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Technical Manual

MDT Heating actuators

AKH – 0400.02

AKH – 0800.02

1 Content

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2 Overview

2.1 Overview devices

The manual refers to the following devices (Order number respectively written in bold letters):

- **AKH-0400.02** Heating actuator 4-fold, 2TE, 24 or 230V AC, MRDC
    - 4 channels for electrothermic valve drives, for the maximum number of electrothermic valve drives have a look at 6.6 Datasheet, detection of 230V AC failure, 230V AC/24V AC short circuit detection of connected load
- **AKH-0800.02** Heating actuator 8-fold, 2TE, 24 or 230V AC, MRDC
    - 8 channels for electrothermic valve drives, for the maximum number of electrothermic valve drives have a look at 6.6 Datasheet, detection of 230V AC failure, 230V AC/24V AC short circuit detection of connected load

Attention: Every actuator can be connected to 230V AC or 24V AC.
A mixture of both voltages is not permitted!

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2.1.1 Special features of the heating actuator

The heating actuators have a very extensive application with specific functions:

Integrated Room temperature controller
The heating can be controlled directly by an actual temperature of the room.
An extensive Room temperature controller is integrated in the device

Extended Scene Function
The extended scene function can, additionally to the set temperature, also switch summer/winter, comfort, night and standby.

Minimum flow temperature
It is possible, e.g. for the bathroom to set a minimum comfort temperature of the floor heating. For this, the ground temperature is measured with an additional floor sensor and maintained at for example 18 degrees. This avoids a "cold" ground in transitional periods.

Extended setpoint value offset
The setpoint value offset can be carried out, addionally to plus/minus (1 bit) and a 2-byte temperature, as well with a 1-byte shift.

Automatic switching heating/cooling
The actuator can automatically switch the heating/cooling mode. For this purpose, one room serves as a reference.

Comfort extension/Presence object
If the actuator is already in night mode, it can be switched for a selectable time back to comfort mode by pressing a key. Alternatively, a presence function can be used

New blinking behaviour
The actuator has a modified blinking behaviour, with which errors can be detected easier.

Plain text diagnosis
The actuator has a plain text diagnostics using a 14-byte object for each channel. Hereby errors can be located in a short time. The current status/error status is displayed here

2.2 Usage & Areas of use

The heating actuator can be connected to 24V AC or 230V AC, so it allows controlling electrothermic valve drives with 24V AC or 230V AC. The heating actuator is available at the design of 4-fold or 8-fold.
Integrated 230V AC failure detection as well as short circuit detection, for both voltage types, at the load allows a high fail-safety. Additional an emergency mode can be adjusted, which gets active when the cyclic control value fails.
The actuator can be controlled as well by a 1 Bit object as by a 1 Byte object. As special feature, the controller contains of an integrated controller, which allows controlling the actuator directly by a temperature value. The integrated controller contains of the 4 operating modes, comfort, night, standby, and frost-/heat protection. The setpoints can be adjusted individual for the single operating modes as well as for the heating and cooling mode.
A limitation of the control value, summer /winter mode as well as a protection of the valves completes the range of service of the heating actuator.

2.3 Exemplary circuit diagram

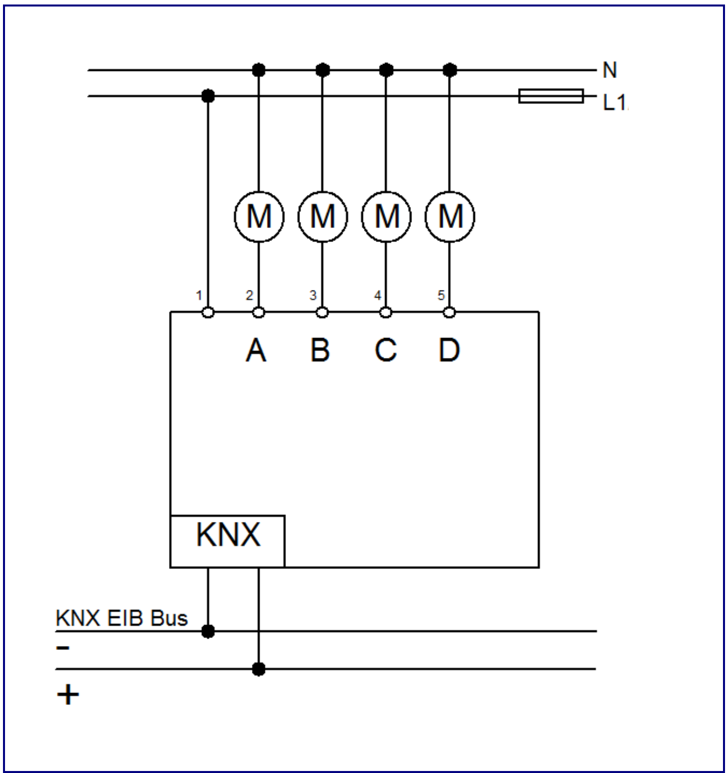

Figure 1: Exemplary circuit diagram heating actuator 4-fold 230V

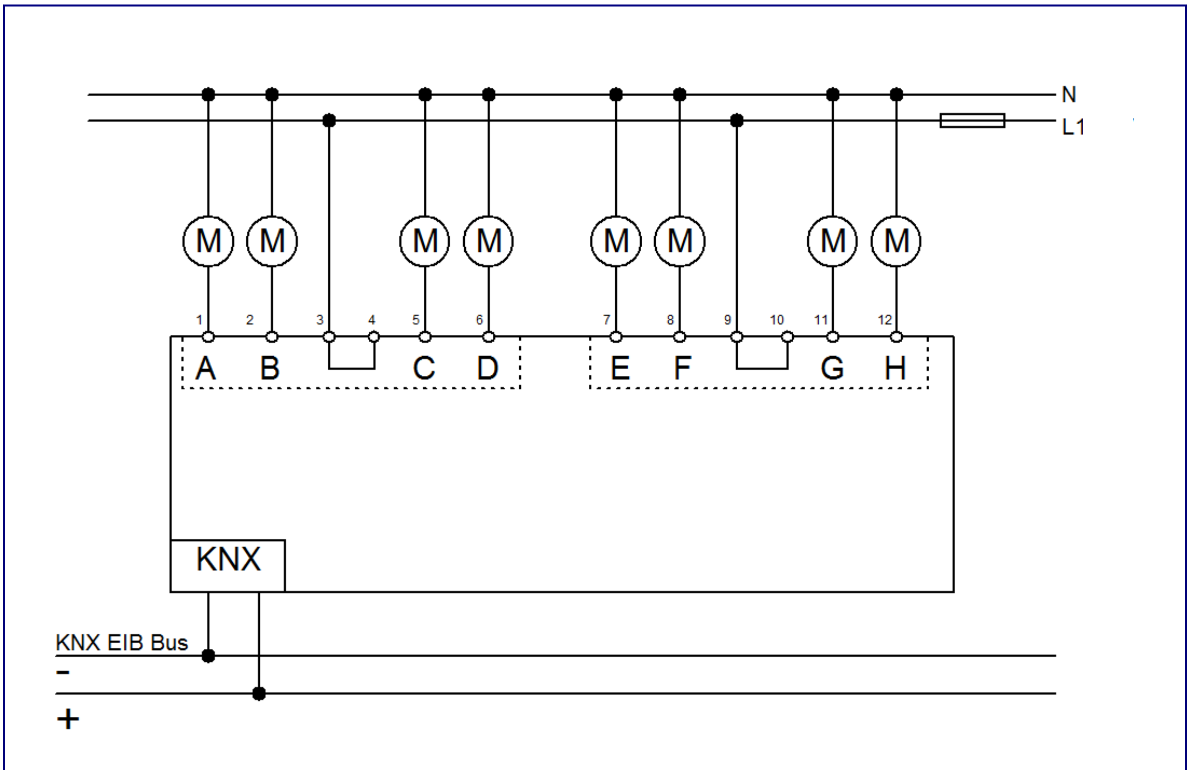

Figure 2: Exemplary circuit diagram heating actuator 4-fold 230V

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2.4 Structure & Handling

The heating actuator, here a 4-fold actuator is shown, contains of the standard elements programming-knob, programming-LED, which shows an active programming mode, and a bus-connection.
The electrothermic valve drives can be connected by the terminal strip with respecting the circuit diagrams.
Every single channel contains of a status-LED, which shows an active channel by a slow flashing. The ratio of on to off corresponds the current control value. A significant faster flashing of the LEDs shows an active disturbance of this channel.

Figure 3: Overview hardware module

2.5 Functions

The functions are identical for all channels. According to the hardware specification, the device contains of up to 8 channels-
The labeling of the channels is in alphabetically consecutive order.
The general settings are the same for all of the channels.
There are 4 possible functions for each channel:

- **Channel not active**
  The channel has no function. So there are not any parameterization options for this channel.

- **switching (1 Bit)**
  The channel works with a 1 Bit value for the control value, e.g. from a two-step controller or a PWM-signal. So the output can only be switched on or off at a change of the 1 Bit Input signal.
  By further options like valve type, activatable blocking objects, activatable emergency mode and dew point alarm as well as status objects, the channel can be adjusted for the present valve type.

- **continuous (1 Byte)**
  The channel works with 1 Byte value for the control value, e.g. from a PI-controller. The Input signal is transmitted to the valve by a PWM-controller with adjustable cycle time.
  Next to the same parameterization options like the 1 Bit input value, the actuator contains of limitations for the control value and the flow temperature at the 1 Byte mode.

- **integrated controller**
  When a channel is selected as integrated controller, the channel creates an own continuous control value from an existing temperature value. This continuous control transmitted to the switching output by a PWM-signal.
  Next to the same parameterization options as by the 1 Byte input value, the actuator contains of a lot additional settings for the controller at the integrated controller mode.

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2.6 Channel-LEDs

Every channel contains of a LED, which shows the current state of the channel. Additional to the status, these LEDs show errors of the channels.
The errors are shown as described below:

- **2x flashing, long break, 2x flashing…**
  The channel is in emergency mode due to missing control value.
- **3x flashing, long break, 3x flashing …**
  At the 230V mode a mains voltage failure can additional be recognized. Because often 4 channels are supplied in common, all 4 channels are flashing.
  At the four fold actuator, the first channel must be always connected to a load. At the 8-fold actuator, additionally the fifth channel must be connected to a load. Otherwise the actuator will switch to the error mode and show this by a flashing off all channel-LEDs.
- **4x flashing, long break, 4x flashing …**
  The belonging channel is at the overload mode or has a short circuit at the output.

The normal behavior of the actuator is also shown via these LEDs as described below:

- **switching mode (1 Bit)**
  The LED shows the switching behavior of the output. If the 2-step controller sends a 1-signal, the LED is switched on.
- **continuous mode (1 Byte)/ integrated controller**
  The LED operates at the PWM mode with the fixed period of 4s and flashes with the cadence of the control value. At a control value of 50%, the LED will shine for 2s and will be off for 2s.

2.7. Settings at the ETS-Software

Selection at the product database

<u>Manufacturer:</u> MDT Technologies
<u>Product family:</u> Actuator
<u>Product type</u>: Heating Actuators
<u>Medium Type:</u> Twisted Pair (TP)
<u>Product name:</u> addicted to the used type, e.g.: AKH-0800.02 Heating actuator 8-fold, 4TE
<u>Order number:</u> addicted to the used type, e.g.: AKH-0800.02

2.8. 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)

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3 Communication objects

3.1 Overview and usage

No.	Name	Object function	Data Point	Direction	Info	Usage	Note
global Objects:							
80/ 160	Summer/Winter	Switchover	DPT 1.001	receive	Actuator reacts to incoming telegram	Buttons, Visu... for manual control	Basic function of the heating actuator, always shown; for switchover between summer and winter mode
81/ 161	Heating/Cooling	Status	DPT 1.100	send	Actuator sends state	Switchover heating/cooling, state	Switchover between heating and cooling or sending the current mode
82/ 162	Heating/Cooling requirement	0 if all valves closed, otherwise 1	DPT 1.002	send	Actuator sends state	Switching of the heating/cooling pump	Sending the heating/cooling requirement for combined systems (2 Pipe system)
82/ 162	Heating requirement	0 if all valves closed, otherwise 1	DPT 1.002	send	Actuator sends state	Switching of the heating pump	Sending the heating requirement for divided systems (4 pipe systems)
83/ 163	Cooling requirement	0 if all valves closed, otherwise 1	DPT 1.002	send	Actuator sends state	Switching of the cooling pump	Sending the cooling requirement for divided systems (4 pipe systems)

84/ 164	Fault	At power failure/short circuit	DPT 1.005	send	Actuator sends error message	Visualization, generating of an error message	Sending an error message; always shown
85/ 165	Max. control value	Output	DPT 5.001	receive	Actuator reacts to incoming telegram	Modelling of the power of the heating/cooling system	Cascading of several heating actuators; is shown when the max control value is activated
86/ 166	Max. control value	Input	DPT 5.001	send	Actuator sends state	another heating actuator	Cascading of several heating actuators; is shown when the max control value is activated
87/ 167	Scene	Activate	DPT 17.001	receive	Actuator reacts to incoming telegram	Buttons, Visu... for manual control	Calling scenes; is shown when scene function is active
88/ 168	Central function	Operating	DPT 1.011	send	Actuator sends state	Error detection, diagnosis, visu	Object can be activated via parameter and sends a cyclic state

Objects per Channel:							
0	Channel A	Control value	DPT 1.001/ DPT 5.001	receive	Actuator reacts to incoming telegram	temperature controller	Receiving the current setpoint; is shown at the 1 Bit and 1 Byte mode
0	Channel A	Temperature value	DPT 9.001	receive	Actuator reacts to incoming telegram	Temperatur-sensor	Receiving the current temperature value; is shown at the mode integrated controller
1	Channel A	Flow temperature	DPT 9.001	receive	Actuator reacts to incoming telegram	Temperatur-sensor	Receiving the flow temperature; is shown when the flow temperature limit is active
2	Channel A	Block	DPT 1.003	receive	Actuator reacts to incoming telegram	Buttons, Visu... for manual control	Blocks the current channel; is shown when the blocking function is active
3	Channel A	State control value	DPT 1.001/ DPT 5.001	send	Actuator sends state	Diagnosis, Visu	Sends the current setpoint; can be activated in the mode integrated controller
4	Channel A	Switch presence	DPT 1.001	receive	Actuator reacts to incoming telegram	Buttons, Visu... for manual control	Extension of the comfort mode – „Party Button“; can be activated in the mode integrated controller

5	Channel A	Forced position	DPT 1.003	receive	Actuator reacts to incoming telegram	Buttons, Visu... for manual control	Activation/Deactivation of the forced position; additional function in all modes
5	Channel A	Dew point alarm	DPT 1.005	receive	Actuator reacts to incoming telegram	Buttons, Visu... for manual control	Activation/Deactivation of the dew point alarm; additional function in all modes
6	Channel A	PWM cooling for 4 pipe system	DPT 5.001	send	Actuator sends state	Channel heating actuator	Output at 4 pipe heating and cooling for the cooling channel; additional function at the mode integrated controller (4 pipe, heating and cooling)
7	Channel A	Setpoint comfort	DPT 9.001	send/ receive	Actuator reacts to incoming telegram/sends state	Visu, Push Button, sending a new setpoint	Sending a new setpoint for the comfort mode; basic function of the mode integrated controller
8	Channel A	Setpoint value offset	DPT 9.002	receive	Actuator reacts to incoming telegram	Visu, Push Button, sending a new setpoint	Setpoint offset; additional function at the mode integrated controller
9	Channel A	Current setpoint	DPT 9.001	senden	Actuator sends state	Diagnosis, Visualisation	Sending the state of the current setpoint; additional function at the mode integrated controller
10	Channel A	Mode selection	DPT 20.102	send/ receive	Actuator reacts to incoming telegram/sends state	Push button, Visu... Visualisation	Selection of the operating mode; general function at the mode integrated controller

