Product documentation

Multi station
Art. No. 23066REGHE

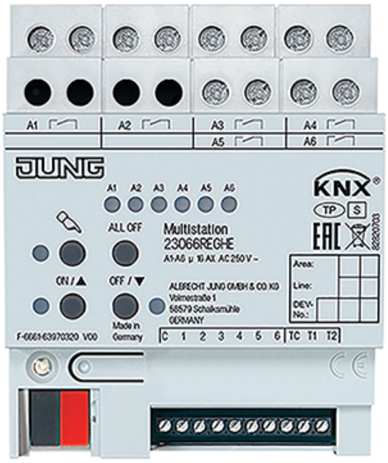

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Table of Contents

1 Product definition

1.1 Product catalogue

Product name:	Multi station
Use:	Actuator
Design:	RMD (rail-mounted device)
Art. No.	23066REGHE

1.2 Function

Relay outputs

The Multi station is used to control electrical loads of three different building systems that are typically used in a residential, office or hotel room: For this, the device possesses 6 potential-free relay outputs. 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 output pair 1 & 2 can also be set to valve activation (separate outputs for two electrothermal actuating drives).
The pair formation of the relay outputs allows mixed operation of the named operating modes. 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.
The relay contacts are suitable for switching 230 VAC mains voltage or 12...48 VDC low voltages and possess a bistable character, which means that the most recently set switching status is maintained unchanged even if the power supply fails.

In Venetian blind operation, the relay can be used to activate electrically-driven Venetian blinds, roller shutters, awnings, venting louvers or similar curtains. The functionalities that can be preset with the ETS independently for each shutter / blinds output include, for instance, separately configurable travelling times, enlarged feedback functions, assignment to up to 5 different safety functions, an extensive sun protection function, and incorporation into scenes or forced-position applications. Centralized control of all blind outputs is also possible.

Alternatively, the actuator can switch electrical loads, such as lighting systems in switching operation. In switching operation the functionalities for each output include, for example, extensive time functions, logic operations, scenes, disabling functions or alternatively forced positions, expanded feedback telegrams, cyclical monitoring of the incoming telegrams and an operating hours counter. Here, too central switching of all switching outputs is possible.

To activate electrothermal valve drives (ETA) for heating or cooling systems, the device has the following scope of functions: Conversion of constant command value telegrams into a pulse-width modulated output signal (PWM). This provides quasi-constant activation of the connected valve drives. Alternatively, conversion of switching command values. Valve drives that are closed or open when deenergised can be connected. In addition: 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.

Binary inputs and analogue inputs

Besides the relay outputs, the device possesses 6 independent binary inputs. By using these inputs, it is possible to read in states from switches, push-buttons or comparable contacts and to process them inside the device or, alternatively, transmit them to the KNX as sensor commands. To evaluate the connected contacts, the device provides separate DC auxiliary voltage (SELV) for connecting potential-free contacts, in a similar manner to a KNX push-button interface. As a result, external power supplies are no longer required.
The device evaluates the recorded switching edges of the voltage signals and thereby determines the states of the contacts connected. Depending on the function configured in the ETS, the device converts the determined contact states into commands. These can be, for instance, telegrams for switching, for dimming or for controlling blinds. It is also possible to program value transmitter functions such as dimming value transmitters, light scene extensions,

temperature value transmitters or brightness value transmitters or commanders for the operating mode switchover of a room temperature controller.

The binary inputs are replaced with 2 analogue inputs, to which external temperature sensors (see Accessories) can be connected as required. These temperature sensors can be used to detect room temperatures, which can be fed to one of the internal room temperature controllers or other bus devices via the KNX.

Room temperature controller

In addition, the actuator contains 2 room temperature controllers (RTC), which are integrated in the device software and which work independently of the process. The command value outputs of these controllers can be internally linked to the valve outputs of the actuator, meaning that temperature control and valve 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 as the valve outputs can also be activated individually 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 room temperature is made available to the integrated controllers via separate communication objects. All the controller functions (e.g. setpoint temperature specification, operating mode switchover, switchover of the operating mode) are controlled via KNX communication objects (object controller without its own operating elements), meaning that controller operation is possible via controller extensions or visualisations.

Logic functions

The device possesses 10 comprehensive logic functions. 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.

Internal group communication

Internal group communication allows internal device linkage of input and output objects of specific functions for the data formats "1-bit", "4-bit", "1-byte", "2-byte" and "4-byte". This simplifies device configuration considerably, as there is no need for project design of group addresses for functions which only communicate internally in the device (e.g. binary input and switching output of the same actuator).

Operation, ETS and mounting

The operating elements (4 push-buttons) on the front panel of the device permit influencing of the relay outputs of the actuator through manual operation in an unprogrammed state and after commissioning (switch on and off / PWM). This feature permits fast checking of connected loads for proper functioning. Moreover, the statuses of the outputs in case of bus voltage failure or bus voltage return and after ETS programming can be set separately.

For project design and commissioning of the device, ETS4 from Version 4.2 onwards or ETS5 is required.

The device is wholly supplied by the connected KNX line and thus does not require any external power supply. The device is designed for mounting on DIN rails in closed compact boxes or in distributors in fixed installations.

1.3 Accessories

Connection cover	Art. No. 2050 K
External sensor	Art. No. FF7.8

2 Mounting, electrical connection and operation

2.1 Safety instructions

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

Serious injuries, fire or property damage possible. Please read and follow manual fully.

Danger of electric shock. Device is not suitable for disconnection from supply voltage.

For parallel connection of several motors to an output it is essential to observe the corresponding instructions of the manufacturers, and to use a cut-off relay if necessary. The motors may be destroyed.

Use only venetian blind motors with mechanical or electronic limit switches. Check the limit switches for correct adjustment. Observe the specifications of the motor manufacturers. Device can be damaged.

Danger of electric shock on the SELV/PELV installation. Do not connect loads for mains voltage and SELV/PELV together on a single switch actuator.

2.2 Device components

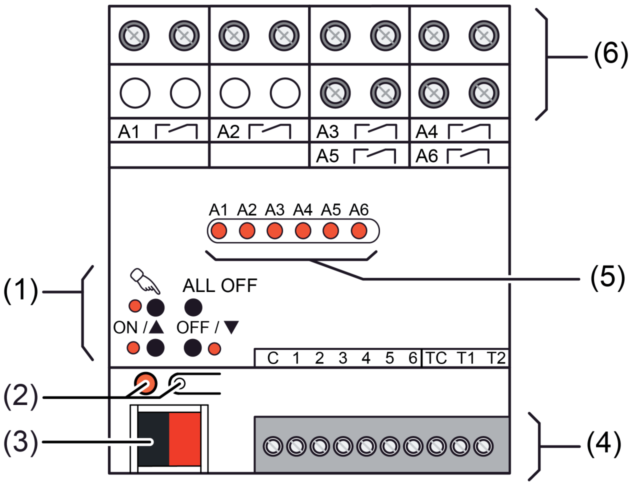

Figure 1: Device components

(1) Button field for manual operation
(2) Programming button and programming LED (red)
(3) KNX bus connection
(4) Device connection terminals for binary inputs (C, 1...6) and analogue inputs (TC, T1, T2)
(5) Status LEDs (red) for the outputs with switching state indication (1 LED per relay output):
LED off: output switched off (deenergised)
LED on: output switched on (energised)
LED flashing slowly: output in manual control
LED flashing quickly: output blocked by manual control
(6) Connection terminals (Ax,) for the connection of the electrical consumers

2.3 Fitting and electrical connection

DANGER!
Electrical shock when live parts are touched.
Electrical shocks can be fatal.
Before working on the device, disconnect the power supply and cover up live parts in the working environment.

Fitting the device

- Snap onto a suitable DIN rail. The screw terminals of the relay outputs should be at the top.
- [i] A KNX data rail is not required.
- [i] Observe the temperature range (see Technical Data) and ensure sufficient cooling, if necessary.

Connecting the device for electrical consumers (230 VAC / 12...48 VDC)

In Venetian blind operation, each pair of adjacent relay outputs (A1 & A2, A3 & A4, A5 & A6) can form a blind output. In each case the left-hand relay output (A1, A3, A5) is intended for the UP direction (), and the right-hand load output (A2, A4, A6) for the DOWN direction (). Venetian blind operation is set as the default in the delivery state of the actuator.
Should valve drives or other electrical consumers (e.g. lighting systems) be connected, then the channel configuration of the relay outputs must be adjusted in the ETS. Valve drives are then optionally connected to the outputs A1 and A2. Switching operation is possible on the outputs A1 to A6, as necessary.

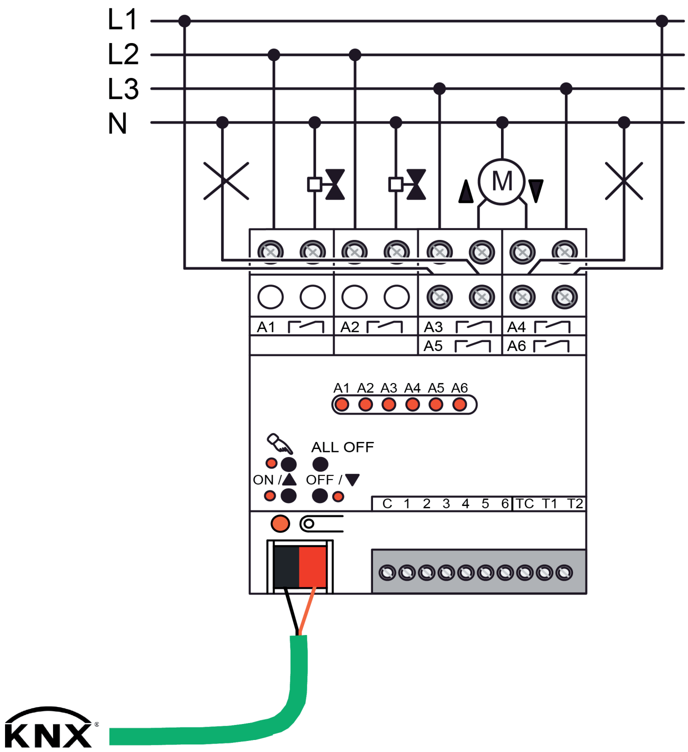

Figure 2: Connection for electrical consumers (connection example with valve drives on A1 and A2, a Venetian blind motor on A3 and A4 and two luminaires on A5 and A6)

- Connect KNX bus line with connecting terminal.

- Connect the electrical consumers to the output terminals according to the intended ETS channel configuration.
- Do not switch the power supply of the relay outputs on yet. First, carry out the ETS commissioning, also applying the required channel configuration.
- After successful completion of the ETS commissioning, the power supply of the relay outputs can be switched on.

i For Venetian blind outputs: The travel directions "UP" and "DOWN" are mutually interlocked via the device software.

i For Venetian blind outputs: Venting louvers must be connected in such a way that they open in travel direction "UP" and close in travel direction "DOWN".

i For valve outputs: Only connect actuators with the same characteristics to each output (deenergised closed/opened).

i Various phase conductors (L1, L2, L3) can be connected to the output terminals.

i Do not connect any three-phase motors.

Connecting the device for binary and analogue inputs

DANGER!

When the mains voltage is connected to the input terminals (4), the bus voltage is connected to the mains potential.

People at remote devices may also receive an electric shock. Connected bus devices are destroyed.

Never connect to the inputs to the mains voltage of FELV circuits.

To evaluate connected contacts, the device provides separate DC auxiliary voltage (SELV) for connecting potential-free contacts, in a similar manner to a KNX push-button interface. As a result, external power supplies are no longer required.

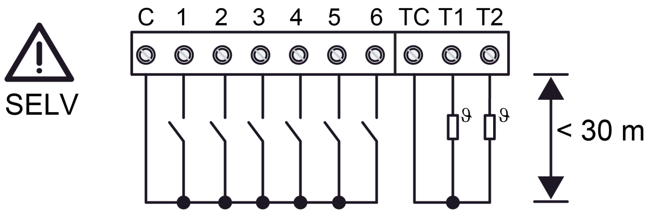

Figure 3: Connection for binary and analogue inputs (connection example)

- Connect potential-free switches or push-buttons (e.g. window contacts, suitable installation switches or push-buttons as NC or NO contacts) to the terminals C and 1...6.
- Connect temperature sensors (see accessories) to the terminals TC and T1 or T2.

i Do not route input cables parallel to mains cables. Otherwise, EMC interference may occur. For cable lengths > 3 m, use shielded cables.

i In the delivery state, the binary inputs work in pairs on the Venetian blind outputs (BI1 UP & BI2 DOWN -> VO1+2 / BI3 UP & BI4 DOWN -> VOJA3+4 / BI5 UP & BI6 DOWN -> VO5+6). This allows activation of Venetian blind outputs even without commissioning by the ETS through connected push-buttons and also function testing (construction site mode).

Installing / removing the protective cap

To protect the bus lines against hazardous voltages in the area of the connecting terminals, a protective cap can be installed.

The cap is installed with the bus terminal in place and the connected bus line led out at the rear.

- To install the cap: slide the cap over the bus terminal until you feel it engage (figure 4).
- To remove the cap: Remove the cap by pressing the sides slightly and by pulling it out to the front (figure 4).

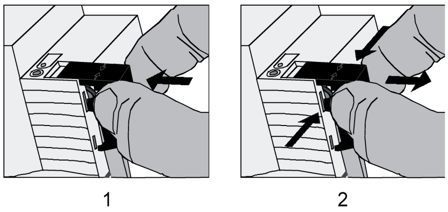

Figure 4: Installing / removing the protective cap for the bus connection

2.4 Commissioning

After mounting and connection of the actuator and connection of the KNX bus line, after wiring of the inputs and of all electrical loads, the device can be put into operation. For blinds operation, special commissioning steps have to be performed prior to programming with the ETS. The following procedure is generally recommended.

DANGER!

Electrical shock on contact with live parts in the installation environment.

Electrical shocks can be fatal.

Before working on the device, disconnect the power supply and cover up live parts in the working environment.

CAUTION!

Incorrect control of the load in case of incorrect device configuration in the ETS!

Danger of destruction of the connected blind drives in blinds operation.

Adapt the device configuration (channel definition) in the ETS to the connected load!

Measuring the travelling times (only in Venetian blind operation)

For the purpose of positioning blinds, shutters and awnings or for adjusting the opening angle of venting louvers, the actuator needs accurate information about the maximum travelling time.

Switch on the power supply of the relay outputs.

- If not yet done, move the blind/shutter into the upper end position (open venting louver completely) in manual operation on the device.

  The upper limit-stop position is reached (venting louver opened).
- Start the measuring time and move the blind/shutter by manual control into the lower end position (close the venting louver completely).
- Stop the time measurement when the lower limit (when the completely closed) position is reached.
- Enter the measured value in the ETS (cf. "software description").

i It is wise to perform several time measurements and to take the average of these values.

i The travelling time can also be determined after commissioning with the ETS (bus operation).

Measuring the travelling time extension (only in shutter / blinds operation)

When travelling upwards, blinds or shutters have a tendency of moving more slowly due to their own weight or to external physical influences (e.g. temperature, wind). The same applies to venting louvers where opening may take longer than closing.
For this reason, the actuator takes the parameterized travelling time extension into account when moving upwards or when opening the louvers (MOVE operation / positioning). The extension is computed as a percentage of the difference of the travelling times in both directions.

The blind/shutter (venting louver) must be in the lower end position (venting louver closed). Switch on the power supply of the relay outputs.

- If not yet done, move the blind/shutter into the lower end position (close venting louver completely) in manual operation on the device.

  Lower end position reached (venting louver closed).
- Start the measuring time and move the blind/shutter by manual control into the upper end position (open the venting louver completely).

- Stop the time measurement when the upper limit (the completely open) position is reached.
- Express the measured value as a percentage of the determined blind/shutter travelling time and enter the value in the ETS (cf. software description).

i It is wise to perform several time measurements and to take the average of these values.

i The travelling time extension can also be determined after commissioning with the ETS (bus operation).

Measuring the slat moving time (only for blinds in blinds operation)

In the case of blinds with slats, the slat moving time is for technical reasons part of the overall travelling time of the blind. The slat moving time is the time required for a movement between the slat positions "closed – 100 %" and "open – 0 %". In order to compute the opening angle of the slats, the actuator needs an information about the slat moving time.

The slats must be completely closed (as in case of downward travel of the blind).

Switch on the power supply of the relay outputs.

- Start the measuring time and open the slats completely by manual control (as in case of upward travel of the blind).
- Take the measuring time when the completely open position is reached.
- Enter the measured value in the ETS (cf. "software description").

i It is wise to perform several time measurements and to take the average of these values.

i The slat moving time can also be determined after commissioning with the ETS (bus operation).

Commissioning with the ETS

Before programming the application program with the ETS, it must be ensured that the output assignment parameter configuration (channel definition) correspond to the electrical consumers connected to the actuator.

- Switch on the KNX bus voltage.

  Check: When the programming button is pressed, the red programming LED must light up. Switching on the bus voltage causes the actuator carry out the "Behaviour after bus voltage return" configured in the ETS. In the state as supplied, this behaviour is set as follows for the outputs...
  A1...A6 (venetian blind outputs): Stop drives,
- Programming the physical address and application program with the ETS

Performing a reference travel (optional only in blinds operation)

The actuator can approach newly preset curtain or louver 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 the reference movement.

Switch on the bus voltage and power supply of the relay outputs.

- If not yet done, move the blind/shutter into the upper end position (open venting louver completely) in manual operation on the device.
- Wait until the output relay has switched off (not only the limit switch of the drive).

  The reference movement is terminated.

- ℹ The actuator stores the curtain, slat or louver positions temporarily. After each bus voltage failure or after programming with the ETS, the actuator therefore automatically performs a reference movement for every output before a new position can be approached.
- ℹ After bus voltage return, the actuator generates an "invalid position" message for each output which can also be transmitted to the bus, if so configured. The message is withdrawn (inverted signal value) as soon as a reference movement could be executed.

2.5 Operation

All relay outputs of the actuator can also be operated manually. The button field with 4 function keys and 3 status LEDs on the front panel of the device can be used for setting the following modes of operation...

- Bus control: operation from touch sensors or other bus devices
- Temporary manual control: 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.

ⓘ The operating modes can be enabled or disabled by parameter settings in the ETS.

ⓘ When manual control is active, the outputs cannot be controlled via the bus.

ⓘ Manual control is only possible when the bus voltage is switched on. After the end of any ETS programming operation, manual control is terminated automatically.

ⓘ In manual mode, bus operation can be disabled via a telegram. Manual operation is terminated on activation of the disabling function.

ⓘ No manual operation of the device is possible if the actuator is programmed by the ETS with an incorrect application program or if the application program was unloaded. In the state of the actuator as supplied, manual operation can be used even before commissioning via the ETS (building site operation).

