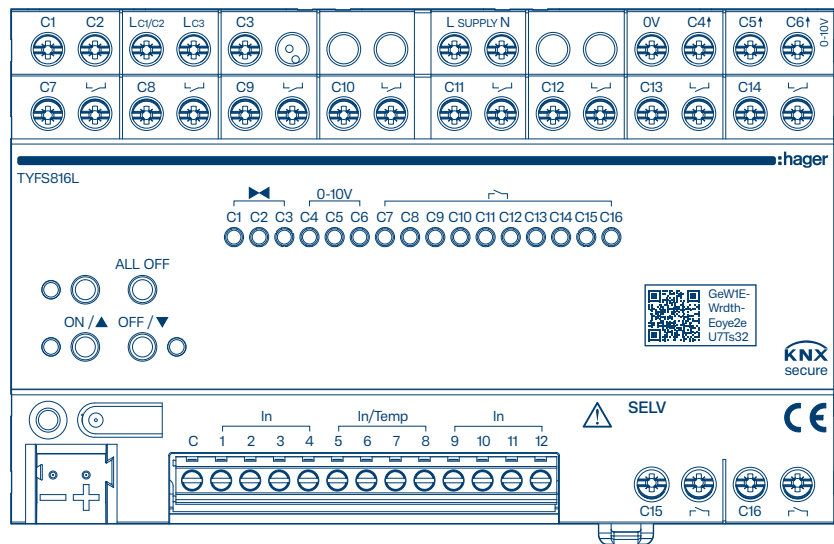


Application description

KNX building management system

Multi control module, 12 inputs / 16 outputs



Multi control module, 12 inputs / 16 outputs,
KNX Secure

TYFS816L



:hager

Product overview

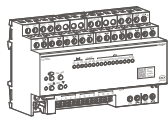
	Order number	Product designation	Application pro-gram	TP Product Radio product
	TYFS816L	Multi control module, 12 inputs / 16 outputs, KNX Secure	STYFS816L	TP Product

Table 1: Product overview

We reserve the right to make any changes of a technical nature.

Table of contents

1	Information on the product.....	8
1.1	Product catalogue	8
1.2	Function	8
1.3	Device components	14
1.4	As-delivered state	15
1.5	Technical data.....	17
1.6	Accessories.....	19
2	Safety instructions	20
3	Mounting and electrical connection	21
4	Commissioning	28
5	Application programs	30
6	Scope of functions	31
7	Notes on software.....	41
8	Operation and indication.....	42
8.1	Button operation and display function.....	42
8.2	Configuring manual operation	50
8.3	Configuring the status display	54
8.4	Operation and indication parameters.....	55
8.5	Object list for operation and indication.....	58
9	General functions	59
9.1	Delay after bus voltage returns	59
9.2	Heartbeat	60
9.3	Room service function (DND/MUR)	61
9.4	"Room occupancy" function	66
9.5	Status / Collective feedback switching status	75
10	FanCoil functions (valve and fan control)	82
10.1	Application basics	82
10.2	FanCoil configuration	86
10.2.1	FanCoil connection aid.....	96
10.2.2	HVAC General parameter	102
11	Valve control.....	105
11.1	Priorities for valve outputs.....	105
11.2	Cross-channel functions for valve outputs	107
11.2.1	Heat requirement.....	108

11.2.2	Pump control	114
11.2.3	Largest command value	121
11.2.4	Summer / winter mode switchover	126
11.2.5	Service mode	129
11.3	Valve output - General	134
11.3.1	Name	134
11.3.2	Data formats for command values	134
11.3.3	PWM cycle time	140
11.3.4	Valve direction of action	142
11.3.5	Reset behaviour	143
11.3.6	"Valve output - General" parameters	146
11.3.7	Objects for "Valve output - General"	151
11.4	Cyclical command value monitoring / emergency operation	153
11.4.1	Command value monitoring / emergency operation parameters	156
11.4.2	Objects for command value monitoring / emergency operation	157
11.5	Command value limit	158
11.5.1	Command value limit parameters	160
11.5.2	Objects for command value limit	160
11.6	Priority control	161
11.6.1	"Forced position" parameters	164
11.6.2	Objects for forced position	166
11.7	Command value status	167
11.7.1	Status parameters	171
11.7.2	Objects for status	172
11.8	Short-circuit and overload detection on electronic valve outputs	173
11.8.1	Short-circuit and overload detection parameters	174
11.8.2	Objects for short-circuit and overload detection	176
11.9	Valve rinsing	177
11.9.1	Valve rinsing parameters	181
11.9.2	Objects for valve rinsing	183
11.10	Operating hours counter	184
11.10.1	Operating hours counter parameters	188
11.10.2	Objects for operating hours counter	191
12	Fan controller	193
12.1	Fan configuration	194
12.2	Fan automatic	206
12.2.1	Fan level depending on operating mode	210
12.2.2	Command value limiting values and command value offset	210

12.3	Fan behaviour	211
12.3.1	Fan run-on time	211
12.3.2	Start-up level	212
12.3.3	Fan level limit	217
12.3.4	Forced fan position.....	220
12.3.5	Fan protection	220
12.4	Operating hours counter	221
12.5	Fan status	232
12.6	Fan control parameters	234
12.7	Fan control objects.....	242
13	Analogue outputs.....	245
13.1	Channel configuration	245
13.2	Name of the analogue output.....	248
13.3	Value range.....	249
13.4	Switching/dimming behaviour	251
13.5	Reset behaviour	255
13.6	Dimming characteristic.....	260
13.6.1	Parameter Dimming characteristic	263
13.7	Time delays.....	264
13.8	Switch-on/switch-off behaviour	266
13.8.1	Soft ON/OFF function.....	266
13.8.2	Automatic switch-off	267
13.8.3	Switch-on/switch-off behaviour parameter	270
13.9	Scene function	272
13.10	Logic operation function	281
13.11	Operating hours counter	284
13.12	Disabling function/Forced position	294
13.12.1	Disabling function/forced position parameter	297
13.12.2	Object list for disabling function/forced position	302
14	Relay outputs.....	303
14.1	Channel configuration	303
14.2	Venetian blind operation	306
14.2.1	Priorities	306
14.2.2	General settings	308
14.2.3	Operation.....	324
14.2.4	Reset and initialisation behaviour	326
14.2.5	Short-time / Long-time operation, travel times	330

14.2.6	Position calculation, position presetting and feedbacks	343
14.2.7	Sun protection function	365
14.2.8	Twilight function.....	420
14.2.9	Scene function.....	424
14.2.10	Ventilation function	431
14.2.11	Disabling function and forced position	437
14.2.12	Door contact block.....	452
14.2.13	Supplementary functions.....	456
14.3	Switching operation.....	464
14.3.1	Priorities	464
14.3.2	General settings	465
14.3.3	Operation.....	470
14.3.4	Reset and initialisation behaviour	472
14.3.5	Cyclical monitoring	477
14.3.6	Feedback telegrams.....	479
14.3.7	Time delays	487
14.3.8	Staircase function.....	489
14.3.9	Scene function.....	501
14.3.10	Disabling function and forced position	509
14.3.11	Logic operation function	518
14.3.12	Operating hours counter.....	521
15	Extensions	531
15.1	Channel configuration extensions parameter	532
15.2	Push-button.....	534
15.2.2	Switching	536
15.2.3	Priority control	539
15.2.4	Dimming and colour temperature	542
15.2.5	Venetian blind / shutter / awning / roof window	551
15.2.6	Value transmitter	555
15.2.7	Scene extension unit.....	575
15.2.8	Short and long button operation	579
15.2.9	Room temperature control point.....	603
15.3	Switch	616
15.3.2	Switching	618
15.3.3	Priority control	623
15.3.4	Value transmitter	626
15.3.5	Scene extension unit.....	644
15.3.6	Room temperature control point.....	649

15.4	Door/window status.....	668
15.5	Temperature sensor.....	676
15.6	Pulse counter	679
16	Room temperature controller	719
16.1	Room temperature controller - General	720
16.1.1	Name.....	720
16.1.2	Operation.....	720
16.1.3	Type of control.....	722
16.1.4	Disabling functions	732
16.1.5	Reset behaviour	732
16.1.6	"Room temperature controller - General" parameters.....	734
16.1.7	Objects for command value output disabling	738
16.2	Operating mode and setpoints.....	739
16.2.1	Operating mode and setpoint parameters.....	754
16.2.2	Objects for operating mode and setpoints	761
16.3	Command value output and command value limit	765
16.3.1	Command value output parameters	768
16.3.2	Command value limit parameters.....	769
16.3.3	Command value output objects.....	771
16.3.4	Objects for command value limit	777
16.4	Room temperature measurement	778
16.4.1	Temperature measurement parameters.....	782
16.4.2	Objects for temperature measurement.....	783
16.5	Controller status.....	785
16.5.1	Status output parameters	788
16.5.2	Objects for controller status.....	788
16.6	Boost function	791
16.6.1	Boost function parameters	791
16.6.2	Objects for boost function.....	792
16.7	Floor temperature monitoring.....	794
16.7.1	Floor temperature monitoring parameters.....	795
16.7.2	Objects for floor temperature monitoring.....	796
16.8	Setpoint temperature limit, cooling.....	797
16.8.1	Setpoint temperature limit parameters	800
16.8.2	Objects for setpoint temperature limit.....	801
16.9	Setpoint temperature increase, heating	803
16.9.1	Setpoint temperature increase parameters	805
16.9.2	Objects for setpoint temperature increase	805

16.10	Scenes	806
16.10.1	Scene parameters	810
16.10.2	Objects for scenes.....	811
17	Logic functions.....	813
17.1	Simple logic functions	815
17.1.1	Logic functions parameters	815
17.1.2	Logic gate.....	817
17.1.3	Converter (1-bit -> 1-byte).....	823
17.1.4	Disabling element (filtering/time)	827
17.1.5	Comparator	834
17.1.6	Limit value switch	844
17.2	Extended logic functions	854
17.2.1	User-defined logic functions	856
17.2.2	Lighting control	871
17.2.3	Parameter for logic functions.....	877
17.2.4	Object table for logic functions	921

1 Information on the product

1.1 Product catalogue

Product name:	Multi control module, 12 inputs / 16 outputs
Use:	Actuator
Design:	RMD (rail-mounted device)
Art. no.	TYFS816L

1.2 Function

General

The device is used to activate electrical loads of up to three different building units (heating/cooling, lighting, shading) that are typically used in residential or office spaces or hotel rooms. The device has up to 12 inputs, which can be used to connect buttons or sensors. Two room temperature controllers and simple and advanced logic functions are also available.

FanCoil control

The device enables the electrical control of up to two fan coil units (FanCoil units). Fan coil units are used to heat or cool rooms depending on the requirements. They can be installed, just like conventional radiators, anywhere a central heating and/or cooling system is installed. In these devices, air circulation is supported by a blower. When doing so, low-noise fans move the room air past the heat exchangers. Up to five speed levels are available to control the blower power.

Depending on the design of the device, fan coil units are used in two-pipe systems (heating only, cooling only, or heating and cooling by means of a shared piping system) or in four-pipe systems (heating and cooling by means of separate pipes). The device supports both pipe principles.

As a rule, the device receives command value telegrams, for example from the internal or an external room temperature controller, and converts these command value specifications into equivalent fan levels. In addition, the device controls the valves in the fan coil unit, either by means of an operating mode specification or, alternatively, directly by separate command value specifications to open or close the heating or cooling line(s) depending on the requirements.

The device also allows manual activation of the blower fan, thus enabling purely ventilation functions without heating or cooling, or individual room ventilation with heating or cooling active. This function is attractive, for example, for hotel rooms or classroom and office spaces. Manual control can be carried out by means of push-button sensors or control panels or the extension inputs of the device.

The fans can be controlled either by switching via relay outputs or constantly via 0...10 V outputs.

Electrothermal valve drives (ETA) for heating or cooling systems can be controlled via 1 bit (relay outputs) or 1 byte (relay outputs or electronic valve outputs) or constantly via 0...10 V outputs. When controlling via relay outputs and electronic valve outputs, continuous command value telegrams are controlled in a pulse width modulated output signal (PWM). This enables quasi-continuous control of the connected valve drives.

The device has the following range of functions:

Normally open or closed valve drives can be connected. Valve drives with 0...10 V inputs can also be connected.

Furthermore, activatable status signals for valve position, cyclical monitoring of the command value telegrams, emergency operation, forced position via bus telegram in summer and winter operation, command value limit, heat requirement and pump control, evaluation of the largest command value, cyclical valve rinsing, service operation and operating hours counter.

Switching / Venetian blind outputs

Up to ten relay outputs are available, depending on the type and number of FanCoil units used. The relay outputs of the device can be set in the ETS either to Venetian blind operation (2 relay outputs per channel) or (1 relay output per channel) to switching operation; mixed operation of these two operating modes is also possible on the device.

In Venetian blind operation the device can be used with its relay contacts to control electrically-driven Venetian blinds, shutters, awnings, roof windows, venting louvres or similar blinds/shutters that are suitable for mains voltage. Alternatively, the device in switching operation switches electrical loads, such as lighting systems or door openers.

Each relay output has bus-powered bistable switching relays, which allows defined preferred positions in the event of bus voltage failure/recovery and after an ETS programming operation.

The functionalities that can be set in the ETS in Venetian blind operation include, for instance, independently configurable travel times, extended feedback functions, assignment to up to 5 different safety functions, an extensive sun protection function, and incorporation into scenes, disabling functions or forced-position applications. Centralized control of all Venetian blind outputs of up to 6 central functions is also possible.

In switching operation the functionalities NC contact or NO contact include, for example, extensive time functions, logic operations, scenes, monitoring functions, operating hours counters, disabling functions or alternatively restraints. In addition, the switching status of a relay output can be signalled back. The central switching operation of all switching outputs of up to 6 central functions is possible, too. The preferred states of the relays in case of bus voltage failure or bus/mains voltage returning can also be set separately.

Analogue outputs

Up to three analogue outputs are available, depending on the type and number of FanCoil units used. External devices (e. g. valve drives, fan motors) can be controlled with a 0...10 V signal via the analogue outputs.

The device permits the separate feedback of the individual switching and dimming states of the connected loads to the KNX. Moreover, a short-circuit and load failure can be signalled separately to the KNX for each channel.

The function features that are independently adjustable for every analogue channel by means of the ETS include, for example, separately configurable dimming ranges, extended feedback functions, a disabling function, or alternatively, a forced position function, a logic operation function, separately adjustable dimming behaviour, soft dimming functions, and time delays.

Each analogue channel can also be integrated into up to 64 scenes with different dimming values. Moreover, the values of the analogue channels in case of a bus voltage failure or when the bus voltage returns and after ETS programming, can be set separately.

The switch-on times of the analogue channels can be detected and evaluated separately by operating hours counters.

Extensions (binary inputs)

The device has 12 independent extension channels. The first four channels work as binary inputs. Channels 5 ... 8 can be used as binary inputs or to connect temperature sensors. Channels 9 ... 12 can be used only as binary inputs. The device can read in up to 12 contact states potential-free via the inputs in event of a shared reference potential and transmit telegrams on the bus accordingly.

With the push-button connected, telegrams for operating a FanCoil unit, switching, forced position, dimming the brightness or colour temperature, shading control, transmitting values, calling up or switching a scene as a scene extension unit or operating a room temperature controller with the room temperature control point can be transmitted on the bus in the "push-button" channel function. Optionally, different telegrams can be transmitted on the bus by pressing the button briefly or for a long time. The contact type of the push-buttons can be parameterised in the process.

- i** The "push-button" channel function is recommended if telegrams are to be transmitted on the KNX, depending on how long the channel/push-button was actuated. For example in the "dimming", "venetian blind", "value transmitter with value adjustment", "telegram upon short or long button actuation" functions or with the "RGB(W) colour adjustment".

With the switch connected, telegrams for switching, forced position, transmitting values, calling up or switching a scene as scene extension unit or operating a room temperature controller with the room temperature control point can be transmitted on the bus by means of one or two objects in the "switch" channel function. One value can be parameterised when closing and one value when opening the contact.

- i** The "switch" channel function is recommended if telegrams are to be transmitted cyclically on the KNX. This allows monitoring, similar to the heartbeat, to be implemented or rising and falling edges - like with the switch - to be evaluated regardless of the time.

With the door or window contacts connected, different window or door states can be evaluated and corresponding telegrams transmitted on the bus in the "door/window status" channel function.

In the "pulse meter" channel function, the channel counts the number of pulses at the input. The "pulse meter" channel function includes the evaluation of a main meter and intermediate meter.

- i** For channels 5 ... 8 only: With the temperature sensor connected, the temperature can be evaluated and corresponding telegrams transmitted on the bus in the "temperature sensor" channel function. Optionally, the temperature measurement of the connected sensor can be supplemented by an external temperature value via the bus.
- i** The connection of 230 V signals or other external voltages to the inputs is not permitted!

Logic module

The device has a wide range of logic functions. Simple logic functions or, alternatively, advanced logic functions are available.

Eight separate logic functions of the simple logic functions can be activated. Using these functions, logic gates (e. g. AND, OR, exclusive OR, each with up to 4 inputs) can be set up and thus switching and status information can be linked and evaluated. Alternatively, a one-bit to one-byte converter and a disabling element with filter and time functions can be configured for each logic function. As a further option, comparators or limit value switches with hysteresis can be set as a logic function. The logic functions have their own KNX communication objects and can process telegrams of the actuator or of other bus devices.

Up to ten extensive logic functions of the advanced logic functions can be used. Simple or complex logical operations can be performed using these functions. In the user-defined version, each logic function possesses up to 8 trigger inputs for the activation of a logical calculation. An optional filter stage allows the hiding of trigger results (e. g. "only react to switch-on commands" or "only react when dimming level greater than 50 %"). Operations can be executed at 1 to 4 levels and can be configured in a user-defined manner to the types "Logic" (e. g. AND, OR, exclusive AND, exclusive OR, each with up to 8 inputs), "Arithmetic" (e. g. addition, subtraction, multiplication, division, percent), "Comparison" (e. g. equal, unequal, greater than, smaller than, area test) or "Type conversion". Operators can be constants, input or output objects. A result stage allows the evaluation, forwarding and, if necessary, also the conversion of results of logical operations.

To simplify the configuration of a logic function, lighting control is available as a configuration template. Alternatively to a user-defined configuration, lighting control can be activated for logic functions 1 and 2 and allows "Welcome" or "Goodbye" control

for the lighting in a hotel room or similar applications (e. g. welcome light on entering a house or central switch-off on leaving an apartment). Defined inputs and outputs are available for lighting control.

All the logic functions use groups of input and output objects with a defined number and defined data types (32 x 1-bit, 16 x 4-bit, 16 x 1-byte, 16 x 2-byte, 8 x 4-byte). It is possible to configure individually in the ETS which logic functions react to which input objects and which output objects are influenced by the logic functions. Sensible linking of input and output objects allows the networking of logic functions, permitting the execution of complex operations. The inputs and outputs are available via communication objects on the KNX or, alternatively, also internally in the device, e. g. for direct connection with binary inputs or relay outputs.

Room service function (DND/MUR)

The device supports two special hotel functions for communicating information from hotel guests to service staff without having to open the room door.

The messages "Do not disturb (DND)" or "Make up room (MUR)" can be transmitted via push-button sensors or manual push-buttons on the extension inputs of the device. The message can be visualised both in the area of the room door and from a central location. This serves to improve the coordination of service personnel. Up to 7 communication objects are visible.

Room occupancy detection function

Especially in larger hotels, it can be advantageous to recognise the actual occupancy of rooms (presence of guests or employees) in order to optimise service. For example, efficient management of cleaning or maintenance staff is possible, as well as a list of occupied rooms in the event of an evacuation.

When this function is activated, up to 8 communication objects are visible. These can be used to view room occupancy from outside the room door or from a central location.

To be able to use this room occupancy function, a door contact is required for each entrance door of the room and a presence detector for each area of the room. The combination of door contact and presence detector enables fairly reliable detection of room occupancy.

In addition, entry profiles can be used to recognise whether the room occupants are guests or employees.

Room temperature controller

Two room temperature controllers are integrated in the device software, which can be used for single-room temperature control. This involves adaptive room temperature controllers which independently adjust optimally to the respective control section. This allows the temperature to be set in up to two rooms to specified setpoints through independent control processes. Depending on the operation, current temperature setpoint and room temperature, using a controller permits a command value for heating or cooling control to be internally forwarded to a valve and FanCoil output.

The controller distinguishes between different operating modes (Comfort, Standby, Night, Frost/heat protection) each with their own temperature setpoints for heating or cooling.

In addition to the basic level heating or cooling, activating an additional level enables an additional heating or cooling unit to be used. In this connection, you can set the temperature setpoint difference between the basic and the additional level by a parameter in the ETS. For major deviations between the temperature setpoint and the actual temperature, you can activate this additional level to heat up or cool down a room faster. You can assign different control algorithms to the basic and additional levels.

The room temperature controller can send status messages to the bus by means of separate communication objects and supports the following functions that can be activated: presence detection, boost function, command value limitation, floor temperature monitoring, frost/heat protection, setpoint temperature limitation for cooling, setpoint temperature increase for heating and integration of the room temperature control in up to 64 scenes.

The room temperatures are recorded per controller by one or optionally by two external KNX temperature sensors (e. g. push-button sensors with temperature measurement).

Operation, mounting and ETS

The controls (4 pushbuttons) on the front panel of the device permit switching the outputs of the device on and off by hand in parallel with the KNX even without bus voltage or in a non-programmed state. The analogue outputs can also be dimmed in addition to their switching function. This feature permits fast checking of connected devices for proper functioning.

The device has its own power supply provided by a mains voltage connection that is independent of the connected load. For activation of the outputs the 230 V mains voltage must always be switched on. The power supply for the device electronics (BCU with application program) is drawn from the bus voltage or from the mains voltage.

The device is designed for mounting on DIN-rails in closed compact boxes or in power distributors in fixed installations in dry rooms.

The device can be updated. Firmware can be easily updated with the Hager/Berker Firmware Update App (additional software).

The device is KNX Data Secure capable. KNX Data Secure offers protection against manipulation in building automation and can be configured in the ETS project. Detailed technical knowledge is a prerequisite. A device certificate, which is attached to the device, is required for safe commissioning. During mounting, the certificate must be removed from the device and stored securely.

Planning, installation and commissioning of the device are carried out with the aid of the ETS, version 5.7.7 and higher or 6.3.0.

1.3 Device components

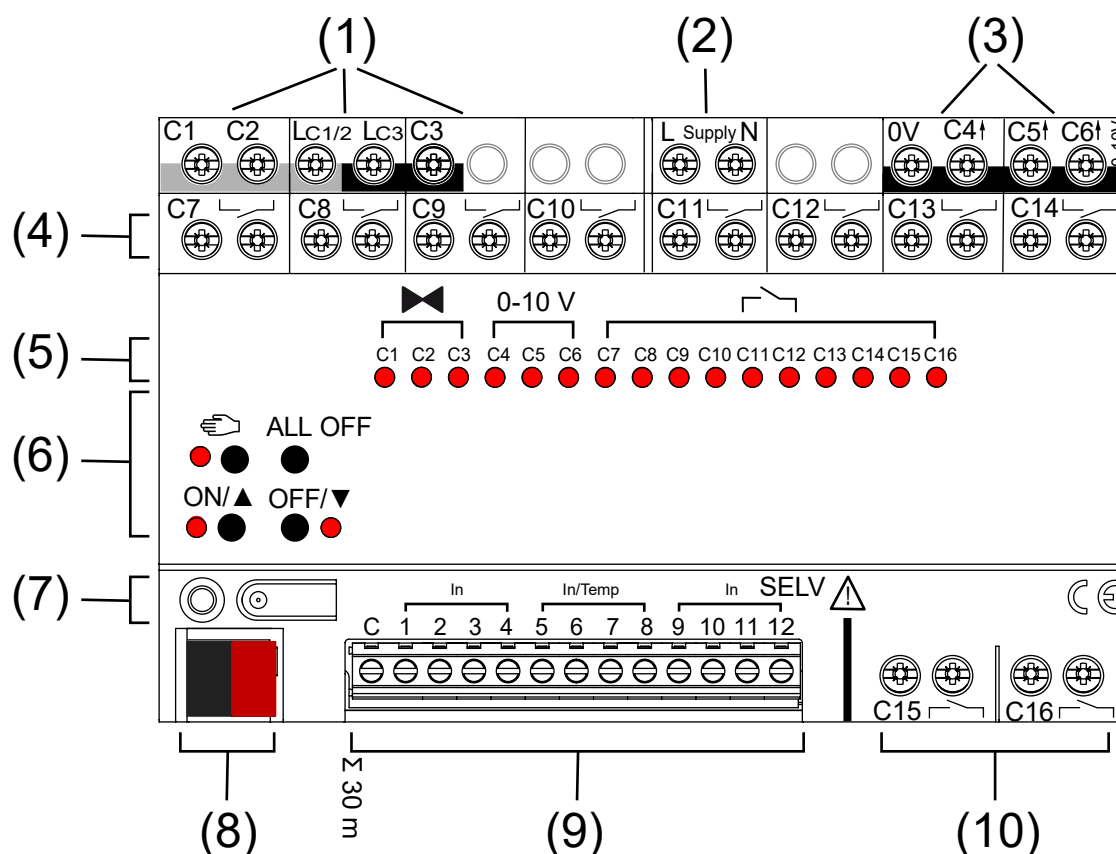


Figure 1: Device components front view

- (1) Electronic valve outputs
- (2) Connection of mains voltage supply
- (3) Analogue outputs 0 -10 V
- (4) Relay outputs C7 ... C14
- (5) Status LEDs, outputs C1 ... C16
- (6) Button field for manual control
- (7) Programming button and LEDs
- (8) KNX connection
- (9) Extensions
- (10) Relay outputs C15 ... C16

Indication Status LED during operation

Off	Disabled
Lights up	Enabled
Flashes slowly	Short circuit (electronic valve outputs)
Flashes quickly	Overload / mains voltage failure / load failure
Flashes rapidly	Output disabled

1.4 As-delivered state

In the state as delivered, the device is passive, i. e. no telegrams are transmitted to the bus. The outputs can, however, be operated by manual control on the device, provide the bus and mains voltage is switched on. In manual operation, no feedback telegrams are sent to the bus. Other functions of the device are deactivated.

-  All status LEDs will flash quickly if the mains voltage supply is missing.
-  The electronic valve outputs require their own power supply. If it is not connected, the status LEDs of the respective outputs will flash quickly.

Manual operation in the as-delivered state differs from manual operation in the programmed state to avoid damaging any loads already connected due to incorrect control.

The device can be programmed and put into operation via the ETS. The physical address is preset to 15.15.255.

The device has been configured at the factory with the following characteristics...

Electronic valve outputs:

- Programmed as electronic switches
- Several outputs can be switched on at the same time

Analogue outputs:

- Are switched on with a fixed command value of 50%.

Relay outputs:

- All outputs are configured for switching, not for Venetian blinds
- Only one relay output may be switched on at a time. If a second one is switched on, the first relay output will switch off automatically.
- Switching off the second output can be intentionally overridden by pressing and holding the button (> 2 s). The output will then remain switched on permanently.

Manual operation in the as-delivered state

When delivered, the device has not yet been commissioned with the ETS, but loads may already be connected, which are to be switched for a function check (construction site operation).

To prevent damage to connected loads due to incorrect control, manual operation in the as-delivered state differs from manual operation in the programmed state. The outputs have been preset as follows:

- The relay outputs are set as switching outputs
- Electronic valve outputs are set as electronic switches
- The analogue outputs are switched on with a fixed command value of 50%.

Operating the outputs

The bus voltage is switched on and the mains voltage supply of the device and the separate supply for the electronic valve outputs are present.

- Press the  button for less than 1 s repeatedly until the status LED (5) of the desired output flashes.
- Press the **ON/▲** or **OFF/▼** button for less than 1 s.

The selected output switches.

A relay output that was previously switched on switches off.

The LEDs **ON/▲** and **OFF/▼** indicate the status of the output.

Switching on the selected output permanently



CAUTION!

Destruction of Venetian blind motors with simultaneous energisation of both running directions.

Destruction of fan motors due to simultaneous energisation of several stages of a fan.

Do not permanently switch on outputs to which a venetian blind or fan motor is connected.

- Switch on the selected relay output permanently: Button **ON/▲** for longer than 2 seconds.

1.5 Technical data

Rated voltage	AC 110 / 230 V ~
Mains frequency	50 / 60 Hz
Ambient temperature	-5 ... +45 °C
Storage/transport temperature	-25 ... +70 °C
Power loss	max. 14 W
Standby power	max. 0.55 W
Electronic valve outputs C1 ... C3	
Connected load at 230°V	
Ohmic load	10 W
Capacitive load	10 W
Connected load at 110°V	
Ohmic load	5 W
Capacitive load	5 W
Number of electrothermal actuators	max. 4 (230 V), 2 (110 V)
Analogue outputs 0-10 V C4 ... C6	
Control voltage	0 ... 10 V
Current carrying capacity	10 mA
Insulation	basic insulation
Relay outputs C7 ... C14	
Switching voltage	AC 230 V ~
Switching current	16 A
AX load	16 AX
External ballasts	16 A, 140 µF
Current carrying capacity Σ C7 ... C14	Σ 80 A
Current carrying capacity Σ neighbouring outputs	Σ 20 A
Connected load	
Ohmic load	3680 W
Lamps, motors	(see figure 2)
Relay outputs C15 ... C16	
Switching voltage	AC 230 V ~
Switching current	8 A
AX load	4 AX
External ballasts	8 A, 96 µF
Current carrying capacity Σ C15 ... C16	Σ 16 A
Connected load	
Ohmic load	1800 W
Lamps, motors	(see figure 2)
Extensions	

Output voltage	DC 5 V SELV
Load output and mains voltage supply connections	
Clampable conductor cross-section	(see figure 3)
Cable length	max. 100 m
Stripping length	8 mm
Connection torque for screw terminals	max. 0.8 Nm
Suitable tool	
Phillips screwdriver (recommended)	PZ1 Plusminus (Pozidriv/slotted)
Phillips screwdriver	PZ1
Slotted screwdriver	4 mm
Extensions connections	
Clampable conductor cross-section	(see figure 4)
Cable length	max. 30 m
Cable type	J-Y(St)Y 2×2×0.8
Stripping length	6 mm
Loosening torque	max. 0.5 Nm
Suitable tool	
Slotted screwdriver	3 mm
Installation width	144 mm / 8 HP
Weight	approx. 490 g
KNX medium	TP256
Commissioning mode	S mode
Rated voltage KNX	DC 21 ... 32 V SELV
Current consumption KNX	14 ... 24 mA
Connection type for bus	Device connection terminal

230 V					
	W	W	VA	W	VA
C7 ... C14	3680	3000	3000	400	1380
C15 ... C16	1000	1000	1000	400	690
110 V					
	W	W	VA	W	VA
C7 ... C14	1840	1500	1500	200	690
C15 ... C16	500	500	500	200	345

Figure 2: Connected load of relay outputs



Figure 3: Clampable conductor cross-sections Load outputs and power supply

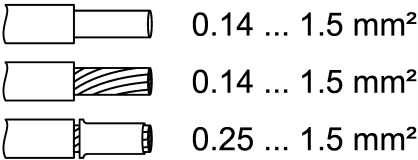


Figure 4: Clampable conductor cross-section extensions

1.6 Accessories

Temperature sensor	161
Temperature sensor	Typ NTC R25: 33kOhm; R-Tol.: ±5%;B25/100: 4300K ±3%

2 Safety instructions

To avoid potential damage, read and follow the following instructions:



Electrical devices may be mounted and connected only by electrically skilled persons.

Danger of electric shock. Always disconnect before carrying out work on the device or load. In so doing, take all the circuit breakers into account, which support dangerous voltages to the device and or load.

Electronic valve outputs

Danger of electric shock. Mains potential is applied to the load even when the output is switched off. Before carrying out work on the load, switch off all corresponding circuit breakers.

Analogue outputs 0-10 V:

Do not connect any external voltage to the outputs. Connected devices must ensure safe isolation from other voltages. Device can be damaged.

Relay outputs:

Danger of electric shock on the SELV/PELV installation. Not suitable for switching SELV/PELV voltages.

Do not connect any three-phase motors. Device can be damaged.

Use only venetian blind motors with mechanical or electronic limit switches. Check the limit switches for correct mastering. Observe the information on the motors from the manufacturing company. Device can be damaged.

Extensions

Danger of electric shock. During installation and cable routing, comply with the regulations and standards which apply for SELV circuits.

Danger of electric shock at the KNX installation. Do not connect any external voltage to the inputs. The device can become damaged, and the SELV potential on the KNX bus line will no longer be available.

3 Mounting and electrical connection

Depending on the parameterisation with the ETS, the outputs have different functions. Therefore, only connection examples can be shown here.

Depending on the fan coil used, there are various options for connecting it to the actuator. The outputs not required for the fan coil can be used freely for switching other loads. A connection example with a fan coil and other loads is shown below.



DANGER!

Electric shock when live parts are touched.

Electric shocks can be fatal.

Always disconnect before carrying out work on the device or load. To do so, switch off all corresponding circuit breakers, secure them against being switched on again and check that there is no voltage. Cover up any adjacent live parts.

Installation instructions load outputs

- In blinds operation, each pair of adjacent relay outputs forms a Venetian blind output. In each case, the left-hand relay output **C7, C9** ,... is intended for the up direction, and the right-hand relay output **C8, C10** ,... for the down direction.
- Analogue outputs 0-10 V have basic insulation, control cable according to VDE regulations for 250 V cables.
- Analogue outputs 0-10 V are not suitable for controlling 0-10 V / 1-10 V interfaces from lighting technology.
- Observe the current carrying capacity of the load outputs (see figure 5).

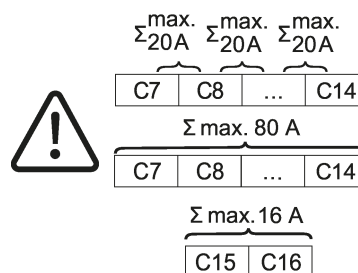


Figure 5: Summation currents

Installation instructions for extensions

- To avoid interference from EMC radiation, do not lay the cable of the extension inputs parallel to lines carrying mains voltage or load lines.
- The voltage potentials of the connection cables for the extension inputs are not electrically isolated from the bus voltage. The connection cables effectively extend the bus line. Note the specification for the bus cable length (max. 1000 m). Com cable (C) length 30 m in total.
- Use extension units 1 to 12 for push-buttons, switches and contacts.

- For NTC temperature sensors (see chapter "Accessories" ► Page 19) use extensions 5 to 8.

Mounting and connecting the device

- Mount the device on DIN rail. Bus terminals must be at the bottom.
- Connect mains voltage supply (2) of the actuator.
- Connect bus with device connection terminal to bus connection.

Fan coil connection variants (see figure 6), (see figure 8)

- Connect the Fan coil to the actuator according to the project design and connection examples.

For details on connecting fan coils, please refer to the documentation provided with the devices.

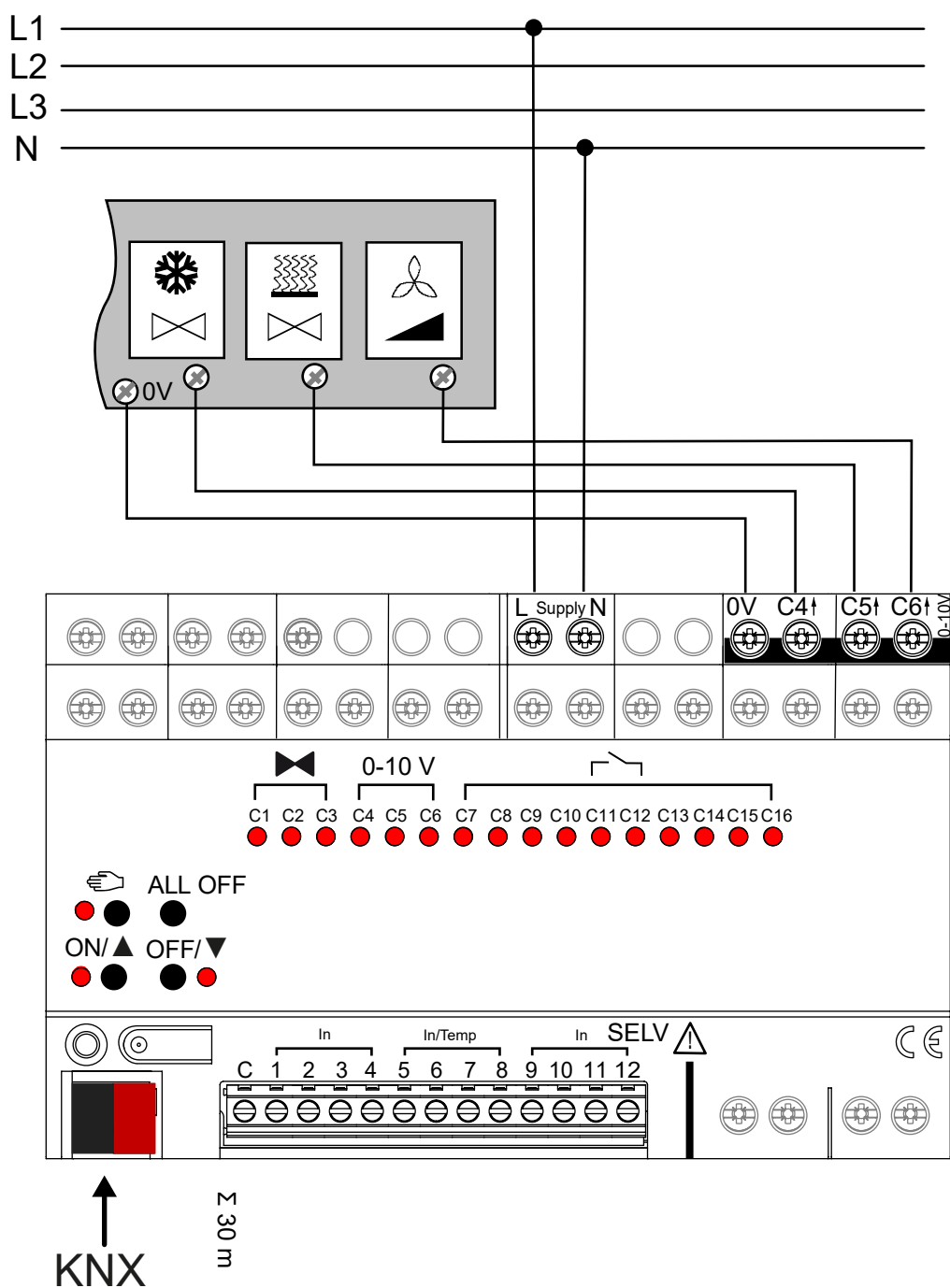


Figure 6: Connection example for 1 fan coil via analogue outputs 0-10V

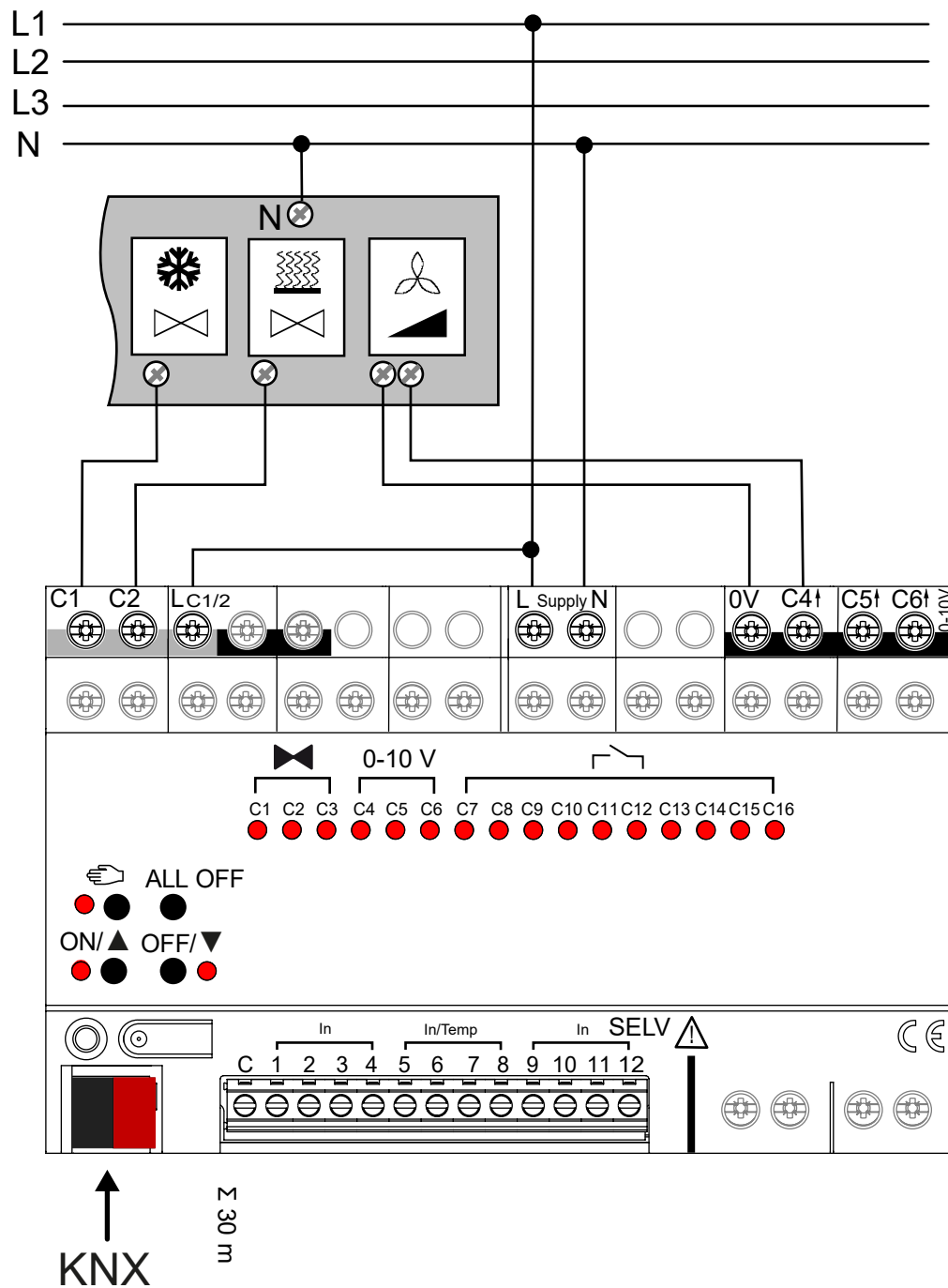


Figure 7: Connection example: 1 FanCoil via electronic valve outputs and analogue output 0-10V

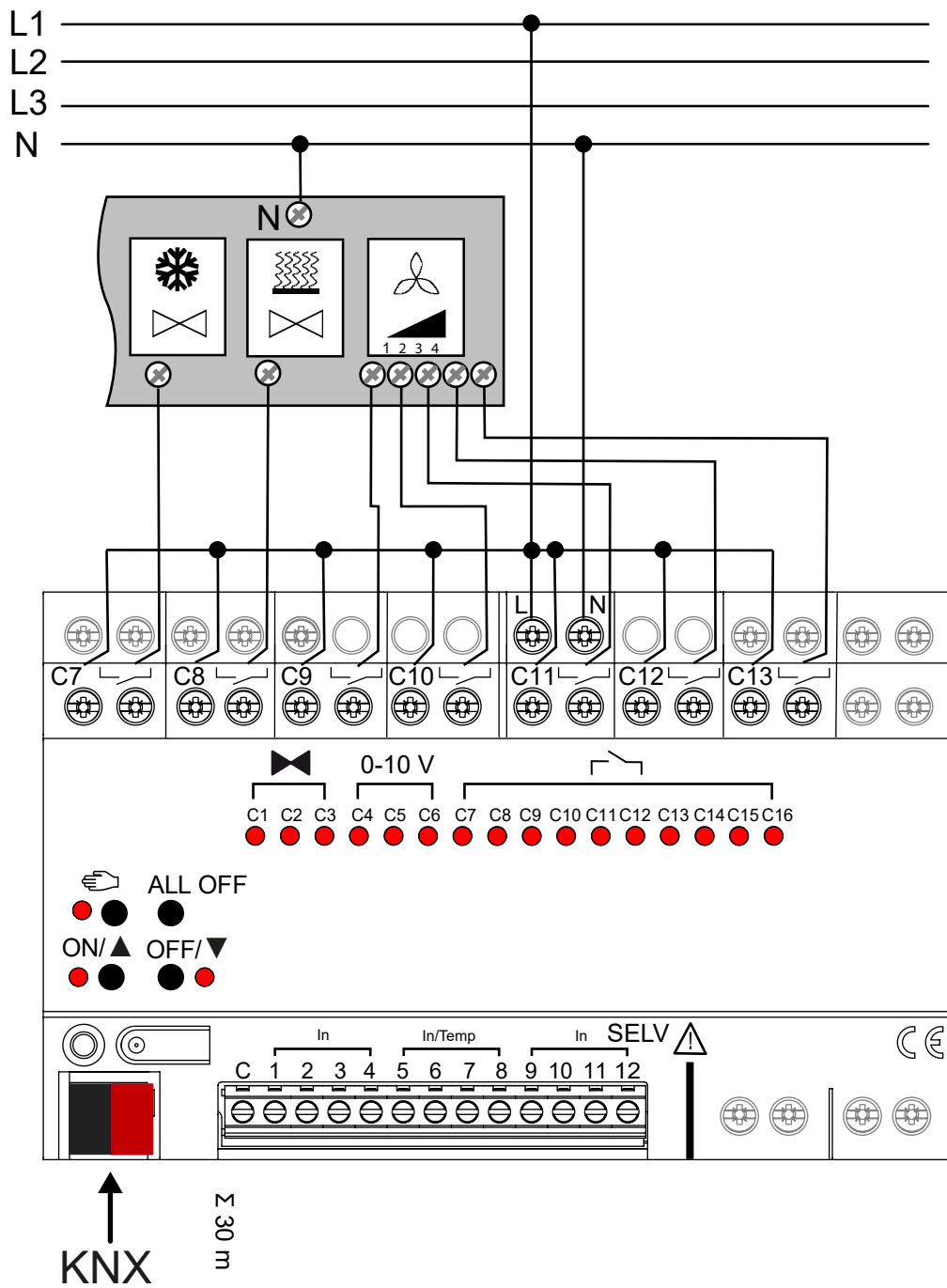


Figure 8: Connection example for 1 fan coil via relay outputs

Connect electrothermal actuators and other loads (see figure 9)

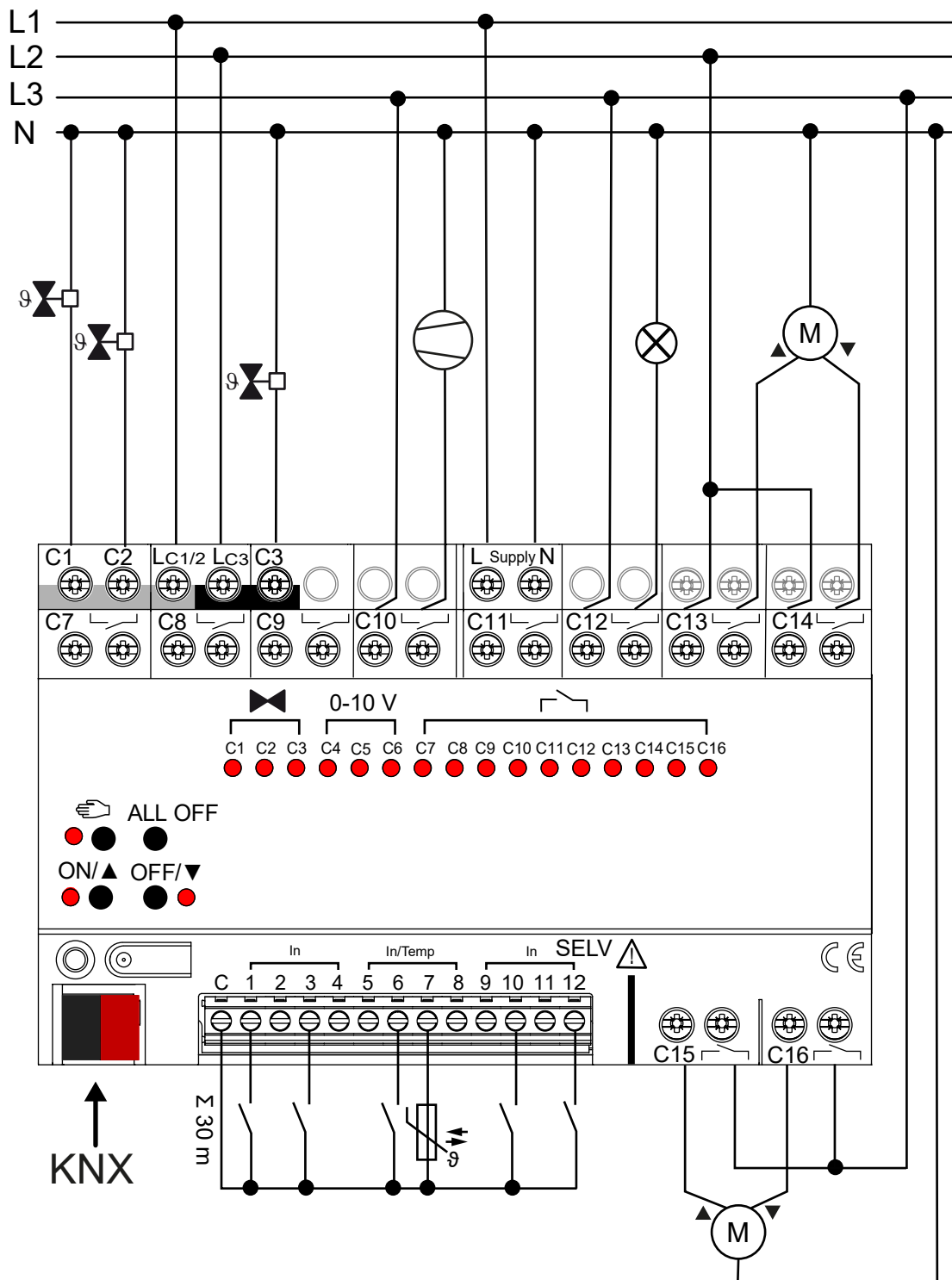


Figure 9: Connection example Electrothermal valve drives, lamps, blind drives

**CAUTION!**

Danger of destruction. When connecting several motors in parallel to one output.

Limit switch contacts can weld together and motors, blinds/shutters and the Venetian blind output can be destroyed.

Observe the manufacturer's instructions. Use cutoff relay if necessary!

- Connecting loads.
- If multiple circuit breakers supply dangerous voltages to the device or load, couple the circuit breakers or label them with a warning to ensure tripping.

Connect the extensions (see figure 9)

**DANGER!**

Electric shock due to connection of 230 V mains voltage or other external voltages to the extension unit inputs.

Electric shocks can be fatal.

Comply with the regulations and standards applicable to SELV circuits.

Only connect potential-free push-buttons, switches or contacts.

- Connect push-buttons, switches, contacts or sensors depending on the project design.

4 Commissioning



CAUTION!

Risk of destruction of connected loads due to undefined relay status

Drive motors or fan motors can be destroyed.

Before switching on the load, ensure that all relay contacts are open. Observe the commissioning sequence.

- Switch on the KNX bus voltage.
- Switch on mains voltage supply (2) of the actuator.
- Perform commissioning with ETS.
- Switch on load circuits.

4.1 Safe-state mode and master reset

Safe-state mode

The safe-state mode stops the execution of the loaded application program.

- i** Only the system software of the device is still functional. ETS diagnosis functions and programming of the device are possible. Manual control is not possible.

Activating safe-state mode

- Switch off the bus voltage or remove the KNX device connection terminal.
- Wait approx. 15 s.
- Press and hold down the programming button.
- Switch on the bus voltage or attach the KNX device connection terminal. Release the programming button only after the programming LED starts flashing slowly.

Safe-state mode is activated.

The programming mode can also be switched on and off in the safe-state mode as usual by briefly pressing the programming button again. The programming LED stops flashing if the programming mode is active.

Deactivating safe-state mode

- Switch off bus voltage (wait approx. 15 s) or carry out ETS programming.

Master reset

The master reset restores the basic device settings (physical address 15.15.255, firmware remains in place). The device must then be recommissioned with the ETS. The "Operation in delivery state" is active again.

In secure operation: A master reset deactivates device security. The device can then be recommissioned with the device certificate.

Performing a master reset

Precondition: The safe-state mode is activated.

- Press and hold down the programming button for > 5 s.

The programming LED flashes quickly.

The device performs a master reset, restarts and is ready for operation again after approx. 5 s.

Restoring the device to factory settings

The device can be reset to factory settings with the Hager/Berker Firmware Update App. This function uses the firmware contained in the device that was active at the time of delivery (delivery state). Restoring the factory settings causes the device to lose its physical address and configuration.

5 Application programs

ETS search paths: Inputs / Outputs / Input Modules / Output Modules / Multi control module, 12 inputs / 16 outputs

Application:

Name	STYFS816A
Version	2.1 for ETS5 version 5.7.7 or higher and ETS6 version 6.3.0 or higher
from mask version	SystemB (07B0)
Summarized description	Multifunction actuator application: Control of up to two FanCoil units with separate fan and valve outputs, switching / Venetian blind outputs, analogue outputs, extensions (binary inputs) With logic functions and two integrated room temperature controllers as well as manual operation, KNX Data Secure capable.

6 Scope of functions

General scope of functions

- KNX Data Secure capable
- Firmware updates are possible
- The device has 16 outputs that can be configured to control up to two FanCoil units. The free outputs are then available for other loads.
- Actively transmitting feedback or status messages can be delayed globally after the bus voltage returns or after ETS programming.
- Manual control of outputs independent of the bus (for instance, building site operation) with LED status indicators. Separate status feedback to the bus for manual control. Manual control can also be disabled via the bus.
- Special manual operation in the as-delivered condition to prevent damage to loads already connected.
- Heartbeat function that can be activated

Scope of HVAC functions

- The HVAC functionality can be parametrised for fan and valve control (FanCoil actuator) or only for valve control (heating actuator).
- Single-channel operation, dual-channel operation or no FanCoil function configurable.
- Five different types of FanCoil systems can be set:
Two-pipe heating only,
Two-pipe cooling only,
Two-pipe heating/cooling by means of change-over object,
Four-pipe heating/cooling by means of change-over object,
4-pipe heating/cooling via command value specification.

"Two-pipe": a common valve for heating and cooling,
"Four-pipe": two separate valves for heating and cooling,
"via change-over object": Change-over of the operation (heating/cooling) by means of a separate 1-bit communication object,
"via command value specification": Change-over of the operation (heating / cooling) directly by means of the command values.
- Control of the fans and valves can be set separately.
Fan: via relay outputs or via 0...10 V outputs
Valves: via relay outputs, via 0...10 V outputs or via electronic valve outputs.
- Connection help in the ETS parameter view makes it easier to connect the individual outputs to the intended loads.
- An output assignment shows the configuration of all outputs in tabular form.

Range of FanCoil functions (fan)

- The behaviour after an ETS programming operation or after the bus voltage returns is invariably set to "no reaction". The output states at the time of bus or mains voltage failure are saved and subsequently tracked.
- Valve rinsing and fan protection can be configured. Valve rinsing can be activated cyclically, at low utilisation or by means of a communication object. The fan protection can be activated via a separate communication object.
- Number of fan levels can be adjusted in the ETS. Up to five or three fan levels can be configured, depending on the type of fan control, the number of Fan-Coil channels and the type of FanCoil system.
- Fan levels can be controlled using the change-over principle (only one fan level output is switched on) or level principle (fan level outputs switch hierarchically).
- Pause "OFF" for level change-over (in change-over principle) or dwell time (in level change-over) can be set. This allows adaptation to time specifications of fan coil unit manufacturers.
- Command value ranges for the fan levels can be adjusted flexibly. The assignment is made in the ETS by configuring a command value (1...100 %) for each fan level.
Incl. hysteresis in the event of switching-back of the level to avoid continual change-over of the fan levels when the command value is located at the border between two fan levels.
- Switch-on behaviour of the fan can be configured. Can be switched on optionally by means of start-up stage with start-up time.
- The fan run-on time for heating and cooling can be configured separately in the ETS.
- A level limitation of the fan can be activated via a separate 1-bit object. This allows limitation of the maximum fan level to a fan level value specified in the ETS.
- Feedback of the active fan level or fan speed by means of single-byte communication object.
All status messages can be transmitted to the bus with a delay after the bus voltage returns or after programming with the ETS.
- Manual fan control possible:
The fan of the connected fan coil unit can be activated in accordance with requirements "by hand" - for example using a push-button sensor or an operating panel installed in a central location. This enables a purely ventilation function.
The manual fan control can be activated/deactivated in accordance with requirements. Separate communication objects are available for this, depending on the application.
In addition, manual fan control can be forcibly activated after the bus or mains voltage returns or after an ETS programming operation.

- The command value telegrams can be monitored cyclically. Monitoring time interval configurable from 1 minute to 23 hours 59 minutes. Reaction after the monitoring time has elapsed without receipt of a command value can be configured. In addition, a 1-bit fault message can be sent to the bus in the event of a fault.
- The operating hours counter used to record the switch-on times of the fans can be activated.

Scope of functions valve outputs

- Up to three independent electronic valve outputs can be configured.
- Valve activation (deenergised opened / closed) can be configured for each output.
- Command value evaluation as "Switching, 1-bit", "Constant, 1-byte" or "Constant, 1-byte with command value limiting value and hysteresis".
- With a 1-byte command value, the outputs are activated by pulse width modulation (PWM). The cycle time can be configured for each valve output.
- Status feedback (1 bit or 1 byte) of each output possible.
- Overload/mains voltage failure and short-circuit message for electronic valve outputs can be set separately for each output by means of an a 1-bit object (polarity can be parametrised).
- Heat requirement and pump control, for positive influencing of the energy consumption of a housing or commercial building. Provision of the largest active command value directly via KNX telegram (1-byte constant). Alternatively or additionally, evaluation of the actuator command values for provision of the general heat requirement information in the form of limiting value monitoring with hysteresis (1-bit switching). Activation of a circulation pump of the heating or cooling circuit via a 1-bit KNX telegram with limiting value evaluation. Optional cyclical anti-sticking protection prevents the sticking of the pump.
- Summer or winter mode can be selected via an object (polarity configurable).
- Each valve output can be locked in a forced position with bus control. Different command values can be configured for summer and winter mode.
- Cyclical monitoring of the command value of each output can be set, taking into account a configurable monitoring time. If no command value telegram is received within the defined monitoring time, the valve output concerned switches to emergency operation. Different command values can be configured for summer and winter mode. The fault telegram is configurable.
- On activation with constant command values, an optional command value limit can be configured, which allows the limitation of received command values at the "Minimum" and "Maximum" limits.
- Automatic valve rinsing to prevent calcification or sticking of a valve which has not been activated for some time.
- Operating hours counter to record the switch-on times of the valve outputs.

- Service mode for the maintenance or installation of valve drives (locking of the valve outputs in a defined state). Both service mode and the locking status are preset by a 2-bit forced operation telegram.
- Own PWM cycle time and command value can be set for manually operated valve outputs.
- Behaviour in case of a bus voltage failure and when the bus voltage returns as well as after ETS programming settable for each valve output.

Room temperature controller

- Up to 2 independent room temperature controllers.
- Individual control of a controller using communication objects.
- Various operating modes can be activated: Comfort, Standby, Night and Frost/heat protection
- Each operating mode can be assigned its own temperature-setpoints (for heating and/or cooling).
- Configuring the temperature setpoints as relative (derived from basic setpoint) or absolute (independent setpoint temperatures for each operating mode).
- Comfort extension possible using presence button in Night or Frost/heat protection mode. Configurable duration of the comfort extension.
- The operating modes are switched over via 1-byte objects according to the KNX specification.
- Status feedback telegrams can be configured.
- Frost/heat protection switchover via window status or by automatic frost protection.
- Operating modes "Heating", "Cooling", "Heating and cooling" each with or without additional level. The temperature setpoints for the additional level are derived via a configurable level offset from the values of the basic level.
- Various control types can be configured for each heating or cooling level: PI control (permanent or switching PWM) or 2-point feedback control (switching).
- Control parameter for PI controller (if desired: proportional range, reset time) and 2-point controller (hysteresis) adjustable.
- Automatic or object oriented switchover between "heating" and "cooling".
- A temporary or permanent setpoint shift for a relative setpoint specification through communication objects is possible (e. g. via a controller extension).
- Configurable step width of the setpoint shift (0.1 K / 0.5 K).
- Deactivating the feedback control or the additional level possible using separate 1-bit objects.
- Room temperature measurement via up to two external KNX temperature sensors. Calibration of the temperature values possible and measured value formation of the external sensors can be configured. The query time for the externally received temperature values can be set.
- The actual and setpoint temperatures can be output on the bus if a configurable deviation is detected (also periodically).

- Separate or shared command value output in heating and cooling mode. This produces one or two command value objects for each level.
- Normal or inverted command value output configurable
- Automatic transmission and cycle-time for command value output configurable
- Command value limit possible.
- Floor temperature limit possible in cooling mode and heating mode. Thus temperature-controlled switch-off of underfloor heating and cooling as protective function.
- Setpoint temperature limit possible in cooling mode. If necessary, the controller limits the setpoint temperature to specific values and prevents an adjustment beyond statutory limits.
- Setpoint temperature increase possible in heating mode. If necessary, the controller raises the setpoint temperature in accordance with the outdoor temperature.

Range of switching / Venetian blind output functions

- Channel configuration: Venetian blind or switching operation can be configured. In Venetian blind operation, the adjacent outputs are combined into single Venetian blind outputs. Each channel can be configured separately according to a template.
- Actively transmitting feedback or status messages can be delayed globally after the bus voltage returns or after ETS programming.

Venetian blind outputs

- Operation configurable: control of blinds with slats, shutters, awnings, roof windows or venting louvres.
- Separately configurable blind/shutter travel times with travel time extension for movements to the upper end position.
- For slatted Venetian blinds, a slat travel time can be configured independently.
- Travel direction change-over time and the times for short-time and long-time operation (step, move) that can be set.
- The reaction when the bus voltage returns and after an ETS programming operation can be set for each output.
- Centralized control of all Venetian blind outputs of up to 6 central functions is possible (UP, DOWN, permanent UP, permanent DOWN).
- Blind/shutter or slat position feedback telegram. In addition, an invalid blind position or an invalid travel movement can be reported back.
- Assigning of outputs to up to 5 different safety functions (3 wind alarms, 1 rain alarm, 1 frost alarm) optionally with cyclical monitoring. The safety functions (objects, cycle times, priority) are programmed device-oriented and in common for all outputs. The assignment of individual outputs to the safety functions and the safety measures can be configured for each channel.

- An extensive sun protection function with fixed and variable blind or slat positions at the beginning and at the end of the function can be activated separately for each output. Dynamic slat offset for slatted blinds included. Also with extended sun protection feature for integration into sophisticated shading control programs (operated via separate automatic and disabling object). Optionally also with automatic heating/cooling and presence detection function.
- Forced-position function or disabling function can be implemented for each Venetian blind output.
- Up to 64 internal scenes configurable per output.
- If the connections are swapped, the direction of travel may be reversed.
- Feedback of the end positions.
- Feedback of the combined function status with a standardised and an extended communication object.
- In the case of Venetian blind and shutter drives, a disabling function can be activated for open patio or balcony doors.
- Extended ventilation functions in conjunction with up to two window contacts.

Switching outputs

- Independent switching of the switching outputs.
- Operation as NO or NC contacts.
- Central switching of up to 6 switching objects (ON, OFF, permanent ON, permanent OFF) and collective feedback.
- Switching feedback mode: after changes or cyclically to the bus.
- Reaction in case of a bus voltage failure and when the bus voltage returns as well as after ETS programming can be set for each output.
- Logic function individual for each output.
- Disabling function can be parameterized for each channel. Forced position function separately for each output as an alternative.
- Timing functions (switch-on delay, switch-off delay, staircase lighting timer, also with pre-warning function).
- Incorporation into light moods: up to 64 internal scenes parameterizable per output.
- Operating hours counter can be activated independently for each output.
- Input monitoring for cyclical updating of the switching object with safety position.
- Feedback of the combined function status with a standardised and an extended communication object.

Extensions

- The device has 12 independent extension channels
- All channels can work as inputs.
- Channels 5 ... 8 can also be used to connect temperature sensors.

- Channels can be activated and deactivated individually
- Adjacent, activated channels can be combined (e. g. E1 + E2)

Channel function "push-button"

- The contact type can be set
- The behaviour after the bus voltage returns can be set
- The disabling function can be set
- The function of the push-button can be set...

Switching

Priority control

Dimming and colour temperature

Venetian blind / shutter / awning / roof window

Value transmitter

Scene extension unit

Short and long button operation

Room temperature control point

Channel function "Switch"

- The number of switch objects can be set
- Different switch functionalities can be parameterised for each object.
- The behaviour when closing the contact can be set
- The behaviour when opening the contact can be set
- The behaviour after the bus voltage returns can be set
- Cyclical transmission can be set
- The disabling function can be set
- The function of the switch can be set...

Switching

Priority control

Value transmitter

Scene extension unit

Room temperature control point

"Door/window status" channel function

- The door/window element to be evaluated can be set
- The door/window number can be assigned
- The evaluation can be adjusted individually
- The evaluation delay can be set
- The object polarity can be set
- The behaviour after the bus voltage returns can be set
- Cyclical transmission can be set

- The disabling function can be set

"Temperature sensor" channel function

- Temperature measurement by connected sensor possible
- The temperature measurement can be supplemented by an external value via the bus
- Measured values can be weighted
- Measured values can be calibrated
- The transmission behaviour can be set

"Pulse counter" channel function

- The counting interval can be set
- Data point type | value range can be selected, e. g. 1 byte (DPT5.010 | 0...255), 2 bytes (DPT7.001 | 0...65535), 4 bytes (DPT13.001 | -2147483648...2147483647)
- Pulses can be counted in the event of a rising, falling or rising and falling edge
- The number of pulses required at the input per indicated counted pulse can be parameterised on the KNX
- The number of counted pulses required to change the meter reading can be parameterised
- Each channel has a main meter and intermediate meter
- The main and intermediate meters can be set separately as up or down meters
- The start and end values of the meters can be specified by parameters or communication objects
- The meter reading can be queried or transmitted automatically via the KNX
- The behaviour after the meter expires can be parameterised (e .g. for synchronisation with visualisation)
- The pulse meter can be reset via the KNX (meter reset)

Room service function (DND/MUR)

- Activating/deactivating the "Do not disturb (DND) indicator
- Activating/deactivating the "Make up room (MUR)" indicator
- The messages can be transmitted via two separate 1-bit objects or a 1-byte object.
- Reset of all messages possible.

Room occupancy detection function

- Evaluation of door contacts
- Evaluation of motion detection by presence detectors
- The "Room occupied" or "Room not occupied" message can be transmitted either via two separate 1-bit objects or a 1-byte object.

- When using entry profiles, the presence of "employees" or "guests" is analysed.

Logic functions

- Simple logic functions or, alternatively, advanced logic functions are available.

Simple logic functions

- Up to eight simple logic functions can be activated.
- Logic gates (e. g. AND, OR, exclusive AND, exclusive OR, each with up to 4 inputs).
- One-bit to one-byte converter with input filter, disabling object and presetting of the output values.
- Disabling element with filter and time functions and disabling object.
- Comparator for values with 9 different input data formats and many comparison operations.
- Limit switch with hysteresis with upper and lower threshold for 9 different input data formats. Incl. presetting of the 1-bit output values.
- The logic functions have their own KNX communication objects and can process telegrams of the actuator or of other bus devices.

Extended logic functions

- Up to ten extended logic functions can be activated.
- User-defined logic functions or configuration template for lighting control.
- Each user-defined logic function possesses up to 8 1-bit trigger inputs for the activation of a logical calculation.
- An optional filter stage allows the hiding of trigger results (e. g. "only react to switch-on commands" or "only react when dimming level greater than 50 %").
- Operations can be executed at 1 to 4 levels and can be configured in a user-defined manner to the types "Logic" (e. g. AND, OR, exclusive AND, exclusive OR, each with up to 8 inputs), "Arithmetic" (e. g. addition, subtraction, multiplication, division, percent), "Comparison" (e. g. equal, unequal, greater than, smaller than, area test) or "Type conversion".
- Operators can be constants, input or output objects.
- A result stage allows the evaluation, forwarding and, if necessary, also the conversion of results of logical operations.
- To simplify the configuration of a logic function, lighting control is available as a configuration template. Alternatively to a user-defined configuration, lighting control can be activated for logic functions 1 and 2 and allows "Welcome" or "Goodbye" control for the lighting in a hotel room or similar applications (e. g. welcome light on entering a house or central switch-off on leaving an apartment).
- All the logic functions use groups of input and output objects with a defined number and defined data types (32 x 1-bit, 16 x 4-bit, 16 x 1-byte, 16 x 2-byte, 8 x 4-byte).

- Sensible linking of input and output objects allows the networking of logic functions, permitting the execution of complex operations.
- The inputs and outputs are available via communication objects on the KNX.

7 Notes on software

ETS project design and commissioning

For project design and commissioning of the device, ETS5 version 5.7.7 or higher or ETS6 version 6.3.0 or higher is required.

Safe-state mode

If the device does not work properly - for instance as a result of errors in the project design or during commissioning - the execution of the loaded application program can be halted by activating the safe-state mode. In safe-state mode, activation of the outputs via the KNX or manual operation is not possible. The room temperature controllers also have no function. The actuator remains passive in safe-state mode, since the application program is not being executed (state of execution: Terminated). Only the system software is still functional so that the ETS diagnosis functions and also programming of the device continue to be possible.

Unloading the application program

The application program can be unloaded with the ETS. In this case, all outputs of the product are switched off. Manual operation is possible.

8 Operation and indication

8.1 Button operation and display function

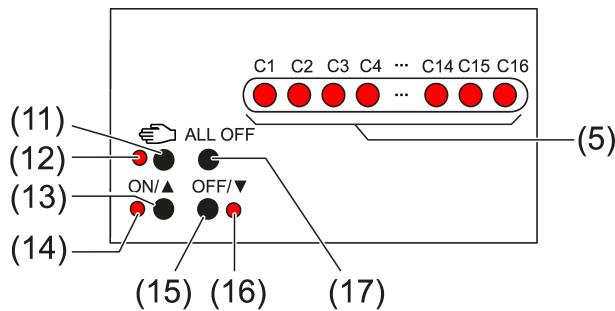


Figure 10: Controls and indicators for manual control

- (5) Status LED C1 ... C16:
Signalling of switched-on outputs when controlled by means of the bus or by manual operation.
- (11) Button
Activation / deactivation of manual control.
- (12) LED
On: continuous manual operation active
Flashing slowly: manual operation temporarily active
- (13) Button ON/▲:
Switch-on output
- (14) LED ON/▲:
LED ON in manual operation indicates a switched-on output.
- (15) Button OFF/▼:
Switch-off output
- (16) LED OFF/▼:
LED ON in manual operation indicates a switched-off output.
- (17) Button ALL OFF:
All outputs OFF (only in permanent manual operation)

Status indication

The status LED C1 ... A16 (5) indicate the states of the outputs.

- Off: Output switched off
- On: Output switched on
- Flashing slowly: Output selected in manual operation or short circuit at the electronic valve output.
- Flashes quickly: Overload or mains voltage failure at the electronic valve output
- Flashes rapidly: Output disabled via continuous manual operation

Bus operation / manual operation

All outputs of the device can be operated manually. A keypad with four function buttons and three status LEDs on the front of the device can be used to switch from bus mode to manual mode and can also be operated in manual operation.

- Bus operation: operation from other bus devices (e. g. room temperature controller, push-buttons, etc.),
- Temporary manual operation: manual control of the device with keypad, automatic return to bus control,
- Permanent manual control mode: exclusively manual operation of the device with keypad, automatic return to bus control only after manual control is stopped manually.

- i** Manual operation can be enabled or disabled by device parameter settings in the ETS.
- i** In manual operation, the outputs cannot be controlled via the bus.
- i** In manual operation mode, bus operation can be disabled by a telegram. Manual operation mode is terminated on activation of the disabling function.
- i** Manual control is only possible when the mains voltage and bus supply voltage is on. Active manual operation is terminated automatically in the event of a mains voltage failure, at the beginning of any ETS programming process, or when the bus voltage returns. Manual control cannot be activated or continued during an ETS programming process.
- i** After a bus failure and restoration the device switches to bus operation.
- i** After failure and return of the mains supply, the device remains in bus mode or manual operation.
- i** Manual operation of the device is still possible if the device is programmed by the ETS with an incorrect application program or if the application program was unloaded.
- i** In the as-delivered state of the device, manual operation can be used even before commissioning via the ETS (construction site mode). However, the operation differs from manual operation in the programmed state (see chapter Delivery state).

Switching on temporary manual operation

Manual control is enabled in the ETS.

Manual control is not disabled.

- Press the  button briefly (< 1 s).

Temporary manual operation mode is active.

Status LED of **C1** flashes (LED  flashes). The two status LEDs **ON/▲** and **OFF/▼** next to the lower buttons show the current status of **C1**.

- i** After temporary manual control is switched on, the switching states of the outputs last set initially remain active.
- i** After 5 s without a button actuation, the actuator returns automatically to bus operation.

Switching off temporary manual operation

Temporary manual operation was activated.

- No button-press for 5 s
- or -
- Select all outputs one after another by briefly pressing the button. Then, press the button again.
- or -
- Switch off the mains voltage supply or reset the bus (bus voltage failure).

Manual operation is terminated.

When exiting manual mode, the outputs retain their current settings. A moving blind moves to the corresponding end position.

- i** The state of all outputs set via manual operation is not changed when temporary manual operation mode is switched off. If, however, a function with a priority higher than that of the normal operation (e. g. disabling function, fan level limitation or manual fan control) has been activated for the outputs via the bus before or during manual control, the actuator executes the function with the higher priority for the outputs concerned.

Switching on permanent manual operation

Manual control is enabled in the ETS.

Manual control is not disabled.

Bus operation or temporary manual operation mode is active.

- Press the  button for at least 5 s.

Permanent manual operation is active and the status LED  is illuminated.

The status LED of **C1** flashes. The two status LEDs **ON/▲** and **OFF/▼** next to the lower buttons show the current status of **C1**.

- i** After permanent manual control is switched on, the switching states of the outputs last set initially remain active.

Switching off permanent manual operation

The device is in permanent manual operation.

- Press the  button for at least 5 seconds.

LED  is off, bus operation is switched on.

When leaving permanent manual mode, the behaviour depends on the project design.

"No change" outputs retain their current settings. A moving blind moves to the corresponding end position.

"Track outputs" Outputs adopt the setting that is then active, e. g. Forced position

Operating the outputs

In manual operation mode the outputs can be operated directly. The parameter settings selected in the ETS directly affect the activation of the outputs in manual control. This means that the switching of an output can also affect other outputs.

When valves are switched on, the PWM cycle time and the command value that are stored on the parameter page "General -> Manual operation" and can also be adjusted there are switched on. When they are switched off, the command value is set to 0%.

When fans that are controlled by 0...10 V are switched on, the command value that is stored on the parameter page "General -> Manual operation" and can also be adjusted there is switched on. When they are switched off, the command value is set to 0%.

Manual operation (permanent or temporary) is active.

- Select the desired output: Press the  button briefly (if necessary, repeatedly).

The status LED of the selected output or output pair C1 ... C16 flashes. Additionally the switching state of the selected output is indicated by the LED **ON/▲** or **OFF/▼** next to the lower buttons in the button field.

- Switch output: Press the button **ON/▲** or button **OFF/▼**. briefly, < 1 s
Valve outputs: Open or close valve.
Fan outputs: Switch the fan / fan level on or off.
Switching outputs: Switch on or switch off.
Analogue outputs: Switch on or switch off.

The selected output switches on or off.

The LEDs **ON/▲** and **OFF/▼** indicate the status.



If a valve is opened in FanCoil operation, always switch on a fan level as well. This prevents the fan coil from overheating or freezing.

- To operate the Venetian blind outputs (in pairs): press the **ON/▲** button or **OFF/▼** button
Briefly: < 1 s: Switch on/off, drive stop.
Long, > 1 s: Move blind/shutter up/down,

The drive stops automatically when the programmed travelling time has elapsed.
- To switch the fan levels on or off by means of the relay outputs:
Press the **ON/▲** button or **OFF/▼** button for the corresponding fan level briefly, < 1 s.

The selected fan level switches, but the parameters for the fan levels are taken into account first. When the fan starts up, if parametrised, the starting stage and the dwell time when switching levels and for the intermediate stages are taken into account. The LEDs of the individual outputs indicate this accordingly.

- Dim output: Press and hold the **ON/▲** button or **OFF/▼** button, > 1 s.
Analogue outputs: The process stops when the button is released or at the respective end value.

The selected output executes the corresponding commands immediately. The two status LEDs **ON/▲** and **OFF/▼** next to the lower buttons indicate the switching status of the selected output.

In temporary manual operation: After running through all of the outputs, the device leaves manual operation when the button  is pressed again.

- i** Executing the switch-on command when valves are already opened causes no reaction. The cycle time of a PWM signal is not restarted. No reaction to executing the switch-off command is shown either if the valves are already closed.
- i** Depending on the parameter configuration in the ETS, feedback telegrams are transmitted to the bus via the feedback objects of a channel ("Active fan level feedback" und "FanCoil active feedback") during operation, if necessary.

Switching off all outputs

All outputs of the actuator (valve, fan level and switching outputs, Venetian blind outputs, electronic valve outputs and analogue outputs) can be switched off simultaneously.

Permanent manual operation is active.

- Press the **ALL OFF** button.

All outputs of the actuator are switched off. The outputs are not locked. Individual activation is possible again after shutoff.

- i** The "ALL OFF" function is not available in temporary manual operation. In this case pressing this button produces no reaction.

Disabling bus control of individual outputs via manual operation

It is possible to use manual operation to disable outputs of the device in such a way that the outputs can no longer be activated via the bus. The corresponding outputs are disabled directly too. When a Venetian blind output is disabled, the output for the opposite direction is also disabled and, when a fan speed is disabled, all fan levels of the fan are disabled.

Permanent manual operation is active.

Disabling of the bus control mode must have been enabled in the ETS.

- To select any output of the device that is to be disabled: press the button  briefly (several times if necessary).

The status LED of the selected output flashes. Additionally the switching state of the selected output is indicated by the status LED **ON/▲** or **OFF/▼** next to the lower buttons in the button field.

- Press the **ON/▲** and the **OFF/▼** buttons simultaneously for at least 5 s.

The selected output or related outputs are disabled (no more control via the bus possible).

All status LEDs of the disabled outputs flash constantly very quickly (even with manual operation deactivated).

-  An output that has been disabled in manual operation can thereafter only be operated in permanent manual operation mode.
-  If a disabled output is selected in manual operation, the flashing frequency of the LED will change.

Cancelling the disabling of bus control of individual outputs

Permanent manual operation is active.

Bus control of an output has been disabled previously in permanent manual operation.

- Select any desired output that is to be re-enabled: press  button briefly (several times if necessary).

The status LED of the selected output flashes irregularly. Additionally the switching state of the selected output is indicated by the status LED **ON/▲** or **OFF/▼** next to the lower buttons in the button field.

- Press the **ON/▲** and the **OFF/▼** buttons simultaneously for at least 5 s.

The selected output is re-enabled (control via the bus is possible again after manual operation is deactivated).

The status LED of the selected output flashes.

Behaviour of combined outputs in manual operation

The device can be adapted very flexibly to the specific application required by means of parameter settings in the ETS. The parameter settings selected in the ETS directly affect the activation of the outputs in manual control:

The device can be used to control one or two FanCoil units by configuring one-channel or alternatively two-channel operation.

In manual operation, all outputs of the device can be operated directly, i. e. switched on or off. Depending on the parameter settings in the ETS, the switching of an output can, depending on the configuration of the fan levels, result in automatic changes in further outputs of the FanCoil channel concerned.

The parametrised output combination is displayed in the ETS on the parameter page "General -> HVAC" as a connection aid.

Observation of the fan levels controlled by means of relays in manual operation mode:

The operating concept for manual operation always takes the following ETS settings into account when controlling the fan levels by means of relay contacts. The default value is shown in bold.

- Number of FanCoil channels (0, 1, 2)
- FanCoil system (2-pipe, **4-pipe**),
- Number of fan levels (1 ... 3 or 1 ... **5**),
- Control of the fan levels (**change-over principle**, level principle),
- Dwell time for level change-over or pause "OFF" for level change-over (0 ... **0.2** ... 25 s).

In manual control of the fan levels the "Control of the fan levels" parameterised in the ETS is evaluated. Thus manual control is subject either to the change-over principle (only one level output is switched on – lower levels are switched off again), or to the level principle (the fan level outputs are switched one after another – lower levels remain switched on).

As a basic principle, even in manual control, when there is a change of the fan level the pause "OFF" set in the ETS (change-over principle: pause by switching off between the change of a fan level) or the dwell time (level principle: dwell time in fan level for level change-over spanning several levels) is taken into account.

When a fan level is switched on (all fan levels previously OFF), then, if parametrised in the ETS, first the start-up level is switched on, and after the set start-up time the fan level selected by the manual control is switched on.

-  Fan run-on times parametrised in the ETS and a level limitation for the fan are not taken into account in manual control.
-  At the beginning of manual control the current fan level is initially always accepted without change. This is also the case if fan protection is being executed at the moment of activation of manual control. After that the fan levels can be changed in manual control.

- i** If the fan is controlled via a 0...10 V output, the command value entered on the parameter page "General -> Manual operation" will be controlled permanently when the fan is switched on. No stage switch-over takes place.

Consideration of the valve positions in manual control:

The operating concept for manual operation always takes the following ETS settings into account when actuating the valve outputs (the values printed in **bold** correspond to the default values of the actuator):

- Number of FanCoil channels (1...2)
- FanCoil system (2-pipe, **4-pipe**).

- i** At the beginning of manual control the current valve position is initially accepted without change. In 4-pipe fan coil systems, switching on a valve output (e. g. heating) does not cause the other valve output (e. g. cooling) of the same channel to switch off. Separate valve outputs used to heat or cool a Fan-Coil channel can also be switched on at the same time in manual mode!

8.2 Configuring manual operation

All outputs of the device have electronic manual operation. The following settings can be made using a keypad with four function buttons and three status LEDs on the front of the device:

- Bus operation: operation via push-button sensors or other bus devices
- Temporary manual operation mode: manual operation locally with button field, automatic return to bus operation
- Permanent manual operation mode: local manual operation with keypad

Manual operation is possible while the device is supplied with power from the bus supply voltage. In the as-delivered state, manual operation is fully enabled. In this un-programmed state, all the outputs can be controlled by manual operation, so that fast function checking (e. g. on the construction site) is possible. However, manual operation in the as-delivered state differs from manual operation in the programmed state (see chapter Delivery state).

After initial commissioning of the actuator via the ETS, manual operation can be enabled or completely disabled.

Disabling manual operation permanently

Manual operation is enabled in the as-delivered state. If the parameter of the same name is deactivated on the "Manual operation" parameter page, no parameters and communication objects for manual operation are available. The outputs can then only be controlled via the bus.

In the case of a temporary status indication, the status LEDs continue to indicate the status of the outputs when the "Manual operation" button is pressed.

Disabling manual operation temporarily

Manual operation can be separately disabled via the bus, even if it is already active. If the disabling function is enabled, then as soon as a disabling telegram is received via the disabling object, the actuator immediately terminates any activated manual operation and locks the function keys on the front panel of the device. The telegram polarity of the disabling object can be configured.

Manual operation must be enabled.

- Activate the parameter "Disabling function" on the "General -> Manual operation" parameter page.

The disabling function of manual operation is enabled and the disabling object becomes visible.

- Select the desired telegram polarity in the parameter "Object polarity".

i If the polarity is "0 = disabled / 1 = enabled", the disabling function is immediately active after the bus voltage returns or after an ETS programming operation (object value "OFF"). To activate manual operation in this case, an enable telegram "ON" must first be sent to the disabling object.

-  After the bus voltage returns, a disabled state that was active beforehand is always inactive when the polarity of the disabling object is non-inverted.
-  When an active manual operation is terminated by a disable, the actuator will also transmit a "Manual operation inactive" status telegram to the bus, if the status messaging function is enabled.

Setting the status message function for manual operation

The device can transmit a status message to the KNX by means of a separate object when the manual operation is activated or deactivated. The status telegram can only be transmitted when the bus voltage is switched on. The polarity of the status telegram can be parameterised.

Manual operation must be enabled.

- Activate the parameter "Status object" on the "Manual operation" parameter page.

The status messaging function of manual operation is enabled and the status object is visible.

- Specify in the parameter "Function" whether the status telegram is generally an "ON" telegram whenever manual operation is activated or only in those cases when permanent manual operation is activated.

-  The status object is always "OFF" when the manual operation is deactivated.
-  The "inactive" status is transmitted automatically to the bus after the bus voltage returns or an ETS programming operation.
-  When active manual operation is terminated by a disable, the device will also transmit a "Manual operation inactive" status telegram to the bus.

Setting the behaviour for permanent manual operation

Behaviour at the beginning of manual operation:

The behaviour at the beginning of manual operation does not differ for temporary and permanent manual operation modes. On activation of manual operation mode, the most recently set states of the outputs initially remain active. Active functions such as forced position, valve rinsing, and service operation can be overridden by manual operation. These functions are reactivated after deactivation of the manual operation mode unless they have been cancelled in the meantime via the KNX. Then the function with the higher priority is always executed.

Behaviour at the end of manual operation:

The behaviour at the end of manual operation is different for temporary and permanent manual operation modes. The temporary manual operation mode is shut off automatically when the last output has been addressed and when the selection button  is pressed once more. During deactivation of the temporary manual operation mode, the actuator returns to 'normal' bus operation and does not change the states selected by manual control. If, however, a function such as forced position, valve rinsing or service operation has been activated via the KNX before or during manual

operation, the actuator executes these functions with higher priority again for the affected outputs.

The permanent manual operation mode is shut off when the selection button  is pressed for more than 5 seconds. Depending on the configuration of the actuator in the ETS, the outputs will be set to the state last adjusted in manual operation or to the state internally tracked when permanent manual operation mode is switched off. The parameter "At end of permanent manual operation" defines the corresponding reaction.

- Set the parameter "At end of permanent manual operation" to "no change".

All telegrams received during active permanent manual operation for direct operation will be rejected. After the end of permanent manual operation, the current state of all outputs remains unchanged. If, however, a forced position, a valve rinsing or a service operation has been activated via the KNX before or during manual operation, the actuator executes these functions with a higher priority for the affected outputs.

- Set the parameter "At end of permanent manual operation" to "track outputs".

During active permanent manual operation, all incoming telegrams are tracked internally. At the end of manual operation, the outputs will be set to the tracked states or to the positions last set before the permanent manual operation. The individual priorities of the functions with respect to one another are taken into account here. Only the function with the greater priority is executed.

 The operations triggered during manual operation update the states of the feedback and status objects. Telegrams are also transmitted to the KNX, if the signal objects concerned are enabled in the ETS and are configured as actively transmitting.

 Active manual operation is always exited in the event of an ETS programming operation. In this case, the parameterised or predefined behaviour at the end of manual operation will not be executed. The actuator executes the configured behaviour after ETS programming instead.

Setting disabling of the bus control

Individual outputs can be disabled locally by manual operation on the device so that the connected outputs can no longer be controlled via the KNX. Such disabling of the bus operation is initiated by operation in permanent manual operation mode and is indicated by rapid flashing of the status LEDs on the front panel of the device. The disabled outputs can then only be activated in permanent manual operation.

Manual operation must be enabled.

- Activate the parameter "Disable bus control of individual outputs" on the parameter page "Manual operation".

The function for disabling the bus control is enabled and can be activated locally. Alternatively, deactivating the parameter prevents disabling of the bus control from being activated in permanent manual operation mode.

- i** The disabling initiated locally has the highest priority. Thus all other functions of the actuator that can be activated via KNX (e. g. forced position, valve rinsing or service operation) are overridden. The bus-disabled output remains in the state last set in permanent manual operation mode. Depending on the configuration of the actuator in the ETS, the groups will be set to the state most recently set or internally tracked after the disabling and subsequent deactivation of permanent manual operation mode.
- i** The disabling function of manual operation does not influence bus-disabled outputs.
- i** A failure of the bus voltage or an ETS programming operation deactivates disabling of the bus control.

HVAC function: setting the PWM cycle time and command value of manual operation

During manual operation, all the parametrised valve outputs are activated with a pulse-width modulation (PWM) using the **ON/▲** button, irrespective of the configured command value data format (1-bit or 1-byte). Taking the cycle time set in the device into account, the average output signal resulting from the statically configured pulse width modulation is a measure of the centred valve position of the control valve and thus a reference for the set room temperature for manual operation. The cycle time of the PWM signal can, like PWM itself, be configured centrally on the parameter page "General -> Manual operation" in the ETS. In consequence, a manual operation locally on the device can allow the use of a different cycle time than in normal operation of the actuator (activation via KNX telegrams).

The **OFF/▼** command always closes the valves completely (0%). In the central operating function of all valve outputs with the **ALL OFF** button, the actuator always activates the valve outputs with a constant signal (0%).

- Configure the parameters "PWM cycle time" and "Control value" (5 ... 100%)" on the parameter page "Manual operation" to the required values.

For opened valve outputs, the actuator sets the set pulse width modulation (PWM) with the preset cycle time. With short-time manual operation, this only takes place when the **ON/▲** button has been pressed. In permanent manual operation, the actuator sets the PWM immediately after the activation of manual operation for opened valve outputs.

In manual operation, the configured valve direction of action (deenergised closed / deenergised opened) is taken into account during valve activation. With deenergised closed valves, the switch-on time is derived directly from the configured PWM and the cycle time.

Example: PWM = 30%, cycle time = 10 minutes -> Switch-on time = 3 minutes, switch-off time = 7 minutes.

In the case of deenergised opened valves, the switch-on time is inverted. Example: PWM = 30%, cycle time = 10 minutes -> Switch-on time = 7 minutes, switch-off time = 3 minutes.

In the as-delivered state, the actuator works with a command value of 50% and a cycle time of 20 minutes.

8.3 Configuring the status display

Configuring the status display

The status LEDs on the front of the device can indicate the current status of the outputs permanently or temporarily.

- Continuous status indication:
The parameter "Indicate status temporarily" on the "General -> Status indication" parameter page is deactivated. In the case of a continuous status indication, the status LEDs always indicate the current status of the outputs.
- Temporary status indication:
The parameter "Indicate status temporarily" on the "General -> Status indication" parameter page is activated. During temporary indication, the status indication is activated by pressing the "Manual operation" button. The display length is set in the ETS.
If manual operation is enabled in the ETS, pressing the "Manual operation" button also activates the temporary or permanent manual operation mode. The status indication always remains active during manual operation. At the end of manual operation mode, the display length of the temporary status indication is restarted. The status LEDs then go out after the configured time has elapsed.
If manual operation is not enabled in the ETS, all status LEDs only show the status of the outputs when the "Manual operation" button is pressed, depending on the duration of the display.

i In the as-delivered state, the continuous status indication is preset.

If the parameter "Control via object" is activated, the "Temporary status indication" communication object is available in the ETS. This object is bidirectional and can firstly signal the status of the temporary status indication, and secondly, activate the status display. If a temporary status indication has been activated by pressing the "Manual operation" button, the object transmits the value "ON". If the object receives a telegram with the value "OFF" or "ON", the status LEDs indicate the status of the outputs according to the display length. Manual operation is not activated in this case.

By linking the "Temporary status indication" objects of several actuators using a common group address, the indication functions of the status LED can be synchronized with one another. It is thus possible to activate the status indications of all actuators in a control cabinet at the same time if manual operation is triggered on one actuator only - e. g. for service or maintenance purposes.

In addition, the "Temporary status display" object could be controlled, for example, by a magnetic contact connected to the KNX, so that the status indications of all actuators are activated by opening the control cabinet door. If the door is closed, the status indications for energy saving remain switched off.

i During a running display length, the "Temporary status indication" object does not transmit any new telegrams if the "Manual operation" button is pressed again.

8.4 Operation and indication parameters

General -> Status display

Indicating status temporarily	Checkbox (yes / no)
The status LEDs on the front of the device can indicate the current status of the outputs permanently or temporarily. Parameter deactivated: Continuous status indication. In this case, the status LEDs always indicate the current status of the outputs. Parameter activated: Temporary status indication. In this case, the status indication is activated by pressing the "Manual operation" button. The display length is set in the ETS. If manual operation is enabled in the ETS, pressing the "Manual operation" button also activates the temporary or permanent manual operation mode. The status indication always remains active during manual operation. At the end of manual operation mode, the display length of the temporary status indication is re-started. The status LEDs then go out after the configured time has elapsed.	

Display length	6 ... 10 ... 255 s
This parameter defines the display length if the temporary status indication is activated.	

Control via object	Checkbox (yes / no)
If the parameter "Control via object" is activated, the "Temporary status indication" communication object is available in the ETS. This object is bidirectional and can firstly signal the status of the temporary status indication, and secondly, activate the status display. If a temporary status indication has been activated by pressing the "Manual operation" button, the object transmits the value "ON". If the object receives a telegram with the value "OFF" or "ON", the status LEDs indicate the status of the outputs according to the display length. Manual operation is not activated in this case.	

General -> Manual operation

Manual control	Checkbox (yes / no)
Manual operation is possible while the device is supplied with power from the bus supply voltage. This parameter defines whether manual operation is to be possible or deactivated permanently.	

Disabling function	Checkbox (yes / no)
Manual operation can be disabled via the KNX, even if it is already active. For this purpose, the disabling object can be enabled here. This parameter is only visible if manual operation is enabled.	

Object polarity	0 = enabled / 1 = disabled 1 = enabled / 0 = disabled
This parameter sets the polarity of the disabling object. This parameter is only visible if the disabling function is enabled.	

Status object	Checkbox (yes / no)
An actuator can transmit a status telegram to the KNX via a separate object when the manual operation is activated or deactivated. This parameter is only visible if manual operation is enabled.	
Function	0 = inactive; 1 = manual operation active 0 = inactive; 1 = permanent manual operation active
This parameter defines the information contained in the status object. The object is always "0", when the manual control mode is deactivated. 0 = inactive; 1 = manual operation active: The object is "1" when manual operation is active (temporary or permanent). 0 = inactive; 1 = permanent manual operation active: The object is only "1" when permanent manual operation is active. This parameter is only visible if the status function is enabled.	
At end of permanent manual operation	no change Output tracking
The behaviour of the actuator at the end of permanent manual operation depends on this parameter. no change: All telegrams received during active permanent manual operation for direct operation (switching, long-time/short-time, positioning, central, scenes, command value telegrams) will be rejected. After the end of the permanent manual operation, the current state of all outputs which was most recently active in manual operation remains unchanged. If, however, a forced position, a disabling function, a safety function or a sun protection function (independent of priority) has been activated via the KNX before or during manual operation, the actuator executes these functions with a higher priority for the outputs concerned. Track outputs: During active permanent manual operation, all incoming telegrams (blinds operation exception: short-time telegrams – step/stop) are internally tracked. At the end of the manual operation, the outputs will be set to the tracked states or to the positions last set before the permanent manual operation for Venetian blind outputs. The individual priorities of the functions with respect to one another are taken into account here. Only the function with the greater priority is executed. Long time operation is not tracked in Venetian blind operation if the corresponding Venetian blind output is already in the appropriate end position. This parameter is only visible if manual operation is enabled.	
Bus control of individual outputs can be disabled	Checkbox (yes / no)
Individual outputs can be disabled locally during permanent manual operation, so that the disabled outputs can no longer be controlled via the KNX. Disabling via manual operation is only permitted if this parameter is activated. This parameter is only visible if manual operation is enabled.	

PWM cycle time	0.5 minutes 1 minute ... 19.5 minutes 20 minutes
During manual operation, all the valve outputs are activated with a pulse-width modulation (PWM) using the button ON/↗, irrespective of the configured command value data format. The cycle time of the PWM signal for a valve output activated by manual operation is configured by this parameter. In consequence, manual operation locally on the device can allow the use of a different cycle time than in normal operation of the device (activation by KNX telegrams). The OFF/↘ command always closes the valves completely (0%). An exception is the central operating function of all valve outputs with the ALL OFF button. Here, the actuator always activates the valve outputs with a constant signal (0%).	
Command value	5 ... 50 ... 100%
This parameter specifies the pulse-pause ratio of the pulse width modulation of the manual operation for opened valve outputs.	

8.5 Object list for operation and indication

Function	Name	Type	DPT	Flag
Disabling	Manual operation - Input	1-bit	1,003	C, -, W, -, U
1-bit object for disabling manual operation on the device. The polarity can be configured.				

Function	Name	Type	DPT	Flag
Status	Manual operation - Output	1-bit	1,002	C, R, -, T, A
1-bit object for manual operation status transmission. The object is "OFF" when manual operation is deactivated (bus control). The object is "ON" when manual operation is activated. You can configure whether temporary or permanent manual operation will be indicated as status information or not.				

Function	Name	Type	DPT	Flag
Temporary status indication	Manual operation - Input/Output	1-bit	1,002	C, R, W, T, A
1-bit object to signal and activate the temporary status indication. This object is bidirectional and can firstly signal the status of the temporary status indication, and secondly, activate the status display. If a temporary status indication has been activated by pressing the "Manual operation" button, the object transmits the value "ON". If the object receives a telegram with the value "OFF" or "ON", the status LEDs indicate the status of the outputs according to the display length. Manual operation is not activated in this case. The object is only visible if the temporary status indication is activated.				

9 General functions

9.1 Delay after bus voltage returns

To reduce telegram traffic on the KNX bus line after bus voltage activation (bus reset), after connection of the device to the bus line or after an ETS programming operation, it is possible to delay all actively transmitted status or feedback. For this purpose, a channel-independent delay can be specified (parameter "Delay after bus voltage returns" on parameter page "General"). To control the valves, a separate delay after the bus voltage returns can be set on the parameter page "Outputs -> Fan coil -> Valves". Only after the configured time elapses are feedback telegrams for initialisation transmitted to the KNX.

Which of the telegrams is actually delayed can be set for each output and status function separately.

- i** The delay has no effect on the behaviour of the outputs. Only the bus telegrams for status or feedback are delayed. The outputs can be activated also during the delay after the bus voltage returns.
- i** A setting of "0" for the delay after the bus voltage returns fully deactivates the time delay. In this case, any messages, if actively transmitted, will be transmitted to the KNX without any delay.

9.1.1 General times parameter

General -> Times

Delay after bus voltage returns	0 ... 59 min 0 ... 17 ... 59 s
To reduce telegram traffic on the bus line after bus voltage activation (bus reset), after connection of the device to the bus line or after programming with the ETS, it is possible to delay all active feedback telegrams of the actuator. This parameter defines a delay time independent of the channel for this case. Only after the time configured here has elapsed are feedback telegrams for initialisation transmitted to the bus. The delay must be activated separately for each output on the corresponding parameter pages. If this parameter is activated, the feedback telegrams will be delayed by the time set here. A setting of "0" for the delay after the bus voltage returns fully deactivates the time delay. In this case, any messages, if actively transmitted, will be transmitted to the KNX without any delay.	

9.2 Heartbeat

The heartbeat function makes it easy to check whether the application is running error-free in a device. For this purpose, the communication object Heartbeat sends a corresponding heartbeat telegram with a settable cycle time. The heartbeat function is enabled on the "General" parameter page.

9.2.1 Parameters for heartbeat

General - Enabled functions

Heartbeat function	Checkbox (yes / no)
If the parameter is activated, the heartbeat functions and thus the "Heartbeat" object are enabled.	

General -> Heartbeat

Cycle time for transmission of the heartbeat	0 ... 23 h 0 ... 2 ... 59 min
This parameter defines the time with which the device sends a telegram with the value "1" when the application is running. To limit the bus load, times shorter than 1 minute are excluded.	

9.2.2 Object list for heartbeat

Function	Name	Type	DPT	Flag
Heartbeat	Actuator - Output	1-bit	1,002	C, R, -, T, A
1-bit object for cyclical signalling of the device function. When the application of the device is running, the communication object transmits the value "1" at the set cycle time.				

9.3 Room service function (DND/MUR)

Do not disturb (DND) / Make up room (MUR)

These functions are primarily used in hotels to communicate information from hotel guests to service staff without having to open the room door.

When this function is activated, up to 7 communication objects are visible, which can be used to communicate the room cleaning or do-not-disturb request from outside at the room door or from a central location.

The logic behind these functions:

- Only one of the outputs can be switched on.
- When the 2nd output is activated, the 1st output switches off automatically
- If a function is already active, it is switched off again the next time the same function is pressed

Application example

The "Do not disturb / Make up room" function can be used in different configurations. This example shows an application in which a manual double button activates the "Do not disturb / Make up room" functions. The service indicator on the door is provided by illuminated pictograms that are switched via relay outputs.

The following inputs and outputs of the device can be used for this purpose.

- Double button for activating "Do not disturb / Make up room":
Each output of the double push-button is wired to an extension input of the device.
The "Channel function" of the two extension units should be set to "Push-button" and the "Function" to "Switching". Switching (TOGGLE) takes place "When pressed". Pressing a push-button a second time switches the function off.
- The output objects of the extension units must be connected to the corresponding input objects of the DND/MUR function via group addresses. To obtain the status of the DND/MUR function at the extension units, the output objects of the DND/MUR function must be connected to the input objects of the extension units via group addresses.
- 2 relay outputs (not necessary if the indicator on the door is a KNX device)
The relay outputs must be connected to the status objects of the DND/MUR function via group addresses. Service indicators, for example, can then be connected to the outputs.

Alternative implementation with mutually interlocked switch

It is also possible to realise the "Do not disturb / Make up room" function with a mutually interlocked switch instead of a double push-button. In this case, the realisation is as follows:

- Each output from the switch is wired to an extension input of the device. The "Channel function" of the two extension units should be set to "Switch" and the "Function" of the selected object should be set to "Switching". "When the contact is closed" switches ON and "When the contact is NC contacted" switches OFF.
- The output objects of the extension units must be connected to the corresponding input objects of the DND/MUR function via group addresses.
- Activate the disabling function of the two extension inputs. The parameter "At the start of disabling" should be parameterised to "No reaction" and the parameter "At the end of disabling" to "Send current status".
Cross-link the output objects of the extension inputs via group addresses with the input object for blocking the other extension input (see figure 11).
- 2 relay outputs (not necessary if the indicator on the door is a KNX device)
The relay outputs must be connected to the status objects of the DND/MUR function via group addresses. Service indicators, for example, can then be connected to the outputs.

The following graphic shows the logical connections:

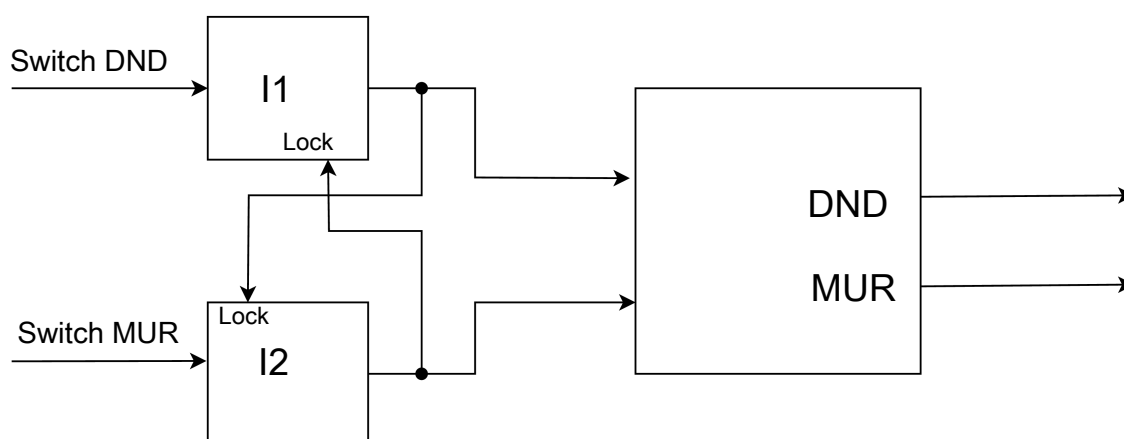


Figure 11: Realisation DND/MUR with mutually interlocked switch

Room condition

In addition to the 1-bit communication objects "Do not disturb" / "Make up room", a 1-byte object can also be enabled to control the two functions.

The 1-byte objects "Room status" and "Room status - Status" are a data type that does not correspond to any KNX standard data type.

The 1-byte objects have the following structure:

Room condition
Hotel room (command or status)

Room condition
0 = Normal (No messages)
1 = MUR - Make up room
2 = DND - Do not disturb
3 ... 255 = reserved (unused)

Reset

The reset function can be used to reset the status of the functions to 0. This can be useful when operating from a central location.

Transmission behaviour

The transmission behaviour can be parameterised to avoid unnecessary telegrams. The send criterion can be set to "only when an output changes" or "all outputs when the inputs are updated".

Cyclical transmission with a parameterisable cycle time can also be set.

9.3.1 Parameter DND/MUR

General - Enabled functions

"Do not disturb / Make up room" function	Active/inactive
The "Do not disturb / Make up room" function can be activated at this point. This function enables hotel guests to pass on a message to service staff without having to open the room door. When this function is activated, further parameters become visible.	

"Do not disturb / Make up room" function -> DND / MUR

Name	Free text
You can optionally assign a name for the "Do not disturb / Make up room" function. For example, the room number for which this function applies can be entered as the name. The text is not programmed into the device, but merely serves as an aid for project design.	

Use the "Room status" object	Active/inactive
When this parameter is activated, the 1-byte communication objects "Room status" and "Room status - Status" become visible. As an alternative to the 1-bit objects, these 1-byte objects can also be used to transmit the request to clean the room or not to disturb the guest at the moment. The 1-byte objects "Room status" and "Room status - Status" are a data type that does not correspond to any KNX standard data type. The 1-byte objects have the following structure: Hotel room (command or status) 0 = Normal (No messages) 1 = MUR - Make up room 2 = DND - Do not disturb 3 ... 255 = reserved (unused)	
Use the "Reset" object	Active/inactive
When this parameter is activated, a 1-bit "Reset" communication object becomes visible via which the "Do not disturb / Make up room" functions can be reset together.	
Transmission criteria	all outputs when updating the inputs only if the output changes
This parameter can be used to select whether the outputs are updated each time the inputs are updated or only when the status of the output changes.	
Cyclical transmission	Active/inactive
When this parameter is activated, the status telegrams "Do not disturb" and "Make up room" are not only sent to the bus when there is a change, but also cyclically. The cycle time may be adjusted separately.	
Cycle time	0 ... 23 h 0 ... 5 ... 59 min 0 ... 59 s
This parameter defines the cycle time for the cyclical transmission. The minimum time that can be set is 10 seconds. This cycle time parameter is only visible if the "Cyclical sending" parameter is activated.	

9.3.2 Object list DND/MUR

Function	Name	Type	DPT	Flag
Do not disturb	DND/MUR - Input	1-bit	1,001	C, -, W, -, U
1-bit object for activating or deactivating the "Do not disturb" function.				

Function	Name	Type	DPT	Flag
Do not disturb - Status	DND/MUR - Output	1-bit	1,001	C, R, -, T, A
1-bit object for the status message of the "Do not disturb" function.				

Function	Name	Type	DPT	Flag
Make up room	DND/MUR - Input	1-bit	1,001	C, -, W, -, U
1-bit object for activating or deactivating the "Make up room" function.				

Function	Name	Type	DPT	Flag
Make up room - Status	DND/MUR - Output	1-bit	1,001	C, R, -, T, A
1-bit object for the status message of the "Make up room" function.				

Function	Name	Type	DPT	Flag
Room condition	DND/MUR - Input	1-byte	not Standard	C, -, W, -, U
1-byte object for activating or deactivating the "Make up room / Do not disturb" function.				

Function	Name	Type	DPT	Flag
Room status - Status	DND/MUR - Output	1-byte	not Standard	C, R, -, T, A
1-byte object for the status message of the "Make up room / Do not disturb" function.				

Function	Name	Type	DPT	Flag
Reset	DND/MUR - Input	1-bit	1,015	C, -, W, -, U
1-bit object for resetting all "Make up room / Do not disturb" messages.				

9.4 "Room occupancy" function

Especially in larger hotels, it can be advantageous to recognise the actual occupancy of rooms (presence of guests or employees) in order to optimise service. For example, efficient management of cleaning or maintenance staff is possible, as well as a list of occupied rooms in the event of an evacuation.

When this function is activated, up to 8 communication objects are visible via which the room occupancy can be viewed from outside at the room door or at a central location.

Necessary components

In order to be able to use this room occupancy function

- one door contact for each entrance door to the room and
- a presence detector is required for each area of the room.

The door contact can either be connected directly to the extension units of the device or a KNX input module is used that sends the status of the door, closed or NC contact, to the bus. The polarity of the object "Door contact" can be configured.

A KNX presence detector or a conventional presence detector that is connected to the room occupancy function via a KNX binary input can be used as a presence detector. The polarity of the object "Presence detector" can also be configured.

- i** A presence detector with 230 V output must not be connected to the extension unit inputs of the device, as the extension units are SELV inputs.

General principle of room allocation

To recognise whether a room is currently occupied, the door contact and presence detector must be combined with corresponding waiting and delay times. The following scenarios are intended to explain functionality.

Example A: Someone enters an empty room (see figure 12)

The door contact is opened, the person enters and the door contact is closed. NO contact starts the presence waiting time = timer 1. If a movement signal is still present when timer 1 expires, the occupancy status changes to "occupied" and a corresponding telegram is sent on the bus. With each new motion detection, a "Room occupied" telegram is sent to the bus again if this is parameterised via the "Send criterion" parameter.

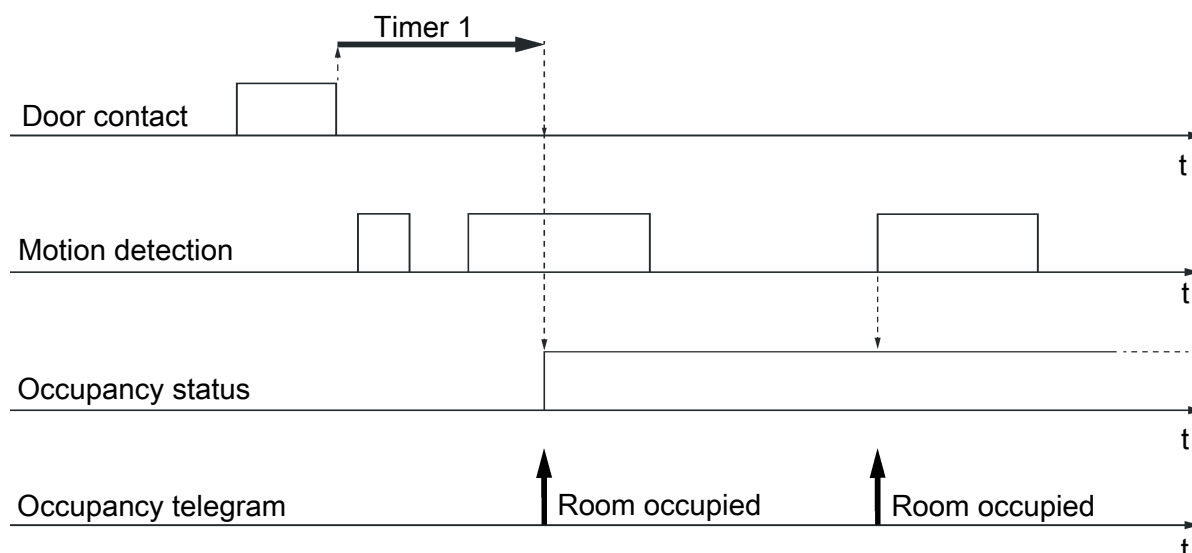


Figure 12: Timing diagram - person enters room (example A)

Example B: Someone enters a room and leaves the room again (see figure 13)

The door contact is opened, the person enters, e.g. to empty the rubbish, and leaves the room again. When motion is detected in the room, the occupancy status is set to "occupied" and a corresponding telegram is sent on the bus. The door contact is closed. NO contact starts the presence waiting time = timer 1. If there is no movement signal when timer 1 expires, timer 2 (delay status room not occupied) is started. If timer 2 expires without having detected a movement, the occupancy status changes to "not occupied" and a corresponding telegram is sent to the bus.

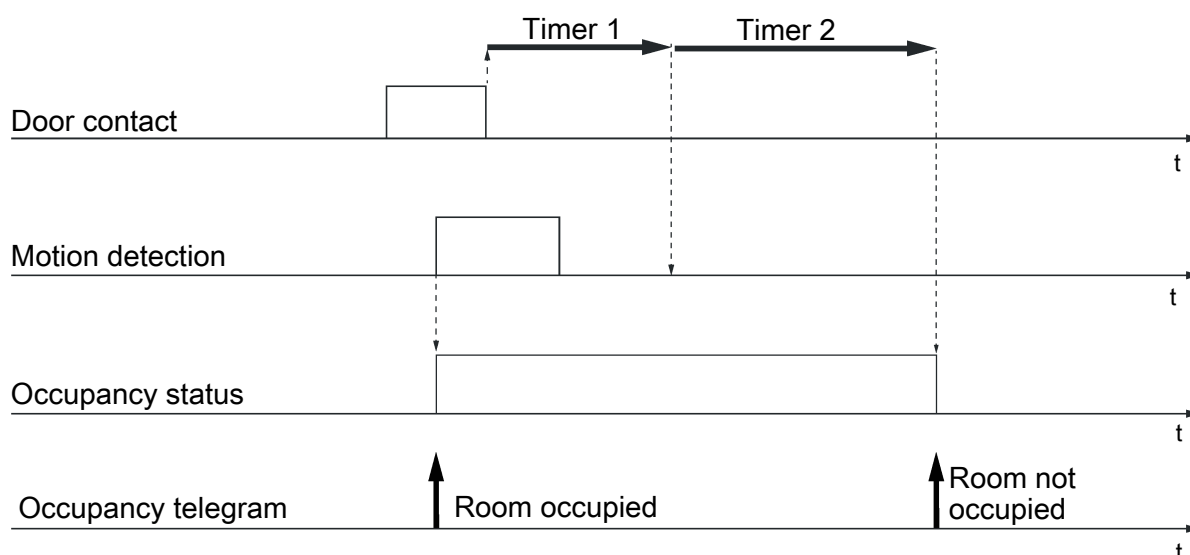


Figure 13: Timing diagram - person enters and leaves the room (example B)

Example C: People in a room, one person leaves the room (see figure 14)

The room is occupied and the door contact is NC contacted, a person leaves the room. The door contact is closed. NO contact starts the presence waiting time = timer 1. If there is no movement signal when timer 1 expires, timer 2 (delay status room not

occupied) is started. If a movement is detected in the room while timer 2 is running, timer 2 is cancelled and "Room occupied" is sent to the bus. During the entire time of example C, the occupancy status is set to "occupied".

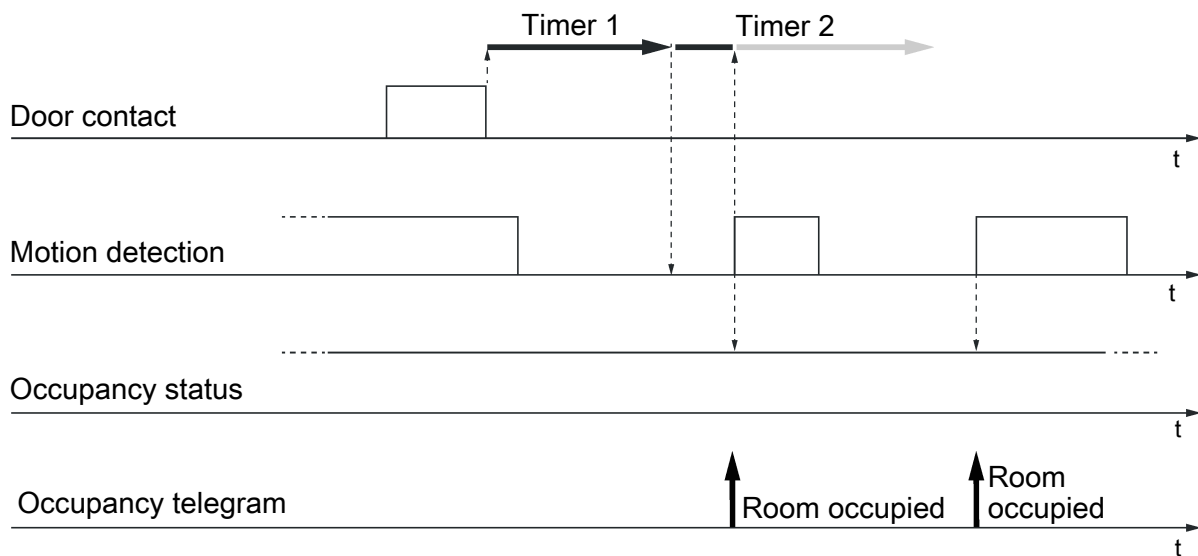


Figure 14: Timing diagram - 2 people enter the room, 1 person leaves (example C)

Example D: A person enters a room (see figure 15)

The door contact is NC contacted, a person enters but goes into a room area without presence detection. With the first motion detection when entering the room, the occupancy status is set to "occupied" and a corresponding telegram is sent on the bus. The door contact is closed. NO contact starts the presence waiting time = timer 1. If there is no movement signal when timer 1 expires, timer 2 (delay status room not occupied) is started. If timer 2 expires without a movement being detected, the occupancy status changes to "not occupied" and a corresponding telegram is sent to the bus. If a movement is subsequently detected because the person is detected again, the occupancy status changes to "occupied" and a corresponding telegram is sent on the bus.

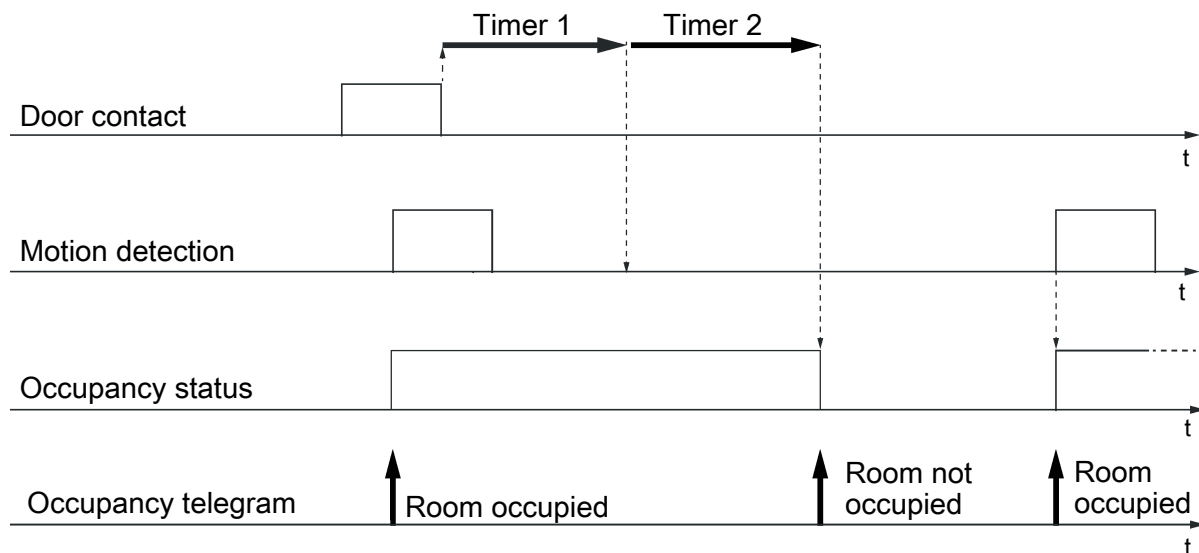


Figure 15: Timing diagram - person enters room, no motion detection at first (example D)

Entry profiles

The entry profiles can be used to display information on who is occupying the room in addition to the occupancy. A distinction is made between guests and employees. The prerequisite for this is, of course, that the employees identify themselves separately, either by means of a separate switch or a corresponding door card to open the door. This information must then be transferred to the "Entry profile (guests / employees)" input object via group addresses.

If the entry profile is activated, the occupancy status is set to "Room occupied by" via the 1-byte object or via the 1-bit objects "Entry profile guests present" or "Entry profile employees present", depending on the last entry profile received.

Room occupancy through

The "Room occupied by - Status" communication object can transmit information to the bus about whether the room is occupied and by whom.

This 1-byte output object has a data type that does not correspond to any KNX standard data point types.

The 1-byte object has the following structure:

Room occupied by
0 = Nobody
1 = Guests
2 = employee
3 ... 255 = reserved (unused)

Transmission criteria

To avoid unnecessary telegrams, the transmission behaviour can be parameterised. A distinction can be made between two options as a transmission criterion:

- "only if an output changes": The occupancy telegram is only resent if the occupancy status changes, i.e. from "Room occupied" to "Room not occupied" or vice versa. This should be sufficient for updating an occupancy status.
- "all outputs when inputs are updated": If a room is occupied, the "Room occupied" occupancy telegram is sent to the bus each time a new motion is detected. This setting is shown in the diagrams above, but can lead to a greater telegram load under certain circumstances.

Cyclical transmission with a parameterisable cycle time can also be set.

9.4.1 Room occupancy" parameter

General - Enabled functions

"Room occupancy" function	Active/inactive
The "Room allocation" function can be activated at this point. This function makes it possible to see from the outside whether a hotel room is occupied. When this function is activated, further parameters become visible.	

"Room occupancy" function -> ROOM

Name	Free text
You can optionally assign a name for the "Room occupancy" function. For example, the room number for which this function applies can be entered as the name. The text is not programmed into the device, but merely serves as an aid for project design.	

Polarity object "Door contact"	0 = closed / 1 = open 0 = open / 1 = closed
This parameter can be used to specify the polarity of the door contact used.	

Polarity object "Presence detector"	0 = no presence / 1 = presence 0 = presence / 1 = no presence
This parameter can be used to specify the polarity of the presence detector used.	

Presence waiting time	0 ... 3 h 0 ... 15 ... 59 min 0 ... 59 s
This parameter is used to set a waiting time that is started when the room door (door contact) is closed. If a motion signal is still present when the presence waiting time that can be set here expires, the occupancy status switches to "occupied" and a corresponding telegram is sent on the bus.	
The minimum time that can be set is one minute.	

Delay Status Room not occupied	0 ... 3 h 0 ... 15 ... 59 min 0 ... 59 s
This parameter is used to specify a delay time that must elapse before a room is shown as unoccupied.	
The delay time starts if no presence detection has taken place after the last time the room door was closed and the presence waiting time has expired. If no presence is detected during this delay time and no door opening is detected, the room is evaluated as unoccupied and telegrams are sent to the bus depending on the parameterisation.	
The minimum time that can be set is one minute.	

Use entry profiles	Active/inactive
Activating this parameter makes four additional communication objects visible. A 1-bit input object, which is used to enter whether they are guests or employees, and two 1-bit output objects, which are used to report the presence of guests and employees. A further communication object "Room occupied by - Status" can transmit information to the bus as to whether the room is occupied and by whom. This 1-byte output object has a data point type that does not correspond to any KNX standard data point type. The initial objects of the entry profiles are always sent together with the occupancy status. The 1-byte object has the following structure: -> Room occupied by 0 = Nobody 1 = Guests 2 = employee 3 ... 255 = reserved (unused)	
Polarity object "Entry profile"	0 = employees / 1 = guests 0 = guests / 1 = employees
This parameter can be used to specify the polarity of the entry profile.	
Transmission criteria	all outputs when updating the inputs only if the output changes
The room occupancy function has up to 5 output objects that send the status of the room occupancy to the KNX. all outputs when the inputs are updated: If a room is occupied, the "Room occupied" occupancy telegram is sent to the bus each time a new motion is detected. This can lead to a greater telegram load under certain circumstances. only if the output changes: The occupancy telegram is only resent if the occupancy status changes, i.e. from "Room occupied" to "Room not occupied" or vice versa. This should be sufficient for updating an occupancy status.	
Cyclical transmission	Active/inactive
When this parameter is activated, all status telegrams for room occupancy are sent to the bus not only when there is a change, but also cyclically. The cycle time may be adjusted separately.	
Cycle time	0 ... 23 h 0 ... 5 ... 59 min 0 ... 59 s
This parameter defines the cycle time for the cyclical transmission. The minimum time that can be set is 10 seconds. This parameter is only visible if the "Cyclical sending" parameter is activated.	

9.4.2 Object list "Room occupancy"

Function	Name	Type	DPT	Flag
Door contact	ROOM - Entrance	1-bit	1,019	C, -, W, -, U

1-bit object for evaluating the door contact of a hotel room. The polarity of the object can be configured.

Function	Name	Type	DPT	Flag
Presence detector	ROOM - Entrance	1-bit	1,018	C, -, W, -, U

1-bit object for evaluating a presence detector in a hotel room. The polarity of the object can be configured.

Function	Name	Type	DPT	Flag
Room occupied - Status	ROOM - Output	1-bit	1,002	C, R, -, T, A

1-bit object for the "Room occupied" status message. All active outgoing objects are always sent together.

Function	Name	Type	DPT	Flag
Room not occupied-Status	ROOM - Output	1-bit	1,002	C, R, -, T, A

1-bit object for the "Room not occupied" status message. This object is the inversion of "Room occupied - Status. All active outgoing objects are always sent together.

Function	Name	Type	DPT	Flag
Room occupied by - Status	ROOM - Output	1-byte	not Standard	C, R, -, T, A

1-byte object for signalling whether and by whom the room is occupied. By guests or employees.
This object is only visible if the "Use entry profiles" parameter has been activated. All active outgoing objects are always sent together.

Function	Name	Type	DPT	Flag
Entry profile (guests / employees)	ROOM - Entrance	1-bit	1,002	C, -, W, -, U

1-bit object for selecting whether the persons entering are guests or employees.
This object is only visible if the "Use entry profiles" parameter has been activated.

Function	Name	Type	DPT	Flag
Entry profile Guests present - Status	ROOM - Output	1-bit	1,002	C, R, -, T, A

1-bit object for signalling whether guests are present.
This object is only visible if the "Use entry profiles" parameter has been activated.

Function	Name	Type	DPT	Flag
Entry profile employee present - Status	ROOM - Output	1-bit	1,002	C, R, -, T, A
1-bit object for status signalling whether employees are present. This object is only visible if the "Use entry profiles" parameter has been activated.				

9.5 Status / Collective feedback switching status

Status - mains voltage failure

The device can monitor its supply voltage at the mains voltage connection. If there is a failure, the device is able to transmit a status telegram to the KNX before stopping operation, provided the bus voltage is uninterrupted.

For the status of a power failure or mains voltage return, this 1-bit communication object is used. The telegram polarity of this object can be parameterised and a delay after bus voltage return can be activated.

Collective feedback

After central commands or after the bus voltage returns, a KNX line is generally heavily loaded by data traffic as many bus devices are actively transmitting the state of their communication objects by means of feedback telegrams. This effect occurs particularly when using visualisations. Collective feedback for switching states can be used to keep the telegram load low during initialisation.

- i** The collective feedback is intended for all outputs that are not assigned Fan-Coil functions. If FanCoil units are parametrised, the outputs provided for this purpose are removed from the collective feedback.

In the collective feedback, the switching states of the electronic valve outputs (outputs **C1** to **C3**) and the analogue outputs (outputs **C4** to **C6**) are combined in a 4-byte communication object. The relay outputs (outputs **C7** to **C16**) are also summarised in another 4-byte communication object. The 32-bit communication objects "Collective feedback C1 ... C6 - Output" and "Collective feedback C7 ... C16 - Output" contain bit-orientated feedback information for the individual outputs.

The data point type of the collective feedback corresponds to the KNX standard (DPT 27.001). This could be used in suitable visualisation applications - for example in public buildings such as schools or hospitals - where the switching states of the entire actuator system are displayed centrally and no separate switching state indication is provided at the control panels. In such applications the collective feedback can replace the 1-bit individual feedbacks and thereby significantly reduce the KNX bus load.

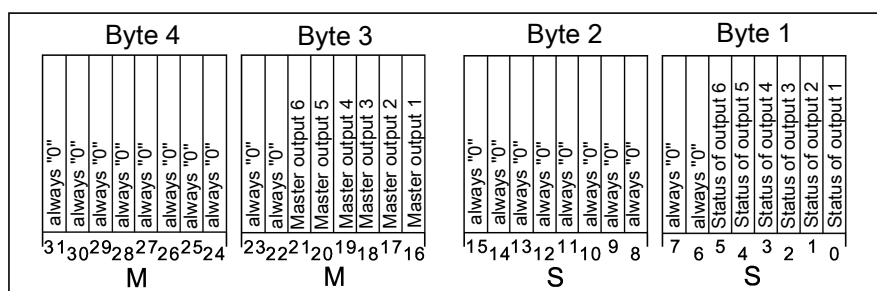


Figure 16: Object structure of the collective feedback for outputs 1 ... 6

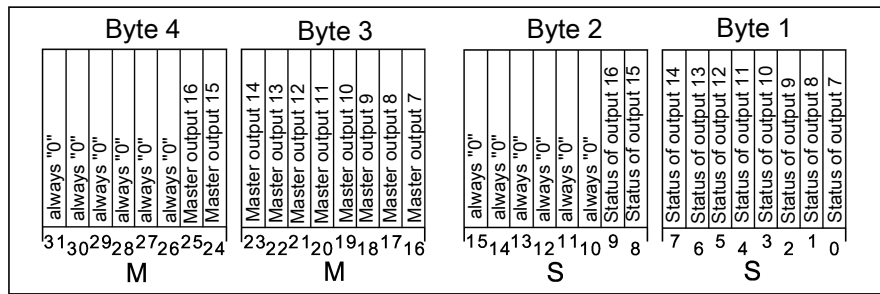


Figure 17: Object structure of the collective feedback for outputs 7 ... 16

The collective feedback indicates a different switching state. In so doing, each output possesses a bit, which signals the switching state ("S bit"), and an additional bit, which defines the masking ("M" bit). The "S"-bits correspond to the logical non-inverted switching states of the outputs and are either "1" (switched on) or "0" (switched off).

The "M"-bits are "1" if this output is available on the actuator, i. e. the channel configuration provides this output. Similarly, the "M"-bits are "0" if the corresponding output is not available on the actuator or a parallel connection of the outputs is configured or FanCoil functions are switched via the outputs. In the latter cases, the corresponding "S"-bits are continuously "0" because there is no switching status.

- i** A "flashing" output (see "Disabling function") is always reported as "switched on".

Activating collective feedback

If the collective feedback is activated, it is transmitted to the KNX whenever a switching state changes or is updated (depending on the parameter "Update of the object value").

- Activate the parameter "Collective feedback" on the parameter page "General".

Collective feedback is enabled. The communication object and others parameters become visible.

The collective feedback is transmitted once the status is updated. An automatic telegram transmission of the feedback takes place after the bus voltage returns or after programming with the ETS.

Setting the update of collective feedback

In the ETS, you can specify when the actuator should update the feedback value for the collective feedback in case of an actively transmitting communication object. The object value updated by the actuator is then signalled actively to the KNX.

Prerequisite:

Collective feedback must be enabled.

- Set the parameter "Update of the object value" to "On each update object 'Switching'/'Central'".

The device updates the feedback value in the object once a new telegram is received on the input objects "Switching" or "Switching central function..." or the switching state changes internally (e. g. through a time function). A new telegram is also then actively transmitted to the KNX each time. The telegram value of the feedback does not necessarily have to change in the process. Hence, corresponding collective feedback is also generated on a switching object such as in the case of cyclical telegrams, for example.

- Set the parameter to "Only if the feedback value changes".

The device only updates the feedback value in the object if the telegram value (e. g. "OFF" to "ON") also changes or the switching state changes internally (e. g. through a time function). If the telegram value of the feedback does not change (e. g. in the case of cyclical telegrams to the "Switching" object with the same telegram value), the actuator does not transmit any feedback. Consequently, with an actively transmitting feedback object, no telegram with the same content will be transmitted repeatedly either.

Setting collective feedback when the bus voltage returns or after programming with the ETS

The collective feedback is transmitted to the KNX after the bus voltage returns or after programming with the ETS. In these cases, the feedback can be time-delayed with the time delay being set globally.

Prerequisite:

Collective feedback must be enabled.

- Activate the parameter "Delay after bus voltage returns" of the collective feedback.

The collective feedback telegram is transmitted with a delay after the bus voltage returns or after an ETS programming operation. No feedback telegram is transmitted during a running delay, even if a switching state changes during the delay.

- Deactivate the parameter "Delay after bus voltage returns" of the collective feedback.

The collective feedback telegram is transmitted immediately after the bus voltage returns or after an ETS programming operation.

Setting the cyclical transmission of the collective feedback

The telegram of the collective feedback can also be transmitted cyclically, in addition to transmission on a change or update.

Prerequisite:

Collective feedback must be enabled.

- Activate the "Cyclical transmission" parameter. Configure the cycle time for the parameter "Time for cyclical transmission".

Cyclical transmission is activated. The collective feedback is transmitted to the KNX cyclically and if one of the switching states changes or is updated.

- Deactivate the "Cyclical transmission" parameter.

Cyclical transmission is deactivated, which means that the collective feedback is only transmitted to the KNX if one of the switching states changes or is updated.

- i** During an active delay after the bus voltage returns, no collective feedback will be transmitted even if a switching state changes.

9.5.1 Status / Collective feedback parameters

General -> Status

Mains voltage failure	Checkbox (yes / no)
The device can monitor its supply voltage at the mains voltage connection. If there is a failure, the device is able to transmit a status telegram to the KNX before stopping operation, provided the bus voltage is uninterrupted.	
Delay after bus voltage returns	Checkbox (yes / no)
The mains voltage failure message can be sent to the bus with a delay after bus voltage return in order to reduce the telegram load. The delay time is configured on the "General" parameter page under the parameter of the same name.	
Object polarity	0 = mains voltage available / 1 = mains voltage failure 1 = mains voltage available / 0 = mains voltage failure
The polarity of the alarm message that is sent in the event of an mains voltage failure can be adjusted here.	

General -> Collective feedback

Collective feedback	Checkbox (yes / no)
The "Collective feedback C1...C6" and "Collective feedback C7...C16" objects and other parameters are displayed only when the function is activated.	

Updating the object value	after each update "Switching"/"Central" object Only if the feedback value changes
Here, you can specify when the device should update the feedback value for the switching status ("Switching -Status" object) in case of an actively transmitting communication object. The object value updated by the actuator is then signalled actively to the KNX. after each update object "Switching"/"Central": The actuator updates the feedback value in the object once a new telegram is received on the input objects "Switching" or "Central switching" or the switching state changes internally (e. g. through a time function). With an actively transmitting feedback object, a new telegram is also then actively transmitted to the KNX each time. The telegram value of the feedback does not necessarily have to change in the process. Hence, a corresponding switching status feedback is also generated on the "Switching" object such as in the case of cyclical telegrams for example. only if the feedback value changes: The actuator only updates the feedback value in the object if the telegram value (e. g. "OFF" to "ON") also changes or the switching state changes internally (e. g. through a time function). If the telegram value of the feedback does not change (e. g. in the case of cyclical telegrams to the "Switching" object with the same telegram value), the actuator does not transmit any feedback. Consequently, with an actively transmitting feedback object, no telegram with the same content will be transmitted repeatedly either.	
Delay when bus voltage returns	Checkbox (yes / no)
The state of the switching status feedback can be transmitted to the KNX with a delay when the bus voltage returns or after an ETS programming operation. The activated parameter causes a delay when the bus voltage returns. The delay time is configured on the parameter page "General -> Times". This parameter is visible only if collective feedback is activated.	
Cyclical transmission	Checkbox (yes / no)
The switching status feedback telegrams can, if actively transmitting, also be transmitted cyclically, in addition to the transmission after updating. Parameter activated: Cyclical transmission is activated. Parameter deactivated: Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.	
Time for cyclical transmission	0...23 h 0...2...59 min 0...59 s
These parameters jointly define the time for cyclical transmission of the switching status feedback. These parameters are only available if cyclical transmission is activated.	

9.5.2 Object list status / collective feedback

Function	Name	Type	DPT	Flag
Mains voltage failure	Actuator - Output	1-bit	1,005	C, R, -, T, A
1-bit object for signalling a mains voltage failure on the device. The object polarity can be configured.				

Function	Name	Type	DPT	Flag
Switching status	Collective feedback C1...C6 - Output	4-byte	27,001	C, R, -, T, A
4-byte object for collected status feedback of the states of outputs C1 ... C6. The collective feedback summarises the switching status in just one telegram. The object contains bit-orientated feedback information.				

Function	Name	Type	DPT	Flag
Switching status	Collective feedback C7...C16 - Output	4-byte	27,001	C, R, -, T, A
4-byte object for collected status feedback of the states of outputs C7 ... C16. The collective feedback summarises the switching status in just one telegram. The object contains bit-orientated feedback information.				

10 FanCoil functions (valve and fan control)

10.1 Application basics

Definition of terms and functional principle

The term "FanCoil" comes from the English-speaking world and is a combination of the words "fan" and "coil". These terms directly describe how a FanCoil works: A fan blows intake air through a heat exchanger, which usually consists of a coil or ribbed heating or cooling register. The temperature of the sucked-in air is thus climate-controlled, i. e. heated or cooled.

The term "fan coil unit" is also used.

Fan coil units are used to control the temperature of rooms, and are a kind of air/water climate control system. Such devices are operated either using the recirculating air principle, or primarily in larger climate control systems in fresh air or mixed air operation.

Fan coil units exist in a wide variety of designs, all of them quite common: devices for wall, ceiling or duct installation, free-standing or integrated horizontally or vertically into enclosures or intermediate ceilings.

In principle, fan coil units work like conventional radiators. However, the air circulation is supported by a blower. In this manner the heat or cold output can be increased significantly, meaning that such devices can also be employed to heat large rooms. It is possible to bring rooms to a comfortable air temperature in a very short time. The devices are as a rule equipped with filters, and have multi-level blowers whose speed and thus ventilation output can be varied by means of fan level inputs or analogue inputs. Fans with up to 6 fan levels are encountered in practise. To reduce noise emissions, the fans are often designed as tangential fans (cross flow fans) (see figure 18).

The heating or cooling energy is supplied to the heat exchanger primarily via pipes that are designed as forward flow and return flow lines. The forward flow lines contain electrically controllable valves, for example equipped with 230 V ~ electrothermal drives (ETA) or electric motor-driven valve drives (MSA), which activate either heating operation or cooling operation.

In many cases the valve drives are a direct component of the fan coil, or have to be mounted on the valves in the fan coil unit as suitable accessories by the electrical or HVAC installation technician during the mounting procedure. If the drives are a component of the fan coil unit, the electrical connection of the valve drives is often performed in a prepared junction box together with the connections for the fan motor.

The device controls the electrical fan levels of a fan coil unit with its relay outputs or via a 0...10 V output. The valves can also be controlled via relay outputs, 0...10 V outputs or via electronic valve outputs. This assumes that the fan coil units are selected that provide the individual connections discretely in the manner described above. As a rule, such fan coils do not have their on control electronics.

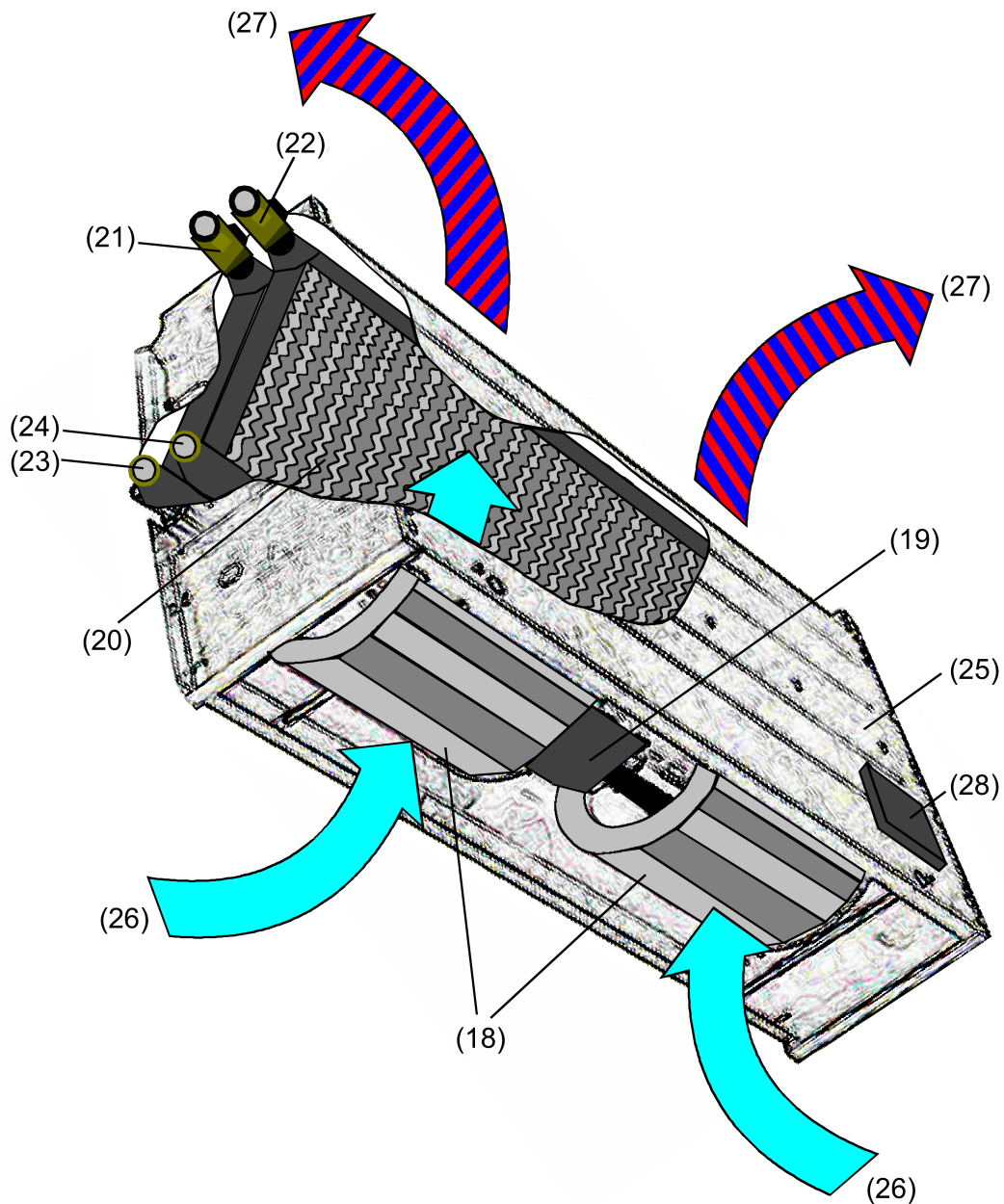


Figure 18: The FanCoil principle (example based on a 4-pipe fan coil unit with upright design)

- (18) Tangential fan (cross flow fan)
- (19) Fan motor (multi-level)
- (20) Heat exchanger (incl. heating and/or cooling register)
- (21) Forward flow valve for heating
- (22) Forward flow valve for cooling
- (23) Return for heating
- (24) Return for cooling
- (25) Housing
- (26) air sucked in (fresh/room air)
- (27) air blown out (cooled or heated)
- (28) Junction box for electrical valve inputs and fan level inputs

Functional differences

A fan coil unit is as a rule equipped with at least one built-in heat exchanger. Fan coil units that have only one heat exchanger are either suitable exclusively for heating or cooling, or, in special designs, also allow combined heating/cooling operation. In such devices, the heating or cooling energy is supplied via a 2-pipe system (see figure 19). One pipe is required for the forward flow, and one pipe for the return flow of the heating or cooling medium. In the case of devices that can function in a combined heating/cooling operation, the exchange of the medium in the pipe (hot water or cold water) is generally performed by a higher-level building climate control system. In 2-pipe systems there is only one valve that opens or closes the water forward flow, thus enabling the heating or cooling energy.

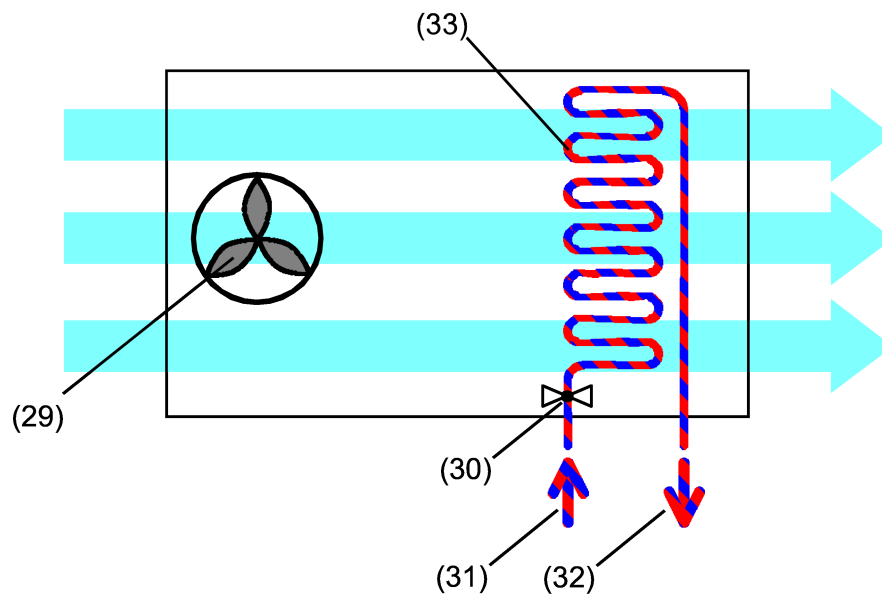


Figure 19: The 2-pipe system

- (29) Fan
- (30) Valve
- (31) Forward flow line
- (32) Return line
- (33) Heat exchanger (heating/cooling register)

There are also fan coil units that have either two separate heat exchangers or one heat exchanger with separate heating and cooling registers. Such devices allow independent heating or cooling operation, for which the heating or cooling energy is supplied via a 4-pipe system (see figure 20). For each heat exchanger, one pipe is required for the forward flow, and one pipe for the return flow of the heating or cooling medium.

In 4-pipe systems there are two valves which open and close the separate water forward flows, thus enabling the heating or cooling energy. As a rule, simultaneous heating and cooling is not possible, nor is it advisable. As the controlling element, the KNX Multistation prevents such activation of both operating modes.

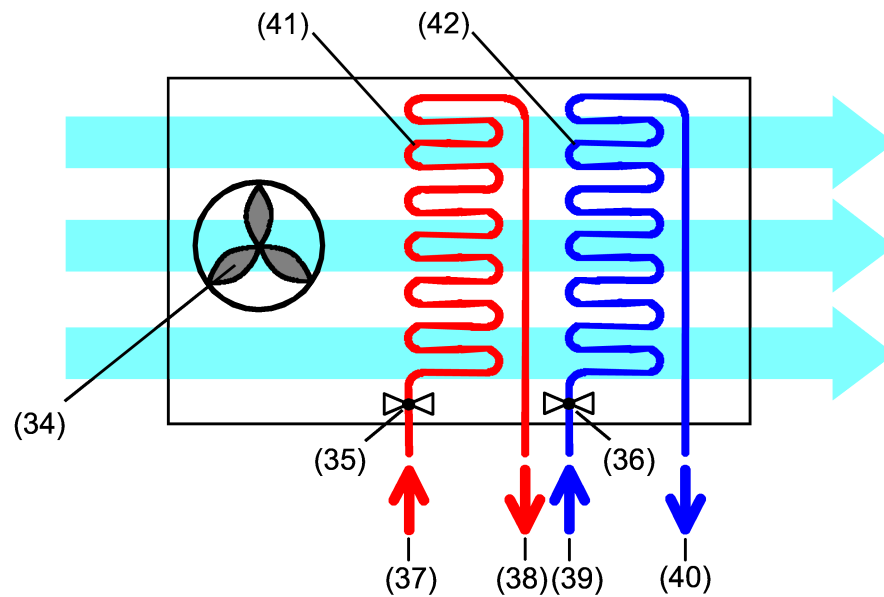


Figure 20: The 4-pipe system

- (34) Fan
- (35) Valve for heating
- (36) Valve for cooling
- (37) Forward flow line for heating
- (38) Return line for heating
- (39) Forward flow line for cooling
- (40) Return line for cooling
- (41) Heat exchanger 1 (heating register)
- (42) Heat exchanger 2 (cooling register)

3-pipe systems also exist, but these are encountered much less often. Such systems are very similar to a 4-pipe system. There are also separate supply lines for heating and cooling water, but these media share a common return line. Therefore two valves are also required.

The return flow is either brought together in the fan coil unit or outside the device in the pipe system.

10.2 FanCoil configuration

The device can be adapted very flexibly to the specific fan coil application required by means of parameter configurations. This means that no, one or two FanCoil devices can be connected.

Furthermore, the device allows control of various fan coil systems which are used in practise as 2-pipe or 4-pipe systems for heating and/or for cooling.

- i** When using two FanCoil channels, both channels are always configured identically. It is therefore not possible to select two different control variants.

The valves and fans must be controlled depending on the FanCoil units used. The device meets most of the technical requirements on the market. The following list shows which control options are available for fans and valves.

Fan control:

- via relay outputs
- via 0...10 V outputs

Valve control:

- via relay outputs
- via 0...10 V outputs
- via electronic valve outputs

- i** Because only a limited number of outputs are available, the selection options for controlling the valves may be restricted depending on the configuration.

Depending on how the valves and fans are controlled, the unused outputs are available for other applications.

- i** The fan and valves are parametrised and controlled completely independently of each other. If dependencies between fans and valves are required (e. g. delayed switch-on of the fan when a valve has been opened), they must be created by means of connections with group addresses and, if necessary, logic functions.

Fan control

The device supports two control modes for the fans of FanCoil systems. When controlling via relay outputs, each fan level is controlled separately via a relay output. Five relay outputs are therefore occupied at a maximum number of five fan levels. Furthermore, relay switching is not silent, which means it is recommended to control the fan via an analogue output in a noise-sensitive environment.

When controlling the fan via an analogue output, the fan level is set in proportion to the voltage applied. This means that all fan levels can be controlled with just one output. In automatic mode, the fan is controlled continuously so that the speed is not changed in steps, but continuously, analogously to the voltage

Valve control

There are three types of valve control. When controlling via relay outputs, the valves are switched either on or off 100%. The length of the switch-on and switch-off times simulates a medium degree of opening. This pulse width modulation (PWM) can therefore be used for very precise control.

When controlling via the electronic valve output, the output is simply switched (PWM), as with the relay outputs. However, unlike the relay outputs, this switching is silent with the electronic valve outputs.

When controlled via relay and electronic valve outputs, the valves are also supplied by means of the voltage applied. This means that the valve is not supplied with voltage when actuated 0%.

The third control method, 0...10 V, is different. Here, the valve requires its own supply voltage and the 0...10 V only serve as a signal voltage. The valves are controlled in proportion to the voltage applied. Pulse width modulation does not take place.

FanCoil channels

Depending on the number of FanCoil channels set in the ETS and the further configuration, the outputs of the device are pre-assigned for the FanCoil functions and can no longer be used for other applications.

Thus the outputs have different functions depending on the number of fan coil channels and depending on the fan coil system (2-pipe or 4-pipe). The parametrised number of fan levels of a FanCoil channel, if controlled via relay outputs, also directly determines the output assignments.

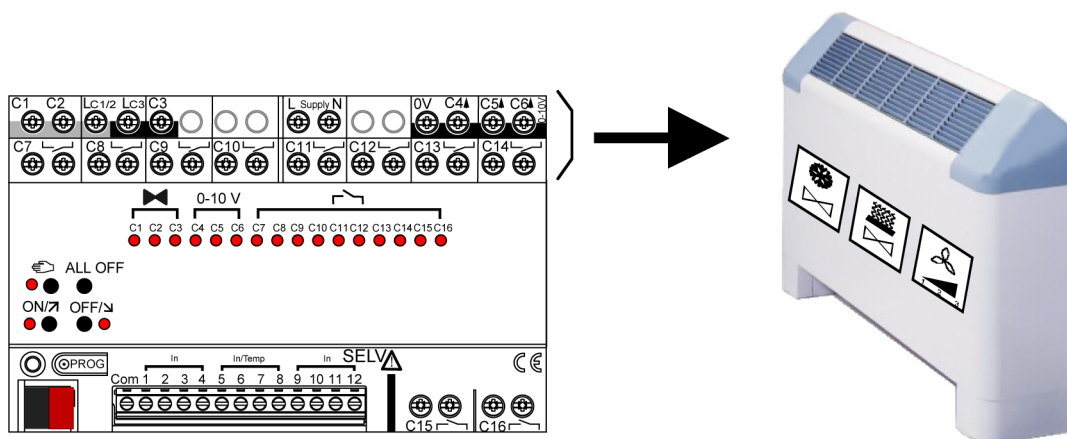


Figure 21: Single-channel operation

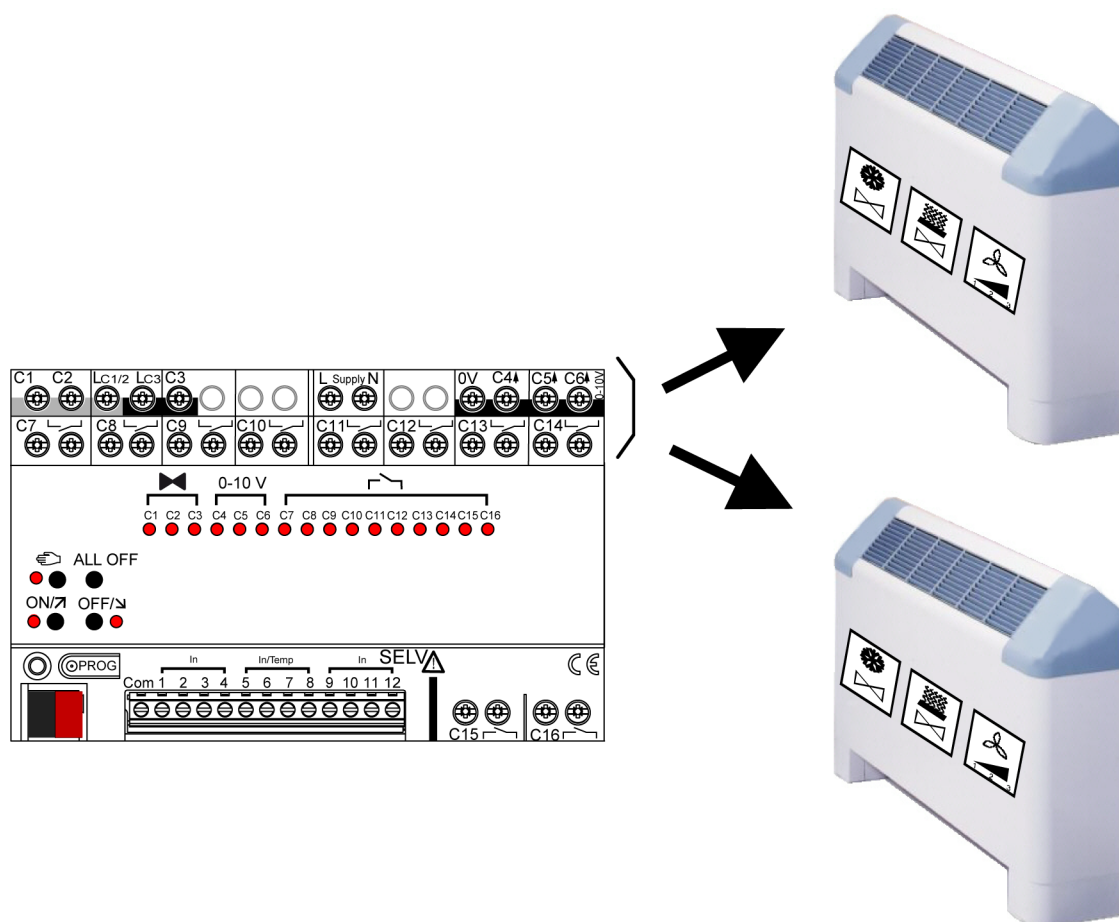


Figure 22: Dual-channel operation

Setting the number of fan coil channels

The number of required fan coil channels is set in the ETS. Depending on the number set, the outputs of the device are used for valve and fan control or are available for other applications.

- Set the "Number of FanCoil channels" parameter on the parameter page "General - HVAC" to "None (FanCoil function deactivated)".

All outputs of the device can be used separately.

- Set the parameter "Number of FanCoil channels" on the parameter page "General - HVAC" to "1 FanCoil channel" or "2 FanCoil channels".

Depending on the other parameters such as the type of FanCoil system, control of fans and valves and the number of fan levels, the outputs of the device are pre-assigned for FanCoil functions so that only the unassigned outputs are available for individual functions.

The device is configured accordingly by setting the parameters. A graphical and tabular assignment of the outputs appears in the connection aid. Furthermore, the corresponding FanCoil configurations are taken into account on all parameter pages of the outputs.

- i** This parameter should be set at the beginning of the device configuration, because all further output-oriented parameters are dependent on this setting. If the parameter is only changed during the course of a device configuration, the assignments of group addresses to objects could be lost or parameter settings could be reset!

Setting the type of fan coil system

After the number of fan coil channels has been set, the type of the fan coil system must be set in the ETS.

The fan coil system determines in what operating modes (heating or cooling) the actuator works, how change-over takes place in the mixed operating mode "heating/cooling", and also defines whether a 2-pipe or a 4-pipe system is being controlled. It also determines how the fan and valves are controlled.

The number of required fan coil channels must have been set already.

- Set the parameter "Type of fan coil system" on the parameter page "General -> HVAC" to "2-pipe only heating".

The fan coil channel concerned can only heat. The heating energy is supplied to the connected fan coil unit via a 2-pipe system (= 1 valve for heating).

- Set the parameter "Type of fan coil system" on the parameter page "General -> HVAC" to "2-pipe only cooling".

The fan coil channel concerned can only cool. The cooling energy is supplied to the connected fan coil unit via a 2-pipe system. (= 1 valve for cooling).

- Set the parameter "Type of fan coil system" on the parameter page "General -> HVAC" to "2-pipe heating/cooling via change-over object".

The fan coil channel concerned can either heat or cool. Which of these modes of operation is active is controlled by a 1-bit switchover object. The heating or cooling energy is supplied to the connected fan coil unit via a combined 2-pipe system (= 1 valve for heating and cooling).

The following settings can only be selected for "Number of fan coil channels = 1"...

- Set the parameter "Type of fan coil system" on the parameter page "General -> HVAC" to "4-pipe heating/cooling via change-over object".

The fan coil channel concerned can either heat or cool. Which of these modes of operation is active is controlled by a 1-bit switchover object. The heating or cooling energy is supplied to the connected fan coil unit via a divided 4-pipe system (= 1 valve for heating and 1 valve for cooling).

- Set the parameter "Type of fan coil system" on the parameter page "General -> HVAC" to "4-pipe heating/cooling via command value specification".

The fan coil channel concerned can either heat or cool. Which of these modes of operation is active is determined by the last command value received (not equal to "0"). The heating or cooling energy is supplied to the connected fan coil unit via a divided 4-pipe system (= 1 valve for heating and 1 valve for cooling).

- i** The parameters for the fan coil system should be set at the beginning of the device parameterisation right after the number of fan coil channels has been defined, because all further channel-oriented parameters are dependent on this setting. If the parameters are only changed during the course of a device configuration, the assignments of group addresses to objects could be lost or parameter settings could be reset!
- i** In the ETS parameterisation, the parameter page "Connection help for output assignment" shows the functions of the up to 8 outputs in accordance with the parameter settings.

Fan coil system

The device usually converts 1-byte control value telegrams, which it receives from the internal or an external KNX room temperature controller, for example, into equivalent fan levels. To do this, the actuator controls the fan levels based on a command value weight parametrised in the ETS.

The device can be used either in the individual operating modes "Heating" or "Cooling" or alternatively in the combination operating mode "Heating / cooling". This means that based on the command values received the device not only ventilates, but also controls heating or cooling valves of a fan coil unit.

In the combination operating mode "Heating / cooling", in normal operation the device is given information whether to heat or cool "from outside" via the bus. The device then decides either based on the command value specification or based on a separate switching object which operation has to be performed. This information is communicated to the device either via a higher-level HVAC controller or via the operating mode specification of a room temperature controller.

In application practise with fan coil units, a distinction is also made between systems which supply the heating or cooling energy to the device either via a 2-pipe system or via a 4-pipe system.

In a 2-pipe system as a rule only a single common heating and/or cooling register is used in the fan coil unit. For this reason only one valve is required for the combined heating and cooling forward flow line. The change of the heating or cooling medium in the pipe is often performed here by a higher-level building HVAC controller. 2-pipe systems are used as standard in a simple application when only heating or cooling is required.

In a 4-pipe system there are usually two different heating and cooling registers in the fan coil unit. The heating and cooling forward flow lines are separate, meaning that two valves are required for flow control.

The operating modes (individual operation, combination operation) and the fan coil system being controlled are configured in the ETS in the common parameter "Type of fan coil system". The parameter setting is made separately for each fan coil channel.

The functional principles of the individual fan coil systems are described in greater detail in the following.

Type of FanCoil system:

"2-pipe heating only" and "2-pipe cooling only" (individual operating modes):

In this type of FanCoil system, the device can either heat or cool in a single individual operating mode. There is thus no option of changing between heating and cooling.

The device receives a command value via the bus and controls its valve output and its fan level outputs based on this specification. The valve connected to the valve output closed when the command value is "0". Likewise the valve opens when the command value is greater than "0".

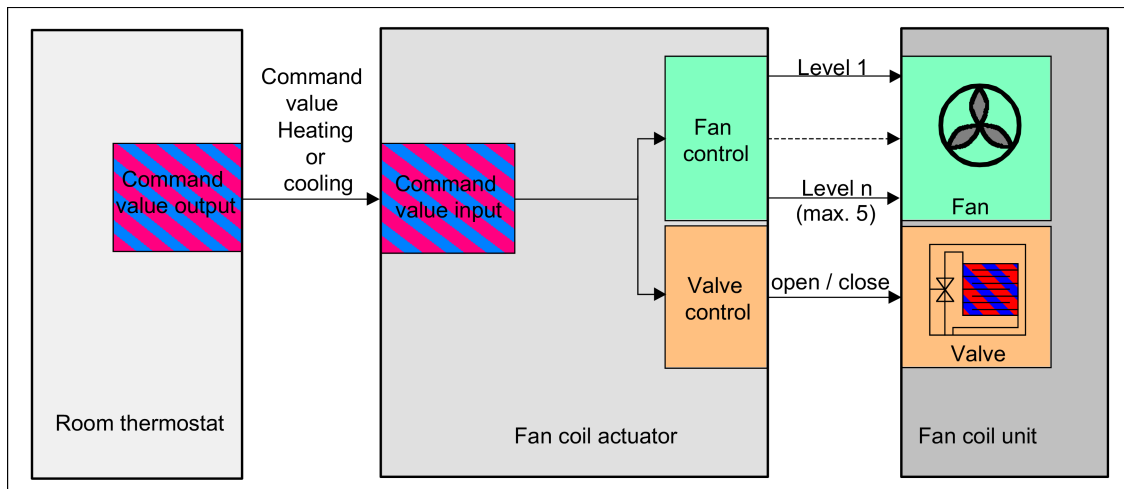


Figure 23: Functional diagram for "2-pipe only heating" and "2-pipe only cooling"

- i** The types "2-pipe only heating" and "2-pipe only cooling" can be configured in either single-channel operation or in two-channel operation.

Type of FanCoil system:

"2-pipe heating/cooling via change-over object" and "4-pipe heating/cooling via change-over object" (combination operating modes):

In this type of fan coil system, the device can either heat or cool in the combination operating mode. Change-over of the operation is performed via the communication object "Heating/cooling - Changeover", which exists for each fan coil channel. The source of the telegram for operating mode change-over can be either any desired central switching point (e. g. building HVAC controller) or the internal or an external room temperature controller, from which the command values are also generated.

The actuator receives two independent command values via the bus. Which of these two command values is evaluated is decided by the last valid operation set (heating or cooling). The command value object not evaluated in this connection is ignored until there is a change-over to its corresponding operation.

As soon as a new operation is specified via the object "Heating/cooling - Change-over", the actuator resets both command values internally to "0" and also initially switches all of the outputs of the channel off. Only a new command value telegram subsequently received of the active operation will cause the actuator to switch its outputs on again accordingly.

Resetting of the internal command values is not performed if a telegram update in accordance with the operation already active (e. g. Heating → Heating) is received via the object "Heating/cooling - Change-over".

The telegram polarity of the object for operating mode change-over has a fixed definition as "0 = cooling / 1 = heating".

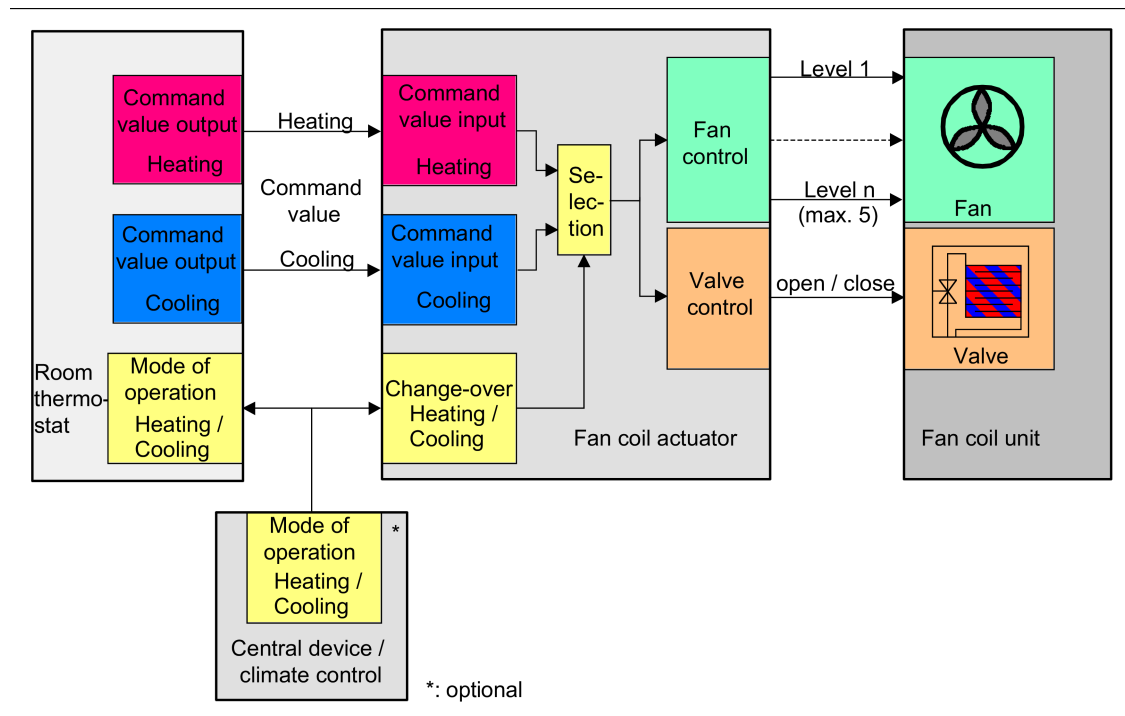


Figure 24: Functional diagram for "2-pipe heating/cooling via change-over object"

In the system "2-pipe heating/cooling via change-over object", the valve for combined heating and cooling which is connected to the valve output closes if the command value of the active operation is equal to "0". Likewise the valve opens when the command value is greater than "0".

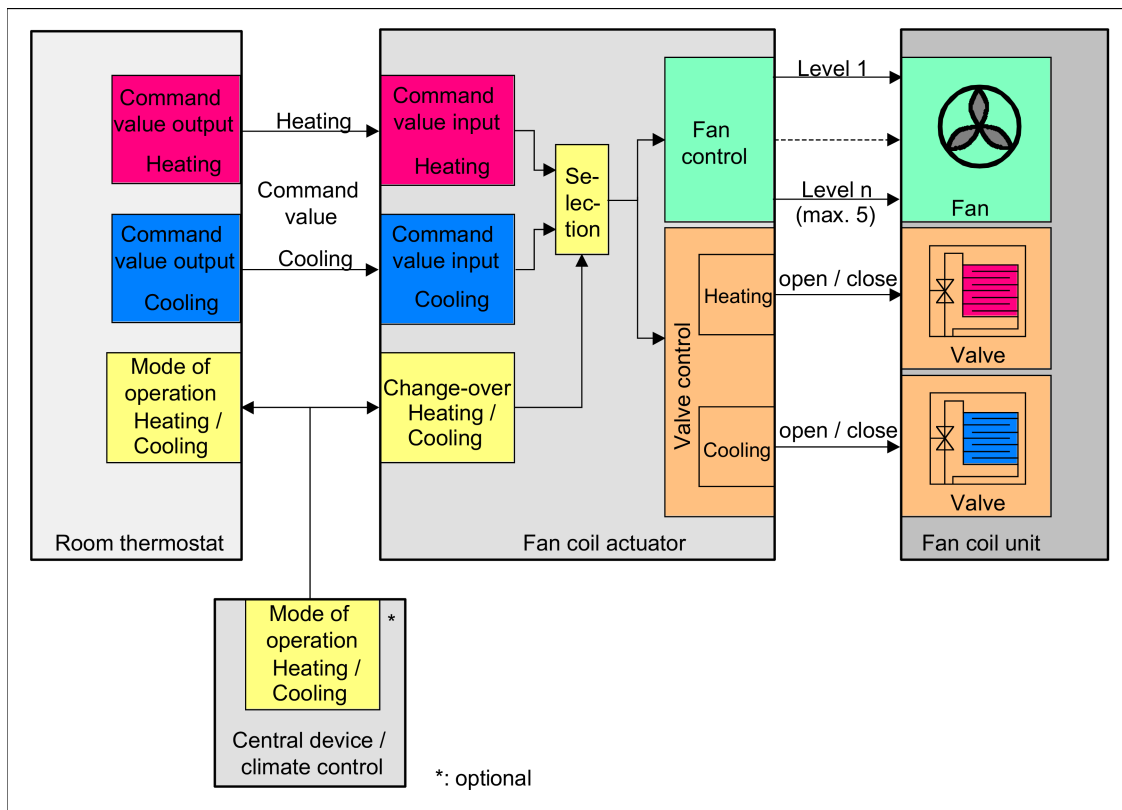


Figure 25: Functional diagram for "4-pipe heating/cooling via change-over object"

In the system "4-pipe heating/cooling via change-over object" the separate valves for heating and cooling which are connected to the valve outputs close if the command value of the corresponding operation is equal "0". Likewise the valve opens when the command value is greater than "0".

After a device reset (restart after any ETS programming operation or switching on the device power supply again, e. g. due to the bus voltage returning), the state of the "Heating/cooling - switchover" object is always invalid. In this situation, the device expects a telegram update to this object. Only after an operating mode telegram is received is the command value considered by the fan coil actuator. If there has still been no update to the object "Heating/cooling - Change-over", the valve and fan outputs of the channel concerned remain switched off. After a device reset, received command value telegrams are saved and tracked as soon as an operation is specified via the object.

- i** In operation when there is a change in the operation, the device switches the valve and fan level outputs on again only when it has received a new command value for the active operation after the change. However, some KNX room temperature controllers may in some circumstances only transmit the telegram for change-over of the operation only after they have transmitted the telegram for the command value of the new operation. In such a situation, the result is that the device does not switch on its valve and fan level outputs immediately after the change of the operation in accordance with the new command value, but rather only when the thermostat transmits a further command value in accordance with its control characteristic. In order to prevent unneces-

sary delays in room temperature control functions, the room temperature controllers concerned should transmit their command values cyclically in addition to transmitting when there is a change.

Type of FanCoil system:

"Four-pipe heating/cooling via command value specification" (combination operating mode):

In this type of fan coil system, the device can either heat or cool in the combination operating mode. The change-over of the operation is performed directly via the command value objects of a fan coil channel. There is no separate communication object for the change-over.

The actuator receives two independent command values for heating and cooling via the bus. The actuator decides independently based on the last command value received which operation and which valve position and fan level must therefore be used.

The operation is changed, however, only when a command value not equal to zero is received. What is decisive for changing to an operation is which of the command values not equal to zero was received last, and not its absolute value. If both command values are equal to zero, the actuator switches all valve and fan level outputs off (after any fan run-on time has elapsed, if necessary), and remains internally in the last valid operation set.

Example 1:

The actuator is in heating operation and is heating with a command value of 100%. Then a command value telegram for cooling with a command value of 75% is received. As a result, the device switches to cooling mode and cools with 75% control value.

Example 2:

The actuator is in cooling operation and is cooling with a command value of 75%. Then a command value telegram for heating with 0% is received. As a result, the device remains in the operation cooling and continues to cool with a command value of 75%.

Example 3:

The actuator is in cooling operation and is cooling with a command value of 75%. The command value for heating was last specified at 0%. Then a command value telegram for cooling with 0% is received. As a result the device switches all of its outputs of the fan coil channel concerned off and waits for new command values.

-  A change in the operation also takes place if the command value does not reach the lower limit for the first fan level parametrised in the ETS.
-  The actuator always executes newly received command value telegrams of the active operation (e. g. heating 75% to heating 50% = heating is performed with the new command value 50%).

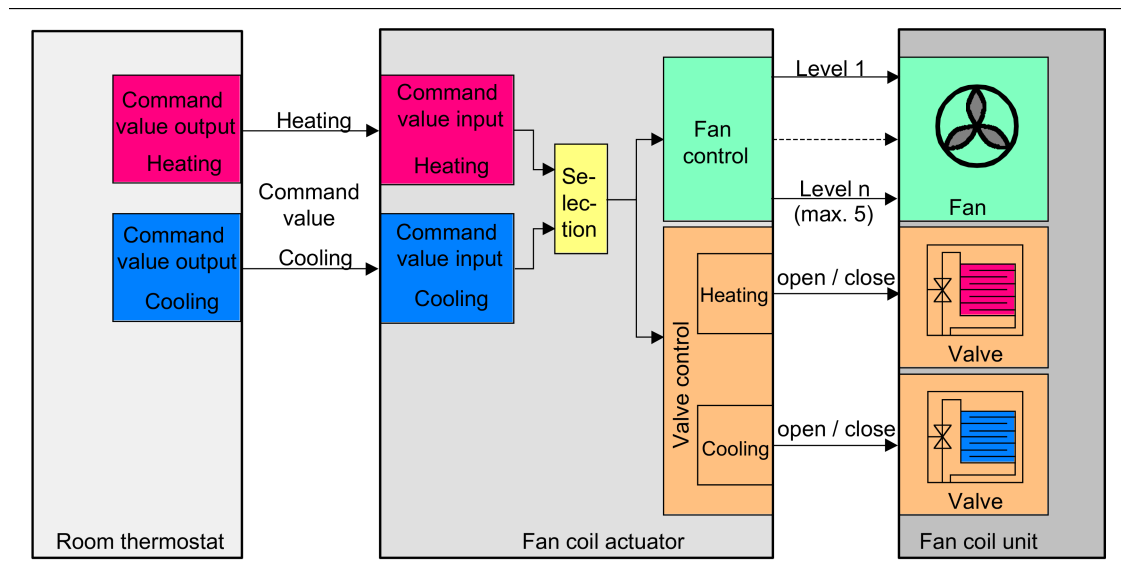


Figure 26: Functional diagram "4-pipe heating/cooling via command value specification"

In the system "4-pipe heating/cooling via command value specification" the separate valves for heating and cooling which are connected to the valve outputs close if the command value of the corresponding operation is equal to "0". Likewise the valve opens when the command value is greater than "0".

10.2.1 FanCoil connection aid

The device enables a number of FanCoil configurations. There are many configuration options, depending on the number of FanCoil channels, the type of FanCoil system, the control of fans and valves and the number of fan levels.

In each configuration, the required outputs of the device are permanently assigned to a FanCoil function and preset and already named on the corresponding parameter pages for parametrisation.

To obtain an overview of which outputs are already assigned and which outputs are still available to control other functions, there is a connection aid on the parameter page "General - HVAC".

This connection aid uses a connection diagram to graphically display which outputs are assigned to which function. Furthermore, a tabular output assignment provides the same information.

i When configuring two FanCoil channels, the set configuration applies to both channels.

Configuration examples are shown here:

1. No FanCoil channel activated

In this setting, no outputs are used for valve or fan control. This means that all outputs can be used separately. No pre-assignment is displayed in the connection diagram and the pre-configured assignments are displayed in the output assignment table.

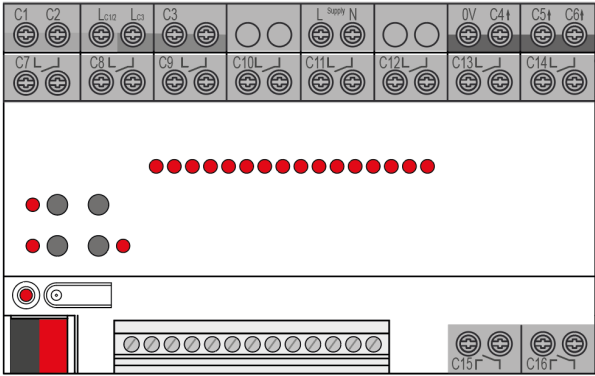


Figure 27: Connection diagram 1

Electronic valve out-puts	C1	C2	C3
Configuration	Valve	Valve	Valve

Analogue outputs	C4	C5	C6
Configuration	Analogue actu-ator	Analogue actuator	Analogue actuator

Relay outputs	C7	C8	C9	C10	C11
Configuration	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind

Relay outputs	C12	C13	C14	C15	C16
Configuration	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind

2. Only valve control activated (heating actuator)

The device can also be used as a pure heating actuator in HVAC functionality. Up to four valve outputs are available for this purpose, depending on the control. The three electronic valve outputs are used in the connection diagram. However, three valves can also be controlled via 1...10 V outputs.