11	Channel A	DPT_HVAC Status	ohne	send	Actuator sends state	Diagnosis, Visu	State object; additional function at the mode integrated controller
11	Channel A	DPT_HVAC Mode	DPT 20.102	send	Actuator sends state	Diagnosis, Visu	State object; additional function at the mode integrated controller
12	Channel A	DPT_RHCC Status	DPT 22.101	send	Actuator sends state	Diagnosis, Visu	State object; additional function at the mode integrated controller
13	Channel A	Mode comfort	DPT 1.001	receive	Actauator reacts to incoming telegram	Buttons, Visu... for manual control	Selection of the operating mode; general function at the mode integrated controller
14	Channel A	Mode night	DPT 1.001	receive	Actauator reacts to incoming telegram	Buttons, Visu... for manual control	Selection of the operating mode; general function at the mode integrated controller
15	Channel A	Mode frost/heat protection	DPT 1.001	receive	Actauator reacts to incoming telegram	Buttons, Visu... for manual control	Selection of the operating mode; general function at the mode integrated controller
16	Channel A	Frost alarm	DPT 1.005	send	Actuator sends state	Diagnosis, Visu	State object; additional function at the mode integrated controller

17	Channel A	Heat alarm	DPT 1.005	send	Actuator sends state	Diagnosis, Visu	State object; basic function at the mode integrated controller
18	Channel A	Setpoint value offset (0=-/1=+)	DPT 1.007	receive	Actauator reacts to incoming telegram	Buttons, Visu... for manual control	Setpoint offset; additional function at the mode integrated controller
19	Channel A	Diagnosis text	DPT 16.000	send	Actuator sends state	Diagnosis, Visu	State object; additional function at the mode integrated controller

Table 1: Overview communication objects

3.2 Default settings of the communication objects

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

Default settings									
Nr.	**Name**	**Object Function**	**Length**	**Priority**	**C**	**R**	**W**	**T**	**U**
0	Channel A	Control value	1 Bit	Low	X		X	X	
0	Channel A	Control value	1 Byte	Low	X		X	X	
0	Channel A	Temperature value	2 Byte	Low	X		X	X	
1	Channel A	Flow temperature	2 Byte	Low	X		X		
2	Channel A	Block	1 Bit	Low	X		X		
3	Channel A	State control value	1 Bit	Low	X	X		X	
3	Channel A	State control value	1 Byte	Low	X	X		X	
4	Channel A	Switch presence	1 Bit	Low	X		X		
5	Channel A	Forced position	1 Bit	Low	X		X		
5	Channel A	Dew point alarm	1 Bit	Low	X		X		
6	Channel A	PWM-Cooling for 4 Pipe system	1 Byte	Low	X	X		X	
7	Channel A	Setpoint comfort	2 Byte	Low	X		X		
8	Channel A	Setpoint value offset	2 Byte	Low	X		X		
9	Channel A	Current setpoint	2 Byte	Low	X	X		X	
10	Channel A	Mode selection	1 Byte	Low	X		X	X	
11	Channel A	DPT_HVAC Status	1 Byte	Low	X	X		X	
11	Channel A	DPT_HVAC Mode	1 Byte	Low	X	X		X	
12	Channel A	DPT_RHCC Status	2 Byte	Low	X	X		X	
13	Channel A	Mode comfort	1 Bit	Low	X	X	X		
14	Channel A	Mode night	1 Bit	Low	X	X	X		
15	Channel A	Mode frost/heat protection	1 Bit	Low	X	X	X		
16	Channel A	Frost alarm	1 Bit	Low	X	X		X	
17	Channel A	Heat alarm	1 Bit	Low	X	X		X	
18	Channel A	Setpoint value offset (1=+/0=-)	1 Bit	Low	X		X		
19	Channel A	Diagnosis text	14 Byte	Low	X	X		X	
+20	**next Channel**								

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80/160	Summer/Winter	Switchover	1 Bit	Low	X		X	X	
81/161	Heating/Cooling	Switchover	1 Bit	Low	X		X		
81/161	Heating/Cooling	Status	1 Bit	Low	X	X		X	
82/162	Heating/Cooling requirement	0 if all valves closed, otherwise 1	1 Bit	Low	X	X		X	
82/162	Heating requirement	0 if all valves closed, otherwise 1	1 Bit	Low	X	X		X	
83/163	Cooling requirement	0 if all valves closed, otherwise 1	1 Bit	Low	X	X		X	
84/164	Fault	At power failure/short circuit	1 Bit	High	X	X		X	
85/165	Max. control value	Output	1 Byte	Low	X	X		X	
86/166	Max. control value	Input	1 Byte	Low	X		X		
87/167	Scene	Activate	1 Byte	Low	X		X		
88/168	Central function	Operating	1 Bit	Low	X	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.

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4 Reference ETS-Parameter

4.1 Setup general

The general settings are shown at the illustration below. These settings are valid for all channels:

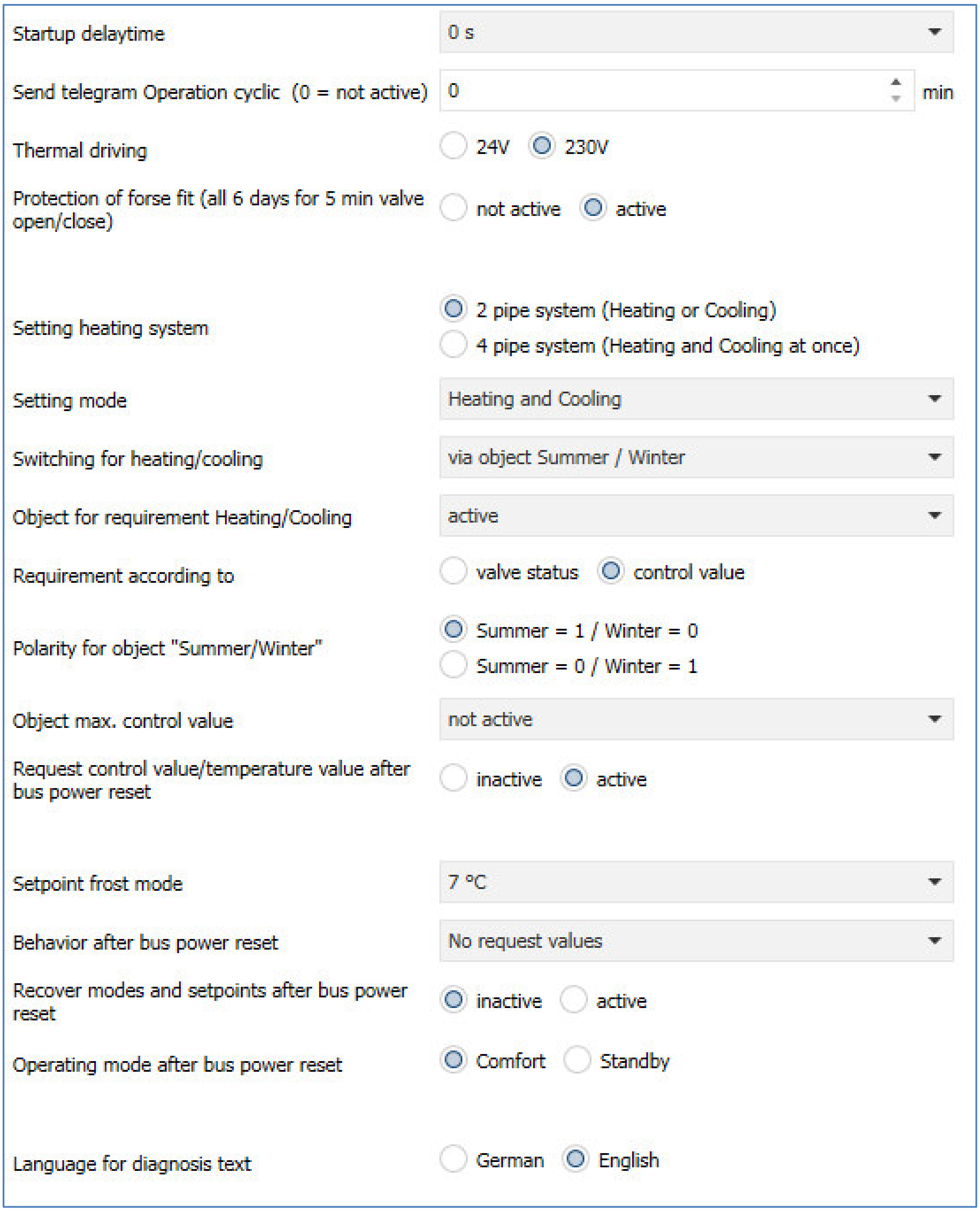

Figure 4: Setup general

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4.1.1 Device configuration

The following both parameters are for the configuration of the actuator:

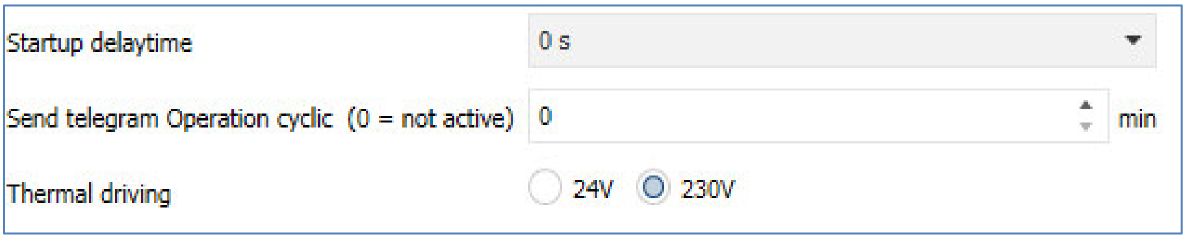

Figure 5: Device configuration

The following chart shows the dynamic range of this parameter:

Sub function	Dynamic range **[default value]**	comment
Startup delaytime	0-60s [0s]	Time, which elapses between bus power reset and the restart of the device
Send "In Operation" telegram cyclic	0-30000min **[0 = not active]**	Setting whether an "in operation" telegram should be sent cyclically
Thermal driving	▪ 24V ▪ **230V**	Setting of the voltage level at the thermal drivings

Table 3: Device configuration

The startup delay time defines the time, which elapses between a bus power return or an ETS-Download and the functional restart of the device.
The setting of the voltage level defines the voltage for the connected thermal drives. This setting changes only the fault detection, other functions are identical. At the 230V mode, the fault detection recognizes power failure as well as short circuits. At the 24V mode only short circuits are recognized. If a fault is detected, a 1-signal is sent by the belonging communication object. Additionally, the channel, which is in the fault mode, reacts with a fast flashing of the belonging channel LED (Shortcut: 4x flashing, long break, 4x flashing…). If the 230V main voltage failures, all 4 channels flash, which are connected to this L-connection (4x flashing, long break, 4x flashing…).

Number	**Name**	**Length**	**Usage**
83/163	Fault	1 Bit	reports an active fault
88/168	In Operation	1 Bit	sends an "in operation" telegram

Table 4: Communication object fault

An active fault can be reset by pressing the programming button

<u>Attention:</u> The first channel of the 4-fold actuator as well as the first and fifth channel of the 8-fold actuator have to be connected first. Otherwise a fault will be detected!
<u>Attention:</u> Every actuator can operate only one voltage, either 230V or 24V. A combination of both voltages is not permitted because of the conductor track distances!

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4.1.2 Summer/Winter mode

At the following settings, the summer/winter mode can be adjusted:

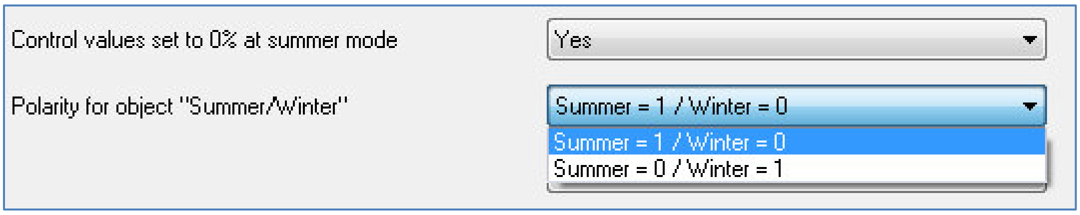

Figure 6: Summer/Winter mode

The following chart shows the dynamic range for this parameter:

Sub function	Dynamic range **[default value]**	comment
Control values set to 0% at summer mode	▪ Yes ▪ **No**	If this setting is active, the control value will set to 0% at summer mode
Polarity for object “Summer/Winter”	▪ **Summer=1/Winter=0** ▪ Summer=0/Winter=1	Adjustment of the polarity for switchover

Table 5: Summer/Winter mode

The heating actuator can be set in a summer or winter mode. The polarity of the switchover object can be adjusted.
Additional a setting can be made which sets the control value continuous to 0% at the summer mode. Of course, this setting can only be done if a switchover between heating and cooling is disabled (have a look at 4.1.3). So the actuator works only at the heating mode.

Number	**Name**	**Length**	**Usage**
80/160	Summer/Winter	1 Bit	Switchover between summer and winter mode

Table 6: Communication object Summer/Winter mode

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4.1.3 Heating/Cooling requirement & switchover

The following figure shows the relavant parameter for the adjustment of the used system:

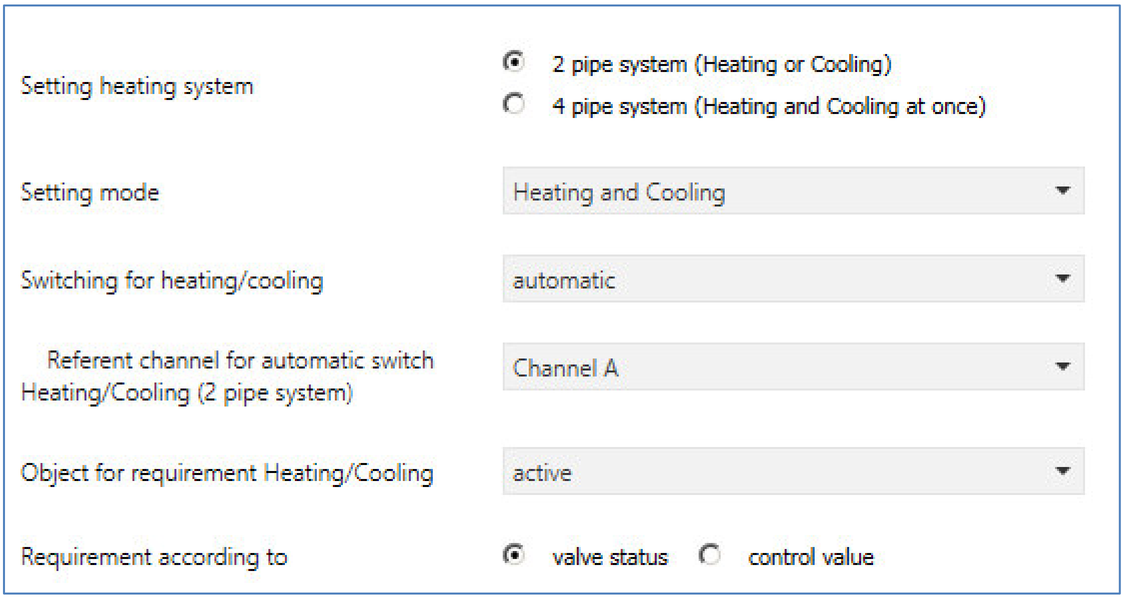

Figure 7: Heating/Cooling switchover

A distinction is made between 4 different systems:
Pure heating system or **pure cooling system** – It exists only one circuit, which can be used only for heating or cooling.
Recommended settings:

Parameter	Setting	Explanation
Setting heating system	2 Pipe systemRohr (Heating or Cooling)	Selection if a 2 pipe or 4 pipe system is present
Setting mode	Heating or Cooling	Selection if a heating or cooling system is present
Switching for heating/cooling	is not shown	
Object for requirement Heating/Cooling	active **or** active with …min power off delay	This parameter activates the object for the heating or cooling requirement
Requirement according to	any value	have a look at Table 10: Settings heating/cooling switchover

Table 7: Recommended settings for a pure heating or a pure cooling system

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2-Pipe System – Heating **and** Cooling – It exists only one circuit for heating/cooling. The system can be either heating or cooling:

