State 06/2014

Technical Manual

MDT Air quality/CO2 Sensor

SCN-MGSUP.01

Further Documents:

Datasheet:

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

Assembly and Operation Instructions:

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

Solution Proposals for MDT products:

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

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

1 Content

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

2 Overview

2.1 Overview Devices

The manual refers to the following sensor(Order number respectively printed in bold letters):

- **SCN-MGSUP.01** Air quality/CO2 Sensor UP
  - integrated temperature Controller: 2 Point, PI-Control, PWM
  - Air quality controller adjustable as Level Controller, PI-Controller, Level Controller binary coded and Level Controller as Byte

2.2 Usage & Areas of Apllication

The temperature controller has its areas of applications in the controlling of home installations and public buildings.
By using the temperature controller, different ways of controlling can be realized. The application area reaches from controlling a room with a single heating/cooling circuit up to combined heating-/cooling-systems.
For all controlling functions the settings “2 step-control”, “PI control continuous” and “Pi control switching” are available. At the heating mode, an additional stage can be activated. For a more precise temperature measurement in bigger rooms, a second temperature sensor can be activated and received via the KNX Bus. From the received value and the measured value, a new resulting value can be calculated according to the adjusted weighting. The temperature controller works with set points which are the basis for the control system. Different set points for different operating modes can be adjusted. Additional these set points can be changed via communication objects.

The Air quality sensor can watch the C02 value in the air and control for example ventilation systems. For this fact, different ways of controlling as Level Controller, PI-Controller and Level Controller binary coded and Level Controller as Byte are available. Additional alarms and messages for decreasing or increasing adjusted values can be adjusted. Furthermore a light control is integrated.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

2.3 Exemplary circuit diagram

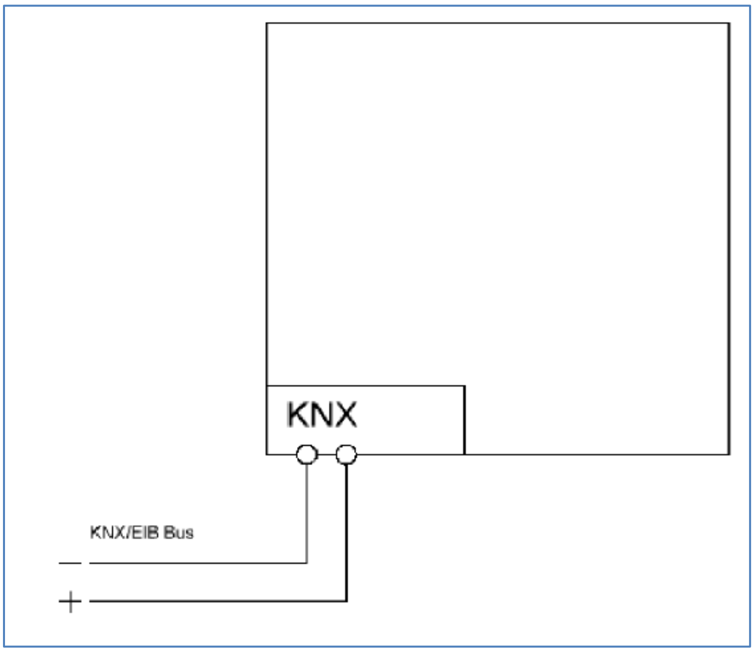

Figure 1: Exemplary circuit diagram

2.4 Structure Hardware Module

All devices contains of a bus connector, a programming-button and a programming-LED.

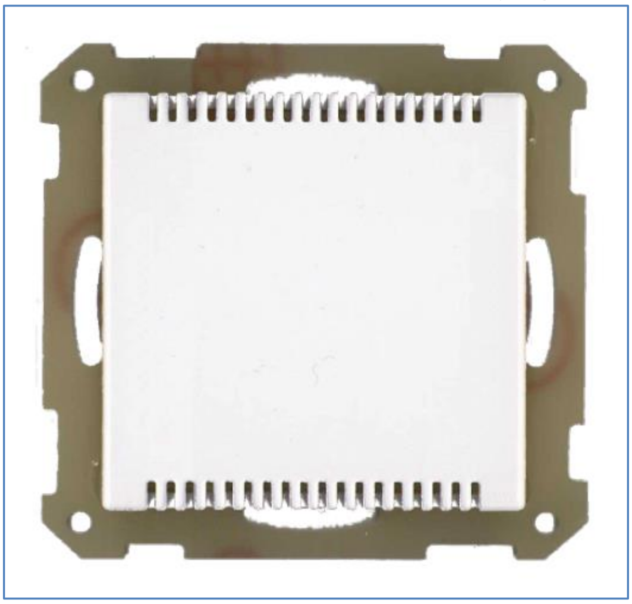

Figure 2: Overview Hardware module

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

2.5 Functions

The functions of the air quality/CO2 Sensor are divided in the following menus:

- **Setup General**
  Here the startup time after a reset can be selected.

- **Temperature Controller**
  Via the temperature controller, a complete Heating-/Cooling-Control can be realized. The temperature controller is divided in 4 submenus. In these submenus, the temperature controller can be adjusted in detail. The description off all parameter and communication objects is available in Chapter 3 – Temperature Controller.

- **Air quality controller**
  The air quality sensor can be parameterized with different ways of controlling. So, for example ventilation systems can be controlled. According to the adjusted way of controlling, the relevant submenus are shown. In these submenus, the temperature controller can be adjusted in detail. The description off all parameter and communication objects is available in Chapter 4 – Air quality Controller.

2.6 Settings at the ETS-Software

Selection at the product database:

Manufacturer: MDT Technologies
Product family: Control System
Product type: Room temperature controller
Medium Type: Twisted Pair (TP)
Product name: Air quality Controller, SCN-MSGUP.01
Order number: SCN-MSGUP.01

2.7 Starting up

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) set bus power up
(3) Press the programming button at the device(red programming LED lights)
(4) Loading of the physical address out of the ETS-Software by using the interface(red LED goes out, as well this process was completed successful)
(5) Loading of the application, with requested parameterization
(6) Switch the power supply on
(7) If the device is enabled you can test the requested functions(also possible by using the ETS-Software)

Attention: After a reset, the CO2 measurement needs up to 7 minutes for sending its first values. Only in this way a precise measurement can be guaranteed!

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3 Temperature Controller

The temperature controller can be activated by the following parameter:

Figure 3: Activation temperature controller

As soon as the temperature controller is activated, the relevant submenus are shown. In these submenus, the temperature controller can be adjusted in detail:

- **Temperature measurement**
  The sending behavior, Min/Max values and temperature correction can be adjusted in this submenu.
- **Alarm/Messages**
  Alarms and messages can be activated and adjusted in this submenu.
- **Controller general**
  Controller type (heating, cooling, heating and cooling) as well as set points and operating modes can be adjusted in this submenu.
- **Controller settings**
  Control value (PI, PWM, 2-step Control) and controller typical settings can be adjusted in this submenu.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.1 Communication objects

3.1.1 Summary and Usage

Nr.	Name	Object function	Data type	Direction	Info	Usage	Tip
global Objects:							
0	Temperature controller	Actual temperature value	DPT 9.001	sending	Sensor sends current temperature	Visualization, other temperature controller	Object sends current temperature value; Object always shown when temperature controller active.
1	Temperature controller	Exceeded max value	DPT 1.001	sending	Sensor sends Max-Value exceeding	Visualization, LED-Display, Tableau	Object is show when Mon/Max values are activated.
2	Temperature controller	Undershot min value	DPT 1.001	sending	Sensor sends falling below Min-Value	Visualization, LED-Display, Tableau	Object is show when Mon/Max values are activated.
3	Temperature controller	Send frost alarm	DPT 1.001	sending	Sensor sends Frost Alarm	Visualization, LED-Display, Tableau	Object is shown when Alarms in the menu “Alarm/Messages” are active.
4	Temperature controller	Send heat alarm	DPT 1.001	sending	Sensor sends Heat Alarm	Visualization, LED-Display, Tableau	Object is shown when Alarms in the menu “Alarm/Messages” are active.
5	Temperature controller	External Sensor	DPT 9.001	receive	Input for temperature value of external sensor	Temperature value external sensor	Object is shown if sensor is adjusted to at least 10% external sensor.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

6	Temperature controller	Specify set point comfort	DPT 9.001	receive	Input for a new absolute set point	Visualization, Control Panel, Tableau	A new absolute set point can be adjusted via this object. Object is always shown if temperature controller active.
7	Temperature controller	Manual set point offset	DPT 9.002	receive	Set point offset according to the current set point	Visualization, Control Panel, Tableau, Push Button	Object is only shown if „Set point value offset via" is set to 2 Byte.
8	Temperature controller	Control value heating	DPT 5.001 DPT 1.001	sending	Sending the current control value	Heating actuator, Control valve	DPT depends to the adjusted control type in the menu „Controller settings". **only at Heating**
8	Temperature controller	Control value heating/cooling	DPT 5.001 DPT 1.001	sending	Sending the current control value	Heating actuator, Control valve	DPT depends to the adjusted control type in the menu „Controller settings". **only at Heating and Cooling**
9	Temperature controller	Control value add. heating	DPT 1.001	sending	Sending the current control value	Heating actuator, Control valve	DPT depends to the adjusted control type in the menu „Controller settings". **only at Heating available, must be activated separately**
10	Temperature controller	Control value cooling	DPT 5.001 DPT 1.001	sending	Sending the current control value	Heating actuator, Control valve	DPT depends to the adjusted control type in the menu „Controller settings". **only at Cooling**

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

11	Temperature controller	Mode comfort	DPT 1.001	receive	Activation of the operating mode comfort	Visualization, Push Button, timer	Object is always shown if temperature controller is active.
12	Temperature controller	Mode night	DPT 1.001	receive	Activation of the operating mode night	Visualization, Push Button, timer	Object is always shown if temperature controller is active.
13	Temperature controller	Mode frost/heat protection	DPT 1.001	receive	Activation of the operating mode frost/heat protection	Visualization, Push Button, timer	Object is always shown if temperature controller is active.
14	Temperature controller	Heating disable object	DPT 1.003	receive	Blocking of the heating mode	Visualization, Push Button,	Object must be activated in the Menu controller general. **only at heating**
15	Temperature controller	Cooling disable object	DPT 1.003	receive	Blocking of the cooling mode	Visualization, Push Button,	Object must be activated in the Menu controller general. **only at cooling**
16	Temperature controller	Heating request	DPT 1.001	sending	sends 1 if control value heating is larger than 1, otherwise 0	Switching actuator for controlling heating pump, Visualization	Object must be activated in the Menu controller general. **only at heating**
17	Temperature controller	Cooling request	DPT 1.001	sending	sends 1 if control value cooling is larger than 1, otherwise 0	Switching actuator for controlling cooling pump, Visualization	Object must be activated in the Menu controller general. **only at cooling**

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

18	Temperature controller	Swicth Heating = 1 / Cooling = 0	DPT 1.001	receive	manual switchover between heating and cooling	Visualization, Push Button, Display	Object is only active if controlling is selected to heating and cooling and heating/cooling switchover is selected to via object
19	Temperature controller	Guiding value	DPT 9.001	receive	Receiving of a outdoor temperature value for guiding of the control value	Connection to an outdoor temperature sensor	Object must be activated in the menu controller general
20	Temperature controller	Max memory value	DPT 9.001	sending	Sending of the maximum temperature value	Visualization, Display	Object is only shown if Min/Max values are activated in the menu temperature measurement
21	Temperature controller	Min memory value	DPT 9.001	sending	Sending of the minimum temperature value	Visualization, Display	Object is only shown if Min/Max values are activated in the menu temperature measurement
22	Temperature controller	Min/Max Value Reset	DPT 1.003	receive	Reset of the Min/Max values	Visualization, Display, Push Button	Object is only shown if Min/Max values are activated in the menu temperature measurement
23	Temperature controller	Reset setpoints	DPT 1.003	receive	Reset of the current setpoints to the parameterized values	Visualization, Display, Push Button	Objects resets setpoints and is normally connected to visualizations, etc

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

24	Temperature controller	DPT HVAC Status	not available	sending	Sending the current controller state	Visualization, Display, Diagnostic	Object is always shown and sends the controller state for diagnostics
25	Temperature controller	Error external sensor	DPT 1.001	sending	Sending an error message if there is no signal from the external sensor	Visualization, Display, LED Display	Object is shown if sensor iss et to at least 10% external sensor
26	Temperature controller	Actual setpoint	DPT 9.001	sending	Sending the current setpoint	Visualization, Display, Diagnostic	Object is always shown if temperature controller is active and can be used to getting the actual setpoint
27	Temperature controller	RHCC Status	DPT 22.101	sending	Sending the current controller state	Visualization, Display, Diagnostic	Object is always shown and sends the controller state for diagnostics
28	Temperature controller	Mode selection	DPT 5.005	receive	Switchover of the operating modes via 1 Byte	Visualization, Display, Push Button	Object is always shwon when the controller is active
29	Temperature controller	Manual set point value offset	DPT 1.001	receive	Setpoint offset relative to the current setpoint	Visualization, Display, Push Button	Object is only shown if „Set point value offset via" is set to 1 Bit

Table 1: Communication objects temperaure controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.1.2 Default settings of the communication objects

Die folgende Tabelle zeigt die Standardeinstellungen für die Kommunikationsobjekte:

Default settings									
Nr.	**Channel/Input**	**Function**	**Length**	**Priority**	**C**	**R**	**W**	**T**	**U**
0	Temperature controller	Actual temperature value	2 Byte	Low	X	X		X	
1	Temperature controller	Exceeded max value	1 Bit	Low	X	X		X	
2	Temperature controller	Undershot min value	1 Bit	Low	X	X		X	
3	Temperature controller	Send frost alarm	1 Bit	Low	X	X		X	
4	Temperature controller	Send heat alarm	1 Bit	Low	X	X		X	
5	Temperature controller	External Sensor	2 Byte	Low	X		X		
6	Temperature controller	Specify set point comfort	1 Byte	Low	X	X		X	
7	Temperature controller	Manual set point offset	1 Bit	Low	X	X		X	
8	Temperature controller	Control value heating	1 Bit	Low	X	X		X	
8	Temperature controller	Control value heating	1 Byte	Low	X	X		X	
8	Temperature controller	Control value heating/cooling	1 Bit	Low	X	X		X	
8	Temperature controller	Control value heating/cooling	1 Byte	Low	X	X		X	
9	Temperature controller	Control value add. heating	1 Bit	Low	X	X		X	
10	Temperature controller	Control value cooling	1 Bite	Low	X	X		X	
10	Temperature controller	Control value cooling	1 Byte	Low	X	X		X	
11	Temperature controller	Mode comfort	1 Bit	Low	X	X	X		
12	Temperature controller	Mode night	1 Bit	Low	X	X	X		
13	Temperature controller	Mode frost/heat protection	1 Bit	Low	X	X	X		
14	Temperature controller	Heating disable object	1 Bit	Low	X		X		
15	Temperature controller	Cooling disable object	1 Bit	Low	X		X		
16	Temperature controller	Heating request	1 Bit	Low	X	X		X	
17	Temperature controller	Cooling request	1 Bit	Low	X	X		X	
18	Temperature controller	Swicth Heating = 1 / Cooling = 0	1 Bit	Low	X		X		
19	Temperature controller	Guiding value	2 Byte	Low	X	X	X		
20	Temperature controller	Max memory value	2 Byte	Low	X	X	X	X	
21	Temperature controller	Min memory value	2 Byte	Low	X	X	X	X	
22	Temperature controller	Min/Max Value Reset	1 Bit	Low	X		X	X	
23	Temperature controller	Reset setpoints	1 Bit	Low	X		X		
24	Temperature controller	DPT HVAC Status	1 Byte	Low	X	X		X	
25	Temperature controller	Error external sensor	1 Bit	Low	X	X		X	

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

26	Temperature controller	Actual setpoint	2 Byte	Low	X	X		X	
27	Temperature controller	RHCC Status	2 Byte	Low	X	X		X	
28	Temperature controller	Mode selection	1 Byte	Low	X		X	X	
29	Temperature controller	Manual set point value offset	1 Bit	Low	X		X		

Table 2: Default Settings of the Communication Objects

You can see the default values for the communication objects from the upper chart. According to requirements the priority of the particular communication objects as well as the flags can be adjusted by the user. The flags allocates the function of the objects in the programming thereby stands C for communication, R for Read, W for write, T for transmit and U for update.