ⓘ Further details concerning manual control, especially with respect to the possible parameter settings and the interaction with other functions of the actuator can be found in chapter 4, "Software description" of the present documentation.

Controls and indicators for manual control

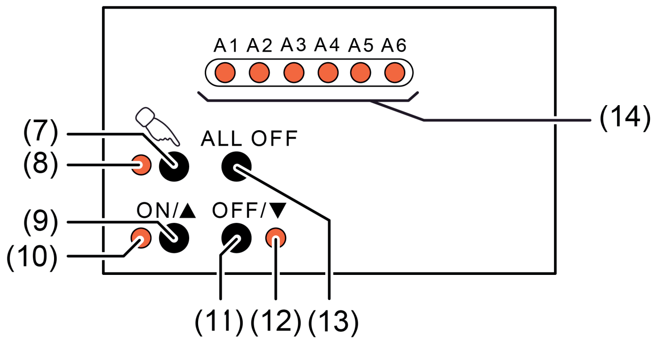

Figure 5: Controls and indicators for manual control on the front panel of the device.

(7) Button ✍
Activation / deactivation of manual control.

(8) LED ✍:
Indicates permanent manual control.

(9) Button ON/▲
Outputs A1...A6 in blinds operation: Sustained press (> 1 s) = upward travel output / brief press (< 1 s) = output stop
Outputs A1...A6 in switching operation: Press = output ON
Outputs A1 & A2 in valve operation: Press = open valve. The pulse-width modulation of manual operation is started.

(10) Status LED ON / ▲:
LED ON in manual operation indicates an active drive movement (UP / open), a switched-on output (NO contact: Relay contact closed / NC contact: Relay contact opened) or an opened valve (deenergised closed: Relay contact closed / deenergised opened: Relay contact opened).

(11) Button OFF / ▼:
Outputs A1...A6 in blinds operation: Sustained press (> 1 s) = downward travel output / brief press (< 1 s) = output stop
Outputs A1...A6 in switching operation: Press = output OFF
Outputs A1 & A2 in valve operation: Press = close valve. The pulse-width modulation is stopped.

(12) Status LED OFF / ▼:
LED ON in manual operation indicates an active drive movement (DOWN / close), a switched-off output (NO contact: Relay contact opened / NC contact: Relay contact closed) or a closed valve (deenergised closed: Relay contact opened / deenergised opened: Relay contact closed).

(13) Button ALL OFF:
All Venetian blind drives stop / all switching outputs OFF / open or close all valves (alternating switching). This button only functions in permanent manual control.

(14) Status LEDs for the relay outputs with switching state indication (1 LED per output):
LED OFF: Relay contact opened
LED ON: Relay contact closed
LED flashing slowly: output in manual control
LED flashing quickly: output blocked by manual control
A switched-on status LED indicates...
...in venetian blinds operation: Move "UP" for A1, A3 ans A5 or move "DWEN" for A2, A4 and A6
for switching outputs: Relay output closed
for valve outputs: Relay output closed. The LEDs indicate the switch-on and switch-off state of the pulse-width modulation.

ⓘ When valve activation: The Status LED ON / ▲ (10) and Status LED OFF / ▼ (12) light up statically during manual operation, showing the valve status set or to be set (valve is closed or closing / valve is opened or opening). Even on valve outputs working with an 8-bit command value (PWM), the LEDs display the logical valve state statically in the same way. The Status LEDs in manual operation do not signal the dynamic switch-on and switch-off phases of the pulse width modulation.

ⓘ With valve activation: In case of manual control, the PWM is carried out as soon as a valve is opened. This is also always done for valve outputs that are configured in the ETS as switching (command value 1 bit). The pulse/pause ratio and the cycle time of the PWM is configured in the ETS specially for manual control in common for the valve outputs.
A special feature is that for manual control the PWM can be configured to 100 %. In this case the command "open valve" opens the valve permanently without carrying out pulse-width modulation.

Priorities

The actuator distinguishes between different functions that can have an effect on an relay 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 control (highest priority),
- 2nd priority: forced position,
- 3rd priority: safety function(s),

Priority levels 4 and 5 can be configured in the ETS. The options are then...

- 4th priority: sun protection function,
- 5th priority: direct operation via the bus (STEP/MOVE operation, positioning, scenes, central function),

or...

- 4th priority: direct operation via the bus (STEP/MOVE operation, positioning, scenes, central function),
- 5th priority: sun protection function,

or...

- 4th priority: sun protection function and direct operation via the bus (STEP/MOVE operation, positioning, scenes, central function).

For switching operation there are the following priorities...

- 1st priority: manual control (highest priority)
- 2nd priority: forced position or disabling function
- 3rd priority: Reset behaviour
- 4th priority: Cyclical monitoring
- 5th priority: Logical operation function / Staircase function
- 6th priority: Normal operation (switching, scene / last command is performed)

The following priorities result for valve outputs...

- 1st priority: manual control (highest priority)
- 3rd priority: Behaviour after ETS programming
- 4th priority: Behaviour in case of bus voltage return / bus voltage failure
- 5th priority: Service mode
- 6th priority: Valve rinsing
- 7th priority: forced position
- 8th priority: command value limit
- 9th priority: Emergency operation (through cyclical monitoring of the command value)
- 10th priority: Normal operation (activation using command value telegrams)

Activation of the valve outputs in manual mode (only with valve outputs)

During manual operation, all the valve outputs are activated with pulse-width modulation (PWM) using the ON / ▲ button, irrespective of the configured command value data format (1-bit or 1-byte). The cycle time of the PWM signal for a valve output activated by manual operation is configured centrally on the parameter page "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 %).

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 % or 100 %).

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.

ℹ Pressing the ON / ▲ button when valves are already opened produces no reaction. The cycle time of a PWM signal is not restarted. On previously closed valves, pressing the OFF / ▼ button also does not produce a reaction.

ⓘ After permanent manual operation has been switched on, the states of the outputs last set initially remain active. However, for opened valve outputs, the pulse width modulation is automatically adjusted to the preset value of manual operation.
After temporary manual operation is switched on, the states of the outputs last set also initially remain active. However, for opened valve outputs, the pulse width modulation is not adjusted to the preset value of manual operation. This only takes place when the valves are first closed and then reopened, in the course of brief manual operation.

First Open function (only for valve outputs)

In most cases, deenergised closed actuators possess the "First Open function". Such an actuator must, before it can be used normally in combination with the actuator, be energised for a specific period during the first electrical commissioning, in order to deactivate an internal mechanical block.
Normally, an intact block in the as-delivered state of the drives means that the actuator does not close fully. This means that the flow rate of the actuators and the hydraulic system can be checked as part of installation and commissioning, even without electrical actuation of the drives. An additional advantage is that the small opening of the valve in the as-delivered state means that systems can heat or cool in a restricted area (frost/heat protection), without the existence of a functioning room temperature control.

ⓘ Deenergised closed actuators with the First Open function are not usually completely closed in the as-delivered state. Such drives must be unlocked using the First Open function, thus activating them for use by the heating actuator.

The activation of the actuators for the execution of the First Open function is easily possible using manual operation of the actuator. In the default setting, the actuator works with a PWM of 50 % and a cycle time of 20 minutes. This produces a switch-on time of 10 minutes, when the command "Open valve" is executed in manual operation. This time is sufficiently long to execute the First Open function properly. In the ETS, both the cycle time and the PWM of manual operation can be configured and thus adjusted to a desired value.
Alternatively, the central operating function can be used with the ALL OFF button to execute the First Open function. In so doing, all the valve outputs execute the open or close command simultaneously (depending on the most recent presetting).

Switching on the temporary manual control

Manual control is enabled in the ETS.

■ Press the ✎ button briefly (< 1 s).

In venetian blinds operation of A1 & A2: The status LEDs of A1 and A2 flash (LED ✎ remains off).
In switching or valve operation of A1: The status LED for A1 flashes (LED ✎ remains off).

ⓘ If outputs are configured in the ETS to venetian blind operation, the 2 status LEDs of an output pair (A1/A2, A3/A4, A5/A6) always flash. If the outputs are configured to switching or valve operation, only the status LED corresponding to the selected output flashes. Mixed operation of Venetian blind, switching and valve operation is possible on outputs A1...A6.

ⓘ After 5 s without a key-press, the actuator returns automatically to bus operation.

Switching off temporary manual operation

Temporary manual control was activated.

■ No button-press for 5 s,

- or -

- Select all outputs one after another by a brief press of the ✎ button. Thereafter, press the ✎ button again,

- or -

- induce bus reset (bus voltage return).

  Temporary manual control is terminated. Status LEDs A1...A6 indicate the valid relay status, provided that the actuator's bus voltage supply is switched on.

ⓘ Manual operation is always exited after an ETS programming operation.

ⓘ The state set via manual control is not changed when temporary manual control is switched off. If, however, a function with a priority higher than that of the direct operation (e.g. forced position, disabling function or safety function) has been activated 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 control

Manual operation is enabled in the ETS and not blocked. Bus operation or temporary manual control is active.

- Press the ✎ button for at least 5 s.

  Permanent manual control is active: The status LED ✎ is illuminated.
  In blinds operation of A1 & A2: The status LEDs of A1 and A2 flash.
  In switching or valve operation of A1: The status LED for A1 flashes.
  The two LEDs ON / ▲ and OFF / ▼ display the current status (upward movement, downward movement, switched on, switched off, valve open, valve closed) of A1.

ⓘ For valve outputs: After permanent manual operation has been switched on, the states of the outputs last set initially remain active. However, for opened valve outputs, the pulse width modulation is automatically adjusted to the preset value of manual operation.

Switching off permanent manual control

Permanent manual control is active.

- Press the ✎ key for at least 5 s.

- or -

- Block manual operation via the corresponding disabling object,

- or -

- induce bus reset (bus voltage return).

  The status LED ✎ goes out. Status LEDs A1...A6 indicate the valid relay status, provided that the actuator's bus voltage supply is switched on.

ⓘ Depending on the configuration of the actuator in the ETS, the outputs will be set to the state last adjusted in the manual mode or to the state internally tracked (direct operation, forced position / disabling function, safety or sun protection position) when the permanent manual mode is shut off.

Controlling an output manually

The device is in continuous or short-term manual mode.

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

The status LED of the selected output flashes. In blinds operation the LEDs of an output pair flash. Additionally the switching / valve state or a travel movement of the selected output is indicated by the status LED "ON/ ▲" or "OFF/ ▼" in the button field.

- Controlling an output by pressing the buttons in the button field.

  Button ON / ▲
  Outputs A1...A6 in blinds operation: Sustained press (> 1 s) = upward travel output / brief press (< 1 s) = output stop
  Outputs A1...A6 in switching operation: Press = output ON
  Outputs A1 & A2 in valve operation: Press = open valve. The pulse-width modulation of manual operation is started.

  Button OFF / ▼:
  Outputs A1...A6 in blinds operation: Sustained press (> 1 s) = downward travel output / brief press (< 1 s) = output stop
  Outputs A1...A6 in switching operation: Press = output OFF
  Outputs A1 & A2 in valve operation: Press = close valve. The pulse-width modulation is stopped.

  The selected output executes the corresponding commands.

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

i For valve outputs: Executing the OPEN / ▲ command when valves are already opened causes no reaction. The cycle time of a PWM signal is not restarted. On previously closed valves, pressing the OFF / ▼ button also does not produce a reaction.

i Depending on the parameter configuration in the ETS, feedback telegrams are transmitted to the bus via the feedback objects of an output during operation, as necessary.

Operate all outputs simultaneously

The device is in continuous manual mode.

- Press the ALL OFF button.

  In venetian blinds operation: All blind drives stop.

  In switching operation: All switching outputs switch OFF.

  In valve operation: Each time the button is pressed, the valves open and close alternately (all open -> all close -> all open...). The configured valve direction of action is taken into account.

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

i For valve outputs: All the valve outputs of the actuator can be activated at the same time. In contrast to the operating function using the ON / ▲ or OFF / ▼ buttons, the actuator always activates the valve outputs with a constant signal (0 % or 100 %), when they are activated simultaneously. Thus, the valves close or open completely. No pulse width modulation is executed.
This operating function is particularly practical for performing the First Open function of deenergised closed valves during first commissioning.
Executing the ON central command when valves are already opened causes PWM to be terminated. The command value switches to 100 %. The cycle time of a PWM signal is not restarted. On previously closed valves, executing the OFF central command does not produce a reaction.

Disabling bus control of individual outputs manually

It is possible to use manual control to disable an output is such a way that it can no longer be activated via the KNX even after the end of the manual control.

The device is in continuous manual mode.

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

- Press the ✎ button briefly as many times as necessary until the desired output is selected.

  The status LED of the selected output flashes. In blinds operation the LEDs of an output pair flash. Additionally the switching / valve state or a travel movement of the selected output is indicated by the status LED "ON/ ▲" or "OFF/ ▼" in the button field.
- Press the ON / ▲ and OFF / ▼ buttons simultaneously for approx. 5 seconds.

  The selected output is disabled (activation via the KNX no longer possible). The status LED of the disabled output flashes quickly and constantly (even with manual operation deactivated). In blinds operation the LEDs of an output pair flash.

ℹ An output that has been disabled in manual control can thereafter only be operated in permanent manual control.

Cancelling the disabling of bus control of individual outputs via manual control.

The device is in continuous manual mode.

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

- Press the ✎ button briefly as many times as necessary until the desired output is selected.

  The status LED of the selected output flashes twice briefly with a time interval. In blinds operation the LEDs of an output pair flash. Additionally the switching / valve state or a travel movement of the selected output is indicated by the status LED "ON/ ▲" or "OFF/ ▼" in the button field.
- Press the ON / ▲ and OFF / ▼ buttons simultaneously for approx. 5 seconds.

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

  The status LED of the selected output flashes slowly. In blinds operation the LEDs of an output pair flash.

3 Technical data

General

Ambient temperature	-5 ... +45 °C
Storage/transport temperature	-25 ... +70 °C
Fitting width	72 mm / 4 modules
Weight	approx. 290 g

KNX

Test mark	KNX/EIB
KNX medium	TP 256
Commissioning mode	S-mode
Rated voltage KNX	DC 21 ... 32 V SELV
Current consumption KNX	4 ... 20 mA
Connection type for bus	Device connection terminal
Power loss	max. 6 W

Relay outputs

Contact type	μ contact, potential-free NO contact
Switching voltage	AC 250 V ~
Minimum switching current AC	100 mA
Switching current AC1	16 A
Switching current AC3	6 A
Fluorescent lamps	16 AX
Switch-on current 20 ms	max. 165 A
Switch-on current 200 μs	max. 800 A
Switching voltage DC	DC 12 ... 24 V
Switching current DC 24 V	6 A

Connected load 230 V	
Ohmic load	3000 W
Blind, fan motors	1380 VA

Lamp loads 230 V	
Incandescent lamps	3000 W
HV halogen lamps	2500 W
HV-LED lamps	max. 400 W
Electronic transformers	1500 W
Inductive transformers	1200 VA

Fluorescent lamps T5/T8	
Fluorescent lamps, uncompensated	1000 VA
Fluorescent lamps, parallel compensated	1160 VA (140 μF)
Fluorescent lamps, duo circuit	2300 VA (140 μF)

Compact fluorescent lamps uncompensated	1000 W
Compact fluorescent lamps, parallel compensated	1160 W (140 μF)

Mercury vapour lamps	
Mercury vapour lamps, uncompensated	1000 W
Mercury vapour lamps, parallel compensated	1160 W (140 μF)

Connections	
single stranded	0.5 ... 4 mm²

Finely stranded without conductor sleeve	0.5 ... 4 mm²
Finely stranded with conductor sleeve	0.5 ... 2.5 mm²

Binary inputs

Rated voltage	DC 3.3 V SELV
Signal duration	min. 100 ms
NO contacts	max. 50
NC contacts	max. 50
Cable length	max. 30 m

Connections

single stranded	0.08 ... 1.5 mm²
Finely stranded without conductor sleeve	0.08 mm² ... 1.0 mm²
Finely stranded with conductor sleeve	0.14 mm² ... 0.5 mm²

Analogue inputs

Measuring range wired remote temperature sensor	-5 ... +70 °C

Connections

single stranded	0.08 ... 1.5 mm²
Finely stranded without conductor sleeve	0.08 mm² ... 1.0 mm²
Finely stranded with conductor sleeve	0.14 mm² ... 0.5 mm²

4 Software description

4.1 Software specification

ETS search paths:
- Output / Binary output mix / Multi station
- Heating, A/C, Ventilation / Valve / Multi station
- Shutter / Shutter / Multi station

Application:

No.	Short description	Name	Version	from mask version
1	Multifunctional switching/blinds application incl. valve control for heating or cooling systems. With 6 binary and 2 analogue inputs, up to 10 logic functions, 2 integrated room temperature controllers and internal group communication. With manual control.	Multi station 802811	1.1 for ETS4 Version 4.2 onwards and ETS5	SystemB (07B0)
2	Multifunctional switching/blinds application incl. valve control for heating or cooling systems. With 6 binary and 2 analogue inputs, up to 10 logic functions, 2 integrated room temperature controllers and expanded internal group communication (including data formats "4-bit", "2-byte" and "4-byte"). With manual control. Replaces the application program "Multi station 802811".	Multi station 802812	1.2 for ETS4 Version 4.2 onwards and ETS5	SystemB (07B0)

4.2 Software "Multi station 80281x"

4.2.1 Scope of functions

General

- Blinds or switching operation for outputs A1...A6 parameterizable. In blinds operation, the outputs A1/A2, A3/A4 and A5/A6 are combined into single blind outputs. Activation of valve drives possible through outputs 1 and 2. Mixed operation on an actuator (for example A1 & A2 valve, A3 & A4 venetian blind, A5 switching, A6 switching) is possible.
- Optionally, 2 integrated room temperature controllers.
- Optionally, up to 6 binary inputs for downloading the states of potential-free NO or NC contacts.
- Optionally, 2 analogue inputs for the connection of temperature sensors (see accessories).
- Up to 10 comprehensive logic functions for the implementation of simple or complex logic operations. "Lighting control" logic template for the implementation of "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).
- Behaviour in case of bus voltage failure and bus voltage return as well as after ETS programming presettable for each output.
- Actively transmitting feedback or status messages can be delayed globally after bus voltage return or after ETS programming.
- Manual operation of outputs independent of the KNX (for instance, construction site mode) with LED status indicators. Separate status feedback to the KNX for manual operation. Manual control can also be disabled via the bus.
- Internal group communication for internal device linkage of input and output objects of specific functions for the data formats "1-bit", "4-bit", "1-byte", "2-byte" and "4-byte". This simplifies device configuration considerably, as there is no need for project design of group addresses for functions which only communicate internally in the device (e.g. binary input and switching output of the same actuator).