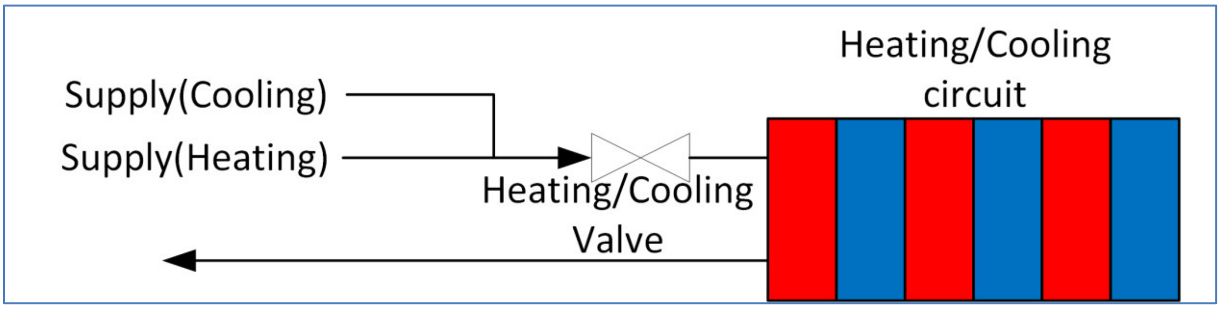

Figure 8: 2-Pipe system

Recommended settings:

Parameter	Setting	Explanation
Setting heating system	2 Pipe system (Heating or Cooling)	Selection of the present system – 2 Pipe system **Important: In this setting, the heating and cooling is interlocked! It is only the heating or the cooling mode active!**
Setting mode	Heating and Cooling	Selection of a combined heating/cooling system
Switching for heating/cooling	via object … **or** automatic with reference channel	A reference for the heating/cooling switchover can be assigned to the heating actuator. This reference channel defines the mode of the 2 Pipe system and has effect to the whole heating actuator. Manual switchover via an object is another way for switching between heating and cooling. **Important: Heating and cooling are interlocked.**
Object for requirement Heating/Cooling	active **or** active with …min power off delay	This parameter activates the object for the heating/cooling requirement. It exists only one object for the heating/cooling requirement.
Requirement according to	any value	have a look at Table 10: Settings heating/cooling switchover

Table 8: Recommended settings for 2 Pipe system - heating and cooling

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4-Pipe system: Two separat circuits for heating and cooling are available. The system can heat and cool to the same time:

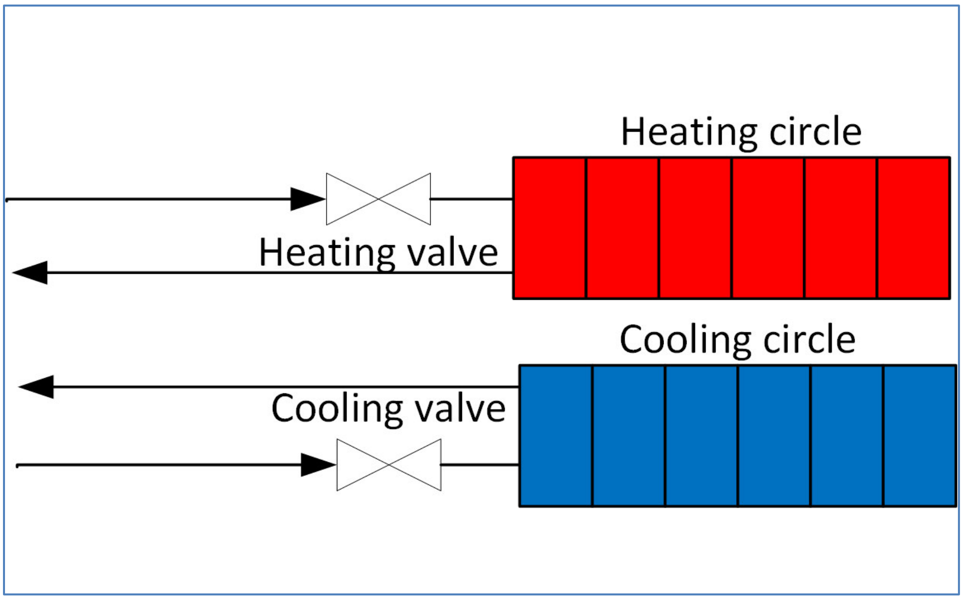

Figure 9: 4-Pipe system

Recommended settings:

Parameter	Setting	Explanation
Setting heating system	4 Pipe system (Heating and Cooling)	Selection of the present system – 2 Pipe system **Important: Heating and cooling are not interlocked at this setting!**
Setting mode	Heating and Cooling	Selection of a combined heating/cooling system
Switching for heating/cooling	via object … **or** automatic with reference channel	The heating actuator can be switched manual between heating and cooling or this can be done via a reference channel. **Important: Wichtig: Despite switchover of heating and cooling, it is possible that the heating actuator heats and cools to the same time, since a separate system is present.**
Object for requirement Heating/Cooling	aktiv **oder** aktiv mit …min Ausschaltverzögerung	This parameter activates the object for the heating/cooling requirement. It exists one object for the heating requirement and one object for the cooling requirement.
Requirement according to	beliebig	have a look at Table 10: Settings heating/cooling switchover

Table 9: Recommended settings 4 Pipe system - heating and cooling

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Overview parameter and description:

Sub function	Dynamic range **[default value]**	comment
Setting heating system	▪ **2 pipe system (Heating or Cooling)** ▪ 4 pipe system (heating and cooling)	Selection if a 2 pipe or a 4 pipe system is present
Setting mode	▪ **Heating** ▪ Cooling ▪ Heating and Cooling	Selection of the mode
Switching for heating/cooling	▪ **not active** ▪ via object summer/winter ▪ via object heating/cooling ▪ automatic	Adjustment of the switching between heating and cooling; onlky available at the mode heating and cooling!
Referent channel for automatic switchover Heating/Cooling (2 pipe system)	▪ Channel A- Channel D[H] **[Channel A]**	Adjustment of the reference channel at automatic switchover between heating and cooling
Object for requirement Heating/Cooling	▪ **not active** ▪ active ▪ active with 10min power off delay ▪ active with 20min power off delay ▪ active with 30min power off delay	Activation of the object heating/cooling requirement and a power off delay.
Requirement according to	▪ **valve status** ▪ control value	**Valve status:** The requirement switches to 0 if no valve is active, which means also at the PWM break. **Control value:** The requirement is switched to 0 if all control values are 0%. **Important: At the setting „valve status“, the object max. control value(have a look at 4.1.5 Max. Control value) is not included.**

Table 10: Settings heating/cooling switchover

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The following table shows the available communication objects:

Number	Name	Length	Usage
80/160	Summer/Winter	1 Bit	Switchover between Summer/Winter
81/161	Heating/Cooling	1 Bit	Switchover between heating (=1) and cooling (=0)
82/162	Heating/Cooling requirement	1 Bit	sends a 0 when no channel is active; at 2 Pipe systems
82/162	Heating requirement	1 Bit	sends a 0 when no channel is active; at 4 Pipe systems or 2 Pipe system
82/162	Cooling requirement	1 Bit	sends a 0 when no channel is active; at 2 Pipe systems
83/163	Cooling requirement	1 Bit	sends a 0 when no channel is active; at 4 Pipe systems

Table 11: Communication objects heating/cooling switchover

4.1.4 Protection of forse fit

The following illustration shows the settings for this parameter:

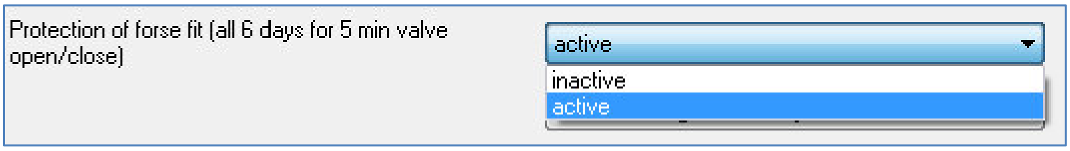

Figure 10: Protection of forse fit

The following chart shows the dynamic range for this parameter:

Sub function	Dynamic range **[default value]**	comment
Protection of forse fit (all 6 days for 5min valve open/close)	▪ **inactive** ▪ active	activates the protection of forse fit

Table 12: Protection of forse fit

To be sure, that a valves, which was not opened for a long period of time, does not block, the heating actuator has a protection of forse fit. This protection controls all channels at a fixed period of 6 days for 5 min and drives the valves once completely open.
So, a smooth operation of the valves can be secured.

4.1.5 Max. Control value

The following illustration shows the settings for this parameter:

Figure 11: max. Control value

The following chart shows the dynamic range for this parameter:

Sub function	Dynamic range **[default value]**	comment
Object max. control value	▪ **inactive** ▪ send at changes ▪ send at changes and at cycle 30min	Activates the objects for the max. control value and defines the sending behavior of them

Table 13: max. Control value

The parameter “Object max. control value” defines whether an object for the maximum control value shall be shown. If this parameter is activated with one of the two settings, two objects will be shown which you can see at the chart below. The maximum control value is only sent at a change or at a change and additional cyclically every 30min.
This function allows heating’s, which can modulate their power, if only less power is required. The object for the output (Number 84/164) sends the maximum used value at the heating actuator of the enabled channels. Afterwards this output signal can be analyzed and send the used power to the heating.
If more than one heating actuator is used, which get all their heating power from one heating, the objects can be connected by the additional object of the input (Number 85/165). Therefore, the output of the first actuator has to be connected to the input of the second actuator and so on. Now the output object of the last actuator sends the maximum used power from all enabled channels of the connected actuators.

Number	Name	Length	Usage
84/164	Max. control value(Output)	1 Byte	sends the current maximum control value
85/165	Max. control value(Input)	1 Byte	receives the current maximum control value from another actuator

Table 14: Communication objects max. Control value

4.1.6 Behavior after bus power reset

The following illustration shows the settings for this parameter:

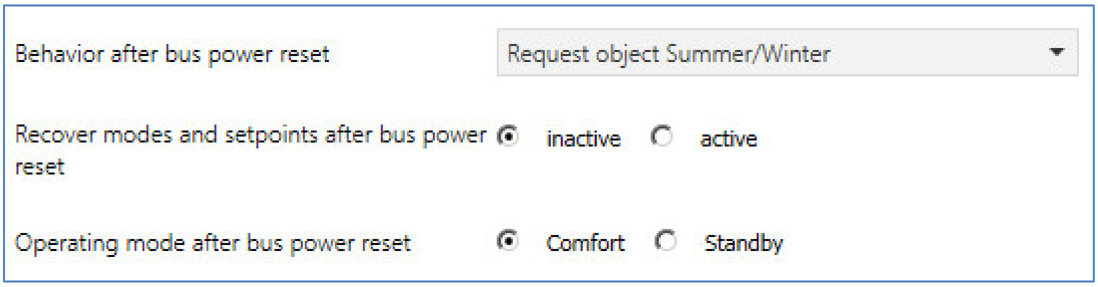

Figure 12: Behavior after bus power reset

The following chart shows the dynamic range for this parameter:

Sub function	Dynamic range **[default value]**	comment
Behavior after bus power reset	▪ **No request values** ▪ Request object Summer/Winter ▪ Winter mode ▪ Summer mode	Adjustment of the behavior of summer/winter after reset
Recover modes and setpoints after bus power reset	▪ **inactive** ▪ active	Adjustment if setpoints and modes should be recovered after a bus power reset
Operating mode after bus power reset	▪ **Comfort** ▪ Standby	Adjustment of the default mode after reset; only available if modes and setpoints are not recovered after a reset

Table 15: Behavior after bus power reset

With the “Behaviour after bus power reset” can be set, which values are to be requested in the event of bus power reset. If no values are requested, the actuator operates as if the valves were in the default settings which means all valves are closed. With the other settings, either the "Summer/Winter" object be requested or it can be set to continue in summer or winter mode.
"Recover modes and setpoints after bus power reset" setting ensures that the actuator continues to operate after a bus power reset with the values that it had before the bus power failure. Please note that after reprogramming or discharging of the actuator, the "standby" mode is active because there were no previous values in this case. Therefore, you have to set an operation mode once manually.
With the setting “Operating mode after bus power reset” can be configured in which mode the actuator starts.

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4.1.7 Setpoint frost mode

The setpoint for the frost mode can be set once and is valid for every channel:

Figure 13: Setpoint frost mode

The following table shows the available settings:

Sub function	Dynamic range **[default value]**	comment
Setpoint frost mode	7°C-14°C **[7°C]**	Adjustment of the setpoint for the frost mode. Valid for all channels.

Table 16: Setpoint frost mode

The setpoint of the heat protection mode is fixed to 35°C.

4.1.8 Diagnosis Text

In the general settings, the language for the diagnosis text can be set:

Figure 14: Language Diagnosis Text

Regardless of the mode, the diagnosis function can be activated in each channel:

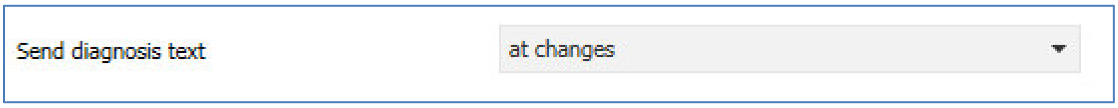

Figure 15: Activation Diagnosis Text

The table below shows the available sending conditions for the diagnosis text:

Sub function	Dynamic range **[default value]**	comment
Send Diagnosis Text	▪ **not active** ▪ at enquiery ▪ at changes	Selection of the sending condition for the diagnosis text

Table 17: Sending Conditions Diagnosis Text

The diagnosis function sends the status of each channel in "clear text", and serves to indicate the current status of the channel quickly

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Diagnosis function can send the following reports:

	Byte 0-1	**Byte 3**	**Byte 5-11**	**Byte 13**
Info	Summer/Winter	Heating/Cooling	Operating Mode	Setpoint > 0%, if yes: Value = 1
Possible Indications	Winter: Wi	Heating: H	Comfort	Setpoint = 0%: 0
	Summer: Su	Cooling: C	Standby	Setpoint >0%: 1
			Night	
			Frost	
			Mode C: Channel is set to Cooling mode but actuator is in Heating mode	
			Mode H: Channel is set to Heating mode but actuator is in Cooling mode	
			Mode ER: Channel is set to different Heating system than configured in “general settings”	
			BIT – Channel set to switching 1 Bit	
			PWM BYTE – Channel is set to continuous 1Byte	
Special Reports	Locked	Channel is locked		
	Emergency	Channel is in Emergency Mode		
	Forced	Channel is in forced position		
	No H/K Info	Channel is configured to 2-Pipe system but there is not set any switchover between Heating and Cooling .		
	230V Error	At the channel group no 230V are connected. The review of 230V is always performed in groups - for channels 1-4 at channel 1 and for channels 5-8 at channel 5		
	Dew Point	The Dew Point Alarm is active		

Table 18: Overview Diagnosis Text

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4.2 Mode selection

Before you can start with the configuration of the channel, you have to select the mode of the channel. The operating mode of a channel is pointed by the given input signal for the control value. The operating mode “switching (1Bit)” processes 1 Bit values, which send only the both states “0” and “1”. These control values are most sent from 2-step-controllers or a PWM converted control value. If a continuous signal, e.g. of a PI-control, is given, you have to select the operating mode “continuous (1 Byte)”. By the mode “integrated controller”, the heating actuator allows you to process these values with a lot of controller functions.
The following illustration shows the selection window for the operation mode of the channels:

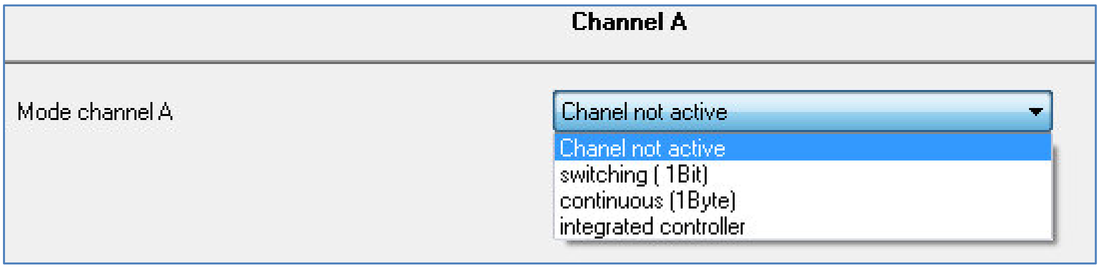

Figure 16: Mode selection

The following chart shows the available operating modes for each channel:

ETS-Text	Dynamic range **[default value]**	comment
Mode channel A-D/H	▪ **Channel not active** ▪ switching (1Bit) ▪ continuous (1Byte) ▪ integrated controller	Adjustment of the operating mode for the channel.