3.2 Reference ETS Parameter

3.2.1 Temperature Measurement

The following settings are available at the ETS-Software:

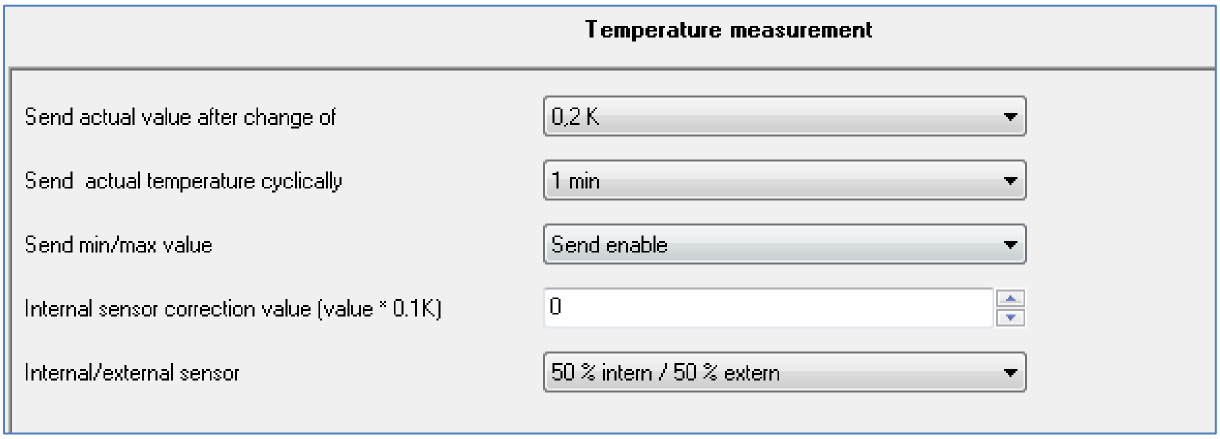

Figure 4: Temperature measurement

The chart shows the dynamic range of the available parameters:

ETS-text	Dynamic range **[default value]**	comment
Send actual value after change of	▪ **disable** ▪ 0,1K - 2,0K	Sending condition for the actual temperature value
Send actual temperature cyclically	▪ **disable** ▪ 1 min – 60 min	Activation of the cyclically sending of the temperature value
Send min/max value	▪ **disable** ▪ Send enable	Activation of the sending of min/max values
Internal sensor correction value (value*0,1K)	-50 – 50 **[0]**	Correction of the internal sensor
Internal/external sensor	▪ **100% intern** ▪ 90% intern/ 10% extern ▪ 80 % intern/ 20% extern ▪ … ▪ 100% extern	Adjustment of the balance between internal and external sensor

Table 3: Parameter Temperature measurement

The effects of the settings are described at the following page.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

- **Send actual value after change of**
  This functions sets when the current temperature value shall be sent. By choosing the setting "disable", no value will be sent at all.

- **Send actual temperature cyclically**
  You can activate this function by choosing a time. Now, the room temperature controller sends the current temperature periodically after the adjusted time. This function is independent from the function "Send actual value after change of". So the temperature controller will send its current value also if there is no change of it.

- **Internal sensor correction value (value*0,1K)**
  You can correct the measured temperature value by this setting. By choosing a negative value for this parameter, the measured value will be lowered and by choosing a positive value, the measured value will be lifted. The value is multiplied by 0,1K, so the current value can be lowered or lifted up to 5K. This setting is useful, when the sensor was built at an unfavorable location, e.g. becoming draft or next to a window. When this function is activated, the temperature controller will also send the corrected values.
  All sensors are matched in-plant to 0,1K.

The chart shows the relevant communication object for the temperature value:

Number	Name	Length	Usage
0	Actual temperature value	2 Byte	sends the current temperature value

Table 4: Communication object temperature value

- **Send min/max value**
  This function activates the sending and saving of the min/max values. When the function is activated by "Send enable", three communication objects will be shown. Two objects for the Min and the Max value and one for the reset of the min/max values.
  The chart shows the relevant communication objects for this parameter:

Number	Name	Length	Usage
20	Max memory value	2 Byte	sends and saves the maximal temperature value
21	Min memory value	2 Byte	sends and saves the minimal temperature value
22	Min/Max memory reset	1 Bit	resets the min/max values

Table 5: Communication objects Min/Max values

- **Internal/external sensor**
  This setting sets the balance between an internal and an external sensor. The setting 100% intern deactivates any external sensor. By choosing any other setting, an external sensor will be activated. So, also communication objects for the external are shown. A balance of 100% extern deactivates the internal sensor and the temperature controller will only note values of the external sensor.
  The communication objects for an activated external sensor are shown at the chart:

Number	Name	Length	Usage
5	External sensor	2 Byte	sends the measured temperature value of the external sensor
28	Error external sensor	1 Bit	sends an error, when the external sensor sends no value for more than 30min

Table 6: Communication objects external sensor

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.2 Alarme/Meldungen

The following settings are available at the ETS-Software:

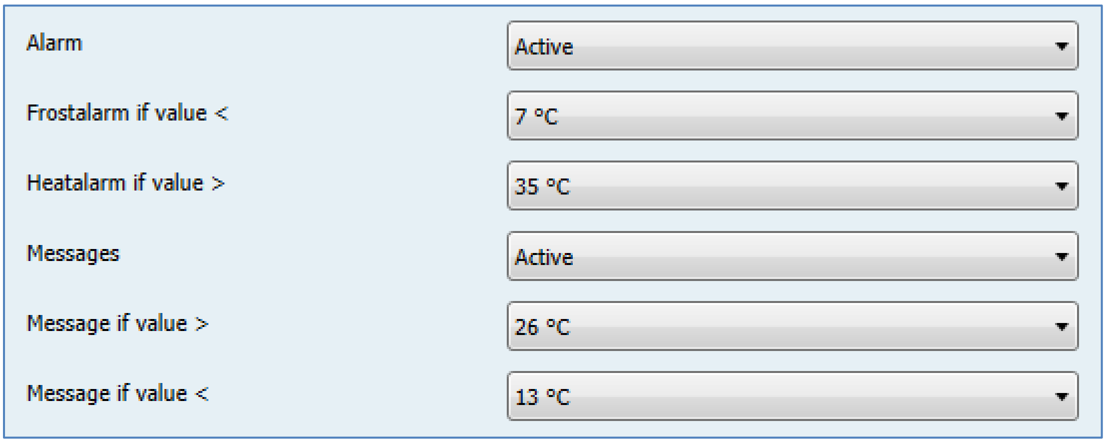

Figure 5: Alarm/Messages

The chart shows the dynamic range of the alarm and messages:

ETS-text	Dynamic range **[default value]**	comment
Alarm	▪ **not active** ▪ active	Activation of the alarm function
Frostalarm if value <	3°C-10°C [7°C]	Dynamic range of the frostalarm Adjustment possible if alarm is activated
Heatalarm if value >	25°C-40°C [35°C]	Dynamic range of the heatalarm Adjustment possible if alarm is activated
Messages	▪ **not active** ▪ active	Activation of the message function
Message if value >	18°C-40°C [26°C]	Dynamic range of the upper message Adjustment possible if messages are activated
Message if value <	1°C-25°C [13°C]	Dynamic range of the lower message Adjustment possible if messages are activated

Table 7: Parameter Alarm/Messages

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

- **Alarm**

  There are two parameterize able alarms, when the alarm function was activated. The frostalarm is for the notification of the lower temperatures and the heatalarm for the notification of the upper temperatures. Both alarms have a separate communication object with the size of 1 Bit.

  The chart shows the relevant communication objects for the alarms:

Number	Name	Length	Usage
3	Frostalarm	1 Bit	send frostalarm
4	Heatalarm	1 Bit	send heatalarm

Table 8: Communication objects alarm

- **Messages**

  The message function is almost identical to the alarm function, but less in its priority. There are two messages available, when the message function was activated. These two messages can be parameterized separately. The dynamic range of the message function is much bigger than the one of the alarm function. So it is also possible, to realize running turn over. Both messages have an own communication object of the size 1 bit. These communication objects are shown in the chart below:

Number	Name	Length	Usage
1	Higher message value	1 Bit	Send the achievement of the higher reporting limit
2	Below message value	1 Bit	Send the achievement of the lower reporting limit

Table 9: Communication objects messages

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.3 Controller general

3.2.3.1 Controller type

The following settings are available at the ETS-Software:

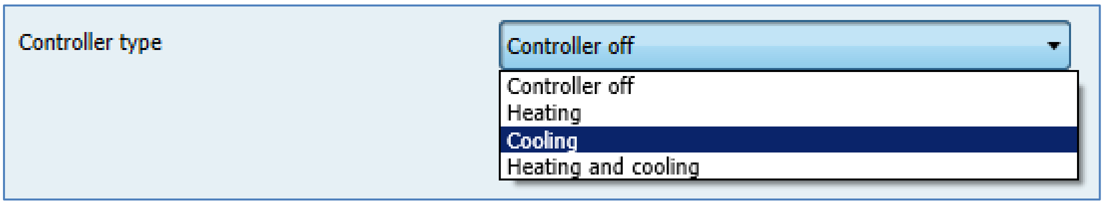

Figure 6: Setting controller type

The chart shows the dynamic range of the controller type:

ETS-text	Dynamic range **[default value]**	comment
Controller type	▪ Controller off ▪ **Heating** ▪ Cooling ▪ Heating and Cooling	Adjustment of the controller type The further settings depent to the adjusted controller type

Table 10: Setting controller type

The controller type defines the function of the room temperature controller. Target of the control is to keep an adjusted temperature constant. There are a lot of settings, which can help to achieve this aim. The settings depend to the adjusted controller type.
By choosing the setting “controller off”, no further settings are possible.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.3.2 Operating Modes & Set points

The following settings are available at the ETS-Software:

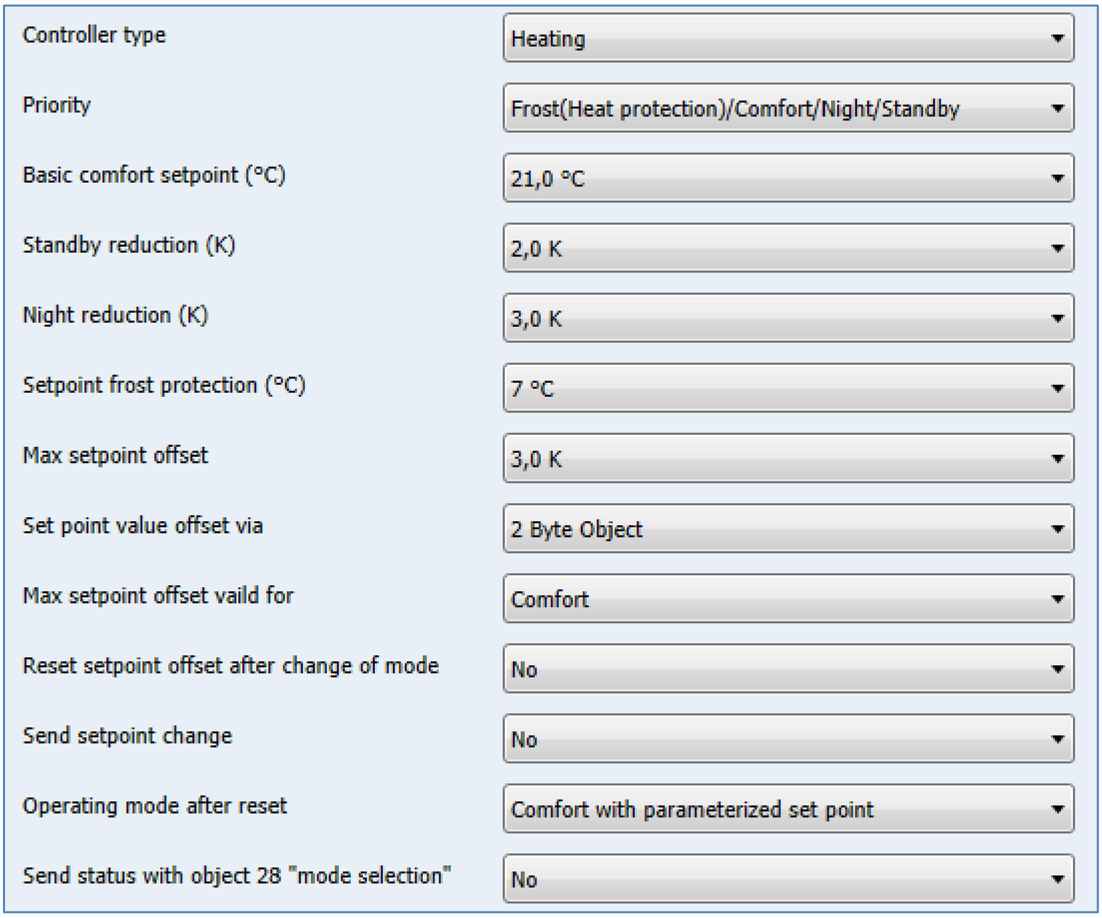

Figure 7: Operating modes & setpoints

The chart shows the dynamic range of the operating modes and setpoints:

ETS-text	Dynamic range **[default value]**	comment
Basis comfort setpoint	18,0°C – 25,0°C [21,0°C]	The basis comfort setpoint is the reference point of the control.
Night reduction	**Lowering in K** 0 K – 10,0 K [3,0 K]	Lowering of the temperature by choosing the operating mode night. Relative to the basis comfort setpoint.
Standby reduction	**Lowering in K** 0 K – 10,0 K [2,0 K]	gets activated when no other operating mode was chosen The lowering is relative to the basis comfort setpoint.
Setpoint frost protection	3°C – 12°C [7°C]	Setpoint of the operating mode frost protection. indicated by an absolute value
Setpoint heat protection	24°C – 40°C [35°C]	Setpoint of the operating mode heat protection. indicated by an absolute value

Table 11: Operating modes & setpoints

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Operating mode Comfort

The operating mode comfort is the reference mode of the controller. The temperature reduction at the operating modes night and standby refer to the setpoint of the comfort mode. When a room is used, the operating mode comfort should be activated. The configured setpoint, the "basic comfort setpoint, is valid for the heating process if the controller was set as heating & cooling (described at 4.4.7).

The chart shows the relevant 1-Bit communication object:

Number	Name	Length	Usage
11	Mode comfort	1 Bit	Activation of the operating mode comfort

Table 12: Communication object operating mode comfort

Operating mode Night

The operating mode night shall cause a significant decrement of the temperature, for example at night or at the weekend. The reduction can be programmed freely and refers to the basic comfort setpoint. If you have programmed a reduction of 5K and a basic comfort setpoint of 21°C, the setpoint for the night mode will be 16°C.

The chart shows the relevant 1-Bit communication object:

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

Table 13: Communication object operating mode night

Operating mode Standby

When nobody is in the room, the operating mode standby is used. This operating mode shall cause a low reduction of the temperature. So the room can be heated up fast again.

The value for the reduction can be programmed freely and refers to basic comfort setpoint. If you have adjusted a reduction of 2K and a basic comfort setpoint of 21°C, the setpoint for the operating mode standby will be 19°C.

The standby mode cannot be activated by a certain communication object. It gets activated, when all operating modes are switched off.

Operating mode Frost/Heat protection

The operating mode frost protection gets activated, when the controller type was set as heating. The heat protection gets activated, when the controller type was set as cooling. When the controller type is set to heating and cooling, the combined operating mode frost-/ heat protection is activated.

This operating mode causes an automatically switch on of heating or cooling, when a parameterized is exceeded or the temperature falls below a parameterized temperature. At this operating mode, the temperature is set as absolute value. You should activate this function if you are longer absent and the temperature must not fall below a specific value or exceed a specific value.

The chart shows the relevant 1-Bit communication objects:

Number	Name	Length	Usage
13	Mode frost protection	1 Bit	Activation of the operating mode frost protection
13	Mode heat protection	1 Bit	Activation of the operating mode heat protection
13	Mode frost/heat protection	1 Bit	Activation of the operating mode frost/heat protection

Table 14: Communication object operating mode frost/heat protection

Priority of the Operating Modes

The following settings are available at the ETS-Software:

Figure 8: Priority of the operating modes

The chart shows the dynamic range of the priority of the operating modes:

ETS-text	Dynamic range **[default value]**	comment
Priority	▪ **Frost/Comfort/Night/Standby** ▪ Frost/Night/Comfort/Standby	Adjustment of the priority of the operating modes

Table 15: Priority of the operating modes

The setting of the priority enables to adjust which operating mode shall be switched primarily when more than one operating mode is switched on. At the priority of Frost/Comfort/Night/Standby, the comfort mode will be switched on even if comfort and night is switched on to the same time. The night mode will only be active, when the comfort mode is switched off. now the controller changes automatically to the night mode.

Operating Mode switchover

There are 2 possibilities for the switchover of the operating modes: On the one hand the operating modes can be switched on by their 1 Bit communication object and on the other hand by a 1 Byte object.
The selection of the operating modes by their 1 Bit communication object occurs via a direct selection of their individual communication object. With consideration of the adjusted priority, the operating mode, which was selected via the 1 Bit communication object, is switched on or off. When all operating modes are switched off, the controller changes to the standby mode.

Example:
The priority was set as Frost/Comfort/Night/Standby.