Venetian blind outputs

- Operating mode configurable: control of blinds with slats, shutters, awnings or venting louvers.
- Separately configurable blind travelling times with travelling time extension for moves into the upper end position.
- For blinds with slats, a slat moving time can be independently configured
- Travel direction change-over time and the times for short-time and long-time operation (step, move) presettable.
- Central control of all shutter outputs via 1-bit MOVE operation telegram possible.
- Blind/shutter or slat position feedback telegram. In addition, an invalid blind position or an invalid travel movement can be reported back. Active (transmitting after changes or cyclically to the bus) or passive (object readout) feedback functions.
- 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 can be implemented for each venetian blind output.
- Up to 8 internal scenes configurable per output.

Switching outputs

- Independent switching of the switching outputs.
- Operation as NO or NC contacts.
- Central switching function with collective feedback.
- Switching feedback mode: Active (transmitting after changes or cyclically to the bus) or passive (object readout) feedback function.
- 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 10 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.

Valve outputs

- 2 independent valve outputs (A1 & A2).
- Valve activation (deenergised opened / closed) can be configured for each output.
- Actuator evaluation as "Switching, 1-bit", "Constant, 1-byte" or "Constant 1-byte with actuator 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 automatically or on read request.
- Collective feedback of all valve states possible via 4-byte telegram.
- A combined valve status allows the collective feedback of various functions of an output in a single 1-byte bus telegram.
- 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 telegram is received within the preset 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 designed, 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.
- The parameters of the valve outputs can be set individually (each valve output possesses its own parameters) or globally (all the valve outputs are configured in the same way with a single configuration).

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.
- Operating mode switchover via 1-byte objects according to the KNX specification or using up to four individual 1-bit objects.
- Status feedback telegrams (also KNX compliant) 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 switch-over 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. Settable polling time of the externally received temperature values.
- 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 actuating output configurable
- Command value limit possible.
- Floor temperature limit possible in heating mode. Thus temperature-controlled switch-off of a floor heater 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.

Logic functions

- 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 or, alternatively, also internally in the device, e.g. for direct connection with binary inputs or relay outputs.

Binary inputs

- Up to 6 independent binary inputs.
- Free assignment of the Switching, Dimming, Venetian blind, Value transmitter (1-byte, 2-byte), HLK value transmitter (operating mode switchover) functions and 2-channel operation for the inputs.
- Disable object for disabling individual inputs (polarity of the disable object is adjustable).
- Scope of detail for the "Switching" function:
  Two independent switching objects available for each input (switching commands can be configured individually).
  Command can be set independently for rising and falling edge (ON, OFF, TOGGLE, no reaction).
  Independent cyclical transmission of the switching objects can be selected depending on the edge or depending on the object value.
- Scope of detail for the "Dimming" function:
  Single-area and dual-area operation possible.
  Time between dimming and switching and dimming step width is adjustable.
  Telegram repetition and stop telegram transmission possible.
- Scope of detail for the "Venetian blind" function:
  Command can be set independently for rising edge (no function, UP, DOWN, TOGGLE).
  Operation concept configurable (short – long – short or long – short).
  Time adjustable between short-time and long-time operation (only for short – long – short)
  Adjustable slat adjustment time (time during which a MOVE command can be terminated by releasing a push-button on the input).
- Scope of detail for the "Value transmitter" function:
  Edge (push-button as NO contact, push-button as NC contact, switch) and value for edge can be configured.
  Value adjustment for push-button long key-press possible for value transmitter.
  For light scene extension with memory function, the scene can also be saved without prior recall.
- Scope of detail for the "HVAC value transmitter (operating mode switchover)" function:
  Edge (push-button as NO contact, push-button as NC contact, switch) and operating mode for edge can be configured.
- Scope of detail for the "2-channel operation" function:
  Operation of two independent channels. This means that only one switch or push-button is enough to transmit up to two telegrams to the KNX.
  The channels can be configured independently of one another for the Switching, Value transmitter (1 byte) or Temperature value transmitter (2 bytes) functions.

Analogue inputs

- 2 independent inputs, which can read in analogue signals from wired temperature sensors (see accessories).
- Detection of room temperatures, which can be fed to one of the internal room temperature controllers or other bus devices via the KNX.
- Temperature comparison possible and transmission behaviour of the temperature configurable.

4.2.2 Notes on software

ETS project design and commissioning

For project design and commissioning of the device, ETS4 from Version 4.2 onwards or ETS5 is required. Project designing and commissioning of the device using ETS2 or ET3 is not possible.

Safe-state mode

If the device - for instance as a result of errors in the project design or during commissioning - does not work properly, the execution of the loaded application program can be halted by activating the safe-state mode. The safe-state mode does not permit control of the relay outputs via the KNX. The binary and analogue inputs are also not evaluated. The integrated room temperature controller, the logic functions and manual operation have no effect. 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.

Activating the safe-state mode

- Switch off the bus voltage or remove the bus terminal.
- Wait approx. 10 seconds.
- Press and hold down the programming button.
- Switch on the bus voltage or attach the bus terminal. Release the programming button only after the programming LED starts flashing slowly.

  The safe-state mode is activated. With a new brief press of the programming button, the programming mode can be switched on and off as usual also in the safe-state mode. If Programming mode is active, the programming LED stops flashing.

i The safe-state mode can be terminated by switching off the bus voltage or by programming with the ETS.

Unloading the application program

The application program can be unloaded with the ETS. In this case the device is without function. Manual operation is no longer possible.

4.2.3 Object table

4.2.3.1 Objects for manual operation

Function: Manual operation

Object	Function	Name	Type	DPT	Flag
1	Disabling	Manual operation - input	1-bit	1.003	C, W, -, (R)[1]

Description 1-bit object for disabling the buttons for manual control on the device. The polarity can be configured.

Function: Manual operation

Object	Function	Name	Type	DPT	Flag
2	Status	Manual operation - output	1-bit	1.002	C, -, T, R[2]

Description 1-bit object for manual control status transmission. The object is "0", when manual control is deactivated (bus control). The object is "1", when manual operation is active. You can configure whether the temporary or the permanent manual operation will be indicated as status information or not.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

4.2.3.2 Objects for relay outputs

Objects for Venetian blind operation

Function: Venetian blind central function

Object	Function	Name	Type	DPT	Flag
151	Central movement	Venetian blind outputs - Central - input	1-bit	1.008	C, W, -, (R)[1]

Description 1-bit object for central actuation (long-time movement) of assigned Venetian blind outputs. The polarity can be configured.

Function: Safety function

Object	Function	Name	Type	DPT	Flag
152	Wind alarm 1	Venetian blind outputs - Safety - input	1-bit	1.005	C, W, -, (R)[1]

Description 1-bit object for central activation or deactivation of the first wind alarm ("0" = wind alarm deactivated / "1" = wind alarm activated).

Function: Safety function

Object	Function	Name	Type	DPT	Flag
153	Wind alarm 2	Venetian blind outputs - Safety - input	1-bit	1.005	C, W, -, (R)[1]

Description 1-bit object for central activation or deactivation of the second wind alarm ("0" = wind alarm deactivated / "1" = wind alarm activated).

Function: Safety function

Object	Function	Name	Type	DPT	Flag
154	Wind alarm 3	Venetian blind outputs - Safety - input	1-bit	1.005	C, W, -, (R)[1]

Description 1-bit object for central activation or deactivation of the third wind alarm ("0" = wind alarm deactivated / "1" = wind alarm activated).

Function: Safety function

Object	Function	Name	Type	DPT	Flag
155	Rain alarm	Venetian blind outputs - Safety - input	1-bit	1.005	C, W, -, (R)[1]

Description 1-bit object for central activation or deactivation of the rain alarm ("0" = rain alarm deactivated / "1" = rain alarm activated).

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Safety function

Object	Function	Name	Type	DPT	Flag
156	Frost alarm	Venetian blind outputs - Safety - input	1-bit	1.005	C, W, -, (R)[1]

Description 1-bit object for central activation or deactivation of the frost alarm ("0" = frost alarm deactivated / "1" = frost alarm activated).

Function: Long-time operation

Object	Function	Name	Type	DPT	Flag
157, 180, 203	Long-time operation	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1-bit	1.008	C, W, -, (R)[1]

Description 1-bit object for activation of long time operation

Function: Short time operation

Object	Function	Name	Type	DPT	Flag
158, 181, 204	Short time operation	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1-bit	1.007	C, W, -, (R)[1]

Description 1-bit object for activation of short time operation or for stopping a drive movement.

Function: Presetting the position

Object	Function	Name	Type	DPT	Flag
159, 182, 205	Position [2]	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1 bytes	5.001	C, W, -, (R)[1]

Description 1-byte object for presetting a position value (0…255) for the height of the Venetian blind or roller shutter or the venting louver position in direct operation.

Function: Presetting the position

Object	Function	Name	Type	DPT	Flag
160, 183, 206	Slat position	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1 bytes	5.001	C, W, -, (R)[1]

Description 1-byte object for presetting a slat position value (0…255) in direct operation.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: The object designation varies with the type of blind (Venetian blind, shutter / awning, venting louver).

Function: Forced position

Object	Function	Name	Type	DPT	Flag
161, 184, 207	Forced position	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	2-bit	2.008	C, W, -, (R)[1]

Description 2-bit object for forced control of an output. The object state after bus voltage return can be predefined by means of a parameter.

Function: Scene function

Object	Function	Name	Type	DPT	Flag
162, 185, 208	Scene extension	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1 bytes	18.001	C, W, -, (R)[1]

Description 1-byte object for recalling scenes or for storing new scene values.

Function: Sun protection function

Object	Function	Name	Type	DPT	Flag
163, 186, 209	Automatic mode	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1-bit	1.003	C, W, -, (R) [1]

Description 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). The object is only visible, if the automatic sun protection is to be tracked immediately when the state of the automatic object changes (parameter setting).

Function: Sun protection function

Object	Function	Name	Type	DPT	Flag
164, 187, 210	Automatic mode disable	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1-bit	1.003	C, W, -, (R) [1]

Description 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 visible, if the automatic sun protection is to be tracked immediately when the state of the automatic object changes (parameter setting).

Function: Sun protection function

Object	Function	Name	Type	DPT	Flag
164, 187, 210	Automatic mode	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1-bit	1.003	C, W, -, (R)[1]

Description 1-bit object for activation or deactivation of the automatic sun protection in the extended sun protection mode. The polarity can be configured. The object is only visible, if the automatic sun protection is to be tracked only when the state of the automatic object changes next time (parameter setting).

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Sun protection function

Object	Function	Name	Type	DPT	Flag
165, 188, 211	Direct operation disable	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1-bit	1.003	C, W, -, (R) [1]

Description 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: Sun protection function

Object	Function	Name	Type	DPT	Flag
166, 189, 212	Sunshine / shading facade	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1-bit	1.002	C, W, -, (R) [1]

Description 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: Sun protection function

Object	Function	Name	Type	DPT	Flag
167, 190, 213	Sunsh./shading position[2]	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1 bytes	5.001	C, W, -, (R) [1]

Description 1-byte object for presetting a variable position value (0…255) for the height of the Venetian blind or roller shutter height or the venting louver position when the sun protection is active.

Function: Sun protection function

Object	Function	Name	Type	DPT	Flag
168, 191, 214	Slat position at start of sun / shading	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1 bytes	5.001	C, W, -, (R) [1]

Description 1-byte object for presetting a variable slat position value (0…255) when the sun protection is active.

Function: Sun protection function

Object	Function	Name	Type	DPT	Flag
169, 192, 215	Sunshine slat position offset	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1 bytes	6.001	C, W, -, (R)[1]

Description 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 during active sun protection.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: The object designation varies with the type of blind (Venetian blind, shutter / awning, venting louver).

Function: Sun protection function – automatic heating/cooling

Object	Function	Name	Type	DPT	Flag
170, 193, 216	Heating/cooling presence	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1-bit	1.018	C, W, -, (R)[1]

Description 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: Sun protection function – automatic heating/cooling

Object	Function	Name	Type	DPT	Flag
171, 194, 217	Heating/cooling change-over	Venetian blind outputs 1 + 2 / 3 + 4 / 5 + 6 - input	1-bit	1.100	C, W, -, (R)[1]

Description 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: Position feedback

Object	Function	Name	Type	DPT	Flag
172, 195, 218	Position feedback [2]	Venetian blind output 1 + 2 / 3 + 4 / 5 + 6 - output	1 bytes	5.001	C, -, T, R[3,4]

Description 1-byte object for position feedback of the Venetian blind or roller shutter height or louver position (0…255).

Function: Position feedback

Object	Function	Name	Type	DPT	Flag
173, 196, 219	Slat position feedback	Venetian blind output 1 + 2 / 3 + 4 / 5 + 6 - output	1 bytes	5.001	C, -, T, R[3,4]

Description 1-byte object for position feedback of the slat position (0…255) if one shutter is controlled.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: The object designation varies with the type of blind (Venetian blind, shutter / awning, venting louver).

3: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

4: The communication flags are set automatically depending on the configuration. "T" flag for active signalling object; "R" flat for passive status object.

Function: Position feedback

Object	Function	Name	Type	DPT	Flag
174, 197, 220	Invalid position feedback	Venetian blind output 1 + 2 / 3 + 4 / 5 + 6 - output	1-bit	1.002	C, -, T, R [1,]

Description 1-bit object for reporting back an invalid position of the Venetian blind or roller shutter height or louver position ("0" = position valid / "1" = position invalid).

Function: Drive movement feedback

Object	Function	Name	Type	DPT	Flag
175, 198, 221	Drive movement feedback	Venetian blind output 1 + 2 / 3 + 4 / 5 + 6 - output	1-bit	1.002	C, -, T, R[1,2]

Description 1-bit object for feedback of an active drive movement (output energised - up or down).
("0" = no drive movement / "1" = drive movement).

Function: Sun protection function

Object	Function	Name	Type	DPT	Flag
176, 199, 222	Automatic mode feedback	Venetian blind output 1 + 2 / 3 + 4 / 5 + 6 - output	1-bit	1.002	C, -, T, R [1,2]

Description 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).

Objects for switching operation

Function: Central function

Object	Function	Name	Type	DPT	Flag
3	Switching	Switching outputs - Central 1 - input	1-bit	1.001	C, W, -, (R)[3]

Description 1-bit object for central switching of assigned output channels. The polarity can be configured.

1: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

2: The communication flags are set automatically depending on the configuration. "T" flag for active signalling object; "R" flat for passive status object.

3: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Central function

Object	Function	Name	Type	DPT	Flag
4	Switching	Switching outputs - Central 2 - input	1-bit	1.001	C, W, -, (R)[1]

Description 1-bit object for central switching of assigned output channels. The polarity can be configured.

Function: Central function

Object	Function	Name	Type	DPT	Flag
5	Switching	Switching outputs - Central 3 - input	1-bit	1.001	C, W, -, (R)[1]

Description 1-bit object for central switching of assigned output channels. The polarity can be configured.

Function: Collective feedback status

Object	Function	Name	Type	DPT	Flag
6	Feedback switching status	Switching outputs - collective feedback - Output	4 bytes	27.001	C, -, T, R [2,]

Description 4-byte object for collective status feedback of the states of all switching outputs. The collective feedback summarises the switching status in just one telegram. The object contains bit-orientated feedback information. The object can be actively transmitting or passively read out (parameter-dependent).

Function: Switching

Object	Function	Name	Type	DPT	Flag
7, 31, 55, 79, 103, 127	Switching	Switching output 1...6 - input	1-bit	1.001	C, W, -, (R) [1]

Description 1-bit input object to activate a switching output ("1" = Switch on / "0" = Switch off; "NO contact" or "NC contact" operating mode can be configured).

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: The communication flags are set automatically depending on the configuration. "T" flag for active signalling object; "R" flat for passive status object.

3: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

Function: Switching feedback

Object	Function	Name	Type	DPT	Flag
8, 32, 56, 80, 104, 128	Switching feedback	Switching output 1...6 - output	1-bit	1.001	C, -, T, R 1,

Description 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 operating mode: Feedback = "0" -> Relay open, feedback = "1" -> Relay closed
NC contact operating mode: Feedback = "0" -> Relay closed, feedback = "1" -> Relay opened

Function: Logic operation function

Object	Function	Name	Type	DPT	Flag
9, 33, 59, 81, 105, 129	Logic operation	Switching output 1...6 - input	1-bit	1.002	C, W, -, (R) 3

Description 1-bit object as input of the logical link of an switching output. After bus voltage return or after programming with the ETS, the object value can be predefined for each parameter.

Function: Scene function

Object	Function	Name	Type	DPT	Flag
13, 37, 63, 85, 109, 133	Scene extension	Switching output 1...6 - input	1 bytes	18.001	C, W, -, (R) 3

Description 1-byte object for polling or saving a scene.

Function: Scene function

Object	Function	Name	Type	DPT	Flag
14, 38, 64, 86, 110, 134	Extended scene recall	Switching output 1...6 - input	1-bit	1.001	C, W, -, (R) 3

Description 1-bit object for extended scene recall. Each ON telegram received recalls the next scene number of a switching output in sequence. Each OFF telegram received recalls the previous scene number.
After a reset (bus voltage return, ETS programming number), an ON or OFF telegram always recalls scene number 1 first.

1: The communication flags are set automatically depending on the configuration. "T" flag for active signalling object; "R" flat for passive status object.

2: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

3: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Disabling function

Object	Function	Name	Type	DPT	Flag
15, 39, 65, 87, 111, 135	Disabling	Switching output 1...6 - input	1-bit	1.003	C, W, -, (R) [1]

Description 1-bit object for disabling a switching output (polarity configurable).

Function: Forced position function

Object	Function	Name	Type	DPT	Flag
16, 40, 66, 88, 112, 136	Forced position	Switching output 1...6 - input	2-bit	2.001	C, W, -, (R) [1]

Description 2-bit object for the forced position of a switching output. The polarity is fixed by the telegram.

Function: Staircase function

Object	Function	Name	Type	DPT	Flag
17, 41, 67, 89, 113, 137	Staircase function start / stop	Switching output 1...6 - input	1-bit	1.010	C, W, -, (R) [1]

Description 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: Staircase function

Object	Function	Name	Type	DPT	Flag
18, 42, 68, 90, 114, 138	Staircase time factor	Switching output 1...6 - input	1 bytes	5.010	C, W, -, (R) [1]

Description 1-byte object to specify a time factor for the switch-on time of the staircase function (value range: 0... 255).

Function: Operating hours counter

Object	Function	Name	Type	DPT	Flag
19, 43, 69, 91, 115, 139	Limiting value / starting value, operating hours counter [2]	Switching output 1...6 - input	2 bytes	7.007	C, W, -, (R) [1]

Description 2-byte object for external specification of a limit value / starting value of the operating hours counter of a switching output.
Value range: 0... 65535 hours

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: Threshold value object or start value object depending on the configured counter type of the operating hours counter.