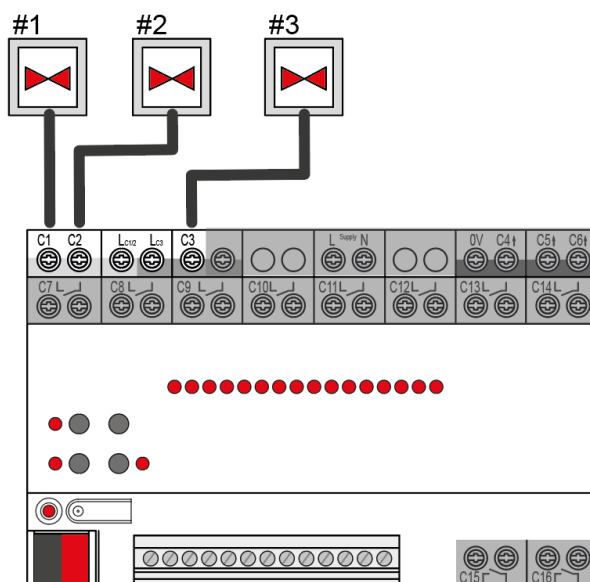


Figure 28: Connection diagram 2

Electronic valve out-puts	C1	C2	C3
Configuration	Valve	Valve	Valve

Analogue outputs	C4	C5	C6
Configuration	Analogue actu- ator	Analogue actuator	Analogue actuator

Relay outputs	C7	C8	C9	C10	C11
Configuration	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind

Relay outputs	C12	C13	C14	C15	C16
Configuration	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind

3. One FanCoil channel, four-pipe heating/cooling, fans via relays and valves via electronic valve outputs

A FanCoil unit is connected in this example. It is a four-pipe system, which can be used for both heating and cooling. The valves are controlled via electronic valve outputs and the fans via relay outputs. Five fan stages have been parameterised. This means that seven outputs are pre-assigned to the FanCoil device. The analogue outputs and the remaining 5 relay outputs can be used individually.

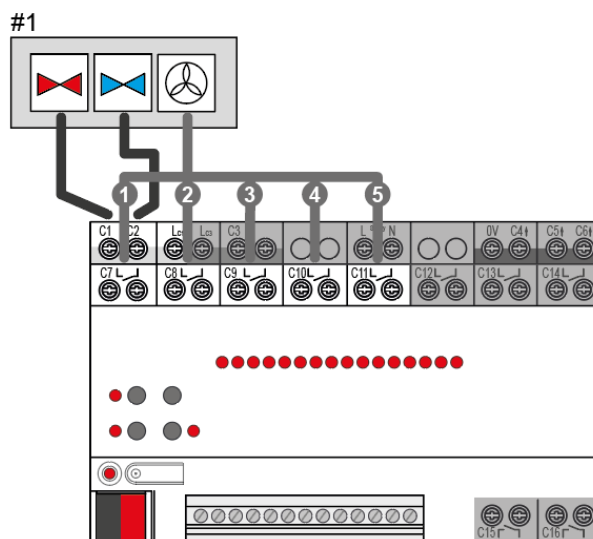


Figure 29: Connection diagram 3

Electronic valve out-puts	C1	C2	C3
Configuration	Heating valve, FanCoil1	Cooling valve, Fan- Coil1	not assigned

Analogue outputs	C4	C5	C6
Configuration	Analogue actu- ator	Analogue actuator	Analogue actuator

Relay outputs	C7	C8	C9	C10	C11
Configuration	Fan level 1, FanCoil1	Fan level 2, FanCoil1	Fan level 3, FanCoil1	Fan level 4, FanCoil1	Fan level 5, FanCoil1

Relay outputs	C12	C13	C14	C15	C16
Configuration	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind

4. One FanCoil channel, four-pipe heating/cooling, fans and valves via 0-10 V outputs

A FanCoil unit is connected in this example. It is also a four-pipe system and can both heat and cool. The fans and valves are controlled via the analogue outputs. Because the fan is controlled via the analogue outputs, no separate outputs need to be reserved for the individual fan levels. The number and configuration of the fan levels is determined on the parameter page of the fan output. In this configuration, three outputs are pre-assigned to the FanCoil device. The 10 relay outputs can be used individually.

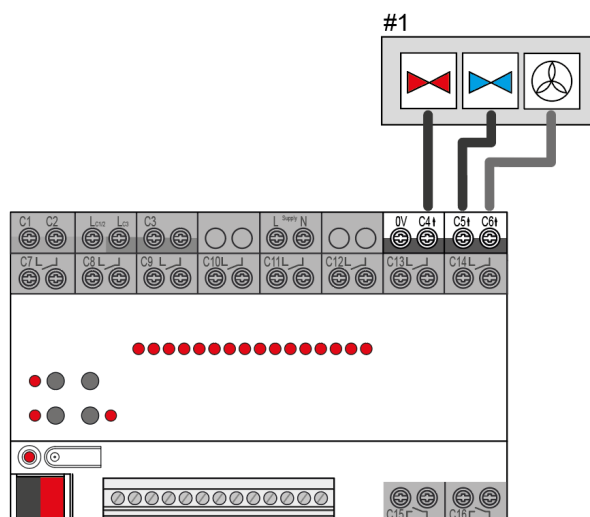


Figure 30: Connection diagram 4

Electronic valve outputs	C1	C2	C3
Configuration	not assigned	not assigned	not assigned

Analogue outputs	C4	C5	C6
Configuration	Heating valve, FanCoil1	Cooling valve, FanCoil1	Fan, FanCoil1

Relay outputs	C7	C8	C9	C10	C11
Configuration	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind

Relay outputs	C12	C13	C14	C15	C16
Configuration	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind

5. Two FanCoil ducts, four-pipe heating/cooling, fans and valves by means of relays

Two FanCoil units are connected in this example. They are four-pipe systems that can be used both for heating and cooling. The fans and valves are controlled via relay outputs and three fan levels have been parametrised for each system. This means that ten outputs are pre-assigned for the FanCoil device. The three analogue outputs can be used individually.

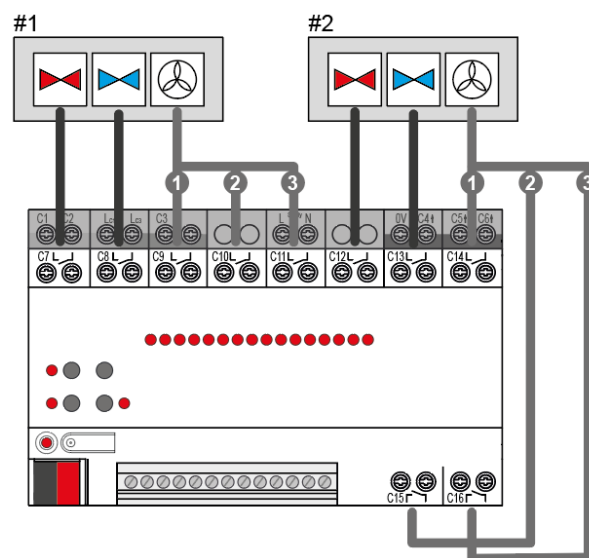


Figure 31: Connection diagram 5

Electronic valve outputs	C1	C2	C3
Configuration	not assigned	not assigned	not assigned

Analogue outputs	C4	C5	C6
Configuration	Analogue actuator	Analogue actuator	Analogue actuator

Relay outputs	C7	C8	C9	C10	C11
Configuration	Heating valve, FanCoil1	Cooling valve, FanCoil1	Fan level 1, FanCoil1	Fan level 2, FanCoil1	Fan level 3, FanCoil1

Relay outputs	C12	C13	C14	C15	C16
Configuration	Heating valve, FanCoil2	Cooling valve, FanCoil2	Fan level 1, FanCoil2	Fan level 2, FanCoil2	Fan level 3, FanCoil2

6. Two FanCoil channels, two-pipe heating/cooling, fans via relays and valves via electronic valve outputs

Two FanCoil units are connected in this example. They are two-pipe systems that can be used both for heating and cooling. The fans are controlled via relay outputs and three fan levels have been parametrised for each system. The valves are controlled via electronic valve outputs. This means that eight outputs are pre-assigned for the FanCoil device. The analogue outputs and the remaining relay outputs can be used individually.

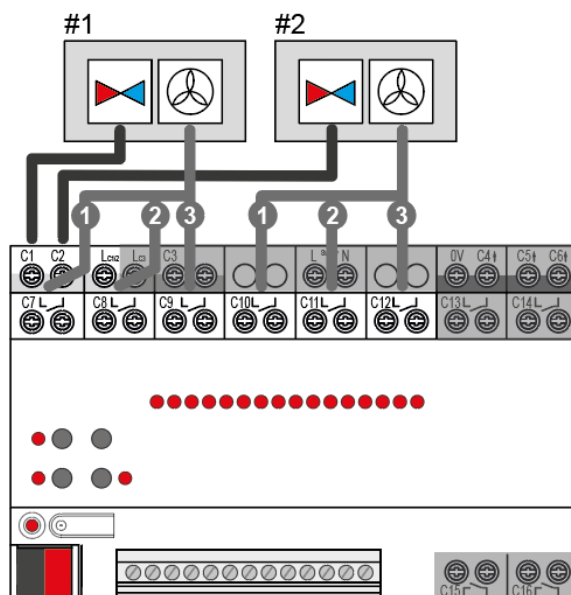


Figure 32: Connection diagram 6

Electronic valve out-puts	C1	C2	C3
Configuration	Heating/cooling valve, FanCoil1	Heating/cooling valve, FanCoil2	not assigned

Analogue outputs	C4	C5	C6
Configuration	Analogue actuator	Analogue actuator	Analogue actuator

Relay outputs	C7	C8	C9	C10	C11
Configuration	Fan level 1, FanCoil1	Fan level 2, FanCoil1	Fan level 3, FanCoil1	Fan level 1, FanCoil2	Fan level 2, FanCoil2

Relay outputs	C12	C13	C14	C15	C16
Configuration	Fan level 3, FanCoil2	Switching/Venetian blind	Switching/Venetian blind	Switching/Venetian blind	Switching/Venetian blind

10.2.2 HVAC General parameter

General -> HVAC

HVAC functions	Fan and valve control (Fan coil actuator) Valve control (heating actuator)
The type of heating/cooling system is set in this parameter. The parameters on the next parameter pages are set accordingly. All fan parameters are hidden in the valve control setting.	

Fan and valve control (Fan coil actuator)

Number of FanCoil channels	none (FanCoil function deactivated) 1 fan coil channel 2 FanCoil channels
The number of FanCoil channels is set here. If "none" is selected, the outputs of the device are not reserved for valve or fan control, but are available for other functions. A different number of outputs are available for the valves and fan levels, depending on the "1 FanCoil channel" or "2 FanCoil channels" selection.	

Type of FanCoil system	Two-pipe heating only Two-pipe cooling only Two-pipe heating/cooling by means of change-over object Four-pipe heating/cooling by means of change-over object 4-pipe heating/cooling via command value specification
This parameter is used to set which FanCoil system is to be used in the system. The FanCoil system can be a device that is operated in a single operating mode, either heating only or cooling only. There is thus no option of changing between heating and cooling. In combined heating/cooling operation, the device can either heat or cool. Change-over of the operation is performed via the communication object "Heating/cooling - Changeover", which exists for each fan coil channel. The source of the telegram for operating mode change-over can be either any desired central switching point (e. g. building HVAC controller) or the internal or an external room temperature controller, from which the command values are also generated. Four-pipe heating/cooling by means of command value specification: In this type of FanCoil system, the device can be used either for heating or cooling in the combined operating mode. The change-over of the operation is performed directly via the command value objects of a fan coil channel. There is no separate communication object for the change-over.	

Fan control	via relay outputs via 0...10 V output
This parameter is used to set how the fan of the FanCoil system is controlled. Depending on the fan that is installed in the FanCoil system, it is controlled via relay outputs or the 0...10 V outputs.	

Number of fan levels	1 ... 3 1 ... 5 *
This parameter is used to set the existing number of fan levels of the FanCoil system. * Because only a limited number of relay outputs are available, the number of fan levels is limited to a maximum of three or five, depending on the parametrised number of FanCoil channels and the type of FanCoil system. This parameter is visible only if the fans are controlled "via relay outputs".	

Valve control	via relay outputs via 0...10-V outputs * via electronic valve outputs *
This parameter is used to set how the valves are controlled. The type of control must be set depending on the valves used. * If two fan coil channels are parameterised, the control of the valves is only possible to a limited extent depending on the type of fan coil system.	

Valve control (heating actuator)

Valve control	none (valve control deactivated) via relay outputs via 0...10 V outputs via electronic valve outputs
This parameter is used to set how the valves are controlled. If "none" is selected, the outputs of the device are not reserved for valve control, but are available for other functions. The type of control must be set depending on the valves used.	

Connection help

Show connection diagram	Active Inactive
When the FanCoil channels are configured to control the fans and valves, the outputs of the device are pre-assigned and are no longer available for the original application. In the connection diagram, the assigned outputs are displayed graphically depending on the set parameters, so that it is clear to which outputs the valves and fans must be connected. The individual fan levels are also taken into account.	

Display output assignment	Active Inactive
Similar to the connection diagram shown in the graphic, all outputs of the device are shown in tabular form with the parametrised functions in the connection assignment. This provides a quick overview of the outputs that are still available.	

11 Valve control

11.1 Priorities for valve outputs

The device distinguishes between various functions and events, which either affect all of some of the assigned valve drives globally, or only specifically affect individual outputs. Because these functions and events cannot be executed simultaneously, there must be priority control. Each global or output-orientated function and each incoming event possesses a priority. The function or the event with the higher priority overrides the lower-priority functions and events.

The following priorities are defined...

- Overload / short-circuit (highest priority)
- Manual control
- Service mode
- Valve rinsing
- Priority control
- Command value limit
- Emergency operation (through cyclical monitoring of the command value)
- Behaviour after ETS programming
- Behaviour when the bus voltage returns or a bus voltage failure occurs
- Normal operation (activation using command value telegrams)

The behaviour after an ETS programming operation is only executed if there have been changes in the configuration of the device. If an application download is executed with a project design already located in the actuator, the actuator will execute the behaviour after bus voltage returns.

In manual operation and in service mode, a parameter separately defines the behaviour of each of the valve outputs at the end of these functions. The device only then executes the configured behaviour if, at the time of enabling, no function with a lower priority is active. Should a lower-level function be active (e. g. forced position), then the actuator will execute the behaviour of this function again.

Special case: A function with a higher priority (e. g. manual operation) is active. Before this, a function with a lower priority (e. g. service mode) was active. This function is deactivated whilst the higher-level function remains active. At the end of the higher-priority function, the state of the outputs should be tracked. The actuator then evaluates the command value of the lower-level function and checks how the behaviour is preset or configured here. The actuator then executes the command value presetting of the lower-level function. If tracking is also preset or configured for this function, the actuator will still go one layer lower and evaluate the behaviour configured there.

Example 1: Service mode is active (valve completely opened / 100% command value). A value of 10% was most recently preset via a command value telegram (normal operation). No other functions are active. Service mode is configured in such a way that the starting state should be tracked at the end of this function.

Permanent manual operation is now activated. The actuator assumes the command value of manual operation (e. g. 50%). Whilst manual operation is active, service mode is deactivated via the KNX. The actuator remains in manual operation until this is exited via the button field. As no more lower-level functions are active, the device evaluates the parameter "Behaviour at the end of permanent manual operation during bus operation". As this parameter is set to "Track outputs", the actuator now evaluates the command value to be tracked. For this, it checks how the behaviour at the end of service mode is preset. Here too, the state should be tracked. Thus, the actuator evaluates the other lower-level functions. As no other functions were and are activated, the actuator sets the last command value presetting at the valve output using the KNX telegram (here 10%).

Example 2: Service mode is active (valve completely opened / 100% command value). A value of 10% was most recently preset via a command value telegram (normal operation). No other functions are active. Service mode is configured in such a way that no change should be executed at the end of this function.

Permanent manual operation is now activated. The actuator assumes the command value of manual operation (e. g. 50%). Whilst manual operation is active, service mode is deactivated via the KNX. The actuator remains in manual operation until this is exited via the button field. As no more lower-level functions are active, the heating actuator evaluates the parameter "Behaviour at the end of permanent manual operation during bus operation". As this parameter is set to "Track outputs", the actuator now evaluates the command value to be tracked. For this, it checks how the behaviour at the end of service mode is preset. There, the configuration states that there should be no change. Thus, the heating actuator for the affected valve output assumes the command value of service mode (here 100%) and sets this at the output. In this case, the actuator no longer evaluates other lower-level functions.

11.2 Cross-channel functions for valve outputs

The device possesses a number of channel-independent functions that can be used for all valve outputs. In order for these functions to be used, they must be enabled on the parameter page "Outputs -> FanCoil -> Valves" or "Outputs -> Valves". The parameters of these channel-independent functions are set on parameter pages of their own.

In addition to the general enabling of the channel-independent functions, the individual valve outputs must also, in some cases, be assigned to the functions on the parameter pages "Outputs -> FanCoil -> Valves -> VOx - General -> Assignments" or "Outputs -> Valves -> VOx - General -> Assignments".

11.2.1 Heat requirement

Heat requirement control

The device possesses heat requirement control. Here, the actuator continuously evaluates the command values of assigned outputs and makes general heat requirement information available as a 1-bit control value in the form of limiting value monitoring with hysteresis. Using a KNX switch actuator, this allows the energy-efficient activation of burner and boiler controllers with suitable control inputs (e. g. requirement-orientated switchover between the reduction and comfort setpoint in a central combi boiler).

A heat requirement is only signalled by the actuator via the object of the same name when at least one command value of the assigned outputs exceeds a limiting value with hysteresis defined in the ETS. A heat requirement signal is retracted when the limiting value is reached or undershot again (see figure 33). The telegram polarity of the heat requirement information can be configured.

- i** In addition, valve outputs, which receive preset command values via the data format "Switching - 1-bit" and "Constant - 1-byte with command value limiting value", influence the heat requirement control. In the case of "Switching - 1-bit", an "OFF" command value is interpreted as "0%" and an "ON" command value as "100%". In the case of "Continuous - 1-byte with command value limiting value", the actuator evaluates the converted switching output signal in the same way ("OFF" is interpreted as "0%", "ON" is interpreted as "100%").
- i** With some functions and events, valve outputs, which are configured to the command value data formats "Switching - 1-bit" and "Continuous - 1-byte", are always activated via a constant command value through pulse width modulation (PWM), providing that command values not equal to 0% or 100% are to be set (after bus voltage returns, after an ETS programming operation, during manual operation, with an active forced position and with active emergency operation). PWM keeps being executed until the named functions have been exited or, after the named events, no more lower-level functions are active and a new command value telegram is received via the bus, overriding the constant command value on the valve output. In this case, the constant command value set by the PWM is also included in the heat requirement control.
- i** After the bus voltage returns and after an ETS programming operation, the actuator always first transmits the status "No heat requirement" without a delay. The actuator then updates the state to "Heat requirement", provided that the condition for this has been fulfilled and the "switch-on delay (heat requirement)" has elapsed.
- i** A valve output affected by a short-circuit / overload (valve completely closed on deenergised closed or completely opened on deenergised opened) does not influence the heat requirement control.

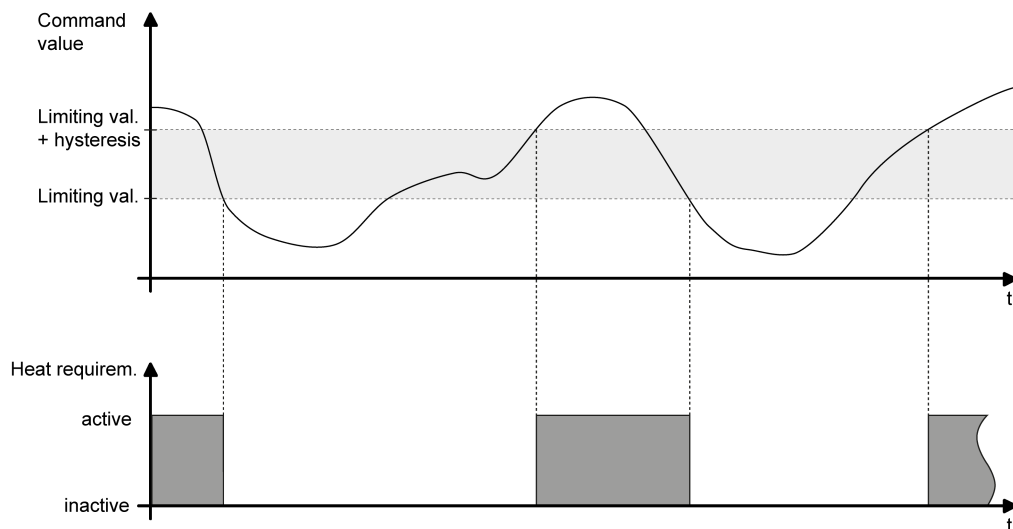


Figure 33: Heat requirement information with sample command value characteristic

Optionally, the actuator can evaluate an external telegram for heat requirement information (e. g. from another FanCoil or heating actuator). This allows the cascading of multiple actuators with a heat requirement signal. The local FanCoil actuator links the 1-bit telegram value of "External heat requirement" object with the internal state of its own heat requirement logically as OR and outputs the result of this link via the object "Heat requirement".

The actuator only outputs the telegram of an active heat requirement after determination when the delay time defined by the parameter "Switch-on delay (heat requirement)" has elapsed. No heat requirement request is transmitted if the actuator no longer determines a heat requirement within the preset time.

The actuator only retracts heat requirement information after determination when the delay time defined by the parameter "Switch-off delay (no heat requirement)" has elapsed. The heat requirement information is not retracted if the actuator no longer determines a new heat requirement within the defined time.

Enabling and configuring the "Heat requirement" function

The Heat requirement function must first be enabled on the "Outputs -> FanCoil -> Valves" parameter page, so that it can be used during actuator operation. The remaining parameters are set on the parameter page "Heat requirement". Additionally, the parameter pages of the individual valve outputs are relevant.

- Configure the parameter "Object polarity" to the required telegram polarity. In addition, define the minimum command value and hysteresis.

Heat requirement control is activated. The heat requirement information becomes active according to the set telegram polarity, if at least one command value of the assigned valve outputs exceeds the configured limiting value plus hysteresis. The heat requirement becomes inactive when the limiting value is reached or undershot again.

The valve outputs must be assigned to the heat requirement control individually on the parameter pages "VOx General -> Assignments" so that they are included in the requirement determination.

- Deactivate the "Heat requirement" checkbox.

Heat requirement control is not available.

Enabling detection of an external heat requirement

Optionally, the actuator can evaluate an external telegram for heat requirement information (e. g. from another FanCoil actuator or heating actuator). This allows the cascading of multiple actuators with a heat requirement signal.

The object must be enabled for an external heat requirement to be recorded.

- Activate the checkbox "Detect external heat requirement via object".

The "Heat requirement - External" object is enabled. The local FanCoil actuator links the 1-bit telegram value of this object with the internal state of its own heat requirement logically as OR and outputs the result of this link via the object "Heat requirement - Status".

- Deactivate the checkbox "Detect external heat requirement via object".

Detection of an external heat requirement is not possible. The actuator only determines the heat requirement information itself.

i Cyclical telegrams to the object "Heat requirement - External" with an identical telegram polarity (ON -> ON, OFF -> OFF) cause no reaction.

i After the device is reset, the current status of the object "Heat requirement - External" is not queried. Only when a bus telegram is received does the actuator take this status into account during evaluation of the heat requirement.

11.2.1.1 Heat requirement parameters

Outputs -> FanCoil -> Valves -> Enables

Heat requirement	Checkbox (yes / no)
The device can even evaluate the command values of its outputs and make general heat requirement available in the form of limiting value monitoring with hysteresis (1-bit, switching). Using a KNX switch actuator, this allows the energy-efficient activation of burner and boiler controllers with suitable control inputs (e. g. requirement-orientated switchover between the reduction and comfort setpoint in a central combi boiler). Here, the heat requirement control of the actuator can be enabled centrally. The valve outputs must be assigned to the heat requirement control individually on the parameter pages "VOx General -> Assignments" so that they are included in the requirement determination.	

Outputs -> FanCoil -> Valves -> Heat requirement

Minimum command value	0 ... 5...100%
The actuator only signals a heat requirement when at least one command value of the assigned outputs exceeds the limiting value defined here plus the hysteresis (see next parameter). A heat requirement signal is retracted when the limiting value is reached or undershot again. This parameter is visible only if the heat requirement function is enabled.	
Hysteresis of the minimum command value	1...10...20%
This parameter specifies the hysteresis of the limiting value of the minimum command value of the heat requirement control. The actuator signals a heat requirement when a command value exceeds the defined limiting value plus the hysteresis defined here. This parameter is visible only if the heat requirement function is enabled.	
Switch-on delay (heat requirement)	0...23 h 0...5...59 min 0...59 s
The actuator only outputs the telegram of an active heat requirement after determination when the delay time defined here has elapsed. No heat requirement request is transmitted if the actuator no longer determines a heat requirement within the time preset here. This parameter is visible only if the heat requirement function is enabled. Definition of the hours, minutes and seconds of the delay time.	

Switch-off delay (no heat requirement)	0...23 h 0...5...59 min 0...59 s
The actuator only retracts heat requirement information after determination when the delay time defined here has elapsed. The heat requirement information is not retracted if the actuator no longer determines a new heat requirement within the time defined here. This parameter is visible only if the heat requirement function is enabled. Definition of the hours, minutes and seconds of the delay time.	
Object polarity	1 = heat requirement / 0 = no heat requirement 0 = heat requirement / 1 = no heat requirement
This parameter defines the telegram polarity of the "Heat requirement - Status" object. It is visible only if the heat requirement function is enabled.	
Detect external heat requirement via object	Checkbox (yes / no)
The actuator is able to evaluate an external heat requirement (e. g. from another FanCoil actuator or heating actuator). The local FanCoil actuator links the external telegram with the internal status of its own heat requirement logically as OR and outputs the result of this link via the "Heat requirement" object. In the "yes" setting, this parameter will enable the object "Heat requirement - External". It is visible only if the heat requirement function is enabled.	

11.2.1.2 Objects for heat requirement

Function	Name	Type	DPT	Flag
Heat requirement - Status	General valve outputs (VO) - Output	1-bit	1,002	C, R, -, T, A
1-bit output object for the transmission of general heat requirement information to suitable burner and boiler controllers. A heat requirement is only signalled by the actuator when at least one command value of the assigned outputs exceeds a limiting value with hysteresis defined in the ETS. A heat requirement signal is retracted when the limiting value is reached or undershot again. In addition, the actuator can optionally evaluate an external telegram. The telegram polarity can be configured. After the bus voltage returns and after an ETS programming operation, the actuator always first transmits the status "No heat requirement" without a delay. The actuator then updates the state to "Heat requirement", provided that the condition for this has been fulfilled and an optionally configured "switch-on delay (heat requirement)" has elapsed.				

Function	Name	Type	DPT	Flag
Heat requirement - External	General valve outputs (VO) - Input	1-bit	1,002	C, -, W, -, U
1-bit input object for the cascading of multiple actuators with a heat requirement signal. The transmitting object of a heat requirement signal of another FanCoil or heating actuator can be connected to this object. The local FanCoil actuator links the external telegram with the internal status of its own heat requirement logically as OR and outputs the result of this link via the object. The telegram polarity can be configured. Cyclical telegrams to this object with an identical telegram polarity (ON -> ON, OFF -> OFF) produce no reaction. After a device reset, the current status of this object is not queried. Only when a bus telegram is received does the actuator take this status into account during evaluation of the heat requirement.				

11.2.2 Pump control

The FanCoil actuator allows switching activation of the circulation pump of the heating or cooling circuit via a 1-bit KNX telegram. When using the pump controller, the pump is only switched on by the actuator via the "Pump control - Switch" object if at least one command value of the assigned outputs exceeds a limiting value with hysteresis defined in the ETS. The pump is switched off when the limiting value is reached or undershot again (see figure 34). This saves electrical energy, as the pump is only activated by sufficiently large, and thus effective, command values. Optional cyclical anti-sticking protection prevents the sticking of the pump, if it has not been switched on by the command value evaluation for a longer period of time. The telegram polarity of the pump control can be configured.

- i** In addition, valve outputs, which receive preset command values via the data format "Switching - 1-bit" and "Constant - 1-byte with command value limit value", influence the pump control. In the case of "Switching - 1-bit", an "OFF" command value is interpreted as "0%" and an "ON" command value as "100%". In the case of "Continuous - 1-byte with command value limiting value", the actuator evaluates the converted switching output signal in the same way ("OFF" is interpreted as "0%", "ON" is interpreted as "100%").
- i** With some functions and events, valve outputs, which are configured to the command value data formats "Switching - 1-bit" and "Continuous - 1-byte", are always activated via a constant command value through pulse width modulation (PWM), providing that command values not equal to 0% or 100% are to be set (after bus voltage returns, after an ETS programming operation, during manual operation, with an active forced position and with active emergency operation). PWM keeps being executed until the named functions have been exited or, after the named events, no more lower-level functions are active and a new command value telegram is received via the bus, overriding the constant command value on the valve output.
In this case, the constant command value set by the PWM is also included in the pump control.
- i** After the bus voltage returns and after an ETS programming operation, the actuator always first transmits the status "Pump OFF" without a delay. The actuator then updates the state to "Pump ON", provided that the condition for this has been fulfilled and an optionally configured "switch-on delay (pump requirement)" has elapsed.
- i** A valve output affected by a short-circuit / overload (valve completely closed on deenergised closed or completely opened on deenergised opened) does not influence the pump control.

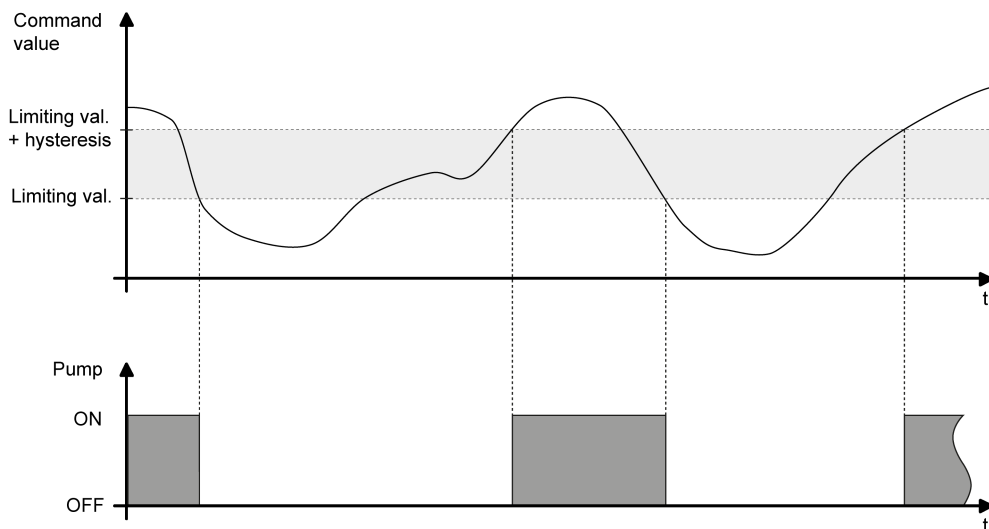


Figure 34: Pump control with sample command value characteristic

Optionally, the actuator can evaluate an external pump control signal (e. g. from another FanCoil or heating actuator). This allows the cascading of multiple actuators with pump control. The local actuator links the 1-bit telegram value of the "Pump control - External" object with the internal state of the pump logically as OR and outputs the result of this link via the "Pump control _ Switching" object.

The actuator only outputs the ON telegram to the pump after determination when the defined delay time has elapsed. The pump is not switched on when the actuator determines within the preset time that the pump must remain switched off, due to a limiting value plus hysteresis again being undershot.

The actuator only outputs the OFF telegram to the pump after determination when the defined delay time has elapsed. The pump is not switched on when the actuator determines within the preset time that the pump must remain switched off, due to a limiting value again being exceeded.

The delay times of the pump controller can be used as an example to match the running time of the pump to the reaction time of the actuated actuators. Thus, a pump should only switch on when the actuators actually open after electrical activation by the actuator (match switch-on delay (pump requirement) with the dead time of the valve drives). The same applies to the closing of the valve drives.

If pump control is enabled, optional cyclical anti-sticking protection can prevent the sticking of the pump, if it has not been switched on by the command value evaluation for a longer period of time (e. g. in the case of heating systems in the summer months). When anti-sticking protection is enabled, the parameter "Cyclical switching on" defines the weekly interval of the protection function. If the pump is not switched on at least once during the set time by the pump controller, the actuator will provide anti-sticking protection, if necessary on a regular basis. The cycle time is reset and restarted on each actuation of the pump by the pump control. The cycle time is started for the first time after a device reset.

When anti-sticking protection is enabled, the parameter "Switch-on time" defines how long the pump should run for the cyclical protection function. The actuator then switches the pump on for the set time without interruption, assuming that anti-sticking protection must be executed.

Enabling and configuring the pump control function

The "pump control" function must first be enabled on the "Outputs -> FanCoil -> Valves" parameter page to allow it to be used during actuator operation. The remaining parameters are set on the parameter page "Pump control". Additionally, the parameter pages of the individual valve outputs are relevant.

- Configure the parameter "Object polarity" to the required telegram polarity. In addition, define the minimum command value and hysteresis.

Pump control is activated. The pump is switched on according to the set telegram polarity if at least one command value of the assigned valve outputs exceeds the configured minimum command value plus hysteresis. The pump is switched off when the minimum command value is reached or undershot again.

The valve outputs must be assigned to the pump control individually on the parameter pages "VOx - General -> Assignments" so that they are included in the command value evaluation.

- Deactivate the "Pump control" parameter.

Pump control is not available.

Enabling detection of an external pump control

Optionally, the actuator can evaluate an external telegram for pump control (e. g. from another FanCoil or heating actuator). This allows the cascading of multiple actuators with pump control.

The object must be enabled for an external pump control signal to be detected.

- Select the checkbox "Detect external pump control via object".

The "Pump control - External" object is enabled. The local heating actuator links the 1-bit telegram value of this object with the internal state of its own pump control logically as OR and outputs the result of this link via the "Switch pump" object.

- Deselect the checkbox "Detect external pump control via object".

Recording of an external pump control signal is not possible. The actuator only controls the pump itself.

-  Cyclical telegrams to the "Pump control - External" object with an identical telegram polarity (ON -> ON, OFF -> OFF) cause no reaction.
-  After the device is reset, the current status of the object "Pump control - External" is not queried. Only when a bus telegram is received does the actuator take this status into account when controlling the pump.

Configuring the anti-sticking protection of the pump controller

If pump control is enabled, optional cyclical anti-sticking protection can prevent the sticking of the pump, if it has not been switched on by the command value evaluation for a longer period of time. The anti-sticking protection must first be enabled on the parameter page "Pump control" so it is executed during actuator operation.

- Select the checkbox and define the interval of the protection function in the parameter "Cyclical switching on". Configure the parameter "Switch-on time" to the required length of the pump run.

Anti-sticking protection is activated. If the pump is not switched on at least once during the set cycle time by the pump controller, the actuator will provide anti-sticking protection, if necessary on a regular basis. The actuator then switches the pump on for the preset switch-on time.

- Deselect the checkbox.

Anti-sticking protection is deactivated.

-  Once started, the anti-sticking protection always runs through to the end. It cannot be cancelled prematurely through the reception of new command values and the resulting restart of the cycle time.

11.2.2.1 Pump control parameters

Outputs -> FanCoil -> Valves

Pump control	Checkbox (yes / no)
The FanCoil actuator allows switching activation of the circulation pump of a heating or cooling circuit via a 1-bit KNX telegram. Here, the pump control of the actuator can be enabled centrally ("yes" setting). The valve outputs must be assigned to the pump control individually on the parameter pages "VOx - General -> Assignments", so that they are included in the control.	

Outputs -> FanCoil -> Valves -> Pump control

Minimum command value	0 ... 100%
The actuator only switches the pump on when at least one command value of the assigned outputs exceeds the defined limiting value plus the hysteresis defined here (see next parameter). The pump is switched off when the limiting value is reached or undershot again. This parameter is visible only if the pump control is enabled.	

Hysteresis of the minimum command value	1 ... 20%
This parameter specifies the hysteresis of the limiting value of the minimum command value of the pump control. The actuator only switches the pump on when a command value exceeds the defined limiting value plus the hysteresis defined here. This parameter is visible only if the pump control is enabled.	

Anti-sticking protection

Activate	Checkbox (yes / no)
If pump control is enabled, optional cyclical anti-sticking protection can prevent the sticking of the pump, if it has not been switched on by the command value evaluation for a longer period of time. In the "Yes" setting, this parameter enables cyclical anti-sticking protection.	

Cyclical switching on	1 ... 26 weeks
When anti-sticking protection is enabled, the length of protection function is defined here. If the pump is not switched on by the pump controller at least once during the time set here, then the actuator will execute anti-sticking protection, if necessary on a regular basis.	

Switch-on time	1 ... 5 ... 15 minutes
When anti-sticking protection is enabled, the length of pump running for the cyclical protection function must be preset here. The actuator then switches the pump on for the time set here without interruption, assuming that anti-sticking protection must be executed.	

Delay times

Switch-on delay (pump requirement)	0 ... 59 min 0 ... 10 ... 59 s
The actuator only outputs the ON telegram to the pump after determination when the delay time defined here has elapsed. The pump is not switched on when the actuator determines within the time preset here that the pump must remain switched off, due to a limiting value plus hysteresis again being undershot. This parameter is visible only if the pump control is enabled. Definition of the minutes and seconds of the delay time.	
Switch-off delay (no pump requirement)	0 ... 23 h 0 ... 10 ... 59 min 0 ... 59 s
The actuator only outputs the OFF telegram to the pump after determination when the delay time defined here has elapsed. The pump is not switched on when the actuator determines within the time preset here that the pump must remain switched off, due to a limiting value again being exceeded. This parameter is visible only if the pump control is enabled. Definition of the hours, minutes and seconds of the delay time.	
Object polarity	0 = switch off pump / 1 = switch on pump 1 = switch off pump / 0 = switch on pump
This parameter defines the telegram polarity of the "Pump control" object. It is visible only if the pump control is enabled.	
Detect external pump control via object	Checkbox (yes / no)
The actuator is able to evaluate an external pump control signal (e. g. from another FanCoil or heating actuator). The local FanCoil actuator links the external telegram with the internal status of the pump logically as OR and outputs the result of this link via the object "Switch pump". This parameter will enable the object "External pump control" in the "Yes" setting. It is visible only if the pump control is enabled.	

11.2.2.2 Objects for pump control

Function	Name	Type	DPT	Flag
Pump control - Switch	General valve outputs (VO) - Output	1-bit	1,001	C, R, -, T, A
1-bit output object for direct activation of a circulation pump of the heating or cooling system. The pump is only switched on by the actuator when at least one command value of the assigned outputs exceeds a limiting value with hysteresis defined in the ETS. The pump is switched off when the limiting value is reached or undershot again. In addition, the actuator can optionally evaluate an external telegram. The telegram polarity can be configured. After the bus voltage returns and after an ETS programming operation, the actuator always first transmits the status "Pump OFF" without a delay. The actuator then updates the state to "Pump ON", provided that the condition for this has been fulfilled and an optionally configured "switch-on delay pump requirement" has elapsed.				
Function	Name	Type	DPT	Flag
Pump control - External	General valve outputs (VO) - Input	1-bit	1,001	C, -, W, -, U
1-bit input object for the cascading of multiple actuators with pump control. The transmitting object for the pump control of another FanCoil or heating actuator can be connected to this object. The local actuator links the external telegram with the internal status of the pump logically as OR and outputs the result of this link via an object. The telegram polarity can be parametrised. Cyclical telegrams to this object with an identical telegram polarity (ON -> ON, OFF -> OFF) produce no reaction. After a device reset, the current status of this object is not queried. Only when a bus telegram is received does the actuator take this status into account when activating the pump.				

11.2.3 Largest command value

Largest command value

Through evaluation and determination of the largest command value in the heating or cooling system, the device allows influencing of the energy consumption of a housing or commercial building. The information on the largest active 1-byte command value can be made available to suitable calorific furnaces with integrated KNX controller directly via a KNX telegram, for example, to determine the optimum flow temperature. If the function is enabled, the device evaluates all the active 1-byte command values of the valve outputs and transmits the externally received largest command value if there is a change by the interval preset in the ETS or cyclically via the object "Largest command value - Status".

-  In the case of valve outputs configured in the ETS to the command value data formats "Switching - 1-bit" or "Continuous - 1-byte by means of command value limiting value", there is no evaluation of the command values preset via the bus. Exception: It may also occur with such command value outputs that a constant command value is active (after bus voltage returns, after an ETS programming operation, during manual operation, with an active forced position and with active emergency operation). In this case, this constant command value is also included in the calculation of the largest command value until the named functions with a higher priority are exited or a new command value telegram is received via the bus, overriding the constant command value at the valve output.
-  After the bus voltage returns and after an ETS programming operation, the actuator transmits the current value of the largest command value without a delay, providing that automatic transmission on change is configured. After a full device reset, the actuator does not transmit automatically, when all the command values are set to 0%. After a device reset, the actuator immediately starts the time for cyclical transmission (if configured), so that the object value effective after the reset is transmitted cyclically.
-  A valve output affected by a short-circuit / overload (valve completely closed on deenergised closed or completely opened on deenergised opened) does not influence the evaluation of the largest command value.

Optionally, the actuator can evaluate an external telegram for the largest command value (e. g. from another FanCoil or heating actuator). This allows the cascading of multiple actuators with a command value signal. The local device compares the 1-byte telegram value of the object "Largest command value - External" with its own largest command value and outputs the largest value via the object "Largest command value - Status".

Enabling the "Largest command value" function

The "Largest command value" function must first be enabled on the parameter page "Outputs -> FanCoil -> Valves" so that it can be used during actuator operation. The remaining parameters are set on the parameter page "Largest command value". Additionally, the parameter pages of the individual valve outputs are relevant.

- Set the parameter "Transmit" to "on change" and/or "cyclical" and set the corresponding criteria.

The "Largest command value" function is activated. The actuator always compares the 1-byte command values of assigned valve outputs and signals the largest command value via the communication object of the same name.

- Select the "Largest command value" checkbox.

The function for transferring the largest command value is not available.

Enabling recording of an external largest command value

Optionally, the actuator can evaluate an external telegram for the largest command value (e. g. from another FanCoil or heating actuator). This allows the cascading of multiple actuators with a command value signal.

The object must be enabled for an external largest command value to be recorded.

- Select the "Record external largest command value via object" checkbox.

The "Largest command value - External" object is enabled. The local heating actuator compares the 1-byte telegram value of this object with its own largest command value and outputs the largest value via the object "Largest command value".

- Select the checkbox "Record external largest command value via object".

Recording of an external largest command value is not possible. The actuator independently determines the largest command value of the valve outputs assigned to it.

-  Cyclical telegrams to the "Largest command value - External" object with the same telegram value cause no reaction.

-  After the device is reset, the current status of the object "Largest command value - External" is not queried. Only when a bus telegram is received does the actuator take this value into account during evaluation of the largest command value.

11.2.3.1 Largest command value parameters

Outputs -> FanCoil -> Valves

Largest command value	Checkbox (yes / no)
The actuator can determine the largest constant command value and forward it to another bus device (e. g. suitable calorific furnaces with integrated KNX control or visualisation). In the "yes" setting, the FanCoil actuator evaluates all the active 1-byte command values of the valve outputs and, optionally, the externally received largest command value (object "External largest command value") and transmits the largest command value via the "Largest command value" object. In the case of valve outputs configured in the ETS to the command value data formats "Switching - 1-bit" or "Constant - 1-byte", there is no evaluation of the command values preset via the bus. Exception: It may also occur with such command value outputs that a constant command value is active (e. g. after bus/mains voltage returns or a forced position and emergency operation or manual operation). In this case, this constant command value is also included in the calculation of the largest command value until the named functions with a higher priority are exited or a new command value telegram is received via the bus, overriding the constant command value at the valve output.	

Outputs -> FanCoil -> Valves -> Largest command value

Transmit	on change cyclical on change and cyclical
The largest command value determined by the device is actively transmitted to the bus. This parameter decides when a telegram is transmitted via the "Largest command value - Status" object. This parameter is visible only if the "Largest command value" function is enabled. on change: A telegram is only transmitted when the largest command value changes. cyclical: The actuator transmits the "Largest command value - Status" telegram only cyclically. The cycle time is defined globally for all feedback on the parameter page "General". on change and cyclical: The actuator transmits the "Largest command value - Status" telegram when the object value changes and also cyclically.	
Transmit on change by	0.3%, 0.5%, 1 ... 3 ... 20%
Here, the change interval of the largest command value for automatic transmission is defined. The actuator only transmits a new telegram value when the largest command value has changed by the interval preset here since the last transmission operation. This parameter is visible only if the "Largest command value" function is enabled.	

Detect external largest command value via object	Checkbox (yes / no)
The actuator is able to evaluate an external largest command value (e. g. from another FanCoil or heating actuator). The local device monitors the external telegram with its own active constant command values and outputs the largest of all command values via the object "Largest control value - Status". This parameter will enable the object "Largest command value - External" in the "yes" setting. It is only available when the "Largest command value" function is enabled.	

11.2.3.2 Objects for largest command value

Function: Evaluation of the largest command value

Function	Name	Type	DPT	Flag
Largest command value - Status	General valve outputs (VO) - Output	1-byte	5,001	C, R, -, T, A
1-byte output object for transmission of the largest constant command value of the FanCoil actuator to another bus device (e. g. suitable calorific furnaces with integrated KNX controller or visualisation). The FanCoil actuator evaluates all the active 1-byte command values of the valve outputs and, optionally, the externally received largest command value and transmits the largest command value via this object. In the case of valve outputs configured in the ETS to the command value data formats "Switching - 1-bit" or "Constant - 1-byte", there is no evaluation of the command values preset via the bus. Exception: It may also occur with such command value outputs that a constant command value is active (e. g. after bus/mains voltage returns or a forced position and emergency operation or manual operation). In this case, this constant command value is also included in the calculation of the largest command value until the named functions with a higher priority are exited or a new command value telegram is received via the bus, overriding the constant command value at the valve output. After the bus voltage returns and after an ETS programming operation, the actuator transmits the current value of the largest command value without a delay, providing that automatic transmission on change is configured. After a full device reset, the actuator does not transmit automatically, when all the command values are set to 0%. After a device reset, the actuator immediately starts the time for cyclical transmission (if configured), so that the object value effective after the reset is transmitted cyclically.				

Function: Evaluation of the largest command value

Function	Name	Type	DPT	Flag
Largest command value - External	General valve outputs (VO) - Input	1-byte	5,001	C, -, W, -, U
1-bit input object for the cascading of multiple actuators with evaluation of the largest constant command value. The transmitting object of a largest command value of another FanCoil or heating actuator can be connected to this object. The local device monitors the external telegram with its own active constant command values and outputs the largest of all command values via an object. Cyclical telegrams to this object with the same value cause no reaction. After a device reset, the current status of this object is not queried. Only when a bus telegram is received does the actuator take this status into account during evaluation.				

11.2.4 Summer / winter mode switchover

The actuator has a summer/winter switchover feature. Depending on the season, this allows the setting of different command value setpoints for a valve output for emergency operation or forced position. Summer or winter mode is directly preset by the 1-bit communication object "Summer/winter operation". The telegram polarity can be configured in the ETS.

The "Summer" or "Winter" state preset via the object is stored internally in the device and is restored after a device reset. In the ETS, it is possible to configure whether, after an ETS programming operation, the saved value is restored or, alternatively, if a defined operation (summer or winter) is activated.

It is also possible to switch the operation during active emergency operation (if called by command value monitoring) or during an active forced position (if activated via the object). In this case, the value belonging to the operation is activated immediately after the switchover. If the value for emergency operation or the forced position is queried when the bus/mains voltage returns or after an ETS programming operation, the command values do not change when the operation is switched over.

Enabling summer/winter mode

The summer/winter operation must first be enabled on the parameter page "Outputs -> FanCoil -> Valves" to allow you to switch between summer and winter mode during actuator operation. The remaining parameters are set on the parameter page "Summer/winter mode". Additionally, the parameter pages of the individual valve outputs are relevant.

- Configure the parameter "Object polarity" to the required telegram polarity.

Summer/winter switchover has been enabled. The "summer/winter mode" communication object becomes visible. On the parameter pages of the individual valve outputs, summer and winter command values can be configured for emergency operation and for a forced position.

- Deselect the checkbox "Summer/winter mode" on the parameter page "Valve outputs -> General valve outputs".

Summer/winter switchover is not available. For the valve outputs, only one command value can be configured separately for emergency operation or a forced position.

Defining the behaviour of summer/winter operation after an ETS programming operation

The "Summer" or "Winter" state preset via the "Summer/winter mode" object is stored internally in the device and is restored after the bus voltage returns. The parameter "After ETS programming" on the parameter page "Summer/winter mode" also defines which operation is active after ETS commissioning.

- Set the parameter to "Summer mode".

In this setting, the actuator activates summer operation after an ETS programming operation. This overwrites the value saved internally in the device.

- Set the parameter to "winter mode".

In this setting, the actuator activates winter mode after an ETS programming operation. This overwrites the value saved internally in the device.

- Set the parameter to "No change (saved operation)".

In this configuration, the actuator activates the most recently saved operation.

-  The operation tracked after the bus voltage returns or preset after an ETS programming operation is not tracked in the "Summer/winter mode" communication object by the actuator.

11.2.4.1 Summer / winter switchover parameters

Outputs -> FanCoil -> Valves

Summer/winter mode	Checkbox (yes / no)
The device has a summer/winter switchover feature. Depending on the season, this allows the setting of different command value setpoints for the valve output for emergency operation or forced position. Activated: Summer/winter switchover is enabled. The "summer/winter mode" communication object becomes visible. Summer and winter command values can be configured for emergency operation and a forced position for the valve output. Deactivated: Summer/winter switchover is not available. For the valve output, only one command value can be configured separately for emergency operation or a forced position.	

Outputs -> FanCoil -> Valves -> Summer/winter mode

Object polarity	1 = winter / 0 = summer 1 = Summer / 0 = Winter
This parameter sets the telegram polarity of the "Summer/winter mode" object.	
After ETS programming operation	Summer mode Winter mode no change (saved operation)
The "Summer" or "Winter" state preset by means of the object "Summer/winter mode" is stored internally in the device and is restored after resetting the device (mains voltage return). The parameter "After ETS programming operation" defines which operation is active after ETS commissioning. Summer operation: In this setting, the device activates summer operation after an ETS programming operation. This overwrites the value saved internally in the device. Winter operation: In this setting, the device activates winter operation after an ETS programming operation. This overwrites the value saved internally in the device. no change (saved operation): In this configuration, the device activates the most recently saved operation.	

11.2.4.2 Objects for summer / winter switchover

Function	Name	Type	DPT	Flag
Summer / winter mode	General valve outputs - Input	1-bit	1,002	C, -, W, -, U
1-bit input object to switch over between summer and winter mode. The telegram polarity can be configured. The status is stored internally in the device if there is a bus or mains voltage failure and is restored after a device reset. Cyclical telegrams to this object with an identical telegram polarity (ON -> ON, OFF -> OFF) produce no reaction.				

11.2.5 Service mode

Service mode allows the bus-controlled locking of all or some valve outputs for maintenance or installation purposes. If service mode is active, actuators can be moved to a defined position (completely open or closed) and locked against activation by command value telegrams. Both service mode and the locking state are preset by a 2-bit forced operation telegram, according to KNX DPT 2.001.

The first bit (bit 0) of the object "Service mode - Activate/Deactivate" directly specifies the locking state. The second bit (bit 1) of the object activates or deactivates service mode. The locking state in the telegram is only evaluated by the actuator, when bit 1 plans for active service mode. Otherwise, bit 0 is ignored.

- i** The valves activated by service mode open or close completely and statically. No pulse width modulation is executed. The configured valve direction of action is taken into account in the electrical activation of the outputs.

Bit 1	Bit 0	Function
0	x	Service mode not active -> normal control according to priority rule
0	x	Service mode not active -> normal control according to priority rule
1	0	Service mode active: Close valves
1	1	Service mode active: Open valves

Bit coding of service mode

Service mode influences the status signals of the affected valve outputs. Depending on the configured command value data format, the following command values are assumed when service mode is active...

- switching (1-bit):
Valve closed = OFF
Valve opened = ON
- constant (1-byte) with pulse width modulation (PWM):
Valve closed = 0%
Valve opened = 100%
- constant (1-byte) with command value limiting value:
Valve closed = OFF
Valve opened = ON

- i** The command value preset by an active service mode is also included in the determination of heat requirements and the largest command value. In addition, service mode has an influence on pump control.

The behaviour of the assigned valve outputs at the end of service mode can be configured. In addition, a 1-bit status object can signal when service mode is active or not.

- i** Updates of the object from "Service mode active" to "Service mode active" while maintaining the forced valve status or from "Service mode inactive" to "Service mode inactive" produce no change in the behaviour of the value outputs. However, the status telegram of the service mode is retransmitted on each update.

- i** Valve outputs locked by service mode can still be activated in manual operation. At the end of a manual operation, the actuator executes the service reaction for the appropriate valve outputs once again if service mode is still activated at this time.

Enabling service mode

Service mode must first be enabled on the parameter page "Outputs -> FanCoil -> Valves", so that it can be activated and deactivated via the KNX during actuator operation.

- Select the "Service mode" checkbox.

Service mode is enabled. The communication objects "Service mode - Activate/Deactivate" und "Service mode - Status" become visible. Valve outputs can be assigned on the parameter pages "VOx - General -> Assignments".

- Deselect the checkbox "Service mode".

Service mode is not available. No valve outputs can be assigned to service mode in the ETS.

Assigning outputs to service mode

For a valve output to be influenced by service mode, an assignment must take place. On the parameter pages "VOx - General -> Assignments", it is possible to define the assignment to service mode separately for each valve output.

- Select the "Service mode" checkbox.

The appropriate valve output is assigned to service mode. It is locked according to the object value when service mode is active.

- Deselect the checkbox "Service mode".

The valve output is not assigned to service mode. Activation and deactivation of the service function does not influence the output.

- i** Assignments can only be made on the parameter pages "VOx - General - Assignments" if service mode is enabled on the parameter page "Outputs -> FanCoil -> Valves".

Defining the behaviour at the end of service mode

When service mode is deactivated, the assigned valve outputs are enabled again. Activation of these outputs using command value telegrams or other functions with a lower priority is then possible. The parameter "Behaviour at the end" on the parameter page "Outputs -> FanCoil -> Valves - Service mode" specifies the state to which the affected valve outputs are set after enabling.

- i** At the end of service mode, the actuator only then executes the configured behaviour if, at the time of enabling, no function with a lower priority is active. Should such a function be active (e. g. forced position), then the actuator will execute it.

- Set the parameter to "No change".

In this setting, assigned valve outputs show no reaction at the end of service mode. They remain in the most recently set state, until a new command value presetting is implemented.

- Set the parameter to "Close output completely".

In this setting, all the assigned valve outputs close completely. Here too, the actuators remain in this state until a new command value presetting is implemented.

- Set the parameter to "Open output completely".

In this setting, all the assigned valve outputs open completely. The actuators remain in this state until a new command value presetting is implemented.

- Set the parameter to "Track state".

In this configuration, the valve state received during the service function or preset by the function is tracked at the end of service mode.

Status function of service mode

An active service mode can optionally be displayed by a 1-bit status object. A telegram with the value "1" displays an active service mode. A telegram with the value "0" displays a deactivated service function.

As soon as service mode is enabled in the ETS, the status communication object is also available.

-  Updates of the 2-bit input object from "Service mode active" to "Service mode active" or from "Service mode inactive" to "Service mode inactive" always causes retransmission of the status telegram.
-  The object value of the status function is not transmitted automatically to the bus after a device reset (ETS programming operation, mains voltage return).

11.2.5.1 Service mode parameters

Outputs -> FanCoil -> Valves

Service mode	Checkbox (yes / no)
Service mode allows the bus-controlled locking of the valve output in case of maintenance or installation. If service mode is active, actuators can be moved to a defined position (completely open or closed) and locked against activation by command value telegrams. Active: Service mode is enabled. The communication object "Service mode - Activate/Deactivate" becomes visible. Inactive: Service mode is not available.	

Outputs -> FanCoil -> Valves -> Service mode"

Behaviour at the end	no change Close output completely Open output completely Track state
This parameter specifies the state which the valve output goes into on when service mode is deactivated.	
Restore last status after bus voltage returns	Checkbox (yes / no)
This parameter defines whether the previous service mode state is automatically restored after the bus voltage returns.	

11.2.5.2 Objects for service mode

Function: Activate/deactivate service mode

Function	Name	Type	DPT	Flag
Service mode - Activate/deactivate	General valve outputs - Input	2-bit	2,001	C, -, W, -, U
2-bit input object for activating and deactivating service mode. With the value "1", bit 1 of the telegram activates service mode. The assigned valve outputs are then locked in the status preset by bit 0 ("0" = Closed / "1" = Opened). The configured valve direction of action is taken into account. The value "0" in bit 1 deactivates service mode again. 0x = Service mode deactivated 10 = Service mode activated, valves closed 11 = Service mode activated, valves opened				

Function: Service mode status

Function	Name	Type	DPT	Flag
Service mode status	Service mode - output	1-bit	1,002	C, R, -, T, A
1-bit output object for status signalling of whether the service mode is active or not. In this case, the telegram polarity is fixed: "0" = Service mode inactive, "1" = Service mode active. The object value is not transmitted automatically after resetting the device (ETS programming operation, bus voltage return).				

11.3 Valve output - General

11.3.1 Name

Optional names can be assigned for each valve output. The names should clarify the use of the output (e. g. "living room floor"). The names are only used in the ETS in the text of the parameter pages and communication objects.

A designation is already preset in the channel configuration of the FanCoil channels, depending on the parametrisation of the device. The designation is made up of the channel number, the operation and the type of control.

11.3.2 Data formats for command values

The device receives 1-bit or 1-byte command value telegrams, transmitted, for example, by KNX room temperature controllers. Usually, the room temperature controller determines the room temperature and generates the command value telegrams using a control algorithm. The actuator controls its valve outputs either in switching form or with a PWM signal, according to the data format of the command values and the configuration in the ETS. The cycle time for constant PWM output signals can be configured separately for each valve output. This allows individual adaptation to different actuator types.

If the valves are controlled via 0-10 V outputs, the control of the valves is fixed to "continuous - 1 byte". Pulse width modulation cannot be set.

i It should be noted that the valve outputs do not carry out temperature control themselves. The actuator converts received command value telegrams or command value presets (e. g. from the internal room temperature controllers of the device) into constant or switching output signals using device functions.

The "Data format" parameter, which is available separately for each valve output on the parameter pages "VOx - General", specifies the input format of the command value objects.

Data format of the command value input "Switching -1-bit"

In the case of a 1-bit command value, the telegram received via the command value object is forwarded directly to the appropriate output of the actuator, taking the configured valve direction of action into account. This means that, if an "ON" telegram is received, the valve is completely opened. The output is then energised for energised closed valves and the output is deenergised for energised opened valve drives. The valve is closed completely when an "OFF" telegram is received. The valve output is then not energised for deenergised closed valves and energised for deenergised opened valve drives.

In the functions and events listed below, valve outputs configured to the command value data formats "Switching - 1-bit" are always activated by a constant command value with pulse width modulation (PWM), provided that command values not equal to 0% or 100% are to be set...

- active forced position,

- active emergency operation,
- after the bus voltage returns,
- after an ETS programming operation,
- in the event of manual operation.

PWM keeps being executed until the named functions have been exited or, after the named events, no more lower-level functions are active and a new command value telegram is received via the bus, overriding the constant command value on the valve output.

- i** In the named cases, the constant command value is also included in the calculation of the largest command value and that of the heat requirement and pump control (optional functions).
- i** Valve outputs, which receive preset command values via the data format "Switching - 1-bit", influence the heat requirement and pump control. Here, an "OFF" command value is interpreted as "0%" and an "ON" command value as "100%".

Data format of the command value input "Constant - 1-byte and control with pulse width modulation (PWM)"

Command values corresponding to the data format "Constant 1-byte" are implemented by the actuator with an equivalent pulse-width-modulated switch signal at the valve outputs. Taking the cycle time settable in the actuator for each output into account, the average output signal resulting from this modulation is a measure of the centred valve position of the control valve and thus a reference for the set room temperature. A shift of the mean value, and thus a change in the heating capacity, can be obtained by changing the duty factor of the switch-on and switch-off pulses of the output signal (see figure 35). The duty factor is adapted constantly by the actuator, depending on the command value received (normal operation) or by active device functions (e. g. manual operation, forced position, emergency operation).

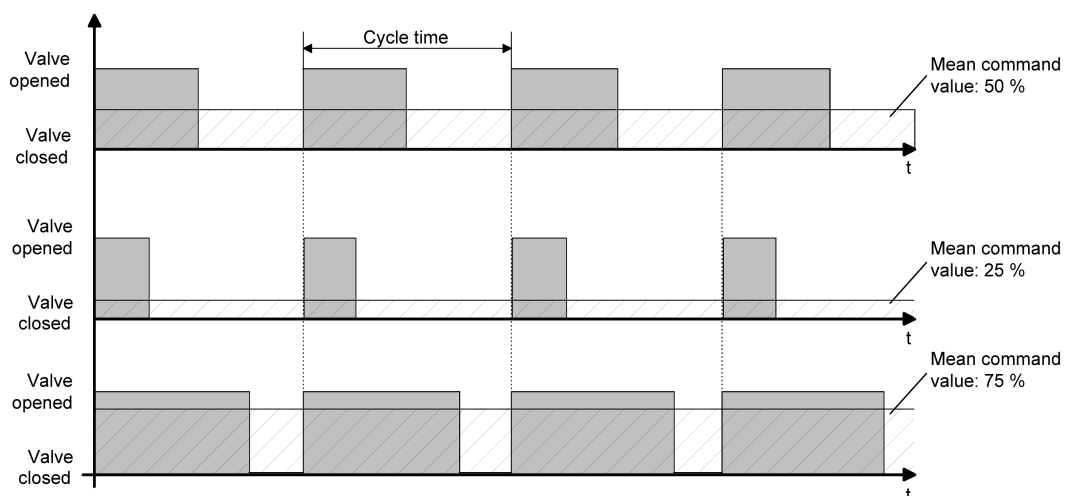


Figure 35: Resulting mean value through variable duty factor with pulse width modulation

In accordance with the configured valve direction of action, the appropriate outputs are either energised or deenergised, depending on the valve position to be approached. In so doing, the duty factor is inverted automatically for a deenergised opened drive. Thus, depending on the valve type used, there is no unintended mean value shift.

Example: Command value: 60% ->

- Duty factor, de-energised closed: 60% ON, 40% OFF,
- Duty factor, de-energised open: 40% ON, 60% OFF.

Example: Command value: 100% ->

- Duty factor, deenergised closed: Permanently ON,
- Duty factor, deenergised opened: Permanently OFF.

Often, control circuits are subject to non-constant changes in the setpoint presetting (e. g. frost protection, night operation, etc.) or short-time interference (e. g. measured value deviations due to brief opening of windows or doors near the sensor). For the setting of the scanning ratio of the required command value to take place as quickly and correctly in these cases, even with a longer set cycle time, without any negative impact on the reaction time of the control section, the actuator uses a special method for continuous command value adjustment.

The following cases are taken into account...

- Case 1

Command value change, e. g. from 80% to 30%, during the opening phase of the valve (see figure 36).

Before the reception of the new command value (30 %), the old setpoint (80 %) was active. The new command value is received during the opening phase of the valve. At this point, the actuator detects that it is still possible to shorten the opening phase, so that it corresponds to the new command value (30%).

The cycle time is not affected by this operation.

The new duty factor is set immediately after the reception of the new command value.

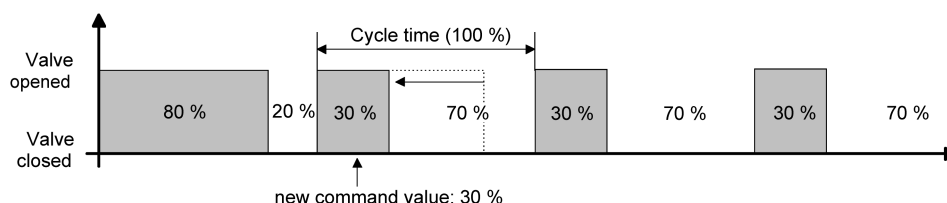


Figure 36: Example of a command value change 80% -> 30% during the opening phase of the valve

- Case 2

Command value change, e. g. from 80% to 30%, during the closing phase of the valve (see figure 37).

Before the reception of the new command value (30 %), the old setpoint (80 %) was active. The new command value is received during the closing phase of the valve. At this point, the actuator detects that it is still possible to extend

the closing phase, so that it corresponds to the new command value (30%). The cycle time remains unchanged, but the starting time of the period is shifted automatically. The new duty factor is set immediately after the reception of the new command value.

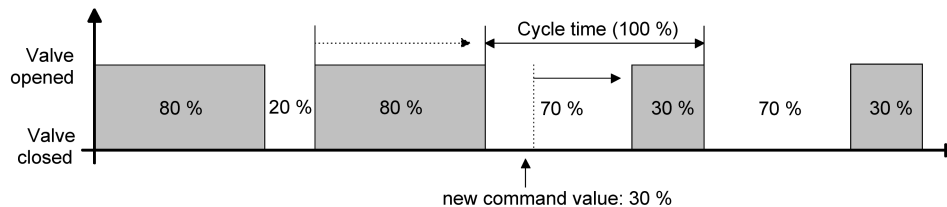


Figure 37: Example of a command value change 80% -> 30% during the closing phase of the valve

– Case 3

Command value change, e. g. from 80% to 30% during the opening phase of the valve (opening phase too long) (see figure 38).

Before the reception of the new command value (30 %), the old setpoint (80 %) was active. The new command value is received during the opening phase of the valve. At this point, the actuator detects that it is necessary to cancel the opening phase immediately and close the valve, so that the duty factor corresponds to the new command value (30%). The cycle time remains unchanged, but the starting time of the period is shifted automatically.

The new duty factor is set immediately after the reception of the new command value.

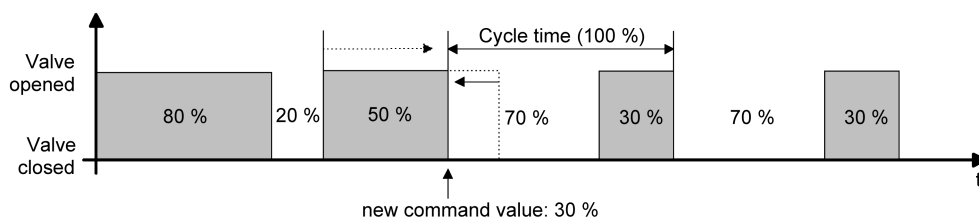


Figure 38: Example of a command value change 80% -> 30% during the opening phase of the valve (opening phase too long)

– Case 4

Command value change, e. g. from 30% to 80%, during the opening phase of the valve (see figure 39).

Before the reception of the new command value (80 %), the old setpoint (30 %) was active. The new command value is received during the opening phase of the valve. At this point, the actuator detects that it is still possible to extend the open phase, so that it corresponds to the new command value (80%). The cycle time is not affected by this operation.

The new duty factor is set immediately after the reception of the new command value.

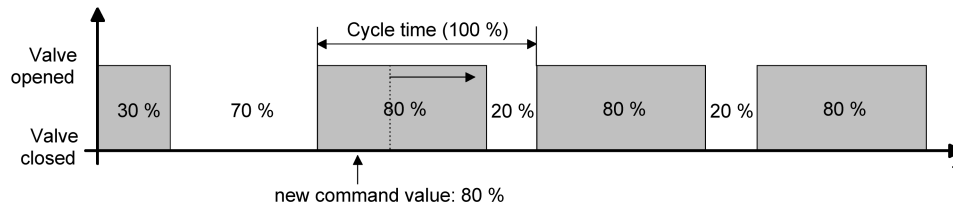


Figure 39: Example of a command value change 30% -> 80% during the opening phase of the valve

– Case 5

Command value change, e. g. from 30% to 80%, during the closing phase of the valve (see figure 40).

Before the reception of the new command value (80 %), the old setpoint (30 %) was active. The new command value is received during the closing phase of the valve. At this point, the actuator detects that it is still possible to reduce the closing phase, so that it corresponds to the new command value (80%). The cycle time remains unchanged, but the starting time of the period is shifted automatically.

The new duty factor is set immediately after the reception of the new command value.

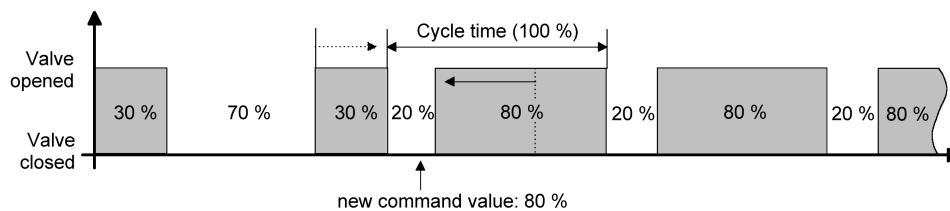


Figure 40: Example of a command value change 30% -> 80% during the closing phase of the valve

– Case 6

Command value change, e. g. from 30% to 80%, during the closing phase of the valve (closing phase too long) (see figure 41).

Before the reception of the new command value (80 %), the old setpoint (30 %) was active. The new command value is received during the closing phase of the valve. At this point, the actuator detects that it is necessary to cancel the closing phase immediately and open the valve, so that the duty factor corresponds to the new command value (80%). The cycle time remains unchanged, but the starting time of the period is shifted automatically.

The new duty factor is set immediately after the reception of the new command value.

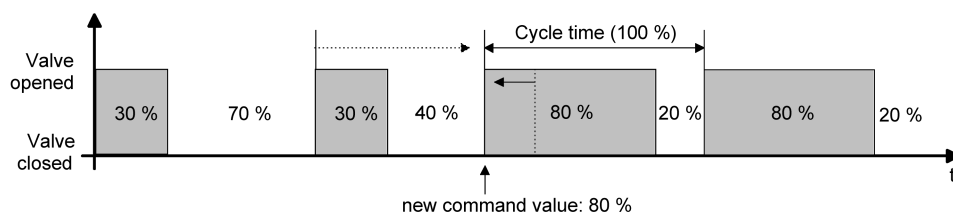


Figure 41: Example of a command value change 30% -> 80% during the opening phase of the valve (opening phase too long)

Data format of the command value input "Constant (1-byte) and activation with command value limiting value"

The data format with limiting value evaluation can be used as an alternative to the conversion of a 1-byte command value into constant pulse width modulation at a valve output. Here, the received constant command value is converted into a switching output signal, depending on the configured limiting value. The valve drive opens when the command value reaches the limiting value or exceeds it (see figure 42). A hysteresis is also evaluated to prevent constant closing and opening of the actuator for command values in the area of the limiting value. The valve drive only closes when the command value undershoots the limiting value minus the configured hysteresis.

The 1-byte data format with limiting value evaluation allows the conversion of constant feedback control by the heating actuator into a two-point controller. This principle is particularly suitable for underfloor heating, in which constant valve activation does not produce the desired heating reaction, on account of the sluggishness. With sluggish underfloor heating systems, small constant command values (only short switch-on phases of the PWM) frequently do not produce any significant level of heating. With large constant command values, the short switch-off phases of a PWM usually have no effect on underfloor heating systems or comparable heating systems. Here, two-point feedback control offers a simple, effective alternative. The valves open or close completely. During activation, unnecessary constant valve positions are avoided using command value telegrams. In addition, the service life of the electrothermal actuators is increased.

The conversion of the constant input signal into a switching command value takes place internally in the device. During processing, the actuator evaluates the converted command value as if it were a received 1-bit command value. It forwards the status directly to the appropriate output, taking the configured valve direction of action into account. Thus, on a "Open valve" command (received command value $\geq$ limiting value), the valve is opened completely. The output is then energised for energised closed valves and the output is deenergised for energised opened valve drives. On a "Close valve" command (received command value $<$ limiting value - hysteresis), the valve is closed completely. The valve output is then not energised for deenergised closed valves and energised for deenergised opened valve drives.

As with a 1-bit input command value, in the functions and events listed below, valve outputs configured to the command value data formats "Constant (1-byte) and activation with command value limiting value" are always activated by a constant command value with pulse width modulation (PWM), provided that command values not equal to 0% or 100% are to be set...

- active forced position,
- active emergency operation,
- after the bus voltage returns,
- after an ETS programming operation,
- in the event of manual operation.

PWM keeps being executed until the named functions have been exited or, after the named events, no more lower-level functions are active and a new command value telegram is received via the bus, overriding the constant command value on the valve output.

- i** In the named cases, the constant command value is also included in the calculation of the largest command value and that of the heat requirement and pump control (optional functions).
- i** Valve outputs which receive preset command values via the data format "Switching (1-byte)" influence the heat requirement and pump control. Here, the actuator evaluates the converted switching output signal in the same way ("OFF" is interpreted as "0%", "ON" is interpreted as "100%").

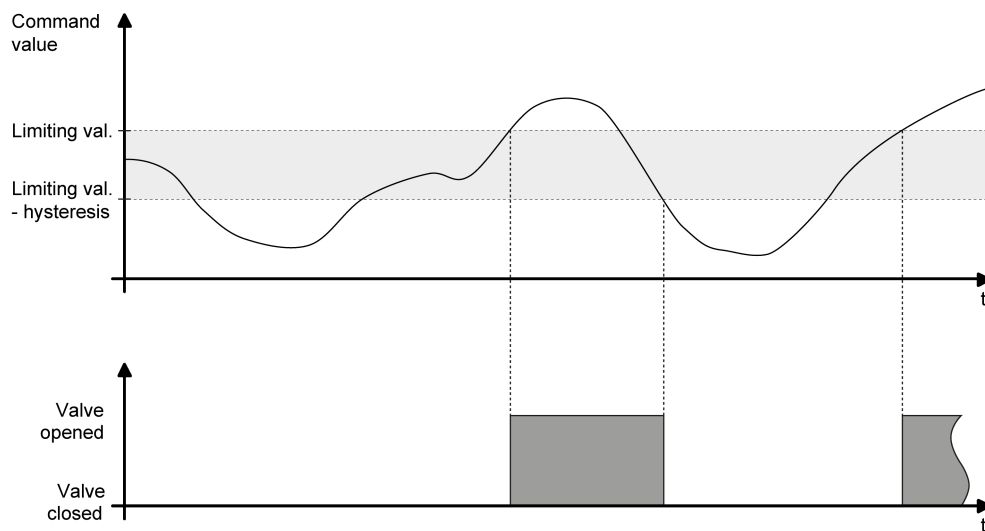


Figure 42: Example of command value evaluation with limiting value

11.3.3 PWM cycle time

The "PWM cycle time" parameter specifies the period length of the pulse-width-modulated output signal of a valve output. It allows adaptation to the adjusting cycle times (the adjusting time it takes the drive to bring the valve from its completely closed to its completely opened position) of the valve drives used. In addition to the adjusting cycle time, take account of the dead time (the time in which the valve drives do not show any response when being switched on or off). If different actuators with different adjusting cycle times are used at an output, take account of the longest of the times.

The "PWM cycle time" parameter is also available for valve drives whose command value data format is configured to "Switching (1-bit)" or "Constant (1-byte) with command value limiting value". For such valve outputs, pulse width modulation can also be executed during an active forced position, emergency operation, manual operation, after the bus voltage returns or after an ETS programming operation, for which, as a result, the presetting of a cycle time is required.

Generally, two different options of how to set the cycle time can be identified...

Case 1

Cycle time > 2 x Adjusting cycle time of the drives used (ETA)

In this case, the switch-on and switch-off times of the actuator are long enough for the actuators to have sufficient time to fully open and fully close within a given period (see figure 43).

- Advantage:
The desired mean value for the command value and thus for the required room temperature will be set relatively precisely, even for several actuators triggered at the same time.
- Disadvantage:
It should be noted, that, due to the full valve lift, the life expectancy of the actuators can diminish. For very long cycle times (> 15 minutes) with less sluggishness in the system, the heat emission into the room, for example, in the vicinity of the radiators, can possibly be non-uniform and be found disturbing.

- i** This cycle time setting is recommended for slower, more sluggish heating systems (such as underfloor heating).
- i** Even for a bigger number of triggered actuators, maybe of different types, this setting can be recommended to be able to obtain a better mean value of the adjusting travels of the valves.

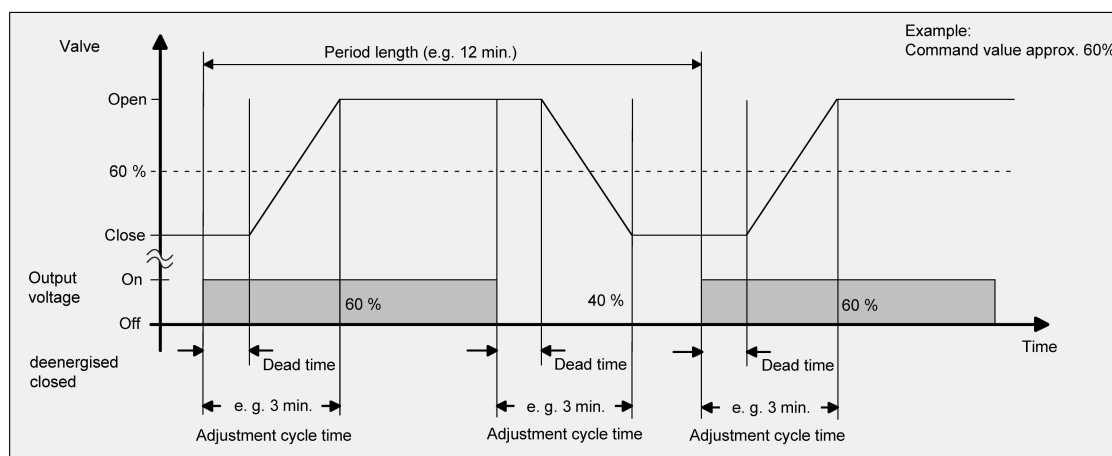


Figure 43: Ideal course of the valve stroke for a
Cycle time > 2 x Adjusting cycle time

Case 2

Cycle time < Adjusting cycle time of the drives used (ETA)

In this case, the switch-on and switch-off times of the actuator are too short for the actuators to have enough time to fully open and fully close within a given period (see figure 44).

- **Advantage:** This setting ensures continuous water flow through the radiators, thus facilitating uniform heat emission into the room. If only one valve drive is triggered the controller can continuously adapt the command value to compensate the mean value shift caused by the short cycle time, thus setting the desired room temperature.
- **Disadvantage:** If more than one drive is activated at the same time, the desired mean value will become the command value, which will result in a very poor adjustment of the required room temperature, or in adjustment of the latter with major deviations, respectively.

This setting is recommended for quicker heating systems (such as radiators).

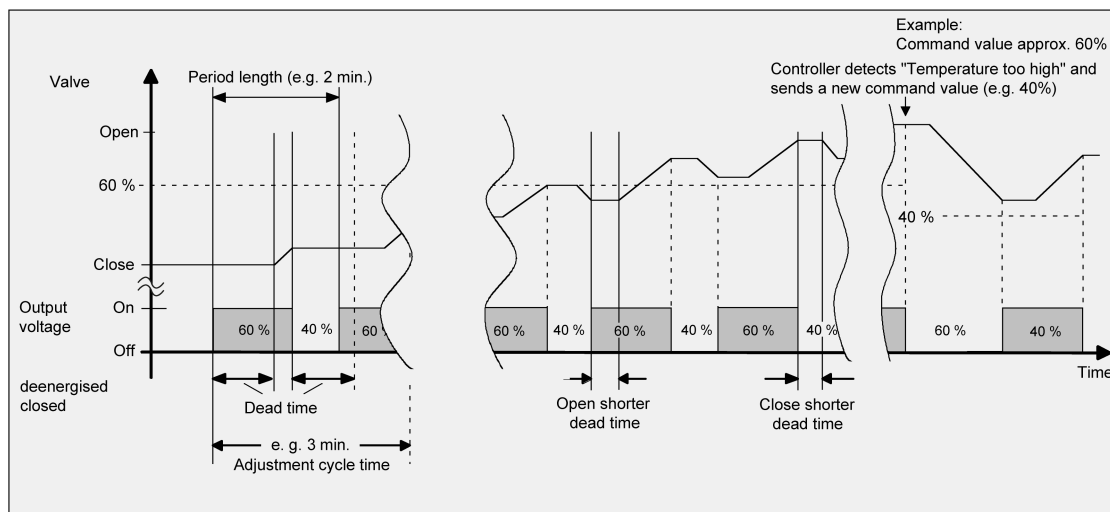


Figure 44: Ideal course of the valve stroke for a
Cycle time < Adjusting cycle time

The continuous flow of water through the valve, and thus the continuous heating of the drives causes variations and changes to the dead times of the drives during the opening and closing phase. The short cycle time and the dead times means that the required command value (mean value) is only set with a possibly large deviation. For the room temperature to be regulated constantly after a set time, the controller must continually adjust the command value to compensate for the mean value shift caused by the short cycle time. Usually, the control algorithm implemented in the controller (PI control) ensures that control deviations are compensated.

11.3.4 Valve direction of action

The device has relay outputs, electronic valve outputs or analogue outputs to control the valves. With the electronic valve outputs and analogue outputs, the valves are controlled silently. Both deenergised closed and deenergised opened actuators can be connected. The parameter "In voltage-free state (direction of action)" on the parameter pages "VOx - General" specifies which drive type is connected to an output.

- i** Valves that are operated at the 0...10 V outputs require a separate power supply, i. e. the valves are permanently supplied with voltage. It is therefore irrelevant whether the valves are closed or open when de-energised.

- i** Only valve drives with the same characteristics may be connected to each output (de-energised closed/opened). The drive type must match the configuration.

The configured valve direction of action is taken into account in each valve activation. With 1-byte command values and deenergised closed valves, the switch-on time is derived directly from the configured PWM and the cycle time.

Example: PWM = 30%, cycle time = 10 minutes -> Switch-on time = 3 minutes, switch-off time = 7 minutes.

In the case of 1-byte command values and deenergised opened valves, the switch-on time is inverted. Example: PWM = 30%, cycle time = 10 minutes -> Switch-on time = 7 minutes, switch-off time = 3 minutes.

On deenergised closed valve drives, command values are not inverted, in accordance with the 1-bit data format. Example: Command value ON -> Output switched on, Command value OFF -> Output switched off.

By contrast, switching command values are inverted for deenergised opened valve drives. Example: Command value ON -> Output switched off, Command value OFF -> Output switched on.

- i** On the LED status display, the valve direction of action configured for each output in the ETS is not taken into account. As a result, the LEDs do not immediately display the valve state (opened / closed). Inversion of the status display according to the valve direction of action thus does not take place.
- i** In the as-delivered state, the valve direction of action for all the valve outputs is set to "deenergised closed".

11.3.5 Reset behaviour

The states of the valve outputs after the bus voltage returns or after an ETS programming operation can be set separately.

Setting the behaviour after the bus voltage returns

The parameter "After bus voltage returns" is separately available for each valve output on the parameter page "VOx - General".

- Set the parameter to "Preset command value".

The actuator sets the command value preset for the valve output by the parameter "Command value". For valve outputs configured in the ETS to the command value data formats "Switching - 1-bit" or "Constant - 1-byte with command value limiting value", a constant command value can also be preset using the parameter "Command value". In this case, a pulse width modulation (5% ... 95%) is executed for the affected command value outputs. In the "0%" and "100%" presettings, the valve outputs are activated continuously. The preset PWM remains active until other functions have been executed or a new command value telegram is received via the bus, overriding the constant command value on the valve output.

- Set the parameter to "Activate command value according to forced position".

For the valve output, the actuator calls the command value configured for the forced position in the ETS. Here, the active operation (summer / winter) is taken into account, providing that a summer / winter change-over is configured. Ensure that, in this setting, the forced position function is not executed! The actuator calls only the command value defined for the forced position.

- Set the parameter to "Activate command value according to emergency operation".

For the valve output, the actuator calls the emergency operation command value configured in the ETS. Here, the active operation (summer / winter) is taken into account, providing that a summer / winter change-over is configured. Ensure that, in this setting, emergency operation is not executed (as would be the case if there was a faulty command value found in the course of command value monitoring)! The actuator calls only the command value defined for emergency operation.

- Set the parameter to "Command value as before power failure".

After the bus voltage returns, the command value is set at the valve output which was active at the moment of the last bus voltage failure. If there is a bus voltage failure, the actuator saves the active command value internally in the device, so that the command value can be restored when the device power supply returns.

If a valve state has been set after the bus voltage returns, it is tracked in the command value status objects. The status objects also transmit after the bus voltage returns only when the initialisation is complete and, if applicable, the "delay after mains voltage return" has elapsed.

Presetting the behaviour after ETS programming

The parameter "After ETS programming" is available separately for each valve output on the parameter page "VOx - General". This parameter can be used to configure the behaviour of an output, irrespective of the behaviour after the bus voltage returns.

- Set the parameter "Command value as after the mains voltage returns".

After an ETS programming operation, the valve output will behave in the manner defined in the parameter "After bus voltage returns". If the behaviour there is configured to "Command value as before bus voltage failure", then that command value is also set after an ETS programming operation which was active at the time of the last bus voltage failure. An ETS programming operation does not overwrite the saved command value.

- Set the parameter to "Preset command value".

The actuator sets the command value preset for the valve output by the parameter "Command value after ETS programming operation". For valve outputs configured in the ETS to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value", a constant command value can also be preset using the parameter "Command value after ETS programming operation". In this case, a pulse width modulation (5% ...

95%) is executed for the affected command value outputs. In the "0%" and "100%" presettings, the valve outputs are activated continuously. The preset PWM remains active until other functions have been executed or a new command value telegram is received via the bus, overriding the constant command value on the valve output.

- Set the parameter to "Activate command value according to forced position".

For the valve output, the actuator calls the command value configured for the forced position in the ETS. Here, the active operation (summer / winter) is taken into account, providing that a summer / winter change-over is configured. Ensure that, in this setting, the forced position function is not executed! The actuator calls only the command value defined for the forced position.

- Set the parameter to "Activate command value according to emergency operation".

For the valve output, the actuator calls the emergency operation command value configured in the ETS. Here, the active operation (summer / winter) is taken into account, providing that a summer / winter change-over is configured. Ensure that, in this setting, emergency operation is not executed (as would be the case if there was a faulty command value found in the course of command value monitoring)! The actuator calls only the command value defined for emergency operation.

i The behaviour after an ETS programming operation is only executed if there have been changes in the configuration of the device. If just an application download is executed with a project design already located in the actuator, then the actuator will execute the configured "Behaviour after bus voltage returns".

i A valve state set after an ETS programming operation is added to the command value status objects. The feedback objects also only first transmit after an ETS programming operation when the initialisation has finished and, if necessary, the "delay time after bus voltage returns" has elapsed.

i An active manual operation mode will be terminated by an ETS programming operation.

11.3.6 "Valve output - General" parameters

Outputs -> FanCoil -> Valves -> VA ... - General

Name of valve output	Free text
The text entered in this parameter is applied to the name of the communication objects and is used to label the valve output in the ETS parameter window (e. g. "Underfloor heating living room"). The text is not programmed in the device. A technical name is already predefined, depending on the device configuration.	

Command value input

Data format	switching - 1-bit constant - 1-byte
The actuator can optionally be controlled via a 1-bit object or a 1-byte object. switching - 1-bit: In the case of a 1-bit command value, the telegram received internally in the device is forwarded directly to the output of the actuator, taking the configured valve direction of action into account. constant 1-byte: In the case of a 1-byte command value, the following parameter "Activation with" determines the type of processing of the command value. In the case of valve control via an analogue output, this 1-byte format is fixed.	

Valve output

Activation with	Pulse Width Modulation (PWM) Command value limiting value
Pulse width modulation (PWM): Command values are implemented by the actuator with an equivalent pulse-width-modulated switch signal at the valve output. Command value limiting value: The constant command value is converted into a switching output signal, depending on a configured limiting value. This selection is visible only if "File format" = "continuous - 1 byte".	
Open valve from a command value limiting value of	1 ... 10 ... 100%
In the 1-byte command value data with limiting value evaluation, the received constant command value is converted into a switching output signal, depending on the limiting value configured here. The valve drive opens when the command value reaches the limiting value or exceeds it. This parameter is available only in the case of "File format" = "Constant - 1-byte" and activation with "command value limiting value".	

Close valve if command value limiting value (hysteresis) falls below	1 ... 5 ... 10%
In the 1-byte command value data with limiting value evaluation, the received constant command value is converted into a switching output signal. A hysteresis is also evaluated to prevent constant closing and opening of the actuator for command values in the area of the limiting value. The valve drive only closes when the command value undershoots the limiting value minus the configured hysteresis. This parameter is only available in the case of "activation with command value limiting value".	

PWM cycle time	0.5 minutes 1.0 minute 1.5 minutes ... 15.0 minutes ... 20.0 minutes

The "PWM cycle time" parameter specifies the switching frequency of the pulse-width-modulated output signal of the valve output. It allows adaptation to the adjusting cycle times (the adjusting time it takes the drive to bring the valve from its completely closed to its completely opened position) of the valve drives used. In addition to the adjusting cycle time, take account of the dead time (the time in which the actuators do not show any. Response when being switched on or off). If different actuators with different adjusting cycle times are used at an output, take account of the longest of the times.

The "PWM cycle time" parameter is always available, irrespective of the data format and the activation type, because, in the case of an active forced position, emergency operation, after the mains voltage returns or after an ETS programming operation, the output is controlled with pulse width modulation for which, as a result, the specification of a cycle time is required.

This parameter is not available when controlling via analogue outputs.

Valve

In voltage-free state (direction of action)	closed open
Valve drives that are closed or open when deenergised can be connected. On each electrical activation of the valve outputs, the actuator takes the valve direction of action configured here into account, so that the command value presettings (Valve closed OFF, 0% / Valve opened ON, 1...100%) can be executed in the correct direction of action. The valve outputs are no longer energised if the valve voltage supply fails or if there is a short-circuit or overload. The actuator takes this state into account and also influences the command value feedback, according to the configured valve direction of action. If the valve is controlled via an analogue output, this parameter will not be displayed.	

Reset behaviour

After the bus voltage returns	Specify command value Activate command value according to forced position Activate the command value according to emergency operation Command value as before power failure
After the bus or mains voltage returns, the valve outputs perform the reaction configured here. Specify command value: The actuator sets the command value preset in the ETS for the valve output by the following parameter "Command value". Activate command value according to forced position: For the valve output, the actuator calls the command value for the forced position configured in the ETS. Here, the active operation (summer / winter) is taken into account, providing that a summer / winter change-over is configured. Ensure that, in this setting, the forced position function is not executed! The actuator calls only the command value defined for the forced position. Activate command value according to emergency operation: For the valve output, the actuator calls the command value configured for emergency operation in the ETS. Here, the active operation (summer / winter) is taken into account, providing that a summer / winter change-over is configured. Ensure that, in this setting, emergency operation is not executed (as would be the case if there was a faulty command value found in the course of command value monitoring)! The actuator calls only the command value defined for emergency operation. Command value as before power failure: After the bus or mains voltage returns, the command value that was active at the moment of the last bus voltage failure is set at the valve output . If there is a bus voltage failure, the actuator saves the active command value internally in the device, so that the command value can be restored when the device power supply returns. The value is saved after a previous device reset (ETS programming operation, bus voltage return) only if the reset was longer than 30 seconds ago. Otherwise the actuator does not save the current command value! In that case, an old value remains valid, as was previously saved by the actuator on the bus voltage failure.	

Command value	0% 5% 10% ... 90% 95% 100%
The command value to be set after the bus voltage returns is defined here. This parameter is visible only if "Behaviour after bus voltage returns" = "Preset command value". For valve outputs configured in the ETS to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value", a constant command value can also be preset using this parameter. In this case, a pulse width modulation (5% ... 95%) is executed for the affected command value outputs. In the "0%" and "100%" presettings, the valve outputs are activated continuously. The preset PWM remains active until other functions have been executed or a new command value telegram is received via the bus, overriding the constant command value on the valve output.	

After ETS programming operation	Command value as after mains voltage returns Specify command value Command value according to forced position Command value according to emergency operation
After an ETS programming operation, the valve outputs perform the configured reaction at this point. Command value as after mains voltage returns: After an ETS programming operation, the valve output behaves in the manner defined in the parameter "After bus voltage returns". If the behaviour there is configured to "Command value as before power failure", then that command value is also set after an ETS programming operation which was active at the time of the last bus voltage failure. An ETS programming operation does not overwrite the saved command value. Specify command value: The actuator sets the command value preset in the ETS for the valve output by the following parameter "Command value". Command value according to forced position: For the valve output, the actuator calls the command value configured for the forced position in the ETS. Here, the active operation (summer / winter) is taken into account, providing that a summer / winter change-over is configured. Ensure that, in this setting, the forced position function is not executed! The actuator calls only the command value defined for the forced position. Command value according to emergency operation: For the valve output, the actuator calls the command value configured for emergency operation in the ETS. Here, the active operation (summer / winter) is taken into account, providing that a summer / winter change-over is configured. Ensure that, in this setting, emergency operation is not executed (as would be the case if there was a faulty command value found in the course of command value monitoring)! The actuator calls only the command value defined for emergency operation.	

Command value	0% 5% 10% ... 90% 95% 100%
The command value to be set after an ETS programming operation is defined here. This parameter is only visible on "Behaviour after ETS programming operation" = "Preset command value". For valve outputs configured in the ETS to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value", a constant command value can also be preset using this parameter. In this case, a pulse width modulation (5% ... 95%) is executed for the affected command value outputs. In the "0%" and "100%" presettings, the valve outputs are activated continuously. The preset PWM remains active until other functions have been executed or a new command value telegram is received via the bus, overriding the constant command value on the valve output.	

11.3.7 Objects for "Valve output - General"

Function command value presetting

Function	Name	Type	DPT	Flag
Command value	VO ... - Input	1-bit	1,001	C, -, W, -, U
1-bit input object for the presetting of a switching command value, e. g. of a KNX room temperature controller. In this case, the telegram polarity is fixed: "0" = Close valve, "1" = Open valve. The configured valve direction of action is taken into account in the electrical activation of the valve. This object is only available for valve outputs configured in the ETS to the command value data format "Switching (1-bit)".				

Function command value presetting

Function	Name	Type	DPT	Flag
Command value	VO ... - Input	1-byte	5,001	C, -, W, -, U

1-byte input object for the presetting of a constant command value, e. g. of a KNX room temperature controller (0...100% -> 0...255). This object is only available for valve outputs configured in the ETS to the command value data formats "Constant (1-bit) with pulse width modulation (PWM)" or "Constant (1-byte) with command value limiting value". With the command value format "Constant (1-byte) with pulse width modulation (PWM)", the telegram value is implemented by the actuator with an equivalent pulse-width-modulated switch signal at the valve outputs. The duty factor is adapted constantly by the actuator, depending on the command value received. The cycle time can be configured in the ETS. In accordance with the configured valve direction of action, the output is either energised or deenergised, depending on the valve position to be approached. In so doing, the duty factor is inverted automatically for a deenergised opened drive.

In the command value format "Constant (1-byte) with command value limiting value", the received constant command value is converted into a switching output signal, depending on a configured limiting value. The valve drive opens when the command value reaches the limiting value or exceeds it. A hysteresis is also evaluated to prevent constant closing and opening of the actuator for command values in the area of the limiting value. The valve drive only closes when the command value undershoots the limiting value minus the configured hysteresis. The conversion of the constant input signal into a switching command value takes place internally in the device. During processing, the actuator evaluates the converted command value as if it were a received 1-bit command value. It forwards the status directly to the appropriate output, taking the configured valve direction of action into account.

11.4 Cyclical command value monitoring / emergency operation

If necessary, cyclical monitoring of the command values can be performed. If, during active cyclical monitoring, there are no command value telegrams during a preset time, then emergency operation is activated for the affected valve output, for which a configurable constant PWM command value can be preset in the ETS.

The command value of emergency operation is always constant and is configured individually in the ETS (0...100% in 10% steps). The command value is executed electrically at the output using a pulse width modulation (PWM).

- i** When emergency operation is active, valve outputs configured to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value" are always activated by a constant command value with pulse width modulation. In this case, this constant command value is also included in the calculation of the largest command value (optional function) until the emergency operation is exited and no other function with a constant command value presetting (e. g. forced position, manual operation) is active.
- i** The configured valve direction of action (deenergised closed / deenergised opened) is taken into account in the electrical activation of the outputs by emergency operation. With deenergised closed valves, the switch-on time is derived directly from the configured PWM and the cycle time. In the case of deenergised opened valves, the switch-on time is inverted.

The actuator has a summer/winter switchover feature. Depending on the season, this allows the setting of different command value setpoints for a valve output for emergency operation Summer/winter switch-over for valve outputs. It is also possible to switch over the operation during active emergency operation. In this case, the value belonging to the operation is activated immediately after the switchover.

If no summer / winter switchover is planned in the actuator, then only a command value can be configured in the ETS for emergency operation.

If command value monitoring is enabled, then the actuator will check the arrival of telegrams on the command value object during a settable time period. The time period is defined separately for each valve output by the "Monitoring cycle" parameter. The time set there should be at least double the time for the cyclical transmission of the command value of the controller, in order to ensure that at least one telegram is received within the monitoring time. Cyclical command value monitoring takes place continuously. The actuator retriggers the monitoring time automatically on each command value telegram received and after a device reset. If there are no command value telegrams during the monitoring time, then the actuator will activate emergency operation.

- i** If the bus control of a valve output was disabled during permanent manual operation, then no command value monitoring is performed for the affected output. This exits active emergency operation. When bus control is enabled by a permanent manual operation, the actuator restarts the monitoring time and checks for incoming command value telegrams.

According to the priority control, active command value monitoring can be overridden by other device functions with a higher priority (e. g. service mode, manual operation). At the end of a higher priority function, the actuator executes emergency operation for the valve outputs concerned once again, if it is still activated by missing command value telegrams.

Optionally, the command value of emergency operation can also be activated after the bus voltage returns or after an ETS programming operation. This is only the recall of the configured command value and not the activation of emergency operation, as takes place during command value monitoring.

- i** The command value preset by active emergency operation is also included in the determination of heat requirement. In addition, the command value of emergency operation has an influence on the pump control.

At the end of emergency operation (new input command value received), the behaviour of a valve output is permanently defined. If no function with a higher priority is active, the actuator always tracks the state for the affected valve outputs most recently preset by normal bus operation (activation by command value telegrams).

- i** After resetting the device (bus voltage return, ETS programming operation), the command value objects initially contain the value "0".
- i** The state of emergency operation (active or inactive) is saved internally in the device after a bus voltage failure and is restored automatically after the bus voltage returns. After the bus voltage returns, the actuator activates emergency operation, if the tracked state allows this.

The actuator makes the 1-bit status telegram "Command value fault" available. As soon as a command value telegram is missing on a monitored valve output, and thus emergency operation is activated, then the actuator transmits a fault signal via this status object. The telegram polarity can be configured. Only after at least one command value telegram has been received for the monitored valve output does the actuator retract the fault signal for cyclical monitoring. Optionally, the fault telegram can also be transmitted cyclically during active emergency operation.

- i** The object "Command value - Fault - Status" does not automatically transmit the status immediately after the bus voltage returns or after an ETS programming operation. A faulty command value must be detected again (expiry of the monitoring time without a command value telegram) for the object value to be transmitted. This is also the case if a saved emergency operation was restored after a device reset.

Enabling cyclical command value monitoring

Cyclical command value monitoring can only be used if it has been enabled in the ETS.

- Select the "Command value monitoring" checkbox on the parameter page "VOx - General - Enable functions". Configure the "Monitoring cycle" of the command value monitoring.

Cyclical command value monitoring is activated. If there are no command value telegrams during the monitoring cycle preset by the parameter of the same name, then emergency operation is activated for the affected valve output, for which the actuator sets a constant PWM command value. This command value is defined on the parameter page "VOx - General - Emergency operation" by the parameter "Command value" (separately for summer and winter if required).

- Deactivate the "Command value monitoring" checkbox.

Cyclical command value monitoring is deactivated.

Configuring the fault signal for cyclical command value monitoring

If a command value fault is identified, then the actuator can optionally transmit a fault telegram via the object "Command value - Fault - Status".

- Set the parameter "Object polarity" on the parameter page "VOx - General - Command value monitoring" to the required telegram polarity.

As soon as a command value telegram is missing on a monitored valve output, and thus emergency operation is activated, then the actuator transmits a fault signal via the object "Command value - Fault - Status" according to the configured telegram polarity. Only after at least one command value telegram has been received for the monitored valve output does the actuator retract the fault signal for cyclical monitoring.

- Select the checkbox "Cyclical transmission in the case of faulty command value".

If a command value fault is identified, then the actuator transmits the fault telegram cyclically. The cycle time is defined for all cyclical status and feedback functions on the parameter page "Outputs - FanCoil - Valves".

- Deselect the checkbox "Cyclical transmission in the case of faulty command value".

If a command value fault is identified, then the actuator transmits the fault telegram only once.

11.4.1 Command value monitoring / emergency operation parameters

VOx - General -> Enabled functions

Command value monitoring	Checkbox (yes / no)
Here, cyclical monitoring of the command values can be enabled as an option ("Yes" setting). If, in active cyclical monitoring, there are no command value telegrams during the monitoring time preset by the parameter of the same name, then emergency operation is activated for the affected valve output, for which a configurable constant PWM command value can be preset.	

VOx - General -> Command value monitoring

Monitoring cycle	0...20...59 min 0...59 s
This parameter specifies the monitoring cycle of the command value monitoring. The actuator must receive at least one command value telegram within the time frame specified here. If there is no command value telegram, then the actuator will assume a fault and will activate emergency operation for the affected valve output. This parameter is only available if command value monitoring is enabled. Presetting of the monitoring time minutes and seconds.	
Object polarity	1 = fault / 0 = no fault / 0 = fault / 1 = no fault
If a command value fault is identified, then the actuator can optionally transmit a fault telegram via the object "Command value - Fault - Status". This parameter defines the telegram polarity of the fault telegram. This parameter is only available if command value monitoring is enabled.	
Cyclical transmission in the case of faulty command value	Checkbox (yes / no)
If a command value fault is identified, then the actuator can optionally transmit the fault telegram cyclically. Here, the cyclical transmission of the fault telegram can be enabled as required ("Yes" setting). This parameter is only available if command value monitoring is enabled.	

VAX - General -> Emergency operation

Command value	0 ... 30 ... 100%
This parameter defines the command value for emergency operation. The command value of emergency operation is always constant and is configured individually in the ETS (0...100% in 10% steps). The command value is executed electrically at the output using a pulse width modulation (PWM). This parameter is visible only if summer/winter mode is not activated.	

11.5 Command value limit

The command value limit allows the restriction of calculated command values to the range limits "minimum" and "maximum". The limits are permanently set in the ETS and, if command value limitation is active, can be neither undershot or exceeded during device operation.

Enabling the command value limit

The command value limit can only be used if it has been enabled in the ETS.

- Set the parameter "Command value limit" on the parameter page "VO x - General - Enabled functions" to "yes".

The command value limit is enabled. The "Activation" parameter defines whether the limiting function can be activated or deactivated as required via a communication object. Alternatively, the command value limit can be permanently active.

- Set the parameter "Command value limit" to "no".

The command value limit is not available.

Setting the activation of the command value limit

The "Activation" parameter on the parameter page "VOx - General - Command value monitoring" defines the type of action of the limiting function.

The command value limit must be enabled.

- Set the parameter to "via object".

The command value limit can only be activated using the 1-bit communication object "Command value limit - Activate/Deactivate" ("1" telegram) or deactivated ("0" telegram). The behaviour of the command value limit is definable separately after a device reset (bus voltage return, ETS programming operation).

- Set the parameter to "permanently active".

The command value limit is permanently active. It cannot be influenced via an object. Command values preset via the KNX or via emergency operation are always limited.

Setting the initialisation behaviour of the command value limit

The command value limit can either be activated or deactivated using the 1-bit communication object "Command value limit - Activate/Deactivate" or be permanently active. When controlling via the object, it is possible to have the actuator activate the command value limit automatically after the bus voltage returns or after an ETS programming operation. The parameters "Activate after bus voltage returns" and "Activate after ETS programming operation" define the initialisation behaviour.

- i With a permanently active command value limit, the initialisation behaviour cannot be configured after the bus voltage returns or an ETS programming operation, because the limit is always active. In this case, no object is available.

The command value limit must be enabled.

- Set the parameter "Active after bus voltage returns" to "No".

The command value limit is not activated automatically after the bus voltage returns. A "1" telegram must first be received via the "Command value limit" object for the limiting function to be activated.

- Set the parameter "Active after bus voltage returns" to "Yes".

In this setting, the actuator does not activate the command value limit automatically after the bus voltage returns. To deactivate the limit a "0" telegram must be received via the "Command value limit" object. The limit can be switched on or off at any time using the object.

- Set the parameter "Active after ETS programming operation" to "no".

The command value limit is not activated automatically after an ETS programming operation. A "1" telegram must first be received via the "Command value limit" object for the limiting function to be activated.

- Set the parameter "Active after ETS programming operation" to "yes".

In this setting, the actuator activates the command value limit automatically after an ETS programming operation. To deactivate the limit a "0" telegram must be received via the "Command value limit" object. The limit can be switched on or off at any time using the object.

- i The status of the command value limit is not automatically tracked in the communication object after a device reset.

- i It is to be noted that, on account of priority control, the actuator executes the behaviour configured by the parameters "Behaviour after bus voltage return" and "Behaviour after an ETS programming operation" on the parameter page "VO x - General" after the bus voltage returns and after an ETS programming operation. The command values preset via configuration after a device reset are not influenced by a command value limit! A command value limit only influences the input command values preset via the bus or emergency operation command values during command value monitoring.

11.5.1 Command value limit parameters

Outputs -> FanCoil -> Valves -> VA ... - General -> Enabled functions

Command value limit	Checkbox (yes / no)
This parameter enables the command value limit. The command value range is defined by a configurable smallest and a configurable largest command value.	

Outputs -> FanCoil -> Valves -> VA x - General -> Control value limitation

Activation	via object permanently active
This parameter decides whether the limit of the command values can either be activated and deactivated by the "Command value limit" object or whether the command value limit is permanently active.	

Active after bus voltage returns	Checkbox (yes / no)
This parameter decides whether the command value limit is activated or inactive after the mains voltage returns.	

Active after ETS programming operation	Checkbox (yes / no)
This parameter decides whether the command value limit is activated or inactive after an ETS programming operation.	

Minimum command value	0 ... 50%
The minimum command value that is valid when the command value limit is activated is defined here.	

Maximum command value	55 ... 100%
The maximum command value that is valid when the command value limit is activated is defined here.	

11.5.2 Objects for command value limit

Function	Name	Type	DPT	Flag
Command value limit - Activate/Deactivate	VO ... - Input	1-bit	1,002	C, -, W, -, U
1-bit input object for requirement-orientated activating and deactivating of a command value limit. The telegram polarity is fixed: "0" = Command value limit inactive, "1" = Command value limit active. Updates of the object from "1" to "1" or "0" to "0" do not produce a reaction. If required, this object is only available for valve outputs configured in the ETS to the command value data format "Constant (1-byte) with pulse width modulation (PWM)". It is possible to have the actuator activate the command value limit automatically after the bus voltage returns or after an ETS programming operation. The status of the command value limit is not then automatically tracked in the communication object.				

11.6 Priority control

A forced position can be configured separately for each valve output and activated according to requirements. If a forced position is active, a defined command value is set at the output. Affected valve outputs are then locked so that they can no longer be activated using functions subject to the forced position (including activation by command value telegrams).

The command value of the forced position is always constant and is configured individually in the ETS (0... 100% in 10% steps). The command value is executed electrically at the output using a pulse width modulation (PWM).

-  When a forced position is active, valve outputs configured to the command value data formats "Switching - 1-bit" or "Constant - 1-byte with command value limiting value" are always activated by a constant command value with pulse width modulation. In this case, this constant command value is also included in the calculation of the largest command value (optional function) until the forced position is exited and no other function with a constant command value presetting (e. g. emergency operation, manual operation) is active.
-  The configured valve direction of action (deenergised closed / deenergised opened) is taken into account in the electrical activation of the outputs by a forced position. With deenergised closed valves, the switch-on time is derived directly from the configured PWM and the cycle time. In the case of deenergised opened valves, the switch-on time is inverted.

The actuator has a summer/winter switchover feature. Depending on the season, this allows the setting of different command value setpoints for a valve output for forced position Summer/winter switch-over for valve outputs. It is also possible to switch over the operation during an active forced position. In this case, the value belonging to the operation is activated immediately after the switchover.

If no summer / winter switchover is planned in the actuator, then only a command value can be configured in the ETS for the forced position.

For each valve output, the forced position is activated and deactivated via a separate 1-bit object. The telegram polarity can be configured. According to the priority control, an active forced position can be overridden by other device functions with a higher priority (e. g. service mode, manual operation). At the end of a higher priority function, the actuator executes the forced reaction for the valve outputs concerned once again if the forced position is still activated at this time.

Optionally, the command value of the forced position can also be activated in case of a bus voltage failure after the bus/mains voltage returns or after an ETS programming operation. This is only the recall of the configured command value and not the activation of the forced position as takes place via the 1-bit object.

-  The command value preset by an active forced position is also included in the determination of heat requirement. In addition, the command value of the forced position has an influence on the pump control.

At the end of a forced position, the behaviour of a valve output is permanently defined. For the affected valve outputs, the actuator always tracks the state most recently preset by functions with a lower priority (emergency operation) or by normal bus operation (activation by command value telegrams).

-  After resetting the device (bus voltage return, ETS programming operation), the command value objects initially contain the value "0".

Enabling the forced position object and configuring the forced position

The forced position as a locking function can be used for each valve output. This function is not enabled separately.

- Set the parameter "Forced position controllable via object" to "yes". Define the parameter "Object polarity" to the required telegram polarity. In addition, configure the required command values (optional for summer and winter mode).

The forced position object is enabled. The affected valve output is locked by a telegram according to the "restraint active" polarity at the defined command value (optional according to the most recently preset operation).

- Set the parameter "Forced position controllable via object" to "no".

The forced position object is not enabled. The forced position for locking the valve output is not possible. Only the command values can be configured, so that a state for the reset behaviour of the valve output can be optionally defined.

-  Updates of the object from "Forced position active" to "Forced position active" or from "Forced position inactive" to "Forced position inactive" produce no reaction.

-  The status preset via the forced position object is stored internally in the device after a bus voltage failure and is restored automatically after the bus voltage returns. After the bus voltage returns, the actuator activates the forced position and, in this way, locks the output, provided the tracked state allows this. However, when presetting the command values, only that behaviour is significant, according to the priority sequence, which the parameter "After bus voltage returns" defines (the command value of the forced position is not activated). The tracked state of the forced position is not then automatically tracked in the communication object by the actuator.

-  After an ETS programming operation, a forced position is always deactivated and the forced position object is "0". In the polarity "0" = Forced position active / "1" = No forced position, a "0" telegram must first be received to activate the forced position. If, after the bus voltage returns, the previously stored object value "0" is restored, then actuator will also activate the forced position in the polarity "0 = Forced position active / 1 = No forced position", thus locking the output!

- i** If the forced position object is not enabled, then only the command value parameters are available, so that valid preset values are available for the actuator reset behaviour, as required ("Activate command value according to forced position").

11.6.1 "Forced position" parameters

Outputs -> FanCoil -> Valves -> VAX - General -> Forced position

Command value	0%
	10%
	...
	30%
	...
	90%
	100%

When forced operation is activated via a 1-bit object, after the mains voltage returns or after an ETS programming operation, it is possible to set the forced command value configured here as the active command value.

When the command value of the forced position is recalled, the valve output configured to the command value data formats "Switching - 1-bit" or "Constant - 1-byte with command value limiting value" is always activated by a constant command value with pulse width modulation.

Command value (summer)	0%
	10%
	...
	30%
	...
	90%
	100%

When forced operation is activated via a 1-bit object, after the mains voltage returns or after an ETS programming operation, it is possible to set the forced command value configured here as the active command value. The command value preset here is only applied if summer operation is activated.

When the command value of the forced position is recalled, the valve output configured to the command value data formats "Switching - 1-bit" or "Constant - 1-byte with command value limiting value" is always activated by a constant command value with pulse width modulation.

Command value (winter)	0%
	10%
	...
	70%
	...
	90%
	100%

When forced operation is activated by means of a 1-bit object, the mains voltage returning or after an ETS programming operation, it is possible to set the forced command value configured here as the active command value. The command value preset here is only applied if winter mode is activated.

When the command value of the forced position is recalled, the valve output configured to the command value data formats "Switching - 1-bit" or "Constant - 1-byte with command value limiting value" is always activated by a constant command value with pulse width modulation.

Forced position controllable via object	Checkbox (yes / no)
This parameter enables the "Forced position - Activate / Deactivate" object. – Yes: The object "Forced position - Activate / Deactivate" is visible. The forced position is activated and deactivated via a separate 1-bit object. – No: The configured forced command values are used to reset the behaviour after the mains voltage returns and after ETS programming operation. A forced position cannot be activated.	

Object polarity	1 = forced position active / 0 = no forced position 0 = forced position active / 1 = no forced position

The telegram polarity of the "Forced position - Activate / Deactivate" object is defined here when the forced position object is enabled.

Status object	Checkbox (yes / no)
This parameter enables the "Forced position - Status" object. – Yes: The "Forced position - Status" object is visible. The polarity of the object is defined: 1 = forced position active / 0 = no forced position – No : The "Forced position - Status" object is not visible.	

11.6.2 Objects for forced position

Function	Name	Type	DPT	Flag
Forced position - Activate/Deactivate	VO ... - Input	1-bit	1,003	C, -, W, -, U
1-bit input object for activating and deactivating of a forced position. The telegram polarity can be configured. Updates of the object from "Forced position active" to "Forced position active" or from "Forced position inactive" to "Forced position inactive" produce no reaction. The status preset via the forced position object is stored internally in the device after a power failure and is restored automatically after the mains voltage returns.				
Function	Name	Type	DPT	Flag
Forced position - Status	VO ... - Output	1-bit	1,011	C, R, -, T, A
One-bit output object used to signal the status of a forced position. The polarity of the object is defined: 1 = forced position active / 0 = no forced position				

11.7 Command value status

Command value status

A status object can be optionally enabled for each valve output. The status object makes the active command value of a valve output available. In the status message, the actuator takes all the functions into account which have an influence on the command value implemented at the output. Depending on the configured data format of the input command value, the status object will possess the data formats named below...

- Input command value "Switching (1-bit)":
Data format of status object "1-bit",
- Input command value "Constant (1-byte) with pulse width modulation (PWM)":
Data format of status object "1-byte",
- Input command value "Constant (1-byte) command value limiting value":
Data format of status object "1-bit".

The status objects will assume different status values, depending on the input data formats of the command values and the state of operation of a valve output.

The actuator distinguishes between different functions and events that can have an effect on the valve outputs. Because these functions and events cannot be executed simultaneously, there is priority control. Each global or output-orientated function and each incoming event possesses a priority. Priorities for valve outputs. The function or the event with the higher priority overrides the lower-priority functions and events. Priority control also influences the status objects. That state is always transmitted as the status which is currently set at a valve output. If a function with a high priority is exited, then the status objects assume the command value of functions with a lower priority, providing that they are active.

Status value for input command value "Switching (1-bit)"...

- State of operation "Normal operation"
-> Status value = Most recently received input command value ("0" or "1"),
- State of operation "Emergency operation" (0... 100%)
-> Status value = emergency operation command value ("0" at 0%, "1" at 1... 100%),
- State of operation "Forced position" (0 ... 100%)
-> Status value = forced command value ("0" at 0%, "1" at 1... 100%),
- State of operation "Valve rinsing" (0%, 100%)
-> Status value = Current command value in rinsing operation ("0" when valve closed, "1" when valve open),
- State of operation "Service mode" (0%, 100%)
-> Status value = Service command value ("0" when valve forcibly closed, "1" when valve forcibly opened),
- State of operation "After device reset" (0... 100%)
-> Status value = According to presetting by parameter "Behaviour after bus or mains voltage returns" or "Behaviour after ETS programming operation" ("0" at 0%, "1" at 1... 100%),

- State of operation "Manual operation" (5... 100%)
-> Status value = Manual operation mode command value ("0" at 0% CLOSE, "1" at 5... 100% OPEN),
- State of operation "Short-circuit / overload" (0%, 100%)
-> Status value = Command value according to valve direction of action ("0" when de-energised closed, "1" when deenergised open).

Status value for input command value "Constant (1-byte) with pulse width modulation (PWM)"...

- State of operation "Normal operation" -> Status value = Most recently received input command value (0... 100%),
- State of operation "Emergency operation" (0... 100%)
-> Status value = Emergency operation command value (0... 100%),
- State of operation "Forced position" (0 ... 100%)
-> Status value = Forced command value (0 ... 100%),
- State of operation "Valve rinsing" (0%, 100%)
-> Status value = Current command value in rinsing operation ("0%" when valve closed, "100%" when valve open),
- State of operation "Service mode" (0%, 100%)
-> Status value = Service command value ("0%" when valve forcibly closed, "100%" when valve forcibly opened),
- State of operation "After device reset" (0...100%)
-> Status value = According to presetting by parameter "Behaviour after bus or mains voltage returns" or "Behaviour after ETS programming operation" ("0" at 0%, "1" at 1...100%),
- State of operation "Manual operation" (5... 100%)
-> Status value = Manual operation mode command value (0% CLOSE, 5...100% OPEN),
- State of operation "Short-circuit / overload" (0%, 100%)
-> Status value = Command value according to valve direction of action (0% when de-energised closed, 100% when deenergised open).

Status value for input command value "Constant (1-byte) command value limiting value"...

- State of operation "Normal operation"
-> Status value = According to evaluation of the input command value by limiting value and hysteresis ("0" for command value < limiting value - hysteresis or "1" for command value >= limiting value),
- State of operation "Emergency operation" (0... 100%)
-> Status value = emergency operation command value ("0" at 0%, "1" at 1... 100%),
- State of operation "Forced position" (0 ... 100%)
-> Status value = forced command value ("0" at 0%, "1" at 1... 100%),
- State of operation "Valve rinsing" (0%, 100%)
-> Status value = Current command value in rinsing operation ("0" when valve closed, "1" when valve open),

- State of operation "Service mode" (0%, 100%)
-> Status value = Service command value ("0" when valve forcibly closed, "1" when valve forcibly opened),
- State of operation "After device reset" (0... 100%)
-> Status value = According to presetting by parameter "Behaviour after bus or mains voltage returns" or "Behaviour after ETS programming operation" ("0" at 0%, "1" at 1... 100%),
- State of operation "Manual operation" (5...100%)
-> Status value = Manual operation mode command value ("0" at 0% CLOSE, "1" at 5... 100% OPEN),
- State of operation "Short-circuit / overload" (0%, 100%)
-> Status value = Command value according to valve direction of action ("0" when de-energised closed, "1" when deenergised open).

Activating the command value status function

The status message of the valve command value is a function of the valve outputs and can be enabled on the parameter pages "VOx - General -> Status".

- Set the "Valve command value" parameter to "yes".

Status feedback is enabled. The status object of the command value becomes visible in the ETS.

- Set the parameter to "no".

Status feedback is deactivated. No status object for the command value is available.

The feedback telegram is transmitted as soon as the status changes. An automatic telegram transmission of the feedback takes place after the bus voltage returns if the supply voltage of the actuators fails and returns or after an ETS programming operation (possibly with a delay).

- i** The status object does not transmit if the status does not change after the activation or deactivation of device functions or new input command values. Transmission only ever takes place after changes to the command value.

Setting the time delay of the command value status feedback

The state of the status message is not transmitted automatically to the bus after the bus voltage returns or after an ETS programming operation. In these cases, feedback can be time-delayed with the time delay being preset globally for all valve outputs together on the parameter page "Outputs -> FanCoil -> Valves".

- Set the parameter "Delay after bus voltage returns" to "Yes".

The status message is transmitted with a delay after the bus voltage returns or after an ETS programming operation. No feedback is transmitted during a running time delay, even if the valve state changes during this delay.

- Set the parameter "Delay after bus voltage returns" to "No".

The status message is transmitted immediately after the bus voltage returns or after an ETS programming operation.

- i If the supply voltage of the actuators fails and returns, then the status message is always transmitted without a delay, providing that the bus voltage supply is switched on.

Setting cyclical transmission of the command value status message

The status message telegram can also be transmitted cyclically via the object in addition to the transmission after changes.

- Set the parameter "Transmit on" to "change and cyclical".

Cyclical transmission is activated.

- Set the parameter "Transmit on" to "change".

Cyclical transmission is deactivated so that the status is transmitted to the bus only when changed by the actuator.

- i The cycle time is defined centrally for all the valve outputs on the parameter page "Outputs -> FanCoil -> Valves".
- i There is no cyclical transmission during an active time delay after the bus voltage returns or after an ETS programming operation.

11.7.1 Status parameters

Outputs -> FanCoil -> Valves -> VA ... - General -> Enabled functions

Status	Checkbox (yes / no)
This parameter generally enables the feedback functions. The feedback functions are configured on the "Status" parameter page.	

Outputs -> FanCoil -> Valves -> VA ... - General -> Status

Valve command value	Active Inactive
This parameter enables the status object "Command value - Status". The data point type depends on the "command value" input object Input command value "Switching (1-bit)": Data format of status object "1-bit", Input command value "Constant (1-byte) with pulse width modulation (PWM)": Data format of status object "1-byte", Input command value "Constant (1-byte) command value limiting value": Data format of status object "1-bit". The status object makes the active command value of the valve output available. All functions are taken into account that have an influence on the command value implemented at the output.	
Transmit on	Change Change and cyclical
The status feedback telegram can also be transmitted cyclically via the active signal object in addition to the transmission after changes. This parameter is only visible in case of enabled status feedback. Change: Cyclical transmission is deactivated so that the feedback telegram is transmitted to the bus only when the status is changed by the actuator. Change and cyclical: Cyclical transmission is activated. The cycle time is defined centrally for all the valve outputs on the parameter page "Outputs -> FanCoil -> Valves". There is no cyclical transmission during an active time delay after the mains voltage returns or an ETS programming operation.	

Delay after bus voltage returns	Checkbox (yes / no)
If used as active signal object, the state of the status feedback information is transmitted to the bus after the mains voltage returns or after an ETS programming operation. In these cases, feedback can be time-delayed with the time delay being preset globally for all valve outputs together on the "General valve outputs" parameter page. This parameter is only visible in case of enabled status feedback. active: The status feedback is transmitted with a delay after the mains voltage returns or after an ETS programming operation. No feedback is transmitted during a running time delay, even if the valve state changes during this delay. inactive: The status feedback is transmitted without a delay after the mains voltage returns or after an ETS programming operation.	

11.7.2 Objects for status

Function: Valve status

Function	Name	Type	DPT	Flag
Status command value	VO ... - Output	1-bit	1,001	C, R, -, T, A
1-bit output object to feed back the active switching command value of a valve output. In this case, the telegram polarity is fixed: "0" = Valve closed, "1" = Valve opened. This object is only available for valve outputs configured in the ETS to the command value data formats "Switching - 1-bit" or "Constant - 1-byte with command value limiting value". It may also occur with such command value outputs that a constant command value (PWM at the output) is active (e. g. after bus/mains voltage returns or a forced position and emergency operation or manual operation). In this case, the status object feeds back a "0" if the command value corresponds to "0%". The object returns a "1" when the set command value corresponds to "1... 100%". The object transmits the current status after the bus voltage returns and after an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.				

Function	Name	Type	DPT	Flag
Status command value	VO ... - Output	1-byte	5,001	C, R, -, T, A
1-byte output object to feed back the active constant command value of a valve output (0 ... 100% -> 0 ... 255). This object is only available for valve outputs configured in the ETS to the command value data format "Constant (1-byte) with pulse width modulation (PWM)". The object transmits the current status after the bus voltage returns and after an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.				

11.8 Short-circuit and overload detection on electronic valve outputs

The device is able to detect an electrical overload or a short circuit at the electronic valve outputs.

- i** It is not possible to detect short circuits or overloads if the valves are controlled via the relay or analogue outputs.

In the event of a short circuit or overload at the electronic valve output, it is detected and protected against destruction by being switched off. The status LED of the affected output starts to flash slowly in the event of a short circuit and quickly in the event of an overload/mains voltage failure. In this case, a short-circuit message or an overload/mains voltage failure message can be sent optionally to the bus by means of two separate 1-bit communication objects.

Short-circuit / overload detection is always active when a valve output is switched on (output energised).

- i** After a short-circuit/overload switch-off, the output must be disconnected from the mains and the fault rectified before the output can resume operation.
- i** A valve output affected by a short-circuit / overload (valve completely closed when deenergised closed or completely opened when deenergised open) does not influence the calculation of the "largest command value" or the heat requirement and pump control.

Short-circuit / overload signal telegrams

Signal telegrams are sent only for the outputs at which the detection of a short circuit or overload has been activated. To do this, enable the signal telegram on the parameter page "Outputs -> FanCoil -> Valves -> Status" using the "Short circuit" and "Overload/mains voltage failure" parameters. The telegram polarity of the status telegram can be set and a delay after the bus voltage returns can also be programmed.

- i** The object transmits the current status after the bus voltage returns and an ETS programming operation after a delay, providing that a delay after the bus voltage returns has been activated.

Resetting a short-circuit message

Valve outputs, identified as having shorted or being overloaded, are detected by the device. In this case, affected valve outputs can no longer be activated by any functions of the device. The cause of the error must be eliminated and the "short-circuit" state also be reset, so that the outputs can be activated again.

There are two options for the recommissioning of one or more deactivated valve outputs...

- Global reset of all short-circuit states:
All the short-circuit states of the device can be reset together. The 1-bit communication object "Short circuit - Reset" is available for this purpose and can be activated on the parameter page "Outputs -> FanCoil -> Valves" using the "Global reset 'Short circuit'" parameter. As soon as the actuator receives a "1" telegram via this object, all the short-circuit states will be reset immediately.

The actuator then deactivates the short-circuit state of each valve output and also retracts the short-circuit signals. If all or individual valve outputs are still short-circuited at this moment, the short-circuit will be set again.

A "0" telegram to the "Reset short-circuit" object produces no reaction.

- Reset by switching off the supply voltage for the electronic valve output or the entire device:

Short-circuit states can be reset by switching off the supply voltage. The following procedure is required for this:

a) Switching off the supply voltage to the electronic valve outputs or the entire device. This causes the device to detect the failure of the supply voltage and the short-circuit message is reset.

b) Rectify the cause of the short-circuit

c) Switch the power supply back on. The valves can then be controlled again normally.

d) If all or individual valve outputs are still short-circuited after the valve voltage supply returns, the short-circuit message will be set again

11.8.1 Short-circuit and overload detection parameters

Outputs -> FanCoil -> Valves -> VA ... - General -> Status

Short-circuit	Checkbox (yes / no)
The device is able to detect a short circuit at the electronic valve outputs and thus protect them against destruction. Outputs which have experienced a short-circuit are deactivated after an identification period. In this case, a short-circuit message can be sent out by means of a KNX communication object. In the "yes" setting, this parameter enables the object "Short-circuit - Status". This parameter is only visible when the valves are controlled via electronic valve outputs.	

Delay after bus voltage returns	Checkbox (yes / no)
The state of the status feedback is sent to the bus after a short circuit. In these cases, feedback can be time-delayed with the time delay being preset globally for all valve outputs together on the "General valve outputs" parameter page. This parameter is available only if the short-circuit message has been enabled. active: The status feedback is transmitted with a delay after the mains voltage returns or after an ETS programming operation. No feedback is transmitted during a running time delay. inactive: The status feedback is transmitted without a delay after the mains voltage returns or after an ETS programming operation.	

Object polarity	1 = short-circuit / 0 = no short-circuit 0 = short-circuit / 1 = no short-circuit
When the object for short-circuit messaging is enabled, the telegram polarity of the "Short-circuit / overload - Status" object is defined here.	

Overload/mains voltage failure	Checkbox (yes / no)
The device is able to detect an overload at the electronic valve output. This is done by measuring the temperature at the output. If the temperature is too high, the output switches off. The output is therefore no longer supplied with mains voltage. This is the same state as in the event of a mains voltage failure at the electronic valve outputs. An overload/mains voltage failure message can be sent to the bus by means of a KNX communication object. In the "yes" setting, this parameter enables the object "Overload / Main voltage failure - Status". This parameter is only visible when the valves are controlled via electronic valve outputs.	

Delay after bus voltage returns	Checkbox (yes / no)
The state of the status feedback is sent to the bus after an overload/mains voltage failure. In these cases, feedback can be time-delayed with the time delay being pre-set globally for all valve outputs together on the "General valve outputs" parameter page. This parameter is available only if the overload/mains voltage failure message has been enabled. active: The status feedback is transmitted with a delay after the mains voltage returns or after an ETS programming operation. No feedback is transmitted during a running time delay. inactive: The status feedback is transmitted without a delay after the mains voltage returns or after an ETS programming operation.	

Object polarity	1 = mains voltage failure / 0 = no mains voltage failure 0 = mains voltage failure / 1 = no mains voltage failure
If the object for the overload/mains voltage failure signal has been enabled, the telegram polarity of the object "Status - Overload/mains voltage failure" object will be defined here.	

Outputs -> FanCoil -> Valves

Global reset short-circuit	Checkbox (yes / no)
If a short circuit occurs at a valve that is connected to a electronic valve output, the output will be deactivated. The output is not automatically switched back on after the fault has been rectified. Either the supply voltage of the electronic valve output or the supply voltage of the entire device must be enabled and switched on again. Alternatively, this parameter can also be used to enable a communication object that allows the outputs to be reset globally. This means that outputs where a short circuit occurred are ready for operation again. This parameter is only visible when the valves are controlled via electronic valve outputs.	

11.8.2 Objects for short-circuit and overload detection

Function	Name	Type	DPT	Flag
Short circuit - Status	VO ... - Output	1-bit	1,005	C, R, -, T, A
1-bit output object to signal an identified short-circuit at the affected valve output. The telegram polarity can be configured. The object transmits the current status after the bus voltage returns and an ETS programming operation after a delay, providing that a delay after the bus voltage returns has been activated.				

Function	Name	Type	DPT	Flag
Overload / mains voltage failure - Status	VO ... - Output	1-bit	1,005	C, R, -, T, A
1-bit output object to signal an identified overload or mains voltage failure at the affected valve output. The telegram polarity can be configured. The object transmits the current status after the bus voltage returns and an ETS programming operation after a delay, providing that a delay after the bus voltage returns has been activated.				

Function	Name	Type	DPT	Flag
Short-circuit - Reset	General valve outputs - Input	1-bit	1,015	C, -, W, -, U
One-bit input object for globally resetting the short-circuit when controlling the valve via electronic valve outputs. This communication object can be used to globally reset a short circuit on the electronic valve outputs without having to enable the electronic valve outputs or the entire device. As soon as the device receives a "1" telegram via this object, all the short-circuit states will be reset immediately. If all or individual valve outputs are still short-circuited at this moment, the short-circuit message will be set again. A "0" telegram to the "Short-circuit reset" object produces no reaction.				

11.9 Valve rinsing

To prevent calcification or sticking of a valve which has not been activated for some time, the actuator has an automatic valve rinsing function. Valve rinsing can be executed cyclically or using a bus command, causing the activated valves to run through the full valve stroke for a preset period of time. During valve rinsing, the actuator activates a command value of 100% without interruption for the affected valve output for half of the configured "Valve rinsing time". For this, the valves open completely. After half the time, the actuator switches to a command value of 0%, causing the connected valves to close completely.

If necessary, the intelligent valve rinsing can be enabled. In so doing, cyclical rinsing using the full stroke is only executed when a defined minimum command value limiting value was not exceeded during actuator operation.

-  During valve rinsing, the actuator executes the command values "1" (corresponds to "100%" - open completely) and "0" (corresponds to "0%" - close completely) for valve outputs configured with a command value limiting value for the data formats "Switching (1-bit)" or "Constant (1-byte)".
-  The actuator takes the valve direction of action configured in the ETS into account in the electrical activation of the valve output.

At the end of valve rinsing, the actuator automatic sets the tracked command value according to the priority control (see chapter "Priorities for valve outputs" ► Page 105).

-  The actuator does not execute valve rinsing if a higher-priority function is active. Nonetheless, the actuator internally starts the rinse length, as soon as the device receives a command for valve rinsing (cyclically or via bus command). If, during an active rinsing time, higher-priority functions are exited, then the actuator will execute the remaining residual time of the rinse function. If the rinsing time continuous to elapse during a function with a higher priority, then there is no residual time. Thus, the actuator will not execute the previously started valve rinsing.
-  If the bus control of individual valve outputs is disabled as part of a permanent manual operation, then the actuator will save the start commands of a valve rinsing operation in the background. In this case, the actuator will start the rinse time immediately after the lifting of the disabling function. If, after this, the manual operation is exited after the rinse time has started (and no other higher-priority functions are active), then the actuator will also execute valve rinsing actively.
-  The actuator also executes valve rinsing by starting the rinse time, even if the valve voltage supply has been switched off. A bus voltage failure immediately interrupts an active rinsing operation. When the bus/mains voltage returns, a previously interrupted rinsing operation is not executed again.
-  Valve rinsing influences the status feedback of the active command value.

Valve rinsing possesses a separate 1-bit status object. Optionally, this object can be used, for example, to display a KNX visualisation that valve rinsing is taking place (rinse operation time running). The status telegram can be used, for example, to disable a KNX room temperature controller for the length of the valve rinsing. Particularly in the case of long rinsing times, the disabling of the room temperature controller, possibly in combination with the disabling of the controller operation, can make a positive contribution to the suppression of the oscillation behaviour of the controller. The telegram polarity of the status object is fixed: "0" = Valve rinsing inactive, "1" = Valve rinsing active.

- i** The object transmits the current status after the bus and mains voltage returns and after an ETS programming operation without a delay.

Enabling valve rinsing

Valve rinsing can only be used if it has been enabled in the ETS.

- Set the parameter "Valve rinsing" on the parameter page "VOx - Enabled functions" to "yes". Using the "Valve rinsing time" parameter on the parameter page "VOx - General - Valve rinsing", configure for how long the rinse function (100% -> 0%) is to be executed.

Valve rinsing is enabled. Additional parameters become visible in the ETS, presetting whether the valve rinsing is to be activated cyclically and / or with bus control.

Set the length of the valve rinsing to the adjusting cycle time of the electrothermal actuators in such a way that they open and close completely. This is usually guaranteed by configuring the rinsing length to double the adjusting cycle time.

- Set the "Valve rinsing" parameter to "no".

Valve rinsing is not available.

Configuring cyclical valve rinsing

The actuator can perform valve rinsing cyclically, if necessary. When using the cyclical valve rinsing, a rinse operation can be started automatically after a configurable cycle time (1 ... 26 weeks). Here too, the valve rinsing length configured in the ETS defines the time for the once-only, complete opening and closing of the activated valve drives. At the end of a rinsing operation, the actuator always restarts the cycle time.

Valve rinsing must be enabled and a valid rinsing time configured.

- Set the "Cyclical valve rinsing" parameter to "yes". In the case of the "Repeat all" parameter, configure how often valve rinsing is to be performed automatically.

Cyclical valve rinsing is enabled.

- Set the "Cyclical valve rinsing" parameter to "No".

Cyclical valve rinsing is completely disabled. Valve rinsing can only be started by the communication object (if enabled).

- i** Each ETS programming operation resets the cycle time. The first rinsing operation with cyclical valve rinsing takes place after an ETS programming operation after the first time cycle has elapsed. If there is a bus voltage failure, the actuator saves the remaining residual time of the current time cycle. The residual cycle time is restarted after the bus voltage returns. A bus voltage failure immediately interrupts an active rinsing operation. If a rinsing operation was previously interrupted, it is not executed again after the bus voltage returns. The actuator then starts a new time cycle for cyclical valve rinsing.

Optionally, intelligent cyclical valve rinsing can be additionally activated. Here, valve rinsing is only executed repeatedly, if, in the current time cycle, a minimum command value limiting value, configurable in the ETS, was not exceeded. If the active command value exceeds the limiting value, then the actuator will stop the cycle time. The actuator only restarts the cycle time if, in the further course of the command value change, a command value of "0%" or "OFF" (completely closed) is set (see figure 45). This prevents valve rinsing if the valve has already run through a sufficiently defined stroke.

If, after exceeding the configured limiting value, the value was not completely closed at least once (command value "0%" or "OFF"), then no further cyclical valve rinsing will take place.

Use of the intelligent cyclical valve rinsing means that rinsing operations over the entire valve stroke are only then used when this is sensible and actually required. For example, in the summer months, the use of heating power is lower. In consequence, the valves are activated less frequently by command values, meaning that valve rinsing should be performed as anti-sticking protection. In the winter months, it is frequent necessary to activate heating valves using normal command value telegrams. The intelligent valve rinsing ensures that no redundant valve rinsing is not performed in the winter. In the summer, the intelligent control performs valve rinsing cyclically.

- i** The cycle time is always started after an ETS programming operation. This also occurs when the active command value exceeds the configured limiting value after the download.
- i** The combination of intelligent valve rinsing with a command value limit with a minimum command value limiting value. If a minimum limiting value of the command value limit exists, then the active command value of the affected valve output is never "0%". In consequence, the actuator would never restart the cycle time as part of intelligent valve rinsing.

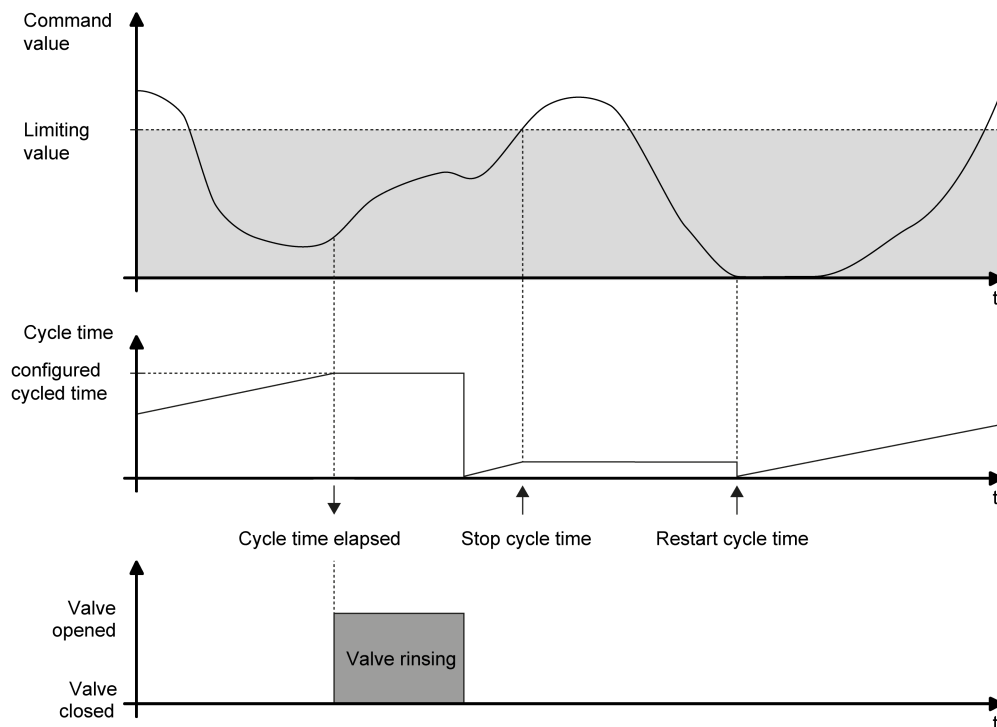


Figure 45: Example of a minimum command value limiting value for intelligent valve rinsing

- Set the parameter "Take command values of last cycle time into account" to "yes". Define the command value limiting value via the parameter "Stop valve rinsing from command value of".

Intelligent cyclical valve rinsing is activated. Valve rinsing is only executed when the configured limiting value was exceeded at least once in the previous time cycle and, consequently, the valve was run to the "0%" command value.

- Set the parameter "Take command values of last cycle time into account" to "no".

Intelligent cyclical valve rinsing is deactivated. Valve rinsing always takes place as soon as the set cycle time has expired.

- i** Valve rinsing can optionally be started and, if required, stopped using a communication object. If valve rinsing was started by the object, then the actuator will stop the cycle time of the cyclical valve rinsing operation. The cycle time is only restarted after the rinsing operation has been fully executed without interruption or a stop command was received via the object.

Configuring bus-controlled valve rinsing via an object

If necessary, valve rinsing can be started and, optionally, stopped using its own 1-bit communication object. This means that it is possible to activate a rinsing operation of the valve controlled by time or an event. It is also possible, for example, to cascade multiple FanCoil actuators, so that they perform valve rinsing simultaneously (link of the individual status objects to the input objects of the valve rinsing).

Bus control can only be used if it has been enabled in the ETS.

Valve rinsing must be enabled and a valid rinsing time configured.

- Set the parameter "Valve rinsing controllable via object" to "yes". In the case of the parameter "Object polarity", configure the telegram polarity, thus presetting whether the bus-controlled starting and stopping, or, alternatively, only starting, is to be possible.

Bus-controlled valve rinsing is enabled. The communication object is visible. The name of the object is aligned to the setting of the permitted telegram polarity ("Start / stop valve rinsing" or "Start valve rinsing"). When a start command is received, the actuator immediately starts the configured time for a rinsing operation. The actuator also actively executes valve rinsing if no higher-priority function is active. If bus-controlled stopping is permitted, then the actuator will also react to stop commands by immediately interrupting running rinsing operations.

- Set the parameter "Valve rinsing controllable via object" to "no".

Bus-controlled valve rinsing is not available. Only cyclical or intelligent valve rinsing is possible.

- i** Updates of the object from "Start" to "Start" or "Stop" to "Stop" do not produce a reaction. The length of an elapsing valve rinsing operation or the cycle time of a cyclical valve rinsing operation are not restarted by this.

- i** Bus-controlled valve rinsing via the object can be combined with a cyclical valve rinsing operation. If valve rinsing was started by the object, then the actuator will stop the cycle time of the cyclical valve rinsing operation. The cycle time is only restarted after the rinsing operation has been fully executed without interruption or a stop command was received via the object.

11.9.1 Valve rinsing parameters

Outputs -> Valves -> VA .. - General -> Enabled functions

Valve rinsing	Checkbox (yes / no)
To prevent calcification or sticking of a valve which has not been activated for some time, the actuator has an automatic valve rinsing function. Valve rinsing can be executed cyclically or using a bus command, causing the activated valves to run through the full valve stroke for a preset period of time. During valve rinsing, the actuator activates a command value of 100% without interruption for half of the configured "Valve rinsing time". For this, the valves open completely. After half the time, the actuator switches to a command value of 0%, causing the connected valves to close completely. In the "Active" setting, this parameter enables valve rinsing.	

Outputs -> Valves -> VA .. - General -> Valve rinsing.

Length of valve rinsing	1 ... 5 ... 59 min
Here, preset for how long the rinse function (100% -> 0%) is to be executed. Set the length of the valve rinsing to the adjusting cycle time of the electrothermal actuators in such a way that they open and close completely. This is usually guaranteed by configuring the rinsing length to double the adjusting cycle time.	
Cyclical valve rinsing	Checkbox (yes / no)
The actuator can perform valve rinsing cyclically, if necessary. When using the cyclical valve rinsing, a rinse operation can be started automatically after a configurable cycle time (1 ... 26 weeks). Here too, the valve rinsing length configured in the ETS defines the time for the once-only, complete opening and closing of the activated valve drives. At the end of a rinsing operation, the actuator always restarts the cycle time. Yes: Cyclical valve rinsing is enabled. Each ETS programming operation resets the cycle time. The first rinsing operation with cyclical valve rinsing takes place after an ETS programming operation after the first time cycle has elapsed. If there is a power failure, the actuator saves the remaining residual time of the current time cycle. The residual cycle time is restarted after the mains voltage returns. A power failure immediately interrupts an active rinsing operation. If a rinsing operation was previously interrupted, it is not executed again after the mains voltage returns. The actuator then starts a new time cycle for cyclical valve rinsing. No: Cyclical valve rinsing is completely disabled. Valve rinsing can only be started by the communication object (if enabled).	
Repeat all	1 ... 5 ... 26 weeks
This parameter defines how often cyclical valve rinsing is to be performed automatically.	
Take command values of last cycle time into account	Checkbox (yes / no)
Optionally, intelligent cyclical valve rinsing can be additionally activated here. Here, valve rinsing is only executed repeatedly, if, in the current time cycle, a configured minimum command value limiting value was not exceeded. If the active command value exceeds the limiting value, then the actuator will stop the cycle time. The actuator only restarts the cycle time if, in the further course of the command value change, a command value of "0%" or "OFF" (completely closed) is set. This prevents valve rinsing if the valve has already run through a sufficiently defined stroke. If, after exceeding the configured limiting value, the value was not completely closed at least once (command value "0%" or "OFF"), then no further cyclical valve rinsing will take place.	
Stop valve rinsing from command value of	10...50...100%
This parameter defines the minimum command value limiting value of the intelligent valve rinsing. Intelligent valve rinsing is only executed repeatedly, if, in the current time cycle, a minimum command value limiting value configured here was not exceeded. If the active command value exceeds the limiting value, then the actuator will stop the cycle time.	

Valve rinsing controllable via object	Checkbox (yes / no)
If necessary, valve rinsing can be started and, optionally, stopped using its own 1-bit communication object. This means that it is possible to activate a rinsing operation of the valve controlled by time or an event. It is also possible, for example, to cascade multiple heating actuators, so that they perform valve rinsing simultaneously (link of the individual status objects to the input objects of the valve rinsing). Bus control can only be used if it has been enabled here.	
Object polarity	1 = start / 0 = stop 1 = stop / 0 = start 1 = start (stop not possible) / 0 = ---
This parameter sets the telegram polarity of the object for external valve rinsing. The name of the object is aligned to the setting of the permitted telegram polarity ("Start / stop valve rinsing" or "Start valve rinsing"). When a start command is received, the actuator immediately starts the configured time for a rinsing operation. The actuator also actively executes valve rinsing if no higher-priority function is active. If bus-controlled stopping is permitted, then the actuator will also react to stop commands by immediately interrupting running rinsing operations.	

11.9.2 Objects for valve rinsing

Function	Name	Type	DPT	Flag
Valve rinsing - Start Valve rinsing - Start / Stop	VO ... - Input	1-bit	1,003	C, -, W, -, U
1-bit input object for starting and stopping valve rinsing. Valve rinsing can be activated by time or an event using this object. It is also possible, for example, to cascade multiple heating actuators, so that they perform valve rinsing simultaneously (link of the individual status objects to the input objects of the valve rinsing). The telegram polarity can be configured. Stopping can be prevented via the object as an option. The time of cyclical valve rinsing is restarted as soon as an externally started valve rinsing operation is stopped by a Stop telegram or by the expiry of the rinsing time. Updates of the object from "Start" to "Start" or "Stop" to "Stop" do not produce a reaction. The length of an elapsing valve rinsing operation or the cycle time of the cyclical valve rinsing are not restarted by this.				
Function	Name	Type	DPT	Flag
Valve rinsing - Status	VO ... - Output	1-bit	1,002	C, R, -, T, A
1-bit output object for status feedback of a valve rinsing operation. The telegram polarity is fixed: "0" = Valve rinsing inactive, "1" = Valve rinsing active. The object transmits the current status after the bus and mains voltage returns and after an ETS programming operation without a delay.				

11.10 Operating hours counter

The operating hours counter determines the switch-on time of a valve output. For the operating hours counter, an output is actively on, when it is energised, i. e. when the status LED on the front panel of the device. As a result, the operating hours counter determines the time during which deenergised closed valves are opened or deenergised opened valves are closed.

The operating hours counter can either be configured as a second meter or as an hour meter.

- **Second counter**
The actuator adds up the determined switch-on time accurately to the second for an energised output. The totalled operating seconds are added in a 4-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 13.100.
- **Hour counter**
The actuator adds up the determined switch-on time accurately to the minute for an energised output in full operating hours (see figure 46). The totalled operating hours are added in a 2-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 7.007.

i During pulse width modulation (PWM) at a valve output, the operating hours counter only evaluates the switch-on time of the PWM signal.

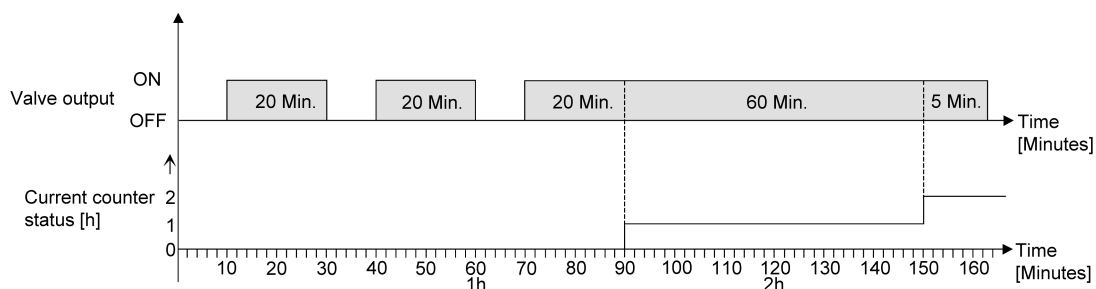


Figure 46: Function of the operating hours counter (using the example of an up-counter)

In the as-delivered state, the operating hour values of all valve outputs of the actuator is "0". If the operating hours counter is not enabled in the configuration of an output, no operating hours will be counted for the valve concerned. Once the operating hours counter is enabled, however, the operating hours will be determined and added up by the ETS immediately after commissioning the actuator.

If the operating hours counter is subsequently disabled again in the parameters and the actuator is programmed with this disabling function, all the operating hours previously counted for the valve output concerned will be deleted. When enabled again, the meter reading of the operating hours counter is always set to "0".

The operating hours values (full hours) or operating seconds stored in the device will not be lost in case of a bus voltage failure or by ETS programming.

On the hour counter: Any summed up operating minutes (full hour not yet reached) will be rejected in this case, however.

After the bus voltage returns or after an ETS programming operation, the actuator passively updates the "Operating hours counter - Meter reading - Status" communication object for each output. The object value can be read out if the read-flag is set. The object value, depending on the configuration for the automatic transmission, is actively transmitted if necessary to the KNX once the configured transmission delay has elapsed after the bus voltage returns (see "Set transmission behaviour of the operating hours counter").

The operating hours counter detects any operation of the valve outputs in manual operation, which means that switching on an output also activates a counting operation and the manual switch-off interrupts a counting operation.

No operating hours are counted if the supply voltage of the valves is not switched on.

Activating the operating hours counter

The operating hours counter only counts the operating hours of a valve output if it was activated in the ETS.

- Set the parameter "Operating hours counter" on the parameter page "VO x - General -> Enabled functions" to "yes".

The operating hours counter is activated.

- Set the parameter "Operating hours counter" on the parameter page "VO x - General -> Enabled functions" to "no".

The operating hours counter is deactivated.

-  Deactivation of the operating hours counter and subsequent programming with the ETS resets the counter status to "0".

Setting the direction of counting of the operating hours meter

The operating hours counter can optionally be configured as an up-counter or down-counter. Depending on this counting direction, a signal value or start value can optionally be set. In this way it is possible, for example, to monitor the operating time of a valve drive by restricting the meter range.

Up-counter:

After activating the operating hours counter by enabling in the ETS or by restarting, the operating hours are counted starting at "0". A maximum of 65,535 hours or 2147483647 can be counted (corresponds to approx. 66 years) before the meter stops and signals a meter operation by means of the object "Operating hours counter - Counter elapsed - Status".

A signal value can optionally be set in the ETS or specified via the communication object "Operating hours counter - Signal value". In this case, the meter operation is signalled to the bus via the "Operating hours counter - Meter elapsed - Status" object

if the limiting value is reached, but the meter continues counting - if it is not restarted - up to the maximum value of 65535 hours and then stops. Only a restart initiates a new counting operation.

Down-counter:

After enabling the operating hours counter in the ETS, the meter reading is on "0" and the actuator signals a counter operation for the output concerned after the programming operation or after the bus voltage returns by means of the "Operating hours count. elapsed" object. Only after a restart is the down-counter set to the maximum value of 65,535 hours or 2147483647 seconds (corresponds to approx. 66 years) and the counter operation is started.

Optionally, a start value can be set in the ETS or specified by means of the communication object "Start value for operating hours counter". If a start value is set, the down-counter is initialised with this value instead of the maximum value after a restart. The meter then counts the start value downwards by the hour. When the down-counter reaches the value "0", the meter operation is signalled to the bus by means of the "Operating hours counter - Meter elapsed - Status" object and the counting is stopped. Only a restart initiates a new counting operation.

The use of the operating hours meter must be set on the parameter page "VO x – General -> Operating hours counter".

- Set the parameter "Counting direction" to "Forward". Set the parameter "Specify signal value" to "via parameter" or "via object" if it is necessary to monitor the signal value. Otherwise, reset the parameter to "no". In the "via parameter" setting, configure the required signal value (1 ... 2147483647 s or 1 ... 65535 h).

The meter counts the operating hours forwards starting from "0". If monitoring the signal value is activated, the actuator transmits a "1" telegram via the object "Operating hours counter - Meter elapsed - Status" for the valve output concerned as soon as the specified value is reached. Otherwise, the counter operation is first transmitted when the maximum value is reached.

- Set the "Counting direction" parameter to "Backward". Set the parameter "Specify start value" to "via parameter" or "via object" if it is necessary to specify a start value. Otherwise, reset the parameter to "no". In the "via parameter" setting, configure the required start value (1 ... 2147483647 s or 1 ... 65535 h).

The meter counts the operating hours down to "0" after a restart. With a start value preset, the start value is counted down, otherwise the counting operation starts at the maximum value. The actuator transmits a "1" telegram via the object "Operating hours counter - Meter elapsed - Status" for the valve output concerned as soon as the value "0" is reached.

- i** The value of the communication object "Operating hours counter - Meter elapsed - Status" is permanently stored internally. The object is initialised immediately with the value saved before after the bus voltage returns or after an ETS programming. If an operating hours counter is in this case identified as having elapsed, i.e. if the object value is a "1", an additional telegram will be

actively transmitted to the bus. If the meter has not yet elapsed (object value "0"), no telegram is transmitted after the bus voltage returns or after an ETS programming operation.

- i** With a signal value or start value preset via object: The values received via the object are first validly accepted and permanently saved internally after a restart of the operating hours counter. The object is initialised immediately with the value saved last after the bus voltage returns or after an ETS programming. The values received will be lost in the case of a bus voltage failure or by an ETS download if no counter restart was executed before. For this reason, when specifying a new start or limiting value it is advisable to always execute a counter restart afterwards as well. A standard value is predefined provided that no signal value or start value has been received yet via the object. The values received and stored via the object are reset to the standard value if the operating hours counter is disabled in the parameters of the ETS and a ETS download is being performed.
- i** With a signal value or start value predefined via object: If the signal value or start value is predefined with "0", the actuator will ignore a counter restart to avoid an undesired reset (e. g. in construction site mode -> operating hours already counted by manual operation).
- i** If the counter direction of an operating hours counter is reversed by reconfiguration in the ETS, a restart of the meter should always be performed after programming the actuator so that the meter is reinitialised.

Restarting the operating hours counter

The meter reading of the operating hours can be reset at any time by the communication object "Operating hours counter - Reset". The polarity of the reset telegram is predefined: "1" = Restart / "0" = No reaction.

- Characterise the communication object "Operating hours counter - Restart" with "1".

In the up-counter the meter is initialised with the value "0" after a restart and in the down-counter initialised with the start value. If no start value was configured or predefined by the object, the start value is preset to 65,535 hours or 2147483647 seconds.

During every counter restart, the initialised meter reading is transmitted actively to the bus. After a restart, the signal of a counter operation is also reset. At the same time, a "0" telegram is transmitted to the bus via the object "Operating hours counter elapsed".

In addition, the signal or start value is initialised.

- i** If a new signal or start value was specified via the communication object, the counter should always be restarted afterwards too. Otherwise, the values received will be lost in the case of a bus voltage failure or by an ETS download.

If a start value or signal value is specified with "0", there are different behaviours after a restart, depending on the principle of the preset value...

Preset as parameter:

The meter elapses immediately after a counter restart.

Preset via object:

A counter restart will be ignored to avoid an undesired reset (e. g. after installation of the devices with operating hours already being counted by manual operation). A start value or signal value greater than "0" must be specified in order to perform the restart.

Transmission behaviour of the operating hours counter

The current value of the operating hours counter is always tracked in the communication object "Operating hours counter - Meter reading - Status". After the bus voltage returns or after an ETS download, the actuator passively updates the "Operating hours counter - Meter reading - Status" communication object in each valve output. The object value can be read out if the read-flag is set.

In addition, the transmission behaviour of this communication object can be set.

The use of the operating hours meter must be set on the parameter page "VO x – General -> Enabled functions".

- Set the parameter "Transmission behaviour" to "on change by interval value". Set the parameter "Counting interval" to the desired value.

The meter reading is transmitted to the bus as soon as it changes by the pre-defined counting value interval. After the bus voltage returns or after an ETS programming operation, the object value is automatically transmitted immediately if the current meter reading corresponds to the counting interval or a multiple thereof. A meter reading "0" is always transmitted in this case.

- Set the parameter "Transmission behaviour" to "cyclical".

The counter value is transmitted cyclically. The cycle time is defined on the parameter page "General valve outputs". After the bus voltage returns or after an ETS programming operation, the meter reading is transmitted to the KNX after the configured cycle time has elapsed.

11.10.1 Operating hours counter parameters

VO ... - General - Enabled functions

Operating hours counter	Checkbox (yes / no)
The operating hours counter can be enabled here. The operating hours counter determines the switch-on time of a valve output. For the operating hours counter, an output is actively on, when it is energised, i. e. when the status LED on the front panel of the device. As a result, the operating hours counter determines the time during which deenergised closed valves are opened or deenergised opened valves are closed. If the operating hours counter is not enabled, no operating hours will be counted for the valve output concerned. Once the operating hours counter is enabled, however, the operating hours will be determined and added up by the ETS immediately after commissioning the actuator. If the operating hours counter is subsequently disabled again in the parameters and the actuator is programmed with this disabling function, all operating hours previously counted will be deleted. When enabled again, the meter reading of the operating hours counter is always set to "0".	

VO ... - General - Operating hours counter

Counting method	Seconds Hours
The operating hours counter can either be configured as a second meter or as an hour meter. Second counter: The actuator adds up the determined switch-on time accurately to the second for a switched-on valve output. The totalled operating seconds are added in a 4-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 13.100. Hour counter: The actuator adds up the determined switch-on time accurately to the minute for a switched-on valve output in full operating hours. The totalled operating hours are added in a 2-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 7.007.	
Counting direction	Forwards Backwards
The operating hours counter can be configured as an up-counter or down-counter. The setting here influences the visibility of the other parameters and objects of the operating hours counter.	
Specifying a signal value	Checkbox (yes / no)
If the up-counter is used, a signal value can optionally be predefined. The setting "No" deactivates the reporting value. This parameter is visible only with "counting direction = forwards".	

Preset value	via parameter via object
This parameter defines whether the signal value can be set via a separate parameter or adapted individually by a communication object from the bus. This parameter is visible only with "counting direction = forwards".	
Signal value	0...2147483647 s * 0...65535 h **
The signal value of the up-counter is set here. Once this signal value is reached, an "ON" telegram is transmitted via the object "Operating hours counter - Meter elapsed - Status". The meter itself continues until the maximum meter reading is reached and then stops. *: With second counter **: With hours counter This parameter is only visible if the parameter "Preset value" is set to "via parameter".	
Specify start value	Checkbox (yes / no)
If the down-counter is used, a start value can optionally be predefined. This parameter defines whether the start value can be set via a separate parameter or adapted individually by a communication object from the bus. The setting "No" deactivates the start value. This parameter is visible only in "counting direction = backwards".	
Preset value	via parameter via object
This parameter defines whether the signal value can be set via a separate parameter or adapted individually by a communication object from the bus. This parameter is visible only with "counting direction = forwards".	
Start value	0...2147483647 s * 0...65535 h **
The start value of the down-counter is set here. *: With second counter **: With hours counter This parameter is visible only if "counting direction = backwards" and the parameter "Preset value" is set to "via parameter".	
Cycle time	0...23 h 0...15...59 min 0...59 s
This parameter defines the cycle time for the cyclical transmission. Setting the cycle time hours, minutes and seconds.	

Counting interval	0...3600...2147483647 s *
	0...1...65535 h **
The interval of the counter value is set here for automatic transmission. The current meter reading is transmitted to the KNX after the interval configured here. *: With second counter **: With hours counter This parameter is only visible if the parameter "Transmission behaviour" is set to "on change by interval value".	

11.10.2 Objects for operating hours counter

Function	Name	Type	DPT	Flag
Operating hours counter - Restart	VO ... - Input	1-bit	1,015	C, -, W, -, U
1-bit object for resetting the operating hours meter of a fan output ("1" = restart, "0" = no reaction).				

Function	Name	Type	DPT	Flag
Operating hours counter - Meter reading - Status	VO ... - Output	4-byte	13,100	C, R, -, T, A
4-byte object to transmit or read out the current meter reading of the operating hours meter of a fan output. Value range: 0...2147483647 seconds In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation. In the as-delivered state, the value is "0". This object is only available with the second counter.				

Function	Name	Type	DPT	Flag
Operating hours counter - Meter reading - Status	VO ... - Output	2-byte	7,007	C, R, -, T, A
2-byte object to transmit or read out the current meter reading of the operating hours meter of a fan output. Value range: 0...65,535 hours In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation. In the as-delivered state, the value is "0". This object is only available with the hour counter.				

Function	Name	Type	DPT	Flag
Operating hours counter - Meter elapsed	VO ... - Output	1-bit	1,002	C, R, -, T, A

1-bit object to sign that the operating hours counter has elapsed (forwards counter = signal value reached / backwards counter = value "0" reached). With a message, the object value is actively transmitted to the KNX ("1" = message active / "0" = message inactive).

In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation.

Function	Name	Type	DPT	Flag
Operating hours counter - Signal value / Start value	VO ... - Input	4-byte	13,100	C, R, W, -, A

4-byte object for external specification of a signal/start value of the operating hours meter of a fan output.

Value range: 0...2147483647 seconds

This object is only available with the second counter.

Function	Name	Type	DPT	Flag
Operating hours counter - Signal value / Start value	VO ... - Input	2-byte	7,007	C, -, W, -, U

2-byte object for external specification of a signal/start value of the operating hours meter of a fan output.

Value range: 0...65,535 hours

This object is only available with the hour counter.

12 Fan controller

Introduction

The device contains a fan controller, which allows the fan to be controlled by heating and cooling systems operated by circulating air, such as fan coil units (FanCoil units), depending on a command value calculated in the controller or using manual operation. The FanCoil control can be configured on the "General -> HVAC" parameter page. The number of FanCoil channels, the number of existing fan levels and the type of fan and valve control can be parametrised here. A connection aid on this page shows the outputs to which the fans and valves must be connected, depending on the control type.

0-10 V outputs or relay outputs are available to control the fans. Different parameters are available depending on the selection.

The individual fans can be configured on the parameter page "Outputs -> FanCoil -> Fan -> LA ... - General". With regard to the control, threshold values for the fan speed changeover and voltage values for the analogue control, the hysteresis between the threshold values and the dwell time when changing the speed as well as the behaviour when changing by several fan levels. Furthermore, the behaviour during automatic/manual switchover and the start-up and coasting behaviour can be set on this parameter page. An operating hours counter, fan status and fan protection can be activated.

- i** The device is reinitialised after an ETS programming operation or after the bus voltage returns. After initialisation, the fan assumes the state it had before programming or the bus failure. This cannot be parametrised.

Fan control priorities

The device distinguishes between different functions that can have an effect on an output. In order to prevent conflicting states, each available function has a certain priority. The function with the higher priority overrides the one with the lower priority.

Manual control of the outputs of the actuator has the second-highest priority. Only the dwell time (pause time) for a level change-over has a higher priority, and is always retained even in case of manual control. If so programmed in the ETS, the start-up level also initially overrides the one preselected manually when any fan level is switched on for the first time.

Taking into account all additional functions, the following priorities have been defined...

- 1st priority: dwell time / pause "OFF" for level change-over (top priority)
- 2nd priority: start-up stage and start-up time
- 3rd priority: manual operation on site at the device
- 4th priority: run-on times for heating and cooling
- 5th priority: disabling function
- 6th priority: fan level limitation

- 7th priority: valve or fan protection
- 8th priority: manual fan control
- 9th priority: normal operation (control via the bus by command values etc.)

12.1 Fan configuration

After the fan levels have been configured, i.e. the appropriate number and the type of control have been set and the command value lower limits incl. the hysteresis have been configured, the fan level behaviour of a fan coil channel can be configured in the ETS.

It is generally recommended to adhere to this sequence when configuring the ETS because the parameters that define the behaviour of the fan (parameter page "Outputs -> FanCoil -> Fan -> LA .. - General") depend on the configuration parameters ("General -> HVAC" parameter page).

The adjustable parameters vary depending on the type of fan control, whether via relay outputs or via 0-10 V outputs. When controlling via 0-10 V outputs, the fan level switchover is assigned corresponding delay times internally in the fan, if necessary, so that these parameters are hidden in the ETS.

Analogue fan control

In contrast to fan control via relay outputs, analogue control offers the following advantages:

- The fan speed can be set in the same way as the command value and can therefore be finely adjusted.
- Only one output is required for control
- The speed can be variably parametrised by specifying the voltage values for the individual threshold values.
- The stage is changed silently.

Fan stages, threshold values and analogue values

In automatic mode, the device converts command values for heating and/or cooling that are received via the bus into equivalent fan levels. The one-byte command value telegrams have a decimal value range of 0...255. This decimal value range is limited to the percentage range of 0 ... 100% command value shown.

With analogue fan control, the stages are required merely for configuration and manual operation. The following examples show the effect of adjusting the threshold value and analogue value.

Example 1 for five fan levels

Fan levels	Thresholds	Analogue values
OFF -> Level 1	10%	1 V = switch-on voltage
Level 1 -> Level 2	30%	3 V
Level 2 -> Level 3	60%	6 V

Fan levels	Thresholds	Analogue values
Level 3 -> Level 4	70%	7 V
Level 4 -> Level 5	80%	8 V = maximum voltage

Automatic mode:

The larger the active command value, the larger the active fan level to be set by the actuator. To allow the device to evaluate which of the up to five fan levels of a fan must be actively set, each fan level is assigned a threshold value of the command value. The assignment is made in the ETS by parametrising a threshold value (1 ... 100%) per fan level.

In addition, an analogue value is specified which is to be used for control when switching to the next stage. In example 1, the fan switches ON at a command value of 10% and a switch-on voltage of 1 V is applied to the output terminals.

If the command value now increases to 20%, the output voltage will not remain at 1 V, but will increase to 2 V analogously to the command value. If the command value rises to 50%, the voltage will rise to 5 V

If the command value is increased further to 79%, the voltage will also be increased to 7.9 V.

Because 8 V is the maximum voltage set, increasing the command value to 90% would only cause the voltage to increase to 8 V.

Example 2 for five fan levels and customised parametrisation

If you wish to run the fan at maximum speed, the maximum voltage can be increased to 10 V. However, 10 V would already be reached at a command value of 80%. If a speed analogous to the command value is also required in the upper speed range, the threshold value for the highest level can also be increased to 100%.

In this example, no linear assignment between threshold values and analogue values is parametrised.

If, for example, you prefer the fan to run slowly at medium voltage, but then run at maximum speed at larger command values, this is possible as described in example 2.

Fan levels	Thresholds	Analogue values
OFF -> Level 1	10%	1 V = switch-on voltage
Level 1 -> Level 2	30%	2 V
Level 2 -> Level 3	40%	3 V
Level 3 -> Level 4	60%	4 V
Level 4 -> Level 5	100%	10 V = maximum voltage

The switch-on behaviour here is the same as in the first example. If the command value is increased to 20%, the voltage at the output will rise to 1.5 V and 3.5 V will be present at the analogue output if it is increased to 50%.

If the command value is now increased to 80%, the voltage will rise to 7 V and to 8.5 V at 90% command value. The voltage increases linearly between the individual stage values.

Control of the fan via relay outputs

Alternating principle and level principle

With standard commercially available fan coil units, a distinction is usually made between two different ways of controlling the fan levels:

- The change-over principle (only one level output can be switched on – all other levels must switch off),
- The level principle (the fan level outputs switch one after another (hierarchically) – lower levels remain switched on, higher levels switched off.).

Which of these two principles has to be used should be obtained from the technical documentation of the connected fan coil. The setting is then performed separately in the ETS for each fan coil channel.

The following tables illustrate the switching behaviour as a function of the specific active fan level and as a function of the principle that has been set.

The examples show the fan levels with the use of only one fan coil channel and the maximum number of fan levels (1... 5). Control of the fan levels with two fan coil channels (2 x 1...3) is carried out in a similar manner.

Control of the fan levels with the level principle (fan outputs switch hierarchically one after the other):

fan level used	Output 7	Output 8	Output 9	Output 10	Output 11
none (off)	off	off	off	off	off
Level 1	ON	off	off	off	off
Level 2	ON	ON	off	off	off
Level 3	ON	ON	ON	off	off
Level 4	ON	ON	ON	ON	off
Level 5	ON	ON	ON	ON	ON

Control of the fan levels with the change-over principle (only one output is switched on):

fan level used	Output 7	Output 8	Output 9	Output 10	Output 11
none (off)	off	off	off	off	off
Level 1	ON	off	off	off	off
Level 2	off	ON	off	off	off
Level 3	off	off	ON	off	off
Level 4	off	off	off	ON	off
Level 5	off	off	off	off	ON

The change-over principle:

When a fan is switched on, there is always only one fan level output active "ON". If the active fan level is changed, the fan coil actuator first switches the previously

switched-on fan level off ("OFF" state), and only after that switches the other output on.

In this case the "Pause 'OFF' for level change-over" parameterised in the ETS is maintained. This means that when the fan level is changed the fan coil actuator remains in the "OFF" state for the parameterised period, and switches directly to the specified level only after the time has elapsed.

Example:

Level 3 is active, then change-over to level 5 by changing the command value → First the fan level output 3 is switched off → After that the actuator waits for the parameterised pause time → Only after that does it switch directly to level 5.

i When the fan is switched on, it is switched directly to the required fan level.

The level principle:

When a fan is switched on, several outputs are switched on, depending on the active fan level. When the fan level is increased, the adjacent output with the next higher output number is also switched on; the lower outputs remain switched on. When the active fan level is decreased, the switched-on output with the largest output number is switched off.

When the fan level is changed through more than one level, the change is not carried out abruptly, but rather always via interim brief activation of the intervening level(s). In this case the "Dwell time for level change-over" parameterised in the ETS is maintained (see "Defining behaviour of the fan levels"). This means that the actuator remains in each intervening level, and is only changed over to the next after the next following level after the time has elapsed.

Example:

Level 3 is active, then change-over to level 5 by changing the command value → Level 4 is switched to first and then there is a wait → Only after that is level 5 switched to.

When the fan is switched on, the first level is also switched on initially, and only switched to Level 2 etc. after the end of the dwell time. When the fan level is changed by only one level, it is switched immediately to the adjacent fan level with no pause.

The following applies to both principles: When the fan is switched off, a fan run-on time is executed if parametrised. Any activated fan level limitation is also taken into account.

Number of fan levels

The device can be adapted very flexibly to the specific fan coil application required by means of parameter configurations. Thus initially the number of fan levels required for the connected devices can be defined.

Up to 5 fan levels can be parametrised when controlling the fan via analogue outputs. When controlled via relay outputs, the maximum number of usable fan levels depends on the number of fan coil channels configured in the ETS; with **one** FanCoil channel it is possible to use 1 ... 5, with **two** channels, 1 ... 3 fan levels.

The following table shows an overview of the output assignments with relay control and only one FanCoil channel:

Number of fan levels	Output 7	Output 8	Output 9	Output 10	Output 11
5	Level 1	Level 2	Level 3	Level 4	Level 5
4	Level 1	Level 2	Level 3	Level 4	Switching/ Venetian blind
3	Level 1	Level 2	Level 3	Switching/ Venetian blind	Switching/ Venetian blind
2	Level 1	Level 2	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind
1	Level 1	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind	Switching/ Venetian blind

The following table shows an overview of the output assignment in the event of relay control with two FanCoil channels:

Number of fan levels	Output 7	Output 8	Output 9	Output 10	Output 11	Output 12
3	LA1: level 1	LA1: level 2	LA1: level 3	LA2: level 1	LA2: level 2	LA2: level 3
2	LA1: level 1	LA1: level 2	Switching/ Venetian blind	LA2: level 1	LA2: level 2	Switching/ Venetian blind
1	LA1: level 1	Switching/ Venetian blind	Switching/ Venetian blind	LA2: level 1	Switching/ Venetian blind	Switching/ Venetian blind

Configuring control of the fan levels via relay outputs

The fan levels are controlled via relay outputs (level or change-over principle) separately in the ETS for each fan channel.

- i** This parameter is not available when the fan is controlled via an analogue output. Because the fan is only ever controlled via one output.

Before this the number of fan coil channels, the type of FanCoil system and the number of fan levels must be set on the parameter page "General -> HVAC".

- Set the "Control" parameter on the parameter page "Outputs -> FanCoil -> Fan -> LA .. - General" to "Only one fan output switches (alternating principle)".

As soon as the fan is running, there is always only one fan level output switched on. All other non-active levels are switched off.

- Set the "Control" parameter on the parameter page "Outputs -> FanCoil -> Fan -> LA .. - General" to "Switch fan level outputs hierarchically (level principle)".

When the fan is switched on, the fan level outputs switch one after another (hierarchically). All fan levels lower than the active fan level remain switched on, higher ones switched off.

Setting threshold values for command values

To enable the device to evaluate which of the up to five fan levels of a FanCoil channel must be actively set, each fan level is assigned a threshold value of the command value. The assignment is made in the ETS by parametrising a command value (1 ... 100%) per fan level.

As soon as a command value reaches or crosses a threshold value, the actuator activates the corresponding fan level.

Before this the number of fan coil channels and the type of fan coil system must have been set on the parameter page "General - HVAC". Moreover, the number of fan levels must have been set already.

- Set the parameter "Threshold value for fan level ... (1 ... 100%)" on the parameter page "LAX - General" (x = number of the fan output) to the required command value. This setting must be made for each fan level.

A fan level switches on when its threshold command value is reached or exceeded. This fan level switches off again as soon as its command value lower limit minus the hysteresis is undershot again.

The following applies: threshold value, level 1 < threshold value, level 2 < ... < Threshold value, level 5.

The threshold values for the various fan levels set in the ETS may not be set to identical values, and also may not overlap! Otherwise the fan levels can no longer be controlled unambiguously according to their sequence!

The ETS does not catch such parameterisation errors automatically!

The number of parameters "Threshold values for fan speed ... (1 ... 100 %)" depends on the parametrised number of fan levels.

Relay outputs: fan levels and threshold values

In normal mode, the device converts command values for heating and/or cooling that are received via the bus into equivalent fan levels. The one-byte command value telegrams have a decimal value range of 0...255. This decimal value range is limited to the percentage range of 0% ... 100% command value shown.

Switch-on criterion:

The larger the active command value, the larger the active fan level to be set by the actuator. To allow the device to evaluate which of the up to five fan levels of a fan must be actively set, each fan level is assigned a threshold value of the command value. Assignment is made in the ETS by configuring a command value (1...100 %) for each fan level.

As soon as a command value reaches or crosses a threshold value, the actuator activates the corresponding fan level.

Example (3 fan levels):

Threshold value for fan level 1: 10%,

Threshold value for fan level 2: 30%,

Threshold value for fan level 3: 70%.

Reaction:

Active command value 25% → fan level 1 is active.

Now the active command value changes to 35%. → Fan level 2 is active.

Now the active command value changes to 80%. → Fan level 3 is active.

- i** Only when controlling via relay outputs: The change-over of the fan levels is always performed taking into account the fan level control set in the ETS (change-over principle or level principle), and taking into account the dwell time or pause time.

As long as the fan is switched off, command values below the threshold value for fan level 1 cause the fan to remain switched off.

Example (3 fan levels):

Threshold value for fan level 1: 10%,

Threshold value for fan level 2: 30%,

Threshold value for fan level 3: 70%.

