Comfort" operating mode. This applies to a setpoint in "Standby" or "Night" mode.

**If the controller is in "Frost" or "Heat" protection mode, a setpoint specification is ignored!**

Background: Some visualisations send fixed values in "Comfort" and need this value to be reported back. This is only possible for the controller if it is also in "Comfort" mode.

### 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 configured as the setpoint.

If the controller mode is set to "Heating and 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/Object Function	Length	Usage
24	Switch Comfort operating mode	1 Bit	Activating the Comfort operating mode

Table 11: Communication object – Comfort mode 1bit

### Night mode

The "Night" operating mode is intended to cause a significant temperature reduction/increase, e.g. at night or at the weekend. The value is freely configurable and refers to the basic Comfort value. Thus, if a reduction of 5K has been set in the parameters and a basic Comfort value of 21°C has been set, the setpoint for the 'Night' operating mode is 16°C. In "Cooling" mode, there is a corresponding increase in the value.

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

Number	Name/Object Function	Length	Usage
25	Switch Night operating mode	1 Bit	Activation of the Night operating mode

Table 12: Communication object – Night mode 1bit

### Standby mode

The "Standby" operating mode is used when no one is using the room. It should cause a slight reduction/increase of the temperature. This value should be set significantly lower than the value for the "Night" operating mode in order to enable a faster reheating/cooling of the room. The value is freely configurable and refers to the basic Comfort value. So if a reduction of 2K has been configured and a basic Comfort value of 21°C has been set, the setpoint for the "Standby" operating 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. Thus, this operating mode also has no communication object.

### Frost-/Heat protection mode

The "Frost protection" operating mode is activated as soon as the "Heating" function has been assigned to the temperature controller, the "Heat protection" operating mode is activated as soon as the "Cooling" function has been assigned to the controller. If the "Heating & Cooling" function is assigned to the controller, a combined operating mode called "Frost/Heat Protection" is activated. The "Frost/Heat Protection" operating mode causes heating or cooling to be switched on automatically if the temperature falls below or exceeds the configured temperature. The temperature is set here as an absolute value. If, for example, the temperature must not fall below a certain value during a longer absence, the "Frost protection" operating mode should be activated.

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

Number	Name/Object Function	Length	Usage
26	Switch Frost protection operating mode	1 Bit	Activates the Frost protection mode
26	Switch Heat protection operating mode	1 Bit	Activates the Heat protection mode
26	Switch Frost-/Heat protection operating mode	1 Bit	Activates the Frost-/Heat protection mode

Table 13: Communication objects – Frost/Heat protection 1bit

## 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)

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 configured.

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

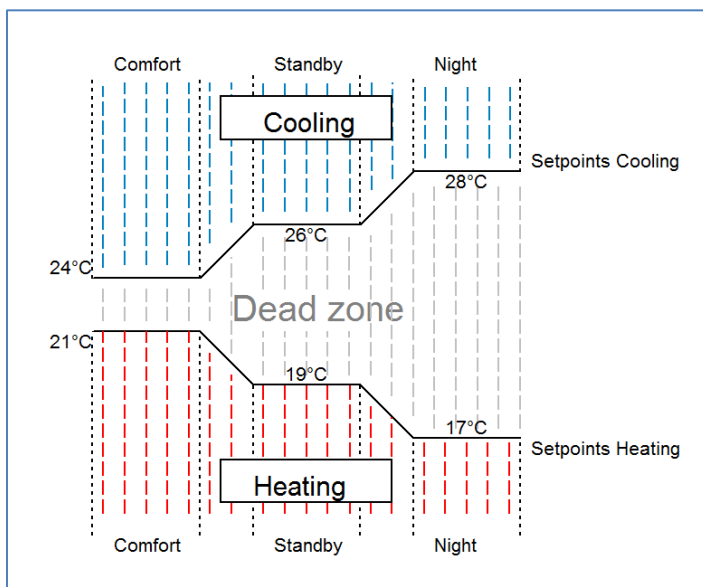


Figure 9: Example – Dead zone and corresponding setpoints

#### 4.2.2.2.2 Independent setpoints

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

The following table shows the corresponding settings:

ETS-Text	Dynamic range [Default value]	Comment
Setpoint Heating/Cooling: Setpoint Comfort (Basic)	7 ... 35 °C [21 °C] [23 °C]	Adjustable setpoints for the operating mode described in each case.  Default values for Heating [upper value] and Cooling [lower value]
Setpoint Standby	7 ... 35 °C [19 °C] [24 °C]	
Setpoint Night	7 ... 35 °C [18 °C] [25 °C]	
Setpoint Frost protection	3 ... 12 °C [7 °C]	Setpoint of the frost protection mode. <b>Visible when "Heating" is active.</b>
Setpoint Heat protection	24 ... 40 °C [35 °C]	Setpoint of the heat protection mode. <b>Visible when "Cooling" is active.</b>
Separate objects for setpoints Comfort/Standby/Night/ Frost protection/Heat protection	<ul style="list-style-type: none"> <li>▪ <b>not active</b></li> <li>▪ active, single objects</li> <li>▪ active, combination object (DPT 275.100)</li> </ul>	Setting of how the setpoint value is to be specified. <b>Individual objects are only possible in the "Heating" or "Cooling" controller types!</b>

Table 14: Settings – Operating modes and Setpoints (independent setpoints)

#### Functional description:

The values for each operating mode are defined by the configuration in the ETS.