Function: Operating hours counter

Object	Function	Name	Type	DPT	Flag
20, 44, 70, 92, 116, 140	Restart op. hours counter	Switching output 1...6 - input	1-bit	1.015	C, W, -, (R) [1]

Description 1-bit object for resetting the operating hours counter of a switching output ("1" = restart, "0" = no reaction).

Function: Operating hours counter

Object	Function	Name	Type	DPT	Flag
21, 45, 71, 93, 117, 141	Value operating hours counter	Switching output 1...6 - output	2 bytes	7.007	C, -, T, (R) [2]

Description 2-byte object to transmit or read out the current counter level of the operating hours counter of a switching output.
If the bus voltage should fail, the value of the communication object is not lost and is actively transmitted to the bus after bus voltage return or an ETS programming operation. In the as-delivered state, the value is "0".

Function: Operating hours counter

Object	Function	Name	Type	DPT	Flag
22, 46, 72, 94, 118, 142	Op. hours counter elapsed	Switching output 1...6 - output	1-bit	1.002	C, -, T, (R) [2]

Description 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 bus ("1" = message active / "0" = message inactive).
If the bus voltage should fail, the value of the communication object is not lost and is actively transmitted to the bus after bus voltage return or an ETS programming operation.

Function: Disabling function

Object	Function	Name	Type	DPT	Flag
23, 47, 73, 95, 119, 143	Disabling acknowledgment	Switching output 1...6 - output	1-bit	1,016	C, -, W, (R) [1]

Description 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).

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

Objects for the valve operation

Function: Pump control

Object	Function	Name	Type	DPT	Flag
227	Switch pump	Valve outputs - Pump - output	1-bit	1.001	C, -, T, R[1]

Description 1-bit 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 (object 228).
The telegram polarity can be configured. After bus voltage return and an ETS programming operation, the actuator always first transmits the status "Pump OFF" without a delay. The actuator then updates the status to "Pump ON", providing that the condition for this has been fulfilled and an optionally configured "Pump delay ACTIVE" has elapsed.

Function: Pump control

Object	Function	Name	Type	DPT	Flag
228	External pump control	Valve outputs - Pump - input	1-bit	1.001	C, W, -, (R)[2]

Description 1-bit object for the cascading of multiple actuators with pump control. The transmitting operation for the pump control of another 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 the object 227.
In this case, the telegram polarity is fixed: "0" = Pump OFF, "1" = Pump ON. Cyclical telegrams to this object with an identical telegram polarity (ON -> ON, OFF -> OFF) produce no reaction. After a device reset, there is no polling of the current status of this object. Only when a bus telegram is received does the actuator take this status into account when activating the pump.

1: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

2: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Evaluation of the largest command value

Object	Function	Name	Type	DPT	Flag
229	Largest command value	Valve outputs - Largest command value - output	1 bytes	5.001	C, -, T, R[1]

Description 1-byte object for transmission of the largest constant command value of the heating actuator to another bus device (e.g. suitable calorific furnaces with integrated KNX controller or visualisation). The actuator evaluates all the active 1-byte command values of the valve outputs and, optionally, the externally received largest command value (object 230) 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) with 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 (e.g. after bus voltage return 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 bus voltage return and 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

Object	Function	Name	Type	DPT	Flag
230	External largest command value	Valve outputs - Largest command value - input	1 bytes	5.001	C, W, -, (R)[2]

Description 1-bit 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 actuator can be connected to this object. The local actuator monitors the external telegram with its own active constant command values and outputs the largest of all command values via object 229.
Cyclical telegrams to this object with the same value cause no reaction. After a device reset, there is no polling of the current status of this object. Only when a bus telegram is received does the actuator take this status into account during evaluation.

1: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

2: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Heat requirement signal

Object	Function	Name	Type	DPT	Flag
231	Heat requirement	Valve outputs - Heat requirement - output	1-bit	1.002	C, -, T, R[1]

Description

1-bit 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 variable 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 (object 232).
The telegram polarity can be configured. After bus voltage return and an ETS programming operation, the actuator always first transmits the status "No heat requirement" without a delay. The actuator then updates the status to "Heat requirement", providing that the condition for this has been fulfilled and an optionally configured "Heat requirement ACTIVE" has elapsed.

Function: Heat requirement signal

Object	Function	Name	Type	DPT	Flag
232	External heat requirement	Valve outputs - Heat requirement - input	1-bit	1.002	C, W, -, (R)[2]

Description

1-bit object for the cascading of multiple actuators with a heat requirement signal. The transmitting object of a heat requirement signal of another actuator can be connected to this object. The local 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 231.
In this case, the telegram polarity is fixed: "0" = Heat requirement INACTIVE, "1" = Heat requirement ACTIVE.
Cyclical telegrams to this object with an identical telegram polarity (ON -> ON, OFF -> OFF) produce no reaction. After a device reset, there is no polling of the current status of this object. Only when a bus telegram is received does the actuator take this status into account during evaluation of the heat requirement.

Function: Toggling of the Summer / Winter operating mode

Object	Function	Name	Type	DPT	Flag
233	Summer / winter change-over	Valve outputs - Operating mode - input	1-bit	1.002	C, W, -, (R)[2]

Description

1-bit 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 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.

1: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

2: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Collective feedback status

Object	Function	Name	Type	DPT	Flag
235	Collective feedback status	Valve outputs - Collective feedback - output	4 bytes	27.001	C, -, (T), (R) [1]

Description 4-byte object for collective status feedback of all valve outputs. The collective feedback summarises the valve states in just one telegram. The object contains bit-orientated feedback information. The object can be actively transmitting or passively read out (parameter-dependent).

Function: Activate / deactivate service mode

Object	Function	Name	Type	DPT	Flag
237	Activate / deactivate	Valve outputs - Service mode - input	2-bit	2.001	C, W, -, (R)[1]

Description 2-bit 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

Object	Function	Name	Type	DPT	Flag
238	Status active / inactive	Valve outputs - Service mode - output	1-bit	1.002	C, -, T, R[2]

Description 1-bit 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 a device reset (ETS programming operation, bus voltage return).

Function: Command value presetting

Object	Function	Name	Type	DPT	Flag
245, 295	Command value	Valve output 1...2 - Input	1-bit	1.001	C, W, -, (R)[1]

Description 1-bit 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 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)".

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

Function: Command value presetting

Object	Function	Name	Type	DPT	Flag
246, 296	Command value	Valve output 1...2 - Input	1 bytes	5.001	C, W, -, (R)[1]

Description

1-byte 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 actuator 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 actuator 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.

Function: Valve status

Object	Function	Name	Type	DPT	Flag
247, 297	Feedback valve command value	Valve output 1...2 - Output	1-bit	1.001	C, -, T, R[2]

Description

1-bit 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".
Exception: It may also occur with such command value outputs that a constant command value is active (e.g. after bus voltage return 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 sends back a "1" when the set command value corresponds to "1...100 %".
The object transmits the current status after bus voltage return and an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

Function: Valve status

Object	Function	Name	Type	DPT	Flag
248, 298	Feedback valve command value	Valve output 1...2 - Output	1 bytes	5.001	C, -, T, R[1]

Description: 1-byte 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 bus voltage return and an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.

Function: Valve forced position

Object	Function	Name	Type	DPT	Flag
249, 299	Forced position	Valve output 1...2 - Input	1-bit	1.003	C, W, -, (R)[2]

Description: 1-bit 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 bus voltage failure and and is restored automatically after a bus voltage return.

Function: Command value monitoring

Object	Function	Name	Type	DPT	Flag
250, 300	Command value fault	Valve output 1...2 - Output	1-bit	1.005	C, -, T, R[1]

Description: 1-bit object to signal a faulty command value (with active command value monitoring, no command value telegram was received within the monitoring time). The telegram polarity can be configured.
Immediately after the bus voltage return or an ETS programming operation, the object "Command value fault" does not transmit the status automatically. 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.

1: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

2: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Command value limit

Object	Function	Name	Type	DPT	Flag
251, 301	Command value limit	Valve output 1...2 - Input	1-bit	1.002	C, W, -, (R)[1]

Description 1-bit 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 bus voltage return or an ETS programming operation. The status of the command value limit is not then automatically tracked in the communication object.

Function: Valve rinsing

Object	Function	Name	Type	DPT	Flag
252, 302	Valve rinsing start Valve rinsing start / stop	Valve output 1...2 - Input	1-bit	1.003	C, W, -, (R)[1]

Description 1-bit 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 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: Valve rinsing

Object	Function	Name	Type	DPT	Flag
253, 303	Valve rinsing status	Valve output 1...2 - Output	1-bit	1.002	C, -, T, R[2]

Description 1-bit 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 bus voltage return and after an ETS programming operation without a delay.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

Function: Combined valve status

Object	Function	Name	Type	DPT	Flag
255, 305	Feedback combined valve status	Valve output 1...2 - Output	1 bytes	---[1]	C, -, T, R[2]

Description 1-byte object for combined feedback of various items of status information of a valve output. The bit coding is preset as follows:
Bit 0: Command value status ("0" = OFF, 0 % / "1" = ON, "1...100 %")
Bit 1: Not assigned (always "0")
Bit 2: Not assigned (always "0")
Bit 3: Valve rinsing ("0" = No valve rinsing / "1" = Valve rinsing active)
Bit 4: Service mode ("0" = No service mode / "1" = Service mode active)
Bit 5: Manual operation ("0" = No manual op. / "1" Manual op. active)
Bit 6: Forced position ("0" = No forced position / "1" = Forced position active)
Bit 7: Not assigned (always "0")
The object transmits the current status after bus voltage return and an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.

Function: Operating hours counter

Object	Function	Name	Type	DPT	Flag
256, 306	Limit value / starting value operating hours counter [3]	Valve output 1...2 - Input	2 bytes	7.007	C, W, -, (R)[4]

Description 2-byte object for external presetting of a limiting value / starting value of the operating hours counter of a valve output.
Value range: 0...65535

Function: Operating hours counter

Object	Function	Name	Type	DPT	Flag
257, 307	Reset operating hours counter	Valve output 1...2 - Input	1-bit	1.015	C, W, -, (R)[4]

Description 1-bit object for resetting the operating hours counter of a valve output ("1" = Restart, "0" = No reaction).

Function: Operating hours counter

Object	Function	Name	Type	DPT	Flag
258, 308	Value operating hours counter	Valve output 1...2 - Output	2 bytes	7.007	C, -, T, (R)[4]

Description 2-byte object to transmit or read out the current counter level of the operating hours counter of a valve output.
If the bus voltage should fail, the value of the communication object is not lost and is actively transmitted to the bus after bus voltage return or an ETS programming operation. In the as-delivered state, the value is "0".

1: Non-standardised DP type.

2: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

3: Threshold value object or start value object depending on the configured counter type of the operating hours counter.

4: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Operating hours counter

Object	Function	Name	Type	DPT	Flag
259, 309	Op. hours counter elapsed	Valve output 1...2 - Output	1-bit	1.002	C, -, T, (R)[1]

Description 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 bus ("1" = message active / "0" = message inactive).
If there is a device reset, the value of the communication object is not lost and is actively transmitted to the bus after bus voltage return or an ETS programming operation.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

4.2.3.3 Objects for binary inputs

Function: Switching

Object	Function	Name	Type	DPT	Flag
345, 346, 347, 348, 349, 350	Switching object X.1	Binary input 1...6 - output	1-bit	1.001	C, W, T [1]

Description 1-bit object for transmission of switching telegrams (ON, OFF). (first switching object)

Function: Switching

Object	Function	Name	Type	DPT	Flag
353, 354, 355, 356, 357, 358	Switching object X.2	Binary input 1...6 - output	1-bit	1.001	C, W, T [1]

Description 1-bit object for transmission of switching telegrams (ON, OFF). (second switching object)

Function: Dimming

Object	Function	Name	Type	DPT	Flag
345, 346, 347, 348, 349, 350	Switching	Binary input 1...6 - output	1-bit	1.001	C, W, T[1]

Description 1-bit object for the transmission of switching telegrams (ON, OFF) for the dimming function.

Function: Dimming

Object	Function	Name	Type	DPT	Flag
353, 354, 355, 356, 357, 358	Dimming	Binary input 1...6 - output	4-bit	3.007	C, W, T[1]

Description 4-bit object for change of relative brightness between 0 and 100 %.

1: For reading, the R-flag must be set. The last value written to the object via the KNX or by the device will be read out.

Function: Venetian blind

Object	Function	Name	Type	DPT	Flag
345, 346, 347, 348, 349, 350	Short time operation	Binary input 1...6 - output	1-bit	1.008	C, -, T [1]

Description 1-bit object for short-time operation of a blind.

Function: Venetian blind

Object	Function	Name	Type	DPT	Flag
353, 354, 355, 356, 357, 358	Long-time operation	Binary input 1...6 - output	1-bit	1.007	C, W, T [2]

Description 1-bit object for long-time operation of a blind.

Function: Value transmitter (dimming value transmitter 1-byte)

Object	Function	Name	Type	DPT	Flag
345, 346, 347, 348, 349, 350	Value	Binary input 1...6 - output	1 bytes	5.001	C, -, T[1]

Description 1 byte object to transmit value telegrams (0... 255).

Function: Value transmitter (value transmitter 2-byte)

Object	Function	Name	Type	DPT	Flag
345, 346, 347, 348, 349, 350	Value	Binary input 1...6 - output	2 bytes	7.001	C, -, T[1]

Description 2 byte object to transmit value telegrams (0... 65,535).

Function: Value transmitter (temperature value transmitter)

Object	Function	Name	Type	DPT	Flag
345, 346, 347, 348, 349, 350	Temperature value	Binary input 1...6 - output	2 bytes	9.001	C, -, T[1]

Description 2-byte object for transmission of temperature value telegrams (0 °C ... 40 °C).

1: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

2: For reading, the R-flag must be set. The last value written to the object via the KNX or by the device will be read out.

Function: Value transmitter (brightness value transmitter)

Object	Function	Name	Type	DPT	Flag
345, 346, 347, 348, 349, 350	Brightness value	Binary input 1...6 - output	2 bytes	9.004	C, -, T[1]

Description 2-byte object for transmission of brightness value telegrams (0 Lux ... 1,500 Lux).

Function: Value transmitter (light scene extension)

Object	Function	Name	Type	DPT	Flag
345, 346, 347, 348, 349, 350	Light scene extension	Binary input 1...6 - output	1 bytes	18.001	C, -, T[1]

Description 1-byte object for opening or saving light scenes (1... 64).

Function: HVAC value transmitter (operating mode switchover)

Object	Function	Name	Type	DPT	Flag
345, 346, 347, 348, 349, 350	HVAC operating mode	Binary input 1...6 - output	1 bytes	20.102	C, -, T[1]

Description 1-byte object for transmitting a telegram for the operating mode switchover of a room temperature controller (Automatic, Comfort, Standby, Night, Frost/heat protection).

Function: Disabling function

Object	Function	Name	Type	DPT	Flag
361, 362, 363, 364, 365, 366	Disabling switching object X.1	Binary input 1...6 - input	1-bit	1.003	C, W, - [2]

Description 1-bit object for disabling the first switching object of an input (polarity configurable).
Only for the "Switching" function!

1: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

2: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Disabling function

Object	Function	Name	Type	DPT	Flag
369, 370, 371, 372, 373, 374	Disabling switching object X.2	Binary input 1...6 - input	1-bit	1.003	C, W, - [1]

Description 1-bit object for disabling the second switching object of an input (polarity configurable).
Only for the "Switching" function!

Function: Disabling function

Object	Function	Name	Type	DPT	Flag
361, 362, 363, 364, 365, 366	Disabling channel 1	Binary input 1...6 - input	1-bit	1.003	C, W, - [1]

Description 1-bit object for disabling the first channel of an input (polarity configurable).
Only with the "2-channel operation" function!

Function: Disabling function

Object	Function	Name	Type	DPT	Flag
369, 370, 371, 372, 373, 374	Disabling channel 2	Binary input 1...6 - input	1-bit	1.003	C, W, - [1]

Description 1-bit object for disabling the second channel of an input (polarity configurable).
Only with the "2-channel operation" function!

Function: Disabling function

Object	Function	Name	Type	DPT	Flag
361, 362, 363, 364, 365, 366	Disabling	Binary input 1...6 - input	1-bit	1.003	C, W, -[1]

Description 1-bit object for disabling an input (polarity configurable).
Only for the "Dimming", "Venetian blind" and "Value transmitter", "HLK value transmitter (operating mode switchover)" functions.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

4.2.3.4 Objects for analogue inputs

Function: Temperature sensor

Object	Function	Name	Type	DPT	Flag
351, 352	Temperature sensor	Analogue input 1...2 - output	2 bytes	9.001	C, -, T[1]

Description 2-byte object for transmitting the room temperature determined by the temperature sensor connected to the analogue input (measuring range: -5...+70 °C). The compared temperature value is always transmitted.

1: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

4.2.3.5 Objects for logic functions

Objects for data inputs

Function: Data inputs

Object	Function	Name	Type	DPT	Flag
378--409	Data input 1...32 (1 bit)	Logic functions - input	1-bit	1.002	C, W, -, (R)[1]

Description: 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

Object	Function	Name	Type	DPT	Flag
410--425	Data input 1...16 (4 bit)	Logic functions - input	4-bit	3.007	C, W, -, (R)[1]

Description: 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

Object	Function	Name	Type	DPT	Flag
426--441	Data input 1...16 (1 byte)	Logic functions - input	1 bytes	5.001	C, W, -, (R)[1]

Description: 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

Object	Function	Name	Type	DPT	Flag
442--457	Data input 1...16 (2 byte)	Logic functions - input	2 bytes	7.001	C, W, -, (R)[1]

Description: 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

Object	Function	Name	Type	DPT	Flag
458--465	Data input 1...8 (4 byte)	Logic functions - input	4 bytes	13.001	C, W, -, (R)[1]

Description: 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.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Objects for result outputs

Function: Result outputs

Object	Function	Name	Type	DPT	Flag
466--497	Result output 1...32 (1 bit)	Logic functions - output	1-bit	1.002	C, -, T, R [1]

Description 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

Object	Function	Name	Type	DPT	Flag
498--513	Result output 1...16 (4 bit)	Logic functions - output	4-bit	3.007	C, -, T, R [1]

Description 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

Object	Function	Name	Type	DPT	Flag
514--529	Result output 1...16 (1 byte)	Logic functions - output	1 bytes	5.001	C, -, T, R[1]

Description 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

Object	Function	Name	Type	DPT	Flag
530--545	Result output 1...16 (2 byte)	Logic functions - output	2 bytes	7.001	C, -, T, R[1]

Description 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

Object	Function	Name	Type	DPT	Flag
546--553	Result output 1...8 (4 byte)	Logic functions - output	4 bytes	13.001	C, -, T, R[1]

Description 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.