Reaction:

Active command value is 0% → fan is switched off.

Now the active command value changes to 5%. → Fan remains switched off.

Now the active command value changes to 15%. → Fan level 1 is active.

Now the active command value changes to 35%. → Fan level 2 is active.

Switch-off criterion / hysteresis (only for relay outputs):

In addition to considering the parametrised threshold values for activating a fan level, the actuator also takes into account a hysteresis for deactivating fan levels. A fan level is only deactivated when the active command value reaches or undershoots the threshold value of the level less the hysteresis derived from the lower limit. The purpose of this behaviour is to prevent constant change-over of the fan levels when the command value is located at the limit between two fan levels.

In addition, when a fan is switched on, command values below the lower limit for fan level 1 minus the hysteresis cause the fan to be switched off. With the command value "0%" the fan switches off in any case.

- i** The hysteresis is only taken into account for deactivation of fan levels, i. e. for switching the fan to a lower level.

The hysteresis is parametrised in the ETS in common for all fan levels of a fan coil channel as a percentage value (0...50%). The absolute command value that has to be reached or undershot for deactivation of a fan level is derived relatively from each command value lower limit, taking into account the common hysteresis.

Example:**Hysteresis: 5%**

Threshold value for fan level 1: 10%,

Threshold value for fan level 2: 30%,

Threshold value for fan level 3: 70%.

Calculation:

Command value for deactivation of the fan level = lower limit of level - (lower limit of level * hysteresis)

→ Command value for deactivation of fan level 1 = 10% - (10% * 5%)

→ Command value for deactivation of fan level 1 = 0.1 - (0.1 * 0.05) = 0.1 - (0.005)

→ 0.005 is rounded up to 0.01 (full percentage - corresponds here to 1%)

→ Command value for deactivation of fan level 1 = 0.1 - (0.01) = 10% - 1% = 9%

...

→ Command value for deactivation of fan level 2 = 28%

→ Command value for deactivation of fan level 3 = 66%

Reaction:

Active command value 15% → fan level 1 is active.

Now the active command value changes to 5%. → Fan switches off.

Now the active command value changes to 35%. → Fan level 2 is active.

Now the active command value changes to 29%. → Fan level 2 remains active, because the hysteresis command value for level 2 (28%) was not undershot.

Now the active command value changes to 25%. → Fan level 1 is active.

i With the hysteresis setting "0%" the hysteresis is inactive, meaning that a fan level is deactivated immediately when its command value lower limit is undershot.

The following command value diagram (see figure 47) illustrates the evaluation of the lower limits for the fan levels and how the hysteresis is taken into account for a fan level change-over. The diagram is simplified, and does not take into account any dwell time or pause time for level change-over (only the active fan level is illustrated), no optional start-up level and no optional fan run-on time.

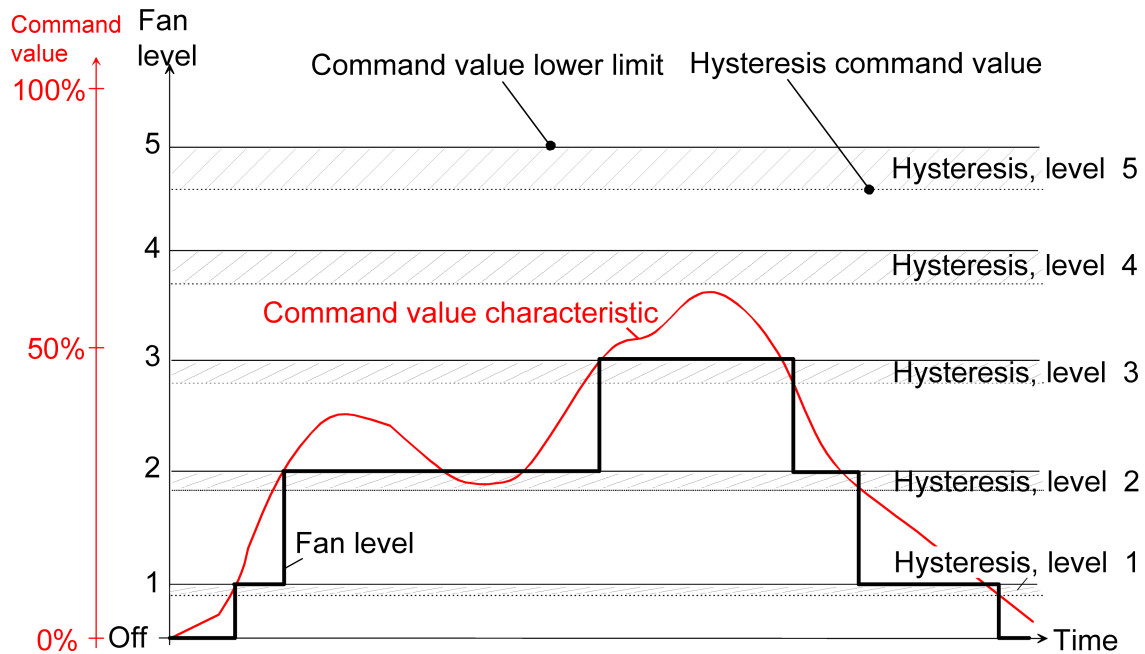


Figure 47: Simplified command value diagram to illustrate a fan level change-over (active fan level), taking into account the command value lower limits and the hysteresis

Setting the hysteresis for relay outputs

A fan level is only deactivated when the active command value reaches or undershoots the lower limit of the level less the hysteresis derived from the lower limit. The hysteresis is set in the ETS only once per fan coil channel, and is derived relatively from each command value lower limit.

Before this the number of fan coil channels and the type of fan coil system must have been set on the parameter page "General -> HVAC". Moreover, the number of fan levels must have been set already.

- Set the parameter "Hysteresis between level values (0 ... 20%)" on the parameter page "Outputs -> FanCoil -> Fan -> LA .. - General" to the required hysteresis.

The set hysteresis affects all of the fan levels relatively. The absolute hysteresis command value is derived individually for each level from its command value lower limit. As soon as the hysteresis command value for a level is undershot, the FanCoil actuator deactivates this level.

With the setting "0%", the hysteresis is inactive, meaning that a fan level is deactivated immediately when its command value lower limit is undershot.

Setting pause "OFF" when changing the level (relay outputs)

Pause "OFF" is set separately in the ETS for each fan channel. The pause is visible and effective only for channels with fan level change-over with the change-over principle and when controlled via relay outputs.

Before configuration of the pause time in the ETS, the number of fan coil channels and the type of fan coil system must have been set on the parameter page "General -> HVAC". The "control of the fan levels" must be set to the "change-over principle".

- Set the parameter "Pause 'OFF' when changing the level" on the parameter page "Outputs -> FanCoil -> Fan -> LA .. - General" to the required pause time.

When the fan level is changed-over, the last fan level output switched on is switched off. Only after the end of the pause time does the device switch on the "new" fan output.

i The pause time for change-over of the fan level cannot be deactivated!

Dwell time for level change-over / pause "OFF" for level change-over (relay outputs)

Due to fan motors' inertia, as a rule there is a limit to how short the time intervals for switching the fan levels can be, i. e. there is a limit to how quickly the fan speed can be varied. Often the technical information for a fan coil unit specifies change-over times that the device must maintain for each fan level change-over. The change-over direction, i. e. whether the level is being increased or decreased, does not play any role here.

When the fan level is changed-over, the "Control of the fan levels" (change-over principle / level principle) parametrised in the ETS is taken into account and distinguished.

Behaviour with the change-over principle (only one output switches):

When a fan is switched on, there is always only one fan level output active "ON". If the active fan level is changed, the fan coil actuator first switches the previously switched-on fan level off ("OFF" state), and only after that switches the other output on.

In this case the "Pause 'OFF' for level change-over" parameterised in the ETS is maintained. This means that when the fan level is changed the fan coil actuator remains in the "OFF" state for the parameterised period, and switches directly to the specified level only after the time has elapsed. If during the pause "OFF" new command values are received or specified, then after the end of the pause time the fan coil actuator switches to the fan level in accordance with the new specification.

If the fan was switched off and is switched on at any level, the device will immediately switch on the corresponding fan output without a pause. Similarly, the fan switches off immediately with no pause in case of a "0" command value or a switch-off command (e. g. disabling function) (if necessary taking into account a fan run-on time).

The following command value diagram (see figure 48) illustrates by means of an example the pause "OFF" for a fan level change-over with the change-over principle. The diagram is simplified and does not take into account any optional start-up level or additional fan run-on time. Moreover, the pause time is shown with an "exaggerated" length in order to convey the switching behaviour better.

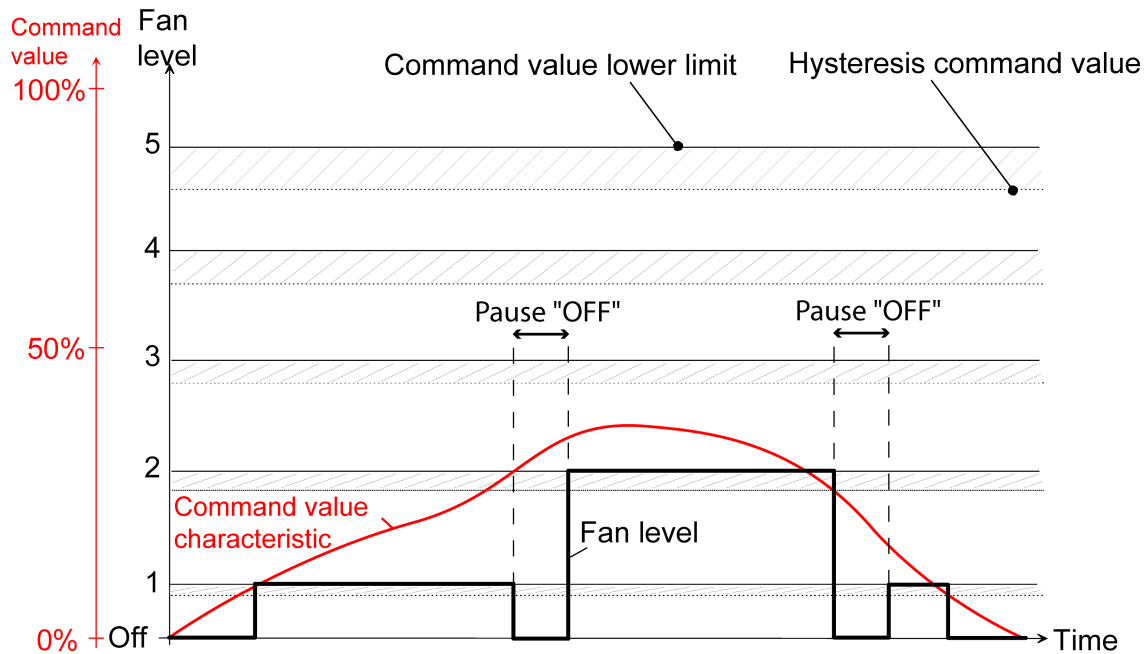


Figure 48: Simplified command value diagram to illustrate a fan level change-over with the change-over principle, taking into account the pause "OFF" 1

Behaviour with the level principle (fan outputs switch hierarchically):

When a fan is switched on, several outputs are switched on, depending on the active fan level. When the fan level is increased, the adjacent output with the next higher output number is also switched on; the lower outputs remain switched on. When the active fan level is decreased, the switched-on output with the largest output number is switched off.

When the fan level is changed through more than one level, the change is not carried out abruptly, but rather always via brief activation of the intervening level(s). In this case the "Waiting time when changing the level" parametrised in the ETS is maintained. This means that the device remains in each intervening level, and is only changed over to the next after the next following level after the time has elapsed.

When the fan is switched on, the first level is also switched on initially, and only switched to level 2 etc. at the end of the start-up time. When the active fan level is changed by only one level, it is switched immediately to the adjacent fan level with no pause.

The following command value diagram (see figure 49) illustrates by means of an example the dwell time for a fan level change-over with the level principle. The diagram is simplified and does not take into account any optional start-up level or additional fan run-on time. Moreover, the length of the dwell time is merely an example.

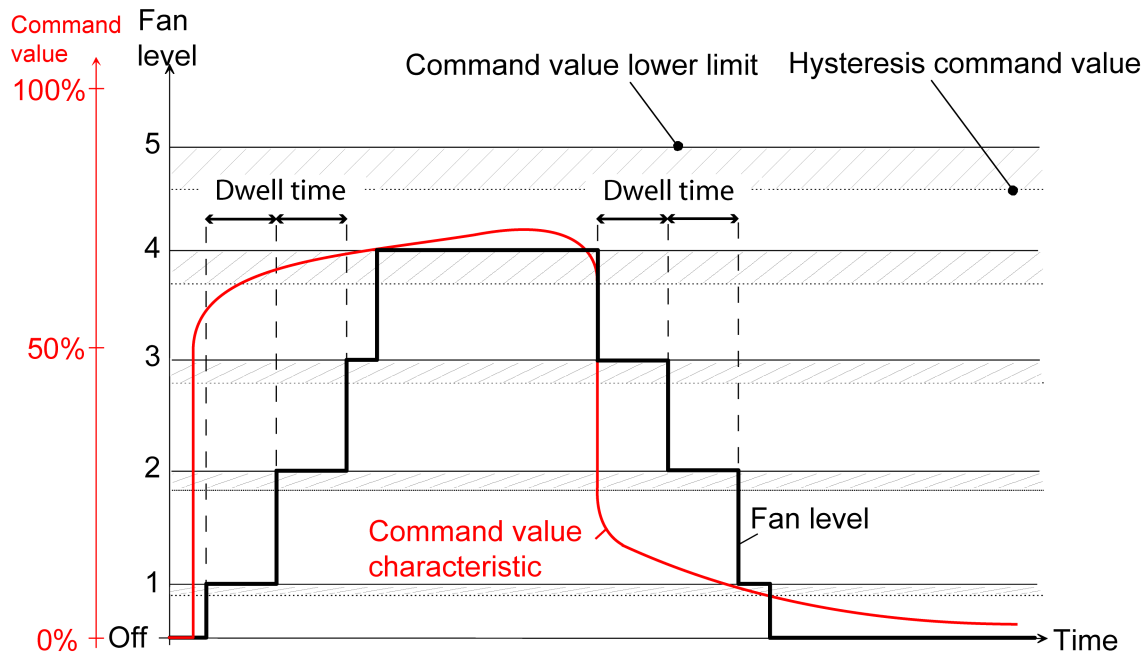


Figure 49: Simplified command value diagram to illustrate a fan level change-over with the level principle, taking into account the dwell time

Because the "Waiting time for level change-over" and the "Pause 'OFF' for level change-over" are derived from a specified characteristic of the connected fan coil unit, these times are always taken into account in all operating modes of the fan coil actuator (e. g. manual control, disabling function, etc.).

Setting the dwell time for level change-over

The dwell time is set separately in the ETS for each fan coil channel. The dwell time is only visible and effective for channels with fan level change-over with the level principle.

Before configuration of the dwell time in the ETS, the number of fan coil channels and the type of fan coil system must have been set on the parameter page "General - HVAC". The "control" must be set to the "level principle".

- Set the "Waiting time when changing the level" parameter on the parameter page "Outputs -> FanCoil -> Fan -> LA .. - General" to the dwell time.

When the fan level is changed through more than one level, the change is carried out taking the waiting time into account via brief activation of the intervening level(s).

- i** When the fan is switched on, the first level is initially switched on (allowing for a start-up time if necessary). Only after the start-up time has elapsed does the system switch to level 2 etc. When the active fan level is changed by only one level, it is switched immediately to the adjacent fan level with no pause.
- i** The dwell time when switching the level cannot be deactivated!

12.2 Fan automatic

Automatic operation / manual operation

The fan control distinguishes between automatic and manual operation.

Switching over between the two operating modes takes place using the 1-bit object "Auto/manual - toggle", through the operation of an extension or push-button sensor configured for "Room temperature controller control point -> Fan control auto/manual".

The parameter "Object polarity" on the fan output parameter page defines with which switching value automatic or manual operation is set via the communication object.

- i** You can switch to manual mode only in comfort operating mode.
- i** Updates to the object value "Automatic mode active" -> "Automatic mode active" or "Manual mode active" -> "Manual mode active" do not produce any reaction.

Automatic mode:

The command value of the controller is used internally in the device for automatic control of the fan levels. As a transition between the levels, there are threshold values, defined according to the command value of the controller, which can be set using parameters in the ETS. If the command value reaches the threshold value of a level during an increase of the command value, the appropriate level is activated. If the command value reaches below a threshold value, minus the configured hysteresis, during a reduction of the command value, then the switchover takes place into the next lowest fan level. The "Hysteresis between thresholds" value applies to all the threshold values. The hysteresis can be entered only when the fan is controlled via relay outputs. This parameter is not required if the fan is controlled via 0-10 V.

The threshold values for the individual fan levels can be configured freely in the range from 1 ... 100 % can be configured.

- i** The threshold values are not checked for plausibility in the ETS, meaning that incorrect configuration is possible. For this reason, it must be ensured that the threshold values, compared to the level value, are configured in ascending order (level 1 threshold value > level 2 threshold value > level 3 threshold value > ...).

When the command value changes, and thus the fan level, it is only possible to switch directly into neighbouring levels (exception: start-up level). Thus, in automatic operation, it is only possible, for example, to switch from level 2 down to level 1 or up to level 3. If the command value change exceeds or undershoots the threshold values of multiple fan levels, then, starting with the current fan level, all the fan levels are activated in succession until the fan level specified by the command value is reached. This parameter is not required if the fan is controlled via 0-10 V.

If the fan is switched off by the automatic system, then it runs on for the time configured as "Fan run-on time, heating" or "Fan run-on time, cooling", providing that these run-on times are configured in the ETS.

- i** If a start-up level is configured in the ETS ("Start-up via level" parameter), then, before the automatic activation of a fan level, it is possible to switch to a level, specified in the ETS and usually higher, for a brief time according to the command value (see section "Start-up level").
- i** The command value evaluated by the fan control in automatic mode can be optionally limited by the parameters "Command value is 0%, to .." or "Command value is 100% as soon as .." at the top and bottom. In addition, the command value can also be increased by a constant value by the "Command value offset" parameter .

Manual operation:

Automatic mode can be switched on and off by means of the "Auto/manual - switchover" communication object. This allows manual mode to be switched to with a push-button sensor or an extension input.

The parameter "Fan level on change-over to manual" then decides whether the fan level most recently set in automatic mode is retained, the fan is switched off or a defined fan level is to be set.

If the fan is switched off manually from the highest level, then it runs on for the time configured as "Fan run-on time, heating" or "Fan run-on time, cooling", providing that these run-on times are configured in the ETS.

- i** You can switch to manual mode only in comfort operating mode.

When manual fan control is deactivated, automatic operation is activated again if no function with a higher priority (e. g. disabling function) is active. In normal operation the device controls the outputs and operation according to the last command value received. Consequently all outputs are switched off if no command value or valid operation has been received at the instant that manual fan control is deactivated.

As long as manual fan control is deactivated, any telegrams that are received for manual control specification of the fan will be rejected.

This configuration can be useful if manual control is enabled at a central point in the building, for example by the concierge. The actual manual control of the fan coil unit is then performed separately in each room depending on requirements, for example using a push-button sensor.

The state of the manual fan control (activated / deactivated) is saved in non-volatile memory in the actuator together with the last manual level specification in the event of bus or mains voltage failure (depending on which of these voltages fails first). Manual fan control that was active before a bus or mains voltage failure is continued after the bus or mains voltage returns.

- i** The 1-bit object "Auto/manual - toggle" only allows switching over between automatic and manual operation. It is not possible to switch the fan levels on using the object.
- i** When changing from manual operation to automatic operation, the waiting time configured in the ETS is taken into account in the case of a connected level change!
- i** The parameter "Fan level on switchover to manual" is not checked for plausibility in the ETS, meaning that an implausible configuration is possible. For this reason, care should be taken to ensure that there is no level in the configuration which is higher than the actual fan levels. If a level which does not exist is to be configured for the change-over to manual control, then the fan controller changes over to the maximum possible level when changing over to manual operation.

Controlling the fan manually

If manual fan control is activated, the fan of the fan coil unit can be controlled directly by means of object "Fan speed - Manual operation - Default" or "Fan speed - Manual operation - Default" object. Either the corresponding fan level or the fan speed is set. If a fan speed is controlled, a conversion to the appropriate fan level will take place internally in the device. This is done using the parametrised number of fan levels (see following table). In this manner the manual fan control can be adapted very flexibly to the operating equipment (e. g. push-button sensor or operating panel).

The data format of the default object can be set to 1 byte objects fan speed (KNX DP type 5.001) or to the fan level (KNX DP type 5.100).

During manual fan control, the fan level corresponding to the value of the last specification telegram is set. If the value of the specification object exceeds the maximum number of fan levels or, in case of active level limitation, it is larger than the limitation level, then the maximum possible or limited level value is set. An object value of "0" switches off the fan if it was last switched on.

The value specification can also be performed if manual fan control is deactivated. In this case, the actuator saves the value temporarily and tracks it as soon as the manual control is activated. Immediately after a device reset (bus and mains voltage failure or ETS programming operation), the status of the fan always remains at the value that was present before the device reset.

- i** Manual fan control is possible only in comfort operating mode.
- i** With manual fan control, the threshold values entered in the ETS have no influence on the fan level to be controlled. The threshold values apply only to the command value in automatic mode.
- i** When controlling the fan via the analogue outputs, the entered analogue values are used as the basis for the voltage values that are applied to the analogue outputs depending on the level.

Depending on the number of fan levels, the fan is controlled manually if the fan speed is specified according to the following scheme:

One fan level:

Fan level 0 = fan level 0%

Fan level 1 = fan level 1 ... 100%

Two or three fan levels

Fan level DPT 5.100	Fan speed DPT 5.001		Fan level DPT 5.100	Fan speed DPT 5.001
0	0%		0	0%
1	1 ... 50%		1	1 ... 33%
2	51 ... 100%		2	34 ... 66%
			3	67 ... 100%

Four or five fan levels

Fan level DPT 5.100	Fan speed DPT 5.001		Fan level DPT 5.100	Fan speed DPT 5.001
0	0%		0	0%
1	1 ... 25%		1	1 ... 20%
2	26 ... 50%		2	21 ... 40%
3	51 ... 75%		3	41 ... 60%
4	76 ... 100%		4	61 ... 80%
			5	81 ... 100%

- i** If the fan is switched on using manual control, the actuator first carries out the start-up level, if it is configured in the ETS. Only after the start-up time for the start-up level has elapsed does the system switch to the manually preset fan level.
- i** No manual fan control is possible during fan protection.

Status signal for automatic fan system

The device has a separate status feedback for automatic/manual operation for each fan output. As soon as the "Automatic fan" parameter is enabled in the ETS, the 1-bit status object "Auto/manual - Status" will appear. The object polarity can be configured.

- i** When the bus voltage returns or after ETS programming, the feedback telegrams of the manual fan control are transmitted actively to the bus. Transmission only takes place after the end of the "Delay after bus voltage returns" (see "Delay after bus voltage returns"). If only the mains voltage is switched on again (bus voltage remained switched on without interruption), the device will not transmit the feedback telegrams of the manual fan control.
- i** The feedback of the manual fan control can, for example, be used to control a status LED on a push-button sensor or a status indication on an operating panel, or also to disable a room temperature controller.

12.2.1 Fan level depending on operating mode

The fan is normally controlled by the command values that come from a room temperature control system. However, there are also applications that make it necessary to adopt a special fan setting for a certain operating mode of the controller.

Example:

In a hotel room, a hotel card switch is used to switch between comfort mode and standby mode. Parameters in the ETS can be used to set that the fan should remain permanently switched on at least at level 1, regardless of the command value in standby mode, to ensure dehumidification of the room even during longer periods of absence.

For this purpose, each fan output has the "Operating mode (HVAC) switchover" communication object. The current operating mode is transferred by means of this object each time the object is changed. This information must be transmitted by the controller. Then the parameters

Fan level in standby mode and

Fan level in post operation

can be used to set the fan to a desired fan level, limit the fan control to a certain speed, switch off the fan completely or leave the control in automatic mode. This means the fan control can be influenced regardless of the temperature control.

12.2.2 Command value limiting values and command value offset

In automatic operation, the command value of the controller is used internally in the device to control the fan levels, according to the fan operating mode. As a transition between the levels, there are threshold values, defined according to the command value of the controller, which can be set using parameters in the ETS. The evaluation of the controller command values can be specially influenced for automatic fan control.

The command value to be evaluated for the fan controller can be influenced by the "Command value is 0% until the specified command value is greater than" parameter in the lower command value range. The fan controller only evaluates the command value according to the configured threshold values when the internal command value of the controller exceeds the configured limiting value. With smaller command values, the fan remains at a standstill.

Similarly, the command value to be evaluated for the fan controller can be limited by the "Command value is 100% as soon as the specified command value is greater than" parameter in the upper command value range. In this case, the controller evaluates command values which exceed the configured limiting value as 100%. This means that the fan works at full power even with command values not at the maximum.

The "Command value offset" parameter allows configuration of a constant command value offset for the fan. The fan controller always adds the configured offset to the command value to be evaluated. The effect of this is that the fan turns at greater power than required by the command value, according to the threshold values. The result of this is that, even if the command value is switched off, the fan will continue to work when the first command value threshold value is exceeded by the offset.

- i** A configured command value offset cannot not affect a command value of greater than 100%. The maximum command value of the fan controller is therefore defined as 100%.

12.3 Fan behaviour

The fan behaviour generally determines the reaction when the fan is switched on and off and when there is a level change-over. In addition it is possible to configure a level limitation here.

12.3.1 Fan run-on time

To prevent the cooling register from freezing at the end of a cooling process or overheating at the end of a heating process, a run-on time can be configured for the fan in the ETS. A separate run-on time can be parametrised for heating and cooling. The delayed switch-off of the fan means that the air flow through the heat exchanger of the fan coil unit is not stopped immediately. Instead, first only the valve is closed, thus continuing to blow air "through" the heat exchanger of the fan coil unit. The fan does not switch off until after the end of the run-on time.

The fan run-on time is taken into account only if the fan is switched off, for example, by a command value specification of "0".

If the device receives a command value not equal to "0" again within the run-on time or is specified as an active fan level, the run-on time will be aborted and the fan level will remain switched on. Moreover, the run-on time is not retrigged even if additional command values equal to "0" are received.

- i** The fan run-on time is not taken into account in the event of manual operation directly on the device and in the event of a bus voltage failure. In these cases the fan can be switched off with no delay.

The following command value diagram (see figure 50) illustrates the fan behaviour after switching off in the operation "Cooling", taking a fan run-on time into account. The diagram is simplified, and does not take into account any dwell time or pause time for level change-over (only the active fan level is illustrated).

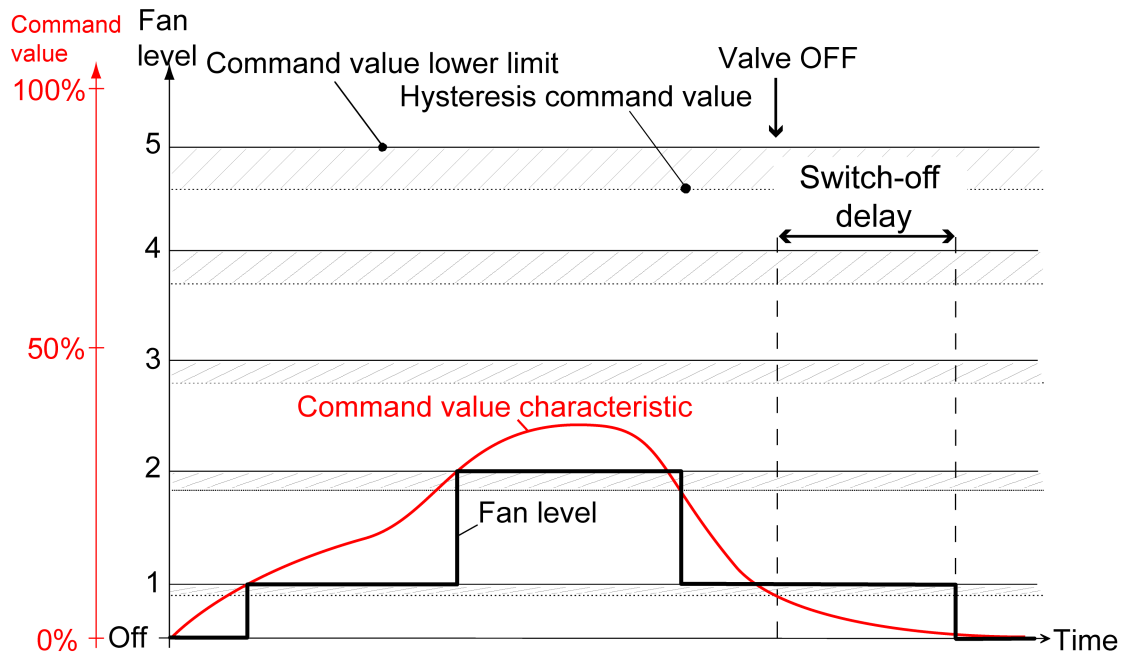


Figure 50: Simplified command value diagram to illustrate a fan level change-over (active fan level), taking into account a run-on time

Configuring the fan run-on time

The fan run-on time is configured separately in the ETS for each fan output separately for heating and cooling.

Before configuration of the fan run-on time in the ETS, the number of fan coil channels and the type of fan coil system must have been set on the parameter page "General -> HVAC".

- Set the "Fan run-on time for heating" and "Fan run-on time for cooling" parameters on the parameter page "Outputs -> FanCoil -> Fan -> LA .. - General" to the required run-on time. The setting "0 minutes 0 seconds" deactivates the run-on time completely.

When the fan is switched off in cooling or heating mode, the run-on time is started and executed. The fan switches off only after the run-on time has elapsed.

i The run-on time has no effect on the switching behaviour of the valves.

12.3.2 Start-up level

The fan can, if it was switched off before and should now start up, be switched on for a parametrised time at a defined start-up level. This start-up level can be any of the available fan levels, and is set in the ETS using the "Start-up via level" parameter.

- i** The start-up level is generally one of the higher fan levels of a fan coil unit, so that at the beginning of a heating or cooling process the fan can start up correctly (reliable start-up of the fan motor through transfer of a higher torque, and thus a higher fan speed).

The start-up level remains active for the "start-up time" configured in the ETS. In automatic operation, the controller only switches to the fan level specified by the command value, when the start-up time has elapsed. There is no switching over if, after the start-up time has elapsed, the fan level specified by the command value matches the start-up level.

- i** If the controlled fan requires a longer period of time for the start-up, then the start-up time in the ETS should be configured to higher values.

The start-up level is always taken into account by the fan control in automatic mode on switching the fan on (if it was previously switched off by the command value evaluation) and, in certain situations, also after activation of manual operation. On changing over to manual operation, the behaviour of the fan depends on the settings of the parameter "Fan level on changing over to manual" and "Start-up via level" and the previous fan level in automatic operation as follows.

- If, due to the "Fan level on change-over to manual" parameter, a defined level from level 1 to level 8 is requested, the controller will set this level on activating manual operation. In this case, the parameter "Start-up via level" is not taken into account if the fan was most recently switched off in automatic operation.
- If, due to the "Fan level on change-over to manual" parameter, "Fan level OFF" is requested, the controller will switch the fan off during the change-over to manual operation. On subsequent pressing of the button for manual control, the "Start-up via level" parameter is taken into account and the start-up level set. Then, the controller waits in this level until further manual operation.
- If, due to the "Fan level on change-over to manual" parameter, no defined level is requested ("No change" setting) and the fan was switched off during automatic operation, then it will remain switched off on changing over to manual operation. On subsequent pressing of the button for manual control, the fan is switched to the first level. The "Start-up via level" parameter is thus not taken into account.

- i** A configured start-up level is applied directly without waiting time.

- i** With a fan change-over via the 1-bit objects, when the fan level is changed by the controller, the active fan level is first switched off before the new level is switched on. In this case, switching off a fan level and the subsequent changeover to a new fan level is not evaluated as a fan start-up, also meaning that the start-up level is not set. In automatic operation, the start-up level is only taken into account if the fan was switched off previously by the command value evaluation (command value < level 1 threshold value minus hysteresis) and then is to start up using a new command value.

- i** The start-up via the start-up level also takes place after switching over from manual operation to automatic operation, providing that the fan was most recently switched off in manual operation and, in automatic operation, a new command value requires the fan to be switched on.

Fan level when the fan is switched on (start-up level)

The start-up level has a high priority in the device because it applies to a mechanical property of the connected fan. The start-up level is thus set and executed every time the fan is switched on regardless of whether the fan was switched on via a command value specification (normal operation), via manual fan activation, via the command value monitoring, via the disabling function, or via manual control. Even when the operation is changed (heating ↔ cooling), the start-up level is always executed when the fan is switched on again.

How long the fan runs after it is switched on in the start-up level can be configured in the ETS as a start-up time. The fan remains at the start-up level until the set start-up time has elapsed. Changes in the active fan level, for example via a new command value specification during the start-up time (exception: command value = "0"), do not cause a change-over of the fan level.

Only after the end of the start-up time does it switch to the fan level corresponding either to the last command value specification or to the direct fan level specification (disabling function, cyclical monitoring, manual fan control, etc.).

The following command value diagram (see figure 51) illustrates the fan behaviour after switching on, taking a start-up level into account. The diagram is simplified, and does not take into account any dwell time or pause time for level change-over (only the active fan level is illustrated), no optional start-up level and no additional fan run-on time.

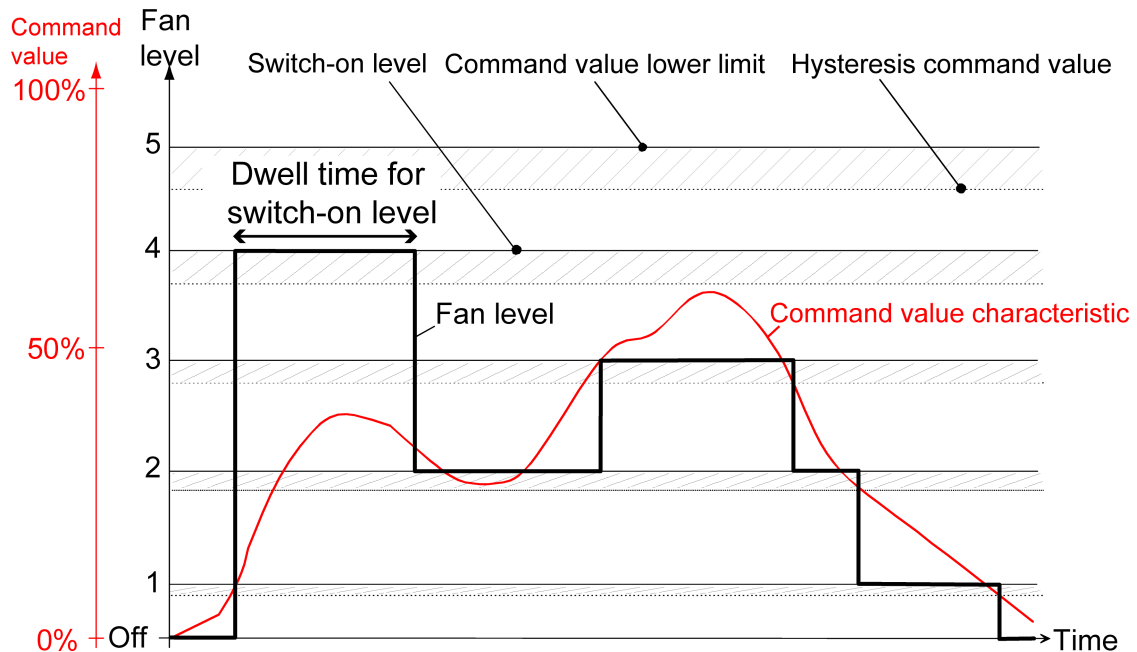


Figure 51: Simplified command value diagram to illustrate a fan level change-over (active fan level), taking into account the start-up level

When the fan is switched on to the start-up level, the "Control of the fan levels" (change-over principle / level principle) parametrised in the ETS is also taken into account. The following examples are intended to illustrate the behaviour of the device in this respect.

Example:

The fan is switched off.

Parametrised start-up level = 5 / control of the fan levels = change-over principle.

The fan is switched on by new command value specification / active fan levels according to command value = 3.

→ The fan first switches to the start-up level (level 5) and remains at this level for the "start-up time" set in the ETS.

→ At the end of the start-up time the fan is initially switched off for the duration of "pause 'OFF' for level change-over"

→ at the end of the pause time the fan is switched to the active fan level (level 3).

When the fan levels are controlled via relay outputs with the level principle (fan outputs switch hierarchically), in the case of level change-over initially all of the "lower" levels are switched on, taking the dwell time into account.

Example:

The fan is switched off.

Parametrised start-up level = 5 / control of the fan levels = level principle.

The fan is switched on by new command value specification / active fan levels according to command value = 3.

→ The fan initially switches the first fan level on (only output 3 closes) and remains at this level for the time of the "Dwell time for level change-over".

→ After that all of the additional levels are switched on in the same manner in stages

as far as the start-on level. The fan then remains at the start-up level (level 5) for the "start-up time" set in the ETS.

→ After the start-up time for the start-up level has elapsed, the fan switched step-by-step to the active fan level (level 3) while observing the "dwell time when changing the level".

Example:

The fan is switched off.

Parametrised start-up level = 2 / control of the fan levels = level principle.

The fan is switched on by new command value specification / active fan levels according to command value = 4.

→ The fan initially switches the first fan level on and remains at this level for the time of the "Dwell time for level change-over".

→ Then the start-up level (level 2) is switched to. The fan then remains there for the "start-up time" set in the ETS.

→ After the start-up time for the start-up level has elapsed, the fan is first switched to level 3 and then to the active fan level (level 4) while observing the "dwell time when changing the level".

The "start-up level" thus has a higher priority than the "Dwell time for level change-over".

- i The following applies for both principles: If the start-up level corresponds directly to the last active fan level specified, then the actuator remains in the set fan level after the end of the dwell time.

Configuring the start-up level

The start-up level and the start-up time are set separately for each fan in the ETS.

Before the configuration of the start-up level in the ETS, the number of fan coil channels and the type of fan coil system must have been set on the parameter page "General -> HVAC". Moreover, the number of fan levels must be set first.

- Set the "Start-up via level" parameter on the parameter page "Outputs -> Fan-Coil -> Fan -> LA .. - General" to the intended level (the selection is limited by the existing number of fan levels) for the fan used. Set the "start-up time" (0 ... 25 s).

The start-up level is activated. The fan switches to the start-up level and remains at this level until the start-up time has elapsed. Only after that does it switch to the specified active fan level.

- i When the fan is switched on to the start-up level and change-over to the active fan level after the end of the start-up time, the control of the fan levels according to the change-over principle or the level principle is always taken into account in the event of relay outputs.

- i** The start-up time cannot be re-triggered. If in normal operation the fan is to be switched off by specifying a new command value (command value = "0") during the start-up time, the start-up time will be terminated immediately and the fan also directly switched off. Furthermore, the "start-up time" has the highest priority in the actuator and overrides the "dwell time when changing the level".

12.3.3 Fan level limit

To reduce the fan noise of a fan coil, the fan level limit can be activated. The level limit reduces the sound emissions by limiting the maximum fan level to a fan level value specified in the ETS by the "Level limit" parameter (limit level). The limit can be switched on and off via the 1-bit object "Level limit - Activation/deactivation", and thus activated in accordance with requirements, for example via a timer during night-time hours in order to reduce noise in bedrooms, or via "manual" operation of a push-button sensor when a "quiet room" is needed (auditorium or the like). The limitation of the fan level is activated by receipt of a "1" telegram via the object "Level limitation - Activation/deactivation". Deactivation is therefore achieved by receiving a "0" telegram.

While a limitation is active, the fan controller prevents the fan from being switched to a higher level than the limitation level. If, at the instant that the limit is activated, the fan is running at a level that is greater than the limit level, then the fan level is immediately reduced to the limitation value. In this case, the switching sequence of the individual levels and the waiting time configured in the ETS are also taken into account in the level switchover.

The limitation level can be one of the available fan levels.

The level controller distinguishes between Automatic and Manual operation.

- i** The fan level limit overrides the start-up level. As a result, when the fan is switched on, if the limit is active, the level has an active limit and the start-up level is not approached. In this case, the limit level is jumped to without waiting.
- i** The level limit has no effect with an activated fan forced position.
- i** The parameter "Level limit" is not checked for plausibility, meaning that an incorrect configuration is possible. For this reason, care should be taken to ensure that there is no limit level in the configuration which is higher than the actual fan levels. If a higher limit level is configured, then the limit has no effect.

Level limitation

To reduce the fan noise of a fan coil, the fan level limit can be activated. The level limitation reduces the sound emissions by limiting the maximum fan level to a fan level value specified in the ETS (limitation level). The limitation can be switched on and off via a 1-bit communication object via the bus, and thus activated in accordance with requirements, for example via a timer during nighttime hours in order to reduce noise in bedrooms, or via "manual" operation of a push-button when a "quiet room" is needed (auditorium or the like).

The limitation of the fan level is activated by receipt of a "1" telegram via the object "Level limitation - Activation/deactivation". Deactivation is therefore achieved by receiving a "0" telegram.

While a limitation is active, the device prevents the fan from being switched to a higher level than the limitation level. If at the instant that the limitation is activated the fan is running at a level that is greater than the limitation level, then the fan level is immediately reduced to the limitation value. In this case the dwell time or the pause "OFF" is also taken into account in the level change-over. When the fan is switched on, however, reduction to the limitation value is only performed after any start-up level that may be active has been processed.

The limitation level can be one of the available lower fan levels; the largest fan level cannot be selected.

The level limitation has an effect on the following functions...

- Fan level control via the bus by means of regular command value telegrams,
- Manual fan control,
- Fan level at the end of the monitoring time in the event of cyclical monitoring,
- Fan protection.

Fan level limitation has no effect on...

- a disabling function,
- manual operation directly at the actuator,
- a start-up level.

After deactivation of one of these functions with higher priority, a level limitation is taken into account if the limitation is activated at that instant.

After an effective level limitation has been deactivated via the object, the device sets the non-limited setpoint fan level for the channel concerned, thus increasing the fan level directly if necessary. In this case, if the fan was switched off and switched on again via the level limitation, a start-up level is also executed, provided that it is parametrised.

The following command value diagram (see figure 52) illustrates by means of an example the reaction to a level limitation for an active fan level that is above the limitation level. The diagram is simplified and does not take into account any dwell or pause times when changing the fan level or any optional start-up speed or additional fan run-on time.

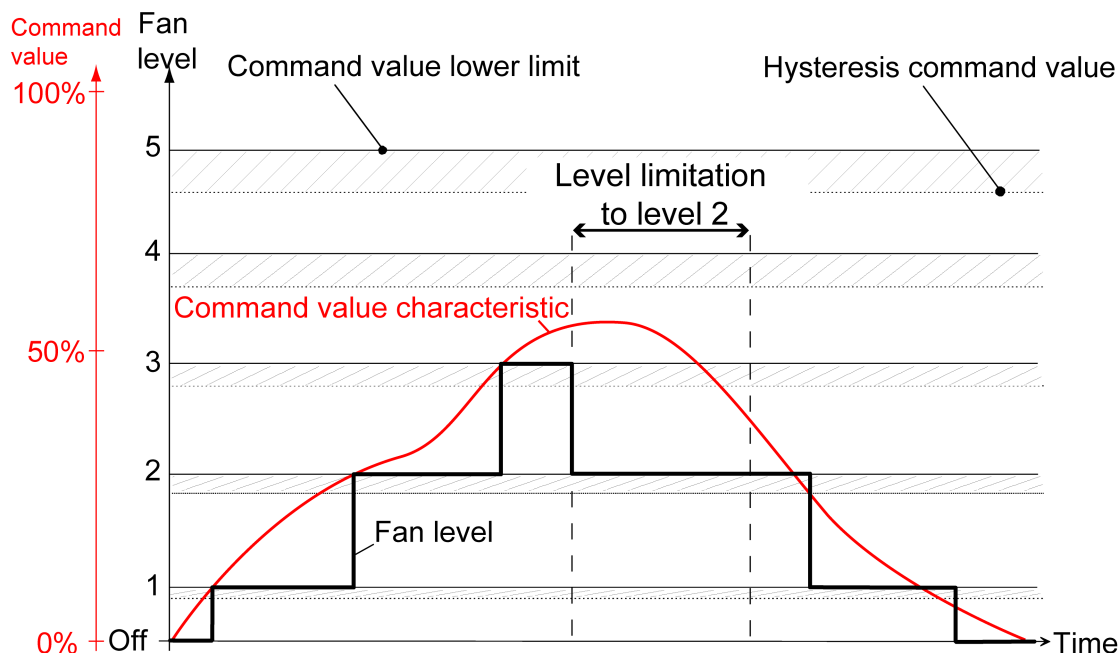


Figure 52: Simplified command value diagram to illustrate the reaction to a fan level limitation

Configuring the level limitation

To reduce the fan noise of a fan coil, the fan level limit can be activated. The limitation is switched on and off via a 1-bit communication object via the bus, and thus activated in accordance with requirements. In order for it to be used, the level limitation must be enabled in the ETS for each fan channel.

Before configuration of the level limitation in the ETS, the number of fan coil channels and the type of fan coil system must have been set on the parameter page "General - HVAC". Moreover, the number of fan levels must be set first.

- Use the "Level limitation (max. fan level)" parameter to configure the limitation stage (no limitation ... max. fan level 4 - the selection is limited by the existing number of fan levels).

The communication object becomes visible in the ETS as soon as a level limitation is parametrised. If the level limitation is activated by means of the communication object, the actuator will limit the fan level. This occurs both when controlling the fan levels via the bus using regular command value telegrams and when controlling the fan manually and with a fan level specification for cyclical monitoring and with fan protection. The fan level and thus the fan speed and therefore the fan noise is reduced.

In the setting "no limitation" for the level limitation, the communication object is hidden.

12.3.4 Forced fan position

The controller provides the option of activating a forced fan position via the bus. With an active forced position, the fan levels can neither be controlled nor switched over in either automatic or manual mode. The fan remains in the forced state until the forced position is removed using the bus. In this manner, it is possible to switch the fan to a locked and controlled state, for example for servicing purposes.

As soon as a "1" telegram is received via the 1-bit object "Forced position - Activation/deactivation", the controller immediately sets the fan level configured in the ETS without delay. The fan can also be completely switched off. The only special feature when activating the forced position is the fact that the fan controller is in automatic operation and a waiting time elapses, due to a previous level change-over. In this case, the fan controller only switches to the forced position level without the waiting time elapsing.

-  The forced position is dominant. For this reason, it cannot be overdriven from automatic mode, manual mode, the level limit or fan protection. Only when the forced position is removed does the fan control begin to control the fan levels according to the active operation.

The removal takes place when a "0" telegram is received via the "Forced position - Activation/deactivation" object. The fan always switches itself off first. In automatic operation, the controller then evaluates the active command value and, when the waiting time configured in the ETS has elapsed, switches to the required fan level, taking an optionally configured start-up level into account. In manual operation, the fan first remains switched off. The fan level is only raised when the manual control button is pressed again. If a start-up level is configured, the controller will, when a button is pressed, switch to the start-up level and remain there until further operation takes place.

-  The parameter "Behaviour in a forced position" is not checked for plausibility, meaning that an incorrect configuration is possible. For this reason, care should be taken to ensure that there is no fan level in the configuration which is higher than the actual fan levels. If a higher level is configured for behaviour in a forced position than the number of fan levels, then the fan controller will start up the maximum possible level when the forced position is activated.
-  The forced fan position does not influence the control algorithm integrated in the controller. The command values of the PI feedback control continue to be transmitted to the bus, even with a forced fan.

12.3.5 Fan protection

The fan protection function allows the fan of a fan coil unit, which has not been active for some time, to be temporarily switched to the maximum level. In this way, the fan motors can be protected against stiffness. In addition, the fan blades and the heat exchanger of the fan coil unit are protected against dust.

If the fan protection is to be used, it must be enabled using the parameter of the same name in the ETS. Fan protection can then be activated or deactivated directly using the 1-bit communication object "Fan protection - Activate/deactivate", for example using a KNX timer.

If the fan protection object has the switching value "1", then the fan protection function is active. The fan then works at the highest possible fan level and overdrives automatic and manual operation. Fan protection can then be switched off again using the "0" switching value in the communication object.

The reaction of the fan to switching fan protection depends on the operation of the automatic fan system. In automatic operation, the fan switches back to the level determined by the command value of the room temperature control. In manual operation, the fan switches off and can then be switched on again by additional manual actuation. The "Start-up via level" parameter is taken into account here.

-  Even if the fan controller is inactive, it is possible to activate the fan using fan protection.
-  With an active level limit, the maximum fan level of fan protection is specified by the limit level.
-  For reasons of safety, fan protection is not carried out with an active forced position.
-  The run-on times of the fan do not take effect with fan protection.

Enabling fan protection

Fan protection can be enabled separately for each fan channel.

- Activate the "Fan protection" parameter on the parameter page "Outputs -> Fan coil -> Fan -> LAx - General" (x = number of the output).

The "Fan protection - Activate/deactivate" communication object in the ETS is visible and can be activated.

- Deactivate the "Fan protection" parameter on the parameter page "Outputs -> Fan coil -> Fan -> LAx - General".

The fan protection is completely deactivated.

12.4 Operating hours counter

The operating hours counter determines the switch-on time of a fan channel. A channel is actively on for the operating hours counter if the fan level is greater than "0", i. e. when current is flowing to the fan.

The operating hours counter can either be configured as a second counter or alternatively as an hour counter.

- Second counter
The device adds up the determined switch-on time accurately to the second for a switched-on output. The totalled operating seconds are added in a 4-byte counter and stored permanently in the device. The current meter reading can

be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 13.100.

- Hour counter

The device adds up the determined switch-on time accurately to the minute for a switched-on output in full operating hours. The totalled operating hours are added in a 2-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 7.007.

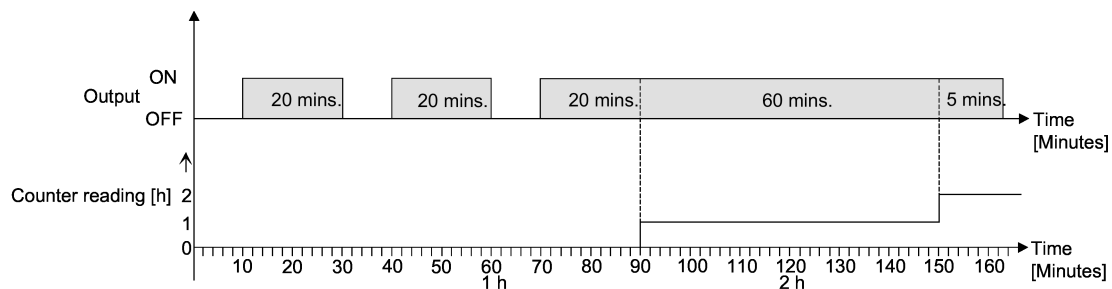


Figure 53: Function of the operating hours counter (using the example of counted hours)

In the delivery state, all values of the actuator are "0". If the operating hours counter is not enabled in the configuration of an output, no operating hours or operating seconds will be counted for the output concerned. Once the operating hours counter is enabled in the ETS, however, the operating hours or operating seconds will be determined and added up by the ETS immediately after commissioning the actuator. If the operating hours counter is subsequently disabled again in the parameters and the actuator is programmed with this disabling function, all the operating hours or operating seconds previously counted for the output concerned will be deleted. When enabled again, the meter reading of the operating hours counter is always set to "0".

The operating hours values (full hours) or operating seconds stored in the device will not be lost in case of a bus voltage failure or by ETS programming.

On the hour counter: Any summed up operating minutes (full hour not yet reached) will be rejected in this case, however.

After the bus voltage returns or after an ETS programming operation, the actuator passively updates the "Operating hours counter - Meter reading - Status" communication object for each output. The object value can be read out if the read-flag is set. The object value, depending on the configuration for the automatic transmission, is actively transmitted if necessary to the KNX once the configured transmission delay has elapsed after the bus voltage returns (see "Set transmission behaviour of the operating hours counter").

Setting the counting direction

The operating hours counter can optionally be configured as an up-counter or down-counter. Depending on this counting direction, a signal value or start value can optionally be set; in this way it is possible, for example, to monitor the operating time of a fan by restricting the meter range.

Up-counter:

After activating the operating hours counter by enabling in the ETS or by restarting, the operating hours are counted starting at "0". A maximum of 65,535 hours or 2147483647 can be counted (corresponds to approx. 66 years) before the meter stops and signals a meter operation by means of the object "Operating hours counter - Counter elapsed - Status".

A signal value can optionally be set in the ETS or specified via the communication object "Operating hours counter - Signal value". In this case, the counter operation is signalled to the KNX via the "Operating hours counter – Counter elapsed - Status" object if the limiting value is reached, but the meter continues counting - if it is not restarted - up to the maximum value and then stops. Only a restart initiates a new counting operation.

Down-counter:

After enabling the operating hours counter in the ETS, the meter reading is on "0" and the actuator signals a counter operation for the output concerned after the programming operation or after the bus voltage returns by means of the object "Operating hours counter – Counter elapsed - Status". Only after a restart is the down-counter set to the maximum value of 65,535 hours or 2147483647 seconds (corresponds to approx. 66 years) and the counter operation is started.

Optionally, a start value can be set in the ETS or specified by means of the communication object "Start value for operating hours counter". If a start value is set, the down-counter is initialised with this value instead of the maximum value after a restart. The meter then counts the start value downwards by the hour. When the down-counter reaches the value "0", the meter operation is signalled to the KNX by means of the "Operating hours counter - Meter elapsed - Status" object and the counting is stopped. Only a restart initiates a new counting operation.

The operating hours counter must be enabled on the parameter page "Outputs -> FanCoil -> LA... - General -> Enabled functions".

- Set the "Counting direction" parameter on the parameter page "Outputs -> FanCoil -> LA... - General -> Operating hours counter" to "Up counter". Set the parameter "Specify signal value" to "via parameter" or "via object" if it is necessary to monitor the signal value. Otherwise deactivate the parameter. In the "via parameter" setting, specify the required signal value.

The meter counts the operating hours forwards starting from "0". If monitoring the signal value is activated, the actuator transmits an "ON" telegram via the object "Operating hours counter - Meter elapsed - Status" for the output concerned as soon as the specified signal value is reached. Otherwise, the counter operation is first transmitted when the maximum value is reached.

- Set the "Counting direction" parameter to "Backward". Set the parameter "Pre-set value" to "via parameter" or "via object" if it is necessary to specify a start value. Otherwise deactivate the parameter. In the "via parameter" setting, parametrise the required start value.

The meter counts the operating hours down to "0" after a restart. With a start value preset, the start value is counted down, otherwise the counting operation starts at the maximum value. The actuator transmits an "ON" telegram via the object "Operating hours counter – Meter elapsed - Status" for the output concerned as soon as the value "0" is reached.

- i** The value of the communication object "Operating hours counter - Meter elapsed - Status" is permanently stored internally. On switching on the bus voltage or after an ETS programming operation, the object is initialised with the most recently saved value. If an operating hours counter is in this case identified as elapsed, i. e. if the object value is a "ON", an additional telegram will be actively transmitted to the KNX as soon as the configured transmit delay has elapsed after the bus voltage returns. If the meter has not yet elapsed (object value "OFF"), no telegram is transmitted after the bus voltage returns or after an ETS programming operation.
- i** In the case of a signal value or start value preset via communication object: The values received via the object are not accepted as valid and permanently saved internally until the operating hours counter is restarted. On switching on the supply voltage or after an ETS programming operation, the object is initialised with the most recently saved value. The values received will be lost in the case of a bus voltage failure or by an ETS programming operation if no counter restart was executed before. For this reason, when specifying a new start or signal value, it is advisable always to execute a counter restart afterwards as well. A standard value of 65,535 hours or 2147483647 seconds is predefined provided that no signal value or start value has been received yet via the object. The values received and stored via the object are reset to the standard value if the operating hours counter is disabled in the parameters of the ETS and an ETS programming operation is being performed.
- i** With a signal or start value predefined via object: If the signal value or start value is predefined with "0", the actuator will ignore a counter restart to avoid an undesired reset (e. g. in construction site mode -> operating hours already counted by manual operation).
- i** If the counter direction of an operating hours counter is reversed by reconfiguration in the ETS, a restart of the meter should always be performed after programming the actuator so that the meter is reinitialised.

Activating the operating hours counter

- On the parameter page "Outputs -> FanCoil -> LA... - General -> Enabled functions", activate the "Operating hours counter" parameter.

The operating hours counter is activated.

- Deactivate the "operating hours counter".

The operating hours counter is deactivated.

- i** Disabling of the operating hours counter and subsequent programming with the ETS resets the counter status to "0".

Setting the transmission behaviour

The current value of the operating hours counter is continuously tracked in the communication object "Operating hours counter – Meter reading - Status". The content of the object is transmitted to the KNX when there is a change by the set count interval or cyclically active. The object value can also be read out at any time if the read flag is set.

The operating hours counter must be enabled on the parameter page "Outputs -> FanCoil - > LA... - General -> Enabled functions".

- Set the parameter "Transmission behaviour" to "on change by interval value". Set the parameter "Counting interval" to the desired value.

The meter reading is transmitted to the KNX as soon as it changes by the pre-defined counting value interval. After the bus voltage returns or after an ETS programming operation, the object value is transmitted automatically after "Delay after bus voltage returns" has elapsed if the current meter reading or a multiple of this corresponds to the counting value interval. A meter reading "0" is always transmitted in this case.

- Set the parameter "Transmission behaviour" to "cyclical".

The counter value is transmitted cyclically. The cycle time is defined via the parameter of the same name. After the bus voltage returns or an ETS programming operation, the meter reading is transmitted to the KNX for the first time after the configured cycle time has elapsed.

Restarting the operating hours counter

The meter reading of the operating hours can be reset at any time by the communication object "Operating hours counter - Reset". The polarity of the reset telegram is predefined: "1" = Restart / "0" = No reaction.

In the up-counter the meter is initialised with the value "0" after a restart and in the down-counter initialised with the start value. If no start value was configured or predefined by the object, the start value is preset to 65535 hours or 2147483647 seconds.

During every counter restart, the initialised meter reading is transmitted actively to the KNX.

After a restart, the signal of a counter operation is also reset. At the same time, an "OFF" telegram is transmitted to the KNX via the object "Operating hours counter – Meter elapsed - Status". In addition, the limiting or start value is initialised.

If a new limiting or start value was predefined via the communication object, a counter restart should always be performed afterwards, too. Otherwise, the values received will be lost in the case of a bus voltage failure or by an ETS programming operation.

If a start value or signal value is specified with "0", there are different behaviours after a restart, depending on the principle of the preset value...

Preset as parameter:

The meter elapses immediately after a counter restart.

Preset via object:

A counter restart will be ignored to avoid an undesired reset (e. g. after installation of the devices with operating hours already being counted by manual operation). A start value or signal value greater than "0" must be specified in order to perform the re-start.

12.4.1 Operating hours counter parameters

Outputs -> FanCoil -> LA... - General -> Enabled functions

Operating hours counter	Checkbox (yes / no)
The operating hours counter can be disabled or enabled here. The operating hours counter determines the switch-on time of a fan channel. A channel is actively on for the operating hours counter if the fan level is greater than "0", i. e. when current is flowing to the fan.	

Outputs -> FanCoil -> LA... - General -> Operating hours counter

Counting method	Seconds Hours

The operating hours counter can either be configured as a second meter or as an hour meter.

Seconds: The actuator adds up the determined switch-on time accurately to the second for a switched-on output. The totalled operating seconds are added in a 4-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 13.100.

Hours: The actuator adds up the determined switch-on time accurately to the minute for a switched-on output in full operating hours. The totalled operating hours are added in a 2-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 7.007.

Counting direction	Forwards Backwards

The operating hours counter can be configured as an up-counter or down-counter. The setting here influences the visibility of the other parameters and objects of the operating hours counter.

Specifying a signal value	Checkbox (yes / no)
If the up-counter is used, a signal value can optionally be predefined. The setting "No" deactivates the reporting value. This parameter is visible only with "counting direction = forwards".	

Preset value	via parameter via object

This parameter defines whether the signal value can be set via a separate parameter or adapted individually by a communication object from the bus.
This parameter is visible only with "counting direction = forwards".

Signal value	0...2147483647 s * 0...65535 h **
The signal value of the up-counter is set here. Once this signal value is reached, an "ON" telegram is transmitted via the object "Operating hours counter - Meter elapsed - Status". The meter itself continues until the maximum meter reading is reached and then stops. *: With second counter **: With hours counter This parameter is only visible if the parameter "Preset value" is set to "via parameter".	
Specify start value	Checkbox (yes / no)
If the down-counter is used, a start value can optionally be predefined. This parameter defines whether the start value can be set via a separate parameter or adapted individually by a communication object from the bus. The setting "No" deactivates the start value. This parameter is visible only in "counting direction = backwards"	
Preset value	via parameter via object
This parameter defines whether the signal value can be set via a separate parameter or adapted individually by a communication object from the bus. This parameter is visible only with "counting direction = forwards".	
Start value	0...2147483647 s * 0...65535 h **
The start value of the down-counter is set here. *: With second counter **: With hours counter This parameter is visible only if "counting direction = backwards" and the parameter "Preset value" is set to "via parameter".	
Cycle time	0...23 h 0...15...59 min 0...59 s
This parameter defines the cycle time for the cyclical transmission. Setting the cycle time hours, minutes and seconds.	

Counting interval	0...3600...2147483647 s *
	0...1...65535 h **
The interval of the counter value is set here for automatic transmission. The current meter reading is transmitted to the KNX after the interval configured here. *: With second counter **: With hours counter This parameter is only visible if the parameter "Transmission behaviour" is set to "on change by interval value".	

12.4.2 Object list operating hours counter

Function	Name	Type	DPT	Flag
Operating hours counter - Restart	LA ... - Input	1-bit	1,015	C, -, W, -, U
1-bit object for resetting the operating hours meter of a fan output ("1" = restart, "0" = no reaction).				

Function	Name	Type	DPT	Flag
Operating hours counter - Meter reading - Status	LA ... - Output	4-byte	13,100	C, R, -, T, A
4-byte object to transmit or read out the current meter reading of the operating hours meter of a fan output. Value range: 0...2147483647 seconds In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation. In the as-delivered state, the value is "0". This object is only available with the second counter.				

Function	Name	Type	DPT	Flag
Operating hours counter - Meter reading - Status	LA ... - Output	2-byte	7,007	C, R, -, T, A
2-byte object to transmit or read out the current meter reading of the operating hours meter of a fan output. Value range: 0...65,535 hours In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation. In the as-delivered state, the value is "0". This object is only available with the hour counter.				

Function	Name	Type	DPT	Flag
Operating hours counter - Meter elapsed	LA ... - Output	1-bit	1,002	C, R, -, T, A
1-bit object to sign that the operating hours counter has elapsed (forwards counter = signal value reached / backwards counter = value "0" reached). With a message, the object value is actively transmitted to the KNX ("1" = message active / "0" = message inactive). In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation.				

Function	Name	Type	DPT	Flag
Operating hours counter - Signal value / Start value	LA ... - Input	4-byte	13,100	C, R, W, -, A
4-byte object for external specification of a signal/start value of the operating hours meter of a fan output. Value range: 0...2147483647 seconds This object is only available with the second counter.				

Function	Name	Type	DPT	Flag
Operating hours counter - Signal value / Start value	LA ... - Input	2-byte	7,007	C, -, W, -, U
2-byte object for external specification of a signal/start value of the operating hours meter of a fan output. Value range: 0...65,535 hours This object is only available with the hour counter.				

12.5 Fan status

Feedback for the active fan level

The device can report the active fan level to the bus separately for each fan output. In this manner the state of the fan coil can be transmitted to the bus at any time and displayed in a visualisation or evaluated further in other bus devices, for example.

The active fan level is fed back by means of a 1-byte value object for all fan levels of a channel.

With fan level feedback via value the feedback object returns the currently valid fan level as a numeric value (according to KNX DPT 5.010). The numeric value corresponds directly to the active fan level (0...max. 5; 0 = no level output switched on, fan OFF). This numeric value is thus limited by the maximum number of fan levels configured in the ETS for the fan coil channel concerned.

In all operating modes of the actuator, i.e. also for manual control on the device, the fan level feedback always returns the current fan state to the bus, as long as the bus voltage is connected and switched on.

The feedback also takes into account the disabling states, fan run-on times and, in the case of level switching, also switching processes via intermediate levels (in the level principle) or pause states (in the changeover principle). Exception: With fan level feedback via a value telegram any pause state for a fan level change-over with the change-over principle is not returned in order to prevent two value telegrams from being transmitted to the bus instantaneously.

Enabling and configuring the feedback of the active fan level

Feedback of the active fan level can be provided separately for each FanCoil channel and is therefore also enabled and configured separately in the ETS.

Before configuration of the fan level feedback, the number of fan coil channels and the type of fan coil system must have been set in the ETS on the parameter page "General -> HVAC".

- Set the "Feedback of active fan level" parameter on the parameter page "Kx - Fan feedback" (x = number of the FanCoil channel) to "yes, active signalling object".

The feedback is enabled. As soon as the actuator updates a feedback object, a telegram is also actively transmitted to the bus. In the ETS, the "Transmission" flags are automatically set for the feedback objects.

- Set the "Feedback of active fan level" parameter on the "Kx - Fan feedback" parameter page to "yes, passive status object".

The feedback is enabled. The actuator updates only the feedback objects internally, and does not transmit any telegram. The object value can be read out via the bus at any time (ValueRead), as a result of which the actuator then transmits a response telegram (ValueResponse). In the ETS, the "Read" flags are automatically set for the feedback objects.

- Set the "Feedback of active fan level" parameter on the "Kx - Fan feedback" parameter page to "no".

Feedback from the active fan level is deactivated. The ETS hides the corresponding communication objects.

Set the type of feedback

The type of feedback is configured separately for each FanCoil channel in the ETS and defines the data format of the feedback objects.

In order to set the data format, fan level feedback must be enabled.

- Set the "Type of feedback" parameter on the "Kx - Fan feedback" parameter page (x = number of the FanCoil channel) to "Fan levels via value".

The data format for the fan level feedback is defined as 1-byte. Only one communication object is visible in common for all fan levels of a channel. When the fan level is changed, the actuator always updates and transmits the current object value.

- Set the "Type of feedback" parameter on the "Kx - Fan feedback" parameter page to "Fan levels individually".

The data format for the fan level feedback is defined as 1-bit. Separate objects are defined separately for each fan level. When the fan level is changed, the actuator updates and transmits only the object values that change.

12.6 Fan control parameters

Outputs -> FanCoil -> Fan -> LA ... - General

Name of the fan	40-character free text
The text entered in this parameter is used to label the controller in the ETS parameter window (e. g. "FanCoil kitchen", "Bathroom fan"). The text is not programmed in the device. A designation has already been preset, depending on the parameterisation of the device. The designation is made up of the channel number, the operation and the type of control.	

Fan configuration

Number of fan levels	1 ... 5
The number of usable fan levels depends on the configuration of the FanCoil system on the General HVAC parameter page. If the fan is controlled "switching via relay outputs", the number of fan levels is configured on the General HVAC parameter page and the number is only shown here for information purposes. With "continuous via 0...10 V outputs" control, configuration takes place at this point. In the configuration with only one fan coil channel a maximum of 5 fan levels can be used. If two FanCoil channels are parametrised, whether three or five fan levels are available depends on the fan control. With this setting the required fan levels and the associated parameters are defined in the ETS.	

Control	only one fan output switches (change-over principle) Fan outputs switch hierarchically (level principle)
In standard commercially available fan coil units, there is generally a distinction made between two different ways to control the fan levels via relay outputs. Which of these two principles has to be used should be obtained from the technical documentation of the connected fan coil. only one fan output switches (change-over principle)": As soon as the fan is running, there is always only one fan level output switched on. All other non-active levels are switched off. Fan outputs switch hierarchically (level principle): The fan level outputs switch in sequence (hierarchically) when the fan is switched on. All fan levels lower than the active fan level remain switched on, higher ones switched off. When only one fan level is used, this parameter is always set to "only one fan output switches (change-over principle)". This parameter is visible only if "Fan control" = "Switching via relay outputs" is set on the General HVAC parameter page.	

Fan OFF threshold value -> Level 1	0...10...100
In automatic operation, the command value of the controller is used internally in the device for automatic control of the fan levels. As a transition between the levels, there are threshold values, defined according to the command value of the controller, which can be set here. If the command value reaches the threshold value of a level during an increase of the command value, the appropriate level is activated. If the command value reaches below a threshold value, minus the configured hysteresis, during a reduction of the command value, then the switchover takes place into the next lowest fan level.	
Fan level 1 threshold value -> Level 2	0 ... 30...100
Fan level 2 threshold value -> Level 3	0 ... 60...100
Fan level 3 threshold value -> Level 4	0 ... 90...100
Fan level 4 threshold value -> Level 5	0 ... 100
Analogue values - Fan OFF -> level 1	0 ... 1 ... 10 V
In automatic operation, the command value of the controller is used internally in the device for automatic control of the fan levels. When controlling the fan via 0...10 V, this parameter can be used to assign voltage values to the individual fan levels. The first value indicates the voltage required to switch on the fan. The last value indicates the maximum voltage value.	
This parameter is visible only if "Fan control" = "via 0...10 V output" is set on the General HVAC parameter page.	
Analogue values for fan level 1 -> level 2	0 ... 3 ... 10 V
This parameter is visible only if "Fan control" = "Continuous via 0...10 V outputs" is set on the General HVAC parameter page	
Analogue values for fan level 2 -> level 3	0 ... 6 ... 10 V
This parameter is visible only if "Fan control" = "Continuous via 0...10 V outputs" is set on the General HVAC parameter page	
Analogue values for fan level 3 -> level 4	0 ... 7 ... 10 V
This parameter is visible only if "Fan control" = "Continuous via 0...10 V outputs" is set on the General HVAC parameter page	
Analogue values for fan level 4 -> level 5	0 ... 8 ... 10 V
This parameter is visible only if "Fan control" = "Continuous via 0...10 V outputs" is set on the General HVAC parameter page	

Hysteresis between threshold values	0... 3 ...50%
If the command value of the room temperature control has undershot the threshold value minus the hysteresis, the fan controller switches back to the next lower level. This parameter is visible only if "Fan control" = "via relay outputs" is set on the General HVAC parameter page.	
Pause "OFF" when switching the level	0 ...25 s, 100 ... 200 ...900 ms
Due to fan motors' inertia, as a rule there is a limit to how short the time intervals for switching the fan levels can be, i. e. there is a limit to how quickly the fan speed can be varied. If the fan controller is working in automatic mode and the fan control has been selected in alternating mode, the old fan level is switched off before the new fan level is switched on. "Pause "OFF" when switching the level" can be set here. If the threshold value is exceeded or undershot and the old fan level has been switched off, the timer for the waiting time will start. The device only switches the new fan level automatically when the waiting time has elapsed. This parameter is visible only if "Fan control" = "via relay outputs" is set on the General HVAC parameter page.	
Dwell time for level change-over	0 ...25 s, 100 ... 200 ...900 ms
Due to fan motors' inertia, as a rule there is a limit to how short the time intervals for switching the fan levels can be, i. e. there is a limit to how quickly the fan speed can be varied. If the fan controller is working in automatic mode and the fan control has been selected hierarchically, the adjustable "Dwell time when changing the level" is observed when the levels are changed. The timer starts the waiting time if the threshold value is exceeded or not reached. The device only switches the new fan level automatically when the waiting time has elapsed. This parameter is visible only if "Fan control" = "via relay outputs" is set on the General HVAC parameter page.	

Fan automatic

Switch-over behaviour when changing by several fan speeds	switch directly to new level Switch through intermediate stages
This parameter is used to set the behaviour of when changing the stage in the event of a large deviation of the current command value in automatic mode. If the new command value is so large that it should not be switched to the next stage, but directly to the next but one, this parameter can also be used to specify the start of the intermediate stages. This parameter is visible only if "Fan control" = "via relay outputs" is set on the General HVAC parameter page.	

Fan level on change-over to manual	No change Fan level 1 Fan level 2 Fan level 3 Fan level 4 Fan level 5 Fan level OFF
If manual mode is switched to from automatic mode, this parameter determines whether the fan remains at the same fan level, a predefined fan level is switched on or the fan switches off.  You can switch to manual mode only in comfort operating mode.	
Object polarity	0 = automatic / 1 = manual 1 = automatic / 0 = manual
The parameter specifies the polarity of the object for the change-over between automatic and manual fan control. Automatic mode is always active after a device reset. The setting made here also applies to the "Auto/Manual - Status" status object.	
Fan level in standby mode	Automatic mode Automatic (min. level 1) Automatic (min. level 2) Automatic (min. level 3) Automatic (min. level 4) Fixed level OFF Fixed level 1 Fixed level 2 Fixed level 3 Fixed level 4 Fixed level 5
The communication object "Operating mode (HVAC) - Switch" informs the fan controller which operating mode the controller is in. With this information, this parameter can change the behaviour of the ventilation in standby mode. The parameter determines the fan level when changing to standby mode. Automatic mode is always active after a device reset. The displayed selection of fan levels depends on the parametrised number of fan levels.	

Fan level in night mode	Automatic mode Automatic (min. level 1) Automatic (min. level 2) Automatic (min. level 3) Automatic (min. level 4) Fixed level OFF Fixed level 1 Fixed level 2 Fixed level 3 Fixed level 4 Fixed level 5
The communication object "Operating mode (HVAC) - Switch" informs the fan controller which operating mode the controller is in. This parameter can use this information to change the behaviour of the ventilation in night mode. The parameter determines the fan speed when changing to night mode. Automatic mode is always active after a device reset. The displayed selection of fan levels depends on the parametrised number of fan levels.	
Command value is 0%, until preset command value is greater than	0 ... 1...100%
The command value evaluated by the fan controller in automatic operation can be optionally limited by this parameter in the bottom command value range. In this case, the controller evaluates command values which fall short of the configured limit value as 0%. This means that the fan stands still even at minimum command values.	
Command value is 100%, as soon as internal command value is greater than	0...99...100%
The command value evaluated by the fan controller in Automatic mode can be optionally limited by this parameter in the top command value range. In this case, the controller evaluates command values which exceed the configured limiting value as 100%. This means that the fan works at full power even with command values not at the maximum.	
Command value offset	0 ... 100%
The command value evaluated by the fan controller in Automatic mode can be optionally raised by the static offset configured here. Should the calculation produce a value of over 100 %, then the command value is limited to the maximum value.	

Fan behaviour

Start-up using level	Fan level 1 Fan level 2 Fan level 3 Fan level 4 Fan level 5
The fan can, if it was switched off before and should now start up, be switched on at a defined start-up level. This start-up level can be any of the available fan levels, and is set using this parameter. The start-up level is usually one of the higher fan levels of a fan coil unit. The start-up level remains active for the "start-up time" configured in the ETS.	
Start-up time	0 ... 5 ... 25 s, 0 ... 900 ms
Fan motors require a design-related time to reach the rated speed. This parameter can be used to adjust the start-up time to the fan used in order to optimise the switch-on behaviour.	
Heating fan run-on time	0 ... 4 min, 0 ... 59 s
If the fan is switched-off in automatic or manual operation, it runs on for the time configured at this point, provided that a factor of more than "0" is set. This parameter applies to the controller operating mode "Heating".	
Cooling fan run-on time	0 ... 4 min, 0 ... 15 ... 59 s
If the fan is switched-off in automatic or manual operation, it runs on for the time configured at this point, provided that a factor of more than "0" is set. This parameter applies to the controller operating mode "Cooling".	
Level limit (max. fan level)	No level limit Fan level 1 Fan level 2 Fan level 3 Fan level 4
To reduce the fan noise of a fan coil, the fan level limit can be activated. The selectable fan level depends on the parametrised maximum fan level. The level limit reduces the sound emissions by limiting the maximum fan level to a fan level value configured here (limitation level). The limit can be switched on and off using the "Level limit – Activate/deactivate" 1-bit object and thus activated as required.	

Behaviour on forced position	No forced position Fan level 1 Fan level 2 Fan level 3 Fan level 4 Fan level 5 Fan level OFF
A controller provides the option of activating a forced fan position via the bus. With an active forced position, the fan levels can neither be controlled nor switched over in either automatic or manual mode. The fan remains in the forced state until the forced position is removed using the bus. In this manner, it is possible to switch the fan to a locked and controlled state, for example for servicing purposes. The selectable fan level depends on the parametrised maximum fan level.	

Fan protection	Active Inactive
The fan protection function allows the fan of a fan coil unit, which has not been active for some time, to be temporarily switched to the maximum level. In this way, the controller fan motors can be protected against stiffness. In addition, the fan blades and the heat exchanger of the fan coil unit are protected against dust against dust. If the fan protection is to be used, it must be activated at this point.	

Operating hours counter	Active Inactive
The operating hours counter can be disabled or enabled here. When the operating hours counter is activated, another parameter page is displayed.	

Fan status

Fan levels	Active Inactive
The device can report the active fan level to the bus separately for each FanCoil channel. In this manner the state of the fan coil can be transmitted to the bus at any time and displayed in a visualisation or evaluated further in other bus devices, for example. As soon as the fan level changes, the 1-byte communication object "Fan level - Status - Current level" is updated.	

Fan automatic	Active Inactive
The device can report back to the bus separately for each FanCoil channel on whether the fan is in manual or automatic mode. In this manner the state of the fan coil can be transmitted to the bus at any time and displayed in a visualisation or evaluated further in other bus devices, for example. As soon as you switch to manual or automatic mode, the one-bit communication object "Auto/manual - Status" changes. The parametrised object polarity is taken into account.	

Delay after bus voltage returns	Active Inactive
A delay after the bus voltage returns can be activated separately for each fan for the device. The delay has no effect on the behaviour of the fan. Only the bus telegrams for status or feedback are delayed. The outputs can be activated also during the delay after the bus voltage returns. The delay time is configured on the "General" parameter page under the parameter of the same name.	

12.7 Fan control objects

Function	Name	Type	DPT	Flag
Heating command value	LA ... - Input	1-byte	5,001	C, -, W, T, U
1-byte object for specifying the command value for heating for the fan coil actuator. Value range: 0...255 (0...100%).				

Function	Name	Type	DPT	Flag
Cooling command value	LA ... - Input	1-byte	5,001	C, -, W, T, U
1-byte object for specifying the command value for cooling for the FanCoil actuator. Value range: 0...255 (0...100%).				

Function	Name	Type	DPT	Flag
Heating/cooling - Switching	LA ... - Input	1-bit	1,001	C, -, W, T, U
1-bit object for mode of operation change-over. Only visible in the fan coil systems "2-pipe heating / cooling via change-over object" and "4-pipe heating / cooling via change-over object". Polarity: "0" = cooling / "1" = heating.				

Function	Name	Type	DPT	Flag
Operating mode (HVAC) - Switchover	LA ... - Input	1-byte	20,102	C, -, W, T, U
This communication object informs the fan controller which operating mode the controller is in. This information can be used to change the behaviour of the ventilation in standby and night mode.				

Function	Name	Type	DPT	Flag
Fan level – Status – Current level	LA ... - Output	1-byte	5,100	C, R, -, T, A
1-byte object for feeding back the current fan level.				

Function	Name	Type	DPT	Flag
Fan speed - Status - Current level	LA ... - Output	1-byte	5,001	C, R, -, T, A
One-byte object for feedback of the current fan speed. The fan speed is a percentage of the current fan level to which the fan has been switched.				

Function	Name	Type	DPT	Flag
Fan protection – Activate/deactivate	LA ... - Input	1-bit	1,001	C, -, W, -, U
One-bit object used to activate the fan protection. Polarity: "0" = fan protection disabled / "1" = fan protection activated.				

Function	Name	Type	DPT	Flag
Level limit – Activate/de-activate	LA ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for activating and deactivating the level limitation. Polarity: "0" = level limitation deactivated / "1" = level limitation activated.				

Function	Name	Type	DPT	Flag
Auto/manual - Switching	LA ... - Input	1-bit	1,003	C, -, W, T, U
1-bit object for activating and deactivating manual fan control. The fan control can be switched to either manual or automatic mode by means of this object, depending on the parametrisation. You can switch to manual mode only in comfort operating mode.				

Function	Name	Type	DPT	Flag
Auto/manual - Status	LA ... - Output	1-bit	1,001	C, R, -, T, A-
One-bit object for status feedback for manual control. The object polarity can be configured.				

Function	Name	Type	DPT	Flag
Fan level – Manual operation – Default	LA ... - Input	1-byte	5,100	C, R, W, -, A
1-byte object for direct specification of the fan level in manual fan control. Value range: 0 ... max. 5. The maximum value is limited by the number of configured fan levels. Values greater than the maximum fan level are interpreted by the actuator like the maximum value.				

Function	Name	Type	DPT	Flag
Fan speed – Manual operation – Preset	LA ... - Input	1-byte	5,001	C, R, W, -, A
1-byte object for direct specification of the fan speed in manual fan control. Value range: 0 ... 100%. The device converts the percentage into fan levels. The following applies 0% = fan off 1% ... = fan level 1 ... 100% = highest fan level depending on the parametrised number of fan levels, there is a proportional assignment between the percentage and the fan level (see chapter "Fan automatic" ► Page 208). The threshold values parametrised in the ETS apply only to automatic mode and have no influence on the fan levels in manual mode.				

Function	Name	Type	DPT	Flag
Fan level - Manual operation - Status	LA ... - Output	1-byte	5,100	C, R, -, T, A-
One-byte object for feeding back the active manual fan level.				

Function	Name	Type	DPT	Flag
Fan speed - Manual operation - Status	LA ... - Output	1-byte	5,001	C, R, -, T, A-
One-byte object for feeding back the active manual fan speed. Because the device works only with fan levels in manual mode, the highest percentage of the currently active fan level is displayed as the status.				

13 Analogue outputs

The analogue outputs are used to control devices with a 0-10 V interface from the heating, air conditioning and ventilation technology. Up to three 0-10 V outputs are available, depending on the type and number of FanCoil units used. Each analogue output can be parametrised separately. The following functions are also available:

- Configurable switch-on and dimming behaviour
- Setting and adjusting the dimming curve
- Time functions: switch-on delay, switch-off delay
- Scene functions
- Link functions
- Disabling functions
- Operating hours counter.

i Lighting control via the analogue outputs is not possible, because the 0-10 V or 1-10 V Interface from the lighting equipment corresponds to a different standard.

13.1 Channel configuration

Channel configuration

If they are not used to control FanCoil units, the analogue outputs can be used to control any other 0...10 V applications.

The three available analogue outputs C4 to C6 are displayed on the "Outputs -> Analogue" parameter page. If all or individual outputs are already being used for FanCoil applications, this is shown in the table and the output is blocked for other applications. If the analogue output is not used for FanCoil applications, its use can still be deactivated. This means that the output can no longer be parametrised and is no longer displayed on the parameter pages.

13.1.1 Channel configuration parameters

Outputs -> Analogue

Using outputs	Checkbox (yes / no)
Whether the individual channels are used or whether they are deactivated is determined here for each analogue output. Analogue outputs that are already reserved for controlling valves or fans are labelled "HVAC" in the table and are hidden.	

13.1.2 Object list for channel configuration

Function	Name	Type	DPT	Flag
Switching - Setting	AO ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for switching the analogue channel on or off ("1" = switch on; "0" = switch off).				

Function	Name	Type	DPT	Flag
Switching - Status	AO ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object for feedback signalling of the switching state ("1" = on / "0" = off) to the bus.				

Function	Name	Type	DPT	Flag
Dimming - Default	AO ... - Input	4-bit	3,007	C, -, W, -, U
Four-bit object for relative dimming of an analogue channel.				

Function	Name	Type	DPT	Flag
Value - Preset	AO ... - Input	1-byte	5,001	C, -, W, -, U
One-byte object used to specify an absolute value (value 0...255) from the bus.				

Function	Name	Type	DPT	Flag
Value - Status	AO ... - Output	1-byte	5,001	C, R, -, T, A
One-byte object for feedback of the current value to the bus.				

13.2 Name of the analogue output

Optional names can be assigned to each analogue output. The designations should clarify the use of the output (e. g. "Bathroom fan", "Bathroom fan flap"). The names are only used in the ETS in the text of the parameter pages and communication objects.

13.2.1 Name of the analogue output parameter

Outputs -> Analogue -> AO ... - General

Name of the analogue output	Free text
The text entered in this parameter is applied to the name of the communication objects and is used for labelling of the analogue output in the ETS parameter window (e g. "Bathroom fan", "Bathroom fan flap"). The text is not programmed in the device.	

13.3 Value range

A lower and upper value limit can be set by defining the adjustable value range. The upper value limit that can be set in the ETS is never exceeded when an analogue channel is switched on. Neither when switching on nor when dimming. The maximum value can be reduced for energy saving reasons, for example. Furthermore, the value, which should be set whenever switching on via the "switching" or "central switching" object or by manual operation on the dimming channel, can be predefined. This switch-on value must always lie between the upper and lower value limits. The adjustable characteristics of the lower value limit in the ETS differ as follows...

Setting a lower value limit

The lower value limit can be set separately for each analogue output.

- Set the "Lower value limit" parameter to the required value.

The set value is not undershot in any switched-on operating state.

- i** The ETS does not check all parametrised values of a channel (e. g. switch-on value, scene values etc.) when editing the lower value limit! If values smaller than the parametrised lower value limit are specified by the ETS configuration, the actuator subsequently sets the minimum value during operation. The same applies if the actuator receives values below the lower value limit by means of the value object during operation.

Setting the upper value limit

The upper value limit can be set separately for each analogue output.

- Set the "Upper value limit" parameter on the "AA x - General" parameter page (x = number of the analogue output 5 ... 7) to the required maximum value.

The set value is not undershot in any switched-on operating state of the analogue output.

- i** The ETS does not check all parametrised values of a channel (e. g. switch-on value, scene values etc.) when editing the upper value limit! If values greater than the parametrised upper value limit are specified by the ETS configuration, the actuator will subsequently set the upper value limit during operation. The same applies if the actuator receives values that exceed the upper value limit by means of the value object during operation.

13.3.1 Value range parameter

Outputs -> Analogue -> AO ... - General

Lower value limit (switched on state)	1% 5% 10% ... 100%

The lower value limit can be set here in 5% increments and is not fallen short of in any switched-on operating state.

Upper value limit	1 % 5 % 10 % ... 100 %

The upper value limit can be set here in 5% increments and is not exceeded in any switched-on operating state.

13.4 Switching/dimming behaviour

Switch-on value

The switch-on value can be set separately for each analogue output.

- Set the "Switch-on value" parameter on the "AA x - General" parameter page (x = number of analogue outputs 4...6) to the required value.

The set value is set after receipt of an ON telegram via the "Switching" communication object or by switching on by manual operation of the analogue channel. Furthermore, the configured switch-on value is set with the "activated" polarity after receipt of a central telegram.

- Alternatively, set the "Switch-on value" parameter to "memory value (value before the last switch-off)".

When switching on, the active and internally saved value prior to switching off last time is set (via the "switching" or "central switching" object). After programming with the ETS, the value is predefined to maximum. A bus voltage failure, however, does not delete the memory value.

- i** If the parametrised switch-on value is greater than the parametrised maximum value, the actuator sets the maximum value as the new value for the analogue channel concerned when switching on (minimum value < switch-on value < maximum value).
- i** A memory value is also then saved internally by a switch-off telegram if the bus-controlled switch-off is overridden, for example, by a disable or forced position function or by a manual operation. In this case, the internally tracked value is saved as memory value.
- i** If no soft ON function is activated, the value is jumped to when switching on. Once a soft ON function is activated, the switch-on value is dimmed according to the dimming speed for the soft ON function.

Behaviour when receiving a value

The dimming behaviour for the absolute dimming can be set separately in the ETS for each analogue channel by means of the "Value - Preset" object.

- Set the "When receiving a value" parameter on the "AA x - General" parameter page (x = number of outputs 4 ... 6) to "Dim to".

Once a new value is received, it is set by means of the configured dimming increment time based on the predefined dimming characteristic.

- Set the parameter "dimming behaviour after receipt of a value" to "jump to".

As soon as a new value is received it will be instantly jumped to.

- Set the parameter "dimming behaviour after receipt of a value" to "Fading". In addition, on the parameter "Time for value via fading", define the necessary fading time for dimming the scene value.

Newly received values are dimmed. The dim fading is activated. The fading time defines the duration of the dimming procedure required to reach the new value. The value of an analogue channel on which the dimming starts and the configured dimming characteristic have no significance. The dimming procedure thus always requires the exact predefined time when specifying a new value.

- i** Values can also be set by a disabling or forced position function. Absolute dimming can also be activated, even in case of bus voltage failure, after the bus or mains voltage returns or after programming with the ETS, by specifying values. In the case of these absolute dimming functions, the values are always instantly jumped to. During a scene recall, the dimming behaviour can be configured separately.

Dimming up in the switched-off state

A relative dimming process can be triggered by the 4-bit "Dimming - Preset" communication object available separately at each output or by a long button-press of the manual operation. The data format of the "Dimming - Preset" object complies with the KNX standard DPT "3.007", which means that the dimming direction and relative dimming increments can be predefined in the dimming telegram or dimming procedures can also be stopped. A relative dimming process is executed via the object until the configured lower or upper value limit of the output is set, the dimming value reaches the dimming increment predefined in the telegram, or a stop telegram is received. A relative dimming process allows a value to be changed constantly and always starts from the value that is set stationary or dynamically at the time of the incoming dimming telegram.

A relative dimming telegram can also switch on an output if this is in the "OFF" state. In some applications, it may be necessary, however, for a switched off output to remain off until a relative dimming telegram is received. This is interesting for example when using scenes: Several outputs are set to a defined value via a scene. Other channels are switched off by the scene. Only the value of the channels not switched off by the scene recall should be changed by dimming up afterwards. Here, it is necessary for outputs not to react to a relative dimming operation and thus not to switch on.

The parameter "With relative dimming up in the switched-off state" defines whether or not an analogue channel in the "OFF" state reacts to a relative dimming telegram.

- Set the parameter to "Switch on output".

The output always reacts to a relative dimming telegram and executes a dimming process. In the "OFF" state, the output switches on with a "dim up" telegram.

- Set the parameter to "No reaction".

The output only reacts to a relative dimming telegram when it is switched on. In the "OFF" state, the output ignores a "dim up" telegram.

- i** In manual operation on the device, it is possible in the "OFF" state to always switch on and increase brightness by a long press of the button. The parameter "With relative dimming up in the switched-off state" thus has no effect on manual operation.

13.4.1 Switching/dimming behaviour parameters

Outputs -> Analogue -> AA... - General -> Switching/dimming behaviour

Switch-on value	1% 5% 10% ... 100% Memory value (value before switching off the last time)
This parameter specifies the value, which should be set whenever switching on via the "switching" or "central switching" object or by manual operation on the analogue channel. The switch-on value must always lie between the upper and lower limit value of the setting range. In the "Memory value" setting, the active and internally saved value prior to switching off last time is set when switching on (via the "switching" or "central switching" object).	
On receipt of a value	jumping to dimming to Fading
A parameter is used here to define whether a value received via the bus is instantly jumped to (absolute dimming), or whether the brightness is dimmed to via the set dimming characteristic. Fading is also possible as an alternative. When fading, the received value is reached in the exact configured fading time irrespective of the dimming characteristic and irrespective of which value the dimming procedure was started at. This allows, for example, several analogue outputs to be set to the same value at the same time.	
Time for value via fading	0 ... 20 ... 240 s
The fading time is set here if fading is predefined in the dimming behaviour. A dimming procedure via fading lasts for the exact configured time. If "0" is set, the value is jumped to directly.	
With relative dimming up in the switched-off state	Switch on output no reaction
This parameter defines whether or not a dimming channel in the "OFF" state reacts to a relative dimming telegram. Switch on channel: The dimming channel always reacts to a relative dimming telegram and executes a dimming process. In the "OFF" state, the channel switches on with a "dim up" telegram. no reaction: The dimming channel only reacts to a relative dimming telegram when it is switched on. In the "OFF" state, the channel ignores a "dim up" telegram.	

13.5 Reset behaviour

Response after a device reset

The switching states or values of the analogue outputs after a bus voltage failure, after the bus or mains voltage returns or after ETS programming can be preset separately.

Presetting the behaviour after ETS programming

The parameter "After ETS programming" is created separately for each analogue channel on the parameter page "AO x - General" (x = number of the analogue output 4 ... 6) created. This parameter can be used to configure the behaviour of a channel, irrespective of the behaviour after the bus voltage returns.

- Set the parameter to a value.

The output is set to the specified value. Make sure that the parametrised value does not fall below the set lower value limit (if present) or exceed the upper value limit.

- Set the parameter to "Switch off".

The output is switched off after a programming in the ETS.

- Set the parameter to "no reaction".

After programming with the ETS, the output shows no response and remains in the switching brightness value currently selected.

- Set the parameter to "as when bus voltage returns".

After an ETS programming operation, the output evaluates the setting of the parameter "After bus voltage returns" and sets the status defined there.

i The configured behaviour will be executed after every application or parameter download by the ETS. A simple download of the physical address alone or partial programming of only the group addresses has the effect that this parameter is disregarded and that the configured "Behaviour after bus or mains voltage returns" will be executed instead!

i A switching state and value set after an ETS programming cycle is added to the feedback objects. Actively transmitting feedback objects also only first transmit after an ETS programming cycle when the initialisation has finished and, if necessary, the "delay time after bus voltage returns" has elapsed.

i In the "no reaction" setting: After the programming operation, a brief switch-off occurs during the initialisation phase of the actuator. Afterwards, the value that was active before is then reset again.

i An active manual operation mode will be terminated by an ETS programming operation.

- i** After an ETS programming operation, the disabling functions and the forced-positions are always deactivated. The values of the forced position objects saved in case of the bus voltage failure are deleted.

Setting the behaviour in case of bus voltage failure

The parameter "After bus voltage failure" can be created separately for each output on the parameter page "AO x - "General" (x = number of output 4... 6) created. This parameter can be used to configure the behaviour of an output, irrespective of the behaviour after the bus voltage returns.

- Set the parameter to a value.

The output is set to the specified value. Make sure the parametrised value does not fall below the set lower value limit or exceed the upper value limit.

- Set the parameter to "Switch off".

The output is switched off in the case of bus voltage failure.

- Set the parameter to "no reaction".

After the bus voltage failure, the output shows no reaction and remains in the currently set state.

- i** Active disabling or forced position functions are cancelled by a bus voltage failure and remain inactive until they are reactivated.

- i** In case of a bus voltage failure, the current states of the forced-positions are also saved so that they can be tracked when the bus voltage returns if necessary (depending on the parameterization of the forced positions).

- i** In case of a bus voltage failure, the current values of all outputs are permanently saved internally so that these values can be reset after the bus voltage returns if this is configured in the ETS. The data is stored before the configured reaction for bus voltage failures takes place and only if the bus voltage has been available before without interruption for at least 20 seconds after the last reset (storage capacitors sufficiently charged for storage purposes). In all other cases nothing is stored (values = "0").

- i** If the bus voltage fails while manual operation is activated on the device, the parameter "Behaviour in case of bus voltage failure" is not executed.

Setting the behaviour after the bus voltage returns

The parameter "Behaviour after bus voltage returns" is created separately for each output on the parameter page "AO x - General" (x = number of output 4 ... 6) created.

- Set the parameter to a value.

The output is set to the specified value. Make sure the parametrised value does not fall below the set lower value limit or exceed the upper value limit.

- Set the parameter to "Switch off".

The output is switched off when the bus voltage returns.

- Set the parameter to "value before bus voltage failure".

After the bus voltage returns, the value last set before bus voltage failure and internally stored in case of bus voltage failure will be tracked.

- Set the parameter to "no reaction".

When the bus voltage returns, the output shows no reaction and remains in the currently set state.

- i** In all settings: When the bus voltage is switched on, the value is set to "0%" if no mains voltage is switch on when the bus voltage returns at the load outputs.
- i** Setting "Value before bus voltage failure": An ETS programming operation of the application or the parameter resets the stored switching state to "OFF - 0".
- i** In the "No reaction" setting: When the bus voltage returns with the mains voltage permanently switched on, the corresponding output shows no response and remains in the brightness state last selected.
- i** A switching state and value set after the bus voltage returns is tracked in the feedback objects. Actively transmitting feedback objects first transmit, however, after the bus or mains voltage returns when the initialisation of the actuator has finished, and if necessary the "delay time after bus voltage returns" has elapsed.
- i** In the case of forced position as supplementary function: The communication object of the forced position can be initialised separately after the bus voltage returns. This has an effect on the reaction of the output if the forced position is activated when the bus voltage returns. The configured "behaviour when bus or mains voltage returns" will be executed only if no forced position when the bus voltage returns is activated!
- i** In the case of enabling function as supplementary function: Active disabling functions are always inactive after the bus voltage returns.
- i** When the bus voltage returns, a manual control will be interrupted.

13.5.1 Reset and initialisation behaviour parameter

Outputs -> Analogue -> AA... - General

After ETS programming operation	Value Switch off no reaction as when bus voltage returns
The actuator allows a value to be set separately for each output after an ETS programming operation. Value: The channel establishes the value defined with the following parameter. Switch off: The output is switched off after an ETS programming procedure. no reaction: After an ETS programming operation, the output retains the current value. like after the bus voltage returns: After an ETS programming operation, the actuator behaves as specified in the parameter "After bus voltage returns".	
Value	1% 5% 10% ... 100%
This parameter defines the value to be set after an ETS programming operation. The value must always lie between the upper and lower value limit of the dimming range. This parameter is visible only in the "value" setting	
In case of bus voltage failure	Value Switch off no reaction
The actuator allows a value to be set separately for each output after a bus voltage failure. Value: The channel establishes the value defined with the following parameter. Switch-off: The channel is switched off in case of bus voltage failure. no reaction: In case of a bus voltage failure, the actuator retains the current value.	

Value	1% 5% 10% ... 100%

This parameter defines the value to be set in case of bus voltage failure. The value must always lie between the upper and lower value limit of the dimming range.

This parameter is visible only in the "value" setting

After the bus voltage returns	Value Switch off Value before bus voltage failure no reaction

The actuator allows the value after the bus voltage returns to be set separately for each output.

Value: The channel establishes the value defined with the following parameter.

Switch-off: The channel is switched off after the bus voltage returns.

Value before bus voltage failure: After the bus voltage returns, the actuator restores the brightness value last stored in case of bus voltage failure.

no reaction: The actuator retains the current value when the bus voltage returns.

Value	1% 5% 10% ... 100%

This parameter defines the value to be set after the bus voltage returns. The value must always lie between the upper and lower value limit of the dimming range.

This parameter is visible only in the "value" setting

13.6 Dimming characteristic

When dimming different HVAC devices, it can be useful to adjust the dimming characteristic. This allows devices with different dimming behaviour to be matched to each other. The device offers several options for adjusting the dimming characteristics of the analogue outputs as required.

- If the control of the HVAC device is regularly controlled via percentage presetting of the dimming value, the suitability of the dimming characteristic in the value range should be checked as a priority.
- If the control of the HVAC device is dimmed manually via the 4-bit object, the dimming characteristic can be adjusted in the time range.

Dimming characteristic curve in the time range

For the analogue outputs, the technically dimmable range (1 ... 100 %) divided into 255 dimming levels (8-bit value: 1 ... 255 / 0 = switched-off). In the as-delivered state of the device, the dimming increment times, i. e. the dimming times between 2 of 255 dimming increments, are set to the identical length. This results in a linear characteristic curve over the entire value range.

The dimmable value range is limited at the upper limit by the maximum value configured in the ETS. The lower limit is determined by the lower value limit.

In some practical applications, a linear dimming characteristic is not optimal. Hence, the actuator in the ETS alternatively permits a user-defined adjustment of the dimming progress.

Setting the dimming characteristic in the time range

- Set the "Characteristic curve in the time range" parameter on the "AA x - General -> Dimming characteristic" parameter page (x = number of the analogue output 4 ... 6) Set to "Linear function".

A linear dimming characteristic curve is set. A time between two dimming increments can also be configured for the entire brightness range in the ETS.

- Set the parameter "Characteristic curve in the time range" on the parameter page "AA x - General -> Dimming characteristic" (x = number of the analogue outputs 4...6) to "User-defined (y ranges)" (y = 2... 5).

A user-defined dimmer characteristic curve is set. Up to four limiting values and five times between two dimming increments can be defined for the definition of the sections

The dimming increment speed is identical for a relative dimming procedure or for the dimming of an absolute value (not fading) and can be set in the ETS separately for each analogue output in the characteristic parameters.

The parameter "Characteristic curve" in the time range is set to "Linear".

- Set the "Time between two dimming steps" parameter on the "AA x - General -> Dimming characteristic" parameter page (x = number of the analogue output 4 ... 6) to the required dimming step time.

During every relative or absolute dimming procedure, the entire value range is dimmed with the configured dimming increment speed.

The parameter "characteristic curve" is set to "user-defined".

- First set the limit values. To do this, set the "Up to limit value" parameters for the various ranges on the "AA x - General -> - Dimming characteristic" parameter page (x = number of analogue output 4 ... 6) to the required subarea limits.

When configuring the limiting values, care must be taken to ensure that the values do not exceed the maximum values or fall below the configured minimum value.

The dimmable value range is divided into up to five sections. In the following, the dimming increment speeds for these three areas can be set separately.

- Set the parameter "Time between two dimming increments" on the parameter page "AA x ...- General _> Dimming characteristic" (x = number of the analogue outputs 4...6) to the necessary dimming increment time for each section.

The dimming characteristic is defined ready. Each of the up to 5 sections is dimmed at the specified dimming increment speed.

Dimming characteristic curve in the value range

Six characteristic curves are available for adapting to different load types, which the device can use to convert the percentage input value from the KNX (DPT 5.001) to the output value of the analogue output. The following table shows the differences in the characteristic curves.

KNX value	KNX value [%]	Logarithmic function [%] (1)	Root function [%] (2)	Linear function [%] (3)	Square function [%] (4)	Cubic function [%] (5)	Exponential function [%] (6)
0	0	0	0	0	0	0	0
1	0.4	0	6	0.4	0	0	0
10	4	42	20	4	0	0	0
25	10	58	31	10	1	0	0
50	20	71	44	20	3	1	0
80	32	79	56	32	10	3	0
100	40	83	63	40	15	6	0
125	50	87	70	50	24	12	0
150	60	90	77	60	35	20	1
175	70	93	83	70	47	32	2.4
200	80	96	88	80	62	48	8
225	90	98	94	90	78	69	25
255	100	100	100	100	100	100	100

Table 1: Dimming characteristics in the value range

Setting the dimming characteristic in the value range

In the as-delivered state, the linear dimming characteristic is set in the value range. If the dimming behaviour is not satisfactory, particularly in the lower dimming range, the dimming behaviour may be improved by selecting a different dimming characteristic. The adjustment of the dimming characteristic is related to the adjustment of the lower value limit and the upper value limit.

The 1-byte communication object "Value - Preset" is connected to a group address. The maximum value is set to 100%. When a value is received, this value is jumped to.

- Set/check the lower value limit.
- Gradually increase the value and assess the change in value.
- If the value change in the lower range is too strong, select a flatter characteristic curve.
- If the value change in the lower range is too weak, select a steeper characteristic curve.
- Set the value from which no more change is visible in the upper area as the maximum value.

The dimming characteristic is set in the value range.

13.6.1 Parameter Dimming characteristic

Outputs -> Analogue -> AO ... - General -> Dimming characteristic

Characteristic curve in the time range	Linear function User-defined (2 ranges) User-defined (3 ranges) User-defined (4 ranges) User-defined (5 ranges)
The dimming curve of the output shown over time can be set here. This allows the device used to be adjusted. Linear function: The progression from 1% (decimal value "1") to 100% (decimal value "255") is linear. User-defined (... Ranges): The progression between the minimum and maximum value can be customised. For this purpose, the range is subdivided in up to five sections. Each section can be configured with an independent dimming speed.	
Range ... Time between two dimming increments	1 ... 25 ... 255 ms
At this point, the dimming step speed (time between two dimming values) of the respective partial range is set. With a linear characteristic curve there is only range 1.	
Range ... until limit value	1% 5 % 10 % ... 100 %
The limit value of the range is parametrised here. This limiting value defines the boundary between the first and second section. With a linear characteristic curve, the limit value is fixed at 100 %.	
Characteristic curve in the value range	Linear function Exponential function Cubic function Square function Root function Logarithmic function
Setting the characteristic curve in the value range allows the 256 dimming steps possible on KNX to be adapted. If this parameter is changed, the curve of the characteristic curve is shown in the diagram below. The selection of the characteristic curve depends on the connected device.	

13.7 Time delays

Up to two time functions can be preset for each analogue output, independently of each other. The time functions affect the "Switching" communication object and delay the object value received depending on the telegram polarity .

-  At the end of a disabling function or forced position function, the switching state received during the function or set before the function can be tracked. Residual times of time functions are also tracked if these had not yet fully elapsed at the time of the reactivation or forced control.
-  A time delay still in progress will be fully aborted by a reset of the actuator (bus voltage failure or ETS programming).

Activating switch-on delay

The switch-on delay can be activated separately in the ETS for each analogue output.

Prerequisite:

The time delays must be enabled on the parameter page "Outputs -> Analogue -> AO... - General -> Enabled functions".

- Activate the checkbox "switch-on delay". Configure the desired switch-on delay.

The switch-on delay is enabled. After reception of an ON telegram via the "switching" object, the configurable time is started. Another ON-telegram triggers the time only when the parameter "Switch-on delay retriggerable" is activated. An OFF-telegram received during the switch-on delay will end the delay and set the switching status to "OFF".

Activating switch-off delay

The switch-off delay can be activated separately in the ETS for each analogue output.

Prerequisite:

The time delays must be enabled on the parameter page "Outputs -> Analogue -> AO... - General -> Enabled functions".

- Activate the checkbox "switch-off delay". Configure the desired switch-off delay.

The switch-off delay is enabled. After reception of an OFF-telegram via the "switching" object, the configurable time is started. Another OFF-telegram triggers the time only when the parameter "Switch-off delay retriggerable" is activated. An ON-telegram received during the switch-off delay will end the delay and set the switching status to "ON".

13.7.1 Time delays parameters

Outputs -> Analogue -> AO ... - General -> Enabled functions

Time delays	Checkbox (yes / no)
This parameter can be used to disable or to enable the time delays. The parameter is deactivated if cyclical monitoring is enabled.	

Outputs -> Analogue -> AA... - General -> Time delays

Switch-on delay	Checkbox (yes / no)
The "switching" communication object can be evaluated with a time delay. This parameter enables the switch-on delay and thereby activates the necessary parameters.	

Delay time	0...59 min 0...10...59 s
This parameter is used for setting the duration of the switch-on delay.	

Switch-on delay retriggerable	Checkbox (yes / no)
A switch-on delay still in progress can be retriggered by another "ON" telegram (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed. The parameters for the switch-on delay are only visible if switch-on delay or switch-on and switch-off delay are activated.	

Switch-off delay	Checkbox (yes / no)
The "switching" communication object can be evaluated with a time delay. This parameter enables the switch-off delay and thereby activates the necessary parameters.	

Delay time	0...59 min 0...10...59 s
This parameter is used for setting the duration of the switch-off delay.	

Switch-off delay retriggerable	Checkbox (yes / no)
A switch-off delay still in progress can be retriggered (parameter activated) by another "OFF" telegram. Alternatively, the retriggering time (parameter deactivated) can be suppressed. The parameters for the switch-off delay are only visible if switch-on delay or switch-on and switch-off delay are activated.	

13.8 Switch-on/switch-off behaviour

13.8.1 Soft ON/OFF function

The soft functions permit an output to be switched on or off at reduced speed when a switching command is received via the "Switching" communication object.

If the soft ON function is activated, a dimming procedure is executed until the switch-on value when switching on. This also occurs if the output is already switched on to a value lower than the switch-on value. Likewise, with the soft OFF function, a dimming process is executed to 0% when receiving an OFF telegram (see figure 54).

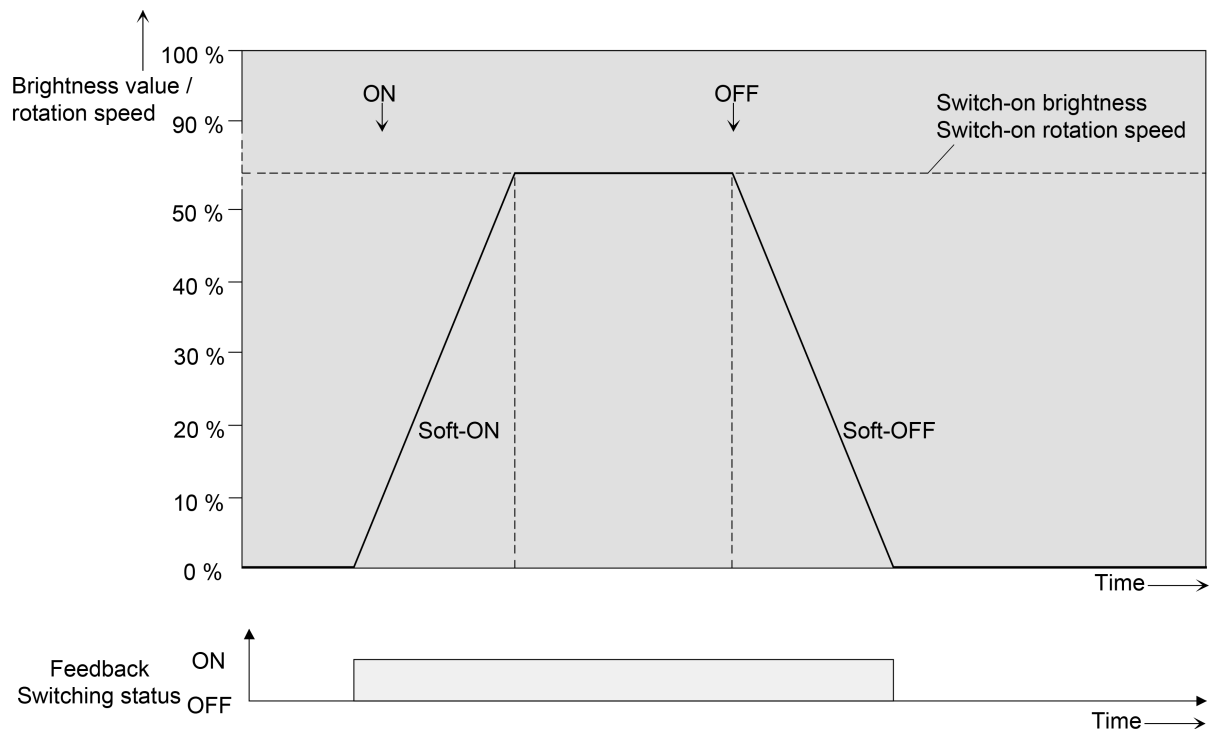


Figure 54: Dimming behaviour of the soft ON/OFF functions (as an example)

The dimming speeds can be configured separately in the ETS for the soft ON and soft OFF function. The relative dimming increment time between 2 of 255 dimming increments is configured directly.

- i** The soft ON or soft OFF functions are not cannot be retriggered by the receipt of further switching telegrams while maintaining the switching status. The soft functions can be activated and configured separately in the ETS.

Enabling and setting soft ON function

The soft ON function can be set separately for each analogue output in the ETS.

The switch-on/off behaviour must be enabled on the parameter page "Outputs -> Analogue -> AO ... - General -> Enabled functions".

- Set the "Soft ON function" parameter on the parameter page "Outputs -> Analogue -> AO ... - General -> Switch-on/off behaviour".

The soft ON function is enabled. The parameter for the time between two dimming increments of the soft ON function becomes visible.

- Configure the parameter "Time between two dimming increments " to the necessary dimming increment time.

Enabling and setting the soft OFF function

The soft ON function can be set separately for each analogue output in the ETS.

The switch-on/off behaviour must be enabled on the parameter page "Outputs -> Analogue -> AO ... - General -> Enabled functions".

- Enable the "Soft OFF function" parameter on the parameter page "Outputs -> Analogue -> AO... - General -> Switch-on/off behaviour".

The soft OFF function is enabled. The parameter for the time between two dimming increments of the soft OFF function becomes visible.

- Configure the parameter "Time between two dimming increments " to the necessary dimming increment time.

13.8.2 Automatic switch-off

The switch-off function permits automatic switching of an analogue output after a value was dimmed or jumped to and this new brightness value is below a switch-off value set in the ETS. A time delay can be configured optionally up to switching off.

The switch-off function is activated after reaching a constant value, i. e. after a completed dimming procedure.

The automatic switch-off function, for example, not only makes it possible to set the speed of a fan to minimum speed, but to switch off by means of relative dimming as well.

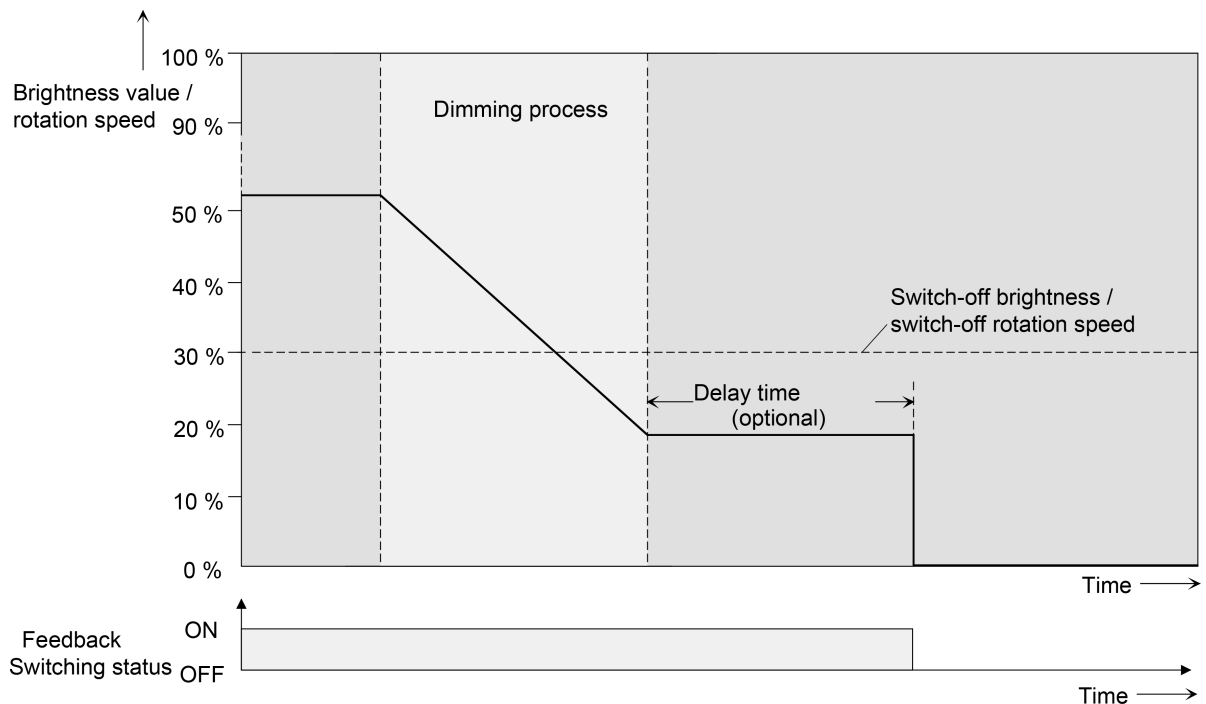


Figure 55: Dimming and switching behaviour of the automatic switch-off function

Switching off always takes place without soft OFF function, i. e. jumping.

The switch-off value can be set within the dimmable range between the lower and upper limit value. The switch-off function is permanently active if the switch-off value is configured to the maximum value and the maximum value is fallen short of randomly.

The feedback objects for switching state and value are updated by the automatic switch-off function after switching off.

The automatic switch-off can firstly be activated by a dimming procedure initiated via the 4-bit ("Dimming - Preset") or 1-byte ("Value - Preset") communication object. Secondly, the automatic switch-off can also be activated if an analogue channel is switched on (switch-on value < switch-off value) or a value is set by programming with the ETS or by a power failure or by the bus / mains voltage returning. The automatic switch-on can also be activated during a scene recall.

It should be noted that the disabling function or forced position function overrides the switch-off function. If the switch-off function is overridden, the actuator terminates the evaluation of the switch-off value.

Enabling automatic switch-off function

The automatic switch-off function can be set separately for each analogue channel in the ETS.

The switch-on/off behaviour must be enabled on the parameter page "Outputs -> Analogue -> AO ... - General -> Enabled functions".

- Enable the parameter "Automatic switch-off" on the parameter page "Outputs -> Analogue -> AO... - General -> Switch-on/off behaviour".

The automatic switch-off function is enabled and activated. Additional parameters become visible.

Setting the switch-off value

The switch-off value must be defined for the switch-off function. The switch-off value is set separately for each analogue channel in the ETS.

The switch-off function must be enabled in the ETS.

- The parameter "Switch off at value less than" on the parameter page "Outputs -> Analogue -> AO... - General -> Switch-on/switch-off behaviour" to the required value.

Once a dimming procedure causes a value to fall below the configured switch-off value and once the value has been set to constant, the analogue channel concerned switches off or alternatively starts the delay until switching off.

-  Please observe that the parametrised value for the switch-off value must be greater than any configured lower value limit and less than the set upper value limit (lower limit value < switch-off value < upper limit value)!

Setting the delay of the switch-off function

A delay can be activated before the switch-off function switches-off automatically after undershooting the switch-off value at the end of a dimming procedure. The time for the delay can optionally be enabled separately for each dimming channel.

The switch-off function must be enabled in the ETS.

- Configure the parameter "Delay time" on the parameter page "Outputs -> Analogue -> AO... - General -> Switch-on/off behaviour" to the required delay time.

Once a dimming procedure causes a value to fall below the parametrised switch-off value and once the value has been set to constant, the actuator triggers the delay time. The analogue channel concerned switches off for good once the delay time has elapsed. The delay time can be re-triggered by further dimming procedures.

13.8.3 Switch-on/switch-off behaviour parameter

Outputs -> Analogue -> AO ... - General -> Enabled functions

Switch-on/switch-off behaviour	Checkbox (yes / no)
Setting the switch-on/switch-off behaviour can be disabled and enabled here.	

Outputs -> Analogue-> AO ... - General -> Switch-on/switch-off behaviour

Soft ON function	Checkbox (yes / no)
The soft ON function allows the analogue channel to be switched on more slowly. If this function is activated, a dimming operation to the switch-on value is executed after receiving a switch-on telegram via the "Switching" object.	

Time between two dimming increments	0...59 s 10... 990 ms
These parameters set the soft ON function for the dimming increment time.	

Soft OFF function	Checkbox (yes / no)
The soft OFF function allows the analogue channel to be switched off more slowly. If this function is activated, a dimming operation to the value "0%" is executed after receiving a switch-off telegram via the "Switching" object.	

Time between two dimming increments	0...59 s 10... 990 ms
These parameters set the soft OFF function for the dimming increment time.	

Automatic switch-off	Checkbox (yes / no)
The automatic switch-off function of the analogue channel can be activated here. If this function is activated, the connect load will switch off completely when a configurable value is undershot at the end of a dimming procedure, and if necessary, after a delay time has elapsed.	

Switch off at value less than	5%, 10% ... 100%
This parameter defines the value, which, if undershot, will cause the analogue channel to be switched off at the end of a dimming procedure, or if necessary, after a delay time has elapsed. This parameter is visible only if the switch-off function is activated.	

Delay until switch-off	Checkbox (yes / no)
The delay for the automatic switch-off function of the analogue channel can be activated here. If activated, the delay time can be set.	

Delay time	0... 23 h 0...59 min 0...30...59
This parameter sets the delay time of the switch-off function. If the switch-off value is undershot at the end of a dimming procedure, the analogue channel is switched off after the time set here has elapsed. The parameters for the time delay are visible only if the switch-off function is enabled.	

13.9 Scene function

Up to 64 scenes can be programmed and scene values stored separately for each analogue output. The scene values are recalled or stored via a separate scene extension object. The data point type of the extension object allows all 64 scenes to be addressed.

The scene function must be enabled on the parameter page "Outputs -> Analogue -> AO... - General -> Enabled functions" for each analogue channel in order for the required communication objects and parameters (on the parameter page "Outputs -> Dimming -> DO... - General -> Scenes") to become visible.

The scene configuration selected in the parametrisation decides whether the number of scenes is either variable (1 ... 64) or fixed to the maximum (64).

- Scene configuration = "variable (1 ... 64 scenes)"
With this setting, the number of scenes used can be selected anywhere in the range 1 to 64. The parameter "Number of scenes" decides how many scenes are visible for the analogue channel in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene.
- Scene configuration = "fixed (64 scenes)"
With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 64) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.

The scene function can be combined together with other functions of a analogue channel, whereby the last received or preset state is always executed:

Presetting a scene recall delay

Each scene recall of an analogue channel can optionally also be delayed. With this feature, dynamic scene sequences can be configured if several scene outputs are combined with cyclical scene telegrams.

Prerequisite

The scene function must be activated on the parameter tab "Outputs -> Analogue -> AO... - General -> Enabled functions".

- On the parameter page "Outputs -> Analogue -> AO... - General -> Scenes", activate the "Delay scene recall" parameter.

The delay time is now activated and can be configured separately. The delay only influences the scene recall of the analogue channel. The delay time is started on arrival of a recall telegram. The corresponding scene will be recalled and the brightness value set on the analogue channel only after this time has elapsed.

-  Each scene recall telegram restarts the delay time and retriggers it. If a new scene recall telegram is received while a delay is active (scene recall not yet executed), the old (and not yet recalled scene) will be rejected and only the scene last received executed.

- i** The scene recall delay has no influence on the storage of scene values. A scene storage telegram within a scene recall delay terminates the delay and thus the scene recall.

Setting the behaviour during ETS programming

When saving a scene, the values are stored internally in the device in a non-volatile manner. To prevent the stored values from being replaced during ETS programming of the application or parameters by the originally programmed scene values, the actuator can inhibit the overwriting of the values. As an alternative, the original values can be reloaded into the device during each programming run of the ETS.

Prerequisite

The scene function must be activated on the parameter tab "Outputs -> Analogue-> AO... - General -> Enabled functions".

- On the parameter page "Outputs -> Analogue -> AO... - General -> Scenes", activate the parameter "Overwrite values stored in the device during the ETS programming operation".

During each ETS programming operation of the application or of the parameters, the scene values configured in the ETS for the analogue channel concerned will be programmed into the actuator. This may overwrite the scene values stored in the device by means of a storage function.

- Deactivate the parameter "Overwrite values stored in the device during the ETS programming operation".

Scene values that may have been stored in the device by means of a storage function are maintained. If no scene values have been stored, the last values programmed in by the ETS remain valid.

- i** When the actuator is commissioned for the first time, this parameter should be activated so that the values are initialised to valid scene values.

Setting scene numbers and scene switching states

The presetting of the scene number depends on the selected scene configuration. With variable configuration the scene number (1...64) with which the scene is addressed, i.e. recalled or stored, must be determined for each scene of the analogue channel. With a fixed scene configuration, the number of a scene is preset invariably. The data point type of the scene extension object permits addressing of up to 64 scenes max.

In addition to specifying the scene number, it is necessary to define which scene command should be set on the analogue channel during a scene recall.

Prerequisite

The scene function must be activated on the parameter tab "Outputs -> Analogue -> AO... - General -> Enabled functions".

- Only with variable scene configuration: On the parameter page "Outputs -> Analogue -> AO... - General -> Scenes", set the parameter for each scene to the numbers with which the scenes are to be addressed.

A scene can be addressed with the configured scene number. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible.

- Only with fixed scene configuration: On the parameter page "Outputs -> Analogue -> AO... - General -> Scenes" select or deselect the parameter "Scene active" if necessary.

Only selected scenes can be used. A deselected scene is deactivated and cannot be recalled or stored via the scene extension unit.

i If with variable scene configuration the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.

- On the parameter page "Outputs -> Analogue -> AO... - General -> Scenes", set the parameter "Brightness value" to the desired value for each scene.

During a scene recall, the configured value is recalled and set on the analogue channel.

i The parameterized brightness value is adopted in the actuator during programming with the ETS only if the parameter "Overwrite values stored in the device during ETS download" is activated.

Setting the storage behaviour

The switching state set for the analogue output can be stored internally via the extension object on receipt of a scene storage telegram. In this case, the switching state can be influenced before the storage by all functions of the analogue output, provided that the individual functions have been enabled (e. g. also the disabling function, forced position function etc.).

Prerequisite

The scene function must be activated on the parameter tab "Outputs -> Analogue -> AO... - General -> Enabled functions".

- On the parameter page "Outputs -> Analogue -> AO... - General -> Scenes", activate the "Storage function" parameter for each scene.

The storage function is activated for the scene in question. On receipt of a storage telegram by means of the "Scenes - Extension unit" object, the current switching state will be stored internally.

- Deactivate the parameter "storage function" for each scene.

The storage function is deactivated for the scene in question. A storage telegram received via the "Scenes - Extension unit" object will be rejected.

Configuring an extended scene recall

The extended scene recall allows calling of up to 64 scenes of an analogue channel in sequence. Here, scene recall takes place via the 1-bit communication object "Extended scene recall". Each ON telegram received via this object recalls the next of the available scenes in the configuration. Each OFF telegram received recalls the

previous scene.

With the extended scene recall, the actuator always recalls the neighbouring scene - starting with the scene most recently recalled via the extended recall. It is irrelevant whether the scene is active on the appropriate analogue channel (scene number = "1...64" or scene active) or inactive (scene number = "0" or scene inactive). If an inactive scene is recalled via the extended scene recall, the appropriate analogue channel will not react.

Only the scenes available in the scene configuration can be selected via the extended scene recall (with "variable" defined by the parameter "number of scenes", with "fixed" always all 64 scenes). After a reset (bus voltage return, ETS programming operation), an ON or OFF telegram always recalls scene 1 first.

i Recall of a scene via the 1-byte extension object does not influence the scene sequence of the extended scene recall. The two recall functions work independently of each other.

- Activate the "Extended scene recall" parameter on the parameter page "Outputs -> Analogue -> AO ... - General -> Scenes".

The object "Extended scene recall" is available. Each ON telegram recalls the next scene. Each OFF telegram recalls the previous scene.

- Deactivate the parameter "Use extended scene recall".

The extended scene recall is deactivated. A scene recall can only take place via the 1-byte scene extension object.

The extended scene recall can take place with or without an overflow at the scene limits. An overflow occurs when the last scene of the selected configuration is reached when counting up or scene 1 when counting down and an additional telegram in the last counting direction is received by the actuator. The overflow behaviour is defined in the ETS.

- Activate the parameter "with overflow".

After reaching the last scene of the selected configuration, a further ON telegram of the overflow is executed and scene 1 is recalled. Similarly, after reaching scene 1, the overflow is executed by further OFF telegram and the last scene of the selected configuration is recalled.

- Deactivate the parameter "With overflow".

A scene overflow is not possible. After reaching the last scene of the selected configuration, further ON telegrams of the extended scene recall are ignored. In the same way, the actuator ignores further OFF telegrams if scene 1 was recalled last.

Setting behaviour when recalling a scene

In the scene configuration of an analogue channel, it is possible to define whether the light intensity instantly jumps or dims to the scene values. When dimming, it can also be predefined whether the dimming procedure should be executed normally by dimming increments or by fading. A scene recall can therefore be executed independent of the set dimming behaviour and dimming characteristic of an output.

Prerequisite

The scene function must be enabled on the parameter page "Outputs -> Analogue -> AO... - General -> Enabled functions".

- On the parameter page "Outputs -> Analogue -> AO... - General -> Scenes", set the parameter "On scene request" to "Jump to value".

The scene values are jumped to instantly during a recall.

- Set the parameter "When recalling a scene" to "Dim to value via dimming increment time". At the same time, define the required "dimming increment time (0...255 ms)" to dim to the scene value.

The scene values concerned are dimmed to during a recall. The time in the parameter selection defines the duration of the dimming procedure between 2 of 255 dimming increments.

- Set the "On scene request" parameter to "Dim values by means of fading". At the same time, define the "fading time (0...240 ms)" required to dim to the scene value.

The scene values concerned are dimmed to during a recall. The dim fading is activated. The time in the parameter selection defines the duration of the dimming procedure required to reach the scene value. The value of an analogue channel at which the dimming process begins is irrelevant. Thus, the dimming procedure in case of a scene recall always requires the exact predefined time.

13.9.1 Scene function parameters

Outputs -> Analogue -> AO ... - General -> Enabled functions

Scene function	Checkbox (yes / no)
This parameter can be used disable or to enable the scene function. The parameter is deactivated if cyclical monitoring is enabled.	

Outputs -> Analogue -> AO ... - General: -> Scenes

Delay scene recall	Checkbox (yes / no)
A scene is recalled via the scene extension object. If required, the scene recall can be delayed on reception of a recall telegram (parameter activated). The recall is alternatively made immediately on reception of the telegram (parameter deactivated).	

Delay time	0...59 min 0...10...59 s
These parameters specify the duration of the scene delay time. This parameter is visible only if "Delay scene recall" has been activated.	

When scene is recalled	Jump to value Dim value over dimming increment time Dimming value by means of fading
When recalling a scene, the configured or stored scene value is set for the analogue channel concerned. This parameter setting can define whether the value can be instantly jumped to or dimmed to or is set via fading. When fading, the value to be set is reached in the exact configured fading time irrespective of the dimming characteristic of a channel and irrespective of which value the dimming procedure was started at. This allows several analogue channels to be set to the same value at the same time, for example.	

Dimming increment time	0 ... 5... 255 ms
Setting of the dimming increment time if the brightness value of a scene should be dimmed. This parameter is visible only if the parameter "When recalling a scene" is set to "Dim to value over dimming increment time".	

Fading time	0 ... 2 ... 240 s
Setting of the fading time if the value of a scene should be dimmed to via fading. This parameter is visible only if the parameter "When recalling a scene" is set to "Dim to value by fading".	

Overwrite values stored in the device during the ETS programming operation	Checkbox (yes / no)
During storage of a scene, the scene values (current states of the analogue outputs concerned) are stored internally in the device. To prevent the stored values from being replaced during ETS programming by the originally programmed scene values, the actuator can inhibit overwriting of the scene values (parameter deactivated). As an alternative, the original values can be reloaded into the device during each programming run of the ETS (parameter activated).	
Use extended scene recall	Checkbox (yes / no)
The extended scene recall allows calling of up to 64 scenes of an analogue channel in sequence. Here, scene recall takes place via the 1-bit communication object "Extended scene recall". Each ON telegram received via this object recalls the next scene. Each OFF telegram received recalls the previous scene. This parameter enables extended scene recall, if required.	
With overflow	Checkbox (yes / no)
The extended scene recall can take place with or without an overflow at the scene limits. An overflow occurs when the last scene of the selected configuration is reached when counting up or scene 1 when counting down and an additional telegram in the last counting direction is received by the actuator. Parameter activated: After reaching the last scene of the selected configuration, a further ON telegram of the overflow is executed and scene 1 is recalled. Similarly, after reaching scene 1, the overflow is executed by further OFF telegram and the last scene of the selected configuration is recalled. Parameter deactivated: A scene overflow is not possible. After reaching the last scene of the selected configuration, further ON telegrams of the extended scene recall are ignored. In the same way, the actuator ignores further OFF telegrams if scene 1 was recalled last. This parameter is only visible when the extended scene recall is used.	
Scene configuration	variable (1...64 scenes) fixed (64 scenes)
The scene configuration selected here decides whether the number of scenes is variable (1 ... 64) or fixed to the maximum (64). variable (1...64 scenes): In this setting, the number of scenes used can be selected anywhere within the range of 1 to 64. The parameter "Number of scenes" decides how many scenes are visible for the switching output in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene. fixed (64 scenes): With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 64) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.	

Number of scenes (1...64)	1...10...64
This parameter is only available with variable scene configuration and defines how many scenes are visible for the analogue channel in the ETS and can therefore be used.	
Scene number	0...1*...64 *: The predefined scene number is dependent on the scene (1...64).
With variable scene configuration, the number of scenes used can be selected anywhere in the range 1 to 64. It is then possible to preset which scene number (1 ... 64) controls each scene. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible. If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case. This parameter is only available with variable scene configuration.	
Scene active	Checkbox (yes / no)
With a fixed scene configuration, individual scenes can be activated or deactivated. Only activated scenes can be used. A deactivated scene cannot be recalled or stored via the scene extension unit. This parameter is only available with fixed scene configuration.	
Value	switch off 1% 5 % ... 100 %
This parameter is used for configuring the value which is set when the scene is recalled. The default value depends on the scene number.	
Memory function	Checkbox (yes / no)
If the parameter is activated, the storage function of the scene is enabled. The current switching state can then be stored internally via the extension object on receipt of a storage telegram. If the parameter is deactivated, the storage telegrams are rejected.	

13.9.2 Object list scene function

Function	Name	Type	DPT	Flag
Scenes - Extension unit	AO ... - Input	1-byte	18,001	C, -, W, -, U
1-byte object for calling or saving a scene.				

Function	Name	Type	DPT	Flag
Scenes - Extended scene recall	AO ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for extended scene recall. Each ON telegram received recalls the next scene of an analogue channel in sequence. Each OFF telegram received recalls the previous scene. After a reset (bus voltage return, ETS programming operation), an ON or OFF telegram always recalls scene 1 first.				

13.10 Logic operation function

A logic function can be parametrised separately for each analogue channel. This function allows the logic operation of the "Switching" object state and an additional logic operation object. The state of the communication object for "switching" can also be evaluated with a time delay if a switch-on delay or switch-off delay is set. The logic operation function can also be combined with other functions of an analogue channel.

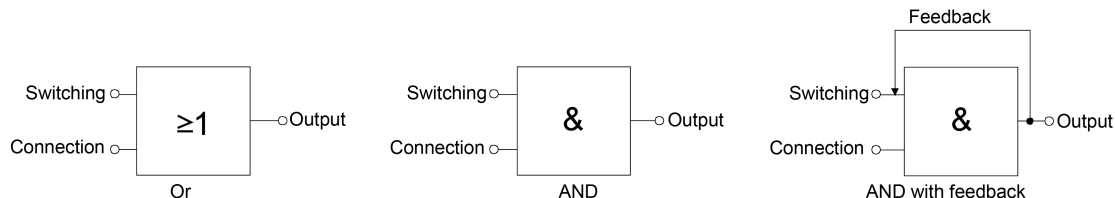


Figure 56: Logic operation types of the logic operation function

"AND with feedback":

With a logic object = "0", the switching output is always "0" (logic AND). In this case, the feedback signal from the output to the "switching" input will directly reset this input when it is being set. The output of the switching output can assume the logical state "1" by a newly received "1" on the input "switching" only when the logic object is = "1".

The object "Logic operation" can be initialised with a configured value after the bus voltage returns or after an ETS programming operation so that a correct logic operation result can be determined immediately and set on the output during a telegram update on the "Switching" object.

- On the parameter page "Outputs -> Analogue -> AO ... - General -> Enabled functions", activate the "Logic operation function" parameter.

The logic operation function is enabled. The communication object "Logic operation function - Input" and the parameters of the logic operation function on the parameter page "Outputs -> Analogue -> AO... - General -> Logic operation function" become visible.

- Set the parameter "Type of logic operation function" to the desired logic operation type.
- Set the parameters "Object value after bus voltage returns" and "Object value after ETS programming" to the required initial states.

The "Logic operation - Input" object is initialised immediately with the set switching states after the bus voltage returns or after an ETS programming of the application program or parameters.

- i** The logic operation function after a reset of the actuator (bus voltage return or ETS programming operation) is first executed when the switching object is updated as the input of the logic operation by at least one telegram.
- i** The states or switching states specified at the end of a disabling function or forced position function, which are set after programming in the ETS, in the case of bus voltage failure or after the bus voltage returns, override the logic

operation function. The configured logic operation is first re-executed and the result set on the switching output when the switching object is updated as the input of the logic operation by at least one telegram.

13.10.1 Logic operation function parameters

Outputs -> Analogue -> AO ... - General -> Enabled functions

Logic operation function	Checkbox (yes / no)
This is where you specify whether the logic operation function is available for the analogue channel.	

Outputs -> Analogue -> AO ... - General -> Logic operation function

Type of logic operation function	OR AND AND with feedback
This parameter defines the logical type of the logic operation function. The object "logic operation" is linked to the logic switching state of the analogue channel (object "switching" after evaluation of the configured time delays if necessary) using the logic operation function set here. This parameter is only visible when the logic operation function is enabled.	

Object value after bus voltage returns	0 (OFF) 1 (ON)
After the bus voltage returns, the object value of the logic operation object is initialised here with the preset value. This parameter is only visible when the logic operation function is enabled.	

Object value after ETS programming operation	0 (OFF) 1 (ON)
After programming the application or the parameters in the ETS, the object value of the logic operation object is initialised here with the preset value. This parameter is only visible when the logic operation function is enabled.	

13.10.2 Object list logic operation function

Function	Name	Type	DPT	Flag
Logic operation function - Input	AA ... - Input	1-bit	1,002	C, -, W, -, U
1-bit object for the input of the logical operation of an analogue channel. After the bus voltage returns or after programming with the ETS, the object value can be pre-defined by means of a parameter.				

13.11 Operating hours counter

The operating hours counter determines the switch-on time of an analogue channel. A channel is actively on for the operating hours counter if the value is greater than "0", i.e. when current is flowing to the load.

The operating hours counter can either be configured as a second meter or as an hour meter.

- **Second counter**
The actuator adds up the determined switch-on time accurately to the second for a switched-on analogue channel. The totalled operating seconds are added in a 4-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 13.100.
- **Hour counter**
The actuator adds up the determined switch-on time accurately to the minute for a switched-on dimming channel in full operating hours. The totalled operating hours are added in a 2-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 7.007.

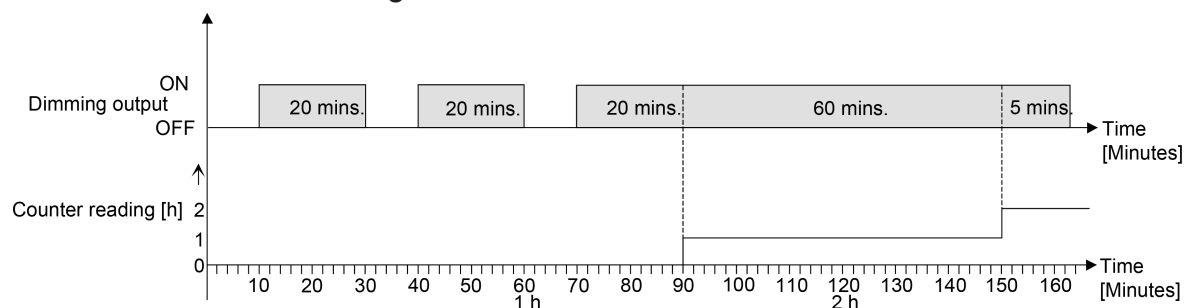


Figure 57: Function of the operating hours counter (using the example of counted hours)

In the delivery state, all values of the actuator are "0". If the operating hours counter is not enabled in the configuration of an output, no operating hours or operating seconds will be counted for the output concerned. Once the operating hours counter is enabled in the ETS, however, the operating hours or operating seconds will be determined and added up by the ETS immediately after commissioning the actuator. If the operating hours counter is subsequently disabled again in the parameters and the actuator is programmed with this disabling function, all the operating hours or operating seconds previously counted for the output concerned will be deleted. When enabled again, the meter reading of the operating hours counter is always set to "0".

The operating hours values (full hours) or operating seconds stored in the device will not be lost in case of a bus voltage failure or by ETS programming.

On the hour counter: Any summed up operating minutes (full hour not yet reached) will be rejected in this case, however.

After the bus voltage returns or after an ETS programming operation, the actuator passively updates the "Operating hours counter - Meter reading - Status" communication object for each output. The object value can be read out if the read-flag is set.

The object value, depending on the configuration for the automatic transmission, is actively transmitted if necessary to the KNX once the configured transmission delay has elapsed after the bus voltage returns (see "Set transmission behaviour of the operating hours counter").

Activating the operating hours counter

- On the parameter page "Outputs -> Analogue -> AO ... - General -> Enabled functions", activate the "Operating hours counter" parameter.

The operating hours counter is activated.

- Deactivate the "operating hours counter".

The operating hours counter is deactivated.

-  Disabling of the operating hours counter and subsequent programming with the ETS resets the counter status to "0".

Setting the counting direction

The operating hours counter can optionally be configured as an up-counter or down-counter. Depending on this counting direction, a signal value or start value can optionally be set; in this way it is possible, for example, to monitor the operating time of a fan by restricting the meter range.

Up-counter:

After activating the operating hours counter by enabling in the ETS or by restarting, the operating hours are counted starting at "0". A maximum of 65,535 hours or 2147483647 can be counted (corresponds to approx. 66 years) before the meter stops and signals a meter operation by means of the object "Operating hours counter - Counter elapsed - Status".

A signal value can optionally be set in the ETS or specified via the communication object "Operating hours counter - Signal value". In this case, the counter operation is signalled to the KNX via the "Operating hours counter - Counter elapsed - Status" object if the limiting value is reached, but the meter continues counting - if it is not restarted - up to the maximum value and then stops. Only a restart initiates a new counting operation.

Down-counter:

After enabling the operating hours counter in the ETS, the meter reading is on "0" and the actuator signals a counter operation for the output concerned after the programming operation or after the bus voltage returns by means of the object "Operating hours counter - Counter elapsed - Status". Only after a restart is the down-counter set to the maximum value of 65,535 hours or 2147483647 seconds (corresponds to approx. 66 years) and the counter operation is started.

A start value can be set optionally in the ETS or can be predefined via the communication object "start value operating hours counter". If a start value is set, the down-counter is initialised with this value instead of the maximum value after a restart. The meter then counts the start value downwards by the hour. When the down-meter

reaches the value "0", the meter operation is signalled to the KNX by means of the "Operating hours counter - Meter elapsed - Status" object and the counting is stopped. Only a restart initiates a new counting operation.

The operating hours counter must be enabled on the parameter page "Outputs -> Analogue -> AA... - General -> Enabled functions".

- Set the "Counting direction" parameter on the parameter page "Outputs -> Analogue -> AO ... - General -> Operating hours counter" to "Up counter". Set the parameter "Preset value" to "via parameter" or "via object" if it is necessary to monitor the signal value. Otherwise, reset the parameter to "no". In the "via parameter" setting, specify the required signal value.

The meter counts the operating hours forwards starting from "0". If monitoring the signal value is activated, the actuator transmits an "ON" telegram via the object "Operating hours counter - Meter elapsed - Status" for the output concerned as soon as the specified signal value is reached. Otherwise, the counter operation is first transmitted when the maximum value is reached.

- Set the "Counting direction" parameter to "Backward". Set the parameter "Preset start value" to "via parameter" or "via object" if it is necessary to specify a start value. Otherwise, reset the parameter to "no". In the "via parameter" setting, parametrise the required start value.

The meter counts the operating hours down to "0" after a restart. With a start value preset, the start value is counted down, otherwise the counting operation starts at the maximum value. The actuator transmits an "ON" telegram via the object "Operating hours counter - Meter elapsed - Status" for the output concerned as soon as the value "0" is reached.

i The value of the communication object "Operating hours counter - Meter elapsed - Status" is permanently stored internally. On switching on the bus voltage or after an ETS programming operation, the object is initialised with the most recently saved value. If an operating hours counter is in this case identified as elapsed, i. e. if the object value is a "ON", an additional telegram will be actively transmitted to the KNX as soon as the configured transmit delay has elapsed after the bus voltage returns. If the meter has not yet elapsed (object value "OFF"), no telegram is transmitted after the bus voltage returns or after an ETS programming operation.

i In the case of a signal value or start value preset via communication object: The values received via the object are not accepted as valid and permanently saved internally until the operating hours counter is restarted. On switching on the supply voltage or after an ETS programming operation, the object is initialised with the most recently saved value. The values received will be lost in the case of a bus voltage failure or by an ETS programming operation if no counter restart was executed before. For this reason, when specifying a new start or signal value, it is advisable always to execute a counter restart afterwards as well. A standard value of 65,535 hours or 2147483647 seconds is predefined provided that no signal value or start value has been received yet

via the object. The values received and stored via the object are reset to the standard value if the operating hours counter is disabled in the parameters of the ETS and an ETS programming operation is being performed.

- i** With a signal or start value predefined via object: If the signal value or start value is predefined with "0", the actuator will ignore a counter restart to avoid an undesired reset (e. g. in construction site mode -> operating hours already counted by manual operation).
- i** If the counter direction of an operating hours counter is reversed by reconfiguration in the ETS, a restart of the meter should always be performed after programming the actuator so that the meter is reinitialised.

Restarting the operating hours counter

The meter reading of the operating hours can be reset at any time by the communication object "Operating hours counter - Reset". The polarity of the reset telegram is predefined: "1" = Restart / "0" = No reaction.

In the up-counter the meter is initialised with the value "0" after a restart and in the down-counter initialised with the start value. If no start value was configured or predefined by the object, the start value is preset to 65535 hours or 2147483647 seconds.

During every counter restart, the initialised meter reading is transmitted actively to the KNX.

After a restart, the signal of a counter operation is also reset. At the same time, an "OFF" telegram is transmitted to the KNX via the object "Operating hours counter – Meter elapsed - Status". In addition, the signal or start value is initialised.

If a new signal or start value was specified via the communication object, the counter should always be restarted afterwards too. Otherwise, the values received will be lost in the case of a bus voltage failure or by an ETS programming operation.

If a start value or signal value is specified with "0", there are different behaviours after a restart, depending on the principle of the preset value...

Preset as parameter:

The meter elapses immediately after a counter restart.

Preset via object:

A counter restart will be ignored to avoid an undesired reset (e. g. after installation of the devices with operating hours already being counted by manual operation). A start value or signal value greater than "0" must be specified in order to perform the restart.

Setting the transmission behaviour

The current value of the operating hours counter is continuously tracked in the communication object "Operating hours counter – Meter reading - Status". The content of the object is transmitted to the KNX when there is a change by the set count interval or cyclically active. The object value can also be read out at any time (set read flag).

The operating hours counter must be enabled on the parameter page "Outputs -> Analogue - > AA... - General -> Enabled functions".

- Set the "Transmission behaviour" parameter on the parameter page " Outputs -> Analogue -> AO ... - General -> Operating hours counter" to "After change by interval value". Set the parameter "Counting interval" to the desired value.

The meter reading is transmitted to the KNX as soon as it changes by the specified counting interval. After the bus voltage returns or after an ETS programming operation, the object value is transmitted automatically after "Delay after bus voltage returns" has elapsed if the current meter reading or a multiple of this corresponds to the counting value interval. A meter reading "0" is always transmitted in this case.

- Set the parameter "Transmission behaviour" to "cyclical".

The counter value is transmitted cyclically. The cycle time is defined via the parameter of the same name. After the bus voltage returns or an ETS programming operation, the meter reading is transmitted to the KNX for the first time after the configured cycle time has elapsed.

13.11.1 Operating hours counter parameters

Outputs -> Analogue -> AA... - General -> Enabled functions

Operating hours counter	Checkbox (yes / no)
The operating hours counter can be disabled or enabled here.	

Outputs -> Analogue -> AA... - General -> Operating hours counter

Counting method	Seconds Hours

The operating hours counter can either be configured as a second meter or as an hour meter.

Seconds: The actuator adds up the determined switch-on time accurately to the second for a switched-on analogue channel. The totalled operating seconds are added in a 4-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 13.100.

Hours: The actuator adds up the determined switch-on time accurately to the minute for a switched-on dimming channel in full operating hours. The totalled operating hours are added in a 2-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 7.007.

Counting direction	Forwards Backwards

The operating hours counter can be configured as an up-counter or down-counter. The setting here influences the visibility of the other parameters and objects of the operating hours counter.

Specifying a signal value	Checkbox (yes / no)

If the up-counter is used, a signal value can optionally be predefined. This parameter specifies whether the signal value is to be used. The setting "No" deactivates the reporting value.

This parameter is only visible in the configuration "Counting direction = Forward".

Preset value	via parameter via object

If the up-counter is used, a signal value can optionally be predefined. This parameter defines whether the signal value can be set via a separate parameter or adapted individually by a communication object from the bus.

This parameter is only visible in the configuration "Counting direction = Forward".

Signal value	0...2147483647 s * 0...65535 h **
Here the reporting value of the up counter is set. Once this signal value is reached, an "ON" telegram is transmitted via the object "Operating hours counter - Meter elapsed - Status". The meter itself continues until the maximum meter reading is reached and then stops. *: With second counter **: With hours counter This parameter is only visible if the parameter "Preset value" is set to "via parameter".	
Specify start value	Checkbox (yes / no)
If the down-counter is used, a start value can optionally be predefined. This parameter specifies whether the start value is to be used. The setting "No" deactivates the start value. This parameter is only visible in the configuration "Counting direction = Backward".	
Preset value	via parameter via object
If the down-counter is used, a start value can optionally be predefined. This parameter defines whether the start value can be set via a separate parameter or adapted individually by a communication object from the bus. This parameter is only visible in the configuration "Counting direction = Backward".	
Start value	0...2147483647 s * 0...65535 h **
The start value of the down-counter is set here. After initialisation, the meter starts counting down from the predefined value to the value "0". If this end value is reached, an "ON" telegram is transmitted via the object "Operating hours counter - Meter elapsed - Status". *: With seconds counter **: With hours counter This parameter is only visible if the parameter "Start value preset" is set to "via parameter".	
Transmission behaviour	cyclical after change by interval value
The current meter reading of the operating hours meter can be transmitted actively to the KNX via the communication object "Operating hours counter – Meter reading – Status". Cyclical: The meter reading is transmitted cyclically to the KNX and when there is a change. after change by interval value: The meter reading is transmitted to the KNX only when there is a change.	

Cycle time	0...23 h 0...15...59 min 0...59 s
This parameter defines the cycle time for the cyclical transmission. This parameter for the cycle time is only visible when parameter "Transmission behaviour of the counter value" is set to "cyclically".	
Counting interval	0...3600...2147483647* 0...1...65535**
The interval of the counter value is set here for automatic transmission. The current meter reading is transmitted to the KNX after the time interval configured here. *: With second counter **: With hours meter This parameter is only visible when parameter "Transmission behaviour of the counter value" is set to "On change by interval value".	

13.11.2 Object list operating hours counter

Function	Name	Type	DPT	Flag
Operating hours counter - Start value	AO ... - Input	4-byte	13,100	C, -, W, -, U
4-byte object for external specification of a limit value/starting value of the operating hours meter of a dimming output. Value range: 0...2147483647 seconds This object is available only for the seconds meter and if a start value has been specified "via object".				
Function	Name	Type	DPT	Flag
Operating hours counter - Start value	AO ... - Input	2-byte	7,007	C, -, W, -, U
2-byte object for external specification of a limit value/starting value of the operating hours meter of a dimming output. Value range: 0...65,535 hours This object is available only for the hour meter and if a start value has been specified "via object".				
Function	Name	Type	DPT	Flag
Operating hours counter - Restart	AO ... - Input	1-bit	1,015	C, -, W, -, U
1-bit object for resetting the operating hours counter of a dimming output ("1" = re-start, "0" = no reaction).				
Function	Name	Type	DPT	Flag
Operating hours counter - Meter reading - Status	AO ... - Output	4-byte	13,100	C, R, -, T, A
4-byte object to transmit or read out the current counter level of the operating hours counter of a dimming output. Value range: 0...2147483647 seconds In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation. In the as-delivered state, the value is "0". This object is only available with the second counter.				

Function	Name	Type	DPT	Flag
Operating hours counter - Meter reading - Status	AO ... - Output	2-byte	7,007	C, R, -, T, A

2-byte object to transmit or read out the current counter level of the operating hours counter of a dimming output.

Value range: 0...65,535 hours

In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation. In the as-delivered state, the value is "0".

This object is only available with the hour counter.

Function	Name	Type	DPT	Flag
Operating hours counter - Meter elapsed - Status	AO ... - Output	1-bit	1,002	C, R, -, T, A

1-bit object to sign that the operating hours counter has elapsed (forwards counter = limit value reached / backwards counter = value "0" reached). With a message, the object value is actively transmitted to the KNX ("1" = message active / "0" = message inactive).

In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation.

13.12 Disabling function/Forced position

A disabling function, or alternatively, a forced position function can be configured for each analogue channel. In this respect, only one of these functions can be enabled for one analogue channel.

Setting the disabling function

During an active disabling function, the KNX control of the analogue channel concerned is overridden and locked. Continuous switching, for example, can also be overridden. The deactivation of the disabling function can optionally take place using an additional 1-bit acknowledgement object. This prevents the deactivation of the disabling function by the disabling object.

- On the parameter page "Outputs -> Analogue -> AO... - General -> Enabled functions" Set the parameter "disabling function / forced position" to "disabling function".

The disabling function is enabled. The communication object "Disabling function - Activate / deactivate" and the parameters of the disabling function on the parameter page "Outputs -> Analogue -> AA... - General -> Disabling function" become visible.

- Set the parameter "Object polarity" to the desired polarity.
- Set the parameter "Beginning of the disabling function" to the required behaviour.

At the beginning of the disabling function, the configured behaviour will be executed and the bus control of the analogue channel locked.

With the "Switch off" setting, the output is switched off and remains in this state.

In the "Value" setting, the channel sets the value set below and remains in this state.

The "Memory value (value before last switch-off)" setting is used to set the value that was active and internally stored before the last switch-off (via the "Switching" or "Central switching" object). After programming with the ETS, the value is predefined to maximum value. Only a bus voltage failure, however, does not delete the memory value.

In the "No reaction" setting, the dimming channel shows no response and remains in the state last selected.

For disabling function without acknowledgement object...

- Deactivate the parameter "Confirmation".

No additional acknowledgement object is available. The disabling function is deactivated by the disabling object according to the set polarity.

- Set the parameter "End of the disabling function" to the required behaviour.

At the end of the disabling function, the configured behaviour will be executed and the bus control of the analogue channel enabled again.

With the "Switch off" setting, the output is switched off and remains in this state.

In the "Value" setting, the channel sets the value set in the following.

The "Memory value (value before last switch-off)" setting is used to set the value that was active and internally stored before the last switch-off (via the "Switching" or "Central switching" object). After programming with the ETS, the value is predefined to maximum value. Only a bus voltage failure, however, does not delete the memory value.

In "Set tracked state", the last switching state received during the disabling function or the value set before the disabling function will be tracked. Any time functions still in progress will also be taken into account if necessary.

In the "No reaction" setting, the output shows no reaction and remains in the state last set by the disabling function.

For disabling function with acknowledgement object...

- Activate the parameter "Acknowledgement".

The acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an "ON telegram". Telegrams to the disabling object according to the "Deactivate disabling" polarity are ignored by the actuator.

 "OFF" telegrams to the acknowledgement object do not product a reaction.

- Set the parameter "End of the disabling function after acknowledgement" to the required behaviour.

At the end of the disabling function, the configured behaviour will be executed and the bus control of the analogue channel enabled again.

With the "Switch off" setting, the output is switched off and remains in this state.

In the "Value" setting, the channel sets the value set in the following.

The "Memory value (value before last switch-off)" setting is used to set the value that was active and internally stored before the last switch-off (via the "Switching" or "Central switching" object). After programming with the ETS, the value is predefined to maximum value. Only a bus voltage failure, however, does not delete the memory value.

With "tracked value", the brightness value received during the disabling function or the value set before the disabling function is tracked at the end of disabling. Any time functions still in progress will also be taken into account if necessary.

In the "No reaction" setting, the output shows no reaction and remains in the state last set by the disabling function.

- i** After a bus voltage failure or after programming the application or the parameters with the ETS, the disabling function is always deactivated (object value "0"). With the inverted setting ("1 = enabled; 0 = disabled"), a telegram update "0" must first be carried out after the initialisation until the disabling is activated.
- i** Updates of the disabling object from "activated" to "deactivated" do not produce a reaction.
- i** A disabled analogue channel can be still be operated manually!
- i** In the setting "Set tracked state": During a disabling function, the overridden functions of the actuator (switching, scenes) continue to be executed internally. Consequently, newly received bus telegrams are evaluated and time functions are triggered as well. At the end of the disabling, the tracked states are set.

Setting forced position function

The forced position function can also be combined with other functions of an analogue channel. With an active forced position, functions with a lower priority are overridden so that the analogue channel concerned is locked.

The forced position function possesses a separate 2-bit communication object. The first bit (bit 0) of the object "Forced position – Activate/deactivate" indicates whether the analogue channel is switched off or switched on by force. If the dimming channel is switched on by force, an ETS parameter defines which value it should be switched on to. The second bit (bit 1) activates or deactivates the restraint (see table below). The behaviour of an analogue channel at the end of the forced-position function can be configured. In addition, the forced object can be initialised when the bus voltage returns.

Bit 1	Bit 0	Function
0	x	Forced position not active -> normal control
1	0	Forced position active: switch off
1	1	Forced position active: switch on

Bit coding of forced position

- On the parameter page "Outputs -> Analogue -> AO ... - General -> Enabled functions" Set the parameter "disabling function" to "forced position".

The forced position function is enabled. The communication object "Forced position - Activate / Deactivate" and the parameter of the forced position function on the parameter page "Outputs -> Analogue -> AO... - General -> Forced position" become visible.

- Set the parameter "forced position end 'inactive'" to the required behaviour.

At the end of the forced position, the configured behaviour will be executed and the bus control of the analogue channel enabled again.

With the "No reaction" setting, the analogue channel remains in the state last set by the forced position.

With "tracked value", the brightness value received during the forced position function or the value set before the function is adjusted at the end of the forced position. Any time functions still in progress will also be taken into account if necessary.

- i Updates of the forced position object from "Forced position active" to "Forced position active" while maintaining the switching status or from "Forced position inactive" to "Forced position inactive" show no reaction.
- i A forcibly activated analogue channel via the KNX can be still be operated manually!
- i With the "tracked value" setting at the end of the forced position: During a forced position, the overridden functions of the actuator (switching, scenes) continue to be executed internally. Consequently, newly received bus telegrams are evaluated and time functions are triggered as well. At the forced end, the tracked states are set.
- i The current state of the forced position object will be stored in case of bus voltage failure.
- Set the parameter "After bus voltage returns" to the required behaviour.

After the bus voltage returns, the configured state is transferred to the "Forced position – Activate / Deactivate" communication object. When a forced position is activated, the analogue channel is immediately activated and interlocked accordingly by the forced control after the bus voltage returns until forced control is enabled via the KNX. In this case the parameter "After bus voltage returns" on the parameter page "Outputs -> Analogue - AO... - General" is not evaluated for the affected analogue channel in this case.

In the "state before bus voltage failure" setting, the forced position state last selected and internally stored before bus voltage failure will be tracked after the bus voltage returns. An ETS programming operation deletes the stored state (reaction in that case same as with "no forced position").

If the tracked state corresponds to "No forced position", the force-independent parameter "After bus voltage returns" (parameter page "Outputs-> Analogue – AO ... - General") will be executed when the bus voltage returns.

- i After programming the application or parameters with the ETS, the forced position function is always deactivated (object value "0").

13.12.1 Disabling function/forced position parameter

Outputs -> Analogue -> AO ... - General -> Enabled functions

Disabling function / Forced position	no selection Disabling function Priority control
It can be defined here whether a disabling function or a forced position for the analogue output should be available. The disabling function is only configurable as an alternative to the forced position function.	

Outputs -> Analogue -> AA... - General -> Disabling function

Status object	Checkbox (yes / no)
This parameter enables the 1-bit status object of the disabling function.	

Acknowledgement	Checkbox (yes / no)
The deactivation of the disabling function can optionally take place using an additional 1-bit acknowledgement object. This prevents the deactivation of the disabling function by the disabling object. Alternatively, the acknowledgement object is not available. In this case, disabling is deactivated via the disabling object. Parameter activated: The acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an "ON telegram". Telegrams to the disabling object according to the "Deactivate disabling" polarity are ignored by the actuator. Parameter deactivated: No additional acknowledgement object is available. The disabling function is deactivated by the disabling object according to the set polarity.	

Polarity of the locking object	0 = enabled; 1 = disabled 1 = enabled; 0 = disabled
This parameter defines the polarity of the disabling object. This parameter is visible only if the disabling function is enabled.	

Beginning of disabling function	Switch off Value Memory value (value before switching off the last time) no reaction
The behaviour of the analogue output at the beginning of the disabling function can be configured. This parameter is visible only if the disabling function is enabled. Switch off: At the start of the disabling function, the analogue output is switched off and locked. Value: At the start of locking, the analogue channel is set to the specified value and locked. Memory value: At the start of the disabling function, the active and internally saved value prior to the last switch-off is set (via the "Switching" or "Central switching" object). no reaction: At the start of a disabling function, the analogue channel shows no reaction and remains in the currently set state. Bus operation of the analogue channel is then locked.	

End of disabling function	Switch off Value Memory value (value before switching off the last time) set tracked state no reaction
The behaviour of the analogue output at the end of the disabling function can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is not used. Switch off: At the end of the disabling function, the analogue output is switched off and enabled again. Value: At the end of disabling, the analogue channel is set to the specified value and enabled again. Memory value: At the end of the disabling function, the active and internally saved value prior to the last switch-off is set (via the "Switching" or "Central switching" object). tracked value: At the end of the disabling function, the state received during the disabling function or the state set before the disabling function is tracked with the appropriate value. Any time functions still in progress will also be taken into account if necessary. no reaction: At the end of a disabling function, the analogue channel shows no reaction and remains in the currently set state. Bus operation of the analogue channel is enabled again.	

End of disabling function after acknowledgement	Switch off Value Memory value (value before switching off the last time) set tracked state no reaction
The behaviour of the analogue output at the end of the disabling function after successful confirmation can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is not used. Switch off: On confirmation, the analogue output is switched off and enabled again. Value: The analogue channel is set to the specified value and enabled again upon acknowledgement. Memory value: On confirmation, the active and internally stored value prior to the last switch-off is set (via the "Switching" or "Central switching" object). set tracked state: Upon acknowledgement, the state received during or before the disabling function will be tracked with the suitable value. Any time functions still in progress will also be taken into account if necessary. no reaction: On confirmation, the analogue channel shows no reaction and remains in the currently set state. Bus operation of the analogue channel is enabled again.	

Outputs -> Analogue -> AO ... - General -> Forced position

Forced position "active, switch-on"	Value no reaction Memory value (value before switching off the last time)
If the forced position is activated and a restraint is "ON", you can define here how the analogue channel should behave. Value: The analogue channel is set to the specified value. no reaction: The analogue channel shows no reaction and remains in the state currently set. Memory value: The active and internally saved value prior to the last switch-off is set (via the "Switching" object).	
Value	1, 5, 10 ... 100%
The device is switched to the value parametrised here if the forced position is activated. This parameter is visible only if "Value" has been set for the ""Switch on actively" forced position" parameter.	

Forced position "active, switch-off"	Switch off
If the forced position is activated and restraint is "OFF", the analogue output is always switched off. This parameter cannot be edited and is only visible when the forced position function is enabled.	
Forced position end "inactive"	no reaction tracked value
The behaviour of the analogue channel at the end of the forced-position can be configured here. This parameter is only visible when the forced position function is enabled. no reaction: The output shows no reaction and remains in the state last set by the forced position. tracked value: At the end of the forced position, the state received during the forced position function or the state set before the function is tracked with the appropriate value. Any time functions still in progress will also be taken into account if necessary. Bus operation of the analogue channel is enabled again.	
After the bus voltage returns	No forced position Forced position active, switch on Forced position active, switch off State before bus voltage failure
The forced position communication object can be initialised after the bus voltage returns. The brightness status of the analogue channel can be influenced when the forced position function is activated. This parameter is only visible when the forced position function is enabled. no forced position: No forced position is activated after the bus voltage returns. Reaction of the analogue channel according to the parameter "Behaviour after bus voltage returns". Forced position active, switch on: The forced position is activated. The analogue channel is switched on to the value predefined by the parameter "Switch on value for forced position 'active'". Forced position active, switch off: The forced position is activated. The analogue output is forcibly switched off. State before bus voltage failure: The forced position state last selected and internally stored before bus voltage failure will be tracked after the bus voltage returns. An ETS programming operation deletes the stored state (reaction in that case same as with "no forced position active"). If the tracked state corresponds to "No forced position", the force-independent parameter "After bus voltage returns" (parameter page "Outputs-> Analogue -> AO ... - General") will be executed when the bus voltage returns.	

13.12.2 Object list for disabling function/forced position

Function	Name	Type	DPT	Flag
Disabling – Activate/De-activate	AO ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for disabling an analogue channel (polarity configurable).				
Function	Name	Type	DPT	Flag
Disabling - Status	AO ... - Output	1-bit	1,003	C, R, -, T, A
One-bit object for querying the current status of the disabling function.				
Function	Name	Type	DPT	Flag
Disabling function - Acknowledgment	AO ... - Input	1-bit	1,016	C, -, W, -, U
1-bit object to acknowledge an active disabling function of an analogue channel. This object is only visible if the acknowledgement is to be used with the disabling function ("1" = Disabling function is deactivated / "0" = disabling function remains active).				
Function	Name	Type	DPT	Flag
Forced position - Activate/deactivate	AO ... - Input	2-bit	2,001	C, -, W, -, U
2-bit object for the forced position of an analogue channel. The polarity is fixed by the telegram.				

14 Relay outputs

The relay outputs are used to control AC 110 / 230 V loads. Depending on the type and number of FanCoil units used, up to 10 outputs are available. Each relay output can be parametrised separately or according to a template. With two adjacent outputs, it is possible to switch between switching outputs and Venetian blind outputs.

14.1 Channel configuration



CAUTION!

Incorrect control of the load in case of incorrect device configuration in the ETS!

Danger of destruction of the connected blind drives.

Adapt the device configuration (channel definition) in the ETS to the connected load!



CAUTION!

Operating the actuator outside its technical specification (see Technical Data) can cause relay contacts to melt.

Risk of destruction of the connected drive motors from melted relay contacts and resulting simultaneous energising of both travel directions.

Only ever operate the actuator within its technical specification!

Configuring channel definition

The device is used to activate electrical loads of up to two different building devices that are typically used in a residential or office spaces or in a hotel room. The device has potential-free relay outputs for this purpose. Two outputs together form a pair which can be configured in the ETS either for Venetian blind operation (combined outputs for UP and DOWN) or, alternatively, to switching operation (separate outputs).

The pair formation of the relay outputs allows mixed operation of the named operating modes on the device. By combining the functions of the relay outputs, in many cases it is possible to plan and execute electrical installations on a room-specific basis.

A mechanical locking of the travel directions is not implemented since the outputs must be controllable separately in switching operation.

- Set the desired functions for the output pairs in the channel definition on the "General" parameter page.

Venetian blind: The appropriate output pair is configured to Venetian blind operation. Both outputs are combined into one blind channel. Suitable slatted Venetian blinds, shutters, awnings, roof windows or venting louvres can be controlled.

Switching: The appropriate output pair is configured to switching operation. Both outputs are programmed separately as two switching channels.

It is possible to deactivate output pairs by deselecting the parameter "Use" (e. g. as a reserve for future applications). Deactivated output pairs have no parameters or communication objects and cannot be controlled even with manual operation.

The parameter and object configurations of the individual outputs depend on the parameters on the pages "General -> HVAC" and "Outputs -> Switching / Venetian blind" and are adjusted by the ETS when the channel definition is changed. Consequently, parameter settings or group address assignments to objects can be lost. For this reason, the channel definition should be reset when beginning the parameterization of the actuator!

Using channel templates

To simplify the configuration, the Venetian blind channels or switching channels can be assigned individually to the same parameters in the ETS and thus configured identically. The parameter "Parametrisation" on the parameter page "Outputs -> Switching / Venetian blind" specifies whether each individual channel of the device can be parametrised individually or whether they are to be configured by means of the parameters of a template channel.

In the "by template" setting, the number of parameters in the ETS is reduced. The parameters of the template channel are then used on these channels automatically. Only the communication objects can then be configured separately for the channels. This setting should be selected, for example, if all channels behave identically and should only be activated by different group addresses (e. g. in office blocks or in hotel rooms).

If the setting "by template" is selected for at least one relay output, a template channel of the corresponding type is displayed in addition to the channels of the relay outputs. This template channel has all the functional parameters of a corresponding relay output except for the "Name" parameter. The template channel does not have its own communication objects. For the relay output that uses the settings of the template channel, only the "Name" parameter and all communication objects remain displayed.

14.1.1 Channel configuration parameters

Outputs -> Switching / Venetian blind

O ... Use	Checkbox (yes / no)
Relay outputs that are not required can be activated or deactivated. Outputs that are reserved for the FanCoil valve or fan control cannot be used, but are labelled as blocked outputs for HVAC.	
O ... Scope of functions	Venetian blind / Switching
The basic switching or Venetian blind function can be defined for each relay output that is not reserved for HVAC functions. This parameter should be set at the start because all other parameters and assignments of the group addresses to the communication objects are dependent on it.	
O ... Parameterisation	individual / by template
To simplify the configuration, all the relay outputs can be assigned to the same parameters in the ETS and thus configured identically. This parameter stipulates whether a relay output of the device can be configured individually or whether the parameters of the template channel are to be applied.	

14.2 Venetian blind operation

Two interconnected relay outputs form a Venetian blind output. AC motors for 110 / 230 V can be controlled. Venetian blinds, shutters, awnings and similar hangings can be controlled by adjusting the operation. Each Venetian blind output can be parametrised separately. The following functions are available:

- Short and long-time operation and travel times that can be set
- Sun protection function and twilight function
- Door contact block
- Forced position and disabling function
- Safety function: 3 independent wind alarms, rain alarm, frost alarm
- Scene functions
- Ventilation function, end position correction and fabric tensioning for awnings

14.2.1 Priorities

The actuator in blinds operation distinguishes between different functions that can have an effect on an output. In order to prevent conflicting states, each available function has a certain priority. The function with the higher priority overrides the function with the lower priority.

For blinds operation there are the following priorities...

- 1st priority: manual operation (top priority)
- 2nd priority: forced position & disabling function
- 3rd priority: door contact disabling
- 4th priority: safety function(s)

Priority levels 5 and 6 can be configured in the ETS. The options are then...

- 5th priority: sun protection function
- 6th priority: direct bus operation, twilight function

or...

- 5th priority: direct bus operation, twilight function
- 6th priority: sun protection function

or...

- 5th priority: sun protection function, direct bus operation, twilight function

i Direct bus operation includes: short-time/long-time operation, positioning, scenes, central functions, reset behaviour, fabric stretching, end position correction.

The behaviour of some functions can be configured at the end (e. g. the behaviour at the end of a safety function or the behaviour at the end of the automatic sun protection). These predefined reactions are only executed if the actuator can then immediately switch to direct operation (lowest priority).

If another function with a lower priority (e. g. sun protection) has been activated during a function with a high priority (e. g. safety), the actuator executes the behaviour at the beginning of the function with the next lower priority (e. g. sun protection). The behaviour at the end of the function with the higher priority (e. g. safety) is then not executed!

14.2.2 General settings

14.2.2.1 Central functions

The actuator offers the possibility of linking selected individual or all Venetian blind outputs with up to six one-bit communication objects. The behaviour during the control of an output via the central functions can be set to "Move" or alternatively to "Permanent" (long-time operation with priority).

Central function = "Move":

This function is comparable to various central group addresses that are linked to the "long-time operation" object of a Venetian blind output. The last command received (UP or DOWN) is executed. The polarity of the central telegram can be configured as inverted if necessary.

Central function = "Permanent":

The assigned Venetian blind outputs are controlled according to the parameterised command (UP or DOWN) and locked during central control. This means that no other central function with the "Move" function can control the locked output. Controls via normal objects for direct operation, e. g. long-time or short-time operation are possible. If an output is assigned to several permanent central functions, the parameterised command decides on the priority of the central function. A "permanent UP" has a higher priority than a "permanent DOWN" and thus is preferably executed. Activating a central function "permanent UP" deactivates other assigned functions for an output with the setting "permanent DOWN".

Activating a permanent central function initiates a long-time movement in the preset travel direction, if priority allows. Deactivating a permanent central function does not lead to a stop, so that an ongoing movement is not affected by this.

Example of permanent central functions

An output is assigned to central function 1 "move", central function 2 "permanent UP" and central function 3 "permanent DOWN". Central functions 2 and 3 are initially deactivated.

When a central telegram = "activate" on central function 3 is received, the assigned Venetian blind output moves down. In this state, it can no longer be controlled by central function 1, since a simple "move" has a lower priority. When a central telegram = "activate" on central function 2 is received, the assigned Venetian blind output moves up immediately. Central function 3 is thus deactivated automatically. Only when central functions 2 and 3 are deactivated can the assigned Venetian blind output be activated again by central function 1.

- i** All central functions are inactive after the bus voltage returns. No central functions are saved in the event of a bus voltage failure.
- i** The duration of a move initiated by a central function cannot be retrIGGERED by receiving further central telegrams of the same polarity and function. If a move has expired, new central telegrams trigger a move again.
- i** Deactivating a permanent central function has no effect on scene delays. Activation ends any scene delays that may be running.

Disconnect central functions

- Activate the central functions on the parameter page "Outputs -> Switching/Venetian blind -> Venetian blind (VB)" using the "Central functions" parameter.

The 6 central objects become visible in the ETS. Names can optionally be assigned for the central functions. The names should illustrate the use of the individual central functions (e. g. "Central DOWN", "Panic UP"). The names are only used in the ETS in the text of the central functions and central objects.

Assign Venetian blind outputs to the central functions

Each Venetian blind output can be assigned to the central functions.

The central functions must be enabled on the parameter page "Outputs -> Switching/Venetian blind -> Venetian blind (VB)".

- The "Assignment" parameters on the parameter pages "Outputs -> Switching/Venetian blind -> VB... - General" to the desired function.

The appropriate output is assigned to the central function. It can be influenced centrally.

- i** The blind, venting louvre or slat position newly set by the central functions is tracked at the end of a travel movement in the feedback objects and also transmitted to the bus, if these are actively transmitting. It should be noted that the actuator can compute positions after application of the supply voltage only if a reference movement into the upper end positions has been performed beforehand.

14.2.2.1.1 Central functions parameters

Outputs -> Switching/Venetian blind -> Venetian blind (VB)

Central functions	Checkbox (yes / no)
If the parameter is activated, the six central functions of the Venetian blind outputs and thus the objects "Central function... VB" are enabled. An assignment of individual Venetian blind outputs to the central functions is only possible if the function is enabled.	

Name of the central functions	Free text
Names can optionally be assigned for the central functions. The names should illustrate the use of the individual central functions (e. g. "Central DOWN", "Panic UP"). The names are only used in the ETS in the text of the central functions and central objects.	

Outputs -> Switching / Venetian blind -> VB... - General

Central function x assignment (x = 1...6)	Checkbox (yes / no)
These parameters assign the central functions to the selected Venetian blind output. These parameters are only visible when central functions are enabled.	

Function and central object polarity	Move (1 = DOWN / 0 = UP) Move (0 = DOWN / 1 = UP) Permanent DOWN (1 = active / 0 = inactive) Permanent UP (1 = active / 0 = inactive)
The function and polarity of the central function is selected here. Move (1 = DOWN / 0 = UP): The last command received (UP or DOWN) is executed. The polarity of the central telegram is preset: 1 = DOWN / 0 = UP Move (0 = DOWN / 1 = UP): The last command received (UP or DOWN) is executed. The polarity of the central telegram is preset: 0 = DOWN / 1 = UP Permanent DOWN (1 = active / 0 = inactive): The assigned Venetian blind output is controlled in the DOWN direction and locked during central control. Permanent UP (1 = active / 0 = inactive): The assigned Venetian blind output is controlled in the UP direction and locked during central control. If an output is assigned to several permanent central functions, the parameterised command decides on the priority of the central function. A "permanent UP" has a higher priority than a "permanent DOWN" and thus is preferably executed. With permanent function, the polarity of the central telegram is always fixed: 1 = activate permanent control / 0 = deactivate permanent control These parameters are only visible when central functions are enabled and assigned.	

14.2.2.1.2 Object list central functions

Function	Name	Type	DPT	Flag
Move	Central function 1 – VB - Input	1-bit	1,008	C, -, W, -, U
Move	Central function 2 – VB - Input	1-bit	1,008	C, -, W, -, U
Move	Central function 3 – VB - Input	1-bit	1,008	C, -, W, -, U
Move	Central function 4 – VB - Input	1-bit	1,008	C, -, W, -, U
Move	Central function 5 – VB - Input	1-bit	1,008	C, -, W, -, U
Move	Central function 6 – VB - Input	1-bit	1,008	C, -, W, -, U
1-bit object for central control of assigned Venetian blind outputs. With central function = "Move": The polarity of the central telegram can be configured as inverted if necessary. With central function = "Permanent UP", "Permanent DOWN": With permanent function, the polarity of the central telegram is always fixed: 1 = activate permanent control / 0 = deactivate permanent control.				

14.2.2.2 Safety functions

The actuator distinguishes up to three different safety functions for each Venetian blind channel. Each safety function has a communication object of its own so that the functions can be activated or deactivated independently of one another.