Now a new setpoint can be specified for each operating mode without affecting any other operating mode.

The setpoint can be set via individual objects (only "Heating" or only "Cooling") for each operating mode or as 8-byte combination objects ("Heating", "Cooling", "Heating and Cooling").

In addition, there is a general object for the setpoint specification, the object "7 - Setpoint setting".

This object is used to change the setpoint in the currently active operating mode (Comfort, Standby, Night).

**Exception: In the operating modes "Frost protection" and "Heat protection" a setpoint specification is ignored!**

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

Description of the operating modes, see [4.2.2.2.1 Depending on Setpoint Comfort \(basic\)](#)

The following table shows the available communication objects:

Number	Name/Object Function	Length	Usage
7	Setpoint setting	2 Byte	General object for setpoint setting
8	Setpoint Comfort	2 Byte	Specify setpoint in Comfort mode
8	Setpoint Comfort (Basic)	2 Byte	Specify setpoint in Comfort mode
8	Setpoint Combination object	8 Byte	Specify setpoint via combined object. <b>Shown for controller type "Heating" or "Cooling"</b>
8	Setpoint Combination object (Heating)	8 Byte	Specify setpoint via combined object. <b>Shown for controller type "Heating and Cooling"</b>
9	Setpoint Standby	2 Byte	Specify setpoint in Standby mode
10	Setpoint Night	2 Byte	Specify setpoint in Night mode
11	Setpoint Frost protection	2 Byte	Specify setpoint in Frost protection mode
11	Setpoint Heat protection	2 Byte	Specify setpoint in Heat protection mode
12	Setpoint Combination object (Cooling)	8 Byte	Specify setpoint via combined object. <b>Shown for controller type "Heating and Cooling"</b>

Table 15: Communication objects – Operating modes and Setpoints (independent setpoints)

#### 4.2.2.2.3 Priority of the operating modes

The following table shows the possible settings for this parameter:

ETS-Text	Dynamic range [Default value]	Comment
Priority	<ul style="list-style-type: none"> <li>▪ <b>Frost(Heat) protection/Comfort/Night/Standby</b></li> <li>▪ Frost(Heat) protection/Night/Comfort/Standby</li> </ul>	Setting the priorities of the operating modes

Table 16: 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 with priority setting “Frost(Heat) protection/Comfort/Night/Standby”, the controller remains in “Comfort” mode until this is switched off. Then the controller automatically switches to “Night” mode.

#### 4.2.2.3 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 17: Example – Mode selection via 1 Bit

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

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

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

Table 18: 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 19: Example – Mode selection via 1 Byte

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

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

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

Number	Name/Object Function	Length	Usage
22	Mode selection	1 Byte	Selection of operating modes
24	Switch Comfort operating mode	1 Bit	Activating the Comfort mode
25	Switch Night operating mode	1 Bit	Activating the Night mode
26	Switch Frost/Heat protection operating mode	1 Bit	Activating the Frost/Heat protection mode

Table 20: Communication objects – Mode selection

#### 4.2.2.4 HVAC Status objects

There are several options for visualising the operating modes.

The following settings are available for the HVAC status objects:

Figure 10: Settings – HVAC status objects

The following table shows all available settings:

ETS-Text	Dynamic range [Default value]	Comment
HVAC-Status object	<ul style="list-style-type: none"> <li>HVAC Status (non-standard DPT)</li> <li>HVAC Mode (DPT 20.102)</li> </ul>	Selection of whether the status is to be output as HVAC Status or HVAC Mode
Additional HVAC Status object	<ul style="list-style-type: none"> <li><b>not active</b></li> <li>HVAC Status (non-standard DPT)</li> <li>HVAC Mode (DPT 20.102)</li> <li>RHCC Status (DPT 22.101)</li> <li>RTC combined status (DPT 22.103)</li> <li>RTSM combined status (DPT 22.107)</li> </ul>	Setting an additional HVAC status object
Send HVAC Status object cyclically	<b>not active</b> 5 min – 4 h	Setting whether and at what intervals the object is to be sent cyclically

Table 21: 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=Night	0x04
3	Frost/Heat protection	1= Frost/Heat protection	0x08
4			
5	Heating/Cooling	0=Cooling/1=Heating	0x20
6			
7	Frost alarm	1=Frost alarm	0x80

Table 22: Assignment – DPT HVAC Status



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 23: 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 24: Assignment – RTC combined status DPT 22.103