Operating mode			**adjusted 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 16: Example switchover of the operating modes via 1 Bit

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

The switchover of the operating modes via 1 Byte occurs by only one object, with the size of 1 Byte, the DPT_HVAC Mode 20.102 of KNX-specification. Additional, there are 2 objects for the visualization available, the 1 Byte object “DPT_HVAC Status” and the 2 Byte object “DPT_RHCC Status”. For the switchover of the operating modes, a Hex-value is sent to the object “mode selection”. The object evaluates the received value and switches the belonging operating mode on and the active operating mode off. If all operating modes are switched off (Hex-value=0), the operating mode standby will be switched on.
The Hex-values for the operating modes are shown at the chart:

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

Table 17: Hex-Values for operating modes

The following example shall clarify how the controller handles received Hex-values and switches operating modes on or off. The chart is to read from the top to the down.
Example:
The priority was set as Frost/Comfort/Night/Standby.

received Hex-value		Handling		adjusted operating mode
0x01		Comfort=1		Comfort
0x03		Comfort=0 Night=1		Night
0x02		Night=0 Standby=1		Standby
0x04		Frost-/Heat protection=1 Standby=0		Frost-/Heat protection

Table 18: Example operating mode switchover via 1 Byte

The DPT HVAC Status communication, DPT_HVAC Status (without number) of KNX-specification, object sends the hex value for the adjusted operating mode. When more than one testify is valid, the hex values are added and the communication object sends the added value. The hex values can be read from visualization afterwards.
The following chart shows the hex values for the single 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 19: Hex-Values DPT HVAC Status

If you heat at the comfort mode, the communication object will send the value 20 (for heating) +1 (for the comfort mode) =21.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

The DPT RHCC Status object is an additional 2 Byte status object with additional status messages. If more than one testify is valid, also here the values will be added in the same way as at the HVAC object.
The following chart shows the hex values for the single messages:

Bit	DPT RHCC Status		Hex-Value
0	Error 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 20: Hex-Values DPT RHCC Status (from Version 1.2)

The Controller reacts always to the value, which was sent last. If you switched the operating mode last via 1 Bit, the controller will react to the switchover by 1 Bit. If you switched the operating mode last via 1 Byte, the controller will react to the switchover by 1 Byte.
The communication objects for the mode selection are shown at the following chart. The first 3 communication objects are for the 1 Bit switchover, the last 3 objects are for the switchover via 1 Byte:

Number	Name	Length	Usage
11	Mode Comfort	1 Bit	Activation of the mode comfort
12	Mode Night	1 Bit	Activation of the mode night
13	Mode Frost/Heat protection	1 Bit	Activation of the mode Frost/ Heat protection
24	DPT_HVAC Status	1 Byte	Visualization of the chosen operating mode
27	DPT_RHCC Status	2 Byte	Visualization measuring/ status of the controller
28	Mode selection	1 Byte	Selection of the operating mode

Table 21: Communication objects for the operating mode switchover

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Operating Mode afte Reset

The following settings are available at the ETS-Software:

Figure 9: Operating mode after reset

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Operating mode after reset	▪ **Comfort with parameterized set point** ▪ Standby with parameterized set point ▪ Hold old state and set point	Adjustment, which operating mode shall be switched on after a bus power return

Table 22: Operating mode after reset

This parameter defines the operating mode, which shall be adjusted after a bus power return. The controller can start with the comfort mode and parameterized set point or with the standby mode and parameterized set point. Furthermore a memory function is integrated which loads the operating mode and set point before bus power down.

3.2.3.3 Set point offset

The following settings are available at the ETS-Software:

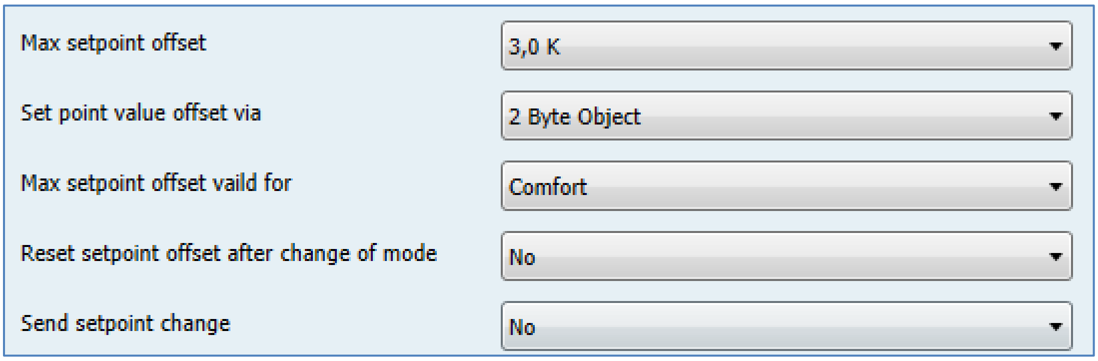

Figure 10: Setpoint offset

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Max setpoint offset	0K – 10,0K [3,0K]	indicates the maximal offset
Setpoint value offset via	▪ **2 Byte Object** ▪ 1 Bit Object	Adjustment how the set point value offset should be done. 2 Byte = an absolute temperature difference is sent, 1 Bit = 1: Actual set point + Step range, 0: Actual set point - Step range
Step range	▪ 0,1K ▪ 0,2K ▪ **0,5K** ▪ 1,0K	Parameter s only shown at set point offset via 1 Bit and defines the set point value offset with every 1 Bit command
Max setpoint offset valid for	▪ **Comfort** ▪ Comfort/Night/Standby	scope of the set point offset
Reset setpoint offset after change of mode	▪ **No** ▪ Yes	Adjustment, whether a set point offset is still valid after change of operating mode or not
Send setpoint change	▪ **No** ▪ Yes	Adjustment, whether a change of mode should be send or not

Table 23: Setpoint offset

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

The setpoint can be changed manual by the setpoint offset without a new parameterization by the ETS-Software. Therefore, 2 variants are available. On the one hand a new setpoint can be pretended by the communication object “Setpoint comfort”. On the other hand the adjusted setpoint can be increased or decreased manual by the communication object “manual setpoint value offset”.
At the read in of a new absolute comfort setpoint, the controller becomes a new basis comfort setpoint. The new basic comfort setpoint causes also an adaption of the indirect setpoints at the other operating modes. Through this function it is for example possible to read the actual room temperature as new basic comfort setpoint in. The settings “max setpoint offset”, “max setpoint offset valid for” and “Reset setpoint offset after change of mode” are not valid at this variant of setpoint offset, because the controller becomes a complete new setpoint. Specifying a new value is possible by calling the object “Setpoint comfort”.
The second opportunity of the manual setpoint offset is the movement of the setpoint depending to the current adjusted setpoint. For this variant of setpoint offset, the object “manual setpoint value offset” is used. Sending a positive Kelvin value at this object causes an increment of the current setpoint. Sending a negative Kelvin value at this object causes a decrement of the current setpoint.
The setting “max setpoint offset” indicates the maximal possible setpoint movement. If the controller is for example set to a basic comfort setpoint of 3K, the setpoint can only be moved manual in the limits of 18°C and 24°C.
Alternative the set point offset can be done with a normal 1 Bit object. In this case, a 1 means a setpoint increase, a 0 means a setpoint lowering. In bith cases the setpoint is changed for the adjusted setp range. This function allows a change of the set point for example by using a push button.
The setting “max setpoint offset valid for” defines the scope of the setpoint offset. You can choose whether the setpoint offset is only valid for the comfort mode or also for the night and standby mode. The operating mode frost/ heat protection is always independent of the setpoint offset.
The setting „Reset setpoint after change of mode” indicates whether a setpoint offset shall be maintained after a change of mode or not. If this parameter is deactivated, the device will switch to the adjusted setpoint for the chosen operating mode after every change of mode.
The communication object “Actual setpoint” is for the query of the current setpoint at the actual adjusted operating mode.

The following chart shows the relevant communication objects:

Number	Name	Length	Usage
6	Setpoint comfort	2 Byte	Parameterization of a new absolute comfort setpoint
7	Manual setpoint value offset	2 Byte	Movement of the setpoint depending to the current adjusted basic comfort setpoint
23	Reset setpoints	1 Bit	Kommunikationsobjekt setzt jegliche Sollwertverschiebung mit einer logischen 1 auf die Parametereinstellungen zurück
26	Actual setpoint	2 Byte	Readout of the actual adjusted setpoint
29	Manual set point value offset	1 Bit	Set point value offset in relation to the current set point via a normal 1 Bit object

Table 24: Communication objects set point value offset

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.3.4 Blocking objects

The following settings are available at the ETS-Software:

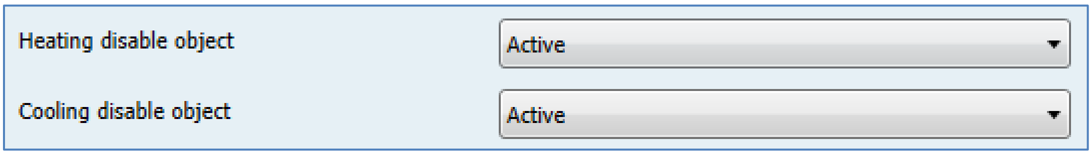

Figure 11: Blocking objects

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Heating disable object	▪ **Inactive** ▪ Active	activates the blocking object for the heating process
Cooling disable object	▪ **Inactive** ▪ Active	activates the blocking object for the cooling process

Table 25: Blocking objects

Depending to the adjusted controller type, one or two blocking objects are available. The blocking objects disable the control value. The blocking objects can be used when the heating or cooling system shall be prevented of an unwanted start.
If the heating must not start at special situations, for example when a window is opened, the blocking object can be used. Another usage of this function is for example the manual blocking, for example by a push button, in case of a cleaning process.
The blocking objects have the size of 1 Bit and blocks by sending a logical 1 at the depending communication object.

The chart shows the relevant communication objects:

Number	**Name**	**Length**	**Usage**
14	Heating disable object	1 Bit	blocks the control value heating
15	Cooling disable object	1 Bit	blocks the control value cooling

Table 26: Communication objects blocking objects

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.3.5 Objects for Heating/Cooling request

The following settings are available at the ETS-Software:

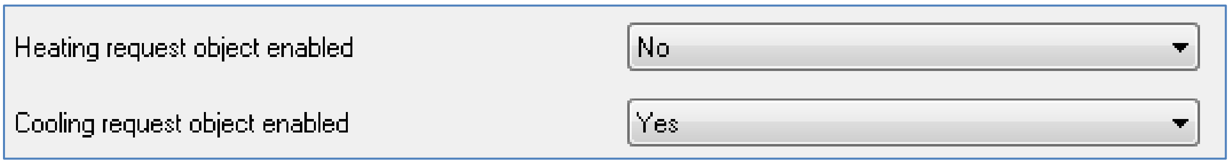

Figure 12: Heating/Cooling request objects

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Heating request object enabled	▪ **No** ▪ Yes	activates the communication object for the visualization of a beginning heating process
Cooling request object enabled	▪ **No** ▪ Yes	activates the communication object for the visualization of a beginning cooling process

Table 27: Heating/Cooling request objects

The setting “Heating/Cooling request enabled” can show objects, which indicates a beginning heating or cooling process. So these objects are status objects.
The objects can be used for the visualization of a beginning or ending heating/cooling process. So, for example, a red LED could show a heating process and a blue LED a cooling process.
A further opportunity for the usage is the central switch of a heating or cooling process. So can be realized that all heating devices of a building switch on, when a controller gives out a heating request.
The 1 Bit communication object gives as long a 1-signal out as the process is active.

The following chart shows the relevant communication objects:

Number	Name	Length	Usage
16	Heating request	1 Bit	indicates a beginning heating process
17	Cooling request	1 Bit	indicates a beginning cooling process

Table 28: Communication objects heating/cooling request

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.3.6 Guiding

The following settings are available at the ETS-Software:

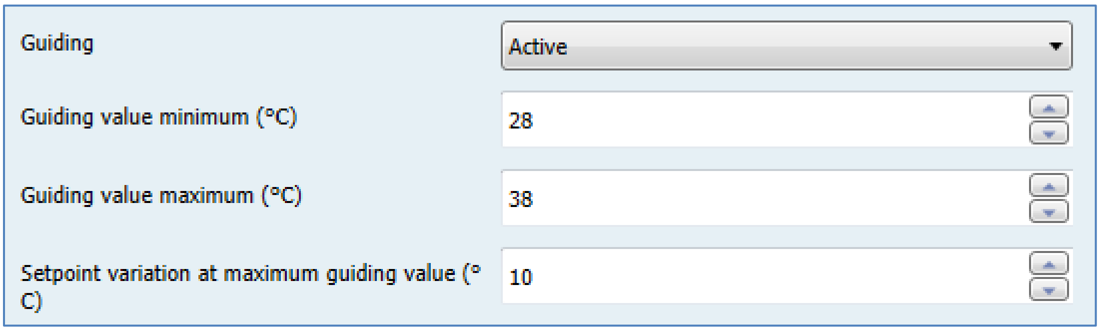

Figure 13: Guiding

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Guiding	▪ **Inactive** ▪ Active	activates/deactivates the guiding
Guiding value minimum (in °C)	-100°C – 100°C [28 °C]	minimum value of the guiding
Guiding value maximum (in °C)	-100°C – 100°C [38 °C]	maximum value of the guiding
Setpoint variation at maximum guiding value (in °C)	-100°C – 100°C [10 °C]	Setpoint offset at achievement of the maximum guiding value

Table 29: Guiding

The parameter guiding causes a linear reposition of the control value in dependence of a guiding value, which is measured by an external sensor. With appropriated parameterization a continuous increment or decrement of the control value can be caused.
For adjusting how the guiding shall impact to the control value, three settings are necessary: Guiding value minimum (w_{min}), guiding value maximum (w_{max}), and setpoint variation at maximum guiding value ($\triangle X$).
The settings for the guiding value maximum (w_{max}) and minimum (w_{min}) describe the range of temperature in which the guiding starts and ends having impact to the setpoint. The real setpoint offset indicates the following formula:

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

If the guiding shall cause an increment of the setpoint, you have to adjust a positive value for the setting “Setpoint variation at maximum guiding value”. If you wish a decrement of the setpoint, you have to choose negative value for the setting “Setpoint variation at maximum guiding value”.
The variation of the setpoint $\triangle X$ is added to the basic comfort setpoint.
A measured temperature value for the guiding above the adjusted maximum value or below the adjusted minimum value has no effect to the setpoint.
So when the value is between the adjusted guiding values (w_{max} & w_{min}) the setpoint is increased or decreased.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

The following diagrams shall illustrate the connection between guiding and setpoint:
(Xsetpoint=new setpoint; Xbasic=basic comfort setpoint)

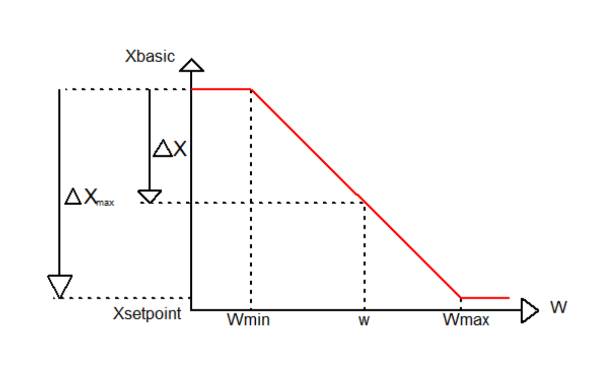

Figure 14: Example Guiding decrement

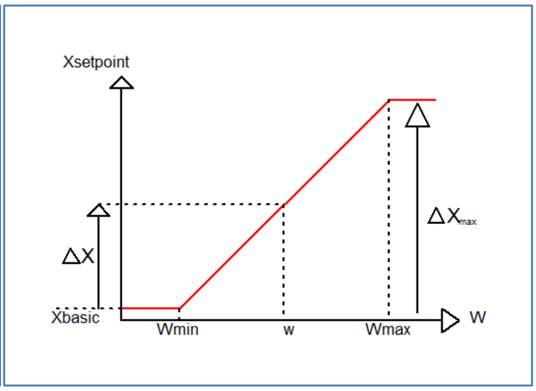

Figure 15: Example Guiding increment

The communication object for the guiding value must be connected to the external measured temperature. Through this object, the guiding becomes the reference value for the guiding process.

The following chart shows the relevant communication objects:

Number	Name	Length	Usage
19	Guiding value	2 Byte	Receiving of the reference temperature for the guiding

Table 30: Communication object guiding

Example for the usage:
For the temperature regulation of a room, the setpoint (22°C) shall be increased in a way that at a measured outside temperature range of 28°C to 38°C, the difference of the temperature outside and inside is never more than 6K.