Table 19: Mode selection

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4.3 Channel Configuration – "switching (1 Bit)"

If the channel is selected as "switching (1 Bit)", the following parameterization options are shown at the submenu for the channel:

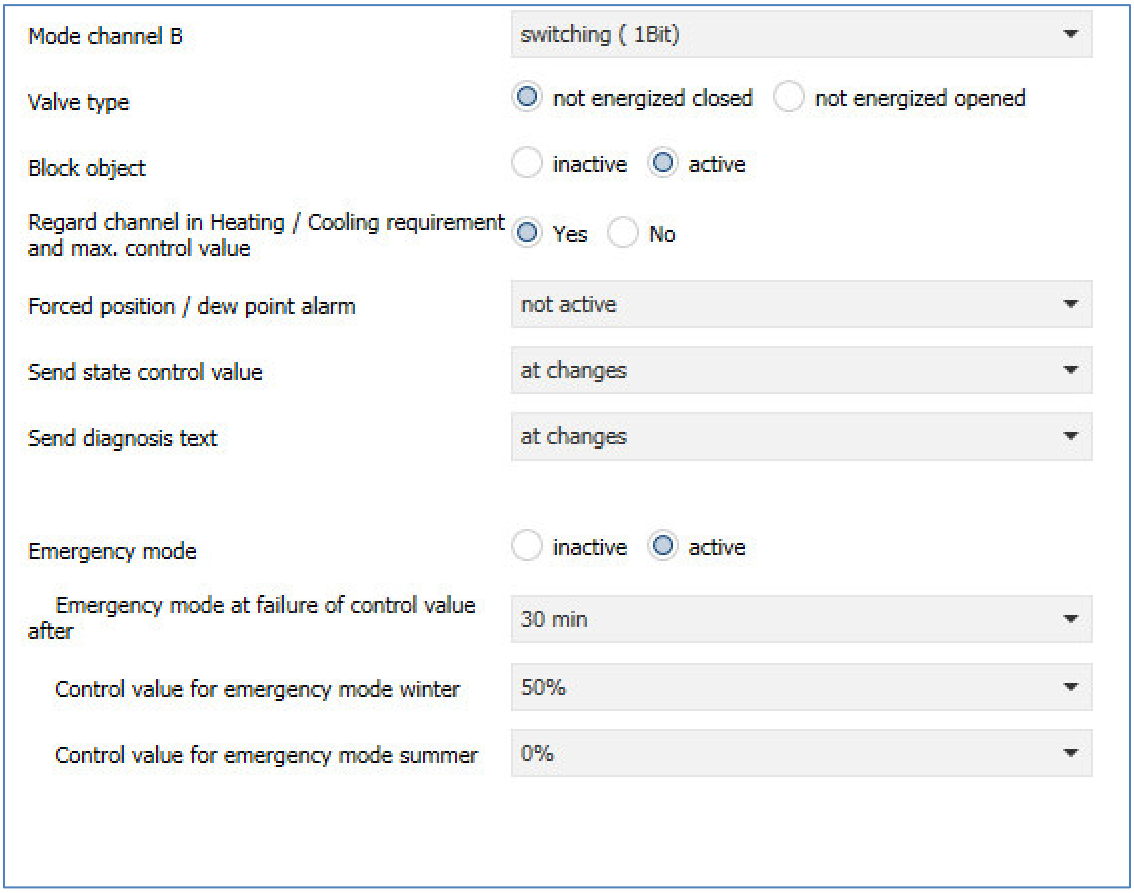

Figure 17: Channel configuration – "switching (1 Bit)"

As soon as the channel is selected as "switching (1 Bit)", a communication object of the size 1 Bit is shown for the control value. This object must be connected to the object, which shall be used to control the valve, via a group address. The incoming signal for the control value can e.g. be sent from Room temperature controller like the SCN-RT, which is adjusted as 2 step controller or as PWM-controller.

Number	Name	Length	Usage
0	Control value	1 Bit	Processes the incoming control value

Table 20: Communication object Control value 1Bit

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4.3.1 General setting

The first basic setting is to choose which type of valves, normally closed or normally opened, is given. So the actuator can transmit the right values to the valves:

Sub function	Dynamic range **[default value]**	comment
Valve type	▪ **not energized closed** ▪ not energized opened	Adjustment of the valve type

Table 21: Valve type

This setting is to configure the output, that it can transmit the right switching state to the output according to the given signal. This is only an adaption to normally closed or normally opened contacts of the valves. At the setting "not energized opened", the output signal is inverted.

Furthermore it can be adjusted, whether a channel shall be integrated in the Heating/cooling requirement and the maximum control value of the general settings:

Sub function	Dynamic range **[default value]**	comment
Regard channel in heating/cooling requirement and max. control value	▪ **Yes** ▪ No	Adjustment whether the channel shall be integrated in the calculation of the max. control value and the heating/cooling requirement.

Table 22: Heating/cooling requirement

If this setting is activated, the actuator will integrate this channel in the calculation of the max. control value and the heating/cooling requirement.

You can adjust for every channel, whether a state object for the control value shall be shown or not. Furthermore the sending conditions are selectable:

Sub function	Dynamic range **[default value]**	comment
Send state control value	▪ **inactive** ▪ at changes ▪ at enquiry	Adjustment, whether a state object of the control value shall be shown and when it shall send its actual value

Table 23: Send state control value

If this parameter is chosen as "inactive", no additional object for the state of the control value is shown. At the setting sending at changes, the communication object sends the state of the control value at every change. The setting sending at enquiry activates a passive state object. This object sends its actual value only at a request.
The communication for the state of the control value has always the same size as the control value itself:

Number	**Name**	**Length**	**Usage**
3	State control value	1 Bit	sends/responds the actual control value

Table 24: Communication object state control value

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4.3.2 Blocking function

You can activate or deactivate a block object for every channel:

Sub function	Dynamic range **[default value]**	comment
Block object	▪ **inactive** ▪ active	Activation/deactivation of the blocking function

Table 25: Blocking function

A channel can be blocked for further operations by its blocking object. The blocking is triggered by sending a logical "1" at the belonging block object. Only through sending a logical "0", the channel is unblocked again. A blocked channel is switched off (control value = 0%). After deactivation of the blocking process, the channel assumes the values, which he had before the blocking process. If telegrams are sent to the channel during the block process, no changes will be happen. But the channel takes the value of the last telegram after unblocking.

Number	Name	Length	Usage
2	Block	1 Bit	blocks the belonging channel

Table 26: Communication object blocking function

4.3.3 Emergency mode

An emergency mode can be activated and adjusted for every channel. An activated emergency mode is shown at the following illustration:

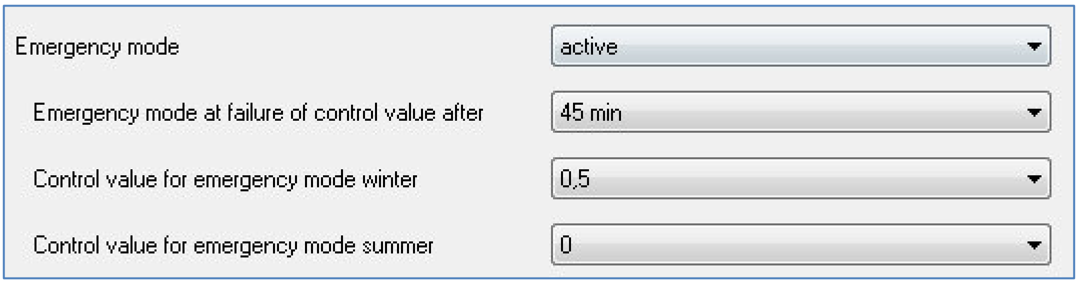

Figure 18: Emergency mode

The dynamic range for the emergency mode is shown at the chart below:

Sub function	Dynamic range **[default value]**	comment
Emergency mode	▪ **inactive** ▪ active	Activation/deactivation of the emergency mode
Emergency mode at failure of control-/temperature value after	inactive, 30min, 35min, 40 min,…,90min **[45min]**	Adjustment, when an emergency shall be activated
Control value for emergency mode winter	100%, 90%, 80%, ..., 0% **[50%]**	Adjustments for control value of the emergency mode at winter
Control value for emergency mode summer	100%, 90%, 80%, ..., 0% **[0%]**	Adjustments for control value of the emergency mode at summer

Table 27: Emergency mode

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As soon as the emergency mode is activated, further settings are for the emergency mode available. The setting “Emergency mode at failure of control value after” adjusts the time when the channel shall be activating the emergency mode. Every communication object of the control value needs a cyclic incoming value. When the adjusted time runs out, the channel switches to the emergency mode. At the operating mode “integrated controller”, the emergency mode is triggered when the heating actuator does not receive a temperature value for the adjusted time.
For both operating modes, summer and winter, a fixed value can be adjusted for an emergency mode. The fixed value can be adjusted in a percental value from 0-100%. The fixed value is converted into a PWM-signal with a fixed PWM-cycle of 10min. This setting prevents the heating of an unchecked use in case of a failure of the temperature controller.
If in channel mode "switching 1 bit" or "continuously 1 byte" an invalid temperature value (temperature> 50 ° C or temperature <-10 ° C) is received, the channel is also switched to emergency mode. If no emergency operation is active and an invalid temperature value is received the channel switches to 0%.

4.3.4 Forced position/Dew point alarm

Additional for every channel a forced position or a dew point alarm can be activated:

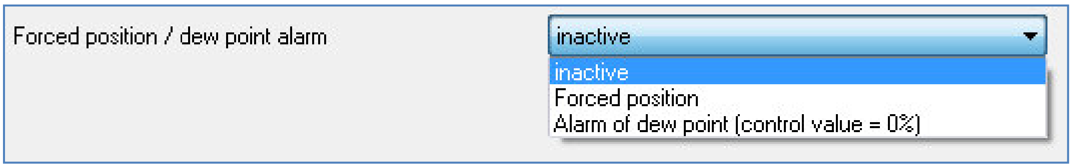

Figure 19: Forced position/Dew point alarm

The dynamic range of this parameter is shown at the chart:

Sub function	Dynamic range **[default value]**	comment
Forced position/ dew point alarm	▪ **inactive** ▪ active	Activation of a forced position or a dew point alarm

Table 28: Forced position/Dew point alarm

If a dew point alarm is selected a further communication is shown. By sending a logical “1”, the dew point alarm is activated. A logical “0” deactivates the dew point alarm again. The dew point alarm sets the control value at the cooling mode to 0%:

Number	**Name**	**Length**	**Usage**
5	Dew point alarm	1 Bit	activates the dew point alarm

Table 29: Communication object dew point alarm

If a forced position is activated, new setting options will be available, which are shown at the chart below:

Sub function	Dynamic range **[default value]**	comment
Forced position/ dew point alarm	**Forced position**	Forced position is activated
Control value for forced position winter	100%, 90%, 80%, ..., 0% **[50%]**	Adjustment of the control value at the winter mode by an activated forced position
Control value for forced position summer	100%, 90%, 80%, ..., 0% **[0%]**	Adjustment of the control value at the summer mode by an activated forced position

Table 30: Forced position

The forced position drives the control value to a fixed position. Thereby, the forced position differences between the summer and the winter mode. For both modes are fixed values of 0% to 100% parameterizing able. The heating actuator works at the forced value as PWM controller with a fixed PWM-cycle of 10min.
A logical "1" activates the forced position. By sending a logical "0", the forced position is deactivated and the channel goes back to its last value or the last received telegram for the control value.

Number	Name	Length	Usage
5	Forced position	1 Bit	activates the forced position

Table 31: Communication object forced position

4.3.5 Diagnosis function

The table below shows the available sending conditions for the diagnostic text:

Sub function	Dynamic range **[default value]**	comment
Send Diagnosis text	▪ **inactive** ▪ at enquiry ▪ at changes	Setting of the sending conditions of the diagnosis text

Table 32: Sending conditions Diagnosis text

The following table shows the corresponding communication object:

Number	Name	Length	Usage
19	Diagnosis text	14 Byte	Sending of the Diagnosis text

Table 33: Communication object Diagnosis text

The description of the diagnosis text you can see at the descriptions of the general settings under 4.1.8 Diagnosis Text.

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4.4 Channel Configuration – "continuous (1 Byte)"

If the channel is selected as "continuous (1 Byte)", the following parameterization options are shown:

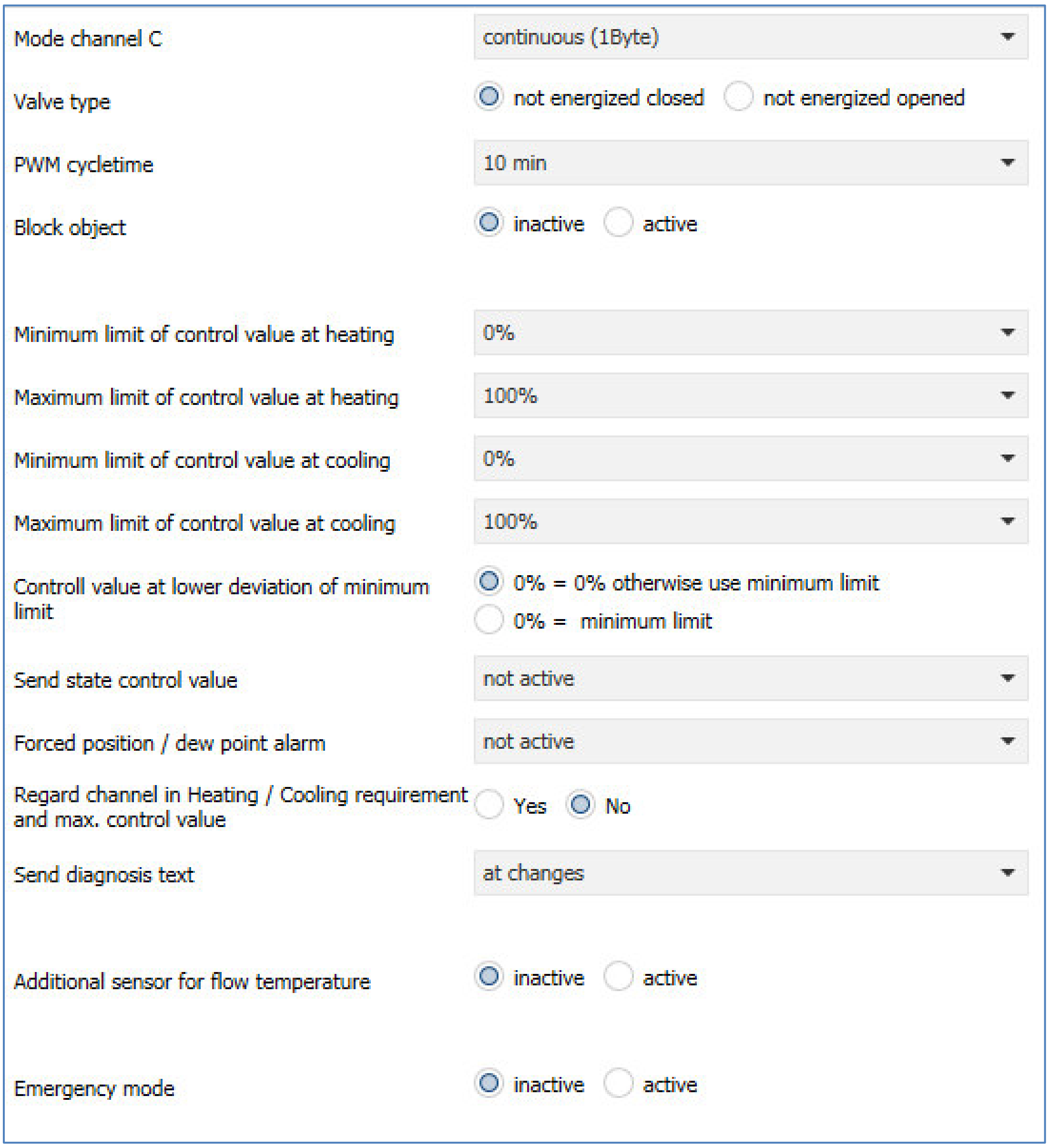

Figure 20: Channel configuration – "continuous"

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The operating mode "continuous (1 Byte)" has the same settings like the operating mode "switching (1 Bit)". These settings are not described again at this section.
There are additional settings available at the operating mode "continuous", which are described at the following sections.