**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 25: Assignment – RTSM combined status DPT 22.107

#### 4.2.2.5 Operating mode after reset

The following table shows all available settings:

ETS-Text	Dynamic range [Default value]	Comment
Operating mode after reset	<ul style="list-style-type: none"> <li>▪ <b>Comfort with configured setpoint</b></li> <li>▪ Standby with configured setpoint</li> <li>▪ hold old state and setpoint</li> </ul>	Setting which operating mode or behaviour is to be activated after a bus voltage return
Operating mode after reprogramming	<ul style="list-style-type: none"> <li>▪ <b>Comfort (Heating)</b></li> <li>▪ Comfort (Cooling)</li> <li>▪ Standby (Heating)</li> <li>▪ Standby (Cooling)</li> </ul>	<b>Only available with setting "hold previous state and setpoint".</b> Determination of the operating mode after reprogramming the unit.

Table 26: Settings – Operating mode after reset

**Comfort with configured setpoint**

After a bus voltage return, the comfort is activated with the setpoint that was specified by the ETS.

**Standby with configured setpoint**

After a bus voltage return, the Standby mode is activated with the setpoint that was specified by the ETS (Comfort setpoint minus Standby reduction).

**Hold previous state and setpoint**

The temperature controller recalls the setpoint and mode that was set before the bus was switched off.

**Operating mode after reprogramming**

This setting defines the operating mode and the controlling type after a new programming of the device.

#### 4.2.2.6 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	<ul style="list-style-type: none"> <li>▪ <b>not active</b></li> <li>▪ 1 Bit</li> <li>▪ 1 Byte</li> </ul>	Setting whether setpoint shift is to be activated via 1 bit or 1 byte
Step width	0,1 K – 1 K [0,5 K]	Setting of the step width for the setpoint shift over 1 Bit/1 Byte. <b>Only visible if setpoint shift over 1 Bit/1 Byte is active.</b>
Status setpoint shift	<ul style="list-style-type: none"> <li>▪ <b>not active</b></li> <li>▪ active</li> </ul>	Activation of an object to send the current status of the setpoint shift
Setpoint shift applies to	<ul style="list-style-type: none"> <li>▪ <b>Comfort</b></li> <li>▪ Comfort/Night/Standby</li> </ul>	Validity range of the setpoint shift
Action when shift in Night/Standby	<ul style="list-style-type: none"> <li>▪ <b>no action</b></li> <li>▪ change to Comfort</li> </ul>	Setting whether to switch back to Comfort after a shift during Night/Standby. <b>Only visible if setpoint shift is only active for Comfort.</b>
Delete setpoint shift after change of operating mode	<ul style="list-style-type: none"> <li>▪ <b>not active</b></li> <li>▪ active</li> </ul>	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	<ul style="list-style-type: none"> <li>▪ not active</li> <li>▪ <b>active</b></li> </ul>	Setting whether the current setpoint shift should be deleted or not after a new absolute setpoint has been specified. <b>Only visible when "independent setpoints" is selected.</b>
Delete setpoint shift after new basic setpoint	<ul style="list-style-type: none"> <li>▪ not active</li> <li>▪ <b>active</b></li> </ul>	Setting whether the current setpoint shift should be deleted or not after a new basic setpoint has been specified. <b>Only visible if "depending on Comfort setpoint (basic)" is selected.</b>
Reset basic setpoint to configured value after operation mode change	<ul style="list-style-type: none"> <li>▪ not active</li> <li>▪ <b>active</b></li> </ul>	Setting whether or not the base setpoint should be reset to the configured basic setpoint after an operating mode change. <b>Only visible if "depending on setpoint Comfort (basic)" is selected.</b>
Send setpoint change	<ul style="list-style-type: none"> <li>▪ not active</li> <li>▪ <b>active</b></li> </ul>	Setting whether a change of the setpoint value should be sent or not.
Send current setpoint cyclically	<ul style="list-style-type: none"> <li>▪ <b>not active</b></li> <li>▪ 5 min – 4 h</li> </ul>	Setting whether and at what intervals the object is to be sent cyclically.

Table 27: Settings – Setpoint shift

**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 via 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.

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 temperature controller between the settings "depending on setpoint comfort (basic)" and "independent setpoints".

#### Setting "depending on setpoint comfort (basic)":

This new basic comfort value (object "8") 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 "7 - 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 "8"), the other setpoints remain unaffected.