The following settings must be done at the controller:
Basics Comfort setpoint: 22°C
Guiding: active
Guising value minimum: 28 °C
Guiding value maximum: 38°C
Setpoint variation at maximum guiding value: 10°C

If the temperature outside increase to value of 32°C now, the setpoint will be increased by the following value:
$\triangle X = 10°C * [(32°C-28°C)/(38°C–28°C)] = 4°C$

So we would have a new setpoint of 22°C+4°C = 26°C.
If the outside temperature reaches the adjusted maximum of 38°C, the setpoint will be 32°C and behave this value even if the temperature would continue to rise.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.3.7 Totzone

The following settings are available at the ETS-Software:

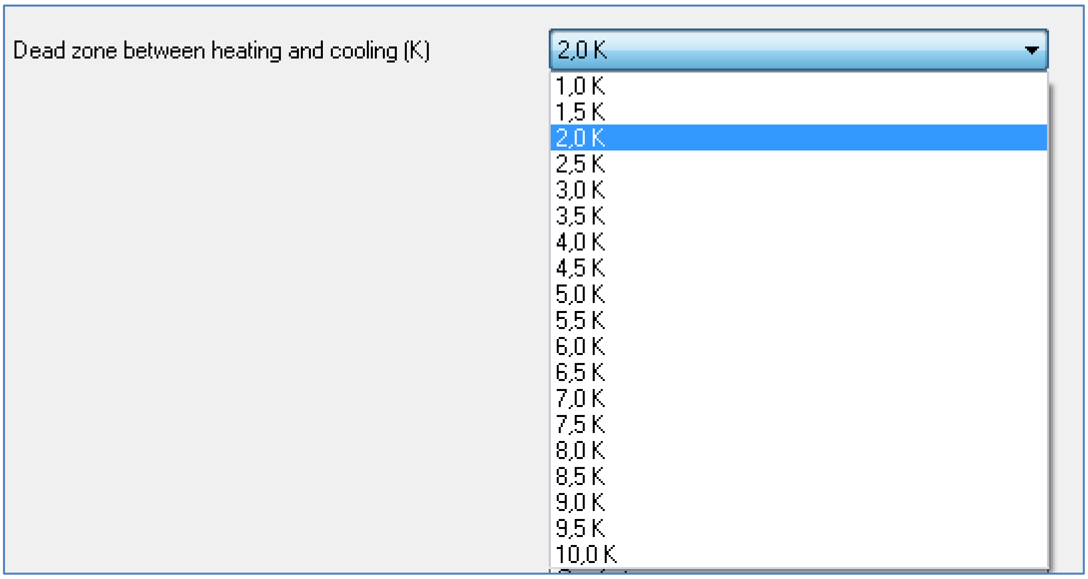

Figure 16: Dead zone

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Dead zone between heating and cooling (K)	1,0K – 10,0K [2,0K]	Dynamic range for the dead zone (Range at which the controller does not activate cooling or heating)

Table 31: Dead zone

The settings for the dead zone are only available, when the controller type was set as heating and cooling. Now the dead zone can be parameterized.
The dead zone describes the range at which the controller neither heats nor cools. So the controller sends no value to the control value, when he is in the dead zone. At the setting for the dead zone, it is to note, that a value which was chosen too small causes many switches between heating and cooling. Whereas, a too big chosen value causes a wide range of the current room temperature.
When the controller is set as heating and cooling, the basic comfort setpoint is always the setpoint for heating. The setpoint for the cooling is given by the summation of basic comfort setpoint and dead zone. So, when the basic comfort setpoint is set to 21°C and the dead zone is set to 3K, the setpoint for heating is 21°C and the setpoint for cooling is 24°C.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

The dependent setpoints for heating and cooling, so the setpoints for the operating modes standby and night, can be parameterized individually at the controller type heating and cooling. So you can set different values for the nigh and standby reduction/increase at heating and cooling. These setpoints are calculated in dependence to the basic comfort setpoints.
The setpoints for the frost and heat protection are individually from the dead zone and the other setpoints.
The following illustration shows the correlations between dead zone and the setpoints for the single operating modes.
The following settings are made for this example:
Basic comfort setpoint: 21°C
Dead zone between heating and cooling: 3K
Increase and Reduction standby: 2K
Increase and Reduction night: 4K

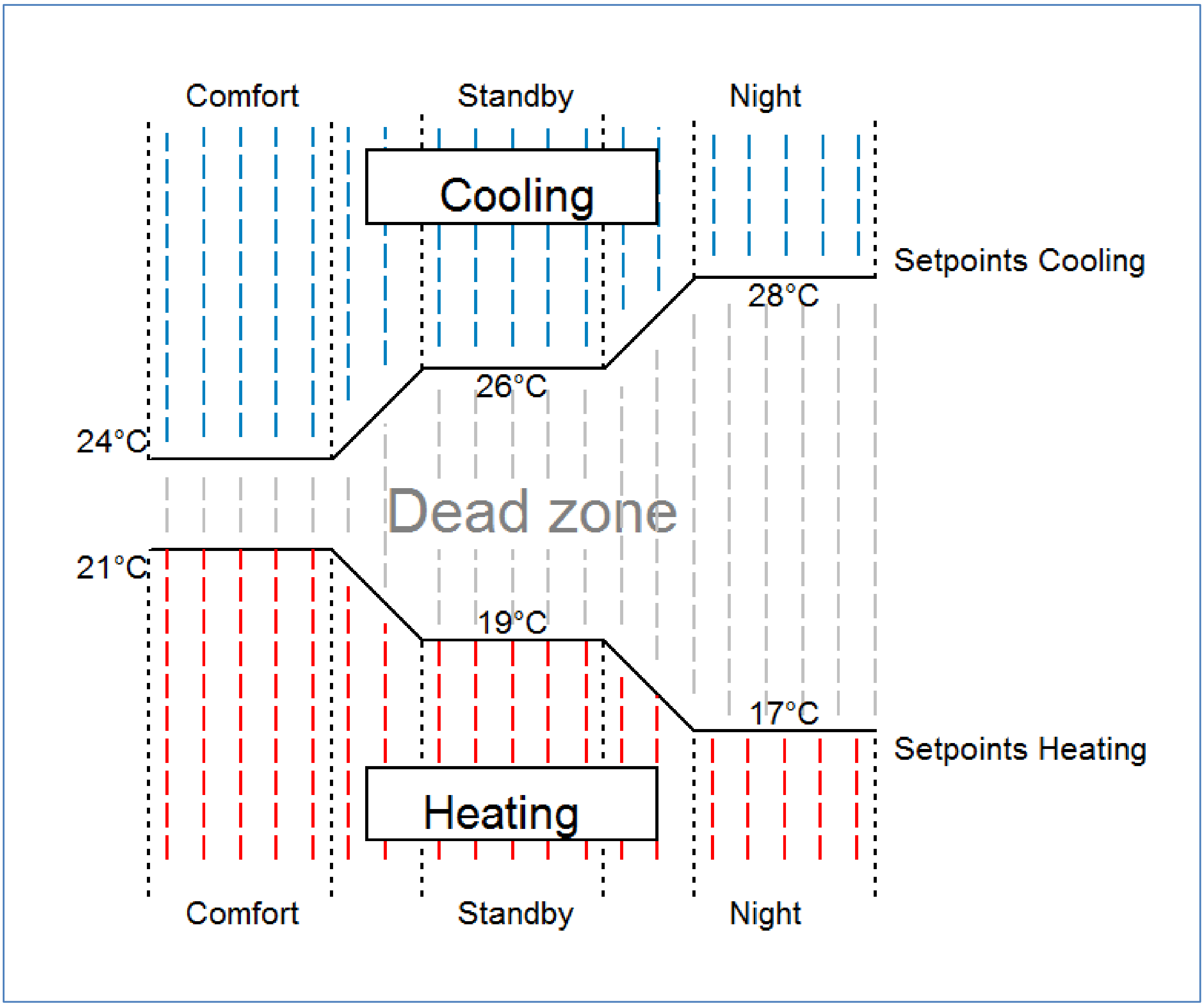

Figure 17: Example dead zone

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.4 Controller settings

3.2.4.1 Control Value

The following settings are available at the ETS-Software:

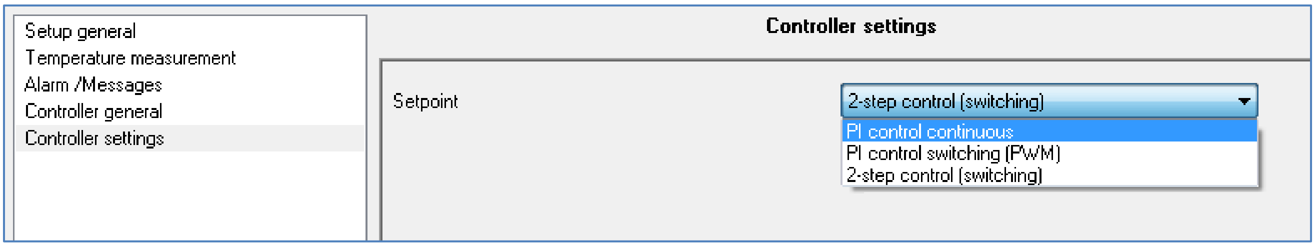

Figure 18: Control value

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Control value	▪ **PI control continuous** ▪ PI control switching (PWM) ▪ 2-step control (switching)	The control variable defines the used control method.

Table 32: Control value

The controller contains of three different controlling methods, which control the control value. Further parameterization options are dependent to the adjusted control method. The following controller can be chosen:

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

The following chart shows the relevant communication objects:

Number	Name	Length	Usage
8	Control value heating	1 Byte/ 1 Bit	controlling of the actuator for heating
8	Control value heating/cooling	1 Byte/ 1 Bit	controlling of the combined actuator for heating and cooling
10	Control value cooling	1 Byte/ 1 Bit	controlling of the actuator for cooling

Table 33: Communication objects control value

According to the adjusted controller type, the control value controls a heating and/or a cooling process. If the control value is chosen as PI control continuous, the communication objects will have the size of 1 Byte, because the object can assume several states. If the control value is chosen as PI control switching or 2-step control, the communication object will have the size of 1 Bit, because the communication object can only assume the states on or off.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.4.2 PI control continuous

The following settings are available at the ETS-Software (here for controller type heating):

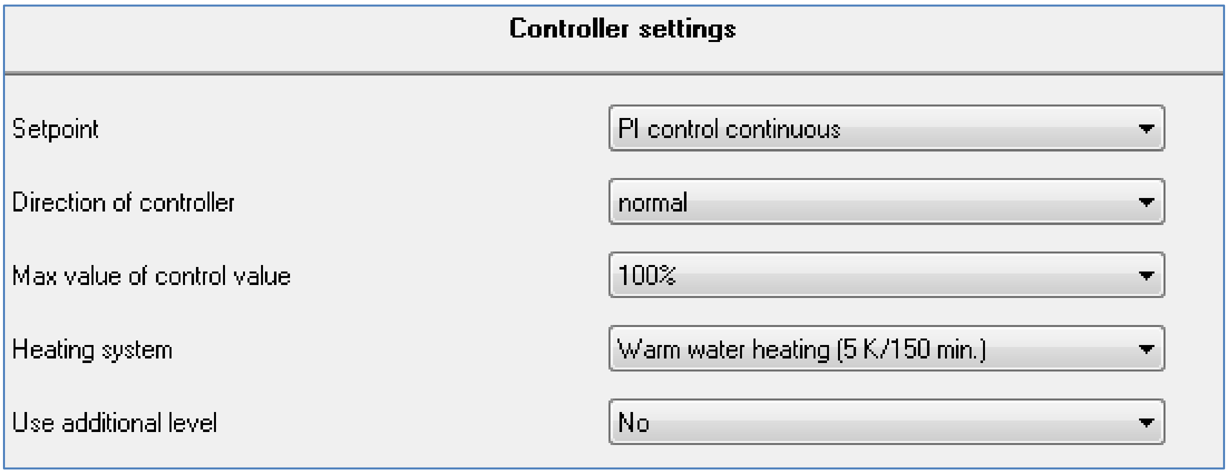

Figure 19: PI control continuous

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Direction of controller	▪ **normal** ▪ inverted	indicates the controlling behavior at rising temperature (4.5.5)
Max value of control value	100%; 90%; 80%; 75%; 70%; 60%; 50%; 40%; 30%; 25%; 20%; 10%; 0% [100%]	indicates the output power at maximum amount
Heating system	▪ **Warm water heating (5K/150 min)** ▪ Underfloor heating (5K/240 min) ▪ Split Unit (4K/90min) ▪ Adjustment via control parameter	Adjustment of the used heating system Individual parameterization available by “Adjustment via control parameter”
Cooling system	▪ **Split Unit (4K/90min)** ▪ Cooling ceiling (5K/240 min) ▪ Adjustment via control parameter	Adjustment of the used cooling system Individual parameterization available by “Adjustment via control parameter”
Proportional range (K)	1K-8K [2K]	By choosing heating/cooling system as “Adjustment via control parameter”, the proportional range can be parameterized freely
Reset time (min)	15min – 210 min [150 min]	By choosing heating/cooling system as “Adjustment via control parameter”, the reset time can be parameterized freely
Send control value cyclic	Disable, 1 min, 2min, 3min, 4 min, 5min, 10min, 15min, 20min, 30min, 40min, 50min, 60min [Disable]	Activation of cyclic sending of the control value with adjustment of the cyclic time
Use additional level	▪ **No** ▪ Yes	Activation of an additional level available, only for heating (4.5.6)

Table 34: PI control continuous

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

The PI control continuous is a continuous controlling with proportional amount, the Proportional range, and an integral amount, the reset time. The size of the proportional range is indicated in K, whereas the I-amount is indicated in minutes.
The control value is controlled in steps from 0% to the adjusted maximum (have a look at 4.5.2.1 Max value of control value) for the PI-control. A big deviation causes at normal direction, a big control value to eliminate the deviation as fast as possible.

Max value of control value

By the setting "Max value of control value" can be adjusted which maximum value the control value can assume. To prevent switching processes at large control values, a maximum can be defined by the setting "Max value of control value". So the control value cannot exceed this value.

Heating/ cooling system

The control parameter (P-amount and I-amount) are adjusted by the setting for the used heating/ cooling system. You can use preset values, which fit to determined heating or cooling systems, or parameterize the proportional range and the reset time freely. The preset values for the corresponding heating or cooling system are based on empirical values and lead often to good controlling results.
By choosing "Adjustment via control parameter", the proportional range and the reset time can be parameterized freely. This setting requires a good knowledge in the field of control technology.

Proportional range

The proportional range describes the P-amount of the controlling. The P-amount produces a proportional increment to the deviation of the control value.
A small proportional range causes a short recovery time of the deviation. The controller reacts thereby almost immediately and sets the control value already at a small deviation almost to the maximum value (=100%). If the proportional range is chosen too small, the system will swing across.

The following setting rules can be defined:

- **small proportional range:** swing across possible at change of setpoint; usage at fast systems; small recovery times
- **big proportional range:** almost no danger of swing across; long recovery times, usage at slow systems which need huge amplifications (big heating power etc.)

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Reset time

The reset time describes the I-amount of the controlling. The I-amount of a controlling causes an integral convergence of the actual value to the setpoint. A short reset time indicates a strong I-amount.
A short reset time causes that the control value approaches fast to the control value, which is set by the proportional range. A big reset time causes a slow approach to this value.
To note is, that a reset time, which is adjusted too small, can cause across swinging. In principle you can say each carrier the system, each bigger the reset time.

The following setting rules can be defined:

- **small reset time:** fast regulating of deviations; usage at fast systems and at places with changing environmental conditions (disturbance variables like draft); danger of swinging across
- **big reset time:** slow regulating of deviations; almost no danger for swinging across; usage at slow systems as underfloor heating

Send control value cyclic

The parameter "Send control value cyclic" causes a cyclic sending of the actual control value. The time shifts between two values can be also parameterized.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.4.3 PI control switching (PWM)

The following settings are available at the ETS-Software (here for controller type heating):

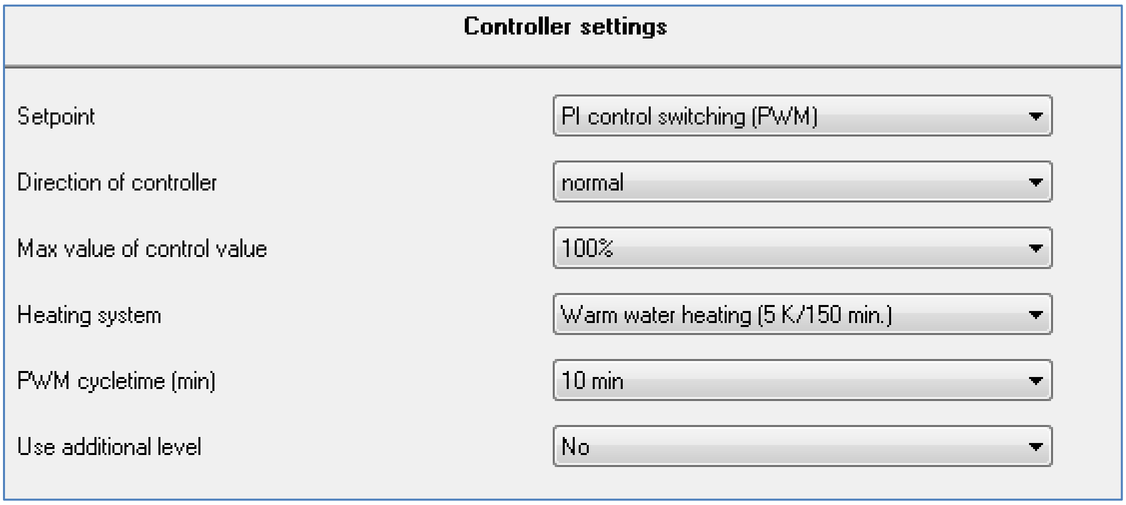

Figure 20: PI control switching (PWM)

The PI control switching is a development of the PI control continuous. All settings of the continuous control are also available at the PI control switching. Additional a PWM cycletime can be adjusted.

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Direction of controller	▪ **normal** ▪ inverted	indicates the controlling behavior at rising temperature (4.5.5)
Max value of control value	100%; 90%; 80%; 75%; 70%; 60%; 50%; 40%; 30%; 25%; 20%; 10%; 0% **[100%]**	indicates the output power at maximum amount
Heating system	▪ **Warm water heating (5K/150 min)** ▪ Underfloor heating (5K/240 min) ▪ Split Unit (4K/90min) ▪ Adjustment via control parameter	Adjustment of the used heating system Individual parameterization available by “Adjustment via control parameter”

Cooling system	▪ **Split Unit (4K/90min)** ▪ Cooling ceiling (5K/240 min) ▪ Adjustment via control parameter	Adjustment of the used cooling system Individual parameterization available by "Adjustment via control parameter"
Proportional range (K)	1K-8K [2K]	By choosing heating/cooling system as "Adjustment via control parameter", the proportional range can be parameterized freely
Reset time (min)	15min – 210 min [150 min]	By choosing heating/cooling system as "Adjustment via control parameter", the reset time can be parameterized freely
Send control value cyclic	Disable, 1 min, 2min, 3min, 4 min, 5min, 10min, 15min, 20min, 30min, 40min, 50min, 60min [Disable]	Activation of cyclic sending of the control value with adjustment of the cyclic time
Use additional level	▪ **No** ▪ Yes	Activation of an additional level available, only for heating (4.5.6)
PWM cycletime (min)	5min, 10min, 15min, 20min, 25min, 30min [10min]	describes the whole time off an on-pulse and an off-pulse

Table 35: PI control switching (PWM)

At the pulse width modulation, the controller switches the control value according to the calculated value of the continuous control on and off. Thereby the control watches also the adjusted cycletime. So the control value is converted to a pulse width modulation with only the two conditions "0" and "1".