There are three different wind alarms available. These alarms, for instance, can be used to protect Venetian blinds or awnings from wind and gusts on several building facades. In addition or as an alternative, a rain alarm, for instance, as a protection for awnings, and a frost alarm as a protection against mechanical damage to lowered Venetian blinds in low temperatures can be activated and used. The telegram polarity of the safety objects is fixed: "0" = No alarm / "1" = Alarm.

Usually, weather stations, which record temperature, wind speed and rain via the sensors, control the communication objects of the safety function.

The safety functions are configured in common for all Venetian blind outputs. The different outputs of the actuator can be separately assigned to all or to individual safety functions. Only assigned outputs respond to a change in the state of the safety objects. The reactions at the beginning of an alarm message ("1" telegram) or at the end of an alarm message ("0" telegram) can be parameterized.

Because outputs are also assigned to multiple safety alarms, the priority of incoming alarm signals can be preset for several channels. Thus, the three wind alarms have the same priority with respect to one another (logic OR). The order of priority of the wind alarms with respect to the frost alarm or to the rain alarm can be configured.

The communication objects for the safety alarms can be monitored for the arrival of cyclical telegrams. If there are no telegrams within a settable monitoring time, the actuator activates the safety movement for the output. The safety function is terminated as soon as a new "0" telegram is received.

Different monitoring times can be selected separately in the ETS for the wind alarms, rain alarm and frost alarm. A shared time is configured for the wind alarms. Each wind alarm has its own time control, so that the wind objects are checked separately for telegram updates.

Assigning safety alarms

The individual safety alarms can be assigned separately for each output. Channels are assigned on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General -> Safety".

The safety functions must be globally enabled on the

"Outputs -> Switching / Venetian blind -> Venetian blind (VB)""Safety" parameter page before the output assignments are configured.

The safety function of an output must be enabled on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". Only then are the channel-related parameters for the safety function visible.

- If an assignment to the wind alarms is necessary, activate the parameter "Assignment to wind alarm x" (x = 1...3).

The output is assigned to the specified wind alarms.

- If an assignment to the rain alarm is necessary, activate the parameter "Assignment to rain alarm".

The output is assigned to the rain alarm.

- If an assignment to the frost alarm is necessary, activate the parameter "Assignment to frost alarm".

The output is assigned to the frost alarm.

Presetting the behaviour at the beginning of a safety alarm

The behaviour of an output at the beginning of a safety alarm can be parameterized separately for each alarm (wind alarms in common, rain and frost alarms separately).

The alarm behaviour is set on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General -> Safety". At the beginning of a safety alarm, the actuator locks the outputs concerned, i. e. control via the KNX by direct operation or by a sun protection function is prevented.

Depending on the selected operation, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening" / "lowering" ↔ "closing").

The safety functions must be globally enabled on the parameter page

"Outputs -> Switching / Venetian blind -> Venetian blind (VB)".

The safety function of an output must be enabled on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". Only then are the channel-related parameters for the safety function visible.

The behaviour in case of a safety alarm can only be adjusted, if the output concerned has been assigned to the corresponding alarm. Since there is no difference between the alarm-dependent configurations, the selection of the parameters is only described below for the wind alarm as an example.

- Set the parameter "For wind alarm" to "no reaction".

At the beginning of the alarm, the output is locked and the relay of the output shows no reaction. Any movements still in progress at this instant will still be completely finished.

- Set the parameter "For wind alarm ..." to "raising" or "opening".

The actuator raises the blind/shutter or opens the venting louvre / roof window at the beginning of the alarm and then locks the output.

- Set the parameter "For wind alarm ..." to "lowering" or "closing".

The actuator lowers the blind/shutter or closes the venting louvre / roof window at the beginning of the alarm and then locks the output.

- Set the parameter "For wind alarm ..." to "stop".

At the beginning of the alarm, the actuator switches the relays of the output to "stop" and locks the output. A travel movement, if any, will be interrupted.

- i** The safety travel time required by an output to move the drive into the end positions is determined by the "Travel time" parameter on the parameter page "Outputs -> switching / Venetian blind -> VB... - General -> Times". Like the long-time operation, a safety movement is derived from the travel time. Downward movement: travel time + 20%; Upward movement: travel time + 20% + configured travel time extension. Safety movements cannot be retrigged.
- i** Slats of blinds are not repositioned at the end of safety movements to end positions.

Setting the behaviour at the end of all safety alarms

The actuator ends the safety interlock of an output only after all safety alarms assigned to the output have become inactive. Afterwards, the output concerned shows the configured "End of safety". This behaviour is set on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Safety" in common for all alarms.

Depending on the selected operation, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening" / "lowering" ↔ "closing").

The safety functions must be globally enabled on the parameter page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)".

The safety function of an output must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". Only then are the channel-related parameters for the safety function visible.

- Set the parameter "end of safety" to "no reaction".

At the end of all safety alarms, the output is released and the relay of the output shows no reaction. Any travel movements still in progress at this instant will still be finished.

- Set the parameter "End of safety (wind, rain, frost)" to "Raise" or "Open".

The actuator enables the output at the end of all safety alarms and raises the blind/shutter or opens the venting louvre / roof window.

- Set the parameter "End of safety (wind, rain, frost)" to "Lower" or "Close".

The actuator enables the output at the end of all safety alarms and lowers the blind/shutter or closes the venting louvre / roof window.

- Set the parameter "End of safety (wind, rain, frost)" to "Stop".

At the end of all safety alarms, the output is released and the actuator switches the relays of the output to "stop". A travel movement, if any, will be interrupted.

- Set the parameter "End of safety (wind, rain, frost)" to "Tracking the position".

At the end of all safety alarms, the output will be set to the state last adjusted statically before the safety function or to the state tracked and internally stored during the safety function. The position objects, the long-time object and the scene function are tracked.

- i** Parameter setting "tracking the position": The actuator can track absolute positions after safety release (position telegram, scene value) only if the position data are known and if the positions have been predefined. In all other cases, no reaction takes place on release of safety. Position data can be tracked, if the output was in a defined position before the safety function or if a new position telegram was received via the position objects during the safety interlock. In the latter case, a reference movement will be executed when the safety function is enabled, if the position before or during the safety interlock was unknown. Known slat positions will also be tracked as described. This is also the case, when the height of the Venetian blind is unknown. Long time movements (movements without position preset) will, however, always be tracked.
- i** The preset "Behaviour at the end of safety (wind, rain, frost)" will only be executed, if the output passes over to direct operation at the end of all safety alarms. If a sun protection function is activated (independent of the preset priority with respect to direct operation), it will be also executed.

Enabling the safety functions

The safety functions must first be globally enabled before they can be configured and used. After global enabling, the individual safety alarms can be enabled or disabled independently of one another.

- Activate the "Safety functions" parameter on the parameter page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)" .

The safety functions are enabled globally and the other parameters become visible.

- Activate the parameters "Wind alarm 1", "Wind alarm 2", "Wind alarm 3", "Rain alarm" and "Frost alarm" depending on functional requirements.

The necessary safety alarms are now enabled. The safety objects are visible and can be linked with group addresses.

- i** An update of the safety objects ("ON" to "ON" or "OFF" to "OFF") shows no reaction.
- i** After failure of the bus voltage or after programming with the ETS, the safety functions are always deactivated.

Presetting the safety priorities

If several safety alarms are assigned to an output, it is important to preset the priority of the incoming safety telegrams. In so doing, an alarm with a higher priority overrides the alarms with the lower priorities. When safety alarm with the higher priority has ended, the safety alarm with the lower priority is executed on condition that it is active.

The safety functions must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)" .

- Set the "Priority of safety alarms" parameter on the parameter page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)" in the required order of priority.

Setting cyclical monitoring

If cyclical telegram monitoring of the safety objects is necessary, the individual monitoring functions must be activated separately. The monitoring functions must be enabled and the monitoring times preset on the parameter page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)".

The safety functions must be enabled for the Venetian blind output.

- If monitoring of the wind alarms is to be activated, the parameter "Monitoring", which is immediately below the wind alarms must be activated.

The monitoring function for the wind alarm objects is now activated. As soon as the monitoring function is activated, telegrams must be transmitted cyclically to all enabled wind alarm objects! If only one of the wind alarm telegrams is missing within the monitoring period, the wind alarm action will be executed for the output concerned.

- Specify the required monitoring time for the wind alarm objects in the "cycle time" parameters.
- If monitoring of the rain alarm is to be activated, the parameter "Monitoring", which is immediately below the rain alarm must be activated.

The monitoring function for the rain alarm object is now activated. As soon as the monitoring function is activated, telegrams must be transmitted cyclically to the rain alarm object!

- Specify the required monitoring time for the rain alarm object in the "cycle time" parameters.
- If monitoring of the frost alarm is to be activated, the parameter "Monitoring", which is immediately below the frost alarm must be activated.

The monitoring function for the frost alarm object is now activated. As soon as the monitoring function is activated, telegrams must be transmitted cyclically to the frost alarm object!

- Specify the required monitoring time for the frost alarm object in the "cycle time" parameters.

The cycle time of the transmitters should be shorter than the monitoring time configured in the actuator in order to ensure that at least one telegram can be received during the monitoring time.

14.2.2.2.1 Safety functions parameters

Outputs -> Switching/Venetian blind -> Venetian blind (VB)

Safety functions	Checkbox (yes / no)
When the safety functions of the actuator, which can number up to 5, are used and should thus be configurable, the channel-independent enabling of the function must take place here.	
Priority of safety alarms High ☐ Medium ☐ Low	Wind → Rain → Frost Wind → Frost → Rain Rain → Wind → Frost Rain → Frost → Wind Frost → Rain → Wind Frost → Wind → Rain
This parameter defines the priority ranking of the individual safety alarms. Interpretation: High → Medium → Low. The three wind alarms have the same priority with respect to one another. This parameter is only visible when the safety functions are enabled!	
Wind alarm 1	Checkbox (yes / no)
Here, the parameter can be used to enable the first wind alarm and thus to enable the communication object.	
Wind alarm 2	Checkbox (yes / no)
Here, the parameter can be used to enable the second wind alarm and thus to enable the communication object.	
Wind alarm 3	Checkbox (yes / no)
Here, the parameter can be used to enable the third wind alarm and thus to enable the communication object.	
Monitoring	Checkbox (yes / no)
If the enabled wind alarms are to be monitored cyclically for incoming telegrams to the safety objects, the monitoring function must be enabled here. Otherwise, there is no cyclical monitoring of the objects. As soon as the monitoring function is activated here, telegrams must be transmitted cyclically to all enabled wind alarm objects.	
Cycle time	0 ... 23 h 0 ... 25 ... 59 min
The wind alarm monitoring time is configured here. Sets the hours and minutes of the monitoring time.	
Rain alarm	Checkbox (yes / no)
Here, the parameter can be used to enable the rain alarm and thus to enable the communication object.	

Monitoring	Checkbox (yes / no)
If the enabled rain alarm is to be monitored cyclically for incoming telegrams to the safety object, the monitoring function must be enabled here. Otherwise, there is no cyclical monitoring of the object. As soon as the monitoring function is activated, telegrams must be transmitted cyclically to the enabled rain alarm object.	

Cycle time	0 ... 23 h 0 ... 25 ... 59 min
The rain alarm monitoring time is configured here. Sets the hours and minutes of the monitoring time.	

Frost alarm	Checkbox (yes / no)
Here, the parameter can be used to enable the frost alarm and thus to enable the communication object.	

Monitoring	Checkbox (yes / no)
If the enabled frost alarm is to be monitored cyclically for incoming telegrams to the safety object, the monitoring function must be enabled here. Otherwise, there is no cyclical monitoring of the object. As soon as the monitoring function is activated, telegrams must be transmitted cyclically to the enabled frost alarm object.	

Cycle time	0 ... 23 h 0 ... 25 ... 59 min
The frost alarm monitoring time is configured here. Sets the hours and minutes of the monitoring time.	

Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions

Safety functions	Checkbox (yes / no)
This parameter can be used to enable the Venetian blind output.	

Outputs -> Switching / Venetian blind -> VB... - General -> Safety

Assignment to wind alarm 1	Checkbox (yes / no)
This parameter defines whether the Venetian blind output responds to the first wind alarm. This parameter is visible only if "Wind alarm 1" has been activated for blind operation on the page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)" page.	

Assignment to wind alarm 2	Checkbox (yes / no)
This parameter defines whether the Venetian blind output responds to the second wind alarm. This parameter is visible only if "Wind alarm 2" has been activated for blind operation on the page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)" page.	

Assignment to wind alarm 3	Checkbox (yes / no)
This parameter defines whether the Venetian blind output responds to the third wind alarm. This parameter is visible only if "Wind alarm 3" has been activated for blind operation on the page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)" page.	
For wind alarm	no reaction Raise/Open Lower/Close stop
This parameter defines the behaviour of the output at the beginning of a wind alarm. no reaction: At the beginning of the wind alarm or wind alarms, the output is interlocked and the relay of the output shows no reaction. Any movements in progress at this instant will still be completely finished. raising / opening: The actuator raises the blind/shutter or opens the venting louvre / roof window at the beginning of the wind alarm or wind alarms and then locks the output. lowering / closing: The actuator lowers the blind/shutter or closes the venting louver / roof window at the beginning of the wind alarm or wind alarms and then locks the output. stop: At the beginning of the wind alarm or wind alarms, the actuator switches the relays of the output to the "stop" position and locks the output. A travel movement, if any, will be interrupted. This parameter is only visible if the output has been assigned to at least one wind alarm.	
Assignment to rain alarm	Checkbox (yes / no)
This parameter defines whether the Venetian blind output responds to the rain alarm. This parameter is visible only if the "Rain alarm" for Venetian blind operation has been activated on the page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)".	

For rain alarm	no reaction Raise/Open Lower/Close stop
This parameter defines the behaviour of the output at the beginning of the rain alarm. no reaction: At the beginning of the rain alarm, the output is locked and the relay of the output shows no reaction. Any movements in progress at this instant will still be completely finished. raising / opening: The actuator raises the blind/shutter or opens the venting louvre / roof window at the beginning of the rain alarm and then locks the output. lowering / closing: The actuator lowers the blind/shutter or closes the venting louvre / roof window at the beginning of the rain alarm and then locks the output. stop: At the beginning of the rain alarm, the actuator switches the relays of the output to the "stop" position and locks the output. A travel movement, if any, will be interrupted. This parameter is only visible, if the output has been assigned to the rain alarm.	
Assignment to frost alarm	Checkbox (yes / no)
This parameter defines whether the Venetian blind output responds to the frost alarm. This parameter is visible only if the "Frost alarm" for blind operation has been activated on the page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)" page.	
For frost alarm	no reaction Raise/Open Lower/Close stop
This parameter defines the behaviour of the output at the beginning of the frost alarm. no reaction: At the beginning of the frost alarm, the output is interlocked and the relay of the output shows no reaction. Any movements in progress at this instant will still be completely finished. raising / opening: The actuator raises the blind/shutter or opens the venting louvre / roof window at the beginning of the frost alarm and then locks the output. lowering / closing: The actuator lowers the blind/shutter or closes the venting louver / roof window at the beginning of the frost alarm and then locks the output. stop: At the beginning of the frost alarm, the actuator switches the relay of the output to the "stop" position and locks the output. A travel movement, if any, will be interrupted. This parameter is only visible, if the output has been assigned to the frost alarm.	

End of safety (wind, rain, frost)	no reaction Raise/Open Lower/Close stop Track position
This parameter defines the behaviour of the output at the end of all safety functions. no reaction: At the end of the safety functions, the output is enabled and the relay of the output shows no reaction. Any travel movements still in progress at this instant will still be finished. raising / opening: The actuator enables the output at the end of all safety alarms and raises the blind/shutter or opens the venting louvre / roof window. lowering / closing: The actuator enables the output at the end of the safety functions and lowers the blind/shutter or closes the venting louvre / roof window. stop: At the end of the safety functions, the output is enabled and the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. Track position: At the end of safety, the output will be set to the state last adjusted before the safety function or to the state tracked and internally stored during the safety function. The position objects, the long-time object and the scene function are tracked. The behaviour preset in this parameter will only be executed, if the output passes over to direct operation at the end of safety. Direct operation will be executed when a sun protection function is active.	

14.2.2.2.2 Object list safety functions

Function	Name	Type	DPT	Flag
Wind alarm 1	General Venetian blind (VB) - Safety - Input	1-bit	1,005	C, -, W, -, U
1-bit object for activation or deactivation of the wind alarm ("0" = wind alarm deactivated / "1" = wind alarm activated).				
Function	Name	Type	DPT	Flag
Wind alarm 2	General Venetian blind (VB) - Safety - Input	1-bit	1,005	C, -, W, -, U
1-bit object for activation or deactivation of the wind alarm ("0" = wind alarm deactivated / "1" = wind alarm activated).				
Function	Name	Type	DPT	Flag
Wind alarm 3	General Venetian blind (VB) - Safety - Input	1-bit	1,005	C, -, W, -, U
1-bit object for activation or deactivation of the wind alarm ("0" = wind alarm deactivated / "1" = wind alarm activated).				
Function	Name	Type	DPT	Flag
Rain alarm	General Venetian blind (VB) - Safety - Input	1-bit	1,005	C, -, W, -, U
1-bit object for activation or deactivation of the rain alarm ("0" = rain alarm deactivated / "1" = rain alarm activated).				
Function	Name	Type	DPT	Flag
Frost alarm	General Venetian blind (VB) - Safety - Input	1-bit	1,005	C, -, W, -, U
1-bit object for activation or deactivation of the frost alarm ("0" = frost alarm deactivated / "1" = frost alarm activated).				

14.2.2.3 Name of a Venetian blind output

Here, you can optionally assign a name for each Venetian blind output. The name is intended to illustrate the use of the output (e. g. "Venetian blind living room", "shutter bathroom"). The names are only used in the ETS in the text of the parameter pages and communication objects.

14.2.2.3.1 Parameter name

Outputs -> Switching / Venetian blind -> VB... - General

Name of Venetian blind output	Free text
The text entered in this parameter is applied to the name of the communication objects and is used to label the Venetian blind output in the ETS parameter window (e. g. "Venetian blind, living room", "Shutter, bathroom"). The text is not programmed in the device.	

14.2.3 Operation

Each Venetian blind output of the actuator can be independently configured for the drive type connected by defining the operation. The device permits the controlling of slatted Venetian blinds, shutters and awnings, or as a third alternative, roof windows. Depending on the preset operation, the ETS adapts the parameters and communication objects for all functions of an output.

For example, in the "Venetian blind" with slat" operation, there are also parameters and objects for slat control. There is no slat control in the "shutter/awning" operation, but a fabric stretching function can be configured for awning use. In the "Venting louvre / roof window" operation, a distinction is made between the "opening" and "closing" drive movements, instead of an up or down movement for Venetian blinds or shutters.

In this documentation, Venetian blinds, roller shutters or awnings are also designated with the term "blind", if the text does not explicitly refer to a particular function (e. g. slat control).

In all modes it is possible to specify positions.

Presetting the operation

The "operation" parameter has been created separately for each Venetian blind output on the parameter pages

"Outputs -> Switching / Venetian blind -> VB... - General".

- Select the required operation in the "operation" parameter.

The "operation" parameter has an influence on many channel-oriented parameters and communication objects. When the operation is changed in the ETS, the parameters are adapted dynamically so that settings already made or links between group addresses can be reset. For this reason, the required operation should be configured at the beginning of the channel-oriented device configuration.

Venting louvres and roof windows must be connected to the outputs in such a way that they are opened in travel direction "UP" and closed in travel direction "DOWN".

An awning travels upwards when it is rolled up.

Reversing the travelling direction

If, when commissioning the device, it is discovered that the direction of travel of a blind/shutter is incorrect, this error can be corrected by activating reversed direction of travel without having to change the installation of the cables on the device. Reversed direction of travel adapts actuation of the connections to the existing installation. Regardless of this, the status LEDs always indicate the actual direction of travel.

The "Reverse direction of travel" parameter has been created separately for each Venetian blind output on the parameter pages

"Outputs -> Switching / Venetian blind -> VB... - General".

14.2.3.1 Operation parameters

Outputs -> Switching / Venetian blind -> VB... - General

Operation	Venetian blind with slat Shutter/awning Venting louvre/roof window
The actuator can control various drive systems. This parameter defines which type of curtain is connected to the output. The ETS adapts all of the following parameters (designations, visible/non visible, etc.) dynamically to the respective "operating mode" parameter. For this reason, the "operation" parameter should be adjusted before all other parameters of an output.	
Reversing the travelling direction	Checkbox (yes / no)
If the connections for the Up and Down directions have been swapped during installation, this parameter can be used to adapt the control of the connections to the installation. Regardless of this, the status LEDs always indicate the actual direction of travel.	

14.2.4 Reset and initialisation behaviour

Presetting the behaviour after ETS programming

The parameter "After ETS programming" has been created separately for each Venetian blind output on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General". This parameter can be used to configure the relay behaviour of the output, irrespective of the behaviour after the bus voltage returns.

Depending on the selected operation, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening" / "lowering" ↔ "closing").

- Set the parameter to "stop".

After programming with the ETS, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

- Set the parameter to "raising" or "opening".

After programming with the ETS, the actuator raises the blind or opens the venting louvre / roof window.

- Set the parameter to "lowering" or "closing".

After programming with the ETS, the actuator lowers the blind or closes the venting louvre / roof window.

- Set the parameter to "as after bus voltage returns".

After an ETS programming operation, the actuator will behave in the manner specified in the parameter "After bus voltage returns".

The parameterised behaviour "After ETS programming" will be executed after every ETS application or parameter download. A simple download of the physical address alone or partial programming of only the group addresses has the effect that this parameter is disregarded and that the configured behaviour "After bus voltage returns" will be executed instead.

After programming with the ETS, the safety functions, the forced positions and the sun protection function are always deactivated.

Setting the behaviour in case of bus voltage failure

The parameter "In case of bus voltage failure" has been created separately for each Venetian blind output on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General". In case of bus voltage failure, the actuator always switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

The configured behaviour will not be adopted, if a manual control mode is active at the time of bus failure.

When there is a bus voltage failure, the current position data of the outputs is permanently saved internally, so that these position values can be accurately tracked after the bus voltage returns, should this be configured. The data will not be stored, if the position data is unknown. The following rules apply for the position data to be

stored:

The current blind, slat, venting louvre and roof window positions are stored. With Venetian blinds, the height to be stored is always referred to as a slat position of 100 % (see "Calculating the slat position"). Positions temporarily approached will be stored also for those outputs that are involved in a travel movement at the time of data storage. Due to the storage of positional data in integer per cent (0 ... 100), a small deviation from the positions that may be reported back later on when the bus voltage returns (within numerical range of 0 ... 255) cannot be avoided.

In case of ETS programming, the saved position data is not lost.

-  In case of bus voltage failure, the current states of the forced position control or – if configured – also the slat offsets of the sun protection positions are stored as well.

Setting the behaviour after the bus voltage returns

The parameter "After the bus voltage returns" has been created separately for each Venetian blind output on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General".

Depending on the selected operation, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening" / "lowering" ↔ "closing").

- Set the parameter to "stop".

When the bus voltage returns, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

- Set the parameter to "raising" or "opening".

When the bus voltage returns, the actuator raises the blind/shutter or opens the venting louvre / roof window.

- Set the parameter to "lowering" or "closing".

When the bus voltage returns, the actuator lowers the blind/shutter or closes the venting louvre / roof window.

- Set the parameter to "approach position".

When the bus voltage returns, the connected drive can approach a position (0 ... 100%) specified by further parameters. If Venetian blinds are controlled with the device, the slats can be positioned independently. The actuator performs a reference movement before the position approach, because the current position at the time when the bus voltage returns is unknown.

-  The forced position communication object can be initialised separately after the bus voltage returns. This has an effect on the reaction of the output when the bus voltage returns if the forced position is activated. The configured behaviour "When bus voltage returns" is executed only if no forced position is activated when the bus voltage returns.

14.2.4.1 Reset and initialisation behaviour parameter

Outputs -> Switching / Venetian blind -> VB... - General

After ETS programming operation	stop Raise/Open Lower/Close like after bus voltage returns

The actuator permits setting the preferred relay contact position after ETS programming separately for each output.

raising / opening: After programming with the ETS, the actuator raises the blind/shutter or opens the venting louvre / roof window.

lowering / closing: After programming with the ETS, the actuator lowers the blind/shutter or closes the venting louvre or the roof window.

stop: After programming with the ETS, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

like after the bus voltage returns: After an ETS programming operation, the actuator behaves as specified in the parameter "After bus voltage returns".

In case of bus voltage failure	stop

The behaviour of the actuator is predefined in case of bus voltage failure. The actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

After the bus voltage returns	stop Raise/Open Lower/Close Approach position

The actuator allows the preferred relay contact position after the bus voltage returns to be set separately for each output.

stop: In case of bus voltage return, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

Raise/Open: When the bus voltage returns, the actuator raises the blind/shutter or opens the venting louvre / roof window.

Lower/Close: When the bus voltage returns, the actuator lowers the blind/shutter or closes the venting louvre / roof window.

Approach position: When the bus voltage returns, the connected drive can approach a position specified by further parameters.

Venetian blind position	0 ... 100%

This parameter specifies the blind position to be approached when the bus voltage returns.

This parameter is visible only if the behaviour "After bus voltage returns" in "Venetian blind" operation is set to "Approach position".

Slat position	0 ... 100%
This parameter specifies the slat position to be approached when the bus voltage returns after the blind has been positioned at the desired height. This parameter is visible only if the behaviour "After bus voltage returns" in "Venetian blind" operation is set to "Approach position".	
Shutter/awning position	0 ... 100%
This parameter specifies the shutter or awning position to be approached when the bus voltage returns. This parameter is only visible if the behaviour "After bus voltage returns" in the "shutter/awning" operation is set to "Approach position".	
Venting louver position	0 ... 100%
This parameter specifies the venting louver / roof window position to be approached in case when the bus voltage returns. This parameter is visible only if the behaviour "After bus voltage returns" in the operation "Venting louver / roof window" is set to "Approach position".	

14.2.5 Short-time / Long-time operation, travel times

14.2.5.1 Short-time / Long-time operation

Determining and configuring short-time and long-time operation

The short-time operation (Step) permits adjusting the slat tilting angle of a Venetian blind or the 'slit opening width' of a shutter. In most cases, short-time operation is activated by pressing a Venetian blind pushbutton sensor permitting manual intervention in the blind controller. When the actuator receives a short-time command while the Venetian blind, shutter, awning or louver is in motion, the travel movement is stopped immediately by the actuator.

A long-time operation (Move) is determined by the travel time of the connected Venetian blind, shutter/awning or louver and must therefore not be preset separately. The travel time must be measured manually and entered into the ETS parameters. The control of an output by means of a long-time or a short-time telegram is also designated as 'direct operation'.

To ensure that the curtain or the louver has definitely reached its end position at the end of long time operation, the actuator always prolongs the long-time movement by 20% of the configured or learnt travel time. The actuator also takes into account the parameterized travel time extension for all upward travel movements or for all travel movements to the open position, as the drive motors are generally slower due to the weight of the blind/shutter or due to external physical influences (e. g. temperature, wind etc.). Thus, it is ensured that the upper end position is always reached even in case of uninterrupted long time travel movements.

- i** A long or short-time operation can be retriggered by a new incoming long time or short time telegram.
- i** A travel movement activated in the manual control mode or by a safety function is always a long-time operation. The "raising" or "lowering" commands configured in the ETS will equally activate the long-time operation.

Presetting short-time operation

Short-time operation is configured separately for each output and independent of the travel time of the blind/shutter or venting louver / roof window. It is possible to specify in the ETS whether the output executes only a "stop" for a travel movement on reception of a short time telegram or whether the output is activated for a specific duration.

- Set the parameter "Short-time operation" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Times" to "yes".

The actuator activates the output concerned for the time specified under "Duration of short-time operation" when a short-time telegram is received and when the output is not in the process of executing a travel movement. If the output is executing a travel movement at the time of telegram reception, the output will only just stop.

- Set the "Short time operation" parameter to "no (only stop)".

The actuator will only stop the output on reception of a short time telegram, if the output is in the process of executing a travel movement. There will be no reaction, if the output is not executing a movement at the time of telegram reception.

The configured "Duration of short-time operation" for a Venetian blind should correspond to approx. $\frac{1}{4}$ of the complete slat travel time and for a shutter to the full travel time needed for opening a shutter.

The short-time operation is always executed without a travel time extension.

14.2.5.2 Setting the travel time

Determining and configuring travel times (manual entry of travel times)

For computing positions and also for executing long time operation, the actuator needs the exact travel time of the connected Venetian blind, shutter/awning or venting louvre / roof window. The travel times must be measured manually and entered into the ETS configuration. It is important to determine the travel time accurately to permit positions to be approached with good precision. Therefore, it is recommended to make several time measurements, then to take the average of the measured values and enter them in the corresponding parameters. The travel time corresponds to the duration of a travel movement from the completely open position (upper end position / awning rolled up) to the completely closed position (lower end position / awning completely unrolled). Not vice-versa! The travel times are to be determined as a function of the different types of drives.

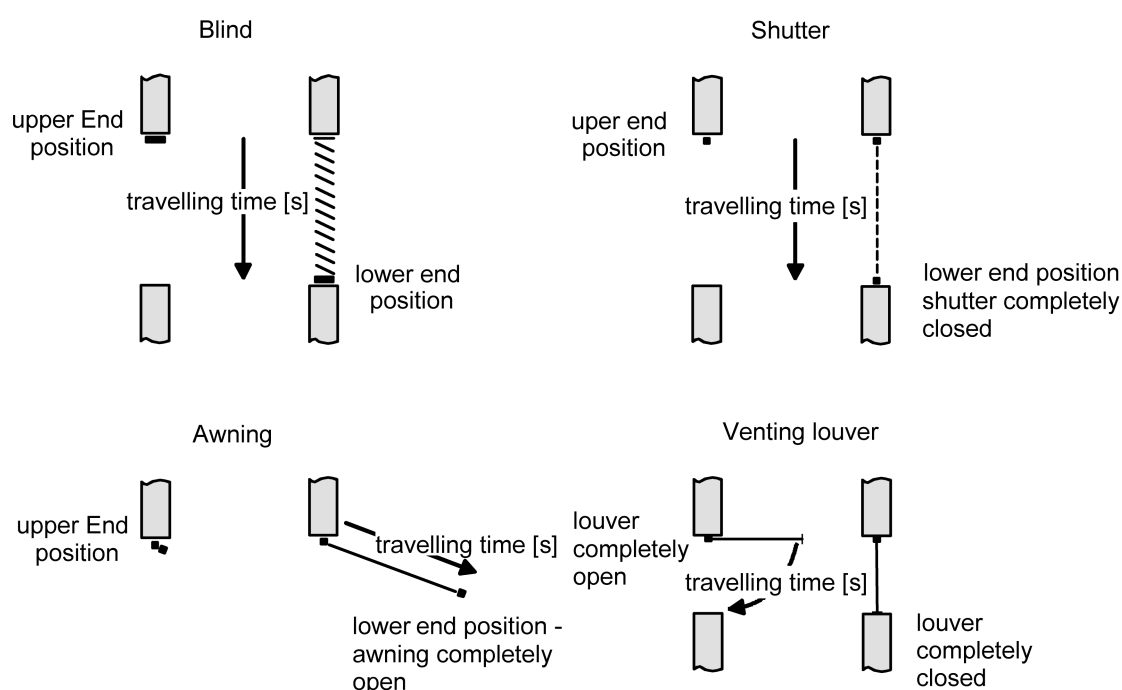


Figure 58: Determining the travel time according to the drive type

Determining and configuring travel times (Setting travel time via the bus)

Apart from the classic setting of the travel time via ETS parameters for each Venetian blind output, it is possible to learn (teaching) the travel time of the blind/shutter or the venting louvre / roof window. This is a particular simplification in the case of facades with identical drives (i.e. identical travel times!). In the case of identical drives, a manually determined travel time of a master Venetian blind output is automatically forwarded to other Venetian blind outputs (slaves). It is also possible for an individual output to learn the travel time independently of other outputs.

A Venetian blind output can be configured as a master or slave. An output configured as a master defines the travel time of the slave outputs of the same actuator and also other actuators of the same type. Slave Venetian blind outputs always acquire their travel time from the 2-byte communication object "Travel time - Preset - Slave". The master Venetian blind output transmits its travel time via the object "Travel time - Teach-in - Master". As a result, the objects for presetting the travel time of the master and of the slave must be linked with each other via the same group address or an internal link.

If the travel time is set via the bus, only one Venetian blind output may be the master in a master-slave application!

Learning the travel time of an individual Venetian blind output largely corresponds to the procedure for an output that is set as the master. The only difference is that it does not transmit its travel time via a communication object to other outputs.

Procedure for setting a travel time via the bus (master-slave):

- The master Venetian blind output must first learn its travel time. The learn mode is started via the object "Travel time - Teach-in - Enable" on the actuator of the master Venetian blind output by means of an "ON" telegram.
- Move the master Venetian blind output fully up / fully open by means of a long-time telegram "UP".
- After the movement has been completed, lower the master Venetian blind output using a long time telegram "DOWN". The master Venetian blind output thereby starts the time measurement.
- Stop the movement immediately after reaching the lower end position / fully closed position using a short-time telegram. The travel time measurement is stopped and temporarily stored internally.
- Afterwards, the provisionally determined time can then be corrected or finely tuned by means of further measurements. To do this, repeat the measuring process by moving the master Venetian blind output again upwards / opening it completely by means of a long-time telegram "UP". After the movement has been completed, move the master Venetian blind output down again using a long-time telegram "DOWN" and stop the movement again using a short-time telegram when the lower end position / fully closed position is reached.
- To end the learning of the master Venetian blind output travel time, stop the learn mode via the object "Travel time - Teach-in - Enable" by means of an "OFF" telegram. The actuator then sends the last determined travel time to the

bus via the object "Travel time - Preset - Master" and returns to normal operation. Bus events received during learning mode (e. g. positions, safety or sun protection functions) are not updated!

- The Venetian blind outputs in slave mode wait for time preset of the master output. As soon as a travel time is received via the object "Travel time - Preset - Slave", all slave outputs apply the travel time in their own configuration.

- i** A learned travel time is stored permanently and remains unchanged even after a bus voltage failure and after ETS programming.
- i** If no travel time has been determined via the bus after the function has been enabled in the ETS, the travel time configured in the ETS for the parameter "Travel time ..." is used for the master and slaves. The travel time configured in the ETS loses its validity once a learning mode has been started and successfully completed. The ETS travel time is not valid again until the parameter "Setting the travel time" is reset to "via parameter".
- i** If the learning mode on the master was terminated without determining a valid travel time (object "Travel time - Teach-in - Enable" = "OFF" before a time measurement expires), the last validly determined time is transmitted via the object "Travel time - Preset - Master". If no valid travel time has yet been determined, the blind travel time set in the ETS is used after the learning mode has been cancelled.

Enabling setting travel time via the bus

If setting the travel time via the bus (master-slave) is to be used, the function can first be enabled globally for the actuator on the parameter page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)" or individually for individual channels on the parameter page "Outputs -> Switching / Venetian blind -> VB ... General -> Times".

If outputs, as slaves, are to take their travel time from a master output of the same actuator, the template function must not be used simultaneously for the master output and the slave output.

If one or more outputs of an actuator are to learn their travel time independently, or if outputs of an actuator, as slaves, are to take their travel time from a master output of the same actuator:

- On the parameter page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)", activate the parameter "Global setting of travel times".
- In the table of Venetian blind outputs, set which output is to be used as the master or which output is to learn its travel time independently.
- In the table of Venetian blind outputs, set which outputs are to be used as slaves and with which master they are to be linked internally.

The function is activated. The communication objects "Travel time - Teach-in - Enable" of the assigned outputs are visible.

For master outputs, the communication objects "Travel time - Teach-in - Master" are also displayed. These objects can be used to transmit the travel times to outputs of other actuators.

If outputs of an actuator, as slaves, are to take their travel time from a master output of a different actuator:

- On the parameter page "Outputs -> Switching / Venetian blind -> Venetian blind (VB)", do not activate the parameter "Global setting of travel times".
- On the parameter pages of the relevant outputs "Outputs -> Switching / Venetian blind -> VB ... General -> Times", configure the parameter "Setting travel time".

The function is activated. The communication objects "Travel time - Teach-in - Enable" of the assigned outputs are visible.

For master outputs, the communication objects "Travel time - Teach-in - Master" are also displayed.

For slave outputs, the communication objects "Travel time - Preset - Slave" are displayed.

- Link the communication objects "Travel time - Preset - Slave" of the relevant outputs to the communication object "Travel time - Teach-in - Master" of a master output via a group address.

Setting the travel time of Venetian blinds, shutters/awnings and venting louvres

A distinction is made as to whether the travel time is configured individually for each Venetian blind output using ETS parameters, or whether the travel time is to be set via the bus (master-slave).

In case of individual configuration of the travel time:

- Set the parameter "Setting the travel time via the bus" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Times" to "via parameter".

The Venetian blind output operates independently with regard to its travel time. The time is not preset via the bus.

- Enter the exact travel times determined in the course of the commissioning procedure into the "Venetian blind travel time" or "Shutter/awning travel time" or "Venting louver / roof window travel time" parameters. The maximum travel time is 19 minutes 59 seconds. The working principle does not allow longer travel times.

The actuator also takes into account the parameterized travel time extension for all upward travel movements or for all travel movements to the open position, as the drive motors are generally slower due to the weight of the blind/shutter or due to external physical influences (e. g. temperature, wind etc.).

When setting the travel time via the bus:

- Set the "Setting the travel time" parameter on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Times" to "Teach-in (KNX master)".

The Venetian blind output is configured as a master and specifies the travel time for other slave outputs. There can only be one master in a master-slave application!

- Set the parameter "Setting travel time via the bus" to "via setting (KNX slave)".

The Venetian blind output is configured and receives its travel time from the master output. There can be any number of slaves in a master-slave application (on the same actuator or with other actuators).

- The parameters "Venetian blind travel time (default setting)" or "Shutter/awning travel time (default setting)" or "Venting louvre travel time / roof window (default setting)" initialise the affected outputs with a valid travel time, provided that no learning mode has been executed on the master and consequently no learned travel time exists yet. The travel time configured in the ETS loses its validity once a learning mode has been started and successfully completed. The ETS travel time is not valid again until the parameter "Setting travel time via the bus" is reset to "no (travel time only via parameter)".

14.2.5.3 Setting slat travel times (with slatted Venetian blinds)

Determining and configuring the slat travel time (slatted Venetian blinds only)

If Venetian blinds are controlled, the slats can be positioned independently. To enable the actuator to compute slat positions and to report them back to the bus, it is necessary that the actuator gets precise information about the time required for a slat rotation. The slat travel time must in each case be determined manually and entered into the parameters.

The actuator is designed in such a way that it can control single-motor Venetian blind drives without a working position. In this drive mode, the slats are directly adjusted by way of mechanical linkage when the height of the Venetian blind is changed. The actuator assumes that the slats are completely closed when the Venetian blind moves downwards. It is assumed that the slats are completely closed when the Venetian blind moves downwards .

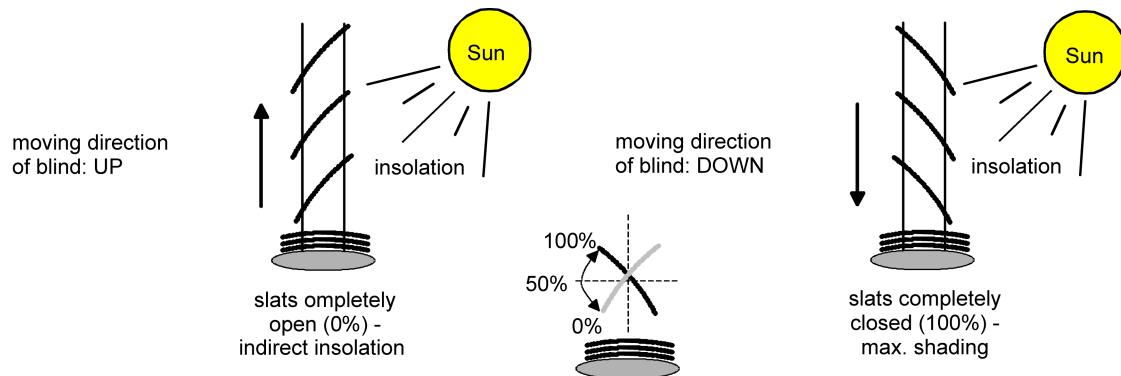


Figure 59: Type 1 - Slatted Venetian blinds with oblique slat position in both travel directions

There are also single-motor Venetian blind systems without a working position the slats of which are horizontal during an upward travel and oblique during a downward travel. Such blind types can also be connected to the actuator, in which case a completely open slat position corresponds to the slats in horizontal position.

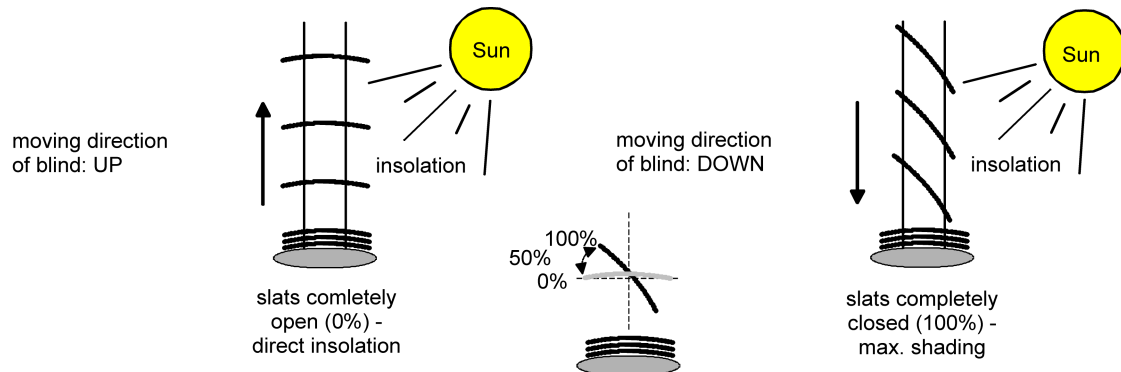


Figure 60: Type 2 - Slatted Venetian blinds with oblique and horizontal slat position

Presetting the slat travel time

- The parameter "Slat travel time" can be found on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Times" exactly to the value determined in the course of the commissioning procedure.

The slat travel time must be shorter than the preset or learnt blind/shutter travel time.

The configured travel time extension will also be taken into account when slats are moved into the completely open position (upward movement).

14.2.5.4 Presetting the travel time extension and switchover time

Presetting the switchover time for travel direction changes

- The parameter "Switchover time when changing the direction of travel" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Times" to the required switchover interval.

In the as-delivered state of the actuator, the switchover time is generally preset to 1 s.

Presetting the travel time extension

- For the parameter "Travel time extension for upward movement" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Times", enter the determined travel time extension (by rounding up the determined extension value if necessary).

14.2.5.5 Short-time / Long-time operation, travel times parameter

The parameters for setting the travel times can either be set globally on the parameter page "General -> Venetian blind outputs (VB)" or also on the individual parameter pages "Outputs -> Switching / Venetian blind -> VB ... General -> Times". In the case of the global setting, internal links between master outputs and slave outputs can be used. In the case of setting the parameters on the individual parameter pages, master outputs and slave outputs are linked using group addresses.

Outputs -> Switching/Venetian blind -> Venetian blind (VB)

Global setting of travel times	Checkbox (yes / no)
If setting the travel time via the bus is to be used, the function must first be enabled globally by this parameter. If the function is not enabled globally, all Venetian blind outputs of the actuator work individually with regard to their travel time.	

Outputs -> Switching / Venetian blind -> VB ... - General -> Times

Setting the travel time	via parameter via teach-in via teach-in (KNX master) via setting (KNX slave)
A distinction is made as to whether the travel time is configured individually for each Venetian blind output using ETS parameters, or whether the travel time is to be set via the bus (master-slave). via parameter: The Venetian blind output operates independently with regard to its travel time. The time is not preset via the bus. via teach-in: The Venetian blind output can learn its own travel time. Unlike a Venetian blind output set as a KNX master, however, it does not forward its travel time to other Venetian blind outputs. via teach-in (KNX master): The Venetian blind output is configured as a master and specifies the travel time for other slave outputs. There can only be one master in a master-slave application! via setting (KNX slave): The Venetian blind output is configured and receives its travel time from the master output. There can be any number of slaves in a master-slave application (on the same actuator or with other actuators). This parameter is only visible if the setting of travel time via the bus has been globally enabled.	

Outputs -> Switching/Venetian blind -> Venetian blind (VB)

Internal link	with master output ...
If the parameter "Global setting of travel times" is activated, the travel times of a master output are forwarded to the slave outputs through internal connections. This eliminates the need for external linking of the communication objects. In this case, at least one output must be set as master.	

Outputs -> Switching / Venetian blind -> VB... - General -> Times

Timeout for teach-in process	1 minute 2 minutes 5 minutes 10 minutes
After this time has elapsed, the teaching process is terminated prematurely. The same behaviour is carried out as on receiving a telegram to end measurement of the travel time. The set timeout time is restarted by: - a new telegram to start measurement of the travel time - a telegram for moving the drive in long-time operation in the case of an output that is not set as a slave output.	
Venetian blind travel time	0...1...19 min 0...59 s
This parameter defines the travel time of the Venetian blind. The time needed for a complete travel from the upper into the lower end position must be determined. This parameter is only visible in the Venetian blind operation.	
Venetian blind travel time (presetting)	0...1...19 min 0...59 s
The travel time of the Venetian blind is preset here if the teach-in function is used. This value is overwritten after a successful teach-in process. This parameter is only visible in the Venetian blind operation.	
Shutter/awning travel time	0...1...19 min 0...59 s
This parameter defines the travel time of the shutter or awning. The time needed for a complete travel from the upper into the lower end position must be determined. This parameter is only visible in the shutter/awning operation.	
Shutter/awning travel time (presetting)	0...1...19 min 0...59 s
The travel time of the shutter or awning is preset here if the teach-in function is used. This value is overwritten after a successful teach-in process. This parameter is only visible in the shutter/awning operation.	
Venting louver/roof window travel time (presetting)	0...1...19 min 0...59 s
The travel time of the venting louver is preset here if the teach-in function is used. This value is overwritten after a successful teach-in process. This parameter is visible only in the venting louver operation.	

Venting louver travel time	0...1...19 min 0...59 s
This parameter defines the travel time of the venting louver. The time needed for a complete travel from the completely open into the completely closed position must be determined. This parameter is visible only in the venting louver operation.	
Slat travel time	0...19 min 0...2...59 s 0...100...900 ms
This parameter defines the travel time of the slats. The time needed for a complete movement from the completely open slat position into the completely closed slat position (travel movement DOWN) must be determined. This parameter is only visible in the Venetian blind operation.	
Short-time operation	no (only stop) yes
This parameter can be used to configure the reaction to a received short time telegram. no (only stop): The drive will only be stopped if it is executing a movement at the time of telegram reception. There is no reaction if no movement is in progress. yes: Short-time operation is started on reception of a short-time telegram when the drive is stationary. If the drive is in motion at the time of telegram reception, it will be stopped.	
Time for short-time operation	0...59 s 0...10... 500 ...990 ms
This parameter defines the duration of short-time operation. This parameter is only visible, if the parameter "Short-time operation" is set to "yes".	
Switch-over for travel direction change	0.5 s 1 s 2 s 5 s
This parameter specifies the break in a travel direction change (switchover time).	

Travel time extension for upward travel	none 0.5% 1% 1.5% 2% 3% 4% 5% 6% 7% 8% 9% 10% 12.5% 15% 20% 30%
The actuator extends all the up movements or all venting louvre / roof window movements into the opened position using the extension configured here. The time extension expressed in percent is the difference between the measured travel time needed to reach the lower end position (completely closed position) and the time needed to reach the upper end position (completely open position).	

14.2.5.6 Object list Short-time / Long-time operation, travel times

Function	Name	Type	DPT	Flag
Travel time - Teach-in - Enable	VB ... - Input	1-bit	1,003	C, -, W, -, U

1-bit object for starting and ending the automatic travel time measurement (teaching). Polarity: 1 = start measurement / 0 = end measurement, abort.
This object is only visible if setting of the travel times is not carried out via parameter.

Function	Name	Type	DPT	Flag
Travel time - Preset - Master	Venetian blind... - Output	2-byte	7,004	C, -, -, T, U

2-byte object for transmitting the learned travel time of a master output to other slave Venetian blind outputs of the same device or to other actuators (slaves). At least one Venetian blind output must be configured as a master! In the case of a master-slave application, this object must always be linked to the "Travel time (slave)" object of the same actuator or other actuators via an identical group address to specify a travel time via the bus!

This object is only visible if "Setting the travel times via the bus" is enabled.

Function	Name	Type	DPT	Flag
Travel time - Preset - Slave	Venetian blind... - Input	2-byte	7,004	C, -, W, -, U

2-byte object for receiving the learned travel time of a master output for other actuators (slaves). At least one Venetian blind output must be configured as a master in the same or in a different actuator! In the case of a master-slave application, this object must always be linked to the "Travel time (master)" object of the same actuator or other actuators via an identical group address to specify a travel time via the bus!

This object is only visible if "Setting the travel times via the bus" is enabled.

Function	Name	Type	DPT	Flag
Long-time operation	VB ... - Input	1-bit	1,008	C, -, W, -, U

1-bit object for activation of long time operation.

Function	Name	Type	DPT	Flag
Short-time operation	VB ... - Input	1-bit	1,007	C, -, W, -, U

1-bit object for activation of short time operation or for stopping a drive movement.

14.2.6 Position calculation, position presetting and feedbacks

14.2.6.1 Position calculation and position presetting

Calculating the curtain height or the venting louvre position

The actuator has a comfortable and accurate positioning function. The actuator calculates the current position of the connected Venetian blind, shutter, awning, venting louvre or roof window whenever these elements are adjusted either by manual or bus control. The calculated position value is a measure of the height of the blind/shutter or of the opening width of the venting louvre / roof window.

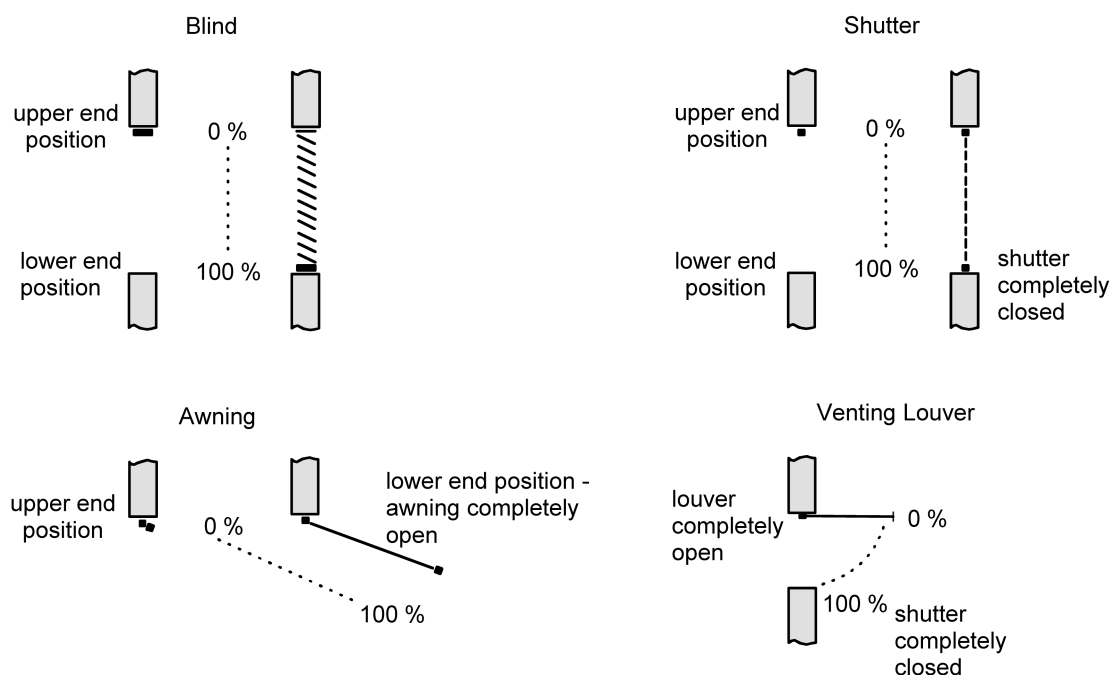


Figure 61: Positions defined as a function of the type of movement

The actuator derives the positions from the configured travel time since conventional drives do not provide feedback about their positions. Thus, the travel time configured or learned separately for each Venetian blind output is the reference for all position approaches and of basic importance for the accuracy of the position calculations. For this reason, the travel times should be determined with great accuracy in order to achieve the best possible positioning results.

For positioning purposes, the actuator calculates the travel time required as a function of the current position.

Example 1

The shutter connected to the certain output has an overall travel time of 20 s. The shutter is in its upper end position (0%). It is to be positioned at 25%. The actuator calculates the travel time required for approaching the desired position:
 $20 \text{ s} \cdot 0.25_{(25\%)} = 5 \text{ s}$. The output will then lower the shutter for 5 s and thus position the shutter at height of 25%.

Example 2

The shutter at an output has an overall travel time of 20 s. The shutter is in the 25% position. It is to be positioned at 75%. The difference between the positions is 50%. The actuator calculates the travel time required for bridging the difference between the positions: $20 \text{ s} \cdot 0.5_{(50\%)} = 10 \text{ s}$. The output will then lower the shutter for 10 s and thus position the blind at height of 75%.

With all the upward movements, the configured travel time extension is automatically added to the calculated travel time.

Example 3

The shutter at an output has an overall travel time of 20 s. The shutter is in the 75% position. It is to be positioned at 25%. The difference between the positions is 50%. The actuator calculates the non-extended travel time required for bridging the difference between the positions:

$20 \text{ s} \cdot 0.5_{(50\%)} = 10 \text{ s}$. Taking the travel time extension into account (e. g. 10%) the actual raising time is: $10 \text{ s} \cdot ((100\% + 10\%_{(\text{travel time extension})}) : 100\%) = 10 \text{ s} \cdot 1.1 = 11 \text{ s}$. The output will then raise the shutter for 11 s and thus position it at a blind height of 25%.

When the lower or upper end positions (0 % or 100 %) are approached, the travel time is always 20 % longer than the overall travel time.

Example 4

The shutter at an output has an overall travel time of 20 s. The shutter is in the 50% position. It is to be positioned at 100%. The difference between the positions is 50%. The actuator calculates the travel time required for bridging the difference between the positions: $20 \text{ s} \cdot 0.5_{(50\%)} = 10 \text{ s}$. As the movement is a limit position movement, the actuator adds 20% of the total travel time:

$10 \text{ s} + (20\% : 100\%) \cdot 20 \text{ s} = 14 \text{ s}$. The output will then lower the shutter for 14 s and thus position it safely at a blind height of 100%.

Example 5

The shutter at an output has an overall travel time of 20 s. The shutter is in the 50% position. It is to be positioned at 0%. The difference between the positions is 50%. The actuator calculates the non-extended travel time required for bridging the difference between the positions: $20 \text{ s} \cdot 0.5_{(50\%)} = 10 \text{ s}$. As the movement is a limit position movement, the actuator additionally adds 20% of the total travel time:

$10 \text{ s} + (20\% : 100\%) \cdot 20 \text{ s} = 14 \text{ s}$.

Taking the travel time extension into account (e. g. 10%) the actual raising time is: $14 \text{ s} \cdot ((100\% + 10\%_{(\text{travel time extension})}) : 100\%) = 14 \text{ s} \cdot 1.1 = 15.4 \text{ s}$. The output will then raise the shutter for 15.4 s and thus position safely at 0%.

- i** The actuator executes position approaches only if a new position deviating from the current position is preset.
- i** The actuator stores the blind or venting louvre / roof window positions temporarily. The actuator can approach newly preset positions only if the current positions are known. For this purpose, each output must be given the opportunity

to synchronise itself whenever the bus voltage is switched on or after every ETS programming run (physical address, application program, partial download). This synchronisation is performed by means of a reference movement.

- i** Position approaches in progress will be aborted in case of bus voltage failure. In case of bus voltage failure, the configured behaviour will be executed.

Calculating the slat position (only with blinds)

In the "Venetian blind" operation, the actuator always calculates the slat position so that the opening angle and thus the amount of light admitted into the room by the blind can be adjusted. A new position approach by a Venetian blind will always be followed by a positioning movement of the slats. Thus, the slat positions last selected will be tracked or readjusted to a new value if a position change has taken place. In case of single-motor Venetian blind systems without a working position, the slats will be readjusted directly by a change of the Venetian blind height. For this reason, an adjustment of the slat position will always have an influence on the position of the Venetian blind itself .

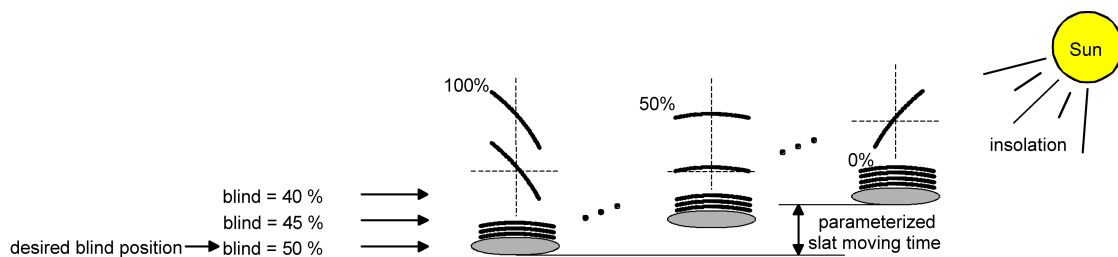


Figure 62: Example of slat positioning affecting the position of the Venetian blind (Typical of slat type 1; analogous reaction for type 2.)

Since a preset slat position is to remain constant until the next change, the actuator will not change the height of the Venetian blind if the calculated travel time required for a change of position lies within the configured slat travel time. Similarly, the actuator accounts for the ratio of the travel times of slat and Venetian blind and – in case of slat position changes – always recalculates the resulting Venetian blind position. If the position feedback objects are used (cf. "Position feedback"), the actuator transmits the blind positions changed by the adaptation also to the bus.

Example (see figure 62)

The Venetian blind position is preset to 50%. A change of the slat angle (100%...0%) initiates the calculation of a new Venetian blind position which is also tracked in the position feedback objects. If the actuator is to approach a new Venetian blind position of e. g. 47% in this case, the actuator will not travel because the calculated travel time is within the configured slat travel time and thus coincides with the slat movement. A change of the Venetian blind position to 55% in this case triggers a Venetian blind movement as the change does not lie within the slat movement (0 to 100%).

In each position operation, the Venetian blind setpoint position refers to a slat position of 100%. In the event of a slat repositioning movement (0 to 100%), the system will therefore report a Venetian blind position below the desired position.

Exception: The Venetian blind setpoint position of 0% (upper end position) is assigned to the slat position of 0%. The readjustment of the slat position will result also in this case in a change of the Venetian blind height (brief downward movement). Only in this case will the actuator report back a blind position above the desired blind position. With slat type 1, the slats are generally horizontal when the Venetian blind is in its upper end position. For this reason, the calculated slat position with a slat type 1 corresponds to the actual opening angle only after the first slat is completely extended (100%).

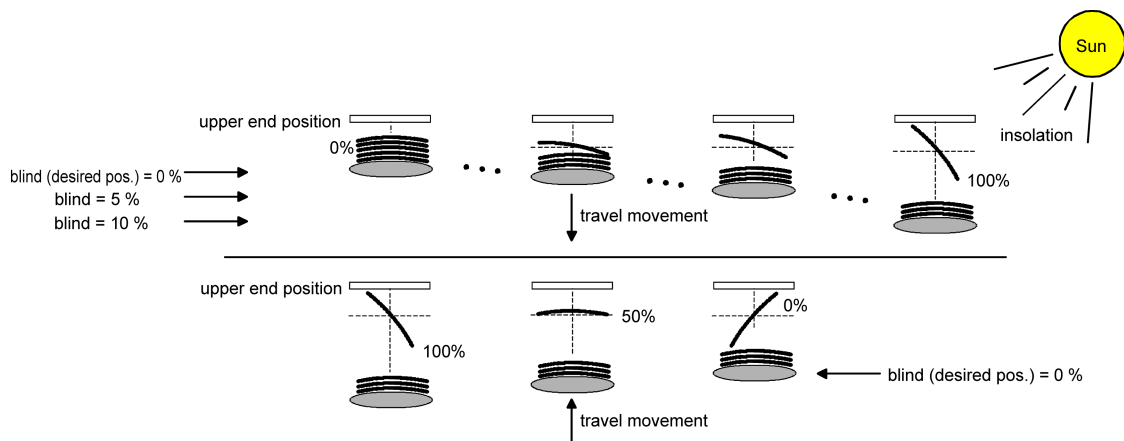


Figure 63: Example of slat positioning with the Venetian blind in upper end position (Typical of slat type 1.)

Example (see figure 63)

The Venetian blind position is preset to 0%. After an extended movement, the Venetian blind is safely in the upper end position. A change of the slat angle (0%...100%) initiates the calculation of a new Venetian blind position which is also tracked in the position feedback objects. If the actuator is to approach a new Venetian blind position of e. g. 5% in this case, the actuator will not travel because the calculated travel time is within the configured slat travel time and thus coincides with the slat movement. A change of the Venetian blind position to 15% in this case triggers a Venetian blind movement as the change does not lie within the slat movement (0 to 100%).

- i** The actuator executes slat position adjustments only if a new position deviating from the current slat position is preset.
- i** The actuator stores the slat positions temporarily. The actuator can approach newly preset slat positions only if the current position is known. For this purpose, each output must be given the opportunity to synchronise itself whenever the bus voltage is switched on or after every ETS programming run (physical address, application program, partial download). This synchronisation is performed by means of a reference movement for the slat or the Venetian blind.
- i** When positioning the Venetian blind height, the slats are always positioned afterwards. After reactivation of the bus voltage or after ETS programming, the actuator will in this case generally move the slats into the 100% position, if no position has been preset for the slats.

- i** The lower the ratio between slat travel time and Venetian blind travel time, the more precise the positioning and the less marked the influence of the slat angle adjustment on the height of the Venetian blind.

Presetting the position

The following ways of presetting positions can be distinguished...

- direct positioning by the positioning objects (direct operation),
- Positioning by activating the sun protection function,
- Positioning using the response after the bus voltage returns,
- Positioning by a scene recall.

Positioning via the positioning objects:

Each Venetian blind, shutter, awning, venting louvre or each roof window can be positioned directly using the "Position ..." object which is separate for each output. An independent positioning object exists for each of the slats. The position approached is always the position last received. The actuator does not show a reaction when the set or to be approached position value is received several times in succession. This type of control is termed 'direct operation' just like operation via short time, long time or central objects or a scene recall. Positioning via the objects therefore has the same priority.

A position movement caused by the communication objects can be interrupted at any time by a long time command, short time command, central command or a scene recall. The direct operation can be overridden by a function with a higher priority, e. g. manual control, forced position, safety or also sun protection (configurable). The position telegrams must correspond to the 1-byte data format according to KNX datapoint type 5.001 (Scaling). The actuator converts the value received (0...255) linearly into a position (0...100%).

value received (0...255)	position derived from it (0...100 %)
0	0% (upper end position / slat or venting louvre opened)
↓	↓ (all intermediate values rounded off to 1% increments)
255	100% (lower end position / slat or venting louvre closed)

Data format of positioning objects with conversion into percentage position values

It is possible that new positioning telegrams are being received while a position approach is in progress. In this case, the actuator immediately reverses the direction of travel, if the new position to be approached lies in the opposite direction. If a slat positioning command is received during a running Venetian blind position approach, the device finishes first the Venetian blind position approach before positioning the slat. If a blind positioning command is received during a slat positioning movement, the actuator interrupts the slat positioning movement and approaches the new blind position. Only then does the actuator switch to the most recently received slat position.

In case of Venetian blind positioning, slat positioning will always be executed later. After switching on the bus voltage or after programming with the ETS, it may be the case that the slat position is unknown, if no long time command for the upward or downward movement with a duration of at least the configured slat travel time has been received or no slat positioning has taken place (no slat reference movement). In this case, the slat is moved during a Venetian blind position approach into the completely closed position (100%). The slat position is then considered as calibrated.

- i** Optionally, the sun protection function offers the possibility of receiving the instruction of the blind height, venting louvre / roof window position or slat position to be adopted during sunshine via separate communication objects and to preset these values variably. This form of variable position preset in the sun protection function is identical to presetting the positions via communication objects in direct operation. The priority of the incoming telegrams in direct operation with the sun protection activated can be additionally configured in the ETS.

Positioning by the sun protection function, the behaviour after the bus voltage returns or by a scene recall:

In case of the actuator functions mentioned, the positions to be approached are configured directly in the ETS depending on the operation. The position values can be specified between 0% and 100% in 1% increments.

With Venetian blinds, the height of the Venetian blind is positioned first in these cases. The configured slat position is adjusted only thereafter.

- i** Important notes for all positioning movements: Using the connected drives frequently for position approaches (for instance several times a day) can result after some time in positioning inaccuracies. These deviations from the setpoint position are mostly due to external physical influences. To achieve accurate positioning in operation it is recommended to perform the reference movement at least once every day. This can be achieved for instance by a central raising command transmitted to the long-object.

Reference movement

After ETS programming (physical address, application program, partial download) or after bus voltage failure all current position data are unknown. The positioning system must be calibrated first before the actuator can approach new positions after the bus voltage returns or after a programming operation. A position calibration is possible by executing the reference movement.

A reference movement is the time required for a travel movement into the upper end position increased by 20% and additionally by the configured travel time extension. A reference travel cannot be retrIGGERED.

Reference movements can be executed by the following commands...

- uninterrupted long time operation (including also a terminated safety movement) into the upper end position activated via the corresponding communication object,
- an approach of the 0% position,
- a manually controlled movement into the upper end position.

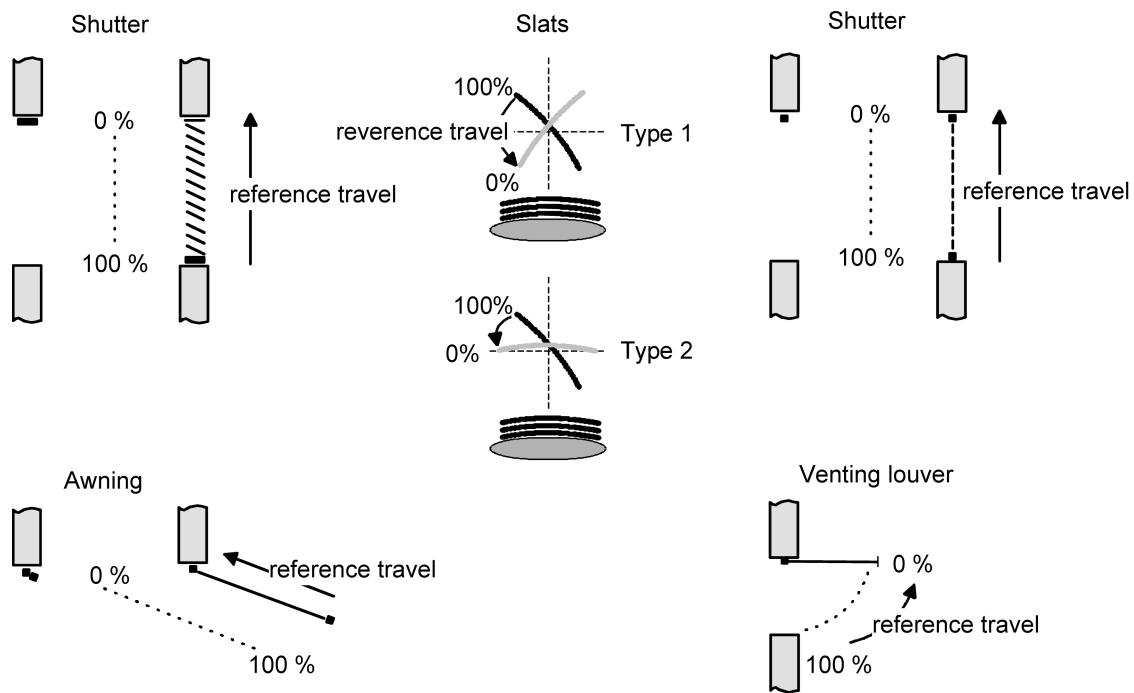


Figure 64: Reference movement

In the event of slat positioning via the corresponding communication objects after the bus voltage returns or after a programming operation, a slat reference movement becomes necessary if the Venetian blind has not been moved beforehand in the up or down directions for at least the configured slat travel time. During a slat reference movement, the actuator always moves first into the completely open position (0%) for the parameterized slat travel time and then moves the slats to the desired position. The slat position is also considered as calibrated when the Venetian blind has been moved by a long-time command in the up or down direction during at least the configured slat travel time.

- i** A terminated reference movement of the Venetian blind will also calibrate the slat position.
- i** If the reference movement is interrupted for instance by a short-time operation, the position is still unknown as before.
- i** A long-time travel into the lower end position activated via the corresponding communication object also calibrates the reference position.
- i** With the sun protection function it is moreover possible to force the actuator to perform a reference movement before each sun protection travel even if the positions are known. Thus, it is ensured that in case of sun protection the configured sun protection position is always precisely approached even after repeated position approaches.
- i** Using the connected drives frequently for position approaches (for instance several times a day) can result after some time in positioning inaccuracies. These deviations from the setpoint position are mostly due to external physical influences. To achieve accurate positioning in operation it is recommended to

perform the reference movement at least once every day. This can be achieved for instance by a central raising command transmitted to the long-time object.

14.2.6.2 Feedback telegrams

Position feedback messages

In addition to presetting positions via positioning objects, the actuator can track the current positions values via separate feedback objects and also transmit them to the KNX, if the bus voltage is on. Thus, the preset setpoint position can be distinguished from the true actual position of the drives activated.

The following feedback telegrams can be preset for each output depending on the parameterised operation...

- Feedback (1-byte) of the Venetian blind, shutter, awning or venting louvre / roof window positions,
- Feedback (1-byte) of the slat position (only with Venetian blinds).

The individual position feedback messages can be enabled in the ETS independent of one another and have communication objects of their own. For each travel movement the actuator calculates the current position and tracks it in the position feedback objects. The positions are tracked and the feedback objects updated even when an output has been activated via short-time or long-time telegrams or by manual control on condition that the bus voltage is on.

The feedback objects are updated after the following events...

- at the end of a travel movement – including a slat positioning movement in a Venetian blind – when the drive stops and when the new position is reached,
- with a movement to an end position already at the time the end position is theoretically reached, i.e. before the 20% extension and the travel time extension have elapsed,
- cyclically even during a travel movement, provided that cyclical transmission is active.

The feedback objects are not updated, if the position last reported back has not changed after a movement (for instance, when the Venetian blind is repositioned, the unchanged slat position will not be reported back a second time). The actuator cannot calculate a feedback position, if the current position data after switch-on of the bus voltage or after ETS programming are still unknown. In these cases, the system must first perform a reference movement so that the position can be calibrated. In case of unknown positions, the actuator automatically performs reference travels, if new positions are preset and if these positions are to be approached. As long as a position is unknown, the value of the feedback objects is "0".

Presetting position feedback for Venetian blind, shutter, awning or venting louvre / roof window positions

The feedback functions can be enabled and programmed independently for each output. When feedback is enabled, the ETS adapts the parameter texts depending on the preset operation ("Venetian blind position feedback", "Shutter/awning position feedback" or "Venting louvre / roof window position"). The position feedback information is transmitted to the bus whenever a position value changes.

The current position can be transmitted to the KNX after the bus voltage returns if the position value differs from the one last transmitted. When the position data are known, the feedback telegram can in this case be transmitted with a time delay to reduce the bus load, with the delay being preset globally and in common for all outputs.

The feedback functions of an output must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". Only then are the parameters for the feedback functions visible.

- Activate the checkbox "Status object Venetian blind position", "Status object shutter/awning position" or "Status object venting louvre / roof window position".

The feedback object is enabled. The position value is transmitted as soon as it changes. No value will be actively transmitted, if the position is unknown.

Feedback must be activated.

- If a delay is necessary after the bus voltage returns or after an ETS programming operation, activate the parameter "Time delay after bus voltage return".

The position feedback is transmitted with a delay after the bus voltage returns or after an ETS programming operation, provided that the position is known (reference movement performed). After the end of the delay, the position last adjusted statically will be transmitted to the KNX. No feedback telegram is transmitted during a running delay, even if a position value changes during this delay.

Feedback must be activated.

- If cyclical transmission is required during active movement, activate the parameter of the same name and configure the required cycle time.

The position feedback is transmitted cyclically during a running travel movement. The parameter "Time for cyclical transmission" specifies the cycle time.

i The cyclical transmission only takes place if the position data is known (reference movement completed).

i If, after the bus voltage returns or after an ETS programming operation, the position data is unknown, the feedback objects are initialised with "0". The object values are then not transmitted to the KNX.

- i** In case of Venetian blind operation, any position change of the Venetian blind within the limits of the slat adjustment (0 to 100%) does not cause a movement and therefore no change of the feedback position data either.

Presetting the position feedback for slat positions (only with Venetian blinds)

The feedback functions for the slat positions can be enabled and programmed independently for each output. The current slat position can be transmitted to the bus after the bus voltage returns if the position value differs from the one last transmitted. When the position data are known, the feedback telegram can in this case be transmitted with a time delay to reduce the bus load, with the delay being preset globally and in common for all outputs.

The feedback functions of an output must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". Only then are the parameters for the slat position feedback functions visible.

- Activate the checkbox "Status object slat position".

The feedback object is enabled. The position value is transmitted as soon as it changes. No value will be actively transmitted, if the position is unknown.

Feedback must be activated.

- If a delay is necessary after the bus voltage returns or after an ETS programming operation, activate the parameter "Time delay after bus voltage return".

The position feedback is transmitted with a delay after the bus voltage returns or after an ETS programming operation, provided that the position is known (reference movement performed). After the end of the delay, the position last adjusted statically will be transmitted to the KNX. During a running delay the affected feedback object is updated but no feedback is transmitted actively, even if a position value changes during this delay.

Feedback must be activated.

- If cyclical transmission is required during active movement, activate the parameter of the same name and configure the required cycle time.

The position feedback is transmitted cyclically during a running travel movement. The parameter "Time for cyclical transmission" specifies the cycle time.

- i** The cyclical transmission only takes place if the position data is known (reference movement completed). The feedback object of the slat position also transmits cyclically during a blind/shutter movement (e. g. Venetian blind position approach).

- i** If, after the bus voltage returns or after an ETS programming operation, the position data is unknown, the feedback objects are initialised with "0". The object values are then not transmitted to the KNX.

- i** In case of Venetian blind operation, any position change of the Venetian blind within the limits of the slat adjustment (0 to 100%) does not cause a movement and therefore no change of the feedback position data either.

Individual and combined status feedbacks

In addition to position data feedback, the actuator can also report back enlarged status information messages and transmit them actively to the KNX.

The following status feedback messages can be separately preset for each output...

- Feedback of an invalid position,
- Drive movement feedback,
- Feedback of the end positions,
- Feedback of the combined function status.

Feedback of an invalid position:

After switch-on of the supply voltage or after programming with the ETS, all the position data of an output is unknown. In this case, the actuator can update the feedback object "Invalid position" (object value "ON"), which will then signal that the object values of the 1-byte position feedback objects are invalid.

An invalid position feedback will only be reversed (object value "OFF") after the position data for the Venetian blind, shutter, awning, venting louvre or roof window have been calibrated by means of a reference movement. The calibration of the slat position in a Venetian blind alone will not result in the reversal of an 'invalid position "invalid position".

As an option, the object value of the status feedback message can be actively transmitted to the KNX in case of a value change.

Drive movement feedback:

The actuator can report back via a separate 1-bit communication object per output whether the connected drive is moving, i.e. whether the output is supplying current for any travel direction. The feedback object has the object value "ON", when current is flowing from the output to the drive. Similarly, "OFF" is written into the object if the output concerned remains in a stop position. In this case, the operation by which the output was activated (short-time or long-time operation, positioning, manual control, etc.) is of no importance.

As an option, the object value of the status feedback message can be actively transmitted to the KNX in case of a value change.

The state of the feedback is only derived from the relay state of the actuator. This means that if a drive is blocked or already in its end position, the value reported back does not correspond to the actual state of the travel movement.

Feedback of the end positions:

Depending on the connected drive or blind/shutter type, the actuator may return one or two 1-bit communication objects if the drive has reached an end position. For a Venetian blind, shutter and awning, the upper and lower end positions are signalled separately. In the case of a venting louvre or roof window, only the lower end position is signalled for a closed venting louvre or a closed window. After switch-on of the supply voltage or after programming with the ETS, all the position data of an output is unknown. In this case, the state "End position not reached" (object value "OFF") is sent. The feedback "End position not reached" is not reversed (object value "ON") until the position data for the Venetian blind, shutter, awning, venting louvre or roof window have been calibrated by means of a reference movement and the end position has been reached by means of a correspondingly long movement.

Function status:

Particularly for simple connection to visualisations or for diagnoses, the actuator can also transmit various status information in combined data points. This can significantly reduce the telegram load. Two different types of data points are available. Both communication objects transmit in the case of a change of status.

Setting feedback of an invalid position

The feedback of an invalid position can be enabled and programmed independently for each output. In the case of enabled feedback, the ETS adapts the parameter texts depending on the set operation ("Status object invalid Venetian blind position", "Status object invalid shutter / awning position" or "Status object invalid venting louvre / roof window position").

The feedback is transmitted to the KNX whenever an object value changes.

The feedback telegram can be transmitted after the bus voltage returns with a time delay to reduce the bus load, with the delay being set globally and in common for all outputs.

The feedback functions of an output must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". Only then are the parameters for the feedback functions visible.

- Activate the checkbox "Status object invalid Venetian blind position", "Status object invalid shutter/awning position" or "Status object invalid venting louvre / roof window position".

The feedback object is enabled. A telegram is transmitted as soon as there is a change (e. g. after ETS programming, after switch-on of the bus voltage or after a reference movement).

Feedback must be activated.

- If a delay after the bus voltage return is necessary, activate the parameter "Time delay after bus voltage return".

The feedback of an invalid position will be transmitted with a delay after the bus voltage returns. After the end of the delay, the object value state last adjusted will be transmitted to the KNX. No feedback telegram is transmitted during a running delay, even if a position value becomes known during this delay, for example through a reference movement.

Automatic transmission after the bus voltage returns only takes place if there has been an internal change to the object state (for example through a reference run during manual operation).

Setting drive movement feedback

The feedback of a drive movement can be enabled and programmed independently for each output. The status feedback is transmitted to the KNX whenever an object value changes.

The feedback telegram can be transmitted after the bus voltage returns with a time delay to reduce the bus load, with the delay being preset globally and in common for all Venetian blind outputs.

The feedback functions of an output must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". Only then are the parameters for the feedback functions visible.

- Activate the checkbox "Status object drive movement".

The feedback object is enabled. A telegram is transmitted when the connected drive starts moving or stops.

Feedback must be activated.

- If a delay after the bus voltage return is necessary, activate the parameter "Time delay after bus voltage return".

The feedback of a travel movement is transmitted after a delay after the bus voltage returns, for example, when the drive starts moving on account of the set behaviour after the bus voltage returns. After the end of the delay, the object value state last adjusted will be transmitted to the KNX. No feedback is transmitted during a running delay, even if the drive stops or starts moving.

-  Automatic transmission only takes place after the bus voltage returns when the drive starts moving when the bus voltage returns or if the bus failure has caused a change to the travel movement.

Setting the feedback of the end positions

The feedback of the end positions can be enabled and programmed independently for each output. In the case of enabled feedback, the ETS adapts the parameter texts depending on the set operation ("End positions" or "Status venting louvre / roof window").

The feedback is transmitted to the KNX whenever an object value changes. After the bus voltage returns, the feedback can be transmitted with a time delay to reduce the bus load, with the delay being preset globally and in common for all outputs.

The feedback functions of an output must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". Only then are the parameters for the feedback functions visible.

- Activate the checkbox "Status objects end positions" or "Status object venting louver / Roof window".

The feedback object is enabled. A telegram is transmitted as soon as there is a change (e. g. after ETS programming, after switch-on of the bus voltage or after a reference movement).

- If a delay after the bus voltage return is necessary, activate the parameter "Time delay after bus voltage return".

The feedback of the end positions will be transmitted with a delay after the bus voltage returns. After the end of the delay, the object value state last adjusted will be transmitted to the KNX. No feedback is transmitted during a running delay.

- If regular signalling of the end positions is required, activate the checkbox "Cyclical transmission".

The end position signal is transmitted cyclically during a running travel movement. The parameter "Time for cyclical transmission" specifies the cycle time.

Setting feedback of the combined function status

The feedback of the combined function status can be enabled and programmed independently for each output.

The feedback functions of an output must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". Only then are the parameters for the feedback functions visible.

- Activate the checkbox "Function status (KNX standard)".

The standardised feedback object is enabled. In addition to the current positions of the blind/shutter and the slats, it contains various bit-coded status information. A telegram is transmitted as soon as there is a change.

14.2.6.3 Parameter position calculation, position presetting and feedbacks

Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions

Status	Checkbox (active /inactive)
This parameter can be used to enable the feedback functions of the Venetian blind output.	

Outputs -> Switching / Venetian blind -> VB... - General -> Status

Status object Venetian blind position	Checkbox (active /inactive)
The current Venetian blind position of the output can be reported separately back to the KNX.	
active: Feedback and the object are activated. The object transmits the current status after each adjustment.	
inactive: There is no feedback object available for the output. Feedback deactivated.	
This parameter is only visible in the Venetian blind operation.	

Status object shutter/awning position	Checkbox (active /inactive)
The current shutter or awning position of the output can be reported separately back to the KNX.	
active: Feedback and the object are activated. The object transmits the current status after each adjustment.	
inactive: There is no feedback object available for the output. Feedback deactivated.	
This parameter is only visible in the shutter/awning operation.	

Status object venting louvre/roof window position	Checkbox (active /inactive)
The current venting louvre / roof window positions of the output can be reported separately back to the KNX.	
active: Feedback and the object are activated. The object transmits the current status after each adjustment.	
inactive: There is no feedback object available for the output. Feedback deactivated.	
This parameter is only visible in the "venting louvre / roof window" operation.	

Delay after bus voltage returns	Checkbox (yes / no)
The feedback telegram can be transmitted to the KNX with a delay after the bus voltage returns or after programming with the ETS. The delay time is configured under "General".	
This parameter is only visible in case of an actively transmitting feedback object.	

Cyclical transmission during active movement	Checkbox (yes / no)
If cyclical transmission of the blind/shutter position is required during active movement, this parameter can be activated. The position feedback is then transmitted cyclically during a running travel movement. The cyclical transmission only takes place if the position data is known (reference movement completed). This parameter is only visible in case of an actively transmitting feedback object.	
Cycle time	2... 5 ...59 s
This parameter specifies the cycle time for the cyclical transmission of the blind/shutter position and is only available if cyclical transmission is activated.	
Status object slat position	Checkbox (active /inactive)
The current slat position of the output can be reported separately back to the KNX. active: Feedback and the object are activated. The object transmits the current status after each adjustment. inactive: There is no feedback object available for the output. Feedback deactivated. This parameter is only visible in the Venetian blind operation.	
Delay after bus voltage returns	Checkbox (active/ inactive)
The feedback telegram can be transmitted to the KNX with a delay after the bus voltage returns or after programming with the ETS. The delay time is configured under "General". This parameter is only visible in case of an actively transmitting feedback object.	
Cyclical transmission during active movement	Checkbox (active/ inactive)
If cyclical transmission of the slat position is required during active movement, this parameter can be activated. The position feedback is then transmitted cyclically during a running travel movement. The feedback object of the slat position also transmits cyclically during a blind/shutter movement (e. g. Venetian blind position approach). The cyclical transmission only takes place if the position data is known (reference movement completed). This parameter is only visible in case of an actively transmitting feedback object.	
Cycle time	1...59
This parameter specifies the cycle time for the cyclical transmission of the slat position and is only available if cyclical transmission is activated.	

Status object invalid Venetian blind position	Checkbox (active/inactive)
The actuator can report to the KNX that the current blind position is unknown (e. g. after an initialisation, when no reference travel has been executed as yet). active: Feedback and the object are activated. The object transmits the current status after each change of its value. inactive: There is no feedback object available for the output. Feedback deactivated. This parameter is only visible in the Venetian blind operation.	
Status object invalid shutter/awning position	Checkbox (active/inactive)
The actuator can report to the KNX that the current shutter/awning position is unknown (e. g. after an initialisation, when no reference travel has been executed as yet). active: Feedback and the object are activated. The object transmits the current status after each change of its value. inactive: There is no feedback object available for the output. Feedback deactivated. This parameter is only visible in the shutter/awning operation.	
Status object invalid venting louvre / roof window position	Checkbox (active/inactive)
The actuator can report to the KNX that the current venting louvre/roof window position is unknown (e. g. after an initialisation, when no reference travel has been executed as yet). active: Feedback and the object are activated. The object transmits the current status after each change of its value. inactive: There is no feedback object available for the output. Feedback deactivated. This parameter is only visible in the "venting louvre / roof window" operation.	
Delay after bus voltage returns	Checkbox (active/inactive)
The feedback telegram can be transmitted to the KNX with a delay after the bus voltage returns or after programming with the ETS. The delay time is configured under "General". This parameter is only visible in case of an actively transmitting feedback object.	
Status object drive movement	Checkbox (active/inactive)
The actuator can report to the KNX that the connected drive is active, i.e. the output is supplying power to the drive for a travel direction. active: Feedback and the object are activated. The object transmits the current status after each change of its value. inactive: There is no feedback object available for the output. Feedback deactivated.	

Delay after bus voltage returns	Checkbox (active/inactive)
The feedback telegram can be transmitted to the KNX with a delay after the bus voltage returns or after programming with the ETS. The delay time is configured under "General". This parameter is only visible in case of an actively transmitting feedback object.	
Status object end positions	Checkbox (active/inactive)
The actuator can report to the KNX that the connected drive is in one of the end positions, depending on the blind/shutter type. active: Feedback and the objects are activated. The objects send the current status after each change of their value. inactive: There is no feedback object available for the output. Feedback deactivated. The parameter is available for the blind/shutter types Venetian blind and shutter/awning.	
Delay after bus voltage returns	Checkbox (active/inactive)
The feedback telegram can be transmitted to the KNX with a delay after the bus voltage returns or after programming with the ETS. The delay time is configured under "General".	
Cyclical transmission	Checkbox (active/inactive)
If cyclical transmission of the end position is required during active movement, this parameter can be activated. The position feedback is then transmitted cyclically.	
Time for cyclical transmission	0 ... 59 h 0 ... 2 ... 59 min 0 ... 59 s
This parameter specifies the cycle time for the cyclical transmission of the slat position and is only available if cyclical transmission is activated.	
Status object venting louvre / roof window	Checkbox (active/inactive)
The actuator can report to the KNX that the connected drive is in the closed end position. active: Feedback and the object are activated. The object transmits the current status after each change of its value. inactive: There is no feedback object available for the output. Feedback deactivated. The parameter is available for the blind/shutter type venting louvre / roof window.	
Delay after bus voltage returns	Checkbox (active/inactive)
The feedback telegram can be transmitted to the KNX with a delay after the bus voltage returns or after programming with the ETS. The delay time is configured under "General".	

Cyclical transmission	Checkbox (active/inactive)
If cyclical transmission of the slat position is required during active movement, this parameter can be activated. The position feedback is then transmitted cyclically during a running travel movement. The feedback object of the slat position also transmits cyclically during a blind/shutter movement (e. g. Venetian blind position approach). The cyclical transmission only takes place if the position data is known (reference movement completed).	
Time for cyclical transmission	0 ... 59 h 0 ... 2 ... 59 min 0 ... 59 s
This parameter specifies the cycle time for the cyclical transmission of the slat position and is only available if cyclical transmission is activated.	
Function state (KNX standard)	Checkbox (active/inactive)
The actuator can report a combined function status on the KNX via a 4-byte communication object with the data point type 241,800 (DPT_StatusSAB). This includes the blind/shutter position and bit-coded status information. active: Feedback and the object are activated. The object transmits actively. A telegram is sent each time an individual status changes. inactive: There is no feedback object available for the output. Feedback deactivated.	
Function state (extended)	Checkbox (active/inactive)
The actuator can report a combined function status to the KNX via a 3-byte communication object with a non-standardised data point type. This includes bit-coded status information and an enumeration of the possible statuses that can disable direct operation due to a higher priority. active: Feedback and the object are activated. The object transmits actively. A telegram is sent each time an individual status changes. inactive: There is no feedback object available for the output. Feedback deactivated.	

14.2.6.4 Object list position calculation, position presetting and feedbacks

Function	Name	Type	DPT	Flag
... - Position	VB ... - Input	1-byte	5,001	C, -, W, -, U
1-byte object for presetting a position value (0...255) for the height of the Venetian blind or shutter or the venting louver / roof window position in direct operation.				

Function	Name	Type	DPT	Flag
Slat - Position	VB ... - Input	1-byte	5,001	C, -, W, -, U
1-byte object for presetting a slat position value (0...255) in direct operation.				

Function	Name	Type	DPT	Flag
... - Position - Status	VB ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object for positional feedback of the Venetian blind or shutter hanging height or the venting louver / roof window position (0...255).				

Function	Name	Type	DPT	Flag
Slat - Position - Status	VB ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object for position feedback of the slat position (0...255) if one Venetian blind is controlled.				

Function	Name	Type	DPT	Flag
Invalid position - Status	VB ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object for reporting back an invalid position of the Venetian blind or shutter height or venting louver position ("0" = position valid / "1" = position invalid).				

Function	Name	Type	DPT	Flag
Drive movement - Status	VB ... - Output	1-bit	1,002	C, R, -, T, A
1-bit object for feedback of an active travel movement (output energised - UP or DOWN). ("0" = no drive movement / "1" = drive movement).				

Function	Name	Type	DPT	Flag
Function state (KNX standard)	VB ... - Output	4-byte	241,800	C, R, -, T, A
The following states are signalled to the KNX using this 4-byte output object: Byte 3 (bit 31 ... Bit 24): Blind/shutter height in percent Byte 2 (bit 23 ... Bit 16): Slat position in percent Bit 15: Slat position (byte 2) valid Bit 14: Blind/shutter height (byte 3) valid Bit 13: Reserved (always "0") Bit 12: Reserved (always "0") Bit 11: Reserved (always "0") Bit 10: Error (always "0", the object "Heartbeat" is used for evaluating the device status) Bit 9: Output has been overridden by manual operation. The bit remains active as long as the status set by the manual operation is active. Bit 8: Disabling function is active Bit 7: Forced position is active Bit 6: At least one safety function (Wind, Rain, Frost) is active Bit 5: Positioning of the blind/shutter restricted (always "0") Bit 4: Positioning of the slats restricted (always "0") Bit 3: End position reached (drive stationary) Bit 2: Defined lower position reached (always "0") Bit 1: Lower end position reached Bit 0: Upper end position reached An application-orientated filter of the displayed messages can be performed by appropriate KNX devices or visualisation solutions.				

Function	Name	Type	DPT	Flag
Function state (extended)	VB ... - Output	3-byte		C, R, -, T, A

The following states are signalled to the KNX using this 3-byte output object:

Bit 23 ... Bit 15: Reserved (always "0")

Bit 14: Night mode active

Bit 13: Validity of the slat position

Bit 12: Validity of the blind/shutter position

Bit 11: Twilight mode active

Bit 10: Sun protection active

Bit 9: Ventilation function active

Bit 8: Drive movement active

Bit 7: Lower end position reached

Bit 6: Upper end position reached

Bit 5: ... Bit 0: Enumeration of various statuses with higher priority (in the case of multiple active statuses, the one with the highest priority is output)

The following statuses (numerical values) are defined for the lower-value 6-bits:

0: No disabling active

1: Permanent manual operation active

2: Forced position active

3: Disabling function without acknowledgement active

4: Disabling function with acknowledgement active

5: Door contact disabling without acknowledgement active

6: Door contact disabling with acknowledgement active

7: Wind alarm active (1, 2 or 3)

8: Rain alarm active

9: Frost alarm active

10: Learn travel time active

11 ... 63: Not used

An application-orientated filter of the displayed messages can be performed by appropriate KNX devices or visualisation solutions.

Function	Name	Type	DPT	Flag
End position - Top - Status	VB ... - Output	1-bit	1,002	C, R, -, T, A
End position - Bottom - Status	VB ... - Output	1-bit	1,002	C, R, -, T, A

1-bit objects for feedback of the end positions.

("0" = drive not in the end position / "1" = drive in the end position).

14.2.7 Sun protection function

Introduction

Each Venetian blind output of the actuator can be separately configured for the execution of a sun protection function. Sun protection is generally realized with blinds, shutters or awnings and offers an intelligent method of shading rooms, terraces or balconies during sunshine depending on the altitude of the sun in the sky and on the intensity of the sunlight.

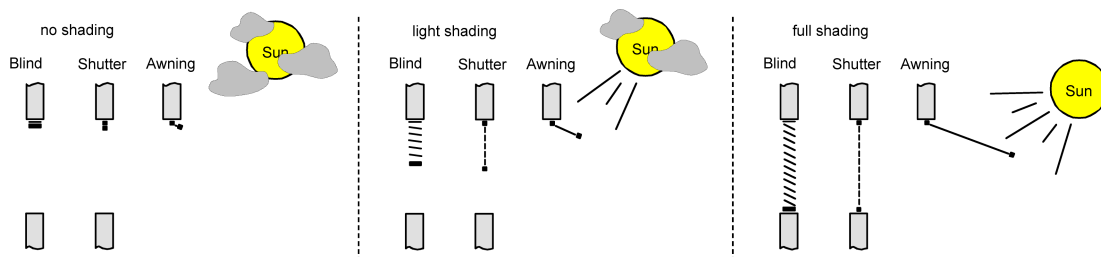


Figure 65: Sun protection principles (example)

The sun protection functions of the actuator can be adapted many different applications. In simple applications as, for instance, in case of direction-dependent measurement of the sun's intensity by means of a brightness sensor, the curtains controlled can be closed partly or completely to prevent being disturbed by direct sunlight. In these applications, the sun protection function merely evaluates the 1-bit sun signal from the brightness or a similar sensor (e. g. weather station with limit value monitoring) and makes a drive open or close the controlled curtains by moving them into fixed configured positions or into variable positions preset via the bus.

In extended applications – for instance where the degree of shading is controlled by weather stations evaluating additionally the sun angle as a function of astro co-ordinates and presetting the blind and also the slat positions dynamically – the sun protection function can be supplemented by an automatic control system. In such applications, the sun protection function evaluates additional KNX communication objects, which can be used to enable or disable the automatic control while the actuator is in operation. This results in a large number of combination variants with intelligent Venetian blind control systems.

Already simple sun protection applications are sufficient to permit a fixed or variable re-adjustment of the positions of Venetian blind slats for adapting the curtain to individual shading requirements. For this purpose, it is possible to set a static slat offset in the ETS configuration, for instance, for adapting the reflection of sunlight depending on the building situation, or additionally, via a KNX communication object, e. g. for manual re-adjustment of the slat opening by people in the room or otherwise by a central building services control system.

In all cases, the priority between an incoming sunshine or automatic telegram and the direct operation of an output (short-time, long-time telegram, scenes, positioning, central) can also be preset in the ETS. This way, a sun protection position can, for instance, be influenced by a manual operation of a push-button sensor in the room and the sun protection function be interrupted. Alternatively, sun protection mode can therefore not be interrupted by a direct operation, i.e. the output is locked.

A sun protection function can be overridden by a safety function, a forced position or also by a manual control locally on the device itself, as these functions of the actuator invariably have a higher priority. At the end of one of the mentioned functions with a higher priority, the same reaction as the one at the beginning of sun protection will be re-executed, if the sun protection function is still active at this time.

The actuator can be operated with two sun protection functions. The simple sun protection or alternatively the extended sun protection that can be enabled.

Simple sun protection

In simple sun protection, shading against sunlight is activated and deactivated via the 1-bit communication object "Sunshine". The polarity of this object can be selected in the ETS. The sun protection is activated as soon as "sunshine" is signalled to the object depending on the preset polarity. After ETS programming or after switch-on of the supply voltage, the object must at first have data written into it by the KNX also in case of inverted polarity before the sun protection can be activated.

A newly received object value (sunshine beginning or sunshine end) can optionally be evaluated with a time delay. This feature permits suppressing brief brightness variations caused, for instance, by passing clouds or by a thunderstorm. An update (from activated to activated) of the "sunshine" object causes the sun protection to be reactivated if it had been influenced and possibly re-enabled beforehand by a direct operation in acc. with the preset priority.

The reaction of a specific output at the beginning of shading can be preset in the ETS. Amongst other things, this setting permits approaching fixed configured positions or positions preset via the KNX and thus variable. Variable positions for sun protection purposes can be preset, for instance, by means of pushbutton sensors or visualisations. In addition, it is possible in case of a defined sun protection positioning movement to have a reference travel executed by forced control. This ensures that identical blind positions are approached synchronously by different outputs in case of a sun protection positioning movement.

The reaction at the end of a shading task can be preset as well. In this situation, the curtain can pass into an end position, be stopped or shown no special reaction. Tracking of positions is possible as well.

A priority setting in the ETS configuration makes it possible to specify whether the sun protection function can be influenced by direct operation or whether the corresponding output is locked by a telegram "Sunshine" in the sun protection position. Basically, the "Manual control", "Forced position" and "Safety" functions have a higher priority so that these functions can override, but not terminate a sun protection. Thus, the sun protection function is re-executed at the end of a function with a higher priority, if the Object "sunshine" continues to signal the presence of sunshine.

-  The following rules must be observed for the extended sun protection: After an ETS programming operation, the sun protection function including automatic operation is always deactivated.

The schematic diagram of the simple sun protection and an example of how sensor components can be integrated into a simple sun protection configuration.

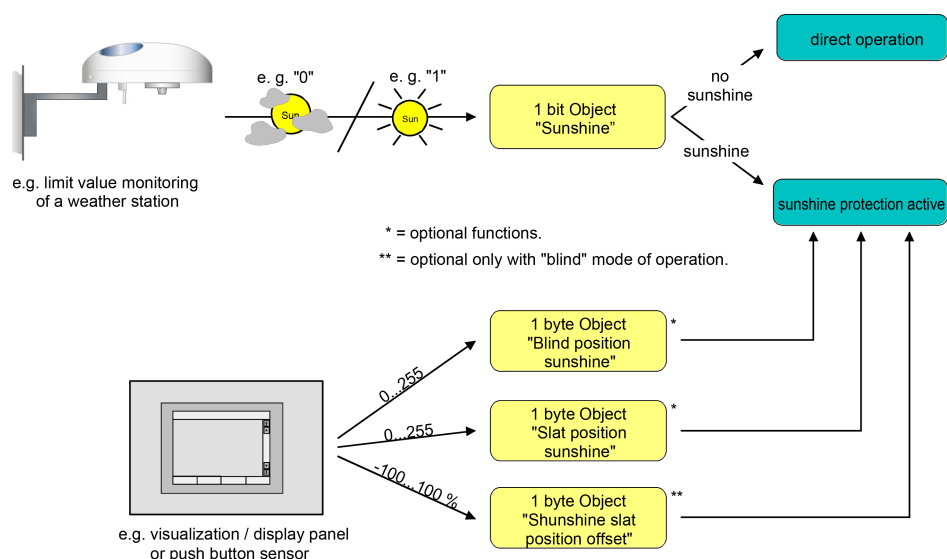


Figure 66: Schematic diagram illustrating the simple sun protection configuration

The function diagram shows all possible functions of the simple sun protection. For reasons of clarity, the functions with a higher priority (manual control, forced position, safety function) are not shown in the diagram.

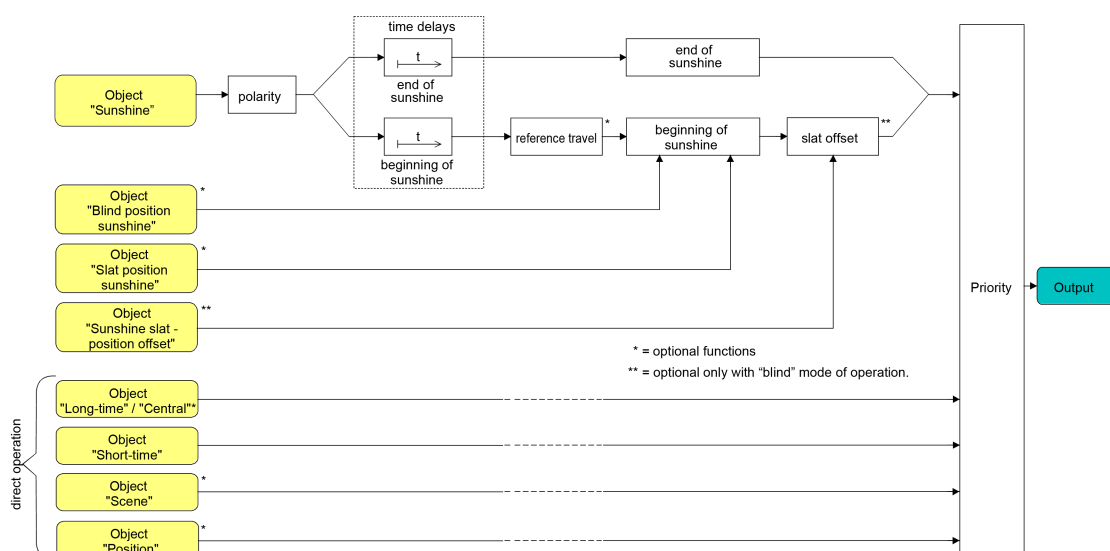


Figure 67: Function diagram illustrating the simple sun protection

Extended sun protection

The extended sun protection has the basic functional properties of the simple sun protection function. In addition, an automatic control system can be implemented. Venetian blind control systems for blind/shutter and slat tracking the position with respect to the position of the sun, like for example, a weather station, can therefore be integrated into the actuator via the bus as an added automatic function.

In extended sun protection, shading against sunlight is activated and deactivated via the 1-bit communication object "Sunshine". A reaction of the output to the sun telegram can be expected only after the automatic control has been activated. In all other cases, the sun protection function is completely deactivated.

As far as the activation of the automatic control via the corresponding object is concerned, the following two cases must be distinguished...

- Sun shading action starting immediately:
Automatic operation is activated as soon as the object "Sun protection - Automatic" receives an "ON" telegram. The output reacts immediately to the activation and shows the preset behaviour depending on the sunlight condition (sunshine / beginning or end of sunshine). The sunlight conditions are derived from the object "sunshine" according to the set polarity - possibly after the delays have elapsed.
After an ETS programming operation or after switch-on of the supply voltage, the "sunshine" object is initialised with "OFF" and, unlike the simple sun protection, evaluated immediately depending on the preset polarity so that shading against sunlight can begin immediately on activation of the automatic sun protection function. Receipt of an "OFF" telegram by the object "Sun protection - Automatic" always terminates an automatic operation independent of the state of the "Sunshine" object.

Application example

Private house with conservatory. The conservatory is equipped with Venetian blinds to shade the place against sunlight. When the conservatory is used, automatic operation is activated, for instance, with a push-button sensor on the wall. The actuator then immediately executes the shading function, if sunshine was detected.

The actuator then carries out the configured behaviour at the end of Sunshine if no sunshine was detected on activating Automatic operation.

- Activation of the sun shading only on the next update:
In this configuration, the polarity of the automatic object can be preset. Automatic operation is activated as soon as the "Automatic sun protection" object is set to 'active' in accordance with polarity. A reaction at the output occurs, however, only after a new change of state has been signalled via "Sunshine" ("OFF" -> "ON" or "ON" -> "OFF"). In this case, the new sunlight condition (beginning of sunshine or end of sunshine) determines the behaviour of the output immediately depending on the preset polarity.
After an ETS programming operation or after switch-on of the supply voltage, the "automatic sun protection" object must at first have data written into it by the bus also in case of inverted polarity before the automatic operation can be activated.
The reception of an "automatically deactivated" telegram by the "automatic sun protection" object always terminates an automatic operation independent of the state of the "sunshine" object.

Application example

An office building is equipped with several Venetian blinds to shade individual offices against sunlight. In the early morning hours, the automatic sun protection is activated in a central place in the building, e. g. in the porter's lodge. The Venetian blinds will, however, not move into the shading positions unless the system has actually reported sunshine for the building facades in question.

The behaviour at the end of automatic operation is configured separately in the ETS and is executed whenever the automatic mode is terminated and when no function with a higher or equal priority is active at this time. In this situation, the curtain can pass into an end position, be stopped or shown no special reaction. Tracking of positions is possible as well.

- i** If the option "Deactivation via direct operation" is set and the running automatic operation is deactivated by a direct operation (long-time operation, short-time operation, positioning, scene extension unit), the drive only performs the function of the direct operation. The parameterised function "At end" of the automatic operation is not executed.

Disabling functions of the extended sun protection:

In the event of the sun shading action starting immediately, the automatic operation can optionally be disabled with an additional communication object. The objects "automatic sun protection" and "sun protection - automatic mode disable" are logically combined (AND with feedback). When disabling is activated, the automatic operation is reset and thus aborted. The output concerned will then show the behaviour at the end of automatic operation. The automatic mode can only be reactivated, if the disabling object is enabled and if the "automatic sun protection" object is updated again by writing an "ON" into it. Any attempt to activate the automatic mode while a disable is active will be ignored.

Automatic operation disabling example

An office room is equipped with Venetian blinds to shade the room against sunlight. The room is moreover equipped with a push-button sensor on the wall with which the automatic operation can be activated or also deactivated. When the automatic mode is activated, the room is immediately shaded against sunlight, if necessary. Depending on the time of day or in the event of disturbing sunlight falling into the room, the people in the room can therefore decide for themselves whether automatic shading is desired or not.

If required, the automatic sun protection is disabled in a central place of the building, for instance, in the porter's lodge. The automatic control of the Venetian blinds can then be deactivated, if servicing work is being carried out (window cleaning or similar work). After the end of disabling, for instance, at the end of the working hours, automatic operation can only be restarted if it is reactivated in any of the rooms in case of need.

In addition, also the direct operation of an output can be disabled with an independent disabling object. When disabling is active, a direct operation can – independently of the preset priority – never override a sun protection function. In this case, direct operation is non-operational in other functions, too. During disabling, incoming direct operation telegrams are completely ignored (positions received via the KNX can then not be tracked either).

If the disabling command is received while a movement initiated by direct operation is in progress, the movement will still be completely finished. Thereafter, direct operation is disabled.

Direct operation disabling example

An office building is equipped with several Venetian blinds to shade individual offices against sunlight. During the working hours, the rooms are to be shaded automatically. Any direct operation – e. g. by means of a simple Venetian blind pushbutton sensor on the wall – is to be disabled during the day. For this reason, the direct operation is disabled, for instance, by the porter or by a building services management system. Cleaners must have the possibility of controlling the shutters directly only after the normal working hours. In this case, direct operation can again be centrally enabled during evening and night hours.

- i** The disabling functions for automatic and for direct operation can also be combined so that it is possible to intervene at any time and as required by the situation in sun protection control functions.

Sunshine signal in the extended sun protection mode:

In the sun protection mode, the system is informed about the prevailing sunshine condition via the "sunshine" communication object. The system decides whether shading is required or not. In the extended sun protection mode, the sunshine signal is only evaluated when the automatic operation is activated as well.

A new value received via the "sunshine" object can optionally be evaluated with a time delay. This feature permits suppressing brief brightness variations caused, for instance, by passing clouds or by a thunderstorm. The time delay is started after an update of the "Sunshine" object also in those cases where the automatic operation is deactivated, so that the newly received information about the sunshine conditions may possibly also be processed with a delay, if the automatic operation is activated later on.

Unlike in the simple sun protection mode, an update of the "sunshine" object from active to active or from inactive to inactive in the extended sun protection mode shows generally no reaction. The behaviour of the output is only influenced if a change of state is being detected. An update of the sunshine signal alone does not result in the activation of the automatic operation either.

When the automatic operation is active, the reaction of a specific output at the beginning of shading can be preset separately in the ETS. Amongst other things, this setting permits approaching fixed configured positions or positions preset via the KNX and thus variable. Positions for sun protection purposes can be variably preset, for instance, by means of a weather station for sun tracking the position.

In addition, it is possible in case of a defined sun protection positioning movement to have a reference travel executed by forced control. This ensures that identical blind positions are approached synchronously by different outputs in case of a sun protection positioning movement.

The reaction of an output at the end of shading with active automatic operation is also separately parameterizable. In this case, too, it is possible, amongst other things, to approach fixed configured positions.

By means of a priority setting in the ETS parameters it can be specified whether the evaluation of the sunshine signal in the automatic mode can be influenced by a direct operation or whether the automatic mode basically locks the corresponding output during sun protection. The "Manual control", "Forced position" and "Safety" functions invariably have a higher priority so that these functions can override, but not termin-

ate a sun protection including an automatic operation. Thus, the sun protection function is re-executed at the end of a function with a higher priority, if the automatic sunshine protection is still active.

An update (from activated to activated) of the "Automatic" object causes the sun protection to be reactivated, if it had been influenced and cancelled beforehand by a direct operation in accordance with the lower priority.

Automatic mode feedback:

The automatic mode of the extended sun protection has its own 1-bit feedback object for signalling on the KNX whether automatic mode is active or not. This feedback object can be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Sun protection" using the "Status" parameter. The telegram polarity is predefined: "OFF" = Automatic mode inactive, "ON" = Automatic mode active. In the case of an activated signal object, the parameter "Time delay for feedback after bus voltage returns" can be used to set whether the object value of the feedback is transmitted automatically to the KNX, even after a device reset for initialisation - possibly after a delay.

The schematic diagram of the enlarged sun protection and an example of how sensor components can be integrated into an enlarged sun protection configuration.

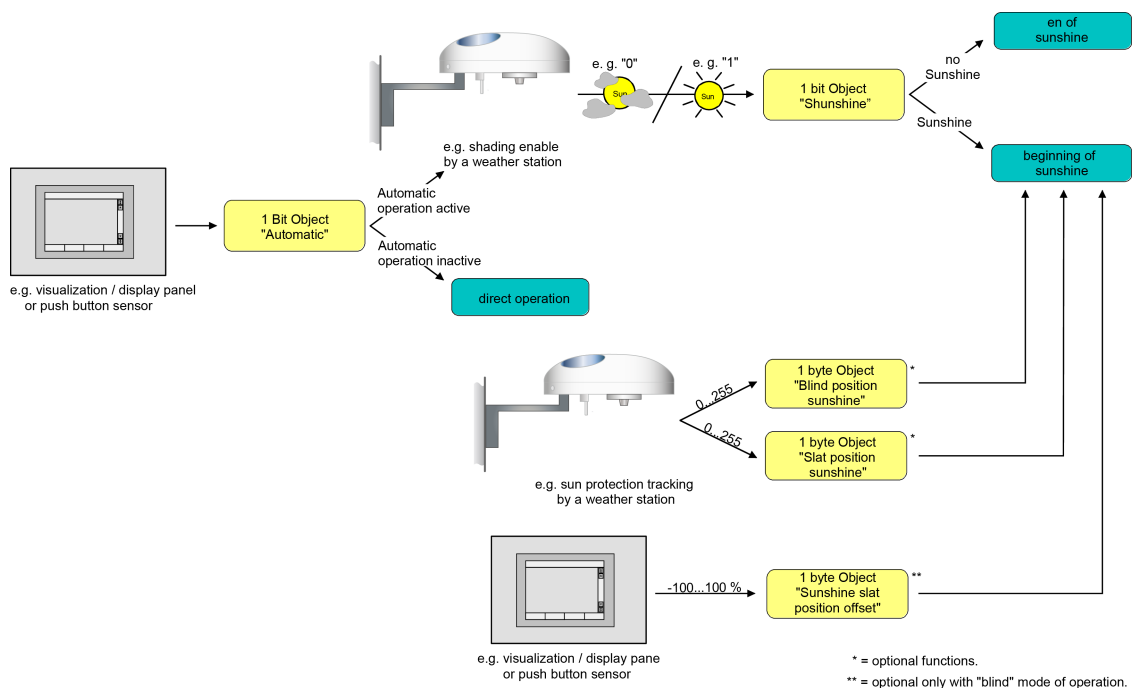


Figure 68: Schematic diagram illustrating the extended sun protection configuration (for reasons of simplicity without disabling functions)

The function diagram shows all possible functions of the enlarged sun protection. For reasons of clarity, the functions with a higher priority (manual control, forced position, safety function) are not shown in the diagram.

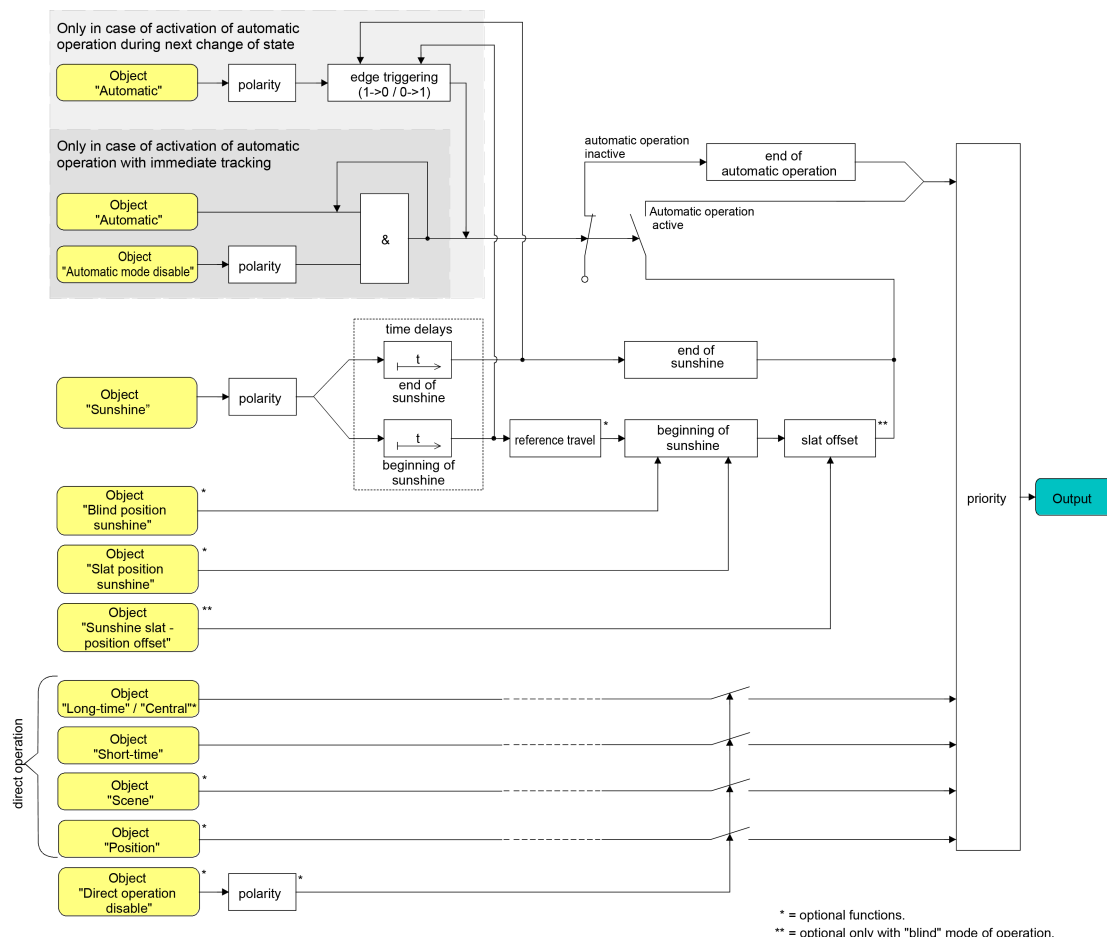


Figure 69: Function diagram illustrating the extended sun protection

- i** The following rules must be observed for the enlarged sun protection: After an ETS programming operation, the sun protection function including automatic operation is always deactivated.

Presetting the type of sun protection

The type of sun protection can be preset separately for each Venetian blind output. The setting determines whether the simple or the extended type of sun protection is configured.

The sun protection function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

- Set the parameter "Type of sun protection" to "simple sun protection".

Simple sun protection is now configured. The required parameters and communication objects become visible.

- Set the parameter "Type of sun protection" to "extended sun protection".

Extended sun protection is now configured. The required parameters and communication objects become visible.

Presetting the priority of sun protection (for simple sun protection only)

The priority of the sun protection function can be set separately for each Venetian blind output. In the simple sun protection, the priority between the object "Sun protection - Sunshine - Activate/Deactivate" and the objects of direct operation (short-time, long-time, central or position telegram, scene recall) must be configured.

The sun protection function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

The function must have been configured for simple sun protection.

- Set the parameter "Priority of sun protection operation over direct operation" on the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Sun protection" to "Same priority".

The sun protection mode can be overridden at any time by direct operation. Similarly, the sun protection overrides the direct operation, when a new "sunshine" telegram is received via the object of the same name and when a configured time delay, if any, has elapsed. If the sun protection function is overridden by a direct operation, the preset behaviour "at the end of sunshine" will not be executed.

- Set the parameter "Priority of sun protection operation with respect to direct operation" to "Higher priority".

An active sun protection will override a direct operation. The sun protection mode can therefore not be interrupted by a direct operation. Direct operation will be possible again only after the sun protection function is terminated.

- Set the parameter "Priority of sun protection operation with respect to direct operation" to "Lower priority".

A direct operation can at any time override the sun protection mode. If the sun protection function is overridden, the preset behaviour "at the end of sunshine" will not be executed. The sun protection function can only be reactivated after an enabling movement controlled by a direct operation has been effected and after a new "sunshine" telegram has been received via the object "Sun protection - Sunshine - Activate/Deactivate". Attempts to activate the sun protection function are ignored for as long as the enabling movement has not taken place.

On the enabling movement:

An enabling movement is an accomplished long-time movement into the upper end position which has been initiated by the objects "Long time operation" or "Central travel control". A manual operation, an upward movement after the bus voltage return, a position approach to "0%" or an upward movement after enabling of forced position or safety functions have no enabling effect!

The sun protection is not enabled if the enabling movement has been interrupted. The sun protection function will also be disabled if the output has been readjusted again by a direct operation after an accomplished enabling movement.

After an ETS programming operation or switch-on of the supply voltage, the sun protection function is always enabled.

- i** Manual local operation on the device itself, the forced position function and the safety functions have a fixed priority higher than that of the sun protection. The sun protection is overridden – but not terminated – by a function with a higher priority. After the end of the function with the higher priority the reaction at the beginning of sun protection will therefore be executed again, if the sun protection is still active at this time.
- i** With the settings "same priority" or "lower priority", the sun protection can be overridden by a direct operation only if the direct control action can be executed at once. A direct operation will therefore not override the sun protection during a manual control locally on the device, an active forced position function or an active safety function.
- i** Parameter setting "same priority" or "lower priority": A variable preset of blind/shutter and slat positions or of a slat offset via the KNX at the beginning of sunshine shows no reaction at the output, if the sun protection was overridden by direct operation. However, the position data or offsets received are stored internally so that the new positions will be approached on reactivation of the sun protection.

Presetting the priority of automatic sun protection (for extended sun protection only)

The priority of the automatic sun protection function can be set separately for each output. In the extended sun protection, the priority between the object "Sun protection - Sunshine - Activate/Deactivate" and the objects of direct operation (short-time, long-time, central or position telegram, scene recall) must be configured. The selected priority affects the evaluation of the sunshine signal in the automatic mode and not the automatic mode itself.

The sun protection function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- Set the parameter "Priority of sun protection operation over direct operation" on the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Sun protection" to "Same priority".

The sunshine signal of the automatic sun protection mode and the corresponding reaction can be overridden at any time by direct operation. Similarly, the sunshine signal overrides the direct operation, when a new "sunshine" or "no sunshine" telegram is received via the

object "Sun protection - Sunshine - Activate/Deactivate" object resulting in a change of state. Moreover, a configured delay time, if any, must have elapsed. If the direct operation overrides the sunshine signal, the preset behaviour "at the end of sunshine" will not be executed.

- Set the parameter
"Priority of sun protection operation with respect to direct operation" to
"Higher priority".

An active automatic mode always overrides the direct operation independent of the sunshine signal. The sunshine signal can therefore not be interrupted by a direct operation. Direct operation will be possible again only after the automatic mode is terminated.

- Set the parameter
"Priority of sun protection operation with respect to direct operation" to
"Lower priority".

A direct operation can at any time override the sunshine signal. If the sunshine signal function is overridden the preset behaviour "at the end of sunshine" will not be executed. The sunshine signal will be evaluated again only after an enabling movement controlled by a direct operation has been effected and when a new "sunshine" or "no sunshine" telegram is received by means of the object "Sun protection - Sunshine - Activate/Deactivate" resulting in a change of state. The sun protection function is ignored for as long as the enabling movement has not taken place.

On the enabling movement:

An enabling movement is an accomplished long-time movement into the upper end position which has been initiated by the objects "Long time operation" or "Central travel control". A manual operation, an upward movement after the bus voltage return, a position approach to "0%" or an upward movement after enabling of forced position or safety functions have no enabling effect!

The sunshine signal is not enabled if the enabling movement has been interrupted. The sunshine signal will be also be disabled, if the output has been re-adjusted again by a direct operation after an accomplished enabling movement.

- i** A direct operation never terminates the automatic mode! Irrespective of a function being overridden by a direct operation, an activation or a deactivation of the automatic mode (telegram update of the object "Sun protection - Automatic - Activate/Deactivate") always re-enables the sunshine signal as well and evaluates it when the automatic mode is active. This behaviour must be observed in particular if the object "Sun protection - Automatic - Activate/deactivate" is written cyclically with telegrams.
- i** Manual local operation on the device, the forced position function and the safety functions have a fixed priority higher than that of the automatic sun protection. The sun protection is overridden – but not terminated – by a function with a higher priority. After the end of the function with the higher priority the reaction last executed by the automatic sun protection will therefore be executed again, if the sun protection is still active at this time.

- i** With the settings "same priority" or "lower priority", the sunshine signal can be overridden by a direct operation only if the direct control action can be executed at once. A direct operation will therefore not override the sunshine signal during a manual control locally on the device, an active forced position function or an active safety function.
- i** Parameter setting "same priority" or "lower priority": A variable preset of blind/shutter and slat positions or of a slat offset via the KNX at the beginning of sunshine shows no reaction at the output, if the sunshine signal was overridden by direct operation. However, the position data or offsets received are stored internally so that the new positions can be approached when the sensor signals that the sun is shining again.
- i** Irrespective of the preset priority, an update of the "Sunshine" object from active to active or from inactive to inactive in the extended sun protection mode shows generally no reaction. The behaviour of the output is only influenced if a change of state is being detected.

Presetting the polarity of the "Sunshine" object

The telegram polarity of the object "Sun protection -Sunshine - Activate/Deactivate" can be set separately for each output. This means that an adaptation to the signals from existing sensors or weather stations is possible in the simple and also in the extended sun protection mode.

The sun protection function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

- The parameter "Polarity of 'Sunshine' object" on the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Sun protection" to the required telegram polarity.

The sunshine signal is evaluated in accordance with the preset priority.

- i** In the simple sun protection, an update (from activated to activated) of the object "Sun protection - Sunshine - Activate/Deactivate" causes the sun protection to be reactivated if it had been influenced and possibly re-enabled beforehand by a direct operation in acc. with the preset priority.
- i** In the extended sun protection mode, an update of the object "Sun protection - Sunshine - Activate/Deactivate" from active to active or from inactive to inactive shows generally no reaction. The behaviour of the output is only influenced if a change of state is being detected.

Setting the activation of the automatic mode (for extended sun protection only)

As far as the activation of the automatic mode is concerned, two cases must be distinguished which can be configured with the help of ETS parameters separately for each output. Either a travel movement in acc. with the reaction at the beginning or the end of sunshine is executed immediately on activation of the automatic mode, or

otherwise the system waits after activation of the automatic mode for a new change of state in the "Sunshine" object until the corresponding output shows the reaction at the beginning or at the end of sunshine.

For the sun protection parameters to be visible, the sun protection function must be enabled on the parameter page

"Outputs -> switching / Venetian blind -> VB... - General -> Enabled functions".

The function must have been configured for extended sun protection.

- Set the parameter "Activation via" on the parameter page "Outputs -> Switching / Venetian blind-> VB... - General ->Sun protection" to "object 'Automatic' & next change of state".

Automatic operation is activated as soon as the "Automatic sun protection" object is set to 'active' in accordance with polarity. A reaction at the output occurs, however, only after a new change of state has been signalled via the "Sunshine" object. In this case, the new state (beginning of sunshine or end of sunshine) determines the behaviour of the output.

- Set the parameter "Activation by" to "Object 'Automatic' & immediate tracking".

Automatic operation is activated as soon as the "Automatic sun protection" object is set to 'active' in accordance with polarity. The state of the "sunshine" object determines the behaviour of the output immediately (beginning of sunshine or end of sunshine).

Presetting the polarity of the "Automatic" object (for extended sun protection only)

The telegram polarity of the automatic object can be set.

The sun protection function must be enabled on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

The extended sun protection must be configured for activation of the automatic mode on next change of state.

- The parameter "Object polarity 'Automatic - Activate/Deactivate'" on the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Sun protection" to the required telegram polarity.

The telegram to the object "Sun protection . Automatic - Activate/Deactivate" will be evaluated depending on the priority set.

- i** After an ETS programming operation or after switch-on of the supply voltage, the object "Sun protection – Automatic – Activate/Deactivate" must at first have data written into it by the KNX also in case of inverted polarity before the automatic mode can be activated.

Presetting the disabling function for the automatic mode (for extended sun protection only)

The automatic mode can be deactivated via a separate disabling object. After enabling of the disabling function in the ETS parameters, the "Sun protection - automatic mode disable" object becomes visible.

The sun protection function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

The extended sun protection must be configured for activation of the automatic mode with immediate tracking of the sunshine signal.

- Activate the "Disabling function" parameter on the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Sun protection".

The disabling function is enabled. The parameter for setting of the polarity becomes visible.

- Set the parameter "Polarity of object 'Automatic mode disable'" to the required telegram polarity.

The telegram to the object "Sun protection - Automatic - Disabling" will be evaluated depending on the priority set.

i The objects "Sun protection - Automatic - Activate/Deactivate" and "Sun protection - Automatic - Disabling" are logically combined (AND with feedback). When disabling is activated, the automatic operation is reset and thus aborted. The output concerned will then show the behaviour at the end of automatic operation. The automatic mode can only be reactivated, if the disabling object is enabled and if the object "Sun protection - Automatic - Activate/Deactivate" is updated again by writing an "ON" telegram into it. Any attempt to activate the automatic mode while a disable is active will be ignored.

i After an ETS programming operation or after switch-on of the supply voltage, the objects "Sun protection – Automatic – Activate/Deactivate" and "Sun protection – Automatic system disabling" are always initialised with "OFF". If the disabling object works with inverted polarity (setting "disabled" = "0") the disabling function is in this case immediately active!

Presetting the disabling function for direct operation (for extended sun protection only)

The direct mode can be deactivated at any time via a separate disabling object. After enabling the disabling function in the ETS parameters, the object "Sun protection - Direct operation - Disabling" becomes visible.

The sun protection function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- Activate the parameter "Disabling function for direct operation" on the parameter page
"Outputs -> Switching / Venetian blind -> VB... General -> Sun protection".

The disabling function is enabled. The parameter for setting of the polarity becomes visible.

- Set the parameter "Polarity of object 'Disable direct operation'" to the required telegram polarity.

The telegram to the object "Sun protection - Direction operation - Disabling" is evaluated depending on the priority set.

- i** After an ETS programming operation or after switching on the supply voltage, the object "Sun protection - Direct operation - Disabling" is always initialised with "OFF". If the disabling object works with inverted polarity (setting "disabled" = "0") the disabling function is in this case immediately active!

Presetting the reaction at the end of automatic operation (for extended sun protection only)

When the automatic operation is being deactivated – also by the disabling function – the output concerned will show the preset reaction, if no function with a higher priority is active at the time of deactivation. The preset reaction will not be executed either on termination of the automatic operation, if the sunshine signal is overridden on account of priority settings by a direct operation. The reaction at the end of automatic operation is set on the parameter page

"Outputs -> Switching / Venetian blind -> VB... General -> Sun protection".

The sun protection function must be enabled on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- Set the parameter "at the end" to "no reaction".

At the end of automatic operation the relay of the output shows no reaction. Any travel movements still in progress at this instant will still be finished.

- Set the parameter "at the end" to "raising" or "opening".

At the end of automatic operation, the actuator raises the blind/shutter or opens the venting louvre / roof window.

- Set the parameter "at the end" to "lowering" or "closing".

At the end of automatic operation, the actuator lowers the blind/shutter or closes the venting louvre / roof window.

- Set the parameter "at the end" to "stop".

At the end of automatic operation, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

- Set the parameter "at the end" to "tracking the position".

At the end of automatic operation, the output will be set to the state last adjusted statically before the automatic sun protection or to the state tracked and internally stored during the automatic sun protection. The position objects, the long-time object and the scene function are tracked.

- i** The behaviour set in this parameter will be executed only if no function of higher priority (e. g. safety) is activated at the end of automatic operation.
- i** If the option "Deactivation via direct operation" is set and the running automatic operation is deactivated by a direct operation (long-time operation, short-time operation, positioning, scene extension unit), the drive only performs the function of the direct operation. The parameterised function "At end" of the automatic operation is not executed.
- i** Parameter setting "tracking the position": The actuator can track absolute positions (position telegram, scene value) at the end of automatic operation only if the position data are known and if the positions have been predefined. There is otherwise no reaction at the end of automatic operation. Position data can be tracked, if the output was in a defined position before the automatic sun protection function or if a new position telegram was received via the position objects during the sun protection. In the latter case, a reference movement will be executed at the end of automatic operation, if the position before or during the sun protection was unknown. Known slat positions will also be tracked as described. This is also the case, when the height of the Venetian blind is unknown. Long time travel movements (movements without position preset) will always be tracked.

Setting automatic operation feedback (for extended sun protection only)

The automatic mode of the extended sun protection has its own 1-bit feedback object for signalling on the KNX whether automatic mode is active or not. This feedback object can be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - Sun protection" using the "Status" parameter. The telegram polarity is fixed: "0" = Automatic mode inactive, "1" = Automatic mode active.

The sun protection function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- Activate the "Status" checkbox on the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Sun protection".

The feedback object is enabled. The status information is transmitted as soon there is a change in automatic operation.

Feedback must be activated.

- If a delay after the bus voltage returns is necessary, activate the parameter "Time delay for feedback after bus voltage returns" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - Sun protection".

The status information will be transmitted with a delay after the bus voltage returns. No feedback telegram is transmitted during a running delay, even if the status information changes during this delay.

Presetting a time delay for beginning and end of sunshine

The telegram received via the object "Sun protection - Sunshine - Activate/Deactivate" for activation or deactivation of shading (depending on polarity) can be evaluated with a time delay separately for each output. The preset delay times are always evaluated in the simple as well as in the extended sun protection mode.

The sun protection function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

- The parameter "Delay at the start of sunshine" on the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Sun protection -> Set Sun protection start" to the required delay time.

The telegram for activation of the sun shading will be evaluated with a delay corresponding to the setting.

- The parameter "Delay at the end of the sunshine" on the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Sunshine -> Set Sun protection end" to the required delay time.

The telegram for deactivation of the sun protection will be evaluated with a delay corresponding to the setting.

- i** A setting of "0" in the parameters deactivates the respective delay time. In this case, the state of the sunshine signal is evaluated immediately.
- i** Simple sun protection mode: An update (from activated to activated) of the "Sunshine" object causes the sun protection to be reactivated in consideration of the delay time, if the sun protection had been influenced or aborted beforehand by a direct operation because of the same or a lower priority.
- i** Extended sun protection: The time delay is started after an update of the object "Sun protection – Sunshine – Activate/Deactivate" also in those cases where the automatic operation is deactivated so that the newly received information about the sunshine conditions may possibly also be processed with a delay, if the automatic operation is activated later on. In the extended sun protection mode, an update of the object "Sun protection - Sunshine - Activate/Deactivate" from active to active or from inactive to inactive shows generally no reaction in contrast to simple sun protection. The behaviour of the output is only influenced if a change of state is being detected. An update of the sunshine signal alone does not result in the activation of the automatic operation either.

Presetting the reaction at the beginning of sunshine

The behaviour of the output at the beginning of sunshine / shading – if applicable, after the end of the delay time – can be configured in the ETS separately for each output. In the simple sun protection mode, the behaviour will be executed, when the sun protection function is activated after receiving a new sunshine signal. In the extended sun protection mode, the output shows the configured reaction, when automatic operation is activated and when a new sunshine signal ("sun is shining") is being received or was received beforehand. The reaction will not be executed if a function with a higher priority is active at the time the sun shading is received.

The reaction for the beginning of sunlight is set on the parameter page

"Outputs -> Switching / Venetian blind -> VB... General
-> Sunshine -> Sun protection start".

The sun protection function must be enabled on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

- Set the parameter "at the beginning of sunshine" to "no reaction".

At the beginning of shading, the output switches over to sun protection while the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished.

- Set the parameter "at the beginning of sunshine" to "raising" or "opening".

At the beginning of shading, the actuator raises the blind/shutter or opens the venting louvre / roof window.

- Set the parameter "at the beginning of sunshine" to "lowering" or "closing".

At the beginning of shading, the actuator lowers the blind/shutter or closes the venting louvre / roof window.

- Set the parameter "at the beginning of sunshine" to "stop".

At the beginning of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

- Set the parameter "at the beginning of sunshine" to "internal scene recall". Configure the internal scene to be recalled (parameter "internal scene").

At the beginning of shading, the actuator recalls the position value for the output concerned which was preset in the scene configuration. This is not a scene recall as in direct operation, but only an approach to the corresponding scene position value.

- Set the parameter "at the beginning of sunshine" to "fixed position".

At the beginning of shading, the actuator recalls a fixed position value for the output concerned.



In the "Venetian blind" operation, the "fixed position" setting can be selected separately for the height of the blind and for the slat position. For this reason, the ETS adapts the parameter selection and enlarges the setting options in this operation.

- "Fixed position" only: Set the parameter "Fixed position of Venetian blind", "Fixed position of shutter/awning" or "Fixed position of venting louvre" to "as specified by parameter". Thereafter, set the parameter "Position of Venetian blind (0...100%)", "Position of shutter/awning (0...100%)" or "Position of venting louvre (0...100%)" to the desired position.

At the beginning of shading, the output invariably approaches the configured position value.

- "Fixed position" only: Set the parameter "Fixed position of Venetian blind", "Fixed position of shutter/awning" or "Fixed position of venting louvre" to "no change of current position".

At the beginning of shading, the last set position of the Venetian blind height, shutter, awning or venting louvre will be maintained.

- "Fixed position" and operation = "Venetian blind" only: Set the parameter "Fixed slat position (0...100%)" to the desired position value.

At the beginning of shading, the output invariably moves the slats to the configured position after the height of the Venetian blind has been adjusted.

- Set the parameter "at the beginning of sunshine" to "variable position".

At the beginning of shading, the actuator recalls the variably specified position value for the output concerned. The variable position of the Venetian blind height, of the shutter, awning or venting louvre position is preset via the separate communication object "sun protection - ...position" (in the "Venetian blind" operation for the slats as well as via the separate object "sun protection - slat position").

i In the "Venetian blind" operation, the "variable position" setting can be selected separately for the Venetian blind height and for the slat position. For this reason, the ETS adapts the parameter selection and enlarges the setting options in this operation.

i The behaviour preset in this parameter will only be executed, if no function with a higher priority (e. g. safety) is activated at the time of shading.

i "Internal scene recall" setting: In this setting, the scene function of the output must be enabled in the ETS! Otherwise, the positions approached at the beginning of sun shading are undefined positions. The scene position values stored in the actuator by a scene storage function will be approached as well. A delay configured for scene recalls has no influence on the recall of the scene value by the sun protection function.

i "Variable position" setting: After an ETS programming operation or after switch-on of the supply voltage the objects "sun protection - ...position" and "sun protection - slat position" must receive position values from the KNX. Otherwise the actuator does not position itself at the start of sun shading as it does not have any valid position data! When the actuator is in operation, the position data can be updated at any time via the KNX even if the sun protection is active (e. g. by a weather station for the purpose of sun tracking the po-

sition). The actuator will then immediately approach the newly received positions if sun shading is active. If a function with a higher priority is active, the actuator stores the newly received position values and approaches them during a later shading operation. The position data last received are not lost in a bus voltage failure.

Presetting a forced reference movement in the sun protection mode

If needed, a reference movement can be executed by forced-control in the simple and in the extended sun protection mode at the beginning of a shading cycle, if fixed or variable position values or scene positions are to be approached or a scene is recalled. The execution of a reference movement by forced control at the beginning of shading can be used in a sun protection positioning operation to ensure that the curtains or slats are moved synchronously by different outputs to identical positions (e. g. in a long row of windows). Without the execution of reference travel by forced control, there might otherwise be positioning inaccuracies with a negative effect on the overall appearance of a building facade with the blinds let down.

A reference movement by forced control will always be executed in the simple sun protection mode, when the beginning of shading is signalled via the "Sunshine" object. Updates of the object from "Sun is shining" to "Sun is shining" do not initiate a reference movement if, at this time, the output is still in the sun protection position.

A reference movement by forced control will be executed in the extended sun protection mode, when the beginning of shading is signalled via the "Sun shading facade" object "Sunshine" object. Updates of the object from "Sun is shining" to "Sun is shining" will never initiate a reference movement. In this case, the sunshine signal must first change from 'sun is not shining' to 'sun is shining' before a new reference movement can take place.

A reference movement by forced control will always be executed for synchronisation purposes as described and also in such cases where the position data of the blind or the slats are known. No reference movement by forced control will be executed at the end of shading.

The sun protection function must be enabled on the parameter page "Outputs -> Switching / Venetian blind-> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

- **Activate the parameter**
"Reference movement before every sun protection positioning operation" on the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Sun protection -> Sun protection start".

At the beginning of shading there is always a reference movement by forced control as described. The preset position will be approached after the end of the reference movement.

- **Deactivate the parameter**
"reference movement before every sun protection positioning operation".

A reference movement at the beginning of sun protection will only be executed, if the position data are unknown, e. g. after an ETS programming operation or after switch-on of the power supply. In all other cases, the preset shading position will be approached immediately.

-  A reference movement is the time required for a travel movement into the upper end position increased by 20% and additionally by the configured travel time extension. A reference travel cannot be retriggered.
-  Variable position preset: No reference movement will be executed, if new position values are preset via the KNX while the sun protection is active.
-  "Venetian blind" operation: A terminated reference travel for the height of the blind also synchronizes the slat position at the same time.

Slat offset in the sun protection mode (only "Venetian blind" operation)

An offset can be specified for the slat position at the start of sun shading separated for each Venetian blind output, if fixed or variable slat position values are to be approached. If necessary, the slat offset can correct the fixed or variable nominal slat position and thus allow the creation of an individual shading situation, when the sun protection is active. The offset can be preset in two ways...

- The slat offset can be configured statically in the ETS. The configuration of a static offset value allows to vary the degree of shading in those parts of the building that are not exposed to full sunshine due to objects in front of the building. The variable slat angle adjusted by the sun protection control or the fixed angle specified in a parameter can thus be overridden so that the slats are always opened a bit wider than originally preset. Alternatively, the slats can also be closed completely by means of the static offset if too much sunlight is reflected into the room.
- The slat offset can also be adjusted by the KNX by means of the separate communication object "Sunshine - Slat - Position - Offset". In this way, the desired slat offset can also be adjusted during an active shading cycle and independent of a direct operation as, for instance, short-time operation. Thus, it is possible, for instance, that persons in a room can correct the slat angle at any time 'manually' and individually by selecting another preset value at a push-button sensor or a visualisation. An offset preset via the object overwrites the value configured in the ETS.

The preset offset is taken into account in the simple and in the extended sun protection mode for each positioning move during an active shading cycle (beginning of sunshine) and added to the predefined nominal slat position. The offset value can be varied within a range from -100% ... 0 ... 100% so that the slats can be moved in both directions into the slat end positions. At an offset of "0 %", the actual slat position is always identical with the predefined nominal slat position for sun protection purposes.

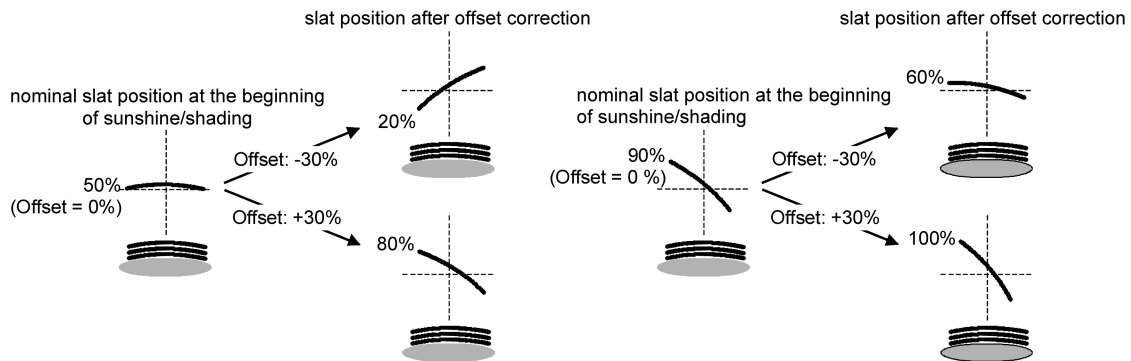


Figure 70: Functional principle of slat offset
(example showing slat type 1 / slat type 2 identical)

The position value actually adjusted with the offset after adding the slat position value is always between 0 and 100%. Minimum and maximum position are thus determined by the slat end positions. These limits cannot be exceeded by specifying an greater offset. Example...

Slat position at the beginning of the sunshine = 90%

Sunshine offset slat position = +30%

-> The resulting slat position is 100% as the end position is reached.

In accordance with the KNX datapoint type 6.001(DPT_Percent_V8), the data format of the communication object "Sunshine – Slat – Position – Offset" permits presetting positive and negative values within a range of -128 ... 0 ... +127. The actuator interprets the value received directly as an offset in %. Values below -100 or above +100 are limited to the minimum offset (-100%) and maximum offset (+100%) and evaluated accordingly.

An offset preset via the object overwrites the value configured in the ETS. In the event of a bus voltage failure, an offset value received via the communication object can be stored internally in a non-volatile memory so that the offset value last received is not lost even in case the supply voltage fails. As an alternative, the offset preset via the KNX can be reset (0%) in the event of a supply voltage failure with the result that the value configured in the ETS is again used in operation. The offset reaction preset in the event of bus voltage failure can be configured in the ETS.

Configuring the slat offset in the sun protection mode (only "Venetian blind" operation)

The sun protection function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

The function must be configured for the "Venetian blind" operation.

The reaction at the beginning of sunshine must be configured to a fixed or variable position preset.

- The parameter "Offset of slat position in sunshine" on the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Sun protection -> Beginning of sun protection" to "no offset".

Offset correction is deactivated. During shading (beginning of sunshine), the fixed or variable slat position will be approached without offset correction. The other parameters relating to offset configuration are hidden.

- Set the parameter "offset of the slat position during sunshine" to "offset as parameter".

The static offset correction based on the parameter specification in the ETS is activated. During every shading operation (beginning of sunshine), the nominal slat position is always corrected by the configured offset value.

- Set the parameter "offset of the slat position during sunshine" to "offset as parameter and via object".

The offset correction based on the parameter specification in the ETS and specification via the object is activated. The slat offset is preset by a fixed value configured in the ETS and can be adapted dynamically with a separate communication object. During every shading operation (beginning of sunshine), the nominal slat position is always corrected by the preset offset value.

- Set the parameter "Slat offset position (-100 ... 100%)" to the required offset value.

The configured value defines the static offset correction of the slat position. The configured value can be adjusted by means of the object "Sunshine – Slat – Position – Offset" if the communication object has been enabled.

- Deactivate the parameter "store in case of bus voltage failure".

The value received via the object will only be stored temporarily in volatile memory. The received value only replaces the configured value until the actuator is reinitialised. After the initialisation, the offset value configured in the ETS will be used again.

- Activate the parameter "store in case of bus voltage failure".

The value received via the object will be stored in case of bus voltage failure in a non-volatile memory of the actuator. The originally configured offset value is definitely overwritten in the process. Only a new ETS programming operation sets the offset back to the configured value.

- i** An offset value received via the KNX is stored temporarily or permanently in the actuator and taken into account during the next shading operation. The reception of an offset value during an active shading phase (beginning of sunshine active) results in immediate and visible correction of the offset angle by the output.
- i** After an ETS programming operation, the offset is always set to the value configured in the ETS
- i** The slat offset has no influence on the behaviour of an output at the end of a shading phase (end of sunshine).

Presetting the reaction at the end of sunshine (for simple sun protection only)

At the end of the shading phase – if applicable, after the end of the delay time – the output concerned will show the preset reaction, if no function with a higher priority is active at the time of deactivation. The preset reaction will also not be executed at the end of sun shading, if the sunshine signal is overridden on account of priority settings by a direct operation.

The reaction for the end of sunlight is set on the parameter page

"Outputs -> Switching / Venetian blind -> VB... General

-> Sun protection -> Sun protection end".

The sun protection function must be enabled on the parameter page "

Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

The function must have been configured for simple sun protection.

- Set the parameter "at the end of sunshine" to "no reaction".

At the end of shading, the relay of the output shows no reaction. Any travel movements still in progress at this instant will still be finished.

- Set the parameter "at the end of sunshine" to "raising" or "opening".

The actuator raises the blind/shutter or opens the venting louvre / roof window at the end of shading.

- Set the parameter "at the end of sunshine" to "lowering" or "closing".

The actuator lowers the blind/shutter or closes the venting louvre / roof window at the end of shading.

- Set the parameter "at the end of sunshine" to "stop".

At the end of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

- Set the parameter "at the end of sunshine" to "tracking the position".

At the end of shading, the output will be set to the state last adjusted statically before sun protection or to the state tracked and internally stored during sun protection. The position objects, the long-time object and the scene function are tracked.

- i** The behaviour preset in this parameter will only be executed, if no function with a higher priority (e. g. safety) is activated when the sun protection is enabled or when a direct operation has not overridden the sunshine signal on account of priority settings.

- i** Parameter setting "tracking the position": The actuator can track absolute positions (position telegram, scene value) at the end of sun protection only if the position data are known and if the positions have been predefined. There is otherwise no reaction at the end of sun shading. Position data can be tracked, if the output was in a defined position before the sun protection function or if a new position telegram was received via the position objects during the sun

protection. In the latter case, a reference movement will be executed at the end of sun protection, if the position before or during the sun protection was unknown. Known slat positions will also be tracked as described. This is also the case, when the height of the Venetian blind is unknown. Long time travel movements (movements without position preset) will always be tracked.

Presetting the reaction at the end of sunshine (for extended sun protection only)

The behaviour of the output at the end of sunshine / shading – if applicable, after the end of the delay time – can be configured in the ETS separately for each output. In the extended sun protection mode, the output shows the configured reaction, when automatic operation is activated and when a new sunshine signal (change of state from "sun is shining" -> "sun is not shining") is being received. The reaction will not be executed if a function with a higher priority is active at the time the sunshine signal changes. The preset reaction will not be executed either, if the sunshine signal is overridden on account of priority settings by a direct operation.

The reaction for the end of sunlight is set on the parameter page

"Outputs -> Switching / Venetian blind -> VB... General

-> Sun protection -> Sun protection end".

The sun protection function must be enabled on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" in order for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- Set the parameter "at the end of sunshine" to "no reaction".

At the end of shading, the relay of the output shows no reaction. Any travel movements still in progress at this instant will still be finished.

- Set the parameter "at the end of sunshine" to "raising" or "opening".

The actuator raises the blind/shutter or opens the venting louvre / roof window at the end of shading.

- Set the parameter "at the end of sunshine" to "lowering" or "closing".

The actuator lowers the blind/shutter or closes the venting louvre / roof window at the end of shading.

- Set the parameter "at the end of sunshine" to "stop".

At the end of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

- Set the parameter "at the end of sunshine" to "internal scene recall". Configure the internal scene to be recalled (parameter "internal scene").

At the end of shading, the actuator recalls the position value for the output concerned which was preset in the scene configuration. This is not a scene recall as in direct operation, but only an approach to the corresponding scene position value.

- Set the parameter "at the end of sunshine" to "fixed position".

At the end of shading, the actuator recalls a fixed position value for the affected output.

- i In the "Venetian blind" operation, the "fixed position" setting can only be selected in common for the height of the blind and for the slat position.
- "Fixed position" only: Set the parameter "Fixed position of Venetian blind", "Fixed position of shutter/awning" or "Fixed position of venting louver" to "as specified by parameter". Thereafter, set the parameter "Position of Venetian blind (0...100%)", "Position of shutter/awning (0...100%)" or "Position of venting louver (0...100%)" to the desired position.

At the end of shading, the output invariably approaches the configured position value.

- "Fixed position" only: Set the parameter "Fixed position of Venetian blind", "Fixed position of shutter/awning" or "Fixed position of venting louver" to "no change of current position".

At the end of shading, the last set position of the Venetian blind height, the shutter, awning or venting louver will be maintained.

- "Fixed position" and operation = "Venetian blind" only: Set the parameter "Fixed slat position (0...100%)" to the desired position value.

At the end of shading, the output invariably moves the slats to the configured position after the height of the Venetian blind has been adjusted.

- i The behaviour preset in this parameter will only be executed, if no function with a higher priority (e. g. safety) is activated at the time the sunshine signal changes. The preset reaction will not be executed either, if the sunshine signal is overridden on account of priority settings by a direct operation.
- i "Internal scene recall" setting: In this setting, the scene function of the output must be enabled in the ETS! Otherwise, the positions approached at the end of sunshine/shading are undefined positions. The scene position values stored in the actuator by a scene storage function will be approached as well. A delay configured for scene recalls has no influence on the recall of the scene value by the sun protection function.

14.2.7.1 Automatic heating/cooling

Automatic heating/cooling can supplement the extended sun protection so that the sun shading of a room is available to an additional application. When automatic heating / cooling is active, a presence signal – e. g. from a KNX/EIB presence detector or monitor – is evaluated in addition to the signals of the extended sun protection function. The automatic sun protection function will then only be activated by the actuator when people are in the room. The room is then shaded or not shaded according to the sunshine signal - as described in previous chapters.

If no presence is signalled to the actuator, it additionally evaluates a heating/cooling signal derived, for instance, from a room temperature controller or from an outside thermostat. In this case, the shading function can be used to support the heating or cooling function in a room. As no persons are present in the room, intensive sunlight can be used, for instance, to heat up the room by opening the slats or by raising the curtain. Similarly, the room can also be shaded against sunlight during the absence of persons, if additional heating up of the room is not desired.

The evaluation of the three 1-bit signals "Presence", "Heating/cooling switchover" and "sunshine", whose telegram polarity can be set independently in the ETS, means that the extended sun protection function with automatic heating/cooling differentiates between the 6 statuses shown in the following table and the corresponding output reactions.

Presence	Heating/cooling switchover	Sunshine / shading facade	Reaction at output
People present	--- (irrelevant)	Sunshine active	At the beginning of sunshine
People present	--- (irrelevant)	Sunshine inactive	At the end of sunshine
No people present	Heating active	Sunshine active	At the beginning of sunshine with heating
No people present	Heating active	Sunshine inactive	At the end of sunshine with heating
No people present	Cooling active	Sunshine active	At the beginning of sunshine with cooling
No people present	Cooling active	Sunshine inactive	At the end of sunshine with cooling

States of the enlarged sun protection function with heating/cooling switchover

As described for the extended sun protection without automatic heating/cooling, the sunshine signal will be delayed, if a delay is configured in the ETS for this signal. In the same way, the presence signal can be evaluated independently after a delay, for example in order to debounce short time changes to the signal state.

The schematic diagram shows the interaction of the different communication objects

of the extended sun protection function in combination with the automatic heating/cooling function. The diagram moreover illustrates the principle of incorporating sensor components into the automatic heating/cooling system.

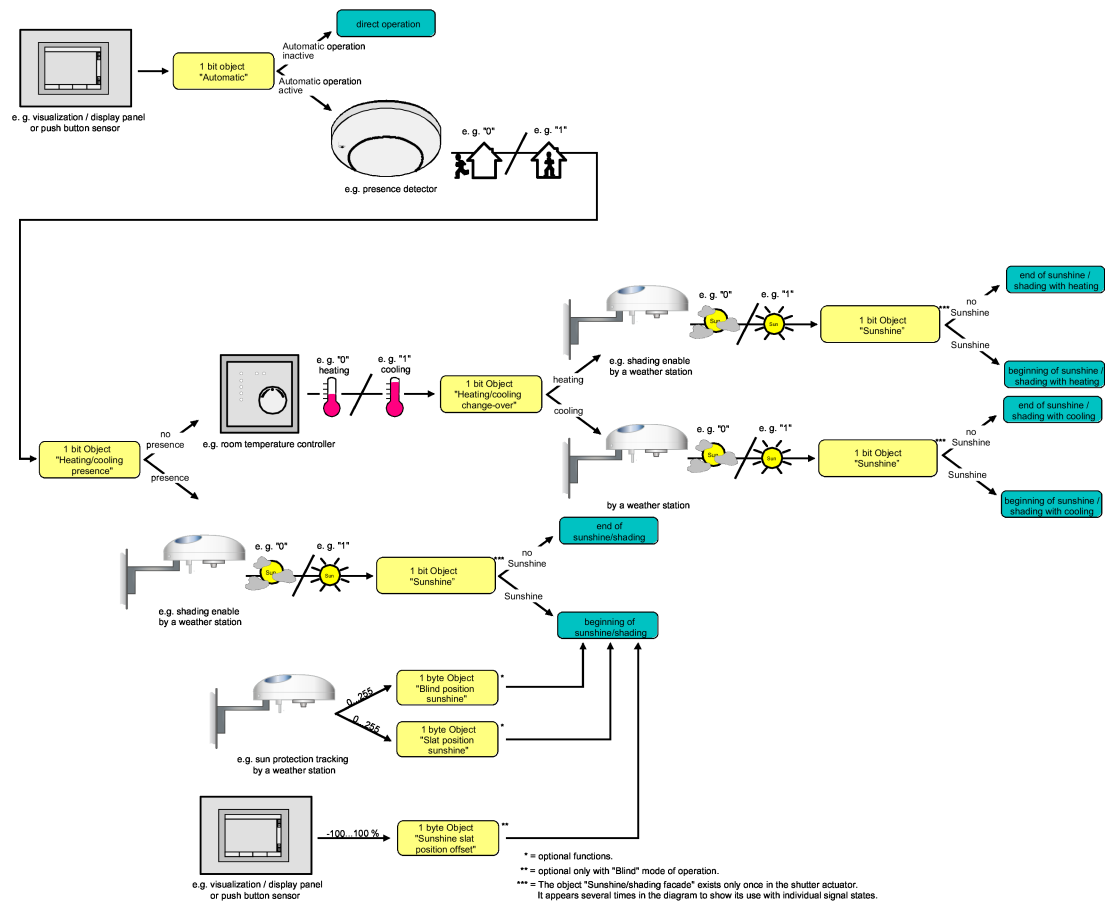


Figure 71: Schematic diagram of automatic heating/cooling (for reasons of simplicity shown without disabling functions of the automatic or direct operation)

In accordance with the schematic diagram, the automatic heating/cooling function is only active when the automatic sun protection is active, too. Like in the extended sun protection mode without automatic heating/cooling, the automatic sun protection is activated by means of the object "Sun protection – Automatic – Activate/Deactivate" depending on the configuration either immediately or only after a change of state has been detected for one of the signals "Presence", "Heating/cooling switchover" and "Sunshine".

After an ETS programming operation or after switch-on of the supply voltage of the actuator, the corresponding communication objects of the signals "Presence", "Heating/cooling switch-over" and "Sunshine" are initialised with ""0". In accordance with the preset polarity, the state of the sunshine and of the presence signal as well as the heating/cooling state will be determined and the corresponding reaction executed provided the automatic sun protection function is active. When the automatic sun protection is active, any change of state of the presence signal or any change in the heating/cooling signal will be evaluated immediately and the corresponding reaction executed.

The function diagram shows all possible functions of the enlarged sun protection with automatic heating/cooling. For reasons of clarity, the functions with a higher priority (manual control, forced position, safety function) are not shown in the diagram.

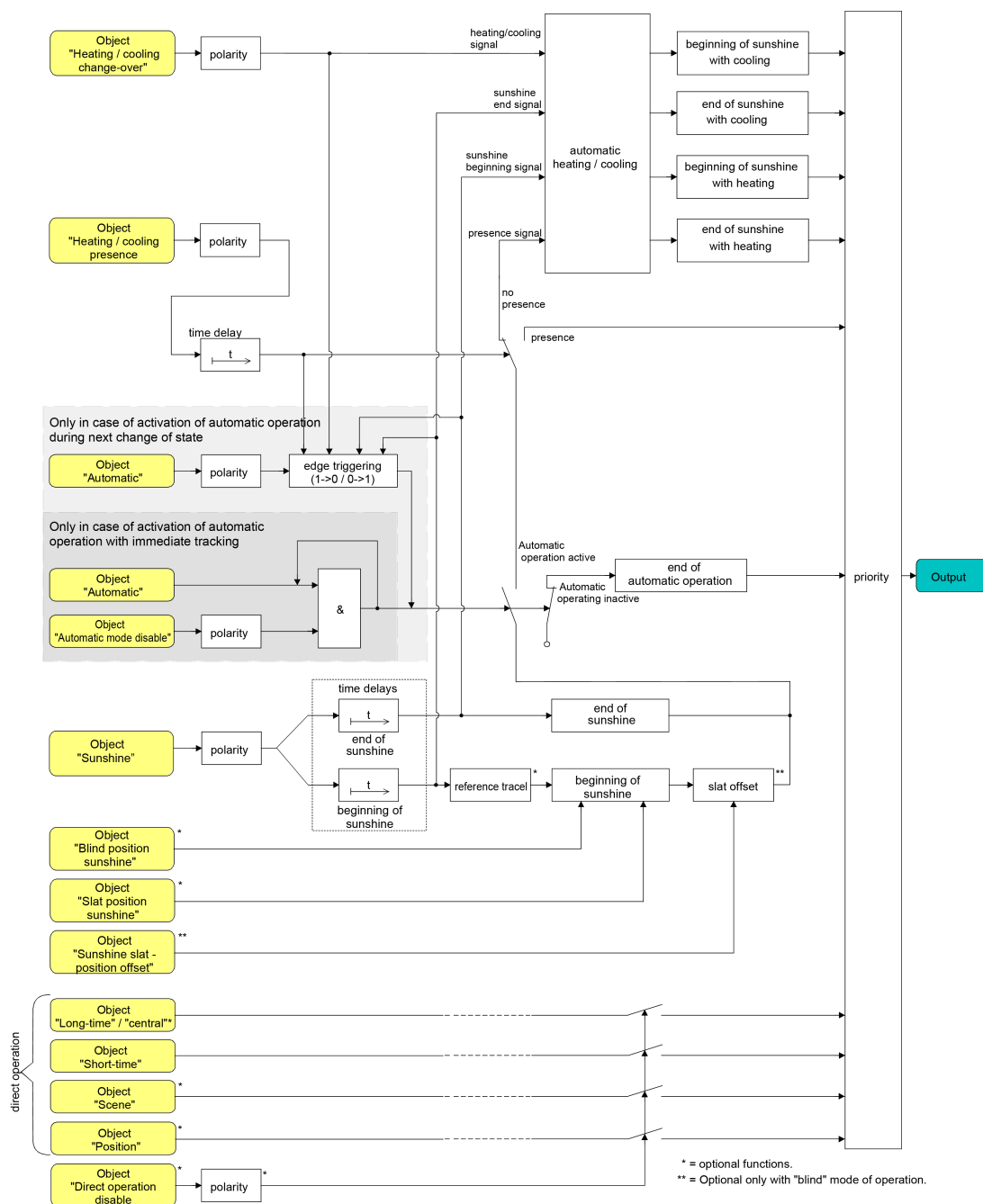


Figure 72: Schematic function diagram of automatic heating/cooling

Setting the polarity of the object "Heating/cooling Switchover"

The telegram polarity of the object "Sun protection - Heating/cooling - Changeover" can be set separately for each output. This means that an adaptation to the signals from existing room temperature controllers or from outside thermostats is possible.

The automatic heating/cooling function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General

-> Sun protection -> Automatic heating/cooling" so that the parameters are visible.

- Set the parameter "Object polarity of 'Heating/cooling switchover'" to the required telegram polarity.

The heating/cooling signal is evaluated in accordance with the preset priority.

- i** An update of the object "Sun protection - Heating / cooling - Changeover" from active to active or from inactive to inactive shows generally no reaction. The behaviour of the output is only influenced if a change of state is being detected.
- i** After switch-on of the supply voltage of the actuator, the heating/cooling switchover is initialised with an object value of "0".

Setting the polarity of the object "Heating/cooling - Presence"

The telegram polarity of the object "Sun protection - Heating/Cooling - Presence" can be set separately for each output. This means that an adaptation to the signals from existing KNX presence detectors or monitors is possible.

The automatic heating/cooling function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Sun protection -> Automatic heating/cooling" so that the parameters are visible.

- Set the parameter "Object polarity 'Heating/Cooling - Presence'" object to the required telegram polarity.

The presence signal is evaluated in accordance with the preset priority.

An update of the object "Sun protection - Heating/Cooling - Presence" from active to active or from inactive to inactive shows generally no reaction. The behaviour of the output is only influenced if a change of state is being detected.

After switch-on of the supply voltage of the actuator, the heating/cooling presence control is initialised with an object value of "0".

Presetting a time delay for beginning and end of presence

The telegram received by means of the object "Sun protection - Heating/Cooling - Presence" for transmission of the presence state (depending on polarity) can be evaluated with a time delay separately for each output.

The automatic heating/cooling function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Sun protection -> Automatic heating/cooling" so that the parameters are visible.

- Set the parameter "delay at the beginning of presence" to the required delay time.

The telegram for activation of the presence mode will be evaluated with a delay corresponding to the setting.

- Set the parameter "delay at the end of presence" to the required delay time.

The telegram for deactivation of the presence mode will be evaluated with a delay corresponding to the setting.

- i** A setting of "0" in the parameters deactivates the respective delay time. In this case, the presence state is evaluated immediately on reception of a telegram.

- i** An update of the object "Sun protection - Heating/Cooling - Presence" from active to active or from inactive to inactive shows generally no reaction. The behaviour of the output is only influenced if a change of state is being detected. An update of the presence signal alone does not result in the activation of the automatic sun protection either.
- i** The time delay is started after an update of the object "Sun protection - Heating/Cooling - Presence" also in those cases where the automatic operation is deactivated so that the newly received presence state may possibly also be processed with a delay, if the automatic operation is activated later on.

Setting the reaction of automatic heating/cooling

The behaviour of the output when automatic heating/cooling is active can be configured separately for each output. A distinction is made between four states in the evaluation of the three 1-bit signals "Presence", "Heating/cooling switchover" and "Sunshine" ...

- "At the **beginning** of sunshine in **heating operation**",
- "At the **end** of sunshine in **heating operation**",
- "At the **beginning** of sunshine in **cooling operation**",
- "At the **end** of sunshine in **cooling operation**".

The reaction of an output can be set separately in the ETS for each of the named states. There is no difference between the parameter settings for the individual states. For this reason, the following section only describes the possible configuration as an example.

The reaction of the automatic heating/cooling is set on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Sun protection -> Automatic heating/cooling".

The automatic heating/cooling" must be enabled so that the parameters are visible.

- Set the parameter "At the beginning of sunshine..." and/or "At the end of sunshine..." to "no reaction".

During automatic heating/cooling, the relays of the output show no reaction. Any movements still in progress will still be finished.

- Set the parameter "At the beginning of sunshine..." and/or "At the end of sunshine..." to "raising" or "opening".

During automatic heating/cooling, the actuator raises the blind/shutter or opens the venting louvre / roof window.

- Set the parameter "At the beginning of sunshine..." and/or "At the end of sunshine..." to "lowering" or "closing".

During automatic heating/cooling, the actuator lowers the blind/shutter or closes the venting louvre / roof window.

- Set the parameter "At the beginning of sunshine..." and/or "At the end of sunshine..." to "stop".

During automatic heating/cooling, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

- Set the parameter "At the beginning of sunshine..." and/or "At the end of sunshine..." to "internal scene recall". The number of the scene to be recalled must be specified in the parameter "Scene number (1...64)".

During automatic heating/cooling, the actuator recalls the position value preset in the scene configuration for the output concerned. This is not a scene recall as in direct operation, but only an approach to the corresponding scene position value.

- Set the parameter "At the beginning of sunshine..." and/or "At the end of sunshine..." to "Fixed position".

During automatic heating/cooling, the actuator recalls the fixed position value for the output concerned.

i In the "Venetian blind" operation, the "fixed position" setting can only be selected in common for the height of the blind and for the slat position.

- "Fixed position" only: Set the parameter "Fixed position of Venetian blind", "Fixed position of shutter/awning" or "Fixed position of venting louvre" to "as specified by parameter". Thereafter, set the parameter "Position of Venetian blind (0...100%)", "Position of shutter/awning (0...100%)" or "Position of venting louvre (0...100%)" to the desired position.

During automatic heating/cooling, the output invariably approaches the configured position value.

- "Fixed position" only: Set the parameter "Fixed position of Venetian blind", "Fixed position of shutter/awning" or "Fixed position of venting louvre" to "no change of current position".

With automatic heating/cooling, the last set position of the Venetian blind height, the shutter, awning or venting louvre will be maintained.

- "Fixed position" and operation = "Venetian blind" only: Set the parameter "Fixed slat position (0...100%)" to the desired position value.

During automatic heating/cooling, the output invariably moves the slats to the configured position after the height of the Venetian blind has been adjusted.

i The parameterized reactions will not be executed if a function with a higher priority is active during automatic heating/cooling (e. g. safety function, forced position or manual control). The preset reaction will not be executed either, if the automatic sun protection is overridden on account of priority settings by a direct operation.

i "Internal scene recall" setting: In this setting, the scene function of the output must be enabled in the ETS! Otherwise, the positions approached during automatic heating/cooling are undefined positions. The scene position values stored in the actuator by a scene storage function will be approached as well. A delay configured for scene recalls has no influence on the recall of the scene value by the automatic heating/cooling function.

14.2.7.2 Sun protection function parameters

Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions

Sun protection functions	Checkbox (yes / no)
The sun protection functions of the Venetian blind output can be enabled here.	

Outputs -> Switching / Venetian blind -> VB... General -> Sun protection"

Type of sun protection	simple sun protection extended sun protection

This parameter defines the scope of sun protection functions.

simple sun protection: Reduced scope of functions with standard configuration possibilities.

extended sun protection: Enlarged scope of functions including the possibilities of simple sun protection. In addition, the connected drive can be integrated in shading control systems depending on the position of the sun. In addition, automatic heating/cooling can be implemented.

Activation via	"Automatic" & next change of state object "Automatic" & immediate tracking object

This parameter defines how to activate the automatic mode and the reactions resulting from such activation.

"Automatic" object & next change of state: Automatic operation is activated as soon as the object "Sun protection - Automatic - Activate/Deactivate" is set to 'active' in accordance with polarity. A reaction at the output occurs, however, only after a new change of state has been signalled via "sunshine". In this case, the new state (beginning of sunshine or end of sunshine) determines the behaviour of the output.

"Automatic" object & immediate tracking: Automatic operation is activated as soon as the object "Sun protection - Automatic - Activate/Deactivate" is set to 'active' in accordance with the polarity. The state of the object "Sun protection - Sunshine - Activate/Deactivate" determines the behaviour of the output immediately (beginning of sunshine or end of sunshine).

The reception of a telegram 'Automatic mode inactive' at the object "Sun protection - Automatic - Activate/Deactivate" immediately ends the automatic mode in both cases. The behaviour in this case is defined by the parameter "At end".

Deactivation via direct operation	Checkbox (inactive/ active)

At this point, it is possible to specify whether automatic operation can be ended via direct operation of the communication objects for long-time operation, short-time operation, positioning of the blind/shutter, or slats or via scene control.

If automatic operation has been deactivated by a direct operation, it must be activated via the object "Sun protection - Automatic - Activate/Deactivate".

"Object polarity "Automatic mode - Activate/Deactivate"	Automatic mode: activated = 1; deactivated = 0 Automatic mode: activated = 0; deactivated = 1
This parameter defines the polarity of the automatic object.	
Disabling function	Checkbox (yes / no)
The automatic mode can be disabled. When disabling is active, the automatic mode is aborted. It can only be reactivated, if a telegram according to "active" is written into the object "Sun protection - Automatic mode - Activate/Deactivate". The objects "Sun protection - Automatic - Activate/Deactivate" and "Sun protection - Automatic - Disabling" are logically combined (AND with feedback). An active parameter enables the disabling function and makes the disabling object visible.	
Object polarity "Automatic - Disabling"	Automatic mode: enabled = 1; disabled = 0 Automatic mode: enabled = 0; disabled = 1
This parameter defines the polarity of the automatic mode disable object. Disabling is active when a telegram with polarity 'disabled' is received. This parameter is only visible, if the parameter "disabling function" is activated.	
Status	Checkbox (inactive/active)
The automatic mode of the extended sun protection has its own 1-bit feedback object for signalling on the KNX whether automatic mode is active or not. This parameter can be used to enable the feedback object and configure it further. inactive: No feedback object is available for the automatic operation of the output concerned. Feedback deactivated. active: Feedback and the object are activated. The object transmits after change of state of automatic mode.	
Delay after bus voltage returns	Checkbox (yes / no)
The feedback telegram can be transmitted to the KNX with a delay after the bus voltage returns or after programming with the ETS. An activated parameter causes the delay time of the feedback when the bus voltage returns. The delay time is configured under "General -> Venetian blind outputs (VB)". This parameter is only visible in case of an actively transmitting feedback object.	

At the end	no reaction Raise/Open Raise/Close stop Track position
The behaviour of the output at the end of automatic mode - including at the start of automatic mode disabling - is defined by this parameter. no reaction: At the end of automatic operation, the sun protection function is ended and the relay of the output shows no reaction. Any travel movements still in progress at this instant will still be finished. raising / opening the louvre: At the end of automatic operation, the actuator terminates the sun protection and raises the blind/shutter or opens the venting louvre / roof window. Lower / Close louvre: At the end of automatic operation, the actuator terminates the sun protection and lowers the blind/shutter or closes the venting louvre / roof window. stop: At the end of automatic operation the sun protection is terminated and the actuator switches the relays of the output to "stop". A travel movement, if any, will be interrupted. Track position: At the end of automatic operation, the output will be set to the state last adjusted before the automatic sun protection or to the state tracked and internally stored during the automatic sun protection. The position objects, the long-time object and the scene function are tracked. The behaviour set in this parameter will be executed only if no function of higher priority (e. g. safety) is activated at the end of automatic operation.	
Priority of sun protection with respect to direct operation	same priority higher priority lower priority
This parameter defines the priority of the sun protection function with respect to direct operation. same priority: The sun protection can be overridden by direct operation and vice versa. Only after the next reception of a "sun is shining" signal will the sun protection mode be activated again. higher priority: The sun protection has the higher priority and cannot be aborted by a direct operation. lower priority: The direct operation has the higher priority and cannot be aborted by sun protection. The sun protection can be activated only after an enabling movement into the upper end position initiated by a direct operation has occurred without interruption. Direct operation = long-time/short-time operation, positioning via objects, scenes, central. The parameter with the named settings and meanings is only available in simple sun protection.	

Priority of sun protection with respect to direct operation	same priority higher priority lower priority
This parameter defines the priority of automatic operation with respect to direct operation. The selected priority affects the evaluation of the sunshine signal in the automatic mode and not the automatic mode itself. same priority: The evaluation of the sunshine signal in the automatic mode can be overridden by a direct operation. In the same way, a direct operation is overridden by the reception of a new sunshine telegram. higher priority: The automatic mode has the higher priority and cannot be aborted by a direct operation irrespective of the state of the sunshine signal. A direct operation will be possible again only after the automatic mode is terminated. lower priority: The direct operation has the higher priority and cannot be aborted by a sunshine signal in the automatic mode. The sunshine signal is evaluated again only after an enabling movement into the upper end position initiated by a direct operation has occurred without interruption and only if the automatic mode is activated and not disabled at this time. Direct operation = long-time/short-time operation, positioning via objects, scenes, central. The parameter with the named settings and meanings is only visible in the extended sun protection.	

"Sunshine" object polarity	Sunshine = 1; no sunshine = 0 Sunshine = 0; no sunshine = 1
This parameter defines the polarity of the input object "sunshine".	

Disabling function for direct operation	Checkbox (yes / no)
Direct operation can be disabled. When disabling is active, a direct operation can – independently of the preset priority – never abort a sun protection function. In this case, direct operation is disabled in other functions, too. An activated parameter enables the disabling function and makes the disabling object visible. Direct operation = long-time/short-time operation, positioning via objects, scenes, central.	

Object-polarity "Direct operation - Disabling"	direct operation: enabled = 1; disabled = 0 direct operation: enabled = 0; disabled = 1
This parameter defines the polarity of the disabling object for direct operation. Disabling is active when a telegram with polarity 'disabled' is received. This parameter is only visible, if the parameter "Direct operation disabling function" is activated.	

Outputs -> Switching / Venetian blind -> VB... General -> Sunshine -> Sun protection start"

Delay at the beginning of sunshine	0...59 min 0... 30 ...59 s
The telegram received via the object "Sunshine" for activation of shading (depending on polarity) can be evaluated with a time delay. A time setting of "0" in the parameters deactivates the respective delay time. In this case, the state of shading is evaluated immediately.	
At the beginning of sunshine	no reaction raise lower stop Internal scene recall fixed Venetian blind or slat position fixed Venetian blind position / Variable slat position slat position fixed / Venetian blind position variable variable Venetian blind and slat position
This parameter defines the behaviour of the output at the beginning of shading – if applicable, after the end of the delay time. no reaction: At the beginning of shading, the output switches over to sun protection while the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished. raising: At the beginning of shading, the actuator raises the blind/shutter. lowering: At the beginning of shading, the actuator lowers the blind/shutter. stop: At the beginning of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. Internal scene recall: At the beginning of shading, the actuator recalls the position values for the affected output which were preset in the scene configuration. This is not a scene recall as in direct operation, but only an approach of the corresponding scene position values. fixed Venetian blind or slat position: At the beginning of shading, the output moves to a configured fixed Venetian blind and slat position. fixed Venetian blind position / Variable slat position: At the beginning of shading, the output controls the approach to a configured fixed Venetian blind position and to slat position preset by a separate object and thus variable. slat position fixed / Venetian blind position variable: At the beginning of shading, the output controls the approach to a configured fixed slat position and to a Venetian blind position preset by a separate object and thus variable. variable Venetian blind and slat position: At the beginning of shading, the output controls the approach to the Venetian blind and slat positions preset by two separate objects and thus variable. This parameter is only visible in the Venetian blind operation.	

At the beginning of sunshine	no reaction raise lower stop Internal scene recall fixed position variable position
This parameter defines the behaviour of the output at the beginning of shading – if applicable, after the end of the delay time. no reaction: At the beginning of shading, the output switches over to sun protection while the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished. raising: At the beginning of shading, the actuator raises the blind/shutter. lowering: At the beginning of shading, the actuator lowers the blind/shutter. stop: At the beginning of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. Internal scene recall: At the beginning of shading, the actuator recalls the position values for the affected output which were preset in the scene configuration. This is not a scene recall as in direct operation, but only an approach of the corresponding scene position values. fixed position: At the beginning of shading, the output controls the approach to a configured fixed position. variable position: At the beginning of shading, the output controls the approach to a position preset by a separate object and thus variable. This parameter is only visible in the shutter/awning operation.	

At the beginning of sunshine	no reaction open close stop Internal scene recall fixed position variable position
This parameter defines the behaviour of the output at the beginning of shading – if applicable, after the end of the delay time. no reaction: At the beginning of shading, the output switches over to sun protection while the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished. open: At the beginning of shading, the actuator opens the venting louvre / roof window. close: At the beginning of shading, the actuator closes the venting louvre / roof window. stop: At the beginning of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. Internal scene recall: At the beginning of shading, the actuator recalls the position values for the affected output which were preset in the scene configuration. This is not a scene recall as in direct operation, but only an approach of the corresponding scene position values. fixed position: At the beginning of shading, the output controls the approach to a configured fixed position. variable position: At the beginning of shading, the output controls the approach to a position preset by a separate object and thus variable. This parameter is only visible in the "venting louvre / roof window" operation.	
Internal scene	Scene 1 Scene 2 ... Scene 64
This parameter defines the internal scene which is recalled at the beginning of shading. This parameter is only visible, if the parameter "At the beginning of sunshine" is set to "internal scene recall".	