A special feature is the common object "7 - 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/Object Function	Length	Usage
7	Setpoint setting	2 Byte	Specification of a new absolute setpoint
8	Setpoint Comfort	2 Byte	Specification of a new absolute setpoint
8	Setpoint Comfort (Basic)	2 Byte	Specification of a new absolute setpoint
8	Setpoint Combination object	8 Byte	Setting for 4 HVAC modes via common object
8	Setpoint Combination object (Heating)	8 Byte	Setting for 4 HVAC modes via common object
9	Setpoint Standby	2 Byte	Specification of a new absolute setpoint
10	Setpoint Night	2 Byte	Specification of a new absolute setpoint
11	Setpoint Frost protection	2 Byte	Specification of a new absolute setpoint
11	Setpoint Heat protection	2 Byte	Specification of a new absolute setpoint
12	Setpoint Combination object (Cooling)	8 Byte	Setting for 4 HVAC modes via common object
13	Current setpoint	2 Byte	Outputs the currently valid setpoint
14	Manual setpoint shift (2 byte)	2 Byte	Shift of the setpoint relative to the preset comfort setpoint. <b>Object is permanently displayed.</b>
15	Manual setpoint shift (1=+ / 0=-)	1 Bit	Increase/decrease the setpoint relative to the preset Comfort setpoints by the set step width
15	Manual setpoint shift (1 byte)	1 Byte	Increase/decrease the setpoint relative to the preset comfort setpoints by the set step width
16	Status setpoint shift	2 Byte	Sending the current status of the setpoint shift

Table 28: Communication objects – Setpoint changes

#### 4.2.2.7 Comfort extension with time

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

Figure 11: 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	<ul style="list-style-type: none"> <li>not active</li> <li>active</li> </ul>	Activation of the Comfort extension via time-dependent object
Comfort extension time	<b>not active</b> 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 29: Settings – Comfort extension with time

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

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

Table 30: 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!**

#### 4.2.2.8 Lock objects

The following table shows all available settings:

ETS-Text	Dynamic range [Default value]	Comment
Lock object for control value Heating	<ul style="list-style-type: none"> <li>▪ <b>not active</b></li> <li>▪ active</li> </ul>	Activates the lock object for the heating process
Lock object for control value Cooling	<ul style="list-style-type: none"> <li>▪ <b>not active</b></li> <li>▪ active</li> </ul>	Activates the lock object for the cooling process

Table 31: 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/Object Function	Length	Usage
35	Lock object Heating	1 Bit	Locking the control value for Heating
36	Lock object Cooling	1 Bit	Locking the control value for Cooling

Table 32: Communication objects – Lock objects for control value

#### 4.2.2.9 Object for Heating/Cooling request

The following table shows the available settings:

ETS-Text	Dynamic range [Default value]	Comment
Object for Heating request	<ul style="list-style-type: none"> <li>▪ <b>not active</b></li> <li>▪ active</li> </ul>	Activates an object to indicate whether a heating request is present or not.
Object for Cooling request	<ul style="list-style-type: none"> <li>▪ <b>not active</b></li> <li>▪ active</li> </ul>	Activates an object to indicate whether a cooling request is present or not.

Table 33: Settings – Objects for Heating/Cooling request

With this setting, two objects are 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 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 switch on as soon as a controller issues the request for heating. The object outputs a "1" as long as the process continues. When the process is finished, a "0" is output.

The following table shows the available communication objects:

Number	Name/Object Function	Length	Usage
41	Heating request	1 Bit	Indicates an active/inactive heating process
42	Cooling request	1 Bit	Indicates an active/inactive cooling process

Table 34: Communication objects – Objects for Heating/Cooling request

#### 4.2.2.10 Reference control via outdoor temperature

**This parameter is only available in "Cooling" mode!**

The following settings are available:

Reference control via outdoor temperature ☐ not active ☒ active

Reference variable minimum 28 °C

Reference variable maximum 38 °C

Setpoint change at maximum reference variable 10 K

Figure 12: Settings – Reference control via outdoor temperature

The following table shows the setting options for this parameter:

ETS-Text	Dynamic range [Default value]	Comment
Reference control via outdoor temperature	<ul style="list-style-type: none"> <li>▪ not active</li> <li>▪ active</li> </ul>	Activation of the parameter. <b>This parameter is only available in "Cooling" mode!</b>
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 35: Settings – Reference control via outdoor 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 ( $\Delta X$ ).

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 ( $\Delta X_{\max}$ ) 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:

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

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  $\Delta X$  is then added to the basic comfort value.

A value above or below the reference value has no effect on the setpoint change. As soon as the value is within the reference variable (i.e. between  $w_{\max}$  &  $w_{\min}$ ), the setpoint is lowered or raised. The following graphics are intended to illustrate the influence of the reference variable on the setpoint:

(Xsoll=new setpoint; Xbasis=base setpoint)