PWM cycletime

The cycletime, „PWM cycletime", serves the controlling for calculating the length of the on-pulse and the off-pulse. This calculation occurs at the base of the calculated continuous value in percent. One PWM cycle contains the time, which elapses from one switching on point to the other.

> **Example:** If a control value of 75% is calculated and a cycletime of 10min is adjusted, the control value will be switched on for 7,5min and switched off for 2,5min.

In principle you can say each carrier the system, each bigger the cycletime.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.4.4 Two-step control (switching)

The following settings are available at the ETS-Software (here for controller type heating):

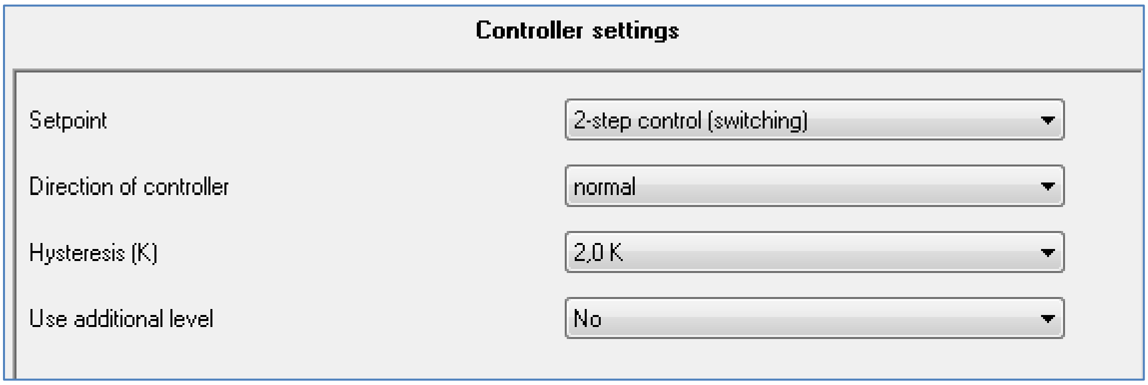

Figure 21: 2-step control (switching)

The following chart shows the dynamic range for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Direction of controller	▪ **normal** ▪ inverted	indicates the controlling behavior at rising temperature (4.5.5)
Hysteresis	0,5K – 5,0K [2,0K]	Setting for the switching off point and the switching on point
Use additional level	▪ **No** ▪ Yes	Activation of an additional level possible, only for heating (4.5.6)

Table 36: 2-step control (switching)

The 2-step control is the easiest way of controlling. The controller switches the control value only on and off.
The controller switches the control value (for example at heating) on, when the measured temperature falls below a certain temperature. By exceeding a certain temperature, the control value will be switched off again. The points for switching on and off depend to the current adjusted setpoint and the adjusted hysteresis.
The 2-step control is used in situations, where the control value can only have two conditions and the controlled temperature can alternate a bit more.

Hysteresis

The setting of the hysteresis is used for calculating the points of switching on and off. This occurs under consideration of the current adjusted setpoint.

> **Example:** The controller is adjusted as heating with and a basic comfort setpoint of 21°C and a hysteresis of 2K. So the controller switches the control value, at the mode comfort, on at 20°C and off at 22°C.

To note is that a big hysteresis generates big differences of the room temperature. A small hysteresis can generate an almost permanent switching process, because the points for switching on and off are very close to each other. This can generate a fast consumption of the control value.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

3.2.4.5 Direction of controller

The following settings are available at the ETS-Software:

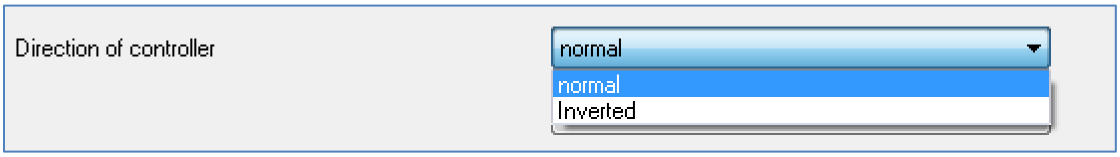

Figure 22: Direction of controller

The direction of the controller describes the behavior of the control value by a changing of the control difference at rising temperature. The control value can react normal or inverted to a rising temperature. The direction of the controller can be adjusted for all control values (PI-control continuous, PI-control switching and 2-Step control).
An inverted control value is for adaption to normally opened valves at the 2-Step control and at the PI-control switching.
An inverted control value means for the single control values, by controller type heating, the following adjustments

- PI-control continuous
  The control value falls at raising regular difference and rises at falling regular difference.
- PI-control switching
  The ratio between duration of switching on to the whole PWM cycletime raise by falling temperature and falls by raising temperature.
- 2-Step control
  The controller switches on at the normal point for switching off and switches off at the normal point for switching on.

3.2.4.6 Additional level

The following settings are available at the ETS-Software:

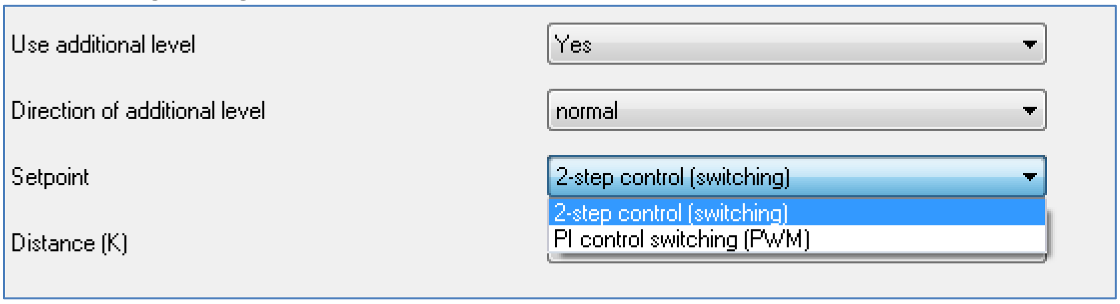

Figure 23: Additional level

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

The dynamic range for an additional level is shown at the following chart (the setting options are shown, when an additional level is activated):

ETS-text	Dynamic range **[default value]**	comment
Direction of controller	▪ **normal** ▪ inverted	indicates the controlling behavior at rising temperature (4.5.5)
Control value	▪ **2-Step control (switching)** ▪ PI control switching (PWM)	Setting of the used control value
Distance (in K)	1,0K – 10,0K [2,0K]	Distance between the setpoints of the normal controlling and the setpoint for the additional level

Table 37: Additional level

An additional level can only be chosen for heating. The direction of the controller can be chosen for the additional level, too. The control value can be chosen as PI-control switching (PWM) or 2-Step control. So the communication object for the additional level has always the size of 1 Bit.
The distance in K describes the setpoint of the additional level. The adjusted distance is deducted from the setpoint of the basic level; the resulting value is the setpoint for the additional level.

> **Example:** The controller has the operating mode comfort, with the basic comfort setpoint of 21°C. The distance is adjusted as 2,0K. So the setpoint for the additional level is 21°C-2,0K=19,0°C.

An additional level can be used at carry systems to reduce the warm up time. For example can a radiator be used as additional level for reducing the war up time of an underfloor heating.

The following chart shows the relevant communication object:

Number	Name	Length	Usage
9	Control value additional heating	1 Bit	control value for the additional level

Table 38: Communication object additional level

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

The following illustration shows the combination of the basic level and the additional level:

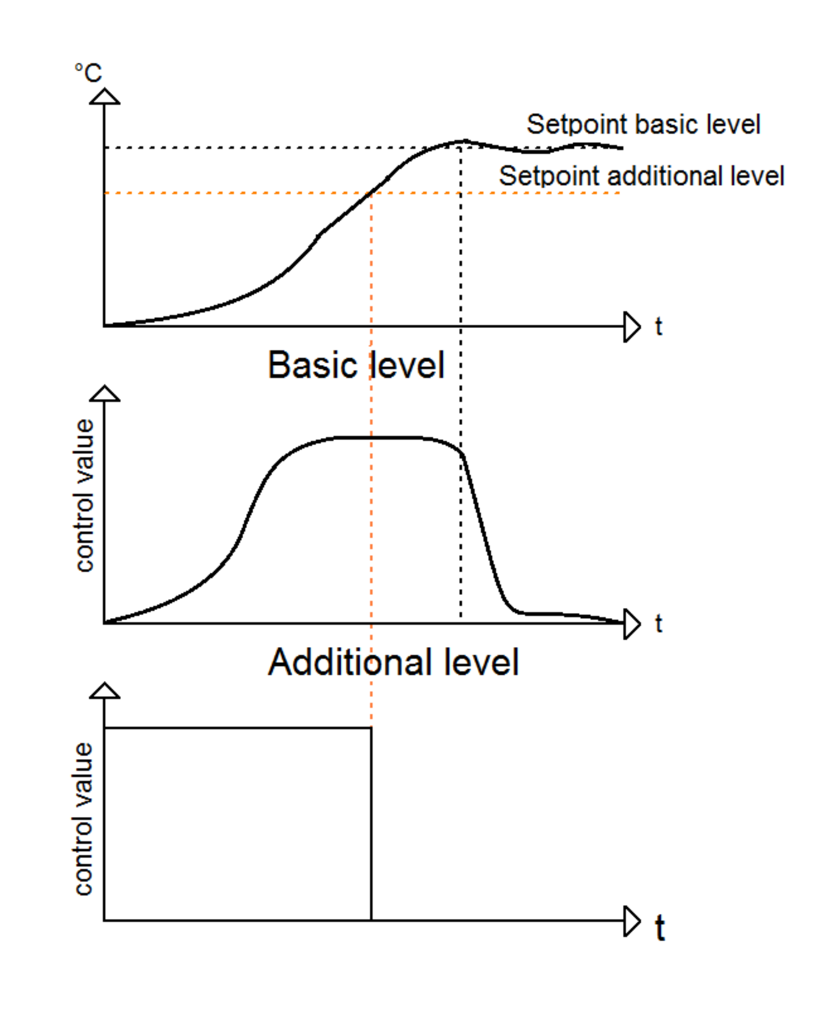

Figure 24: Combination of basic and additional level

3.2.4.7 Additional settings for heating and cooling

The following settings are available at the ETS-Software:

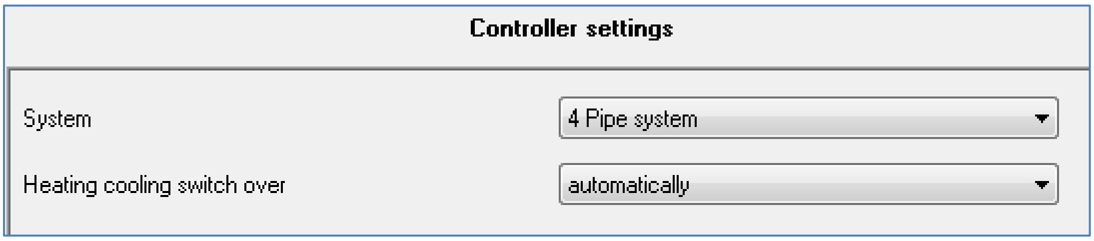

Figure 25: Heating & Cooling

The following chart shows the dynamic range, when the controller type is adjusted as heating and cooling:

ETS-text	Dynamic range **[default value]**	comment
System	▪ **2 Pipe system** ▪ 4 Pipe system	Setting for combined or divided heating and cooling circuits
Heating/cooling switch over	▪ **automatically** ▪ via object	Selection between manual and automatic switch over

Table 39: Heating & Cooling

When the controller type is chosen as heating and cooling, the upper shown settings are available. By the setting for the system, the used system can be chosen. When a combined heating and cooling system is used, the setting 2 Pipe system must be chosen. When a divided system for heating and cooling is used, the setting 4 Pipe system must be chosen.
Furthermore it is possible to choose between an automatic and a manual switch over.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

2 Pipe system

At a common pipe system for heating and cooling, only one communication object for the control value is available. Before changing between heating and cooling, a switchover must occur. The control value can also have only one controller (PI-continuous, PI-switching, 2-Step control). Also the direction must be identical for heating and cooling. But the parameter for the heating and cooling process can be defined individually (as described from 4.5.2 to 4.5.4).

The following illustration shows the setting option for a 2 Pipe system:

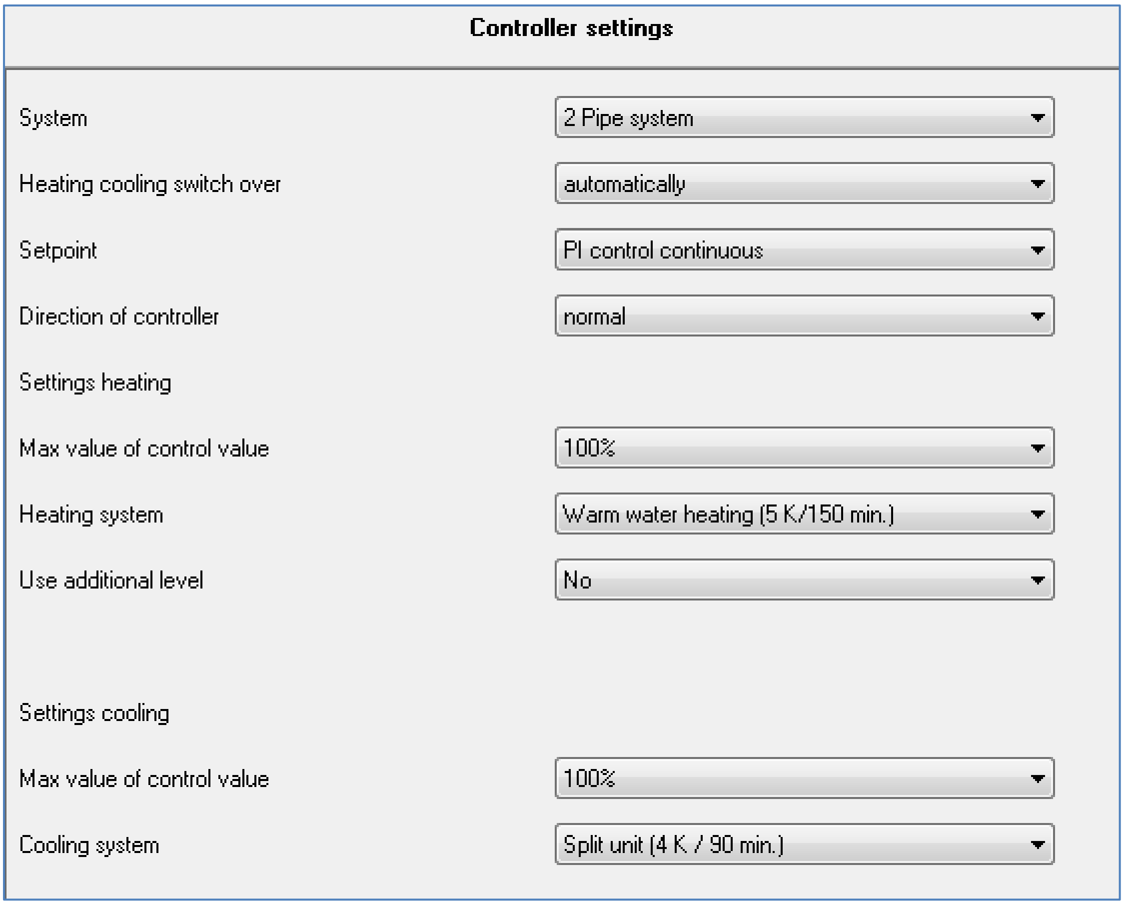

Figure 26: 2 Pipe system

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

4 Pipe system

When a divided pipe system is used, both operations can be parameterized individually. Consequently two communication objects for the control value exist. So it is possible, to control the heating process e.g. via a PI-control continuous and the cooling process e.g. via a 2-step control, because both processes are controlled by different devices. So for every of the both processes are the settings available, which are described from “3.2.4 Controller settings”.