Fixed Venetian blind position	same as configured value no change to current position
The fixed Venetian blind position at the beginning of shading can either be preset statically by a separate parameter or basically adjusted to the value prevailing at the time of shading activation, i.e. remain unchanged. same as configured value: At the beginning of shading, the configured Venetian blind position will be approached. no change in current position: At the beginning of shading, the current Venetian blind position will be maintained. In this case, the output behaves as if only the slat were positioned as a result of shading. This parameter is only visible, if the Venetian blind is to approach a fixed position at the beginning of shading. This parameter is only visible in the "Venetian blind with slat" operation.	
Position of blind (0...100%)	0... 50 ...100
This parameter sets the fixed position of the Venetian blind to be approached at the beginning of shading. This parameter is only visible, if the parameter "Fixed position of Venetian blind" is set to "as specified by parameter". This parameter is only visible in the "Venetian blind with slat" operation.	
Fixed slat position	0... 50 ...100%
This parameter sets the fixed position of the slat to be approached at the beginning of shading and, as the case may be, after positioning of the Venetian blind. This parameter is only visible, if the slat is to approach a fixed position at the beginning of shading. This parameter is only visible in the "Venetian blind with slat" operation.	
Fixed shutter/awning position	same as configured value no change to current position
The fixed position of the shutter or awning at the beginning of shading can either be preset statically by a separate parameter or basically adjusted to the value prevailing at the time of shading activation, i.e. remain unchanged. same as configured value: At the beginning of shading, the configured shutter or awning position will be approached. no change in current position: At the beginning of shading, the current shutter or awning position will be maintained. Any movements in progress at the time of shading activation will be finished. This parameter is only visible when the shutter or awning should approach a fixed position value at the beginning of sun shading. This parameter is only visible in the shutter/awning operation.	

Position of shutter / awning (0...100%)	0... 50 ...100
This parameter sets the fixed position of the shutter or awning to be approached at the beginning of shading. This parameter is only visible, if the parameter "Fixed position of shutter/awning" is set to "as specified by parameter". This parameter is only visible in the shutter/awning operation.	
Fixed position of venting louvre	same as configured value no change to current position
The fixed venting louvre position at the beginning of shading can either be preset statically by a separate parameter or basically adjusted to the value prevailing at the time of shading activation, i.e. remain unchanged. same as configured value: At the beginning of shading, the configured venting louvre position will be approached. no change in current position: At the beginning of shading, the current venting louvre position will be maintained. Any movements in progress at the time of shading activation will be finished. This parameter is only visible if the venting louvre is to approach a fixed position at the beginning of shading. This parameter is only visible in the "venting louvre / roof window" operation.	
Position of the venting louvers	0... 50 ...100%
This parameter sets the fixed position of the venting louvre to be approached at the beginning of shading. This parameter is only visible, if the parameter "Fixed position of venting louver" is set to "as specified by parameter". This parameter is only visible in the "venting louvre / roof window" operation.	
Reference travel before every sun protection positioning operation	Checkbox (yes / no)
A forced reference travel of the drive is performed before sun protection positioning. A reference movement is a positioning movement into the upper end position or into the completely open position. By means of a forced reference movement, drives connected to different outputs can be synchronised. If no synchronising movement is forced, the actuator performs a reference movement only once after the supply voltage returns.	

Offset of the slat position during sunshine	no offset Offset as configured Offset as configured and by object
For manual adjustment of the slat angle during a shading or sun tracking the position operation, a slat offset can be preset. The offset corrects the preset slat angle in positive or in negative direction. The lighting conditions in a room can thus be individually adapted by persons present in the room. no offset: Offset correction is deactivated. Offset as parameter: The slat offset is statically preset by means of a fixed parameter value. Offset as parameter and via object: The slat offset is preset by a fixed parameter value and can be dynamically adapted via a separate communication object. This parameter is only visible, if the slat is to approach a fixed or a variable position at the beginning of shading. This parameter is only visible in the "Venetian blind with slat" operation.	

Offset slat position	-100...0...100%
This parameter is used for setting the slat offset. The value specified in this parameter is added at the beginning of shading to the current slat angle. Even with offset correction, the 0...100% slat position limits cannot be overstepped. It should be noted that the configured offset value can be overwritten by the object after reception of a dynamic value. This parameter is only visible, if the parameter "offset with fixed and variable slat position" is set to "offset as configured" or to "offset as configured and via object". This parameter is only visible in the "Venetian blind with slat" operation.	

Store in case of bus voltage failure	Checkbox (yes / no)
If the offset is preset via the object, this parameter defines whether the received value is to be stored in the actuator's NV memory. Parameter activated: The value received via the object will be stored permanently in the actuator in case of bus voltage failure. The originally configured offset value is definitely overwritten in the process. Parameter deactivated: The value received via the object will only be stored temporarily in volatile memory. This only replaces the configured value until the actuator is reinitialised (return of bus voltage). After the initialisation, the offset value configured in the ETS will be used again. This parameter is visible only if the parameter "Slat position offset in sunshine" is set to "offset as configured and via object". This parameter is only visible in the "Venetian blind with slat" operation.	

Outputs -> Switching / Venetian blind -> VB... General -> Sun protection -> Sun protection end"

Delay at the end of sunshine	0...59 min 0... 30 ...59 s
The telegram received via the object "Sunshine" for deactivation of shading (depending on polarity) can be evaluated with a time delay. A time setting of "0" in the parameters deactivates the respective delay time. In this case, the state of shading is evaluated immediately.	
At the end of sunshine	no reaction Raise/Open Lower/Close stop Track position
This parameter defines the behaviour of the output at the end of shading – if applicable, after the end of the delay time. no reaction: At the end of shading, the output quits the sun protection mode and the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished. raising / opening: The actuator raises the blind/shutter or opens the venting louvre / roof window at the end of shading. lowering / closing: The actuator lowers the blind/shutter or closes the venting louvre / roof window at the end of shading. stop: At the end of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. Track position: At the end of shading, the output will be set to the state last adjusted before sun protection or to the state tracked and internally stored during sun protection. The position objects, the long-time object and the scene function are tracked. The behaviour preset in this parameter will only be executed if no function with a higher priority (e. g. safety) is activated at the end of shading. This parameter is only visible in the simple sun protection.	

At the end of sunshine	no reaction raise lower stop Internal scene recall fixed Venetian blind or slat position
This parameter defines the behaviour of the output at the end of shading – if applicable, after the end of the delay time. no reaction: At the end of shading, the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished. raising: At the end of shading, the actuator raises the blind/shutter. lowering: At the end of shading, the actuator lowers the blind/shutter. stop: At the end of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. Internal scene recall: At the end of shading, an internal scene of the actuator is recalled. fixed Venetian blind or slat position: At the end of shading, the output moves to a configured fixed Venetian blind and slat position. This parameter is only visible in the extended sun protection. This parameter is only visible in the Venetian blind operation. This parameter does not define the behaviour of the output at the end of automatic operation (cf. parameter "At end")!	

At the end of sunshine	no reaction raise lower stop Internal scene recall fixed position
This parameter defines the behaviour of the output at the end of shading – if applicable, after the end of the delay time. no reaction: At the end of shading, the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished. raising: At the end of shading, the actuator raises the blind/shutter. lowering: At the end of shading, the actuator lowers the blind/shutter. stop: At the end of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. Internal scene recall: At the end of shading, an internal scene of the actuator is recalled. fixed position: At the end of shading, the output controls the approach to a configured fixed position. This parameter is only visible in the extended sun protection. This parameter is only visible in the shutter/awning operation. This parameter does not define the behaviour of the output at the end of automatic operation (cf. parameter "At end")!	

At the end of sunshine	no reaction open close stop Internal scene recall fixed venting louvre position
This parameter defines the behaviour of the output at the end of shading – if applicable, after the end of the delay time. no reaction: At the end of shading, the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished. open: At the end of shading, the actuator opens the venting louvre / roof window. close: At the end of shading, the actuator closes the venting louvre / roof window. stop: At the end of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. Internal scene recall: At the end of shading, an internal scene of the actuator is recalled. fixed position: At the end of shading, the output controls the approach to a configured fixed position. This parameter is only visible in the extended sun protection. This parameter is only visible in the "venting louvre / roof window" operation. This parameter does not define the behaviour of the output at the end of automatic operation (cf. parameter "At end")!	
Internal scene	Scene 1 Scene 2 ... Scene 64
This parameter defines the internal scene which is recalled at the end of shading. This parameter is only visible, if the parameter "At the end of sunshine" is set to "internal scene recall".	

Fixed Venetian blind position	same as configured value no change to current position
The fixed Venetian blind position at the end of shading can either be preset statically by a separate parameter or basically remain at the value set or tracked by the shading operation. same as configured value: At the end of shading, the configured Venetian blind position will be approached. no change in current position: At the end of shading, the current Venetian blind position will be maintained. In this case, the output behaves as if only the slat were positioned as a result of the end of shading. This parameter is only visible, if the Venetian blind is to approach a fixed position at the end of shading. This parameter is only visible in the Venetian blind operation.	
Venetian blind position	0 ... 50 ... 100%
This parameter sets the fixed position of the Venetian blind to be approached at the end of shading. This parameter is only visible, if the parameter "Fixed position of Venetian blind" is set to "as specified by parameter". This parameter is only visible in the "Venetian blind with slat" operation.	
Fixed slat position	0 ... 50 ... 100%
This parameter sets the fixed position of the slat to be approached at the end of shading and, as the case may be, after positioning of the Venetian blind. This parameter is only visible, if the slat is to approach a fixed position at the beginning of shading. This parameter is only visible in the "Venetian blind with slat" operation.	
Fixed shutter/awning position	same as configured value no change to current position
The fixed position of the shutter or awning at the end of shading can either be preset statically by a separate parameter or basically adjusted to the value prevailing at the time of shading activation, i.e. remain unchanged. same as configured value: At the end of shading, the configured shutter or awning position will be approached. no change in current position: At the end of shading, the current shutter or awning position will be maintained. Any movements in progress at the time of shading activation will be finished. This parameter is only visible, if the shutter or awning is to approach a fixed position at the end of shading. This parameter is only visible in the shutter/awning operation.	

Position of shutter / awning	0 ... 50 ... 100%
This parameter sets the fixed position of the shutter or awning to be approached at the end of shading. This parameter is only visible, if the parameter "Fixed position of shutter/awning" is set to "as specified by parameter". This parameter is only visible in the shutter/awning operation.	

Fixed position of venting louvre	same as configured value no change to current position
The fixed venting louvre position at the end of shading can either be preset statically by a separate parameter or basically adjusted to the value prevailing at the time of shading activation, i.e. remain unchanged. same as configured value: At the end of shading, the configured venting louvre position will be approached. no change in current position: At the end of shading, the current venting louvre position will be maintained. Any movements in progress at the time of shading activation will be finished. This parameter is only visible if the venting louvre is to approach a fixed position at the end of shading. This parameter is only visible in the "venting louvre / roof window" operation.	

Position of venting louvre	0 ... 50 ... 100%
This parameter sets the fixed position of the venting louvre to be approached at the end of shading. This parameter is only visible, if the parameter "Fixed position of venting louver" is set to "as specified by parameter". This parameter is only visible in the "venting louvre / roof window" operation.	

Outputs -> Switching / Venetian blind -> VB... - General -> Sun protection -> Automatic heating/cooling"

Automatic heating/cooling	Checkbox (yes / no)
This parameter can be used to activate the automatic heating/cooling function. The automatic heating/cooling function adds a presence detection function to the extended sun protection mode. If a person is present, the extended sun protection is executed as described. If nobody is present, however, the Venetian blinds, shutters, awnings, venting louvres or roof windows can be operated in such a way that these devices support the heating or cooling function of the building. When the function is enabled, the other parameters and objects are visible. The automatic heating/cooling function can only be activated in the extended sun protection mode. Moreover, the automatic heating/cooling function is only active when the automatic mode of the extended sun protection function is activated.	

"Object polarity "Heating/cooling - Switchover"	Cooling = 0; heating = 1 Cooling = 1; heating = 0
This parameter defines the polarity of the object for heating/cooling switchover. This object is linked, for instance, with room temperature controllers or outside thermometers. The heating/cooling switchover is initialised after the return of the supply voltage of the actuator according to the object value "0" and the set polarity. This parameter is visible only if automatic heating/cooling is enabled.	
Object polarity "Heating/cooling - Presence"	no presence = 0; presence = 1 no presence = 1; presence = 0
This parameter defines the polarity of the object for presence control in case of automatic heating/cooling. This object is linked, for example, with KNX presence detectors. The heating/cooling presence control is initialised after the return of the supply voltage of the actuator according to the object value "0" and the set polarity. This parameter is visible only if automatic heating/cooling is enabled.	
Delay at the beginning of presence	0 ... 59 min 0 ... 30 ... 59 s
The telegram received via the object "Heating/cooling presence" for activation of the presence function (according to polarity) can be evaluated with a time delay. A time setting of "0" in the parameters deactivates the respective delay time. In this case, the state of the presence object is evaluated immediately. These parameters are visible only if automatic heating/cooling is enabled.	
Delay at the end of presence	0 ... 59 min 0 ... 30 ... 59 s
The telegram received via the object "Heating/cooling presence" for deactivation of the presence function (in acc. with polarity) can be evaluated with a time delay. A time setting of "0" in the parameters deactivates the respective delay time. In this case, the state of the presence object is evaluated immediately. These parameters are visible only if automatic heating/cooling is enabled.	

In heating mode/cooling mode	no reaction
At the beginning of sunshine	raise
At the end of sunshine	lower
	Internal scene recall
	fixed Venetian blind or slat position

This parameter defines the behaviour of the output at the end / at the beginning of sunshine / shading with heating / cooling – if applicable, after the end of the delay time.

no reaction: The relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished.

raising: The actuator raises the blind/shutter.

lowering: The actuator lowers the blind/shutter.

Internal scene recall: An internal scene of the actuator is recalled.

fixed Venetian blind or slat position: The output moves to a configured fixed Venetian blind and slat position.

This parameter is visible only if automatic heating/cooling is enabled.

This parameter is only visible in the "Venetian blind with slats" operation.

*: The parameter settings for heating or cooling or beginning or end must be parameterized separately. The setting options - also for the follow-up parameters - are identical in all cases.

In heating mode/cooling mode	no reaction
At the beginning of sunshine	raise
At the end of sunshine	lower
	Internal scene recall
	fixed position

This parameter defines the behaviour of the output at the end / at the beginning of sunshine / shading with heating / cooling – if applicable, after the end of the delay time.

no reaction: The relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished.

raising: The actuator raises the blind/shutter.

lowering: The actuator lowers the blind/shutter.

Internal scene recall: An internal scene of the actuator is recalled.

fixed position: The output controls the approach to a configured fixed position.

This parameter is visible only if automatic heating/cooling is enabled.

This parameter is only visible in the shutter/awning operation.

*: The parameter settings for heating or cooling or beginning or end must be parameterized separately. The setting options - also for the follow-up parameters - are identical in all cases.

In heating mode/cooling mode At the beginning of sunshine At the end of sunshine	no reaction Open louvre Close louvre Internal scene recall fixed position
This parameter defines the behaviour of the output at the end / at the beginning of sunshine / shading with heating / cooling – if applicable, after the end of the delay time. no reaction: The relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished. Open louvre: The actuator opens the venting louvre. Close the louvre: The actuator closes the venting louvre. Internal scene recall: An internal scene of the actuator is recalled. fixed position: The output controls the approach to a configured fixed position. This parameter is visible only if automatic heating/cooling is enabled. This parameter is only visible in the "venting louvre / roof window" operation. *: The parameter settings for heating or cooling or beginning or end must be parameterized separately. The setting options - also for the follow-up parameters - are identical in all cases.	
Scene number (1...64)	1...64
This parameter defines the number of the internal scene which is recalled. This parameter is only visible, if the parameters "At the beginning of sunshine" and/or "At the end of sunshine" of the automatic heating/cooling are set to "internal scene recall".	
Fixed Venetian blind position	same as configured value no change to current position
The fixed Venetian blind position in case of automatic heating/cooling can either be preset statically by a separate parameter or basically remain at the current value. same as configured value: The configured Venetian blind position will be approached. no change in current position: The current Venetian blind position will be maintained. In this case, the output behaves as if only the slat were positioned. This parameter is only visible, if the Venetian blind is to approach a fixed position in case of automatic heating/cooling. This parameter is only visible in the "Venetian blind with slats" operation.	
Venetian blind position	0 ... 50 ... 100%
This parameter sets the fixed position of the Venetian blind to be approached in case of automatic heating/cooling. This parameter is only visible, if the parameter "Fixed position of Venetian blind" is set to "as specified by parameter". This parameter is only visible in the "Venetian blind with slats" operation.	

Fixed slat position	0 ... 50 ... 100%
This parameter sets the fixed position of the slat to be approached in case of automatic heating/cooling and, as the case may be, after positioning of the Venetian blind. This parameter is only visible, if the slat is to approach a fixed position with automatic heating/cooling. This parameter is only visible in the "Venetian blind with slats" operation.	
Fixed shutter/awning position	same as configured value no change to current position
The fixed shutter/awning position in case of automatic heating/cooling can either be preset statically by a separate parameter or basically remain at the current value. same as configured value: The configured shutter or awning position will be approached. no change in current position: The current shutter/awning position will be maintained. This parameter is only visible, if the shutter or awning is to approach a fixed position in case of automatic heating/cooling. This parameter is only visible in the shutter/awning operation.	
Shutter/awning position	0... 50 ...100%
This parameter sets the fixed position of the shutter or awning to be approached with automatic heating/cooling. This parameter is only visible, if the parameter "Fixed position of shutter/awning" is set to "as specified by parameter". This parameter is only visible in the shutter/awning operation.	
Fixed position of venting louvre	same as configured value no change to current position
The fixed venting louvre position in case of automatic heating/cooling can either be preset statically by a separate parameter or basically remain at the current value. same as configured value: The configured venting louvre position will be approached. no change in current position: The current venting louvre position will be maintained. This parameter is only visible, if the venting louvre is to approach a fixed position in case of automatic heating/cooling. This parameter is only visible in the "venting louvre / roof window" operation.	
Venting louvre/roof window position	0... 50 ...100%
This parameter sets the fixed position of the venting louvre to be approached in case of automatic heating/cooling. This parameter is only visible, if the parameter "Fixed position of venting louver" is set to "as specified by parameter". This parameter is only visible in the "venting louvre / roof window" operation.	

14.2.7.3 Object sun protection function

Function	Name	Type	DPT	Flag
Sun protection - Automatic mode - Activate/deactivate	VB ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activation or deactivation of the automatic sun protection in the extended sun protection mode ("1" = automatic mode activated / "0" = automatic mode deactivated).				

Function	Name	Type	DPT	Flag
Sun protection - Automatic mode - Disable	VB ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for disabling of the automatic sun protection in the extended sun protection mode. The polarity can be configured. The object is only available if the disabling function of the automatic mode is enabled in the extended sun protection.				

Function	Name	Type	DPT	Flag
Sun protection - Direction operation - Disable	VB ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for disabling direct operation in the extended sun protection mode (direct operation = Move / Step / Position / Scene / Central). The polarity can be configured.				

Function	Name	Type	DPT	Flag
Sun protection - Sunshine - Activate/Deactivate	VB ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for activation or deactivation of sun shading in the simple or extended sun protection mode (sun / no sun). The polarity can be configured.				

Function	Name	Type	DPT	Flag
Sun protection ... - Position	VB ... - Input	1-byte	5,001	C, -, W, -, U
1-byte object for presetting a variable position value (0...255) for the height of the Venetian blind or shutter or the venting louvre / roof window position in direct operation when the sun protection is active.				

Function	Name	Type	DPT	Flag
Sun protection - Slat - Position	VB ... - Input	1-byte	5,001	C, -, W, -, U
1-byte object for presetting a variable slat position value (0...255) when the sun protection is active.				

Function	Name	Type	DPT	Flag
Sun protection - Slat - Position - Offset	VB ... - Input	1-byte	6,001	C, -, W, -, U
1-byte object for presetting a slat position angle (-100% ... +100% / smaller or larger position angles are treated as + or -100%) for 'manual' readjustment of the slat position when the sun protection is active.				
Function	Name	Type	DPT	Flag
Sun protection - Heating/cooling - Presence	VB ... - Input	1-bit	1,018	C, -, W, -, U
1-bit object for activation of Presence mode during automatic heating/cooling. The polarity can be configured. This object is generally linked with presence detectors.				
Function	Name	Type	DPT	Flag
Sun protection - Heating/cooling - Switchover	VB ... - Input	1-bit	1,100	C, -, W, -, U
1-bit object for switching over between heating and cooling operation during automatic heating/cooling. The polarity can be configured. This object is generally linked with room temperature controllers (object "heating/cooling switchover").				
Function	Name	Type	DPT	Flag
Sun protection - Automatic mode - Status	VB ... - Output	1-bit	1,003	C, R, -, T, A
1-bit object for feedback of active automatic operation in extended sun protection ("0" = Automatic operation not active - direct operation active / "1" = Automatic operation active). The object is only available if the feedback of the automatic mode is enabled in the extended sun protection.				

14.2.8 Twilight function

In "Venetian blind with slats" and "Shutter/awning" operating modes, the twilight function can be activated. The twilight function allows the blind/shutter to be closed to provide privacy in the evening and opened in the morning, for example.

The reaction of a specific output at the beginning of the twilight function can be pre-set in the ETS. It is possible, among other things, to approach the upper or lower end position or configured position values.

The reaction at the end of the twilight function can also be set. In this situation, the blind/shutter can move to an end position, for example, or show no special reaction.

Twilight mode is started and also ended using a 1-bit object with the data point type 1.003 DPT_Enable. The value "1" means that the twilight function is active. The value "0" means that the twilight function is not active.

Activating the twilight function

The twilight function can be activated independently for each Venetian blind or shutter/awning output on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - Enabled functions".

The operation must be set to "Venetian blind with slats" or "Shutter/awning" mode.

- Activate the checkbox "Twilight function".

The parameter page

"Outputs -> Switching / Venetian blind -> VB... - Twilight function" is enabled and the twilight function is activated.

-  The twilight function cannot be configured in the "Venting louvre / roof window" operation.

Setting the twilight function

The twilight function can be enabled independently for each Venetian blind or shutter/awning output by the parameter on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - Enabled" functions. If the function is enabled, the parameter page "Outputs -> Switching / Venetian blind -> VB..." - General -> Twilight function" is displayed in the ETS.

The twilight function must be enabled.

- Set the parameter "Start of twilight function" to "No reaction".

At the beginning of the twilight function, the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished.

- Set the parameter "Start of twilight function" to "raising".

At the beginning of the twilight function, the actuator raises the blind/shutter.

- Set the parameter "Start of twilight function" to "lowering".

At the beginning of the twilight function, the actuator lowers the blind/shutter.

- Set the parameter "Start of twilight function" to "Approach position". Set the position of the Venetian blind and the slats or the position of the shutter/awning. Set the position of the Venetian blind and the slats or the position of the shutter/awning.

At the beginning of the twilight function, the actuator recalls the set position value for the output concerned.

- Set the parameter "Start of twilight function" to "Internal scene recall". Configure the internal scene to be recalled (parameter "Scene number").

At the beginning of the twilight function, the actuator recalls the position value for the output concerned which was preset in the scene configuration. This is not a scene recall as in direct operation, but only an approach to the corresponding scene position value.

At the end of the twilight function, the output concerned will show the preset reaction if no function with a higher priority is active at the time of deactivation.

The twilight function must be enabled.

- Set the parameter "End of twilight function" to "No reaction".

At the end of the twilight function, the relay of the output shows no reaction. Any travel movements still in progress at this instant will still be finished.

- Set the parameter "End of twilight function" to "raising".

The actuator raises the curtain.

- Set the parameter "End of twilight function" to "lowering".

The actuator lowers the curtain.

- Set the parameter "End of twilight function" to "Approach position". Set the position of the Venetian blind and the slats or the position of the shutter/awning. Set the position of the Venetian blind and the slats or the position of the shutter/awning.

At the beginning of the twilight function, the actuator recalls the set position value for the output concerned.

14.2.8.1 Parameters for the twilight function

Outputs -> Switching / Venetian blind -> VB... - General -> Twilight function

Start of twilight function	no reaction raise lower Approach position Internal scene recall

The behaviour of the output at the beginning of twilight is set here.

no reaction: At the beginning of twilight, the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished.

raising: The actuator raises the blind/shutter at the beginning of twilight.

lowering: The actuator lowers the blind/shutter at the beginning of twilight.

Approach position: The output moves to a fixed parameterised blind/shutter position at the beginning of twilight.

Internal scene recall: At the beginning of twilight, the actuator recalls the position values for the affected output which were preset in the scene configuration. This is not a scene recall as in direct operation, but only an approach of the corresponding scene position values. Visible only if the scene function is enabled for this output.

Venetian blind position	0 ... 60 ...100%
Slat position	0 ... 100 %
Shutter/awning position	0 ... 60 ...100%

This parameter sets the blind/shutter position value to be approached at the beginning of twilight.

This parameter is only visible if the parameter "Start of twilight function" is set to "approach position".

These parameters are visible, depending on the blind/shutter type.

Internal scene recall at start of twilight	0 ... 10 ... 64

This parameter defines the internal scene which is recalled at the beginning of twilight.

This parameter is only visible if the parameter "Start of twilight function" is set to "Internal scene recall".

End of twilight function	no reaction raise lower Approach position Track position

The behaviour of the output at the end of twilight is set here.

no reaction: At the end of twilight, the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished.

raising: The actuator raises the blind/shutter at the end of twilight.

lowering: The actuator lowers the blind/shutter at the end of twilight.

Approach position: The output moves to a fixed parameterised blind/shutter position at the end of twilight.

Tracking the position: At the end of the twilight function, the output will be set to the state last set statically before the twilight function or to the state tracked and internally stored during the twilight function. The position objects, the long-time object and the scene function are tracked.

Venetian blind position	0...100%
Slat position	0...100%
Shutter/awning position	0...100%

This parameter sets the blind/shutter position value to be approached at the end of twilight.

This parameter is only visible if the parameter "End of twilight function" is set to "approach position".

These parameters are visible, depending on the blind/shutter type.

14.2.8.2 Object list for twilight function

Function	Name	Type	DPT	Flag
Twilight function - Activate/deactivate	VB ... - Input	1-bit	1,003	C, -, W, -, U

1-bit object used to activate or deactivate the twilight function.

14.2.9 Scene function

An actuator can hold up to 64 scenes for each output and store scene position values for the height of a Venetian blind, shutter or awning or the venting louver / roof window position. In the 'Venetian blinds' operation, the user can also preset slat positions. The scene values are recalled or stored via a separate scene extension object. The data point type of the extension object allows all 64 scenes to be addressed.

The scene function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" for each Venetian blind output, in order for the required communication objects and parameters (on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Scenes") to become visible.

The scene configuration selected in the parameterization decides whether the number of scenes is either variable (1 ... 64) or alternatively fixed to the maximum (64).

- Scene configuration = "variable (1 ... 64 scenes)"
With this setting, the number of scenes used can be selected anywhere in the range 1 to 64. The parameter "Number of scenes" decides how many scenes are visible for the switching output in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene.
- Scene configuration = "fixed (64 scenes)"
With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 64) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.

Like the output control via short time, long time, central or position telegrams, the scene function should be assigned to direct operation. For this reason, a recalled scene position can at any time be overridden by a manual control, a forced position or a safety function. The scene position last recalled can also be readjusted by other telegrams of the direct operation mode. The priority of direct operation and also of the scene function can be configured with respect to the sun protection function (cf. "Sun protection function").

Presetting a scene recall delay

Each scene recall of an output can optionally also be delayed. With this feature, dynamic scene sequences can be configured if several scene outputs are combined with cyclical scene telegrams.

Prerequisite

The scene function must be enabled on the parameter tab "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions".

- On the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Scenes", activate the "Delay scene recall" parameter.

The delay time is now activated and can be configured separately. The delay only influences the scene recall of the switching output. The delay time is started on arrival of a recall telegram. The corresponding scene will be recalled and the output set to the respective scene position value only after this time has elapsed.

- i** Each scene recall telegram restarts the delay time and retriggers it. If a new scene recall telegram is received while a delay is active (scene recall not yet executed), the old (and not yet recalled scene) will be rejected and only the scene last received executed.
- i** The scene recall delay has no influence on the storage of scene values. A scene storage telegram within a scene recall delay terminates the delay and thus the scene recall.

Setting the behaviour during ETS programming

When a scene is saved, the scene position values are stored permanently in the device. To prevent the stored values from being replaced during ETS programming of the application or of the parameters by the originally programmed scene position values, the actuator can inhibit overwriting of the scene values. As an alternative, the original values can be reloaded into the device during each programming run of the ETS.

Prerequisite

The scene function must be enabled on the parameter tab "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions".

- On the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Scenes", activate the parameter "Overwrite values stored in the device during the ETS programming operation".

During each ETS programming of the application or of the parameters, the scene position values configured in the ETS for the output concerned will be programmed into the actuator. Scene values stored in the device by means of a storage function will be overwritten, if any.

- Deactivate the parameter "Overwrite values stored in the device during the ETS programming operation".

Scene position values stored in the device with a storage function will be maintained. If no scene values have been stored, the position values last programmed in the ETS remain valid.

- i** When the actuator is commissioned for the first time, this parameter should be activated so that the output is initialised to valid scene position values.

Presetting scene numbers and scene positions

The presetting of the scene number depends on the selected scene configuration. With variable configuration the scene number (1...64) with which the scene is addressed, i.e. recalled or stored, must be determined for each scene of the output.

With a fixed scene configuration, the number of a scene is preset invariably. The data point type of the scene extension object permits addressing of up to 64 scenes max.

In addition to specifying the scene number, it must be defined which position is to be set for the output in case of a scene recall. In the "Venetian blind with slat" operation, two position values must be defined for the Venetian blind position and slat position.

Prerequisite

The scene function must be enabled on the parameter tab "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions".

- Only with variable scene configuration: On the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Scenes", set the parameter for each scene to the numbers with which the scenes are to be addressed.

A scene can be addressed with the configured scene number. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible.

- Only with fixed scene configuration: On the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Scenes" select or deselect the parameter "Scene active" if necessary.

Only selected scenes can be used. A deselected scene is deactivated and cannot be recalled or stored via the scene extension unit.

i If with variable scene configuration the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.

- On the parameter page "Outputs -> Switching / Venetian blind -> VB... General -> Scenes" for each scene, set the parameters "position of Venetian blind", "position of shutter/awning", "position of venting louvre / roof window" and "position of slat" to the desired position value (0 ... 100%) setting.

During a scene recall, the configured scene position is recalled and set on the output.

i The configured scene positions are then adopted in the actuator during programming with the ETS only if the parameter "Overwrite values stored in the device during ETS download" is activated.

i Before approaching the required scene position, the actuator may perform a reference movement, if the current position data is unknown (e. g. after an ETS programming operation or after switch-on of the bus voltage).

Setting the storage behaviour

The current position value of a Venetian blind, shutter, awning, venting louvre and also of a slat can be stored internally via the extension object on reception of a scene storage telegram. The position value can be influenced before storage by all functions of the output (e. g. short-time and long-time operation, central or scene recall telegram, safety and sun protection function and manual control).

Prerequisite

The scene function must be enabled on the parameter tab "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions".

- On the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Scenes", activate the "Storage function" parameter for each scene.

The storage function is activated for the scene in question. On reception of a storage telegram via the "Scene extension unit" object, the current position value will be internally stored.

- Deactivate the parameter "storage function" for each scene.

The storage function is deactivated for the scene in question. A storage telegram received via the "Scene extension unit" object will be rejected.

Optionally, a visual feedback via the output can be signalled when executing a storage command. As feedback, the drive connected to the output moves for the configured travel time of the visual feedback in the opposite direction to the last travel command and then back again. This enables the system operator to determine locally whether the desired scene position has been saved correctly in the actuator.

-  The visual feedback is only available in the "Venetian blind with slat" and "shutter/awning" operating modes.
- On the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Scenes", activate the parameter "Visual feedback for storage function". Set the duration of the travel movement for the directional travel of the visual feedback for the parameters "Venetian blind travel time" or "shutter/awning travel time".

When a storage function is executed, the visual feedback is activated immediately. The output travels in the opposite direction of the last move command and then back again for the duration of the configured travel time.

- Deactivate the parameter "visual feedback for storage function".

When storing a scene, the visual feedback is not executed. The actuator adopts the current position value of the output without special feedback.

-  The visual feedback is only executed if no other function with a higher priority (e. g. safety function) is active in the moment when the memory function is active.

14.2.9.1 Scene function parameters

Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions

Scene function	Checkbox (yes / no)
This parameter can be used to disable or to enable the scene function.	

Outputs -> Switching / Venetian blind -> VB... - General: -> Scenes

Delay scene recall	Checkbox (yes / no)
A scene is recalled via the scene extension object. If required, the scene recall can be delayed on reception of a recall telegram (parameter activated). The recall is alternatively made immediately on reception of the telegram (parameter deactivated).	

Delay time	0...59 min 0...10...59 s
This parameter specifies the length of the scene delay time.	

Visual feedback for storage function	Checkbox (yes / no)
Optionally, a visual feedback via the output can be signalled when executing a storage command. As feedback, the drive connected to the output moves for the configured travel time of the visual feedback in the opposite direction to the last travel command and then back again. Parameter activated: When a storage function is executed, the visual feedback is activated immediately. The output travels in the opposite direction of the last move command and then back again for the duration of the configured travel time. Parameter deactivated: When storing a scene, the visual feedback is not executed. The actuator adopts the current position value of the output without special feedback. This parameter is only available in the "Venetian blind with slat" and "shutter/awning" operating modes.	

Venetian blind travel time	1...2...59 s
Setting the travel time for the visual feedback. This parameter is only available if the visual feedback is used and the operation is set to "Venetian blind with slat".	

Shutter/awning travel time	1...2...59 s
Setting the travel time for the visual feedback. This parameter is only available if the visual feedback is used and the operation is set to "shutter/awning".	

Overwrite values stored in the device during the ETS programming operation	Checkbox (yes / no)
During storage of a scene, the scene position values are stored internally to memory in the device. To prevent the stored values from being replaced during ETS programming by the originally programmed scene position values, the actuator can inhibit overwriting of the scene values (parameter deactivated). As an alternative, the original values can be reloaded into the device during each programming run of the ETS (parameter activated).	
Scene configuration	variable (1...64 scenes) fixed (64 scenes)
The scene configuration selected here decides whether the number of scenes is either variable (1 ... 64) or fixed to the maximum (64). variable (1...64 scenes): In this setting, the number of scenes used can be selected anywhere within the range of 1 to 64. The parameter "Number of scenes" decides how many scenes are visible for the output in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene. fixed (64 scenes): With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 64) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.	
Number of scenes	1... 10 ...64
This parameter is only available with variable scene configuration and defines how many scenes are visible for the output in the ETS and can therefore be used.	
Scene number	0...1*...64 *: The predefined scene number is dependent on the scene (1...64).
With variable scene configuration, the number of scenes used can be selected anywhere in the range 1 to 64. It is then possible to preset which scene number (1 ... 64) controls each scene. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible. If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case. This parameter is only available with variable scene configuration.	
Scene active	Checkbox (yes / no)
With a fixed scene configuration, individual scenes can be activated or deactivated. Only activated scenes can be used. A deactivated scene cannot be recalled or stored via the scene extension unit. This parameter is only available with fixed scene configuration.	

Venetian blind position	0*...100 % *: The predefined position is dependent on the scene (1...64).
This parameter is used for configuring the position of the Venetian blind, which is set when the scene is recalled. This parameter is only available in the "Venetian blind with slat" operation.	
Slat position	0*...100 % *: The predefined position is dependent on the scene (1...64).
This parameter is used for configuring the position of the slat, which is set when the scene is recalled. This parameter is only available in the "Venetian blind with slat" operation.	
Shutter/awning position	0*...100 % *: The predefined position is dependent on the scene (1...64).
This parameter is used for configuring the position of the shutter or awning , which is set when the scene is recalled. This parameter is only available in the "Shutter/awning" operation.	
Venting louvre/roof window position	0*...100 % *: The predefined position is dependent on the scene (1...64).
This parameter is used for configuring the position of the venting louvre or roof window, which is set when the scene is recalled. This parameter is only available in the "venting louvre / roof window" operation.	
Memory function	Checkbox (yes / no)
If the parameter is activated, the storage function of the scene is enabled. The current position value can then be stored internally via the extension object on receipt of a storage telegram. If the parameter is deactivated, the storage telegrams are rejected.	

14.2.9.2 Object list scene function

Function	Name	Type	DPT	Flag
Scenes - Extension unit	VB ... - Input	1-byte	18,001	C, -, W, -, U
1-byte object for calling or saving a scene.				

14.2.10 Ventilation function

Ventilation function

In "Venetian blind with slats" and "Shutter/awning" operating modes, the ventilation function can be activated. The ventilation function allows slat opening on a Venetian blind, for example, or the opening of the shutter after a window casement has been opened or tilted. The position of the window can be detected by one or two contacts on the window frame or on the window latch.

Depending on the blind/shutter type and the available contacts, the positions of the blind/shutter and/or the slats can be set for open and tilted windows. If the blind/shutter is located below the parameterised ventilation position, the ventilation function is activated when the window is opened/tilted and the blind/shutter is moved to the set position.

If there are two contacts present for distinguishing between an open window and a tilted window, these two contacts are actuated one after the other when the window is tilted. This could lead to a jolting movement of the blind/shutter when it first approaches the ventilation position for the open window and immediately afterwards the ventilation position for the tilted window. For this reason, the Venetian blind actuator waits for a settable time after receiving the "Window opened" telegram. If, in this time, it receives the "Window tilted" telegram, it moves the blind/shutter directly to the ventilation position for the tilted window. If the Venetian blind actuator does not receive a "Window tilted" telegram, it moves the blind/shutter to the ventilation position for the open window.

The reaction on closing the window can either be permanently set or controlled via an object. The reactions set for day operation and night operation can be different. One of two different objects can be used for selection between day operation and night operation via an object:

- The 1-bit object "Ventilation function - Day/night - Switchover" has the data point type 1.024 DPT_Day/Night. The value "0" means night. The value "1" means day.
- The 1-byte object "Scenes - Extension unit" has the data point type 18,001 DPT_SceneControl. A scene number from 1 to 64 can be set for day operation and another for night operation.

i The ventilation function cannot be configured in the "Venting louvre / roof window" operation.

Activating the ventilation function

The ventilation function can be activated independently for each Venetian blind or shutter/awning output on the parameter page "Outputs -> Switching / Venetian blind -> VB... - Enabled functions".

The operation must be set to "Venetian blind with slats" or "Shutter/awning" mode.

- Activate the checkbox "Ventilation function".

The parameter page

"Outputs -> Switching / Venetian blind -> VB... - Ventilation function" is enabled and the ventilation function is activated.

-  The ventilation function cannot be configured in the "Venting louvre / roof window" operation.
-  The ventilation function cannot be configured together with the supplementary function "End position correction" or "Fabric stretching".

Setting the ventilation function

The ventilation function can be enabled independently for each Venetian blind or shutter/awning output by the parameters on the parameter page "Outputs -> Switching / Venetian blind -> VB... - Enabled" functions. If the function is enabled, the parameter page "Outputs -> Switching / Venetian blind -> VB..." - General -> Ventilation function" appears.

The ventilation function must be enabled.

- The parameter "Ventilation function trigger" is used to set whether only an opened window or also a tilted window is to be evaluated.
- Set the object values for an opened window and/or a tilted window according to the number of contacts. If two contacts are evaluated, the two parameters "Object polarity ..." must not be identical.
- If two contacts are evaluated, set the evaluation delay to prevent jerky movement when the drive approaches two separate positions one immediately after the other.
- Set the positions of the blind/shutter for an opened window and/or a tilted window according to the blind/shutter type and the number of window contacts.
- Use the parameter "Behaviour" to determine whether the blind/shutter is always to show the same reaction when the window is closed (setting "fixed") or whether the reaction is to be different in day operation and night operation (setting "dynamic (day-night switchover)").
- If the blind/shutter is always to show the same reaction when the window is closed, use the parameter "Position" to set whether the blind/shutter is to retain the ventilation position, approach a defined position, or track the position.
- If the reaction of the blind/shutter is to be different in day operation and night operation, use the parameter "Day/night switchover via" to set whether the 1-bit object "Ventilation position - Day/night switchover" or the 1-byte object "Scenes - Extension unit" is to be used. The object "Scenes - Extension unit" will be available only if the scene function is enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - Enabled functions".
- If the object "Scenes - Extension unit" is used, set the scene numbers for day operation and night operation.
- Use the parameters "Day operation position" and "Night operation position" to set whether the blind/shutter is to retain the ventilation position, approach a defined position, or track the position.

14.2.10.1 Parameters for ventilation function

Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions

Ventilation function	Checkbox (yes / no)
The ventilation function can be disabled or enabled here.	

Outputs -> Switching / Venetian blind -> VB... - General -> Ventilation function

Window contacts

Trigger ventilation function	Open window (1 contact) Open and tilted window (2 contacts)

The parameter defines whether the ventilation position of the blind/shutter is only to be activated for an open window or whether separate ventilation positions are to be available for an open window and for a tilted window.

Additional parameters and communication objects are displayed depending on this parameter setting.

This parameter is only available if the ventilation function is enabled.

Object polarity	0 = window open / 1 = window closed 1 = window open / 0 = window closed

Depending on the window contact used and the setting of the connected binary input, the value of the communication object "Ventilation function - Window contact 1 - Activate/Deactivate" at which the ventilation function is activated when the window is opened is set here.

This parameter is only available if "one contact for opened window" is selected.

Object polarity	Contact 1	Contact 2
Window opened	0 / 1	0 / 1
Window tilted	0 / 1	0 / 1

Depending on the window contacts used and the setting of the connected binary inputs, the values of the communication objects "Ventilation function - Window contact 1 - Activate/Deactivate" and "Ventilation function - Window contact 2 - Activate/Deactivate" at which the ventilation function is activated when the window is opened and tilted are set here.

The settings of these two parameters must be different.

If none of the conditions for an opened or tilted window is met, the window is considered to be closed.

This parameter is only available if two contacts are selected for distinguishing between an opened window and a tilted window.

Evaluation delay between window contacts 1 and 2	0 ... 2 ... 30 s
If two window contacts are used to distinguish between a tilted window and an open window, a time offset generally occurs between actuation of the first contact and actuation of the second contact. The delay can be set here. This parameter is only available if two contacts are selected for distinguishing between an opened window and a tilted window.	

Ventilation position

Window opened	
Venetian blind	0 ... 60 ... 100%
Slat	0 ... 100%
Shutter/awning	0 ... 60 ... 100%
Window tilted	
Slat	0 ... 80 ... 100%
Venetian blind	0 ... 100%
Shutter/awning	0 ... 80 ... 100%
Depending on the blind/shutter type and the window contacts present, up to four values can be set here for the ventilation positions.	

Window closed again

Behaviour	Fixed dynamic (day-night switchover)
If the same reaction is always to occur at the end of the ventilation function, the setting "fixed" must be selected here. The following parameter "Behaviour" is then displayed. If the blind/shutter is to react differently when the window is closed during the day and at night, the setting "dynamic (day-night switchover)" must be selected here. The parameter for selecting the object with which the switchover between day operation and night operation is to occur is then displayed.	
Position	no reaction Approach position Track position
This parameter defines the behaviour of the blind/shutter if no distinction is to be made between day operation and night operation. no reaction: The blind/shutter remains in the current position. Approach position: Depending on the blind/shutter type, a fixed position can be set with the following parameter. Track position: When the window is closed, the last state set before the ventilation function or the state tracked during the ventilation function is set at the output.	

Venetian blind	0 ... 80 ... 100%
Slat	0 ... 80 ... 100%
Shutter/awning	0 ... 80 ... 100%
If a fixed position is to be approached when closing the window with no distinction between day and night operation, the position can be set here dependent on the blind/shutter type.	
Day/night switchover via	1-bit object Scene extension unit
This parameter determines which object is used for the switchover between day operation and night operation. The option "Scene extension unit" is available only if the scene function is activated on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions".	
Object polarity	0 = day operation / 1 = night operation 1 = day operation / 0 = night operation
In the case of switchover between day operation and night operation via a 1-bit object, the polarity of the object can be set here.	
Scene number day operation	1 ... 64
Scene number night operation	1 ... 2 ... 64
If the scene extension unit is used for switchover between day operation and night operation, the corresponding scene numbers can be set here. The two scene numbers must be different.	
Day operation position	no reaction Approach position Track position
This parameter defines the behaviour of the blind/shutter when the window is closed during the day if a distinction is made between day operation and night operation. no reaction: The blind/shutter remains in the current position. Approach position: Depending on the blind/shutter type, a fixed position can be set with the following parameter. Tracking the position: When the window is closed, the last state set before the ventilation function or the state tracked during the ventilation function is set at the output.	
Venetian blind	0 ... 80 ... 100%
Slat	0 ... 80 ... 100%
Shutter/awning	0 ... 80 ... 100%
If a fixed position is to be approached when closing the window in day operation, the position can be set here dependent on the blind/shutter type.	

Night operation position	no reaction Approach position Track position
This parameter defines the behaviour of the blind/shutter when the window is closed during the night if a distinction is made between day operation and night operation. no reaction: The blind/shutter remains in the current position. Approach position: Depending on the blind/shutter type, a fixed position can be set with the following parameter. Track position: When the window is closed, the last state set before the ventilation function or the state tracked during the ventilation function is set at the output.	
Venetian blind	0 ... 80 ... 100%
Slat	0 ... 80 ... 100%
Shutter/awning	0 ... 80 ... 100%
If a fixed position is to be approached when closing the window in night operation, the position can be set here dependent on the blind/shutter type.	

14.2.10.2 Object list for ventilation function

Function	Name	Type	DPT	Flag
Ventilation function - Window contact 1 - Activate/deactivate	VB ... - Input	1-bit	1,019	C, -, W, -, U
Ventilation function - Window contact 2 - Activate/deactivate	VB ... - Input	1-bit	1,019	C, -, W, -, U
1-bit objects for starting or ending the ventilation function				
Function	Name	Type	DPT	Flag
Ventilation function - Day/night - Switchover	VB ... - Input	1-bit	1,024	C, -, W, -, U
1-bit objects for switchover between day and night operation				

14.2.11 Disabling function and forced position

A disabling function, or alternatively, a forced position function can be configured for each Venetian blind output. In this respect, only one of these functions can be enabled for one Venetian blind output.

Setting the disabling function

During an active disabling function, the KNX control of the output concerned is overridden and locked. The disabling function has the second highest priority after manual control. Therefore, an active disabling function overrides the sun protection function and the direct operation (short-time, long-time telegram, scenes, positioning, central). Permanent locking for service purposes (drive stop) or as lock-out protection (raising Venetian blind), for example, can also be overridden.

The deactivation of the disabling function can optionally take place using an additional 1-bit acknowledgement object. This prevents the deactivation of the disabling function by the disabling object.

- On the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" Set the parameter "disabling function / forced position" to "disabling function".

The disabling function is enabled. The communication object "Disabling function - Activate / deactivate" and the parameters of the disabling function on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Disabling function" become visible. The polarity of the disabling object is predefined (1 = output disabled, 0 = output enabled).

- Set the parameter "Beginning of the disabling function" to the required behaviour.

At the beginning of the disabling function (ON telegram to the disabling object), the configured behaviour will be executed and the bus control of the output locked.

no reaction: The relay of the output shows no reaction and remains in the position last set.

stop: At the beginning of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

raising / opening: The actuator raises the blind or opens the venting louvre / roof window.

lowering / closing: The actuator lowers the blind/shutter or closes the venting louvre / roof window.

Approach position: At the beginning of the disabling function, the connected drive can approach a position (0...100%) specified by further parameters. If Venetian blinds are controlled with the device, the slats can be positioned in-

dependently. The actuator performs a reference movement before the position approach, because the current position at the time of the disabling function is unknown.

For disabling function without acknowledgement object...

- Deactivate the parameter "Use acknowledgement".

No additional acknowledgement object is available. The disabling function is deactivated via the disabling object by means of an "OFF" telegram.

- Set the parameter "End of the disabling function" to the required behaviour.

At the end of the disabling function, the configured behaviour will be executed and the bus control of the output enabled again.

no reaction: The relay of the output shows no reaction and remains in the position last set.

stop: At the end of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

raising / opening: The actuator raises the blind or opens the venting louvre / roof window.

lowering / closing: The actuator lowers the blind/shutter or closes the venting louvre / roof window.

Track position: The last switching state received during the disabling function or the last position set before the disabling function (terminated travel movement) will be tracked.

For disabling function with acknowledgement object...

- Activate the parameter "Use acknowledgement".

The acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an ON telegram. OFF telegrams to the disabling object or to the acknowledgement object are ignored by the actuator.

- Set the parameter "End of the disabling function after acknowledgement" to the required behaviour.

After an acknowledgement, the configured behaviour will be executed and the bus operation of the output enabled again.

no reaction: The relay of the output shows no reaction and remains in the position last set.

stop: At the end of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

raising / opening: The actuator raises the blind or opens the venting louvre / roof window.

lowering / closing: The actuator lowers the blind/shutter or closes the venting louvre / roof window.

Track position: The last switching state received during the disabling function or the last position set before the disabling function (terminated travel movement) will be tracked.

- i** After a bus voltage failure or after programming the application or the parameters with the ETS, the disabling function is always deactivated (object value "0").
- i** Updates of the disabling object from "activated" to "deactivated" do not produce a reaction.
- i** The relay of a dimming channel disabled output via the KNX can still be operated manually!

Status message of the disabling function

- Activate the parameter "Status object".

The status object is available. The object sends a telegram with the value "1" if the disabling function is active. The object sends a telegram with the value "0" if the disabling function is inactive.

Setting forced position function

The forced position function can be enabled for each output. The forced position has the second highest priority after manual control. It therefore overrides the safety function, the sun protection function and the direct operation (short-time, long-time telegram, scenes, positioning, central). During a forced-position state, the output concerned is locked so that it can no longer be controlled with functions of a lower priority, but only with a manual control. At the end of a manual control, the forced-position action is re-executed if the forced position is still active.

The forced position function possesses a separate 2-bit communication object. The first bit (bit 0) of the object "Forced position - Activate / Deactivate" indicates whether the Venetian blind output is raised or lowered under forced control. The second bit (bit 1) activates or deactivates the restraint (see table below).

The behaviour of a Venetian blind output at the end of the forced-position function can be configured. In addition, the forced object can be initialised when the bus voltage returns.

Bit 1	Bit 0	Function
0	x	Forced position not active -> normal control
1	0	Forced position active, raising/opening
1	1	Forced position active: lowering / closing

Table 2: Bit coding of forced position

The forced travel time required by an output to move the drive into the end positions is determined by the "Travel time" parameter on the parameter page "Outputs -> switching / Venetian blind -> VO... - General -> Times". Like long time operation, a

forced-position movement is derived from the travel time.

Downward movement: travel time + 20%; Upward movement: travel time + 20% + configured travel time extension. Forced movements cannot be retrIGGERED.

- i** The slats of blinds are not repositioned at the end of forced movements into the end positions.
- i** Updates of the forced position object from "forced position active" to "forced position active" while maintaining the forced movement direction or from "forced position inactive" to "forced position inactive" show no reaction.
- i** After programming of the application or of the parameters with the ETS, the forced position is always cancelled.
- i** The current state of the forced position function will be stored in case of bus voltage failure.
- On the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions" Set the parameter "disabling function" to "forced position".

The forced position function is enabled. The communication object "Forced position - Activate / Deactivate" and the parameter of the forced position function on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Forced position" become visible.

- Set the parameter "End of the forced position" to the required behaviour.

At the end of the forced position, the configured behaviour will be executed and the bus control of the Venetian blind output enabled again.

Track position: At the end of a forced position function, the output will be set to the state adjusted statically before the forced position function or to the state tracked and internally stored during the forced position function. The position objects, the long-time object and the scene function are tracked.

no change: At the end of forced position function, the state last adjusted will not be changed. Thereafter, the output is again enabled. Any travel movements still in progress at this instant will still be finished.

- i** Parameter setting "tracking the position": The actuator can track absolute positions (position telegram, scene value) during activated forced control only if the position data are known and if positions have been predefined. If this is not the case, no reaction takes place at the time forced control is enabled. Position data can be tracked, if the output has been in a defined position before the forced position function or if a new position telegram has been received via the position objects while the forced position function was interlocked. In the latter case, a reference movement will be executed when the forced position function is enabled, if the position was unknown before or during the safety interlock. Known slat positions will also be tracked as described. This is also the case, when the height of the Venetian blind is unknown. Long time movements (movements without position preset) will, however, always be tracked.

- i** The preset behaviour at the "end of the forced position function" will only be executed, if the output passes over to direct operation at the end of the forced position function. If a safety function or a sun protection function is activated (independent of the preset priority with respect to direct operation), the function with the next lower priority will be executed. The configured behaviour is not executed when the forced position is terminated by a specification when the bus voltage returns. In this case the set behaviour "After bus voltage returns" will be evaluated.

The forced position communication object can be initialised after the bus voltage returns. In this way, an output can be influenced and locked on bus initialisation when the forced position function is being activated.

- Set the parameter "After bus voltage returns" to the required behaviour.

After the bus voltage returns, the configured state is transferred to the "Forced position – Activate / Deactivate" communication object. When a forced position is activated, the output is immediately activated and interlocked accordingly by forced control after the bus voltage returns until a forced position is enabled via the KNX. The parameter "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General" is not evaluated for the affected output in this case.

no forced position active: The forced position is deactivated after the bus voltage returns. In this case, the set behaviour "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General" will be executed when the bus voltage returns.

Forced position function ON, raising or forced position function ON, opening: After the bus voltage returns, the forced position is activated and the blind raised or the venting louvre / roof window opened. The output concerned is interlocked by forced control until an enable signal is received via the KNX. The set behaviour "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General" is not evaluated for the affected output in this case.

Forced position function ON, lowering or forced position function ON, closing: After the bus voltage returns, the forced position is activated and the blind closed or the venting louvre / roof window closed. The output concerned is interlocked by forced control until an enable signal is received via the KNX. The set behaviour "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General" is not evaluated for the affected output in this case.

State of the forced position before bus voltage failure: The forced position state last selected and internally stored before bus voltage failure will be tracked after the bus voltage returns. An ETS programming operation deletes the stored state (reaction in that case same as with "no forced position active"). If the tracked state corresponds to "No forced position active", the behaviour "After bus voltage returns" on the parameter page "Relay outputs... - VB... - General" will be executed when the bus voltage returns.

- i** After programming the application or parameters with the ETS, the forced position function is always deactivated (object value "0").

14.2.11.1 Disabling function and forced position parameters

Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions

Forced position / Disabling function	no selection Disabling function Priority control
It can be defined here whether a disabling function or a forced position for the Venetian blind output should be available. The disabling function is only configurable as an alternative to the forced position function.	

Outputs -> Switching / Venetian blind -> VB... - General -> Disabling function

Status object	Checkbox (yes / no)
The parameter determines whether the communication object "Disabling function - Status" is visible. Parameter activated: The status object is available. The object sends a telegram with the value "1" if the disabling function is active. The object sends a telegram with the value "0" if the disabling function is inactive. Parameter deactivated: No additional status object is available.	
Acknowledgement	Checkbox (yes / no)
The deactivation of the disabling function can optionally take place using an additional 1-bit acknowledgement object. This prevents the deactivation of the disabling function by the disabling object. Alternatively, the acknowledgement object is not available. In this case, disabling is deactivated via the disabling object. Parameter activated: The acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an ON telegram. OFF telegrams to the disabling object are ignored by the actuator. Parameter deactivated: No additional acknowledgement object is available. The disabling function can be deactivated via the disabling object by means of an "OFF" telegram.	

Beginning of disabling function	no reaction stop raise lower Approach position
The behaviour of the output at the beginning of the disabling function can be configured. This parameter is visible only if the disabling function is enabled. no reaction: The relay of the output shows no reaction and remains in the position last set. stop: At the beginning of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. raising: The actuator raises the blind/shutter. lowering: The actuator lowers the blind/shutter. Approach position: At the beginning of the disabling function, the connected drive can approach a position (0...100%) specified by further parameters. If Venetian blinds are controlled with the device, the slats can be positioned independently. The actuator performs a reference movement before the position approach, because the current position at the time of the disabling function is unknown. This parameter is only available in the "Venetian blind with slat" and "shutter/awning" operating modes.	
Beginning of disabling function	no reaction stop open close Approach position
The behaviour of the output at the beginning of the disabling function can be configured. This parameter is visible only if the disabling function is enabled. no reaction: The relay of the output shows no reaction and remains in the position last set. stop: At the beginning of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. open: The actuator opens the venting louvre / roof window. close: The actuator closes the venting louvre / roof window. Approach position: At the beginning of the disabling function, the connected drive can approach a position (0...100%) specified by further parameters. If Venetian blinds are controlled with the device, the slats can be positioned independently. The actuator performs a reference movement before the position approach, because the current position at the time of the disabling function is unknown. This parameter is only available in the "venting louvre / roof window" operation.	

Venetian blind position	0 ... 100%
This parameter sets the position value of the Venetian blind to be approached at the beginning of the disabling function. This parameter is only visible if the parameter "beginning of the disabling function" is set to "approach position". This parameter is only visible in the "Venetian blind with slat" operation.	
Slat position	0 ... 100%
This parameter sets the position value of the slat to be approached at the beginning of the disabling function and, as the case may be, after positioning of the Venetian blind. This parameter is only visible if the parameter "beginning of the disabling function" is set to "approach position". This parameter is only visible in the "Venetian blind with slat" operation.	
Shutter/awning position	0 ... 100%
This parameter sets the position value of the shutter or awning to be approached at the beginning of the disabling function. This parameter is only visible if the parameter "beginning of the disabling function" is set to "approach position". This parameter is only visible in the shutter/awning operation.	
Venting louvre/roof window position	0 ... 100%
This parameter sets the position value of the venting louvre or roof window to be approached at the beginning of the disabling function. This parameter is only visible if the parameter "beginning of the disabling function" is set to "approach position". This parameter is only visible in the "venting louvre / roof window" operation.	

End of disabling function	no reaction stop raise lower Track position
The behaviour of the output at the end of the disabling function can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is not used. no reaction: The relay of the output shows no reaction and remains in the position last set. stop: At the end of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. raising: The actuator raises the blind/shutter. lowering: The actuator lowers the blind/shutter. Track position: The last switching state received during the disabling function or the last position set before the disabling function (terminated travel movement) will be tracked. This parameter is only available in the "Venetian blind with slat" and "shutter/awning" operating modes.	

End of disabling function	no reaction stop open close Track position
The behaviour of the output at the end of the disabling function can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is not used. no reaction: The relay of the output shows no reaction and remains in the position last set. stop: At the end of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. open: The actuator opens the venting louvre / roof window. close: The actuator closes the venting louvre / roof window. Track position: The last switching state received during the disabling function or the last position set before the disabling function (terminated travel movement) will be tracked. This parameter is only available in the "venting louvre / roof window" operation.	

End of disabling function after acknowledgement	no reaction stop raise lower Track position

The behaviour of the output at the end of the disabling function can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is not used.

no reaction: The relay of the output shows no reaction on acknowledgement and remains in the position last set.

stop: On acknowledgement, The actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

raising: The actuator raises the blind/shutter on acknowledgement.

lowering: The actuator lowers the blind/shutter on acknowledgement.

Track position: The last switching state received during the disabling function or the last position set on acknowledgement (terminated travel movement) will be tracked.

This parameter is only available in the "Venetian blind with slat" and "shutter/awning" operating modes.

End of disabling function after acknowledgement	no reaction stop open close Track position

The behaviour of the output at the end of the disabling function can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is not used.

no reaction: The relay of the output shows no reaction on acknowledgement and remains in the position last set.

stop: On acknowledgement, The actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

open: The actuator opens the venting louver / roof window on acknowledgement.

close: The actuator closes the venting louver / roof window on acknowledgement.

Track position: The last switching state received during the disabling function or the last position set on acknowledgement (terminated travel movement) will be tracked.

This parameter is only available in the "venting louver / roof window" operation.

Outputs -> Switching / Venetian blind -> VB... - General -> Forced position

End of forced position	Track position
	no change
At the end of the forced position, the configured behaviour will be executed and the bus control of the Venetian blind output enabled again. This parameter is only visible when the forced position function is enabled. Track position: At the end of a forced position function, the output will be set to the state adjusted statically before the forced position function or to the state tracked and internally stored during the forced position function. The position objects, the long-time object and the scene function are tracked. no change: At the end of forced position function, the state last adjusted will not be changed. Thereafter, the output is again enabled. Any travel movements still in progress at this instant will still be finished.	

After the bus voltage returns	no forced position active Forced position on, raising Forced position on, lowering State of forced position before bus voltage failure
After the bus voltage returns, the configured state is transferred to the "Forced position" communication object. When a forced position is activated, the output is immediately activated and interlocked accordingly by forced control after the bus voltage returns until a forced position is enabled via the KNX. The parameter "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General" is not evaluated for the affected output in this case. This parameter is only visible when the forced position function is enabled. no forced position active: The forced position is deactivated after the bus voltage returns. In this case, the set behaviour "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General" will be executed when the bus voltage returns. Forced position ON, raising: After the bus voltage returns, the forced position is activated and the blind raised. The output concerned is interlocked by forced control until an enable signal is received via the KNX. The behaviour "After bus voltage returns" set on the parameter page "Relay outputs... - VB... - General" is not evaluated for the affected output in this case. Forced position ON, lowering: After the bus voltage returns, the forced position is activated and the blind lowered. The output concerned is interlocked by forced control until an enable signal is received via the KNX. The behaviour "After bus voltage returns" set on the parameter page "Relay outputs... - VB... - General" is not evaluated for the affected output in this case. State of the forced position before bus voltage failure: The forced position state last selected and internally stored before bus voltage failure will be tracked after the bus voltage returns. An ETS programming operation deletes the stored state (reaction in that case same as with "no forced position active"). If the tracked state corresponds to "No forced position active", the behaviour "After bus voltage returns" on the parameter page "Relay outputs... - VB... - General" will be executed when the bus voltage returns. This parameter is only available in the "Venetian blind with slat" and "shutter/awning" operating modes.	

After the bus voltage returns	no forced position active Forced position ON, open Forced position ON, close State of forced position before bus voltage failure
After the bus voltage returns, the configured state is transferred to the "Forced position" communication object. When a forced position is activated, the output is immediately activated and interlocked accordingly by forced control after the bus voltage returns until a forced position is enabled via the KNX. The parameter "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General" is not evaluated for the affected output in this case. This parameter is only visible when the forced position function is enabled. no forced position active: The forced position is deactivated after the bus voltage returns. In this case, the set behaviour "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General" will be executed when the bus voltage returns. Forced position function ON, opening: After the bus voltage returns, the forced position is activated and the venting louvre / roof window opened. The output concerned is interlocked by forced control until an enable signal is received via the KNX. The behaviour "After bus voltage returns" set on the parameter page "Relay outputs... - VB... - General" is not evaluated for the affected output in this case. Forced position function ON, closing: After the bus voltage returns, the forced position is activated and the venting louvre / roof window closed. The output concerned is interlocked by forced control until an enable signal is received via the KNX. The set behaviour "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General" is not evaluated for the affected output in this case. State of the forced position before bus voltage failure: The forced position state last selected and internally stored before bus voltage failure will be tracked after the bus voltage returns. An ETS programming operation deletes the stored state (reaction in that case same as with "no forced position active"). If the tracked state corresponds to "No forced position active", the behaviour "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General" will be executed when the bus voltage returns. This parameter is only available in the "venting louvre / roof window" operation.	

14.2.11.2 Object list disabling function and forced position

Function	Name	Type	DPT	Flag
Forced position - Activate/deactivate	VB ... - Input	2-bit	2,001	C, -, W, -, U
2-bit object for the forced position of a Venetian blind output. The polarity is fixed by the telegram.				
Function	Name	Type	DPT	Flag
Disabling function - Activate/deactivate	VB ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for disabling an active Venetian blind output ("1" = disabling function active, "0" = disabling function inactive).				
Function	Name	Type	DPT	Flag
Disabling function - Acknowledgement	VB ... - Input	1-bit	1,016	C, -, W, -, U
1-bit object to acknowledge an active disabling function of a Venetian blind output. This object is only visible if the acknowledgement is to be used with the disabling function ("1" = Disabling function is deactivated / "0" = disabling function remains active).				
Function	Name	Type	DPT	Flag
Disabling function - Status	VB ... - Output	1-bit	1,003	C, R, -, T, A
1-bit object to acknowledge an active disabling function of a Venetian blind output. This object is only visible if the acknowledgement is to be used with the disabling function ("1" = Disabling function is deactivated / "0" = disabling function remains active).				

14.2.12 Door contact block

In "Venetian blind with slats" and "Shutter/awning" operating modes, door contact disabling can be activated. Door contact disabling prevents the blind/shutter from closing while a balcony or patio door is open so that persons are not locked out. While door contact disabling is active, only movements due to a forced position / disabling function or manual operation via the control panel buttons are executed.

Door contact disabling is started when the communication object "Door contact disabling - Activate / Deactivate" receives a telegram with the value "1". The reaction to this telegram can be set. The blind/shutter can retain its current status ("no reaction"), stop, move upwards to the end position, move downwards to the end position or move to a defined position.

Door contact disabling can be ended by one of two events. Either it is ended when the communication object "Door contact disabling - Activate / Deactivate" receives a telegram with the value "0" or it is ended when the optional communication object "Door contact disabling - Acknowledgement" receives a telegram with the value "1". The reaction to the end of door contact disabling can be set. The blind/shutter can retain its current status ("no reaction"), stop, move upwards to the end position, move downwards to the end position or move to a position triggered by events with a lower priority ("tracking the position"). After the end of door contact disabling, the controller is enabled again by all events with a lower priority.

The device can transmit the current status of the door contact disabling via the optional communication object "Door contact disabling - Status".

14.2.12.1 Parameters for door contact disabling

Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions

Door contact block	Checkbox (yes / no)
The door contact block can be disabled or enabled here.	

Outputs -> Switching / Venetian blind -> VB... - General -> Door contact block

Status object	Checkbox (inactive/ active)
If this parameter is activated, the ETS displays the optional communication object "Door contact disabling - Status".	

Acknowledgement	Checkbox (inactive/ active)
If this parameter is activated, the ETS displays the optional communication object "Door contact disabling - Acknowledgement". The door contact block can then be ended only by means of this communication object. Telegrams to the communication object "Door contact disabling - Activate / Deactivate" with the value "0" do not end door contact disabling.	

Start of the door contact block	no reaction stop raise lower Approach position
This parameter defines the reaction of the blind/shutter when door contact disabling is started via the communication object "Door contact disabling - Activate / Deactivate". no reaction: At the beginning of door contact disabling, the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished. stop: At the beginning of door contact disabling, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. raising: The actuator raises the blind/shutter at the beginning of door contact disabling. lowering: The actuator lowers the blind/shutter at the beginning of door contact disabling. Approach position: At the beginning of door contact disabling, the output controls the approach to a configured fixed Venetian blind and slat position. The position objects, the long-time object and the scene function are tracked. The behaviour preset in this parameter will only be executed if no function with a higher priority (e. g. disabling function) is activated at the beginning of door contact disabling.	

Venetian blind position	0 ... 100%
Slat position	0 ... 100%
Shutter/awning position	0 ... 100%
Depending on the blind/shutter type, the values for the blind/shutter position while door contact disabling is active can be set here.	

End of door contact block	no reaction stop raise lower Track position
End of door contact block after acknowledgement	no reaction stop raise lower Track position

Depending on the setting of the parameter "Acknowledgement", one of the two parameters is displayed.

The behaviour of the output at the end of door contact disabling is set here.

no reaction: At the end of door contact disabling, the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished.

stop: At the end of door contact disabling, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

raising: The actuator raises the blind/shutter at the end of door contact disabling.

lowering: The actuator lowers the blind/shutter at the end of door contact disabling.

Track position: At the end of door contact disabling, the output will be set to the state last adjusted before door contact disabling or to the state tracked and internally stored during door contact disabling. The position objects, the long-time object and the scene function are tracked.

The behaviour preset in this parameter will only be executed if no function with a higher priority (e. g. disabling function) is activated at the end of door contact disabling.

14.2.12.2 Object list for door contact disabling

Function	Name	Type	DPT	Flag
Door contact block - Activate/deactivate	VB ... - Input	1-bit	1,019	C, -, W, -, U
1-bit objects for starting or ending door contact disabling A telegram with the value "1" starts door contact disabling. Other telegrams with the value "1" are ignored. If acknowledgement is not activated, a telegram with the value "0" ends the function. Other telegrams with the value "0" are ignored.				
Function	Name	Type	DPT	Flag
Door contact block - Status	VB ... - Output	1-bit	1,003	C, R, -, T, A
When door contact disabling is activated, the object sends a telegram with the value "1". When door contact disabling is deactivated, the object sends a telegram with the value "0".				
Function	Name	Type	DPT	Flag
Door contact block - Acknowledgement	VB ... - Input	1-bit	1,016	C, -, W, -, U
A telegram with the value "1" ends door contact disabling. Other telegrams with the value "1" or telegrams with the value "0" are ignored.				

14.2.13 Supplementary functions

Depending on the operation set the actuator has up to two supplementary functions per output. In the "Shutter/Awning" operation, the supplementary function "lower end position correction" or "Fabric-stretching" can be configured in the ETS as an alternative. In the "Venetian blind with slats" operation, only the supplementary function "lower end position correction" can be configured. Only in the "Venting louvre / roof window" operation can no supplementary function be selected.

Whether a supplementary function is available, and, whichever that may be, is specified by the parameter of the same name on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions".

Fabric stretching

In the "Shutter/awning operation, the "Fabric stretching" function can be activated. The Fabric stretching function permits stretching the fabric of an awning tight after lowering.

If activated in the ETS parameters, fabric stretching is executed during each downward movement into any position after stopping and after the configured switchover delay has elapsed. The curtain is then 'stretched' by moving briefly into the opposite travel direction .

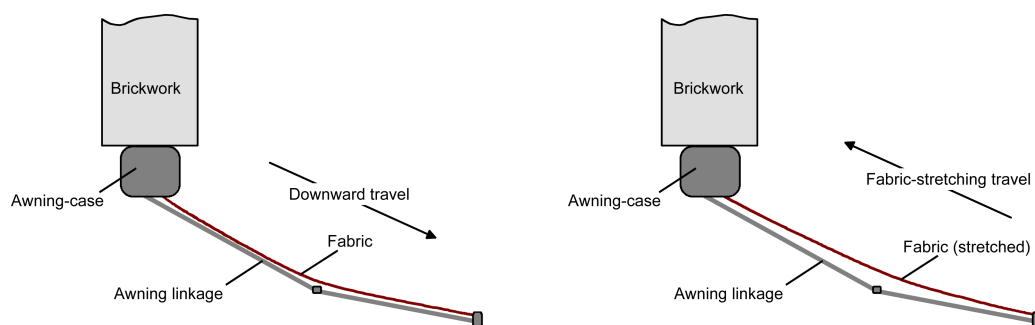


Figure 73: Fabric stretching in an awning

The downward travel can be triggered by any of the following events: Long-time, short-time or position telegram, forced position, safety or sun protection function, central telegram or scene recall and also the manual control.

Fabric stretching is never effected in upward movements (retraction of the awning).

- i** Fabric stretching affects the determination of positions and the position feedback since a fabric stretching movement changes the position of a shutter or an awning. After a positioning movement, the position value reported back after the fabric stretching operation will always be a smaller one.
- i** The Fabric stretching function cannot be configured as a supplementary function in the Venetian blind with slat" or "venting louvre / roof window" modes of operation.

Activating the fabric stretching function

The fabric stretching function can be activated independently for each Venetian blind or shutter on the parameter page

"Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions".

The operation must be set to "Shutter/awning".

- Set the parameter "supplementary function" to "Fabric stretching".

The parameter page

"Outputs -> Switching / Venetian blind -> VB... - General -> Fabric stretching" is enabled and the Fabric stretching function is activated.

- i** Fabric stretching can only be configured as an alternative to the function "lower end position correction".

Set fabric stretching function

The fabric stretching function can be activated independently for each shutter or awning output using the parameter "Supplementary function" on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". If the function is enabled, the parameter page "Outputs -> Switching / Venetian blind -> VB..." - General -> - Fabric stretching" appears in the ETS.

The Fabric stretching function must be enabled.

- Select the desired value for the "Time for fabric stretching" parameter.

After the end of a downward movement, the blind stops and – after the switchover time has elapsed – moves in the opposite direction for a period corresponding to the configured fabric stretching time.

- i** Set the time for fabric stretching to less than the predefined travel time of the shutter or awning. Otherwise, there is the risk of malfunction.
- i** Fabric stretching will only be effected if the downward movement lasts longer than the configured fabric stretching time.

Correction lower end position

In "Venetian blind with slats" and shutter/awning operating modes, the correction for the end position can be activated for the bottom end position (100%). The end position correction allows slat opening on a Venetian blind (e. g. ventilation function) or the opening of the shutter after the blind/shutter has moved downwards to the bottom end position.

The end position correction is activated after stopping at the bottom end position (completion of the extended long-time movement) and after the configured change-over time has elapsed. For correction, the blind/shutter is then moved briefly into the opposite travel direction, positioning the slats or opening the roller blind e. g. for the purpose of ventilation function.

The end position correction can either always be active, or it can be activated via a separate 1-bit communication object (e. g. controlled by a window contact. Application case: When the window is closed, the end position correction is not executed. With the window already open for ventilation.).

The end position correction is configured differently in the ETS depending on the operation. On a Venetian blind a slat position (0...100%) can be configured, which is switched to immediately after the downward movement to the bottom end position

through subsequent slat positioning. In contrast, a travel time is set for a shutter. This time defines the length of the downward movement of the roller blind when opening the shutter.

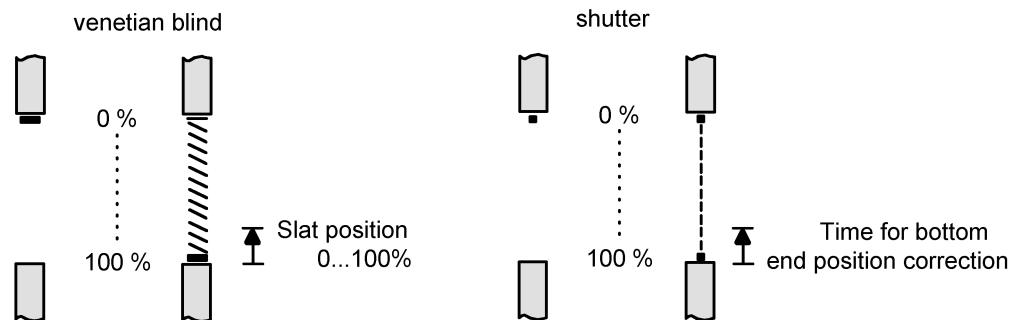


Figure 74: End position correction of a Venetian blind or shutter

The trigger of the downward movement to the lower end position for end position correction is either a long-time telegram or a central telegram (downwards). Other functions (short-time or position telegram, disabling function, forced position, safety/sun protection or scene recall as well as manual operation) do not cause end position correction!

The end position is corrected only if the Venetian blind or shutter was moved to the bottom end position (100 %). In contrast to fabric stretching, the end position is not corrected for positions deviating from this (0...99%).

- i** End position correction affects the determination of positions and the position feedback since the positioning of the slats or a downward movement changes the position of a venetian blind or a roller blind. In a positioning movement to the lower end position, the position value reported back after the end position correction will always be a smaller one.
- i** End position correction / ventilation function cannot be configured as an supplementary function in the venting louvre / roof window operation.

Activating end position correction

The correction of the lower end position can be activated independently for each Venetian blind or shutter/awning output on the parameter page "Outputs -> Switching / Venetian blind -> VB... - Enabled functions".

The operation must be set to "Venetian blind with slats" or "Shutter/awning" mode.

- Set the "Supplementary function" parameter to "Lower end position correction".

The parameter page

"Outputs -> Switching / Venetian blind -> VB... - Lower end position correction" is enabled and the end position correction is activated.

- i** End position correction cannot be configured as an additional function in the Venting louver operation.

- i** In "Shutter / Awning" operation, bottom end position correction can only be configured as an alternative to the "Fabric stretching" function.

Setting end position correction

The end position correction can be enabled independently for each Venetian blind or shutter/awning output using the "Additional function" parameter on the parameter page "Outputs -> Switching / Venetian blind -> VB... - Enabled" functions. If the function is enabled, the parameter page "Outputs -> Switching / Venetian blind -> VB..." - General -> Lower end position correction" will be displayed in the ETS. The end position correction is configured differently in the ETS depending on the operation.

The end position correction must be enabled.

- Set the parameter "Lower end position correction / ventilation function" to "always active".

The end position correction / ventilation function is always active. As soon as the blind/shutter has been moved to the lower end position by a long-time command, the actuator executes the correction.

- Set the parameter "Lower end position correction / ventilation function" to "control via object".

The end position correction / ventilation function is active object-controlled. If necessary, it can be enabled by an ON telegram to the "Lower end position correction - Activate/Deactivate" object. The actuator only executes the correction if the blind/shutter is moved to the lower end position by a long-time command (drive run completed) and then the enable telegram is received (e. g. opening a window). The enabling of the end position correction is automatically cancelled as soon as the output is controlled again using any other commands. As a result, the correction must be reactivated via another enable telegram if it is to be executed again by direct operation after the next long-time movement to the lower end position.

OFF telegrams to the object "Lower end position correction - Activate/Deactivate" deactivate the end position correction / ventilation function. The output does not change its blind/shutter position as a result.

- In the "Venetian blind" operation: Set the desired slat position value for the end position correction / ventilation function using the "Slat position for end position correction" parameter.

After the end of a downward movement to the bottom end position, the blind/shutter stops and, after the change-over time has elapsed, moves in the opposite direction for a period calculated from the slat position and the configured slat travel time.

- In the "Shutter / awning" operation: Using the "Time for bottom end position correction", set the desired upwards travel time for the end position correction, for the opening of the shutter.

After the end of a downward movement to the bottom end position, the blind/shutter stops and, after the change-over time has elapsed, moves in the opposite direction for the set period of time.

- i** Set the "Time for bottom end position correction" to less than the predefined travel time of the shutter. Otherwise, there is the risk of malfunction.

14.2.13.1 Supplementary functions parameters

Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions

Supplementary function	no supplementary function Correction lower end position Fabric stretching
Here, it can be defined, which supplementary function should be used for the Venetian blind output. Alternatively, the supplementary function can be switched off. The "fabric stretching time" setting can only be selected in the "Shutter/awning" operation. This parameter is not available in the "venting louvre / roof window" operation.	

Outputs -> Switching / Venetian blind -> VB... - General -> Fabric stretching

Time for fabric stretching	0...1...59 s 0...900 ms
This parameter can be used to specify the time for fabric stretching. After the end of a downward movement, the awning stops and – after the switchover time has elapsed – moves in the opposite direction for a period corresponding to the fabric stretching time configured here. The time for fabric stretching must be less than the travel time of the shutter/awning! The parameters regarding the time for the fabric stretching are only available in the operation "shutter/awning"	

Outputs -> Switching / Venetian blind -> VB... - General -> Lower end position correction

Lower end position correction / ventilation function	always active control via object
The end position correction/ventilation function can either always be active, or alternatively it can be activated via a separate 1-bit communication object (e. g. controlled by a window contact, application: When the window is closed, the end position correction / ventilation function is executed. With the window already open for ventilation.). always active: The end position correction/ventilation function is always active. As soon as the blind/shutter has been moved to the lower end position by a long-time command, the actuator executes the correction. control via object: The end position correction/ventilation function is active object-controlled. If necessary, it can be enabled by an ON telegram to the "Lower end position correction - Activate/Deactivate" object. The actuator only executes the correction if the blind/shutter is moved to the lower end position by a long-time command (drive run completed) and then the enable telegram is received (e. g. opening a window). The enabling of the end position correction / ventilation function is automatically cancelled as soon as the output is controlled again using any other commands. As a result, the correction must be reactivated via another enable telegram if it is to be executed again by direct operation after the next long-time movement to the lower end position. OFF telegrams to the object "Lower end position correction - Activate/Deactivate" deactivate the end position correction / ventilation function. The output does not change its blind/shutter position as a result. This parameter is only available if the end position correction is enabled.	
Slat position for end position	0... 50 ...100%
The slat position value desired for the end position correction can be set at this point. After the end of a downward movement to the bottom end position, the blind/shutter stops and, after the change-over time has elapsed, moves in the opposite direction for a period calculated from the slat position and the configured slat travel time. This parameter is only available in the "Venetian blind with slat" operation if the end position correction is enabled.	
Time to correct lower end position	0...1...59 s 0...900 ms
The desired upward travel time for opening the shutter for the end position correction can be set here. After the end of a downward movement to the bottom end position, the blind/shutter stops and, after the change-over time has elapsed, moves in the opposite direction for the set period of time. The parameters regarding the time of the end position correction / ventilation function are only available if the function is enabled in the "shutter/awning" operation	

14.2.13.2 Object list supplementary function

Function	Name	Type	DPT	Flag
Correction lower end position - Activate/deactivate	VB ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for enabling the end position correction after the blind has been moved to the lower end position by a long-time movement of direct operation ("1" = enabling signal issued).				

14.3 Switching operation

In switching operation, the lighting can be switched or other loads for 110/230 V can be operated. The NC or NO contact operation can be set to define the basic function of the switch. Each switching output can be parametrised separately. The following functions are available:

- Reset and initialisation behaviour, cyclical monitoring
- Sun protection function and twilight function
- Disabling function and forced position
- Logic operation function
- Scene functions
- Time functions: switch-on delay, switch-off delay, staircase lighting timer with run-on time
- Operating hours counter

14.3.1 Priorities

The actuator in switching operation distinguishes between different functions that can have an effect on an output. In order to prevent conflicting states, each available function has a certain priority. The function with the higher priority overrides the function with the lower priority.

For switching operation there are the following priorities...

- 1st priority: manual operation (top priority),
- 2nd priority: forced position & disabling function,
- 3th priority: Cyclical monitoring,
- 4th priority: Logical operation function & Staircase function,
- 5th priority: direct bus operation ("switching" object, scenes, central functions, reset behaviour)

The behaviour of some functions can be configured at the end (e. g. the behaviour at the end of a manual operation or the behaviour at the end of the disabling function). These predefined reactions are only executed if the actuator can then immediately switch to direct operation (lowest priority).

If another function with a lower priority (e. g. manual operation) has been activated during a function with a high priority (e. g. disabling function), the actuator executes the behaviour at the beginning of the function with the next lower priority (e. g. disabling function). The behaviour at the end of the function with the higher priority (e. g. manual operation) is then not executed!

14.3.2 General settings

14.3.2.1 Central functions

The actuator offers the possibility of linking selected individual or all switching outputs with up to 6 1-bit communication objects. The behaviour during the control of an output via the central functions can be set to "Switching" or alternatively to "Permanent" (Switching with priority).

Central function = "Switching":

This function is comparable to various central group addresses that are linked to the "Switching" object of a switching output. The last command received (ON or OFF) is executed. The polarity of the central telegram can be configured as inverted if necessary.

Central function = "Permanent":

The assigned switching outputs are controlled according to the parameterised command (ON or OFF) and locked during central control. This means that no other central function with the "Switching" function can control the locked output. Controls via normal switching objects are possible. If an output is assigned to several permanent central functions, the parameterised command decides on the priority of the central function. A "permanent OFF" has a higher priority than a "permanent ON" and thus is preferably executed. Activating a central function "permanent OFF" deactivates other assigned functions for an output with the setting "permanent ON".

Example of permanent central functions

An output is assigned to central function 1 "switching", central function 2 "permanent OFF" and central function 3 "permanent ON". Central functions 2 and 3 are initially deactivated.

When a central telegram = "activate" on central function 3 is received, the assigned switching output switches on. In this state, it can no longer be controlled by central function 1, since a simple "switching" has a lower priority. When a central telegram = "activate" on central function 2 is received, the assigned switching output switches off immediately. Central function 3 is thus deactivated automatically. Only when central functions 2 and 3 are deactivated can the assigned switching output be activated again by central function 1.

- i** All central functions are inactive after the bus voltage returns. No central functions are saved in the event of a bus voltage failure.

Disconnect central functions

- Activate the central functions on the parameter page "Outputs -> Switching / Venetian blind -> Switching (SO)" using the parameter "Central functions".

The 6 central objects become visible in the ETS. Names can optionally be assigned for the central functions. The names should illustrate the use of the individual central functions (e. g. "All ON", "Central OFF"). The names are only used in the ETS in the text of the central functions and central objects.

Assign switching outputs to the central functions

Each switching output can be assigned to the central functions.

The central functions must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> Switching (SO)".

- The parameters "Function and polarity of the central object" on the parameter pages "Outputs -> Switching / Venetian blind -> SO... - General" to the desired function.

The appropriate output is assigned to the central function. It can be influenced centrally.

The switching state newly set by the central functions is tracked in the feedback objects and also transmitted to the bus, if these are actively transmitting.

14.3.2.1.1 Central functions parameters

Outputs -> Switching / Venetian blind -> Switching (SO)

Central functions	Checkbox (yes / no)
If the parameter is activated, the 6 central functions of the switching outputs and thus the objects "Central function ... - Switching." are enabled. An assignment of individual switching outputs to the central functions is only possible if the function is enabled.	

Name of the central functions	Free text
Names can optionally be assigned for the central functions. The names should illustrate the use of the individual central functions (e. g. "All ON", "Central OFF"). The names are only used in the ETS in the text of the central functions and central objects.	

Outputs -> Switching / Venetian blind -> SO... - General

Central function x assignment (x = 1...6)	Checkbox (yes / no)
These parameters assign the supplementary functions to the selected switching output. These parameters are only visible when central functions are enabled.	

Function and central object polarity	Switching (1 = ON / 0 = OFF) Switching (0 = ON / 1 = OFF) Permanent ON (1 = active / 0 = inactive) Permanent OFF (1 = active / 0 = inactive)
The function and polarity of the central function is selected here. Switching (1 = ON / 0 = OFF): The last command received (ON or OFF) is executed. The polarity of the central telegram is preset: 1 = ON / 0 = OFF Switching (0 = ON / 1 = OFF): The last command received (ON or OFF) is executed. The polarity of the central telegram is preset: 0 = ON / 1 = OFF Permanent ON (1 = active / 0 = inactive): The assigned switching output is switched on and locked during central control. Permanent OFF (1 = active / 0 = inactive): The assigned switching output is switched off and locked during central control. If an output is assigned to several permanent central functions, the parameterised command decides on the priority of the central function. A "permanent OFF" has a higher priority than a "permanent ON" and thus is preferably executed. With permanent function, the polarity of the central telegram is always fixed: 1 = activate permanent control / 0 = deactivate permanent control. These parameters are only visible when central functions are enabled and assigned.	

14.3.2.1.2 Object list central functions

Function	Name	Type	DPT	Flag
Switching	Central function 1 – SO - Input	1-bit	1,001	C, -, W, -, U
Switching	Central function 2 – SO - Input	1-bit	1,001	C, -, W, -, U
Switching	Central function 3 – SO - Input	1-bit	1,001	C, -, W, -, U
Switching	Central function 4 – SO - Input	1-bit	1,001	C, -, W, -, U
Switching	Central function 5 – SO - Input	1-bit	1,001	C, -, W, -, U
Switching	Central function 6 – SO - Input	1-bit	1,001	C, -, W, -, U
1-bit object for central control of assigned switching outputs. With central function = "Switching": The polarity of the central telegram can be configured as inverted if necessary. With central function = "Permanent ON", "Permanent OFF": With permanent function, the polarity of the central telegram is always fixed: 1 = activate permanent control / 0 = deactivate permanent control.				

14.3.2.2 Name of a switching output

Here, you can optionally assign a name for each switching output. The name is intended to illustrate the use of the output (e. g. "light kitchen", "wall lamp living room"). The names are only used in the ETS in the text of the parameter pages and communication objects.

14.3.2.2.1 Parameter name

Relay outputs... -> SO... - General

Name of switching output	Free text
The text entered in this parameter is applied to the name of the communication objects and is used to label the switching output in the ETS parameter window (e. g. "light kitchen", "wall lamp living room"). The text is not programmed in the device.	

14.3.3 Operation

The relay of a switching output can be configured as NO or NC contacts. In this way, the inversion of switching states is possible.

The parameter "operation" has been created separately for each switching output on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General".

- Set the operation to "NO contact".

The relay works as an NO contact. The logical switching state of the switching output is not forwarded to the relay in inverted form.

Switching state = OFF ("0") -> relay contact open,

Switching state = ON ("1") -> relay contact closed.

- Set the operation to "NC contact".

The relay works as an NC contact. The logical switching state of the switching output is forwarded to the relay in inverted form.

Switching state = OFF ("0") -> relay contact closed,

Switching state = ON ("1") -> relay contact open.

The logic switching state "ON" or "OFF" is set by the communication object "Switching" and influenced by the functions that can be optionally activated (e. g. timing/staircase functions, logic operations, disabling/forced-control position functions, scenes, central objects).

The 1-bit feedbacks always feed back the logical switching state of the switching outputs. Depending on the configured relay operating mode and an inverted or non-inverted evaluation, a status feedback has the following meanings:

NO contact not inverted: Feedback = "ON" -> Relay closed, feedback = "OFF" -> Relay opened

NO contact inverted: Feedback = "ON" -> Relay opened, feedback = "OFF" -> Relay closed

NC contact not inverted: Feedback = "ON" -> Relay opened, feedback = "OFF" -> Relay closed

NC contact inverted: Feedback = "ON" -> Relay closed, feedback = "OFF" -> Relay opened

Feedback of the current switching status via the "switching" object is not possible.

14.3.3.1 Operation parameters

Outputs -> Switching / Venetian blind -> SO... - General

Operation	NO contact NC contact
The relay of a switching output can be configured as NO or NC contacts. In this way, the inversion of switching states is possible. NO contact: Switching state = OFF ("0") -> Relay contact opened Switching state = ON ("1") -> Relay contact closed NC contact: Switching state = OFF ("0") -> Relay contact closed Switching state = ON ("1") -> Relay contact opened	

14.3.3.2 Object list operation

Function	Name	Type	DPT	Flag
Switching	SO ... - Input	1-bit	1,001	C, -, W, -, U
1-bit input object to activate a switching output ("1" = Switch on / "0" = Switch off; "NO contact" or "NC contact" operation can be configured).				

14.3.4 Reset and initialisation behaviour

The switching states of the switching outputs in the event of a bus voltage failure, after the bus voltage returns or after an ETS programming operation can be set separately.

Presetting the behaviour after ETS programming

The parameter "After ETS programming" has been created separately for each switching output on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General". This parameter can be used to configure the switching state of a switching output, irrespective of the behaviour after the bus voltage returns.

- Set the parameter to "no reaction".

After ETS programming, the relay of the output shows no response and remains in the switching state last selected. The internal logical switching state is not lost by the ETS programming operation.

- Set the parameter to "Open contact".

The relay contact opens after an ETS programming operation.

- Set the parameter to "Close contact".

The relay contact closes after an ETS programming operation.

- Set the parameter to "as when bus voltage returns".

After an ETS programming operation, the switching output will behave in the manner defined in the parameter "After bus voltage returns". If the behaviour there is configured to "state as before bus voltage failure", then that switching state is also set after an ETS programming operation which was active at the time of the last bus voltage failure. An ETS programming operation does not overwrite the saved switching state.

i The configured behaviour will be executed after every application or parameter download by the ETS. A simple download of the physical address alone or partial programming of only the group addresses has the effect that this parameter is disregarded and that the configured "After bus voltage returns" will be executed instead.

i A switching state set after an ETS programming operation is added to the feedback object. Actively transmitting feedback objects also only first transmit after an ETS programming cycle when the initialisation has finished and, if necessary, the "delay after bus voltage returns" has elapsed.

i After an ETS programming operation, the disabling functions and the forced-positions are always deactivated. The states of the forced position objects saved in case of the bus voltage failure are deleted.

Setting the behaviour in case of bus voltage failure

The "In case of bus voltage failure" parameter is separately available for each switching output on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General".

- Set the parameter to "no reaction".

In case of bus voltage failure, the relay of the output shows no reaction and remains in the switching state last selected.

- Set the parameter to "Open contact".

The relay contact opens in case of bus voltage failure.

- Set the parameter to "Close contact".

The relay contact closes in case of bus voltage failure

i Active disabling functions or forced position functions are cancelled by a bus voltage failure and remain inactive until they are reactivated after the bus voltage returns.

i In case of a bus voltage failure, the current states of the forced-positions are also saved so that they can be tracked when the bus voltage returns if necessary (depending on the parameterization of the forced positions).

i In case of a bus voltage failure, the current switching states of all switching outputs are saved internally, so that these states can be reset after the bus voltage returns if this is configured in the ETS.

Setting the behaviour after the bus voltage returns

The parameter "After the bus voltage return" has been created separately for each switching output on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General".

- Set the parameter to "no reaction".

After the bus voltage returns, the relay of the output shows no reaction and remains in the switching state last selected.

- Set the parameter to "Open contact".

The relay contact is opened.

- Set the parameter to "Close contact".

The relay contact is closed.

- Set the parameter to "state as before bus voltage failure".

After the bus voltage returns, the switching state last set and internally stored before bus voltage failure will be tracked.

- Preset parameter to "Activate staircase function". This setting is only available when the staircase function of the appropriate switching output is enabled.

The staircase function is – irrespective of the "Switching" object - activated after the bus voltage returns.

- i Setting "state as before bus voltage failure": An ETS programming operation of the application or the parameter resets the stored switching state to "OFF".
- i If a switching state has been set after the bus voltage returns, it will be tracked in the feedback objects. Actively transmitting feedback objects do not transmit after the bus voltage returns until the initialisation of the actuator has finished, and if necessary the "Delay after bus voltage returns" has elapsed.
- i In the case of forced position as supplementary function: The communication object of the forced position can be initialised separately after the bus voltage returns. This has an effect on the reaction of the switching output when the forced position is activated when the bus voltage returns. The configured "behaviour after bus voltage returns" is executed only if no forced position after the bus voltage returns is activated!
- i In the case of enabling function as supplementary function: Active disabling functions are always inactive after the bus voltage returns.

14.3.4.1 Reset and initialisation behaviour parameter

Outputs -> Switching / Venetian blind -> SO... - General

After ETS programming operation	Close contact Open contact no reaction as when bus voltage returns
The actuator permits setting of the reaction separately for each switching output after an ETS programming operation. Close contact: The relay contact closes after an ETS programming operation. Open contact: The relay contact opens after an ETS programming operation. no reaction: After ETS programming, the relay of the output shows no response and remains in the switching state last selected. The internal logical switching state is not lost by the ETS programming operation. as when bus voltage returns: After an ETS programming operation, the switching output will behave in the manner defined in the parameter "After bus voltage returns". If the behaviour there is configured to "state as before bus voltage failure", then that switching state is also set after an ETS programming operation which was active at the time of the last bus voltage failure. An ETS programming operation does not overwrite the saved switching state.	
In case of bus voltage failure	Close contact Open contact no reaction
The actuator permits setting of the reaction separately for each switching output if there is a bus voltage failure. Close contact: The relay contact closes in case of bus voltage failure. Open contact: The relay contact opens in case of bus voltage failure no reaction: In case of bus voltage failure, the relay of the output shows no reaction and remains in the switching state last selected.	

After the bus voltage returns	Close contact Open contact State as before bus voltage failure no reaction Activating staircase function
The actuator allows the reaction to be set separately for each switching output after the bus voltage returns. Close contact: The relay contact is closed. Open contact: The relay contact is opened. State as before bus voltage failure: After the bus voltage returns, the switching state last set and internally stored before the bus failure will be tracked. no reaction: After the bus voltage returns, the relay of the output shows no reaction and remains in the switching state last selected. Activate staircase function: The staircase function is – irrespective of the "Switching" object - activated after the bus voltage returns. This setting is only available when the staircase function is enabled.	

14.3.5 Cyclical monitoring

The actuator offers the option of monitoring individual switching outputs cyclically for the arrival of switching telegrams. In this way, the objects which must be updated cyclically by the KNX can be monitored. In so doing, the polarity of the telegram update ("OFF" or "ON") is insignificant.

If there is no update of the monitored objects within a specifically configured monitoring time, then the affected switching outputs set themselves to the preferred pre-defined contact position. However, this does not disable the outputs, so that, after the reception of a further switching telegram, the new switching state is set at the output.

The monitoring time can be defined separately for each switching output on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General" by the parameter "cycle time". The time is restarted for a switching output after each reception of a switching telegram via the objects "Switching" or "Central switching" (if at least one central function is assigned to the affected switching output). The monitoring time is also restarted automatically after the bus voltage returns or after an ETS programming operation.

Activate cyclical monitoring

The cyclical monitoring function can be activated separately for each switching output by the "Cyclical monitoring" parameter on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General". If the function is activated, as soon as the monitoring time elapses without having received a telegram update, the actuator sets the preference period for the appropriate switching output after the time has elapsed.

- Set the parameter to "no".

Cyclical monitoring is deactivated.

- Set the parameter to "Yes, 'ON' when time has elapsed".

Cyclical monitoring is activated. After the time has elapsed, the switching output is switched on. The cycle time can be configured.

- Set the parameter to "Yes, 'OFF' when time has elapsed".

Cyclical monitoring is activated. After the time has elapsed, the switching output is switched off. The cycle time can be configured.

 If cyclical monitoring is activated, the following functions cannot be configured: time delays and staircase, logic operation and scene functions.

 The disabling and forced position function has a higher priority than the cyclical monitoring.

14.3.5.1 Cyclical monitoring parameters

Outputs -> Switching / Venetian blind -> SO... - General

Cyclical monitoring	no yes, "ON" when time has elapsed yes, "OFF" when time has elapsed
The actuator offers the option of monitoring individual switching outputs cyclically for the arrival of switching telegrams. In this way, the objects which must be updated cyclically by the KNX can be monitored. In so doing, the polarity of the telegram update ("OFF" or "ON") is insignificant. If there is no update of the monitored objects within a specifically configured monitoring time, then the affected switching outputs set themselves to the preferred predefined contact position. However, this does not disable the outputs, so that, after the reception of a further switching telegram, the new switching state is set at the output. no: Cyclical monitoring is deactivated. yes, 'ON' when time has elapsed: Cyclical monitoring is activated. After the time has elapsed, the switching output is switched on. yes, 'OFF' when time has elapsed: Cyclical monitoring is activated. After the time has elapsed, the switching output is switched off.	
Cycle time	0...23 h 0...2...59 min 0...59 s
The monitoring time for cyclical monitoring is set here. This parameter is only visible if cyclical monitoring is enabled.	

14.3.6 Feedback telegrams

The actuator can track the current switching state of a switching output via a feedback object and can also transmit them to the KNX. On each switching operation, the actuator determines the object value of the feedback. The actuator tracks the switching state and updates the feedback object even when a switching output, for example, is activated by a supplementary function or scene function.

The switching status feedback object is updated after the following events...

- Immediately after switch-on of a switching output (if necessary, first after a switch-on delay has elapsed / also after a staircase function).
- After switch-off of a switching output (if necessary, only after a switch-off delay has elapsed / also after a staircase function).
- During updating of the switching state from "ON" to "ON" or "OFF" to "OFF" when the switching output is already switched on or off. However, only if the parameter "Update of the object value" is configured to "On each update of object 'Switching'/'Central'".
- At the start or end of a disabling or forced position function, if a state changes as a result.
- Whenever the bus voltage returns or at the end of any ETS programming operation (if necessary, also delayed).

i In the case of disabling function as supplementary function: A "flashing" switching channel is always reported as "switched on".

Activate switching status feedback

The switching status feedback is also directly transmitted to the KNX whenever the feedback value is updated.

Optionally, the actuator can also feed back the status of an independent switching output in inverted form.

The "Switching status object" parameter is separately available for each switching output on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Status." Feedback takes place by means of the "Switching - Status" object.

Prerequisite:

The feedback signals must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- Activate the checkbox "Status object switching".

A switching status is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after the bus voltage returns or after programming with the ETS. The switching status is written to the object in non-inverted form.

- Optionally activate the checkbox "Invert".

A switching status is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after the bus voltage returns or after programming with the ETS. The switching status is written to the object in inverted form.

- Deactivate the checkbox "Status object switching".

The switching status feedback of the affected switching output is deactivated.

Depending on the configured relay operating mode and an inverted or non-inverted evaluation, a status feedback has the following meanings:

NO contact not inverted: Feedback = "ON" -> Relay closed, feedback = "OFF" -> Relay opened

NO contact inverted: Feedback = "ON" -> Relay opened, feedback = "OFF" -> Relay closed

NC contact not inverted: Feedback = "ON" -> Relay opened, feedback = "OFF" -> Relay closed

NC contact inverted: Feedback = "ON" -> Relay closed, feedback = "OFF" -> Relay opened

- i** Feedback of the current switching status via the "switching" object is not possible.

Set update of "Switching feedback"

In the ETS, you can specify when the actuator should update the feedback value for the switching status (object "Switching - Status") in case of an actively transmitting communication object. The object value updated by the actuator is then signalled actively to the KNX.

The parameter "Update of the object value" is separately available for each switching output on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Status."

Prerequisite:

The feedback signals must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions". In addition, the switching status feedback must be configured to actively transmitting.

- Set the parameter "Update of the object value" to "On each 'Switching'/'Central' object update".

The actuator updates the feedback value in the object once a new telegram is received on the input objects "Switching" or "Central switching" or the switching state changes internally (e. g. through a time function). With an actively transmitting feedback object, a new telegram is also then actively transmitted to the KNX each time. The telegram value of the feedback does not necessarily have to change in the process. Hence, a corresponding switching status feedback is also generated on the "Switching" object such as in the case of cyclical telegrams for example.

- Set the parameter to "Only if the feedback value changes".

The actuator only updates the feedback value in the object if the telegram value (e. g. "OFF" to "ON") also changes or the switching state changes internally (e. g. through a time function). If the telegram value of the feedback does not change (e. g. in the case of cyclical telegrams to the "Switching" object with the same telegram value), the actuator does not transmit any feedback. Consequently, with an actively transmitting feedback object, no telegram with the same content will be transmitted repeatedly either.

This setting is recommendable, for instance, if the "Switching" and "Switching feedback" objects are linked to an identical group address. This is often the case when activating by means of light scene push-button sensors (recall and storage function).

Setting switching status feedback when bus voltage returns or after programming with the ETS

If used as active message object, the switching status feedback states are transmitted to the KNX after the bus voltage returns or after programming with the ETS. In these cases, the feedback telegram can be time-delayed, with the delay being preset globally for all switching outputs together.

- Activate the parameter "Delay after bus voltage returns" on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Status".

The switching status telegram is transmitted with a delay after the bus voltage returns or after an ETS programming operation. No feedback telegram is transmitted during a running delay, even if the switching state changes during this delay.

- Deactivate the parameter.

The switching status telegram is transmitted immediately after the bus voltage returns or after an ETS programming operation.

Setting cyclical transmission of the switching status feedback telegram

The switching status feedback telegrams can, if actively transmitting, also be transmitted cyclically, in addition to the transmission after updating.

- Activate the "Cyclical sending" parameter on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Status".

Cyclical transmission is activated. The cycle time for the switching status feedback can be configured separately for the "Cycle time" parameter.

- Deactivate the parameter.

Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.

In addition to switching status feedback, the actuator can also report back enlarged status information messages and transmit them actively to the KNX.

Particularly for simple connection to visualisations or for diagnoses, the actuator can also transmit various status information in combined data points. This can significantly reduce the telegram load. Two different types of data points are available. Both communication objects transmit in the case of a change of status.

Activating feedback of the combined function status

Particularly for simple connection to visualisations or for diagnoses, the actuator can also transmit various status information in combined data points. This can significantly reduce the telegram load. Two different types of data points are available. Both communication objects transmit in the case of a change of status.

The feedback of the combined function status can be enabled and programmed independently for each output.

The feedback functions of an output must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions". Only then can the parameters for the feedback messages be seen on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Status".

- Activate the checkbox "Function status (KNX standard)".

The standardised feedback object is enabled. In addition to the current brightness value (for the switch actuator either 0% or 100%), it contains various bit-coded status information. A telegram is transmitted as soon as there is a change.

The feedback functions of an output must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> VB... - General -> Enabled functions". Only then can the parameters for the feedback messages be seen on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Status".

- Activate the checkbox "Function status (KNX extended)".

The feedback object is enabled. It contains various bit-coded status information and an enumeration of the various statuses with higher priorities. A telegram is transmitted as soon as there is a change.

14.3.6.1 Parameters for feedback

Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions

Status	Checkbox (yes / no)
This parameter can be used to disable or to enable the feedback functions.	

Outputs -> Switching / Venetian blind -> SO... - General -> Status

Status object switching	Checkbox (active /inactive)
The current switching state of the switching output can be reported separately back to the KNX. inactive: The switching status feedback of the affected switching channel is deactivated. active: A switching status is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after the bus voltage returns or after programming with the ETS.	

Invert	Checkbox (active/ inactive)
The current switching state of the switching output can be reported separately back to the KNX. inactive: The switching status is written to the object in non-inverted form. active: The switching status is written to the object in inverted form.	

Updating of the object value	after each update object "Switching"/"Central" only if the feedback value changes
Here, you can specify when the actuator should update the feedback value for the switching status ("Switching -Status" object) in case of an actively transmitting communication object. The object value updated by the actuator is then signalled actively to the KNX. This parameter is only visible if the status object is activated. after each update object "Switching"/"Central": The actuator updates the feedback value in the object once a new telegram is received on the input objects "Switching" or "Central switching" or the switching state changes internally (e. g. through a time function). With an actively transmitting feedback object, a new telegram is also then actively transmitted to the KNX each time. The telegram value of the feedback does not necessarily have to change in the process. Hence, a corresponding switching status feedback is also generated on the "Switching" object such as in the case of cyclical telegrams for example. only if the feedback value changes: The actuator only updates the feedback value in the object if the telegram value (e. g. "OFF" to "ON") also changes or the switching state changes internally (e. g. through a time function). If the telegram value of the feedback does not change (e. g. in the case of cyclical telegrams to the "Switching" object with the same telegram value), the actuator does not transmit any feedback. Consequently, with an actively transmitting feedback object, no telegram with the same content will be transmitted repeatedly either.	

Delay after bus voltage returns	Checkbox (yes / no)
The states of the switching status feedback can be transmitted to the KNX with a delay after the bus voltage returns or after an ETS programming operation. The activated parameter causes a delay when the bus voltage returns. The delay time is configured on the "General" parameter page. This parameter is only visible if the status object is activated.	
Cyclical transmission	Checkbox (yes / no)
The switching status feedback telegrams can, if actively transmitting, also be transmitted cyclically, in addition to the transmission after updating. This parameter is only visible if the status object is activated. Parameter activated: Cyclical transmission is activated. Parameter deactivated: Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.	
Time for cyclical transmission	0...23 h 0...2...59 min 0...59 s
This parameter defines the time for the cyclical transmission of the switching status feedback. This parameter is only available if cyclical transmission is activated.	
Function state (KNX standard)	Checkbox (active/inactive)
The actuator can report a combined function status to the KNX via a 2-byte communication object with the data point type 207,600 (DPT_StatusLightingActuator). This includes the brightness value and bit-coded status information. active: Feedback and the object are activated. A telegram is sent each time an individual status changes. inactive: There is no feedback object available for the output. Feedback deactivated.	
Function state (extended)	Checkbox (active/inactive)
The actuator can report a combined function status to the KNX via a 3-byte communication object with a non-standardised data point type. This includes bit-coded status information and an enumeration of the possible statuses that can disable direct operation due to a higher priority. active: Feedback and the object are activated. A telegram is sent each time an individual status changes. inactive: There is no feedback object available for the output. Feedback deactivated.	

14.3.6.2 Object list for feedback

Function	Name	Type	DPT	Flag
Switching - Status	Switching... - Output	1-bit	1,001	C, R, -, T, A
1-bit object for feedback signalling of a switching state of a switching output ("1" = on / "0" = off) to the bus. Depending on the configured relay operating mode, the feedback value should be interpreted differently: NO contact operation: Feedback = "0" -> Relay open, feedback = "1" -> Relay closed NC contact operation: Feedback = "0" -> Relay closed, feedback = "1" -> Relay opened				

Function	Name	Type	DPT	Flag
Function state (KNX standard)	Switching... - Output	2-byte	207,600	C, R, -, T, A
The following states are signalled to the KNX using this 2-byte output object: Byte 1 (bit 8 ... Bit 15): Brightness value in percent (switched on = 100%, switched off = 0%) Bit 7: Error (always "0", the object "Heartbeat" is used for evaluating the device status) Bit 6: Output has been overridden by manual operation. The bit remains active as long as the status set by the manual operation is active. Bit 5: Dimming process active (always "0") Bit 4: Staircase function active Bit 3: Night operation active (always "0") Bit 2: Restraint active Bit 1: Disabling function active Bit 0: Brightness value (byte 1) valid An application-orientated filter of the displayed messages can be performed by appropriate KNX devices or visualisation solutions.				

Function	Name	Type	DPT	Flag
Function state (extended)	Switching... - Output	3-byte		C, R, -, T, A
The following states are signalled to the KNX using this 3-byte output object: Bit 23 ... Bit 9: Reserved (always "0") Bit 8: Staircase function active (any active pre-warning times are not displayed here) Bit 7: Switch-off delay active Bit 6: Switch-on delay active Bit 5: ... Bit 0: Enumeration of various statuses with higher priority (in the case of multiple active statuses, the one with the highest priority is output) The following statuses (numerical values) are defined for the lower-value 6-bits: 0: No disabling active 1: Permanent manual operation active 2: Restraint active 3: Disabling function without acknowledgement active 4: Disabling function with acknowledgement active 5 ... 63: Not used An application-orientated filter of the displayed messages can be performed by appropriate KNX devices or visualisation solutions.				

14.3.7 Time delays

Up to two time functions can be preset for each switching output, independently of each other. The time functions affect the communication objects "Switching" or "Central switching" only (if at least one of the central functions is activated for the output concerned) and delay the object value received depending on the telegram polarity.

- i** At the end of a disabling function or forced position function, the switching state received during the function or set before the function can be tracked. Residual times of time functions are also tracked if these had not yet fully elapsed at the time of the reactivation or forced control.
- i** The time delays do not influence the staircase function if this is enabled.
- i** A time delay still in progress will be fully aborted by a reset of the actuator (bus voltage failure or ETS programming).

Activating switch-on delay

The switch-on delay can be activated separately in the ETS for each switching output.

Prerequisite:

The time delays must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- Activate the checkbox "switch-on delay". Configure the desired switch-on delay.

The switch-on delay is enabled. After receipt of an ON telegram via the "switching" or "central switching" object, the configurable time is started. Another ON telegram triggers the time only if the parameter "Retriggerable" is activated. An OFF-telegram received during the switch-on delay will end the delay and set the switching status to "OFF".

Activating switch-off delay

The switch-off delay can be activated separately in the ETS for each switching output.

Prerequisite:

The time delays must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- Activate the checkbox "switch-off delay". Configure the desired switch-off delay.

The switch-off delay is enabled. After reception of an OFF telegram via the "switching" or "central switching" object, the configurable time is started. Another OFF-telegram triggers the time only when the parameter "Switch-off delay retriggerable" is activated. An ON-telegram received during the switch-off delay will end the delay and set the switching status to "ON".

14.3.7.1 Time delays parameters

Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions

Time delays	Checkbox (yes / no)
This parameter can be used to disable or to enable the time delays. The parameter is deactivated if cyclical monitoring is enabled.	

Outputs -> Switching / Venetian blind -> SO... - General -> Time delays

Switch-on delay	Checkbox (yes / no)
The communication objects "Switching" or "Central switching" can be evaluated after a time delay. This parameter enables the switch-on delay and thereby activates the necessary parameters.	

Delay time	0...59 min 0...10...59 s
This parameter is used for setting the duration of the switch-on delay.	

Retriggerable	Checkbox (yes / no)
A switch-on delay still in progress can be retriggered by another "ON" telegram (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed. This parameter is only visible if switch-on delay is activated.	

Switch-off delay	Checkbox (yes / no)
The communication objects "Switching" or "Central switching" can be evaluated after a time delay. This parameter enables the switch-off delay and thereby activates the necessary parameters.	

Delay time	0...59 min 0...10...59 s
This parameter is used for setting the duration of the switch-off delay.	

Retriggerable	Checkbox (yes / no)
A switch-off delay still in progress can be retriggered (parameter activated) by another "OFF" telegram. Alternatively, the retriggering time (parameter deactivated) can be suppressed. This parameter is only visible if switch-off delay is activated.	

14.3.8 Staircase function

The staircase function can be used for implementing time-controlled lighting of a staircase or for function-related applications. The staircase function must be enabled in the ETS on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions", in order for the required communication objects and parameters to be switched to visible.

The staircase function is activated via the communication object "Staircase function Start/Stop" and is independent of the "switching" object of a switching output. In this way, parallel operation of time and normal control is possible, whereby the command last received is always executed: A telegram to the "switching" object or a scene recall at the time of an active staircase function aborts the staircase time prematurely and presets the switching state according to the received object value (the time delays are also taken into account) or scene value. Likewise, the switching state of the "switching" object can be overridden by a staircase function.

Time-independent continuous light switching can also be implemented in combination with a disabling function because the disabling function has a higher priority and overrides the switching state of the staircase function.

The staircase function can also be extended by means of a supplementary function. At the same time, it is possible to activate a time extension. The "time extension" permits retriggering of an activated staircase via the object "Staircase function - Start/Stop" n times. Alternatively, the "time preset via the bus" can be set. With this supplementary function, the configured staircase time can be multiplied by a factor received via the bus, thus it can be adapted dynamically.

Furthermore, an extension of the staircase function can be implemented by means of a separate switch-on delay and pre-warning function. The pre-warning should, according to DIN 18015-2, warn any person still on the staircase that the light will soon be switched off.

Specifying switch-on behaviour of the staircase function

An ON telegram to the "Staircase function - Start/Stop" object activates the staircase time (T_{ON}), the duration of which is defined by the "Staircase time" parameters. In addition, a switch-on delay (T_{Delay}) can be activated (see "presetting switch-on delay of the staircase function"). At the end of the staircase time, the output switches off or activates optionally the pre-warning time ($T_{Prewarn}$) of the pre-warning function (see "presetting pre-warning function of the staircase function"). Taking into account any possible switch-on delay and pre-warning function, this gives rise to the switch-on behaviour of the staircase function as shown in the following diagram.

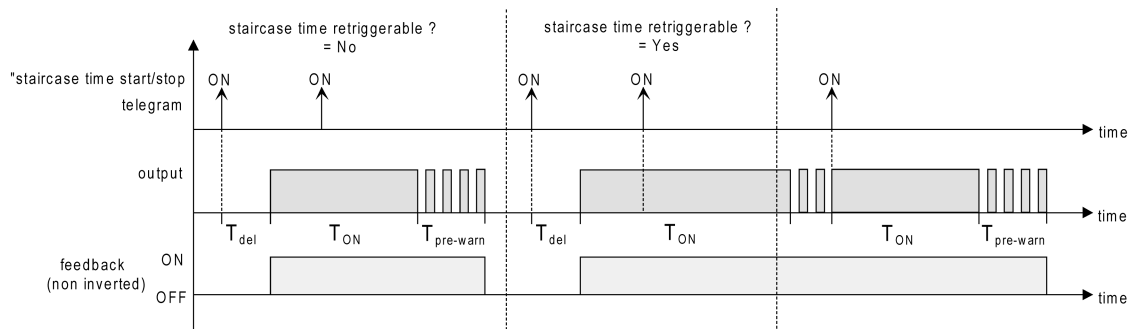


Figure 75: Switch-on behaviour of the staircase function

The parameter "Retriggerable" specifies whether the staircase time can be re-triggered.

Prerequisite:

The staircase function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- Activate the parameter "Retriggerable".

Every ON telegram received during the ON phase of the staircase time re-triggers the staircase time completely.

- Deactivate the parameter "Retriggerable".

ON telegrams received during the ON phase of the staircase time are rejected. The staircase time is not retriggered.

- i** An ON telegram received during the pre-warning time always re-triggers the staircase time independently of the parameter "Staircase time retriggerable".
- i** When the supplementary function "Time extension" is preset, the parameter "Retriggerable" cannot be adjusted. In this case, it is permanently deactivated.

Specifying switch-off behaviour of the staircase function

In the case of a staircase function, the reaction to an OFF telegram can also be configured to the object "Staircase function - Start/Stop". Without the receipt of an OFF telegram the output switches off after the pre-warning time elapses, if necessary. Taking into account any possible switch-on delay and pre-warning function, this gives rise to the switch-off behaviour of the staircase function as shown in the following diagram.

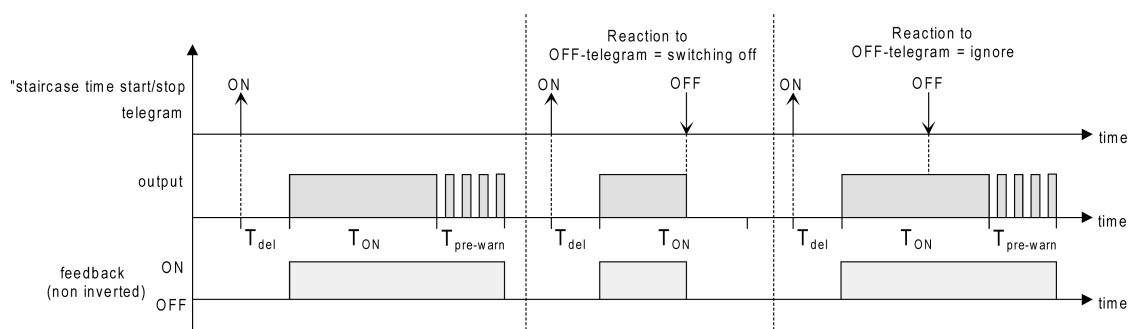


Figure 76: Switch-off behaviour of the staircase function

The parameter "Reaction to OFF-telegram" defines whether the staircase time (T_{ON}) of the staircase function can be aborted prematurely.

Prerequisite:

The staircase function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- Set parameter "Reaction to OFF-telegram" to "switch off".

The output switches off immediately as soon as an OFF telegram is received by means of the object "Staircase function - Start/Stop" during the ON phase of the staircase time. If the staircase time is stopped prematurely by such a telegram, there is no pre-warning, i. e. the pre-warning time is not started.

- Set parameter "Reaction to OFF-telegram" to ignore".

OFF telegrams received during the ON phase of the staircase time are rejected. The staircase time will be executed completely to the end with pre-warning if necessary.

i With the supplementary function "time preset via the bus", the staircase time of the staircase function can also be started by the reception of a new time factor. In this case, received "0" factors are interpreted as an OFF telegram. Here too, the parameter "Reaction to OFF telegram" is evaluated so that a staircase time can be cancelled early.

i The parameter "Reaction to OFF telegram" does not influence the reception and the evaluation of OFF telegrams via the "Switching" object.

Setting the switch-on delay of the staircase function

An ON telegram for activation of the staircase function can also be evaluated with a time delay. This switch-on delay can be activated separately for the staircase function and has no influence on the configurable time delays for the object "switching".

Prerequisite:

The staircase function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Staircase function", deactivate the "Switch-on delay" parameter.

The switch-on delay is deactivated. The staircase time is activated immediately after receiving an ON telegram on the object "Staircase function - Start/Stop" and the output switched on.

- Activate the parameter "switch-on delay".

The switch-on delay for the staircase function is enabled. The desired switch-on delay time can be specified. After receipt of an ON telegram on the object "Staircase function - Start/Stop", the switch-on delay is started. Another ON-telegram triggers the time only when the parameter "Switch-on delay retriggerable" is activated. The staircase time is activated and the output is switched on only after the time delay has elapsed.

- i** An OFF telegram via the object "Staircase function - Start/Stop" during the switch-on delay only terminates the delay if the parameter "Reaction to OFF-telegram" is set to "switch off". Otherwise, the OFF telegram is ignored.
- i** When the supplementary function "Time extension" is preset, the parameter "Switch-on delay retriggerable" cannot be adjusted. In this case, it is permanently deactivated.

Setting the pre-warning function of the staircase function

The pre-warning should, according to DIN 18015-2, warn persons still on the staircase that the light will soon be switched off. The lighting connected on the output is briefly switched off repeatedly as a pre-warning, before the output is switched off permanently. At the same time, the pre-warning time (T_{Prewarn}), the duration of the interruptions during the pre-warning ($T_{\text{Interrupt}}$) and the number of pre-warning interruptions are configurable (see figure 77). The pre-warning time is added to the staircase time (T_{ON}). The pre-warning time influences the value of the feedback object so that the value "OFF" (in the case of non-inverted transmission) is first tracked after the pre-warning time in the object has elapsed.

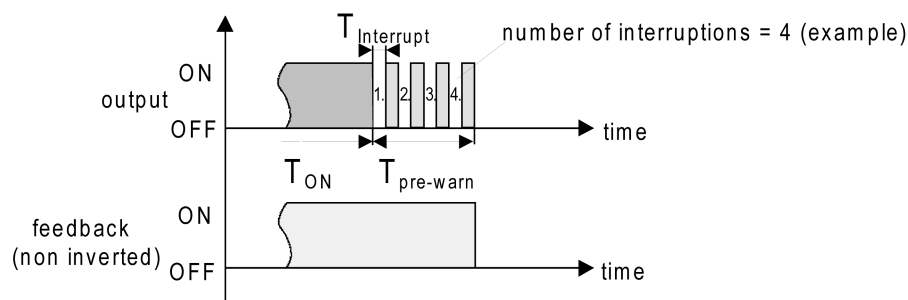


Figure 77: The pre-warning function of the staircase function (example)

Prerequisite:

The staircase function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Staircase function", set the parameter "At the end of the staircase time" to "activate pre-warning time".

The pre-warning function is enabled. The desired pre-warning time (T_{Prewarn}) can be preset.

- Set the parameter "Number of pre-warnings" to the desired value (1...10).

Within the pre-warning time, the lighting connected on the output is switched off just as often as configured here. The 1st pre-warning is always executed at the beginning of the entire pre-warning time.

- Set the parameters "Time for pre-warning interruptions" to the desired value.

An interruption ($T_{\text{Interrupt}}$) during the pre-warning time is just as long as configured here. The adjustable interruption time allows the switch-off phase of the lighting to be adapted individually to the lamps used.

- i** It should be noted that the "number of pre-warnings" and the "time for pre-warning interruptions" must be attuned to the duration of the entire "pre-warning time". Hence, the entire switch-off phase during a pre-warning ("number of pre-warnings" + "time for pre-warning interruptions") must not be set longer than the pre-warning time! Otherwise, malfunctions can be expected.
- i** An ON telegram to the object "Staircase function - Start/Stop" while a pre-warning function is still in progress stops the pre-warning time and always re-starts the staircase time (independently of the parameter "Staircase time re-triggerable"). Even during the pre-warning time, the parameter "reaction to OFF telegram" is evaluated so that a pre-warning in progress can be terminated early by switching off.

Setting supplementary function of the staircase function – time extension

With the time extension function, the staircase time can be retriggered several times, i.e. extended, via the "Staircase function - Start/Stop" object. The duration of the extension is predefined by several operations at the control section (several ON telegrams in succession). The configured staircase time can be extended in this way by the configured factor (a maximum of 5-fold). The time is then always extended automatically at the end of a single staircase time (T_{ON}) (see figure 78).

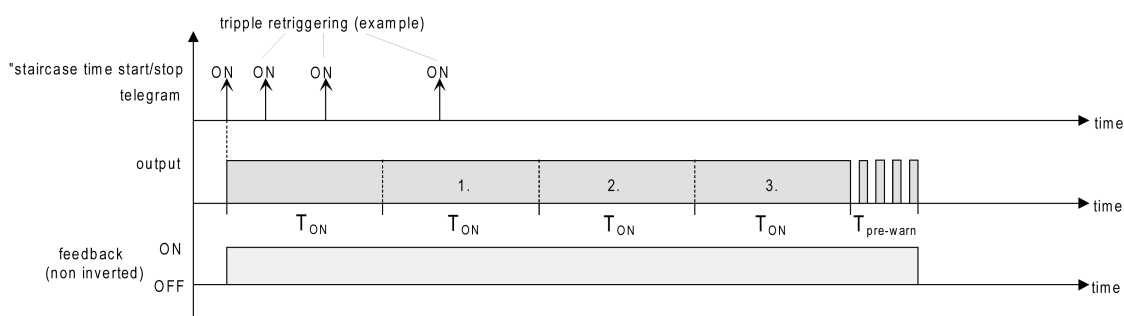


Figure 78: Time extension of the staircase function

With this function, the lighting time in a staircase can be extended (e. g. by a person after shopping) by a defined length without having to retrigger the lighting every time the lighting shuts off automatically.

Prerequisite:

The staircase function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions."

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Staircase function" Set the parameter "Supplementary function for staircase function" to "time extension" and set the maximum desired factor on the parameter "maximum time extension".

The staircase time is retriggered each time an ON telegram is received on the "Staircase time - Start/Stop" object after the staircase time has elapsed, depending on the number of telegrams received, but only as often as pre-defined by the configured factor.

For example, the "3-fold time" setting means that after the started staircase time has elapsed, it can be retriggered automatically a maximum of three additional times. The time is therefore extended a maximum of four fold.

- i** A time extension can be triggered during the entire staircase time (T_{ON}) will take place. There is no time limit between two telegrams for the time extension. Telegrams for the time extension are only evaluated during the staircase time. An ON telegram during the pre-warning function triggers the staircase time as a restart, which means that a new time extension is possible. If a switch-on delay was configured, the time extension is recorded during the switch-on delay.
- i** If a time extension was configured as a supplementary function, the parameters "Staircase time retriggerable" and "Switch-on delay retriggerable" are permanently deactivated since the staircase time can be retriggered by the time extension.

Setting supplementary function of the staircase function – time preset via the bus

With time specification via the bus, the configured staircase time can be multiplied by an 8-bit factor received via the KNX, thus it can be adapted dynamically. With this setting, the factor is derived from the object "Staircase - Time factor". The possible factor value for setting the staircase time is between 1...255.

The entire staircase time arises as a product from factor (object value) and the configured staircase time as a basis as follows ...

Staircase time = (staircase function - time factor) x (Staircase time parameter)

Example:

Object value "Staircase function - Time factor" = 5; parameter "Staircase time" = 10 s.

-> set staircase time = 5 x 10 s = 50 s.

Alternatively, the staircase function parameter can define whether the receipt of a new factor also starts the staircase time of the staircase function at the same time. In this case, the object "Staircase function - Start/Stop" is not necessary and the received factor value determines the starting and stopping.

Prerequisite:

The staircase function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions.

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> staircase function", set the "Supplementary function" parameter to "Time preset via bus" and deactivate the parameter "Staircase function activatable via 'staircase time' object".

The staircase time can be adapted dynamically by the "Staircase function - time factor" object. A value "0" is interpreted as value "1". The staircase function is started and stopped exclusively via the "Staircase function - Start/Stop" object.

- Activate the parameter "supplementary function" to "time preset via the bus" and activate the parameter "staircase function activatable via 'staircase time' object".

The staircase time can be adapted dynamically by the "Staircase function - time factor" object. In addition, the staircase function is started with the new staircase time (the object "Staircase function - Start/Stop" is not necessary). A factor value "0" is interpreted as an OFF telegram, whereby in this case, the configured reaction to an OFF telegram is evaluated, too.

A larger staircase with several floors is an example as an application for the time preset via the bus with automatic starting of the staircase time. On each floor there is a push-button sensor that transmits a factor value to the staircase function. The higher the floor, the greater the factor value transmitted so that the lighting stays switched on longer if the passing through the staircase needs more time. When a person enters a staircase and a pushbutton is pressed, the staircase time is now adjusted dynamically to the staircase time and switches on the lighting at the same time, too.

- i** The staircase function is started via the reception of a new factor: A factor > 0 received during a pre-warning time always triggers the staircase time independently of the parameter "Staircase time retriggerable".
- i** After a reset (bus voltage return or ETS programming) the "Staircase function - time factor" object is always initialised with "1". However, the staircase function is not started automatically solely as the result of this (see "Set behaviour of staircase function after bus voltage returns").
- i** The two supplementary functions "time extension" and "time preset via the bus" can only be configured alternatively.

Setting the behaviour of the staircase function after the bus voltage returns

The staircase function can optionally be started automatically after the bus voltage returns.

Prerequisite:

The staircase function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General", set the parameter "After bus voltage returns" to "Activate staircase function".

The staircase time of the staircase function is started immediately after the bus voltage returns.

- i When automatically starting the staircase function after the bus voltage returns, no switch-on delay is started if the staircase function has configured such a delay.
- i The device only executes the configured "Behaviour when bus voltage returns" only if the last ETS programming of the application or of the parameters ended at least approx. 20 s prior to switching on the bus voltage. Otherwise (ETS < 20 s) the behaviour "after ETS programming" will be performed also after the bus voltage returns.
- i The configured behaviour will be executed only if no forced position after the bus voltage returns has been activated.

14.3.8.1 Staircase function parameters

Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions

Staircase function	Checkbox (yes / no)
This parameter can be used to disable or to enable the staircase function. The parameter is deactivated if cyclical monitoring is enabled.	

Outputs -> Switching / Venetian blind -> SO... - General -> Staircase function

Staircase time	0...23 h 0...3...59 min 0...59 s
The duration of the switch-on time for the staircase function is configured here.	

Retriggerable	Checkbox (yes / no)
An active switch-on time can be retriggered (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed. This parameter is preset to deactivated if the supplementary function "Time extension" is configured. Re-triggering will not be possible.	

Switch-on delay	Checkbox (yes / no)
The staircase function enables the activation of an own switch-on delay. This switch-on delay affects the trigger result of the staircase function and thus delays the switch-on. activated: The switch-on delay for the staircase function is enabled. After receipt of an ON telegram on the object "Staircase function - Start/Stop", the switch-on delay is started. Another ON-telegram triggers the time only when the parameter "Switch-on delay retriggerable" is activated. The staircase time is activated and the output is switched on only after the time delay has elapsed. deactivated: The switch-on delay is deactivated. The staircase time is activated immediately after receiving an ON telegram on the object "Staircase function start/stop" and the output switched on.	

Switch-on delay	0...23 h 0...59 min 0...30...59 s
This parameter is used for setting the duration of the switch-on delay.	

Retriggerable	Checkbox (yes / no)
An active switch-on delay can be retriggered (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed. This parameter is deactivated if the supplementary function "Time extension" is configured. Re-triggering will not be possible. The parameters for the switch-on delay are only visible when the switch-on delay is used.	

Reaction to OFF-telegram	switch off ignore
An active switch-on time can be aborted prematurely by switching off the staircase function. switch off: The switch-on time is aborted after receipt of an OFF telegram on the object "Staircase time start/stop". With the supplementary function "time preset via the bus" and the setting "Staircase function activatable via object 'Staircase time' = activated" the switch-on time can also be prematurely ended by a factor of "0". ignore: OFF Telegrams or "0" factors are ignored. The switch-on time will be executed completely to the end.	
Supplementary function	no supplementary function Time extension Time preset via the bus
The staircase function can be extended by the two supplementary functions "Time extension" and "Time specifications via bus", which should be used alternatively. This parameter enables the desired supplementary function and thereby activates the necessary parameters or objects. no supplementary function: No supplementary function is enabled. Time extension: The time extension is activated. This function permits retriggering an activated staircase lighting time span n-times via the object "Staircase function - start/stop". Time preset via the bus: The time preset via the bus is activated. With this supplementary function, the configured switch-on time can be multiplied by a factor received via the KNX, thus it can be adapted dynamically.	
Maximum time extension	1-fold staircase time 2-fold staircase time 3-fold staircase time 4-fold staircase time 5-fold staircase time
In case of a time extension (retriggering the lighting time n-times via the object "Staircase function - start/stop"), the parameterised staircase lighting time will be extended by the value programmed in this parameter. "1-fold staircase time" means that after the started staircase time has elapsed, it can be retriggered a maximum of one more time. The time is therefore extended two fold. The other settings behave in a similar manner. This parameter is visible only if the supplementary function "time extension" is set.	

Staircase function activatable via "Staircase time" object	Checkbox (yes / no)
A time preset via the bus can specify here whether the receipt of a new time factor also starts the switch-on time (parameter activated). At the same time, the object "Staircase function - start/stop" is hidden. If the parameter is deactivated, the switch-on time can be activated exclusively via the object "Staircase function - start/stop". This parameter is visible only if the supplementary function "time preset via the bus" is set.	
At the end of staircase time	switch off Activate pre-warning time
At the end of the staircase time, the actuator for the switching output concerned displays the configured behaviour here. The output can be set to switch off immediately or alternatively to execute a pre-warning function. switch off: At the end of the staircase time, the actuator switches off the switching output concerned. Activate pre-warning time: At the end of the staircase time, the switching output can generate a pre-warning prior to switching off. The pre-warning, for example, should warn any person still on the staircase that the light will soon be switched off.	
Pre-warning time	0...59 min 0... 30 ...59 s
This parameter is used for setting the duration of the pre-warning time. The pre-warning time is added to the switch-on time.	
Time for pre-warning interruptions	0...59 s 0... 500 ...900 ms
This parameter defines the duration of a pre-warning interruption, i.e. how long the switching output is to remain off during a pre-warning interruption. The time should be customized individually to the switch-off behaviour of the lamp used.	
Number of pre-warnings	1... 3 ..10
This parameter defines how often the switching output is to switch off within the pre-warning time. i.e. how many pre-warnings will be generated.	

14.3.8.2 Object list staircase function

Function	Name	Type	DPT	Flag
Staircase function - Start/Stop	SO ... - Input	1-bit	1,010	C, -, W, -, U
1-bit object to activate or deactivate the switch-on time of the staircase function of a switching output ("1" = switch-on / "0" = switch-off).				
Function	Name	Type	DPT	Flag
Staircase function - Time factor	SO ... - Input	1-byte	5,010	C, -, W, -, U
1-byte object to specify a time factor for the switch-on time of the staircase function (value range: 0... 255).				

14.3.9 Scene function

Up to 64 scenes can be programmed and scene values stored separately for each switching output. The scene values are recalled or stored via a separate scene extension object. The data point type of the extension object allows all 64 scenes to be addressed.

The scene function must be enabled on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions" for each switching output in order for the required communication objects and parameters (on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Scenes") to become visible.

The scene configuration selected in the parameterization decides whether the number of scenes is either variable (1 ... 64) or alternatively fixed to the maximum (64).

- Scene configuration = "variable (1 ... 64 scenes)"
With this setting, the number of scenes used can be selected anywhere in the range 1 to 64. The parameter "Number of scenes" decides how many scenes are visible for the switching output in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene.
- Scene configuration = "fixed (64 scenes)"
With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 64) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.

The scene function can be combined together with other functions of a switching output, whereby the last received or preset state is always executed:

Telegrams to the "Switching" objects, a scene recall or scene storage telegram at the time of an active staircase function aborts the staircase time prematurely and presets the brightness state according to the received object value (time delays are also taken into account) or scene value.

Similarly, the state of the switching output, which was preset by the "Switching", "Dimming" or "Brightness value" objects or by a scene recall, can be overridden by a staircase function.

Presetting a scene recall delay

Each scene recall of a switching output can optionally also be delayed. With this feature, dynamic scene sequences can be configured if several scene outputs are combined with cyclical scene telegrams.

Prerequisite

The scene function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Scenes", activate the "Delay scene recall" parameter.

The delay time is now activated and can be configured separately. The delay only influences the scene recall of the switching output. The delay time is started on arrival of a recall telegram. The corresponding scene will be recalled and the switching output set to the switching state value only after this time has elapsed.

- i** Each scene recall telegram restarts the delay time and retriggers it. If a new scene recall telegram is received while a delay is active (scene recall not yet executed), the old (and not yet recalled scene) will be rejected and only the scene last received executed.
- i** The scene recall delay has no influence on the storage of scene values. A scene storage telegram within a scene recall delay terminates the delay and thus the scene recall.

Setting the behaviour during ETS programming

When a scene is saved, the switching states are saved permanently in the device. To prevent the stored values from being replaced during ETS programming of the application or parameters by the originally programmed scene switching states, the actuator can inhibit overwriting of the switching states. As an alternative, the original values can be reloaded into the device during each programming run of the ETS.

Prerequisite

The scene function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Scenes", activate the parameter "Overwrite values stored in the device during the ETS programming operation".

During each ETS programming operation of the application or of the parameters, the scene switching states configured in the ETS for the switching output concerned will be programmed into the actuator. Scene switching states stored in the device by means of a storage function will be overwritten, if any.

- Deactivate the parameter "Overwrite values stored in the device during the ETS programming operation".

Scene switching states stored in the device with a storage function will be maintained. If no scene switching states have been stored, the switching states last programmed in the ETS remain valid.

- i** When the actuator is commissioned for the first time, this parameter should be activated so that the switching output is initialised with valid scene switching states.

Setting scene numbers and scene switching states

The presetting of the scene number depends on the selected scene configuration. With variable configuration the scene number (1...64) with which the scene is addressed, i.e. recalled or stored, must be determined for each scene of the switching

output. With a fixed scene configuration, the number of a scene is preset invariably. The data point type of the scene extension object permits addressing of up to 64 scenes max.

In addition to specifying the scene number, it is necessary to define which scene command (ON, OFF) should be set on the switching output during a scene recall.

Prerequisite

The scene function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- Only with variable scene configuration: On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Scenes", set the parameter for each scene to the numbers with which the scenes are to be addressed.

A scene can be addressed with the configured scene number. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible.

- Only with fixed scene configuration: On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Scenes" select or deselect the parameter "Scene active" if necessary.

Only selected scenes can be used. A deselected scene is deactivated and cannot be recalled or stored via the scene extension unit.

i If with variable scene configuration the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Scenes" set the parameter "Switching state for each scene to the desired switching command.

During a scene recall, the configured switching state is recalled and set on the switching output.

i The configured switching state is adopted in the actuator during programming with the ETS only if the parameter "Overwrite values stored in the device during ETS download" is activated.

Setting the storage behaviour

The switching state set for the switching output can be stored internally via the extension object on reception of a scene storage telegram. In this case, the switching state can be influenced before the storage by all functions of the switching output provided that the individual functions have been enabled (e. g. also the disabling function, forced-control position function etc.).

Prerequisite

The scene function must be activated on the parameter tab "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Scenes", activate the "Storage function" parameter for each scene.

The storage function is activated for the scene in question. On receipt of a storage telegram by means of the "Scenes - Extension unit" object, the current switching state will be stored internally.

- Deactivate the parameter "storage function" for each scene.

The storage function is deactivated for the scene in question. A storage telegram received via the "Scenes - Extension unit" object will be rejected.

Optionally, a visual feedback via the switching output can be signalled when executing a storage command. The channel flashes once as feedback in the configured flashing time. This enables the system operator to determine locally whether the desired scene switching state has been saved correctly in the actuator. A switching state feedback on the KNX is not generated.

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Scenes", activate the parameter "Visual feedback for storage function". In the parameter "Flashing time", set the time in which the visual feedback is to be executed.

When a storage function is executed, the visual feedback is activated immediately. The output switches to the opposite switching state for the duration of the configured flashing time and then back to the saved scene command.

- Deactivate the parameter "visual feedback for storage function".

When storing a scene, the visual feedback is not executed. The actuator adopts the current switching state of the output without special feedback.

-  The visual feedback is only executed if no other function with a higher priority (e. g. disabling function) is active in the moment when the memory function is active.

Configuring an extended scene recall

The extended scene recall allows recalling of up to 64 scenes of the switching output in sequence. Here, scene recall takes place via the 1-bit communication object "Scenes - Extended scene recall". Each ON telegram received via this object recalls the next of the available scenes in the configuration. Each OFF telegram received recalls the previous scene.

With the extended scene recall, the actuator always recalls the neighbouring scene - starting with the scene most recently recalled via the extended recall. It is irrelevant whether the scene is active on the appropriate switching output (scene number = "1...64" or scene active) or inactive (scene number = "0" or scene inactive). If an inactive scene is recalled via the extended scene recall, the appropriate switching output with not react.

Only the scenes available in the scene configuration can be selected via the extended scene recall (with "variable" defined by the parameter "number of scenes", with "fixed" always all 64 scenes). After a reset (bus voltage return, ETS programming operation), an ON or OFF telegram always recalls scene 1 first.

i Recall of a scene via the 1-byte extension object does not influence the scene sequence of the extended scene recall. The two recall functions work independently of each other.

- Activate the parameter "Extended scene recall" on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Scenes".

The object "Scenes - Extended scene recall" is available. Each ON telegram recalls the next scene. Each OFF telegram recalls the previous scene.

- Deactivate the parameter "Extended scene recall".

The extended scene recall is deactivated. A scene recall can only take place via the 1-byte scene extension object.

The extended scene recall can take place with or without an overflow at the scene limits. An overflow occurs when the last scene of the selected configuration is reached when counting up or scene 1 when counting down and an additional telegram in the last counting direction is received by the actuator. The overflow behaviour is defined in the ETS.

- Activate the parameter "with overflow".

After reaching the last scene of the selected configuration, a further ON telegram of the overflow is executed and scene 1 is recalled. Similarly, after reaching scene 1, the overflow is executed by further OFF telegram and the last scene of the selected configuration is recalled.

- Deactivate the parameter "With overflow".

A scene overflow is not possible. After reaching the last scene of the selected configuration, further ON telegrams of the extended scene recall are ignored. In the same way, the actuator ignores further OFF telegrams if scene 1 was recalled last.

14.3.9.1 Scene function parameters

Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions

Scene function	Checkbox (yes / no)
This parameter can be used to disable or to enable the scene function. The parameter is deactivated if cyclical monitoring is enabled.	

Outputs -> Switching / Venetian blind -> SO... - General: -> Scenes

Delay scene recall	Checkbox (yes / no)
A scene is recalled via the scene extension object. If required, the scene recall can be delayed on reception of a recall telegram (parameter activated). The recall is alternatively made immediately on reception of the telegram (parameter deactivated).	

Delay time	0...59 min 0...10...59 s
This parameter specifies the length of the scene delay time.	

Visual feedback for storage function	Checkbox (yes / no)
Optionally, a visual feedback via the switching output can be signalled when executing a storage command. The channel flashes once as feedback in the configured flashing time. Parameter activated: When a storage function is executed, the visual feedback is activated immediately. The output switches to the opposite switching state for the duration of the configured flashing time and then back to the saved scene command. Parameter deactivated: When storing a scene, the visual feedback is not executed. The actuator adopts the current switching state of the output without special feedback.	

Flashing time	0...5...10 s
The flashing time in which the visual feedback is to be executed is set here. This parameter is only visible when visual feedback is used.	

Overwrite values stored in the device during the ETS programming operation	Checkbox (yes / no)
During storage of a scene, the scene values (current states of the switching outputs concerned) are stored internally in the device. To prevent the stored values from being replaced during ETS programming by the originally programmed scene values, the actuator can inhibit overwriting of the scene values (parameter deactivated). As an alternative, the original values can be reloaded into the device during each programming run of the ETS (parameter activated).	

Use extended scene recall	Checkbox (yes / no)
The extended scene recall allows recalling of up to 64 scenes of the switching output in sequence. Here, scene recall takes place via the 1-bit communication object "Extended scene recall". Each ON telegram received via this object recalls the next scene. Each OFF telegram received recalls the previous scene. This parameter enables extended scene recall, if required.	
With overflow	Checkbox (yes / no)
The extended scene recall can take place with or without an overflow at the scene limits. An overflow occurs when the last scene of the selected configuration is reached when counting up or scene 1 when counting down and an additional telegram in the last counting direction is received by the actuator. Parameter activated: After reaching the last scene of the selected configuration, a further ON telegram of the overflow is executed and scene 1 is recalled. Similarly, after reaching scene 1, the overflow is executed by further OFF telegram and the last scene of the selected configuration is recalled. Parameter deactivated: A scene overflow is not possible. After reaching the last scene of the selected configuration, further ON telegrams of the extended scene recall are ignored. In the same way, the actuator ignores further OFF telegrams if scene 1 was recalled last. This parameter is only visible when the extended scene recall is used.	
Scene configuration	variable (1...64 scenes) fixed (64 scenes)
The scene configuration selected here decides whether the number of scenes is either variable (1 ... 64) or alternatively fixed to the maximum (64). variable (1...64 scenes): In this setting, the number of scenes used can be selected anywhere within the range of 1 to 64. The parameter "Number of scenes" decides how many scenes are visible for the switching output in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene. fixed (64 scenes): With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 64) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.	
Number of scenes	1...10...64
This parameter is only available with variable scene configuration and defines how many scenes are visible for the switching output in the ETS and can therefore be used.	

Scene number	0...1*...64 *: The predefined scene number is dependent on the scene (1...64).
With variable scene configuration, the number of scenes used can be selected anywhere in the range 1 to 64. It is then possible to preset which scene number (1 ... 64) controls each scene. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible. If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case. This parameter is only available with variable scene configuration.	
Scene active	Checkbox (yes / no)
With a fixed scene configuration, individual scenes can be activated or deactivated. Only activated scenes can be used. A deactivated scene cannot be recalled or stored via the scene extension unit. This parameter is only available with fixed scene configuration.	
Switching state	ON OFF
This parameter is used for configuring the switching state which is set when the scene is recalled.	
Memory function	Checkbox (yes / no)
If the parameter is activated, the storage function of the scene is enabled. The current switching state can then be stored internally via the extension object on receipt of a storage telegram. If the parameter is deactivated, the storage telegrams are rejected.	

14.3.9.2 Object list scene function

Function	Name	Type	DPT	Flag
Scenes - Extension unit	SO ... - Input	1-byte	18,001	C, -, W, -, U
1-byte object for calling or saving a scene.				
Function	Name	Type	DPT	Flag
Scenes - Extended scene recall	SO ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for extended scene recall. Each ON telegram received recalls the next scene of a switching output in sequence. Each OFF telegram received recalls the previous scene. After a reset (bus voltage return, ETS programming operation), an ON or OFF telegram always recalls scene 1 first.				

14.3.10 Disabling function and forced position

A disabling function, or alternatively, a forced position function can be configured for each switching output. In this respect, only one of these functions can be enabled for one switching output.

Setting the disabling function

During an active disabling function, the KNX operation of the switching output concerned is overridden and locked. Continuous light switching, for example, can also be overridden. The deactivation of the disabling function can optionally take place using an additional 1-bit acknowledgement object. This prevents the deactivation of the disabling function by the disabling object.

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions" Set the parameter "disabling function / forced position" to "disabling function".

The disabling function is enabled. The communication object "Disabling function - Activate / deactivate" and the parameters of the disabling function on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Disabling function" become visible.

- Set the parameter "Object polarity" to the desired polarity.
- Set the parameter "Beginning of the disabling function" to the required behaviour.

At the beginning of the disabling function, the configured behaviour will be executed and bus operation of the switching output locked.

When the setting "No change of switching state" is selected, the relay of the output shows no reaction and remains in the switching state last set (switching state in acc. with last non-inverted feedback telegram).

In the "Flashing" setting, the switching output is switched on and off cyclically during the disabling. The "Time for flashing of the disabling functions" is configured individually for each switching output. During flashing, the logical switching state of the switching output is fed back as "Switched on".

For disabling function without acknowledgement object...

- Deactivate the checkbox "Acknowledgement".

No additional acknowledgement object is available. The disabling function is deactivated by the disabling object according to the set polarity.

- Set the parameter "End of the disabling function" to the required behaviour.

At the end of the disabling function, the configured behaviour will be executed and the bus operation of the switching output enabled again.

In the "No change of switching state" setting, the relay of the output shows no reaction and remains in the state last set by the disabling function.

In "Set tracked state", the last switching state received during the disabling function or the switching state set before the disabling function will be tracked. Any time functions still in progress will also be taken into account if necessary.

In the "Flashing" setting, the switching output is switched on and off cyclically after the disabling. The "Time for flashing of the disabling functions" is configured individually for each switching output. During flashing, the logical switching state of the output is fed back as "Switched on". The flashing state remains active until another KNX command is received and thereby predefines another switching state.

For disabling function with acknowledgement object...

- Activate the "Acknowledgement" checkbox.

The acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an ON telegram. Telegrams to the disabling object according to the "Deactivate disabling" polarity are ignored by the actuator.

i "OFF" telegrams to the acknowledgement object do not product a reaction.

- Set the parameter "End of the disabling function after acknowledgement" to the required behaviour.

After an acknowledgement, the configured behaviour will be executed and the bus operation of the switching output enabled again.

In the "No change of switching state" setting, the relay of the output shows no reaction and remains in the state last set by the disabling function.

On acknowledgement in "Set tracked state", the last switching state received during the disabling function or the switching state set before the disabling function will be tracked. Any time functions still in progress will also be taken into account if necessary.

In the "Flashing" setting, the switching output is switched on and off cyclically after the acknowledgement. The "Time for flashing of the disabling functions" is configured individually for each switching output. During flashing, the logical switching state of the output is fed back as "Switched on". The flashing state remains active until another KNX command is received and thereby predefines another switching state.

i After a bus voltage failure or after programming the application or the parameters with the ETS, the disabling function is always deactivated (object value "0"). With the inverted setting ("1 = enabled; 0 = disabled"), a telegram update "0" must first be carried out after the initialisation until the disabling is activated.

i Updates of the disabling object from "activated" to "deactivated do not produce a reaction.

i The relay of a switching output disabled via the KNX can still be operated manually!

- i** In the setting "Set tracked state": During a disabling function, the overridden functions of the actuator (switching, scenes) continue to be executed internally. Consequently, newly received bus telegrams are evaluated and time functions are triggered as well. At the end of the disabling, the tracked states are set.

Setting forced position function

The forced position function can also be combined with other functions of a switching output. With an active forced position, functions with a lower priority are overridden so that the switching output concerned is locked.

The forced position function possesses a separate 2-bit communication object. The first bit (bit 0) of the object "Forced position" indicates whether the switching output is switched off or switched on by force. The second bit (bit 1) activates or deactivates the restraint (see table below).

The behaviour of a switching output at the end of the forced position can be configured. In addition, the forced object can be initialised when the bus voltage returns.

Bit 1	Bit 0	Function
0	x	Forced position not active -> normal control
1	0	Forced position active: switch off
1	1	Forced position active: switch on

Table 3: Bit coding of forced position

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions" Set the parameter "disabling function" to "forced position".

The forced position function is enabled. The communication object "Forced position - Activate / Deactivate" and the parameter of the forced position function on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Forced position" become visible.

- Set the parameter "forced position end 'inactive'" to the required behaviour.

At the end of the forced position, the configured behaviour will be executed and the bus operation of the switching output enabled again.

In the "No change of switching state" setting, the relay of the output shows no reaction and remains in the state last set by the forced position.

In the "Track switching state", the state received during the forced position function or the switching state set before the function can be tracked at the end of the forced position. Any time functions still in progress will also be taken into account if necessary.

- i** Updates of the forced position object from "Forced position active" to "Forced position active" while maintaining the switching status or from "Forced position inactive" to "Forced position inactive" show no reaction.

- i** A switching output forcibly activated via the KNX can be still be operated manually!

i In the setting "Track switching state" at the end of the forced position: During a forced position, the overridden functions of the actuator (switching, scenes) continue to be executed internally. Consequently, newly received bus telegrams are evaluated and time functions are triggered as well. At the forced end, the tracked states are set.

i The current state of the forced position object will be stored in case of bus voltage failure.

- Set the parameter "After bus voltage returns" to the required behaviour.

After the bus voltage returns, the configured state is transferred to the "Forced position" communication object. When a forced position is activated, the switching output is immediately activated and interlocked accordingly by forced control after the bus voltage returns until a forced position is enabled via the KNX. The parameter "After bus voltage return" on the parameter page "Outputs -> Switching / Venetian blind - SO... - General" is not evaluated for the affected switching output in this case.

In the "state before bus voltage failure" setting, the forced position state last selected and internally stored before bus voltage failure will be tracked after the bus voltage returns. An ETS programming operation deletes the stored state (reaction in that case same as with "no forced position active").

If the tracked state corresponds to "No forced position", the force-independent parameter "After bus voltage return" (parameter page "Outputs-> Switching / Venetian blind - SO... - General") will be executed when the bus voltage returns.

i After programming the application or parameters with the ETS, the forced position function is always deactivated (object value "0").

14.3.10.1 Disabling function and forced position parameters

Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions

Disabling function / Forced position	no selection Disabling function Priority control
It can be defined here whether a disabling function or a forced position for the switching output should be available. The disabling function is only configurable as an alternative to the forced position function.	

Outputs -> Switching / Venetian blind -> SO... - General -> Disabling function

Status object	Checkbox (yes / no)
If disabling is active, the switching output can transmit the status via a 1-bit communication object. Parameter activated: The status object is available. When the disabling function is activated, it sends a telegram with the value "1" ("enabled"). When the disabling function is deactivated, it sends a telegram with the value "0" ("not enabled"). Parameter deactivated: No additional status object is available.	

Acknowledgement	Checkbox (yes / no)
The deactivation of the disabling function can optionally take place using an additional 1-bit acknowledgement object. This prevents the deactivation of the disabling function by the disabling object. Alternatively, the acknowledgement object is not available. In this case, disabling is deactivated via the disabling object. Parameter activated: The acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an ON telegram. Telegrams to the disabling object according to the "Deactivate disabling" polarity are ignored by the actuator. Parameter deactivated: No additional acknowledgement object is available. The disabling function is deactivated by the disabling object according to the set polarity.	

Object polarity	0 = disabled; 1 = enabled 1 = enabled; 0 = disabled
This parameter defines the polarity of the disabling object. This parameter is visible only if the disabling function is enabled.	

Beginning of disabling function	no change to the switching state Switch off Switch on Flashing
The behaviour of the switching output at the beginning of the disabling function can be configured. This parameter is visible only if the disabling function is enabled. no change of switching state: The relay of the output shows no reaction and remains in the switching state last set (switching state in acc. with last non-inverted feedback telegram). Switch off: At the beginning of the disabling function, the switching output is switched off and locked. Switch on: At the beginning of the disabling function, the switching output is switched on and locked. Flash: The switching output is switched on and off cyclically during the disabling. The flashing time is set with the parameter "Time for flashing of the disabling function". During flashing, the logical switching state of the switching output is fed back as "Switched on".	
End of disabling function	no change to the switching state Switch off Switch on set tracked state Flashing
The behaviour of the switching output at the end of the disabling function can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is not used. no change of switching state: The relay of the output shows no reaction and remains in the state last set by the disabling function. Switch off: At the end of the disabling function, the switching output is switched off and enabled again. Switch on: At the end of the disabling function, the switching output is switched on and enabled again. set tracked state: The last switching state received during the disabling function or the switching state set before the disabling function will be tracked. Any time functions still in progress will also be taken into account if necessary. Flash: The switching output is switched on and off cyclically after the disabling. The flashing time is set with the parameter "Time for flashing of the disabling function". During flashing, the logical switching state of the output is fed back as "Switched on". The flashing state remains active until another KNX command is received and thereby predefines another switching state.	

End of disabling function after acknowledgement	no change to the switching state Switch off Switch on set tracked state Flashing
The behaviour of the switching output at the end of the disabling function after acknowledgement can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is not used. no change of switching state: The relay of the output shows no reaction on acknowledgement and remains in the state last set by the disabling function. Switch off: On acknowledgement, the switching output is switched off and enabled again. Switch on: On acknowledgement, the switching output is switched on and enabled again. set tracked state: On acknowledgement, the last switching state received during the disabling function or the switching state set before the disabling function will be tracked. Any time functions still in progress will also be taken into account if necessary. Flash: The switching output is switched on and off cyclically after the acknowledgement. The flashing time is set with the parameter "Time for flashing of the disabling function". During flashing, the logical switching state of the output is fed back as "Switched on". The flashing state remains active until another KNX command is received and thereby predefines another switching state.	

Time for flashing the disabling functions	1 s 2 s 5 s 10 s
Switching outputs can flash in the disabled state (cyclical switching on and off). The flashing time for the switching output is configured here.	

Relay outputs -> SO... - General -> Forced position

Forced position "active, switch-on"	Switch on
If the forced position is activated and restraint is "ON", the switching output is always switched on. This parameter cannot be edited and is only visible when the forced position function is enabled.	
Forced position "active, switch-off"	Switch off
If the forced position is activated and restraint is "OFF", the switching output is always switched off. This parameter cannot be edited and is only visible when the forced position function is enabled.	

Forced position end "inactive"	Tracking the switching state no change to the switching state Switch off Switch on
The behaviour of the switching output at the end of the forced-position can be configured here. This parameter is only visible when the forced position function is enabled. Track switching state: The state received during the forced position function or the switching state set before the function can be tracked at the end of the forced position. Any time functions still in progress will also be taken into account if necessary. no change of switching state: The relay of the output shows no reaction and remains in the state last set by the forced position. Switch off: At the end of the forced position, the switching output is switched off and enabled again. Switch on: At the end of the forced position, the switching output is switched on and enabled again.	
After the bus voltage returns	No forced position Forced position active, switch on Forced position active, switch off State before bus voltage failure
The forced position communication object can be initialised after the bus voltage returns. The switching state of the output can be influenced when the forced position function is being activated. This parameter is only visible when the forced position function is enabled. no forced position: When the bus voltage returns, the force-independent parameter "After bus voltage return" (parameter page "Outputs-> Switching / Venetian blind -> SO... - General") will be executed when the bus voltage returns. Forced position active, switch on: The forced position is activated. The switching output is switched on under forced control. Forced position active, switch off: The forced position is activated. The switching output is switched off under forced control. State before bus voltage failure: The forced position state last selected and internally stored before bus voltage failure will be tracked after the bus voltage returns. An ETS programming operation deletes the stored state (reaction in that case same as with "no forced position active"). If the tracked state corresponds to "No forced position", the force-independent parameter "After bus voltage return" (parameter page "Outputs-> Switching / Venetian blind -> SO... - General") will be executed when the bus voltage returns.	

14.3.10.2 Object list disabling function and forced position

Function	Name	Type	DPT	Flag
Disabling function - Activate/deactivate	SO ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for disabling a switching output (polarity configurable).				

Function	Name	Type	DPT	Flag
Disabling function - Acknowledgement	SO ... - Input	1-bit	1,016	C, -, W, -, U
1-bit object to acknowledge an active disabling function of a switching output. This object is only visible if the acknowledgement is to be used with the disabling function ("1" = Disabling function is deactivated / "0" = disabling function remains active).				

Function	Name	Type	DPT	Flag
Disabling function - Status	SO ... - Output	1-bit	1,003	C, R, -, T, A
1-bit object to acknowledge an active disabling function of a switching output. This object is only visible if the acknowledgement is to be used with the disabling function ("1" = Disabling function is deactivated / "0" = disabling function remains active).				

Function	Name	Type	DPT	Flag
Forced position - Activate/deactivate	SO ... - Input	2-bit	2,001	C, -, W, -, U
2-bit object for the forced position of a switching output. The polarity is fixed by the telegram.				

14.3.11 Logic operation function

A logic function can be configured separately for each switching output. This function allows the logic operation of the "Switching" object state and an additional logic operation object. The state of the communication object for "switching" can also be evaluated with a time delay if a switch-on delay or switch-off delay is set.

The logic function can also be combined with other functions of a switching output. A combination with the staircase function is not possible, however.

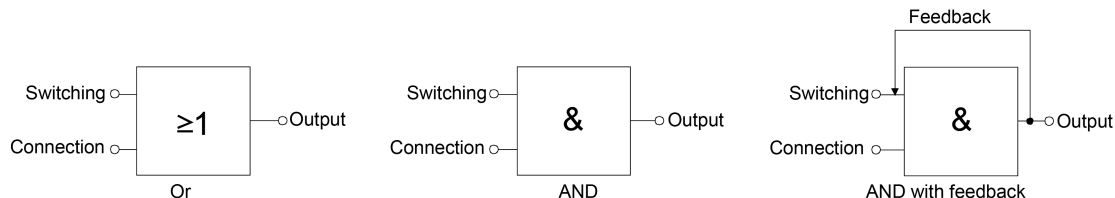


Figure 79: Logic operation types of the logic operation function

"AND with feedback":

With a logic object = "0", the switching output is always "0" (logic AND). In this case, the feedback signal from the output to the "switching" input will directly reset this input when it is being set. The output of the switching output can assume the logical state "1" by a newly received "1" on the input "switching" only when the logic object is = "1".

The object "Logic operation" can be initialised with a configured value after the bus voltage returns or after an ETS programming operation so that a correct logic operation result can be determined immediately and set on the output of the switching output during a telegram update on the "Switching" object.

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions", activate the "Logic operation function" parameter.

The logic operation function is enabled. The communication object "Logic operation function - Input" and the parameters of the logic operation function on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Logic operation function" become visible.

- Set the parameter "Type of logic operation function" to the desired logic operation type.
- Set the parameters "Object value after bus voltage returns" and "Object value after ETS programming" to the required initial states.

The "Logic operation - Input" object is initialised immediately with the set switching states after the bus voltage returns or after an ETS programming of the application program or parameters.

- i** The logic operation function after a reset of the actuator (bus voltage return or ETS programming operation) is first executed when the switching object is updated as the input of the logic operation by at least one telegram.
- i** The states or switching states specified at the end of a disabling function or forced position function, which are set after programming in the ETS, in the case of bus voltage failure or after the bus voltage returns, override the logic

operation function. The configured logic operation is first re-executed and the result set on the switching output when the switching object is updated as the input of the logic operation by at least one telegram.

14.3.11.1 Logic operation function parameters

Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions

Logic operation function	Checkbox (yes / no)
The logic operation function can be enabled here. The parameter is deactivated and unchangeable if the staircase function or cyclical monitoring is enabled.	

Outputs -> Switching / Venetian blind -> SO... - General -> Logic operation function

Type of logic operation function	OR AND AND with feedback
This parameter defines the logical type of the logic operation function. The object "Logic operation - Input" is linked to the logic switching state of the switching output (object "Switching" after evaluation of any configured time delays) on the basis of the logic operation function set here. This parameter is only visible when the logic operation function is enabled.	
Object value after bus voltage returns	0 (OFF) 1 (ON)
After the bus voltage returns, the object value of the logic operation object is initialised here with the preset value. This parameter is only visible when the logic operation function is enabled.	
Object value after ETS programming operation	0 (OFF) 1 (ON)
After programming the application or the parameters in the ETS, the object value of the logic operation object is initialised here with the preset value. This parameter is only visible when the logic operation function is enabled.	

14.3.11.2 Object list logic operation function

Function	Name	Type	DPT	Flag
Logic operation function - Input	SO ... - Input	1-bit	1,002	C, -, W, -, U
1-bit object as input of the logical link of an switching output. After the bus voltage returns or after programming with the ETS, the object value can be predefined by means of a parameter.				

14.3.12 Operating hours counter

The operating hours counter determines the switch-on time of a switching output. For the operating hours counter, an output is actively on when the relay contact is closed, i.e. when current is flowing to the load. In consequence, a closed contact is always evaluated, irrespective of the set relay operating mode (NO or NC contact) and the logical feedback of the switching status.

The operating hours counter can either be configured as a second counter or alternatively as an hour counter.

- Second counter

The actuator adds up the determined switch-on time accurately to the second for a closed relay contact. The totalled operating seconds are added in a 4-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 13.100.

- Hour counter

The actuator adds up the determined switch-on time accurately to the minute for a closed relay contact in full operating hours. The totalled operating hours are added in a 2-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 7.007.

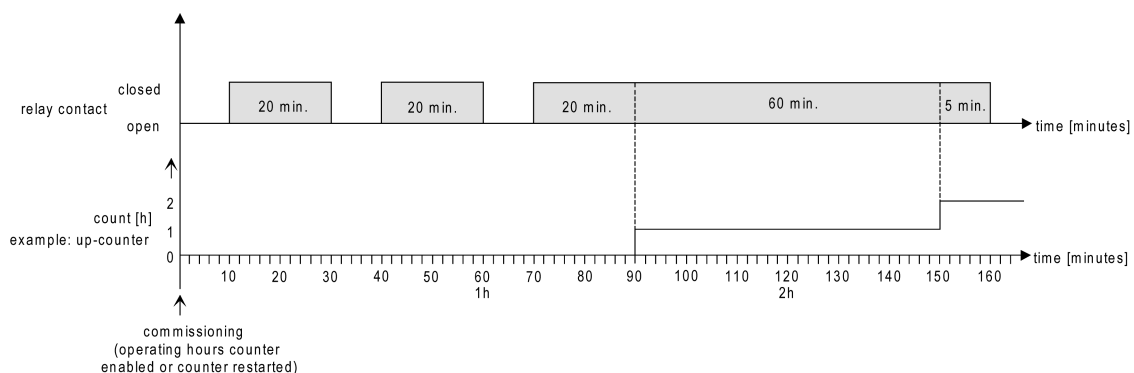


Figure 80: Function of the operating hours counter (using the example of counted hours)

In the delivery state, all values of the actuator are "0". If the operating hours counter is not enabled in the configuration of an output, no operating hours or operating seconds will be counted for the output concerned. Once the operating hours counter is enabled in the ETS, however, the operating hours or operating seconds will be determined and added up by the ETS immediately after commissioning the actuator. If the operating hours counter is subsequently disabled again in the parameters and the actuator is programmed with this disabling function, all the operating hours or operating seconds previously counted for the output concerned will be deleted. When enabled again, the meter reading of the operating hours counter is always set to "0".

The operating hours values (full hours) or operating seconds stored in the device will not be lost in case of a bus voltage failure or by ETS programming.

On the hour counter: Any summed up operating minutes (full hour not yet reached) will be rejected in this case, however.

After the bus voltage returns or after an ETS programming operation, the actuator passively updates the "Operating hours counter - Meter reading - Status" communication object for each output. The object value can be read out if the read-flag is set. The object value, depending on the configuration for the automatic transmission, is actively transmitted if necessary to the KNX once the configured transmission delay has elapsed after the bus voltage returns (see "Set transmission behaviour of the operating hours counter").

Activating the operating hours counter

- On the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions", activate the "Operating hours counter" parameter.

The operating hours counter is activated.

- Deactivate the "operating hours counter".

The operating hours counter is deactivated.

-  Disabling of the operating hours counter and subsequent programming with the ETS resets the counter status to "0".

Setting the counting direction

The operating hours counter can optionally be configured as an up-counter or down-counter. Depending on this counting direction, a signal value or start value can optionally be set; in this way it is possible, for example, to monitor the operating time of a lamp by restricting the counter range.

Up-counter:

After activating the operating hours counter by enabling in the ETS or by restarting, the operating hours are counted starting at "0". A maximum of 65,535 hours or 2147483647 can be counted (corresponds to approx. 66 years) before the meter stops and signals a meter operation by means of the object "Operating hours counter - Counter elapsed - Status".

A signal value can optionally be set in the ETS or specified via the communication object "Operating hours counter - Signal value". In this case, the counter operation is signalled to the KNX via the "Operating hours counter - Counter elapsed - Status" object if the limiting value is reached, but the meter continues counting - if it is not restarted - up to the maximum value and then stops. Only a restart initiates a new counting operation.

Down-counter:

After enabling the operating hours counter in the ETS, the meter reading is on "0" and the actuator signals a counter operation for the output concerned after the programming operation or after the bus voltage returns by means of the object "Operating hours counter - Counter elapsed - Status". Only after a restart is the down-counter set to the maximum value of 65,535 hours or 2147483647 seconds (corres-

ponds to approx. 66 years) and the counter operation is started.

Optionally, a start value can be set in the ETS or specified by means of the communication object "Start value for operating hours counter". If a start value is set, the down-counter is initialised with this value instead of the maximum value after a restart. The meter then counts the start value downwards by the hour. When the down-meter reaches the value "0", the meter operation is signalled to the KNX by means of the "Operating hours counter - Meter elapsed - Status" object and the counting is stopped. Only a restart initiates a new counting operation.

The operating hours counter must be activated on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- Set the "Counting direction" parameter on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Operating hours counter" to "Up counter". Set the parameter "Preset value" to "via parameter" or "via object" if monitoring is required. In the "via parameter" setting, specify the required value.

The meter counts the operating hours forwards starting from "0". If monitoring is activated, the actuator transmits an "ON" telegram via the object "Operating hours counter - Meter elapsed - Status" for the output concerned as soon as the specified value is reached. Otherwise, the counter operation is first transmitted when the maximum value is reached.

- Set the "Counting direction" parameter to "Backward". Set the parameter "Start value" to "via parameter" or "via object" if a preset value is required. In the "via parameter" setting, specify the required value.

The meter counts the operating hours down to "0" after a restart. With a start value preset, the start value is counted down, otherwise the counting operation starts at the maximum value. The actuator transmits an "ON" telegram via the object "Operating hours counter - Meter elapsed - Status" for the output concerned as soon as the value "0" is reached.

i The value of the communication object "Operating hours counter - Meter elapsed - Status" is permanently stored internally. On switching on the bus voltage or after an ETS programming operation, the object is initialised with the most recently saved value. If an operating hours counter is in this case identified as elapsed, i. e. if the object value is a "ON", an additional telegram will be actively transmitted to the KNX as soon as the configured transmit delay has elapsed after the bus voltage returns. If the meter has not yet elapsed (object value "OFF"), no telegram is transmitted after the bus voltage returns or after an ETS programming operation.

i In the case of a signal value or start value preset via communication object: The values received via the object are not accepted as valid and permanently saved internally until the operating hours counter is restarted. On switching on the supply voltage or after an ETS programming operation, the object is initialised with the most recently saved value. The values received will be lost in the case of a bus voltage failure or by an ETS programming operation if no counter restart was executed before. For this reason, when specifying a new start or signal value, it is advisable always to execute a counter restart after-

wards as well. A standard value of 65,535 hours or 2147483647 seconds is predefined provided that no signal value or start value has been received yet via the object. The values received and stored via the object are reset to the standard value if the operating hours counter is disabled in the parameters of the ETS and an ETS programming operation is being performed.

- i** With a signal or start value predefined via object: If the signal value or start value is predefined with "0", the actuator will ignore a counter restart to avoid an undesired reset (e. g. in construction site mode -> operating hours already counted by manual operation).
- i** If the counter direction of an operating hours counter is reversed by reconfiguration in the ETS, a restart of the meter should always be performed after programming the actuator so that the meter is reinitialised.

Restarting the operating hours counter

The meter reading of the operating hours can be reset at any time by the communication object "Operating hours counter - Reset". The polarity of the reset telegram is predefined: "1" = Restart / "0" = No reaction.

In the up-counter the meter is initialised with the value "0" after a restart and in the down-counter initialised with the start value. If no start value was configured or predefined by the object, the start value is preset to 65535 hours or 2147483647 seconds.

During every counter restart, the initialised meter reading is transmitted actively to the KNX.

After a restart, the signal of a counter operation is also reset. At the same time, an "OFF" telegram is transmitted to the KNX via the object "Operating hours counter – Meter elapsed - Status". In addition, the limiting or start value is initialised.

- i** If a new signal or start value was specified via the communication object, the counter should always be restarted afterwards too. Otherwise, the values received will be lost in the case of a bus voltage failure or by an ETS programming operation.

If a start value or signal value is specified with "0", there are different behaviours after a restart, depending on the principle of the preset value...

Preset as parameter:

The meter elapses immediately after a counter restart.

Preset via object:

A counter restart will be ignored to avoid an undesired reset (e. g. after installation of the devices with operating hours already being counted by manual operation). A start value or signal value greater than "0" must be specified in order to perform the restart.

Setting the transmission behaviour

The current value of the operating hours counter is continuously tracked in the communication object "Operating hours counter – Meter reading - Status". The content of the object is transmitted to the KNX when there is a change by the set count interval or cyclically active. The object value can also be read out at any time (set read flag).

The operating hours counter must be activated on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions".

- Set the "Transmission behaviour" parameter on the parameter page "Outputs -> Switching / Venetian blind -> SO... - General -> Operating hours counter" to "After change by interval value". Set the parameter "Counting interval" to the desired value.

The meter reading is transmitted to the KNX as soon as it changes by the specified counting interval. After the bus voltage returns or after an ETS programming operation, the object value is transmitted automatically after "Delay after bus voltage returns" has elapsed if the current meter reading corresponds to the counting interval or a multiple thereof. A meter reading "0" is always transmitted in this case.

- Set the parameter "Transmission behaviour" to "cyclical".

The counter value is transmitted cyclically. The cycle time is defined via the parameter of the same name. After the bus voltage returns or an ETS programming operation, the meter reading is transmitted to the KNX for the first time after the configured cycle time has elapsed.

14.3.12.1 Operating hours counter parameters

Outputs -> Switching / Venetian blind -> SO... - General -> Enabled functions

Operating hours counter	Checkbox (yes / no)
The operating hours counter can be disabled or enabled here.	

Outputs -> Switching / Venetian blind -> SO... - General -> Operating hours counter

Counting method	Seconds
	Hours

The operating hours counter can either be configured as a second meter or as an hour meter.

Second counter: The actuator adds up the determined switch-on time accurately to the second for a closed relay contact. The totalled operating seconds are added in a 4-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 13.100.

Hour counter: The actuator adds up the determined switch-on time accurately to the minute for a closed relay contact in full operating hours. The totalled operating hours are added in a 2-byte counter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Operating hours counter - Counter reading - Status" communication object or when there is a change in an interval value in accordance with DPT 7.007.

Counting direction	Forwards
	Backwards

The operating hours counter can be configured as an up-counter or down-counter. The setting here influences the visibility of the other parameters and objects of the operating hours counter.

Specifying a signal value	Checkbox (yes / no)

If the up-counter is used, a signal value can optionally be predefined. This parameter specifies whether the signal value is to be used. The setting "No" deactivates the reporting value.

This parameter is only visible in the configuration "Counting direction = Forward".

Preset value	via parameter
	via object

If the up-counter is used, a signal value can optionally be predefined. This parameter defines whether the signal value can be set via a separate parameter or adapted individually by a communication object from the bus.

This parameter is only visible in the configuration "Counting direction = Forward".

Signal value	0...2147483647 s * 0...65535 h **
Here the reporting value of the up counter is set. Once this signal value is reached, an "ON" telegram is transmitted via the object "Operating hours counter - Meter elapsed - Status". The meter itself continues until the maximum meter reading is reached and then stops. *: With second counter **: With hours counter This parameter is only visible if the parameter "Preset value" is set to "via parameter".	
Specify start value	Checkbox (yes / no)
If the down-counter is used, a start value can optionally be predefined. This parameter specifies whether the start value is to be used. The setting "No" deactivates the start value. This parameter is only visible in the configuration "Counting direction = Backward".	
Preset value	via parameter via object
If the down-counter is used, a start value can optionally be predefined. This parameter defines whether the start value can be set via a separate parameter or adapted individually by a communication object from the bus. This parameter is only visible in the configuration "Counting direction = Backward".	
Start value	0...2147483647 s * 0...65535 h **
The start value of the down-counter is set here. After initialisation, the meter starts counting down from the predefined value to the value "0". If this end value is reached, an "ON" telegram is transmitted via the object "Operating hours counter - Meter elapsed - Status". *: With seconds counter **: With hours counter This parameter is only visible if the parameter "Start value preset" is set to "via parameter".	
Transmission behaviour	cyclical after change by interval value
The current meter reading of the operating hours meter can be transmitted actively to the KNX via the communication object "Operating hours counter – Meter reading – Status". cyclical: The meter reading is transmitted cyclically to the KNX and when there is a change. after change by interval value: The meter reading is transmitted to the KNX only when there is a change.	

Cycle time	0...23 h 0...15...59 min 10...59 s
This parameter defines the cycle time for the cyclical transmission. This parameter for the cycle time is only visible when parameter "Transmission behaviour of the counter value" is set to "cyclically".	
Counting interval	0...3600...2147483647 s* 0...1...65535 h**
The interval of the counter value is set here for automatic transmission. The current meter reading is transmitted to the KNX after the counting interval configured here. *: With second counter **: With hours counter This parameter is only visible if the parameter "Transmission behaviour" is set to "on change by interval value".	

14.3.12.2 Object list operating hours counter

Function	Name	Type	DPT	Flag
Operating hours counter - Signal value	SO ... - Input	4-byte	13,100	C, -, W, -, U
Operating hours counter - Start value	SO ... - Input	4-byte	13,100	C, -, W, -, U

4-byte object for external preset of a signal value of the operating hours counter of a switching output in the case of an up-counter or a start value in the case of a down-counter.
Value range: 0...2147483647 seconds
This object is only available with the second counter.

Function	Name	Type	DPT	Flag
Operating hours counter - Signal value	SO ... - Input	2-byte	7,007	C, -, W, -, U
Operating hours counter - Start value	SO ... - Input	2-byte	7,007	C, -, W, -, U

2-byte object for external preset of a signal value of the operating hours counter of a switching output in the case of an up-counter or a start value in the case of a down-counter.
Value range: 0...65,535 hours
This object is only available with the hour counter.

Function	Name	Type	DPT	Flag
Operating hours counter - Restart	SO ... - Input	1-bit	1,015	C, -, W, -, U

1-bit object for resetting the operating hours counter of a switching output ("1" = restart, "0" = no reaction).

Function	Name	Type	DPT	Flag
Operating hours counter - Meter reading - Status	SO... - Output	4-byte	13,100	C, R, -, T, A

4-byte object to transmit or read out the current counter level of the operating hours counter of a switching output.
Value range: 0...2147483647 seconds
In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation. In the as-delivered state, the value is "0".
This object is only available with the second counter.