1: For reading, the R-flag must be set. The last value written to the object by the device will be read out.

4.2.3.6 Objects for room temperature controllers

Objects for setpoint temperature specification

Function: Setpoint temperature specification

Object	Function	Name	Type	DPT	Flag
554, 625	Basic setpoint	Controller 1...2 - input	2 bytes	9.001	C, W, -, (R)[1]

Description 2-byte object for external specification of the basic setpoint for relative setpoint specification. Depending on the operating mode, 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 depending on the configured interval of the basic setpoint shift (0.1 K or 0.5 K).
The temperature value must always be specified in the format "°C".

Function: Setpoint temperature specification

Object	Function	Name	Type	DPT	Flag
554, 625	Setpoint active operating mode	Controller 1...2 - input	2 bytes	9.001	C, W, -, (R)[1]

Description 2-byte object for external setting of a setpoint for absolute setpoint presetting. Depending on the operating mode, 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".

Objects for operating mode change-over

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
556, 627	Operating mode switchover	Controller 1...2 - input	1 bytes	20.102	C, W, T, (R)[2]

Description 1-byte object for change-over of the operating mode of the controller according to the KNX specification. This object is only available in this way when the operating mode switchover is to take place over 1 byte (parameter-dependent).
After bus voltage return or an ETS programming operation (controller reset), the current operating mode is transmitted via this object.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
556, 627	Comfort mode	Controller 1...2 - input	1-bit	1.001	C, W, T, (R)[1]

Description 1-bit object for change-over to the "Comfort" operating mode. This object is only available in this way when the operating mode change-over is to take place over 4 x 1 bit (parameter-dependent).
After bus voltage return or an ETS programming operation (controller reset), the "Comfort" operating mode, if active, is transmitted via this object.

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
557, 628	Standby mode	Controller 1...2 - input	1-bit	1.001	C, W, T, (R)[1]

Description 1-bit object for change-over to the "Standby" operating mode. This object is only available in this way when the operating mode change-over is to take place over 4 x 1 bit (parameter-dependent).
After bus voltage return or an ETS programming operation (controller reset), the "Standby" operating mode, if active, is transmitted via this object.

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
558, 629	Night operation	Controller 1...2 - input	1-bit	1.001	C, W, T, (R)[1]

Description 1-bit object for change-over to the "Night" operating mode. This object is only available in this way when the operating mode change-over is to take place over 4 x 1 bit (parameter-dependent).
After bus voltage return or an ETS programming operation (controller reset), the "Night operation" operating mode, if active, is transmitted via this object.

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
559, 630	Frost/ heat protection	Controller 1...2 - input	1-bit	1.001	C, W, T, (R)[1]

Description 1-bit object for change-over to the "Frost / heat protection" operating mode. This object is only available in this way when the operating mode change-over is to take place over 4 x 1 bit (parameter-dependent).
After bus voltage return or an ETS programming operation (controller reset), the "Frost / heat protection" operating mode, if active, is transmitted via this object.

1: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Function: Operating mode switchover

Object	Function	Name	Type	DPT	Flag
560, 631	Operating mode forced-control	Controller 1...2 - input	1 bytes	20.102	C, W, T, (R)[1]

Description 1-byte object for forced change-over (highest priority) of the operating mode of the controller according to the KNX specification. This object is only available in this way when the operating mode switchover is to take place over 1 byte (parameter-dependent).

Function: Operating mode change-over presence detection

Object	Function	Name	Type	DPT	Flag
561, 632	Presence button	Controller 1...2 - input	1-bit	1.001	C, W, T, (R)[1]

Description 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 a bus voltage return or an ETS programming operation (controller reset), the presence function is always inactive.
This object is only visible if the presence detection is configured to "Presence button".

Function: Operating mode change-over presence detection

Object	Function	Name	Type	DPT	Flag
561, 632	Presence detector	Controller 1...2 - input	1-bit	1.001	C, W, T, (R)[1]

Description 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 a bus voltage return or an ETS programming operation (controller reset), the presence function is always inactive.
This object is only visible if the presence detection is configured to "Presence detector".

1: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Function: Operating mode change-over window status

Object	Function	Name	Type	DPT	Flag
562, 633	Window status	Controller 1...2 - input	1-bit	1.019	C, W, -, (R)[1]

Description 1-bit object for the coupling of window contacts.
Polarity: Window open = "1", window closed = "0".

Object for operating mode change-over

Function: Operating mode change-over

Object	Function	Name	Type	DPT	Flag
563, 634	Heating / cooling change-over	Controller 1...2 - output	1-bit	1.100	C, -, T, (R)[2]

Description 1 bit object to transmit the automatically set operating mode of the controller ("Heating" or "Cooling" modes).
Object value "1" = Heating; Object value "0" = Cooling.
After bus voltage return or an ETS programming operation (controller reset), the current operating mode is transmitted via this object. This object is only available in this way when the operating mode switchover is to take place automatically (parameter-dependent).

Function: Operating mode change-over

Object	Function	Name	Type	DPT	Flag
563, 634	Heating / cooling change-over	Controller 1...2 - input	1-bit	1.100	C, W, T, (R)[2]

Description 1 bit object to switch over the operating mode of the controller ("Heating" or "Cooling" modes). Object value "1" = Heating; Object value "0" = Cooling.
After a bus voltage return or ETS programming operation (controller reset), the object value is always "0", irrespective of which operating mode is specified via configuration after a reset. This object is only available in this way when the operating mode change-over is to take place manually (not automatically by the controller) (parameter-dependent).

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Objects for controller status

Function: Status signal

Object	Function	Name	Type	DPT	Flag
564, 635	KNX status operating mode	Controller 1...2 - output	1 bytes	20.102	C, -, T, (R)[1]

Description 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 bus voltage return or an ETS programming operation (controller reset), the current status is transmitted via this object. This object is only available when "Controller status" = "KNX-compliant".

Function: Status signal

Object	Function	Name	Type	DPT	Flag
564, 635	Controller status	Controller 1...2 - output	1 bytes	---[2]	C, -, T, (R)[1]

Description 1-byte object used by the controller to output the current state of operation (e.g. to a controller extension).
After bus voltage return or an ETS programming operation (controller reset), the current status is transmitted via this object. This object is only available when "Controller status" = "General controller".

Function: Status signal

Object	Function	Name	Type	DPT	Flag
564, 635	Controller status ...	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 1-bit object for single status feedback of configured controller functions. This object is only available in this way when a part of the controller status is to be transmitted singly as 1-bit information (parameter-dependent).
After bus voltage return or an ETS programming operation (controller reset), the current status is transmitted via this object.

Function: Status signal

Object	Function	Name	Type	DPT	Flag
572, 643	KNX status	Controller 1...2 - output	2 bytes	22.101	C, -, T, (R)[1]

Description 2-byte object that the controller uses to display elementary basic functions in a KNX-harmonised manner.
After bus voltage return or an ETS programming operation (controller reset), the current status is transmitted via this object. This object is only available when "Controller status" = "KNX-compliant".

1: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

2: Non-standardised DP type.

Function: Status signal

Object	Function	Name	Type	DPT	Flag
572, 643	Status signal addition	Controller 1...2 - output	1 bytes	---[1]	C, -, T, (R)[2]

Description 1-byte object used by the controller to output the current enlarged state of operation (e.g. to a controller extension).
After bus voltage return or an ETS programming operation (controller reset), the current status is transmitted via this object. This object is only available when "Controller status" = "General controller".

Function: Status signal

Object	Function	Name	Type	DPT	Flag
573, 644	KNX status forced oper. mode	Controller 1...2 - output	1 bytes	20.102	C, -, T, (R)[2]

Description 1-byte object used by the controller to output the operating mode in the event of forced position. 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 bus voltage return or an ETS programming operation (controller reset), the current status is transmitted via this object. This object is only available when "Controller status" = "KNX-compliant".

Objects for heating / cooling signal functions

Function: Heating energy message

Object	Function	Name	Type	DPT	Flag
605, 676	Heating indication	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[2]

Description 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: Cooling energy message

Object	Function	Name	Type	DPT	Flag
606, 677	Cooling indication	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[2]

Description 1-bit object for the controller to report a request for cooling energy. Object value = "1": energy request, object value = "0": no energy request.

1: Non-standardised DP type.

2: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Objects for controller disabling functions

Function: Disable controller

Object	Function	Name	Type	DPT	Flag
589, 660	Disable controller	Controller 1...2 - input	1-bit	1.001	C, W, -, (R)[1]

Description 1-bit object for deactivating the controller (activating dew point operation). Polarity: Controller deactivated = "1", controller activated = "0". This object is only available if controller switch-off via the bus is enabled.

Function: Disable controller

Object	Function	Name	Type	DPT	Flag
590, 661	Disable additional level	Controller 1...2 - input	1-bit	1.001	C, W, -, (R)[1]

Description 1-bit object for deactivating the additional level of the controller. Polarity: Additional level deactivated = "1", additional level activated = "0". This object is only available in this way if two-level heating or cooling operation is configured.

Object for heating command value output and combined valve heating/cooling

Function: Command value

Object	Function	Name	Type	DPT	Flag
591, 662	Command value for heating / command value, basic heating	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[2]

Description 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".

Function: Command value

Object	Function	Name	Type	DPT	Flag
591, 662	Command value for heating (PWM) / command value, basic heating (PWM)	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[2]

Description 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)".

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

2: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Function: Command value

Object	Function	Name	Type	DPT	Flag
591, 662	Command value for heating / command value, basic heating	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 1-bit object to output the switching 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 2-point feedback control".

Function: Command value

Object	Function	Name	Type	DPT	Flag
591, 662	Command value for heating/cooling / command value, basic level	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 1-byte object to output the combined continuous 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 "Continuous PI control".

Function: Command value

Object	Function	Name	Type	DPT	Flag
591, 662	Command value for heating/cooling (PWM) / command value, basic level (PWM)	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 1-bit object to output the combined PWM 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 PI control (PWM)".

Function: Command value

Object	Function	Name	Type	DPT	Flag
591, 662	Command value for heating/cooling / command value, basic level	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 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".

1: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Object for command value output, additional heating and combined valve additional heating/cooling

Function: Command value

Object	Function	Name	Type	DPT	Flag
592, 663	Command value additional heating	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 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".

Function: Command value

Object	Function	Name	Type	DPT	Flag
592, 663	Command value additional heating (PWM)	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 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)".

Function: Command value

Object	Function	Name	Type	DPT	Flag
592, 663	Command value additional heating	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 1-byte 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

Object	Function	Name	Type	DPT	Flag
592, 663	Command value additional level	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 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

Object	Function	Name	Type	DPT	Flag
592, 663	Command value additional level (PWM)	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 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)".

1: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Function: Command value

Object	Function	Name	Type	DPT	Flag
592, 663	Command value additional level	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 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

Object	Function	Name	Type	DPT	Flag
593, 664	Command value cooling / Command value basic cooling	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 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".

Function: Command value

Object	Function	Name	Type	DPT	Flag
593, 664	Command value cooling (PWM) / Command value basic cooling (PWM)	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 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)".

Function: Command value

Object	Function	Name	Type	DPT	Flag
593, 664	Command value cooling / Command value basic cooling	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 1-bit object to output the switching 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 2-point feedback control".

1: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Object for command value output, additional cooling

Function: Command value

Object	Function	Name	Type	DPT	Flag
594, 665	Command value additional cooling	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 1-byte object to output the continuous 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 "Continuous PI control".

Function: Command value

Object	Function	Name	Type	DPT	Flag
594, 665	Command value additional cooling (PWM)	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 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)".

Function: Command value

Object	Function	Name	Type	DPT	Flag
594, 665	Command value additional cooling	Controller 1...2 - output	1-bit	1.001	C, -, T, (R)[1]

Description 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".

Object for additional PWM heating command value output and combined valve PWM additional heating/cooling

Function: Command value

Object	Function	Name	Type	DPT	Flag
595, 666	PWM command value for heating / PWM command value, basic heating	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 1-byte object to output the internal continuous command value of a PWM controller 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)". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

1: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Function: Command value

Object		Function	Name	Type	DPT	Flag
	595, 666	PWM command value for heating/cooling / PWM command value, basic level	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 1-byte object to output the combined continuous command value of a PWM controller 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 PI control (PWM)". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

Object for additional command value output, PWM additional heating and combined valve PWM additional heating/cooling

Function: Command value

Object		Function	Name	Type	DPT	Flag
	596, 667	PWM com. value, add. heating	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 1-byte object to output the internal continuous command value of a PWM controller 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". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

Function: Command value

Object		Function	Name	Type	DPT	Flag
	596, 667	PWM command value additional level	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 1-byte object to output the combined continuous command value of a PWM feedback controller 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)". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

1: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Object for additional command value output, PWM cooling

Function: Command value

Object	Function	Name	Type	DPT	Flag
597, 668	PWM command value cooling / PWM command value basic cooling	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 1-byte object to output the internal continuous command value of a PWM feedback controller 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)". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

Object for additional command value output, PWM additional cooling

Function: Command value

Object	Function	Name	Type	DPT	Flag
598, 669	PWM com. value, add. cooling	Controller 1...2 - output	1 bytes	5.001	C, -, T, (R)[1]

Description 1-byte object to output the internal continuous command value of a PWM feedback controller 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)". In addition to the switching 1 bit command value of the PWM, the calculated continuous command value of the controller can also be transmitted to the bus and displayed, e.g. in a visualisation.

Object for outputting the setpoint temperature

Function: Set temperature

Object	Function	Name	Type	DPT	Flag
334, 405, 476, 547, 618, 689	Set temperature	Controller 1...2 - output	2 bytes	9.001	C, -, T, R

Description 2-byte object for the output of the current temperature setpoint. Depending on the operating mode, 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 bus voltage return or an ETS programming operation (controller reset), the current setpoint temperature is transmitted via this object.

1: For reading, the R-flag must be set. The last value written to the object via the bus or by the device will be read.

Object for basic setpoint shift (only for relative setpoint presetting)

Function: Basic setpoint shifting

Object	Function	Name	Type	DPT	Flag
570, 641	Current setpoint shifting	Controller 1...2 - output	1 bytes	6.010	C, -, T, R

Description 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 parameter "Setpoint shift step width" and is either 0.1 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 bus voltage return 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 volatile memory, the shift is always "0" immediately after a bus voltage return or an ETS programming operation.
This object is only available in this way if relative setpoint presetting is configured.

Function: Basic setpoint shifting

Object	Function	Name	Type	DPT	Flag
571, 642	Preset setpoint shifting	Controller 1...2 - input	1 bytes	6.010	C, W, -, (R)[1]

Description 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 parameter "Setpoint shift step width" and is either 0.1 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.
This object is only available in this way if relative setpoint presetting is configured.

Object for detecting the outdoor temperature

Function: Outdoor temperature

Object	Function	Name	Type	DPT	Flag
574, 645	Outdoor temperature	Controller 1...2 - input	2 bytes	9.001	C, W, -, (R)[1]

Description 2-byte object for detecting the outdoor temperature. The received value is used solely for limiting the setpoint temperature in cooling mode.
Possible range of values: -99.9 °C to +99.9 °C.
The temperature value must always be specified in the format "°C".

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Object for limiting the setpoint temperature

Function: Setpoint temperature limit

Object	Function	Name	Type	DPT	Flag
575, 646	Limit of cooling setpoint temperature	Controller 1...2 - input	1-bit	1.001	C, W, -, (R)[1]

Description 1-bit object for activating the setpoint temperature limit. Polarity: Setpoint temperature limit ON = "1"; Setpoint temperature limit OFF = "0". This communication object is only available when the setpoint temperature limit intends activation via an object.

Object for limiting the floor temperature

Function: Floor temperature limitation

Object	Function	Name	Type	DPT	Flag
601, 672	Floor temperature	Controller 1...2 - input	2 bytes	9.001	C, W, -, (R)[1]

Description 2-byte object for coupling an external temperature sensor for floor temperature limitation.
The temperature value must always be specified in the format "°C".

Objects for room temperature measurement

Function: Room temperature measurement

Object	Function	Name	Type	DPT	Flag
615, 686	Actual-temperature	Controller 1...2 - output	2 bytes	9.001	C, -, T, R

Description 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: Room temperature measurement

Object	Function	Name	Type	DPT	Flag
616, 687	Received temperature 1 (temperature sensor 1)	Controller 1...2 - input	2 bytes	9.001	C, W, -, (R)[1]

Description 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".

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

Function: Room temperature measurement

Object	Function	Name	Type	DPT	Flag
617, 688	Received temperature 2 (temperature sensor 2)	Controller 1...2 - input	2 bytes	9.001	C, W, -, (R)[1]

Description 2-byte object for coupling a further external KNX temperature sensor (e.g. push-button sensor with temperature measurement) for room temperature detection. Thus cascading of multiple temperature sensors for room temperature measurement. The possible temperature range is specified by the KNX DPT 9.001.
The temperature value must always be specified in the format "°C".
This communication object is only available when the second temperature sensor is enabled.

1: For reading, the R-flag must be set. The last value written to the object via the bus will be read.

4.2.4 Functional description

4.2.4.1 General channel-independent functions

4.2.4.1.1 Channel definition

Configuring channel definition

CAUTION!

Incorrect control of the load in case of incorrect device configuration in the ETS!

Danger of destruction of the connected blind drives in blinds operation.

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!

The device is used to activate electrical loads of up to three different building units that are typically used in a residential or office spaces or in a hotel room. For this, the device possesses 6 potential-free relay outputs. 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 output pair 1 & 2 can also be set to valve activation (separate outputs for two electrothermal actuating drives).
The pair formation of the relay outputs allows mixed operation of the named operating modes. 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 or valve operation.

- Set the parameter "Function of outputs..." to "1 x Venetian blind output".

  The appropriate output pair is configured to blind operation. Both outputs are combined into one blind channel.
- Set the parameter "Function of outputs..." to "2 x switching outputs".

  The appropriate output pair is configured to switching operation. Both outputs are programmed separately as two switching channels.
- Set the parameter "Function of outputs A1 and A2" to "2 x valve outputs".

  The first output pair is configured to valve operation. Both outputs are programmed separately as two valve channels.

i The parameter and object configurations of the individual outputs depend on the parameters on the "General" page and are readjusted 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.

4.2.4.1.2 Manual operation

All outputs of the actuator can also be operated manually. The button field with 4 function keys and 3 status LEDs on the front panel of the device can be used for setting and controlling the following modes of operation...

- Bus control: operation from touch sensors or other bus devices
- Temporary manual control: 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.