The following illustration shows the setting options for a 4 Pipe system:

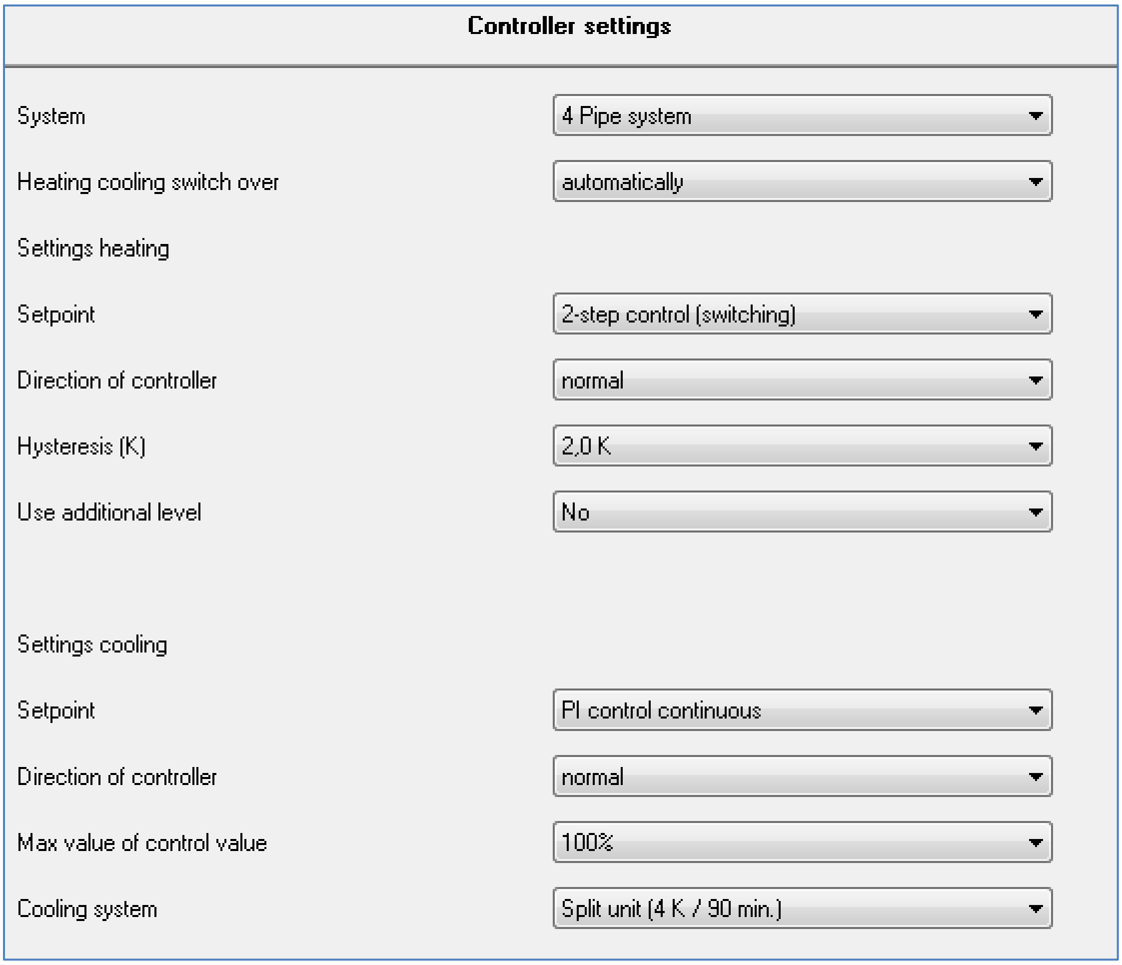

Figure 27: 4 Pipe system

Switchover heating and cooling

By the setting “heating/cooling switch over” it is possible to adjust whether the controller shall switch automatically or via communication object. At the automatic switchover, the controller evaluates the setpoints and knows because of the adjusted setpoints in which mode the controller is at the moment. When the controller heated before, the controller switches over when the measured temperature rises over the adjusted setpoint for cooling. As long as the controller is at the dead zone between heating and cooling, the heating process remains set, but does not heat as long as the temperature is above the adjusted setpoint for heating.
By choosing the switchover via object, an additional communication object is shown. By this object the switchover can be done. The controller stays as long at the adjusted operating mode until it becomes a signal via the according communication object. As long as the controller is at the heating mode only the setpoint for the heating is watched, also if the controller is, according to its setpoints, already at the cooling mode. A start of the cooling mode is also only possible, when the controller becomes a signal via the communication object.
A “0” switches the heating process on and a “1” switches the cooling process on.

The following chart shows the relevant communication object:

Number	Name	Length	Usage
18	Heating/Cooling switchover	1 Bit	Switchover between heating and cooling 0=heating; 1=cooling

Table 40: Communication object heating and cooling

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

4 Air quality controller

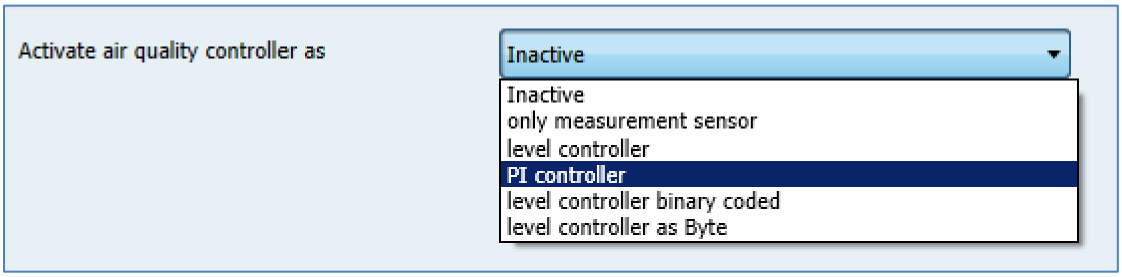

Figure 28: Activation air quality controller

The air quality controller can be activated in different modes. According to the activated mode, the relevant submenus are shown.
The following modes are available:

- **Only Measurement sensor**
  By choosing this setting, only the measurement is active. So only the submenu for the C02 measurement is shown.
- **Level Controller**
  By choosing this setting, the measurement, the level controller and the light control is activated and the relevant menus are shown.
- **PI Controller**
  By choosing this setting, the measurement, the PI controller and the light control is activated and the relevant menus are shown.
- **Level Controller binary coded**
  By choosing this setting, the measurement, the level controller binary coded and the light control is activated and the relevant menus are shown.
- **Level Controller as Byte**
  By choosing this setting, the measurement, the level controller with percental output and the light control is activated and the relevant menus are shown.

4.1 Communication Objects

4.1.1 Summary and Usage

Nr.	Name	Object function	Data type	Direction	Info	Usage	Tip
Objects for CO2 measurement:							
34	Air quality controller	Transmit C02 value	DPT 9.008	sending	Sensor sends measured value	Visualization, Input for Controller	Object is always shown when air quality controller is active
35	Air quality controller	Receive external measured value	DPT 9.008	receive	Input for an external C02 sensor	external C02 Sensor	Object is only shown if sensor is set to at least 10% external sensor
36	Air quality controller	Exceed max value	DPT 1.001	sending	Sends a 1 if measured value is higher than adjusted max value	Visualization, LED Display, Additional stage	Object is always shown when air quality controller is active
37	Air quality controller	Undershot min value	DPT 1.001	sending	Sends a 1 if measured value is lower than adjusted min value	Visualization, LED Display, Additional stage	Object is always shown when air quality controller is active

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Objects air quality controller:

38	Air quality controller	Set setpoint	DPT 9.008	receive	Sending a new set point	Visualization, Display	Object is shown if air quality controller is activated with PI controller
39	Air quality controller	Actual setpoint	DPT 9.008	sending	Sending the current set point	Visualization, Diagnostic	Object is shown if air quality controller is activated with PI controller
40	Air quality controller	Block controller	DPT 1.003	receive	Object blocks the control value	Push Button, Visualization	Object must be activated in the menu for the controller settings. Block object can be activated for PI-controller and level controller.
41	Air quality controller	Output control value	DPT 5.001	sending	Sending the current control value in %	Fan-Coil Actuator, Ventilator regulation …	Object for sending a continuous control value. Is only shown at PI-controller and Level controller as Byte.
42	Air quality controller	Output level 1	DPT 1.001	sending	Switching of the first output level	Fan-Coil Actuator, controlling Ventilation levels	Object is shown at air quality controller as level controller
42	Air quality controller	Output level Bit 0	DPT 1.001	sending	Switching output stage	Fan-Coil Actuator with binary coded input	Object is shown at air quality controller as level controller binary coded

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

43	Air quality controller	Output level 2	DPT 1.001	sending	Switching of the second output level	Fan-Coil Actuator, controlling Ventilation levels	Object is shown at air quality controller as level controller
43	Air quality controller	Output level Bit 1	DPT 1.001	sending	Switching output stage	Fan-Coil Actuator with binary coded input	Object is shown at air quality controller as level controller binary coded
44	Air quality controller	Output level 3	DPT 1.001	sending	Switching of the third output level	Fan-Coil Actuator, controlling Ventilation levels	Object is shown at air quality controller as level controller
44	Air quality controller	Output level Bit 2	DPT 1.001	sending	Switching output stage	Fan-Coil Actuator with binary coded input	Object is shown at air quality controller as level controller binary coded
45	Air quality controller	Output level 4	DPT 1.001	sending	Switching of the fourth output level	Fan-Coil Actuator, controlling Ventilation levels	Object is shown at air quality controller as level controller
49	Air quality controller	Switching Day/Night	DPT 1.001	receive	Switchover between Day/night	Push Button, Timer, Visualization…	Object is shown when Air quality controller is activated as level controller (byte/binary coded) or as PI Controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Objects for Light control:							
50	Air quality controller	Green light	DPT 1.001	sending	switches according to the adjusted threshold value	LED-Display, Visualization, Generating alarms…	Object is shown when light control is active. Light control is available for all ways of controlling.
51	Air quality controller	Yellow light	DPT 1.001	sending	switches according to the adjusted threshold value	LED-Display, Visualization, Generating alarms…	Object is shown when light control is active. Light control is available for all ways of controlling.
52	Air quality controller	Orange light	DPT 1.001	sending	switches according to the adjusted threshold value	LED-Display, Visualization, Generating alarms…	Object is shown when light control is active. Light control is available for all ways of controlling.
53	Air quality controller	Red light	DPT 1.001	sending	switches according to the adjusted threshold value	LED-Display, Visualization, Generating alarms…	Object is shown when light control is active. Light control is available for all ways of controlling.
Alarm-Objects:							
54	Air quality controller	internal sensor fault	DPT 1.001	sending	sends a 1 when an error of the internal sensor was detected	LED-Display, Visualization, Generating alarms…	Object is always shown when air quality sensor is active
55	Air quality controller	external sensor fault	DPT 1.001	sending	sends a 1 when an error of the external sensor was detected	LED-Display, Visualization, Generating alarms…	Object is only shown if sensor is set to at least 10% external sensor

Table 41: Communication objects air quality sensor

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1 • Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

4.1.2 Default settings of the communication objects

The following chart shows the default settings of the communication objects:

Default settings									
Nr.	**Name**	**Function**	**Length**	**Priority**	**K**	**L**	**S**	**Ü**	**A**
34	Air quality controller	Transmit C02 value	2 Byte	Low	X	X		X	
35	Air quality controller	Receive external measured value	2 Byte	Low	X		X		
36	Air quality controller	Exceed max value	1 Bit	Low	X	X		X	
37	Air quality controller	Undershot min value	1 Bit	Low	X	X		X	
38	Air quality controller	Set setpoint	2 Byte	Low	X		X		
39	Air quality controller	Actual setpoint	2 Byte	Low	X	X		X	
40	Air quality controller	Block controller	1 Bit	Low	X		X		
41	Air quality controller	Output control value	1 Byte	Low	X	X		X	
42	Air quality controller	Output level 1	1 Bit	Low	X			X	
42	Air quality controller	Output level Bit 0	1 Bit	Low	X			X	
43	Air quality controller	Output level 2	1 Bit	Low	X			X	
43	Air quality controller	Output level Bit 1	1 Bit	Low	X			X	
44	Air quality controller	Output level 3	1 Bit	Low	X			X	
44	Air quality controller	Output level Bit 2	1 Bit	Low	X			X	
45	Air quality controller	Output level 4	1 Bit	Low	X			X	
49	Air quality controller	Switching Day/Night	1 Bit	Low	X		X		
50	Air quality controller	Green light	1 Bit	Low	X	X		X	
51	Air quality controller	Yellow light	1 Bit	Low	X	X		X	
52	Air quality controller	Orange light	1 Bit	Low	X	X		X	
53	Air quality controller	Red light	1 Bit	Low	X	X		X	
54	Air quality controller	internal sensor fault	1 Bit	Low	X			X	
55	Air quality controller	external sensor fault	1 Bit	Low	X			X	

Table 42: Default settings communication objects

You can see the default values for the communication objects from the upper chart. According to requirements the priority of the particular communication objects as well as the flags can be adjusted by the user. The flags allocates the function of the objects in the programming thereby stands C for communication, R for Read, W for write, T for transmit and U for update.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

4.2 Reference ETS Parameter

4.2.1 CO2 Measurement

The following image shows the available settings at the menu C02 measurement:

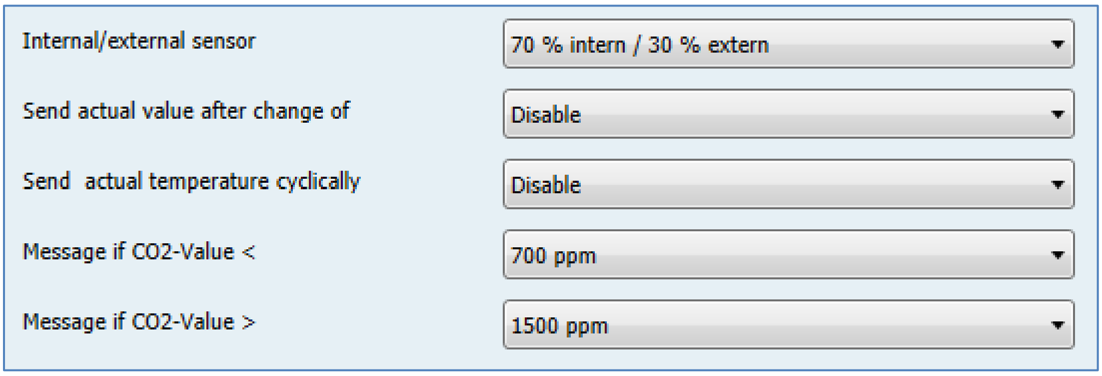

Figure 29: Menu C02 Measurement

The following parameter are available:

ETS-text	Dynamic range **[default value]**	comment
Internal/external sensor	▪ **100% intern** ▪ 90% intern / 10% extern ▪ … ▪ 10% intern / 90% extern ▪ 100% extern	Adjusts the ratio how the measured value is calculated from internal and external sensor
Send actual value after change of	▪ **Disable** ▪ 2% ▪ 5% ▪ 10% ▪ 20%	Adjusts at which change the actual C02 value is sent
Send actual temperature cyclically	▪ **Disable** ▪ 1min – 60min	Activates the cyclic sending of the C02 value
Message if CO2-Value <	400ppm-2000ppm **[700ppm]**	Activates a message when the measured value falls below the adjusted value
Message if CO2-Value >	400ppm-2000ppm **[1500ppm]**	Activates a message when the measured value is higher the adjusted value

Table 43: Parameter C02 Measurement

Sensor internal/external
This parameter defines the percental calculation of the measuring value from an external and the internal value. If the ventilation system should be controlled by the average of the C02 measuring values from the kitchen and the living room, the parameter "Sensor internal/external" must be set to 50% intern/50% extern. The measuring value of the external sensor must be connected to the object 35 "Receive external measured value" in one group address. The sending behavior of the external sensor should be set to cyclically with a time period of 5min and at changes for best results.
Send actual value after change of
This parameter defines the percental change, when the measured value shall be send at the object 34.
Send actual value cyclically
This parameter defines in which time periods the value should be send on the object 34. The output is independent of a change of the value.
Message if CO2 Wert </>
This parameter defines the threshold for the Min and Max values. If the measured value falls below the minimum value a 1 is sent from the object 37. If the value exceeds the maximum value a 1 is sent from the object 36.

The following chart shows the communication objects for the C02 measurement

Number	Name	Length	Usage
34	Transmit C02 value	2 Byte	Sending the actual C02 value
35	Receive external measured val	2 Byte	Input for the external measured C02 value
36	Exceed max. value	1 Bit	Sending a message if adjusted value is exceeded
37	Undershot min. value	1 Bit	Sending a message if value falls below adjusted lower threshold

Table 44: Communication objects C02 measurement

Attention: The C02 measurement needs after a reset up to 7 minutes until sending its first value. Only in this way an error free operation can be guaranteed!