The control value and the state object for the control value have the size of 1 Byte at this operating mode. So the control value needs continuous values, e.g. from a PI-controller:

Number	Name	Length	Usage
0	Control value	1 Byte	Processes the incoming control value
3	State control value	1 Byte	State object of the actual control value

Table 34: Communication objects control value – 1 Byte

4.4.1 PWM cycletime

The PWM cycletime is used for calculating the on and off pulses of the control value. This calculation is based on the incoming control value. A PWM cycle includes the whole time which elapses from one switch-on pulse to the next.

Example: If a control value of 75% is calculated and PWM cycletime of 10min is adjusted, the control value will be switched on for 7.5min and switched off for 2.5min.

The dynamic range of the PWM cycletime is shown at the following chart:

Sub function	Dynamic range **[default value]**	comment
PWM cycletime	1min, 2min, …, 10min, 15min, 20min, 25min, 30min **[10min]**	Adjustment of the PWM cycletime

Table 35: PWM cycletime

Basically, two different settings have proved. On the one hand the setting in which the valves open completely and close completely during one cycle. And on the other hand the setting in which the cycletime is much less than the adjustment time of the valves and so an average position of the valves is adjusted.
Both adjustment options and the usage of them are shown at the following section. If more than one valve is adjusted, it is recommended to adjust to the slowest one.

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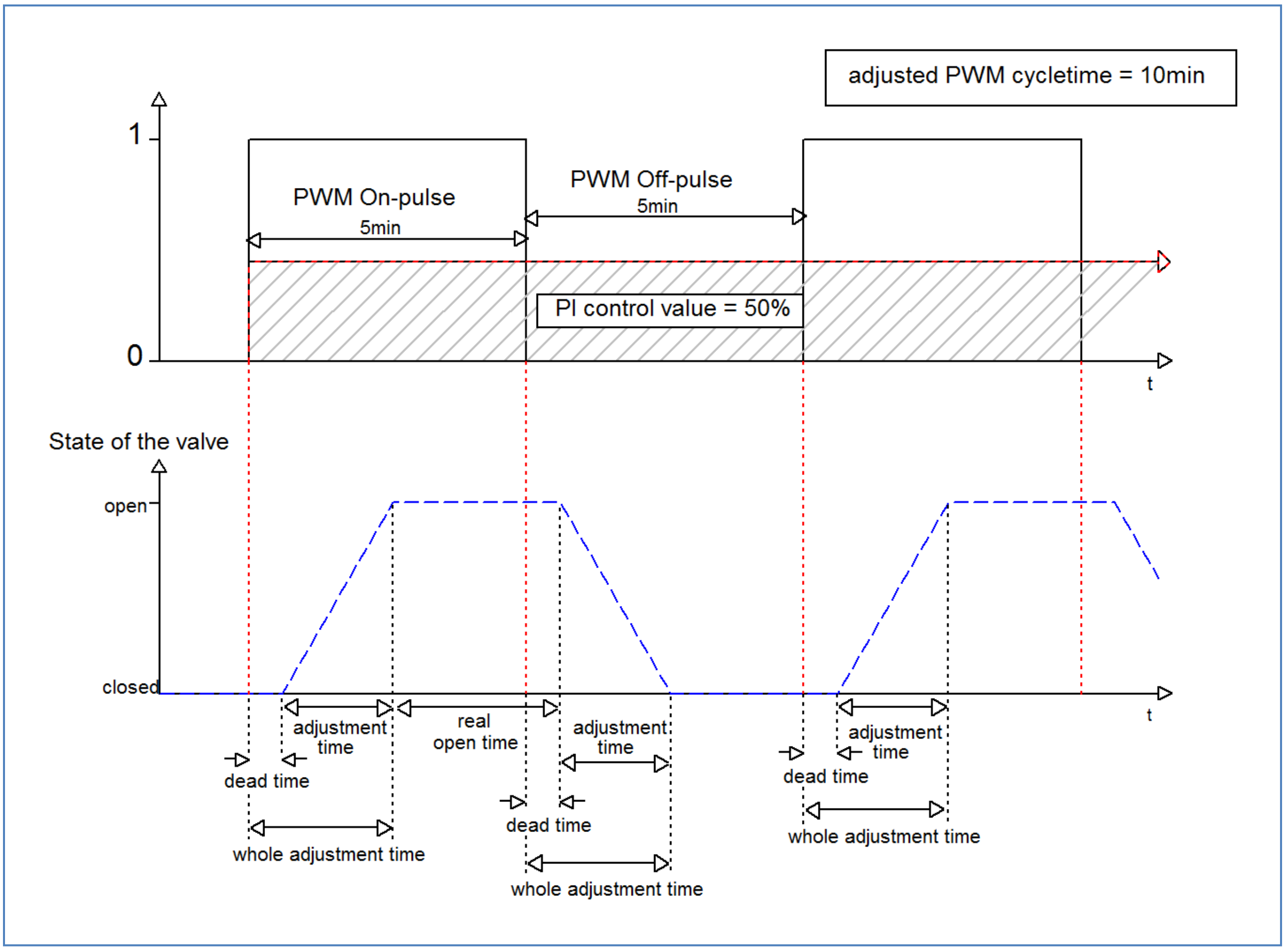
Option 1: Cycletime is larger than the adjustment time of the valves

These setting effects, that the valves are driven once completely open and once completely close during one cycletime. So the valve goes trough all possible steps during one cycletime.
The adjustment time of the valve is composed by the dead time (time which elapses between controlling the valve and opening the valve) and the real adjustment time of the valve. So the time at wich the valve is really opened is much smaller than the controlling during one PWM cycle.

The principle of this option is shown at the diagram below:



The whole adjustment time is here about 2.5 – 3min. This is a typical adjustment time for underfloor heatings. So the real open or real close time is about this time smaller than the whole controlling time. Although this adjustment time shortens both, the real opening time and the real closing time, the room temperature controlled by this method is relatively accurately.
However, this method can also cause larger variation of the temperature close to the heat source. Furthermore, caused by relatively frequent opening and closing the valves are more heavily loaded. This setting is proven particularly at slow systems, e.g. underfloor heatings.

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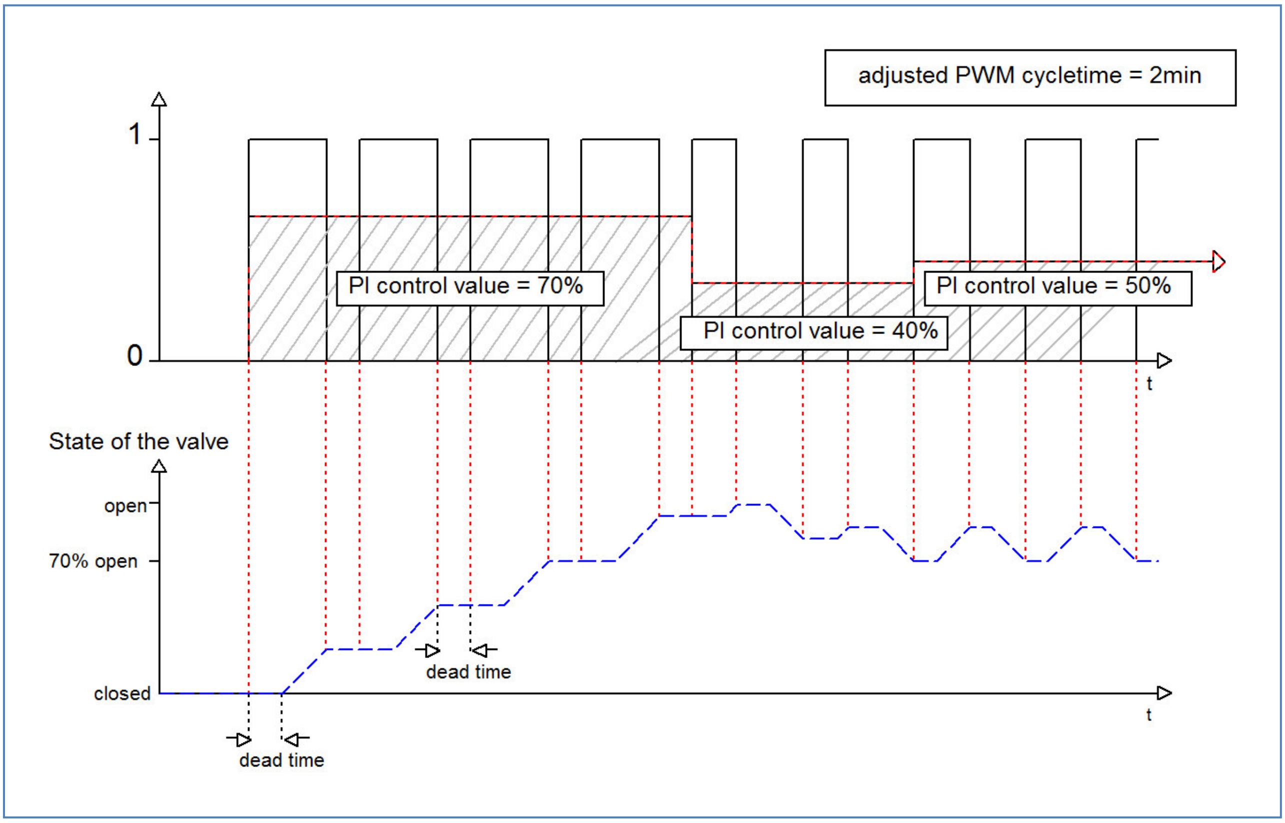
Option 2: Cycletime is shorter than the adjustment time of the valves

These setting effects, that the valves can not be completely opened or closed between a PWM On pulse respectively an Off pulse. So the valve makes only small movements.
Long-term, this setting effects an average value of the valve-state.

The principle of this option is shown at the diagram below:



Also here, the whole adjustment time is about 3min. But now the valve can only make small steps during the controlling time, not as in the previous settings, the entire amplitude. At the beginning, the off-pulse is only as long as dead time and so no adjustment takes place. So the valve drives continuously opened. When the temperature increases the adjusted value, the temperature controller readjusts the control value and so the PWM pulse is calculated again. Long-term, an alomost continiuos value of the valve-state is reached.
To note at this setting is, that the dead times are reduced because of the permanently flowing warm water through the valves. So the real driving times become longer during one controlling process. But since the temperature controller reacts dynamically, it will adapt the control value and so the nearly constant position of the valves is reached.
Advantageous of this method is that the valves are not loaded too much. Furthermore the room temperature is controlled nearly constant by the permanent adaption of the control value.
But if more than one valve is controlled, an average state of the valves is nearly unreachable. Thus, this can cause variations of the room temperature.
This setting is proven particularely at fast systems where just one valve is controlled, e.g. radiators.

4.4.2 Limitation of the control value

The control value can be limited as well as at the heating as at the cooling mode in both directions (minimum and maximum):

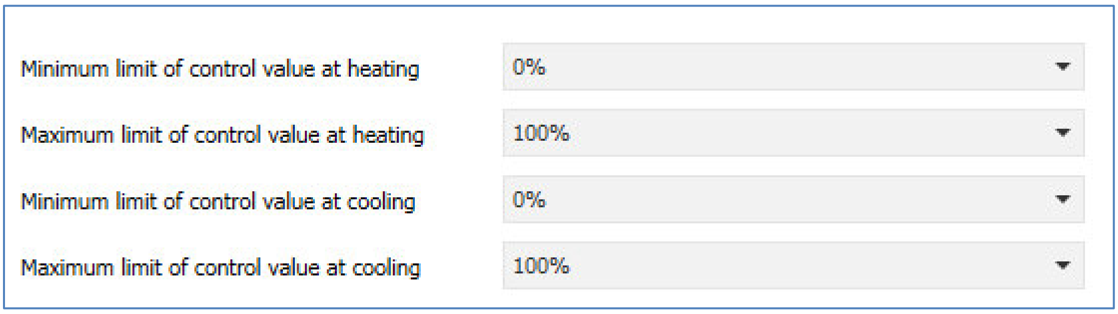


Figure 21: Limitation of the control value

The settings for these parameters are shown in the table below:

Sub function	Dynamic range **[default value]**	comment
Minimum limit of control value at heating	0%, 5%, 10%,…,50% **[0%]**	Adjustment of the minimum limit of the control value at heating
Maximum limit of control value at heating	100%, 95%, 90%,…,50% **[100%]**	Adjustment of the maximum limit of the control value at heating
Minimum limit of control value at cooling	0%, 5%, 10%,…,50% **[0%]**	Adjustment of the minimum limit of the control value at cooling
Maximum limit of control value at cooling	100%, 95%, 90%,…,50% **[100%]**	Adjustment of the maximum limit of the control value at cooling

Table 36: Limitation of the control value

The limitation of the control value limits the amount of the control value, which is transmitted to create a PWM-signal. The limitation is activated, when a value is chosen which is smaller/higher than the possible value for the control value, so minimum larger than 0 or maximum smaller than 1.If an input signal is out of the adjusted limitation, it will be decreased or increased. The PWM signal is calculated from the new input signal.

> **Example:** At the heating mode, the maximum limit is chosen to 70% and the minimum limit is chosen to 10%. The PWM cycletime is adjusted to 10min. If a control value of 100% is sent for the input, the channel takes the maximum limit of 70% and calculates from this value the on-pulse as 7min. A control value in the limitations works normal, so a control value of 50% creates an on-pulse of 5min

The limitation can be parameterized individually as well for the heating as for the cooling.
Here the minimum limit is done in the way, so that a control value of 0% also causes a control value of 0%. Every control value above 0% but below the minimum limit is set to the adjusted minimum limit. This behavior is reasonable because of energy saving issues, because otherwise the electrothermic valve drives would consume, even if they are not used, the minimum limit of the nominal power consumption.