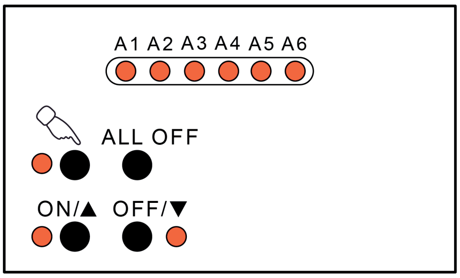

Figure 6: Elements for manual control on the front panel of the device

The operation of the function keys, the control of the outputs and the status display are described in detail in chapter "2.5 Manual control".
The configuration, status feedback, disabling via a bus telegram, and interaction with other functions of the actuator when manual control is activated and deactivated are described in greater detail below.

Manual control is possible only while the actuator is supplied with power from the bus supply voltage. In the state as supplied the manual control mode is fully enabled. In this unprogrammed state, the individual outputs can be switched on and off so that fast function checking of the connected drives (e.g. on the construction site) is possible.

After initial commissioning of the actuator via the ETS, manual control can be enabled or disabled separately for various states of operation. Manual control can, for instance, be disabled during bus operation.

Enabling the manual control mode

Manual operation is generally enabled by means of the parameter "Manual operation during bus operation" on the "Manual operation" parameter page.

- Set the parameter "Manual control during bus operation" to "enabled".

  Manual control is then basically enabled when the bus voltage is on. The outputs of the actuator can be activated via the KNX or manually. This setting corresponds to the setting of the actuator as delivered.

- Set the parameter "Manual control during bus operation" to "disabled".

  Manual operation is completely disabled. In this configuration, the actuator outputs can only be operated via the bus.

ⓘ Further parameters and communication objects of the manual control are visible only in the configuration "Manual control during bus operation = enabled". For this reason, the disabling function, the status message and bus control disabling can only be configured in the above parameter setting.

Presetting the behaviour at the beginning and at the end of manual control

The manual control distinguishes the temporary and permanent manual control. The behaviour is different depending on these modes of operation, especially at the end of manual control. It should always be noted that bus operation is always disabled while manual control is active. This means that the manual control mode has the highest priority.

Behaviour at the beginning of manual control:
In Venetian blind or switching operation, the behaviour at the beginning of manual operation does not differ for temporary and permanent manual operation. When manual control is activated, all travel movements that were started beforehand by bus control for the venetian blind outputs will still be completed unless the travel movement in question is stopped by hand. Switching states of switching outputs will be maintained. In addition, the switching state or PWM on the electronic valve outputs, i.e. the active command value, remains uninfluenced by the activation of manual operation and continues to be executed without interruption.
Active forced-positions, disabling, safety and sun protection functions can be overridden by manual operation. These functions are reactivated after deactivation of the manual operation unless they have been cancelled in the meantime via the KNX. Then the function with the higher priority is always executed.
In valve operation, the behaviour at the beginning of manual operation differs for temporary and permanent manual operation. On activation of short-time manual operation, the most recently set states of the valve outputs initially remain active. For opened valve outputs, the pulse width modulation is not adjusted to the preset value of manual operation. This only takes place when the valves are first closed and then reopened, in the course of brief manual operation. Even after permanent manual operation is switched on, the states of the outputs last set initially remain active. However, for opened valve outputs, the pulse width modulation is automatically adjusted to the preset value of manual operation.

Behaviour at the end of manual control:
The behaviour at the end of manual control is different for temporary and permanent manual control. Temporary manual control is switched off automatically as soon as the last output has been selected and the selection button ✎ is pressed another time, or no button is pressed for 5 s. When temporary manual control is switched of the actuator returns to normal bus operation and does not change the status last set via manual control. 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 control, the actuator executes these functions with a higher priority again for the outputs concerned.
Permanent manual control is switched off if selection button ✎ is pressed for longer than 5 s. Depending on the parameterization of the actuator in the ETS, the outputs will be set to the state last adjusted in the manual mode or to the state internally tracked (direct operation, forced position, disabling, safety or sun protection position) when the permanent manual mode is switched off. The parameter "Behaviour at the end of permanent manual control during bus operation" defines the corresponding reaction.

- Set the parameter "Behaviour at the end of permanent manual control during bus operation" to "no change".

  All telegrams received during an active permanent manual control mode for direct operation (switching, long-time/short-time, positioning, central, scenes, control 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.

- Set the parameter "Behaviour at the end of permanent manual control during bus operation" to "track outputs".

During an active permanent manual control, 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.

i 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.

i The following should be observed for the valve outputs:
During manual operation, all the valve outputs are activated with pulse-width modulation (PWM), irrespective of the configured command value data format (1-bit or 1-byte). The cycle time of the PWM signal for a valve output activated by manual operation is configured centrally on the parameter page "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).

i During an ETS programming operation, an activated manual operation mode will always be terminated. In this case, the parameterized or predefined behaviour at the end of manual control will not be executed. The actuator executes the configured behaviour after an ETS programming operation instead.

Presetting a manual control disable

The manual control mode can be separately disabled via the KNX, 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 of the manual control, the actuator immediately terminates an activated manual control and locks the function keys on the front panel of the device. The telegram polarity of the disabling object is parameterisable.

The manual control mode during bus operation must be enabled in the ETS.

- Set the parameter "Disabling function ?" on parameter page "Manual control" to "yes".

  The disabling function of the manual control mode is enabled and the disabling object is visible.

- Select the desired telegram polarity in the "Disabling object polarity" parameter.

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

i When an active manual control is terminated by a disable, the actuator will also transmit a "Manual control inactive" status telegram to the bus, if the status messaging function is enabled.

Presetting the status message function for the manual control mode

An actuator can transmit a status telegram to the KNX via a separate object when the manual operation is activated or deactivated. The polarity of the status telegram can be parameterised.

The manual control mode during bus operation must be enabled.

- Set the parameter "Transmit status ?" on parameter page "Manual control" to "yes".

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

- Specify in the parameter "Status object function and polarity" whether the status telegram is generally a "1" telegram whenever the manual control mode is activated or only in those cases where the permanent manual mode is activated.

- ℹ The status object is always "0" when the manual control mode is deactivated.
- ℹ The status is not transmitted automatically to the bus after bus voltage return or an ETS programming operation.
- ℹ When active manual control is terminated by a disable function of the manual operation, the actuator will also transmit a "Manual control inactive" status telegram to the bus.

Setting disabling of the bus control

Individual switching, valve or Venetian blind outputs can be disabled locally by manual operation on the device, so that the disabled outputs can no longer be activated via KNX telegrams. Such disabling of the bus operation is initiated by operation in permanent manual operation and is indicated by rapid flashing of the Status LED (A1...A6) of the outputs concerned. The disabled outputs can then only be activated in permanent manual control.

The manual control mode during bus operation must be enabled in the ETS.

- ■ Set the parameter "Disable bus control of individual outputs during bus operation" on parameter page "Manual control" to "yes".

  The function for disabling the bus control is enabled and can be activated locally. Alternatively, this parameter can be set to "no" to prevent disabling of the bus control from being activated in permanent manual operation.

- ℹ The disabling initiated locally has the highest priority. Thus all other functions of the actuator that can be activated via the KNX (e.g. forced position, disabling or safety function) are overridden. The bus-disabled output remains in the state last set in permanent manual control.
  Depending on the parameterization of the actuator in the ETS, the outputs will be set to the state last adjusted in the manual mode or to the state internally tracked (direct operation, forced position, disabling, safety or sun protection position) when the permanent manual mode is reactivated and subsequently shut off.
- 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. Activation of the outputs via the KNX is possible again after a device reset.

Setting the cycle time and PWM of manual operation (only for valve outputs)

During manual operation, all the valve outputs are activated with a pulse-width modulation (PWM), 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 "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 valve close 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 % or 100 %).

- ■ Configure the parameters "Cycle time for manual operation" and "PWM for manual operation (5...100 %)" on the "Manual operation" parameter page 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.

4.2.4.1.3 Telegram rate limit

It is possible to configure a general telegram rate limit using the parameter of the same name on the "General" parameter page. If the telegram rate limit is enabled, no more telegrams are transmitted to the KNX in 17 seconds (permanently defined, cyclical time interval) than is specified in the ETS. This avoids fast edge changes at the inputs causing an inpermissibly high bus load.

ⓘ A telegram rate limit does not influence a configured delay after bus voltage return. These two functions can be combined in any way.

4.2.4.1.4 Internal group communication

The internal group communication allows internal device linkage of input and output objects of specific functions for the data formats "1-bit", "1-byte" and "2-byte" (with the application program "Multi station 802811") and "1-bit", "4-bit", "1-byte", "2-byte" and "4-byte" (with the application program "Multi station 802812"). In many cases, this simplifies device configuration considerably, as there is no need for project design of group addresses for functions which only communicate internally in the device. For example, the command value outputs of device-internal room temperature controllers can be internally linked to the valve outputs of the actuator, meaning that temperature control and valve activation can take place using just one bus device, if required. The precondition is that the data formats (1-bit / 1-byte) of the command value inputs and outputs to be linked are identical.
It is also possible to link binary inputs, which are configured to the "Switching" or "Venetian blind" function, to the switching or Venetian blind outputs of the actuator. The data inputs and result outputs of the logic functions can use internal group communication.

Internal group communication uses internal connections (internal group addresses) to link the available communication interfaces of certain device functions. This renders external linking of objects via external group addresses superfluous. However, the communication objects of the device functions are visible as usual in the object view in the ETS project.

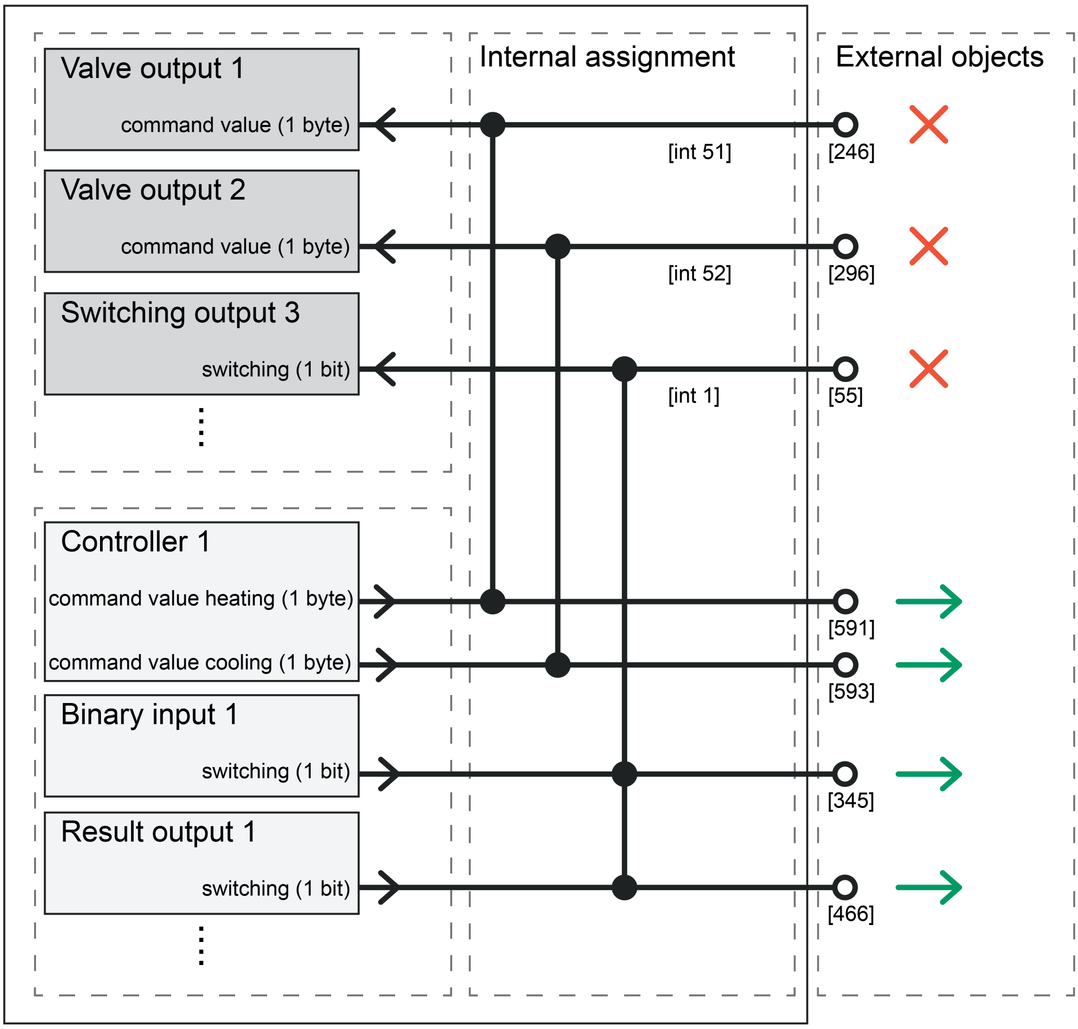

Figure 7: Project design example for internal group communication

In addition to internal group communication, it is possible to assign external group addresses to transmitting communication objects in the ETS project (e.g. objects of the binary inputs or the result outputs of the logic functions). This is sensible, for example, if the values or states of actuator outputs are also to be transmitted to the KNX, to activate other KNX bus devices. Simultaneous use of internal and external group communication is thus possible for sending objects.

Caution:
For input objects receiving values or states from the KNX, when using internal group communication, prevent external communication from also taking place. It is therefore not permitted to link the input objects (e.g. the command value inputs of the valve outputs or the objects of the switching and Venetian blind outputs) with external group addresses if internal group addresses have been assigned!

Internal group communication interconnects device functions, without using external communication objects and group addresses. Actual linking takes place using internal connections which are assigned to the appropriate functions via normal parameters. The following table shows the device functions which support internal group communication and clarifies the data formats used. Only functions of the same data format can be internally linked.

Function	1-b-it	4-bit *	1 bytes	2 bytes	4 bytes *
Switching outputs Central 1	x				
Switching outputs Central 2	x				
Switching outputs Central 3	x				
Venetian blind outputs Central	x				
Venetian blind outputs Wind alarm 1	x				
Venetian blind outputs Wind alarm 2	x				
Venetian blind outputs Wind alarm 3	x				
Venetian blind outputs Rain alarm	x				
Venetian blind outputs Frost alarm	x				
Venetian blind outputs Frost alarm	x				
Valve outputs, command value, continuous			x		
Valve outputs, command value, switching	x				
Switching outputs Switching	x				
Venetian blind outputs Short-time operation	x				
Venetian blind outputs Long-time operation	x				
Binary inputs Switching 1	x				
Binary inputs Switching 2	x				
Binary inputs Dimming		x			
Binary inputs Short-time operation	x				
Binary inputs Long-time operation	x				
Binary inputs Value transmitter 1-byte			x		
Binary inputs Light scene extension			x		
Binary inputs Temperature value transmitter				x	
Binary inputs HVAC value transmitter			x		
Binary inputs 2-channel operation Switching 1	x				
Binary inputs 2-channel operation Switching 2	x				

Binary inputs 2-channel operation Value transmitter 1			x		
Binary inputs 2-channel operation Value transmitter 2			x		
Binary inputs 2-channel operation Temperature transmitter 1				x	
Binary inputs 2-channel operation Temperature transmitter 2				x	
Analogue inputs Temperature value				x	
Room temperature controller command values, continuous			x		
Room temperature controller command values, switching	x				
Room temperature controller Temperature value 1				x	
Room temperature controller Temperature value 2				x	
Logic functions Data inputs 1-bit	x				
Logic functions Data inputs 4-bit **		x			
Logic functions Data inputs 1-byte			x		
Logic functions Data inputs 2-byte **				x *	
Logic functions Data inputs 4-byte **					x
Logic functions Result outputs 1-bit	x				
Logic functions Result outputs 4-bit **		x			
Logic functions Result outputs 1-byte			x		
Logic functions Result outputs 2-byte **				x *	
Logic functions Result outputs 4-byte **					x

Device functions with internal group communication
*: Only with application program "Multi station 802812"!
**: Only the first 8 data inputs or result outputs!
***: Only the first 4 data inputs or result outputs!

If internal group communication is to be used, then this must be enabled centrally on the "General" parameter page. If enabled, the supported device functions can be linked to the internal connections of the matching data format. With the application program "Multi station 802811" 50 1-bit, another 50 1-byte and 10 2-byte internal addresses are available for this. With the application program "Multi station 802812" 50 1-bit, 10 4-bit, 50 1-byte, 10 2-byte and 10 4-byte internal addresses are available.
The parameters for linking the internal group addresses are available on the parameter pages of the corresponding functions. In addition, all the link parameters are available in collected form on the "Overview, internal group communication" parameter page. This parameter page can be used directly for the project design of the links and also serves as an overview of internal group communication, similar to an object table in the ETS.

i Just as when linking multiple communication objects with an external group address, with internal group communication, multiple transmitting functions (e.g. a binary input and the result output of a logic function) can be linked to a receiving function (e.g. a switching output) by using an internal connection (figure 7). In so doing, ensure that the most recently transmitted data value of the transmitting functions prevails and overwrites the previous values.

4.2.4.2 Functional description of the venetian blind outputs

4.2.4.2.1 Channel-independent functions

Delay after bus voltage return

To reduce telegram traffic on the KNX 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 actively transmitted feedback telegrams of the actuator outputs. For this purpose, a channel-independent delay can be specified (parameter "Delay after bus voltage return" on parameter page "General blind outputs"). Only after the configured time elapses are feedback telegrams for initialisation transmitted to the KNX.
Which of the telegrams are actually delayed and which are not can be specified for each Venetian blind output and for 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 also be activated during the delay after bus voltage return.

ℹ A setting of "0" for the delay after bus voltage return deactivates the delaying function altogether. In this case, any messages, if actively transmitted, will be transmitted to the KNX without any delay.

Central function

The actuator offers the possibility of linking selected individual or all venetian blind outputs with a 1-bit central communication object. The behaviour in case of activating an output via the central function is comparable to a central group address linked with all "Long time operation" objects.
The outputs assigned to the central function are activated in accordance with the central object value received. If necessary, the polarity of the central telegram can be configured as inverted. The behaviour of the channels is identical with the normal control via the "Long-time operation" objects. In this case the central telegram has got the same priority so the command last received (long-time or central) will be executed.

Enabling the central function

- Enable the central function on parameter page "General blind outputs" by setting the "Central function for blind outputs?" parameter to "Yes".

  The "Central movement" communication object is visible.

Assigning outputs to the central function

Each venetian blind output can be assigned independently to the central function.

The central function must have been enabled on parameter page "General blind outputs".

- Set the Parameter "Assignment to central function ?" on parameter page "Relay outputs... -> VBO... - Enabled functions" to "yes".

  The appropriate output is assigned to the central function. It can be moved centrally.

ℹ The blind, venting louvre or slat position newly set by the central function 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 limit positions has been performed beforehand.

i The central function belongs to the set of 'direct operations' of an output. For this reason, the central function has the same priority compared with operation using the short time or long time objects, used to control the positioning objects or to recall scenes.

i After a bus voltage return or after programming with the ETS, the central function is always inactive (object value "0").