Function	Name	Type	DPT	Flag
Operating hours counter - Meter reading - Status	SO... - Output	2-byte	7,007	C, R, -, T, A

2-byte object to transmit or read out the current counter level of the operating hours counter of a switching output.
Value range: 0...65,535 hours

In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation. In the as-delivered state, the value is "0".

This object is only available with the hour counter.

Function	Name	Type	DPT	Flag
Operating hours counter - Meter elapsed - Status	SO... - Output	1-bit	1,002	C, R, -, T, A

1-bit object to sign that the operating hours counter has elapsed (forwards counter = limit value reached / backwards counter = value "0" reached). With a message, the object value is actively transmitted to the KNX ("1" = message active / "0" = message inactive).

In the event of a bus voltage failure, the value of the communication object is not lost and is actively transmitted to the bus after the bus voltage returns or after an ETS programming operation.

15 Extensions

The device has 12 independent extension channels. The first four channels can operate as binary inputs. Channels 5 ... 8 can be used as binary inputs or to connect temperature sensors. Channels 9 ... 12 can be used only as binary inputs. The device can read in up to 12 contact states potential-free via the inputs in event of a shared reference potential and transmit telegrams on the bus accordingly.

It is possible to deactivate channels by deselecting the parameter "Use" (e. g. as a reserve for future applications). Deactivated channels have no parameters or communication objects and cannot be controlled even with manual operation.

- i** The connection of 230 V signals or other external voltages to the inputs is not permitted!

Channel configuration

Each channel can be operated and parameterised separately. Individual channels can execute the following channel functions:

- Push-button
- Switch
- Door/window status
- Pulse counter
- Temperature sensor (channel 5 ... 8 only)

The following connection example shows a possible connection of the extensions:

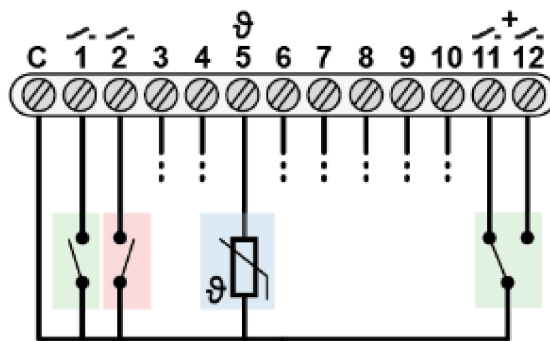


Figure 81: Connection example for extensions

Combining

Adjacent channels can be combined in activated condition (e. g. E1 + E2). Combined channels can execute the following channel functions:

- Push-button
- Door/window status

- i** Combined channels can allow, for example, multi-switches (top/bottom), series push-buttons / venetian blind push-buttons / rotary switches, reversing switches/push-buttons to act interactively on a venetian blind via two inputs/channels.

- i** Combined channels in the "door/window status" channel function can, for example, generate a shared status message for a window with two magnetic contacts.

Using channel templates

To simplify the configuration, the input channels can be assigned individually to the same parameters in the ETS and thus configured identically. The parameter "Parameterisation" on the parameter page "Extensions" specifies whether each individual channel of the device can be parametrised individually or whether they are to be configured using the parameters of a template channel.

In the "by template" setting, the number of parameters in the ETS is reduced. The parameters of the template channel are then used on these channels automatically. Only the communication objects can then be configured separately for the channels. This setting should be selected, for example, if all channels behave identically and should only be activated by different group addresses (e. g. in office blocks or in hotel rooms).

If the setting "by template" is selected for at least one channel, a template channel of the corresponding type is displayed in addition to the channels of the extensions. This template channel has all the functional parameters of a corresponding input channel except for the "Name" parameter. The template channel does not have its own communication objects. For the channel that uses the settings of the template channel, only the "Name" parameter and all communication objects remain displayed.

15.1 Channel configuration extensions parameter

Extensions

I ... Use	Checkbox (yes / no)
Input channels that are not required can be deactivated.	
I ... Combining	Ex + Ey / no (x and y are the channel numbers of neighbouring channels that can be combined)
The combination with the neighbouring channel can be defined for each input channel. This parameter should be set at the start because all other parameters and assignments of the group addresses to the communication objects are dependent on it.	
I ... Parameterisation	individual / by template
To simplify the configuration, all the extension inputs can be assigned to the same parameters in the ETS and thus configured identically. This parameter stipulates whether an input channel of the device can be configured individually or whether the parameters of the template channel are to be applied.	

Extension units -> E - General

Name of the extension input	Free text
The text entered in this parameter is applied to the name of the communication objects and is used for labelling of the extension unit in the ETS parameter window. The text is not programmed in the device.	
Channel function	Push-button Switch Door/window status Temperature sensor Pulse counter
Each input of the device can be activated and deactivated individually. Each input can be operated and parameterised separately. – Push-button – Switch – Door/window status – Pulse counter – Temperature sensor (channel 5 ... 8 only)	

15.2 Push-button

The "push-button" channel function can be parametrised for each input. The following functions are available in the "push-button" channel function:

- Switching
- Priority control
- Dimming and colour temperature
- Venetian blind / shutter / awning / roof window
- Value transmitter
- Scene extension unit
- Short and long button operation
- Room temperature control point

The ETS provides the corresponding parameters and communication objects dynamically for the function according to the parameterised function.

The contact type and debouncing time are to be parameterised separately for each channel. A disabling function can be activated optionally for each push-button channel.

- i** The "push-button" channel function is recommended if telegrams are to be transmitted on the KNX, depending on how long the channel/push-button was actuated. For example in the "dimming", "venetian blind", "value transmitter with value adjustment", "telegram upon short or long button actuation" functions or with the "RGB(W) colour adjustment".

15.2.1 Table of parameters

The following parameters are generally available for the "push-button" channel function.

Function	Switching Priority control Dimming and colour temperature Venetian blind / shutter / awning / roof window Value transmitter Scene extension unit Short and long button operation Room temperature control point
This parameter determines the function of the push-button connected to the channel.	

Contact type	NO contact NC contact
This parameter determines the contact type of the push-button connected to the channel.	
Debounce time	4 ... 10 ... 255 ms
This parameter specifies the software debouncing time. A signal edge is evaluated at the input after a delay based on this time.	

15.2.2 Switching

In the "push-button" channel function, the push-button can be parameterised in the "switching" function. The ETS indicates up to three communication objects for each channel for the "switching" function. The parameters can be used to determine the value the "switching" object is to obtain when the push-button is pressed and/or released. Furthermore, the behaviour of the channel after the bus voltage returns can be parameterised and a disabling function activated. No distinction is made between a brief or long press.

15.2.2.1 Table of parameters

The following parameters are available in the "push-button" channel function with the parameterised "switching" function.

When pressed	no reaction ON OFF TOGGLE
This parameter defines the reaction when the push-button is pressed.	
When released	no reaction ON OFF TOGGLE
This parameter determines the reaction when the push-button is released.	
After the bus voltage returns	no reaction transmit current state ON OFF
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel, an ON telegram or an OFF telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	

At the beginning of the disabling function	no reaction ON OFF TOGGLE
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling.	
At the end of the disabling function	no reaction transmit current state ON OFF TOGGLE
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling.	
Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.2.2.2 Object list

The following communication objects are available in the "push-button" channel function with the parameterised "switching" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Switching	I ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object for transmission of switching telegrams (ON, OFF).				

Function	Name	Type	DPT	Flag
Switching - Status	I ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for receiving feedback telegrams (ON, OFF). This object is visible if the "When pressed" parameter or "When released" parameter is configured to "TOGGLE".				

Function	Name	Type	DPT	Flag
Switching - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured.				

15.2.3 Priority control

In the "push-button" channel function, the push-button can be parameterised for the "forced position" function. The ETS indicates up to two communication objects for each channel for the "forced position" function. The parameters can be used to determine the value the "forced position" object is to obtain when the push-button is pressed and/or released. Furthermore, the behaviour of the channel after the bus voltage returns can be parameterised and a disabling function activated. No distinction is made between a brief or long press.

15.2.3.1 Table of parameters

The following parameters are available in the "push-button" channel function with the parameterised "forced position" function.

When pressed	no reaction Forcing active, ON Forcing active, OFF Forcing inactive
This parameter defines the reaction when the push-button is pressed.	
When released	no reaction Forcing active, ON Forcing active, OFF Forcing inactive
This parameter determines the reaction when the push-button is released.	
After the bus voltage returns	no reaction transmit current state Forcing active, ON Forcing active, OFF Forcing inactive
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel, a forcing active ON telegram, a forcing active OFF telegram or a forcing inactive telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	

At the beginning of the disabling function	no reaction Forcing active, ON Forcing active, OFF Forcing inactive
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling.	
At the end of the disabling function	no reaction transmit current state Forcing active, ON Forcing active, OFF Forcing inactive
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling.	
Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.2.3.2 Object list

The following communication objects are available in the "push-button" channel function with the parameterised "forced position" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Priority control	I ... - Output	2-bit	2,001	C, R, -, T, A
2-bit input object for activating and deactivating the forced position. With the value "1", bit 1 of the telegram activates the forced position. The assigned channels are then locked in the state specified by bit 0 ("0" = OFF / "1" = ON). The value "0" in bit 1 deactivates the forced position again. 0x = forcing inactive 10 = forcing active, OFF 11 = forcing active, ON				
Function	Name	Type	DPT	Flag
Forced position -Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured.				

15.2.4 Dimming and colour temperature

In the "push-button" channel function, the push-button can be parameterised for the "dimming and colour control" function. The ETS indicates up to four communication objects for each channel for the "dimming and colour control" function. The parameters can be used to determine the value the objects "Dimming - ..." obtain when the button is pressed. Furthermore, the behaviour of the channel after the bus voltage returns can be parameterised and a disabling function activated.

Generally, the device transmits a switching telegram after a brief actuation and a dimming telegram after a long actuation. In the standard parameterisation the device transmits a telegram for stopping the dimming action after a long actuation. The duration of pressing the button between switching and dimming is 400 milliseconds in the default parameterisation and can be set in the advanced parameters. The brightness and/or the colour temperature can be dimmed.

- i** The time between switching and dimming should be adjusted according to the parameterised debouncing time.

Status

If an actuator is controlled by multiple control points, the actuator must report its switching status back to the 1-bit object "Dimming - Switching - Status" of the channel. Due to the feedback, the device detects that the actuator has changed its switching status by input from another element and adjusts the dimming direction accordingly. The status is visible only if switchover commands are set.

- i** The dimming direction is always only evaluated and switched locally, unless the actuator changes its switching status due to input from multiple elements (e. g. lighting ON / change of brightness value only). The 4-bit dimming objects and the 3-byte combi object are not tracked via the bus.

Advanced configuration options

The device has advanced parameters for the dimming function. If necessary, these advanced parameters can be activated and thus be made visible.

In the continuous dimming mode (100%), the device transmits a telegram only at the beginning of the long press to start the dimming process and generally a stop telegram after the end of the press. For dimming in small levels it may be useful if the device repeats the dimming telegram in case of a sustained press for a time that can be set (parameter "Telegram repetition"). The stop telegram after the end of the press is then not needed.

The following settings are made if the advanced parameters are switched to invisible (advanced parameters = inactive):

- Time between switching and dimming = 400 ms
- Dimming ranges = 100 %
- Stop telegram = active
- Telegram repetition = inactive

15.2.4.1 Brightness

The brightness is dimmed in the default configuration.

The control of the brightness in the "Dimming and colour temperature" function distinguishes between dual-area operation and single-area operation. The parameter "Brightness on pressing" defines the single-area or dual-area dimming function.

Dual-area operation	Single-area operation
Brighter (ON)	Brighter/darker (TOGGLE)
Darker (OFF)	Brighter (TOGGLE)
	Darker (TOGGLE)

With dual-area operation, the device transmits a telegram for switching on or off after a brief actuation, and a telegram for increasing the brightness ("Brighter") or dimming ("Darker") after a long actuation.

In the event of single-area operation, the device transmits ON and OFF telegrams alternately ("TOGGLE") each time the respective button is briefly pressed. If the button is pressed and held, the device transmits either a telegram for dimming up ("brighter") or down ("darker") or the "Brighter" and "Darker" telegrams alternately.

15.2.4.2 Colour temperature

The "Dimming and colour temperature" function with the control of the colour temperature distinguishes between dual-area operation and single-area operation. The parameter "Colour temperature on pressing" defines the single-surface or double-surface dimming function.

Dual-area operation	Single-area operation
Colder (ON)	Colder / warmer (TOGGLE)
Warmer (OFF)	Colder (TOGGLE)
	Warmer (TOGGLE)

In the event of dual-area operation, the device transmits a telegram for switching on or off after short actuation and a telegram for dimming to a colder or warmer colour temperature after long actuation.

In the event of single-area operation, the device transmits ON and OFF telegrams alternately ("TOGGLE") each time the respective button is briefly pressed. In the event of long actuation, the device transmits either a telegram for dimming colder or warmer or the "Colour temperature colder" and "Colour temperature warmer" telegrams alternately.

15.2.4.3 Brightness and colour temperature

The dimming process can only adjust either the brightness or the colour temperature via individual objects.

Optionally, the brightness and the colour temperature can also be adjusted together via a combi object.

The "Dimming and colour temperature" function with the control of the brightness and colour temperature distinguishes between dual-area operation and single-area operation. The parameter "Brightness + colour temperature on pressing" defines the single-area or dual-area dimming function.

Dual-area operation	Single-area operation
Brighter + colder (ON)	Brighter + colder / darker + warmer (TOGGLE)
Darker + warmer (OFF)	Brighter + colder (TOGGLE)
	Darker + warmer (TOGGLE)

In dual-area operation, the device sends a telegram for switching on or off in the event of brief actuation and a telegram for brighter/colder or darker/warmer dimming in the event of long actuation.

In the event of single-area operation, the device transmits ON and OFF telegrams alternately ("TOGGLE") each time the respective button is briefly pressed. In the event of long actuation, the device transmits either a telegram for brighter/colder dimming or darker/warmer dimming or the "Brighter + colder" and "Darker + warmer" telegrams alternately.

15.2.4.4 Table of parameters

The following parameters are available in the "push-button" channel function with the parameterised "Dimming and colour temperature" function.

Dimming control	Single object: brightness Single object: colour temperature Combi object: brightness + colour temperature
With this parameter, either the brightness or the colour temperature can be dimmed by means of an individual object, or the brightness and colour temperature can be controlled together by means of a combination object	
Brightness on pressing	no reaction Brighter (ON) Darker (OFF) Brighter/darker (TOGGLE) Brighter (TOGGLE) Darker (TOGGLE)
This parameter defines the reaction when a button is pressed. If the device is to toggle on a brief press, the corresponding switching objects of other sensors with the same function must be interlinked. This parameter is visible only if: dimming control = individual object: brightness	
Colour temperature on pressing	no reaction Colder (ON) Warmer (OFF) Colder / warmer (TOGGLE) Colder (TOGGLE) Warmer (TOGGLE)
This parameter defines the reaction when a button is pressed. If the device is to toggle on a brief press, the corresponding switching objects of other sensors with the same function must be interlinked. This parameter is visible only if: dimming control = individual object: colour temperature	

Brightness + colour temperature on pressing	no reaction Brighter + colder (ON) Darker + warmer (OFF) Brighter + colder / darker + warmer (TOGGLE) Brighter + colder (TOGGLE) Darker + warmer (TOGGLE)
This parameter defines the reaction when a button is pressed. If the device is to toggle on a brief press, the corresponding switching objects of other sensors with the same function must be interlinked. This parameter is visible only if: dimming control = combination object: brightness + colour temperature	
Extended settings	Active Inactive
When the advanced parameters are activated, the ETS shows the following parameters.	
Time between switching and dimming	0 ... 50 s 100 ... 400 ... 990 ms
This parameter defines how long the button must be pressed for a dimming telegram to be transmitted.	
Dimming brightness by	1.5% 3% 6% 12.5% 25% 50% 100%
This parameter sets the relative dimming level when the brightness is increased. On each button actuation, the brightness is changed at maximum by the configured step width. It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").	

Dimming darker by	1.5%
	3%
	6%
	12.5%
	25%
	50%
	100%

This parameter sets the relative dimming level when the brightness is reduced. On each button actuation, the brightness is changed at maximum by the configured step width.

It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").

Colour temperature colder by	1.5%
	3%
	6%
	12.5%
	25%
	50%
	100%

This parameter sets the relative dimming level when the colour temperature is increased. On each button actuation, the brightness is changed at maximum by the configured step width.

It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").

Colour temperature warmer by	1.5%
	3%
	6%
	12.5%
	25%
	50%
	100%

This parameter sets the relative dimming level when the colour temperature is reduced. On each button actuation, the brightness is changed at maximum by the configured step width.

It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").

Stop telegram	Active Inactive
On "Active" the device transmits a telegram for stopping the dimming process when the button is released. When the device transmits telegrams for dimming in smaller levels, the stop telegram is generally not needed.	
Telegram repetition	Active Inactive
This parameter can be used to activate telegram repetition for dimming. With telegram repetition activated, the device cyclically sends relative dimming telegrams (in the parameterised step width) to the bus if the button is pressed long.	
Time between two telegrams	200 ms 300 ms 400 ms 500 ms 750 ms 1000 ms 2000 ms
This parameter defines the interval at which the dimming telegrams are automatically repeated in the telegram repetition mode. This parameter is only visible if "Telegram repetition = active"!	
After the bus voltage returns	no reaction transmit current state ON OFF
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel, an ON telegram or an OFF telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	

At the beginning of the disabling function	no reaction ON OFF TOGGLE
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling.	
At the end of the disabling function	no reaction transmit current state ON OFF TOGGLE
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling.	
Object polarity	0 = enable / 1 = disable 1 = enable / 0 = disable
This parameter defines the value of the disabling object at which the disabling function is active.	

15.2.4.5 Object list

The following communication objects are available in the "push-button" channel function with the parameterised "dimming and colour temperature" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Dimming - Switching	I ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object for transmission of switching telegrams (ON, OFF).				

Function	Name	Type	DPT	Flag
Dimming - Brightness	I ... - Output	4-bit	3,007	C, R, -, T, A
4-bit object for sending relative dimming telegrams to adjust the brightness.				

Function	Name	Type	DPT	Flag
Dimming - Brightness and colour temperature	I ... - Output	3-byte	250,600	C, R, -, T, A
3-byte object for sending dimming telegrams for adjusting the brightness and the colour temperature in combination.				

Function	Name	Type	DPT	Flag
Dimming - Switching - Status	I ... - Output	1-bit	1,001	C, -, W, -, U
1-bit object for receiving feedback telegrams (ON, OFF). This object is visible if the parameter " ... when pressed" is parameterised to "TOGGLE".				

Function	Name	Type	DPT	Flag
Dimming - Colour temperature fading	I ... - Output	4-bit	3,007	C, R, -, T, A
4-bit object for sending relative dimming telegrams to adjust the colour temperature.				

Function	Name	Type	DPT	Flag
Dimming - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured.				

15.2.5 Venetian blind / shutter / awning / roof window

In the "push-button" channel function, the push-button can be parameterised for the "venetian blind / shutter / awning / roof window" function. The ETS indicates up to three communication objects for each channel for the "venetian blind / shutter / awning / roof window" function. The parameters can be used to determine the values the "Venetian blind" objects obtain when the push-button is pressed. Furthermore, the behaviour of the channel after the bus voltage returns can be parameterised and a disabling function activated.

The "Type of blind/shutter" parameter can be used to select whether "Venetian blind" or "shutter / awning / skylight" are to be controlled. The selectable values of the "Command sequence" parameter vary, depending on the setting.

The "Venetian blind / shutter / awning / skylight" function distinguishes between dual-area operation (UP, DOWN) and single-area operation (TOGGLE). The "Command on pressing" parameter defines the single-area or double-area blind function.

Dual-area operation	Single-area operation
UP	TOGGLE
DOWN	

Dual-area operation means that e. g. the device transmits a telegram for upward movement if one channel is actuated and a telegram for downward movement if a different channel is actuated.

Single-area operation means the device changes the direction of the long-time telegram after each long actuation. Several short time telegrams in succession have the same direction.

Status

If the actuator can be controlled from several sensors, a faultless single-area operation requires that the long-time objects of the control elements are interlinked. The device would otherwise not be able to detect that the actuator has been addressed from another sensor, in which case it would have to be actuated twice during the next use in order to produce the desired reaction.

15.2.5.1 Table of parameters

The following parameters are available in the "push-button" channel function with the parameterised function "venetian blind / shutter / awning / roof window".

Type of blind/shutter	Venetian blind Shutter / awning / roof window
This parameter defines the type of blind/shutter to be controlled and optimises the available setting options of the channel function.	
Command on pressing	UP DOWN TOGGLE
This parameter defines the running direction of the drive on pressing the button. If the setting is "TOGGLE", the direction is changed after each long time command. If several devices are to control the same drive, the long-time objects of the devices must be interlinked to ensure that the running direction can be changed correctly.	
Command sequence	Up/down - Step Step - Up/down
Two different operating concepts can be selected to actuate the "shutter / awning / roof window" blind/shutter types.	
Command sequence	Step - Up/down - Step Up/down - Step Step - Up/down Step - Up/down or step
For Venetian blind control, four different operating concepts can be selected.	
Long button actuation from (t1)	0 ... 59 s 100 ... 400 ... 990 ms
This parameter sets the time after which the long-time operation will be evaluated on pressing the button. This parameter is not visible for the "command sequence = Up/down - Step"	
Time window for slat adjustment (t2)	0 ... 59 s 0 ... 500 ... 990 ms
The time during which a transmitted MOVE telegram can be terminated by releasing the button (STEP) is set here. This function serves to adjust the slats of a venetian blind. This parameter is not visible for the "command sequence = Step - Up/down"	
Show info graphic	Active Inactive
If info graphic is activated, the graphic diagram of the command sequence and related text information are displayed.	

After the bus voltage returns	no reaction transmit current state UP DOWN
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel, an UP telegram or a DOWN telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	
At the beginning of the disabling function	no reaction UP DOWN
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling.	
At the end of the disabling function	no reaction transmit current state UP DOWN
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling.	
Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.2.5.2 Object list

The following communication objects are available in the "push-button" channel function with the parameterised function "venetian blind / shutter / awning / roof window". The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Venetian blind - Short time operation	I ... - Output	1-bit	1,007	C, R, -, T, A
1-bit object for the transmission of telegrams with which a venetian blind or shutter drive motor can be stopped or with which the blind slats can be adjusted by short time operation.				

Function	Name	Type	DPT	Flag
Venetian blind - Long time operation	I ... - Output	1-bit	1,008	C, R, W, T, A
1-bit object for the transmission of telegrams with which a venetian blind or shutter drive motor can be moved upwards or downwards.				

Function	Name	Type	DPT	Flag
Venetian blind - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured.				

15.2.6 Value transmitter

In the "push-button" channel function, the push-button can be parameterised for the "value transmitter" function. The ETS indicates up to six communication objects for each channel for the "value transmitter" function. The parameters can be used to determine the value the "value transmitter" objects obtain when the button is pressed.

With the "value transmitter" function, the device sends parameterised values to the bus at the press of a button.

Value adjustment

Furthermore, a value adjustment and the behaviour of the channel after the bus voltage returns can be parameterised and a disabling function activated. No distinction is made between a brief or long press.

In the function as value transmitter with value adjustment, the device transmits the parameterised value when the button is briefly pressed. After the initial value adjustment, the device still transmits the parameterised value or the device takes the value to be transmitted depending on the parameterisation from the value adjustment or from the status object if the button is briefly pressed. This allows fixed or changeable values or values transmitted via the bus to be called up.

Optionally, the channel adjusts the value if the button is pressed for a long time. This allows, for example, absolute dimming of the values to be generated. The direction of the value adjustment can be parameterised in the process. The value adjustment can be configured flexibly by allowing the starting time in the event of pressing the button for a long time and the time between the telegrams to be parameterised.

i The value adjustment is not available, with "DPT 249.600 | colour temperature value + brightness" and "RGBW/HSVW colour value".

Value ranges

The value transmitter knows 14 different value ranges. The parameter "Data point type | Value range" determines the value range used by the value transmitter, depending on the application case:

Function	Function	Lower numerical limit	Upper numerical limit
1-byte value transmitter	0...100%	0%	100%
1-byte value transmitter	0...255	0	255
1-byte value transmitter	0...360°	0°	360°
1-byte value transmitter	0...255%	0%	255%
1-byte value transmitter	-128...127	-128	127

Function	Function	Lower numerical limit	Upper numerical limit
2-byte value transmitter	0...65535	0	65535
2-byte value transmitter	Colour temperature value	1000 K	10000 K
2-byte value transmitter	-32768...32767	-32768	32767
2-byte value transmitter	Temperature value	0 °C	40 °C
2-byte value transmitter	Brightness value	0 lux	1500 lux
6-byte value transmitter	Colour temperature value + brightness	1000 K 0%	10000 K 100%
3-byte value transmitter	RGB/HSV with colour wheel sequence	#000000	#FFFFFF
3-byte value transmitter	RGB/HSV with brightness adjustment	#000000	#FFFFFF
6-byte value transmitter	Colour value RGBW/HSVW	#000000 + 0	#FFFFFF + 255

For each of these ranges, the value that can be transmitted to the bus for each button actuation is configurable.

15.2.6.1 Table of parameters

The following parameters are available in the "push-button" channel function with the parameterised "value transmitter" function.

Data point type Value range	DPT 5.001 0 ... 100% DPT 5.010 0 ... 255 DPT 5.003 0 ... 360° DPT 5.004 0 ... 255% DPT 6.010 -128 ... 127 DPT 7.001 0 ... 65535 DPT 7.600 1000 ... 10000 K DPT 8.001 -32768 ... 32767 DPT 9.001 0 ... 40 °C DPT 9.004 0 ... 1500 lux DPT 249.600 Colour temperature value + brightness RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) Colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)

The "value transmitter" function distinguishes between 1-byte, 2-byte 3-byte and 6-byte values.

The following parameters and their settings depend on the setting for this parameter.

Value when pressed	0 ... 100%
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 5.001 0 ... 100%".	
Value when pressed	0 ... 255
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 5.010 0 ... 255".	
Value when pressed	0 ... 360°
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 5.003 0 ... 360°".	

Value when pressed	0 ... 255%
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 5.004 0 ... 255%".	
Value when pressed	-128...0 ... 127
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 6.010 -128 ... 127".	
Value when pressed	0 ... 65535
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 7.001 0 ... 65535".	
Colour temperature value when pressed	1000 ... 2700 ... 10000 K
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 7.600 1000 ... 10000 K".	
Value when pressed	-32768 ... 0 ... 32767
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 8.001 -32768 ... 32767".	
Temperature value when pressed	0 ... 20 ... 40 °C
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 9.001 0 ... 40 °C".	
Brightness value when pressed	0, 50 ... 300 ... 1500 lux
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 9.004 0 ... 1500 lux".	
Colour temperature value when pressed	1000 ... 2700 ... 10000 K
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Brightness value when pressed	0 ... 100%
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Adjustment duration in the actuator	0 ... 100 min, 0, 1 ... 59 s, 0 ... 900 ms
This parameter defines the object value when the button is pressed. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	

Colour value when pressed	#000000 ... #FFFFFF
This parameter determines the object values of the value transmitter 3-byte (or value transmitter 6-byte), brightness value (V), saturation (S) and colour hue (H) objects when the button is pressed. It is visible with "data point type value range = RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)", "data point type value range = RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)" and "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)". The value (RGB/HSV) is configured by means of a colour picker. With the data point type value range "colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)", the white value is configured by means of a separate slider.	
White value when pressed	0 ... 255
This parameter defines the object value of the white level (W) object when the button is pressed. It is visible only if "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)".	
Value adjustment	Active Inactive
In the "push-button" channel function, the device can adjust the value in the "value transmitter" function. If the value adjustment is activated by a long button-press, the ETS shows further parameters.  The value adjustment is not available, with "DPT 249.600 colour temperature value + brightness" and "RGBW/HSVW colour value".	
Start value	same as configured value same as value after last adjustment like value from status object
Value adjustment can begin with different starting values. With "same as configured value": After each long press, the device always starts with the value configured in the ETS. With "same as value after last adjustment": After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value. With "same as value from status object": When the push-button is pressed for a long time, the device starts with the value that it or another device with this group address transmitted as the last value.  This selection is available only with 1-byte or 2-byte value transmitters.	

Start value	as parameterised colour value same as value after last adjustment same as value from status object colour angle (H) same as value from status object RGB
Value adjustment can begin with different starting values. With "same as parameterised colour value": After each long actuation, the device always starts with the value programmed by the ETS. With "same as value after last adjustment": After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value. With "same as value from colour hue (H) status object": After long actuation, the device starts with the value that it or another device with this group address transmitted as the last value. With "same as value from RGB status object": After long actuation, the device starts with the value that it or another device with this group address transmitted as the last value.  This selection is available only with RGB/HSV with colour wheel sequence.	

Start value	as parameterised colour value same as value after last adjustment same as value from status object brightness (V) same as value from status object RGB
Value adjustment can begin with different starting values. With "same as parameterised colour value": After each long actuation, the device always starts with the value programmed by the ETS. With "same as value after last adjustment": After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value. With "same as value from brightness (V) status object": After long actuation, the device starts with the value that it or another device with this group address transmitted as the last value. With "same as value from RGB status object": After long actuation, the device starts with the value that it or another device with this group address transmitted as the last value.  This selection is available only with RGB/HSV with brightness adjustment.	

Direction	upwards downwards Toggling (alternating)
With a long press, the device can either vary the values always in the same direction or it stores the direction of the last adjustment and reverses it on the next button-press.	
i This selection is available only with 1-byte or 2-byte value transmitters.	

Direction	Colour sequence in clockwise direction (red -> green -> blue -> red -> ...) Colour sequence in anti-clockwise direction (red -> blue -> green -> red -> ...) Toggling colour sequence (alternating when each new rising edge)
With a long press, the device can either vary the values always in the same direction or it stores the direction of the last adjustment and reverses it on the next button-press.	
i This selection is available only with RGB/HSV with colour wheel sequence.	

Direction	brighter darker Toggling (alternating)
With a long press, the device can either vary the values always in the same direction or it stores the direction of the last adjustment and reverses it on the next button-press.	
i This selection is available only with RGB/HSV with brightness adjustment.	

Increment	1 ... 15
In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the adjustment range or if it exceeds the upper limit, the sensor adapts the step width of the last step automatically.	
i This selection is available only with 1-byte value transmitters.	

Increment	1, 2, 5, 10, 20, 50, 75, 100 , 200, 500, 750, 1000
In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the adjustment range or if it exceeds the upper limit, the sensor adapts the step width of the last step automatically.	
i This selection is available only with 2-byte value transmitters (0 ... 65535 and -32768 ... 32767) available.	

Increment	0.5, 1, 1.5, 2, ..., 40
In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the adjustment range or if it exceeds the upper limit, the sensor adapts the step width of the last step automatically.	
i This selection is available only with 2-byte value transmitters (0 ... 40 °C).	
Increment	1, 10, 20, ..., 500 , ..., 1000
In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the adjustment range or if it exceeds the upper limit, the sensor adapts the step width of the last step automatically.	
i This selection is available only with 2-byte value transmitters (1000 ... 10000 K).	
Increment	1, 2, 3, ..., 50 , ..., 1500 lux
In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the adjustment range or if it exceeds the upper limit, the sensor adapts the step width of the last step automatically.	
i This selection is available only with 2-byte value transmitters (0 ... 1500 lux).	
Increment	1, 2, 4, 5, 10, 20, 25, 30, 50, 60 °
In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the adjustment range or if it exceeds the upper limit, the sensor adapts the step width of the last step automatically.	
i This selection is available only with 3-byte value transmitters (RGB/HSV).	
Value adjustment starts after	0.5 s after pressing the button 1 s after pressing the button 2 s after pressing the button 3 s after pressing the button 5 s after pressing the button
This parameter determines the time from when the device starts the value adjustment after a key is pressed.	
Time between two telegrams	0.5 s 1 s 2 s 3 s
This parameter defines the interval at which the device transmits new telegrams during a value adjustment.	

Value adjustment with overflow	Active Inactive
If value adjustment is to be effected without overflow (setting "inactive") and if the device reaches the lower limit of the adjustment range or the upper limit during value adjustment, the adjustment will be stopped automatically by the sensor. If the value adjustment with overflow is programmed (setting "active") and if the device reaches the lower or the upper limit, it will transmit the value of this range limit and then add a pause the duration of which corresponds to two levels. Thereafter, the device transmits a telegram with the value of the other range limit and continues the value adjustment in the same direction.	
After the bus voltage returns	no reaction transmit current state Transmit value
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel or a value parameterised accordingly for the set data point type value range is transmitted on the bus. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	
Value	0 ... 100%
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 5.001 0 ... 100%".	
Value	0 ... 255
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 5.010 0 ... 255".	
Value	0 ... 360°
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 5.003 0 ... 360°".	
Value	0 ... 255%
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 5.004 0 ... 255%".	
Value	-128...0 ... 127
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 6.010 -128 ... 127".	
Value	0 ... 65535
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 7.001 0 ... 65535".	

Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 7.600 1000 ... 10000 K".	
Value	-32768 ... 0 ... 32767
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 8.001 -32768 ... 32767".	
Temperature value	0 ... 20 ... 40 °C
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 9.001 0 ... 40 °C".	
Brightness value	0, 50 ... 300 ... 1500 lux
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 9.004 0 ... 1500 lux".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Brightness value	0 ... 100%
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Adjustment duration in the actuator	0 ... 100 min, 0, 1 ... 59 s, 0 ... 900 ms
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Colour value	#000000 ... #FFFFFF
This parameter determines the object values of the 3-byte value transmitter (or 6-byte value transmitter), brightness value (V), saturation (S) and colour hue (H) objects after the bus voltage returns. It is visible with "data point type value range = RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)", "data point type value range = RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)" and "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001, DPT 5.001)". The value (RGB/HSV) is configured by means of a colour picker. With the data point type value range "colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)", the white value is configured by means of a separate slider.	

White value	0 ... 255
This parameter determines the object value of the white value (W) after the bus voltage returns. It is visible only if "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)".	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	
At the beginning of the disabling function	no reaction Transmit value
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling.	
Value	0 ... 100%
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 5.001 0 ... 100%".	
Value	0 ... 255
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 5.010 0 ... 255".	
Value	0 ... 360°
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 5.003 0 ... 360°".	
Value	0 ... 255%
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 5.004 0 ... 255%".	
Value	-128...0 ... 127
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 6.010 -128 ... 127".	
Value	0 ... 65535
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 7.001 0 ... 65535".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 7.600 1000 ... 10000 K".	

Value	-32768 ... 0 ... 32767
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 8.001 -32768 ... 32767".	
Temperature value	0 ... 20 ... 40 °C
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 9.001 0 ... 40 °C".	
Brightness value	0, 50 ... 300 ... 1500 lux
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 9.004 0 ... 1500 lux".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Brightness value	0 ... 100%
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Adjustment duration in the actuator	0 ... 100 min, 0, 1 ... 59 s, 0 ... 900 ms
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Colour value	#000000 ... #FFFFFF
This parameter determines the object values of the 3-byte value transmitter (or 6-byte value transmitter), brightness value (V), saturation (S) and colour hue (H) objects at the beginning of the disabling. It is visible with "data point type value range = RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)", "data point type value range = RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)" and "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)". The value (RGB/HSV) is configured by means of a colour picker. With the data point type value range "colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)", the white value is configured by means of a separate slider.	

White value	0 ... 255
This parameter determines the object value of the white value (W) object at the beginning of the disabling. It is visible only if "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)".	
At the end of the disabling function	no reaction transmit current state Transmit value
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling.	
Value	0 ... 100%
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 5.001 0 ... 100%".	
Value	0 ... 255
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 5.010 0 ... 255".	
Value	0 ... 360°
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 5.003 0 ... 360°".	
Value	0 ... 255%
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 5.004 0 ... 255%".	
Value	-128...0 ... 127
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 6.010 -128 ... 127".	
Value	0 ... 65535
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 7.001 0 ... 65535".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 7.600 1000 ... 10000 K".	

Value	-32768 ... 0 ... 32767
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 8.001 -32768 ... 32767".	
Temperature value	0 ... 20 ... 40 °C
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 9.001 0 ... 40 °C".	
Brightness value	0, 50 ... 300 ... 1500 lux
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 9.004 0 ... 1500 lux".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Brightness value	0 ... 100%
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Adjustment duration in the actuator	0 ... 100 min, 0, 1 ... 59 s, 0 ... 900 ms
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Colour value	#000000 ... #FFFFFF
This parameter determines the object values of the 3-byte value transmitter (or 6-byte value transmitter), brightness value (V), saturation (S) and colour hue (H) objects at the end of the disabling. It is visible with "data point type value range = RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)", "data point type value range = RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)" and "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)". The value (RGB/HSV) is configured by means of a colour picker. With the data point type value range "colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)", the white value is configured by means of a separate slider.	

White value	0 ... 255
This parameter determines the object value of the white value (W) object at the end of the disabling. It is visible only if "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)".	
Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.2.6.2 Object list

The following communication objects are available in the "push-button" channel function with the parameterised "value transmitter" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Value transmitter - 0...100%	I ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object for the transmission of values from 0 to 100%. These objects are visible only if "data point type value range = DPT 5.001 0 ... 100%".				

Function	Name	Type	DPT	Flag
Value transmitter - 0...255	I ... - Output	1-byte	5,010	C, R, -, T, A
1-byte object for the transmission of values from 0 to 255. These objects are visible only if "data point type value range = DPT 5.010 0 ... 255".				

Function	Name	Type	DPT	Flag
Value transmitter - 0...360°	I ... - Output	1-byte	5,003	C, R, -, T, A
1-byte object for the transmission of values from 0 to 360°. These objects are visible only if "data point type value range = DPT 5.003 0 ... 360°".				

Function	Name	Type	DPT	Flag
Value transmitter - 0...255%	I ... - Output	1-byte	5,004	C, R, -, T, A
1-byte object for the transmission of values from 0 to 255%. These objects are visible only if "data point type value range = DPT 5.004 0 ... 255%".				

Function	Name	Type	DPT	Flag
Value transmitter - -128...127	I ... - Output	1-byte	6,010	C, R, -, T, A
1-byte object for the transmission of values from -128 to 127. These objects are visible only if "data point type value range = DPT 6.010 -128 ... 127".				

Function	Name	Type	DPT	Flag
Value transmitter - 0...65535	I ... - Output	2-byte	7,001	C, R, -, T, A

2-byte object for the transmission of values from 0 to 65535.

These objects are visible only if "data point type | value range = DPT 7.001 | 0 ... 65535".

Function	Name	Type	DPT	Flag
Value transmitter - Colour temperature value	I ... - Output	2-byte	7,600	C, R, -, T, A

2-byte object for transmitting colour temperatures from 1000 to 10000 Kelvin.

These objects are visible only if "data point type | value range = DPT 7.600 | 1000 ... 10000 K".

Function	Name	Type	DPT	Flag
Value transmitter - -32768...32767	I ... - Output	2-byte	8,001	C, R, -, T, A

2-byte object for the transmission of values from -32768 to 32767.

These objects are visible only if "data point type | value range = DPT 8.001 | -32768 ... 32767".

Function	Name	Type	DPT	Flag
Value transmitter - Temperature value	I ... - Output	2-byte	9,001	C, R, -, T, A

2-byte object for transmitting temperature values from 0 to 40 °C.

These objects are visible only if "data point type | value range = DPT 9.001 | 0 ... 40 °C".

Function	Name	Type	DPT	Flag
Value transmitter - Brightness value	I ... - Output	2-byte	9,004	C, R, -, T, A

2-byte object for transmitting brightness values from 0 to 1500 Lux.

These objects are visible only if "data point type | value range = DPT 9.004 | 0 ... 1500 lux".

Function	Name	Type	DPT	Flag
Value transmitter - Colour temperature value and brightness value	I ... - Output	6-byte	249,600	C, R, -, T, A

6-byte object used to transmit a colour temperature value, a brightness value and the adjustment time in the actuator. The actuator sets the received values during the adjustment time.

These objects are visible only if "data point type | value range = DPT 249.600 | colour temperature value + brightness" applies.

Function	Name	Type	DPT	Flag
Value transmitter - RGB/HSV (colour wheel sequence)	I ... - Output	3-byte	232,600	C, R, -, T, A
3-byte object for transmitting 3-byte colour information. These objects are visible only if "data point type value range = RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)".				

Function	Name	Type	DPT	Flag
Value transmitter - RGB/HSV (brightness adjustment)	I ... - Output	3-byte	232,600	C, R, -, T, A
3-byte object for transmitting 3-byte colour information. These objects are visible only with data point type value range: RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001).				

Function	Name	Type	DPT	Flag
Value transmitter - RGBW	I ... - Output	6-byte	251,600	C, R, -, T, A
6-byte object for transmitting 6-byte colour information. These objects are visible only with data point type value range: colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001).				

Function	Name	Type	DPT	Flag
Value transmitter - Colour hue (H)	I ... - Output	1-byte	5,003	C, R, -, T, A
1-byte object for transmitting the colour hue. These objects are visible only with data point type value range: - - RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) - - RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) - Colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)				

Function	Name	Type	DPT	Flag
Value transmitter - Saturation (S)	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object for transmitting the saturation.

These objects are visible only with data point type | value range:

- - RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)
- - RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)

- Colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)

Function	Name	Type	DPT	Flag
Value transmitter - brightness value (V)	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object for transmitting the brightness value.

These objects are visible only with data point type | value range:

- - RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)
- - RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)

- Colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)

Function	Name	Type	DPT	Flag
Value transmitter - White value (W)	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object for transmitting the white level.

These objects are visible only with data point type | value range: colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001).

Function	Name	Type	DPT	Flag
Value transmitter - Brightness value (V) status	I ... - Input	1-byte	5,001	C, -, W, -, U

1-byte object for receiving the brightness value.

These objects are only visible with the following configuration:

- - Data point type | value range: RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)

- "Start value" parameter = as value from brightness (V) status object

Function	Name	Type	DPT	Flag
Value transmitter - Colour hue (H) status	I ... - Input	1-byte	5,003	C, -, W, -, U
1-byte object for receiving the colour hue. These objects are only visible with the following configuration: - Data point type value range: RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) - "Start value" parameter = as value from colour hue (H) status object				
Function	Name	Type	DPT	Flag
Value transmitter - RGB - Status	I ... - Input	3-byte	232,600	C, -, W, -, U
3-byte object for receiving 3-byte colour information. These objects are only visible with the following configuration: - Parameter: data point type value range: RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001), RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001). - "Start value" parameter = as value from RGB status object				
Function	Name	Type	DPT	Flag
Value transmitter - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured.				

15.2.7 Scene extension unit

In the "push-button" channel function, the push-button can be parameterised for the "scene extension unit" function. The ETS indicates up to two communication objects for the "scene extension unit" function. The parameters can be used to determine the value the "scene extension unit" object obtains when the button is pressed. Furthermore, the behaviour of the channel after the bus voltage returns can be parameterised and a disabling function activated.

In the scene extension unit function, the device calls either a parameterised scene number (1...64) or switches between two scenes if the button is briefly pressed. This makes it possible to recall scenes stored in other devices. Optionally, the channel performs a storage function if the button is pressed for a long time.

Setting options when button is pressed briefly:

- Recall scene: results in simply recalling the scene.
- Switch over scene: The input option for a second scene number (1...64) appears. The two entered scene numbers are switched to and from each time the button is briefly pressed.

Setting options when button is pressed and held:

- No reaction
- Storage function: A storage command is generated by a button actuation for more than five seconds. In the scene extension unit function, a storage telegram is in this case transmitted to the bus. The internal scene is stored. The internal scene control module will then request the current scene values for the actuator groups used from the bus.

i A button actuation lasting between one and five seconds will be discarded as invalid.

15.2.7.1 Table of parameters

The following parameters are available in the "push-button" channel function with the parameterised "scene extension unit" function.

Short button operation	Recall scene Switch over scene
This parameter defines the functionality of the scene extension unit. If the device is used as a scene extension unit, the scenes can either be stored in one or several other KNX devices (e. g. light scene push button sensor). When a scene is recalled, the device transmits a telegram with the respective scene number via the extension object of the button.	
Scene number	1...64
In accordance with the KNX standard, objects with data type 18.001 "Scene Control" can retrieve or store up to 64 scenes by their numbers. The parameter defines the scene number to be transmitted when the button is pressed. The input of the scene number is available only if "Call scene" is active in the event of the "short button actuation" command.	
First scene number	1...64
In accordance with the KNX standard, objects with data type 18.001 "Scene Control" can retrieve or store up to 64 scenes by their numbers. The parameter defines the scene number to be transmitted when the button is pressed. The input of the first scene number is available only if "Switch over scene" is active when the "Short button actuation" command is issued.	
Second scene number	1, 2 ... 64
In accordance with the KNX standard, objects with data type 18.001 "Scene Control" can retrieve or store up to 64 scenes by their numbers. The parameter defines the scene number to be transmitted when the button is pressed. The input of the second scene number is available only if "Switch over scene" is active when the "Short button actuation" command is issued.	
Long button operation	No reaction Memory function
This parameter defines the functionality of the scene extension unit. If the device is used as a scene extension unit, the scenes can either be stored in one or several other KNX devices (e. g. light scene push button sensor). With activated storage function, the device transmits a telegram with the respective scene number via the extension object of the button.	

After the bus voltage returns	no reaction transmit current state Recall scene
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel or a parameterised scene number is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	
Scene number	1...64
The parameter defines here the scene number to be transmitted after the bus voltage returns.	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	
At the beginning of the disabling function	no reaction Recall scene
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling.	
Scene number	1...64
The scene number to be transmitted at the beginning of the disabling is defined here.	
At the end of the disabling function	no reaction transmit current state Recall scene
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling.	
Scene number	1...64
The scene number to be transmitted at the end of the disabling is defined here.	
Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.2.7.2 Object list

The following communication objects are available in the "push-button" channel function with the parameterised "scene extension unit" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Scene extension unit - Scene number	I ... - Output	1-byte	18,001	C, R, -, T, A
1-byte object for recalling, switching over or storing one of a maximum of 64 scenes at a scene push-button sensor.				

Function	Name	Type	DPT	Flag
Scene extension unit - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured.				

15.2.8 Short and long button operation

- i** The "short and long button actuation" function replaces the "2-channel operation" function.

In the "push-button" channel function, the push-button can be parameterised for the "short and long button actuation" function. The ETS indicates up to nine communication objects for each channel for the "short and long button actuation" function. The parameters can be used to determine the values the "short and long button actuation" objects obtain when the button is pressed. Furthermore, the behaviour of the channel after the bus voltage returns can be parameterised and a disabling function activated.

The "short and long button actuation" function allows two objects to be operated with one push-button. Two different functions can be configured to transmit different telegrams.

The following functions are available for selection:

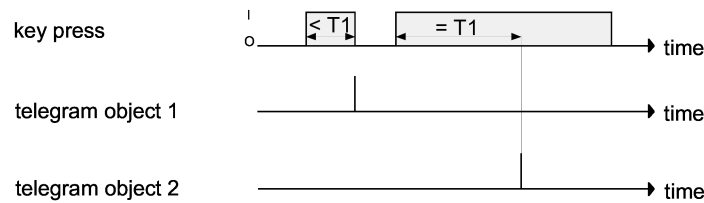
- DPT 1.001 | Switching
- DPT 2.001 | Priority control
- DPT 5.001 | 0 ... 100%
- DPT 5.010 | 0 ... 255
- DPT 5.003 | 0 ... 360°
- DPT 5.004 | 0 ... 255%
- DPT 6.010 | -128 ... 127
- DPT 7.001 | 0 ... 65535
- DPT 8.001 | -32768 ... 32767
- DPT 9.001 | 0 ... 40 °C
- DPT 9.004 | 0 ... 1500 lux
- DPT 18.001 | Call up scene (externally)
- DPT 18.001 | Switch scene (external)
- Room temperature control point
- RGB/HSV (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)
- RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)

The object value that the device is to transmit on a button actuation can be selected depending on the selected function.

Transmission behaviour, long button actuation = object 2

With this transmission behaviour, exactly one telegram is sent each time the button is pressed.

- The device sends the telegram for object 1 if the button is pressed briefly.
- The device sends the telegram for object 2 if the button is pressed longer.



$T1$ = time between object 1 and object 2

Figure 82: Example of "object 1 or object 2" operating concept

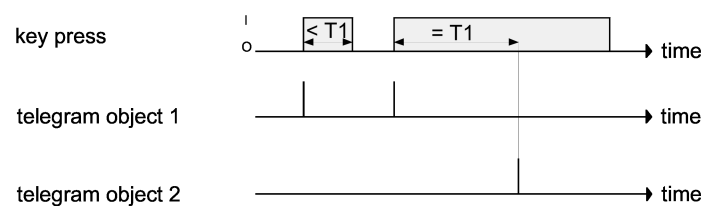
The "Long button actuation from" parameter defines the time period for distinguishing between short-time and long-time operation. If the push-button is pressed for shorter than the parameterised time, only the telegram for object 1 is transmitted on the bus. If the "long button actuation" time is exceeded by the actuation period, only the telegram for object 2 is transmitted on the bus.

i The device does not directly transmit a telegram on the bus.

Transmission behaviour, long button actuation = object 1 and object 2

With this transmission behaviour, one or alternatively two telegrams can be transmitted each time the button is pressed.

- The device will send the telegram for object 1 if the button is pressed briefly.
- The device will send the telegram for object 1 and then the telegram for object 2 if the button is pressed longer.



$T1$ = time between object 1 and object 2

Figure 83: Example of "object 1 and object 2" operating concept

The "Long button actuation from" parameter defines the time period for distinguishing between short-time and long-time operation. The telegram for object 1 is immediately transmitted on the bus if the button is pressed. If the push-button remains pressed for the parameterised time, the telegram for object 2 is also transmitted on the bus. If the push-button is released before the time expires, no further telegram is transmitted on the bus.

i The "long button actuation from" time is to be parameterised for a sufficient period, depending on the application case, to prevent simultaneous transmission of the objects.

15.2.8.1 Table of parameters

The following parameters are available in the "push-button" channel function with the parameterised "short and long button actuation" function.

Short button operation (object 1)	no function DPT 1.001 Switching DPT 2.001 Priority control DPT 5.001 0 ... 100% DPT 5.010 0 ... 255 DPT 5.003 0 ... 360° DPT 5.004 0 ... 255% DPT 6.010 -128 ... 127 DPT 7.001 0 ... 65535 DPT 7.006 1000 ... 10000 K DPT 8.001 -32768 ... 32767 DPT 9.001 0 ... 40 °C DPT 9.004 0 ... 1500 lux DPT 18.001 Call up scene (externally) DPT 18.001 Switch scene (external) DPT 249.600 Colour temperature value + brightness Room temperature control point RGB/HSV (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)
This parameter determines the function of the short button actuation and defines the other parameters and communication objects to be displayed.	
Function	Operating mode switchover Forced operating mode switchover Presence function Setpoint temperature shift
A room temperature control point can optionally switch over (force) the operating mode with normal or high priority, change the presence status or change the current room temperature setpoint value. Visible only if "short button actuation (object 1) = room temperature control point".	

Setpoint temperature shift	by relative temperature value by counter value
Depending on the setting of the "Target temperature shift" parameter, the shift takes place by means of the 2-byte communication object in accordance with KNX DPT 9.002 or KNX DPT 6.010. Visible only if "functionality = setpoint temperature shift".	
Long button operation (object 2)	no function DPT 1.001 Switching DPT 2.001 Priority control DPT 5.001 0 ... 100% DPT 5.010 0 ... 255 DPT 5.003 0 ... 360° DPT 5.004 0 ... 255% DPT 6.010 -128 ... 127 DPT 7.001 0 ... 65535 DPT 7.006 1000 ... 10000 K DPT 8.001 -32768 ... 32767 DPT 9.001 0 ... 40 °C DPT 9.004 0 ... 1500 lux DPT 18.001 Call up scene (externally) DPT 18.001 Switch scene (external) DPT 249.600 Colour temperature value + brightness Room temperature control point RGB/HSV (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)
This parameter determines the function of the long button actuation and defines the other parameters and communication objects to be displayed.	
Function	Operating mode switchover Forced operating mode switchover Presence function Setpoint temperature shift
A room temperature control point can optionally switch over (force) the operating mode with normal or high priority, change the presence status or change the current room temperature setpoint value. Visible only if "long button actuation (object 2) = room temperature control point".	

Setpoint temperature shift	by relative temperature value by counter value
Depending on the setting of the "Target temperature shift" parameter, the shift takes place by means of the 2-byte communication object in accordance with KNX DPT 9.002 or KNX DPT 6.010. Visible only if "functionality = setpoint temperature shift".	
Short button operation (object 1) Long button operation (object 2)	ON OFF TOGGLE
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 1.001 Switching".	
Short button operation (object 1) Long button operation (object 2)	no reaction Forcing active, ON Forcing active, OFF Forcing inactive
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 2.001 Forced position".	
Short button operation (object 1) Long button operation (object 2) Value	0...100 %
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 5.001 0 ... 100%".	
Short button operation (object 1) Long button operation (object 2) Value	0...255
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 5.010 0 ... 255".	
Short button operation (object 1) Long button operation (object 2) Value	0...360°
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 5.003 0 ... 360°".	

Short button operation (object 1) Long button operation (object 2) Value	0...255 %
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 5.004 0 ... 255%".	
Short button operation (object 1) Long button operation (object 2) Value	-128...0...127
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 6.010 -128 ... 127".	
Short button operation (object 1) Long button operation (object 2) Value	0...65535
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 7.001 0 ... 65535".	
Short button operation (object 1) Long button operation (object 2) Value	1000...2700...10000 K
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 7.600 1000 ... 10000 K".	
Short button operation (object 1) Long button operation (object 2) Value	-32768...0...32767
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 8.001 -32768 ... 32767".	
Short button operation (object 1) Long button operation (object 2) Temperature value	0...20...40 °C
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 9.001 0 ... 40 °C".	

Short button operation (object 1) Long button operation (object 2) Brightness value	0... 300 ...1500 lux
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality of object 1 (2) = DPT 9.004 0 ... 1500 lux".	
Short button operation (object 1) Long button operation (object 2) Scene number	1 ...64
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 18.001 Recall scene (externally)".	
Short button operation (object 1) Long button operation (object 2) First scene number	1 ...64
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 18.001 Switch over scene (externally)".	
Short button operation (object 1) Long button operation (object 2) Second scene number	1... 2 ...64
This parameter defines the object value transmitted to the bus when the button is pressed. It is visible only if "functionality = DPT 18.001 Switch over scene (externally)".	
Short button operation (object 1) Long button operation (object 2) Colour temperature value	1000 ... 2700 ... 10000 K
This parameter defines the object value when the button is pressed. It is visible only if "functionality = DPT 249.600 colour temperature value + brightness".	
Short button operation (object 1) Long button operation (object 2) Brightness value	0 ... 100 %
This parameter defines the object value when the button is pressed. It is visible only if "functionality = DPT 249.600 colour temperature value + brightness".	

Short button operation (object 1) Long button operation (object 2) Adjustment duration in the actuator	0 ... 100 min, 0, 1 ... 59 s, 0 ... 900 ms
This parameter defines the object value when the button is pressed. It is visible only if "functionality = DPT 249.600 colour temperature value + brightness".	
Short button operation (object 1) Long button operation (object 2) Operating mode	Comfort Standby Night Frost/heat protection Switchover: comfort/standby Switchover: comfort/night Switchover: standby/night Switchover: comfort/standby/night
If the room temperature control point is intended to change over the operating mode of the room temperature controller with normal priority, the extension unit can either switch on a defined operating mode or switch between different operating modes when operated. Visible only if "functionality = room temperature control point -> operating mode change-over".	
Short button operation (object 1) Long button operation (object 2) Forced operating mode	Forcing inactive (auto) Comfort Standby Night Frost/heat protection Switchover: comfort/standby Switchover: comfort/night Switchover: standby/night Switchover: comfort/standby/night Toggle: forced inactive (auto) / comfort Toggle: forced inactive (auto) / standby Toggle: forced inactive (auto) / night Switchover: forced inactive (auto) / frost/heat protection
If the room temperature control point is intended to switch the operating mode of the room temperature controller with high priority, the extension unit can either enable change-over with normal priority (auto), switch on a defined operating mode with high priority or switch different operating modes when operated. Visible only if "functionality = room temperature control point -> forced operating mode change-over".	

Short button operation (object 1) Long button operation (object 2)	Presence ON Presence OFF Presence TOGGLE
The room temperature control point can switch the presence state of the room temperature controller either on or off in a defined way or the extension unit can switch between both states ("Presence TOGGLE") by pressing the button. Visible only if "functionality = room temperature control point -> presence function".	
Short button operation (object 1) Long button operation (object 2) Setpoint temperature shift	+2 K +1.5 K +1 K +0.5 K -0.5 K -1 K -1.5 K -2 K
The temperature difference is defined in Kelvin here by which the setpoint temperature will be shifted up or down when the button is pressed. To shift the setpoint temperature, the room temperature control point uses the two communication objects "Setpoint temperature shift" and "Setpoint temperature shift - Status". The communication object "Setpoint temperature shift - Status" informs the room temperature control point about the current state of the room temperature controller. Based on this value and the parameter here, the room temperature control point calculates the new level value, which it transmits to the room temperature controller by means of the "setpoint temperature shift" communication object. Visible only if "Functionality = room temperature control point -> Setpoint temperature shift -> By relative temperature value".	
Short button operation (object 1) Long button operation (object 2)	Increase setpoint temperature Reduce setpoint temperature
The direction of the target temperature shift is defined here at the room temperature control point. To shift the setpoint temperature, the room temperature control point uses the two communication objects "Setpoint temperature shift" and "Setpoint temperature shift - Status". The communication object "Setpoint temperature shift - Status" informs the extension unit about the current state of the room temperature controller. Based on this value and the parameter here, the room temperature control point calculates the new level value, which it transmits to the room temperature controller by means of the "setpoint temperature shift" communication object. Visible only if "Functionality = room temperature control point -> Setpoint temperature shift -> By counting value".	

Short button operation (object 1) Long button operation (object 2) Colour value	#000000 ... #FFFFFF
This parameter determines the object values of the colour hue (H), saturation (S), brightness value (V), which is transmitted to the bus when the button is pressed. It is visible if "functionality = RGB/HSV (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)".	
Short button operation (object 1) Long button operation (object 2) White value	0 ... 255
This parameter defines the object value of the white level (W) object when the button is pressed. It is visible only if "functionality = RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)".	
Extended settings	Active Inactive
This parameter enables advanced configuration options for the "short and long button actuation" function. If the advanced parameters are deactivated, the device transmits object 1 if the button is pressed briefly and object 2 if it is pressed for a long period. Pressing the button for at least 3 seconds is regarded as long. When the advanced parameters are activated, the ETS shows the following parameters.	
Transmission behaviour, long button actuation	Object 2 Object 1 and Object 2
This parameter defines the transmission behaviour of long button actuation. Object 2: object 1 is transmitted by pressing the button briefly and object 2 is transmitted by pressing the button for a long period Object 1 and object 2: object 1 is transmitted by pressing the button briefly and object 1 and object 2 are transmitted by pressing the button for a long period	
Long button operation from	0...3...25 s 0...990 ms
This parameter defines the interval at which the device transmits the telegram for object 1 and the telegram for object 2, depending on the selected transmission behaviour. A time from 100 ms to 25.5 s can be set.  The "long button actuation from" time is to be parameterised for a sufficient period, depending on the application case, to prevent simultaneous transmission of the objects.	

After the bus voltage returns Object 1 (object 2)	no reaction Transmit value
This parameter determines the reaction after the bus voltage returns. Either no telegram or a value parameterised according to the functionality is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	
At the beginning of the disabling function Object 1 (object 2)	no reaction Transmit value
Besides disabling the channel, the device can immediately react when the disabling occurs. Either no telegram or a value parameterised according to the functionality is transmitted on the bus according to the parameterisation. This parameter defines the reaction of the channel at the beginning of the disabling.	
At the end of the disabling function Object 1 (object 2)	no reaction Transmit value
Besides disabling the channel, the device can immediately react at the end of the disabling. Either no telegram or a value parameterised according to the functionality is transmitted on the bus according to the parameterisation. This parameter defines the reaction of the channel at the end of the disabling.	
Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.2.8.2 Object list

The following communication objects are available in the "push-button" channel function with the parameterised "short and long button actuation" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Switching	I ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to send switching telegrams if the button is briefly pressed (object 1).				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Switching	I ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to send switching telegrams if the button is pressed and held (object 2).				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Switching - Status	I ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for receiving feedback telegrams (ON, OFF) (object 1). This object is visible if the parameter "Short button actuation (object 1)" is parameterised to "TOGGLE".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Switching - Status	I ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for receiving feedback telegrams (ON, OFF) (object 2). This object is visible if the parameter "Long button actuation (object 2)" is parameterised to "TOGGLE".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Forced position	I ... - Output	2-bit	2,001	C, R, -, T, A
2-bit input object for activating and deactivating the forced position (object 1). With the value "1", bit 1 of the telegram activates the forced position. The assigned channels are then locked in the state specified by bit 0 ("0" = OFF / "1" = ON). The value "0" in bit 1 deactivates the forced position again. 0x = forcing inactive 10 = forcing active, OFF 11 = forcing active, ON				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Forced position	I ... - Output	2-bit	2,001	C, R, -, T, A

2-bit input object for activating and deactivating the forced position (object 1).

With the value "1", bit 1 of the telegram activates the forced position. The assigned channels are then locked in the state specified by bit 0 ("0" = OFF / "1" = ON). The value "0" in bit 1 deactivates the forced position again.

0x = forcing inactive

10 = forcing active, OFF

11 = forcing active, ON

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Value 0...100%	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send value telegrams if the button is briefly pressed (object 1).

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Value 0...100%	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send value telegrams if the button is pressed and held (object 2).

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Value 0...255	I ... - Output	1-byte	5,010	C, R, -, T, A

1-byte object to send value telegrams if the button is briefly pressed (object 1).

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Value 0...255	I ... - Output	1-byte	5,010	C, R, -, T, A

1-byte object to send value telegrams if the button is pressed and held (object 2).

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Value 0...360°	I ... - Output	1-byte	5,003	C, R, -, T, A

1-byte object to send value telegrams if the button is briefly pressed (object 1).

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Value 0...360°	I ... - Output	1-byte	5,003	C, R, -, T, A
1-byte object to send value telegrams if the button is pressed and held (object 2).				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Value 0...255%	I ... - Output	1-byte	5,004	C, R, -, T, A
1-byte object to send value telegrams if the button is briefly pressed (object 1).				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Value 0...255%	I ... - Output	1-byte	5,004	C, R, -, T, A
1-byte object to send value telegrams if the button is pressed and held (object 2).				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Value -128...127	I ... - Output	1-byte	6,010	C, R, -, T, A
1-byte object to send value telegrams if the button is briefly pressed (object 1).				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Value -128...127	I ... - Output	1-byte	6,010	C, R, -, T, A
1-byte object to send value telegrams if the button is pressed and held (object 2).				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Value 0...65535	I ... - Output	2-byte	7,001	C, R, -, T, A
2-byte object to send value telegrams if the button is briefly pressed (object 1).				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Value 0...65535	I ... - Output	2-byte	7,001	C, R, -, T, A
2-byte object to send value telegrams if the button is pressed and held (object 2).				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Colour temperature value	I ... - Output	2-byte	7,600	C, R, -, T, A
2-byte object to send value telegrams if the button is briefly pressed (object 1).				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Colour temperature value	I ... - Output	2-byte	7,600	C, R, -, T, A
2-byte object to send value telegrams if the button is pressed and held (object 2).				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Value -32768...32767	I ... - Output	2-byte	8,001	C, R, -, T, A
2-byte object to send value telegrams if the button is briefly pressed (object 1).				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Value -32768...32767	I ... - Output	2-byte	8,001	C, R, -, T, A
2-byte object to send value telegrams if the button is pressed and held (object 2).				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 -Temperature value	I ... - Output	2-byte	9,001	C, R, -, T, A
2-byte object to send temperature values if the button is briefly pressed (object 1).				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 -Temperature value	I ... - Output	2-byte	9,001	C, R, -, T, A
2-byte object to send temperature values if the button is pressed and held (object 2).				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Brightness value	I ... - Output	2-byte	9,004	C, R, -, T, A
2-byte object to transmit brightness values if the button is briefly pressed (object 1).				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Brightness value	I ... - Output	2-byte	9,004	C, R, -, T, A
2-byte object to send brightness values if the button is pressed and held (object 2).				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Scene number 1...64	I ... - Output	1-byte	18,001	C, R, -, T, A
1-byte object to send scene values if the button is briefly pressed (object 1).				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Scene number 1...64	I ... - Output	1-byte	18,001	C, R, -, T, A
1-byte object to send scene values if the button is pressed and held (object 2).				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Colour temperature value and brightness value	I ... - Output	6-byte	249,600	C, R, -, T, A
6-byte object used to transmit a colour temperature value, a brightness value and the adjustment time in the actuator (object 1). The actuator sets the received values during the adjustment time. These objects are visible only if "Short button actuation (object 1) = DPT 249.600 colour temperature value + brightness".				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Colour temperature value and brightness value	I ... - Output	6-byte	249,600	C, R, -, T, A
6-byte object used to transmit a colour temperature value, a brightness value and the adjustment time in the actuator (object 2). The actuator sets the received values during the adjustment time. These objects are visible only if "Long button actuation (object 2) = DPT 249.600 colour temperature value + brightness".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Operating mode	I ... - Output	1-byte	20,102	C, R, -, T, A

1-byte object for switching a room temperature controller between the Comfort, Standby, Night and Frost/heat protection operating modes.

This object is only visible if "Functionality = operating mode switchover".

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Operating mode	I ... - Output	1-byte	20,102	C, R, -, T, A

1-byte object for switching a room temperature controller between the Comfort, Standby, Night and Frost/heat protection operating modes.

This object is only visible if "Functionality = operating mode switchover".

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Operating mode - Status	I ... - Input	1-byte	20,102	C, -, W, -, U

1-byte object for receiving the operating mode of a room temperature controller.

This object is only visible if "Functionality = operating mode switchover".

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Operating mode - Status	I ... - Input	1-byte	20,102	C, -, W, -, U

1-byte object for receiving the operating mode of a room temperature controller.

This object is only visible if "Functionality = operating mode switchover".

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Operating mode - Forcing	I ... - Output	1-byte	20,102	C, R, -, T, A

1-byte object for switching a room temperature controller under forced control between the Automatic, Comfort, Standby, Night and Frost / heat protection operating modes.

This object is only visible if "Functionality = forced operating mode switchover".

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Operating mode - Forcing	I ... - Output	1-byte	20,102	C, R, -, T, A
1-byte object for switching a room temperature controller under forced control between the Automatic, Comfort, Standby, Night and Frost / heat protection operating modes. This object is only visible if "Functionality = forced operating mode switchover".				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Operating mode - Forcing - Status	I ... - Input	1-byte	20,102	C, -, W, -, U
1-byte object for receiving the operating mode of a room temperature controller. This object is only visible if "Functionality = forced operating mode switchover".				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Operating mode - Forcing - Status	I ... - Input	1-byte	20,102	C, -, W, -, U
1-byte object for receiving the operating mode of a room temperature controller. This object is only visible if "Functionality = forced operating mode switchover".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Presence	I ... - Output	1-bit	1,018	C, R, -, T, A
1-bit object for changing over the presence status of a room temperature controller. This object is only visible if "Functionality = presence function".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Presence	I ... - Output	1-bit	1,018	C, R, -, T, A
1-bit object for changing over the presence status of a room temperature controller. This object is only visible if "Functionality = presence function".				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Presence - Status	I ... - Input	1-bit	1,018	C, -, W, -, U
1-bit object for receiving the presence status of a room temperature controller. This object is only visible if "Functionality = presence function".				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Presence - Status	I ... - Input	1-bit	1,018	C, -, W, -, U
1-bit object for receiving the presence status of a room temperature controller. This object is only visible if "Functionality = presence function".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Setpoint temperature shift	I ... - Output	2-byte	9,002	C, R, -, T, A
2-byte object for specification of a target temperature shift in Kelvin. The value "0" means that no shift is active . Values can be specified between -670760 K and 670760 K. This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Setpoint temperature shift	I ... - Output	2-byte	9,002	C, R, -, T, A
2-byte object for specification of a target temperature shift in Kelvin. The value "0" means that no shift is active . Values can be specified between -670760 K and 670760 K. This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Setpoint temperature shift - Status	I ... - Input	2-byte	9,002	C, -, W, -, U
2-byte object for receiving the status of the current target temperature shift in Kelvin. This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Setpoint temperature shift - Status	I ... - Input	2-byte	9,002	C, -, W, -, U
2-byte object for receiving the status of the current target temperature shift in Kelvin. This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Setpoint temperature shift	I ... - Output	1-byte	6,010	C, R, -, T, A
1-byte object for specification of a target temperature shift. The value "0" means that no shift is active . The value is depicted in a two's complement in the positive or negative direction. This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Setpoint temperature shift	I ... - Output	1-byte	6,010	C, R, -, T, A
1-byte object for specification of a target temperature shift. The value "0" means that no shift is active . The value is depicted in a two's complement in the positive or negative direction. This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Setpoint temperature shift - Status	I ... - Input	1-byte	6,010	C, -, W, -, U
1-byte object to receive the status of the current target temperature shift. This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Setpoint temperature shift - Status	I ... - Input	1-byte	6,010	C, -, W, -, U

1-byte object to receive the status of the current target temperature shift.

This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Colour value (RGB)	I ... - Output	3-byte	232,600	C, R, -, T, A

3-byte object to send RBG values if the button is briefly pressed (object 1).

This object is visible only if "colour control = combi object: RGB or combi object: RGBW" was selected.

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Colour value (RGB)	I ... - Output	3-byte	232,600	C, R, -, T, A

3-byte object to send RBG values if the button is pressed and held (object 2).

This object is visible only if "colour control = combi object: RGB or combi object: RGBW" was selected.

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Colour value (RGBW)	I ... - Output	6-byte	251,600	C, R, -, T, A

6-byte object to send RBGW values if the button is briefly pressed (object 1).

This object is visible only if "colour control = combi object: RGB or combi object: RGBW" was selected.

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Colour value (RGBW)	I ... - Output	6-byte	251,600	C, R, -, T, A

6-byte object to send RBGW values if the button is pressed and held (object 2).

This object is visible only if "colour control = combi object: RGB or combi object: RGBW" was selected.

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Red colour value	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send the red colour value if the button is briefly pressed (object 1).
This object is visible only if "colour control = individual object: RGB or individual object: RGBW" was selected.

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Red colour value	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send the red colour value if the button is pressed and held (object 2).
This object is visible only if "colour control = individual object: RGB or individual object: RGBW" was selected.

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Green colour value	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send the green colour value if the button is briefly pressed (object 1).
This object is visible only if "colour control = individual object: RGB or individual object: RGBW" was selected.

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Green colour value	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send the green colour value if the button is pressed and held (object 2).
This object is visible only if "colour control = individual object: RGB or individual object: RGBW" was selected.

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Blue colour value	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send the blue colour value if the button is briefly pressed (object 1).
This object is visible only if "colour control = individual object: RGB or individual object: RGBW" was selected.

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Blue colour value	I ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object to send the blue colour value if the button is pressed and held (object 2). This object is visible only if "colour control = individual object: RGB or individual object: RGBW" was selected.				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Colour hue (H)	I ... - Output	1-byte	5,003	C, R, -, T, A
1-byte object to send the colour hue if the button is briefly pressed (object 1). This object is visible only if "colour control = individual object: HSV or individual object: HSVW" was selected.				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Colour hue (H)	I ... - Output	1-byte	5,003	C, R, -, T, A
1-byte object to send the colour hue if the button is pressed and held (object 2). This object is visible only if "colour control = individual object: HSV or individual object: HSVW" was selected.				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - Saturation (S)	I ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object to send the saturation if the button is briefly pressed (object 1). This object is visible only if "colour control = individual object: HSV or individual object: HSVW" was selected.				

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - Saturation (S)	I ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object to send the saturation if the button is pressed and held (object 2). This object is visible only if "colour control = individual object: HSV or individual object: HSVW" was selected.				

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 1 - Brightness value (V)	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send the brightness value if the button is briefly pressed (object 1).
This object is visible only if "colour control = individual object: HSV or individual object: HSVW" was selected.

Function	Name	Type	DPT	Flag
Short and long button actuation - Object 2 - Brightness value (V)	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send the brightness value if the button is pressed and held (object 2).
This object is visible only if "colour control = individual object: HSV or individual object: HSVW" was selected.

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1 - White value (W)	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send the white value if the button is briefly pressed (object 1).
This object is visible only if "colour control = individual object: HSVW" was selected.

Function	Name	Type	DPT	Flag
Short and long button operation - Object 2 - White value (W)	I ... - Output	1-byte	5,001	C, R, -, T, A

1-byte object to send the white value if the button is pressed and held (object 2).
This object is visible only if "colour control = individual object: HSVW" was selected.

Function	Name	Type	DPT	Flag
Short and long button operation - Object 1/2 - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U

1-bit object for activating or deactivating the disabling function. The object polarity can be configured.

15.2.9 Room temperature control point

In the "push-button" channel function, the push-button can be parameterised for the "room temperature control point" function. The ETS indicates up to three communication objects for the "room temperature control point" function. The parameters can be used to determine the value the "RTC control point" objects obtain when the button is pressed. Furthermore, the behaviour of the channel after the bus voltage returns can be parameterised and a disabling function activated. No distinction is made between a brief or long press.

The "room temperature control point" channel function can be used to actuate a KNX room temperature controller.

The room temperature control point itself is not involved in the temperature control process. It allows the user to operate the single-room regulation from different points in the room. The room temperature control point can also be used to control central heating control devices located, for example, in a sub-distribution unit.

Typical KNX room temperature controllers generally offer different ways of influencing the room temperature control:

- Operating mode switchover:
Switching between different modes of operation (e. g. "Comfort", "Night" ...) with different setpoint temperatures assigned to each mode by the controller.
- Presence function:
Signalling the presence of a person in a room. The signalling may also be combined with a configured switchover in the mode of operation.
- Setpoint temperature shift:
Adjustment of the setpoint temperature via a temperature offset (DPT 9.002) or via levels (DPT 6.010).

The room temperature control point is operated with the button functions of the device. In this way, it is possible to completely control a room temperature controller by changing the operating mode, specifying the presence function or adjusting the target temperature shift.

15.2.9.1 Operating mode switchover

Switchover of the controller operating mode can be effected in accordance with the standard function block for room temperature controllers defined in the KNX handbook using two 1-byte communication objects. The operating mode can be switched over with the normal and with the forced objects. The object "RTC control point - Operating mode" allows different modes to be selected:

- Comfort
- Standby
- Night
- Frost/heat protection
- Switchover: comfort/standby
- Switchover: comfort/night

- Switchover: standby/night
- Switchover: comfort/standby/night

The communication object "RTC control point - Operating mode - Forcing" is of higher priority. It permits forced switching between the following modes of operation:

- Forcing inactive (auto)
- Comfort
- Standby
- Night
- Frost/heat protection
- Switchover: comfort/standby
- Switchover: comfort/night
- Switchover: standby/night
- Switchover: comfort/standby/night
- Toggle: forced inactive (auto) / comfort
- Toggle: forced inactive (auto) / standby
- Toggle: forced inactive (auto) / night
- Switchover: forced inactive (auto) / frost/heat protection

The operating mode transmitted to the bus when pressing the button of the room temperature control point is defined by the parameter "When pressed". Depending on the parameterised operating concept, either pressing a button will activate one of the above modes or each button actuation will toggle between two or three modes.

- i** It is recommended to visualise the state when switching over. The visualisation can take place by means of a switch setting or by a status LED, actuated, for example, via the output of the push-button interface.

15.2.9.2 Presence function

All channels whose functionality is set to "presence function" have the two communication objects "RTC control point - Presence" and "RTC control point - Presence - Status". The "When pressed" parameter determines the object value transmitted to the bus in the event of button actuation.

15.2.9.3 Setpoint temperature shift

Another function of the room temperature control point that is available is the target temperature shift. It makes use of either two 2-byte communication objects with datapoint type 9.002 or two 1-byte communication objects with datapoint type 6.010 (integer with sign).

This control point function allows the basic setpoint for the temperature to be shifted on a room temperature controller by pressing a button. The control point is usually operated in the same way as the main control point. A button configured as target temperature shift reduces or increases the target temperature shift value each time

the button is pressed. The direction of the value adjustment is defined by the parameters "Increase setpoint temperature difference when pressed" or "Reduce setpoint temperature difference when pressed".

Communication with main controller

To enable the device to shift the target temperature on a room temperature controller, the controller must have input and output objects for the target temperature shift. In this case, the output object of the controller must be connected to the input object of the room temperature control point, and the input object of the controller must be connected to the output object of the room temperature control point in each case via their own group address.

All objects are of the same datapoint type and have the same value range. A target temperature shift is interpreted by count values: a shift in positive direction is expressed by positive values, whereas a shift in negative direction is represented by negative object values. An object value of "0" means that no target temperature shift has been set.

The room temperature control points detect the current position of the setpoint adjustment by means of the object "RTC control point - Target temperature shift - Status" of the room temperature control point connected to the room temperature controller. Starting from the value of the communication object, the setpoint is adjusted in the configured direction each time a button is pressed on a room temperature control point. Each time the setpoint is adjusted, the new shift by means of the object "RTC control point - Target temperature shift" of the room temperature control point is sent to the room temperature regulator.

With the "by counter value" function, the individual levels are weighted by the controller itself.

This requires that the respective communication objects are connected to all room temperature control points and the controller. The feedback information from the controller enables the room temperature control point to continue the adjustment at any time at the right point.

15.2.9.4 Table of parameters

The following parameters are available in the "push-button" channel function with the parameterised "room temperature control point" function.

Function	Operating mode switchover Forced operating mode switchover Presence function Setpoint temperature shift
A room temperature control point can optionally switch over (force) the operating mode with normal or high priority, change the presence status or change the current room temperature setpoint value. With regard to the setting of this parameter, the ETS shows further parameters.	
When pressed	Comfort Standby Night Frost/heat protection Switchover: comfort/standby Switchover: comfort/night Switchover: standby/night Switchover: comfort/standby/night
If the room temperature control point is intended to change over the operating mode of the room temperature controller with normal priority, the extension unit can either switch on a defined operating mode or switch between different operating modes when operated.	

When pressed	Forcing inactive (auto) Comfort Standby Night Frost/heat protection Switchover: comfort/standby Switchover: comfort/night Switchover: standby/night Switchover: comfort/standby/night Toggle: forced inactive (auto) / comfort Toggle: forced inactive (auto) / standby Toggle: forced inactive (auto) / night Switchover: forced inactive (auto) / frost/heat protection
If the room temperature control point is intended to switch the operating mode of the room temperature controller with high priority, the extension unit can either enable change-over with normal priority (auto), switch on a defined operating mode with high priority or switch different operating modes when operated.	
When pressed	Presence ON Presence OFF Presence TOGGLE
The room temperature control point can switch the presence state of the room temperature controller either on or off in a defined way or the extension unit can switch between both states ("Presence TOGGLE") by pressing the button. This parameter is only visible if "Functionality = presence function".	
Setpoint temperature shift	by relative temperature value By meter value
Depending on the setting of the "Target temperature shift" parameter, the shift takes place by means of the 2-byte communication object in accordance with KNX DPT 9.002 or KNX DPT 6.010. This parameter is visible only if "functionality = target temperature shift".	

When pressed	+2 K +1.5 K +1 K +0.5 K -0.5 K -1 K -1.5 K -2 K

The temperature difference is defined in Kelvin here by which the setpoint temperature will be shifted up or down when the button is pressed.

To shift the target temperature value, the room temperature control point uses the two communication objects "RTC control point - Target temperature shift" and "RTC control point - Target temperature shift - Status".

The communication object "RTC control point - Target temperature shift - Status" informs the room temperature control point about the current state of the room temperature controller. Based on this value and the parameter here, the room temperature control point calculates the new level value, which it sends to the room temperature controller via the communication object "RTC control point - Target temperature shift".

This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".

When pressed	Increase setpoint temperature Reduce setpoint temperature

The direction of the target temperature shift is defined here at the room temperature control point.

To shift the target temperature value, the room temperature control point uses the two communication objects "RTC control point - Target temperature shift" and "RTC control point - Target temperature shift - Status".

The communication object "RTC control point - Target temperature shift - Status" informs the extension unit about the current state of the room temperature controller. Based on this value and the parameter here, the room temperature control point calculates the new level value, which it sends to the room temperature controller via the communication object "RTC control point - Target temperature shift".

This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".

After the bus voltage returns	no reaction transmit current state Comfort Standby Night Frost/heat protection
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel, a comfort telegram, a standby telegram, a night telegram or a frost/heat protection telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page). Visible only if "Functionality = operating mode change-over".	
After the bus voltage returns	no reaction transmit current state Forcing inactive (auto) Comfort Standby Night Frost/heat protection
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel, a forcing inactive (auto) telegram, a comfort telegram, a standby telegram, a night telegram or a frost/heat protection telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page). Visible only if "Functionality = forced operating mode change-over".	
After the bus voltage returns	no reaction transmit current state Presence ON Presence OFF Presence TOGGLE
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel or a presence telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page). This parameter is only visible if "Functionality = presence function".	

After the bus voltage returns	no reaction +2 K +1.5 K +1 K +0.5 K -0.5 K -1 K -1.5 K -2 K

This parameter determines the reaction after the bus voltage returns.

Either no telegram or a temperature value telegram is transmitted on the bus according to the parameterisation.

The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).

This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".

After the bus voltage returns	no reaction Increase setpoint temperature Reduce setpoint temperature

This parameter determines the reaction after the bus voltage returns.

Either no telegram or a counting value telegram is transmitted on the bus according to the parameterisation.

The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).

This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".

Disabling function	Inactive Active

This parameter enables the disabling function for the channel.

At the beginning of the disabling function	no reaction Comfort Standby Night Frost/heat protection

Besides disabling the channel, the device can immediately react when the disabling occurs.

This parameter defines the reaction of the channel at the beginning of the disabling. Visible only if "Functionality = operating mode change-over".

At the beginning of the disabling function	no reaction Forcing inactive (auto) Comfort Standby Night Frost/heat protection
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling. Visible only if "Functionality = forced operating mode change-over".	
At the beginning of the disabling function	no reaction Presence ON Presence OFF Presence TOGGLE
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling. This parameter is only visible if "Functionality = presence function".	
At the beginning of the disabling function	no reaction +2 K +1.5 K +1 K +0.5 K -0.5 K -1 K -1.5 K -2 K
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling. This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".	

At the beginning of the disabling function	no reaction Increase setpoint temperature Reduce setpoint temperature
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling. This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".	
At the end of the disabling function	no reaction transmit current state Comfort Standby Night Frost/heat protection
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. Visible only if "Functionality = operating mode change-over".	
At the end of the disabling function	no reaction transmit current state Forcing inactive (auto) Comfort Standby Night Frost/heat protection
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. Visible only if "Functionality = forced operating mode change-over".	
At the end of the disabling function	no reaction transmit current state Presence ON Presence OFF Presence TOGGLE
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. This parameter is only visible if "Functionality = presence function".	

At the end of the disabling function	no reaction +2 K +1.5 K +1 K +0.5 K -0.5 K -1 K -1.5 K -2 K
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".	
At the end of the disabling function	no reaction Increase setpoint temperature Reduce setpoint temperature
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".	
Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.2.9.5 Object list

The following communication objects are available in the "push-button" channel function with the parameterised "room temperature control point" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
RTC control point - Operating mode	I ... - Output	1-byte	20,102	C, R, -, T, A
1-byte object for switching a room temperature controller between the Comfort, Standby, Night and Frost/heat protection operating modes. This object is only visible if "Functionality = operating mode switchover".				

Function	Name	Type	DPT	Flag
RTC control point - Operating mode - Status	I ... - Input	1-byte	20,102	C, -, W, -, U
1-byte object for receiving the operating mode of a room temperature controller. This object is only visible if "Functionality = operating mode switchover".				

Function	Name	Type	DPT	Flag
RTC control point - Operating mode - Forced	I ... - Output	1-byte	20,102	C, R, -, T, A
1-byte object for switching a room temperature controller under forced control between the Automatic, Comfort, Standby, Night and Frost / heat protection operating modes. This object is only visible if "Functionality = forced operating mode switchover".				

Function	Name	Type	DPT	Flag
RTC control point - Operating mode - Forced - Status	I ... - Input	1-byte	20,102	C, -, W, -, U
1-byte object for receiving the operating mode of a room temperature controller. This object is only visible if "Functionality = forced operating mode switchover".				

Function	Name	Type	DPT	Flag
RTC control point - Presence	I ... - Output	1-bit	1,018	C, R, -, T, A
1-bit object for changing over the presence status of a room temperature controller. This object is only visible if "Functionality = presence function".				

Function	Name	Type	DPT	Flag
RTC control point - Presence - Status	I ... - Input	1-bit	1,018	C, -, W, -, U
1-bit object for receiving the presence status of a room temperature controller. This object is only visible if "Functionality = presence function".				

Function	Name	Type	DPT	Flag
RTC control point - Set-point temperature shift	I ... - Output	2-byte	9,002	C, R, -, T, A

2-byte object for specification of a target temperature shift in Kelvin. The value "0" means that no shift is active . Values can be specified between -670760 K and 670760 K.

This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".

Function	Name	Type	DPT	Flag
RTC control point - Set-point temperature shift - Status	I ... - Input	2-byte	9,002	C, -, W, -, U

2-byte object for receiving the status of the current target temperature shift in Kelvin. This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".

Function	Name	Type	DPT	Flag
RTC control point - Set-point temperature shift	I ... - Output	1-byte	6,010	C, R, -, T, A

1-byte object for specification of a target temperature shift. The value "0" means that no shift is active . The value is depicted in a two's complement in the positive or negative direction.

This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".

Function	Name	Type	DPT	Flag
RTC control point - Set-point temperature shift - Status	I ... - Input	1-byte	6,010	C, -, W, -, U

1-byte object to receive the status of the current target temperature shift.

This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".

Function	Name	Type	DPT	Flag
RTC control point - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U

1-bit object for activating or deactivating the disabling function. The object polarity can be configured.

15.3 Switch

The "switch" channel function can be parametrised for each input. The following functions are available for each output object in the "switch" channel function:

- Switching
- Priority control
- Value transmitter
- Scene extension unit
- Room temperature control point

The ETS provides the corresponding parameters and communication objects dynamically for the function according to the parameterised function.

The debouncing time is to be parameterised separately for each channel. One or two output objects can be parameterised and actuated in the "switch" channel function. The available functions can be selected and combined independently of each other for both output objects. A disabling function can be activated optionally for each switch channel output object.

A command can be parameterised when closing and when opening the contact for each switch channel output object.

- i** The "switch" channel function is recommended if telegrams are to be transmitted cyclically on the KNX. This allows monitoring, similar to the heartbeat, to be implemented or rising and falling edges - like with the switch - to be evaluated regardless of the time.

15.3.1 Table of parameters

The following parameters are generally available for the "switch" channel function.

Number of objects	1 2
This parameter defines the number of output objects actuated in the "switch" channel function for each channel.	
Debounce time	4 ... 10 ... 255 ms
This parameter specifies the software debouncing time. A signal edge is evaluated at the input after a delay based on this time.	

The following parameters are available for each output object for the "switch" channel function.

Function	Switching Priority control Value transmitter Scene extension unit Room temperature control point
This parameter determines the function of the switch connected to the channel for each output object.	

15.3.2 Switching

In the "switch" channel function, each object of the switch can be parameterised separately for the "switching" function. The ETS indicates up to three communication objects for each switch channel output object for the "switching" function. The parameters can be used to determine which value the "switch" object receives when the contact is closed or opened. Furthermore, the behaviour of the switch channel output object after the bus voltage returns can be parameterised and a disabling function activated. The switching status of the switch channel output objects can be transmitted cyclically on the bus. No distinction is made between a brief or long press.

15.3.2.1 Table of parameters

The following parameters are available in the "switch" channel function with the parameterised "switching" function for each switch channel output object.

When closing the contact	no reaction ON OFF TOGGLE
This parameter determines the reaction when closing the contact of the switch. With "TOGGLE", the ETS application program makes the status object available.	
When opening the contact	no reaction ON OFF TOGGLE
This parameter determines the reaction when opening the contact of the switch. With "TOGGLE", the ETS application program makes the status object available.	
After the bus voltage returns	no reaction transmit current state ON OFF
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel, an ON telegram or an OFF telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	

Send switching status cyclically	Inactive Active
The switching status of the switch channel output objects can be transmitted cyclically on the bus. This parameter enables the cyclical transmission.	
Cycle time	0...24 h 0... 5 ...59 min 0...59 s
This parameter defines the interval at which the switching status is transmitted on the bus. The cycle time can be parameterised between 3 seconds and 24 hours.	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	
At the beginning of the disabling function	no reaction ON OFF TOGGLE
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling. i With "TOGGLE", the feedback of an actuator is to be connected with the "switching" object if the status object is not already made available by the settings of the parameter "When closing the contact" or "When opening the contact".	
At the end of the disabling function	no reaction transmit current state ON OFF TOGGLE
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. i With "TOGGLE", the feedback of an actuator is to be connected with the "switching" object if the status object is not already made available by the settings of the parameter "When closing the contact" or "When opening the contact".	

Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.3.2.2 Object list

The following communication objects are available in the "switch" channel function with the parameterised "switching" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Object 1 - Switching	I ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object for transmission of switching telegrams (ON, OFF). This is object 1 of the parameterised output objects.				
i With "TOGGLE", the feedback of an actuator is to be connected with the "switching" object if the status object is not already made available by the settings of the parameter "When closing the contact" or "When opening the contact".				

Function	Name	Type	DPT	Flag
Object 1 - Switching - Status	I ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for receiving feedback telegrams (ON, OFF). This is object 1 of the parameterised output objects.				
This object is visible if the "When closing the contact" or "When opening the contact" parameter is parameterised to "TOGGLE".				

Function	Name	Type	DPT	Flag
Object 1 - Switching - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured. This is object 1 of the parameterised output objects.				

Function	Name	Type	DPT	Flag
Object 2 - Switching	I ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object for transmission of switching telegrams (ON, OFF). This is object 2 of the parameterised output objects.				
i With "TOGGLE", the feedback of an actuator is to be connected with the "switching" object if the status object is not already made available by the settings of the parameter "When closing the contact" or "When opening the contact".				

Function	Name	Type	DPT	Flag
Object 2 - Switching - Status	I ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for receiving feedback telegrams (ON, OFF). This is object 2 of the parameterised output objects.				
This object is visible if the "When closing the contact" or "When opening the contact" parameter is parameterised to "TOGGLE".				

Function	Name	Type	DPT	Flag
Object 2 - Switching - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured. This is object 2 of the parameterised output objects.				

15.3.3 Priority control

In the "switch" channel function, each object of the switch can be parameterised separately for the "forced position" function. The ETS indicates up to two communication objects for each switch channel output object for the "forced position" function. The parameters can be used to determine which value the "forced position" object receives when the contact is closed or opened. Furthermore, the behaviour of the switch channel output object after the bus voltage returns can be parameterised and a disabling function activated. The switching status of the switch channel output objects can be transmitted cyclically on the bus. No distinction is made between a brief or long press.

- i** A forced position can be used as a superordinate, prioritised function. A forced position is recommended for load management or in service mode.

15.3.3.1 Table of parameters

The following parameters are available in the "switch" channel function with the parameterised "forced position" function for each switch channel output object.

When closing the contact	no reaction Forcing active, ON Forcing active, OFF Forcing inactive
This parameter determines the reaction when closing the contact of the switch.	
When opening the contact	no reaction Forcing active, ON Forcing active, OFF Forcing inactive
This parameter determines the reaction when opening the contact of the switch.	
After the bus voltage returns	no reaction transmit current state Forcing active, ON Forcing active, OFF Forcing inactive
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel, a forcing active ON telegram, a forcing active OFF telegram or a forcing inactive telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	

Send switching status cyclically	Inactive Active
The switching status of the switch channel output objects can be transmitted cyclically on the bus. This parameter enables the cyclical transmission.	
Cycle time	0...24 h 0...5...59 min 0...59 s
This parameter defines the interval at which the switching status is transmitted on the bus. The cycle time can be parameterised between 3 seconds and 24 hours.	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	
At the beginning of the disabling function	no reaction Forcing active, ON Forcing active, OFF Forcing inactive
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling.	
At the end of the disabling function	no reaction transmit current state Forcing active, ON Forcing active, OFF Forcing inactive
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling.	
Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.3.3.2 Object list

The following communication objects are available in the "switch" channel function with the parameterised "forced position" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Object 1 - Forced position	I ... - Output	2-bit	2,001	C, R, -, T, A
2-bit input object for activating and deactivating the forced position. With the value "1", bit 1 of the telegram activates the forced position. The assigned channels are then locked in the state specified by bit 0 ("0" = OFF / "1" = ON). The value "0" in bit 1 deactivates the forced position again. This is object 1 of the parameterised output objects. 0x = forcing inactive 10 = forcing active, OFF 11 = forcing active, ON				

Function	Name	Type	DPT	Flag
Object 1 - Forced position - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured. This is object 1 of the parameterised output objects.				

Function	Name	Type	DPT	Flag
Object 2 - Forced position	I ... - Output	2-bit	2,001	C, R, -, T, A
2-bit input object for activating and deactivating the forced position. With the value "1", bit 1 of the telegram activates the forced position. The assigned channels are then locked in the state specified by bit 0 ("0" = OFF / "1" = ON). The value "0" in bit 1 deactivates the forced position again. This is object 2 of the parameterised output objects. 0x = forcing inactive 10 = forcing active, OFF 11 = forcing active, ON				

Function	Name	Type	DPT	Flag
Object 2 - Forced position - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured. This is object 2 of the parameterised output objects.				

15.3.4 Value transmitter

In the "switch" channel function, each object of the switch can be parameterised separately for the "value transmitter" function. The ETS indicates up to six communication objects for each switch channel output object for the "value transmitter" function. The parameters can be used to determine which value the "value transmitter" objects receive when the contact is closed or opened.

Furthermore, the behaviour of the switch channel output object after the bus voltage returns can be parameterised and a disabling function activated. The value status of the switch channel output objects can be transmitted cyclically on the bus. No distinction is made between a brief or long press.

The "value transmitter" function is used by the device to transmit parameterised values on the bus when closing and opening the contact.

Value ranges

The value transmitter knows 13 different value ranges. The parameter "Data point type | Value range" determines the value range used by the value transmitter, depending on the application case:

Function	Function	Lower numerical limit	Upper numerical limit
1-byte value transmitter	0...100%	0%	100%
1-byte value transmitter	0...255	0	255
1-byte value transmitter	0...360°	0°	360°
1-byte value transmitter	0...255%	0%	255%
1-byte value transmitter	-128...127	-128	127
2-byte value transmitter	0...65535	0	65535
2-byte value transmitter	Colour temperature value	1000 K	10000 K
2-byte value transmitter	-32768...32767	-32768	32767
2-byte value transmitter	Temperature value	0 °C	40 °C
2-byte value transmitter	Brightness value	0 lux	1500 lux
6-byte value transmitter	Colour temperature value + brightness	1000 K 0%	10000 K 100%
3-byte value transmitter	RGB/HSV	#000000	#FFFFFF

Function	Function	Lower numerical limit	Upper numerical limit
6-byte value transmitter	Colour value RGBW/HSVW	#000000 + 0	#FFFFFF + 255

The value that can be transmitted on the bus when closing and/or opening the contact can be parameterised for each of these ranges.

15.3.4.1 Table of parameters

The following parameters are available in the "switch" channel function with the parameterised "value transmitter" function for each switch channel output object.

Data point type Value range	DPT 5.001 0 ... 100% DPT 5.010 0 ... 255 DPT 5.003 0 ... 360° DPT 5.004 0 ... 255% DPT 6.010 -128 ... 127 DPT 7.001 0 ... 65535 DPT 7.600 1000 ... 10000 K DPT 8.001 -32768 ... 32767 DPT 9.001 0 ... 40 °C DPT 9.004 0 ... 1500 lux DPT 249.600 Colour temperature value + brightness RGB/HSV (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) Colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)

The "value transmitter" function distinguishes between 1-byte, 2-byte 3-byte and 6-byte values.

The following parameters and their settings depend on the setting for this parameter.

When closing the contact	no reaction Transmit value
This parameter determines the reaction when closing the contact of the switch. Transmit value: The ETS displays a suitable input field where the value can be entered according to the set "data point type value range".	
When opening the contact	no reaction Transmit value
This parameter determines the reaction when opening the contact of the switch. Transmit value: The ETS displays a suitable input field where the value can be entered according to the set "data point type value range".	
Value	0 ... 100%
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 5.001 0 ... 100%".	

Value	0 ... 255
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 5.010 0 ... 255".	
Value	0 ... 360°
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 5.003 0 ... 360°".	
Value	0 ... 255%
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 5.004 0 ... 255%".	
Value	-128...0 ... 127
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 6.010 -128 ... 127".	
Value	0 ... 65535
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 7.001 0 ... 65535".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 7.600 1000 ... 10000 K".	
Value	-32768 ... 0 ... 32767
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 8.001 -32768 ... 32767".	
Temperature value	0 ... 20 ... 40 °C
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 9.001 0 ... 40 °C".	
Brightness value	0, 50 ... 300 ... 1500 lux
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 9.004 0 ... 1500 lux".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Brightness value	0 ... 100%
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	

Adjustment duration in the actuator	0 ... 100 min, 0, 1 ... 59 s, 0 ... 900 ms
This parameter determines the object value when closing or opening the contact. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Colour value	#000000 ... #FFFFFF
This parameter determines the object values of the 3-byte value transmitter (or 6-byte value transmitter), brightness value (V), saturation (S) and colour hue (H) objects when closing or opening the contact. It is visible with "data point type value range = RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)", "data point type value range = RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)" and "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001)". The value (RGB/HSV) is configured by means of a colour picker. With the data point type value range "colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)", the white value is configured by means of a separate slider.	
White value when pressed	0 ... 255
This parameter determines the object value of the white value (W) object when closing or opening the contact. It is visible only if "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)".	
After the bus voltage returns	no reaction transmit current state Transmit value
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel or a value parameterised accordingly for the set data point type value range is transmitted on the bus. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	
Value	0 ... 100%
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 5.001 0 ... 100%".	
Value	0 ... 255
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 5.010 0 ... 255".	

Value	0 ... 360°
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 5.003 0 ... 360°".	
Value	0 ... 255%
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 5.004 0 ... 255%".	
Value	-128...0 ... 127
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 6.010 -128 ... 127".	
Value	0 ... 65535
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 7.001 0 ... 65535".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 7.600 1000 ... 10000 K".	
Value	-32768 ... 0 ... 32767
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 8.001 -32768 ... 32767".	
Temperature value	0 ... 20 ... 40 °C
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 9.001 0 ... 40 °C".	
Brightness value	0, 50 ... 300 ... 1500 lux
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 9.004 0 ... 1500 lux".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Brightness value	0 ... 100%
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	

Adjustment duration in the actuator	0 ... 100 min, 0, 1 ... 59 s, 0 ... 900 ms
This parameter determines the object value after the bus voltage returns. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Colour value	#000000 ... #FFFFFF
This parameter determines the object values of the 3-byte value transmitter (or 6-byte value transmitter), brightness value (V), saturation (S) and colour hue (H) objects after the bus voltage returns. It is visible with "data point type value range = RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)", "data point type value range = RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)" and "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001)". The value (RGB/HSV) is configured by means of a colour picker. With the data point type value range "colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)", the white value is configured by means of a separate slider.	
White value	0 ... 255
This parameter determines the object value of the white value (W) after the bus voltage returns. It is visible only if "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)".	
Transmit value cyclically	Inactive Active
The value status of the switch channel output objects can be transmitted cyclically on the bus. This parameter enables the cyclical transmission.	
Cycle time	0...24 h 0...5...59 min 0...59 s
This parameter defines the interval at which the value status is transmitted on the bus. The cycle time can be parameterised between 3 seconds and 24 hours.	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	

At the beginning of the disabling function	no reaction Transmit value
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling.	
Value	0 ... 100%
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 5.001 0 ... 100%".	
Value	0 ... 255
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 5.010 0 ... 255".	
Value	0 ... 360°
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 5.003 0 ... 360°".	
Value	0 ... 255%
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 5.004 0 ... 255%".	
Value	-128...0 ... 127
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 6.010 -128 ... 127".	
Value	0 ... 65535
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 7.001 0 ... 65535".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 7.600 1000 ... 10000 K".	
Value	-32768 ... 0 ... 32767
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 8.001 -32768 ... 32767".	
Temperature value	0 ... 20 ... 40 °C
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 9.001 0 ... 40 °C".	

Brightness value	0, 50 ... 300 ... 1500 lux
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 9.004 0 ... 1500 lux".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Brightness value	0 ... 100%
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Adjustment duration in the actuator	0 ... 100 min, 0, 1 ... 59 s, 0 ... 900 ms
This parameter determines the object value at the beginning of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Colour value	#000000 ... #FFFFFF
This parameter determines the object values of the 3-byte value transmitter (or 6-byte value transmitter), brightness value (V), saturation (S) and colour hue (H) objects at the beginning of the disabling. It is visible with "data point type value range = RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)", "data point type value range = RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)" and "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)". The value (RGB/HSV) is configured by means of a colour picker. With the data point type value range "colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)", the white value is configured by means of a separate slider.	
White value	0 ... 255
This parameter determines the object value of the white value (W) object at the beginning of the disabling. It is visible only if "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)".	

At the end of the disabling function	no reaction transmit current state Transmit value
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling.	
Value	0 ... 100%
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 5.001 0 ... 100%".	
Value	0 ... 255
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 5.010 0 ... 255".	
Value	0 ... 360°
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 5.003 0 ... 360°".	
Value	0 ... 255%
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 5.004 0 ... 255%".	
Value	-128...0 ... 127
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 6.010 -128 ... 127".	
Value	0 ... 65535
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 7.001 0 ... 65535".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 7.600 1000 ... 10000 K".	
Value	-32768 ... 0 ... 32767
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 8.001 -32768 ... 32767".	
Temperature value	0 ... 20 ... 40 °C
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 9.001 0 ... 40 °C".	

Brightness value	0, 50 ... 300 ... 1500 lux
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 9.004 0 ... 1500 lux".	
Colour temperature value	1000 ... 2700 ... 10000 K
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Brightness value	0 ... 100%
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Adjustment duration in the actuator	0 ... 100 min, 0, 1 ... 59 s, 0 ... 900 ms
This parameter determines the object value at the end of the disabling. It is visible only if "data point type value range = DPT 249.600 colour temperature value + brightness".	
Colour value	#000000 ... #FFFFFF
This parameter determines the object values of the 3-byte value transmitter (or 6-byte value transmitter), brightness value (V), saturation (S) and colour hue (H) objects at the end of the disabling. It is visible with "data point type value range = RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)", "data point type value range = RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)" and "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)". The value (RGB/HSV) is configured by means of a colour picker. With the data point type value range "colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)", the white value is configured by means of a separate slider.	
White value	0 ... 255
This parameter determines the object value of the white value (W) object at the end of the disabling. It is visible only if "data point type value range = colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)".	
Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.3.4.2 Object list

The following communication objects are available in the "switch" channel function with the parameterised "value transmitter" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter – 0 ... 100%	I ... - Output	1-byte	5,001	C, R, -, T, A
Object 2 - Value transmitter – 0 ... 100%				
1-byte object for the transmission of values from 0 to 100%. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 5.001 0 ... 100%".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter – 0 ... 255	I ... - Output	1-byte	5,010	C, R, -, T, A
Object 2 - Value transmitter – 0 ... 255				
1-byte object for the transmission of values from 0 to 255. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 5.010 0 ... 255".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter – 0 ... 360°	I ... - Output	1-byte	5,003	C, R, -, T, A
Object 2 - Value transmitter – 0 ... 360°				
1-byte object for the transmission of values from 0 to 360°. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 5.003 0 ... 360°".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter – 0 ... 255%	I ... - Output	1-byte	5,004	C, R, -, T, A
Object 2 - Value transmitter – 0 ... 255%				
1-byte object for the transmission of values from 0 to 255%. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 5.004 0 ... 255%".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter – -128 ... 127	I ... - Output	1-byte	6,010	C, R, -, T, A
Object 2 - Value transmitter – -128 ... 127				
1-byte object for the transmission of values from -128 to 127. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 6.010 -128 ... 127".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter – 0 ... 65535	I ... - Output	2-byte	7,001	C, R, -, T, A
Object 2 - Value transmitter – 0 ... 65535				
2-byte object for the transmission of values from 0 to 65535. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 7.001 0 ... 65535".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - Colour temperature value	I ... - Output	2-byte	7,600	C, R, -, T, A
Object 2 - Value transmitter - Colour temperature value				
2-byte object for transmitting colour temperatures from 1000 to 10000 Kelvin. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 7.600 1000 ... 10000 K".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter – -32768 ... 32767	I ... - Output	2-byte	8,001	C, R, -, T, A
Object 2 - Value transmitter – -32768 ... 32767				
2-byte object for the transmission of values from -32768 to 32767. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 8.001 -32768 ... 32767".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - Temperature value	I ... - Output	2-byte	9,001	C, R, -, T, A
Object 2 - Value transmitter - Temperature value				
2-byte object for transmitting temperature values from 0 to 40 °C. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 9.001 0 ... 40 °C".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - Brightness value	I ... - Output	2-byte	9,004	C, R, -, T, A
Object 2 - Value transmitter - Brightness value				
2-byte object for the transmission of brightness values from 0 to 1500 lux. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 9.004 0 ... 1500 lux".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - Colour temperature value and brightness value	I ... - Output	6-byte	249,600	C, R, -, T, A
Object 2 - Value transmitter - Colour temperature value and brightness value				
6-byte object used to transmit a colour temperature value, a brightness value and the adjustment time in the actuator. The actuator sets the received values during the adjustment time. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only if "data point type value range = DPT 249.600 colour temperature value + brightness" applies.				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - RGB/HSV (colour wheel sequence) Object 2 - Value transmitter - RGB/HSV (colour wheel sequence)	I ... - Output	3-byte	232,600	C, R, -, T, A
3-byte object for transmitting 3-byte colour information. This is object 1 or 2 of the parameterised output objects. These objects are visible only if "data point type value range = RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)".				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - RGB/HSV (brightness adjustment) Object 2 - Value transmitter - RGB/HSV (brightness adjustment)	I ... - Output	3-byte	232,600	C, R, -, T, A
3-byte object for transmitting 3-byte colour information. This is object 1 or 2 of the parameterised output objects. These objects are visible only with data point type value range: RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001).				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - RGBW Object 2 - Value transmitter - RGBW	I ... - Output	6-byte	251,600	C, R, -, T, A
6-byte object for transmitting 6-byte colour information. This is object 1 or 2 of the parameterised output objects. These objects are visible only with data point type value range: colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001).				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - Colour hue (H)	I ... - Output	1-byte	5,003	C, R, -, T, A
Object 2 - Value transmitter - Colour hue (H)				
1-byte object for transmitting the colour hue. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only with data point type value range:				
- - RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) - - RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) - - Colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - Saturation (S)	I ... - Output	1-byte	5,001	C, R, -, T, A
Object 2 - Value transmitter - Saturation (S)				

1-byte object for transmitting the saturation. This is object 1 or 2 of the parameterised output objects.

These objects are visible only with data point type | value range:

- - RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)
- - RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)
- - Colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - Brightness value (V)	I ... - Output	1-byte	5,001	C, R, -, T, A
Object 2 - Value transmitter - Brightness value (V)				
1-byte object for transmitting the brightness value. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only with data point type value range:				
- RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) - RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) - Colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001)				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - White value (W)	I ... - Output	1-byte	5,001	C, R, -, T, A
Object 2 - Value transmitter - White value (W)				
1-byte object for transmitting the white level. This is object 1 or 2 of the parameterised output objects.				
These objects are visible only with data point type value range: colour value RGBW/HSVW (RGBW: DPT 251.600, HSVW: DPT 5.003, DPT 5.001, DPT 5.001, DPT 5.001).				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - Brightness value (V) - Status	I ... - Input	1-byte	5,001	C, -, W, -, U
Object 2 - Value transmitter - Brightness value (V) - Status				
1-byte object for receiving the brightness value. This is object 1 or 2 of the parameterised output objects.				
These objects are only visible with the following configuration:				
- Data point type value range: RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001) - "Start value" parameter = as value from brightness (V) status object				

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - Colour hue (H) - Status	I ... - Input	1-byte	5,003	C, -, W, -, U
Object 2 - Value transmitter - Colour hue (H) - Status				

1-byte object for receiving the colour hue. This is object 1 or 2 of the parameterised output objects.

These objects are only visible with the following configuration:

- - Data point type | value range: RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001)
- - "Start value" parameter = as value from colour hue (H) status object

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - RGB - Status	I ... - Input	3-byte	232,600	C, -, W, -, U
Object 2 - Value transmitter - RGB - Status				

3-byte object for receiving 3-byte colour information. This is object 1 or 2 of the parameterised output objects.

These objects are only visible with the following configuration:

- - Parameter: data point type | value range: RGB/HSV with brightness adjustment (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001), RGB/HSV with colour wheel sequence (RGB: DPT 232.600, HSV: DPT 5.003, DPT 5.001, DPT 5.001).
- - "Start value" parameter = as value from RGB status object

Function	Name	Type	DPT	Flag
Object 1 - Value transmitter - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
Object 2 - Value transmitter - Disabling				

1-bit object for activating or deactivating the disabling function. The object polarity can be configured. This is object 1 or 2 of the parameterised output objects.

15.3.5 Scene extension unit

In the "switch" channel function, each object of the switch can be parameterised separately for the "scene extension unit" function. The ETS indicates up to two communication objects for each switch channel output object for the "scene extension unit" function. The parameters can be used to determine which value the "scene extension unit" object receives when the contact is closed and/or opened. Furthermore, the behaviour of the switch channel output object after the bus voltage returns can be parameterised and a disabling function activated. The switching status of the switch channel output objects can be transmitted cyclically on the bus. No distinction is made between a brief or long press.

In the scene extension unit function, the device either calls a parameterised scene number (1...64) or switches between two scenes when the contact is closed or opened. This makes it possible to recall scenes stored in other devices.

Setting options when closing or opening the contact:

- Recall scene: results in simply recalling the scene.
- Switch over scene: The input option for a second scene number (1...64) appears. The two entered scene numbers are switched to and from each time the contact is closed or opened.

i This function can be used to call up to four different scenes if the switch is switched four times (Close - Open - Close - Open) if "Switch over scenes" is parameterised for "When closing the contact" and "When opening the contact".

15.3.5.1 Table of parameters

The following parameters are available in the "switch" channel function with the parameterised "scene extension unit" function for each switch channel output object.

When closing the contact	Recall scene Switch over scene
The functionality of the scene extension unit when closing the contact of the switch is set here. Recall scene: results in simply recalling the scene. Switch over scene: The input option for a second scene number (1...64) appears. The two entered scene numbers are switched to and from each time the contact is closed.  The device transmits a telegram with the respective scene number on the bus.	
Scene number	1 ... 64
According to the KNX standard, objects with data type 18.001 "Scene Control" can call up to 64 scenes by their numbers. The scene number to be transmitted when closing the contact is defined here. The input of the scene number is available only if "When closing the contact = Call scene".	
First scene number	1 ... 64
According to the KNX standard, objects with data type 18.001 "Scene Control" can call up to 64 scenes by their numbers. The scene number to be transmitted when closing the contact is defined here. The input of the first scene number is available only if "When closing the contact = Switch over scene".	
Second scene number	1, 2 ... 64
According to the KNX standard, objects with data type 18.001 "Scene Control" can call up to 64 scenes by their numbers. The scene number to be transmitted when closing the contact is defined here. The input of the second scene number is available only if "When closing the contact = Switch over scene".	

When opening the contact	Recall scene Switch over scene
The functionality of the scene extension unit when opening the contact of the switch is set here. Recall scene: results in simply recalling the scene. Switch over scene: The input option for a second scene number (1...64) appears. The two entered scene numbers are switched to and from each time the contact is opened. i The device transmits a telegram with the respective scene number on the bus.	
Scene number	1 ... 64
According to the KNX standard, objects with data type 18.001 "Scene Control" can call up to 64 scenes by their numbers. The scene number to be transmitted when opening the contact is defined here. The input of the scene number is available only if "When closing the contact = Call scene".	
First scene number	1 ... 64
According to the KNX standard, objects with data type 18.001 "Scene Control" can call up to 64 scenes by their numbers. The scene number to be transmitted when opening the contact is defined here. The input of the first scene number is available only if "When closing the contact = Switch over scene".	
Second scene number	1, 2 ... 64
According to the KNX standard, objects with data type 18.001 "Scene Control" can call up to 64 scenes by their numbers. The scene number to be transmitted when opening the contact is defined here. The input of the second scene number is available only if "When closing the contact = Switch over scene".	
After the bus voltage returns	no reaction transmit current state Recall scene
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel or a parameterised scene number is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	

Scene number	1 ... 64
The parameter defines here the scene number to be transmitted after the bus voltage returns.	
Send scene number cyclically	Active Inactive
The output objects of the "door/window status" channel function can be transmitted cyclically on the bus. This parameter enables the cyclical transmission.	
Cycle time	0 ... 24 h 0 ... 5 ... 59 min 0 ... 59 s
This parameter defines the interval at which the output objects are transmitted on the bus. The cycle time can be parameterised between 3 seconds and 24 hours.	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	
At the beginning of the disabling function	no reaction Recall scene
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling.	
Scene number	1 ... 64
The scene number to be transmitted at the beginning of the disabling is defined here.	
At the end of the disabling function	no reaction transmit current state Recall scene
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling.	
Scene number	1 ... 64
The scene number to be transmitted at the end of the disabling is defined here.	
Object polarity	0 = enable / 1 = disable 1 = enable / 0 = disable
This parameter defines the value of the disabling object at which the disabling function is active.	

15.3.5.2 Object list

The following communication objects are available in the "switch" channel function with the parameterised "scene extension unit" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Object 1 - Scene extension unit - Scene number	I ... - Output	1-byte	18,001	C, R, -, T, A
1-byte object for recalling, switching over or storing one of a maximum of 64 scenes at a scene push-button sensor. This is object 1 of the parameterised output objects.				

Function	Name	Type	DPT	Flag
Object 1 - Scene extension unit - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured. This is object 1 of the parameterised output objects.				

Function	Name	Type	DPT	Flag
Object 2 - Scene extension unit - Scene number	I ... - Output	1-byte	18,001	C, R, -, T, A
1-byte object for recalling, switching over or storing one of a maximum of 64 scenes at a scene push-button sensor. This is object 2 of the parameterised output objects.				

Function	Name	Type	DPT	Flag
Object 2 - Scene extension unit - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured. This is object 2 of the parameterised output objects.				

15.3.6 Room temperature control point

In the "switch" channel function, each object of the switch can be parameterised separately for the "room temperature control point" function. The ETS indicates up to three communication objects for each switch channel output object for the "room temperature control point" function. The parameters can be used to determine which values the "RTC control point" objects receive when the contact is closed or opened. Furthermore, the behaviour of the switch channel output object after the bus voltage returns can be parameterised and a disabling function activated. The RTC status of the switch channel output objects can be transmitted cyclically on the bus. No distinction is made between a brief or long press.

The "room temperature control point" channel function can be used to actuate a KNX room temperature controller.

The room temperature control point itself is not involved in the temperature control process. It allows the user to operate the single-room regulation from different points in the room. The room temperature control point can also be used to control central heating control devices located, for example, in a sub-distribution unit.

Typical KNX room temperature controllers generally offer different ways of influencing the room temperature control:

- Operating mode switchover:
Switching between different modes of operation (e. g. "Comfort", "Night" ...) with different setpoint temperatures assigned to each mode by the controller.
- Presence function:
Signalling the presence of a person in a room. The signalling may also be combined with a configured switchover in the mode of operation.
- Setpoint temperature shift:
Adjustment of the setpoint temperature via a temperature offset (DPT 9.002) or via levels (DPT 6.010).

The room temperature control point is operated by the switch functions of the device. In this way, it is possible to completely control a room temperature controller by changing the operating mode, specifying the presence function or adjusting the target temperature shift.

15.3.6.1 Operating mode switchover

Switchover of the controller operating mode can be effected in accordance with the standard function block for room temperature controllers defined in the KNX handbook using two 1-byte communication objects. The operating mode can be switched over with the normal and with the forced objects. The objects "RTC control point - Operating mode" enable the following modes to be selected:

- Comfort
- Standby
- Night
- Frost/heat protection

- Switchover: comfort/standby
- Switchover: comfort/night
- Switchover: standby/night
- Switchover: comfort/standby/night

The communication object "RTC control point - Operating mode - Forcing" is of higher priority. It permits forced switching between the following modes of operation:

- Forcing inactive (auto)
- Comfort
- Standby
- Night
- Frost/heat protection
- Switchover: comfort/standby
- Switchover: comfort/night
- Switchover: standby/night
- Switchover: comfort/standby/night
- Toggle: forced inactive (auto) / comfort
- Toggle: forced inactive (auto) / standby
- Toggle: forced inactive (auto) / night
- Switchover: forced inactive (auto) / frost/heat protection

The operating mode transmitted on the bus when closing or opening the switch of the room temperature control point is defined by the parameters "When closing the contact" and "When opening the contact". It is possible that either one of the above modes is called up or two or three modes are switched between.

15.3.6.2 Presence function

All channels whose functionality is set to "presence function" have the two communication objects "RTC control point - Presence" and "RTC control point - Presence - Status". The parameters "When closing the contact" and "When opening the contact" determine the object value transmitted on the bus when closing or opening the contact.

15.3.6.3 Setpoint temperature shift

Another function of the room temperature control point that is available is the target temperature shift. It makes use of either two 2-byte communication objects with datapoint type 9.002 or two 1-byte communication objects with datapoint type 6.010 (integer with sign).

This control point function allows the basic setpoint temperature to be shifted on a room temperature controller by closing or opening the contact. The control point is usually operated in the same way as the main control point. A switch output object parameterised as setpoint temperature shift reduces or increases the setpoint tem-

perature shift value once each time the contact is closed or opened. The direction of the value adjustment is defined by the parameters "When closing the contact" and "When opening the contact".

Communication with main controller

To enable the device to shift the target temperature on a room temperature controller, the controller must have input and output objects for the target temperature shift. In this case, the output object of the controller must be connected to the input object of the room temperature control point, and the input object of the controller must be connected to the output object of the room temperature control point in each case via their own group address.

All objects are of the same datapoint type and have the same value range. A target temperature shift is interpreted by count values: a shift in positive direction is expressed by positive values, whereas a shift in negative direction is represented by negative object values. An object value of "0" means that no target temperature shift has been set.

The room temperature control points detect the current position of the setpoint adjustment by means of the object "RTC control point - Target temperature shift - Status" of the room temperature control point connected to the room temperature controller. Starting from the value of the communication object, the setpoint is adjusted in the configured direction each time a button is pressed on a room temperature control point. Each time the setpoint is adjusted, the new shift by means of the object "RTC control point - Target temperature shift" of the room temperature control point is sent to the room temperature regulator.

With the "by counter value" function, the individual levels are weighted by the controller itself.

This requires that the respective communication objects are connected to all room temperature control points and the controller. The feedback information from the controller enables the room temperature control point to continue the adjustment at any time at the right point.

15.3.6.4 Table of parameters

The following parameters are available in the "switch" channel function with the parameterised "room temperature control point" function for each switch channel output object.

Function	Operating mode switchover Forced operating mode switchover Presence function Setpoint temperature shift
A room temperature control point can optionally switch over (force) the operating mode with normal or high priority, change the presence status or change the current room temperature setpoint value. With regard to the setting of this parameter, the ETS shows further parameters.	
When closing the contact	Comfort Standby Night Frost/heat protection Switchover: comfort/standby Switchover: comfort/night Switchover: standby/night Switchover: comfort/standby/night
If the room temperature control point is intended to change over the operating mode of the room temperature controller with normal priority, the extension unit can either switch on a defined operating mode or switch between different operating modes when the contact is closed.	
When opening the contact	Comfort Standby Night Frost/heat protection Switchover: comfort/standby Switchover: comfort/night Switchover: standby/night Switchover: comfort/standby/night
If the room temperature control point is intended to change over the operating mode of the room temperature controller with normal priority, the extension unit can either switch on a defined operating mode or switch between different operating modes when the contact is opened.	

When closing the contact	Forcing inactive (auto) Comfort Standby Night Frost/heat protection Switchover: comfort/standby Switchover: comfort/night Switchover: standby/night Switchover: comfort/standby/night Toggle: forced inactive (auto) / comfort Toggle: forced inactive (auto) / standby Toggle: forced inactive (auto) / night Switchover: forced inactive (auto) / frost/heat protection
If the room temperature control point is intended to switch the operating mode of the room temperature controller with high priority, the extension unit can either enable the change-over with normal priority (auto), switch on a defined operating mode with high priority or switch between different operating modes when the contact is closed.	
When opening the contact	Forcing inactive (auto) Comfort Standby Night Frost/heat protection Switchover: comfort/standby Switchover: comfort/night Switchover: standby/night Switchover: comfort/standby/night Toggle: forced inactive (auto) / comfort Toggle: forced inactive (auto) / standby Toggle: forced inactive (auto) / night Switchover: forced inactive (auto) / frost/heat protection
If the room temperature control point is intended to switch the operating mode of the room temperature controller with high priority, the extension unit can either enable the change-over with normal priority (auto), switch on a defined operating mode with high priority or switch between different operating modes when the contact is opened.	

When closing the contact	Presence ON Presence OFF Presence TOGGLE
The room temperature control point can switch the presence state of the room temperature controller either on or off in a defined way or the extension unit can switch between both states ("Presence TOGGLE") when the contact is closed. This parameter is only visible if "Functionality = presence function".	
When opening the contact	Presence ON Presence OFF Presence TOGGLE
The room temperature control point can switch the presence state of the room temperature controller either on or off in a defined way or the extension unit can switch between both states ("Presence TOGGLE") when the contact is opened. This parameter is only visible if "Functionality = presence function".	
Setpoint temperature shift	by relative temperature value By meter value
Depending on the setting of the "Target temperature shift" parameter, the shift takes place by means of the 2-byte communication object in accordance with KNX DPT 9.002 or KNX DPT 6.010. This parameter is visible only if "functionality = target temperature shift".	
When closing the contact	+2 K +1.5 K +1 K +0.5 K -0.5 K -1 K -1.5 K -2 K
The temperature difference is defined in Kelvin here by which the setpoint temperature will be shifted up or down when the contact is closed. To shift the target temperature value, the room temperature control point uses the two communication objects "RTC control point - Target temperature shift" and "RTC control point - Target temperature shift - Status". The communication object "RTC control point - Target temperature shift - Status" informs the room temperature control point about the current state of the room temperature controller. Based on this value and the parameter here, the room temperature control point calculates the new level value, which it sends to the room temperature controller via the communication object "RTC control point - Target temperature shift". This parameter is visible only if "Functionality = setpoint temperature shift" and "Setpoint temperature shift = by relative temperature value".	

When opening the contact	+2 K +1.5 K +1 K +0.5 K -0.5 K -1 K -1.5 K -2 K

The difference in temperature by which the setpoint temperature is shifted up or down when the contact is opened is defined in Kelvin here.

To shift the target temperature value, the room temperature control point uses the two communication objects "RTC control point - Target temperature shift" and "RTC control point - Target temperature shift - Status".

The communication object "RTC control point - Target temperature shift - Status" informs the room temperature control point about the current state of the room temperature controller. Based on this value and the parameter here, the room temperature control point calculates the new level value, which it sends to the room temperature controller via the communication object "RTC control point - Target temperature shift".

This parameter is visible only if "Functionality = setpoint temperature shift" and "Setpoint temperature shift = by relative temperature value".

When closing the contact	Increase setpoint temperature Reduce setpoint temperature

The direction of the target temperature shift is defined here at the room temperature control point.

To shift the target temperature value, the room temperature control point uses the two communication objects "RTC control point - Target temperature shift" and "RTC control point - Target temperature shift - Status".

The communication object "RTC control point - Target temperature shift - Status" informs the extension unit about the current state of the room temperature controller. Based on this value and the parameter here, the room temperature control point calculates the new level value, which it sends to the room temperature controller via the communication object "RTC control point - Target temperature shift".

This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".

When opening the contact	Increase setpoint temperature Reduce setpoint temperature
The direction of the target temperature shift is defined here at the room temperature control point. To shift the target temperature value, the room temperature control point uses the two communication objects "RTC control point - Target temperature shift" and "RTC control point - Target temperature shift - Status". The communication object "RTC control point - Target temperature shift - Status" informs the extension unit about the current state of the room temperature controller. Based on this value and the parameter here, the room temperature control point calculates the new level value, which it sends to the room temperature controller via the communication object "RTC control point - Target temperature shift". This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".	
After the bus voltage returns	no reaction transmit current state Comfort Standby Night Frost/heat protection
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel, a comfort telegram, a standby telegram, a night telegram or a frost/heat protection telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page). Visible only if "Functionality = operating mode change-over".	

After the bus voltage returns	no reaction transmit current state Forcing inactive (auto) Comfort Standby Night Frost/heat protection
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel, a forcing inactive (auto) telegram, a comfort telegram, a standby telegram, a night telegram or a frost/heat protection telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page). Visible only if "Functionality = forced operating mode change-over".	
After the bus voltage returns	no reaction transmit current state Presence ON Presence OFF Presence TOGGLE
This parameter determines the reaction after the bus voltage returns. Either no telegram, a telegram according to the current input state at the channel or a presence telegram is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page). This parameter is only visible if "Functionality = presence function".	

After the bus voltage returns	no reaction +2 K +1.5 K +1 K +0.5 K -0.5 K -1 K -1.5 K -2 K

This parameter determines the reaction after the bus voltage returns.

Either no telegram or a temperature value telegram is transmitted on the bus according to the parameterisation.

The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).

This parameter is visible only if "Functionality = setpoint temperature shift" and "Setpoint temperature shift = by relative temperature value".

After the bus voltage returns	no reaction Increase setpoint temperature Reduce setpoint temperature

This parameter determines the reaction after the bus voltage returns.

Either no telegram or a counting value telegram is transmitted on the bus according to the parameterisation.

The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).

This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".

Send operating mode cyclically	Inactive Active

The switching status of the switch channel output objects can be transmitted cyclically on the bus.

This parameter enables the cyclical transmission.

Visible only if "Functionality = operating mode change-over".

Send forced operation mode cyclically	Inactive Active

The switching status of the switch channel output objects can be transmitted cyclically on the bus.

This parameter enables the cyclical transmission.

Visible only if "Functionality = forced operating mode change-over".

Send presence status cyclically	Inactive Active
The switching status of the switch channel output objects can be transmitted cyclically on the bus. This parameter enables the cyclical transmission. This parameter is only visible if "Functionality = presence function".	
Send target temperature shift cyclically	Inactive Active
The switching status of the switch channel output objects can be transmitted cyclically on the bus. This parameter enables the cyclical transmission. This parameter is visible only if "functionality = target temperature shift".	
Cycle time	0...24 h 0...5...59 min 0...59 s
This parameter defines the interval at which the switching status is transmitted on the bus. The cycle time can be parameterised between 3 seconds and 24 hours.	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	
At the beginning of the disabling function	no reaction Comfort Standby Night Frost/heat protection
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling. Visible only if "Functionality = operating mode change-over".	

At the beginning of the disabling function	no reaction Forcing inactive (auto) Comfort Standby Night Frost/heat protection
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling. Visible only if "Functionality = forced operating mode change-over".	
At the beginning of the disabling function	no reaction Presence ON Presence OFF Presence TOGGLE
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling. This parameter is only visible if "Functionality = presence function".	
At the beginning of the disabling function	no reaction +2 K +1.5 K +1 K +0.5 K -0.5 K -1 K -1.5 K -2 K
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling. This parameter is visible only if "Functionality = setpoint temperature shift" and "Setpoint temperature shift = by relative temperature value".	

At the beginning of the disabling function	no reaction Increase setpoint temperature Reduce setpoint temperature
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling. This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".	
At the end of the disabling function	no reaction transmit current state Comfort Standby Night Frost/heat protection
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. Visible only if "Functionality = operating mode change-over".	
At the end of the disabling function	no reaction transmit current state Forcing inactive (auto) Comfort Standby Night Frost/heat protection
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. Visible only if "Functionality = forced operating mode change-over".	
At the end of the disabling function	no reaction transmit current state Presence ON Presence OFF Presence TOGGLE
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. This parameter is only visible if "Functionality = presence function".	

At the end of the disabling function	no reaction +2 K +1.5 K +1 K +0.5 K -0.5 K -1 K -1.5 K -2 K
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. This parameter is visible only if "Functionality = setpoint temperature shift" and "Setpoint temperature shift = by relative temperature value".	
At the end of the disabling function	no reaction Increase setpoint temperature Reduce setpoint temperature
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling. This parameter is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".	
Object polarity	0 = Released / 1 = Locked 1 = Released / 0 = Locked
This parameter defines the value of the disabling object at which the disabling function is active.	

15.3.6.5 Object list

The following communication objects are available in the "switch" channel function with the parameterised "room temperature control point" function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Operating mode	I ... - Output	1-byte	20,102	C, R, -, T, A

1-byte object for switching a room temperature controller between the Comfort, Standby, Night and Frost/heat protection operating modes. This is object 1 of the parameterised output objects.

This object is only visible if "Functionality = operating mode switchover".

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Operating mode - Status	I ... - Input	1-byte	20,102	C, -, W, -, U

1-byte object for receiving the operating mode of a room temperature controller. This is object 1 of the parameterised output objects.

This object is only visible if "Functionality = operating mode switchover".

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Operating mode - Forcing	I ... - Output	1-byte	20,102	C, R, -, T, A

1-byte object for switching a room temperature controller under forced control between the Automatic, Comfort, Standby, Night and Frost / heat protection operating modes. This is object 1 of the parameterised output objects.

This object is only visible if "Functionality = forced operating mode switchover".

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Operating mode - Forcing - Status	I ... - Input	1-byte	20,102	C, -, W, -, U

1-byte object for receiving the operating mode of a room temperature controller. This is object 1 of the parameterised output objects.

This object is only visible if "Functionality = forced operating mode switchover".

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Presence	I ... - Output	1-bit	1,018	C, R, -, T, A

1-bit object for changing over the presence status of a room temperature controller. This is object 1 of the parameterised output objects.

This object is only visible if "Functionality = presence function".

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Presence - Status	I ... - Input	1-bit	1,018	C, -, W, -, U

1-bit object for receiving the presence status of a room temperature controller. This is object 1 of the parameterised output objects.

This object is only visible if "Functionality = presence function".

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Setpoint temperature shift	I ... - Output	2-byte	9,002	C, R, -, T, A

2-byte object for specification of a target temperature shift in Kelvin. The value "0" means that no shift is active. Values can be specified between -670760 K and 670760 K. This is object 1 of the parameterised output objects.

This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Setpoint temperature shift status - Status	I ... - Input	2-byte	9,002	C, -, W, -, U

2-byte object for receiving the status of the current target temperature shift in Kelvin. This is object 1 of the parameterised output objects.

This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Setpoint temperature shift	I ... - Output	1-byte	6,010	C, R, -, T, A

1-byte object for specification of a target temperature shift. The value "0" means that no shift is active. The value is depicted in a two's complement in the positive or negative direction. This is object 1 of the parameterised output objects.

This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Setpoint temperature shift status - Status	I ... - Input	1-byte	6,010	C, -, W, -, U

1-byte object to receive the status of the current target temperature shift. This is object 1 of the parameterised output objects.

This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".

Function	Name	Type	DPT	Flag
Object 1 - RTC control point - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U

1-bit object for activating or deactivating the disabling function. The object polarity can be configured. This is object 1 of the parameterised output objects.

Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Operating mode	I ... - Output	1-byte	20,102	C, R, -, T, A

1-byte object for switching a room temperature controller between the Comfort, Standby, Night and Frost/heat protection operating modes. This is object 2 of the parameterised output objects.

This object is only visible if "Functionality = operating mode switchover".

Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Operating mode - Status	I ... - Input	1-byte	20,102	C, -, W, -, U

1-byte object for receiving the operating mode of a room temperature controller. This is object 2 of the parameterised output objects.

This object is only visible if "Functionality = operating mode switchover".

Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Operating mode - Forcing	I ... - Output	1-byte	20,102	C, R, -, T, A

1-byte object for switching a room temperature controller under forced control between the Automatic, Comfort, Standby, Night and Frost / heat protection operating modes. This is object 2 of the parameterised output objects.

This object is only visible if "Functionality = forced operating mode switchover".

Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Operating mode - Forcing - Status	I ... - Input	1-byte	20,102	C, -, W, -, U

1-byte object for receiving the operating mode of a room temperature controller. This is object 2 of the parameterised output objects.

This object is only visible if "Functionality = forced operating mode switchover".

Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Presence	I ... - Output	1-bit	1,018	C, R, -, T, A

1-bit object for changing over the presence status of a room temperature controller. This is object 2 of the parameterised output objects.

This object is only visible if "Functionality = presence function".

Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Presence - Status	I ... - Input	1-bit	1,018	C, -, W, -, U

1-bit object for receiving the presence status of a room temperature controller. This is object 2 of the parameterised output objects.

This object is only visible if "Functionality = presence function".

Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Setpoint temperature shift	I ... - Output	2-byte	9,002	C, R, -, T, A

2-byte object for specification of a target temperature shift in Kelvin. The value "0" means that no shift is active. Values can be specified between -670760 K and 670760 K. This is object 2 of the parameterised output objects.

This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".

Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Setpoint temperature shift status - Status	I ... - Input	2-byte	9,002	C, -, W, -, U

2-byte object for receiving the status of the current target temperature shift in Kelvin. This is object 2 of the parameterised output objects.

This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above relative temperature value".

Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Setpoint temperature shift	I ... - Output	1-byte	6,010	C, R, -, T, A
1-byte object for specification of a target temperature shift. The value "0" means that no shift is active. The value is depicted in a two's complement in the positive or negative direction. This is object 2 of the parameterised output objects. This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".				
Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Setpoint temperature shift status - Status	I ... - Input	1-byte	6,010	C, -, W, -, U
1-byte object to receive the status of the current target temperature shift. This is object 2 of the parameterised output objects. This object is visible only if "functionality = target temperature shift" and "type of target temperature shift = above meter value".				
Function	Name	Type	DPT	Flag
Object 2 - RTC control point - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured. This is object 2 of the parameterised output objects.				

15.4 Door/window status

The "Door/window status" channel function can be parametrised for each input. The device can indicate a door/window status in combination with a sensor connected to the channel. In the "door/window status" channel function, the device indicates a door/window status on the bus by means of an output object according to the parameterisation.

-  The door/window status is transmitted in compressed form on the bus by the 2-byte object "Door/window status - Overall state - Status". The status can be interpreted and indicated by means of visualisation.
-  In addition, a door or window number can be assigned, with the effect that the status information is supplemented for visualisation by means of the object "Door/window status - Door/window number".

The ETS provides the suitable parameters for the function and up to five communication objects dynamically according to the parameterised function.

The following states are available for evaluation of a window sash:

- open
- closed
- tilted
- unknown

The following states are available for evaluation of a window handle:

- open
- closed
- tilted
- unknown

The following states are available for evaluation of a door leaf:

- open
- closed
- unknown

The following states are available for evaluation of a door handle:

- locked
- unlocked
- unknown

Door/window status in the single channel configuration

A contact can be evaluated in the single channel configuration. The "0" and "1" states can be evaluated. The meaning of the evaluated states can be parameterised flexibly in a table.

Door/window status in the combined channel configuration

Two contacts can be evaluated in the combined channel configuration. The "0" and "1" states can be evaluated separately for each contact. Contact 1 and contact 2 can be flexibly assigned to channels 1 and 2. The meaning of the evaluated states can be parameterised flexibly in a table.

Two channels, for example each with a magnetic contact, can be used. They can be used in the top and bottom window area, which allows the closed, open or tilted window status to be evaluated in combination.

Evaluation of the 2-byte object "Door/window status - Overall status - Status"

The device transmits suitable telegrams by means of the 2-byte object "Door/window status - Overall state - Status" on the bus according to the parameterisation.

The individual bits of the 2-byte object "Door/window status - Overall status - Status" have the following meaning...

Bit of the status object	Meaning
0 ... 2	"0" = undefined, "1" = leaf/sash closed, "2" = leaf/sash tilted, "3" = leaf/sash open
3 ... 5	"0" = undefined, "1" = handle closed, "2" = handle tilted, "3" = handle open
6 ... 7	"0" = undefined, "1" = closure unlocked, "2" = closure locked
8	"0" = no leaf/sash status, "1" leaf/sash status used
9	"0" = no handle status, "1" handle used status
10	"0" = no closure status, "1" closure used status
11	"0" = window, "1" = door
12	not used (permanent "0")
13	not used (permanent "0")
14	not used (permanent "0")
15	not used (permanent "0")

Advanced settings

An evaluation delay, an additional 1-bit status object, a debouncing time and the object polarity can be defined in the advanced parameters.

At the end of the evaluation delay, the device transmits the evaluated state on the bus.

An additional 1-bit status object can transmit the state of the contact according to the object polarity on the bus.

15.4.1 Table of parameters

The following parameters are available in the "door/window status" channel function.

Element	Window Door
This parameter defines the sub-element whose status is to be evaluated.	
Evaluation	Wing Handle
This parameter defines the sub-element whose status is to be evaluated. Visible only if the "Window" element has been parameterised.	
Evaluation	Wing Closure
This parameter defines the sub-element whose status is to be evaluated. Visible only if the "Door" element has been parameterised.	
Window number assigned	Active Inactive
The window element to be evaluated can be assigned an identifiable window number if this parameter is activated. Visible only if the "Window" element has been parameterised.	
Number	0 ... 4294967295
This parameter defines the identifiable window number. The window number is transmitted on the bus if the status is changed by means of a communication object.	
Door number assigned	Active Inactive
The door element to be evaluated can be assigned an identifiable door number if this parameter is activated. Visible only if the "Door" element has been parameterised.	
Number	0 ... 4294967295
This parameter defines the identifiable door number. The door number is transmitted on the bus in the event of a status change by means of a communication object.	
Name of contact 1	Free text
The text entered in this parameter is used to label the contact in the ETS parameter window (e. g. "Living room window", "Bathroom door"). The text is not programmed in the device.	

Leaf/sash (contact 1 = 0)	open closed tilted unknown

This parameter in the table "Evaluation of the states" defines the state if contact 1 of the window sash is "0". The object polarity can be parameterised in the advanced parameters.

Leaf/sash (contact 1 = 1)	Open closed tilted unknown

This parameter in the table "Evaluation of the states" defines the state if contact 1 of the window sash is "1". The object polarity can be parameterised in the advanced parameters.

Handle (contact 1 = 0)	open closed tilted unknown

This parameter in the table "Evaluation of the states" defines the state if contact 1 of the window handle is "0". The object polarity can be parameterised in the advanced parameters.

Handle (contact 1 = 1)	open closed tilted unknown

This parameter in the table "Evaluation of the states" defines the state if contact 1 of the window handle is "1". The object polarity can be parameterised in the advanced parameters.

Leaf/sash (contact 1 = 0)	open closed unknown

This parameter in the table "Evaluation of the states" defines the state if contact 1 of the door leaf is "0". The object polarity can be parameterised in the advanced parameters.

Leaf/sash (contact 1 = 1)	open closed unknown
This parameter in the table "Evaluation of the states" defines the state if contact 1 of the door leaf is "1". The object polarity can be parameterised in the advanced parameters.	
Closure (contact 1 = 0)	locked unlocked unknown
This parameter in the table "Evaluation of the states" defines the state if contact 1 of the door closure is "0". The object polarity can be parameterised in the advanced parameters.	
Closure (contact 1 = 1)	locked unlocked unknown
This parameter in the table "Evaluation of the states" defines the state if contact 1 of the door closure is "1". The object polarity can be parameterised in the advanced parameters.	
Extended settings	Active Inactive
When the advanced parameters are activated, the ETS shows the following parameters. The default values of the advanced parameters are used if the advanced parameters are deactivated.	
Evaluation delay (0 = inactive)	0 ... 1 ... 59 s 0 ... 990 ms
The door/window status can be evaluated and transmitted after a delay. An evaluation delay of 1 second is activated in the default parameterisation. Visible only if "Advanced parameters = active".	
Additional 1-bit status object	Active Inactive
This parameter enables an additional 1-bit status object, which transmits the state of the contact on the bus according to the object polarity. Visible only if "Advanced parameters = active".	
Debounce time	4 ... 30 ... 255 ms
This parameter specifies the software debouncing time. A signal edge is evaluated at the input after a delay based on this time. Visible only if "Advanced parameters = active".	

Object polarity	0 = closed / 1 = open 1 = closed / 0 = open
This parameter sets the polarity of the contact for adjustment to the NO or NC contacts.	
After the bus voltage returns	no reaction transmit current state
This parameter determines the reaction after the bus voltage returns. Either no telegram or a telegram according to the current input state at the channel is transmitted on the bus according to the parameterisation. The reaction after the bus voltage returns takes place only after the parameterised "delay after bus voltage returns" expires ("General" parameter page).	
Send output objects cyclically	Active Inactive
The output objects of the "door/window status" channel function can be transmitted cyclically on the bus. This parameter enables the cyclical transmission.	
Cycle time	0 ... 24 h 0, 1 ... 59 min 0 ... 59 s
This parameter defines the interval at which the output objects are transmitted on the bus. The cycle time can be parameterised between 3 seconds and 24 hours.	
Disabling function	Inactive Active
This parameter enables the disabling function for the channel.	
At the beginning of the disabling function	no reaction individual settings
Besides disabling the channel, the device can immediately react when the disabling occurs. This parameter defines the reaction of the channel at the beginning of the disabling.	
Wing status	open closed tilted unknown
This parameter defines the state at the beginning of the disabling with the individual setting.	

Handle status	open closed tilted unknown
This parameter defines the state at the beginning of the disabling with the individual setting.	
Wing status	open closed unknown
This parameter defines the state at the beginning of the disabling with the individual setting.	
Handle status	locked unlocked unknown
This parameter defines the state at the beginning of the disabling with the individual setting.	
At the end of the disabling function	no reaction transmit current state
Besides disabling the channel, the device can immediately react at the end of the disabling. This parameter defines the reaction of the channel at the end of the disabling.	
Object polarity	0 = enable / 1 = disable 1 = enable / 0 = disable
This parameter defines the value of the disabling object at which the disabling function is active.	

15.4.2 Object list

The following communication objects are available in the "door/window status" channel function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Door/window contact 1 status	I ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object for transmission of an additional 1-bit status. This object transmits the state of the contact according to the object polarity on the bus. Visible only if the additional 1-bit status object was activated in the parameters.				

Function	Name	Type	DPT	Flag
Door/window overall status	I ... - Output	2-byte	---	C, R, -, T, A
2-byte object for transmission of the door/window status. – Bit 0...2: "0" = undefined, "1" = leaf/sash closed, "2" = leaf/sash tilted, "3" = leaf/sash open – Bit 3...5: "0" = undefined, "1" = handle closed, "2" = handle tilted, "3" = handle open – Bit 6...7: "0" = undefined, "1" = closure unlocked, "2" = closure locked – Bit 8: "0" = no leaf/sash status, "1" leaf/sash used status – Bit 9: "0" = no handle status, "1" handle used status – Bit 10: "0" = no closure status, "1" closure used status – Bit 11: "0" = window, "1" = door – Bit 12...15: not used				

Function	Name	Type	DPT	Flag
Door/window lock	I ... - Output	1-bit	1,003	C, -, W, -, U
1-bit object for activating or deactivating the disabling function. The object polarity can be configured.				

Function	Name	Type	DPT	Flag
Door/window number	I ... - Output	4-byte	12,001	C, R, -, T, A
4-byte object for transmission of the door or window number. The door/window number is transmitted on the bus each time the status is changed. Visible only if the window number or door number was assigned in the parameters.				

15.5 Temperature sensor

The "temperature sensor" channel function can be parametrised for inputs 5 and 8. The device can indicate the actual temperature in combination with a sensor Accessories connected to the channel. In the "temperature sensor" channel function, the device indicates an actual temperature on the bus by means of an output object according to the parameterisation.

The ETS provides the appropriate parameters and up to three communication objects dynamically according to the parameterised function.

15.5.1 Table of parameters

The following parameters are available in the "temperature sensor" channel function.

Temperature measurement by	connected sensor connected sensor and ext. value via bus
The "Temperature measurement by" parameter specifies the sensors used to measure the room temperature. "connected sensor": The temperature sensor connected to the device channel has been activated. Thus, the actual temperature value is determined only locally on the device. In this configuration, the feedback control will start directly after a device reset. "connected sensor and ext. value via bus": This setting is used to combine the selected temperature sources. The external temperature is received by means of the "External value" 2-byte object.	
Weighting of the measured values	10% to 90% 20% to 80% 30% to 70% 40% to 60% 50% to 50% 60% to 40% 70% to 30% 80% to 20% 90% to 10%
The weighting of the measured temperature value of the connected sensor and the external sensor is defined here. That results in an overall value, which will be used for the further interpretation of the room temperature. This parameter is visible only if "Room temperature measurement by = connected sensor and ext. value via bus".	

Connected sensor (0 = inactive)	-12.8...0...12.7
Determines the value in Kelvin by which the measured value of the connected sensor is adjusted. This parameter is visible only if the temperature detection system requires a connected sensor.	
External value via bus (0 = inactive)	-12.8...0...12.7
Determines the value in Kelvin by which the external sensor's room temperature value is calibrated. This parameter is only visible when the temperature detection system requires an external sensor.	
Transmit actual temperature	on change cyclical on change and cyclical
This parameter defines when the device transmits the actual temperature on the bus. According to the parameterisation, the ETS application program provides additional parameters.	
On change by	0.1 ... 0.2 ... 25.5
Determines the size of the value change of the room temperature in Kelvin after which the current value is automatically transmitted to the bus via the "Actual temperature" object.	
Cycle time	0 ... 24 h, 0 ... 15 ... 60 min, 0 ... 60 s
This parameter defines whether and when (in hours, minutes and seconds) the determined room temperature is to be periodically output via the "Actual temperature" object. The cycle time may be within a time frame of 3 seconds to 24 hours.	
Actual temperature without calibration	Active Inactive
If necessary, the unadjusted room temperature can be additionally transmitted to the bus as an information value via the object "Actual temperature without adjustment" and, for example, be displayed in visualisations. This parameter enables the corresponding object. i Besides the calibrated actual temperature, the additional object can be used advantageously for visualisation.	

15.5.2 Object list

The following communication objects are available in the "temperature sensor" channel function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Temperature sensor - Actual temperature - Status	I ... - Output	2-byte	9,001	C, R, -, T, A

2-byte object for displaying the actual temperature (room temperature) determined internally. Possible range of values: -99.9 °C to +99.9 °C.

The actual temperature is determined either by the connected sensor or by a combination of the connected sensor and an external value via the bus.

i The output value does not take into account the parameterised values for the calibration.

i The weighting of the measured values "connected sensor and ext. value via bus" is taken into account.

The temperature value is always output in the format "°C".

Function	Name	Type	DPT	Flag
Temperature sensor external value	I ... - Input	2-byte	9,001	C, -, W, -, U

2-byte object used to couple an external KNX room temperature sensor or a room temperature control point. Thus cascading of multiple temperature sensors for room temperature measurement. Possible range of values: -99.9 °C to +99.9 °C.

The temperature value must always be specified in the format "°C".

Function	Name	Type	DPT	Flag
Temperature sensor - Actual temperature without calibration - Status	I ... - Output	2-byte	9,001	C, R, -, T, A

2-byte object for the display of the determined actual temperature. The actual temperature is either determined by the internal sensor or by a combination of the internal sensor with an external temperature.

i The output value takes into account the parameterised values for the calibration.

i The weighting of the measured values "connected sensor and ext. value via bus" is taken into account.

The temperature value is always output in the format "°C".

15.6 Pulse counter

For each channel whose function is set to "pulse counter", the ETS indicates up to 16 communication objects. To an extent, the object data formats are dependent on the set pulse counter function.

In the function as a pulse meter, the device can count the number of pulses at the input of a channel.

As soon as a channel is set to the "pulse meter" function, this channel provides two pulse meters. The main meter and the intermediate meter are controlled equally by the pulses at the input channel, but count independently of each other. Both meters are configured independently of each other on separate parameter pages ("Main meter" and "Intermediate meter").

Synchronisation can be generated for load management. A synchronisation input is implemented by another input. Its output switch object can be linked to a group address on the "Meter query" input communication object, where it receives the synchronisation pulse.

- i** The prerequisite is that the parameter "Query meter reading via object" is activated.

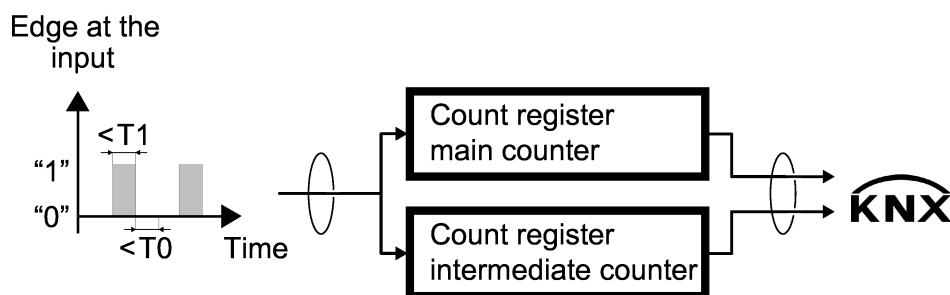


Figure 84: Pulse counter, functional diagram

- T0 Minimum signal duration for "0" signals
 T1 Minimum signal duration for "1" signals

Function of the pulse counter

The following basic settings for the functionality of the pulse meter are to be configured together for the main and intermediate meters on the parameter page "Extensions -> I ... - General". These basic settings cannot differentiate between the main and primary counters.

- Size and interval of the countable value range (parameter "Data point type | Value range")
- Signal evaluation in the device (parameter "Count pulses for")
- Ratio of the pulses output by the pulse generator to the pulses counted in the device ("Change meter reading per" parameter)
- Factor of the meter reading change per counted pulse ("Increment per meter reading change" parameter)

- Debouncing time and minimum signal duration
- Handling the meter reading after the bus voltage returns or ETS download

Size and interval of the countable value range

For each channel whose function is set to "pulse counter", the ETS indicates up to 16 communication objects. Some of the data formats depend on the set data point type | value range of the pulse meter. The parameter "Data point type | Value range" defines the value range of the pulse meter to one of the following sizes and intervals:

- Pulse counter 0...255 (1-byte / KNX DPT 5.010)
- Pulse counter -128...127 (1-byte / KNX DPT 6.010)
- Pulse counter 0...65,535 (2-byte / KNX DPT 7.001)
- Pulse counter -32,768...32,767 (2-byte / KNX DPT 8.001)
- Pulse counter 0...4,294,967,295 (4-byte / KNX DPT 12.001)
- Pulse counter -2,147,483,647...2,147,483,647 (4-byte / KNX DPT 13.001)

The different data point types | value ranges of the pulse meter vary only in terms of the size and interval of the countable value range. The manner in which the pulses are counted is defined through the parameters in the ETS. For this purpose, the ETS provides different parameters that can adjust the function of the pulse meter individually, independently of the set data point type | value range of the pulse meter.

Signal evaluation in the device

The signal evaluation in the device is defined in the ETS. The device can recognise pulses by rising and/or falling edges. The "Count pulses for" parameter defines the edge that starts the signal evaluation in the device. The following settings in the ETS are possible:

- rising edge
- falling edge
- rising and falling edge

Ratio of the pulses output by the pulse generator to the pulses counted in the device

The "Change meter reading per" parameter defines the ratio of the pulses received at the input to the pulses counted in the device. The device works with a configurable debouncing time or minimum signal duration.

Example of setting the pulses at the input per counted pulse:
- "Data point type value range" = DPT 7.001 0...65,535
- "Count pulses for" = rising edge
- "Change meter reading per" = 4 pulses
- "Increment per counter reading change" = 1

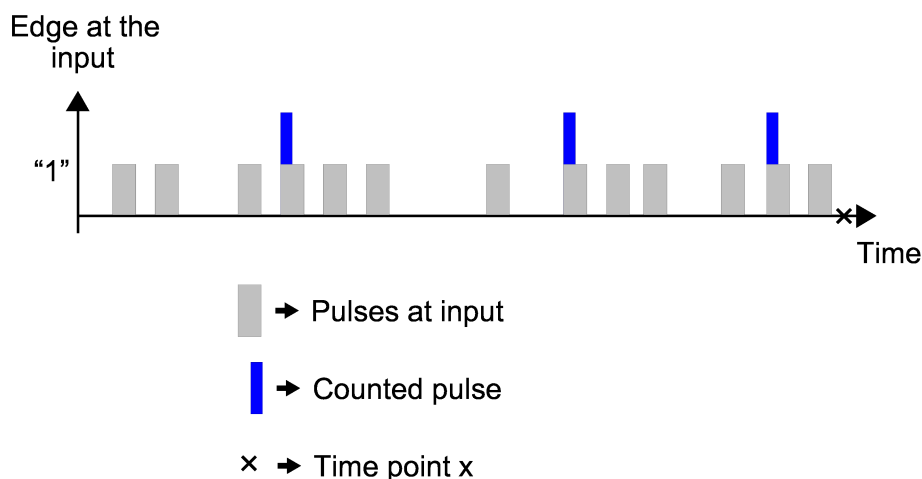


Figure 85: Example of setting the pulses at the input per counted pulse

The device internally counts the meter reading up for each counted pulse (up-counter) or down (down-counter). Thus, in this example the up-counter has a meter reading of 3. At time point x, the communication "... Meter reading" would transmit a "3" on the bus at the time x.

Factor of meter reading change per counter pulse

The "Change meter reading per" parameter defines the factor for the meter reading increase resulting from each counted pulse.

Example of setting the pulses at the input per counted pulse:

- "Data point type | value range" = DPT 7.001 | 0...65,535

- "Count pulses for" = rising edge

- "Change meter reading per" = 2 pulses

- "Increment per counter reading change" = 5

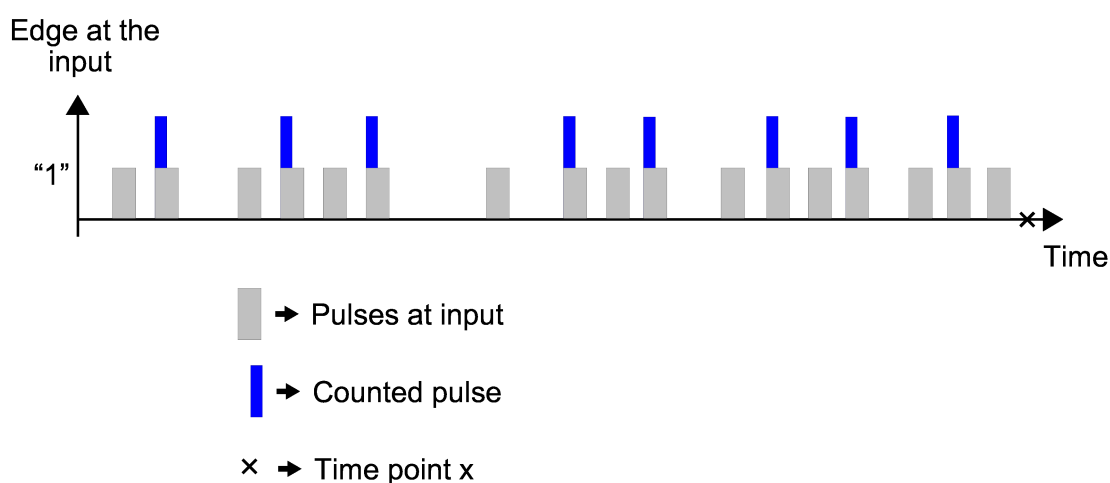


Figure 86: Example for setting the number of changes in counter status per counted pulse

The device internally counts the meter reading up for each counted pulse (up-counter) or down (down-counter). To determine the meter reading, the value of the configured "increment per meter reading change" is multiplied by the number of counted pulses. Thus, in this example an up meter would have a meter reading of "40". The "Change meter reading per" parameter defines the ratio of the pulses received at the input to the pulses counted in the device (17 pulses at the input -> 8 counted pulses). The communication object "... Meter reading" sends a "40" to the KNX at time point x.

Debounce time or minimum signal duration

The parameter "Activate minimum signal duration" decides whether the input is to work with a definable time for the signal debouncing or a minimum signal duration for "0" or "1" signals with the configured pulse meter function.

If "Debounce time" is configured, the input immediately responds to an edge at the input. When the edge is detected at the input, a timer in the device begins to determine the time since the edge was detected. The input does not evaluate any pulses for the configured debounce duration.

If "Minimum signal duration" has been configured, when an edge is detected at the input, a timer in the device begins to determine the time since the detection. The input only evaluates the pulse after the configured minimum signal duration has elapsed. The signal must remain stable during the minimum signal duration.

The debounce time of the signal is defined by the device software via the parameter "Debounce time". When the pulse counter function is configured, the duration which must elapse between two pulses for a valid pulse of the connected contacts to be identified is defined for the input via the debounce time. In this way, it is possible to prevent the device from mistakenly identifying short conduction faults as a pulse. The debounce time makes it possible to adapt the signal evaluation to the contact quality of the connected pulse output also.

Increase the debounce time in the ETS if undesirable pulse evaluations with very fast edge changes resulting in rapidly changing telegram states occur regularly or sporadically.

The parameters "Minimum signal duration for ..." are used to determine the times of the minimum signal duration for "0" and "1" signals by means of the device software. When the pulse counter function is configured, the period during which a pulse must be present until a valid pulse is identified is defined for the input via the minimum signal duration. Different times can be defined for "0" and "1" signals here. In this way, it is possible to prevent the device from mistakenly identifying short conduction faults as a pulse.

Example of setting the minimum signal duration:
- "Data point type value range" = DPT 7.001 0...65,535
- "Count pulses for" = rising edge
- "Change meter reading per" = 1 pulses

Example of setting the minimum signal duration:

- "Increment per counter reading change" = 1

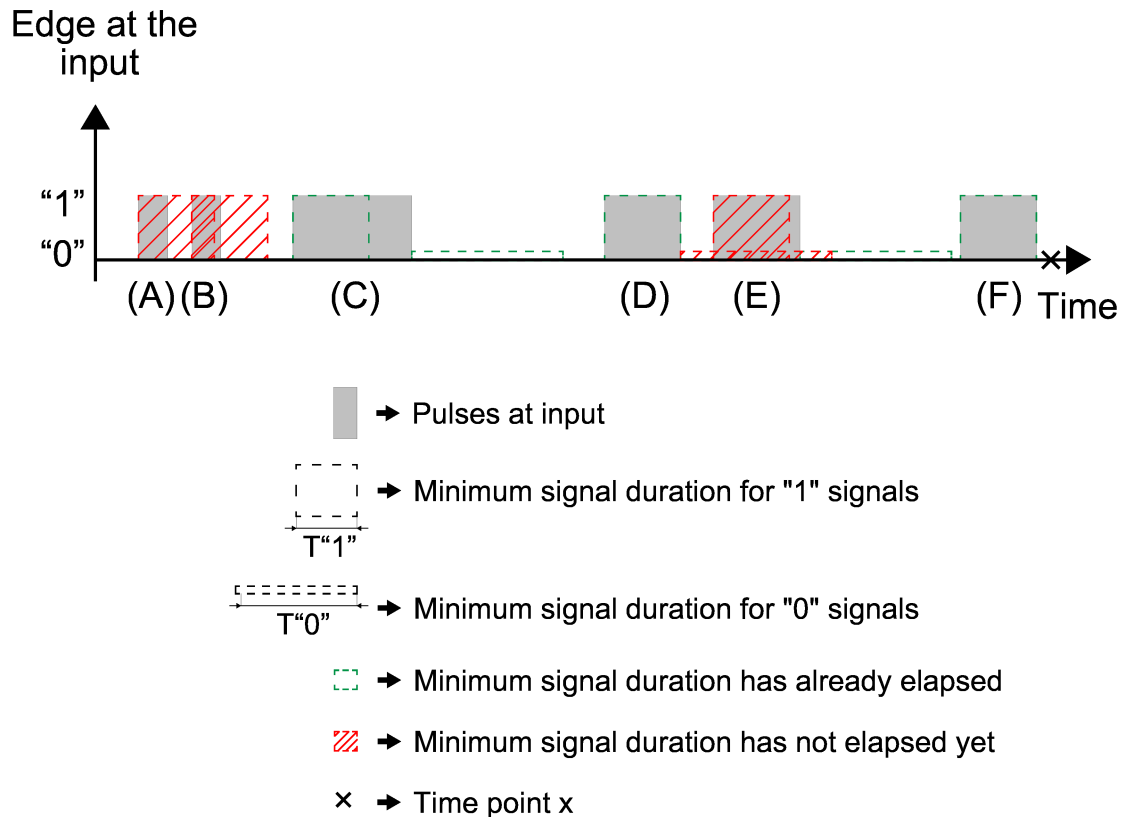


Figure 87: Example of setting the minimum signal duration

- (A) The duration of this pulse is shorter than the minimum signal duration defined for "1" signals. This pulse is not identified as a valid pulse by the device.
- (B) The duration of this pulse is shorter than the minimum signal duration defined for "1" signals. This pulse is not identified as a valid pulse by the device.
- (C) The duration of this pulse is longer than the minimum signal duration defined for "1" signals. This pulse is identified as a valid pulse by the device.
- (D) The duration of this pulse is equal to the minimum signal duration defined for "1" signals. The minimum signal duration for "0" signals has already elapsed. This pulse is identified as a valid pulse by the device.
- (E) The duration of this pulse is equal to the minimum signal duration defined for "1" signals. However, the minimum signal duration for "0" signals has not elapsed yet. This pulse is not identified as a valid pulse by the device.
- (F) The duration of this pulse is equal to the minimum signal duration defined for "1" signals. The minimum signal duration for "0" signals has already elapsed. This pulse is identified as a valid pulse by the device.

The device internally counts the meter reading up for each pulse (up-counter) or down (down-counter). To determine the counter status, the device evaluates the minimum signal duration set for the "0" and "1" signals. In this example, first the minimum signal duration for "0" signals must elapse after a valid pulse has been identified. Only then can the device recognise a "1" signal as a valid pulse again. Thus, in this example the up-counter has a meter reading of 3. At time point x, the communication "... Meter reading" sends a "3" to the KNX at time point x.

Handling the meter reading after the bus voltage returns or ETS download

The "Transmit after bus voltage returns" and "Reset after ETS download" parameters define the behaviour of the device when dealing with the meter readings of the main and intermediate meters.

-  The parameter settings are valid until the next time these parameters are adjusted in the ETS. The configured behaviour after bus voltage returns and after an ETS download is taken into account with each ETS download.

Main counter and intermediate counter

The following pulse meter settings are to be configured on the "Main meter" and "Intermediate meter" parameter pages. These settings are to be considered separately for the main and intermediate counters. The functions of the main and intermediate counters are identical except for a few parameter settings and so are described together here. The following parameters are different for the main and intermediate counters:

- "Behaviour after counter status query via KNX"
- "Send meter reading"
- "Behaviour after counter has elapsed"

The counting direction can be separately defined for the main and intermediate counters in the ETS parameters. The meters function as either up- or down-counters. Regardless of counting direction, pulse counting begins at the start value and ends at the end value. The start and end values can be specified for the device via parameter or communication object. The value range in which the start/end values lie is based on the set "data point type | value range" of the pulse meter. When setting via parameter, the start and end values of the pulse counting are specified directly in the ETS. In this case, the preset default value is also oriented to the counter's counting direction. When setting via communication object, communication objects to specify the start and end values are enabled. The data format of the communication objects is oriented to the set "functionality" of the pulse counter.

-  Condition (up-counter): Start value < End value
-  Condition (down-counter): Start value > End value

The communication objects "... Start value" and "... End value" have the value "0" after a programming procedure. Therefore the greater than / less than condition is not satisfied. The meter has stopped and is in interval limit fault state. The interval

limit fault is reported to the communication object of the same name on the KNX. As soon as the meter has received valid start and end values, the interval limit fault is cancelled and confirmed with a "0" telegram. The meter is ready for operation. Start and end values can be changed via the communication objects at any time. Parameter "Behaviour after meter has elapsed" defines the behaviour of the meter when the end value received via the communication object is greater or less than (depending on the counting direction) the current meter reading. If there is a power failure or a new programming procedure, the start and end values previously specified via communication object are saved within the device. Once the device restarts, these values are set as start and end values again. Whether the meter readings are transmitted after the bus voltage returns or are reset after a programming procedure is defined by the parameters on the parameter page "Extensions -> I ... - General" together for the main and intermediate meters.

-  Start and end values specified via communication object also remain saved within the device after a discharge process.

The device can optionally transmit the current meter readings on the KNX in the event of "on change", "cyclical" or "on change and cyclical".

-  A counter status change caused by a change of the start or end values does not result in transmission of the counter status. Transmission of the counter status after changes only occurs via the recognition of input pulses.

With the meter reading query function, the device offers another possibility to send the counter status to the KNX. In this case, the device transmits the meter reading only if the counter status is queried by means of a communication object. The "Query meter reading via object" parameter enables the corresponding communication object. This function can be used in parallel with the automatic transmission. The behaviour of the main counter after a counter status query via KNX is permanently defined. The main counter continues to run after the counter status is queried. This is one aspect in which the main counter differs from the intermediate counter. The behaviour of the intermediate counter after a counter status query via KNX can be defined with the same parameters. After a counter status query, the intermediate counter can either continue to run or be reset and restarted. The device transmits the meter reading status before the meter reading is reset and the meter restarted.

-  This behaviour is suitable, for example, for a bar chart display in a visualisation used to query the intermediate meter every hour.

When the specified end value is reached, the meter has elapsed. Optionally, an elapsed counter can be reported with a KNX telegram via the communication object "... Elapsed counter report". This communication object is enabled if the "Meter expiry status object" parameter is set to "Active".

Another function which is different between the main and intermediate counters is the behaviour after the counter elapses. The "Behaviour after meter expiry" parameter is permanently set to "Reset meter and restart" on the "Main meter" parameter page. On the "Intermediate meter" parameter page, this parameter decides whether the intermediate counter is to be reset and restarted or remain expired.

In the "Reset meter and restart" setting, the meter counts until the defined end value. Once this end value is reached, the meter reading is reset and the meter begins counting pulses from the defined start value again.

When "Intermediate counter stays elapsed" is set, the intermediate meter counts until the defined end value. Once this end value is reached, the intermediate counter stops counting. The intermediate meter must be reset before it can start counting pulses from the defined start value again. The corresponding communication object "... Counter reset" is enabled by the parameter "Meter reset via object". This parameter is permanently set to "Active" in the "Meter stays elapsed" setting.

- i** In the same way, the configured "Behaviour after meter has elapsed" defines the behaviour of the meter if the end value received by the communication object is smaller or greater (depending on the counting direction) than the current meter reading.

The meter can be reset via KNX by means of the communication object "... Counter reset" separately for the main and intermediate meter of each input if the "Meter reset via object" parameter is set to "Active". During a meter reset, the meter reading is reset to the start value and the meter is restarted. The function of the communication object "... Counter reset" can be disabled, which allows an unintentional meter reset to be prevented. The communication object, which temporarily disables the possibility to reset the meter, is enabled when the parameter "Reset meter by disabling object" is set to "Active". During the disabled period (polarity of disabling object can be set), KNX telegrams to the communication object "... Counter reset" are ignored and the meter cannot be reset. After the disabling is cancelled by a new KNX telegram with reversed polarity, the meter reading can again be reset.

Overview: Functions of the main and intermediate counters

One channel provides two pulse meters. The main meter and intermediate meter are controlled equally by the pulses at the channel, but count independently of each other. Both meters are configured independently of each other on separate parameter pages ("Main meter" and "Intermediate meter"). Project design of the main and intermediate counters is slightly different.

Function	Main counter	Intermediate counter
Can the data format of the meter be set?	Yes	Yes
Are counter statuses saved if there is a bus voltage failure?	Yes	Yes
Can start and end values can be specified in the parameters?	Yes	Yes
Can start and end values can be specified via communication objects?	Yes	Yes
Can the counting direction be set?	Yes	Yes
Can the meter reading be queried via a KNX communication object?	Yes	Yes

Function	Main counter	Inter-mediate counter
Can the behaviour of the counter after a counter status query via KNX be set?	No	Yes
Can the meter reading be independently transmitted by the device?	Yes	Yes
Can the meter reading be reset automatically and the meter restarted after the status has been cyclically transmitted?	No	Yes
Can an elapsed counter be reported via a KNX telegram?	Yes	Yes
Can the behaviour of the counter after it has elapsed be defined?	No	Yes
Can the meter be reset and restarted with a KNX telegram?	Yes	Yes

15.6.1 Table of parameters

The following parameters are available in the "pulse meter" channel function on the parameter page "I ... - General" .

Data point type Value range	DPT 5.010 0...255 DPT 6.010 -128...127 DPT 7.001 0...65,535 DPT 8.001 -32,768...32,767 DPT 12.001 0...4294967295 DPT 13.001 -2147483648...2147483647
This parameter defines the value range of the pulse meter. The size and interval of the counting range are set in dependence on this setting.	
Count pulses on	rising edge falling edge rising and falling edge
The device can recognise pulses by rising and/or falling edges. This parameter specifies the edge which starts signal evaluation in the device.	
Change meter reading per	1 ... 10000 pulses
This parameter defines the ratio of pulses received at the input to the pulses counted in the device. The number of valid pulses specified here must be detected at the device input so the pulse counter can count a pulse.	
Increment per counter reading change	1 ... 10000
This parameter defines the factor for the meter reading change resulting from each counted pulse. The change in counter status is yielded by multiplying the factor entered here with the pulses counted by the pulse counter.	
Activate minimum signal duration	Active Inactive
This parameter decides whether the channel is to work with a definable time for the signal debouncing or a minimum signal duration for "0" or "1" signals with the configured pulse meter function. In the "active" setting, additional parameters that define the minimum signal duration for "0" and "1" signals become visible. In the "inactive" setting, the device works with a debouncing time in milliseconds defined by the parameter of the same name.	

for "0" signal	0 ... 59 min 0 ... 59 s 15 ... 100 ... 999 ms
This parameter defines the time of the minimum signal duration for "0" signals. When the pulse counter function is configured, the period during which a pulse must be present until a valid pulse is identified is defined for the input via the minimum signal duration. A minimum signal duration of 0 min 0 s 15 ms to 59 min 59 s 999 ms can be set.	
for "1" signal	0 ... 59 min 0 ... 59 s 15 ... 100 ... 999 ms
This parameter defines the time of the minimum signal duration for "1" signals. When the pulse counter function is configured, the period during which a pulse must be present until a valid pulse is identified is defined for the input via the minimum signal duration. A minimum signal duration of 0 min 0 s 15 ms to 59 min 59 s 999 ms can be set.	
Debounce time	4 ... 10 ... 255 ms
This parameter defines the signal debouncing time by means of the device software. With the configured pulse meter function, the pulse duration after which a valid pulse of the connected contacts is identified is defined for the input by the debouncing time.	
Transmit after bus voltage returns	Active Inactive
This parameter defines the behaviour of the device when handling the counter statuses of the main and intermediate counters. In the "active" setting, the current meter readings after the bus voltage returns are automatically transmitted on the KNX by means of the "Main meter reading" and "Intermediate meter reading" communication objects.	
Reset after ETS download	Active Inactive
This parameter defines the behaviour of the device when handling the counter statuses of the main and intermediate counters. In the "active" setting, the current meter readings are reset due to an ETS download.	
The following parameters are available in the "pulse meter" channel function on the "Main meter" parameter page.	
Counting direction	Forwards Backwards
The meter functions as either an up- or down-counter. This parameter defines the counting direction. The counting range is determined by the functionality of the pulse meter and by the start and end values specified for the main meter.	

Start value specification	via parameter via group object
Regardless of counting direction, pulse counting begins at the start value and ends at the end value. The start and end values can be specified for the device via parameter or communication object. Depending on this setting, the ETS provides either a parameter or a communication object for specifying the start value. The value range in which the start and end value lie is based on the set "data point type value range" of the pulse meter. i Condition (up meter): start value < end value condition (down meter): start value > end value	

Start value	0 ... 254
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 5.010 0...255" is set.	

Start value	1 ... 255
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 5.010 0...255" is set.	

Start value	-128 ... 0 ... 126
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 6.010 -128...127" is set.	

Start value	-127 ... 127
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 6.010 -128...127" is set.	

Start value	0 ... 65534
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 7.001 0...65,535" is set.	
Start value	1 ... 65535
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 7.001 0...65,535" is set.	
Start value	-32768 ... 0 ... 32766
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 8.001 -32,768...32,767" is set.	
Start value	-32767 ... 32767
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 8.001 -32,768...32,767" is set.	
Start value	0 ... 4294967294
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 12.001 0...4,294,967,295" is set.	
Start value	1 ... 4294967295
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 12.001 0...4,294,967,295" is set.	

Start value	-2147483648 ... 0 ... 2147483646
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 13.001 -2,147,483,648...2,147,483,647" is set.	

Start value	-2147483647 ... 2147483647
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 13.001 -2,147,483,648...2,147,483,647" is set.	

End value specification	via parameter via group object
Regardless of counting direction, pulse counting begins at the start value and ends at the end value. The start and end values can be specified for the device via parameter or communication object. Depending on this setting, the ETS provides either a parameter or a communication object for specifying the end value. The value range in which the start and end value lie is based on the set "data point type value range" of the pulse meter. i Condition (up meter): start value < end value condition (down meter): start value > end value	

End value	1 ... 255
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 5.010 0...255" is set.	

End value	0 ... 254
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 5.010 0...255" is set.	

End value	-127 ... 127
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 6.010 -128...127" is set.	
End value	-128 ... 0 ... 126
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 6.010 -128...127" is set.	
End value	1 ... 65535
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 7.001 0...65,535" is set.	
End value	0 ... 65534
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 7.001 0...65,535" is set.	
End value	-32767 ... 32767
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 8.001 -32,768...32,767" is set.	
End value	-32768 ... 0 ... 32766
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 8.001 -32,768...32,767" is set.	

End value	1 ... 4294967295
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 12.001 0...4,294,967,295" is set.	
End value	0 ... 4294967294
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 12.001 0...4,294,967,295" is set.	
End value	-2147483647 ... 2147483647
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 13.001 -2,147,483,648...2,147,483,647" is set.	
End value	-2147483648 ... 0 ... 2147483646
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 13.001 -2,147,483,648...2,147,483,647" is set.	
Query meter reading via object	Active Inactive
With the meter reading query function, the device offers another possibility to send the counter status to the KNX. In this case, the device transmits the meter reading only if the counter status is queried by means of a communication object. This parameter enables the corresponding communication object. This function can be used in parallel with the automatic transmission.	
Behaviour after counter expiry	Reset meter and restart
This parameter is permanently set to "Reset meter and restart". Correspondingly, the main counter is reset and restarted after the counter has elapsed. In the same way, the configured "Behaviour after meter has elapsed" defines the behaviour of the meter when the end value received via the communication object is greater or less than (depending on the counting direction) the current meter reading.	

Status object ""Counter expiry""	Active Inactive
Optionally, the expiry of a meter can be reported with a KNX telegram by means of the "meter expiry" communication object. This communication object becomes available when this parameter is set to "active".	
Meter reset via object	Active Inactive
The meter reset via KNX can be set separately by means of the "meter reset" communication object for the main and intermediate meter of each input if this parameter is set to "active". When a meter is reset, the meter reading is reset to the start value and restarted.	
Reset meter by disabling object	Active Inactive
The function of the "meter reset" communication object can be disabled. The communication object, which temporarily disables the possibility to reset a meter, is enabled if this parameter is set to "active".	
Object polarity	1 = disable / 0 = enable 0 = disable / 1 = enable
The polarity of the disabling object for the meter reset can be set with this parameter.	
Send meter reading	on change cyclical on change and cyclical
This parameter defines the criterion for automatic transmission of the counter status. Additional parameters are displayed depending on this setting.	
On change by	1 ... 100 ... 65535 (255, 127, 32767, ...)
If the meter reading is to be transmitted after changing, this parameter defines the exact value by which the meter reading needs to have changed for the device to transmit the current meter reading again. The value range of this parameter is based on the set "data point type value range" of the pulse meter. This parameter is visible when the meter reading is sent "For change" or "For change and cyclical".	
Cycle time	0 ... 24 h 0 ... 5 ... 59 min 0 ... 10 ... 59 s
The device always transmits the meter reading cyclically after the time defined in the parameters has elapsed. The sum resulting from the parameters for minutes, seconds and milliseconds yields the total cycle time. This parameter is visible when the meter reading is sent "Cyclically" or "For change and cyclically". A cycle time of 3 s to 24 h can be set.	

The following parameters are available in the "Pulse meter" channel function on the "Intermediate meter" parameter page.