4.4.3 Flow temperature limit

For avoiding variations at the control circuit, an additional flow temperature limit can be activated:

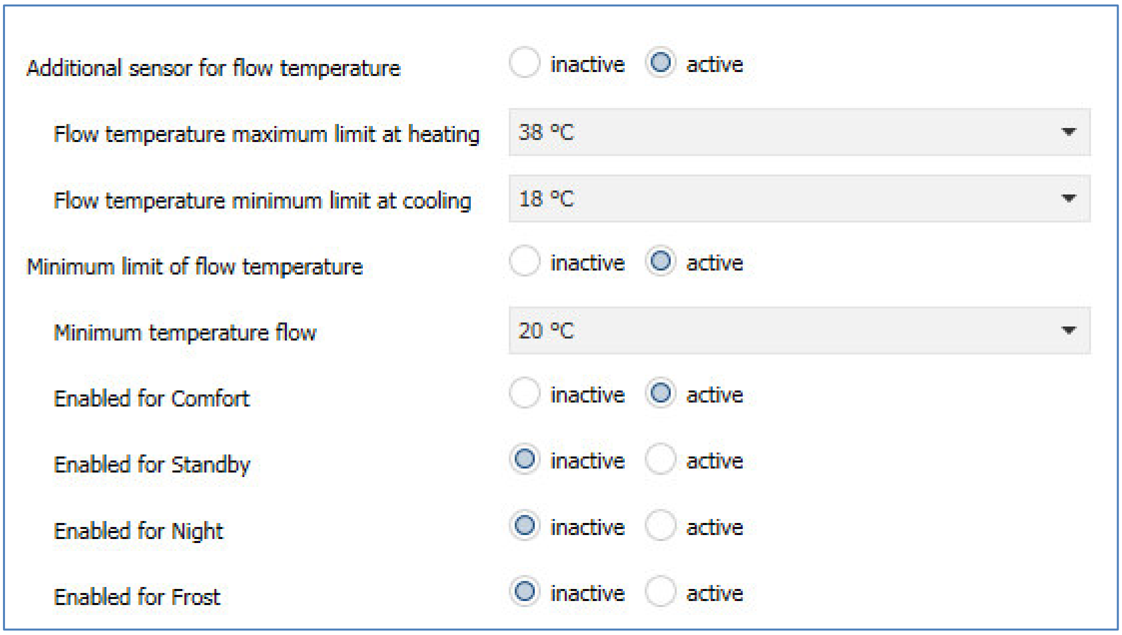


Figure 22: Flow temperature limit

The settings for these parameters are shown in the following table:

Sub function	Dynamic range **[default value]**	comment
Additional sensor for flow temperature	▪ **inactive** ▪ active	Activation/Deactivation of a flow temperature limit
Flow temperature limit at heating	inactive, 25°C, 26°C, 27°C, …,60°C **[38°C]**	Adjustment of the maximum flow temperature at heating
Flow temperature limit at cooling	inactive, 15°C, 16°C, 17°C, …,25°C **[18°C]**	Adjustment of the minimum flow temperature at cooling
Minimum limit of flow temperature	▪ **inactive** ▪ active	Activation/Deactivation of minimum flow temperature limit
Minimum temperature flow	14°C, 15°C,…,25°C **[20°C]**	Adjustment of the minimum flow temperature
Enabled for Comfort/ Standby/Night/Frost	▪ **inactive** ▪ active	Activation/Deactivation of the modes for which the limit is valid

Table 37: Settings Flow temperature limit

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The flow temperature limit restricts the actual flow temperature. This allows to limit the heating temperature, which is needed in some situations. If for example an underfloor heating should not heat above a certain value to protect the flooring, the heating temperature can be limited by the flow temperature limit. The flow temperature limit requires a second temperature sensor at the flow. This sensor measures the actual flow tempearure. The object, which records the temperature value has to be connected to the object for the flow temperature of the heating actuator. This one limits the flow temperature according to the adjusted parameters.

Number	Name	Length	Usage
1	Flow temperature	2 Byte	Processing of the measured flow temperature

Table 38: Communication object flow temperature

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4.4.4 Control value at lower deviation of minimum limit

The following illustration shows the settings for this parameter:

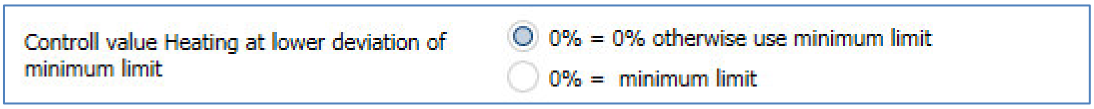

Figure 23: Control value at lower deviation of minimum limit

The following table shows the available options for a value of 0%:

Sub function	Dynamic range **[default value]**	comment
Control value at lower deviation of minimum limit	▪ **0% = 0%, otherwise use the value of the minimum control value** ▪ 0% = Minimum control value	Setting what will take place at an control value of 0%

Table 39: Control value at lower deviation of minimum limit

The above parameter determines the behavior when the channel receives an control value of 0%:

- **0% = 0%, otherwise use the value of the minimum control value**
  When receiving a control value of 0% the channel will be set steadily to OFF, i.e. the 0% will be really interpreted as 0%
- **0% = Minimum control value**
  When receiving a control value of 0% the channel will be set to the adjusted minimum control value. For example, if a control value of 0% is received and the minimum control value is set to 10%, the channel gets the settings for 10%.

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4.5 Channel Configuration – "integrated controller"

At the operating mode "integrated controller", the channel contains of the same parameterization options like at "continuous (1 Byte)" and "switching (1 Bit)". These functions are not described again art this section. Have a look at the sections 4.3 and 4.4 for these functions.
There are a lot of additional functions available, which are described at the following sections.

At the normal menu, the only difference between the operating mode "integrated controller" and the operating mode "continuous" is the selection between heating and cooling.

Figure 24: Heating/cooling mode

This switchover causes, that the controlling can be adjusted according to its use. At the heating, only heating control parameters are shown and at the cooling only cooling control parameters. At an combined controlling, both parameters are shown.

Additionally a new submenu is shown at the operating mode "integrated controller". The controller can be parameterized at this submenu.

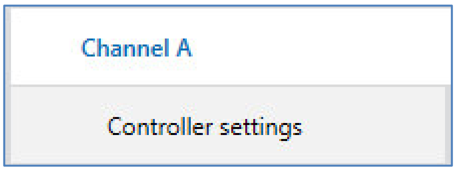

Figure 25: Submenu "integrated controller"

4.5.1 Operating modes

The integrated controller contains of different operating modes, which can be individually adjusted as described below:

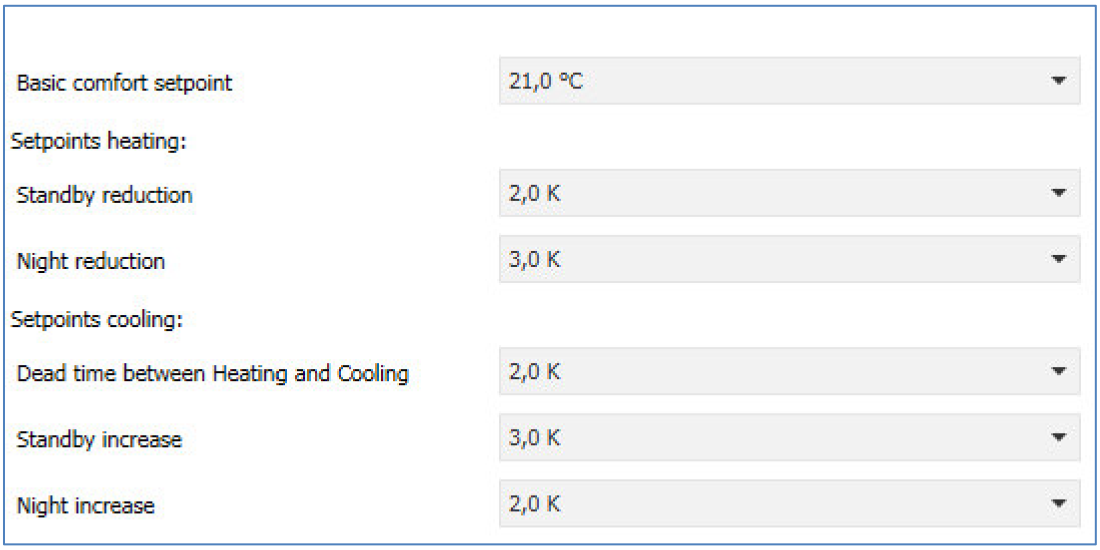

Figure 26: Operating modes for heating & cooling

The settings for the operating modes are shown in the table below:

Sub function	Dynamic range **[default value]**	comment
Basic comfort setpoint	18,0°C, 18,5°C, 19,0°C, ..., 25°C **[21°C]**	Adjustment of the basic setpoint; valid for heating and cooling
Setpoint heating		
Standby reduction (K)	0K, 0,5K, 1,0K, ..., 10,0K **[2,0K]**	Adjustment of the reduction at the heating mode and adjusted standby mode
Night reduction (K)	0K, 0,5K, 1,0K, ..., 10,0K **[3,0K]**	Adjustment of the reduction at the heating mode and adjusted night mode
Setpoint cooling:		
Standby increase (K)	0K, 0,5K, 1,0K, ..., 10,0K **[2,0K]**	Adjustment of the increment at the cooling mode and adjusted standby mode
Night increase (K)	0K, 0,5K, 1,0K, ..., 10,0K **[3,0K]**	Adjustment of the increment at the cooling mode and adjusted night mode

Table 40: Operating modes

If the controller is selected only as heating or as cooling, only settings for the adjusted operating mode are shown.
The operating modes with their differences are described at the following sections.

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4.5.1.1 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 4.5.7 Additional settings at combined heating & cooling mode).
The chart shows the relevant 1-Bit communication object:

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

Table 41: Communication object operating mode comfort

4.5.1.2 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**
14	Mode night	1 Bit	Activation of the operating mode night

Table 42: Communication object operating mode night

4.5.1.3 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.

4.5.1.4 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**
15	Mode frost/heat protection	1 Bit	Activation of the operating mode frost/heat protection

Table 43: Communication object operating mode frost/heat protection

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4.5.2 Priority of the operating modes

The illustration shows the settings for the priority of the operating modes:

Figure 27: Priority of the operating modes

The settings for the priority are shown in the table below:

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

Table 44: 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.

4.5.3 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 (from Version 1.2).
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 set to: 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 45: Example operating mode switchover via 1 Bit

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The changeover 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 changeover 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 46: Hex-values 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 47: Example operating mode switchover via 1 Byte

The object “Mode selection“ can also send its current state, by activating the following parameter:

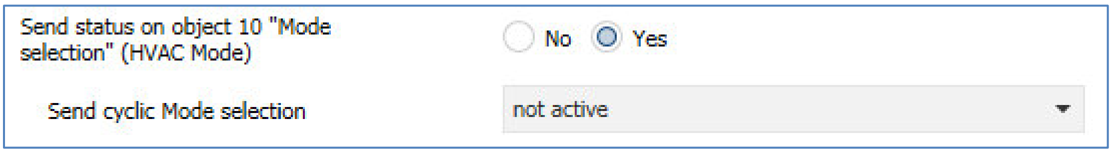

Figure 28: Send state on "Mode selection"

Thus, the object also sends the status according to Table 46: Hex-values operating modes. The values agree with the KNX standard and can be evalauated, without further processing, for example, from Gira Home server.

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The object 11 is a pure status object and can be sent as DPT HVAC Status or DPT 20.102 - HVAC Mode. It can also be transmitted cyclically when needed. How to use the object, see the following parameters:

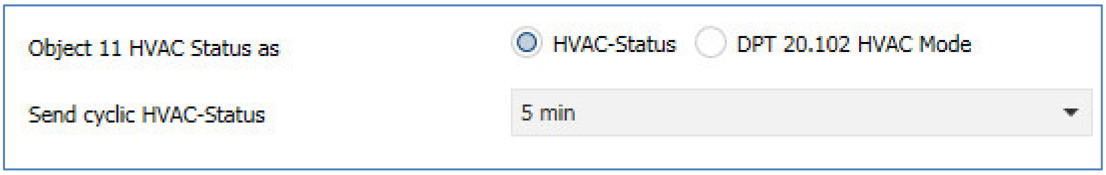

Figure 29: Usage of object 11

If the object 11 used as DPT 20.102 - HVAC Mode, so it sends the values for the individual operating modes as shown in Table 46: hex values operating modes. The difference to the use of the operating mode selection as a sending object is that, with this setting, there are 2 separate objects for switching and operation.

Is the object 11 used as DPT HVAC Status (without number), the object sends the following values for each state:

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 48: Hex-Values DPT HVAC Status

When heated in the comfort mode, for example, the communication object will send the value 20 (for heating) +1 (for the comfort mode) =21.
The DPT RHCC Status object is an additional 2 Byte status object with additional status messages. Again, the hex values of multiple messages are added and the generated value is output
The following chart shows the hex values for the single messages:

Bit	DPT RHCC Status		Hex-Value
0	Error Sensor	1=Error	0x01
8	Heating/Cooling	0=Cooling/1=Heating	0x100
13	Frost alarm	1=Frost alarm	0x2000
14	Heat alarm	1=Heat alarm	0x4000

Table 49: Hex-Values DPT RHCC Status

The Controller reacts always to the value, which was sent last. Has the operating mode been switched lastly via 1 Bit, the controller will react to the changeover by 1 Bit. Has the operating mode been switched lastly via 1 Byte, the controller will react to the changeover by 1 Byte.

The communication objects for the mode selection switchover are shown at the following table. The first 3 objects are for the 1 Bit switchover, the last 3 objects are for the switchover via 1 Byte:

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

Table 50: Communication objects for the operating mode changeover

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4.5.4 Setpoint offset

The following settings are available at the ETS-Software:

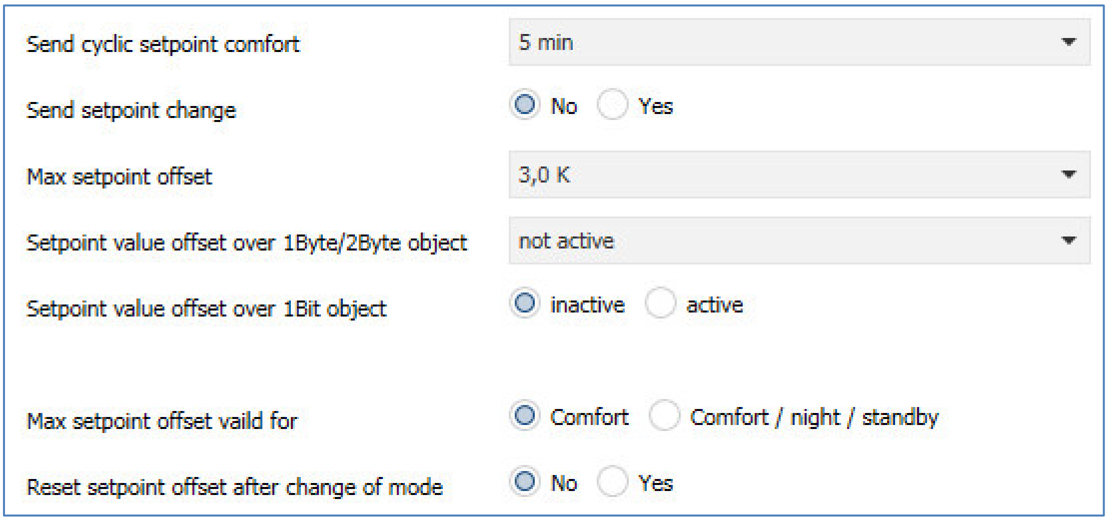

Figure 30: Settings Setpoint offset

The following table shows the possible settings for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Send cyclic setpoint comfort	▪ **not active** ▪ 5min – 4h	Setting whether the object - setpoint comfort is to be sent cyclically
Send setpoint change	▪ **No** ▪ Yes	Adjustment whether a change of setpoint should be send or not
Max setpoint offset	0K – 10,0K **[3,0K]**	indicates the maximal offset
Setpoint value offset over 1Byte/2Byte object	▪ **not active** ▪ 2Byte-Object ▪ 1Byte-Object	Setting whether the setpoint offset should be effected over 2 byte or 1 byte object
Setpoint value offset over 1Bit object	▪ **inactive** ▪ active	Setting whether the setpoint offset should be effected over 1-bit object
Step Width	0,1K – 1K **[1K]**	Setting only visible when setpoint value offset via 1Bit or 1Byte activated. Common parameter for 1Byte and 1Bit
Max setpoint offset valid for	▪ **Comfort** ▪ Comfort/Night/Standby	scope of the setpoint offset
Reset setpoint offset after change of mode	▪ **No** ▪ Yes	Adjustment whether a setpoint offset is still valid after change of operating mode or not

Table 51: Settings Setpoint offset

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Following section describes the various options for setpoint offset adjustment. Using channel A as an example, increase thenumber of the appropriate communication objects for channel B-D respectively B-H in each case "+20":

Setting a new absolute setpoint

When setting a new absolute comfort setpoint to the controller, a new basic comfort value is read. This new comfort value also causes an automatic adjustment of dependent setpoints in the other operation modes. With 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 gets a complete new basic setpoint. Specifying a new value is possible by calling the object “Setpoint comfort”.