Safety functions:

The actuator can handle up to five different safety functions. 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 can be used, for instance, to protect Venetian blinds or awnings on several building facades from wind and gusts. 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 programmed and configured in common for all shutter/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 for each channel.
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 device activates the safety movement for the output. The safety function is terminated as soon as a new "0" telegram is received.
For the wind alarms, the rain alarm and the frost alarm, different monitoring times between '1 minute' and '23 hours 59 minutes' can be separately selected in the ETS. A shared time is configured for the wind alarms. Each wind alarm has its own time control, so that the wind objects are separately checked for telegram updates.

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.

- Set the parameter "Safety functions" on the "General blinds output -> Safety" parameter page to "enabled".

  The safety functions are globally enabled and the other parameters and the parameter page "Safety times" become visible.

- Set the parameters "Wind alarm 1", "Wind alarm 2", "Wind alarm 3", "Rain alarm" and "Frost alarm" depending on functional requirements to "enabled". The "disabled" option deactivates the corresponding alarm.

  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.

ⓘ 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 have been globally enabled.

- Set the "Priority of safety alarms" parameter on the "Gerenal blinds output -> Safety" parameter page in the required order of priority.

ⓘ The three wind alarms have the same priority with respect to one another (logic OR). The last telegram update to the wind alarm objects decides which of the wind alarms will be executed. The wind alarm is completely deactivated for an assigned output only after all three objects are inactive ("0").

Presetting 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 "General blind outputs -> Safety times" parameter page.

The safety functions must have been globally enabled.

- If monitoring of the wind alarms is to be activated, the parameter "Use wind alarm monitoring function ?" must be set to "yes".

  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 reaction will be executed for the output concerned.
- Specify the required monitoring time for the wind alarm objects in the "Wind alarm monitoring times" parameters.

- If the monitoring function is to be activated for a rain alarm, the parameter "Use rain alarm monitoring function ?" must be set to "yes".

  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 "Rain alarm monitoring times" parameters.

- If the monitoring function is to be activated for a frost alarm, the parameter "Use frost alarm monitoring function ?" must be set to "yes".

  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 "Frost alarm monitoring times" parameters.

i 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.

4.2.4.2.2 Operating mode

Each venetian blind output of the actuator can be independently configured for the drive type connected by defining the operating mode. The device permits controlling slatted Venetian blinds, roller shutters, awnings and also venting louvres. Depending on the preset operating mode, the ETS adapts the parameters and communication objects for all functions of an output. For example, in the "Venetian blind" operating mode, there are also parameters and objects for slat control. There is no slat control in the "Roller shutter / awning" operating mode, but a fabric stretching function can be configured for awning use. In the "Venting louvre" operating mode, a distinction is made between the "Closing" and "Opening" drive movements, instead of an up or down movement for Venetian blinds or roller 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 operating mode

The parameter "Mode of operation" exists separately for each shutter output on the parameter page "Relay outputs... -> VBO... - General".

- Select the required operating mode in the "Operating mode" parameter.

ℹ The "Operating mode" parameter has an influence on many channel-oriented parameters and communication objects. When the operating mode 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 operating mode should be configured at the beginning of the channel-oriented device configuration.

ℹ Venting louvres must be connected to the outputs in such a way that they are opened in the movement direction "up - ▲" and closed in the movement direction "down - ▼".

ℹ An awning travels upwards when it is rolled up.

4.2.4.2.3 Reset and initialisation behaviour

The preferred relay contact positions after bus voltage return or after ETS programming can be preset separately for each output.

Presetting the behaviour after ETS programming

The parameter "Behaviour after ETS programming" is available separately for each venetian blind output on the parameter page "Relay outputs... -> VBO... - General". This parameter can be used to configure the relay behaviour of the output, irrespective of the behaviour after bus voltage return.
Depending on the selected operating mode, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening the louver" / "lowering" ↔ "closing the louver).

- 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 the louver".

  After programming with the ETS, the actuator raises the blind or opens the venting louvre.
- Set the parameter to "lowering" or "closing the louver".

  After programming with the ETS, the actuator lowers the blind or closes the venting louvre.

ⓘ The "Behaviour after ETS programming" as parameterized 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 return" 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 "Behaviour in case of bus voltage failure" is available separately for each venetian blind output on the parameter page "Relay outputs... -> VBO... - General". The parameter defines the behaviour of a shutter output if the bus voltage fails. The configured behaviour will not be adopted, if a manual control mode is active at the time of bus failure (state LEDs blinking in case of temporary or permanent manual control).
Depending on the selected operating mode, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening the louver" / "lowering" ↔ "closing the louver).

- Set the parameter to "stop".

  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.
- Set the parameter to "no reaction".

  In the event of bus voltage failure, the relay of the output shows no reaction. The relay remains in the last set state, so that connected drives move to the appropriate end position.

- [i] 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 bus voltage return, should this be configured. 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). 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 and louver positions are stored. With Venetian blinds, the height to be stored is always referred to a slat position of 100 % (cf. "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. On account of the fact that position data is stored as integer percentage values (0...100), a minor deviation from the positions reported back later during bus voltage return (number range 0..255) cannot be avoided.

  In case of ETS programming, the saved position data is not lost.
- [i] 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 bus voltage return

The parameter "Behaviour after bus voltage return" is available separately for each venetian blind output on the parameter page "Relay outputs... -> VBO... - General".
Depending on the selected operating mode, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening the louver" / "lowering" ↔ "closing the louver).

- Set the parameter to "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.
- Set the parameter to "raising" or "opening the louver".

  After bus voltage return, the actuator raises the blind or opens the venting louver.
- Set the parameter to "lowering" or "closing the louver".

  After bus voltage return, the actuator lowers the blind or closes the venting louver.
- Set parameter to "position in case of bus voltage failure".

  After bus voltage return, the forced position value (including slat position for Venetian blinds) last selected and internally stored before bus voltage failure will be tracked. Before the positioning movement, the actuator executes a reference movement.
- Set the parameter to "position approach".

  In case of bus voltage return, 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 bus voltage return is unknown.

- [i] "Position on bus voltage failure" setting: If no position values could be stored in case of bus failure because the position data was unknown (no reference movement executed), the actuator shows no reaction with this configuration either.
- [i] The forced position communication object can be initialised separately after bus voltage return. This has an effect on the reaction of the output when the forced position is activated. The configured "Behaviour on bus voltage return" is only executed when no forced position after a bus voltage return is activated.

4.2.4.2.4 Short-time / Long-time operation, travelling times

Determining and configuring short-time and long-time operation

The short-time operation (Step) permits adjusting the slat tilting angle of a 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 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 movement time of the connected Venetian blind, roller shutter/awning or louver and must therefore not be preset separately. The movement 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 movement time. The configured travelling time extension will moreover be taken into account by the actuator for all upward travels or all travel movements into the open position as the drive motors are then generally no so fast due to the weight of the curtains or 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.

ⓘ A long time or a short time operation can be retriggered by a new incoming long time or short time telegram.

ⓘ 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 the short time operation

Short-time operation is configured separately for each output and independent of the travelling time of the curtain or of the louvre. 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 parameter page "Relay outputs... -> VBO... - 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 parameter "Short time operation" on parameter page "Relay outputs... -> VBO... - Times" 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" should correspond, for a Venetian blind, to approx. ¼ of the complete slat moving time and for a roller shutter to the full time needed for opening the roller shutter segments.

ⓘ The short time operation is always executed without a movement time extension.

Determining and configuring travelling times

For computing positions and also for executing long time operation, the actuator needs the exact movement time of the connectedVenetian blind, roller shutter/awning or louver. The movement times must be measured manually and entered into the ETS configuration. It is important to determine the movement time accurately to permit positions to be approached with good precision. Therefore, it is recommended to make several time measurements and to take the average of these values before entering them into the corresponding parameter. The movement time corresponds to the duration of a drive 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 movement times are to be determined as a function of the different types of drives.

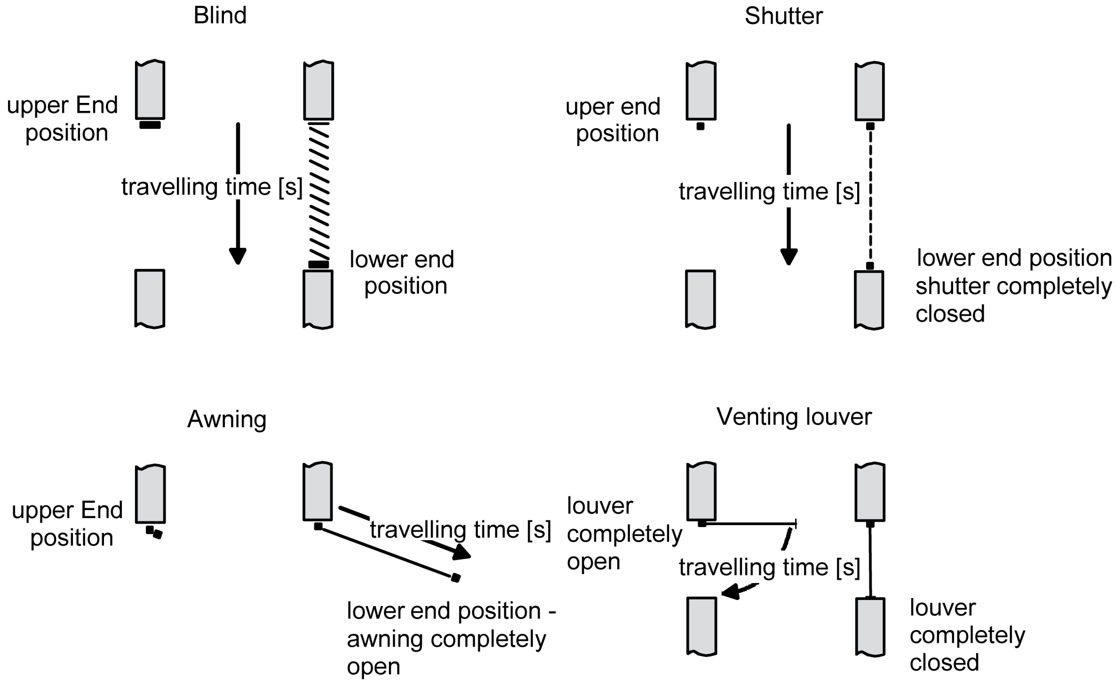

Figure 8: Determining the movement time according to the drive type

Setting the movement time of Venetian blinds, roller shutters/awnings and louvers

The measurement of the movement time is described in detail in chapter "Commissioning".

- Enter the exact movement times determined in the course of the commissioning procedure into the parameters "Blind travelling time" or "Shutter/awning travelling time" or "Venting louver travelling time" on parameter page "Relay outputs... -> VBO... - Times". The maximum travelling time is '19 minutes 59 seconds. The working principle does not allow longer movement times.

i The parameterized travelling time extension will moreover be taken into account by the actuator for all upward travels or all travel movements into the open position as the drive motors are then generally no so fast due to the weight of the curtains or to external physical influences (e.g. temperature, wind, etc.).

Determining and configuring the slat moving time (only with slatted Venetian blinds)

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 moving 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 blind moves downwards. The actuator assumes that the slats are completely closed when the Venetian blind moves downwards . These Venetian blinds are the most common type on the market.

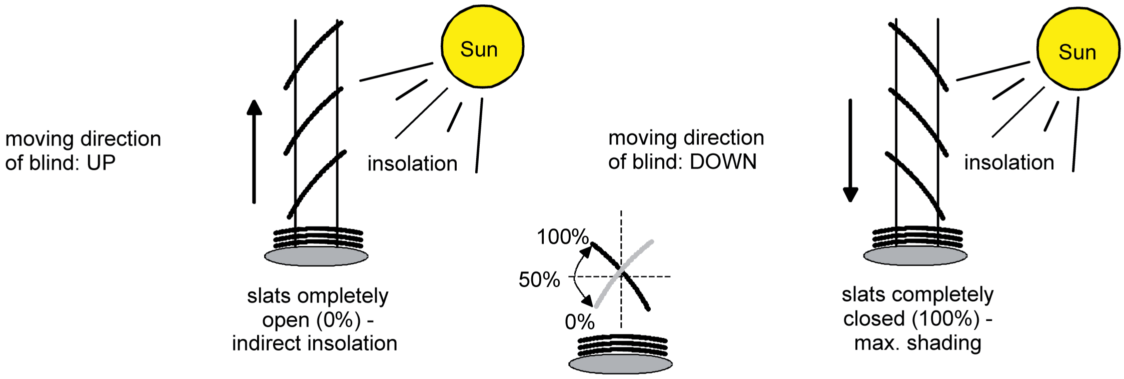

Figure 9: Type 1 - Slatted Venetian blinds with oblique slat position in both travel directions

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.

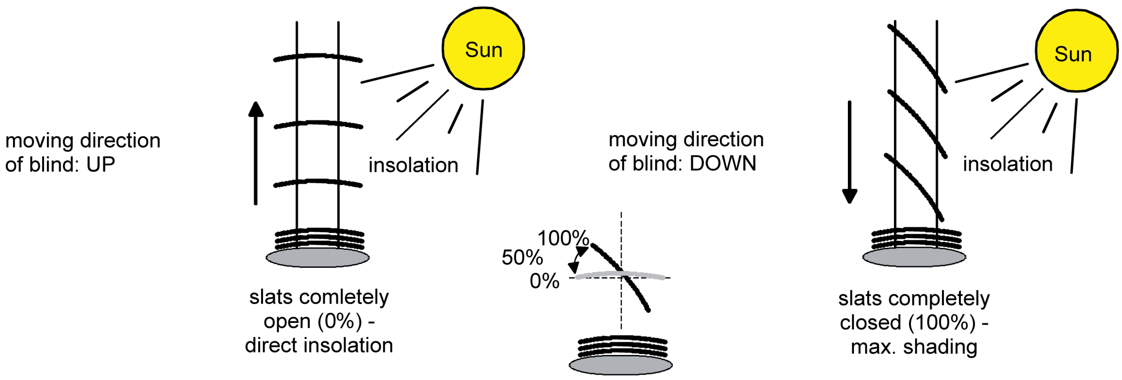

Figure 10: Type 2 - Slatted Venetian blinds with oblique and horizontal slat position

Presetting the slat moving time

The measurement of the slat moving time is described in detail in chapter "Commissioning".

- Enter the exact value determined in the course of the commissioning procedure into the parameter "Slat travelling time" on parameter page "Relay outputs... -> VBO... - Times".

ⓘ The slat moving time must be shorter than the preset or learnt blind travelling time.

ⓘ The configured movement time extension will also be taken into account when slats are moved into the completely open position (upward movement).

Presetting the movement time extension

- Enter the determined movement time extension (by rounding up the determined extension value) into the parameter "Movement time extension for upward movement" on parameter page "Relay outputs... -> VBO... - General".

Presetting the switchover time for movement direction changes

- Set the parameter "Switchover time for travel direction change" on parameter page "Relay outputs... -> VBO... - Times" to the required switchover interval.

i In the as-delivered state of the actuator, the switchover time is generally preset to 1 s.

4.2.4.2.5 Presetting the position and feedbacks

Computing the curtain height or the louver position

The actuator has a comfortable and accurate positioning function. The actuator calculates the current position of the connected blind, shutter, awning or louver whenever these elements are adjusted either by manual or bus control. The calculated position value is a measure of the height of the curtain or of the opening width of the venting louver .

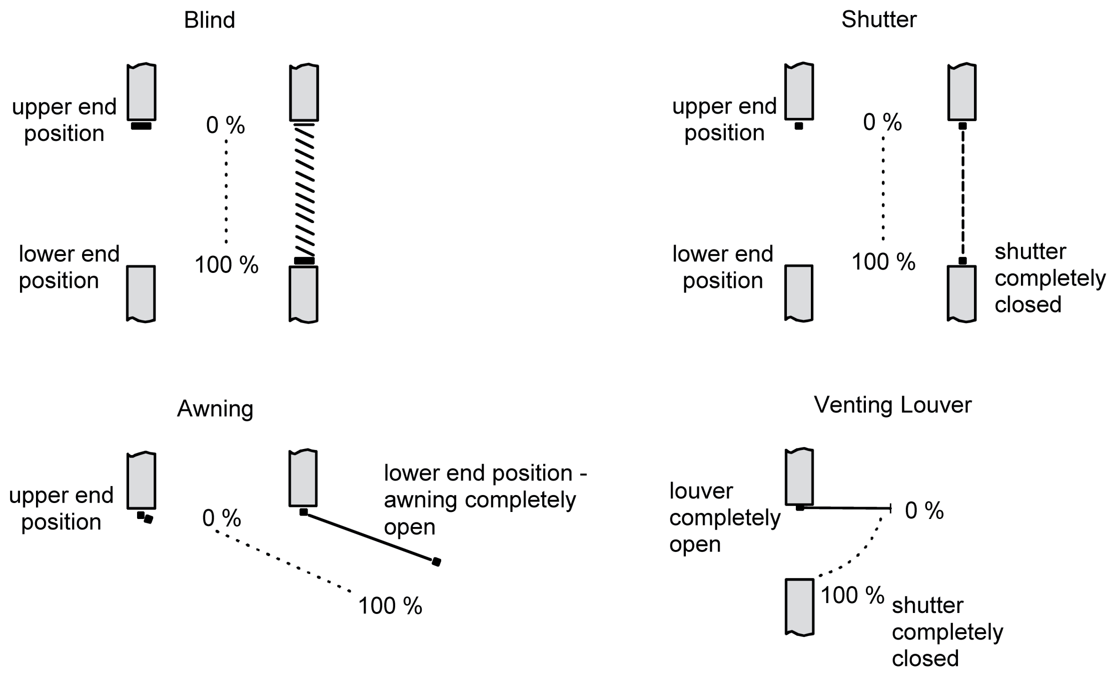

Figure 11: Positions defined as a function of the type of movement

The actuator derives the positions from the configured travelling time since conventional drives do not provide feedback about their positions. Thus, the travelling time separately parameterized for each shutter output is the reference for all position approaches and of basic importance for the accuracy of the position calculations. For this reason, the travelling times should be determined with great accuracy in order to achieve the best possible positioning results.

For positioning purposes, the actuator calculates the movement time required as a function of the current position.
Example 1...
The roller shutter connected to the certain output has an overall travelling time of 20 s. The roller shutter is in its upper end position (0 %). It is to be positioned at 25 %. The actuator calculates the movement time required for approaching the desired position: 20 s × 0.25(25 %) = 5 s. The output will then lower the roller shutter for 5 s and thus position the blind at height of 25 %.

Example 2...
The shutter connected to the certain output has an overall travelling 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 travelling time required for bridging the difference between the positions: 20 s × $0.5_{(50\ \%)}$ = 10 s. The output will then lower the roller shutter for 10 s and thus position the blind at height of 75 %.