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

4.2.2 Light control

The following figure shows the available settings for the light control:

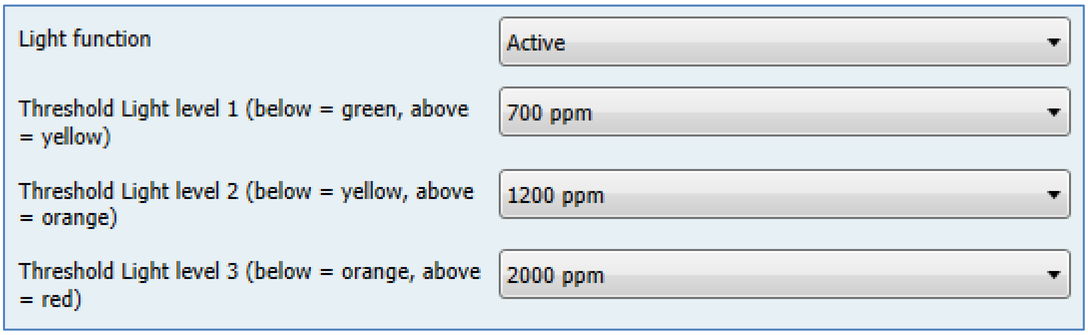

Figure 30: Menu light control

The following parameters are available:

ETS-text	Dynamic range **[default value]**	comment
Light function	▪ Active ▪ **Inactive**	activates the light control
Threshold light level 1 (below = green, above = yellow)	400ppm-2000ppm **[700ppm]**	defines the threshold between green and yellow
Threshold light level 2 (below = yellow, above = orange)	400ppm-2000ppm **[1200ppm]**	defines the threshold between yellow and orange
Threshold light level 3 (below = orange, above = red)	400ppm-2000ppm **[1500ppm]**	defines the threshold between orange and red

Table 45: Parameter light control

The light control offers an easy option for supervising the air quality in a room and sending messages, alarms or causing actions. Three thresholds can be defined, which result in 4 different states.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

The following figure shows the principle of the light control:

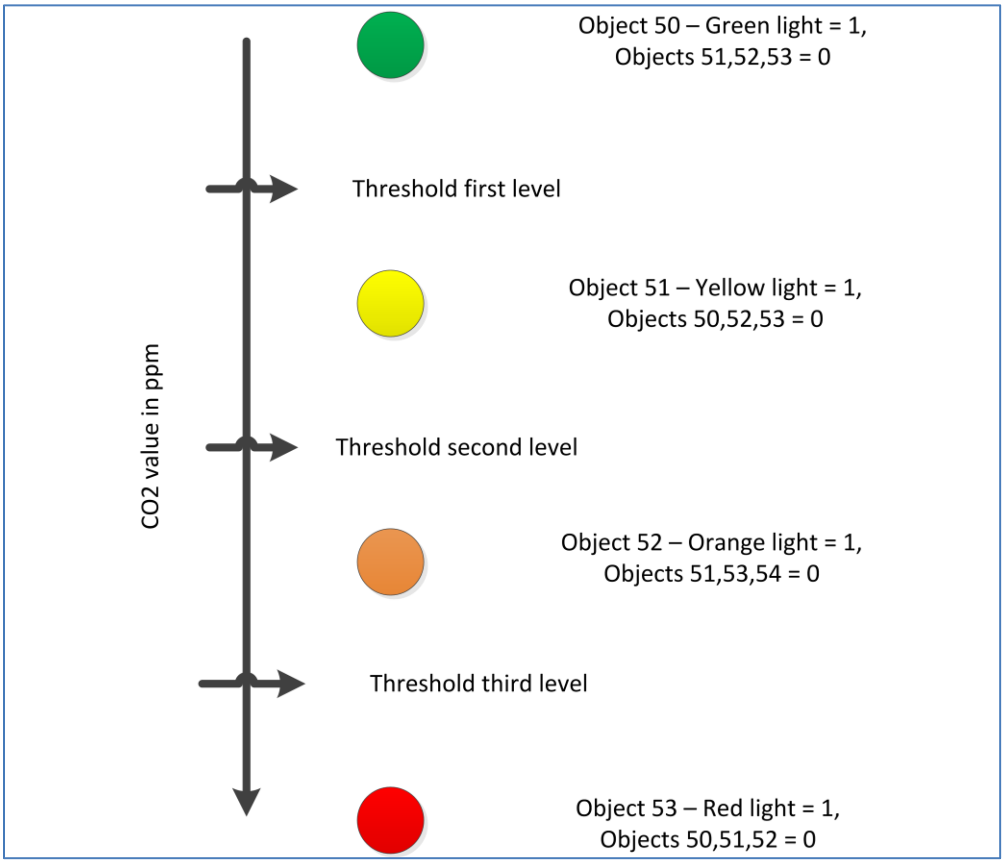

Figure 31: Light control

The following table shows the available communication objects for the light control:

Number	Name	Length	Usage
50	Green light	1 Bit	Showing a green light = C02 value below first threshold
51	Yellow light	1 Bit	Showing a yellow light = C02 value above first threshold and below second threshold
52	Orange light	1 Bit	Showing a orange light = C02 value above second threshold and below third threshold
53	Red light	1 Bit	Showing a red light = C02 value above third threshold

Table 46: Communication objects light control

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

4.2.3 Level controller

The following figure shows the available settings for the level controller:

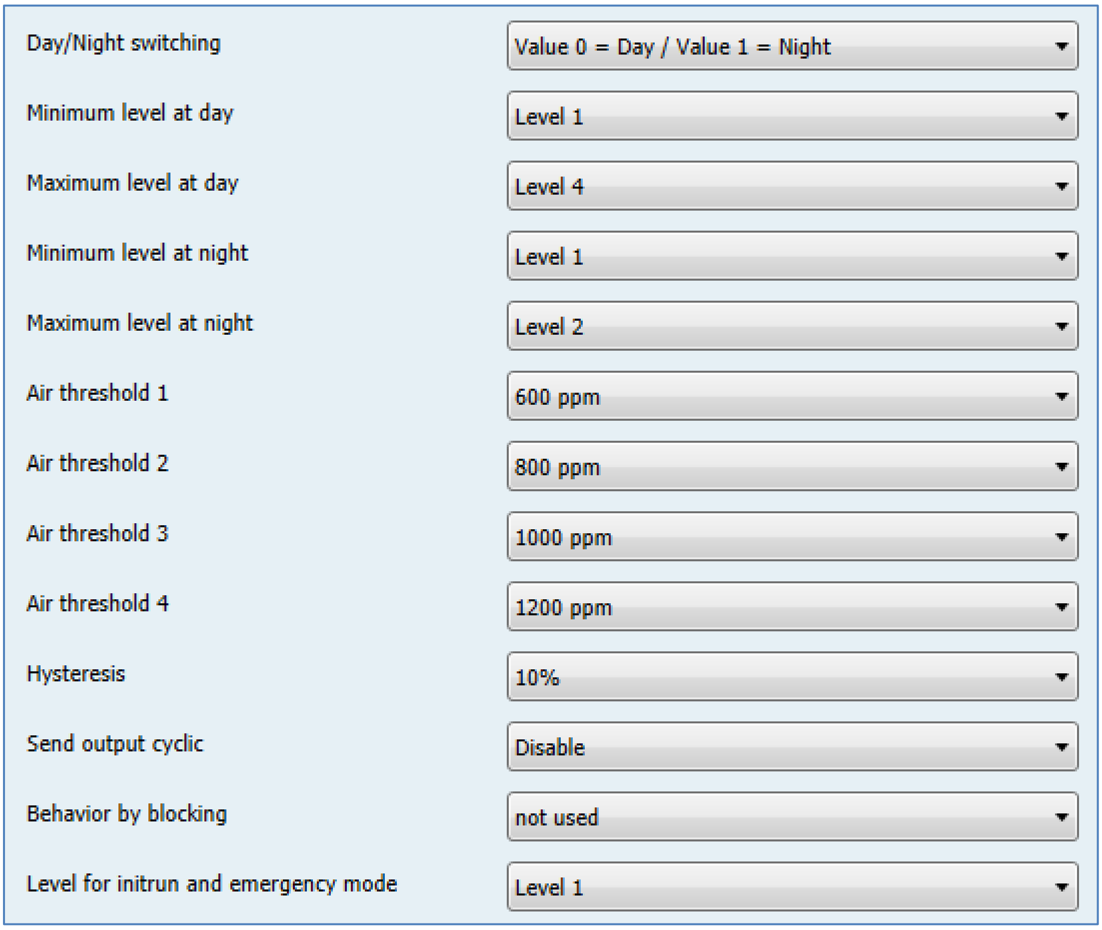

Figure 32: Menu level controller

Day/Night switchover

The following parameters are available:

ETS-text	Dynamic range **[default value]**	comment
Day/Night switching	▪ **Value 0 = Day/Value 1 = Night** ▪ Value 0 = Night/Value 1 = Tag	defines the polarity of the Day/Night object
Minimum level at day	▪ Level 0 ▪ **Level 1** ▪ Level 2 ▪ Level 3 ▪ Level 4	defines the minimum level at mode day
Maximum level at day	▪ Level 0 ▪ Level 1 ▪ Level 2 ▪ Level 3 ▪ **Level 4**	defines the maximum level at mode day
Minimum level at night	▪ Level 0 ▪ **Level 1** ▪ Level 2 ▪ Level 3 ▪ Level 4	defines the minimum level at mode night
Maximum level at night	▪ Level 0 ▪ Level 1 ▪ **Level 2** ▪ Level 3 ▪ Level 4	defines the maximum level at mode night

Table 47: Day/Night switchover level controller

The day/night switchover limits the minimum/maximum level for the day/night mode. If the ventilation should run at night with only a lower level for limiting the noise or the supply air, this can be realized by using this parameter.

The following table shows the relevant communication object:

Number	Name	Length	Usage
49	Switching Day/Night	1 Bit	Switching between day and night mode

Table 48: Communication object Day/Night switchover#

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Output level controller

The following parameters are available:

ETS-text	Dynamic range **[default value]**	comment
Air threshold 1	400ppm – 2000ppm **[600ppm]**	Below this threshold all levels are switched off, above this threshold level 1 is switched on
Air threshold 2	400ppm – 2000ppm **[800ppm]**	Below this threshold level 1 is switched on, above this threshold level 2 is switched on
Air threshold 3	400ppm – 2000ppm **[1000ppm]**	Below this threshold level 2 is switched on, above this threshold level 3 is switched on
Air threshold 4	400ppm – 2000ppm **[1200ppm]**	Below this threshold level 3 is switched on, above this threshold level 4 is switched on
Hysteresis	10%-50% **[10%]**	Hysteresis for the switchover of the output stage
Send output cyclic	▪ **Disable** ▪ 1 min – 60 min	Parameter activates the cyclic sending of all 4 output objects

Table 49: Parameter output level controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

The following figure shows the switching behavior of the outputs as a function of the threshold values:

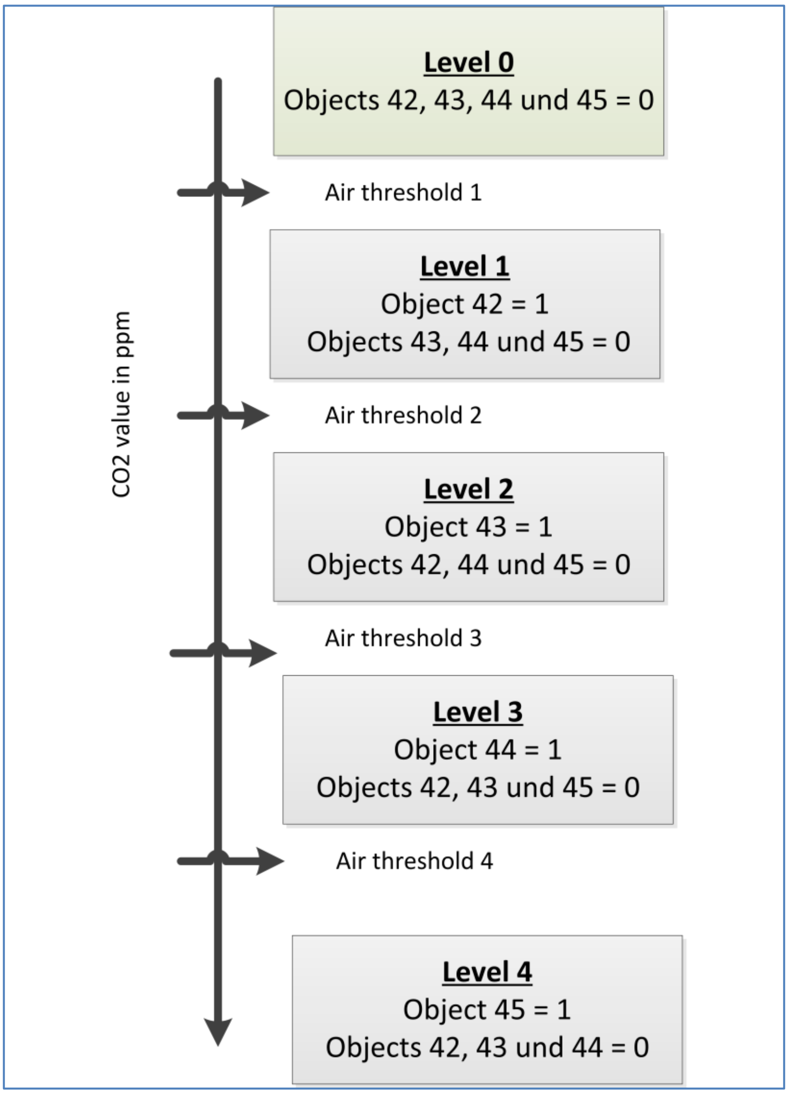

Figure 33: Level controller

Hysteresis
The hysteresis is used to avoid frequent switching. So would be switched with a hysteresis of 10% and a threshold of 600ppm at 660ppm and 540ppm.

Send output cyclic
With this parameter, the cyclic sending of the outputs can be activated. In this case, all output states according to the adjusted time are sent cyclically.

The following table shows the relevant communication objects:

Number	Name	Length	Usage
42	Output level 1	1 Bit	Switching of the first output level
43	Output level 2	1 Bit	Switching of the second output level
44	Output level 3	1 Bit	Switching of the third output level
45	Output level 4	1 Bit	Switching of the fourth output level

Table 50: Communication objects output level controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Block function

The following parameters are available:

ETS-text	Dynamic range **[default value]**	comment
Behavior by blocking	▪ **not used** ▪ hold value ▪ send a specific value	Adjustment of the behavior by blocking
Level by blocking	▪ Level 0 ▪ **Level 1** ▪ Level 2 ▪ Level 3 ▪ Level 4	If the setting „send a specific value“ is adjusted , the output level which should be called can be selected.

Table 51: Parameter Block function

The settings cause the following actions:

- **not used**
  Block function is deactivated and no object is shown.
- **hold value**
  The current level is hold at activating the block function and will not be changed as long as the block function is active.
- **send a specific value**
  The adjusted level is called by activating the blocking function.

The following table shows the relevant communication objects for the blocking function.

Number	Name	Length	Usage
40	Block controller	1 Bit	Blocks the output of the level controller

Table 52: Communication object blocking function level controller

Initrun and emergency mode

The parameter initrun and emergency mode defines the stage which is switched after a reset or sensor fault.

The following parameter is available:

ETS-text	Dynamic range **[default value]**	comment
Level for initrun and emergency mode	▪ Level 0 ▪ **Level 1** ▪ Level 2 ▪ Level 3 ▪ Level 4	defines the output level at reset or a sensor fault

Table 53: Parameter initrun and emergency mode

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

4.2.4 Level controller binary coded

The level controller binary-coded is described by its functionality identical to the normal level controller as described in 4.2.3 Level controller. Only the output stage is already being transmitted binary coded. In this case, the object 42 is bit 0, the object 43 and object 44, the bit 1, bit 2
The binary coded switching is shown at the following table:

normal level controller	binary value	binary coded level controller
Level 0	000	Object 42, 43 ,44 = 0
Level 1	001	Object 42 = 1, Objects 43 & 44 = 0
Level 2	010	Object 43 = 1 ,Objects 42 & 44 = 0
Level 3	011	Objects 42 & 43 = 1, Object 44 = 0
Level 4	100	Object 44 = 1 ,Objects 42 & 43 = 0

Table 54: Level controller binary coded

The following table shows the relevant communication objects:

Number	**Name**	**Length**	**Usage**
42	Output level Bit 0	1 Bit	Set Bit 0
43	Output level Bit 1	1 Bit	Set Bit 1
44	Output level Bit 2	1 Bit	Set Bit 2

Table 55: Communication objects binary coded level controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

4.2.5 Level controller as Byte

The "Level controller as Byte" has a steady output, however, in contrast to PI control does not regulate dynamically. 4 levels can be defined for each an absolute percentage value can be specified. The 5th level is the Off-state.

The following figure shows the available settings in the menu level controller as byte:

Day/Night switching	Value 0 = Day / Value 1 = Night
Minimum value at day	10%
Maximum value at day	100%
Minimum value at night	10%
Maximum value at night	30%
Air threshold 1	600 ppm
Output value at day	0%
Output value at night	0%
Air threshold 2	800 ppm
Output value at day	0%
Output value at night	0%
Air threshold 3	1000 ppm
Output value at day	0%
Output value at night	0%
Air threshold 4	1200 ppm
Output value at day	0%
Output value at night	0%
Hysteresis	10%
Send output cyclic	Disable
Behavior by blocking	not used
Value for initrun and emergency mode	20%

Figure 34: Level controller as byte

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Day/Night switchover

The following parameters are available:

ETS-text	Dynamic range **[default value]**	comment
Day/Night switching	▪ **Value 0 = Day/Value 1 = Night** ▪ Value 0 = Night/Value 1 = Tag	defines the polarity of the Day/Night object
Minimum level at day	0-100% **[10%]**	defines the minimum value at mode day
Maximum level at day	0-100% **[100%]**	defines the maximum value at mode day
Minimum level at night	0-100% **[10%]**	defines the minimum value at mode night
Maximum level at night	0-100% **[30%]**	defines the maximum value at mode night

Table 56: Switching Day/Night-Level controller as byte

With the day / night switching and the associated Minimum / Maximum output level, ventilation control can be limited. If, for example, the fan should run in night mode only with 30%, for reducing the noise level of ventilation or to minimize avoid drafts, so this can be realized with these parameter.