Number	Name	Length	Usage
7	Setpoint comfort	2 Byte	Setting a new absolute setpoint

Table 52: Communication object Setpoint comfort

Setpoint value offset via 2Byte

When using the setpoint value offset via 2Byte object, a positive Kelvin value for an increase and a negative Kelvin value for a decrease are sent to the object "Setpoint value offset". Here, the displacement always refers to the value which has been set in the parameters. Thus, the value of the parameters will be restored with sending the value 0K.
By the parameter "Max Setpoint value offset ", the maximum manual displacement of the setpoint can be set. If, for example, the controller is set to a basic comfort setpoint of 21°C and a max. setpoint value offset of 3K, the basic comfort value can be manually moved only within the limits of 18°C to 24°C.
By the parameter "Max Setpoint offset valid for" can be set whether the displacement is valid only for comfort mode or also for the night and standby mode. The mode frost/heat protection is independent of the setpoint .
By setting of a new comfort setpoint via the object "setpoint comfort", an active setpoint value offset will be reset back to 0.

Number	Name	Length	Usage
8	Setpoint value offset	2 Byte	Set point offset relative to the pre-set comfort setpoint

Table 53: Communication object Setpoint value offset via 2Byte

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Setpoint value offset via 1Byte

When using the setpoint value offset via 1Byte object, a value of -128 to 127 is sent to the object "Setpoint value offset". The setpoint is then adjusted depending on the set step width, the setpoint adjustment is calculated according to the following scheme:
sent value x set step width = setpoint displacement

Example:

Set Step width	0,5K
Sent value	6
Current setpoint	21°C
-> Setpoint value offset	6 x 0,5K = 3K
-> New Setpoint	21°C + 3°C = 24°C

Number	Name	Length	Usage
8	Setpoint value offset	1 Byte	Set point offset relative to the pre-set comfort setpoint in compliance with the step width

Table 54: Communication object Setpoint value offset via 1Byte

Setpoint value offset via 1Bit

When using the setpoint value offset via 1Bit object, a value of 1Bit (1=+/0=-) is sent to the object "Setpoint value offset". The setpoint is then adjusted depending on the set step width. A “0” decreases the setpoint by the specified step width, a “1” increases the setpoint by the specified step width.

Example:

Set Step width	0,5K
Sent value	0
Current setpoint	21°C
-> Setpoint value offset	-0,5°C
-> New Setpoint	21°C – 0,5°C = 20,5°C

Number	Name	Length	Usage
18	Setpoint value offset (1=+/0=-)	1 Bit	Set point offset relative to the pre-set comfort setpoint. 1 = + set step width / 0 = - set step witdh

Table 55: Communication object Setpoint value offset via 1Bit

Current Setpoint

The following illustration shows the possible settings for sending of setpoint changes:

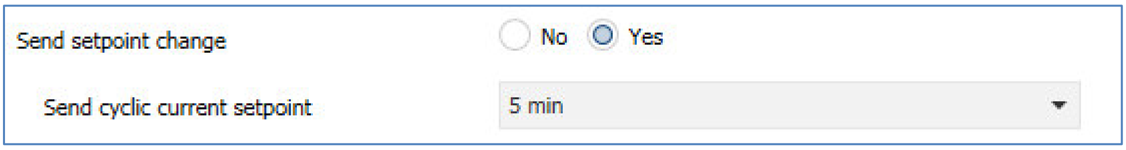

Figure 31: Send setpoint change

The following table shows the possible settings for this parameter:

ETS-text	Dynamic range **[default value]**	comment
Send setpoint change	▪ **No** ▪ Yes	Adjustment whether a change of setpoint should be send or not
Send cyclic current setpoint	▪ **not active** ▪ 5min – 4h	Setting whether the object current setpoint is to be sent cyclically. Adjustable only when send setpoint changes is activated

Table 56: Settings - Send setpoint change

The communication object "Current setpoint" is used to display the current setpoint value (for the selected operating mode) and can be sent cyclically or after a change:

Number	**Name**	**Length**	**Usage**
9	Current setpoint	2 Byte	Sends the current setpoint

Table 57: Communication object - Current Setpoint

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4.5.5 Message function (Frost/Heat)

With the message function can be reported if a certain temperature is exceeded or undercut. This is shown by its associated communication objects:

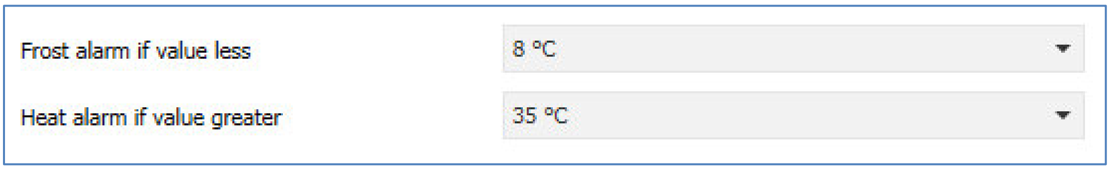

Figure 32: Message function (Frost/Heat)

The possible settings for this parameter are shown in the table below:

Sub function	Dynamic range **[default value]**	comment
Frost alarm if value less	inactive, 1°C-25°C [8°C]	Adjustment range of the lower report value; Setting available if message function is activated
Heat alarm if value greater	inactive, 18°C-40°C [35°C]	Adjustment range of the upper report value; Setting available if message function is activated

Table 58: Message function (Frost/Heat)

The message function reports the exceedance or undercut by the associated object. The exceedance of the upper value is shown by the heat alarm and the undercut of the lower value is shown by the frost alarm. Both objects have the size of 1 Bit and can be used for visualizations or for the initiation of counteractions.
The following table shows the two objects:

Number	Name	Length	Usage
16	Frost alarm	1 Bit	reports the decrement of the lower report value
17	Heat alarm	1 Bit	reports the increment of the upper report value

Table 59: Communication objects message function

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4.5.6 Heating/Cooling system

By setting an appropriate heating system, the controller gets adjusted to the existing heating and cooling system:

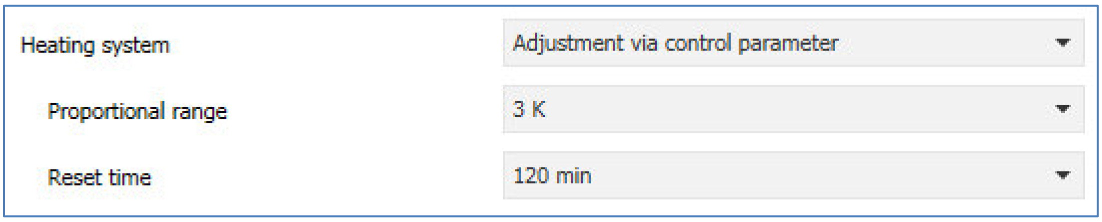

Figure 33: Heating/cooling system

The following table shows the possible settings for this parameter:

Sub function	Dynamic range **[default value]**	comment
Heating/Cooling system	▪ **Warm water heating (4K/120min)** ▪ Underfloor heating (4K/150min) ▪ Split Unit (4K/60min) ▪ Adjustment via control parameter	Setting of the used heating/cooling system. Individual parameterizations available by setting number 4
Proportional range (K)	1K-8K **[3K]**	If “Adjustment via control parameter” is selected for the heating/cooling system, the proportional range can be chosen freely
Reset time (min)	15min – 210 min **[120 min]**	If “Adjustment via control parameter” is selected for the heating/cooling system, the reset time can be chosen freely

Table 60: Heating/cooling system

By the setting of the used heating system the individual control parameters, P-share and I-share, are adjusted. The adjustment of the heating system applies to both, a heating and a cooling operation. It is possible to use predefined values which fit to certain heating/cooling systems as well as to parameterize the parts of the P-Controller and the I-Controller individually. The predefined values for the belonging heating or cooling system are based on practically tested values and usually lead to good control results.
If “Adjustment via control parameter” is selected, the P-share and the I-share can be chosen freely.
Note: This setting needs enough knowledge at the area of control engineering.

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4.5.6.1 Proportional range

The proportional range describes the P-amount of the controlling. The P-amount produces a proportional increase of the control variable to the system deviation.
A small proportional range causes a short recovery time of the system deviation. The controller reacts thereby almost immediately and sets the control variable already at a small system deviations almost to the maximum value (=100%). If the proportional range is chosen too small, the risk of overshooting is very large..
A proportional range of 4K sets the setpoint to 100% at a system deviation (difference between setpoint and actual temperature) of 4°C. With this setting, a control deviation of 1°C would cause a control value of 25%.

➔ Details on setting and operation of the PI controller under 6.4.2

4.5.6.2 Reset time

The reset time describes the I-amount of the controlling. The I-amount of a controlling causes an integral approach of the actual value to the setpoint. A short reset time indicates a strong I-amount.
A short reset time causes that the control variable 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 the risk of an overshooting.
Basically, the slower the system, the greater the reset time.

➔ Details on setting and operation of the PI controller under 6.4.2

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4.5.7 Additional settings at combined heating & cooling mode

If the integrated controller is set to heating and cooling mode, it must be adjusted whether a combined circuit or a divided circuit for heating and cooling is given:

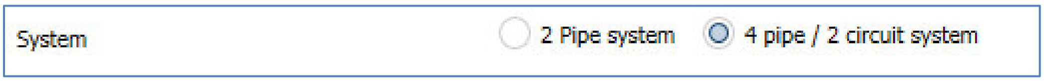

Figure 34: Combined systems

The following chart shows the dynamic range of this parameter:

Sub function	Dynamic range **[default value]**	comment
System	▪ **2 Pipe system** ▪ 4 Pipe system	Adjustment whether combined or divided systems are given

Table 61: Combined systems

At the setting “2 Pipe system“, a combined heating and cooling system is geiven. One channel controls the valve for heating and cooling.
If the setting “4 Pipe system” is selected, a divided system is given with an own cooling circuit and an own heating circuit. As there are two valves given, the valves must be controlled from different channels. So an extra communication object, called “PWM cooling for 4 pipe system”, is shown. This object can be processed arbitrarily, e.g. from another channel of the heating actuator.

The communication object for a 4 pipe system is shown below:

Number	Name	Length	Usage
6	PWM cooling for 4 pipe system	1 Byte	Control value for the cooling mode. Only visible when set to “4 Pipe system”.

Table 62: Communication object PWM cooling for 4 pipe system

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4.5.8 Comfort Extension

The comfort extension causes a temporary switch in the comfort mode. The following parameters are available for this purpose:

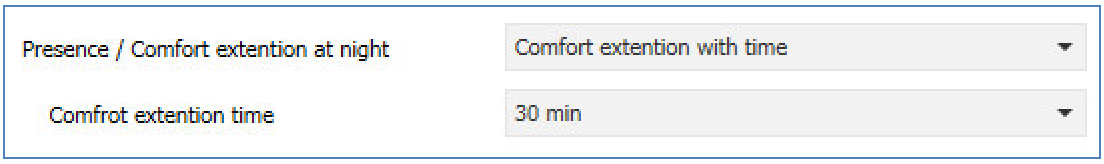

Figure 35: Comfort extension

The following table shows the possible settings for this parameter:

Sub function	Dynamic range **[default value]**	comment
Presence / Comfort extension at night	▪ **not active** ▪ Comfort extension with time ▪ Copmfort over presence object	Activation of the comfort extension via time dependent object or via presence
Comfort extension time	▪ **30 min**, 1 h, 1,5 h, 2 h, 2,5 h, 3 h, 3,5 h, 4 h	Adjustable time for the comfort extension

Table 63: Settings Comfort extension

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

Nummer	Name	Größe	Verwendung
4	Comfort extension	1 Bit	Temporary switchover into the comfort mode via object for the duration of a predetermined time
4	Switch presence	1 Bit	Temporary switchover into the comfort mode via object. Time-independent.

Table 64: Communication object Comfort extension

The comfort extension can be used for example to extend the comfort mode when visiting, parties, etc. For example the channel is already set to the night mode, by using the comfort extension it can be switched for a certain time back in the comfort mode. When sending a 1 to the object Comfort extension, the channel is from night mode to comfort mode for the configured "comfort extension time". After this time has elapsed, the channel automatically switches back to night mode.
The comfort extension works only for a switch from the night to comfort mode and back!

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4.5.9 Dead Zone

The following settings are available at the ETS-Software:

Figure 36: Dead zone

The following table shows the possible settings 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 65: Settings Dead zone

The settings for the dead zone are only available, when the controller type (see at 4.2 mode selection) 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 should be noted 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.

5 Index

5.1 Register of Illustrations

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5.2 List of tables

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6 Attachment

6.1 Statutory requirements

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

6.2 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.

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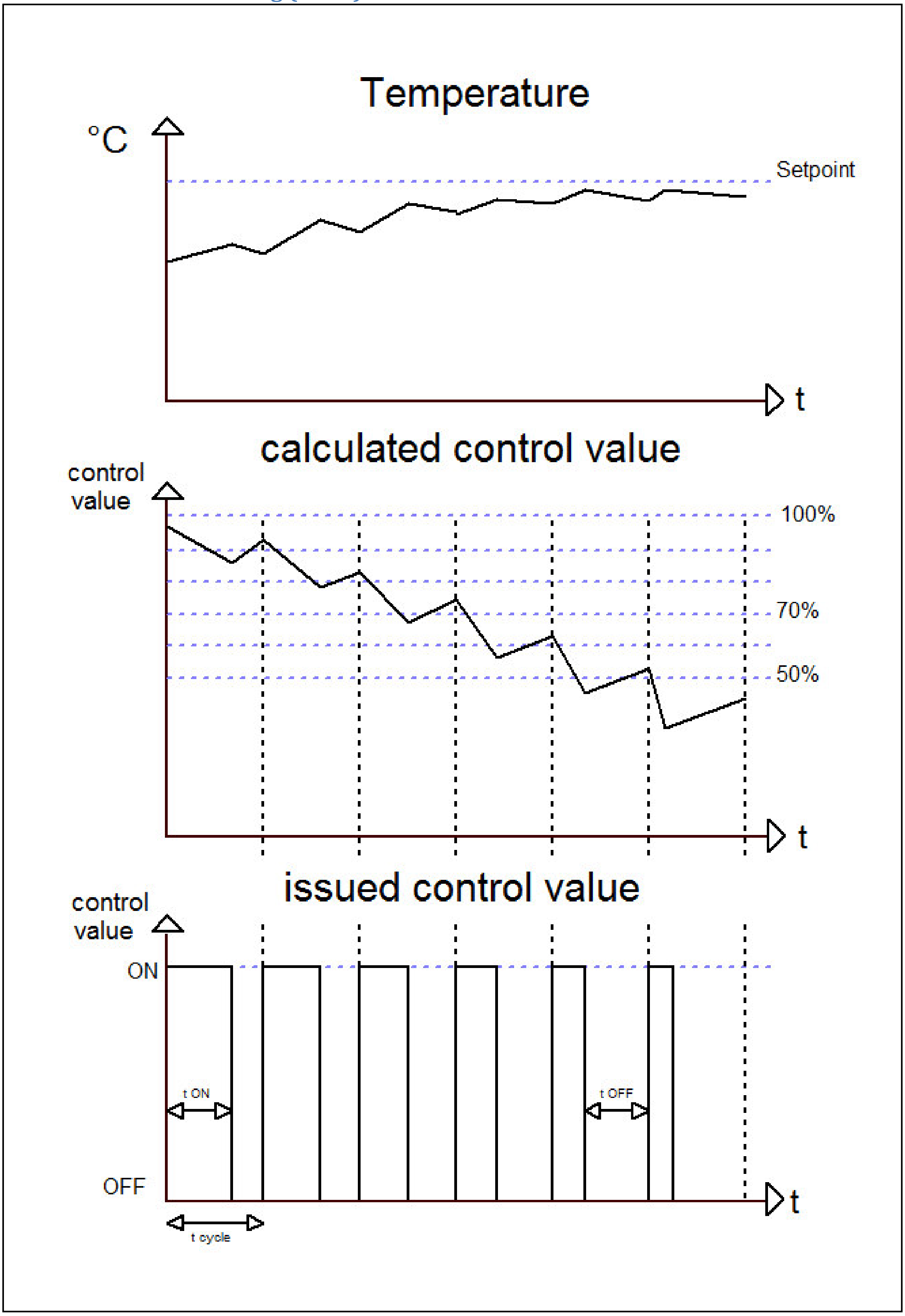
6.4 Remarks

6.4.1 PI-control switching (PWM)



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The heating actuator converts the continuous signal of a PI controller to a PWM signal. The control variable signal (0-100% or 0-255 KNX) of PI control is not passed on to output, but processed internally only. From the output of the PI control, the PWM control converts the control variable into an on / off pulse. However, this On/Off pulse has not, like in the 2 point control, a fixed switchpoint forOn/Off , but the length of the pulses are determined based on the calculated control variable of the PI control. The greater the calculated control variable of the PI control, the greater is the ratio of On/Off time.
The cycle time can be parameterised individually. The cycle time is defined as the time which a complete cycle (the duration of an On/Off pulse together) includes (see chart on previous page). The duration of the switching-on impulse is calculated from the product of calculated control variable and cycle time. For example, with a cycle time of 10 minutes and a calculated control value of 70%, the switch-on impulse is: 0.7 * 10 min = 7 min. The remaining 3 minutes of the cycle thus remain for the switch-off impulse. A short cycle time has the effect that the switching-on impulses recur at fairly short intervals. Thereby an excessive drop in temperature is avoided and the actual value is mostly stable. However, this can cause by too frequent switching pulses, which may adversely affect the system or may overload the bus. When setting the cycle time it has to be distinguished between the two settings, described under “4.4.1 PWM cycle”. Depending on the system and the desired effect setting the cycle time can then be performed.