Counting direction	Forwards Backwards
The meter functions as either an up- or down-counter. This parameter defines the counting direction. The counting range is determined by the functionality of the pulse meter and the start and end values specified for the intermediate meter.	
Start value specification	via parameter via group object
Regardless of counting direction, pulse counting begins at the start value and ends at the end value. The start and end values can be specified for the device via parameter or communication object. Depending on this setting, the ETS provides either a parameter or a communication object for specifying the start value. The value range in which the start and end value lie is based on the set "data point type value range" of the pulse meter.	
 Condition (up meter): start value < end value condition (down meter): start value > end value	
Start value	0 ... 254
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 5.010 0...255" is set.	
Start value	1 ... 255
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 5.010 0...255" is set.	
Start value	-128 ... 0 ... 126
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 6.010 -128...127" is set.	

Start value	-127 ... 127
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 6.010 -128...127" is set.	
Start value	0 ... 65534
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 7.001 0...65,535" is set.	
Start value	1 ... 65535
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 7.001 0...65,535" is set.	
Start value	-32768 ... 0 ... 32766
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 8.001 -32,768...32,767" is set.	
Start value	-32767 ... 32767
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 8.001 -32,768...32,767" is set.	
Start value	0 ... 4294967294
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 12.001 0...4,294,967,295" is set.	

Start value	1 ... 4294967295
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 12.001 0...4,294,967,295" is set.	
Start value	-2147483648 ... 0 ... 2147483646
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The start value can lie within this value range if "DPT 13.001 -2,147,483,648...2,147,483,647" is set.	
Start value	-2147483647 ... 2147483647
When setting via parameter, the start value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The start value can lie within this value range if "DPT 13.001 -2,147,483,648...2,147,483,647" is set.	
End value specification	via parameter via group object
Regardless of counting direction, pulse counting begins at the start value and ends at the end value. The start and end values can be specified for the device via parameter or communication object. Depending on this setting, the ETS provides either a parameter or a communication object for specifying the end value. The value range in which the start and end value lie is based on the set "data point type value range" of the pulse meter.  Condition (up meter): start value < end value condition (down meter): start value > end value	
End value	1 ... 255
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 5.010 0...255" is set.	

End value	0 ... 254
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 5.010 0...255" is set.	
End value	-127 ... 127
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 6.010 -128...127" is set.	
End value	-128 ... 0 ... 126
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 6.010 -128...127" is set.	
End value	1 ... 65535
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 7.001 0...65,535" is set.	
End value	0 ... 65534
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 7.001 0...65,535" is set.	
End value	-32767 ... 32767
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 8.001 -32,768...32,767" is set.	

End value	-32768 ... 0 ... 32766
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 8.001 -32,768...32,767" is set.	

End value	1 ... 4294967295
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 12.001 0...4,294,967,295" is set.	

End value	0 ... 4294967294
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 12.001 0...4,294,967,295" is set.	

End value	-2147483647 ... 2147483647
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts up. The end value can lie within this value range if "DPT 13.001 -2,147,483,648...2,147,483,647" is set.	

End value	-2147483648 ... 0 ... 2147483646
When setting via parameter, the end value of the pulse counting is specified directly with this parameter. In this case, the preset default value is also oriented to the counter's counting direction. This value range is available when the meter counts down. The end value can lie within this value range if "DPT 13.001 -2,147,483,648...2,147,483,647" is set.	

Query meter reading via object	Active Inactive
With the meter reading query function, the device offers another possibility to send the counter status to the KNX. In this case, the device transmits the meter reading only if the counter status is queried by means of a communication object. This parameter enables the corresponding communication object. This function can be used in parallel with the automatic transmission.	
Behaviour	meter continues to run Meter counter and restart
The behaviour of the intermediate meter after querying a meter reading by means of an object can be defined. After a counter status query, the intermediate counter can either continue to run or be reset and restarted. The device transmits the meter reading status before the meter reading is reset and the meter restarted.	
Behaviour after counter expiry	Meter remains expired (reset required) Meter counter and restart
This parameter defines whether the intermediate counter is reset and restarted after it elapses or if it stays elapsed. In the "Reset meter and restart" setting, the meter counts until the defined end value is reached. Once this end value is reached, the meter reading is reset and the meter begins counting pulses from the defined start value again. In the "Meter remains elapsed (reset required)" setting, the intermediate meter counts until the defined end value is reached. Once this end value is reached, the intermediate counter stops counting. The intermediate meter must be reset before it can start counting pulses from the defined start value again. The "Meter reset via object" parameter is permanently set to "active" in the "Meter stays elapsed" setting. In the same way, the configured "Behaviour after meter has elapsed" defines the behaviour of the meter if the end value received by the communication object is smaller or greater (depending on the counting direction) than the current meter reading.	
Status object "Counter expiry"	Active Inactive
Optionally, the expiry of a meter can be reported with a KNX telegram by means of the "meter expiry" communication object. This communication object becomes available when this parameter is set to "active".	
Meter reset via object	Active Inactive
The meter reset via KNX can be set separately by means of the "meter reset" communication object for the main and intermediate meter of each input if this parameter is set to "active". When a meter is reset, the meter reading is reset to the start value and restarted.	

Reset meter by disabling object	Active Inactive
The function of the "meter reset" communication object can be disabled. The communication object, which temporarily disables the possibility to reset a meter, is enabled if this parameter is set to "active".	
Object polarity	1 = disable / 0 = enable 0 = disable / 1 = enable
The polarity of the disabling object for the meter reset can be set with this parameter.	
Send meter reading	on change cyclical on change and cyclical
This parameter defines the criterion for automatic transmission of the counter status. Additional parameters are displayed depending on this setting.	
On change by	1 ... 100 ... 65535 (255, 127, 32767, ...)
If the meter reading is to be transmitted after changing, this parameter defines the exact value by which the meter reading needs to have changed for the device to transmit the current meter reading again. The value range of this parameter is based on the set "data point type value range" of the pulse meter. This parameter is visible when the meter reading is sent "For change" or "For change and cyclical".	
Cycle time	0 ... 24 h 0 ... 5 ... 59 min 0 ... 10 ... 59 s
The device always transmits the meter reading cyclically after the time defined in the parameters has elapsed. The sum resulting from the parameters for minutes, seconds and milliseconds yields the total cycle time. This parameter is visible when the meter reading is sent "Cyclically" or "For change and cyclically". A cycle time of 3 s to 24 h can be set.	

15.6.2 Object list

The following communication objects are available for the main meter in the "pulse meter" channel function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Main counter expiry	I ... - Output	1-bit	1,002	C, R, -, T, A

This 1-bit object reports that the main counter has elapsed to the KNX. Visible only if the "Meter expiry status object" parameter is set to "active".

Function	Name	Type	DPT	Flag
Main counter interval limit error	I ... - Output	1-bit	1,002	C, R, -, T, A

This 1-bit object reports a main counter interval limit fault to the KNX.

An interval limit error is transmitted if: - Up meter: start value $\geq$ end value, - Down meter: start value $\leq$ end value.

The interval limit fault is also read out if the communication objects "start value" and "end value" have not yet received a valid value telegram via the KNX.

Function	Name	Type	DPT	Flag
Puls counter - main meter - meter reading - query	I ... - Input	1-bit	1,017	C, -, W, -, U

1-bit object for querying the current main counter status. If this object is defined with a "1" telegram, the device transmits the current meter reading to the KNX.

This communication object is visible only if the "Query meter reading via object" parameter is set to "active".

Function	Name	Type	DPT	Flag
Main meter reset	I ... - Input	1-bit	1,015	C, -, W, -, U

1-bit object for resetting the current main counter status.

If this object is defined with a "1" telegram, the meter reading is reset to the start value that was configured or specified via an object.

This communication object is visible only if the "Meter reset via object" parameter is set to "active".

Function	Name	Type	DPT	Flag
Puls counter - main meter - meter reading - status	I ... - Output	1-byte	5,010	C, R, -, T, A

This 1-bit object automatically transmits the current meter reading of the main meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...255 here).

Function	Name	Type	DPT	Flag
Puls counter - main meter - meter reading - status	I ... - Output	1-byte	6,010	C, R, -, T, A

This 1-bit object automatically transmits the current meter reading of the main meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -128...127 here).

Function	Name	Type	DPT	Flag
Puls counter - main meter - meter reading - status	I ... - Output	2-byte	7,001	C, R, -, T, A

This 2-bit object automatically transmits the current meter reading of the main meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...65535 here).

Function	Name	Type	DPT	Flag
Puls counter - main meter - meter reading - status	I ... - Output	2-byte	8,001	C, R, -, T, A

This 2-bit object automatically transmits the current meter reading of the main meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -32768...32767 here).

Function	Name	Type	DPT	Flag
Puls counter - main meter - meter reading - status	I ... - Output	4-byte	12,001	C, R, -, T, A

This 4-bit object automatically transmits the current meter reading of the main meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...4294967295 here).

Function	Name	Type	DPT	Flag
Puls counter - main meter - meter reading - status	I ... - Output	4-byte	13,001	C, R, -, T, A

This 4-bit object automatically transmits the current meter reading of the main meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -2147483648...2147483647 here).

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	1-byte	5,010	C, -, W, -, U

If the main counter is working as an up-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...255 here).

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	1-byte	6,010	C, -, W, -, U

If the main counter is working as an up-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -128...127 here).

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	2-byte	7,001	C, -, W, -, U

If the main counter is working as an up-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...65535 here).

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	2-byte	8,001	C, -, W, -, U

If the main counter is working as an up-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -32768...32767 here).

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	4-byte	12,001	C, -, W, -, U
If the main counter is working as an up-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter 0...4294967295 here).				

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	4-byte	13,001	C, -, W, -, U
If the main counter is working as an up-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter -2147483648...2147483647 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	1-byte	5,010	C, -, W, -, U
If the main counter is working as an up-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter 0...255 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	1-byte	6,010	C, -, W, -, U
If the main counter is working as an up-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter -128...127 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	2-byte	7,001	C, -, W, -, U
If the main counter is working as an up-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter 0...65535 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	2-byte	8,001	C, -, W, -, U
If the main counter is working as an up-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter -32768...32767 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	4-byte	12,001	C, -, W, -, U
If the main counter is working as an up-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter 0...4294967295 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	4-byte	13,001	C, -, W, -, U
If the main counter is working as an up-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter -2147483648...2147483647 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	1-byte	5,010	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter 0...255 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	1-byte	6,010	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter -128...127 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	2-byte	7,001	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter 0...65535 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	2-byte	8,001	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter -32768...32767 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	4-byte	12,001	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter 0...4294967295 here).				

Function	Name	Type	DPT	Flag
Main counter end value	I ... - Input	4-byte	13,001	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the end value of the main counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter -2147483648...2147483647 here).				

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	1-byte	5,010	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter 0...255 here).				

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	1-byte	6,010	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter -128...127 here).				

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	2-byte	7,001	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter 0...65535 here).				

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	2-byte	8,001	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (here: pulse meter -32768...32767).				

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	4-byte	12,001	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter 0...4294967295 here).				

Function	Name	Type	DPT	Flag
Main counter start value	I ... - Input	4-byte	13,001	C, -, W, -, U
If the main counter is working as a down-counter, the input receives the start value of the main counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object". As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type value range" of the pulse meter (pulse meter -2147483648...2147483647 here).				

Function	Name	Type	DPT	Flag
Pulse meter - Main meter - Meter reset - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U

Reset of the current main counter status can be disabled via this object. If the "Reset meter by disabling object" parameter is set to "active", the meter reset function can be disabled by this object even if it is enabled in the parameters. During the time it is disabled, the meter cannot be reset. The polarity of the object is defined by the "Object polarity" parameter in the process.

The following communication objects are available for the intermediate meter in the "pulse meter" channel function. The name can be adjusted with the "Name" parameter.

Function	Name	Type	DPT	Flag
Intermediate counter expiry	I ... - Output	1-bit	1,002	C, R, -, T, A

This 1-bit object reports that the intermediate counter has elapsed to the KNX. Visible only if the "Meter expiry status object" parameter is set to "active".

Function	Name	Type	DPT	Flag
Intermediate counter interval limit error	I ... - Output	1-bit	1,002	C, R, -, T, A

This 1-bit object reports an intermediate counter interval limit fault to the KNX.

An interval limit error is transmitted if: - Up meter: start value $\geq$ end value, - Down meter: start value $\leq$ end value.

The interval limit fault is also read out if the communication objects "start value" and "end value" have not yet received a valid value telegram via the KNX.

Function	Name	Type	DPT	Flag
Puls counter - intermediate meter - meter reading - query	I ... - Input	1-bit	1,017	C, -, W, -, U

1-bit object for querying the current intermediate counter status. If this object is defined with a "1" telegram, the device transmits the current meter reading to the KNX.

This communication object is visible only if the "Query meter reading via object" parameter is set to "active".

Function	Name	Type	DPT	Flag
Pulse meter - Intermediate meter - Meter reset	I ... - Input	1-bit	1,015	C, -, W, -, U

1-bit object for resetting the intermediate counter.

If this object is defined with a "1" telegram, the meter reading is reset to the start value that was configured or specified via an object.

This communication object is visible only if the "Meter reset via object" parameter is set to "active".

Function	Name	Type	DPT	Flag
Puls counter - intermediate meter - meter reading - status	I ... - Output	1-byte	5,010	C, R, -, T, A

This 1-bit object automatically transmits the current meter reading of the intermediate meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...255 here).

Function	Name	Type	DPT	Flag
Puls counter - intermediate meter - meter reading - status	I ... - Output	1-byte	6,010	C, R, -, T, A

This 1-bit object automatically transmits the current meter reading of the intermediate meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -128...127 here).

Function	Name	Type	DPT	Flag
Puls counter - intermediate meter - meter reading - status	I ... - Output	2-byte	7,001	C, R, -, T, A

This 2-bit object automatically transmits the current meter reading of the intermediate meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...65535 here).

Function	Name	Type	DPT	Flag
Puls counter - intermediate meter - meter reading - status	I ... - Output	2-byte	8,001	C, R, -, T, A

This 2-bit object automatically transmits the current meter reading of the intermediate meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -32768...32767 here).

Function	Name	Type	DPT	Flag
Puls counter - intermediate meter - meter reading - status	I ... - Output	4-byte	12,001	C, R, -, T, A

This 4-bit object automatically transmits the current meter reading of the intermediate meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...4294967295 here).

Function	Name	Type	DPT	Flag
Puls counter - intermediate meter - meter reading - status	I ... - Output	4-byte	13,001	C, R, -, T, A

This 4-bit object automatically transmits the current meter reading of the intermediate meter on the KNX (after a change or cyclically).

The meter reading can be read out via the KNX if the R-flag is set. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -2147483648...2147483647 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	1-byte	5,010	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...255 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	1-byte	6,010	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -128...127 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	2-byte	7,001	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...65535 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	2-byte	8,001	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -32768...32767 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	4-byte	12,001	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...4294967295 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	4-byte	13,001	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -2147483648...2147483647 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	1-byte	5,010	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...255 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	1-byte	6,010	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -128...127 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	2-byte	7,001	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...65535 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	2-byte	8,001	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -32768...32767 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	4-byte	12,001	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...4294967295 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	4-byte	13,001	C, -, W, -, U

If the intermediate counter is working as an up-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -2147483648...2147483647 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	1-byte	5,010	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...255 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	1-byte	6,010	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -128...127 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	2-byte	7,001	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...65535 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	2-byte	8,001	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -32768...32767 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	4-byte	12,001	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...4294967295 here).

Function	Name	Type	DPT	Flag
Intermediate counter end value	I ... - Input	4-byte	13,001	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the end value of the intermediate counter via this communication object. This object is visible when parameter "End value specification" is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -2147483648...2147483647 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	1-byte	5,010	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...255 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	1-byte	6,010	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -128...127 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	2-byte	7,001	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...65535 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	2-byte	8,001	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -32768...32767 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	4-byte	12,001	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter 0...4294967295 here).

Function	Name	Type	DPT	Flag
Intermediate counter start value	I ... - Input	4-byte	13,001	C, -, W, -, U

If the intermediate counter is working as a down-counter, the input receives the start value of the intermediate counter via this communication object. This object is visible if the "Start value specification" parameter is set to "Via communication object".

As long as no correct value telegram is received, the input transmits an interval limit fault. The data format and data point type are set according to the configured "data point type | value range" of the pulse meter (pulse meter -2147483648...2147483647 here).

Function	Name	Type	DPT	Flag
Pulse meter - Intermediate meter - Meter reset - Disabling	I ... - Input	1-bit	1,003	C, -, W, -, U

Reset of the current intermediate counter status can be disabled via this object. If the "Reset meter by disabling object" parameter is set to "active", the meter reset function can be disabled by this object even if it is enabled in the parameters. During the time it is disabled, the meter cannot be reset. The polarity of the object is defined by the "Object polarity" parameter in the process.

16 Room temperature controller

Two controllers are integrated in the device software, which can be used for single-room temperature control. This allows the temperature to be set in up to 2 rooms or room areas to specified setpoints through independent control processes. The command value outputs of these controllers can be linked to the electronic valve outputs of the actuator, meaning that temperature control and valve and fan activation can take place using just one bus device, if required. The use of external room temperature controllers (e. g. push-button sensors with RTC) is thus not absolutely essential, but is possible because the valve and fan outputs can also be activated separately via the KNX. The integrated controllers can also transmit command value telegrams to the KNX and thus activate other heating actuators or fan coil actuators.

The integrated controllers of the device always work as the main controller. All the controller functions (e. g. setpoint temperature specification, operation switchover, switchover of the operation) are controlled via KNX communication objects (object controller without its own operating elements), meaning that controller operation is possible via controller extensions or visualisations. The room temperature is made available to the integrated controllers via separate communication objects.

16.1 Room temperature controller - General

16.1.1 Name

Optional names can be assigned for each room temperature controller. The names should clarify the use of the output (e. g. "heating living room" or "cooling ceiling office 1"). The names are only used in the ETS in the text of the parameter pages and communication objects.

16.1.2 Operation

Introduction

A room temperature controller distinguishes between two different operating modes. The operating modes specify whether you want the controller to use its command value to trigger heating systems ("heating" single operating mode) or cooling systems ("cooling" single operating mode). You can also activate mixed operation, with the controller being capable of changing over between "Heating" and "Cooling" either automatically or, alternatively, controlled by a communication object.

In addition, you can establish two-level control operation to control an additional heating or cooling unit. For two-level feedback control, separate command values will be calculated as a function of the temperature deviation between the setpoint and the actual value for the basic and additional levels. Parameter "operation" in the parameter branch "Room temperature controller -> RTCx - General" sets the operation and, if necessary, enables the additional level(s).

"Heating" or "cooling" single operating modes

In the single "Heating" or "Cooling" operating modes without any additional level, the controller will always work with one command value. Alternatively, when the additional level is enabled, it will use two command values in the configured operation. Depending on the room temperature determined and on the specified setpoint temperatures of the operating modes, the room temperature controller will automatically decide whether heating or cooling energy is required and calculates the command value for the heating or cooling system.

"Heating and cooling" mixed operating mode

In the "Heating and cooling" mixed operating mode, the controller is capable of triggering heating and cooling systems. In this connection, you can set the change-over behaviour of the operating modes...

- Parameter "Heating/cooling switchover" in the parameter branch "Room temperature controller -> RTC... - General" set to "automatically via RTC".
In this case, a heating or cooling mode is automatically activated, depending on the determined room temperature and on the specified setpoint temperature. If the room temperature is within the preset deadband neither heating nor cooling will take place (both command values = "0"). The communication object "Setpoint temperature" displays the most recently active setpoint for heating or cooling. If the room temperature is higher than the cooling setpoint tem-

perature, cooling will take place. If the room temperature is higher than the heating setpoint temperature, heating will take place.

When the operation is changed over automatically, the information can be actively sent to the bus via the object "operation - Status" to indicate whether the controller is working in the heating mode ("1" telegram) or in the cooling mode ("0" telegram). In this case, a telegram will be transmitted immediately on changing from heating to cooling (object value = "0") or from cooling to heating (object value = "1"), respectively.

The "Cyclical transmission" parameter enables cyclical transmission (factor setting > "0 min") and specifies the cycle time.

With an automatic operating mode change-over, it should be noted that under certain circumstances there will be continuous change-over between heating and cooling if the deadband is too small! For this reason, you should, if possible, not set the deadband (temperature difference between the setpoint temperatures for the comfort heating and cooling modes) below the default value (2 K).

- Parameter "Heating/cooling switchover" in the parameter branch "Room temperature controller -> RTC... - General" set to "via object".

In this case, the operation is controlled via the "operation" object, irrespective of the deadband. This type of change-over can, for example, become necessary if both heating and cooling should be carried out through a one-pipe system (heating and cooling system). For this, the temperature of the medium in the single-pipe system must be changed via the system control. Afterwards the heating/cooling operation is set via the object (often the single-pipe system uses cold water for cooling during the summer, hot water for heating during the winter).

The "operation" object has the following polarities: "1": heating; "0": cooling. After a reset, the object value will be "0", and the "operation after reset" set in the ETS will be activated. The parameter "operation after reset" can be used to determine which operation is activated after a reset. For the "Heating" or "Cooling" settings, the controller will activate the configured heating/cooling operation immediately after the initialisation phase. In case of parameterisation "operation before reset" the operation which was selected before the reset will be activated.

Setpoint temperatures can be specified for each operating mode in the ETS as part of configuration. It is possible to configure the setpoints for the "Comfort", "Standby" and "Night" modes directly (absolute setpoint presetting) or relatively (derivation from basic setpoint). With absolute setpoint presetting there is no basic setpoint and also no deadband in the mixed operating mode "Heating and cooling" (if necessary also with additional level). Consequently, the room temperature controller cannot control the switchover of the operation automatically, which is why, in this configuration, the setting for the parameter "Heating/cooling switchover" is fixed in the ETS to "via object".

16.1.3 Type of control

Introduction

To facilitate convenient temperature control in living or business spaces a specific control algorithm which controls the installed heating or cooling systems is required. Taking account of the preset temperature setpoints and the actual room temperature, the controller thus determines command values which trigger the heating or the cooling system. The control system (control circuit) consists of a room temperature controller, a valve drive or an actuator with switching output signals (e. g. heating actuator when ETD electrothermal drives are used), the actual heating or cooling element (e. g. radiator or cooling ceiling) and of the room. This results in a controlled system (see figure 88).

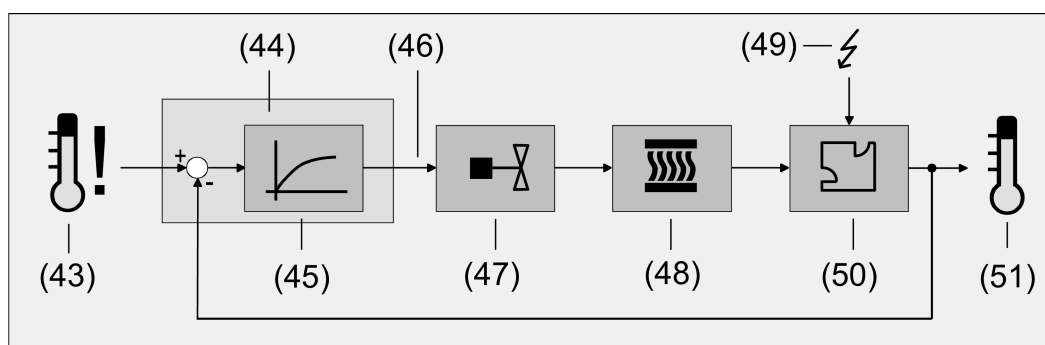


Figure 88: Controlled system of single-room temperature control

- (43) Setpoint temperature presetting
- (44) Room temperature controller
- (45) Control algorithm
- (46) Command value
- (47) Valve control (valve drive, ETD, heating actuator, ...)
- (48) Heat/cold exchanger (radiator, cooling ceiling, FanCoil, ...)
- (49) Fault variable (sunlight penetration, outdoor temperature, illumination systems, ...)
- (50) Room
- (51) Actual temperature (room temperature)

The controller evaluates the actual temperature (51) and compares it with the specified setpoint temperature (43). With the aid of the selected control algorithm (45), the command value (46) is then calculated from the difference between the actual and the setpoint temperature. The command value controls valves or fans for heating or cooling systems (47), meaning that heating or cooling energy in the heat or cold exchangers (48) is passed into the room (50). Regular readjustment of the command value means that the controller is able to compensate for setpoint / actual temperature differences caused by external influences (49) in the control circuit. In addition, the flow temperature of the heating or cooling circuit influences the control system which necessitates adaptations of the variable.

The room temperature controller facilitates either proportional/integral (PI) feedback control as a continuously working or switching option, or, alternatively, switching 2-point feedback control. In some practical cases, it can become necessary to use more than one control algorithm. For example, in bigger systems using floor heating, one control circuit which solely triggers the floor heating can be used to keep the latter at a constant temperature. The radiators on the wall, and possibly even in a side area of the room, will be controlled separately by an additional level with its own control algorithm. In such cases, distinction must be made between the different types of control, as floor heating systems, in most cases, require control parameters which are different to those of radiators on the wall, for example. It is possible to configure up to four independent control algorithms in two-level heating and cooling operation.

The command values calculated by the control algorithm are output via the "Heating command value" or "Cooling command value" communication objects. Depending on the control algorithm selected for the heating and/or cooling mode, the format of the command value objects is, among other things, also specified. In this way, 1-bit or 1-byte command value objects can be created. The control algorithm is specified by the parameters "Type of heating control" or "Type of cooling control" in the "Room temperature control -> RTCx - General" parameter branch and, if necessary, also with a distinction of the basic and additional stages.

Continuous PI control

PI control is an algorithm which consists of a proportional part and an integral part. Through the combination of these control properties, you can obtain room temperature control as quickly and precisely as possible without or only with low deviations. When you use this algorithm, the room temperature controller will calculate a new continuous command value in cycles of 30 seconds and transmit it to the bus via a 1-byte value object if the calculated command value has changed by a specified percentage. The parameter "on change by (0 = inactive)" in the parameter branch "Room temperature controller -> RTCx - General -> Command value output" specifies the change interval in percent.

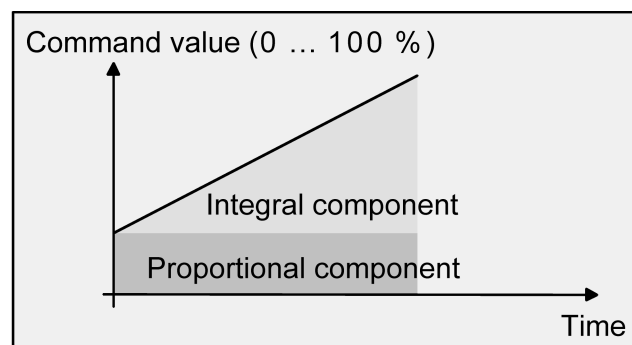


Figure 89: Continuous PI control

An additional heating or cooling stage as PI control works in the same way as the PI control of the basic stage, with the exception that the setpoint will shift, taking account of the parameterized step width.

Switching PI control

With this type of feedback control, the room temperature will also be kept constant by the PI control algorithm. Taking the mean value for a given time, the same behaviour of the control system will result as you would obtain with a continuous controller. The difference compared with continuous feedback control is only the way how the command value is output. The command value calculated by the algorithm in cycles of every 30 seconds is internally converted into a pulse-width-modulated (PWM) command value signal and sent to the bus via a 1-bit switching object. Taking into account the cycle time settable using the parameter "PWM cycle time" in the parameter branch "Room temperature controller x -> RTCx - General -> Command value output", the mean value of the command signal resulting from this modulation is a measure for the centred valve position of the control valve and thus a reference for the set room temperature.

A shift of the mean value, and thus a change in the heating capacity, can be obtained by changing the duty factor of the switch-on and switch-off pulses of the command value signal.

If the command value is changed, the current PWM cycle is adapted as required so that the duty factor corresponds as directly as possible to the new command value. This adaptation is carried out in the same way as during activation of the valve outputs.

For a command value of 0% (permanently off) or of 100% (permanently on), a command value telegram corresponding to the command value ("0" or "1") will always be sent after a cycle time has elapsed.

For switching PI control, the controller will always use continuous command values for internal calculation. Such continuous values can additionally be sent to the bus via a separate 1-byte value object, for example, as status information for visualisation purposes (if necessary, also separately for the additional levels). The status value objects will be updated at the same time as the command value is output. The parameters "On change by (0 = inactive)" and "Cyclical (0 = inactive)" have no function here. An additional heating or cooling stage as switching PI control works in the same way as the PI control of the basic stage, with the exception that the setpoint will shift, taking account of the parameterised step width. All PWM control options will use the same cycle time.

Cycle time:

The pulse-width-modulated command values are mainly used for activating electro-thermal drives (ETD). In this regard, the room temperature controller transmits the switching command value telegrams to an actuator equipped with semiconductor switching elements to which the drives are connected (e. g. heating actuator). By setting the cycle time of the PWM signal on the controller, you can adapt the feedback control to the drives used. The cycle time sets the switching frequency of the PWM signal and allows adaptation to the adjusting cycle times of the valve drives used (the adjusting time it takes the drive to bring the valve from its completely closed to its completely opened position). In addition to the adjusting cycle time, take account of the dead time (the time in which the valve drives do not show any response when be-

ing switched on or off). If different actuators with different adjusting cycle times are used, take account of the longest of the times. Always note the information given by the manufacturers of the actuators.

During cycle time configuration, a distinction can always be made between two cases...

Case 1: Cycle time $> 2 \times$ adjusting cycle time of the electrothermal drives used (ETA)

In this case, the switch-on or switch-off times of the PWM signal are long enough for the actuators to have sufficient time to fully open or fully close within a given time period.

Advantages:

The desired mean value for the command value and thus for the required room temperature will be set relatively precisely, even for several actuators triggered at the same time.

Disadvantages:

It should be noted, that, due to the full valve lift to be continuously 'swept', the life expectancy of the actuators can diminish. For very long cycle times (> 15 minutes) with less sluggishness in the system, the heat emission into the room, for example, in the vicinity of the radiators, can possibly be non-uniform and be found disturbing.

-  This setting is recommended for sluggish heating systems (such as underfloor heating).
-  Even for a bigger number of triggered actuators, maybe of different types, this setting can be recommended to be able to obtain a better mean value of the adjusting travels of the valves.

Case 2: Cycle time $<$ adjusting cycle time of the electrothermal drives used (ETA)

In this case, the switch-on or switch-off times of the PWM signal are too short for the actuators to have enough time to fully open or fully close within a given period.

Advantages:

This setting ensures continuous water flow through the radiators, thus facilitating uniform heat emission into the room.

If only one valve drive is triggered the controller can continuously adapt the command value to compensate the mean value shift caused by the short cycle time, thus setting the desired room temperature.

Disadvantages:

If more than one drive is triggered at the same time the desired mean value will become the command value, which will result in a very poor adjustment of the required room temperature, or in adjustment of the latter with major deviations, respectively. The continuous flow of water through the valve, and thus the continuous heating of the drives causes changes to the dead times of the drives during the opening and closing phase. The short cycle time and the dead times means that the required command value (mean value) is only set with a possibly large deviation. For the room

temperature to be regulated constantly after a set time, the controller must continually adjust the command value to compensate for the mean value shift caused by the short cycle time. Usually, the control algorithm implemented in the controller (PI control) ensures that control deviations are compensated.

- i** This setting is recommended for quick-reaction heating systems (such as surface radiators).

Adapting the PI control

In a building, different systems can be installed which heat up or cool down a room. One option is to uniformly heat or cool the surroundings via heat transfer media (preferably water or oil) in connection with room air convection. Such systems are used, for example, with wall mounted heaters, underfloor heating or cooling ceilings. Alternatively or additionally forced air systems may heat or cool rooms. In most cases such systems are electrical forced hot air systems, forced cool air systems or refrigerating compressors with fan. Due to the direct heating of the room air such heating and cooling systems work quite swiftly.

The control parameters need to be adjusted so that the PI control algorithm may efficiently control all common heating and cooling systems thus making the room temperature control work as fast as possible and without deviation. Certain factors can be adjusted with a PI control that can influence the control behaviour quite significantly at times. For this reason, the room temperature controller can be set to predefined control parameters for the most common heating and cooling systems. In case the selection of a corresponding heating or cooling system does not yield a satisfactory result with the default values, the adaptation can optionally be optimised using control parameters.

Predefined control parameters for the heating or cooling stage and, if applicable, also for the additional stages are adjusted via the "type of heating" or "type of cooling" parameters. These fixed values correspond to the practical values of a properly planned and executed air conditioning system and will result in an ideal behaviour of the temperature control. The heating and cooling types shown in the following tables can be set for heating and cooling operation.

Type of heating	Proportional range (preset)	Reset time (preset)	recommended PI control type	recommended PWM cycle time
Heat water heating	1 Kelvin	830 minutes	constant/PWM	15 min.
Underfloor heating	1.5 Kelvin	1000 minutes	PWM	15-20 min.
Electrical heating	1 Kelvin	830 minutes	PWM	10-15 min.
Blower coil unit	1 Kelvin	500 minutes	constant	---
Split unit (split climate control unit)	1 Kelvin	500 minutes	PWM	10-15 min.

Predefined control parameters and recommend control types for heating systems

Cooling type	Proportional range (preset)	Reset time (preset)	recommended PI control type	recommended PWM cycle time
Cooling ceiling	1 Kelvin	830 minutes	PWM	15-20 min.
Blower coil unit	1 Kelvin	500 minutes	constant	---
Split unit (split climate control unit)	1 Kelvin	500 minutes	PWM	10-15 min.
Underfloor cooling	1.5 Kelvin	1000 minutes	PWM	15-20 min.

Predefined control parameters and recommend control types for cooling systems

If the "Type of heating" or "Type of cooling" parameters are set to "Via control parameters", it is possible to adjust the control parameters manually. The feedback control may be considerably influenced by presetting the proportional range for heating or for cooling (P component) and the reset time for heating or for cooling (I component).

- i** Even small adjustments of the control parameters will lead to noticeable different control behaviour!
- i** The adaptation should start with the control parameter setting for the corresponding heating or cooling system according to the specified fixed values mentioned in the above tables.

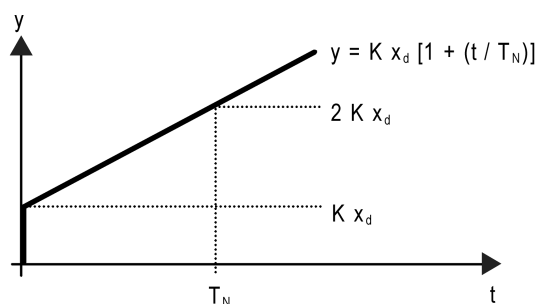


Figure 90: Function of the command value of a PI control

y: Command value

x_d : control difference ($x_d = x_{set} - x_{act}$)

$P = 1/K$: Configurable proportional band

$K = 1/P$: Gain factor

T_N : configurable reset time

PI control algorithm: Command value $y = K x_d [1 + (t / T_N)]$

Deactivation of the reset time (setting = "0") ->

P control algorithm: Command value $y = K x_d$

Parameter setting	Effect
P: Small proportional range	large overshoot in case of setpoint changes (possibly permanently), quick adjustment to the setpoint
P: Large proportional range	no (or small) overshooting but slow adjustment
T _N : Short reset time	fast compensation of control deviations (ambient conditions), risk of permanent oscillations
T _N : Long reset time	slow compensation of control deviations

Effects of the settings for the control parameters

2-point feedback control

2-point feedback control represents a very simple temperature control. For this type of feedback control, two hysteresis temperature values are set. The actuators are triggered by the controller via switch-on and switch-off command value commands (1-bit type). A constant command value is not calculated for this type of control. The room temperature is also evaluated by this type of control in cycles every 30 seconds. Thus the command values change, if required, only at these times. The disadvantage of a continuously varying temperature as a result of this feedback control option is in contrast with the advantage of this very simple 2-point room temperature control. For this reason, quick-reaction heating or cooling systems should not be triggered by a 2-point feedback control system, for this can lead to very high overshooting of the temperature, thus resulting in loss of comfort. When presetting the hysteresis limiting values, you should distinguish between the operating modes.

"Heating" or "cooling" single operating modes:

In heating mode, the controller will turn on the heating when the room temperature has fallen below a preset limit. In heating mode, the feedback control will only turn off the heating once a preset temperature limit has been exceeded. In cooling mode, the controller will turn on the cooling system when the room temperature has exceeded a preset limit. The control system will only turn off the cooling system once the temperature has fallen below a preset limit. In this connection, the command value "1" or "0" will be output, depending on the switching status, if the temperature exceeds or falls below the hysteresis limits.

The hysteresis limits of both operating modes can be configured in the ETS.

The following two images each show a 2-point feedback control for the individual operating modes "Heating" (see figure 91) or "Cooling" (see figure 92). The images take two temperature setpoints, one-stage heating or cooling and non-inverted command value output into account.

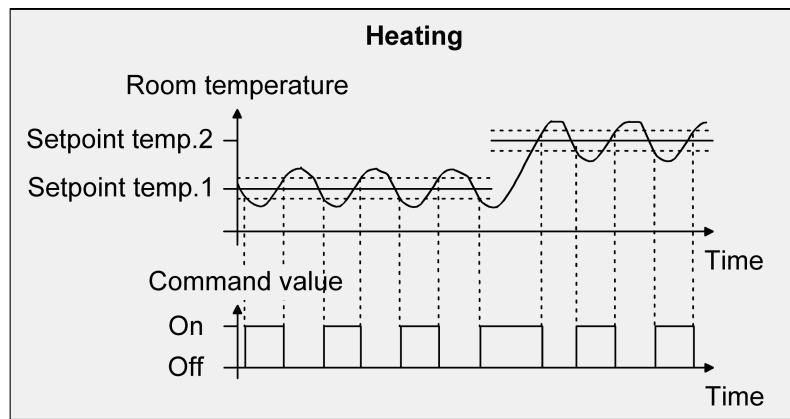


Figure 91: 2-point feedback control for the single "Heating" operating mode

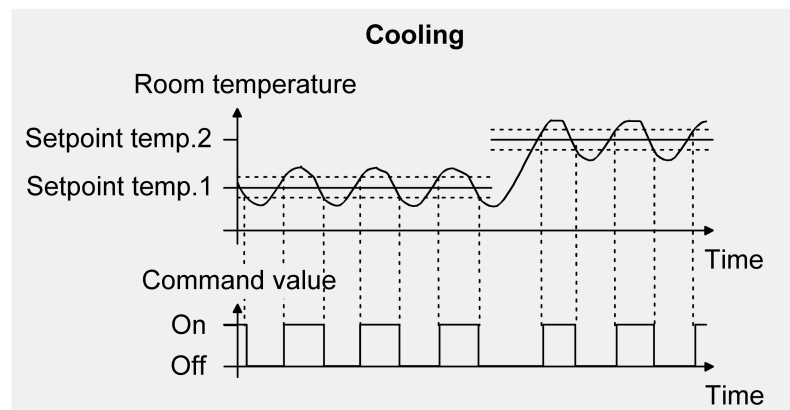


Figure 92: 2-point feedback control for the single "Cooling" operating mode

An additional 2-point feedback control heating or cooling level works exactly the same as the 2-point feedback control of the basic level. The difference is that the setpoint and the hysteresis values will shift by taking into account the configured level offset.

"Heating and cooling" mixed operating mode:

In mixed operation, a distinction is made whether the change-over between heating and cooling is to be effected automatically or in a controlled way through the object...

- With automatic operating mode change-over, in the heating mode the controller will turn on the heating when the room temperature has fallen below a preset hysteresis limit. In this case, as soon as the room temperature exceeds the setpoint of the current operating mode, the feedback control will turn off the heating in the heating mode. In the same way, in cooling mode, the controller will turn on the cooling system when the room temperature has exceeded a preset hysteresis limit. As soon as the room temperature falls below the setpoint of the current operating mode, the feedback control will turn off the cooling system in the cooling mode. Thus, in mixed operation, there is no upper hysteresis limit for heating or no lower one for cooling, respectively, for these values would be in the deadband. Within the deadband, neither heating nor cooling will take place.

- With an operating mode switchover via the object, in heating mode, the controller will turn on the heating when the room temperature has fallen below a preset hysteresis limit. The feedback control will only turn off the heating in the heating mode once the preset upper hysteresis limit has been exceeded. In the same way, in cooling mode, the controller will turn on the cooling system when the room temperature has exceeded a preset hysteresis limit. The feedback control will only turn off the cooling system in the cooling mode once the temperature has fallen below the preset lower hysteresis limit. As with the individual operation of heating or cooling, there are two hysteresis limits per operation. Although there is a deadband for the calculation of the temperature setpoints for cooling, it has no influence on the calculation of the two-point command value, as the operating mode is switched over "manually" through the corresponding object. Within the hysteresis spans, it thus will be possible to request heating or cooling energy for temperature values that are located within the deadband.

The following two images show 2-point feedback control for the mixed operating mode "Heating and cooling", distinguishing between heating mode (see figure 93) and cooling mode (see figure 94). The images take two temperature setpoints, a non-inverted command value output and an automatic operating mode switchover into account. When the operation is switched over via the object, an upper hysteresis for heating and a lower hysteresis for cooling are active.

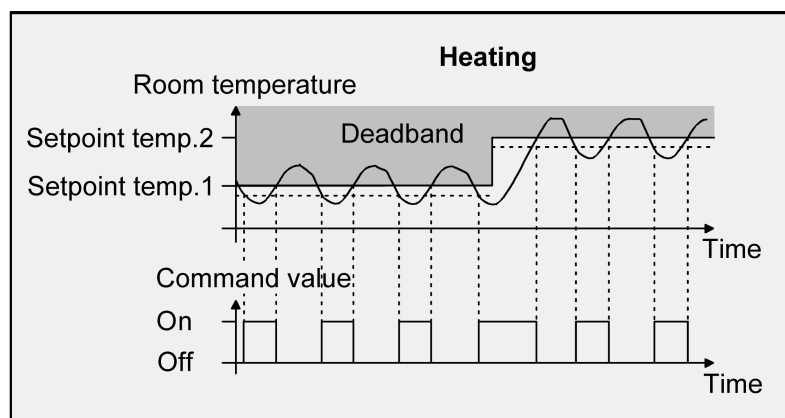


Figure 93: 2-point feedback control for mixed "Heating and cooling" mode with active heating mode

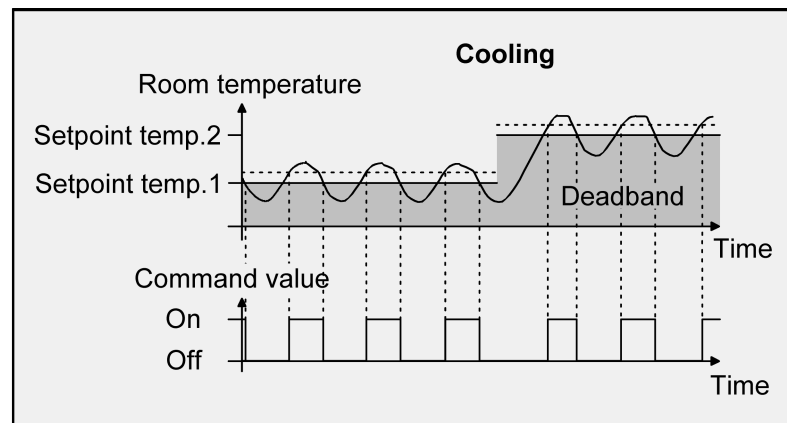


Figure 94: 2-point feedback control for mixed "Heating and cooling" mode with active cooling operation

The command value "1" or "0" will be output, depending on the switching status, if the temperature exceeds or falls below the hysteresis limits or the setpoints.

An additional 2-point feedback control heating or cooling level works exactly the same as the 2-point feedback control of the basic level. The difference is that the setpoint and the hysteresis values will shift by taking into account the configured level offset.

Adapting the 2-point feedback control

2-point feedback control represents a very simple temperature control. For this type of feedback control, two hysteresis temperature values are set. The upper and lower temperature hysteresis limits can be adjusted via parameters. It has to be considered that...

- a small hysteresis will lead to smaller temperature variations but to a higher KNX bus load,
- a large hysteresis switches less frequently but will cause uncomfortable temperature variations.

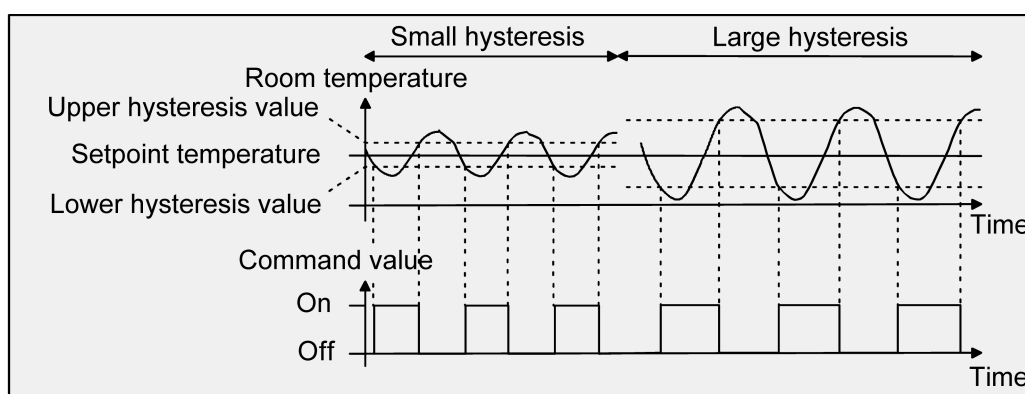


Figure 95: Effects of the hysteresis on the switching behaviour of a 2-point feedback control command value

16.1.4 Disabling functions

Disable controller

Certain operation conditions may require the deactivation of the room temperature control. For example, the controller can be switched-off during the dew point mode of a cooling system or during maintenance work on the heating or cooling system. When set to "yes", the parameter "Controller output disabling object" in the parameter node "Room temperature controller -> RTCx - General" enables the 1-bit object "Command value outputs - Disable". In addition, the controller disable function can be switched off when set to "No".

In case a "1" telegram is received via the enabled disable object, the room temperature control will be completely deactivated. In this case, all the command values are equal to "0"/"OFF" (wait 30 s for update interval of the command values). The controller, however, can be operated in this case via the communication objects.

Disable additional level

The additional stage can be separately disabled when in two-stage heating or cooling mode. When set to "yes", the parameter "Additional level disabling object" in the parameter node "Room temperature controller -> RTCx - General" enables the 1-bit object "Command value outputs - Additional level - Disable". In addition, the disable function of the additional level can be switched off when set to "No". In case a "1" telegram is received via the enabled disable object, the room temperature control is completely deactivated by the additional level. The command value of the additional level is "0" while the basic level continues to operate.

i Disabling operation is always inactive after a device reset (bus voltage return, ETS programming operation).

16.1.5 Reset behaviour

Additional information on the operating mode after a reset

In the ETS, it is possible to use the parameter "Operating mode after reset" in the parameter node "Room temperature controller -> RTCx - General" to set which operating mode is to be activated after bus voltage returns or after an ETS programming operation. The following settings are possible here...

- "Restore operating mode before reset" -> The mode set before a reset according to the operating mode objects will be restored after the initialisation phase of the device. Operating modes set by a function with a higher priority before the reset (Forced, Window status, Presence status) are not effected.
- "Comfort" -> The Comfort mode will be activated after the initialisation phase.
- "Standby" -> The standby mode will be activated after the initialisation phase.
- "Night" -> The Night mode will be activated after the initialisation phase.
- "Frost/heat protection" -> The frost/heat protection mode will be activated after the initialisation phase.

Further information on the operation after reset

In the ETS, it is possible to use the parameter "operation after reset" in the parameter node "Room temperature controller -> RTC ... - General" to set which operation is to be activated after the bus voltage returns or after an ETS programming operation. The following settings are possible for the parametrised heating and cooling operation (with or without additional stages)...

- "Heating" -> Heating mode is activated after the initialisation phase.
- "Cooling" -> Cooling mode is activated after the initialisation phase.
- "Operation before reset" -> The operation set before a reset is reset after the initialisation phase of the device.

 This parameter can be seen on the "Setpoints" parameter page only if an absolute setpoint is specified.

16.1.6 "Room temperature controller - General" parameters

General -> Enabled functions

Room temperature controller	Active Inactive
When the parameter is activated, the room temperature controller function is visible.	
Number of room temperature controllers	1 ... 2
The number of room thermostats is defined here.	

Room temperature controller -> RTC ... - General

Name of controller	40-character free text
The text entered in this parameter is used to label the controller in the ETS parameter window (e. g. "Kitchen control", "Bathroom temperature"). The text is not programmed in the device.	
Operation	Heating Cooling Heating and cooling Basic and additional heating Basic and additional cooling Basic and additional heating and cooling
The room temperature controller distinguishes between two different operating modes. The operating modes specify whether you want the controller to use its command value to trigger heating systems ("heating" single operating mode) or cooling systems ("cooling" single operating mode). You can also activate mixed operation, with the controller being capable of changing over between "Heating" and "Cooling" via a communication object. In addition, you can establish two-level control operation to control an additional heating or cooling unit. For two-level feedback control, separate command values will be calculated as a function of the temperature deviation between the setpoint and the actual value and transmitted to the bus for the basic and additional levels. This parameter specifies the operation and, if necessary, enables the additional level(s).	
Command values for heating and cooling	to separate objects (4-pipe / 2 circuits) to shared object (2-pipe / 1 circuit)
If the parameter is set to "shared object", the command value will be transmitted to a shared object during heating or cooling. This function is used, if the same heating system is used to cool the room in the summer and used to heat the room in the winter. This parameter is only visible with "Heating and cooling" mixed operating mode.	

Additional separate command value objects	Checkbox (yes / no)
If the parameter is set to "yes", two separate objects "Command value heating" and "Command value cooling" are displayed in addition to the shared object "Command value heating/cooling". These objects are for both visualisation purposes and also rooms with, for example, combined wall heating/cooling and separate underfloor heating. This parameter is only visible in the mixed "Heating and cooling" operating mode with output of the command values to a shared object.	

Heating

Type of control (if applicable, for basic and additional level)	continuous PI control switching PI control (PWM) switching 2-point feedback control
Selecting a feedback control algorithm (PI or 2-point) with data format (1-byte or 1-bit) for the heating system.	
Type of heating (if applicable, for basic and additional level)	Hot water heater (1.0 K / 830 min) Underfloor heating (1.5 K / 1000 min) Electric heating (1.0 K / 830 min) Fan coil unit (1.0 K / 500 min) Split unit (1.0 K / 500 min) via control parameter
Adapting the PI algorithm to different heating systems using predefined values for the proportional range and reset time control parameters. With the "Using control parameters" setting, it is possible to set the control parameters in a manner deviating from the predefined values within specific limits. This parameter is only visible if "Type of heating control = Continuous PI control".	
Proportional range	1... 5 ...12.7 K
Separate setting of the "Proportional range" control parameter. This parameter is only visible if "Type of heating = via control parameter" and the heating control type "PI control".	
Reset time (0 = inactive)	0... 830 ...2550 min
Separate setting of the "Reset time" control parameter. This parameter is only visible if "Type of heating = via control parameter" and the heating control type "PI control".	
Lower hysteresis limit	-12.8...- 0.5 K
Definition of bottom hysteresis (switch-on temperatures) of the heating. This parameter is only visible if "Type of heating control = Switching 2-point feedback control (ON/OFF)".	

Upper hysteresis limit	0.5...12.7 K
Definition of top hysteresis (switch-off temperatures) of the heating. This parameter is only visible if "Type of heating control = Switching 2-point feedback control".	

Cooling

Type of control (if applicable, for basic and additional level)	continuous PI control switching PI control (PWM) switching 2-point feedback control
Selecting a feedback control algorithm (PI or 2-point) with data format (1-byte or 1-bit) for the cooling system	

Type of cooling (if applicable, for basic and additional level)	Cooling ceiling (1.0 K / 830 min) Fan coil unit (1.0 K / 500 min) Split unit (1.0 K / 500 min) Floor cooling (1.5 K / 1000 min) via control parameter
Adapting the PI algorithm to different cooling systems using predefined values for the proportional range and reset time control parameters. With the "Using control parameters" setting, it is possible to set the control parameters in a manner deviating from the predefined values within specific limits. This parameter is only visible if "Type of cooling control = PI control".	

Proportional range	1... 5 ...12.7 K
Separate setting of the "Proportional range" control parameter. This parameter is only visible if "Type of cooling = via control parameter" and the cooling control type "PI control".	

Reset time (0 = inactive)	0... 830 ...2550 min
Separate setting of the "Reset time" control parameter. This parameter is only visible if "Type of cooling = via control parameter" and the cooling control type "PI control".	

Lower hysteresis limit	-12.8...- 0.5 K
Definition of bottom hysteresis (switch-off temperatures) of the cooling. This parameter is only visible if "Type of cooling control = Switching 2-point control".	

Upper hysteresis limit	0.5...12.7 K
Definition of top hysteresis (switch-on temperatures) of the cooling. This parameter is only visible if "Type of cooling control = Switching 2-point control".	

Heating/cooling switchover	automatic via RTC via object
In a configured mixed mode it is possible to switch over between heating and cooling. With a relative setpoint specification, you can choose between automatic switchover and switchover via object. With an absolute setpoint specification, the setting "via object" is fixed. When the switchover via object is active, the "operation" input object becomes visible.	
Disabling object additional level	Checkbox (yes / no)
The additional stages can be separately disabled via the bus. The parameter enables the disable object as necessary. This parameter is only visible in two-level heating and cooling operation.	
Disabling object controller output	Checkbox (yes / no)
This parameter enables the "Disable command value outputs" object. If the controller is disabled, there is no feedback control until enabled (command values = 0).	
Operation after reset	Heating Cooling Operation before reset
This parameter specifies which operation is set immediately after a device reset. With "operation before reset": The operation set before a reset is reset after the initialisation phase of the device. This parameter is visible only with the absolute setpoint presetting.	
Operation mode after reset	Restore operating mode before reset Comfort Standby Night Frost/heat protection
This parameter specifies which operating mode is set immediately after a device reset. With "Restore operation mode before reset": The mode set before a reset according to the operating mode object will be restored after the initialising phase of the device. Operating modes set by a function with a higher priority before the reset (Forced, Window status, Presence status) are not effected.	

16.1.7 Objects for command value output disabling

Function	Name	Type	DPT	Flag
Operation	RTC ... -Input	1-bit	1,100	C, -, W, -, U
1-bit object for setting the heating or cooling operation. 0 = Cooling 1 = Heating This object is only visible in the heating and cooling operation and with a "Heating/cooling switchover via object".				

Function	Name	Type	DPT	Flag
Operation - status	RTC ... - Output	1-bit	1,100	C, R, -, T, A
1-bit object for displaying the operation Heating or Cooling. 0 = Cooling 1 = Heating This object is only visible in the heating and cooling operation.				

Function	Name	Type	DPT	Flag
Command value outputs - Disabling	RTC ... -Input	1-bit	1,001	C, -, W, -, U
1-bit object used to disable the command value outputs. In case a "1" telegram is received via the enabled disable object, the room temperature control will be completely deactivated. In this case, all the command values are equal to "0"/"OFF" (wait 30 s for update interval of the command values).				

Function	Name	Type	DPT	Flag
Command value outputs - Additional value - Disabling	RTC ... -Input	1-bit	1,001	C, -, W, -, U
1-bit object used to disable the command value outputs of the additional level. In case a "1" telegram is received via the enabled disable object, the room temperature control is completely deactivated by the additional level. The command value of the additional level is "0" while the basic level continues to operate.				

16.2 Operating mode and setpoints

Introduction - Operating modes

The room temperature controller has various operating modes. The selection of these modes will, for example, facilitate the activation of different temperature setpoints, depending on the presence of a person, on the state of the heating or cooling system, on the time of the day, or on the day of the week. The following operating modes can be distinguished:

- **Comfort**
Comfort mode is usually activated if persons are in a room, and the room temperature should, for this reason, be adjusted to an adequately convenient value. The switchover to this operating mode can take place either by specifying an operating mode via the operating mode switchover or with presence control, for example, using a PIR presence detector on the wall or a ceiling mounted presence detector.
 - **Standby**
If a room is not used during the day because persons are absent, you can activate the Standby mode. Thereby, you can adjust the room temperature on a standby value, thus to save heating or cooling energy, respectively
 - **Night**
During the night hours or during the absence of persons for a longer time, it mostly makes sense to adjust the room temperature to lower values for heating systems (e. g. in bedrooms). In this case, cooling system can be set to higher temperature values, if air conditioning is not required (e. g. in offices). For this purpose, you can activate the Night mode.
 - **Frost/heat protection**
Frost protection will be required if, for example, the room temperature must not fall below critical values while the window is open. Heat protection can be required where the temperature rises too much in an environment which is always warm, mainly due to external influences. In such cases, you can activate the Frost/heat protection operation and prescribe some temperature setpoint of its own for either option, depending on whether "Heating" or "Cooling" has been selected, to prevent freezing or overheating of the room.
 - **Comfort extension (temporary Comfort mode)**
You can activate the comfort extension from the Night or Frost/heat protection mode (not triggered by the "Window status" object) and use it to adjust the room temperature to a comfort value for some time if, for example, there are people in the room during the night hours. This mode can exclusively be activated via the presence object. The comfort extension option will be automatically deactivated after a definable time has elapsed, or by receiving a presence object value = "0". You cannot retrigger this extension.
- i** You can assign your own setpoint temperature to the "Heating" or "Cooling" operating modes for each operating mode.

Operating mode switchover

The operating mode is switched by the "Operating mode - Preset" object.

During the running time, the operating mode can be changed over through this value object immediately after the receipt of only one telegram. In this connection, the value received will set the operating mode. In addition, a second 1-byte object is available which, by forced control and through a higher level, can set an operating mode, irrespective of any other switchover options.

Taking the priority into account, a specific switchover hierarchy will result from the operating mode switchover by the objects, a distinction being made between presence detection by the presence button (see figure 96) or the presence detector (see figure 97). In addition, the status of the windows in the room can be evaluated using the "Frost/heat protection - Window contact - Status" object, meaning that, when a window is open, the controller can switch to frost/heat protection mode, irrespective of the set operating mode, in order to save energy.

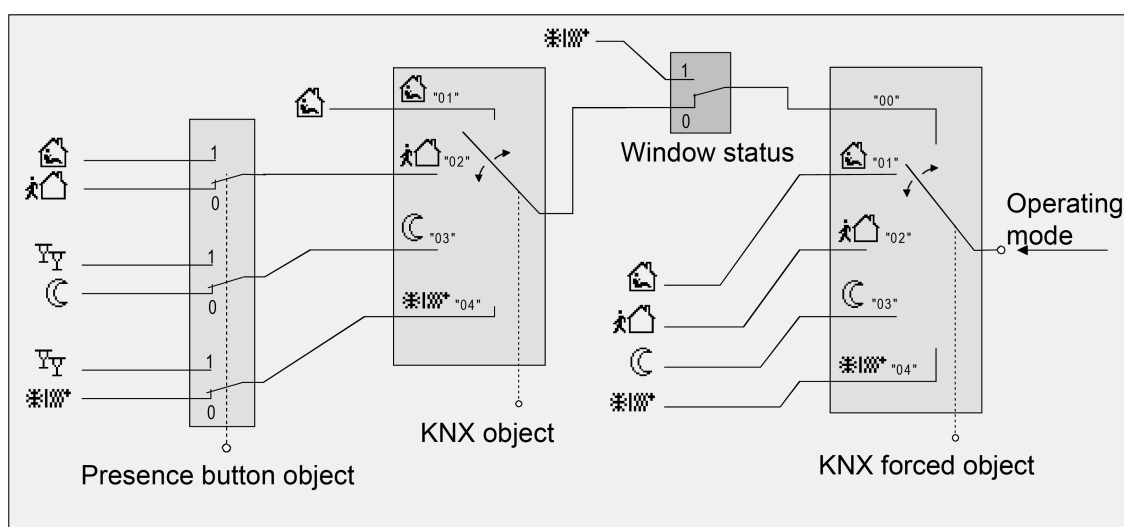


Figure 96: Operating mode switchover through KNX object with presence button

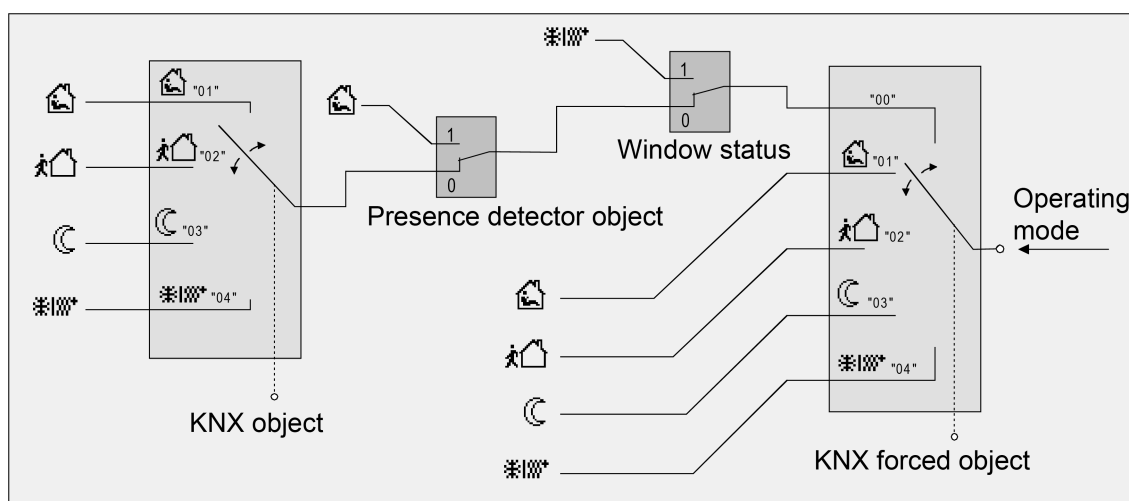


Figure 97: Operating mode switchover through KNX object with presence detector

Object value Operating mode	Object value Forced ob- ject Oper. m.	Object Window status	Pres- ence button	Pres- ence detector	resulting operating mode
00	00	0	X	0	No modification
01	00	0	0	-	Comfort
02	00	0	0	-	Standby
03	00	0	0	-	Night
04	00	0	0	-	Frost/heat protec- tion
01	00	0	1	-	Comfort
02	00	0	1	-	Comfort
03	00	0	1	-	Comfort ex- tension
04	00	0	1	-	Comfort ex- tension
01	00	0	-	0	Comfort
02	00	0	-	0	Standby
03	00	0	-	0	Night
04	00	0	-	0	Frost/heat protec- tion
X	00	0	-	1	Comfort
X	00	1	-	X	Frost/heat protec- tion
X	00	1	X	-	Frost/heat protec- tion
X	01	X	X	X	Comfort
X	02	X	X	X	Standby
X	03	X	X	X	Night
X	04	X	X	X	Frost/heat protec- tion

Status of the communication objects and the resulting operating mode

X: Status irrelevant

-: Not possible

- i** After the mains voltage returns or after an ETS programming operation, the value corresponding to the set operating mode is actively transmitted to the bus if the "Transmit" flag is set.
- i** In parameterisation of a presence button: the presence object will be active ("1") for the period of an active comfort extension. The presence object will be automatically deleted ("0") if the comfort extension is stopped after the extension time has elapsed, or if the operating mode has been changed by an oper-

ation through the switchover objects or a forced operating mode is deactivated by the KNX forced object (forced object -> "00"). The controller therefore automatically resets the status of the presence button when an object value is received via the operating mode objects or the forced object is reset.

Additional information on the presence function / comfort extension

With presence detection, the room temperature controller can quickly switch over to a comfort extension upon push-button actuation using a presence button or, using a presence detector, switch to Comfort mode when movement by a person in the room is detected.

The parameter "Presence detection" in the parameter node "RTCx - General -> Enabled functions" enables the parameter page "Presence detection". The remaining parameters can be set there.

In this regard, the parameter "Presence detection" determines whether presence detection is movement-controlled by a presence detector or done manually using a presence button:

- Presence detection by the presence button

The 1-bit communication object "Presence detection - Presence button" is enabled. An "ON" telegram to this object makes it possible to switch to the comfort extension if Night or Frost/heat protection mode (not activated by the "Window status" object!) is active. The extension will be automatically deactivated as soon as the configured "Length of comfort extension" time has elapsed. A comfort extension can be deactivated in advance if an "OFF" telegram is received via the object of the presence button. You cannot re-trigger the extension time.

If you have set the length of comfort extension to "0" in the ETS, you cannot activate a comfort extension from the Night or Frost/heat protection mode. In this case, the operating mode will not be changed, although the presence function has been activated.

If the standby mode is active, actuation on a presence object value = "ON" allows a switchover to the Comfort mode. This will also be the case if you have configured the length of comfort extension to "0". Comfort mode will remain active as long as the presence function remains active, or until another operating mode is specified.

The presence function will always be deleted whenever a switchover to a different operating mode takes place, or after a forced operating mode has been deactivated (associated with KNX forced switchover). In the event of a device reset (power failure, ETS programming operation), an active presence function is always deleted.



If, during an active comfort extension and with a frost/heat protection switchover being configured "via window status", a window is opened, then the controller will activate frost/heat protection immediately. The comfort extension remains active in the background and the configured time continues to elapse. If the time elapses and the window remains open, the presence is reset and

an appropriate telegram is sent to the bus. However, if the window is closed again before the time has elapsed, then the comfort extension is executed again with the remaining run time.

- Presence detection by the presence detector

Two 1-bit communication objects "Presence detection - Presence object" are enabled. With this objects it is possible to integrate presence detectors into room temperature control. If a movement is detected ("ON" telegram), the controller will switch to Comfort mode. In this connection, it is irrelevant what has been set by the switchover objects. Only a window contact or the KNX forced object are of higher priority.

Both objects form an "Or" link of two presence detectors. In larger rooms, the use of two presence detectors can be useful. As long as one of the two detectors detects a presence, the controller remains in Comfort mode.

After the delay time has elapsed in the presence detector after a detected movement ("OFF" telegram), the controller will return to the mode which was active before presence detection, or it will compensate the telegrams of the operating mode objects received during presence detection, respectively.

In the event of a device reset (power failure, ETS programming operation), an active presence function is always deleted. In this case, the presence detector must transmit a new "ON"-telegram to the controller to activate the presence function.

Additional information on the window status and the automatic frost protection

The room temperature controller offers various options to switch to frost/heat protection mode. In addition to switching over by means of the corresponding operating mode switchover object, frost/heat protection can be activated by a window contact, or alternatively, the frost protection can be activated by an automatic temperature function. The window contact or the automatic function has higher priority. The "Frost/heat protection" parameter determines how the switchover to forced frost/heat protection takes place:

- Frost/heat protection switchover "via window contact (frost and heat protection)"

The 1-bit object "Window contact" is enabled. A telegram having the value of = "ON" (open window) and sent to this object will activate the frost/heat protection mode. If this is the case, the operating mode cannot be deactivated by the switchover objects (except for the KNX forced object) or the presence function. Only a telegram with the value = "OFF" (closed window) will reset the window status and deactivate the frost/heat protection mode. After this, the operating mode set before the opening of the window or that mode carried by the bus while the window was open will be activated.

You can optionally configure a delay for the evaluation of the window status. Such delay can make sense if short ventilation of the room by opening the window is not supposed to change the operating mode. The delay time is set by the "Delay time" parameter and can be between 1 and 255 minutes. The window status will only be changed and thus the frost/heat protection mode activated after this parameterized time has elapsed. A setting of "0" will effect

the immediate activation of the frost/heat protection mode when the window is open. The window status will be in effect in the heating and in the cooling mode. After a power failure or ETS programming operation, the window status is always inactive.

– Frost protection mode switchover "via temperature drop (frost protection only)"

For this setting, automatic switchover to the frost protection mode can be made at times, depending on the room temperature determined.

If there are no window contacts, this setting can prevent unnecessary heating up of a room when windows or external doors are open.

With this function, a quick temperature drop can be detected by measuring the actual temperature every 4 minutes as is the case when a window is open in the winter months, for example. You can use the "Temperature drop detection from" parameter to set the maximum temperature drop in K / 4 min for switching over to the frost protection mode. If the controller detects that the room temperature has changed by at least the configured temperature jump within four minutes, frost protection is activated. After the time specified by the "Frost protection period" parameter has elapsed, the controller again automatically switches to the operating mode which was set before frost protection or which was tracked during automatic operation. It is not possible to retrigger an elapsing frost protection period.

-  An activated automatic frost protection is cancelled by a setpoint shift, a setpoint change or an increase in the room temperature by 1 Kelvin.
-  The KNX override object has a higher priority than the automatic frost protection mode and can interrupt the latter.
-  The automatic frost protection mode only acts on heating for temperatures below the setpoint temperature of the operating mode set. Thus, no automatic switchover to frost protection can take place at room temperatures in the deadband or in the active cooling mode if the "Heating and cooling" operation is on. Automatic heat protection activation is not intended with this parameterization.
-  Frequent draughts in a room can cause unintentional activation/deactivation of frost protection when the automatic frost protection mode is active and if the set temperature decrease is too low. Therefore switching into the frost/heat protection mode by window contacts should generally be preferred to the automatic option.

Setpoint temperature presetting

Setpoint temperatures can be specified for each operating mode in the ETS as part of configuration. It is possible to configure the setpoints for the "Comfort", "Standby" and "Night" modes directly (absolute setpoint presetting) or relatively (derivation from basic setpoint). The setpoint temperatures can later be adapted during regular operation by KNX communication objects if desired.

- i The "Frost/heat protection" operating mode allows the separate configuration of two temperature setpoints for heating (frost protection) and cooling (heat protection) solely in the ETS. These temperature values cannot be changed later during controller operation.

The "Setpoint specification" parameter on the parameter page "Room temperature controller -> RTCx - General -> Setpoints" defines the way the setpoint temperature is specified...

- Setting "relative"
When presetting the set-temperatures for Comfort, Standby and Night mode, attention has to be paid to the fact that all setpoints depend on each other as all values are derived from the basic temperature (basic setpoint). The parameter "Setpoint temperature - Basic value" on the parameter page "Room temperature controller -> RTCx - General -> Setpoints" determines the basic setpoint, which is loaded as a preset value when the device is programmed via the ETS. Taking into account the "Standby" and "Night" parameters under the header "Temperature shift via operating mode", the temperature setpoints for the standby and night mode are derived from this value depending on the heating or cooling operation. The deadband will be additionally considered for the "Heating and cooling" operation.
The 2-byte object "Basic setpoint" provides the option of changing the basic temperature, and thus all the dependent setpoint temperatures during device operation. A change via the object must always be enabled in the ETS by configuring the parameter "Approve activations via bus" to "yes". If the basic setpoint adjustment via the bus is disabled, the "Basic setpoint" object will be hidden. The controller rounds the temperature values received via the object to the specified "Step width of the setpoint shift" (0.1 K or 0.5 K).
 - Setting "absolute"
The setpoint temperatures for Comfort, Standby and Night mode are independent of each other. Depending on the operation and mode, various temperature values can be specified in the ETS within the range +7.0 °C to +40.0 °C. The ETS does not validate the temperature values. It is thus possible, for example, to select smaller setpoint temperatures for cooling mode than for heating mode, or to specify lower temperatures for Comfort mode than for Standby mode.
After commissioning using the ETS the setpoint temperatures can be changed via the bus by means of temperature telegrams. This can be done using the communication object "Setpoint temperature - Active operating mode". When the controller receives a telegram via this object, it immediately sets the received temperature as the new setpoint of the active operating mode, and operates from then on with this setpoint. In this manner it is possible to adapt the setpoint temperatures of all operating modes separately for heating and cooling mode. The frost or heat protection temperature programmed using the ETS cannot be changed in this manner.
- i With absolute setpoint presetting there is no basic setpoint and, in the mixed operating mode "Heating and cooling" (if necessary also with additional level), also no deadband. Consequently, the room temperature controller cannot control the switchover of the operation automatically, which is why, in this config-

uration, the setting for the parameter "Heating/cooling switchover" is fixed in the ETS to "via object".

Furthermore, setpoint shifting does not exist for absolute setpoint presetting.

- i** In two-level control mode, all set-temperatures of the additional level are derived from the setpoint temperatures of the basic level. The setpoint temperature of the additional level are determined by subtracting the "Difference between basic and additional levels", which is permanently configured in the ETS, from the setpoints of the basic level in heating mode or by adding the setpoints in cooling mode. If the temperature setpoints of the basic level are changed, the setpoint temperatures of the additional level will be automatically changed as well. Both levels will heat or cool with the same command value at the same time when the level distance is "0".

The temperature setpoints programmed in the room temperature controller by the ETS during commissioning can be changed via communication objects. In the ETS, the parameter "Overwrite setpoints in the device during ETS programming" on the parameter page "Room temperature controller -> RTCx - General -> Setpoints" can be used to determine whether the setpoints that are present in the device and may have been subsequently changed are overwritten during an ETS programming operation and thus replaced again by the values configured in the ETS. If this parameter is "Yes", then the setpoint temperatures are deleted in the device during a programming operation and replaced by the values of the ETS. If this parameter is configured to "No", then setpoints present in the device remain unchanged. The setpoint temperatures entered in the ETS then have no significance.

- i** During initial commissioning of the device the parameter "Overwrite setpoints in device during ETS programming" must be set to "yes" in order to perform valid initialisation of the memory slots in the device. The setting "Yes" is also necessary if essential controller properties (operation, setpoint specification, etc.) are changed in the ETS through new parameter configurations.

Setpoint temperatures for relative setpoint presetting

Depending on the operation, different cases should be distinguished when specifying the relative setpoint temperature, which then have an impact on the temperature derivation from the basic setpoint.

Setpoints for operation "Heating"

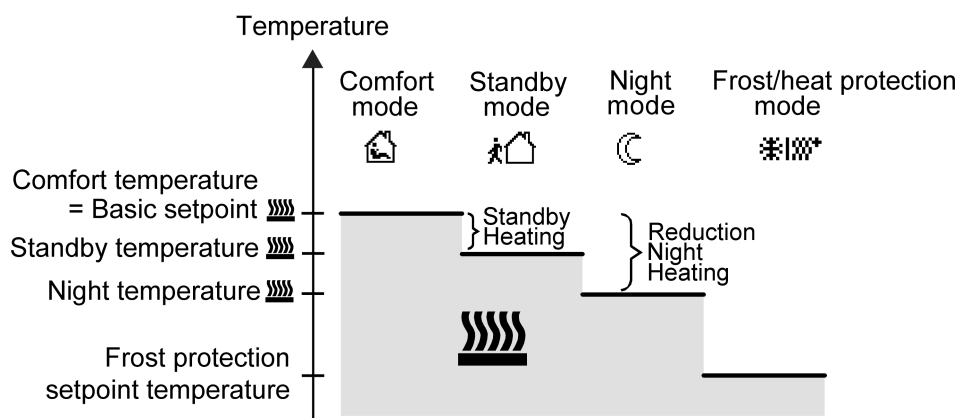


Figure 98: Setpoint temperatures in the operation "Heating"

The setpoint temperatures for Comfort, Standby and Night mode exist in this operation and the frost protection temperature can be preset (see figure 98). The following applies...

$$T_{\text{Standby setpoint heating}} \leq T_{\text{Comfort setpoint heating}}$$

or

$$T_{\text{Night setpoint heating}} \leq T_{\text{Comfort setpoint heating}}$$

The Standby and Night setpoint temperatures are derived from the reduction temperatures configured in the ETS from the comfort setpoint temperature (basic setpoint). The frost protection is supposed to prevent the heating system from freezing. For this reason, the frost protection temperature (default: +7 °C) should be set to a lower value than the night temperature. In principle, however, it is possible to select frost protection temperature values between +7.0 °C and +40.0 °C. The possible range of values for a setpoint temperature is bounded by the frost protection temperature in the lower range.

The level offset configured in ETS will be additionally considered in a two-level heating mode (see figure 99).

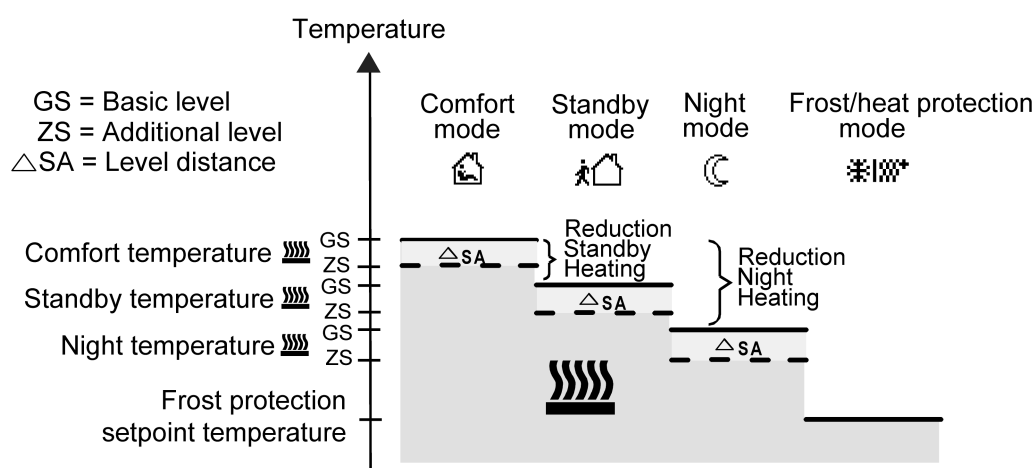


Figure 99: Setpoint temperatures in the operation "Basic and additional heating"

$$T_{\text{Comfort setpoint additional level heating}} \leq T_{\text{Comfort setpoint basic level heating}}$$

$$T_{\text{Standby setpoint additional level heating}} \leq T_{\text{Standby setpoint basic level heating}}$$

$$T_{\text{Standby setpoint heating}} \leq T_{\text{Comfort setpoint heating}}$$

or

$$T_{\text{Comfort setpoint additional level heating}} \leq T_{\text{Comfort setpoint basic level heating}}$$

$$T_{\text{Night setpoint additional level heating}} \leq T_{\text{Night setpoint basic level heating}}$$

$$T_{\text{Night setpoint heating}} \leq T_{\text{Comfort setpoint heating}}$$

Setpoints for the "cooling" operation

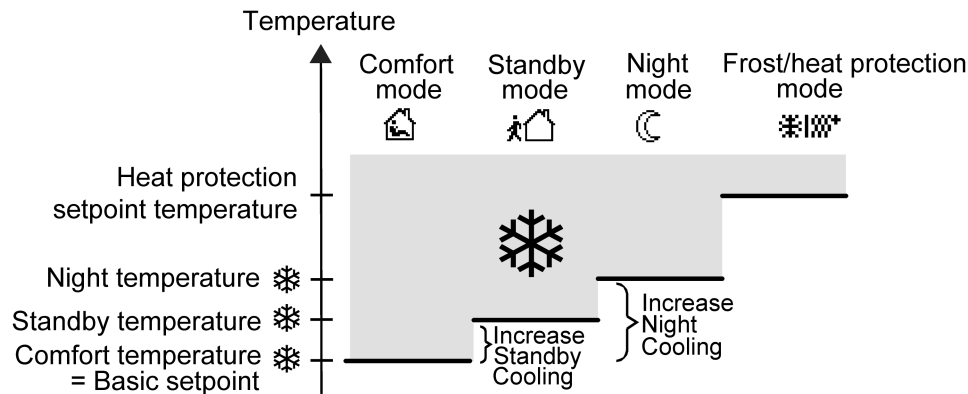


Figure 100: Setpoint temperatures in the operation "Cooling"

The setpoint temperatures for Comfort, Standby and Night mode exist in this operation and the heat protection temperature can be preset (see figure 100).

The following applies...

$$T_{\text{Comfort setpoint cooling}} \leq T_{\text{Standby setpoint cooling}}$$

or

$$T_{\text{Comfort setpoint cooling}} \leq T_{\text{Night setpoint cooling}}$$

The standby and night set-temperatures are derived after the parameterized increase-temperatures from the comfort setpoint temperature (basic setpoint). The heat protection is intended to ensure that the temperature does not exceed the maximum permissible room temperature in order to protect system components. For this reason, the heat protection temperature (default: +35 °C) should be set to a higher value than the night temperature. In principle, however, it is possible to select heat protection temperature values between +7.0 °C and +45.0 °C. The possible range of values for a setpoint temperature is bounded by the heat protection temperature in the upper range.

The level offset configured in ETS will be additionally considered in a two-level cooling mode (see figure 101).

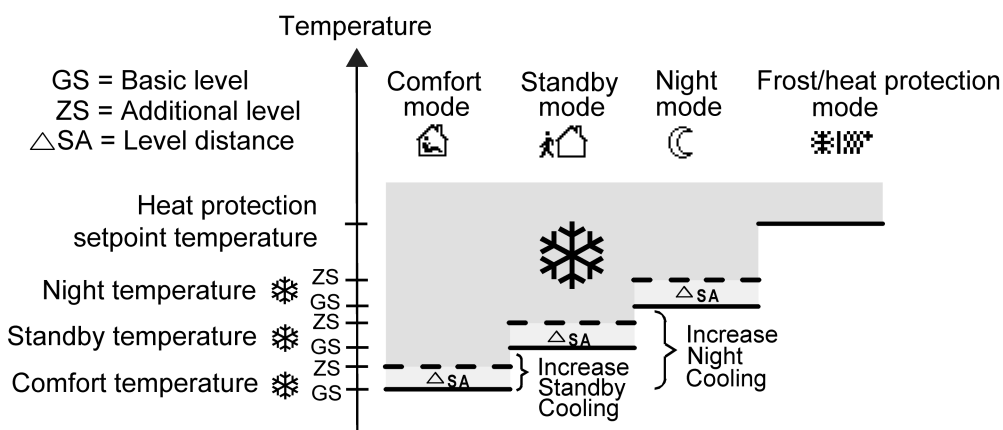


Figure 101: Setpoint temperatures in the operation "Basic and additional cooling"

$$\begin{aligned}
 T_{\text{Comfort setpoint basic level cooling}} &\leq T_{\text{Comfort setpoint additional level cooling}} \\
 T_{\text{Standby setpoint basic level cooling}} &\leq T_{\text{Standby setpoint additional level cooling}} \\
 T_{\text{Comfort setpoint cooling}} &\leq T_{\text{Standby setpoint cooling}}
 \end{aligned}$$

or

$$\begin{aligned}
 T_{\text{Comfort setpoint basic level cooling}} &\leq T_{\text{Comfort setpoint additional level cooling}} \\
 T_{\text{Night setpoint basic level cooling}} &\leq T_{\text{Night setpoint additional level cooling}} \\
 T_{\text{Comfort setpoint cooling}} &\leq T_{\text{Night setpoint cooling}}
 \end{aligned}$$

Setpoints for the "heating and cooling" operation

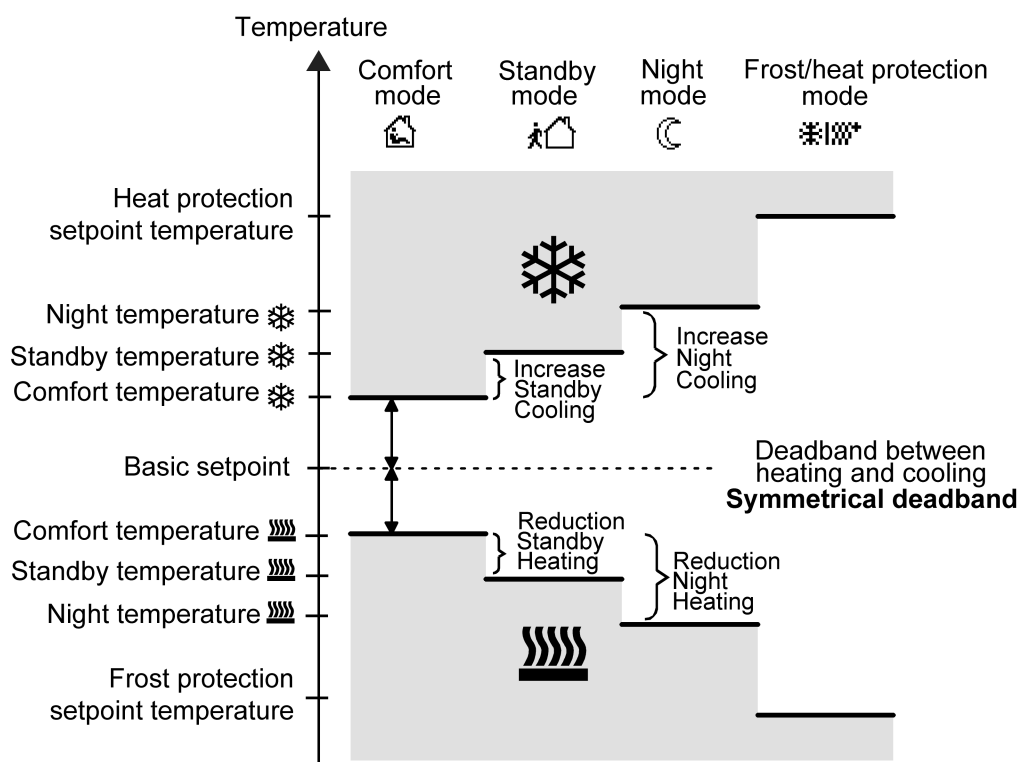


Figure 102: Setpoint temperatures in the operation "Heating and cooling" with symmetrical deadband

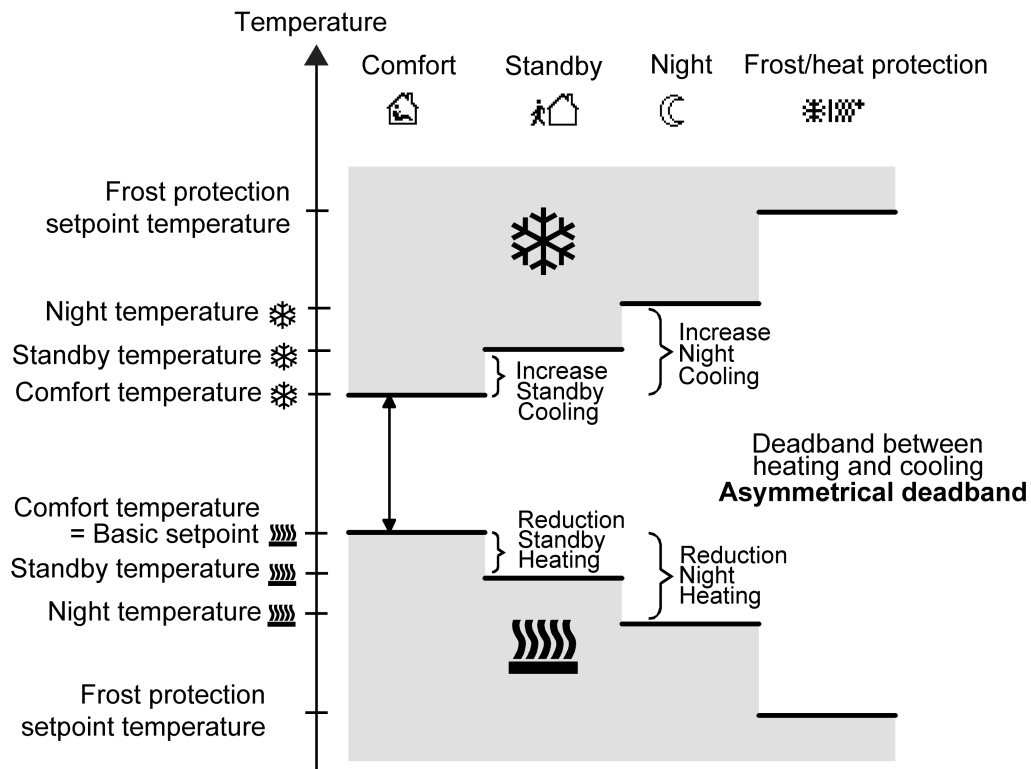


Figure 103: Setpoint temperatures in the operation "Heating and cooling" with asymmetrical deadband

For this heating/cooling operation, the setpoint temperatures of both heating/cooling modes exist for the Comfort, Standby and Night operation as well as the deadband. A distinction is made in the deadband position with combined heating and cooling. A symmetrical (see figure 102) or an asymmetrical (see figure 103) deadband position can be configured. In addition, the frost protection and the heat protection temperatures can be preset.

The following applies...

$$T_{\text{Standby setpoint heating}} \leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Standby setpoint cooling}}$$

or

$$T_{\text{Night setpoint heating}} \leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Night setpoint cooling}}$$

The standby and night setpoint temperatures are derived from the comfort setpoint temperatures for heating or cooling. The temperature increase (for cooling) and the temperature decrease (for heating) of both operating modes can be preset in ETS. The comfort temperatures themselves are derived from the deadband and the basic setpoint. The frost protection is supposed to prevent the heating system from freezing. For this reason, the frost protection temperature (default: +7 °C) should be set to a lower value than the night temperature for heating. In principle, however, it is possible to select frost protection temperature values between +7.0 °C and +40.0 °C. The heat protection is intended to prevent the temperature from exceeding the maximum permissible room temperature in order to protect system components. For this reason, the heat protection temperature (default: +35 °C) should be set to a higher value than the night temperature for cooling. In principle, however, it is possible to select heat protection temperature values between +7.0 °C and +45.0 °C. The pos-

sible range of values for a setpoint temperature for "heating and cooling" lies between +7.0 °C and +45.0 °C and is bounded by the frost protection temperature in the lower range and by the heat protection temperature in the upper range.

The level offset configured in ETS will be additionally considered in a two-level heating or cooling mode.

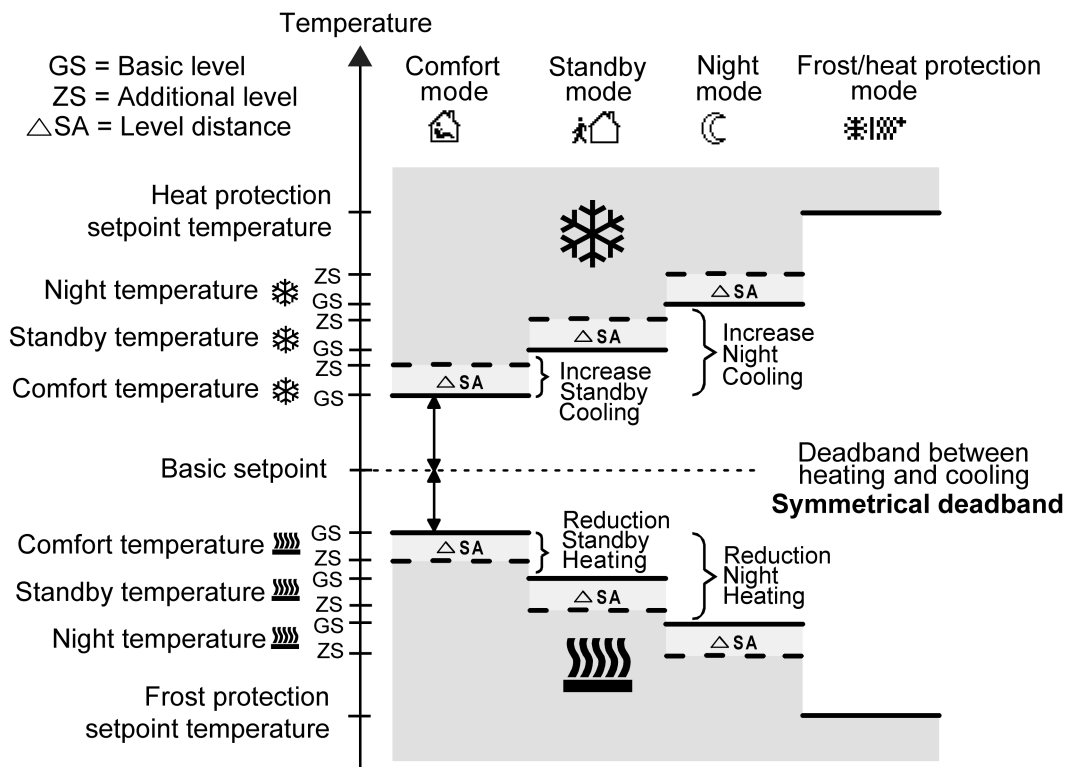


Figure 104: Setpoint temperatures in the operation "Basic and additional heating and cooling" with symmetrical deadband

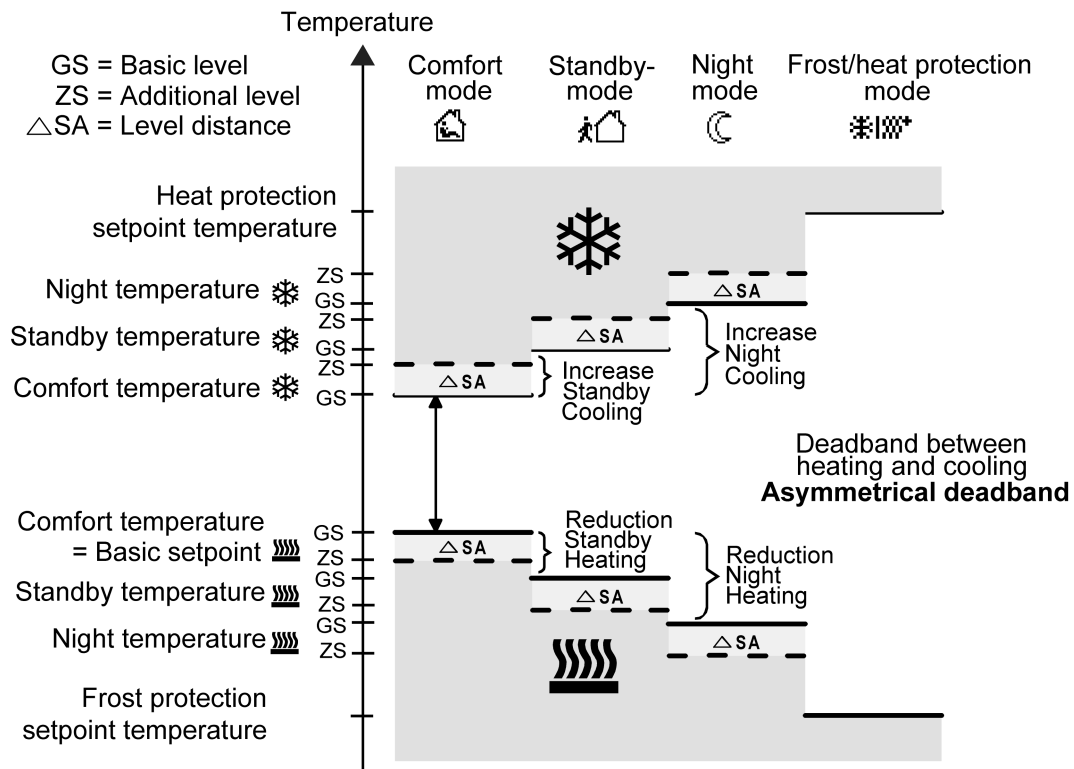


Figure 105: Setpoint temperatures in the operation "Basic and additional heating and cooling" with asymmetrical deadband

$$\begin{aligned} T_{\text{Comfort setpoint add. level Heating}} &\leq T_{\text{Comfort setpoint basic level Heating}} \leq T_{\text{Comfort setpoint basic level Cooling}} \leq T_{\text{Comfort setpoint add. level Cooling}} \\ T_{\text{Standby setpoint add. level Heating}} &\leq T_{\text{Standby setpoint basic level. Heating}} \leq T_{\text{Standby setpoint basic level. Cooling}} \leq T_{\text{Standby setpoint add. level Cooling}} \\ T_{\text{Standby setpoint heating}} &\leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Standby setpoint cooling}} \end{aligned}$$

or

$$\begin{aligned} T_{\text{Comfort setpoint add. level Heating}} &\leq T_{\text{Comfort setpoint basic level Heating}} \leq T_{\text{Comfort setpoint basic level Cooling}} \leq T_{\text{Comfort setpoint add. level Cooling}} \\ T_{\text{Night setpoint add. level Heating}} &\leq T_{\text{Night setpoint basic level Heating}} \leq T_{\text{Night setpoint basic level Cooling}} \leq T_{\text{Night setpoint add. level Cooling}} \\ T_{\text{Night setpoint heating}} &\leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Night setpoint cooling}} \end{aligned}$$

i In the case of switching 2-point feedback control, the hysteresis values must additionally be taken into account!

Deadband and deadband positions in the combined heating and cooling operation

With relative setpoint presetting, the comfort setpoint temperatures for heating and cooling are derived from the basic setpoint in consideration of the set deadband. The deadband (temperature zone for which there is neither heating nor cooling) is the difference between the comfort setpoint temperatures. This deadband does not exist for absolute setpoint presetting.

The parameters "Deadband between heating and cooling", "Allocation of deadband" and "Basic setpoint temperature" are specified in the ETS configuration. One distinguishes between the following settings...

- Allocation of deadband = "symmetrical"
The deadband preset in the ETS is divided into two parts at the basic setpoint. Based on the resulting half deadband, the comfort setpoint temperatures are derived directly from the basic setpoint.

The following applies...

$$T_{\text{Basic setpoint}} - \frac{1}{2}T_{\text{Deadband}} = T_{\text{Comfort setpoint heating}}$$

and

$$T_{\text{Basic setpoint}} + \frac{1}{2}T_{\text{Deadband}} = T_{\text{Comfort setpoint cooling}}$$

$$\rightarrow T_{\text{Comfort setpoint cooling}} - T_{\text{Comfort setpoint heating}} = T_{\text{Deadband}}$$

$$\rightarrow T_{\text{Comfort setpoint cooling}} \geq T_{\text{Comfort setpoint heating}}$$

- Allocation of deadband = "asymmetrical"
With this setting the comfort setpoint temperature for heating equals the basic setpoint! The deadband preset in the ETS is effective only from the basic setpoint in the direction of comfort temperature for cooling. Thus the comfort setpoint temperature for cooling is derived directly from the comfort setpoint for heating.

The following applies...

$$T_{\text{Basic setpoint}} = T_{\text{Comfort setpoint heating}}$$

$$\rightarrow T_{\text{Basic setpoint}} + T_{\text{Deadband}} = T_{\text{Comfort setpoint cooling}}$$

$$\rightarrow T_{\text{Comfort setpoint cooling}} - T_{\text{Comfort setpoint heating}} = T_{\text{Deadband}}$$

$$\rightarrow T_{\text{Comfort setpoint cooling}} \geq T_{\text{Comfort setpoint heating}}$$

16.2.1 Operating mode and setpoint parameters

Room temperature controller -> RTC ... - General -> Setpoints

Overwrite setpoints in device during ETS programming operation	Checkbox (yes / no)
The setpoint temperatures programmed in the room temperature controller by the ETS during commissioning can be changed via communication objects. This parameter can be used to define whether the setpoints present in the device, which may have been changed subsequently, are overwritten during an ETS programming operation and thus replaced again by the values parameterised in the ETS. If this parameter is "Yes", then the setpoint temperatures are deleted in the device during a programming operation and replaced by the values of the ETS. If this parameter is configured to "No", then setpoints present in the device remain unchanged. The setpoint temperatures entered in the ETS then have no significance.	

Setpoint presetting	absolute relative
It is possible to configure the setpoints for the "Comfort", "Standby" and "Night" modes directly (absolute setpoint presetting) or relatively (derivation from basic setpoint). This parameter defines the way the setpoint temperature is preset. With "Relative": All temperature setpoints are derived from the basic temperature (basic setpoint). With "Absolute": The setpoint temperatures are independent of each other. Different temperature values can be specified for each operation and mode.	

Setpoint temperatures via operating mode for absolute setpoint presetting

Heating

Comfort	7 ... 21.0 ... 40 °C
With absolute setpoint presetting the setpoint temperatures for Comfort, Standby and Night mode are independent of each other. Depending on the operation and mode, various temperature values can be specified in the ETS within the range +7.0 °C to +40.0 °C. The ETS does not validate the temperature values. It is thus possible, for example, to select smaller setpoint temperatures for cooling mode than for heating mode, or to specify lower temperatures for Comfort mode than for Standby mode. After commissioning using the ETS the setpoint temperatures can be changed via the bus by means of temperature telegrams. This can be done using the communication object "Setpoint temperature - Active operating mode". Presetting of the setpoint temperature for the Comfort heating mode. These parameters are only visible with absolute setpoint presetting!	
Standby	7 ... 19.0 ... 40 °C
Presetting of the setpoint temperature for heating standby mode.	
Night	7 ... 17.0 ... 40 °C
Presetting of the setpoint temperature for heating night mode.	

Frost protection	7.0 ... 40 °C
Presetting of the setpoint temperature for heating frost protection mode.	

Cooling

Comfort	7 ... 23.0 ... 40 °C
Presetting of the setpoint temperature for cooling standby mode.	

Standby	7 ... 25.0 ... 40 °C
Presetting of the setpoint temperature for cooling standby mode.	

Night mode	7 ... 27.0 ... 40 °C
Presetting of the setpoint temperature for cooling night mode.	

Heat protection	7 ... 35.0 ... 45 °C
Presetting of the setpoint temperature for cooling heat protection mode.	

Accept change permanently via bus	Checkbox (yes / no)

One has to distinguish between two cases, defined by this parameter, if the setpoint is changed by the object. This parameter is only visible with absolute setpoint pre-setting!

When "Yes": If, with this setting, the setpoint temperature is adjusted, the controller saves the value permanently to the permanent storage. The newly adjusted value will overwrite the initial value, i.e. the absolute setpoint temperature originally loaded using the ETS. The changed values are also retained after a device reset, after a switchover of the operating mode or after a switchover of the operation (with absolute setpoint specification individually for each operating mode for heating and cooling).

When "No": The setpoints received via the object remain active only temporarily. In case of a bus voltage failure, after a switchover to another operating mode (e. g. Comfort to Standby, or also Comfort to Comfort), or after a switchover of the operation (e. g. Heating to Cooling), the last setpoint changed will be discarded and replaced by the initial value.

Difference between basic and additional level	0 ... 2 ... 12.7 K

In a two stage control mode it is necessary to determine the temperature difference to the basic stage with which the additional stage is to be incorporated into the control. This parameter defines the level spacing.

The parameter can only be seen in two-level control operation.

Setpoint temperatures via operating mode for relative setpoint presetting

Basic setpoint temperature	7 ... 21.0 ... 40 °C

This parameter defines the temperature value to be applied as the basic setpoint after commissioning by the ETS. All the temperature setpoints are derived from the basic setpoint.

This parameter is only visible with relative setpoint presetting!

Approve change via bus	Checkbox (yes / no)
Here, it is possible to specify if it is possible to change the basic setpoint via the bus. This parameter is only visible with relative setpoint presetting!	

Accept permanently	Checkbox (yes / no)
In addition to specifying individual setpoint temperatures by the ETS or basic setpoint object, the user can shift the basic setpoint in a specific range via a communication object. Whether a basic setpoint shifting only affects the currently active operating mode or whether it influences all other setpoint temperatures of the remaining operating modes is determined by this parameter. In the "yes" setting, the shift of the basic setpoint carried out affects all operating modes. The shift is maintained even after a switchover of the operation or mode or adjusting the basic setpoint. The changed values are also retained after a device reset, after a switchover of the operating mode or after a switchover of the operation. In the "no" setting, the basic setpoint shift carried out takes effect for only as long as the operation or mode is not changed or the basic setpoint is maintained. Otherwise the setpoint shift will be reset to "0". This parameter is only visible with relative setpoint presetting!	

Temperature shift via operating mode for relative setpoint presetting

Heating

Standby	-10...-2...0 K
The value by which the standby setpoint temperature for heating is lowered compared to the heating comfort temperature. The parameter is only visible in the "Heating" or "Heating and cooling" operation (if necessary with additional levels) and only with relative setpoint presetting.	
Night	-10...-4...0 K
The value by which the night temperature for heating is lowered compared to the heating comfort temperature. The parameter is only visible in the "Heating" or "Heating and cooling" operation (if necessary with additional levels) and only with relative setpoint presetting.	
Frost protection	7.0 ... 40 °C
This parameter specifies the setpoint temperature for frost protection. The parameter is only visible in "Heating" or "Heating and cooling" operations (if necessary with additional levels).	

Cooling

Standby	0...20...10 K
The value by which the standby setpoint temperature for cooling is raised compared to the cooling comfort temperature. The parameter is only visible in the "Cooling" or "Heating and cooling" operation (if necessary with additional levels) and only with relative setpoint presetting.	

Night mode	0... 4 ...10 K
The value by which the night temperature for cooling is raised compared to the cooling comfort temperature. The parameter is only visible in the "Cooling" or "Heating and cooling" operation (if necessary with additional levels) and only with relative setpoint presetting.	
Heat protection	7 ... 35 , ... 45 °C
This parameter specifies the setpoint temperature for heat protection. The parameter is only visible in "Cooling" or "Heating and cooling" operations (if necessary with additional levels).	
Difference between basic and additional level	0... 2 ...12.7 K
In a two stage control mode it is necessary to determine the temperature difference to the basic stage with which the additional stage is to be incorporated into the control. This parameter defines the level spacing. The parameter can only be seen in two-level control operation.	

Setpoint temperature shift

Maximum shift upwards	0 K + 1 K + 2 K + 3 K + 4 K + 5 K + 6 K + 7 K + 8 K + 9 K + 10 K
This is used to define the maximum range in which the basic setpoint temperature can be adjusted upwards. This parameter is only visible with relative setpoint presetting!	

Maximum shift downwards	0 K - 1 K - 2 K - 3 K - 4 K - 5 K - 6 K - 7 K - 8 K - 9 K - 10 K
This is used to define the maximum range in which the basic setpoint temperature can be adjusted downwards. This parameter is only visible with relative setpoint presetting!	
Type of shift	Via counter value x step width Via relative temperature value
Depending on the setting of the parameter "Type of shift", the shift takes place via a 2-byte communication object according to KNX DPT 9.002 or via a 1-byte communication object according to KNX DPT 6.010. This parameter is only visible with relative setpoint presetting!	
Accept changes permanently via bus	Checkbox (yes / no)
In addition to specifying individual setpoint temperatures by the ETS or basic setpoint object, the user can shift the basic setpoint in a specific range using the sensor buttons or a communication object. Whether a basic setpoint shifting only affects the currently active operating mode or whether it influences all other setpoint temperatures of the remaining operating modes is determined by this parameter. In the "yes" setting, the shift of the basic setpoint carried out affects all operating modes. The shift is maintained even after a switchover of the operation or mode or adjusting the basic setpoint. In the "no" setting, the basic setpoint shift carried out takes effect for only as long as the operation or mode is not changed or the basic setpoint is maintained. Otherwise the setpoint shift will be reset to "0".	

Value adjustment

Increment	0.1 K 0.5 K
This parameter defines the value of a level of the setpoint shift. With a setpoint shift, the basic setpoint (with relative setpoint specification) is changed by the temperature value configured here when there is an adjustment by one step in a positive or negative direction. The controller module rounds the temperature values received via the "Setpoint temperature - Basic value" object and matches the values to the step width configured here. The parameter is only available if the shift has the setting "Via counter value x step width". In combination with the function "Setpoint heating temperature increase", the setpoint temperature can also be modified in smaller steps, even with a step width of 0.5 K.	

Deadband between heating and cooling

Allocation of deadband	symmetrical asymmetrical
With relative setpoint presetting, the comfort setpoint temperatures for the operation "Heating and cooling" are derived from the basic setpoint in consideration of the set deadband. The deadband (temperature zone for which there is neither heating nor cooling) is the difference between the comfort setpoint temperatures. Symmetrical setting: The deadband preset in the ETS plug-in is divided in two parts at the basic setpoint. Based on the resulting half deadband, the comfort setpoint temperatures are derived directly from the basic setpoint (Basic setpoint - 1/2 deadband = Heating comfort temperature or Basic setpoint + 1/2 deadband = Cooling comfort temperature). Asymmetrical setting: With this setting the comfort setpoint temperature for heating equals the basic setpoint! The preset deadband is effective only from the basic setpoint in the direction of comfort temperature for cooling. Thus the comfort setpoint temperature for cooling is derived directly from the comfort setpoint for heating. The parameter is only visible in the "Heating and cooling" operation (if necessary with additional levels) and only with relative setpoint presetting!	
Size	0.1...1...25.5 K
With relative setpoint presetting, the comfort setpoint temperatures for heating and cooling are derived from the basic setpoint in consideration of the set deadband. The deadband (temperature zone for which there is neither heating nor cooling) is the difference between the comfort setpoint temperatures. It is set using this parameter. The parameter is only visible in the "Heating and cooling" operation (if necessary with additional levels) and only with relative setpoint presetting.	

Setpoint temperature transmission behaviour

on change by (0 = inactive)	0...0.1...25.5 K
Determines the size of the value change required to transmit the current value automatically to the bus via the "Setpoint temperature" object. In the "0" setting, the setpoint temperature is not transmitted automatically when there is a change.	
Cyclical (0 = inactive)	0...255 min
This parameter determines whether the setpoint temperature is to be transmitted cyclically via the "Setpoint temperature" object. Definition of the cycle time by this parameter. In the "0" setting, the setpoint temperature is not transmitted cyclically.	

Presence detection

Room temperature controller -> RTC ... - General -> Enabled functions

Presence detection	Checkbox (yes / no)
With presence detection, the room temperature controller can quickly switch over to a comfort extension upon push-button actuation using a presence button or, using a presence detector, switch to Comfort mode when movement by a person in the room is detected. If this parameter is activated, further parameters will become visible.	

Room temperature controller -> RTC ... - General -> Presence detection

Presence detection	Presence button Presence detector
Presence button: The 1-bit communication object "Presence detection - Presence button" is enabled. An "ON" telegram to this object makes it possible to switch to the comfort extension if night or frost/heat protection mode is active. Presence detector: Two 1-bit communication objects "Presence detection - presence object" are enabled. With this objects it is possible to integrate presence detectors into room temperature control. If a movement is detected ("ON" telegram), the controller will switch to Comfort mode. Both objects form an "Or" link of two presence detectors. In larger rooms, the use of two presence detectors can be useful. As long as one of the two detectors detects a presence, the controller remains in Comfort mode	
Length of the comfort extension (0 = inactive)	0 ... 30 ... 255 min
This parameter can be used to set the duration of a comfort extension by means of a presence object. A comfort extension can be deactivated in advance if an "OFF" telegram is received via the object of the presence button. You cannot re-trigger the extension time	

16.2.2 Objects for operating mode and setpoints

Function	Name	Type	DPT	Flag
Operating mode - Pre-set	RTC ... -Input	1-byte	20,102	C, -, W, T, U

1-byte object for change-over of the operating mode of the controller according to the KNX specification.

After the mains voltage returns or an ETS programming operation, the current operating mode is transmitted by means of this object.

Function	Name	Type	DPT	Flag
Operating mode - Forced	RTC ... -Input	1-byte	20,102	C, -, W, T, U

1-byte object for forced change-over (highest priority) of the operating mode of the controller according to the KNX specification.

Function	Name	Type	DPT	Flag
Presence detection - Presence button	RTC ... -Input	1-bit	1,001	C, -, W, T, U

1-bit object through which an external presence button (e. g. from a controller extension) can be linked to the controller (polarity: Presence exists = "1", no presence exists = "0").

Presence allows permanent switching to Comfort mode (starting in Standby mode) or temporary switching to this comfort extension (starting from Night mode or Frost/heat protection mode).

Presence in Standby mode: If there is a presence, the controller activates Comfort mode. As soon as the object no longer signals a presence, the controller switches back to Standby mode.

Presence in Night mode or Frost/heat protection mode: If there is a presence, the controller activates the comfort extension. After the configured length of the comfort extension has elapsed, the system automatically switches back to Night mode or Frost/heat protection mode. In this case, the object value is reset automatically.

After the mains voltage returns or an ETS programming operation (controller reset), the presence function is always inactive.

This object is only visible when presence detection is configured to "Presence button".

Function	Name	Type	DPT	Flag
Presence detection - Presence object 1	RTC ... -Input	1-bit	1,001	C, -, W, -, U
Presence detection - Presence object 2	RTC ... -Input	1-bit	1,001	C, -, W, -, U

1-bit object through which an external KNX presence detector can be linked to the controller (polarity: Presence exists = "1", no presence exists = "0").

If there is a presence, the controller activates Comfort mode, provided that no higher-level function (e. g. window status) is active. The controller switches to the last specified operating mode as soon as the presence detector ceases to signal a presence.

After the mains voltage returns or an ETS programming operation (controller reset), the presence function is always inactive.

These objects are only visible when presence detection is configured to "Presence detector".

Function	Name	Type	DPT	Flag
Frost/heat protection - Window contact	RTC ... -Input	1-bit	1,019	C, -, W, -, U

1-bit object for the coupling of window contacts.

Polarity: Window open = "1", window closed = "0".

Function	Name	Type	DPT	Flag
Frost protection - Temperature drop - Status	RTC ... - Output	1-bit	1,011	C, R, -, T, A

1-bit object to signal a detected temperature drop.

Polarity: temperature drop detected = "1", no temperature drop detected = "0".

Function	Name	Type	DPT	Flag
Setpoint temperature - Active operating mode - Status	RTR ... - Output	2-byte	9,001	C, R, -, T, A

2-byte object for the output of the current temperature setpoint. Depending on the operation, the possible range of values is limited by the configured frost protection and/or heat protection temperature.

The temperature value is always output in the format "°C".

After the mains voltage returns or an ETS programming operation (controller reset), the current setpoint temperature is transmitted via this object.

Function: absolute setpoint temperature specification

Function	Name	Type	DPT	Flag
Setpoint temperature - Active operating mode	RTR ... - Input	2-byte	9,001	C, -, W, -, U

2-byte object for external setting of a setpoint for absolute setpoint presetting. Depending on the operation, the possible range of values is limited by the configured frost protection and/or heat protection temperature. The controller rounds the temperature values received via the object to 0.1 K.

The temperature value must always be specified in the format "°C".

Function: relative setpoint temperature specification, basic value

Function	Name	Type	DPT	Flag
Setpoint temperature - Basic value	RTR ... - Input	2-byte	9,001	C, -, W, -, U

2-byte object for external specification of the basic setpoint for relative setpoint specification. Depending on the operation, the possible range of values is limited by the configured frost protection and/or heat protection temperature. The controller rounds the temperature values received irrespective of the configured value of the of the setpoint shift (0.1 K or 0.5 K).

The temperature value must always be specified in the format "°C".

Function	Name	Type	DPT	Flag
Setpoint temperature - Basic value - Status	RTR ... - Output	2-byte	9,001	C, R, -, T, A

2-byte object for the output of the current basic setpoint. Depending on the operation, the possible range of values is limited by the configured frost protection and/or heat protection temperature.

The temperature value is always output in the format "°C".

After the mains voltage returns or an ETS programming operation (controller reset), the current basic setpoint temperature is transmitted via this object.

Function: relative setpoint temperature shift via direct temperature value

Function	Name	Type	DPT	Flag
Setpoint temperature - Shift	RTR ... - Input	2-byte	9,002	C, -, W, -, U

2-byte object for setting a basic setpoint shifting, e. g. via a controller extension. The value of a counter value in the communication object is dependent on the configured setpoint shift value (0.1 K or 0.5 K). The value "0" means that no shift is active. The value is depicted in a double complement in the positive and negative direction.

In case the limits of the value range are exceeded by the preset external value, the controller will automatically reset the received value to the minimum and maximum limits.

Function	Name	Type	DPT	Flag
Setpoint temperature - Shift - Status	RTR ... - Output	2-byte	9,002	C, R, -, T, A

2-byte object for giving feedback on the current setpoint shift for evaluation, e. g. by a controller extension. The value "0" means that no shift is active. The value is depicted in a double complement in the positive and negative direction.

After the mains voltage returns or an ETS programming operation (controller reset), the current value for the basic setpoint shift is transmitted via this object. Since the value for the basic setpoint shift is stored exclusively in a volatile memory, the shift is always "0" immediately after the mains voltage returns or an ETS programming operation.

Function: relative setpoint temperature shift via meter value ... Increment

Function	Name	Type	DPT	Flag
Setpoint temperature - Shift	RTR ... - Input	1-byte	6,010	C, R, -, T, A

1-byte object for setting a basic setpoint shifting, e. g. via a controller extension. The value of a counter value in the communication object is dependent on the configured setpoint shift value (0.1 K or 0.5 K). The value "0" means that no shift is active. The value is depicted in a double complement in the positive and negative direction.

In case the limits of the value range are exceeded by the preset external value, the controller will automatically reset the received value to the minimum and maximum limits.

Function	Name	Type	DPT	Flag
Setpoint temperature - Shift - Status	RTR ... - Output	1-byte	6,010	C, R, -, T, A

1-byte object for giving feedback on the current setpoint shift for evaluation, e. g. by a controller extension. The value of a counter value in the communication object is dependent on the configured setpoint shift value (0.1 K or 0.5 K). The value "0" means that no shift is active. The value is depicted in a double complement in the positive and negative direction.

After the mains voltage returns or an ETS programming operation (controller reset), the current value for the basic setpoint shift is transmitted via this object. Since the value for the basic setpoint shift is stored exclusively in a volatile memory, the shift is always "0" immediately after the mains voltage returns or an ETS programming operation.

16.3 Command value output and command value limit

Automatic transmission

On automatic transmission of the command value telegrams, a distinction is made with regard to the type of control...

- **Continuous PI control:**
In the case of continuous PI control, the room temperature controller calculates a new command value cyclically every 30 seconds and outputs it to the bus via a 1-byte value object. In so doing, the parameter "On change by (0 = inactive)" in the parameter node "Room temperature controller x -> RTCx - General -> Command value output" can be used to specify the change interval of the command value in percent, according to which a new command value is to be output to the bus. The change interval can be configured to "0" so that a change in the command value will not result in an automatic transmission. In addition to the command value output following a change, the current command value may be periodically transmitted. In addition to the times when changes are to be expected, other command value telegrams will be output according to the active value after a configurable cycle time. This ensures that, during cyclical security monitoring of the command value in valve drive or in the addressed switch actuator, telegrams are received within the monitoring time. The time interval defined by the parameter "Cyclical (0 = inactive)" should correspond to the monitoring time in the actuator (cycle time in the controller is preferably to be configured smaller). The "0" setting will deactivate the periodic transmission of the command value.
With continuous PI control it must be noted that if the cyclical and the automatic transmission are both deactivated, no command value telegrams will be transmitted in case of a change!
- **Switching PI control (PWM):**
In case of a switching PI control (PWM), the room temperature controller calculates a new command value internally every 30 seconds. The parameter "PWM cycle time" defines the cycle time of the PWM command value signal.
If the command value is changed, the current PWM cycle is adapted as required so that the duty factor corresponds as directly as possible to the new command value. This adaptation is carried out in the same way as during activation of the valve outputs .
- **2-point feedback control:**
In case of a 2-point feedback control, the room temperature and thus the hysteresis values are evaluated periodically every 30 seconds, so that the command values, if required, will change solely during these times. As, with this control algorithm, no continuous command values are calculated, the parameter "On change by (0 = inactive)" has no effect with this control algorithm. In addition to the command value output following a change, the current command value may be periodically transmitted on the bus. In addition to the times when changes are to be expected, other command value telegrams will be output according to the active value after a configurable cycle time. This ensures that, during cyclical security monitoring of the command value in valve drive or in the addressed switch actuator, telegrams are received within the

monitoring time. The time interval defined by the parameter "Cyclical (0 = inactive)" should correspond to the monitoring time in the actuator (cycle time in the controller is preferably to be configured smaller). The "0" setting will deactivate the periodic transmission of the command value.

Command value limit

Optionally a command value limit can be configured in the ETS. The command value limit allows the restriction of calculated command values to the range limits "Minimum command value" and "Maximum command value". The limits are permanently set in the ETS and, if command value limitation is active, can be neither undershot or exceeded during device operation. It is possible, if available, to specify various limiting values for the basic and additional stages and for heating and cooling.

The "Activation" parameter on the parameter page "Room temperature controller -> RTCx - General -> Command value limit" defines the type of action of the limiting function. The command value limit can either be activated or deactivated using the 1-bit communication object "Command value limit", or be permanently active. When controlling via the object, it is possible to have the controller activate the command value limit automatically after the bus voltage returns or after an ETS programming operation. Here, the "Active after reset" parameter defines the initialisation behaviour. In the "no" setting, the command value limit is not automatically activated after a device reset. A "1" telegram must first be received via the "Command value limit" object for the limit to be activated. In the "yes" setting, the controller activates the command value limit automatically after a device reset. To deactivate the limit a "0" telegram must be received via the "Command value limit - Activate / Deactivate" object. The limit can be switched on or off at any time using the object.

With a permanently active command value limit, the initialisation behaviour cannot be configured separately after a device reset, as the limit is always active. In this case it is also not possible to configure any object.

As soon as the command value limit is active, calculated command values are limited according to the limiting values from the ETS. The behaviour with regard to the minimum or maximum command value is then as follows...

- **Minimum command value:**
The "Minimum command value" parameter specifies the lower command value limiting value. The setting can be made in 5% increments in the range 5% ... 50% can be made. With an active command value limit, the set minimum command value is not undershot by command values. If the controller calculates smaller command values, it sets the configured minimum command value. The controller transmits a 0% command value if no more heating or cooling energy has to be demanded.
- **Maximum command value:**
The "Maximum command value" parameter specifies the upper command value limiting value. The setting can be made in 5% increments in the range 55% ... 100% can be made. With an active command value limit, the set maximum command value is not exceeded. If the controller calculates larger command values, it sets the configured maximum command value.

If the limit is removed, the device automatically repositions the most recently calculated command value to the unlimited values when the next calculation interval for the command values (30 seconds) has elapsed.

- i** An active command value limit has a negative effect on the control result when the command value range is very restricted. A control deviation must be expected.

Special case for command value 100% (Clipping mode)

If with a PI control the calculated command value of the controller exceeds the physical limits of the actuator, in other words if the calculated command value is greater than 100%, then the command value is set to the maximum value (100%) and thus limited. This special, necessary control behaviour is also called "clipping". With PI control the command value can reach the value "100%" if there is a large deviation of the room temperature from the setpoint temperature or the controller requires a long time to adjust to the setpoint with the heating or cooling energy that is being applied. The controller evaluates this state in a particular manner.

The controller maintains the maximum command value only as long as it is necessary. After that it adjusts the command value downwards according to the PI algorithm. The advantage of this control characteristic is the fact that the room temperature does not exceed the setpoint temperature at all, or only slightly. It should be mentioned that this necessary control principle increases the tendency to oscillate about the setpoint.

- i** Clipping may also occur when a command value limit is active (maximum command value). In this case, if the internally calculated command value reaches 100%, then the controller only transmits to the bus the maximum command value according to the ETS configuration.

16.3.1 Command value output parameters

Room temperature controller -> RTR ... - General -> Control value output

PWM cycle time	1 ... 15 ... 255 min
This parameter specifies the cycle time for the pulse width modulated command value (PWM).	
Visible only if the "Type of control" is set to the parameter "Switching PI control (PWM)".	

Polarity of the command values

Heating	normal (under current, this means opened) inverted (under current, this means closed)

At this point, it is possible to specify whether the command value telegram for heating is output normally or in inverted form.
This parameter is only visible if the operation "Heating" or "Heating and cooling" is configured and not two-level operation.

Basic level heating	normal (under current, this means opened) inverted (under current, this means closed)

At this point, it is possible to specify whether the command value telegram for the basic level heating is output normally or in inverted form.
This parameter is only visible if the operation "Heating" or "Heating and cooling" is configured along with two-level operation.

Additional level heating	normal (under current, this means opened) inverted (under current, this means closed)

At this point, it is possible to specify whether the command value telegram for the additional level heating is output normally or in inverted form.
This parameter is only visible if the operation "Heating" or "Heating and cooling" is configured along with two-level operation.

Cooling	normal (under current, this means opened) inverted (under current, this means closed)

At this point, it is possible to specify whether the command value telegram for cooling is output normally or in inverted form.
This parameter is only visible if the operation "Cooling" or "Heating and cooling" is configured and not two-level operation.

Basic level cooling	normal (under current, this means opened) inverted (under current, this means closed)
At this point, it is possible to specify whether the command value telegram for the basic level cooling is output normally or in inverted form. This parameter is only visible if the operation "Cooling" or "Heating and cooling" is configured along with two-level operation.	
Additional level cooling	normal (under current, this means opened) inverted (under current, this means closed)
At this point, it is possible to specify whether the command value telegram for the additional level cooling is output normally or in inverted form. This parameter is only visible if the operation "Cooling" or "Heating and cooling" is configured along with two-level operation.	

Transmission behaviour

On change by (0 = inactive)	0... 3 ...100 %
This parameter determines the size of the command value change that will automatically transmit continuous command value telegrams via the command value objects. Thus this parameter only affects command values which are configured to "Continuous PI control" and to the 1-byte additional command value objects of the "Switching PI control (PWM)".	
Cyclical	0... 10 ...255 min
This parameter determines the time interval for the cyclical transmission of the command values via all command value objects.	

16.3.2 Command value limit parameters

Room temperature controller -> RTR ... - General -> Control value limitation

Activation	Via object permanently active
The command value limit allows the restriction of calculated command values to the range limits "minimum" and "maximum". The limits are permanently set in the ETS and, if command value limitation is active, can be neither undershot or exceeded during device operation. The "Activation" parameter defines the type of action of the limiting function. The command value limit can either be activated or deactivated using the 1-bit communication object "Command value limit - Activate / Deactivate" or be permanently active.	

16.3.3 Command value output objects

Object for heating command value output and combined valve heating/cooling

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Heating	RTR ... - Output	1-byte	5,001	C, R, -, T, A
Basic heating level command value	RTR ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object to output the continuous command value of the heating mode. In two-level heating mode, command value output for the basic heating. This object is only available in this way if the type of feedback control is configured to "Continuous PI control". * These objects are only visible if, with combined heating/cooling command value, separate command value objects are also displayed.				

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Heating	RTR ... - Output	1-bit	1,001	C, R, -, T, A
Basic heating level command value	RTR ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to output the PWM command value of the heating mode. In two-level heating mode, command value output for the basic heating. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)". * These objects are only visible if, with combined heating/cooling command value, separate command value objects are also displayed.				

Function	Name	Type	DPT	Flag
Command value - Heating - Status	RTR ... - Output	1-byte	5,001	C, R, -, T, A
Basic level heating command value - Status	RTR ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object for additional continuous output for the PWM command value of the heating mode. In two-level heating mode, command value output for the basic heating. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)". * These objects are only visible if, with combined heating/cooling command value, separate command value objects are also displayed.				

Function: Command value

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Heating/Cooling / Command value basic level heating/cooling	RTR ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to output the combined switching command value of the heating and cooling mode. In two-level heating/cooling mode, command value output for the basic level. This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Switching 2-point feedback control".				

Object for command value output, additional heating and combined valve additional heating/cooling

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Additional level heating	RTR ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object to output the continuous command value for additional heating in two-level operation. This object is only available in this way if the type of feedback control is configured to "Continuous PI control".				
* This object is visible only if, with combined heating/cooling command value, separate command value objects are also displayed.				

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Additional level heating	RTR ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to output the continuous PWM command value for additional heating in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)".				
* This object is visible only if, with combined heating/cooling command value, separate command value objects are also displayed.				

Function	Name	Type	DPT	Flag
Command value - Additional level heating - Status	RTR ... - Output	1-byte	5,001	C, R, -, T, A
1-bit object for additional continuous output for the PWM command value for additional heating in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)".				
* This object is visible only if, with combined heating/cooling command value, separate command value objects are also displayed.				

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Additional level heating	RTR ... - Output	1-bit	1,001	C, R, -, T, A
Command value - Additional level heating	RTR ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to output the switching command value for additional heating in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching 2-point feedback control".				

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Additional level heating/cooling	RTR ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object to output the combined continuous command value for additional level in two-level operation. This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Continuous PI control".				

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Additional level heating/cooling	RTR ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to output the combined switching PWM command value for additional level in two-level operation. This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Switching PI control (PWM)".				

Function	Name	Type	DPT	Flag
Command value - Additional level heating/cooling - Status	RTR ... - Output	1-byte	5,001	C, R, -, T, A
1-bit object for additional continuous output of the combined command value for additional level in two-level operation. This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Switching PI control (PWM)".				

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Additional level heating/cooling	RTR ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to output the combined switching command value for additional level in two-level operation. This object is only available in this way if the command values for heating and cooling mode are output to a shared object (parameter-dependent). The type of feedback control must also be configured to "Switching 2-point feedback control".				

Object for command value output, cooling

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Cooling	RTR ... - Output	1-byte	5,001	C, R, -, T, A
Command value - Basic level cooling	RTR ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object to output the continuous command value of the cooling mode. In two-level cooling mode, command value output for the basic cooling. This object is only available in this way if the type of feedback control is configured to "Continuous PI control".				
* These objects are only visible if, with combined heating/cooling command value, separate command value objects are also displayed.				

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Cooling	RTR ... - Output	1-bit	1,001	C, R, -, T, A
Command value - Basic level cooling	RTR ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to output the PWM command value of the cooling mode. In two-level cooling mode, command value output for the basic cooling. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)".				
* These objects are only visible if, with combined heating/cooling command value, separate command value objects are also displayed.				

Function	Name	Type	DPT	Flag
Command value - Additional level cooling	RTR ... - Output	1-bit	1,001	C, R, -, T, A
Command value - Additional level cooling	RTR ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to output the continuous PWM command value for additional cooling in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)". * These objects are only visible if, with combined heating/cooling command value, separate command value objects are also displayed.				

Function	Name	Type	DPT	Flag
Command value - Additional level cooling - Status	RTR ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object for additional continuous output of the PWM command value for additional cooling in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching PI control (PWM)". * These objects are only visible if, with combined heating/cooling command value, separate command value objects are also displayed.				

Function: Command value

Function	Name	Type	DPT	Flag
Command value - Additional level cooling	RTR ... - Output	1-bit	1,001	C, R, -, T, A
1-bit object to output the switching command value for additional cooling in two-level operation. This object is only available in this way if the type of feedback control is configured to "Switching 2-point feedback control". * These objects are only visible if, with combined heating/cooling command value, separate command value objects are also displayed.				

16.3.4 Objects for command value limit

Function	Name	Type	DPT	Flag
Command value limit - Activate/Deactivate	RTR ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for activating or deactivating the command value limit.				

16.4 Room temperature measurement

Basic principles

The controller detects the room temperatures using one or possibly two external KNX temperature sensors (e. g. push-button sensors with temperature measurement). Temperature detection is configured on the parameter page "Room temperature controller -> RTCx - General -> Room temperature measurement". Depending on the configuration, the 2-byte objects "Room temperature - Measured value 1" and optionally, the additional "Room temperature - Measured value 2", are enabled.

i According to KNX DPT 9.001, the temperature values must be made available to the controller in the format "°C".

When choosing the mounting location of the external temperature sensor, the following points must be considered...

- The temperature sensor should not be used in multiple combinations, especially together with flush-mounted dimmers.
- Do not install the temperature sensor in the area of large electrical consumers (avoid heat influences).
- Installation in the vicinity of radiators or cooling systems is not advisable.
- The temperature sensor should not be exposed to direct sun.
- The installation of sensors on the inside of an outside wall might have a negative impact on the temperature measurement.
- Temperature sensors should be installed at least 30 cm away from doors, windows or ventilation devices and at least 1.5 m above the floor.

Temperature detection and measured value formation

The "Temperature detection of the room controller by" parameter in the parameter node "Room temperature controller -> RTCx - General -> Room temperature measurement" specifies how many external KNX sensors detect the room temperature. The following settings are possible for temperature detection...

- "Temperature input 1"
The actual temperature is determined solely via an external temperature value. In this case, the KNX temperature sensor is connected to the controller via the 2-byte object "Room temperature - Measured value 1".
The controller can request the current temperature value cyclically. For this purpose, the parameter "Cyclical query of the temperature values" must be set to a value > "0". The request interval can be configured within the limits of 1 minute to 255 minutes.
After a device reset, the controller will first wait for a valid temperature telegram until the feedback control starts and a command value, if applicable, is output.
- "Temperature input 1 and 2"
The actual temperature is determined using two external temperature values. The selected temperature sources are combined. In this case, the KNX temperature sensors are connected to the controller via the two

2-byte objects "Room temperature - Measured value 1" and "Room temperature - Measured value 2".

When evaluating, the real actual temperature is made up of the two temperature values provided. The weighting of the temperature values is defined by the parameter "Weighting of temp. inputs 1 and 2". Depending on the different locations of the sensors or non-uniform heat distribution inside the room, it is thus possible to adjust the actual temperature measurement. Temperature sensors that are subject to negative external influences (for example, unfavourable location because of exposure to sun or radiator or door/window in the immediate vicinity) are often weighted less heavily.

Example: A temperature sensor has been installed next to the entrance door. An additional temperature sensor has been mounted on an inner wall in the middle of the room below the ceiling.

Sensor 1: 21.5 °C

Sensor 2: 22.3 °C

Determination of measured value: 30% to 70%

$$\begin{aligned} \rightarrow T_{\text{Result 1}} &= T_1 = 21.5 \text{ °C} \cdot 0.3 = 6.45 \text{ °C}, \\ \rightarrow T_{\text{Result 2}} &= T_2 = 22.3 \text{ °C} \cdot 0.7 = 15.61 \text{ °C} \\ \rightarrow T_{\text{Result}} &= T_{\text{Result 1}} + T_{\text{Result 2}} = \underline{22.06 \text{ °C}} \end{aligned}$$

The controller can request both current temperature values cyclically. For this purpose, the parameter "Query time for temperature values" must be set to a value > "0". The request interval can be configured within the limits of 1 minute to 255 minutes.

After a device reset, the controller will first wait for valid temperature telegrams to both objects until control starts and a command value, if applicable, is output.

Calibrating the measured values

In some cases during room temperature measurement, it may be necessary to adjust the external KNX temperature values. Adjustment becomes necessary, for example, if the temperature measured by the sensors stays permanently below or above the actual temperature in the vicinity of the sensor. To determine the temperature deviation, the actual room temperature should be detected with a reference measurement using a calibrated temperature measuring device.

Using the parameters "Adjust temperature input 1 by" and "Adjust temperature input 2 by", it is possible to configure the positive (temperature increase, factors: 1 ... 127) or negative (temperature decrease, factors -128... -1) temperature calibration in levels of 0.1 K. Thus, the calibration is made only once statically and is the same for all operating modes of the controller.

- i** The measured value has to be increased, if the value measured by the sensor lies below the actual room temperature. The measured value has to be decreased, if the value measured by the sensor lies above the actual room temperature.

- i** During room temperature control, the device always uses the adjusted temperature value to calculate the command values. The adjusted temperature value is transmitted to the bus via the "Room temperature - Actual value - Status" object. When determining the measured value using both external sensors, the calibrated values are also used to calculate the actual value.
- i** Temperature adjustment only affects the room temperature measurement.

Transmission of the actual temperature

The determined actual temperature can be actively transmitted to the bus via the 2-byte object "Room temperature - Actual value - Status". Parameter "On change by (0 = inactive)" specifies the temperature value by which the actual value has to change in order to have the actual temperature value automatically transmitted via the object. Possible temperature value changes lie within a range of 0.1 K and 25.5 K. Setting to "0" at this point will deactivate the automatic transmission of the actual temperature.

In addition, the actual value can be transmitted periodically. The parameter "Cyclical (0 = inactive)" specifies the cycle time (1 to 255 minutes). The value "0" will deactivate the periodical transmission of the actual temperature value. If the "Read" flag is set on the "Actual temperature" object, this makes it possible to read out the current actual value at any time over the bus. It has to be pointed out that with deactivated periodical transmission and deactivated automatic transmission, no more actual temperature telegrams will be transmitted!

After the bus voltage returns or after programming by the ETS, the object value will be updated according to the current actual temperature value and transmitted as soon as all the external temperature values of the KNX sensors have been received. If no external temperature values have been received after a reset, then the value "0" will be seen in the "Actual temperature" object. For this reason, all the external temperature sensors should always transmit their current measured temperature value after a reset!

During room temperature control, the controller always uses the calibrated temperature values to calculate the command values. The calibrated temperature values can be actively transmitted to the bus via the "Actual temperature" object.

Monitoring the actual temperature

The cyclical actual temperature monitoring can be activated or deactivated via parameter. The parameter "Cyclical monitoring of the temperature inputs" on the parameter page "Room temperature controller -> RTCx - General -> Room temperature measurement" activates or deactivates this function. When cyclical actual temperature monitoring is active, the device cyclically checks whether the configured input objects "Room temperature - Measured value 1" and "Room temperature - Measured value 2" have received new values. The cycle time can be configured by parameter and applies equally to all temperature inputs.

If the value is not updated within the cycle time on one of the configured temperature sensors, the controller signals this error via the KNX-compliant controller status RHCC. Correspondingly, bit 0 ("0" = No error / "1" = Error) of the status telegram (object "Controller status RHCC - KNX-compliant") can be evaluated.

The controller remains active even when no input temperature values are received. The basic levels and the additional levels work with the last received temperature value and continue outputting command values.

The error status is cancelled when all configured temperature inputs are updated within a cycle period. Then the status telegram is also updated and transmitted.

16.4.1 Temperature measurement parameters

Room temperature controller -> RTC ... - General -> room temperature measurement

Room temperature source	Temperature input 1 Temperature input 1 and 2
The controller detects the room temperatures using one or possibly two external KNX temperature sensors (e. g. push-button sensors with temperature measurement). Depending on the configuration, the 2-byte objects "Room temperature - Measured value 1" and, optionally, the additional "Room temperature - Measured value 2", are enabled. After a device reset, the controller will first wait for valid temperature telegrams to both objects until control starts and a command value, if applicable, is output. Setting "Temperature input 1": The actual temperature is determined solely via an external temperature value. In this case, the KNX temperature sensor is connected to the controller via the 2-byte object "Room temperature - Measured value 1". Setting "Temperature input 1 and 2": The actual temperature is determined using two external temperature values. The selected temperature sources are combined. In this case, the KNX temperature sensors are connected to the controller via the two 2-byte objects "Room temperature - Measured value 1" and "Room temperature - Measured value 2".	
Weighting of temp. inputs 1 and 2	10% to 90% 20% to 80% 30% to 70% 40% to 60% 50% to 50% 60% to 40% 70% to 30% 80% to 20% 90% to 10%
The weighting of the temperature values of the two external KNX temperature sensors is specified here. That results in an overall value, which will be used for the further interpretation of the room temperature. This parameter is only visible when the temperature detection system requires two external temperature sensors.	
Cyclical monitoring of temperature inputs	Checkbox (yes / no)
Here, cyclical monitoring of the temperature inputs can be enabled as an option ("Yes" setting). If, during active cyclical monitoring, there are no temperature values during the cycle time defined by the parameter of the same name, emergency operation will be activated.	
Cycle time	0 ... 4 h 1 ... 20 ... 59 min
Presetting of the monitoring time hours and minutes.	

Cyclical query of the temperature values	Checkbox (yes / no)
This setting determines whether the controller queries the temperature values cyclically. In the "No" setting, the temperature value is not automatically queried by the controller. In this case the communication partner (e. g. controller extension) must transmit its temperature value itself.	
Cycle time	1 ... 10... 255 min
The query period for the external temperature values is specified here.	

Temperature calibration

Adjust temperature input 1 by	-12.8...0...12.7 K
Specifies the value by which the room temperature measured value of the first external KNX temperature sensor is adjusted.	
Adjust temperature input 2 by	-12.8...0...12.7 K
Specifies the value by which the room temperature measured value of the second external KNX temperature sensor is adjusted.	

Room temperature transmission behaviour

On change by (0 = inactive)	0...0.5...25.5 K
This parameter specifies the temperature value by which the actual value has to change in order to have the actual temperature value transmitted automatically via the object. The "0" setting deactivates the automatic transmission of the actual temperature.	
Cyclical (0 = inactive)	0...15...255 min
This parameter specifies whether and when the determined room temperature is output cyclically via the "Actual temperature" object.	

16.4.2 Objects for temperature measurement

Function	Name	Type	DPT	Flag
Room temperature - Actual value - Status	RTC ... - Output	2-byte	9,001	C, R, -, T, A
2-byte object for the display of the actual temperature active in the controller (room temperature). The possible temperature range is specified by the received temperature values and corresponds to the range specified by the KNX DPT 9.001. The temperature value is always output in the format "°C".				

Function	Name	Type	DPT	Flag
Room temperature - Measured value 1	RTC ... -Input	2-byte	9,001	C, -, W, T, U
2-byte object for coupling an external KNX temperature sensor (e. g. push-button sensor with temperature measurement) for room temperature detection. The possible temperature range is specified by the KNX DPT 9.001. The temperature value must always be specified in the format "°C".				

Function	Name	Type	DPT	Flag
Room temperature - Measured value 2	RTC ... -Input	2-byte	9,001	C, -, W, T, U
2-byte object for coupling an external KNX temperature sensor (e. g. push-button sensor with temperature measurement) for room temperature detection. The possible temperature range is specified by the KNX DPT 9.001. The temperature value must always be specified in the format "°C".				

16.5 Controller status

Heating/cooling message

Depending on the set operation, separate objects can be used to indicate whether the controller is currently demanding heating or cooling energy and is thus actively heating or cooling. As long as the heating command value is > 0 , a "1" telegram will be transmitted via the object "Heating status object". The signal telegram is only reset when the command value is "0" ("0" telegram is transmitted). The same applies to the object "Cooling status object".

The signal objects can be enabled by the "Heating status object" or "Cooling status object" parameters in the parameter branch "Room temperature controller x -> RTCx - General -> Status". The control algorithm controls the signal objects. Please note that the command values are recalculated every 30 s, thus updating the signal objects.

Controller status

The room temperature controller can transmit its current status to the KNX. A choice of data formats is available for this. The parameter "Status" in the parameter node "RTCx - General -> Enabled functions" enables the parameter page "Status". The different status objects can be activated there individually.

- The KNX-compliant controller status feedback is harmonised on a manufacturer-independent basis.
- The objects "Controller status RHCC - KNX compliant", "Controller status RTC - KNX compliant" and "Controller status RTSM - KNX compliant" display elementary basic functions of the controller.
- These objects are supplemented by the two 1-byte objects "Operating mode status" and "Forced operating mode status" (DPT 20.102), which report back the operating mode actually set at the controller. The last two objects mentioned above are generally used to enable controller extensions to display the controller operating mode correctly in the KNX compliant status display. Therefore, these objects should be connected with controller extensions if the KNX-compliant status feedback is not configured.

Bit coding of the 2-byte object "Controller status RHCC - KNX compliant" (DPT 22.101)

Bit of the status telegram	Meaning on "1"	Meaning on "0"
0	Error	no error
1	not used (permanent "0")	
2	not used (permanent "0")	
3	not used (permanent "0")	
4	not used (permanent "0")	
5	not used (permanent "0")	
6	not used (permanent "0")	

Bit of the status telegram	Meaning on "1"	Meaning on "0"
7	not used (permanent "0")	
8	"Heating" operation	"Cooling" operation
9	not used (permanent "0")	
10	not used (permanent "0")	
11	not used (permanent "0")	
12	Controller disabled (dew point operation)	Controller enabled
13	Frost alarm (frost protection temperature undershot)	no frost alarm (frost protection temperature exceeded)
14	Heat alarm (heat protection temperature exceeded)	no heat alarm (heat protection temperature undershot)
15	not used (permanent "0")	

Bit coding of the 2-byte object "Controller status RTC - KNX compliant" (DPT 22.103)

Bit of the status telegram	Meaning on "1"	Meaning on "0"
0	Error	no error
1	"Heating" operation	"Cooling" operation
2	Controller disabled (dew point operation)	Controller enabled
3	Frost alarm (frost protection temperature undershot)	no frost alarm (frost protection temperature exceeded)
4	Heat alarm (heat protection temperature exceeded)	no heat alarm (heat protection temperature undershot)
5	Controller inactive (deadband)	Controller active
6	not used (permanent "0")	
7	"Heating" operation enabled	"Heating" operation disabled
8	"Cooling" operation enabled	"Cooling" operation disabled
9	not used (permanent "0")	
10	not used (permanent "0")	
11	not used (permanent "0")	
12	not used (permanent "0")	
13	not used (permanent "0")	
14	not used (permanent "0")	
15	not used (permanent "0")	

Bit coding of the 1-byte object "Controller status RTSM - KNX compliant" (DPT 21.107)

Bit of the status telegram	Meaning on "1"	Meaning on "0"
0	Window opened (For "Frost/heat protection = Automatic frost protection": – The bit is active if the automatic frost protection of the temperature drop detection is active. For "Frost/heat protection = via window status": – The bit is active if at least one window is open after the delay time has elapsed.)	no window open (For "Frost/heat protection = Automatic frost protection": – The bit is inactive if the automatic frost protection of the temperature drop detection is inactive. For "Frost/heat protection = via window status": – The bit is inactive if all windows are closed.)
1	Presence (Presence detector)	no presence (presence detector)
2	Presence (Presence button)	no presence (presence button)
3	Comfort extension active	Comfort extension inactive
4	Forced operating mode active	Forced operating mode inactive
5	not used (permanent "0")	
6	not used (permanent "0")	
7	not used (permanent "0")	

- i** Bit 0 of the 1-byte object "Controller status RTSM - KNX compliant" (DPT 21.107) becomes active, depending on the setting of the parameter "Frost/heat protection".

16.5.1 Status output parameters

Room temperature controller -> RTC ... - General -> Status

Heating / Cooling (depending on the operation of the controller)

Status object - Heating	Checkbox (yes / no)
Depending on the set operation, a separate object can be used to signal whether the controller is currently demanding heating energy and is thus actively heating. The "Yes" setting here enables the message function for heating.	

Status object - Cooling	Checkbox (yes / no)
Depending on the set operation, a separate object can be used to signal whether the controller is currently demanding cooling energy and is thus actively cooling. The "Yes" setting here enables the message function for cooling.	

Controller status

Status objects - Operating mode	Checkbox (yes / no)
The room temperature controller can transmit its current status to the KNX. If the parameter is activated, the objects "Operating mode - Preset - Status", "Operating mode - Active mode - Status" and "Operating mode - Forced - Status" are visible.	

Status object – RHCC	Checkbox (yes / no)
The room temperature controller can transmit its current status to the KNX. If the parameter is activated, the object "Controller status RHCC" is visible.	

Status object – RTC	Checkbox (yes / no)
The room temperature controller can transmit its current status to the KNX. If the parameter is activated, the object "Controller status RTC" is visible.	

Status object – RTSM	Checkbox (yes / no)
The room temperature controller can transmit its current status to the KNX. If the parameter is activated, the object "Controller status RTSM" is visible.	

16.5.2 Objects for controller status

Function	Name	Type	DPT	Flag
Operating mode - Pre-set	RTR ... - Input	1-byte	20,102	C, -, W, T, U
1-byte object for change-over of the operating mode of the controller according to the KNX specification.				
After the mains voltage returns or an ETS programming operation, the current operating mode is transmitted by means of this object.				

Function	Name	Type	DPT	Flag
Operating mode - Pre-set - Status	RTR ... - Output	1-byte	20,102	C, R, -, T, A

1-byte object used by the controller to output the current operating mode. This object is generally used to enable controller extensions to display the controller operating mode correctly in the KNX compliant status display. Therefore this object should be connected with controller extensions if the KNX compliant status feedback is not configured.

After the mains voltage returns or an ETS programming operation, the current status is transmitted by means of this object. This object is only available if the parameter "Status objects - Operating mode" is activated.

Function	Name	Type	DPT	Flag
Operating mode - Forced	RTR ... - Input	1-byte	20,102	C, W, -, T, U

1-byte object for forced change-over (highest priority) of the operating mode of the controller according to the KNX specification.

Function	Name	Type	DPT	Flag
Operating mode - Forced - Status	RTR ... - Output	1-byte	20,102	C, R, -, T, A

1-byte object used by the controller to output the operating mode in the event of restraint. This object is generally used to enable controller extensions to display the controller operating mode correctly in the KNX compliant status display. Therefore this object should be connected with controller extensions if the KNX compliant status feedback is not configured.

After the mains voltage returns or an ETS programming operation, the current status is transmitted by means of this object. This object is only available if the parameter "Status objects - Operating mode" is activated.

Function	Name	Type	DPT	Flag
Controller status RHCC - KNX-compliant	RTR ... - Output	2-byte	22,101	C, R, -, T, A

2-byte object that the controller uses to display elementary basic functions in a KNX-harmonised manner (RHCC).

After the mains voltage returns or an ETS programming operation, the current status is transmitted by means of this object.

Function	Name	Type	DPT	Flag
Controller status RTSM - KNX-compliant	RTR ... - Output	1-byte	21,107	C, R, -, T, A

2-byte object that the controller uses to display elementary basic functions in a KNX-harmonised manner (RTSM).

After the mains voltage returns or an ETS programming operation, the current status is transmitted by means of this object.

Function	Name	Type	DPT	Flag
Controller status RTC - KNX-compliant	RTR ... - Output	2-byte	22,103	C, R, -, T, A

2-byte object that the controller uses to display elementary basic functions in a KNX-harmonised manner (RTC).

After the mains voltage returns or an ETS programming operation, the current status is transmitted by means of this object.

Function	Name	Type	DPT	Flag
Heating - Status	RTR ... - Output	1-bit	1,001	C, R, -, T, A

1-bit object for the controller to report a request for heating energy. Object value = "1": energy request, object value = "0": no energy request.

Function	Name	Type	DPT	Flag
Cooling - Status	RTR ... - Output	1-bit	1,001	C, R, -, T, A

1-bit object for the controller to report a request for cooling energy. Object value = "1": energy request, object value = "0": no energy request.

16.6 Boost function

The boost function can be used temporarily to heat or cool a room intensively. If the boost function is activated via the "Boost - Activate / Deactivate" object, the command value is set to maximum (ON or 100%) in the standard parameterisation for a duration of 5 minutes. After the time has elapsed, the boost switches off again automatically.

Once the boost function has elapsed, the controller checks the current actual temperature and the setpoint temperature. The command values set to maximum by the boost function are not switched off until the corresponding temperature limits are exceeded in heating mode and undershot in cooling mode.

The parameter "Boost function" in the parameter node "RTCx - General -> Enabled functions" enables the parameter page "Boost function". The remaining parameters can be set there.

The current status of the boost function and the residual time of a current boost can be sent to the bus.

-  The boost function cannot be retriggered.
-  The boost function can be aborted at any time.
-  The controller calculates the command values cyclically every 30 seconds. This can delay the adoption of the command value by a maximum of 30 s. As this delay affects switching on and off, the duration of the boost function remains unchanged.

16.6.1 Boost function parameters

Room temperature controller -> RTC ... - General -> Boost function

Effect on	Heating Cooling Heating and cooling
The boost function can optionally be used for heating only, for cooling only or for both heating and cooling. The options available for this parameter depend on the operation set on the parameter page "RTC x - General".	
In heating mode, effect on	Basic level heating Additional level heating Basic and additional level heating
In the case of heating with the basic and additional levels, the boost function can optionally have an effect on the basic level only, the additional level only or both the basic and additional levels.	

In cooling mode, effect on	Basic level cooling Additional level cooling Basic and additional level cooling
In the case of cooling with the basic and additional levels, the boost function can optionally have an effect on the basic level only, the additional level only or both the basic and additional levels.	

Heating

Boost period	1 ... 5 ... 60 min
The device performs the boost according to the configuration of this parameter for a period of 1 to 60 minutes.	
Boost - Command value	0 ... 100 %
For the configured duration, the command value is set to the value parameterised here, e. g. maximum (ON or 100%).	

Cooling

Boost period	1 ... 5 ... 60 min
The device performs the boost according to the configuration of this parameter for a period of 1 to 60 minutes.	
Boost - Command value	0 ... 100 %
For the configured duration, the command value is set to the value parameterised here, e. g. maximum (ON or 100%).	

Transmission behaviour

Cyclical transmission of residual time (0 = inactive)	0...59 min 0 ... 10...59 s
If the boost function is activated, the object "Boost - Remaining run time" can cyclically transmit the residual time of the running boost function in seconds.	

16.6.2 Objects for boost function

Function	Name	Type	DPT	Flag
Boost - Activate/Deactivate	RTR ... - Input	1-bit	1,010	C, -, W, -, U
1-bit input object for requirement-orientated activation and deactivation of the boost function. The telegram polarity is fixed: "0" = boost inactive, "1" = boost active. Updates of the object from "1" to "1" or "0" to "0" do not produce a reaction.				

Function	Name	Type	DPT	Flag
Boost - Status	RTR ... - Output	1-bit	1,011	C, R, -, T, -
1-bit object via which the controller outputs the current status of the boost function. When the boost function is activated, the status object is set to the value "1". When the boost function is deactivated, the status object is set to the value "0". After a reset, the status message object value is "0". The status object is only sent when there is a change.				

Function	Name	Type	DPT	Flag
Boost - Remaining run time	RTR ... - Output	2-byte	7,005	C, R, -, T, -
2-byte object via which the controller outputs the period of the boost function. The residual time of the boost function is transmitted via the object in 10 second increments.				

16.7 Floor temperature monitoring

The cyclical monitoring of the floor temperature can be activated in the controller in order to influence the minimum or maximum temperature of a floor heating system. If the monitoring is enabled in the ETS, the controller continuously monitors the floor temperature. If the floor temperature exceeds a specified limiting value during heating or falls below a specified limiting value during cooling, the controller switches off the corresponding command value for heating or cooling. This switches off the heating or cooling and the system cools down or heats up. The controller will only set the most recently calculated command value again when the temperature exceeds / falls below the limiting value minus a hysteresis of 1 K.

-  With a pulse width-modulated command value, the temperature limit only switches off the command value when the current PWM time cycle has elapsed.
-  Depending on the configuration, the temperature may have a strong impact on the controller behaviour. Poor parameterisation of the limit temperature (limit temperature near to the room/setpoint temperature) means that it is possible that the specified setpoint temperature for the room can never be reached!
-  The cyclical monitoring of the floor temperature is used to increase the comfort behaviour of the heating/cooling system and must not be used as a safety-relevant protection function (immediate forced switch-off of the heating/cooling performance).

Which operation the cyclical monitoring should be applied to can be set in the ETS. It is possible to limit the minimum and / or the maximum floor temperature by the parameter "Monitoring of". In two-level heating or cooling mode, it is also possible to set whether the floor temperature limit applies to the basic level only, the additional level only or both the basic and additional levels.

The underfloor heating temperature to be monitored is fed into the controller via the KNX communication object "Floor temperature - Measured value". This object can be used to inform the controller of the current floor temperature using suitable temperature value telegrams from other bus devices (e. g. analogue input with temperature sensor, etc.).

The minimum and maximum limit temperatures the underfloor heating system is permitted to reach are specified in the ETS via the parameters "Maximum permissible floor temperature" and "Minimum permissible floor temperature". The temperatures can be set to a value between 10 ... 45 °C. If the limit temperature is exceeded in heating mode or fallen below in cooling mode, the controller switches the floor heating system off via the command value. As soon as the floor temperature has fallen 1 K below the limit temperature in heating mode or risen 1 K above the limit temperature in cooling mode, the controller switches the command value on again, assuming this is provided for in the control algorithm. The hysteresis 1 K is fixed.

- i** The cyclical monitoring does not affect the "Heating" or "Cooling" message telegrams. If the floor temperature exceeds or falls below the limiting value, only the command value is switched off. In this case, the "Heating" or "Cooling" message remains active.
- i** The limiting temperatures for minimum and maximum are not checked for plausibility. The following generally applies: "Minimum permissible floor temperature" < allowed floor temperature range < "Maximum permissible floor temperature".

16.7.1 Floor temperature monitoring parameters

Room thermostat -> RTR ... - General -> Floor temperature monitoring

Monitoring of	Maximum floor temperature Minimum floor temperature Maximum and minimum floor temperature
This parameter determines which operation the cyclical floor temperature monitoring should be applied to. Either heating (maximum floor temperature), cooling (minimum floor temperature) or heating and cooling can be limited.	
Effect on	Basic level Additional level Basic and additional level
Depending on which heating or cooling circuit is used for the floor, this parameter defines which level is affected by the floor temperature monitoring.	

Heating

Maximum permissible floor temperature	10 ... 35 ... 45 °C
The maximum limit temperature which the floor may reach in heating mode is specified here. If this temperature is exceeded, the controller switches the underfloor heating system off using the command value. As soon as the floor temperature has fallen 1 K under the limit temperature, the controller switches the command value on again, assuming that this is provided for in the control algorithm.	

Cooling

Minimum permissible floor temperature	10 ... 45 °C
The minimum limit temperature which the floor may reach in cooling mode is specified here. If the temperature falls below this value, the controller switches the underfloor cooling system off using the command value. As soon as the floor temperature has risen 1 K above the limit temperature, the controller switches the command value on again, assuming that this is provided for in the control algorithm.	

16.7.2 Objects for floor temperature monitoring

Function	Name	Type	DPT	Flag
Floor temperature - Limiting value exceeded/undershot - Status	RTR ... - Output	1-bit	1,011	C, R, -, T, A

1-bit object for the status output of the monitoring of the configured limiting values of the floor temperature. If the monitoring is enabled in the ETS, the controller continuously monitors the floor temperature. If the floor temperature exceeds a specified limiting value during heating or falls below a specified limiting value during cooling, the controller switches off the corresponding command value for heating or cooling. This switches off the heating or cooling. The controller will only set the most recently calculated command value again when the temperature exceeds / falls below the limiting value minus a hysteresis of 1 K again.

Function	Name	Type	DPT	Flag
Floor temperature - Measured value	RTR ... - Input	2-byte	9,001	C, -, W, -, U

2-byte object for coupling an external temperature sensor for floor temperature monitoring.

The temperature value must always be specified in the format "°C".

16.8 Setpoint temperature limit, cooling

In accordance with statutory requirements in Germany and elsewhere, the temperature at the workplace should be a maximum of 26 °C, or at least 6 K below outdoor temperatures higher than 32 °C. Exceeding these limits is only permissible in exceptional circumstances. To meet these requirements, the room temperature controller offers a setpoint temperature limit, which is only effective in cooling mode. If necessary, the controller limits the setpoint temperature to specific values and prevents an adjustment beyond the limits.

The parameter "Limitation type" in the parameter node "Room temperature controller -> RTC x - General -> Setpoint temperature limit, cooling" can activate the limit and specify its function. The following settings are possible:

- Setting "Only difference to outdoor temperature"

In this setting, the outdoor temperature is monitored and compared to the active setpoint temperature. The desired maximum temperature difference to the outdoor temperature can be specified in the range between 1 K and 15 K. The specification is made using the parameter "Difference between setpoint temperature and outdoor temperature of". The value can be set in step widths of 1 K.

If the outdoor temperature rises above the value of the parameter "Limit above outdoor temperature of", then the controller activates the setpoint temperature limit. It then permanently monitors the outdoor temperature and raises the setpoint temperature so that it is beneath the outdoor temperature by the amount configured. Should the outdoor temperature continue to rise, the controller raises the setpoint temperature until the required difference to the outdoor temperature is achieved. It is then not possible to undershoot the raised setpoint, e. g. by changing the basic setpoint change.

The change to the setpoint temperature limit is temporary. It only applies for as long as the outdoor temperature exceeds the value of the parameter "Limit above outdoor temperature of".

With the setpoint temperature limit, the configured temperature difference relates to the setpoint temperature of the Comfort mode for cooling. In other operating modes, the temperature distance to Comfort mode must be taken into account.

Example:

In the ETS, the difference between the setpoint temperature and the outdoor temperature is set to 6 K. The standby setpoint temperature is configured to 2 K higher than the comfort setpoint temperature. The result of this is that, for command value limiting, the setpoint temperature in Standby mode may only be a maximum of 4 K below the outdoor temperature. The setpoint temperature limit applies to Night mode in the same way.



The automatic raising of the setpoint temperature by the setpoint temperature limit goes only as far as the configured heat protection temperature. Therefore the heat protection temperature can never be exceeded.

- i A basic setpoint shift never affects an active setpoint temperature limit with differential measurement to the outdoor temperature! In this case, the setpoint temperature limit only works with the unshifted basic setpoint. A setpoint shift active before the limitation is restored after the limitation, if it was not reset in another way, e. g. by an operating mode switchover.
- i If the setpoint temperature limit is active, the difference between the basic cooling and additional cooling levels is not taken into account. The command values for both levels are identical. Only when the temperature falls below the limit temperature is the difference between the levels considered again.
- Setting "only maximum setpoint temperature"
In this setting, no setpoint temperatures that are greater than the maximum setpoint temperature configured in the ETS are permitted in cooling mode for the Comfort, Standby and Night modes. The maximum setpoint temperature is specified in the parameter "Maximum setpoint temperature in cooling mode" and can be configured within the limits 20 °C to 35 °C in steps of 1 °C. With an active limit, no larger setpoint can be set in cooling operation, e. g. by a basic setpoint change or a setpoint shift. However, heat protection is not influenced by the setpoint temperature limit.
The maximum setpoint temperature configured in the ETS generally relates to the comfort setpoint temperature of cooling mode. In other operating modes, the temperature distance to Comfort mode must be taken into account. Example...
The maximum setpoint temperature is configured to 26 °C. The standby setpoint temperature is configured to 2 K higher than the comfort setpoint temperature. The result of this is that, for command value limiting, the setpoint temperature in Standby mode is limited to 28 °C. The setpoint temperature limit applies to Night mode in the same way.
- Setting "Maximum setpoint temperature and difference to outdoor temperature"
This setting is a combination of the two above-mentioned settings. In the downward direction, the setpoint temperature is limited by the maximum outdoor temperature difference, whilst in the upward direction, the limit is made by the maximum setpoint.
The maximum setpoint temperature has priority over the outdoor temperature difference. This means that the controller keeps on raising the setpoint temperature according to the difference to the outdoor temperature configured in the ETS until the maximum setpoint temperature or the heat protection temperature is exceeded. Then the setpoint is limited to the maximum value.

A setpoint limit enabled in the ETS can be activated or deactivated as necessary using a 1-bit object. For this, the parameter "Activation" can be set to "via object". In this case, the controller only takes the setpoint limit into account if it has been enabled via the object "Setpoint temperature limit - Activate / Deactivate" ("1" telegram). If the limitation is not enabled ("0" telegram), the cooling setpoint temperatures are not limited. After a device reset (bus voltage return, ETS programming operation), the object value is "0", meaning that the setpoint limit is inactive.

- i The setpoint limit has no function in Heating mode.

Status message of the setpoint temperature limit

If a setpoint temperature limit is active, this is signalled to the bus via the object "Setpoint temperature limit - Status". This makes it possible for the user to recognise a changed temperature setpoint. After a reset, the status message object value is "0". This corresponds to the normal setpoint of the operating modes "Comfort", "Standby" and "Night". The setpoint temperature status is only sent when there is a change.

16.8.1 Setpoint temperature limit parameters

Room temperature controller -> RTC ... - General -> Setpoint temperature limit for cooling

Limitation type	only difference to outdoor temperature only maximum setpoint temperature maximum setpoint temperature and difference to outdoor temperature
The variable on which the setpoint temperature limit depends can be defined here. "only difference to outdoor temperature": In this setting, the outdoor temperature is monitored and compared with the active setpoint temperature. The specification of the maximum temperature difference to the outdoor temperature is made using the "Difference to outdoor temperature in cooling mode" parameter. If the outdoor temperature rises above 32 °C, then the controller activates the setpoint temperature limit. It then permanently monitors the outdoor temperature and raises the setpoint temperature so that is beneath the outdoor temperature by the amount configured. Should the outdoor temperature continue rising, the controller raises the setpoint temperature until the required difference to the outdoor temperature is reached, or, at most, the heat protection temperature. It is then not possible to undershoot the raised setpoint, e. g. by changing the basic setpoint change. The change to the setpoint temperature limit is temporary. It only applies for as long as the outdoor temperature exceeds 32 °C. "only maximum setpoint temperature": In this setting, no setpoint temperatures that are greater than the maximum setpoint configured in the ETS are permitted in cooling mode for the Comfort, Standby and Night modes. The maximum temperature setpoint is specified by the "Max. setpoint temperature in cooling operation" parameter. With an active limit, no larger setpoint can be set in cooling operation, e. g. by a basic setpoint change or a setpoint shift. However, heat protection is not influenced by the setpoint temperature limit. "maximum setpoint temperature and difference to outdoor temperature": This setting is a combination of the two above-mentioned settings. In the downward direction, the setpoint temperature is limited by the maximum outdoor temperature difference, whilst in the upward direction, the limit is made by the maximum setpoint. The maximum setpoint temperature has priority over the outdoor temperature difference. This means that the controller keeps on raising the setpoint temperature according to the difference to the outdoor temperature configured in the ETS until the maximum setpoint temperature or the heat protection temperature is exceeded. Then the setpoint is limited to the maximum value.	
Limit from an outdoor temperature of	20...32...45 °C
This parameter defines the outdoor temperature at which limitation of the setpoint temperature becomes active in cooling mode.	

Difference between setpoint temperature and outdoor temperature of	1 ...6 ...15 K
This parameter defines the maximum difference between the setpoint temperature in Comfort mode and the outdoor temperature with an active setpoint temperature limit. This parameter is visible only if setpoint temperature monitoring is enabled. However, this is only if the parameter "Setpoint temperature limit in cooling operation" is then set to "Only difference to outdoor temperature" or "Max. setpoint temperature and difference to outdoor temperature".	
Maximum setpoint temperature	+20 ... +26 ... +35 °C
This parameter defines the maximum setpoint temperature in Comfort mode with an active setpoint temperature limit. This parameter is visible only if setpoint temperature monitoring is enabled. However, this is only if the parameter "Setpoint temperature limit in cooling operation" is then set to "Only max. setpoint temperature" or "Max. setpoint temperature and difference to outdoor temperature".	
Activation	via object permanently active
A setpoint limit enabled in the ETS can be activated or deactivated as necessary using a 1-bit object. For this, this parameter can be set to "Yes". In this case, the controller only takes the setpoint limit into account, if it has been enabled via the object "Cooling setpoint temperature limit" ("1" telegram). If the limitation is not enabled ("0" telegram), the cooling setpoint temperatures are not limited. This parameter is visible only if setpoint temperature monitoring is enabled.	

16.8.2 Objects for setpoint temperature limit

Function	Name	Type	DPT	Flag
Setpoint temperature limit - Activate / Deactivate	RTR ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for activation or deactivation of a setpoint temperature limit. – "0" = deactivate raising of setpoint – "1" = activate raising of setpoint If the activation of the setpoint limit is set to "permanently active", the communication object will not be visible.				
Function	Name	Type	DPT	Flag
Setpoint temperature limit - Status	RTR ... - Output	1-bit	1,011	C, R, -, T, A
1-bit object for signalling an active setpoint temperature limit. – "0" = raising of setpoint not active – "1" = raising of setpoint active				

Function	Name	Type	DPT	Flag
Outdoor temperature - Measured value	RTR ... - Input	2-byte	9,001	C, -, W, -, U
The measured value of the outdoor temperature is required if a direct dependency between the setpoint temperature and the outdoor temperature is to be established. When the "Cooling setpoint temperature limit" or "Heating setpoint temperature increase" functions are activated, such a connection exists and this object becomes visible.				

16.9 Setpoint temperature increase, heating

The room temperature controller offers a setpoint temperature increase, which is only effective in heating mode.

The comfort and standby setpoints are raised gradually as the outdoor temperature falls. This counteracts the radiative cooling from outdoor walls in winter, increasing the sense of well-being. The working range can be configured and is defined via the parameter "Raise from difference between setpoint temperature and outdoor temperature of".

The following values are used for calculation of the setpoint temperature increase:

- Setpoint temperature (before increase)
- current outdoor temperature
- configured difference between setpoint temperature and outdoor temperature
- Increase factor

These values are used in the following formula:

Setpoint temperature increase = Setpoint temperature + (Setpoint temperature - (Outdoor temperature + Difference between setpoint temperature and outdoor temperature)) x Increase factor

Example for setpoint temperature increase:

- Heating Comfort mode setpoint temperature = Specified setpoint temperature = 21 °C
- Difference between setpoint temperature and outdoor temperature = 10 K
- Increase factor = 10

Outdoor temperature = 11 °C, Preset setpoint + (Preset setpoint (Outdoor temperature + Difference between setpoint temperature and outdoor temperature) x Factor) = 21.0 °C

-> Set setpoint temperature = Specified setpoint temperature = 21 °C

Outdoor temperature = 10 °C, Preset setpoint + (Preset setpoint (Outdoor temperature + Difference between setpoint temperature and outdoor temperature) x Factor) = 21.1 °C

-> Set setpoint temperature = Calculated setpoint temperature = 21.1 °C

Outdoor temperature = 9 °C, Preset setpoint + (Preset setpoint (Outdoor temperature + Difference between setpoint temperature and outdoor temperature) x Factor) = 21.2 °C

-> Set setpoint temperature = Calculated setpoint temperature = 21.2 °C

Outdoor temperature = 8 °C, Preset setpoint + (Preset setpoint (Outdoor temperature + Difference between setpoint temperature and outdoor temperature) x Factor) = 21.3 °C

-> Set setpoint temperature = Calculated setpoint temperature = 21.3 °C

If the value of the shifted outdoor temperature (grey characteristic line) falls below the value of the specified setpoint temperature (green characteristic line), the calculated setpoint temperature (blue characteristic line) becomes active. When setpoint tem-

perature increase is activated, the calculated setpoint is then set as the setpoint temperature. Correspondingly, the specified setpoint temperature is reactivated when the calculated setpoint temperature value falls below the specified setpoint temperature.

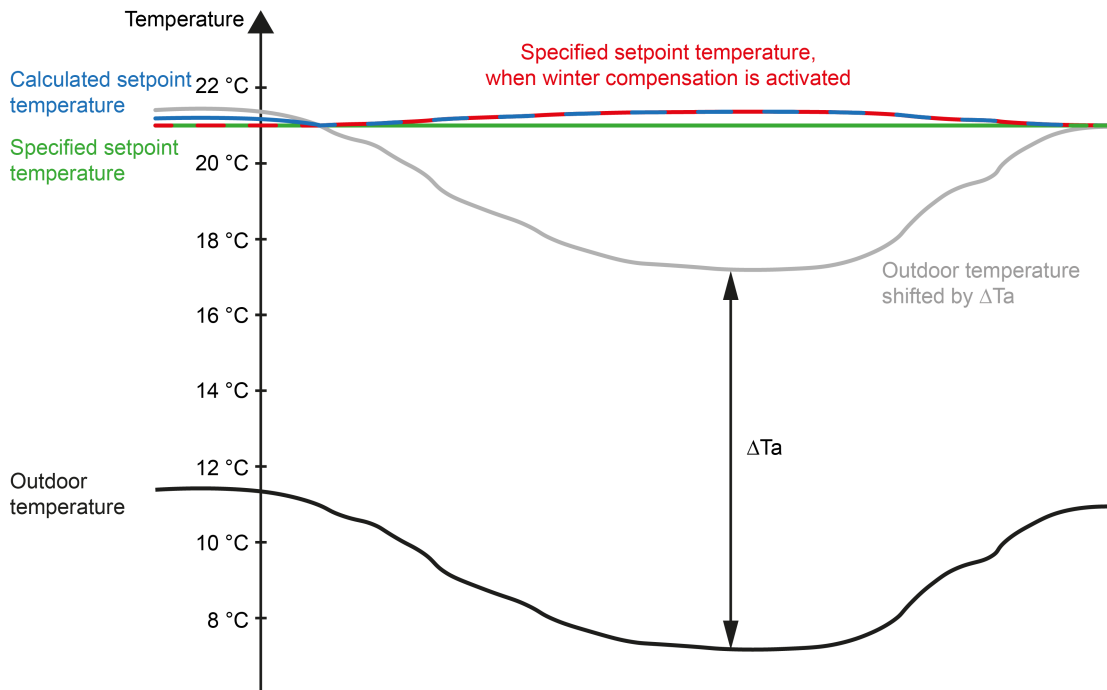


Figure 106: Example for winter compensation

ΔT_a configured difference between setpoint temperature and outdoor temperature

Additional information about setpoint temperature increase, heating

- The precondition for "setpoint temperature increase, heating" is reception of a valid outdoor temperature.
- Setpoints shifted by "setpoint temperature increase, heating" are checked against the frost and heat protection temperatures and if they fall below or exceed them respectively, they are restricted to these values.
- The "setpoint temperature increase, heating" only works in the operating modes Comfort and Standby.
- Switching between heating and cooling changes the operation; which is the corresponding precondition for "setpoint temperature increase, heating".
- "Cooling" operation switches "setpoint temperature increase, heating" to inactive and sets its offset to the value "0".
- An operating mode switchover to Comfort or Standby operating mode does not affect the "setpoint temperature increase, heating". By contrast, the Night and Frost/heat protection modes switch the "setpoint temperature increase, heating" to inactive.

Status message of setpoint temperature increase, heating

If "setpoint temperature increase, heating" is active, this is signalled to the bus via the object "Setpoint temperature increase - Status". This makes it possible for the user to recognise a changed temperature setpoint. After a reset, the status message object value is "0". This corresponds to the normal setpoint of the operating modes "Comfort", "Standby" and "Night". The setpoint temperature status is only sent when there is a change.

16.9.1 Setpoint temperature increase parameters

Increase beyond difference between setpoint temperature and outdoor temperature of	10 ...15 ...20 K
This parameter defines the difference between the setpoint temperature and the outdoor temperature beyond which the setpoint temperature increase gradually takes effect.	
Increase factor	0...0.2
This parameter defines the intensity of the setpoint temperature increase	

16.9.2 Objects for setpoint temperature increase

Function	Name	Type	DPT	Flag
Setpoint temperature increase - Status	RTR ... - Output	1-bit	1,011	C, R, -, T, A
1-bit object for signalling an active setpoint temperature increase.				
- "0" = raising of setpoint not active - "1" = raising of setpoint active				

16.10 Scenes

Up to 64 scenes can be created for the room temperature controller and scene values (operating mode) stored. The scene values are recalled or stored via a separate scene extension object. The data point type of the extension object allows all scenes to be addressed.

The scene function must be enabled on the parameter page "Room temperature controller -> RTCx - General -> Enabled functions" so that the required communication objects and parameters (on the parameter page "Room temperature controller -> RTCx - General -> Scenes") become visible.

The scene configuration selected in the parameterization decides whether the number of scenes is either variable (1 ... 64) or alternatively fixed to the maximum (64).

- Scene configuration = "variable (1 ... 64 scenes)"
With this setting, the number of scenes used can be selected anywhere in the range 1 to 64. The parameter "Number of scenes" decides how many scenes are visible in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene.
- Scene configuration = "fixed (64 scenes)"
With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 64) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.

The scene function can be combined together with other functions of the room temperature controller, whereby the last received or set state is always executed.

Presetting a scene recall delay

Each scene recall of the room temperature controller can also be optionally delayed. With this feature, dynamic scene sequences can be configured if several scene outputs are combined with cyclical scene telegrams.

Prerequisite

The scene function must be enabled on the parameter page "Room temperature controller -> RTCx - General -> Enabled functions".

- On the parameter page "Room temperature controller -> RTCx - General -> Scenes", activate the parameter "Delay scene recall".

The delay time is now activated and can be configured separately. The delay only affects the scene recall of the room temperature controller. The delay time is started on arrival of a recall telegram. Only after the time has elapsed is the corresponding scene called up and the operating mode set.

- i** Each scene recall telegram restarts the delay time and retriggers it. If a new scene recall telegram is received while a delay is active (scene recall not yet executed), the old (and not yet recalled scene) will be rejected and only the scene last received executed.

- i** The scene recall delay has no influence on the storage of scene values. A scene storage telegram within a scene recall delay terminates the delay and thus the scene recall.

Setting the behaviour during ETS programming

When saving a scene, the operating modes are stored internally in the device in a non-volatile manner. To ensure that the stored values are not replaced by the originally programmed scene operating modes during an ETS programming operation of the application program or the parameters, the actuator can prevent the operating modes from being overwritten. As an alternative, the original values can be reloaded into the device during each programming run of the ETS.

Prerequisite

The scene function must be enabled on the parameter page "Room temperature controller x -> RTCx - General -> Enabled functions".

- Activate the parameter "Overwrite values stored in the device during the ETS programming operation" on the parameter page "Room temperature controller x -> RTCx - General -> Scenes".

With each ETS programming operation of the application program or the parameters, the scene operating modes configured in the ETS are programmed into the actuator. This may overwrite the scene operating modes stored in the device by means of a storage function.

- Deactivate the parameter "Overwrite values stored in the device during the ETS programming operation".

Scene operating modes that may have been stored in the device by means of a storage function are maintained. If no scene switching states have been stored, the last operating modes programmed in by the ETS remain valid.

- i** When commissioning the actuator for the first time, the parameter should be activated so that the operating mode is initialised to valid scene operating modes.

Presetting scene numbers and scene operating modes

The presetting of the scene number can be defined for each scene of the room temperature controller, by which scene number (1...64) the scene is addressed, i.e. called up or stored.

The data point type of the scene extension object permits addressing of up to 64 scenes max.

In addition to defining the scene number, it must be defined which scene command (Comfort mode, Standby mode, Night mode, Frost/heat protection) is to be set when a scene is called up on the room temperature controller.

Prerequisite

The scene function must be enabled on the parameter page "Room temperature controller x -> RTCx - General -> Enabled functions".

- On the parameter page "Room temperature controller x -> RTCx - General -> Scenes", set the parameter "Scene number" for each scene to the number by which the scenes are to be addressed.

A scene can be addressed with the configured scene number. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible.

- i** If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.
- On the parameter page "Room temperature controller RTC -> RTC - General -> Scenes", set the "Operating mode" parameter for each scene to the desired operating mode.

With a scene recall, the configured operating mode is recalled and set at the room temperature controller.