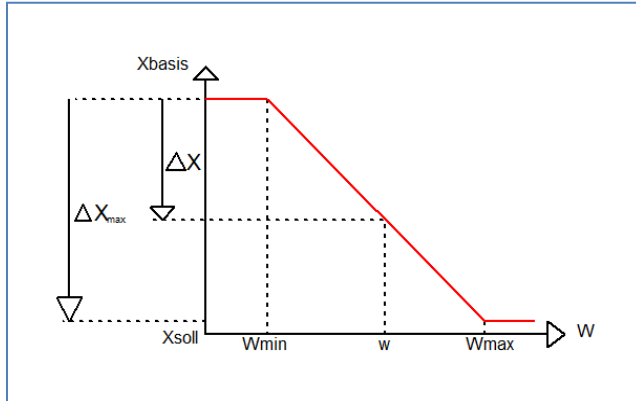


Figure 13: Example – Reference control/decrease

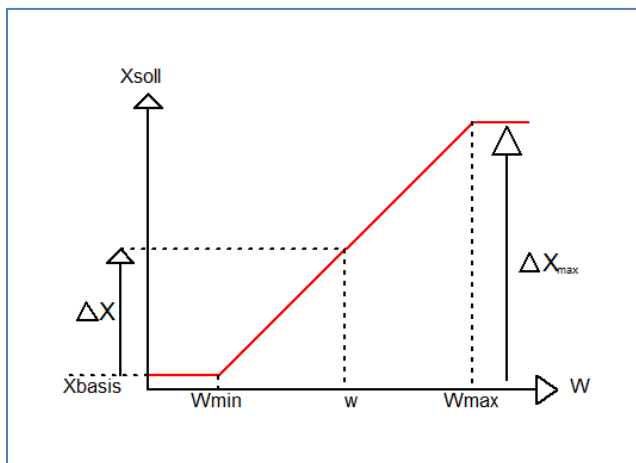


Figure 14: Example – Reference control/increase

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/Object Function	Length	Usage
43	Outdoor temperature/Reference value	1 Byte	Receiving an external measured value as a reference variable

Table 36: 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:  $\Delta X = 10^\circ\text{C} * [(32^\circ\text{C} - 28^\circ\text{C}) / (38^\circ\text{C} - 28^\circ\text{C})] = 4^\circ\text{C}$ .

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.

**4.2.2.11 Flow temperature limitation****This parameter is only available in “Heating” mode!**

The following parameter activates the flow temperature limitation:

Figure 15: 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. <b>This parameter is only available in “Heating” mode!</b>

Table 37: 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/Object Function	Length	Usage
31	Flow temperature Heating	2 Byte	Receiving the measured flow temperature

Table 38: Communication object – Flow temperature limitation

#### 4.2.2.12 Limit temperature of cooling medium via dew point monitoring

The following settings are available for this parameter:

Limit temperature of cooling medium over dew point monitoring ☐ not active ☒ active over dew point alarm (1Bit)

Figure 16: Settings – Limit temperature of cooling medium over dew point monitoring

The following table shows the available setting:

ETS-Text	Dynamic range [Default value]	Comment
Limit temperature of cooling medium over dew point monitoring	<ul style="list-style-type: none"> <li>not active</li> <li>active over dew point alarm (1Bit)</li> </ul>	Selection of how the temperature is to be limited. <b>This parameter is only available in Cooling mode!</b>

Table 39: 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.

The following table shows the corresponding objects:

Number	Name/Object Function	Length	Usage
32	Dew point alarm	1 Bit	Receiving the dew point alarm <b>Shown when active via 1Bit object</b>

Table 40: Communication object – Limit temperature of cooling medium via dew point monitoring

#### 4.2.2.13 Window contact

The following settings are available for this parameter:

Window contact ☐ not active ☒ active

State of window ☒ 0=closed / 1=open (standard DPT)  
☐ 1=closed / 0=open

Delay time  s

Action when opening the window

Action when closing the window ☒ HVAC Mode before locking  
☐ HVAC Mode catch up

Release time

Figure 17: Settings – Window contact

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

ETS-Text	Dynamic range [Default value]	Comment
Window contact	<ul style="list-style-type: none"> <li>▪ <b>not active</b></li> <li>▪ active</li> </ul>	Setting whether window contact is monitored or not
State of window	<ul style="list-style-type: none"> <li>▪ <b>0=closed / 1=open (standard DPT)</b></li> <li>▪ 1=closed / 0=open</li> </ul>	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	<ul style="list-style-type: none"> <li>▪ <b>HVAC Mode before locking</b></li> <li>▪ HVAC Mode catch up</li> </ul>	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 41: 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.

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/Object Function	Length	Usage
34	Window contact input: 0=closed / 1=open / 1=closed / 0=open	1 Bit	Receiving the current window status. Polarity depending on parameter setting.

Table 42: 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 33 "Diagnosis"** 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
<b>Info</b>		Heating/Cooling	Operation mode	Control value > 0%, if „yes“: Value 1
<b>Possible messages</b>		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	
<b>Special messages</b>	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 43: Overview – Diagnosis text

### 4.2.3 Controller settings

First it is necessary to define the controller here. The output of the control value is defined with the selection "Operating mode". Depending on this setting, the other parameters are displayed.