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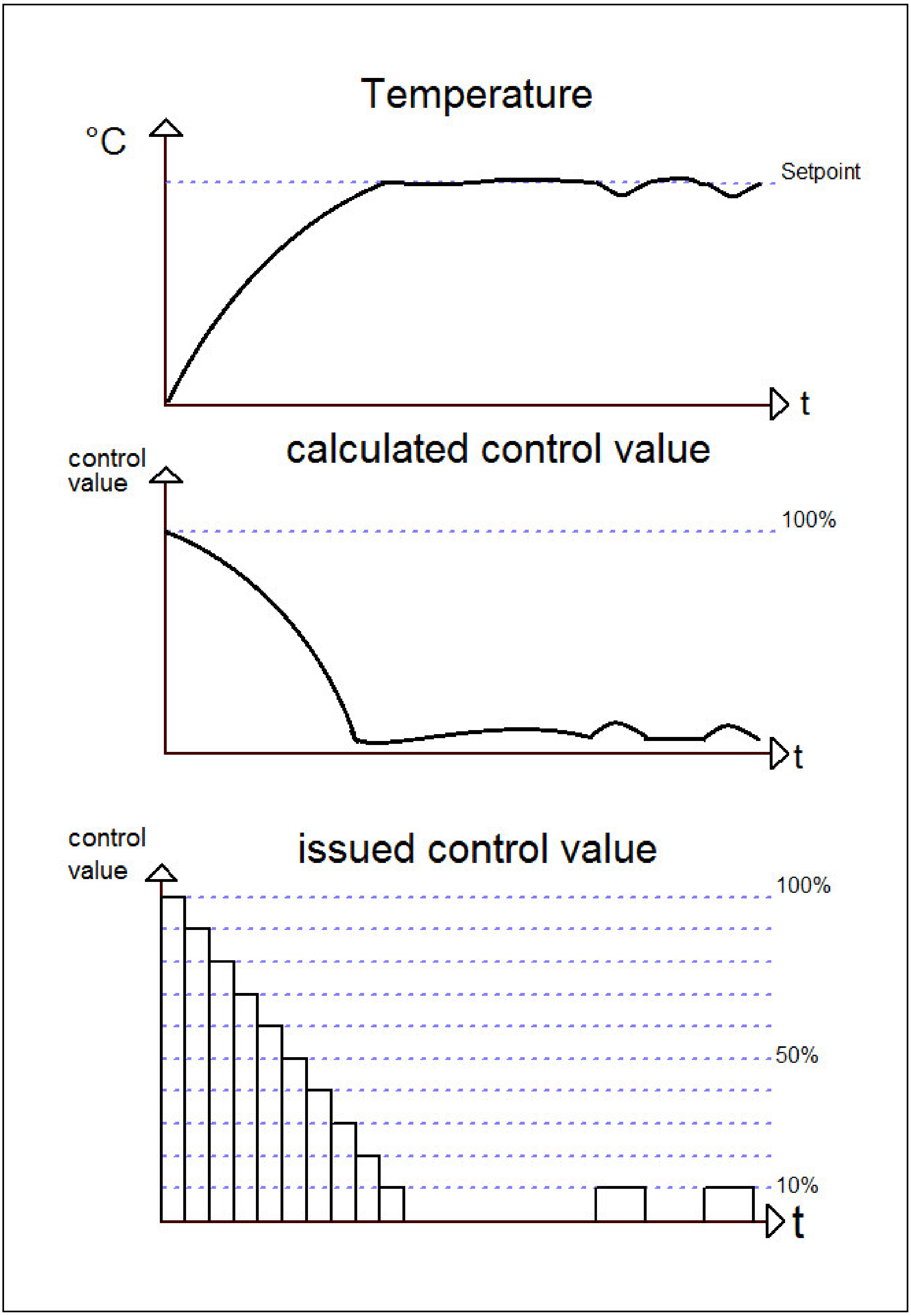
6.4.2 PI-control continuous

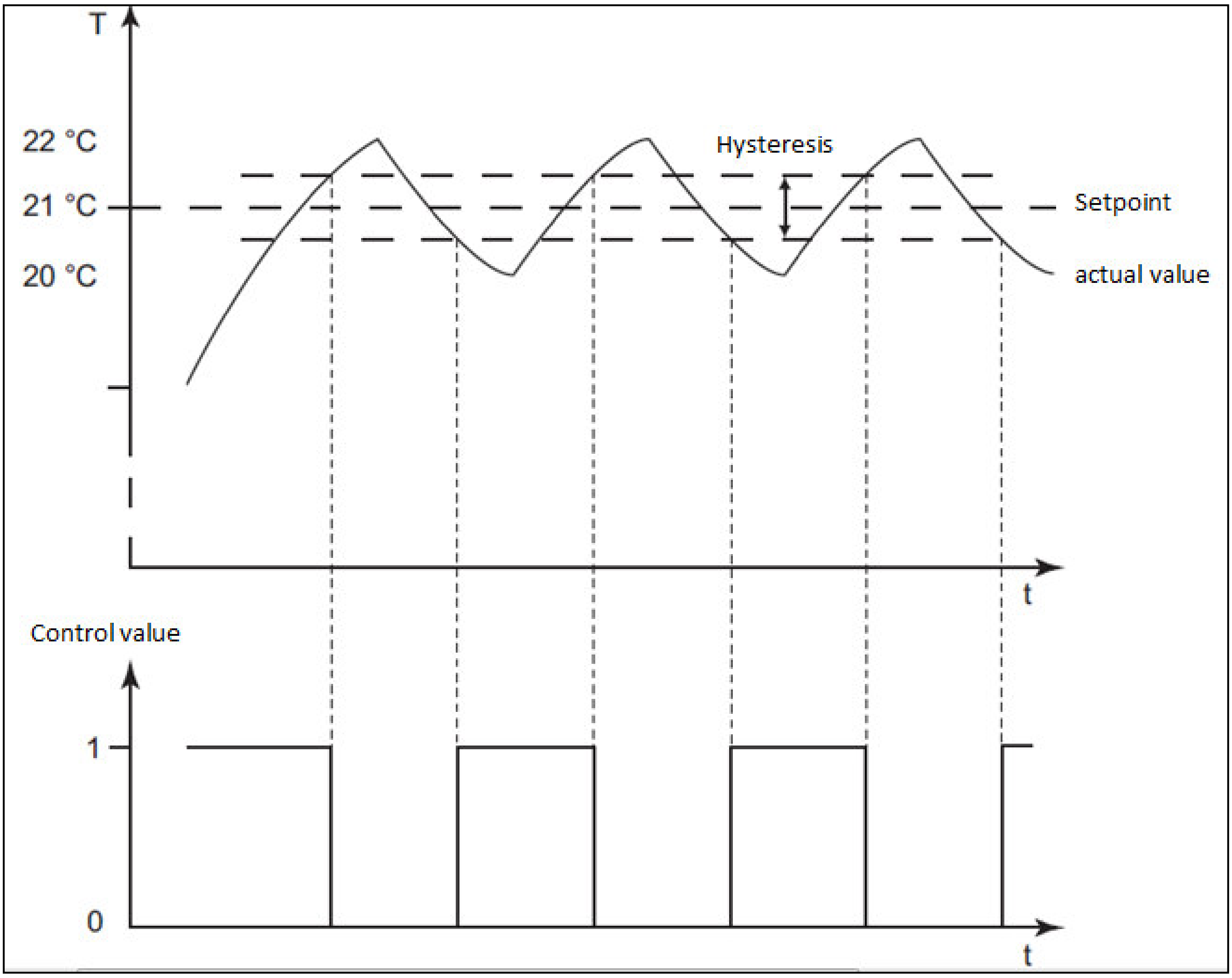


The modulating PI control is a control with a constantly changing control variable. The value of the control variable is always precisely adjusted to the existing system deviation (the difference between the setpoint and actual temperature). The PI control consists of a proportionate amount, the P controller, and an integral amount, the I-controller. By connecting these two types of regulators the benefits of both controllers are combined.
The communication object of PI control for the control variable is a 1Byte object. The value of the control variable can take different percentage states (see picture above). The KNX software converts the control variable signal to a 1Byte object, where 0% = 0 and 100% = 255.
The P amount of the PI-controller causes that the control variable reacts with a proportional response to an upcoming system deviation. Example: If the control variable of 30% would correspond to a systen deviation of 1°C, so at a deviation of 2°C, the control variable would cause 60%. The share of the P-controller is indicated as proportional range and specified in K (dimensionless). The value for the proportional range states just the proportional impact of a pending system deviation to the control variable. With the same control deviation, a half proportional range means a twice control value. The P-controller is a very fast controller, but a P-controller alone has always a lasting system deviation.
The I-amount of the PI-controller causes that the control variable reacts with an integral response to an upcoming system deviation. The currently upcoming system deviation is always added to the control variable. Since the control difference is getting smaller due to the influence of the control variable, consequently, the control value is always getting smaller. Thus, the actual value slowly approaches to the target value. The setting range of the I-controller is called reset time and is expressed in minutes. The smaller the reset time is, the larger the I-amount of the total control. The I-controller is a slow controller, but it is able to control and compensate the system deviation completely.
The PI controller now combines the advantages of both controllers, so it produces a relatively fast controller without any remaining system deviation. For the setting applies that a small proportional range leads to a dynamic behavior of the controller.The range should also not be too small as this might lead to an overshooting. It also applies that a small reset time leads to fast Settling of the system deviation. However, a too short reset time might also lead to an overshooting of the controller. Thus, the following principles for the setting can be defined:

- **Small proportional range:** little risk of overshooting; but slow adjustment; Usage wherever large system increases are needed (high heat output, etc.)
- **large proportional range:** high risc of overshooting after setpoint change; fast settling to setpoint; Usage in fast systems
- **small reset time:** fast correction of system deviations; Usage in fast systems and where changing environmental conditions (disturbances, such as draughts, etc.) prevail.
- **large reset time:** fast correction of system deviations; low risc of overshooting; usage in slow heating systems,such as underfloor heating

The continuous PI control should be used where the control variable can be monitored continuously and can assume a plurality of states, such as several valve states (10% open, 50% open; ...) and precise control results are desired.

6.4.3 2-Step control



6.5 Revision History

Version 1.0 -1st TM-version of the "2nd Generation" of heating actuators - State 08/16

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MDT Heating Actuator 4/8-fold, MDRC

Version		
AKH-0400.02	Heating Actuator 4-fold	2SU MDRC, to control electrothermic valve drives 24-230VAC
AKH-0800.02	Heating Actuator 8-fold	4SU MDRC, to control electrothermic valve drives 24-230VAC

The MDT Heating Actuator receives KNX/EIB telegrams and controls up to independent electrical outputs . Each channel has its own LED indicator.

Each channel supplies up to 4 electrothermic valve drives and can be parameterized individually via ETS.
The channels are controllable with PWM (1Bit) or 1Byte telegrams. The integrated temperature controller manages the actuating value given by external KNX temperature sensors. The temperature controller offers comfort-, night-, frost protection- and summer- /winter- operation.

The MDT Heating Actuator detects mains voltage failure and has emergency operation if the cyclic telegram is missing. Additionally they provide objects for heating request and cyclic movement of the valves.

The MDT Heating Actuator is a modular installation device for fixed installation in dry rooms. It fits on DIN 35mm rails in power distribution boards or closed compact boxes.

For project design and commissioning of the MDT Heating Actuator it is recommended to use the ETS or later.
Please download the application software at www.mdt.de/Downloads.html

AKH-0400.02

AKH-0800.02

- Production in Germany, certified according to ISO 9001
- **Extensive function extension**
- Each channel controls up to 4 electrothermic valve drives (230VAC)
- Controllable with 1Bit (Switching/PWM) / 1Byte actuating variable or direct control with temperature value via KNX bus
- **Integrated PI temperature controller (Heating and Cooling)**
- Given value is stored at voltage failure
- 1Bit +/-, 1Byte or 2Byte absolute object to set the given value
- Comfort-, night- and frost protection. Summer-/winter operation
- Emergency operation if cyclic actuating variable fails
- Short circuit detection of connected load
- Detection of 230VAC mains voltage failure
- Objects for heating request and cyclic movement of the valves
- **Extensive scene functions**
- **Minimum flow temperature**
- **Diagnostics for each channel with 14Byte plain text object**
- Modular installation device for DIN 35mm rails
- Integrated bus coupling unit
- 3 years warranty

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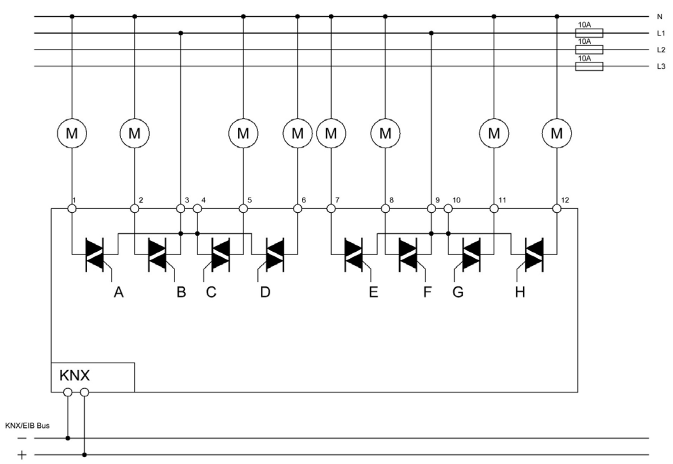
Technical Data	AKH-0400.02 AKH-0800.02
Number of outputs	4/8
Output switching current	
24VAC and ohmic load	500mA
230VAC and ohmic load	500mA
max. inrush current**	5A
External switching voltage	24-230VAC
Maximum load	
Number of electrotermic valves*	230VAC: 4 each channel 24VAC: 3 each channel
Output life expectancy	Triac output, wearless
Specification KNX Interface	TP-256
Available application software	ETS 4/5 Project file for ETS 3 (*.pr5)
Permitted wire gauge	
Screw terminal	0,5 - 4,0mm² solid core 0,5 - 2,5mm² finely stranded
KNX busconnection terminal	0,8mm Ø, solid core
Power supply	KNX bus
Power consumption KNX bus typ.	< 0,3W
Operation temperature range	0 to + 45°C
Enclosure	IP 20
Dimensions MDRC (Space Units)	2/4SU

* depends on manufacturer. Inrush current for 4 electrothermic valves has to be < 1A each electrothermic valve ** every group of four outputs

Examplary circuit diagram AKH-0800.02



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