- i** The configured operating mode is adopted in the actuator during an ETS programming operation only if the parameter "Overwrite values stored in the device during the ETS programming operation" is activated.

Setting the storage behaviour

The operating mode set on the room temperature controller can be stored internally when a scene storage telegram is received via the extension object. The operating mode can be influenced by all functions of the room temperature controller before storage, provided that the individual functions are also enabled.

Prerequisite

The scene function must be enabled on the parameter page "Room temperature controller x -> RTCx - General -> Enabled functions".

- On the parameter page "Room temperature controller x -> RTCx - General -> Scenes", activate the "Storage function" parameter for each scene.

The storage function is activated for the scene in question. On receipt of a storage telegram by means of the "Scenes - Extension unit" object, the current operating mode will be stored internally.

- Deactivate the parameter "storage function" for each scene.

The storage function is deactivated for the scene in question. A storage telegram received via the "Scenes - Extension unit" object will be rejected.

Configuring an extended scene recall

The extended scene recall allows calling of up to 64 scenes of a room temperature controller in sequence. Here, scene recall takes place via the 1-bit communication object "Scenes - Extended scene recall". Each ON telegram received via this object recalls the next of the available scenes in the configuration. Each OFF telegram received recalls the previous scene.

With the extended scene recall, the controller always recalls the neighbouring scene

- starting with the scene most recently recalled via the extended recall. It is irrelevant whether the scene is active (scene number = "1...64" or scene active) or inactive (scene number = "0" or scene inactive). If an inactive scene is recalled via the extended scene recall, the room temperature controller will not react.

Only the scenes available in the scene configuration can be selected via the extended scene recall (with "variable" defined by the parameter "number of scenes", with "fixed" always all 64 scenes). After a reset (bus voltage return, ETS programming operation), an ON or OFF telegram always recalls scene 1 first.

Recall of a scene via the 1-byte extension object does not influence the scene sequence of the extended scene recall. The two recall functions work independently of each other.

- On the parameter page "Room temperature controller -> RTCx - General -> Scenes", activate the parameter "Extended scene recall".

The object "Scenes - Extended scene recall" is available. Each ON telegram recalls the next scene. Each OFF telegram recalls the previous scene.

- Deactivate the parameter "Extended scene recall".

The extended scene recall is deactivated. A scene recall can only take place via the 1-byte scene extension object.

The extended scene recall can take place with or without an overflow at the scene limits. An overflow occurs when the last scene of the selected configuration is reached when counting up or scene 1 when counting down and an additional telegram in the last counting direction is received by the actuator. The overflow behaviour is defined in the ETS.

- Activate the parameter "with overflow".

After reaching the last scene of the selected configuration, a further ON telegram of the overflow is executed and scene 1 is recalled. Similarly, after reaching scene 1, the overflow is executed by further OFF telegram and the last scene of the selected configuration is recalled.

- Deactivate the parameter "With overflow".

A scene overflow is not possible. After reaching the last scene of the selected configuration, further ON telegrams of the extended scene recall are ignored. In the same way, the actuator ignores further OFF telegrams if scene 1 was recalled last.

16.10.1 Scene parameters

Room temperature controller -> RTC ... - General -> Enabled functions

Scenes	Checkbox (yes / no)
This parameter can be used to disable or to enable the scene function.	

Room temperature controller -> RTC ... - General -> Scenes

Delay scene recall	Checkbox (yes / no)
A scene is recalled via the scene extension object. If required, the scene recall can be delayed on reception of a recall telegram (parameter activated). The recall is alternatively made immediately on reception of the telegram (parameter deactivated).	

Delay time	0 ... 59 min, 0...10...59 s
This parameter specifies the length of the scene delay time. Sets the scene delay time in minutes.	

Overwrite values stored in the device during the ETS programming operation	Checkbox (yes / no)
During storage of a scene, the scene values are stored internally to memory in the device. To prevent the stored values from being replaced during ETS programming by the originally programmed scene values, the actuator can inhibit overwriting of the scene values (parameter deactivated). As an alternative, the original values can be reloaded into the device during each programming run of the ETS (parameter activated).	

Extended scene recall	Checkbox (yes / no)
The extended scene recall allows calling of up to 64 scenes of a controller in sequence. Here, scene recall takes place via the 1-bit communication object "Scenes - Extended scene recall". Each ON telegram received via this object recalls the next scene. Each OFF telegram received recalls the previous scene. This parameter enables extended scene recall, if required.	

With overflow	Checkbox (yes / no)
The extended scene recall can take place with or without an overflow at the scene limits. An overflow occurs when the last scene of the selected configuration is reached when counting up or scene 1 when counting down and an additional telegram in the last counting direction is received by the actuator. Parameter activated: After reaching the last scene of the selected configuration, a further ON telegram of the overflow is executed and scene 1 is recalled. Similarly, after reaching scene 1, the overflow is executed by further OFF telegram and the last scene of the selected configuration is recalled. Parameter deactivated: A scene overflow is not possible. After reaching the last scene of the selected configuration, further ON telegrams of the extended scene recall are ignored. In the same way, the actuator ignores further OFF telegrams if scene 1 was recalled last. This parameter is only visible when the extended scene recall is used.	

Scene configuration	Variable (1 ... 64 scenes) fixed (64 scenes)
The scene configuration selected here decides whether the number of scenes is either variable (1 ... 64) or alternatively fixed to the maximum (64). variable (1...64 scenes): In this setting, the number of scenes used can be selected anywhere within the range of 1 to 64. The parameter "Number of scenes" decides how many scenes are visible for the switching output in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene. fixed (64 scenes): With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 64) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.	
Number of scene assignments	1 ... 10 ... 64
This parameter defines how many scenes are visible for the room temperature controller in the ETS and can therefore be used. This parameter is visible only if the scene configuration is set to "variable".	
Scene number	0 ... 1*... 64 *: The predefined scene number is dependent on the scene (1...64).
It is possible to preset which scene number (1 ... 64) controls each scene. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible. If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.	
Operating mode	Comfort mode Standby mode Night mode Frost/heat protection mode
This parameter is used for configuring the operating mode which is set when the scene is recalled.	
Memory function	Checkbox (yes / no)
If the parameter is activated, the storage function of the scene is enabled. The current operating mode can then be stored internally via the extension object on receipt of a storage telegram. If the parameter is deactivated, the storage telegrams are rejected.	

16.10.2 Objects for scenes

Function	Name	Type	DPT	Flag
Scenes - Extension unit	RTR ... - Input	1-byte	18,001	C, -, W, -, U
1-byte object for calling or saving a scene.				

Function	Name	Type	DPT	Flag
Scenes - Extended scene recall	RTR ... - Input	1-bit	1,001	C, -, W, -, U
1-bit object for extended scene recall. Each ON telegram received recalls the next scene of a controller in sequence. Each OFF telegram received recalls the previous scene. After a reset (bus voltage return, ETS programming operation), an ON or OFF telegram always recalls scene 1 first.				

17 Logic functions

The device has a very flexible way of using logic functions. It is possible to choose between the simple and the extended logic function.

The **simple logic functions** offers the following options:

- Up to eight logic functions can be activated.
- Logic gates (e. g. AND, OR, exclusive OR, each with up to 4 inputs) can be set up and thus switching and status information can be linked and evaluated.
- A one-bit to one-byte converter and a disabling element with filter and time functions can be configured for each logic function.
- Comparators or limit value switches with hysteresis can be set as a logic function.
- The logic functions have their own KNX communication objects and can process telegrams of the actuator or of other bus devices.

The **extended logic functions** offers the following options:

- Up to ten logic functions can be activated
- User-defined logic functions or configuration template for lighting control.
- Each user-defined logic function possesses up to 8 1-bit trigger inputs for the activation of a logical calculation.
- An optional filter stage allows the hiding of trigger results (e. g. "only react to switch-on commands" or "only react when dimming level greater than 50 %").
- Operations can be executed at 1 to 4 levels and can be configured in a user-defined manner to the types "Logic" (e. g. AND, OR, exclusive AND, exclusive OR, each with up to 8 inputs), "Arithmetic" (e. g. addition, subtraction, multiplication, division, percent), "Comparison" (e. g. equal, unequal, greater than, smaller than, area test) or "Type conversion".
- Operators can be constants, input or output objects. A result stage allows the evaluation, forwarding and, if necessary, also the conversion of results of logical operations.
- To simplify the configuration of a logic function, lighting control is available as a configuration template. Alternatively to a user-defined configuration, lighting control can be activated for logic functions 1 and 2 and allows "Welcome" or "Goodbye" control for the lighting in a hotel room or similar applications (e. g. welcome light on entering a house or central switch-off on leaving an apartment).
- All the logic functions use groups of input and output objects with a defined number and defined data types (32 x 1-bit, 16 x 4-bit, 16 x 1-byte, 16 x 2-byte, 8 x 4-byte).
- Sensible linking of input and output objects allows the networking of logic functions, permitting the execution of complex operations.
- The inputs and outputs are available via communication objects on the KNX

Selecting logic functions and configuring their number

To be able to use logic functions, they must be selected on the "General" parameter page.

- The "Logic functions" parameter can be used to select whether no logic functions, the simple logic functions or the extended logic functions are to be used. If one of the logic functions is selected, the number of logic functions must also be selected.

If "None" is selected, no logic function will be visible.

If you select "Simple logic functions" or "Extended logic functions", the "Logic functions" parameter node that contains additional parameter pages will become available. The configuration of the logic functions takes place in this parameter node.

Configure the "Number of logic functions" parameter to the desired value; with a different number of logic functions available for the simple and extended logic functions.

Logic functions can be enabled in steps so that the number of visible functions and, in consequence, the available parameters and communication objects are visible in the ETS.

-  The application program deletes existing logic functions from the configuration if the number of available functions is reduced.

17.1 Simple logic functions

The device contains up to eight simple logic functions. Simple logical operations in a KNX installation can be performed using these functions. Linking of input and output objects allows the networking of logic functions, permitting the execution of complex operations.

17.1.1 Logic functions parameters

General -> Enabled functions

Logic functions	none simple logic function extended logic function
This parameter allows you to differentiate between simple or extended logic functions or no logic function at all. If the simple or extended logic function is activated, the "Logic functions" parameter node will become available, which contains additional parameter pages. The configuration of the logic functions takes place in this parameter node.	
Number of logic functions (1...8)	1...8
The number of required logic functions is defined here.	

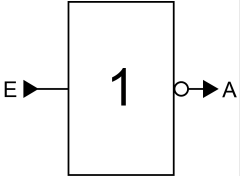
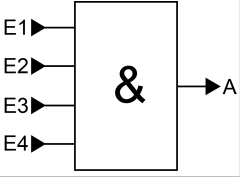
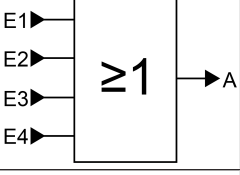
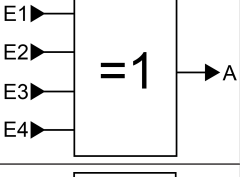
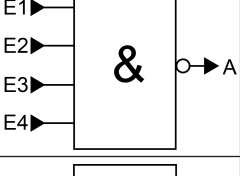
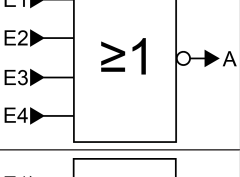
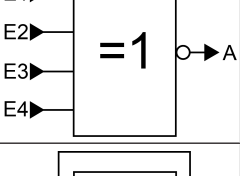
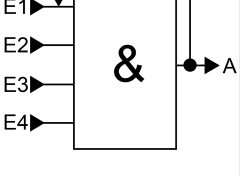
Logic functions -> Logic function...

Name of logic function	Free text
The text entered in this parameter is applied to the name of the communication objects and is used to label the logic function in the ETS parameter window (e. g. "limit value switch outside temperature", disabling of venetian blind garden door). The text is not programmed in the device.	

Type of logic function	Logic gate Converter (1-bit -> 1-byte) Disabling element (filtering/time) Comparator Limit value switch with hysteresis
It is possible to be define which logical operation is to be executed for each logic function. This parameter is visible only if the simple logic functions have been set on the "General" parameter page. Logic gate: The logic function works as a Boolean logic gate with optionally 1 ... 4 inputs and one output. Converter (1-bit -> 1-byte): The logic function is configured as a converter. The converter has a 1-bit input and a 1-byte output and also a disabling object. ON / OFF telegrams can be converted to preconfigured values. The disabling object is able to deactivate the converter. Disabling element (Filtering/Time): The logic function is configured as a disabling element. The disabling element has a 1-bit input and a 1-bit output. This logic function can delay input signals depending on the state (ON or OFF) and output them filtered at the output. A disabling object is also available, which can be used to deactivate the disabling element. Comparator: The logic function works as a comparator with an input whose data format can be parameterised, and with a 1-bit output to output the result of the comparison operation. The reference function and the reference value are configured in the ETS. Limit value switch with hysteresis: The logic function acts like a limit switch with hysteresis. An input with a configurable data format and a 1-bit output are available. The hysteresis is determined by an upper and lower threshold. The threshold values can be parameterised in the ETS. The input value is compared with the threshold values. The command at the output (ON / OFF) upon exceeding or falling below the configured threshold values can be configured.	

17.1.2 Logic gate

A logic gate has up to 4 Boolean inputs (1-bit) and one logic output (1-bit). In consequence, a logic operation only supports the 1-bit data format. The following table shows configurable comparison operations Logic gate and explains their function.

Logic gate	Description	Icon
Invert (NOT)	The logic gate has only one input. The input is forwarded to the gate output inverted.	
AND (AND)	Logic gate has 4 inputs. The output is "1" if all inputs are "1". Otherwise the output is "0".	
OR (OR)	Logic gate has 4 inputs. The output is "0" if all inputs are "0". Otherwise the output is "1".	
Exclusive OR (XOR)	Logic gate has 4 inputs. The output is "1" if only one input is "1". Otherwise the output is "0".	
inverted And (NAND)	Logic gate has 4 inputs. The output is "0" if all inputs are "1". Otherwise the output is "1".	
inverted Or (NOR)	Logic gate has 4 inputs. The output is "1" if all inputs are "0". Otherwise the output is "0".	
inverted Exclusive OR (NXOR)	Logic gate has 4 inputs. The output is "0" if only one input is "1". Otherwise the output is "1".	
AND with feed-back (ANDR)	Logic gate has 4 inputs. The output is fed back to the first input of the gate. The output is "1" if all inputs are "1". Otherwise the output is "0". If input 1 is set to "1" and the output is still "0", the feedback of input 1 is also reset to "0". Only when	

Logic gate	Description	Icon
	inputs 2 ... 4 are "1" will a newly received "1" at input 1 cause the output to assume the logical state "1". Application: Switch light manually only at twilight -> Switch on input 1, twilight sensor on input 2 -> The manual switching signal is ignored for as long as the twilight sensor has not issued an enabling signal. The manual switching sign is only executed at twilight.	

Inputs of a logic gate can be activated or deactivated separately. This allows gates with an individual number of inputs (1 ... 4) to be implemented. As an option, it is possible to invert inputs.

The transmission behaviour of the gate output can be configured.

17.1.2.1 Logic gate parameters

Logic functions -> Logic function...

Selection logic gate	Invert (NOT) AND (AND) OR (OR) Exclusive OR (XOR) inverted And (NAND) inverted Or (NOR) inverted Exclusive OR (NXOR) AND with feedback (ANDR)
This parameter defines the function of the logic gate and is only visible if "Type of logic function = logic gate". Invert (NOT): The inverter is configured. The gate has one input and one output. The Boolean data value of the input is forwarded to the output inverted. And (AND): An AND gate is configured. The gate has 1...4 inputs and one output. The inputs are logically AND-linked. The result is forwarded to the output. OR (OR): An OR gate is configured. The gate has 1...4 inputs and one output. The inputs are logically OR-linked. The result is forwarded to the output. Exclusive-OR (XOR): An exclusive-OR gate is configured. The gate has 1...4 inputs and one output. The inputs are logically Exclusive-OR-linked. The result is forwarded to the output. inverted AND (NAND): An inverted AND gate is configured. The gate has 1...4 inputs and one output. The inputs are logically AND-linked. The result is forwarded to the output inverted. inverted OR (NOR): An OR gate is configured. The gate has 1...4 inputs and one output. The inputs are logically OR-linked. The result is forwarded to the output inverted. inverted Exclusive OR (NXOR): An inverted Exclusive OR gate is configured. The gate has 1...4 inputs and one output. The inputs are logically Exclusive-OR-linked. The result is forwarded to the output inverted. AND with feedback (ANDR): An AND gate with feedback is configured. The gate has 1...4 inputs and one output. The output is fed back to the first input of the gate.	
Input 1	deactivated Input object
Inputs of a logic gate can be activated or deactivated separately. This allows gates with an individual number of inputs (1 ... 4) to be implemented. This parameter defines whether the first input of the gate should be used. This parameter is only visible if "Type of logic function = logic gate".	

Input 2	deactivated Input object
Inputs of a logic gate can be activated or deactivated separately. This allows gates with an individual number of inputs (1 ... 4) to be implemented. This parameter defines whether the second input of the gate should be used. This parameter is only visible if "Type of logic function = logic gate".	
Input 3	deactivated Input object
Inputs of a logic gate can be activated or deactivated separately. This allows gates with an individual number of inputs (1 ... 4) to be implemented. This parameter defines whether the third input of the gate should be used. This parameter is only visible if "Type of logic function = logic gate".	
Input 4	deactivated Input object
Inputs of a logic gate can be activated or deactivated separately. This allows gates with an individual number of inputs (1 ... 4) to be implemented. This parameter defines whether the fourth input of the gate should be used. This parameter is only visible if "Type of logic function = logic gate".	
Invert input	Checkbox (yes / no)
It is possible to invert inputs of the logic gate as an option. This parameter is available for each input of the gate and defines whether the respective input should be evaluated unchanged or inverted. This parameter is only visible if "Type of logic function = logic gate".	
Transmission criteria	Always transmit when the inputs are updated transmit only if the output changes transmit cyclically
The transmission behaviour of the output can be configured here. always transmit when the input is updated: The output transmits the current object value to the KNX with every telegram that is received at the input. transmit only if the output changes: The output only transmits the current object value if the object value has changed compared to the last transmission process. The output always transmits during the first telegram to an input after the bus voltages return or after an ETS programming operation. transmit cyclically: With this setting, the output transmits the current object value to the KNX cyclically. After the bus voltage returns or after an ETS programming operation, the cyclical transmission is not started until the first telegram has been received at the input. The output also transmits as soon as a new telegram is received at the input. At the same time, the cycle time for cyclical transmission is restarted!	

Delay for transmission of the result	0...99 h 0...59 min 0...59 s
An optional delay before result transmission (telegram at output) can be configured. With the setting "always transmit when the input is updated": Telegrams at the output are only transmitted after the trigger when the delay has elapsed. The delay time is restarted by each telegram at the input. With the setting "only transmit if the output changes": Telegrams are only sent when the object value changes at the output if the delay has expired. If the logic function is reprocessed by a new telegram at the input within the delay time and the object value changes again, then the delay restarts. If the object value of the output does not change due to new input telegrams, the delay does not restart.	
Cycle time	0...99 h 0 ... 5 ...59 min 0...59 s
During cyclical transmission of the output, this parameter defines the cycle time. If the cycle time is parameterised with "0h, 0min, 0s", no cyclical transmission takes place.	

17.1.2.2 Object list for logic gate

Function	Name	Type	DPT	Flag
Logic gate (...) Input 1	Logic .. - Input	1-bit	1,002	C, -, W, -, U

1-bit object as input 1 of a logic gate (1...8). The input status can be inverted optionally.

This object is only available if the type of logic function is configured to "logic gate" and input 1 is used.

Function	Name	Type	DPT	Flag
Logic gate (...). Input 2	Logic .. - Input	1-bit	1,002	C, -, W, -, U

1-bit object as input 2 of a logic gate (1...8). The input status can be inverted optionally.

This object is only available if the type of logic function is configured to "logic gate" and input 2 is used.

Function	Name	Type	DPT	Flag
Logic gate (...) Input 3	Logic .. - Input	1-bit	1,002	C, -, W, -, U

1-bit object as input 3 of a logic gate (1...8). The input status can be inverted optionally.

This object is only available if the type of logic function is configured to "logic gate" and input 3 is used.

Function	Name	Type	DPT	Flag
Logic gate (...) Input 4	Logic .. - Input	1-bit	1,002	C, -, W, -, U

1-bit object as input 4 of a logic gate (1...8). The input status can be inverted optionally.

This object is only available if the type of logic function is configured to "logic gate" and input 4 is used.

Function	Name	Type	DPT	Flag
Logic gate output	Logic... - Output	1-bit	1,002	C, R, -, T, A

1-bit object as output of a logic gate (1...8).

This object is only available if the type of logic function is configured to "logic gate".

17.1.3 Converter (1-bit -> 1-byte)

The converter has a 1-bit input and a 1-byte output and also a disabling object. ON / OFF telegrams can be converted to preconfigured values. The disabling object is able to deactivate the converter.

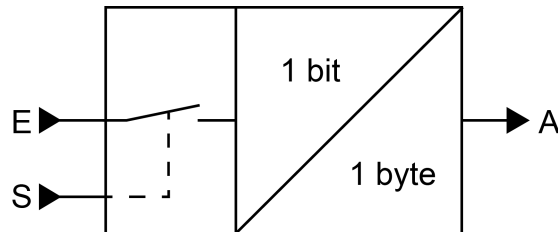


Figure 107: Converter (1-bit -> 1-byte)

The converter can react differently to input states. The parameter "Reaction at input to" defines whether the converter responds to ON and OFF commands or alternatively only processes ON or OFF telegrams.

A concrete 1-byte output value can be assigned to each 1-bit input status. The two output values can be configured anywhere in the range 0 ... 255 as required. The data format of the converter output object is set to DPT 5.001 (0...100%).

The disabling object can be deactivated via the converter. A deactivated converter no longer processes input states and consequently does not convert any new output values (the last value is retained and transmitted cyclically, if necessary). At the end of a disabling function, the converter is enabled again. The converter then waits for the next telegram at the input.

The telegram polarity of the disabling object can be configured.

The transmission behaviour of the converter output can be configured.

17.1.3.1 Converter parameters

Logic functions -> Logic function...

Reaction at input to	ON and OFF telegrams ON telegrams OFF telegrams
The converter can react differently to input states. It is defined here whether the converter responds to ON and OFF commands or alternatively only processes ON or OFF telegrams.	
Polarity of the locking object	0 = enabled / 1 = disabled 0 =disabled/ 1 = enabled
This parameter defines the polarity of the disabling object.	
Output value for ON (0...255)	0...255
A concrete 1-byte output value can be assigned to each 1-bit input status. This parameter defines the output value for ON telegrams. This parameter is only visible when the input should react to ON telegrams.	
Output value for OFF (0...255)	0...255
A concrete 1-byte output value can be assigned to each 1-bit input status. This parameter defines the output value for OFF telegrams. This parameter is only visible when the input should react to OFF telegrams.	
Transmission criteria	always transmit when the input is updated transmit only if the output changes transmit cyclically
The transmission behaviour of the output can be configured here. always transmit when the input is updated: The output transmits the current object value to the KNX with every telegram that is received at the input. transmit only if the output changes: The output only transmits the current object value if the object value has changed compared to the last transmission process. The output always transmits during the first telegram to an input after the bus voltages return or after an ETS programming operation. transmit cyclically: With this setting, the output transmits the current object value to the KNX cyclically. After the bus voltage returns or after an ETS programming operation, the cyclical transmission is not started until the first telegram has been received at the input. The output also transmits as soon as a new telegram is received at the input. At the same time, the cycle time for cyclical transmission is restarted!	

Transmission delay for sending the hours result (0...99)	0...99
An optional delay before result transmission (telegram at output) can be configured. With the setting "always transmit when the input is updated": Telegrams at the output are only transmitted after the trigger when the delay has elapsed. The delay time is restarted by each telegram at the input. With the setting "only transmit if the output changes": Telegrams are only sent when the object value changes at the output if the delay has expired. If the logic function is reprocessed by a new telegram at the input within the delay time and the object value changes again, then the delay restarts. If the object value of the output does not change due to new input telegrams, the delay does not restart. This parameter defines the hours of the delay time.	
Minutes (0...59)	0...59
This parameter defines the minutes of the delay time.	
Seconds (0...59)	0...59
This parameter defines the seconds of the delay time. The parameters for the transmission delay are only visible for "Transmission criteria" = "Always transmit when the input is updated" and "Only transmit when the output changes".	
Cycle time hours (0...99)	0...99
During cyclical transmission of the output, this parameter defines the cycle time. Setting the cycle time hours.	
Minutes (0...59)	0...5...59
This parameter defines the minutes of the cycle time.	
Seconds (0...59)	0...59
This parameter defines the seconds of the cycle time. The parameters for the cycle time are only visible if "transmission criteria" = "transmit cyclically".	

17.1.3.2 Object list for converter

Function	Name	Type	DPT	Flag
Converter Input	Logic ... - Input	1-bit	1,002	C, -, W, -, U
1-bit object as input of a converter. It is possible to configure whether the converter responds to ON and OFF commands or alternatively processes only ON or only OFF telegrams. This object is only available if the type of logic function is configured to "converter".				

Function	Name	Type	DPT	Flag
Converter Disabling function	Logic ... - Input	1-bit	1,002	C, -, W, -, U
1-bit object as disabling input of a converter. A disabled converter no longer processes input states and consequently does not convert any new output values (the last value is retained and transmitted cyclically, if necessary). The telegram polarity can be configured. This object is only available if the type of logic function is configured to "converter".				

Function	Name	Type	DPT	Flag
Converter Output	Logic ... - Output	1-byte	5,001	C, R, -, T, A
1-byte object as value output of a converter. This object is only available if the type of logic function is configured to "converter".				

17.1.4 Disabling element (filtering/time)

The disabling element has a 1-bit input and a 1-bit output as well as a disabling object. Input states (ON/OFF) can be delayed independently of one another and filtered at the output before output. The filter makes it possible to invert the states of the output (e. g. ON -> OFF) or to suppress it completely (e. g. OFF -> ---, OFF is not transmitted). If the filter is not used, the disabling element only works with the time functions if required. Alternatively, it is possible to use only the filter (without delays).

The disabling object is able to deactivate the disabling element.

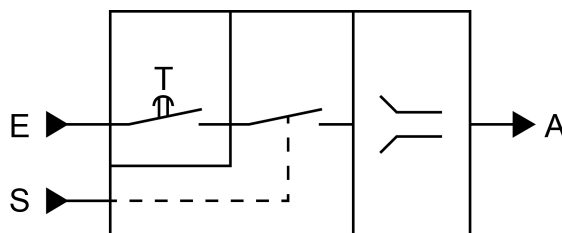


Figure 108: Disabling element (filtering/time)

The parameter "Time function" defines whether ON or OFF telegrams or both states are evaluated with a delay after reception at the input. If a delay is provided, the delay time can be configured separately for ON and OFF telegrams. A delay is only effective if the delay time is set to greater than "0". Each telegram received at the input re-triggers the receptive delay time.

If no delay is configured, the input telegrams go directly into the filter.

- i** Special feature when using the delays: If no telegram is received at the input, a configured delay time (time > 0) acts like an automatic cyclic trigger of the filter. The most recently received input status is then forwarded to the filter automatically and repeatedly after the delay has elapsed. This then works according to its configuration and forwards the result to the output of the disabling element. Consequently, the output then also transmits telegrams depending on the transmission criteria set. If the cyclical transmission of the output is not desired due to the automatic triggering of the filter, the transmission criterion should be set to "only transmit if the output changes".

If no delay is provided, the filter is only triggered automatically via the received telegrams and thus not automatically.

- i** After the bus voltage returns or after an ETS programming operation, the delays are triggered automatically.

The filter is set by the parameter "Filter function" according to the following table.

Filter function	Result
ON -> ON / OFF -> OFF	Input telegrams are forwarded to the output unchanged. Filter deactivated.
ON -> --- / OFF -> OFF	ON telegrams are filtered and not forwarded to the output. OFF telegrams are forwarded to the output unchanged.

Filter function	Result
ON -> ON / OFF -> ---	OFF telegrams are filtered and not forwarded to the output. ON telegrams are forwarded to the output unchanged.
ON -> OFF / OFF -> ON	ON telegrams are converted to OFF telegrams and OFF telegrams are converted to ON telegrams and are forwarded to the output.
ON -> --- / OFF -> ON	ON telegrams are filtered and not forwarded to the output. OFF telegrams are converted to ON telegrams and forwarded to the output.
ON -> OFF / OFF -> ---	OFF telegrams are filtered and not forwarded to the output. ON telegrams are converted to OFF telegrams and forwarded to the output.

The disabling element can be deactivated by the disabling object. A deactivated disabling element no longer forwards any input states to the filter and consequently does not convert any new output values (the last value is retained and transmitted cyclically, if necessary). However, the input states are still evaluated (even with effective delays). At the end of a disabling function, the disabling element is enabled again. The disabling element waits for the next telegram at the input or for the next cycle of the configured delay times.

The telegram polarity of the disabling object can be configured.

The transmission behaviour of the disabling element output can be configured.

17.1.4.1 Disabling element parameters

Logic functions -> Logic function...

Time function	no delay delay only ON telegrams delay only OFF telegrams Delay ON and OFF telegrams
This parameter defines whether ON or OFF telegrams or both states are evaluated with a delay after reception at the input. If a delay is provided, the delay time can be configured separately for ON and OFF telegrams. If no delay is configured, the input telegrams go directly into the filter.	
Delay for ON telegrams Minutes (0...59)	0...59
The delay for ON telegrams is configured here. A delay is only effective if the delay time is set to greater than "0". Each ON telegram received at the input re-triggers the delay time. Special feature when using the delays: If no telegram is received at the input, a configured delay time (time > 0) acts like an automatic cyclic trigger of the filter. The most recently received input status is then forwarded to the filter automatically and repeatedly after the delay has elapsed. This then works according to its configuration and forwards the result to the output of the disabling element. Consequently, the output then also transmits telegrams depending on the transmission criteria set. If the cyclical transmission of the output is not desired due to the automatic triggering of the filter, the transmission criterion should be set to "only transmit if the output changes". After the bus voltage returns or after an ETS programming operation, the delays are triggered automatically. Setting the ON delay time minutes.	
Seconds (0...59)	0...10...59
Setting the seconds of the ON delay time. The parameters for the ON delay are only available if the parameter "Time function" is set to "only delay ON telegrams" or "delay ON and OFF telegrams".	

Delay for OFF telegrams Minutes (0...59)	0...59
The delay for OFF telegrams is configured here. A delay is only effective if the delay time is set to greater than "0". Each OFF telegram received at the input re-triggers the delay time. Special feature when using the delays: If no telegram is received at the input, a configured delay time (time > 0) acts like an automatic cyclic trigger of the filter. The most recently received input status is then forwarded to the filter automatically and repeatedly after the delay has elapsed. This then works according to its configuration and forwards the result to the output of the disabling element. Consequently, the output then also transmits telegrams depending on the transmission criteria set. If the cyclical transmission of the output is not desired due to the automatic triggering of the filter, the transmission criterion should be set to "only transmit if the output changes". After the bus voltage returns or after an ETS programming operation, the delays are triggered automatically. Setting the OFF delay time minutes.	
Seconds (0...59)	0...10...59
Setting the OFF delay time seconds. The parameters for the OFF delay are only available if the parameter "Time function" is set to "only delay OFF telegrams" or "delay ON and OFF telegrams".	
Polarity of the locking object	0 = enabled / 1 = disabled 0 =disabled/ 1 = enabled
This parameter defines the polarity of the disabling object.	

Filter function	ON -> ON / OFF -> OFF ON -> --- / OFF -> OFF ON -> ON / OFF -> --- ON -> OFF / OFF -> ON ON -> --- / OFF -> ON ON -> OFF / OFF -> ---

This parameter defines the function of the filter.

ON -> ON / OFF -> OFF: Input telegrams are forwarded to the output unchanged. Filter deactivated.

ON -> --- / OFF -> OFF: ON telegrams are filtered and not forwarded to the output. OFF telegrams are forwarded to the output unchanged.

ON -> ON / OFF -> ---: OFF telegrams are filtered and not forwarded to the output. ON telegrams are forwarded to the output unchanged.

ON -> OFF / OFF -> ON: ON telegrams are converted to OFF telegrams and OFF telegrams are converted to ON telegrams and forwarded to the output.

ON -> --- / OFF -> ON: ON telegrams are filtered and not forwarded to the output. OFF telegrams are converted to ON telegrams and forwarded to the output.

ON -> OFF / OFF -> ---: OFF telegrams are filtered and not forwarded to the output. ON telegrams are converted to OFF telegrams and forwarded to the output.

Transmission criteria	always transmit when the input is updated transmit only if the output changes transmit cyclically

The transmission behaviour of the output can be configured here.

always transmit when the input is updated: The output transmits the current object value to the KNX with every telegram that is received at the input. In addition, transmission at the output is repeated if no telegram was received at the input when the delay times were used and the configured time has expired.

transmit only if the output changes: The output only transmits the current object value if the object value has changed compared to the last transmission process. After the bus voltage returns or an ETS programming operation, the output always transmits.

transmit cyclically: With this setting, the output transmits the current object value to the KNX cyclically. After the bus voltage returns or after an ETS programming operation, the cyclical transmission is not started until the first telegram has been received at the input. If the ON/OFF delay is used, the cyclical transmission starts automatically once the delay time has expired after the bus voltage returns or after an ETS programming operation. The output also transmits as soon as a new telegram is received at the input. At the same time, the cycle time for cyclical transmission is restarted!

Cycle time hours (0...99)	0...99
During cyclical transmission of the output, this parameter defines the cycle time. Setting the cycle time hours.	
Minutes (0...59)	0...5...59
This parameter defines the minutes of the cycle time.	
Seconds (0...59)	0...59
This parameter defines the seconds of the cycle time. The parameters for the cycle time are only visible if "transmission criteria" = "transmit cyclically".	

17.1.4.2 Object list for disabling element

Function	Name	Type	DPT	Flag
Disabling element Input	Logic .. - Input	1-bit	1,002	C, -, W, -, U
1-bit object as input of a disabling element. This object is only available if the type of logic function is configured to "disabling element".				
Function	Name	Type	DPT	Flag
Disabling element Disabling function	Logic .. - Input	1-bit	1,002	C, -, W, -, U
1-bit object as disabling input of a disabling element. A disabled disabling element no longer forwards any input states to the filter and consequently does not convert any new output values (the last value is retained and transmitted cyclically, if necessary). The telegram polarity can be configured. This object is only available if the type of logic function is configured to "disabling element".				
Function	Name	Type	DPT	Flag
Disabling element Output	Logic... - Output	1-bit	1,002	C, R, -, T, A
1-bit object as output of a disabling element. This object is only available if the type of logic function is configured to "disabling element".				

17.1.5 Comparator

The comparator works with an input whose data format can be parameterised, and with a 1-bit output to output the result of the comparison operation. The comparator compares the value received at the input with a configured reference value and evaluates whether the reference is correct (result = true) or not (result = false) according to the specified reference function.

The reference function and the reference value are configured in the ETS.

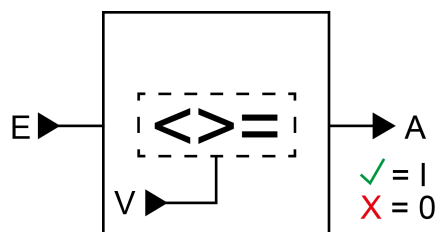


Figure 109: Comparator

The parameter "data format" defines the size and format of input object according to the following table. The output object is preset to 1-bit (DPT 1.002) and outputs the result of the comparison operation (ON = true / OFF = false). The reference value that can be set in the ETS adapts to the input data format.

Data format	KNX DPT
4-bit dimming	3,007
1-byte operating mode switchover	20,102
1-byte scene extension unit	18,001
1-byte value 0...255	5,010
1-byte brightness value 0...100%	5,001
2-byte value 0...65535	7,001
2-byte value -32768...32767	8,001
2-byte floating-point number	9.0xx
4-byte value -2147483648...2147483647	13,001

The following table shows the possible reference functions (I = input value, R = reference value).

Reference function	Function
equal (I = R)	The comparator output is "ON" (true) if the input is equal to the reference value. Otherwise the output is "OFF" (false).
not equal (I ≠ R)	The comparator output is "ON" (true) if the input is unequal to the reference value. If the input value is equal to the reference value, the output is "OFF" (false).
greater than (I > R)	The comparator output is "ON" (true) if the input is greater than the reference value. If the input value is less than or equal to the reference value, the output will switch "OFF" (false).

Reference function	Function
greater than or equal ($I \geq R$)	The comparator output is "ON" (true) if the input is greater than the reference value or equal to the reference value. If the input value is smaller than the reference value, the output will switch "OFF" (false).
smaller than ($I < R$)	The comparator output is "ON" (true) if the input is less than the reference value. If the input value is greater than or equal the reference value, the output will switch "OFF" (false).
smaller than or equal ($I \leq R$)	The comparator output is "ON" (true) if the input is less than the reference value or equal to the reference value. If the input value is greater than the reference value, the output will switch "OFF" (false).
Range testing less than ($R1 < I < R2$)	There are two reference values. The comparator output is "ON" (true) if the input is greater than the first reference value or less than the second reference value. If the input value is less than the first reference value or equal the first reference value or greater than the second reference value or equal the second reference value, the output will switch "OFF" (false).
Range testing less than or equal to ($R1 \leq I \leq R2$)	There are two reference values. The comparator output is "ON" (true) if the input is greater than or equal the first reference value and smaller than or equal the second reference value. If the input value is smaller than the first reference value or greater than the second reference value, the output will switch "OFF" (false).

The transmission behaviour of the comparator output can be configured.

17.1.5.1 Comparator parameters

Logic functions -> Logic function...

Data format	4-bit dimming (DPT 3.007) 1-byte operating mode switchover (DPT 20.102) 1-byte scene extension unit (DPT 18.001) 1-byte value 0...255 (DPT 5.010) 1-byte brightness value 0...100% (DPT 5.001) 2-byte value 0...655,535 (DPT 7.001) 2-byte value -32,768...32,767 (DPT 8.001) 2-byte floating-point number (DPT 9.0xx) 4-byte value -2,147,483,648...2,147,483,647 (DPT 13.001)
This parameter defines the size and format of input object. The output object is pre-set to 1-bit (DPT 1.002) and outputs the result of the comparison operation (ON = true / OFF = false).	

Reference function	equal ($I = R$) not equal ($I \neq R$) greater than ($I > R$) greater than or equal ($I \geq R$) smaller than ($I < R$) smaller than or equal ($I \leq R$) Range testing less than ($V1 < I < V2$) Range testing less than or equal to ($V1 \leq I \leq V2$)
The comparator compares the value received (I) at the input with a configured reference value (R) and evaluates whether the comparison is correct (result = true) or not (result = false) according to the specified reference function here. equal ($I = R$): The comparator output is "ON" (true) if the input is equal the reference value. Otherwise the output is "OFF" (false). not equal ($I \neq R$): The comparator output is "ON" (true) if the input is unequal to the reference value. If the input value is equal to the reference value, the output is "OFF" (false). greater than ($I > R$): The comparator output is "ON" (true) if the input is greater than the reference value. If the input value is less than or equal to the reference value, the output will switch "OFF" (false). greater than or equal ($I \geq R$): The comparator output is "ON" (true) if the input is greater than the reference value or equal to the reference value. If the input value is smaller than the reference value, the output will switch "OFF" (false). smaller than ($I < R$): The comparator output is "ON" (true) if the input is less than the reference value. If the input value is greater than or equal the reference value, the output will switch "OFF" (false). smaller than or equal ($I \leq R$): The comparator output is "ON" (true) if the input is smaller than the reference value or equal to the reference value. If the input value is greater than the reference value, the output will switch "OFF" (false). Range testing less than ($R1 < I < R2$): There are two reference values. The comparator output is "ON" (true) if the input is greater than the first reference value or less than the second reference value. If the input value is less than the first reference value or equal the first reference value or greater than the second reference value or equal the second reference value, the output will switch "OFF" (false). Range testing less than or equal to ($R1 \leq I \leq R2$): There are two reference values. The comparator output is "ON" (true) if the input is greater than or equal the first reference value and smaller than or equal the second reference value. If the input value is smaller than the first reference value or greater than the second reference value, the output will switch "OFF" (false).	

Reference value (R)	Dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) dimming brightness, stop (8) dimming brightness, 100% (9) dimming brightness, 50% (10) dimming brightness, 25% (11) dimming brightness, 12.5% (12) dimming brightness, 6% (13) dimming brightness, 3% (14) dimming brightness, 1.5% (15)

This parameter specifies the internal reference value (R) for the reference function.
 This parameter is available only if the "data format" is set to "4-bit dimming (DPT 3.007)".

Reference value (R)	Automatic mode (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)

This parameter specifies the internal reference value (R) for the reference function.
 This parameter is only available if the "data format" is set to "1-byte operating mode switchover (DPT 20.102)".

Reference value (R)	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)

This parameter specifies the internal reference value (R) for the reference function.
 This parameter will be available only if the "data format" is set to "1-byte scene extension unit (DPT 18.001)".

Reference value (R) (0...255)	0...255
This parameter specifies the internal reference value (R) for the reference function. This parameter will be available only if the "data format" is set to "1-byte value -0...255 (DPT 5.010)".	
Reference value (R) (0...100%)	0...100
This parameter specifies the internal reference value (R) for the reference function. This parameter will be available only if the "data format" is set to "1-byte brightness value 0...100% (DPT 5.001)".	
Reference value (R) (0...65535)	0...65535
This parameter specifies the internal reference value (R) for the reference function. This parameter will be available only if the "data format" is set to "2-byte value 0...65535 (DPT 7.001)".	
Reference value (R) (-32768...32767)	-32768...0...32767
This parameter specifies the internal reference value (R) for the reference function. This parameter will be available only if the "data format" is set to "2-byte value -32768...32767 (DPT 8.001)".	
Reference value (R) (-671088...670760)	-671088...0...670760
This parameter specifies the internal reference value (R) for the reference function. This parameter is only available if the "data format" is set to "2-byte floating point value (DPT 9.0xx)".	
Reference value (R) (-2147483648...2147483647)	-2147483648...0...2147483647
This parameter specifies the internal reference value (R) for the reference function. This parameter will be available only if the "data format" is set to "4-byte value -2147483648...2147483647 (DPT 13.001)".	

- i** Two reference values (R1 & R2) can be configured if the range testing is configured as "reference function". In this case, the setting options are identical.

Transmission criteria	always transmit when the input is updated transmit only if the output changes transmit cyclically
The transmission behaviour of the output can be configured here. always transmit when the input is updated: The output transmits the current object value to the KNX with every telegram that is received at the input. transmit only if the output changes: The output only transmits the current object value if the object value has changed compared to the last transmission process. The output always transmits during the first telegram to an input after the bus voltages return or after an ETS programming operation. transmit cyclically: With this setting, the output transmits the current object value to the KNX cyclically. After the bus voltage returns or after an ETS programming operation, the cyclical transmission is not started until the first telegram has been received at the input. The output also transmits as soon as a new telegram is received at the input. At the same time, the cycle time for cyclical transmission is restarted!	
Transmission delay for sending the hours result (0...99)	0...99
An optional delay before result transmission (telegram at output) can be configured. With the setting "always transmit when the input is updated": Telegrams at the output are only transmitted after the trigger when the delay has elapsed. The delay time is restarted by each telegram at the input. With the setting "only transmit if the output changes": Telegrams are only sent when the object value changes at the output if the delay has expired. If the logic function is reprocessed by a new telegram at the input within the delay time and the object value changes again, then the delay restarts. If the object value of the output does not change due to new input telegrams, the delay does not restart. This parameter defines the hours of the delay time.	
Minutes (0...59)	0...59
This parameter defines the minutes of the delay time.	
Seconds (0...59)	0...59
This parameter defines the seconds of the delay time. The parameters for the transmission delay are only visible for "Transmission criteria" = "Always transmit when the input is updated" and "Only transmit when the output changes".	
Cycle time hours (0...99)	0...99
During cyclical transmission of the output, this parameter defines the cycle time. Setting the cycle time hours.	
Minutes (0...59)	0...5...59
This parameter defines the minutes of the cycle time.	

Seconds (0...59)	0...59
This parameter defines the seconds of the cycle time. The parameters for the cycle time are only visible if "transmission criteria" = "transmit cyclically".	

17.1.5.2 Object list for Comparator

Function	Name	Type	DPT	Flag
Comparator Input	Logic .. - Input	4-bit	3,007	C, -, W, -, U
4-bit object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "4-bit dimming (DPT 3.007)".				

Function	Name	Type	DPT	Flag
Comparator Input	Logic .. - Input	1-byte	20,102	C, -, W, -, U
1-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "1-byte operating mode switchover (DPT 20.102)".				

Function	Name	Type	DPT	Flag
Comparator Input	Logic .. - Input	1-byte	18,001	C, -, W, -, U
1-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "1-byte scene extension unit (DPT 18.001)".				

Function	Name	Type	DPT	Flag
Comparator Input	Logic .. - Input	1-byte	5,010	C, -, W, -, U
1-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "1-byte value 0...255 (DPT 5.010)".				

Function	Name	Type	DPT	Flag
Comparator Input	Logic .. - Input	1-byte	5,001	C, -, W, -, U
1-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "1-byte brightness value 0...100% (DPT 5.001)".				

Function	Name	Type	DPT	Flag
Comparator Input	Logic .. - Input	2-byte	7,001	C, -, W, -, U
2-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "2-byte value 0...65535 (DPT 7.001)".				

Function	Name	Type	DPT	Flag
Comparator Input	Logic .. - Input	2-byte	8,001	C, -, W, -, U
2-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "2-byte value -32768...32767 (DPT 8.001)".				

Function	Name	Type	DPT	Flag
Comparator Input	Logic .. - Input	2-byte	9.0xx	C, -, W, -, U
2-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "2-byte floating point value (DPT 9.0xx)".				

Function	Name	Type	DPT	Flag
Comparator Input	Logic .. - Input	4-byte	13,001	C, -, W, -, U
4-byte object as input of a comparator. This object is only available if the type of logic function is configured to "comparator" and the data format is configured to "4-byte value -2147483648...2147483647 (DPT 13.001)".				

Function	Name	Type	DPT	Flag
Comparator Output	Logic .. - Output	1-bit	1,002	C, R, -, T, A
1-bit object as output of a comparator. The output object is preset to 1-bit (DPT 1.002) and outputs the result of the comparison operation (ON = true / OFF = false). This object is only available if the type of logic function is configured to "comparator".				

17.1.6 Limit value switch

The limit value switch works with an input whose data format can be configured, and with a 1-bit output to output the result of the threshold evaluation. The limit value switch compares the value received at the input with two configurable hysteresis threshold values. Once the upper threshold value (H2) is reached or exceeded, the output can transmit a switching telegram (e. g. ON = true). If the value falls below the lower threshold value (H1), the output can transmit another switching telegram (e. g. OFF = false).

The switching telegrams can always be configured in the ETS when the threshold values are exceeded and undershot.

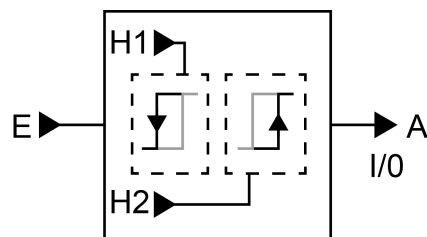


Figure 110: Limit value switch

The two threshold values define a hysteresis. The hysteresis prevents frequent switching back and forth of the output, provided that the input value changes continuously in small intervals. Only when the change in value at the input exceeds the hysteresis as a whole, does the output switch the status.

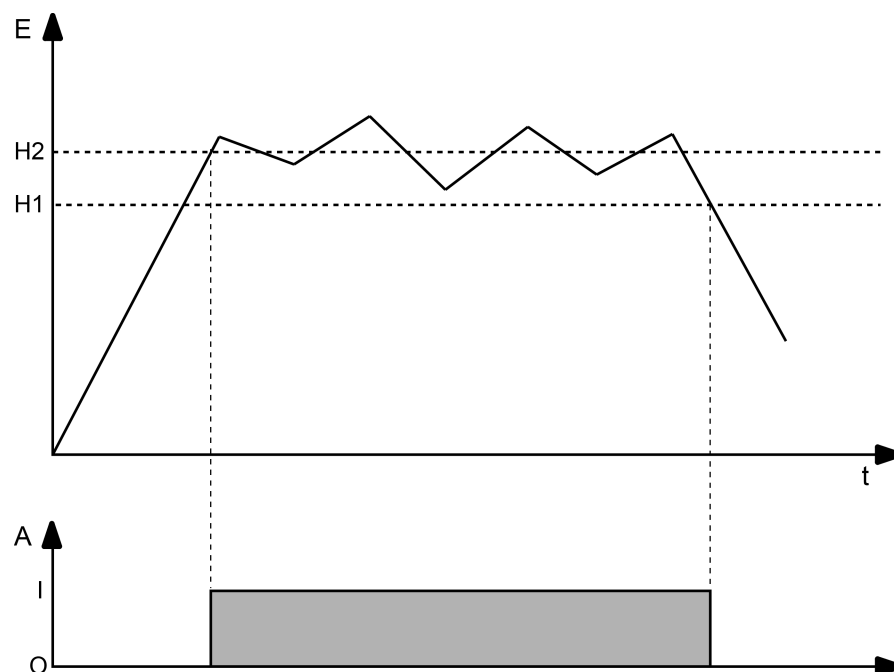


Figure 111: Example of a hysteresis evaluation by upper and lower threshold value

- i** The two threshold values can be freely configured in the ETS. Make sure that the upper threshold value is greater than the lower one!

- i** After the bus voltage returns or after an ETS programming operation, the output always transmits a telegram when the first value has been received at the input. The telegram depends on whether the value reaches or exceeds the upper threshold (H2) or not. If the value is less than the upper threshold, a telegram is transmitted in accordance with "Telegram upon not reaching the lower threshold". Otherwise the output transmits the "telegram on exceeding the upper threshold value".

The parameter "data format" defines the size and format of input object according to the following table. The output object is preset to 1-bit (DPT 1.002) and outputs the result of the threshold evaluation (ON = true / OFF = false). The threshold values that can be set in the ETS adapt to the input data format.

Data format	KNX DPT
4-bit dimming	3,007
1-byte operating mode switchover	20,102
1-byte scene extension unit	18,001
1-byte value 0...255	5,010
1-byte brightness value 0...100%	5,001
2-byte value 0...65535	7,001
2-byte value -32768...32767	8,001
2-byte floating-point number	9.0xx
4-byte value -2147483648...2147483647	13,001

The transmission behaviour of the limit value switch can be configured.

17.1.6.1 Limit value switch parameters

Logic functions -> Logic function...

Data format	4-bit dimming (DPT 3.007) 1-byte operating mode switchover (DPT 20.102) 1-byte scene extension unit (DPT 18.001) 1-byte value 0...255 (DPT 5.010) 1-byte brightness value 0...100% (DPT 5.001) 2-byte value 0...655,535 (DPT 7.001) 2-byte value -32,768...32,767 (DPT 8.001) 2-byte floating-point number (DPT 9.0xx) 4-byte value -2,147,483,648...2,147,483,647 (DPT 13.001)
This parameter defines the size and format of input object. The output object is pre-set to 1-bit (DPT 1.002) and outputs the result of the threshold evaluation (ON = true / OFF = false).	
Lower threshold value (H1)	Dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) dimming brightness, stop (8) dimming brightness, 100% (9) dimming brightness, 50% (10) dimming brightness, 25% (11) dimming brightness, 12.5% (12) dimming brightness, 6% (13) dimming brightness, 3% (14) dimming brightness, 1.5% (15)
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is available only if the "data format" is set to "4-bit dimming (DPT 3.007)".	

Lower threshold value (H1)	Automatic mode (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "1-byte operating mode switchover (DPT 20.102)".	
Lower threshold value (H1)	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter will be available only if the "data format" is set to "1-byte scene extension unit (DPT 18.001)".	
Lower threshold value (H1) (0...255)	0...255
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter will be available only if the "data format" is set to "1-byte value -0...255 (DPT 5.010)".	
Lower threshold value (H1) (0...100%)	0...100
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter will be available only if the "data format" is set to "1-byte brightness value 0...100% (DPT 5.001)".	
Lower threshold value (H1) (0...65535)	0...65535
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter will be available only if the "data format" is set to "2-byte value 0...65535 (DPT 7.001)".	

Lower threshold value (H1) (-32768...32767)	-32768...0...32767
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter will be available only if the "data format" is set to "2-byte value -32768...32767 (DPT 8.001)".	
Lower threshold value (H1) (-671088...670760)	-671088...0...670760
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter is only available if the "data format" is set to "2-byte floating point value (DPT 9.0xx)".	
Lower threshold value (H1) (-2147483648...2147483647)	-2147483648...0...2147483647
This parameter defines the lower threshold value (H1) of the limit value switch. This parameter will be available only if the "data format" is set to "4-byte value -2147483648...2147483647 (DPT 13.001)".	
Upper threshold value (H2)	Dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) dimming brightness, stop (8) dimming brightness, 100% (9) dimming brightness, 50% (10) dimming brightness, 25% (11) dimming brightness, 12.5% (12) dimming brightness, 6% (13) dimming brightness, 3% (14) dimming brightness, 1.5% (15)
This parameter defines the upper threshold value (H2) of the limit value switch. This parameter is available only if the "data format" is set to "4-bit dimming (DPT 3.007)".	

Upper threshold value (H2)	Automatic mode (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
This parameter defines the upper threshold value (H2) of the limit value switch. This parameter is only available if the "data format" is set to "1-byte operating mode switchover (DPT 20.102)".	
Upper threshold value (H2)	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
This parameter defines the upper threshold value (H2) of the limit value switch. This parameter will be available only if the "data format" is set to "1-byte scene extension unit (DPT 18.001)".	
Upper threshold value (H2) (0...255)	0...255
This parameter defines the upper threshold value (H2) of the limit value switch. This parameter will be available only if the "data format" is set to "1-byte value -0...255 (DPT 5.010)".	
Upper threshold value (H2) (0...100%)	0...100
This parameter defines the upper threshold value (H2) of the limit value switch. This parameter will be available only if the "data format" is set to "1-byte brightness value 0...100% (DPT 5.001)".	
Upper threshold value (H2) (0...65535)	0...65535
This parameter defines the upper threshold value (H2) of the limit value switch. This parameter will be available only if the "data format" is set to "2-byte value 0...65535 (DPT 7.001)".	

Upper threshold value (H2) (-32768...32767)	-32768...0...32767
This parameter defines the upper threshold value (H2) of the limit value switch. This parameter will be available only if the "data format" is set to "2-byte value -32768...32767 (DPT 8.001)".	
Upper threshold value (H2) (-671088...670760)	-671088...0...670760
This parameter defines the upper threshold value (H2) of the limit value switch. This parameter is only available if the "data format" is set to "2-byte floating point value (DPT 9.0xx)".	
Upper threshold value (H2) (-2147483648...2147483647)	-2147483648...0...2147483647
This parameter defines the upper threshold value (H2) of the limit value switch. This parameter will be available only if the "data format" is set to "4-byte value -2147483648...2147483647 (DPT 13.001)".	
Telegram on reaching or exceeding the upper threshold value	ON telegram OFF telegram
The telegram of the output upon reaching or exceeding the upper threshold can be configured here.	
Telegram on falling below the lower threshold value	ON telegram OFF telegram
The telegram of the output upon not reaching the lower threshold can be configured here.	
Transmission criteria	always transmit when the input is updated transmit only if the output changes transmit cyclically
The transmission behaviour of the output can be configured here. always transmit when the input is updated: The output transmits the current object value to the KNX with every telegram that is received at the input. transmit only if the output changes: The output only transmits the current object value if the object value has changed compared to the last transmission process. The output always transmits during the first telegram to an input after the bus voltages return or after an ETS programming operation. transmit cyclically: With this setting, the output transmits the current object value to the KNX cyclically. After the bus voltage returns or after an ETS programming operation, the cyclical transmission is not started until the first telegram has been received at the input. The output also transmits as soon as a new telegram is received at the input. At the same time, the cycle time for cyclical transmission is restarted!	

Transmission delay for sending the hours result (0...99)	0...99
An optional delay before result transmission (telegram at output) can be configured. With the setting "always transmit when the input is updated": Telegrams at the output are only transmitted after the trigger when the delay has elapsed. The delay time is restarted by each telegram at the input. With the setting "only transmit if the output changes": Telegrams are only sent when the object value changes at the output if the delay has expired. If the logic function is reprocessed by a new telegram at the input within the delay time and the object value changes again, then the delay restarts. If the object value of the output does not change due to new input telegrams, the delay does not restart. This parameter defines the hours of the delay time.	
Minutes (0...59)	0...59
This parameter defines the minutes of the delay time.	
Seconds (0...59)	0...59
This parameter defines the seconds of the delay time. The parameters for the transmission delay are only visible for "Transmission criteria" = "Always transmit when the input is updated" and "Only transmit when the output changes".	
Cycle time hours (0...99)	0...99
During cyclical transmission of the output, this parameter defines the cycle time. Setting the cycle time hours.	
Minutes (0...59)	0...5...59
This parameter defines the minutes of the cycle time.	
Seconds (0...59)	0...59
This parameter defines the seconds of the cycle time. The parameters for the cycle time are only visible if "transmission criteria" = "transmit cyclically".	

17.1.6.2 Object list for limit value switch

Function	Name	Type	DPT	Flag
Limit value switch Input	Logic... - Input	4-bit	3,007	C, -, W, -, U
4-bit object as input of a limit value switch. This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "4-bit dimming (DPT 3.007)".				

Function	Name	Type	DPT	Flag
Limit value switch Input	Logic... - Input	1-byte	20,102	C, -, W, -, U
1-byte object as input of a limit value switch. This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "1-byte operating mode switchover (DPT 20.102)".				

Function	Name	Type	DPT	Flag
Limit value switch Input	Logic... - Input	1-byte	18,001	C, -, W, -, U
1-byte object as input of a limit value switch. This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "1-byte scene extension unit (DPT 18.001)".				

Function	Name	Type	DPT	Flag
Limit value switch Input	Logic... - Input	1-byte	5,010	C, -, W, -, U
1-byte object as input of a limit value switch. This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "1-byte value 0...255 (DPT 5.010)".				

Function	Name	Type	DPT	Flag
Limit value switch Input	Logic... - Input	1-byte	5,001	C, -, W, -, U
1-byte object as input of a limit value switch. This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "1-byte brightness value 0...100% (DPT 5.001)".				

Function	Name	Type	DPT	Flag
Limit value switch Input	Logic... - Input	2-byte	7,001	C, -, W, -, U
2-byte object as input of a limit value switch. This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "2-byte value 0...65535 (DPT 7.001)".				

Function	Name	Type	DPT	Flag
Limit value switch Input	Logic... - Input	2-byte	8,001	C, -, W, -, U
2-byte object as input of a limit value switch. This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "2-byte value -32768...32767 (DPT 8.001)".				

Function	Name	Type	DPT	Flag
Limit value switch Input	Logic... - Input	2-byte	9.0xx	C, -, W, -, U
2-byte object as input of a limit value switch. This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "2-byte floating point value (DPT 9.0xx)".				

Function	Name	Type	DPT	Flag
Limit value switch Input	Logic... - Input	4-byte	13,001	C, -, W, -, U
4-byte object as input of a limit value switch. This object is only available if the type of logic function is configured to "limit value switch" and the data format is configured to "4-byte value -2147483648...2147483647 (DPT 13.001)".				

Function	Name	Type	DPT	Flag
Limit value switch Output	Logic .. - Output	1-bit	1,002	C, R, -, T, A
1-bit object as output of a limit value switch. The output object is preset to 1-bit (DPT 1.002) and outputs the result of the threshold evaluation (ON = true / OFF = false). This object is only available if the type of logic function is configured to "limit value switch".				

17.2 Extended logic functions

Enabling data inputs

Data inputs are input objects of the logic functions. Logic functions receive switching states (1-bit), dimming commands (4-bit) or value telegrams (1-byte, 2-byte, 4-byte) for processing via these inputs. This information usually comes from the KNX installation via group addresses.

A shared collection of data inputs of varying data formats is available for all the logic functions. Data inputs can be enabled in groups as necessary so that only certain input data formats are available, according to requirements. Thus, each data format possesses a parameter to enable the data inputs.

Unused data formats should not be enabled, to make the object table of the actuator and the configuration of the logic functions clearer.

- On the parameter page "Logic functions -> Inputs", set the parameter "...Use input objects?" to "Yes" according to the required data format. 32 1-bit objects, 16 4-bit, 1-byte and 2-byte objects and 8 4-byte objects are available.

The input objects of the desired data format are enabled in the ETS.

- i** The application program deletes assigned data inputs from the individual configuration of logic functions, if data formats are hidden in the input configuration later on. This means that triggers, comparison functions or operators of individual logic functions may become faulty or may cease to work. When hiding data formats, always check that the appropriate data inputs are no longer used in logic functions!
- i** After resetting the device (bus voltage return, ETS programming operation), data inputs always have the status or value "0" for as long as no telegram is received from the KNX or via the internal group communication.

The device contains up to ten extended logic functions. Simple or complex logical operations in a KNX installation can be performed using these functions. All the logic functions use groups of input and output objects with a defined number and defined data types. It is possible to configure individually in the ETS which logic functions react to which input objects and which output objects are influenced by the logic functions.

Sensible linking of input and output objects allows the networking of logic functions, permitting the execution of complex operations.

The inputs and outputs are available via communication objects on the KNX.

Result outputs

A shared collection of result outputs is available for all extended logic functions. In the ETS, a logic function is configured separately for each processing step, to which result outputs of the function are to be assigned. Thus, result objects not only receive final results of logic operations for forwarding to other KNX devices or actuator functions. Result objects can also contain intermediate results of individual processing

steps (e. g. intermediate result of the filter output) or make data available directly for inputs of comparison functions and operators of additional logic functions. This allows linkage of logic operations, for example (see figure 112).

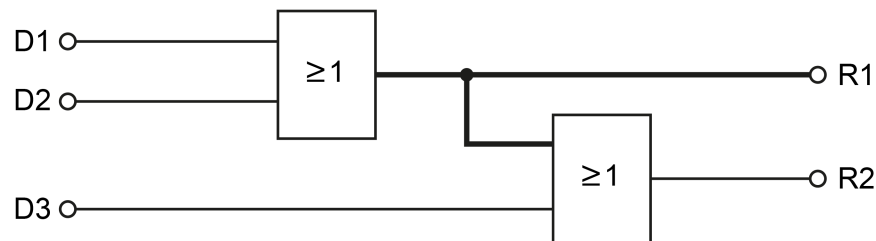


Figure 112: Example of linkage of a result output in two logic functions

- D Data inputs
- R1 linked result output of logic function 1
- R2 Result output of logic function 2

The following table shows the collection of the available result outputs.

Data format	Data type	Number
1-bit	1,002	32
4-bit	3,007	16
1-byte	5,001. 5,010, 18,001, 20,102 *	16
2-byte	7.001, 8.001, 9.0xx *	16
4-byte	13,001	8

Collection of the result outputs / *: Depending on the configuration

17.2.1 User-defined logic functions

Logic functions can be configured and used in user-defined form. In the user-defined version, each logic function possesses up to 8 trigger inputs for the activation of a logical calculation. An optional filter stage allows the hiding of trigger results (e. g. "only react to switch-on commands" or "only react when dimming level greater than 50 %"). Operations can be executed at 1 to 4 levels and can be configured in a user-defined manner to the types "Logic" (e. g. AND, OR, exclusive AND, exclusive OR, each with up to 8 inputs), "Arithmetic" (e. g. addition, subtraction, multiplication, division, percent), "Comparison" (e. g. equal, unequal, greater than, smaller than, area test) or "Type conversion". Operators can be constants, input or output objects. A result stage allows the evaluation, forwarding and, if necessary, also the conversion of results of logical operations.

Alternatively to the user-defined setting, logic functions 1 and 2 can be configured as a configuration aid to "Lighting control".

Processing stages

The processing of each logic function takes place flexibly and in multiple stages. The defined multiple stages mean that the evaluation of the triggering input signals can be adapted independently and individually to many applications by the actual logic operation and the result output.

Each stage possesses data inputs and optional constants for data processing. In addition, result outputs are available for forwarding the processed information to subsequent stages of the logic function.

Result objects can be used to implement almost any linkages of multiple logic functions via the final result of a logic function of the last processing stage or stages superior to intermediate results. This allows the implementation of simple logic operations (e. g. logical OR with 2 data inputs) or also complex logic and mathematical applications (e. g. lighting controllers, people counters, threshold switches).

- i** If result objects are used in multiple processing stages of a logic function (e. g. "Result object 1 (1-bit)" is used for the intermediate result of the trigger stage and for an operation result), note that lower-level stages overwrite the object values. To ensure object values are not lost during the processing chain of a logic function, the evaluation of an object value must take place at a higher stage before a lower-level stage causes a new object value to be written to the result object.

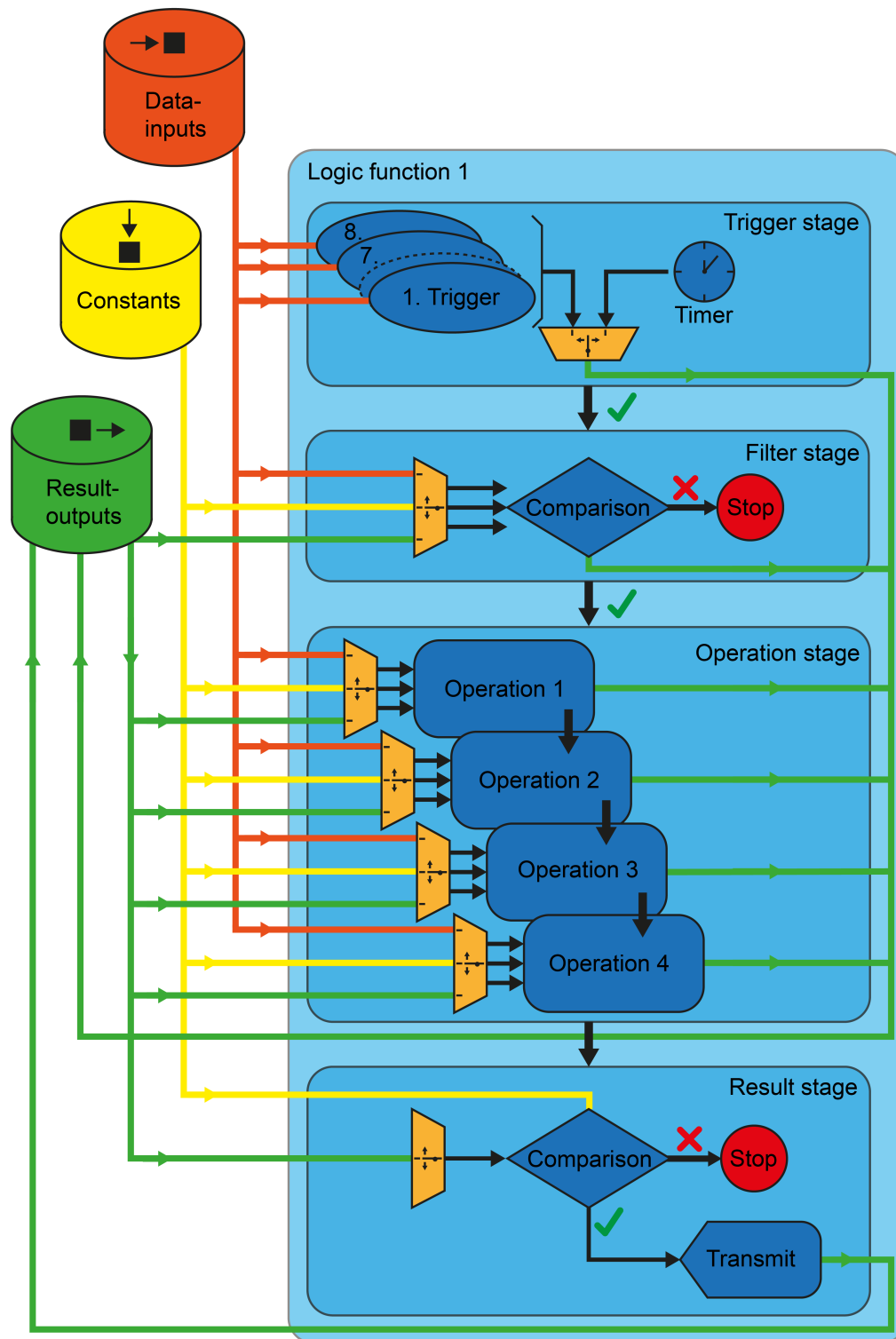


Figure 113: Processing stages of a logic function

A logic function contains 4 processing stages which are recalled and processed in sequence:

- **Trigger stage:**
The trigger stage is the first processing stage of a logic function. This stage contains up to 8 trigger inputs as communication objects with the data formats 1-bit, 4-bit, 1-byte, 2-byte or 4-byte or, optionally, an automatic trigger (time trigger). As soon as at least one trigger is assigned to a data input, the logic

function waits for any trigger telegrams during continuous operation. If no monitoring of a time trigger was configured, then the logic function reacts to each trigger telegram and processes the subsequent processing stages immediately. If no trigger telegram is received, the entire logic function remains unprocessed.

If monitoring of a time trigger was configured, then the trigger stage expects at least one trigger telegram within the configured monitoring time. If triggers are received continuously in this case, then the logic function does not execute any further processing stages. Only if no trigger telegram has been received within the monitoring time will the logic function process the following stages. In consequence, the monitoring time of the trigger can be used as an alarm function.

If no trigger has been assigned to a data input, then the triggering of a logic function only takes place via the automatic trigger (time function).

In the simplest case, the trigger occurs automatically and thus cyclically. In many cases, logic functions need only be executed irregularly (when the input signal changes). Then it is wise to use the data inputs of the filter or operation stage as trigger inputs too. However, triggers can also be completely free from the inputs of the logical data processing and, for example, respond to separate triggers (trigger through a special command: For example, through a presence signal when people are present).

- Filter stage:

This optional stage is the second processing stage of a logic function. The filter is only activated if a valid trigger was detected. The filter then uses comparison operations to determine whether the execution condition of the logic function is fulfilled. The filter thus allows the hiding of trigger results (e. g. "only react to switch-on commands" or "only react when dimming level greater than 50 %").

The comparison operation of the filter stage possesses up to 3 of its own inputs according to the data format set for filtering (1-bit, 4-bit, 1-byte, 2-byte, 4-byte). These inputs can be fed via selected data inputs of the logic functions, via any definable constants or also via data formats of other logic functions matching the result outputs.

Recall of subsequent processing stages of the logic function only occurs when the result of the filter stage comparison operation was logically true (TRUE). With a logically false result of the comparison, the processing of the logic function is cancelled. The function then waits for the next valid trigger and then carries out the filter comparison again.

- Operation stage:

After a trigger and any positive filter comparison, the operation stage performs the actual logic operation of the logic function. An operation can be configured in a user-defined manner to the types "Logic" (e. g. AND, OR, exclusive AND, exclusive OR, each with up to 8 inputs), "Arithmetic" (e. g. addition, subtraction, multiplication, division, percent), "Comparison" (e. g. equal, unequal, greater, smaller, area test) or "Type conversion". Operands, i.e. input data to be processed, can be constants or input objects as required, but also result objects of higher-level processing stages or other logic functions.

If required, an operation stage can process up to 4 individual operations of the

named type. This means that, for example, up to 4 logic gates can be implemented in just one logic function, which can also be interlinked. In addition, arithmetic calculation operations can be combined with comparators, for example, allowing simple implementation of counters with a threshold value switch.

Each individual operation writes the individual result of the logic operation to a result object of a matching data format.

- **Result stage:**

The result stage is the last processing stage of a logic function, which is recalled automatically as soon as the last operation of the operation stage is executed in the processing. Result objects, written with an operation or intermediate result in higher-level processing stages, never actively transmit their status or value. Active transmission of a result object value is only implemented by the result stage.

In a logic function, only the result stage can be used, for example to transmit a final operation result or intermediate result of any other logic function actively to the KNX or to the internal group communication.

In the parameter settings, the result stage must be informed of the result object to which it should react. For this, the data format (1-bit, 4-bit, 1-byte, 2-byte, 4-byte) and then one of the matching result objects must be selected.

Optionally, the result can be evaluated and filtered before the object value is transmitted. A filter can be configured for this, which compares the object value of the result with up to 2 configurable constants. The result stage only performs further processing of the object value if the filter result is true (TRUE), i.e. the comparison operator for result testing has been fulfilled.

The transmission criterion of the result stage (transmit on each trigger, only when the object value changes, cyclically) can be configured. An optional transmission delay of the cycle time for automatic transmission can also be configured.

If the data format of the result stage is set to "1-bit switching (DPT1.xxx)", then the result can optionally be converted to up to 4 other data formats (4-bit, 1-byte, 2-byte, 4-byte) or to up to 4 other 1-bit result objects. For this, a type conversion is available with which, when used, it is simple, for example, to convert switching commands to value commands or other control commands according to the input command (ON, OFF, ON and OFF). In this case, the result stage only actively transmits telegrams via the result objects of the appropriate data format specified in the type conversion. The result object originally configured in the result stage is then only used to evaluate the switching state. No further telegram is then actively transmitted via this object.

Trigger stage - additional information

In the trigger stage, the decision is taken as to whether a logic function is processed or not. Only with a valid detected trigger are the following processing steps recalled and processed.

A distinction is made between external and automatic triggers. External triggers can only be enabled data inputs of the logic functions. The logic function evaluates an external object trigger, if any telegram update is received at least one of the up to 8 trig-

ger inputs via the KNX or via internal group communication. The parameter "Use cyclical trigger monitoring?" then decides whether each object trigger immediately leads to a valid trigger result ("No" setting -> no trigger monitoring) or whether a trigger monitoring time is evaluated ("Yes" setting). If trigger monitoring is used, a logic function waits for the configured time and only triggers a valid trigger if no object trigger is performed during the monitoring time. If telegram updates to trigger objects have been received within the monitoring time, nothing further occurs. The trigger stage then terminates the processing of a logic function.

The monitoring time is restarted after a device reset (bus voltage return, ETS programming operation) and with each received object trigger.

Alternatively, an automatic trigger can be used. The automatic trigger is always active if no trigger input is used (all triggers set to "deactivated"). The trigger stage then always evaluates a valid trigger cyclically after the "Time for automatic trigger" has elapsed and activated the next processing stage of the logic function.

The time for the automatic trigger is started after a device reset (bus voltage return, ETS programming operation) and repeated cyclically.

The triggering of a logic function by a trigger must not always lead to an action of the logic function which also influences result objects. The influencing of the result objects is usually dependent on the subsequent processing stages.

The trigger stage can simply write as an intermediate result of one to the 32 1-bit result objects. The trigger stage stores the state "1" (TRUE) in the selected result object if a valid trigger has been detected. This means that the trigger decision can be read out in the result object or used for further logic calculations (in the same logic function or in other functions). The object value of the intermediate result is not automatically set to "0" (FALSE) by the trigger stage. In consequence, the result object must be manually deleted after the evaluation of the intermediate result, for example by an operation (constant "0" through logic operation "equal" to the result object), as otherwise only a "1" (TRUE) would be in the object.

Filter stage - additional information

The filter stage is optional. It can be used, for example, to check the execution condition of a logic function. If no filter has been configured, then the next processing stage of the logic function is always executed directly. Otherwise, the comparison between the 2 to 3 inputs of the filter (operands) must be true (TRUE). If the execution condition is false (FALSE), then all the subsequent processing stages are no longer executed and the logic function waits for the next trigger.

The data format of the filter stage defines the format of all the comparison inputs of the filter and is independent of the other processing stages. The comparison output of the filter always corresponds to the 1-bit data format. In consequence, the result is either true (TRUE) or false (FALSE).

The following table shows the possible filter input data formats.

Data format	DPT	Number of possible operands
1-bit switching	1.xxx *	2
4-bit dimming	3,007	3

Data format	DPT	Number of possible operands
1-byte operating mode switchover	20,102	3
1-byte scene extension unit	18,001	3
1-byte value 0...255	5,010	3
1-byte brightness value 0...100 %	5,001	3
2-byte value 0...65535	7,001	3
2-byte value -32768...32767	8,001	3
2-byte floating-point number	9.0xx **	3
4-byte value -2147483648...2147483647	13,001	3

*: The data format of the linked operands (data inputs or result outputs) is preset in the ETS object table to 1.002 "Boolean". Irrespective of this, any 1-bit KNX data type can be used.

**: Any 2-byte floating point data values can be processed.

- i** The format of 1-byte data inputs or result outputs is preset in the ETS object table to "5.001 / brightness value 0...100%". For 2-byte inputs and outputs, the data format is ideally set to "7.001/ value 0...65535". If other input data formats are configured in the filter than those specified by the object presetting, then the data type of the used objects must be adjusted in the ETS and matched to the configuration. Always ensure that the data values initiated in the filters correspond to the configured data format! In addition, only objects of the same data type may be compared!

Depending on the configured data format, the filter makes 2 or 3 operands (x, y, z) available as inputs. The available operands are compared with each other using the set comparison operation.

The following table shows all the possible filter comparison operations.

Comparison operation	Execution condition	Number of possible operands (x, y, z)
equal *	$x = y$	2
unequal *	$x \neq y$	2
greater	$x > y$	2
greater than	$x \geq y$	2
smaller	$x < y$	2
smaller than	$x \leq y$	2
Range testing smaller than	$x < y < z$	3
Range testing smaller than or equal	$x \leq y \leq z$	3

*: Only selectable with 1-bit data format.

The up to 3 operands can be configured independently of one another using the parameter "Comparison value..." to the following types:

- "Constant":
Any constant from the value range of the corresponding data format defines the comparison value of the filter input.
- "Input object":
The comparison value is any data input of the selected data format. The selectable data inputs are not only defined by the selected filter data format, but also by the data inputs enabled globally for all logic functions (parameter page "Logic functions -> General logic functions"). If the data inputs matching the selected filter data format are not enabled globally, no assignment of data inputs is possible!
- "Result object":
The comparison value is any result output of the selected data format.

- i** It is possible to configure different operand types at the filter input. Thus, for example, the first filter input (x) can be a data input, the second input (y) a constant and the third comparison value (z) a matching result object.
- i** It is also possible to use data inputs functioning as triggers as the operand for the filter stage. However, any data input of the matching data format can always be used as a filter operand.
- i** A name (max. 20 characters of free text) can be assigned to each comparison value. This name is used solely for clear identification in the ETS parameter window and should describe the filter input used in as concrete terms as possible (e. g. "Lighting status", "External brightness" or "Filter ON"). The designed text is not loaded into the device during an ETS programming operation.

The filter stage can also write as an intermediate result to one of the 32 1-bit result objects. The filter stage stores the state "1" (TRUE) in the selected result object if the execution condition of the logic function is true (TRUE). If the result of the comparison operation is incorrect (FALSE), then the filter stage writes the status "0" (FALSE) to the result object. This means that the filter decision can be read out in the result object or used for further logic calculations (in other functions).

Operation stage - Additional information

The actual logic operation of a logic function is executed in the operation stage. If required, an operation stage can contain up to 4 individual operations, which are processed individually. Depending on the configured type of logical operation, each operation contains up to 8 of its own operators. The results of each operation are stored in result objects and are thus made available for the subsequent processing steps of the same logic function or for processing in other functions.

Whether and how results are used in subsequent processing steps or in other logic functions (particularly in the result stage) is solely dependent on the project design of the logic functions.

- i** This application program allows an enormous range of combinations and almost any cascading of individual operations and logic functions. The use of data inputs and result outputs in the individual processing stages is not checked for plausibility by the application. For this reason, the configuration of a logic function in the ETS requires a certain amount of care. This should particularly be taken into account when setting and using 1-byte and 2-byte data types.
- i** In particular, the sequential execution of the up to 4 operations of the operation stage allows use of the result of previous operations as the input for subsequent operations. Thus it is possible, for example through combination of all 4 operations, to create logic gates with up to 29 binary inputs. In addition, for example, the 2 operands of an arithmetic multiplication can be expanded to a multiplication with 5 input data values through inclusion of all 4 operations.

An operation can be set to the types "Logic", "Arithmetic", "Comparison" and "Type conversion" as required. This determines which logic operations are executed and which data formats can be used for operators and results.

With the "Logic" and "Arithmetic" type, only operands and result objects of the same type can be used in an operation.

In the "Comparison" operation type, it is possible to compare 4-bit, 1-byte, 2-byte and 4-byte data values. The comparison result is then always written to a 1-bit result object.

With operations of the type "Type conversion", one of the available data formats (1-bit, 4-bit, 1-byte, 2-byte and 4-byte) can be converted to any other format.

The following table shows the available data formats dependent on the selected operation type for operands and result objects.

Type of operation	1-bit	4-bit	1-byte	2-byte	4-byte
Logic					
- Operand	x	-	-	-	-
- Result output	x	-	-	-	-
Arithmetic					
- Operand	-	-	x	x	x
- Result output	-	-	x	x	x
Comparison					
- Operand	-	x	x	x	x
- Result output	x	--	--	--	--
Type conversion					
- Operand	x	x	x	x	x
- Result output	x	x	x	x	x

When processing operations, the following rules are complied with:

- Results exceeding the maximum value of the target data format are set to the maximum value. Results not reaching the minimum value of the target data format are set to the minimum value.
- In target data formats with unsigned data types, negative results become "0".

- Arithmetic: Divisions by "0" lead to the operation being cancelled. No result is written.
 - 2-byte floating point values (DPT 9.0xx): In the case of a value overflow, the result will be limited to the maximum value (671,760.96) of the data type. If there is a value underrun, the operation limits the result to the minimum value (-671,088.64).
- i** A name (max. 20 characters of free text) can be assigned to each operation. This name is used solely for clear identification in the ETS parameter window and should describe the operation used in as concrete terms as possible (e. g. "Twilight switch", "Light control" or "People counter"). The designed text is not loaded into the device during an ETS programming operation.

The operands are the inputs of an operation. The operands can be configured independently of one another using the parameter "Operand..." to the following types:

- "Constant":
Any constant from the value range of the corresponding data format defines the input value.
 - "Input object":
The input value is any data input of the selected data format. The selectable data inputs are not only defined by the operation data format, but also by the data inputs enabled globally for all logic functions (parameter page "Logic functions -> General logic functions"). If the data inputs matching the selected operation data format are not enabled globally, no assignment of data inputs is possible!
 - "Result object":
The input value is any result output of the selected data format.
- i** It is perfectly possible to configure different operand types at the inputs of an operation. Thus, for example, the first input (x) can be a data input, the second input (y) a constant and the third input value (z) a matching result object.
- i** It is also possible to use data inputs functioning as triggers or the filter input as the operand for the operation stage. However, any data input of the matching data format can always be used as an operand.

Operation "logic"

A logic operation contains up to 8 operators, which should be regarded as a Boolean input (1-bit) of the logic gate. In consequence, a logic operation only supports the 1-bit data format.

The following table shows configurable logic operations.

Logical operation	Short	Description
Equal	ID	The input (operand) is forwarded unchanged to the result.
Unequal	NOT	The input (operand) is forwarded inverted to the result.

Logical operation	Short	Description
And	AND	Result = "1" if all inputs = "1", otherwise result = 0.
Or	OR	Result = "0" if all inputs = "0", otherwise result = "1".
Exclusive or	XOR	Result = "1" if only one input = "1", otherwise result = "0".
inverted And	NAND	Inverted And at the output.
inverted Or	NOR	Inverted Or at the output.
inverted exclusive Or	NXOR	Inverted Exclusive Or at the output.
And with feedback	ANDR	And with feedback of the result to Input 1. Result = "1" if all inputs = "1", otherwise result = 0 (logic And). If input 1 is set to "1" and result is still "0", the Feedback of input 1 will also be reset to "0". Only if all inputs 2...8 = "1" will a newly-received "1" at input 1 cause The result to assume the logic state "1". Application: Switch light manually only at twilight -> Switch to input 1, twilight sensor to Input 2 -> The manual switching signal is ignored for as long as the Twilight sensor has not issued an enabling signal. The manual switching signal is executed only at twilight.

"Arithmetic" operation

The data format can be configured for arithmetic operations. 1-byte, 2-byte or 4-byte value operations can be executed. All the operands and also the result object always correspond to the same data format.

The following table shows configurable arithmetic operations.

Arithmetic operation	Calculation	Description
Identity	$x = \text{operation output}$	The input (operand x) is forwarded unchanged to the result.
Addition	$x + y$	Result from addition of both inputs.
Subtraction	$x - y$	Result from subtraction of both inputs.
Multiplication	$x \cdot y$	Result from multiplication of both inputs.
Division	$x : y$	Result from division of both inputs. *

Arithmetic operation	Calculation	Description
Rest of division / modulo	$\text{MOD } x : y$	Result from modulo (remainder after division) of both inputs.
Minimum	$\text{MIN } x \ y$	Result is the minimum of both inputs.
Maximum	$\text{MAX } x \ y$	Result is the maximum of both inputs.
Percent	$\text{PERCENT } (100 \cdot [x : y])$	Result is the percentage value of the first Input (x) in relation to the second input (y).

*: Divisions by "0" lead to the operation being cancelled. No result is written.

Operation "comparison"

An operation can also perform comparisons. The data format of the input data values (operands) to be compared can be configured. 4-bit, 1-byte, 2-byte or 4-byte comparison operations can be executed. The result output of the operation always corresponds to the 1-bit data format. In consequence, the comparison result is either true (TRUE) or false (FALSE).

The following table shows configurable comparison operations.

Comparison operation	Comparison condition	Number of possible operands (x, y, z)
equal	$x = y$	2
unequal	$x \neq y$	2
greater	$x > y$	2
greater than	$x \geq y$	2
smaller	$x < y$	2
smaller than	$x \leq y$	2
Range testing smaller than	$x < y < z$	3
Range testing smaller than or equal	$x \leq y \leq z$	3

Operation "type conversion"

Type conversion allows the conversion of data formats. For this, the operation possesses an input (operand x) and a result output. The parameter "Logic operation" defines the data format of the result output. The parameter "Input data format of logic operation" specifies the data format of the input.

The following diagram shows all the configurable type conversions and the target data format value ranges which can be converted with them.

	Source (data input)									
	1-Bit DPT 1.001	4-Bit DPT 3.007	1-Byte DPT 20.102	1-Byte DPT 18.001	1-Byte DPT 5.010	1-Byte DPT 5.001	2-Byte DPT 7.001	2-Byte DPT 8.001	2-Byte DPT 9.0xx	4-Byte DPT 13.001
1-Bit DPT 1.001	≡	0...1	0...1	0...1	0...1	0...1	0...1	0...1	0...1	0...1
4-Bit DPT 3.007	0...1	≡	0...15	0...15	0...15	0...15	0...15	0...15	0...15	0...15
1-Byte DPT 20.102	0...1	0...4	≡	0...4	0...4	0...4	0...4	0...4	0...4	0...4
1-Byte DPT 18.001	0...1	0...63	0...4	≡	0...63	0...63	0...63	0...63	0...63	0...63
1-Byte DPT 5.010	0...1	0...100	0...4	0...63	≡	0...100	0...255	0...255	0...255	0...255
1-Byte DPT 5.001	0...1 %	0...100 %	0...4 %	0...63 %	0...100 %	≡	0...100 %	0...100 %	0...100 %	0...100 %
2-Byte DPT 7.001	0...1	0...65.534	0...4	0...63	0...255	0...100	≡	0...32.767	0...65.535	0...65.535
2-Byte DPT 8.001	0...1	-100...100	0...4	0...63	0...255	0...100	0...32.767	≡	-32.768... 32.767	-32.768... 32.767
2-Byte DPT 9.0xx	0...1	-100...100	0...4	0...63	0...255	0...100	0...65.535	-32.768... 32.767	≡	-671.088... 670.433
4-Byte DPT 13.001	0...1	-100...100	0...4	0...63	0...255	0...100	0...65.535	-32.768... 32.767	-671.088... 670.433	≡

Figure 114: Configurable type conversions with value ranges according to the target data format

Depending on the data formats of the source and the target, the information below should be taken into account:

- When converting brightness values (DPT 5.001), conversion of the % value interpreted by the source data type to other value types takes place directly to the value of the target format (e. g. 1 % -> "1", 2 % -> "2", 50 % -> "50").
- When converting value types to the data format of the scene extension (DPT 18.001), positive values are converted directly to decimal values of the scene extension unit (e. g. 25 % -> "25" recall of scene 26, 50 % -> "50" recall of scene 51, 100 % -> "63" recall of scene 64). Negative values and "0" are converted to "0" (recall of scene 1).
- The 1-byte data type 20.102 represents the operating modes of a KNX room temperature controller: Automatic = "0", Comfort operation = "1", Standby operation = "2", Night operation = "3", Frost/heat protection operation = "4". When this type is converted to other value formats, the values (0...4) are simply transferred.
The conversion to the Boolean 1-bit data type specifies whether Standby mode is active. With other active operating modes, the converted 1-bit value = "0" ("1" = Standby mode active, "0" = Standby mode not active).
When converting brightness values to DPT 20.102: The % values from the input value are converted in equivalent form in operating modes (0% -> Auto, 1% -> Comfort, 2% -> Standby...). Values from other data types are then simply converted as equivalent values for an operating mode specification.
- The 1-byte data type 18.001 consists of a scene number 0...63 (corresponds to scenes 1...64) as well as a further bit, which indicates whether a scene should be queried or saved.
During conversion to the Boolean 1-bit data type, "1" displays whether a scene is to be saved (and not just recalled) ("1" = Save scene, "0" = Recall scene). With conversions to other numerical values, the number of the scene is transferred as 0...63.

During conversion of data types to the type 18.001, the bit for saving a scene is not set. The values are then simply converted as scene numbers for scene recall.

- The 4-bit data type 3.007 is usually used during a dimming operation to change the brightness of an activated luminaire in relative form (dependent on the current brightness). This data type consists of a bit, which designates the dimming direction (dim up, dim down), and also an unsigned 3-bit dimming command, which defines the relative dimming step width (e. g. "111" -> 1 %, "110" -> "3 %, "001" -> 100 %). The dimming command "000" causes stoppage of a dimming operation.

During conversion to other data types, the dimming command in data type 3.007 is first internally converted to signed values -100...+100 %. The sign is defined by the dimming direction (e. g. "+1 %" for dimming up with a dimming step width of 1 %, "-100 %" with a dimming step width of 100 % and dimming down). Conversions to other data types are thus performed as follows:

Conversion to the Boolean 1-bit data type specifies whether a dimming or stop command was triggered ("0" = Stop, "1" = Dimming operation (dim up or dim down)).

During conversion to a signed value, the "dim up" dimming commands are converted to positive numbers and "dim down" commands to negative numbers. The amount of the result is produced from the dimming step width in "%". If the dimming command = "Stop", then the result is also "0".

During conversion to a scene extension (DPT 18.001), the positive values (after conversion, i.e. "dim up") are converted directly to decimal values of the scene extension unit (e. g. 25 % -> "25", 50 % -> "50", 100 % -> "63" (maximum value for 18.001)).

During conversion to brightness values (DPT 5.001), amounts of dimming step widths for dimming up are transmitted directly to the brightness value.

Amounts of dimming step widths for dimming down are mathematically deducted from 100 % and then transmitted to the brightness value.

During conversion unsigned 2-byte values (DPT 7.001), amounts of dimming step widths for dimming up are transmitted directly to the 2-byte value.

Amounts of dimming step widths for dimming down are mathematically deducted from the end value of the target value range (65,535) and then transmitted to the 2-byte value.

During conversion of signed values to the 4-bit data type 3.0074, positive numbers are converted to "dim up" and negative numbers to "dim down". Unsigned values are only ever converted to "Dim up". The amount of the number is directly converted to the dimming command. If the amount = "0", then this value is converted to a Stop command. Otherwise, the amount of the number to be converted is converted into a dimming command that, without "0", only permits the values "1 (100 %) ... 7 (1 %)" is implemented. This is carried out according to the numeric ranges named here: >75 -> "1 (100 %)", >37 -> "2 (50 %)", >18 -> "3 (25 %)", >9 -> "4 (12 %)", >4 -> "5 (6 %)", >2 -> "6 (3 %)", >0 -> "7 (1 %)".

Result stage - additional information

Result objects written with an operation or intermediate result in a logic function only actively transmit their status or value with a telegram to the KNX when they are evaluated in the result stage. Thus, in each logic function, a result object from the higher-level processing stages can be specified as an output object to be evaluated. Alternatively, result objects, whose object value was influenced in other logic functions, can also be evaluated in a result stage.

The result stage only ever evaluates one result object of a defined data format. For this reason, the data format and then a matching result object must be selected in the ETS. Examples:

1. The last operation of the operation stage of a logic function writes the 1-byte result object 1 with an unsigned value (0...255). This result should be transmitted actively to the KNX. For this, the result stage of the corresponding logic function must be set to the data format "1-byte value 0...255 (DPT 5.010)" and result object 1 selected.
2. In logic function 1, two logic gates are defined in the operation stage, each with one output. The output of the first gate and the output of the second gate should be transmitted to the KNX. The gate outputs write two 1-bit result outputs with a Boolean value (TRUE, FALSE). Two result stages are required to transmit the results. On the one hand, the data format "1-bit switching (DPT 1.xxx)" must be set in the result stage of logic function 1 and the result object of the first logic gate selected. On the other hand, a second logic function must be created, in which only the result stage is relevant. Other processing stages of this logic function can remain unused. In the second logic function, the data format "1-bit switching (DPT 1.xxx)" must be also set in the result stage and then the result object of the second logic gate selected. For the second logic function to be executed at all and the result of the second logic gate evaluated and transmitted, it is necessary that the second logic function reacts to the same trigger result as logic function 1.

Optionally, the result stage can perform a test of the data value of the initiated result object. The result stage possesses a filter function for this. The data format of the result stage also defines the format of all the comparative inputs of the filter. Depending on the set comparative operation, the filter makes 1 to 2 operands (x, y) available as constants. The available operands are compared with each other using the comparison operation (=, ≠, >, ≥, <, ≤, < <, ≤ ≤). The result of the filter is either true (TRUE) or false (FALSE). Only if the filter result is true (TRUE) will the result stage continue to process the initiated result. Otherwise, the stage terminates processing and does not transmit any telegram to the KNX.

If the data format of the result stage is set to "1-bit switching (DPT1.xxx)", then the result can optionally be converted to up to 4 other data formats (4-bit, 1-byte, 2-byte, 4-byte) or to up to 4 other 1-bit result objects. 1 to 4 type conversions are available for this. When they are used, it is simple, for example, to convert switching commands to value commands or other control commands. The type conversion works according to the input command and converts either all the telegrams (ON and OFF) or only certain telegrams (ON or OFF), as required. This allows additional result filtering.

Type conversion means that it is possible to convert the input values "ON" and "OFF"

into defined value commands or control commands according to the configured target data format. With a 1-bit target data format, it is possible to reverse the polarity of received switching telegrams (ON becomes OFF or OFF becomes ON).

When using type conversion, the result stage only actively transmits telegrams via the result objects of the appropriate data format specified in the type conversion. The result object originally configured in the result stage is then only used to evaluate the switching state. No further telegrams are transmitted actively via this object unless they are also used as an output in the type conversion!

The transmission criterion can be defined in the result stage. The following settings are possible:

- Transmit on every trigger:
The result stage transmits the current object value via the selected result object or via the type conversion objects on each valid trigger of the logic function. An optional delay before result transmission can be configured. If the delay is used, each processing operation retriggers the delay time after a valid trigger. Telegrams are only transmitted after the trigger when the delay has elapsed. In so doing, the telegram value is transmitted which the result stage initiated at the beginning of the delay time.
- Transmit only if the result changes:
The result stage only uses the selected result object or the objects of the type conversions in a processing operation to transmit the current object value if the object value has changed compared to the last transmission operation via the same result stage. Transmission always occurs on the first trigger after the bus voltage returns.
An optional delay before result transmission can be configured here. If the object value changes, telegrams are only transmitted when the delay has elapsed. If the logic function is reprocessed by a new trigger within the delay time and the object value changes again, then the delay restarts. The result stage then transmits the object value changed by the new processing.
- Transmit cyclically after first trigger:
In this setting, the result stage transmits the results cyclically via the selected result object or via the type conversion objects. The cyclical transmission is started by the first valid trigger after the bus voltage returns or after an ETS programming operation. The cycle time for transmission of the result can be set in the ETS.
In addition to cyclical transmission, the result is also transmitted on each valid trigger.

17.2.2 Lighting control

To simplify the configuration of a logic function, lighting control is available as a configuration template. Alternatively to a user-defined configuration, lighting control can be activated for logic functions 1 and 2 and allows "Welcome" or "Goodbye" control for the lighting in a hotel room or similar applications (e. g. welcome light on entering a house or central switch-off on leaving an apartment).

Defined inputs and outputs are available for lighting control.

Function

Lighting control distinguishes between the applications "Welcome" (welcome light) and "Goodbye" (light fully OFF). The "Type of logic function" parameter on the parameter page "Logic functions -> Logic function .." defines the function:

- **Welcome:**
When entering a room or a building, the triggering trigger switches on the lighting in a targeted manner, providing that it was fully switched off. The trigger for activating lighting can be a 1-bit switching telegram of a push-button sensor or a hotel card reader. The polarity of the switching telegram for activating lighting (ON, OFF) can be configured.
Using the 8 or 15 lighting inputs, the controller detects whether luminaires in the room are switched on. The "Welcome" function is only executed if all the luminaires are switched off (all lighting inputs = "OFF") and the light is switched on when entering the room. Ideally, the 1-bit feedback objects of the KNX actuator channels of the luminaires to be evaluated are each linked to a lighting input of the controller.
The lighting for a "Welcome" is switched off via the 1-bit result object selected in the result stage.
- **Goodbye:**
When leaving a room or a building, the triggering trigger switches off the lighting centrally, providing that it was partially or fully switched on. The trigger for deactivating lighting can be a 1-bit switching telegram of a push-button sensor or a hotel card reader. The polarity of the switching telegram for deactivating lighting (ON, OFF) can be configured.
Using the 8 or 15 lighting inputs, the controller detects whether all or individual luminaires in the room are switched on. The "Goodbye" function is only executed if only one luminaire is switched on (at least one lighting input = "ON") and, on leaving the room, the light is to be switched off. Here too, ideally, the 1-bit feedback objects of the KNX actuator channels of the luminaires to be evaluated are each linked to a lighting input of the controller.
The lighting for a "Goodbye" is switched off via the 1-bit result object selected in the result stage.

i Lighting control is only available for the logic functions 1 and 2. For example, it is thus possible for logic function 1 to execute the "Welcome" function and for logic function 2 to execute the "Goodbye" function (see "Example for lighting control").

The following images show the individual processing stages and the internal linking of the lighting control. A distinction is made as to whether 8 lighting inputs or, alternatively, 15 lighting inputs are available.

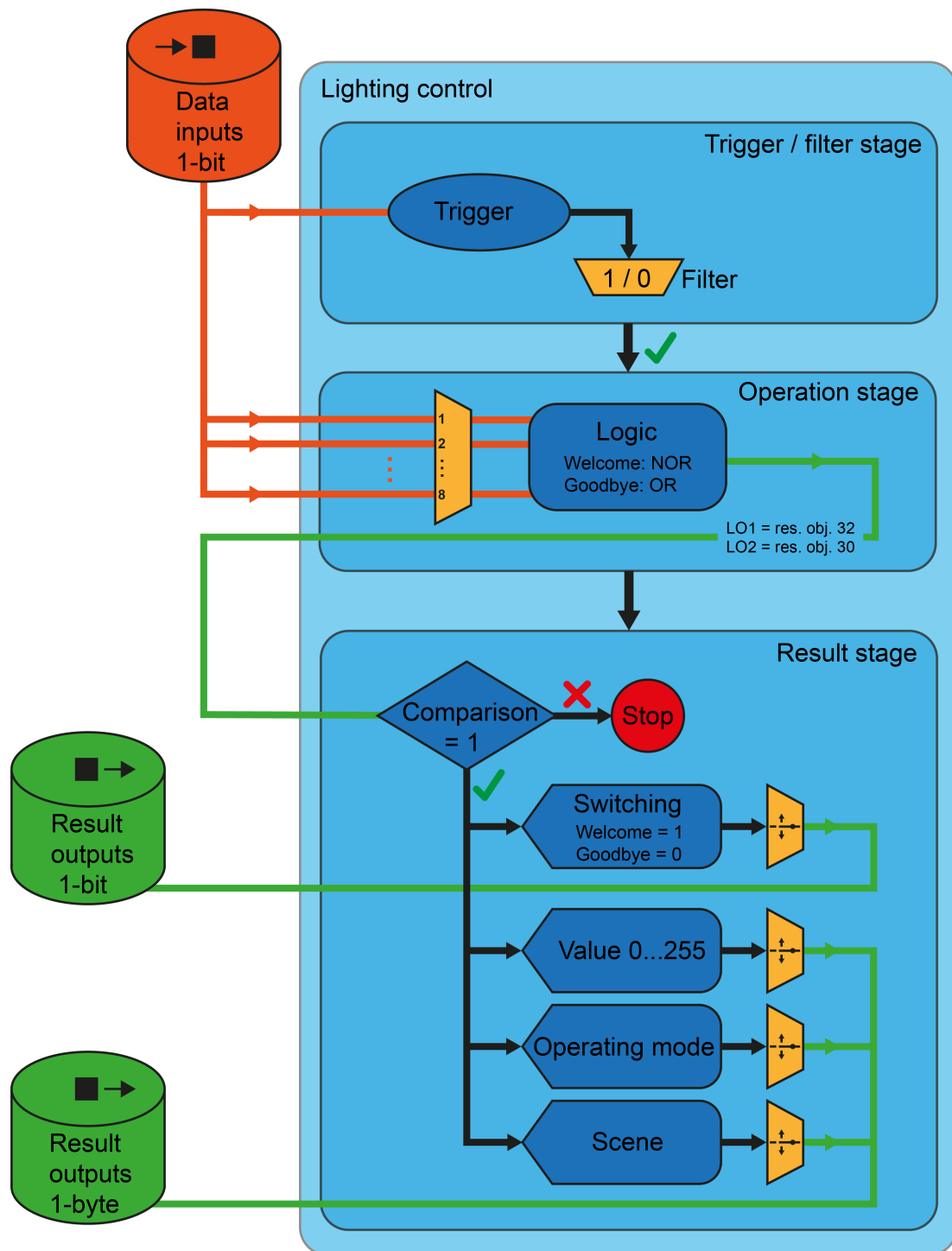


Figure 115: Processing stages of lighting control with 8 lighting inputs

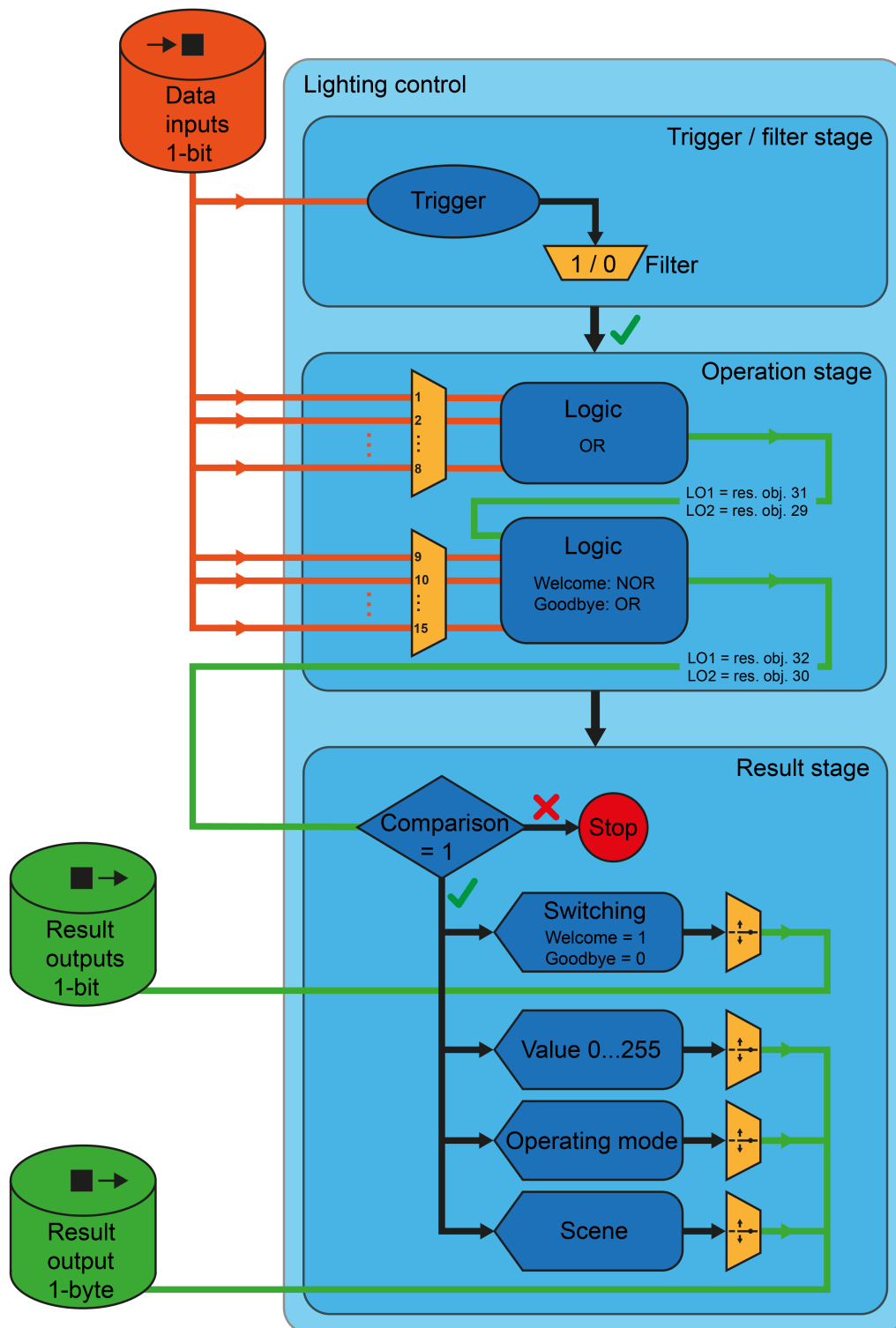


Figure 116: Processing stages of lighting control with 15 lighting inputs

If it is desirable that the lighting is not switched on immediately on a "Welcome" or switched off immediately on a "Goodbye", then an optional delay can be configured for switching the lighting on and off. When the delay is used, the result of the lighting control is only transmitted after the set time has elapsed.

Optionally, type conversions can be used in the result stage of the lighting control. This means that it is possible to transmit additional KNX commands in other data formats and, besides lighting, to influence other units of a room (e. g. heating). Three

independent type conversions are available, which, as required, can serve the 1-byte data formats "Value 0...255 (DPT 5.010)", "Operating mode switchover (DPT 20.101)" and "Scene extension unit (DPT 18.001)" via separate result outputs.

i Lighting control is a special configuration of a logic function. For the lighting control to be able to make all the required functions available alongside data inputs and result outputs, as described, it is necessary for the ETS user to link result outputs internally and thus invisibly. This connects the operation stage and the result stage and matches them. When using lighting control in the logic functions 1 and 2, the 1-bit result outputs 30 and 32 are always used exclusively and, if 15 lighting inputs are configured, also the 1-bit result outputs 29 and 31. These result objects may not be used in any other logic functions and also not written with group telegrams (internal and external)! Otherwise, there is the risk of malfunction in the lighting control!

Lighting control example

The application example explained below shows the configuration and linkage of lighting control with suitable KNX sensors and actuators (see figure).

Initial situation and function requirement:

In a hotel room, there is a KNX hotel card reader by the door. In addition, the sub-distribution unit contains a 2x switching actuator (e. g. the two switching outputs of the available actuator) and a 2x KNX push-button sensor is installed somewhere in the hotel room. Two luminaires (e. g. 1 x ceiling light, 1 x ambience) are connected to the outputs of the switching actuator. Logic functions 1 and 2 are used as lighting control. The first logic function should execute a welcome light as a "Welcome" on entering the room, whilst the second logic functions should implement a Light OFF function as a "Goodbye" as soon as the hotel card is removed. The push-button sensor should also allow the guest to control the lighting in the hotel room individually.

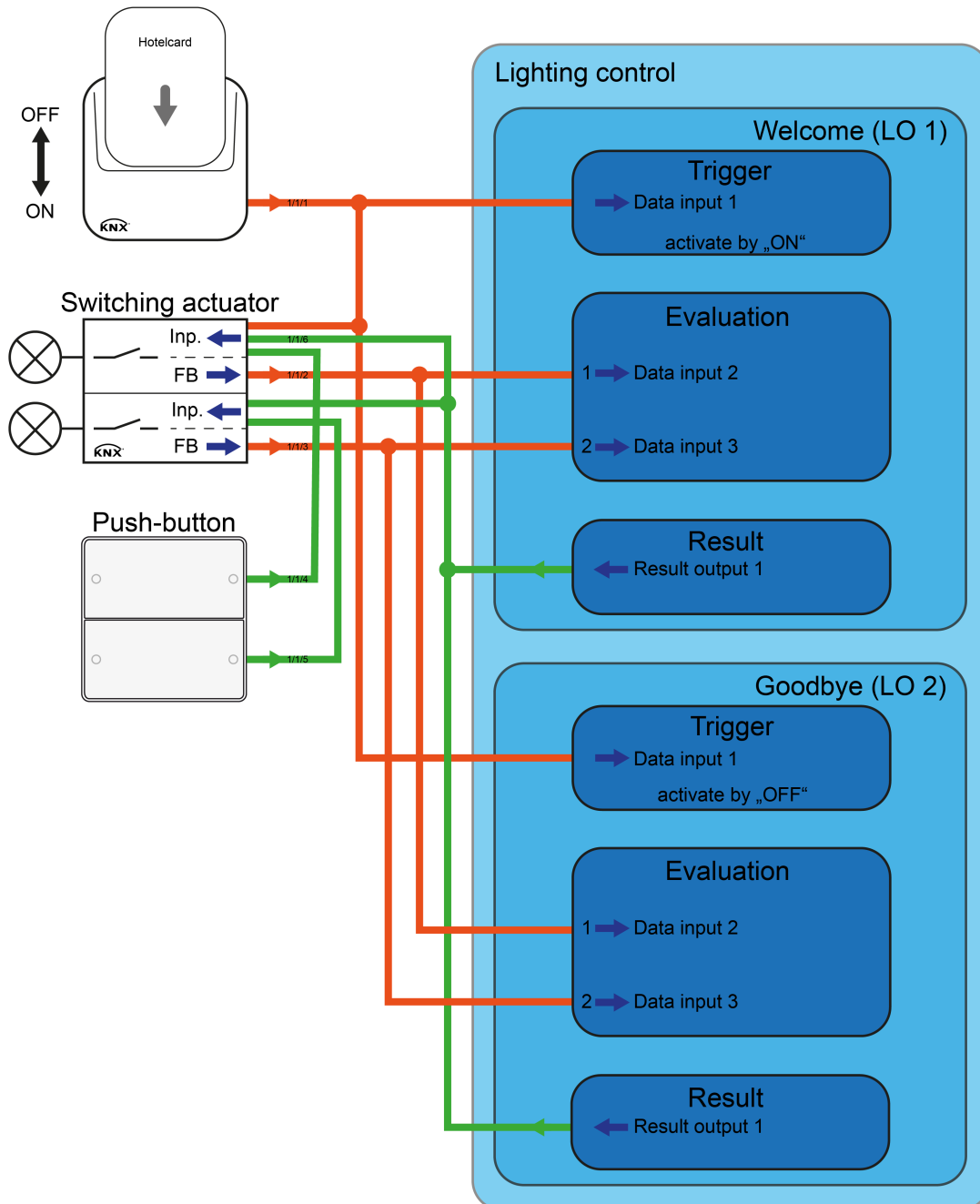
Function:

On entering the hotel room, the guest inserts the hotel card into the reading device. This causes the hotel card reader to transmit an "ON" telegram to data input 1 of the logic functions, which is assigned to the 1-bit trigger inputs. The "ON" telegram causes the "Welcome" control to evaluate the lighting situation via data inputs 2 and 3. If the lighting in the room is switched off completely, i.e. the two 1-bit switching status feedback items of the switching actuator were most recently "OFF", then the first logic function activates the welcome light by an "ON" telegram via result output 1. This object is linked to the two switching inputs of the switching actuator via a separate group address. In consequence, both lighting channels react to the switch-on command of the lighting control. The welcome light thus switches on the entire room lighting. Then, the lighting situation can be adapted as required using the push-button sensor.

Should the entire lighting or a part of it already be switched on when entering the hotel room, then the "Welcome" controller does not react.

If the guest leaves the hotel room for a longer period of time, then they remove the hotel card. This causes the hotel card reader to transmit an "OFF" telegram to data input 1 of the logic functions. This "OFF" telegram triggers the "Goodbye" control, which evaluates the lighting situation in the room via data inputs 2 and 3. Should the

entire lighting or only a part of it already be switched on, then the controller triggers an "OFF" telegram via result output 1. This switches off the lighting completely. Should the entire lighting already be switched off on leaving the hotel room, then the "Goodbye" controller does not react.



- i** As an alternative to the KNX push-button sensor, the binary inputs of the actuator can be used to which standard installation push-buttons or switches can be connected. In addition, a conventional hotel card reader (without KNX bus coupler) can be connected to a binary input.
- i** The displayed application example can be expanded to up to 15 separate lightning channels for the evaluation of the lighting situation. This means that central lighting control of an apartment or an office or accommodation building

can be implemented, for example. By using the type switchover in the result stage, other units of a room or building, beside lighting, can be controlled (e. g. a KNX-compatible heating or air-conditioning system via the integrated room temperature controller -> Activation of Comfort mode on entering, activation of Standby mode on leaving the room).

17.2.3 Parameter for logic functions

General -> Enabled functions

Logic functions	none simple logic function extended logic function
This parameter allows you to differentiate between simple or extended logic functions or no logic function at all. If the simple or extended logic function is activated, the "Logic functions" parameter node will become available, which contains additional parameter pages. The configuration of the logic functions takes place in this parameter node.	
Number of logic functions	1 ... 10
The number of required logic functions is defined here. The selection option for this parameter is available only with the "extended logic function".	

Logic functions -> Inputs

Use 1-bit input objects?	no yes (32 objects)
Data inputs are input objects of the logic functions. Logic functions receive switching states (1-bit), dimming commands (4-bit) or value telegrams (1-byte, 2-byte, 4-byte) for processing via these inputs. A shared collection of data inputs of varying data formats is available for all the logic functions. Data inputs can be enabled in groups as necessary so that only certain input data formats are available, according to requirements. Thus, each data format possesses a parameter to enable the data inputs. Unused data formats should not be enabled, to make the object table of the actuator and the configuration of the logic functions clearer. This parameter enables the 32 1-bit input objects as necessary.	
Use 4-bit input objects?	no yes (16 objects)
This parameter enables the 16 4-bit input objects as necessary.	
Use 1-byte input objects?	no yes (16 objects)
This parameter enables the 16 1-byte input objects as necessary.	
Use 2-byte input objects?	no yes (16 objects)
This parameter enables the 16 2-byte input objects as necessary.	
Use 4-byte input objects?	no yes (8 objects)
This parameter enables the 8 4-byte input objects as necessary.	

Logic functions -> Logic function ..

Name of logic function	20-character free text
The text entered in this parameter is used to label the logic function in the ETS parameter window (e. g. "Logic window contacts", "Lighting corridor"). The text is not programmed in the device.	
Type of logic function	User-defined logic function
	Lighting control hotel "Welcome" (8 inputs)
	Lighting control hotel "Welcome" (15 inputs)
	Lighting control hotel "Goodbye" (8 inputs)
	Lighting control hotel "Goodbye" (15 inputs)
Logic functions can be configured and used in user-defined form or as a "Lighting controller" configuration template. user-defined logic function: In the user-defined version, each logic function possesses up to 8 trigger inputs for the activation of a logical calculation. An optional filter stage allows the hiding of trigger results (e. g. "only react to switch-on commands" or "only react when dimming level greater than 50 %"). Operations can be executed at 1 to 4 levels and can be configured in a user-defined manner to the types "Logic" (e. g. AND, OR, exclusive AND, exclusive OR, each with up to 8 inputs), "Arithmetic" (e. g. addition, subtraction, multiplication, division, percent), "Comparison" (e. g. equal, unequal, greater than, smaller than, area test) or "Type conversion". Operators can be constants, input or output objects. A result stage allows the evaluation, forwarding and, if necessary, also the conversion of results of logical operations. Only one user-defined logic function can be configured for the logic functions 3...10. "Welcome" hotel lighting control (8 inputs), "Welcome" hotel lighting control (15 inputs), "Goodbye" hotel lighting control (8 inputs), "Goodbye" hotel lighting control (15 inputs): To simplify the configuration of a logic function, the lighting control is available as a configuration template. Alternatively to a user-defined configuration, lighting control can be activated for logic functions 1 and 2 and allows "Welcome" or "Goodbye" control for the lighting in a hotel room or similar applications (e. g. welcome light on entering a house or central switch-off on leaving an apartment). Depending on the selection here, up to 8 or 15 defined lighting inputs are available as status information for lighting control.	

Logic functions -> Logic function ..-> LO... - Trigger

Trigger 1	deactivated Data input 1 (1-bit) ... Data input 32 (1-bit) Data input 1 (4-bit) ... Data input 16 (4-bit) Data input 1 (1-byte) ... Data input 16 (1-byte) Data input 1 (2-byte) ... Data input 16 (2-byte) Data input 1 (4-byte) ... Data input 8 (4-byte)
The first external trigger source is defined here. External triggers can only be enabled data inputs of the logic functions. The logic function evaluates an external object trigger, if any telegram update is received at the trigger input via the KNX or via internal group communication. The data inputs of a specific data format are only available if the correspond data inputs are generally enabled.	
Trigger 2...8	
See trigger 1.	
Use automatic trigger?	Yes
An automatic trigger is always used if no external trigger (no data input as a trigger) is configured. The trigger stage then always evaluates a valid trigger cyclically after the "Time for automatic trigger" has elapsed and activated the next processing stage of the logic function. The setting of this parameter cannot be changed. This parameter is only available if all the triggers (1...8) are set to "deactivated".	
Time for automatic trigger in hours (0...99)	0...99
If the automatic trigger is used, this parameter defines the time, after whose expiry a valid trigger is always evaluated. The time for the automatic trigger is started after a device reset (bus voltage return, ETS programming operation) and repeated cyclically. Setting the cycle time hours.	
Minutes (0...59)	0...59
Setting the cycle time minutes.	
Seconds (0...59)	0...10...59
Setting the cycle time seconds.	

Milliseconds (1...9 x 100)	1...9
Sets the cycle time milliseconds. These parameters are only available if all the triggers (1...8) are set to "deactivated".	
Use cyclical trigger monitoring function?	yes no
This parameter then decides whether each object trigger immediately leads to a valid trigger result ("No" setting -> no trigger monitoring) or whether a trigger monitoring time is evaluated ("Yes" setting). If trigger monitoring is used, a logic function waits for the configured time and only triggers a valid trigger if no object trigger is performed during the monitoring time. If telegram updates to trigger objects have been received within the monitoring time, nothing further occurs. The trigger stage then terminates the processing of a logic function. This parameter is only available in this way if at least one external object trigger is configured.	
Monitoring time in hours (0...99)	0...99
If cyclical trigger monitoring is used, this parameter defines the monitoring time. The monitoring time is restarted after a device reset (bus voltage return, ETS programming operation) and with each received object trigger. Sets the monitoring time hours.	
Minutes (0...59)	0...59
Sets the monitoring time minutes.	
Seconds (0...59)	0...10...59
Sets the monitoring time seconds.	
Milliseconds (1...9 x 100)	1...9
Sets the monitoring time milliseconds. These parameters are only available is the parameter "Use cyclical trigger monitoring function?" is set to "yes".	
Write trigger stage output to an input object as an intermediate result?	yes no
The trigger stage can write as an intermediate result of one to the 32 1-bit result objects. The trigger stage stores the state "1" (TRUE) in the selected result object if a valid trigger has been detected. This means that the trigger decision can be read out in the result object or used for further logic calculations (in the same logic function or in other functions).	
Selection of result object	Result output 1 (1-bit) ... Result output 32 (1-bit)
Definition of the result object for the 1-bit intermediate result of the trigger stage. This parameter is only available if the parameter "Write trigger stage output to an input object as an intermediate result?" is set to "yes".	

Logic functions -> Logic function ..-> LO... - Filter

Use filter stage?	yes no
The filter stage is optional. It can be used, for example, to check the execution condition of a logic function. If no filter has been configured, then the next processing stage of the logic function is always executed directly. Otherwise, the comparison between the 2 to 3 inputs of the filter (operands) must be true (TRUE). If the execution condition is false (FALSE), then all the subsequent processing stages are no longer executed and the logic function waits for the next trigger. This parameter enables the filter stage.	
Data format for comparison operation	1-bit switching (DPT 1.xxx) 4-bit dimming (DPT 3.007) 1-byte operating mode switchover (DPT 20.102) 1-byte scene extension unit (DPT 18.001) 1-byte value 0...255 (DPT 5.010) 1-byte brightness value 0...100 % (DPT 5.001) 2-byte value 0...65,535 (DPT 7.001) 2-byte value -32,768...32,767 (DPT 8.001) 2-byte floating-point number (DPT 9.0xx) 4-byte value -2147483648...2147483647 (DPT 13.001)
This parameter defines the data format of the filter stage. In consequence, it specifies the format of all comparison inputs of the filter. The comparison output of the filter always corresponds to the 1-bit data format. In consequence, the result is either true (TRUE) or false (FALSE). This parameter is only available if the filter stage is used.	

Comparison operation	Equal ($x = y$) not equal ($x \neq y$) greater than ($x > y$) greater than or equal ($x \geq y$) smaller than ($x < y$) smaller than or equal ($x \leq y$) Range testing smaller than ($x < y < z$) Range testing smaller than or equal ($x \leq y \leq z$)
The comparison operation of the filter is specified here. In the data format "1-bit switching (DPT 1.xxx)", only the settings "Equal ($x = y$)" and "Unequal ($x \neq y$)" can be selected. This parameter is only available if the filter stage is used.	
Comparison value 1 (x)	Constant Input object Result object
Depending on the configured data format, the filter makes 2 or 3 operands (x, y, z) available as inputs. The available operands are compared with each other using the set comparison operation. This parameter defines the first operand and is only available if the filter stage is used. Constant: Any constant from the value range of the corresponding data format defines the comparison value of the filter input. Input object: The comparison value is any data input of the selected data format. The selectable data inputs are not only defined by the selected filter data format, but also by the data inputs enabled globally for all logic functions (parameter page "Logic functions -> General logic functions"). If the data inputs matching the selected filter data format are not enabled globally, no assignment of data inputs is possible! Result object: The comparison value is any result output of the selected data format.	
Constant comparison value 1 (x)	0 (false) 1 (true)
The constant of the 1-bit comparison value is specified here. This parameter is only available with the data format "1-bit switching (DPT 1.xxx)" and the evaluation of a constant.	

Constant comparison value 1 (x)	Dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) dimming brightness, stop (8) dimming brightness, 100% (9) dimming brightness, 50% (10) dimming brightness, 25% (11) dimming brightness, 12.5% (12) dimming brightness, 6% (13) dimming brightness, 3% (14) dimming brightness, 1.5% (15)
The constant of the 4-bit comparison value is specified here. This parameter is only available with the data format "4-bit dimming (DPT 3.007)" and the evaluation of a constant.	
Constant comparison value 1 (x)	Automatic mode (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
The constant of the 1-byte comparison value for the operating mode switchover is specified here. This parameter is only available with the data format "1-byte operating mode switchover (DPT 20.102)" and the evaluation of a constant.	
Constant comparison value 1 (x)	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
The constant of the 1-byte comparison value for the scene extension unit is specified here. This parameter is only available with the data format "1-byte scene extension unit (DPT 18.001)" and the evaluation of a constant.	
Constant comparison value 1 (x) (0...255)	0...255
The constant of the 1-byte comparison value for the value command is specified here. This parameter is available only if a constant is evaluated with the data format "1-byte value 0...255 (DPT 5.010)".	

Constant comparison value 1 (x) (0...100%)	0...100
The constant of the 1-byte input value for the comparison value command is specified here. This parameter is only available with the data format "1-byte brightness value 0...100 % (DPT 5.001)" and the evaluation of a constant.	
Constant comparison value 1 (x) (0...65535)	0...65535
The constant of the 2-byte comparison value for the unsigned value command is specified here. This parameter is available only if a constant is evaluated with the data format "2-byte value 0...65535 (DPT 7.001)".	
Constant comparison value 1 (x) (-32768...32767)	-32768...0...32767
The constant of the 2-byte comparison value for the signed value command is specified here. This parameter is available only if a constant is evaluated with the data format "2-byte value -32768...32767 (DPT 8.001)".	
Constant comparison value 1 (x) (-671088...670760)	-671088.00...0.00... 670760.00
The constant of the 2-byte comparison value for the floating point value command is specified here. This parameter is only available with the data format "2-byte floating point value (DPT 9.0xx)" and the evaluation of a constant.	
Constant comparison value 1 (x)	-2147483648...0... 2147483647
The constant of the 4-byte comparison value for the value command is specified here. This parameter is available only if a constant is evaluated with the data format "4-byte value -2147483648...2147483647 (DPT 13.001)".	
Selection of input object	Data input 1 (1-bit) ... Data input 32 (1-bit)
This parameter specifies the input object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 1-bit data formats and evaluation of an input object.	

Selection of input object	Data input 1 (4-bit) ... Data input 16 (4-bit)
This parameter specifies the input object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 4-bit data formats and evaluation of an input object.	
Selection of input object	Data input 1 (1-byte) ... Data input 16 (1-byte)
This parameter specifies the input object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 1-byte data formats and evaluation of an input object.	
Selection of input object	Data input 1 (2-byte) ... Data input 16 (2-byte)
This parameter specifies the input object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 2-byte data formats and evaluation of an input object.	
Selection of input object	Data input 1 (4-byte) ... Data input 8 (4-byte)
This parameter specifies the input object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 4-byte data formats and evaluation of an input object.	
Selection of result object	Result output 1 (1-bit) ... Result output 32 (1-bit)
This parameter specifies the result object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 1-bit data formats and evaluation of a result object.	
Selection of result object	Result output 1 (4-bit) ... Result output 16 (4-bit)
This parameter specifies the result object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 4-bit data formats and evaluation of a result object.	

Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the result object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 1-byte data formats and evaluation of a result object.	
Selection of result object	Result output 1 (2-byte) ... Result output 16 (2-byte)
This parameter specifies the result object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 2-byte data formats and evaluation of a result object.	
Selection of result object	Result output 1 (4-byte) ... Result output 8 (4-byte)
This parameter specifies the result object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 4-byte data formats and evaluation of a result object.	
Name of comparison value	20-character free text
The text entered in this parameter is used to label the comparison value in the ETS parameter window (e. g. "Lighting status", "External brightness" or "Filter ON"). The text is not programmed in the device.	
Comparison value 2 (y)	
See comparison value 1 (x).	
Comparison value 3 (z)	
See comparison value 1 (x). The parameters for the comparison value 3 (z) are only available with the comparison operations "Range check smaller than ($x < y < z$)" and "Range check smaller than or equal to ($x \leq y \leq z$)".	
Write filter stage output to an input object as an intermediate result?	yes no
The filter stage can write as an intermediate result of one of the 32 1-bit result objects. The filter stage stores the state "1" (TRUE) in the selected result object if the execution condition of the logic function is true (TRUE). If the result of the comparison operation is incorrect (FALSE), then the filter stage writes the status "0" (FALSE) to the result object. This means that the filter decision can be read out in the result object or used for further logic calculations (in other functions).	

Selection of result object	Result output 1 (1-bit) ... Result output 32 (1-bit)
Definition of the result object for the 1-bit intermediate result of the filter stage. This parameter is only available if the parameter "Write filter stage output to an input object as an intermediate result?" is set to "yes".	

Logic functions -> Logic function ..-> LO... - Logical operation

Use logic operation 1?	yes no
The actual logic operation of a logic function is executed in the operation stage. If required, an operation stage can contain up to 4 individual operations, which are processed individually. This parameter enables the first operation.	

Name of operation	20-character free text
The text entered in this parameter is used to label the operation in the ETS parameter window (e. g. "Twilight switch", "Light control" or "People counter"). The text is not programmed in the device. This parameter is only available if the first operation is enabled.	

Type of logic operation	Logic Arithmetic Comparison Type conversion
An operation can be set to the types "Logic", "Arithmetic", "Comparison" and "Type conversion" as required. This determines which logic operations are executed and which data formats can be used for operators and results. With the "Logic" and "Arithmetic" type, only operands and result objects of the same type can be used in an operation. In the "Comparison" operation type, it is possible to compare 4-bit, 1-byte, 2-byte and 4-byte data values. The comparison result is then always written to a 1-bit result object. With operations of the type "Type conversion", one of the available data formats (1-bit, 4-bit, 1-byte, 2-byte and 4-byte) can be converted to any other format. This parameter is only available if the first operation is enabled.	

The following parameters are only available for the "Logic" operation...

Logical operation	Equal (ID) Not equal (NOT) AND (AND) OR (OR) Exclusive OR (XOR) inverted And (NAND) inverted Or (NOR) inverted Exclusive OR (NXOR) AND with feedback (ANDR)
This parameter defines the logic operation to be executed. It is only available if the first operation is enabled and the type of the logical operation is configured to "Logic". Equal (ID): The input (operand) is forwarded unchanged to the result. Not equal (NOT): The input (operand) is forwarded in inverted form to the result. And (AND): Result = "1" if all inputs = "1", otherwise result = 0. Or (OR): Result = "0", if all inputs = "0", otherwise result = "1". Exclusive or (XOR): Result = "1", if only one input = "1", otherwise result = "0". inverted and (NAND): inverted and at the output. inverted or (NOR): inverted OR at the output. inverted exclusive OR (NXOR): inverted exclusive or at the output. And with feedback (ANDR): And with result feedback to input 1. Result = "1", if all inputs = "1", otherwise result = "0" (logical AND). If input 1 is set to "1" and the result is still "0", the feedback of input 1 is also reset to "0". Only when all the inputs 2...8 = "1" will the newly-received "1" at input 1 cause the result to assume the logical state "1". Application: Only switch light manually at twilight -> Switch on input 1, twilight sensor at input 2 -> The manual switching signal is ignored for as long as the twilight sensor has not issued an enabling signal. The manual switching sign is only executed at twilight.	
Data format of logic operation	1-bit switching (DPT 1.xxx)
A logic operation contains up to 8 operators, which should be regarded as a Boolean input (1-bit) of the logic gate. In consequence, a logic operation only supports the 1-bit data format. This parameter cannot be changed and is only visible when the type of the logic operation is configured as "Logic".	

Operand 1 (x)	deactivated Constant Input object Result object
Depending on the configured data format, the operation makes 2 or 3 operands (x, y, z) available as inputs. This parameter defines the first operand and is only available when the type of the logic operation is configured as "Logic". deactivated: This setting allows deactivation of an input of the operation. This setting is available if the logic operation is not configured to "Equal (ID)" or "Not equal (NOT)". Constant: Any constant from the value range of the corresponding data format defines the input value. Input object: The input value is any data input of the 1-bit data format. The selectable data inputs are not only defined by the operation data format, but also by the data inputs enabled globally for all logic functions (parameter page "Logic functions -> Inputs"). If the data inputs matching the selected operation data format are not enabled globally, no assignment of data inputs is possible! Result object: The input value is any result output of the 1-bit data format.	

Constant operand 1 (x)	0 (false) 1 (true)
The constant of the 1-bit operand is specified here. This parameter is only available with "Operand 1 (x) = Constant".	

Selection of input object	Data input 1 (1-bit) ... Data input 32 (1-bit)
This parameter specifies the input object for the first operand. This parameter is only available with evaluation of an input object.	

Selection of result object	Result output 1 (1-bit) ... Result output 32 (1-bit)
This parameter specifies the result object for the first operand. This parameter is only available with evaluation of a result object.	

Operand 2 (y) ... Operand 8 (e)	
See operand 1 (x). These operands are only available if the logic operation is not configured to "Equal (ID)" or "Not equal (NOT)".	

Selection of result object	Result output 1 (1-bit) ... Result output 32 (1-bit)
This parameter specifies the result object, in which the logic operation stores the result.	

The following parameters are only available for the "Arithmetic" operation...

Logical operation	Identity (x = operation output) Addition (x + y) Subtraction (x - y) Multiplication (x • y) Division (x : y) Rest of division / modulo (MOD x : y) Minimum (MIN x y) Maximum (MAX x y) Percent (100 • [x : y])
This parameter defines the arithmetic operation to be executed. It is only available if the first operation is enabled and the type of the logical operation is configured to "Arithmetic". Identity (x = operation output): The input (operand x) is forwarded unchanged to the result. Addition (x + y): Result from addition of both inputs. Subtraction (x - y): Result from subtraction of both inputs. Multiplication (x • y): Result from multiplication of both inputs. Division (x : y): Result from division of both inputs. Divisions by "0" lead to the operation being cancelled. No result is written. Rest of division / modulo (MOD x : y): Result from modulo (remainder after division) of both inputs. Minimum (MIN x y): Result is the maximum of both inputs. Maximum (MAX x y): Result is the minimum of both inputs. Percent (100 • [x : y]): Result is the percentage value of the first input (x) relative to the second input (y).	
Data format of logic operation	1-byte value 0...255 (DPT 5.010) 1-byte brightness value 0...100 % (DPT 5.001) 2-byte value 0...65,535 (DPT 7.001) 2-byte value -32,768...32,767 (DPT 8.001) 2-byte floating-point number (DPT 9.0xx) 4-byte value -2147483648...2147483647 (DPT 13.001)
This parameter defines the data format of the arithmetic operation. 1-byte, 2-byte or 4-byte value operations can be executed. All the operands and also the result object always correspond to the same data format. This parameter is only available when the type of the logic operation is configured as "Arithmetic".	

Operand 1 (x)	Constant Input object Result object
An arithmetic operation makes 2 operands (x, y) available as inputs. This parameter defines the first operand and is only available when the type of the logic operation is configured as "Arithmetic". Constant: Any constant from the value range of the corresponding data format defines the input value. Input object: The input value is any data input of the selected data format. The selectable data inputs are not only defined by the operation data format, but also by the data inputs enabled globally for all logic functions (parameter page "Logic functions -> General logic functions"). If the data inputs matching the selected operation data format are not enabled globally, no assignment of data inputs is possible! Result object: The comparison value is any result output of the selected data format.	
Constant operand 1 (x) (0...255)	0...255
The constant of the 1-byte input value for the value command is specified here. This parameter is available only if a constant is evaluated with the data format "1-byte value 0...255 (DPT 5.010)".	
Constant operand 1 (x) (0...100%)	0...100
The constant of the 1-byte input value for the brightness value command is specified here. This parameter is only available with the data format "1-byte brightness value 0...100 % (DPT 5.001)" and the evaluation of a constant.	
Constant operand 1 (x) (0...65535)	0...65535
The constant of the 2-byte input value for the unsigned value command is specified here. This parameter is available only if a constant is evaluated with the data format "2-byte value 0...65535 (DPT 7.001)".	
Constant operand 1 (x) (-32768...32767)	-32768...0...32767
The constant of the 2-byte input value for the signed value command is specified here. This parameter is available only if a constant is evaluated with the data format "2-byte value -32768...32767 (DPT 8.001)".	
Constant operand 1 (x) (-671088...670760)	-671088.00...0.00... 670760.00
The constant of the 2-byte input value for the floating point value command is specified here. This parameter is only available with the data format "2-byte floating point value (DPT 9.0xx)" and the evaluation of a constant.	

Constant operand 1 (x)	-2147483648...0... 2147483647
The constant of the 4-byte input value for the value command is specified here. This parameter is available only if a constant is evaluated with the data format "4-byte value -2147483648...2147483647 (DPT 13.001)".	
Selection of input object	Data input 1 (1-byte) ... Data input 16 (1-byte)
This parameter specifies the input object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 1-byte data formats and evaluation of an input object.	
Selection of input object	Data input 1 (2-byte) ... Data input 16 (2-byte)
This parameter specifies the input object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 2-byte data formats and evaluation of an input object.	
Selection of input object	Data input 1 (4-byte) ... Data input 8 (4-byte)
This parameter specifies the input object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 4-byte data formats and evaluation of an input object.	
Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the result object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 1-byte data formats and evaluation of a result object.	
Selection of result object	Result output 1 (2-byte) ... Result output 16 (2-byte)
This parameter specifies the result object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 2-byte data formats and evaluation of a result object.	

Selection of result object	Result output 1 (4-byte) ... Result output 8 (4-byte)
This parameter specifies the result object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 4-byte data formats and evaluation of a result object.	

Operand 2 (y)	
See operand 1 (x).	

Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the 1-byte result object, in which the logic operation stores the result. The selection is dependent on the configured data format. This parameter is only available with 1-byte data formats.	

Selection of result object	Result output 1 (2-byte) ... Result output 16 (2-byte)
This parameter specifies the 2-byte result object, in which the logic operation stores the result. The selection is dependent on the configured data format. This parameter is only available with 2-byte data formats.	

Selection of result object	Result output 1 (4-byte) ... Result output 8 (4-byte)
This parameter specifies the 4-byte result object, in which the logic operation stores the result. The selection is dependent on the configured data format. This parameter is only available with 4-byte data formats.	

The following parameters are only available for the "Comparison" operation...

Logical operation	Equal ($x = y$) not equal ($x \neq y$) greater than ($x > y$) greater than or equal ($x \geq y$) smaller than ($x < y$) smaller than or equal ($x \leq y$) Range testing smaller than ($x < y < z$) Range testing smaller than or equal ($x \leq y \leq z$)
This parameter defines the logic comparison operation to be executed. It is only available if the first operation is enabled and the type of the logical operation is configured to "Comparison".	

Data format of logic operation	4-bit dimming (DPT 3.007) 1-byte operating mode switchover (DPT 20.102) 1-byte scene extension unit (DPT 18.001) 1-byte value 0...255 (DPT 5.010) 1-byte brightness value 0...100 % (DPT 5.001) 2-byte value 0...65,535 (DPT 7.001) 2-byte value -32,768...32,767 (DPT 8.001) 2-byte floating-point number (DPT 9.0xx) 4-byte value -2147483648...2147483647 (DPT 13.001)
The data format of the input data values (operands) to be compared can be configured here. 4-bit, 1-byte, 2-byte or 4-byte comparison operations can be executed. The result output of the operation always corresponds to the 1-bit data format. In consequence, the comparison result is either true (TRUE) or false (FALSE). This parameter is only available if the first operation is enabled and the type of the logical operation is configured to "Comparison".	
Operand 1 (x)	Constant Input object Result object
Depending on the configured data format, a logical comparison operation makes 2 or 3 operands (x, y, z) available as inputs. This parameter defines the first operand and is only available when the type of the logic operation is configured as "Comparison". Constant: Any constant from the value range of the corresponding data format defines the input value. Input object: The input value is any data input of the selected data format. The selectable data inputs are not only defined by the operation data format, but also by the data inputs enabled globally for all logic functions (parameter page "Logic functions -> General logic functions"). If the data inputs matching the selected operation data format are not enabled globally, no assignment of data inputs is possible! Result object: The comparison value is any result output of the selected data format.	

Constant operand 1 (x)	Dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) dimming brightness, stop (8) dimming brightness, 100% (9) dimming brightness, 50% (10) dimming brightness, 25% (11) dimming brightness, 12.5% (12) dimming brightness, 6% (13) dimming brightness, 3% (14) dimming brightness, 1.5% (15)
The constant of the 4-bit input value is specified here. This parameter is only available with the data format "4-bit dimming (DPT 3.007)" and the evaluation of a constant.	
Constant operand 1 (x)	Automatic mode (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
The constant of the 1-byte comparison value for the operating mode switchover is specified here. This parameter is only available with the data format "1-byte operating mode switchover (DPT 20.102)" and the evaluation of a constant.	
Constant operand 1 (x)	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
The constant of the 1-byte input value for the scene extension unit is specified here. This parameter is only available with the data format "1-byte scene extension unit (DPT 18.001)" and the evaluation of a constant.	
Constant operand 1 (x) (0...255)	0...255
The constant of the 1-byte input value for the value command is specified here. This parameter is available only if a constant is evaluated with the data format "1-byte value 0...255 (DPT 5.010)".	

Constant operand 1 (x) (0...100%)	0...100
The constant of the 1-byte input value for the brightness value command is specified here. This parameter is only available with the data format "1-byte brightness value 0...100 % (DPT 5.001)" and the evaluation of a constant.	
Constant operand 1 (x) (0...65535)	0...65535
The constant of the 2-byte input value for the unsigned value command is specified here. This parameter is available only if a constant is evaluated with the data format "2-byte value 0...65535 (DPT 7.001)".	
Constant operand 1 (x) (-32768...32767)	-32768...0...32767
The constant of the 2-byte input value for the signed value command is specified here. This parameter is available only if a constant is evaluated with the data format "2-byte value -32768...32767 (DPT 8.001)".	
Constant operand 1 (x) (-671088...670760)	-671088.00...0.00... 670760.00
The constant of the 2-byte input value for the floating point value command is specified here. This parameter is only available with the data format "2-byte floating point value (DPT 9.0xx)" and the evaluation of a constant.	
Constant operand 1 (x)	-2147483648...0... 2147483647
The constant of the 4-byte input value for the value command is specified here. This parameter is available only if a constant is evaluated with the data format "4-byte value -2147483648...2147483647 (DPT 13.001)".	
Selection of input object	Data input 1 (4-bit) ... Data input 16 (4-bit)
This parameter specifies the input object for the first comparison value. The selection is dependent on the configured data type. This parameter is only available with 4-bit data formats and evaluation of an input object.	
Selection of input object	Data input 1 (1-byte) ... Data input 16 (1-byte)
This parameter specifies the input object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 1-byte data formats and evaluation of an input object.	

Selection of input object	Data input 1 (2-byte) ... Data input 16 (2-byte)
This parameter specifies the input object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 2-byte data formats and evaluation of an input object.	
Selection of input object	Data input 1 (4-byte) ... Data input 8 (4-byte)
This parameter specifies the input object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 4-byte data formats and evaluation of an input object.	
Selection of result object	Result output 1 (4-bit) ... Result output 16 (4-bit)
This parameter specifies the result object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 4-bit data formats and evaluation of a result object.	
Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the result object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 1-byte data formats and evaluation of a result object.	
Selection of result object	Result output 1 (2-byte) ... Result output 16 (2-byte)
This parameter specifies the result object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 2-byte data formats and evaluation of a result object.	
Selection of result object	Result output 1 (4-byte) ... Result output 8 (4-byte)
This parameter specifies the result object for the first input value. The selection is dependent on the configured data type. This parameter is only available with 4-byte data formats and evaluation of a result object.	

Operand 2 (y)	
See operand 1 (x).	

Selection of result object	Result output 1 (4-bit) ... Result output 16 (4-bit)
This parameter specifies the 4-bit result object, in which the logic comparison operation stores the result. The selection is dependent on the configured data format. This parameter is only available with 4-bit data formats.	

Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the 1-byte result object, in which the logic comparison operation stores the result. The selection is dependent on the configured data format. This parameter is only available with 1-byte data formats.	

Selection of result object	Result output 1 (2-byte) ... Result output 16 (2-byte)
This parameter specifies the 2-byte result object, in which the logic comparison operation stores the result. The selection is dependent on the configured data format. This parameter is only available with 2-byte data formats.	

Selection of result object	Result output 1 (4-byte) ... Result output 8 (4-byte)
This parameter specifies the 4-byte result object, in which the logic comparison operation stores the result. The selection is dependent on the configured data format. This parameter is only available with 4-byte data formats.	

The following parameters are only available for the "Type conversion" operation...

Logical operation	x -> 1-bit (DPT 1.xxx) x -> 4-bit (DPT 3.007) x -> 1-byte operating mode (DPT 20.102) x -> 1-byte scene (DPT 18.001) x -> 1-byte 0...255 (DPT 5.010) x -> 1-byte 0...100 % (DPT 5.001) x -> 2-byte 0...65,535 (DPT 7.001) x -> 2-byte -32,768...32,767 (DPT 8.001) x -> 2-byte floating point value (DPT 9.0xx) x -> 4-byte -2147483648...2147483647 (DPT 13.001)
This parameter specifies the data format of the result output. It is only available if the first operation is enabled and the type of the logical operation is configured to "Type conversion".	

Input data format of logic operation	1-bit switching (DPT 1.xxx) 4-bit dimming (DPT 3.007) 1-byte operating mode switchover (DPT 20.102) 1-byte scene extension unit (DPT 18.001) 1-byte value 0...255 (DPT 5.010) 1-byte brightness value 0...100 % (DPT 5.001) 2-byte value 0...65,535 (DPT 7.001) 2-byte value -32,768...32,767 (DPT 8.001) 2-byte floating-point number (DPT 9.0xx) 4-byte value -2147483648...2147483647 (DPT 13.001)
This parameter specifies the data format of the input (operand). It is only available if the first operation is enabled and the type of the logical operation is configured to "Type conversion".	

Operand 1 (x)	Constant Input object Result object
The type conversion makes an operand available as an input. This parameter defines this operand and is only available when the type of the logic operation is configured as "Type conversion". Constant: Any constant from the value range of the corresponding data format defines the input value. Input object: The input value is any data input of the selected data format. The selectable data inputs are not only defined by the selected data format, but also by the data inputs enabled globally for all logic functions (parameter page "Logic functions -> General logic functions"). If the data inputs matching the selected data format are not enabled globally, no assignment of data inputs is possible! Result object: The input value is any result output of the selected data format.	
Constant operand 1 (x)	0 (false) 1 (true)
The constant of the 1-bit input value is specified here. This parameter is only available with the input data format "1-bit switching (DPT 1.xxx)" and the evaluation of a constant.	
Constant operand 1 (x)	Dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) dimming brightness, stop (8) dimming brightness, 100% (9) dimming brightness, 50% (10) dimming brightness, 25% (11) dimming brightness, 12.5% (12) dimming brightness, 6% (13) dimming brightness, 3% (14) dimming brightness, 1.5% (15)
The constant of the 4-bit input value is specified here. This parameter is only available with the input data format "4-bit dimming (DPT 3.007)" and the evaluation of a constant.	

Constant operand 1 (x)	Automatic mode (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
The constant of the 1-byte input value for the operating mode switchover is specified here. This parameter is only available with the input data format "1-byte operating mode switchover (DPT 20.102)" and the evaluation of a constant.	
Constant operand 1 (x)	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
The constant of the 1-byte input value for the scene extension unit is specified here. This parameter is only available with the input data format "1-byte scene extension unit (DPT 18.001)" and the evaluation of a constant.	
Constant operand 1 (x) (0...255)	0...255
The constant of the 1-byte input value for the value command is specified here. This parameter is only available with the input data format "1-byte value 0...255 (DPT 5.010)" and the evaluation of a constant.	
Constant operand 1 (x) (0...100%)	0...100
The constant of the 1-byte input value for the brightness value command is specified here. This parameter is only available with the input data format "1-byte brightness value 0...100 % (DPT 5.001)" and the evaluation of a constant.	
Constant operand 1 (x) (0...65535)	0...65535
The constant of the 2-byte input value for the unsigned value command is specified here. This parameter is only available with the input data format "2-byte value 0...65535 (DPT 7.001)" and the evaluation of a constant.	
Constant operand 1 (x) (-32768...32767)	-32768...0...32767
The constant of the 2-byte input value for the signed value command is specified here. This parameter is only available with the input data format "2-byte value -32768...32767 (DPT 8.001)" and the evaluation of a constant.	

Constant operand 1 (x) (-671088...670760)	-671088.00...0.00... 670760.00
The constant of the 2-byte input value for the floating point value command is specified here. This parameter is only available with the input data format "2-byte floating point value (DPT 9.0xx)" and the evaluation of a constant.	
Constant operand 1 (x)	-2147483648...0... 2147483647
The constant of the 4-byte input value for the value command is specified here. This parameter is only available with the input data format "4-byte value -2147483648...2147483647 (DPT 13.001)" and the evaluation of a constant.	
Selection of input object	Data input 1 (1-bit) ... Data input 32 (1-bit)
This parameter specifies the input object for the input value. The selection is dependent on the configured input data type. This parameter is only available with 1-bit data formats and evaluation of an input object.	
Selection of input object	Data input 1 (4-bit) ... Data input 16 (4-bit)
This parameter specifies the input object for the input value. The selection is dependent on the configured input data type. This parameter is only available with 4-bit data formats and evaluation of an input object.	
Selection of input object	Data input 1 (1-byte) ... Data input 16 (1-byte)
This parameter specifies the input object for the input value. The selection is dependent on the configured input data type. This parameter is only available with 1-byte data formats and evaluation of an input object.	
Selection of input object	Data input 1 (2-byte) ... Data input 16 (2-byte)
This parameter specifies the input object for the input value. The selection is dependent on the configured input data type. This parameter is only available with 2-byte data formats and evaluation of an input object.	

Selection of input object	Data input 1 (4-byte) ... Data input 8 (4-byte)
This parameter specifies the input object for the input value. The selection is dependent on the configured input data type. This parameter is only available with 4-byte data formats and evaluation of an input object.	
Selection of result object	Result output 1 (1-bit) ... Result output 32 (1-bit)
This parameter specifies the result object for the input value. The selection is dependent on the configured input data type. This parameter is only available with 1-bit data formats and evaluation of a result object.	
Selection of result object	Result output 1 (4-bit) ... Result output 16 (4-bit)
This parameter specifies the result object for the input value. The selection is dependent on the configured input data type. This parameter is only available with 4-bit data formats and evaluation of a result object.	
Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the result object for the input value. The selection is dependent on the configured input data type. This parameter is only available with 1-byte data formats and evaluation of a result object.	
Selection of result object	Result output 1 (2-byte) ... Result output 16 (2-byte)
This parameter specifies the result object for the input value. The selection is dependent on the configured input data type. This parameter is only available with 2-byte data formats and evaluation of a result object.	
Selection of result object	Result output 1 (4-byte) ... Result output 8 (4-byte)
This parameter specifies the result object for the input value. The selection is dependent on the configured input data type. This parameter is only available with 4-byte data formats and evaluation of a result object.	

Selection of result object	Result output 1 (1-bit) ... Result output 32 (1-bit)
This parameter specifies the 1-bit result object, in which the type conversion stores the result. The selection is dependent on the configured output data format. This parameter is only available with 1-bit data formats.	
Selection of result object	Result output 1 (4-bit) ... Result output 16 (4-bit)
This parameter specifies the 4-bit result object, in which the type conversion stores the result. The selection is dependent on the configured output data format. This parameter is only available with 4-bit data formats.	
Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the 1-byte result object, in which the type conversion stores the result. The selection is dependent on the configured output data format. This parameter is only available with 1-byte data formats.	
Selection of result object	Result output 1 (2-byte) ... Result output 16 (2-byte)
This parameter specifies the 2-byte result object, in which the type conversion stores the result. The selection is dependent on the configured output data format. This parameter is only available with 2-byte data formats.	
Selection of result object	Result output 1 (4-byte) ... Result output 8 (4-byte)
This parameter specifies the 4-byte result object, in which the type conversion stores the result. The selection is dependent on the configured output data format. This parameter is only available with 4-byte data formats.	
Use logic operation 2?	yes no
The actual logic operation of a logic function is executed in the operation stage. If required, an operation stage can contain up to 4 individual operations, which are processed individually. This parameter enables the second operation. See operation 1.	

Use logic operation 3?	yes no

The actual logic operation of a logic function is executed in the operation stage. If required, an operation stage can contain up to 4 individual operations, which are processed individually.

This parameter enables the third operation.

See operation 1.

Use logic operation 4?	yes no

The actual logic operation of a logic function is executed in the operation stage. If required, an operation stage can contain up to 4 individual operations, which are processed individually.

This parameter enables the fourth operation.

See operation 1.

Logic functions -> Logic function .. -> LO.. - Result

Data format for result evaluation	1-bit switching (DPT 1.xxx) 4-bit dimming (DPT 3.007) 1-byte operating mode switchover (DPT 20.102) 1-byte scene extension unit (DPT 18.001) 1-byte value 0...255 (DPT 5.010) 1-byte brightness value 0...100 % (DPT 5.001) 2-byte value 0...65,535 (DPT 7.001) 2-byte value -32,768...32,767 (DPT 8.001) 2-byte floating-point number (DPT 9.0xx) 4-byte value -2147483648...2147483647 (DPT 13.001)

Result objects written with an operation or intermediate result in a logic function only actively transmit their status or value with a telegram to the KNX when they are evaluated in the result stage. Thus, in each logic function, a result object from the higher-level processing stages can be specified as an output object to be evaluated. Alternatively, result objects, whose object value was influenced in other logic functions, can also be evaluated in a result stage.

The result stage only ever evaluates one result object of a defined data format. For this reason, the data format and then a matching result object must be selected here.

Selection of result object	Result output 1 (1-bit) ... Result output 32 (1-bit)
This parameter specifies the 1-bit result object, in which the result stage is evaluated. The selection is dependent on the configured data format. This parameter is only available with 1-bit data formats.	
Selection of result object	Result output 1 (4-bit) ... Result output 16 (4-bit)
This parameter specifies the 4-bit result object, in which the result stage is evaluated. The selection is dependent on the configured output data format. This parameter is only available with 4-bit data formats.	
Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the 1-byte result object, in which the result stage is evaluated. The selection is dependent on the configured output data format. This parameter is only available with 1-byte data formats.	
Selection of result object	Result output 1 (2-byte) ... Result output 16 (2-byte)
This parameter specifies the 2-byte result object, in which the result stage is evaluated. The selection is dependent on the configured output data format. This parameter is only available with 2-byte data formats.	
Selection of result object	Result output 1 (4-byte) ... Result output 8 (4-byte)
This parameter specifies the 4-byte result object, in which the result stage is evaluated. The selection is dependent on the configured output data format. This parameter is only available with 4-byte data formats.	
Check result (filter)?	yes no
Optionally, the result stage can perform a test of the data value of the initiated result object. The result stage possesses a filter function for this. The data format of the result stage also defines the format of all the comparative inputs of the filter. Depending on the set comparative operation, the filter makes 1 to 2 operands (x, y) available as constants. The available operands are compared with each other using the comparison operation. The result of the filter is either true (TRUE) or false (FALSE). Only if the filter result is true (TRUE) will the result stage continue to process the initiated result. Otherwise, the stage terminates processing and does not transmit any telegram to the KNX. This parameter enables the result check.	

Operator for result check	equal (result = x) not equal (result $\neq$ x) greater than (result > x) greater or equal than (result $\geq$ x) smaller than (result < x) smaller or equal than (result $\leq$ x) Range testing smaller than (x < result < y) Range testing smaller than or equal (x $\leq$ result $\leq$ y)
The comparison operation of the result filter is specified here. This parameter is only available if the result check is used.	
Constant operand 1 (x)	0 (false) 1 (true)
The constant of the 1-bit comparison value is specified here. This parameter is only available with the data format "1-bit switching (DPT 1.xxx)" and the evaluation of a constant.	
Constant operand 1 (x)	Dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) dimming brightness, stop (8) dimming brightness, 100% (9) dimming brightness, 50% (10) dimming brightness, 25% (11) dimming brightness, 12.5% (12) dimming brightness, 6% (13) dimming brightness, 3% (14) dimming brightness, 1.5% (15)
The constant of the 4-bit comparison value is specified here. This parameter is only available with the data format "4-bit dimming (DPT 3.007)" and the evaluation of a constant.	

Constant operand 1 (x)	Automatic mode (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
The constant of the 1-byte comparison value for the operating mode switchover is specified here. This parameter is only available with the data format "1-byte operating mode switchover (DPT 20.102)" and the evaluation of a constant.	
Constant operand 1 (x)	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
The constant of the 1-byte comparison value for the scene extension unit is specified here. This parameter is only available with the data format "1-byte scene extension unit (DPT 18.001)" and the evaluation of a constant.	
Constant operand 1 (x)	0...255
The constant of the 1-byte comparison value for the value command is specified here. This parameter is available only if a constant is evaluated with the data format "1-byte value 0...255 (DPT 5.010)".	
Constant operand 1 (x)	0...100
The constant of the 1-byte input value for the comparison value command is specified here. This parameter is only available with the data format "1-byte brightness value 0...100 % (DPT 5.001)" and the evaluation of a constant.	
Constant operand 1 (x)	0...65535
The constant of the 2-byte comparison value for the unsigned value command is specified here. This parameter is available only if a constant is evaluated with the data format "2-byte value 0...65535 (DPT 7.001)".	
Constant operand 1 (x)	-32768...0...32767
The constant of the 2-byte comparison value for the signed value command is specified here. This parameter is available only if a constant is evaluated with the data format "2-byte value -32768...32767 (DPT 8.001)".	

Constant operand 1 (x)	-671088.00...0.00... 670760.00
The constant of the 2-byte comparison value for the floating point value command is specified here. This parameter is only available with the data format "2-byte floating point value (DPT 9.0xx)" and the evaluation of a constant.	
Constant operand 1 (x)	-2147483648...0... 2147483647
The constant of the 4-byte comparison value for the value command is specified here. This parameter is available only if a constant is evaluated with the data format "4-byte value -2147483648...2147483647 (DPT 13.001)".	
Constant operand 2 (y)	
See operand 1 (x). This parameter is only available with the operators "Range check smaller than ($x < \text{result} < z$)" and "Range check smaller than or equal to ($x \leq \text{result} \leq z$)".	
First type conversion for 1-bit result	inactive only for ON results only for OFF results for ON and OFF results
If the data format of the result stage is set to "1-bit switching (DPT 1.xxx)", then the result can optionally be converted to up to 4 other data formats (4-bit, 1-byte, 2-byte, 4-byte) or to other 1-bit result objects. The type conversion in the result stage is available for this. When they are used, it is simple, for example, to convert switching commands to value commands or other control commands. The type conversion works according to the input command and converts either all the telegrams (ON and OFF) or only certain telegrams (ON or OFF), as required. This allows additional result filtering. This parameter enables the type conversion of the result stage and defines which input states are evaluated and converted.	

Target data format for type conversion	1-bit switching (DPT 1.xxx) 4-bit dimming (DPT 3.007) 1-byte operating mode switchover (DPT 20.102) 1-byte scene extension unit (DPT 18.001) 1-byte value 0...255 (DPT 5.010) 1-byte brightness value 0...100 % (DPT 5.001) 2-byte value 0...65,535 (DPT 7.001) 2-byte value -32,768...32,767 (DPT 8.001) 2-byte floating-point number (DPT 9.0xx) 4-byte value -2147483648...2147483647 (DPT 13.001)
The data format to which the type conversion should convert the initiated 1-bit state (ON, OFF) is specified here. This parameter is only visible if the type conversion is enabled.	
Output value for type conversion ON	0 (false) 1 (true)
The output value of the 1-bit type conversion is specified here. This parameter is only available with the data format "1-bit switching (DPT 1.xxx)" and the conversion of ON states.	
Output value for type conversion ON	Dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) dimming brightness, stop (8) dimming brightness, 100% (9) dimming brightness, 50% (10) dimming brightness, 25% (11) dimming brightness, 12.5% (12) dimming brightness, 6% (13) dimming brightness, 3% (14) dimming brightness, 1.5% (15)
The output value of the 4-bit type conversion is specified here. This parameter is only available with the data format "4-bit dimming (DPT 3.007)" and the conversion of ON states.	

Output value for type conversion ON	Automatic mode (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
The output value of the 1-byte type conversion is specified here. This parameter is only available with the data format "1-byte operating mode switchover (DPT 20.102)" and the conversion of ON states.	
Output value for type conversion ON	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
The output value of the 1-byte type conversion is specified here. This parameter is only available with the data format "1-byte scene extension unit (DPT 18.001)" and the conversion of ON states.	
Output value for type conversion ON (0 ... 255)	0...255
The constant of the 1-byte comparison value for the value command is specified here. This parameter is available only if a constant is evaluated with the data format "1-byte value 0...255 (DPT 5.010)".	
Output value for type conversion ON (0 ... 100%)	0...100%
The output value of the 1-byte type conversion is specified here. This parameter is only available with the data format "1-byte brightness value 0...100 % (DPT 5.001)" and the conversion of ON states.	
Output value for type conversion ON (0... 65535)	0...65535
The output value of the 2-byte type conversion is specified here. This parameter is only available with the data format "2-byte value 0...65535 (DPT 7.001)" and the conversion of ON states.	
Output value for type conversion ON (-32768...32767)	-32768...0...32767
The output value of the 2-byte type conversion is specified here. This parameter is only available with the data format "2-byte value -32768...32767 (DPT 8.001)" and the conversion of ON states.	

Output value for type conversion ON (-671088...670760)	-671088.00...0.00... 670760.00
The output value of the 2-byte type conversion is specified here. This parameter is only available with the data format "2-byte floating point value (DPT 9.0xx)" and the conversion of ON states.	
Output value for type conversion ON	-2147483648...0... 2147483647
The output value of the 4-byte type conversion is specified here. This parameter is only available with the data format "4-byte value -2147483648...2147483647 (DPT 13.001)" and the conversion of ON states.	
Output value for type conversion OFF	0 (false) 1 (true)
The output value of the 1-bit type conversion is specified here. This parameter is only available with the data format "1-bit switching (DPT 1.xxx)" and the conversion of OFF states.	
Output value for type conversion OFF	Dimming darker, stop (0) dimming darker, 100% (1) dimming darker, 50% (2) dimming darker, 25% (3) dimming darker, 12.5% (4) dimming darker, 6% (5) dimming darker, 3% (6) dimming darker, 1.5% (7) dimming brightness, stop (8) dimming brightness, 100% (9) dimming brightness, 50% (10) dimming brightness, 25% (11) dimming brightness, 12.5% (12) dimming brightness, 6% (13) dimming brightness, 3% (14) dimming brightness, 1.5% (15)
The output value of the 4-bit type conversion is specified here. This parameter is only available with the data format "4-bit dimming (DPT 3.007)" and the conversion of OFF states.	
Output value for type conversion OFF	Automatic mode (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
The output value of the 1-byte type conversion is specified here. This parameter is only available with the data format "1-byte operating mode switchover (DPT 20.102)" and the conversion of ON states.	

Output value for type conversion OFF	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
The output value of the 1-byte type conversion is specified here. This parameter is only available with the data format "1-byte scene extension unit (DPT 18.001)" and the conversion of OFF states.	
Output value for type conversion OFF (0...255)	0...255
The constant of the 1-byte comparison value for the value command is specified here. This parameter is available only if a constant is evaluated with the data format "1-byte value 0...255 (DPT 5.010)".	
Output value for type conversion OFF (0...100)	0...100
The output value of the 1-byte type conversion is specified here. This parameter is only available with the data format "1-byte brightness value 0...100 % (DPT 5.001)" and the conversion of OFF states.	
Output value for type conversion OFF (0...65535)	0...65535
The output value of the 2-byte type conversion is specified here. This parameter is only available with the data format "2-byte value 0...65535 (DPT 7.001)" and the conversion of OFF states.	
Output value for type conversion OFF (-32768...32767)	-32768...0...32767
The output value of the 2-byte type conversion is specified here. This parameter is only available with the data format "2-byte value -32768...32767 (DPT 8.001)" and the conversion of OFF states.	
Output value for type conversion OFF (-671088...670760)	-671088.00...0.00... 670760.00
The output value of the 2-byte type conversion is specified here. This parameter is only available with the data format "2-byte floating point value (DPT 9.0xx)" and the conversion of OFF states.	
Output value for type conversion OFF	-2147483648...0... 2147483647
The output value of the 4-byte type conversion is specified here. This parameter is only available with the data format "4-byte value -2147483648...2147483647 (DPT 13.001)" and the conversion of OFF states.	

Selection, result object for type conversion output value	Result output 1 (1-bit) ... Result output 32 (1-bit)
This parameter specifies the 1-bit result object, to which the type conversion writes the converted result. The selection is dependent on the configured target data format. This parameter is only available with 1-bit data formats.	
Selection, result object for type conversion output value	Result output 1 (4-bit) ... Result output 16 (4-bit)
This parameter specifies the 4-bit result object, to which the type conversion writes the converted result. The selection is dependent on the configured target data format. This parameter is only available with 4-bit data formats.	
Selection, result object for type conversion output value	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the 1-byte result object, to which the type conversion writes the converted result. The selection is dependent on the configured target data format. This parameter is only available with 1-byte data formats.	
Selection, result object for type conversion output value	Result output 1 (2-byte) ... Result output 16 (2-byte)
This parameter specifies the 2-byte result object, to which the type conversion writes the converted result. The selection is dependent on the configured target data format. This parameter is only available with 2-byte data formats.	
Selection, result object for type conversion output value	Result output 1 (4-byte) ... Result output 8 (4-byte)
This parameter specifies the 4-byte result object, to which the type conversion writes the converted result. The selection is dependent on the configured target data format. This parameter is only available with 4-byte data formats.	
Second type conversion for 1-bit result	inactive only for ON results only for OFF results for ON and OFF results
See first type conversion.	

Third type conversion for 1-bit result	inactive only for ON results only for OFF results for ON and OFF results
See first type conversion.	
Fourth type conversion for 1-bit result	inactive only for ON results only for OFF results for ON and OFF results
See first type conversion.	
Result transmission criteria	Send on every trigger send only if the result changes transmit cyclically after first trigger
The transmission criterion can be defined in the result stage using this parameter. send on every trigger: The result stage transmits the current object value via the selected result object or via the type conversion objects on each valid trigger of the logic function. An optional delay before result transmission can be configured. If the delay is used, each processing operation retriggers the delay time after a valid trigger. Telegrams are only transmitted after the trigger when the delay has elapsed. In so doing, the telegram value is transmitted which the result stage initiated at the beginning of the delay time. send only if the result changes: The result stage only uses the selected result object or the objects of the type conversions in a processing operation to transmit the current object value if the object value has changed compared to the last transmission operation via the same result stage. Transmission always occurs on the first trigger after the bus voltage returns. An optional delay before result transmission can be configured here. If the object value changes, telegrams are only transmitted when the delay has elapsed. If the logic function is reprocessed by a new trigger within the delay time and the object value changes again, then the delay restarts. The result stage then transmits the object value changed by the new processing. send cyclically after first trigger: In this setting, the result stage transmits the results cyclically via the selected result object or via the type conversion objects. The cyclical transmission is started by the first valid trigger after the bus voltage returns or after an ETS programming operation. The cycle time for transmission of the result can be set in the ETS. In addition to cyclical transmission, the result is also transmitted on each valid trigger.	
Transmission delay for sending the hours result (0...99)	0...99
With the transmission criteria "Transmit on each trigger" and "Only transmit when the result changes", the optional delay for transmitting the result can be configured here. Telegrams are only transmitted when the delay has elapsed. Sets the hours of the delay.	

Minutes (0...59)	0...59
Sets the minutes of the delay.	
Seconds (0...59)	0...59
Sets the seconds of the delay.	
Milliseconds (1...9 x 100)	1...9
Sets the milliseconds of the delay.	
Cycle time for transmission of the result hours (0...99)	0...99
With the transmission criterion "Transmit cyclically after first trigger", the time for cyclical transmission of the result can be configured here. Setting the cycle time hours.	
Minutes (0...59)	0...5...59
Setting the cycle time minutes.	
Seconds (0...59)	0...59
Setting the cycle time seconds.	
Milliseconds (1...9 x 100)	1...9
Sets the cycle time milliseconds.	

Logic functions -> Logic function .. -> LO.. – Lighting control

Evaluation of activating command (trigger)

Switching command to activate the lighting via	Data input 1 (1-bit) ... Data input 32 (1-bit)
When entering a room or a building, the triggering trigger switches on the lighting in a targeted manner for a "Welcome", providing that it was fully switched off. The trigger for activating lighting can be a 1-bit switching telegram of a push-button sensor or a hotel card reader. This parameter is only available with "Welcome" lighting control.	
Switching command to deactivate the lighting via	Data input 1 (1-bit) ... Data input 32 (1-bit)
With a "Goodbye", when leaving a room or a building, the triggering trigger switches off the lighting centrally, providing that it was partially or fully switched on. The trigger for deactivating lighting can be a 1-bit switching telegram of a push-button sensor or a hotel card reader. This parameter is only available with "Goodbye" lighting control.	

Polarity of the switching command to activate lighting	OFF telegram ON telegram
The polarity of the switching telegram for activating lighting (ON, OFF) can be configured here. This parameter is only available with "Welcome" lighting control.	

Polarity of the switching command to deactivate lighting	OFF telegram ON telegram
The polarity of the switching telegram for deactivating lighting (ON, OFF) can be configured here. This parameter is only available with "Goodbye" lighting control.	

Evaluation of lighting

Use lighting input 1?	no yes
Using lighting inputs, the controller detects whether luminaires in the room are switched on. The "Welcome" function is only executed if all the luminaires are switched off (all lighting inputs = "OFF") and the light is switched on when entering the room. The "Goodbye" function is only executed if only one luminaire is switched on (at least one lighting input = "ON") and, on leaving the room, the light is to be switched off. Ideally, the 1-bit feedback objects of the KNX actuator channels of the luminaires to be evaluated are each linked to a lighting input of the controller. This parameter enables the first lighting input.	

Selection of input object	Data input 1 (1-bit) ... Data input 32 (1-bit)
This parameter specifies the data input which is to be evaluated as the lighting input. This parameter is only available when the first lighting input is enabled.	

Use lighting input 2...15?	no yes
See lighting input 1. Lighting input 9 ... 15 is visible only if "Lighting control Home Welcome (15 inputs)" has been parameterised as the "type of logic function".	

Selection of input object	Data input 1 (1-bit) ... Data input 32 (1-bit)
This parameter specifies the data input which is to be evaluated as the lighting input. This parameter is available only if lighting input 2 ... 15 is enabled.	

Result

Selection of result object for lighting control output "Switching"	Result output 1 (1-bit) ... Result output 28 (1-bit)
The lighting for a "Welcome" is switched on, or switched off for a "Goodbye" via the 1-bit result object selected here.	

Delay until switching on the lighting (0...99)	0 ... 99
If it is desirable that the lighting is not switched on immediately on a "Welcome", then an optional delay can be configured here for switching the lighting on. When the delay is used, the result of the lighting control is only transmitted after the set time has elapsed. Sets the hours of the delay.	

Minutes (0...59)	0 ... 59
Sets the minutes of the delay.	

Seconds (0...59)	0 ... 59
Sets the seconds of the delay.	

Milliseconds (1...9 x 100)	1 ... 9
Sets the milliseconds of the delay. These parameters are only available with "Welcome" lighting control.	

Delay until switching off the lighting in hours (0...99)	0 ... 99
If it is desirable that the lighting is not switched off immediately on a "Goodbye", then an optional delay can be configured here for switching the lighting off. When the delay is used, the result of the lighting control is only transmitted after the set time has elapsed. Sets the hours of the delay.	

Minutes (0...59)	0 ... 59
Sets the minutes of the delay.	

Seconds (0...59)	0 ... 59
Sets the seconds of the delay.	

Milliseconds (1...9 x 100)	1 ... 9
Sets the milliseconds of the delay. These parameters are only available with "Goodbye" lighting control.	

Type conversion

Type conversion "Value 0...255"	inactive active
Optionally, type conversions can be used in the result stage of the lighting control. This means that it is possible to transmit additional KNX commands in other data formats and, besides lighting, to influence other units of a room (e. g. heating). Three independent type conversions are available, which, as required, can serve the 1-byte data formats "Value 0...255 (DPT 5.010)", "Operating mode switchover (DPT 20.101)" and "Scene extension unit (DPT 18.001)" via separate result outputs. This parameter enables the type conversion for value conversions 0...255 by the result stage.	
Output value for type conversion (0...255)	0...255
The value to which the type conversion is to convert the switching command of the lighting control is defined here. This parameter is available only if the type conversion "Value 0...255" is activated.	
Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the 1-byte result object, in which the type conversion stores the result. This parameter is only available if the type conversion "Value 0...255" is enabled.	
"Operating mode switchover" type conversion	inactive active
Optionally, type conversions can be used in the result stage of the lighting control. This means that it is possible to transmit additional KNX commands in other data formats and, besides lighting, to influence other units of a room (e. g. heating). This parameter enables the type conversion for an operating mode switchover by the result stage.	
Output value for type conversion	Automatic mode (0) Comfort mode (1) Standby mode (2) Night mode (3) Frost/heat protection (4)
The operating mode to which the type conversion is to convert the switching command of the lighting control is defined here. This parameter is only available if the type conversion "Operating mode switchover" is activated.	
Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the 1-byte result object, in which the type conversion stores the result. This parameter is only available if the type conversion "Operating mode switchover" is activated.	

Type conversion "Scene extension unit"	inactive active
Optionally, type conversions can be used in the result stage of the lighting control. This means that it is possible to transmit additional KNX commands in other data formats and, besides lighting, to influence other units of a room (e. g. heating). Three independent type conversions are available, which, as required, can serve the 1-byte data formats "Value 0...255 (DPT 5.010)", "Operating mode switchover (DPT 20.101)" and "Scene extension unit (DPT 18.001)" via separate result outputs. This parameter enables the type conversion for scene control by the result stage.	
Output value for type conversion	Recall scene 1 (0) Recall scene 2 (1) ... Recall scene 64 (63) Save scene 1 (128) Save scene 2 (129) ... Save scene 64 (191)
The scene command to which the type conversion is to convert the switching command of the lighting control is defined here. This parameter is available only if the type conversion "Scene extension unit" is activated.	
Selection of result object	Result output 1 (1-byte) ... Result output 16 (1-byte)
This parameter specifies the 1-byte result object, in which the type conversion stores the result. This parameter is only available if the type conversion "Scene extension unit" is enabled.	

17.2.4 Object table for logic functions

Objects for data inputs

Function: data inputs

Function	Name	Type	DPT	Flag
Data input 1...32 (1-bit)	Logic functions - input	1-bit	1,002	C, -, W, -, U
1-bit objects as data inputs of the logic functions. The assignment of an object to the logic functions (LO1...LO10) can be configured as a trigger or data input. These objects are only visible if 1-bit input objects are to be used.				

Function: data inputs

Function	Name	Type	DPT	Flag
Data input 1...16 (4-bit)	Logic functions - input	4-bit	3,007	C, -, W, -, U
4-bit objects as data inputs of the logic functions. The assignment of an object to the logic functions (LO1...LO10) can be configured as a data input. These objects are only visible if 4-bit input objects are to be used.				

Function: data inputs

Function	Name	Type	DPT	Flag
Data input 1...16 (1-byte)	Logic functions - input	1-byte	5,001	C, -, W, -, U
1-byte objects as data inputs of the logic functions. The assignment of an object to the logic functions (LO1...LO10) can be configured as a data input. These objects are only visible if 1-byte input objects are to be used.				

Function: data inputs

Function	Name	Type	DPT	Flag
Data input 1...16 (2-byte)	Logic functions - input	2-byte	7,001	C, -, W, -, U
2-byte objects as data inputs of the logic functions. The assignment of an object to the logic functions (LO1...LO10) can be configured as a data input. These objects are only visible if 2-byte input objects are to be used.				

Function: data inputs

Function	Name	Type	DPT	Flag
Data input 1...8 (4-byte)	Logic functions - input	4-byte	13,001	C, -, W, -, U
4-byte objects as data inputs of the logic functions. The assignment of an object to the logic functions (LO1...LO10) can be configured as a data input. These objects are only visible if 4-byte input objects are to be used.				

Objects for result outputs

Function: result outputs

Function	Name	Type	DPT	Flag
Result output 1...32 (1-bit)	Logic functions - output	1-bit	1,002	C, R, -, T, A
1-bit objects as result output of the logic functions. The assignment of an object to the logic functions (LO1...LO10) as a result output can be configured. The 1-bit result outputs 29...32 can be exclusively assigned to the logic functions 1 and 2 if the lighting controllers are configured in these logic functions. Exclusive result outputs are specially labelled in the function text and may not be linked to group addresses and also not used by other logic functions!				

Function: result outputs

Function	Name	Type	DPT	Flag
Result output 1...16 (4-bit)	Logic functions - output	4-bit	3,007	C, R, -, T, A
4-bit objects as result output of the logic functions. The assignment of an object to the logic functions (LO1...LO10) as a result output can be configured.				

Function: result outputs

Function	Name	Type	DPT	Flag
Result output 1...16 (1-byte)	Logic functions - output	1-byte	5,001	C, R, -, T, A
1-byte objects as result output of the logic functions. The assignment of an object to the logic functions (LO1...LO10) as a result output can be configured.				

Function: result outputs

Function	Name	Type	DPT	Flag
Result output 1...16 (2-byte)	Logic functions - output	2-byte	7,001	C, R, -, T, A
2-byte objects as result output of the logic functions. The assignment of an object to the logic functions (LO1...LO10) as a result output can be configured.				

Function: result outputs

Function	Name	Type	DPT	Flag
Result output 1...8 (4-byte)	Logic functions - output	4-byte	13,001	C, R, -, T, A
4-byte objects as result output of the logic functions. The assignment of an object to the logic functions (LO1...LO10) as a result output can be configured.				



Hager Controls

BP10140

67703 Saverne Cedex

France

+33 (0) 3 88 02 87 00

info@hager.com

hager.com