The following table shows the relevant communication objects:

Number	Name	Length	Usage
49	Switching Day/Night	1 Bit	Switching between Day/Night mode

Table 57: Communication object Day/night switchover - Level controller as byte

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Output level controller as byte

The following settings are available:

ETS-text	Dynamic range **[default value]**	comment
Air threshold 1	400ppm – 2000ppm **[600ppm]**	Below this threshold the output is switched off, above this threshold level 1 is switched on
Output value at day	0-100%	Value for the first level at day mode
Output value at night	0-100%	Value for the first level at night mode
Air threshold 2	400ppm – 2000ppm **[800ppm]**	Above this threshold level 2 is switched on
Output value at day	0-100%	Value for the second level at day mode
Output value at night	0-100%	Value for the second level at night mode
Air threshold 3	400ppm – 2000ppm **[1000ppm]**	Above this threshold level 3 is switched on
Output value at day	0-100%	Value for the third level at day mode
Output value at night	0-100%	Value for the third level at night mode
Air threshold 4	400ppm – 2000ppm **[1200ppm]**	Above this threshold level 4 is switched on
Output value at day	0-100%	Value for the fourth level at day mode
Output value at night	0-100%	Value for the fourth level at night mode
Hysteresis	10%-50% **[10%]**	Hysteresis for the switchover of the output stage
Send output cyclic	▪ **not used** ▪ 1 min – 60 min	Parameter activates the cyclic sending of all 4 output objects

Table 58: Parameter output - Level controller as byte

Hysteresis
The hysteresis is used to avoid frequent switching. So would be switched with a hysteresis of 10% and a threshold of 600ppm at 660ppm and 540ppm.
Send output cyclic
With this parameter, the cyclic sending of the outputs can be activated. In this case, all output states according to the adjusted time are sent cyclically.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

If, for example, chosen the following parameters:

Air threshold 1	600 ppm
Output value at day	30%
Output value at night	10%
Air threshold 2	800 ppm
Output value at day	50%
Output value at night	30%
Air threshold 3	1000 ppm
Output value at day	75%
Output value at night	40%
Air threshold 4	1200 ppm
Output value at day	100%
Output value at night	50%

So that would result in the following output states:

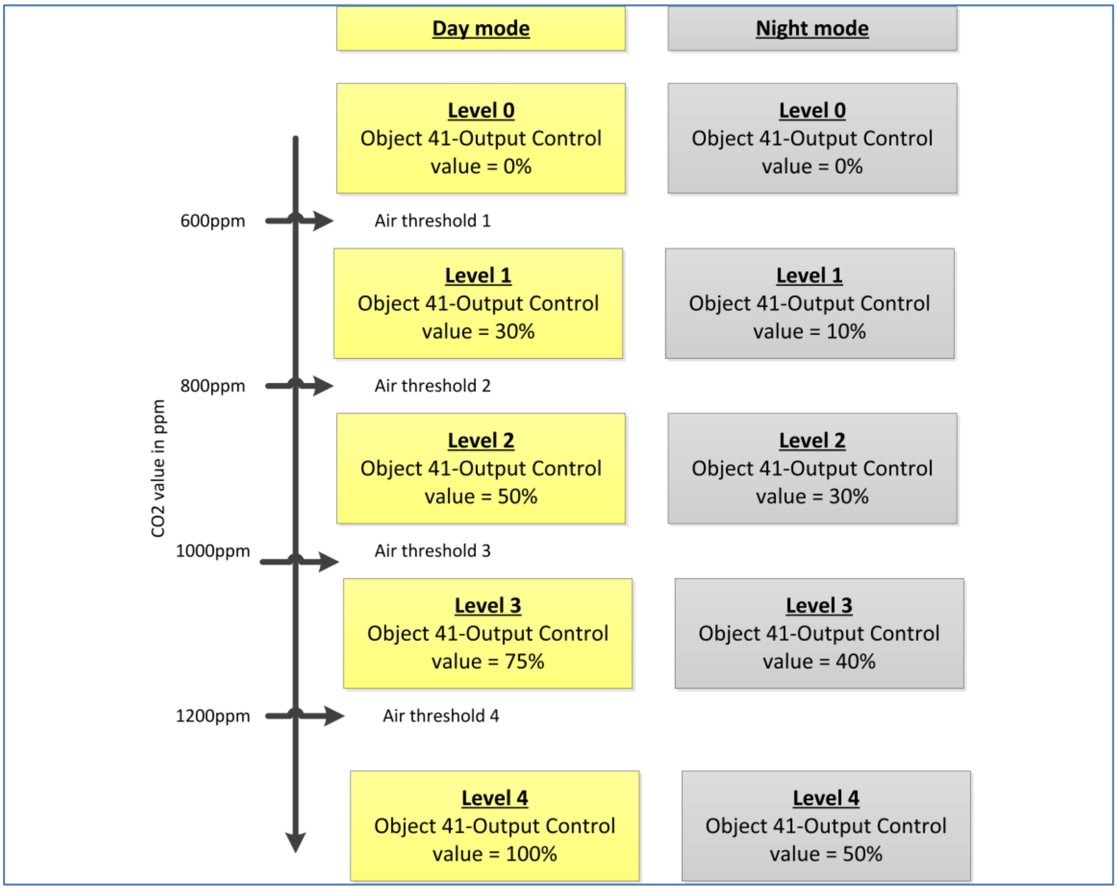

Figure 35: Example output - Level controller as byte

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

However, please note that the settings for the Minimal-/Maximal-value for day / night operation are paramount and can limit the settings for the output.
The following table shows the relevant communication objects:

Number	**Name**	**Length**	**Usage**
41	Output control value	1 Byte	Control value for actuator

Table 59: Communication object output - Level Controller as byte

Block function

The following settings are available:

ETS-text	Dynamic range **[default value]**	comment
Behavior by blocking	▪ **not used** ▪ hold value ▪ send a specific value	Adjustment of the behavior by blocking
Level by blocking	0-100% **[0%]**	If the setting „send a specific value“ is adjusted , the output level which should be called can be selected.

Table 60: Parameter Block function - Level controller as byte

The settings cause the following actions:

- **not used**
  Block function is deactivated and no object is shown.
- **hold value**
  The current level is hold at activating the block function and will not be changed as long as the block function is active.
- **send a specific value**
  The adjusted level is called by activating the blocking function.

The following table shows the relevant communication objects for the blocking function.

Number	**Name**	**Length**	**Usage**
40	Block controller	1 Bit	Blocks the output of the level controller

Table 61: Communication object blocking function level controller

Initrun and emergency mode

The parameter initrun and emergency mode defines the stage which is switched after a reset or sensor fault.
The following parameter is available:

ETS-text	Dynamic range **[default value]**	comment
Level for initrun and emergency mode	0-100% **[20%]**	defines the output level at reset or a sensor fault

Table 62: Parameter initrun and emergency mode

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

4.2.6 PI-Controller

The PI-Controller sends a steady control value in the same way like the “Level controller as byte”. Its output object is thus also a 1-byte value. In contrast to the stage controller as a byte, however, the PI controller calculates its value as a function of the difference between the adjusted set point and actual value, including the control parameters proportional and integral value.

The following figure shows the available settings in the menu PI-controller:

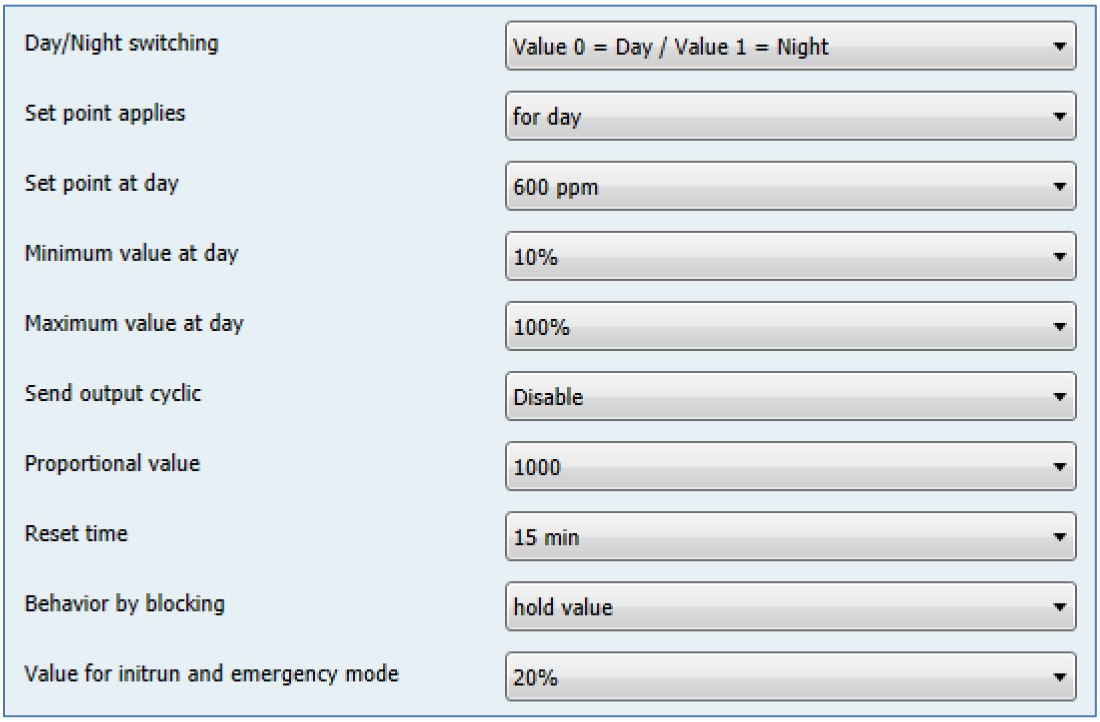

Figure 36: Parameter PI-Controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Day/Night Switchover and set points

The following settings are available:

ETS-text	Dynamic range **[default value]**	comment
Day/Night switching	▪ **Value 0 = Day/Value 1 = Night** ▪ Value 0 = Night/Value 1 = Tag	defines the polarity of the Day/Night object
Set point applies	▪ **for day** ▪ for night ▪ for day and night ▪ until changing day/night	Setting for which mode the set point, and is thus the controller shall be activated.
Set point at day	400-2000ppm **[600ppm]**	Adjustment of the set point for the day mode
Set point at night	400-2000ppm **[700ppm]**	Adjustment of the set point for the night mode
Minimum value at day	0-100% **[10%]**	defines the minimum stage for the day mode
Maximum value at day	0-100% **[100%]**	defines the maximum stage for the day mode
Minimum value at night	0-100% **[10%]**	defines the minimum stage for the night mode
Maximum value at night	0-100% **[30%]**	defines the maximum stage for the night mode

Table 63: Parameter Day/Night switchover - PI-Controller

Set points
The parameter „Set point applies“ adjusts when a set point is valid.
The setting causes the following actions:

- **for day**
  A set point can only be adjusted for the day mode. In the night mode, the controller is switched off.
- **for night**
  A set point can only be adjusted for the night mode. In the day mode, the controller is switched off.
- **for day and night**
  Two different set points for day and night mode can be adjusted. So the controller is switched on in day and night mode.
- **until changing day/night**
  Setting causes the same behavior as the setting "day and night", with the difference that the manual sending of a new set point via the “object 38 - Set setpoint” when switching between day / night mode is invalid and the parameter value is reloaded.

Via the “object 38 - Set setpoint” a new set point can set via visualization, etc. The new set point is maintained at all settings except for the setting "only to day / night change", see also above description.

Minimum/Maximum value day/night
With the day / night switching and the associated Minimum / Maximum output level ventilation control can be limited. If, for example, the fan should run in night mode only with 30%, for reducing the noise level of ventilation or to minimize avoid drafts, so this can be realized with these parameter. It should be noted that the Minimal-/Maximum values limit the controller and thus the actual value under certain circumstances cannot be fully corrected until the set point.

The following chart shows the relevant communication objects:

Number	Name	Length	Usage
38	Set setpoint	2 Byte	Sending an new absolute set point
39	Actual setpoint	2 Byte	Showing the actual set point
49	Switching Day/Night	1 Bit	Switchover between day/night mode

Table 64: Communciation objects day/night & set points - PI-Controller

Output PI-Controller

For configuring the PI-Controller, the both parameter proportional value and reset time are used:
Proportional value:
The proportional value is the P-component of a controller. The P component of a controlling leads to a proportional increase of the manipulated variable to control difference.
A small proportional band leads to a rapid regulation of the control difference. The controller reacts almost abruptly at a small proportional band and sets the control value, even for small difference between set point and actual value, almost to the maximum (100%). If the proportional band is too small the risk of overshoot is very large.
Reset time:
The integral represents the I-component of a controller. The I-component of a controlling leads to an integral approximation of the actual value to the desired value. Short integral means that the regulator has a strong I-component.
A short reset time has the effect that the control value rapidly approaching the area corresponding to the proportional set control value. A large integral value causes a slow approach to this value.

The following illustration shows the behavior of the PI-Control:

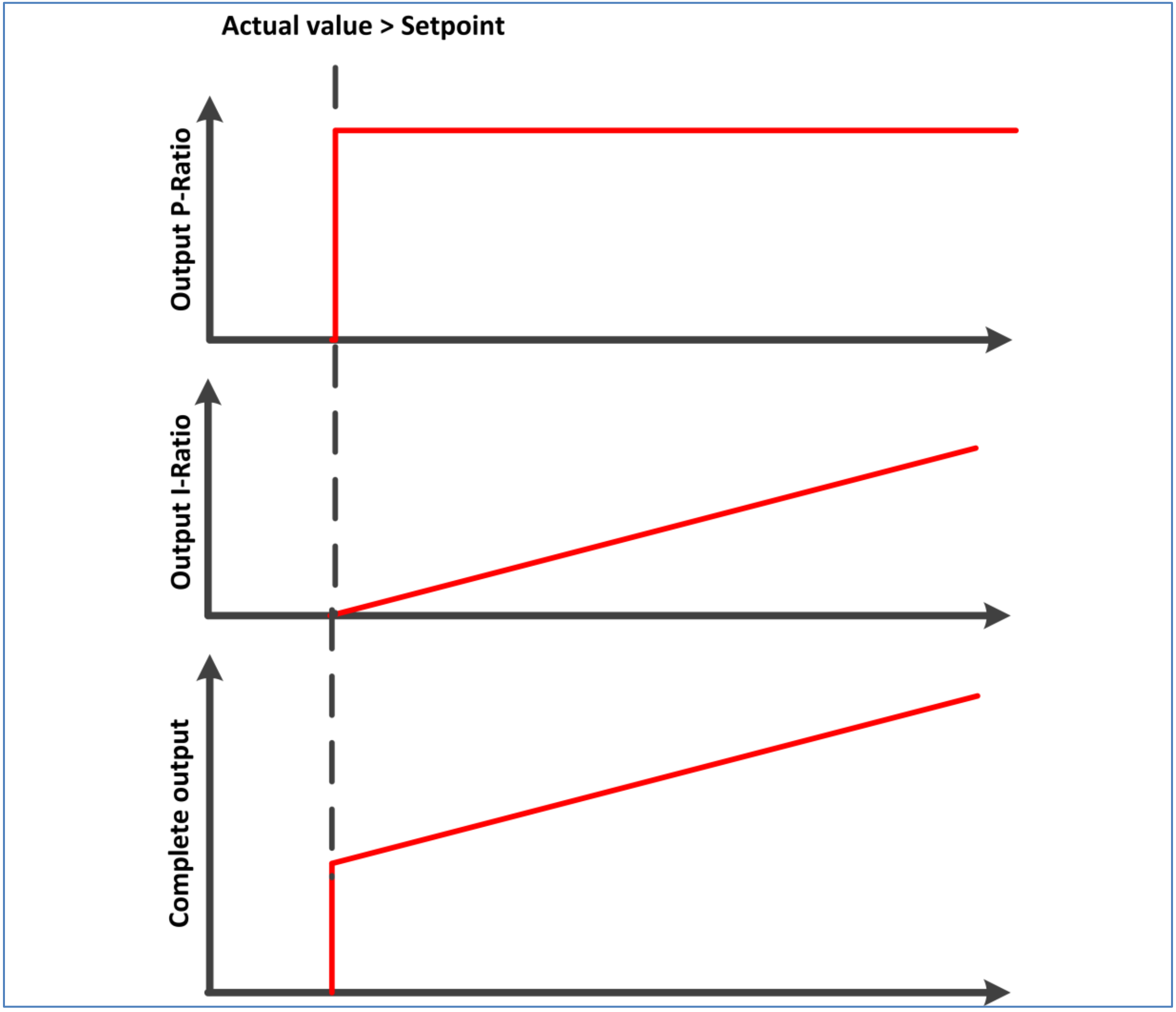

Figure 37: Principle of the PI-Control

The parameter „Send cyclic“ activates cyclic sending of the control value, independent of a change of the control value.

The following chart shows the relevant communication object:

Number	Name	Length	Usage
41	Output control value	1 Byte	Control value for the actuator

Table 65: Communication object output-PI-Controller

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

Block function

The following settings are available:

ETS-text	Dynamic range **[default value]**	comment
Behavior by blocking	▪ **not used** ▪ hold value ▪ send a specific value	Adjustment of the behavior by blocking
Level by blocking	0-100% **[0%]**	If the setting „send a specific value“ is adjusted , the output level which should be called can be selected.

Table 66: Parameter Block function - Level controller as byte

The settings cause the following actions:

- **not used**
  Block function is deactivated and no object is shown.
- **hold value**
  The current level is hold at activating the block function and will not be changed as long as the block function is active.
- **send a specific value**
  The adjusted level is called by activating the blocking function.

The following table shows the relevant communication objects for the blocking function.

Number	Name	Length	Usage
40	Block controller	1 Bit	Blocks the output of the level controller

Table 67: Communication object blocking function level controller

Initrun and emergency mode

The parameter initrun and emergency mode defines the stage which is switched after a reset or sensor fault.
The following parameter is available:

ETS-text	Dynamic range **[default value]**	comment
Level for initrun and emergency mode	0-100% **[20%]**	defines the output level at reset or a sensor fault

Table 68: Parameter initrun and emergency mode

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

5 Index

5.1 List of Illustrations

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

5.2 List of tables

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

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 Routine disposal

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

Risk for life of electrical power!
All activities on the device should only be done by an electrical specialist. The county specific regulations and the applicable EIB-directives have to be observed.

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de

6.4 Datasheet

MDT technologies GmbH • 51766 Engelskirchen • Papiermühle 1
Phone: +49-2263-880 • Fax: +49-2263-4588 • knx@mdt.de • www.mdt.de