The following table shows the setting options for this parameter:

ETS-Text	Dynamic range [Default value]	Comment
Operating mode	<ul style="list-style-type: none"> <li>▪ <b>PI control continuous</b></li> <li>▪ PI control switching (PWM)</li> <li>▪ 2-step control (switching)</li> </ul>	This setting determines the type of control used

Table 44: 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/Object Function	Length	Usage
17	Control value Heating	1 Byte 1 Bit	Controlling the actuator for the heating process
17	Control value Heating/Cooling	1 Byte 1 Bit	Controlling the actuator for the heating and cooling process
18	Control value Cooling	1 Byte 1 Bit	Controlling the actuator for the cooling process

Table 45: 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).

#### 4.2.3.1 PI-control continuous

If the "Operating mode" is selected as continuous PI control, the following setting options are available (here: controller type "Heating"):

Operating mode	PI control continuous
Direction of controller	<input checked="" type="radio"/> normal <input type="radio"/> Inverted
Maximum value of control value	100%
Heating system	Underfloor Heating (4K / 150min)
Send control value cyclically	5 min

Figure 18: 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	<ul style="list-style-type: none"> <li>normal</li> <li>inverted</li> </ul>	Specifies the control behaviour with rising temperature
Maximum value of control value	100%; 90%; 80%; 75%; 70%; 60%; 50%; 40%; 30%; 25%; 20%; 10%; 0%	Specifies the output power of the control value in maximum operation
Heating system	<ul style="list-style-type: none"> <li><b>Water heating (4K / 120 min)</b></li> <li>Underfloor heating (4K / 150 min)</li> <li>Split Unit (4K / 60min)</li> <li>Adjustment via control parameter</li> </ul>	Setting of the heating system used. Individual parameterization possible via setting 4
Cooling system	<ul style="list-style-type: none"> <li><b>Split Unit (4K / 60 min)</b></li> <li>Cooling ceiling (4K / 150 min)</li> <li>Adjustment via control parameter</li> </ul>	Setting of the cooling system used. Individual parameterization possible via setting 3
Proportional range	1 K - 20 K [4 K]	<b>Only visible with "Adjustment via control parameters".</b> Here the proportional band can be set freely
Reset time	15 min – 240 min [150 min]	<b>Only visible with "Adjustment via control parameters".</b> The integral range can be freely adjusted here
Send control value cyclically	not active, 1 min – 60 min [5 min]	Activation of cyclical sending of the control value with setting of the cycle time

Table 46: Settings – PI control continuous

PI control is a continuous control with a proportional component, the "P component" and an integral component, the "I component". The size of the "P component" is specified in K (Kelvin).

The "I component" is referred to as reset time and is specified in min (minutes).

The control value for continuous PI control is controlled in steps from 0% up to the set maximum value of the control value.

#### **Maximum value of control value**

This setting can be used to set the maximum value the control value may assume. To prevent switching operations with large manipulated variables, the parameter "Max value of 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 configure 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.

#### 4.2.3.2 PI control switching (PWM)

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

Operating mode	PI control switching (PWM)
Direction of controller	<input checked="" type="radio"/> normal <input type="radio"/> Inverted
Maximum value of control value	100%
Heating system	Underfloor Heating (4K / 150min)
PWM cycle	10 min
Send control value cyclically	not active

Figure 19: 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	<ul style="list-style-type: none"> <li>normal</li> <li>inverted</li> </ul>	Specifies the control behaviour with rising temperature
Maximum value of control value	100%; 90%; 80%; 75%; 70%; 60%; 50%; 40%; 30%; 25%; 20%; 10%; 0%	Specifies the output power of the control value in maximum operation
Heating system	<ul style="list-style-type: none"> <li><b>Water heating (4K / 120 min)</b></li> <li>Underfloor heating (4K / 150 min)</li> <li>Split Unit (4K / 60min)</li> <li>Adjustment via control parameter</li> </ul>	Setting the heating system used. Individual configuration possible via setting 4
Cooling system	<ul style="list-style-type: none"> <li><b>Split Unit (4K / 60 min)</b></li> <li>Cooling ceiling (4K / 150 min)</li> <li>Adjustment via control parameter</li> </ul>	Setting of the cooling system used. Individual configuration possible via setting 3
Proportional range	1 K - 20 K [4 K]	<b>Only visible with "Adjustment via control parameters".</b> Here the proportional band can be set freely
Reset time	15 min – 240 min [150 min]	<b>Only visible with "Adjustment via control parameters".</b> The integral range can be freely adjusted here
PWM cycle	1 – 30 min [10 min]	Setting the PWM cycle time. Includes the total time of a switch-on and switch-off pulse
Send control value cyclically	not active, 1 min – 60 min [5 min]	Activation of cyclical sending of the control value with setting of the cycle time

Table 47: 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**

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/Object Function	Length	Usage
19	Status control value Heating	1 Byte	Sends the status as a percentage value
19	Status control value Heating/Cooling	1 Byte	Sends the status as a percentage value
20	Status control value Cooling	1 Byte	Sends the status as a percentage value

**Table 48: Communication objects – Status control value**

#### 4.2.3.3 2-step control (switching)

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

Operating mode	2-step control (switching)
Direction of controller	<input checked="" type="radio"/> normal <input type="radio"/> Inverted
Switching hysteresis	2,0 K
Send control value cyclically	not active

Figure 20: 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	<ul style="list-style-type: none"> <li>▪ <b>normal</b></li> <li>▪ inverted</li> </ul>	Specifies the control behaviour when the temperature rises. Adaptation to normally open valves
Switching hysteresis	0,5 K – 5,0 K [2,0 K]	Setting for upper and lower switch-on and switch-off point
Send control value cyclically	not active, 1 min - 60 min [5 min]	Setting whether and at what interval the control value is sent cyclically

Table 49: 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.

#### Switching hysteresis

The setting of the switching hysteresis is used by the controller to calculate the switch-on and switch-off point. This is done 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 and Cooling" mode:

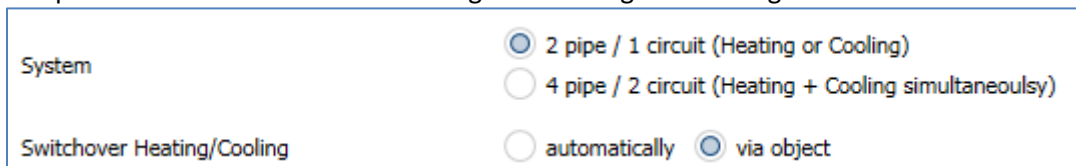


Figure 21: Additional settings – Heating and Cooling

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

ETS-Text	Dynamic range [Default value]	Comment
System	<ul style="list-style-type: none"> <li>2 pipe / 1 circuit (Heating or Cooling)</li> <li>4 pipe / 2 circuit (Heating + Cooling simultaneously)</li> </ul>	Setting for separate or combined heating / cooling circuits
Switchover Heating/Cooling	<ul style="list-style-type: none"> <li>automatically</li> <li>via object</li> </ul>	Setting whether the changeover is carried out automatically via the temperature or via a separate object. <b>Only with setting "Setpoints - depending on Comfort setpoint"</b>
	via object	With setting "Independent setpoints" only via object. Not changeable.

Table 50: 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 **"Switchover Heating/Cooling"** 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 - depending on setpoint Comfort (basic)" is selected).

#### 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 switchover. This can also be used simultaneously for changing between heating and cooling medium in the system. This ensures, for example, that warm water flows in a heating/cooling ceiling during heating and cold water during cooling. In this case only one common controller (PI, PWM or 2-point) can be selected for the control value. The direction of action can also only be defined identically for both processes. However, the individual control parameters for the selected controller can be parameterized independently of each other.

#### 4 pipe system (4 pipe/2 circuit):

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

#### Switchover Heating/Cooling:

Using 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/Object Function	Length	Usage
39	Switchover 1=Heating / 0=Cooling	1 Bit	Switching between Heating and Cooling Mode
40	Status 1=Heating / 0=Cooling	1 Bit	Sending the status whether Heating or Cooling mode.

Table 51: Communication objects – Heating/Cooling switchover

#### 4.2.3.6 Additional level

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

Figure 22: Settings – Additional level

The following table shows the setting options for additional level:

ETS-Text	Dynamic range [Default value]	Comment
Additional level	<ul style="list-style-type: none"> <li>not active</li> <li>active</li> </ul>	Activation of the additional level
Direction of action with rising temperature	<ul style="list-style-type: none"> <li>normal</li> <li>inverted</li> </ul>	Indicates the control behaviour with increasing temperature
Control value	<ul style="list-style-type: none"> <li>2-step control (switching)</li> <li>PI control switching (PWM)</li> </ul>	Setting the type of controller that is used
Distance	0,5 – 5,0 K [2,0 K]	Defining the setpoint of the additional level as the difference to the current setpoint

Table 52: 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 level) 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/Object Function	Length	Usage
21	Control value Heating, additional level	1 Bit	Controlling the actuator for the additional level

Table 53: Communication object – Additional level

#### 4.2.3.7 Emergency mode

The following picture shows the available settings:

Figure 23: Settings – Emergency mode

The following table shows the available settings:

ETS-Text	Dynamic range [Default value]	Comment
Emergency mode	<ul style="list-style-type: none"> <li>not active</li> <li><b>active</b></li> </ul>	Activation/deactivation of emergency mode
Emergency mode at failure of temperature value after...	30 ... 90 Minutes [30 Minutes]	Setting from when emergency operation is to start.
Control value for emergency mode	0 – 100 % [50 %]	Setting a fixed control value while emergency mode is active

Table 54: Settings – Emergency mode

**Emergency mode** can be activated for each channel. The setting "**Emergency mode on failure of temperature value after**" can be used to set from when emergency mode is to be activated. The input object for the measured temperature value needs a cyclical pulse. If this signal remains absent for the configured time, emergency mode is activated. A fixed "**Control value for emergency mode**" of 0-100% can be set for this.

Emergency mode prevents the heating from being permanently operated at 100%, for example, or from cooling down at low temperatures if a measured temperature value is not received and the resulting malfunction or failure of the controller occurs.

As soon as a measured temperature value is received again, the channel leaves the emergency mode and continues to operate normally. The monitoring time starts anew each time a temperature value is received.

## 5 Index

### 5.1 Register of illustrations

Figure 1: Exemplary circuit diagram.....	6
Figure 2: Structure & Handling.....	6
Figure 3: General settings.....	10
Figure 4: Settings – Temperature, Alarms, Messages .....	12
Figure 5: Settings – Channel/Object description.....	13
Figure 6: Example – Channel/Object description.....	13
Figure 7: Settings – Temperature controller.....	15
Figure 8: Settings – Setpoints for Standby/Night.....	16
Figure 9: Example – Dead zone and corresponding setpoints.....	19
Figure 10: Settings – HVAC status objects.....	23
Figure 11: Settings – Comfort extension with time.....	29
Figure 12: Settings – Reference control via outside temperature.....	31
Figure 13: Example – Reference control/decrease .....	32
Figure 14: Example – Reference control/increase.....	32
Figure 15: Settings – Flow temperature limitation.....	33
Figure 16: Settings – Limit temperature of cooling medium over dew point monitoring.....	34
Figure 17: Settings – Window contact .....	34
Figure 18: Settings – PI control continuous .....	38
Figure 19: Settings – PI control switching (PWM) .....	40
Figure 20: Settings – 2-step control (switching) .....	42
Figure 21: Additional settings – Heating and Cooling.....	43
Figure 22: Settings – Additional level.....	45
Figure 23: Settings – Emergency mode.....	46

## 5.2 List of tables

Table 1: Communication objects – Temperature controller .....	9
Table 2: Communication objects – General objects .....	9
Table 3: General settings .....	10
Table 4: General communication object .....	11
Table 5: Settings – Temperature, Alarms, Messages .....	12
Table 6: Communication objects – Min/Max values .....	13
Table 7: Communication objects – Alarms .....	13
Table 8: Communication objects – Messages .....	14
Table 9: Settings – Controller type .....	16
Table 10: Settings – Operating modes and Setpoints (depending on Setpoint Comfort) .....	17
Table 11: Communication object – Comfort mode 1bit .....	18
Table 12: Communication object – Night mode 1bit .....	18
Table 13: Communication objects – Frost/Heat protection 1bit .....	18
Table 14: Settings – Operating modes and Setpoints (independent setpoints) .....	20
Table 15: Communication objects – Operating modes and Setpoints (independent setpoints) .....	21
Table 16: Setting – Priority of the operating modes .....	21
Table 17: Example – Mode selection via 1 Bit .....	22
Table 18: Hex values of HVAC Modes .....	22
Table 19: Example – Mode selection via 1 Byte .....	22
Table 20: Communication objects – Mode selection .....	22
Table 21: Settings – HVAC status objects .....	23
Table 22: Assignment – DPT HVAC Status .....	23
Table 23: Assignment – DPT RHCC Status .....	24
Table 24: Assignment – RTC combined status DPT 22.103 .....	24
Table 25: Assignment – RTSM combined status DPT 22.107 .....	25
Table 26: Settings – Operating mode after reset .....	25
Table 27: Settings – Setpoint shift .....	26
Table 28: Communication objects – Setpoint changes .....	28
Table 29: Settings – Comfort extension with time .....	29
Table 30: Communication object – Comfort extension with time .....	29
Table 31: Settings – Lock objects for control value .....	30
Table 32: Communication objects – Lock objects for control value .....	30
Table 33: Settings – Objects for Heating/Cooling request .....	30
Table 34: Communication objects – Objects for Heating/Cooling request .....	30
Table 35: Settings – Reference control via outside temperature .....	31
Table 36: Communication object – Reference control via outside temperature .....	32
Table 37: Settings – Flow temperature limitation .....	33
Table 38: Communication object – Flow temperature limitation .....	33
Table 39: Settings – Limit temperature of cooling medium via dew point monitoring .....	34
Table 40: Communication object – Limit temperature of cooling medium via dew point monitoring .....	34
Table 41: Settings – Window contact .....	35
Table 42: Communication object – Window contact .....	35
Table 43: Overview – Diagnosis text .....	36
Table 44: Settings – Operating mode of the controller .....	37
Table 45: Communication objects – Control value .....	37
Table 46: Settings – PI control continuous .....	38
Table 47: Settings – PI control switching (PWM) .....	40
Table 48: Communication objects – Status control value .....	41



Table 49: Settings – 2-step control (switching).....	42
Table 50: Additional settings – Heating and Cooling .....	43
Table 51: Communication objects – Heating/Cooling switchover.....	44
Table 52: Settings – Additional level .....	45
Table 53: Communication object – Additional level.....	45
Table 54: Settings – Emergency mode.....	46

## 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	DB V1.0	10/2021
------	---------------	---------	---------