With all the upward movements, the configured movement time extension is automatically added to the calculated movement time.
Example 3...
The shutter connected to the certain output has an overall travelling 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 unextended movement time required for bridging the difference between the positions:
20 s × 0.5(50 %) = 10 s. Taking the movement time extension into account (e.g. 10 %), the actual raising time is: 10 s × ((100 % + 10 %(extension)) : 100 %) = 10 s × 1.1 = 11 s. The output will then raise the roller 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 movement time is always 20 % longer than the overall movement time.
Example 4...
The shutter connected to the certain output has an overall travelling 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 movement time required for bridging the difference between the positions: 20 s × 0.5(50 %) = 10 s. As the movement is a limit position movement, the actuator adds 20 % of the total movement time:
10 s + (20 % : 100 %) · 20 s = 14 s. The output will then lower the roller shutter for 14 s and thus positions it safely at a blind height of 100 %.

Example 5:
The shutter connected to the certain output has an overall travelling 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 unextended movement time required for bridging the difference between the positions: 20 s × 0.5(50 %) = 10 s. As the movement is a limit position movement, the actuator also adds 20 % of the total movement time: 10 s + (20 % : 100 %) - 20 s = 14 s. Taking the movement time extension into account (e.g. 10 %), the actual raising time is: 10 s × ((100 % + 10 %(extension)) : 100 %) = 10 s × 1.1 = 15.4 s. The output will then raise the roller 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 curtain or louver positions temporarily. The actuator can approach newly preset curtain or louver positions only if the current positions are known. For this purpose, each output must be given the opportunity to synchronise itself whenever the supply voltage is switched on or after every ETS programming operation (physical address, application program, partial download). Synchronisation is performed with the help of a reference movement (cf. "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 "blinds" operating mode, 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 blind itself .

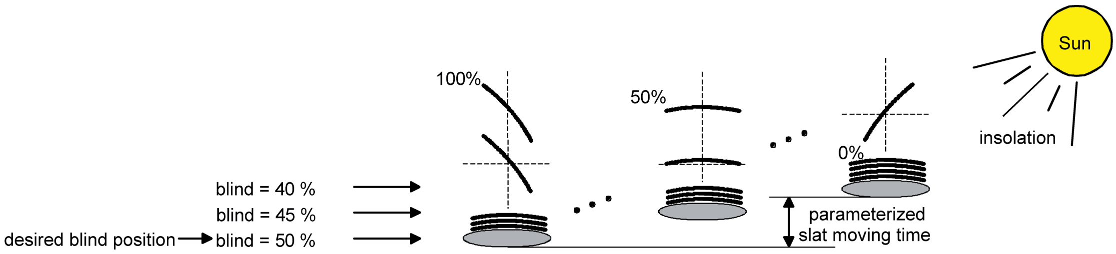

Figure 12: Example of slat positioning affecting the position of the Venetian blind (typical of slat type 1; analogous reaction for type 2)

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 movement time required for a change of position lies within the configured slat moving time. Similarly, the actuator accounts for the ratio of the moving 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 (figure 12)…
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 blind position of, let's say 47 % in this case, the actuator will not perform a travel movement as the calculated travelling time lies within the parameterized slat moving time and therefore 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%).

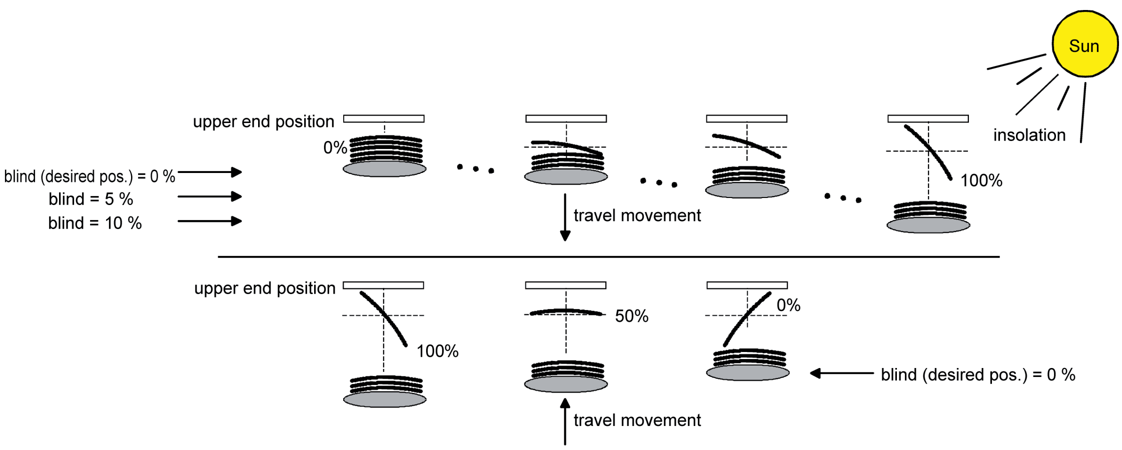

Figure 13: Example of slat positioning with the Venetian blind in upper end position (typical of slat type 1)

Example (figure 13)...
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 blind position of, let's say 5 % in this case, the actuator will not perform a travel movement as the calculated travelling time lies within the parameterized slat moving time and therefore 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 supply voltage is switched on or after every ETS programming operation (physical address, application program, partial download). The synchronisation is performed with the help of a reference movement for the slat or the Venetian blind (cf. "reference movement").
- ℹ A change of the Venetian blind height will always result in a change of the slat position. After reactivation of the supply voltage of 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 smaller the ratio between slat moving time and Venetian blind travelling time, the more precise the position approaches and the less marked the influence of the slat angle adjustment on the height of the Venetian blind.

Reference movement

After ETS programming (physical address, application program, partial download) or after bus voltage failure, all current position data are unknown. Before the actuator can approach new positions after bus voltage return or after programming, the positioning system must at first be calibrated. 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 is not retriggerable.

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.

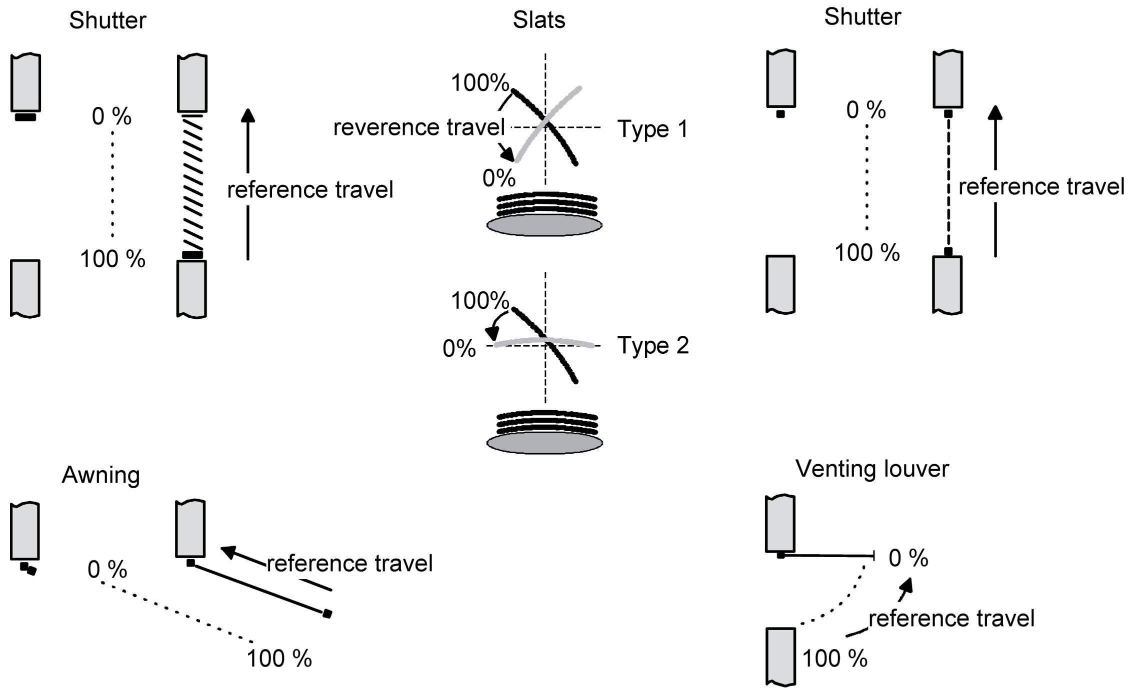

Figure 14: Reference movement

In the event of slat positioning via the corresponding communication objects after bus voltage return or after programming, 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 moving time. During a slat reference movement, the actuator always moves the slats for the parameterized slat moving time into the completely open position (0 %) and then 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 moving 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.

Presetting the position

The following ways of presetting positions can be distinguished…

- Direct positioning via the positioning objects (direct operation),
- Positioning by activating the sun protection function,
- Positioning using the response to bus voltage return,
- Positioning by a scene recall.

Positioning via the positioning objects:
Each Venetian blind, roller shutter, awning or venting louvre 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 conform to the 1-byte data format as per
KNX datapoint type 5.001 (scaling). The actuator converts the value received (0...255) linearly into a position (0...100 %).

Received value (0...255)	**Position derived from value (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 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 power supply of the actuator 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 travel with a duration of at least the configured slat moving 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 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 bus voltage return 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 operating mode. 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 time object.

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 parameterized mode of operation...

- Feedback (1 byte) of the Venetian blind, roller shutter, awning or venting louver position,
- 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 drive 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 movement time extension have elapsed.

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 and supply voltage or after ETS programming are still unknown. In these cases, the actuator must first perform a reference travel (cf. "Reference travel") 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, roller shutter, awning or venting louver 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 operating mode ("Venetian blind position feedback", "Roller shutter/awning position feedback" or "Venting louver position feedback"). The feedback can be used as an active message object or as a passive status object. As an active signalling object, the position feedback information is transmitted to the bus whenever a position value changes. As a passive status object, there is no telegram transmission after a change. In this case, the object value must be read out. The ETS automatically sets the object communication flags required for proper functioning.
In case of an actively transmitting signalling object, the current position can be transmitted to the KNX after bus voltage return, 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 for all outputs in common (cf. "Delay after bus voltage return").

The feedback functions of an output must be enabled on parameter page "Relay outputs... -> VBO... - Enabled functions". Only then are the parameters for the feedback functions visible.

- Set the parameter "Venetian blind position feedback", "Roller shutter / awning position feedback" or "Venting louver position feedback" to "Feedback object is active signalling object".

  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.

- Set the parameter "Venetian blind position feedback", "Roller shutter/awning position feedback" or "Rückmeldung Lüftungsklappenposition" on parameter page "Ax - Feedbacks" to "feedback object is passive status object".

  The feedback object is enabled. The position value will be transmitted in response only if the feedback object is read out from by the KNX. If the position is unknown, a value of "0" will be reported back after readout.

The feedback must be set as actively transmitting.

- If a time delay after bus voltage return or an ETS programming operation is necessary, configure the parameter "Time delay for feedback after bus voltage return ?" to "Yes".

  The position feedback is transmitted with a delay after bus voltage return or after an ETS programming operation, provided that the position is known (reference movement performed). After the end of the time 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.

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. As with the position feedback of the Venetian blind height, the feedback can be used as an active message object or as a passive status object. In case of an actively transmitting signalling object, the current slat position can be transmitted to the bus after bus voltage return, 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 for all outputs in common (cf. "Delay after bus voltage return").

The feedback functions of an output must be enabled on parameter page "Relay outputs... -> VBO... - Enabled functions". Only then are the parameters for the slat position feedback functions visible.

- Set the parameter "Slat position feedback" to "feedback object is active signalling object".

  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.

- Set the parameter "Slat position feedback" to "feedback object is passive status object".

  The feedback object is enabled. The position value will be transmitted in response only if the feedback object is read out from by the KNX. If the position is unknown, a value of "0" will be reported back after readout.

The feedback must be set as actively transmitting.

- If a time delay after bus voltage return or an ETS programming operation is necessary, configure the parameter "Time delay for feedback after bus voltage return ?" to "Yes".

The position feedback is transmitted with a delay after bus voltage return or after an ETS programming operation, provided that the position is known (reference movement performed). After the end of the time 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.

i If, after a bus voltage return or 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 launch a movement and therefore no change of the feedback position data either.

'Unknown position' feedback and travel movement

In addition to position data feedback, the actuator can also report back enlarged 1-bit status information messages and transmit them actively to the KNX, if the bus voltage is on.

The following status feedback messages can be separately preset for each output…

- Feedback of an invalid position,
- Drive movement feedback,

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 – when the bus voltage is on – the actuator can update the feedback object "Invalid position" (object value "1") which will then signal that the object values of the 1-byte position feedback objects are invalid.
An invalid position feedback will be only be reversed (object value "0") after the position data for the Venetian blind, roller shutter, awning or venting louver 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' status message.
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 of the travel directions. The feedback object has a value of "1" when current is flowing from the output to the drive. Likewise, a "0" 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 drive movement.

Setting feedback of an invalid position

The feedback of an invalid position can be enabled and programmed independently for each output. When feedback is enabled, the ETS adapts the parameter texts depending on the preset operating mode ("Invalid Venetian blind position feedback",
"Invalid roller shutter/awning position feedback" or "Invalid venting louver position feedback").
The feedback can be used as an active message object or as a passive status object. As an active signalling object, the status feedback information is transmitted to the KNX whenever a

position value changes. As a passive status object, there is no telegram transmission after a change. In this case, the object value must be read out. The ETS automatically sets the object communication flags required for proper functioning. If the object is an actively transmitting signalling object, the feedback telegram can be transmitted after bus voltage return with a time delay to reduce the bus load, with the delay being preset globally for all outputs in common (cf. "Delay after bus voltage return").

The feedback functions of an output must be enabled on parameter page "Relay outputs... -> VBO... - Enabled functions". Only then are the parameters for the feedback functions visible.

- Set the parameter "Invalid blind position feedback", "Invalid shutter/awning position feedback" or "invalid venting louver position feedback" to "feedback object is active signalling object".

  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 supply voltage or after a reference movement).

- Set the parameter "Invalid Venetian blind position feedback", "Invalid roller shutter / awning position feedback" or "Invalid venting louver position feedback" to "Feedback object is passive signalling object".

  The feedback object is enabled. A telegram will be transmitted in response only if the feedback object is read out by the bus.

The feedback must be set as actively transmitting.

- If a time delay after bus voltage return should be necessary, the parameter "Time delay for feedback after bus voltage return" on parameter page "Relay outputs... -> VBO... – Feedbacks" must be set to "yes".

  The feedback of an invalid position will be transmitted with a delay after bus voltage return. After the end of the time 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.

i Automatic transmission after bus voltage return 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 feedback can be used as an active message object or as a passive status object. As an active signalling object, the status feedback information is transmitted to the KNX whenever a position value changes. As a passive status object, there is no telegram transmission after a change. In this case, the object value must be read out. The ETS automatically sets the object communication flags required for proper functioning.
If the object is an actively transmitting signalling object, the feedback telegram can be transmitted after bus voltage return with a time delay to reduce the bus load, with the delay being preset globally for all venetian blind outputs in common (cf. "Delay after bus voltage return").

The feedback functions of an output must be enabled on parameter page "Relay outputs... -> VBO... - Enabled functions". Only then are the parameters for the feedback functions visible.

- Set the parameter "Slat position feedback" to "Feedback object is active signalling object".

  The feedback object is enabled. A telegram is transmitted when the connected drive starts moving or stops.

- Set the parameter "Slat position feedback" to "Feedback object is passive status object".

The feedback object is enabled. A telegram representing the current travel movement will be transmitted in response only if the feedback object is read out by the KNX.

The feedback must be set as actively transmitting.

- If a time delay after bus voltage return should be necessary, the parameter "Time delay for feedback after bus voltage return" on parameter page "Relay outputs... -> VBO... – Feedbacks" must be set to "yes".

  The feedback of a drive movement is transmitted after a delay on bus voltage return, for example, when the drive starts moving on account of the set behaviour after bus voltage return. After the end of the time delay, the object value state last adjusted will be transmitted to the KNX. No feedback telegram is transmitted during a running delay, even if the drive stops or starts moving.

i Automatic transmission only takes place after a bus voltage return when the drive starts moving on bus voltage return or if the bus failure has caused a change to the drive movement.

4.2.4.2.6 Safety functions:

The actuator can handle up to five different safety functions:
3 x wind alarm, 1 x rain alarm, 1 x frost alarm. Each safety function has a communication object of its own so that the functions can be activated or deactivated independently of one another. The safety functions are programmed and configured in common for all shutter/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 ("1" telegram) can be parameterized for each alarm separately whereas the reaction at the end of an alarm ("0" telegram) can be parameterized for all alarms in common .

An output can be assigned independently to the wind alarms, the rain alarm and the frost alarm. If an output is associated with several alarms, the preset priority decides which of the alarms will prevail and be executed. 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 order of priority of the wind alarms with respect to the frost alarm or to the rain alarm can be configured for several channels on the parameter page
"General Venetian blind outputs -> Safety". The three wind alarms have the same priority with respect to one another (logic OR). The last telegram update to the wind alarm objects decides which of the wind alarms will be executed. The wind alarm is completely deactivated only after all three objects are inactive ("0").
An output in the active safety alarm state is locked, i.e. the control of the output concerned via the KNX by direct operation (short-time, long-time telegram, scenes, positioning, central) or by a sun protection function is prevented. Only a forced position and a manual control locally on the device itself have a higher priority so that these functions may override a safety interlock. At the end of a forced position or of a manual control, the safety reaction is re-executed if an assigned safety alarm is still active.

Assigning safety alarms

The individual safety alarms can be assigned separately for each output. The channels are assigned on parameter page "Relay outputs... -> VBO... - Safety".

The safety functions must be globally enabled on the "General blind outputs -> Safety" parameter page before the output assignments are configured.

The safety function of an output must be enabled on parameter page
"Relay outputs... -> VBO... - Enabled functions". Only then are the channel-related parameters for the safety function visible.

- If an assignment to the wind alarms is necessary, set the parameter "Assignment to wind alarms" to the wind alarm or the wind alarms required.

  The output is assigned to the specified wind alarms.
- If an assignment to the rain alarm is necessary, set the parameter "Assignment to rain alarm" to "yes".

  The output is assigned to the rain alarm.
- If an assignment to the frost alarm is necessary, set the parameter "Assignment to frost alarm" to "yes".

  The output is assigned to the frost alarm.

i If an output is assigned to an alarm which is not globally enabled, the assignment is without effect.

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 preset on parameter page "Relay outputs... -> VBO... - Safety". At the beginning of a safety alarm, the actuator locks the outputs concerned, i.e. control via the KNX by direct operation (short time, long time telegram, scenes, positioning) or by a sun protection function is prevented.
Depending on the selected operating mode, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening the louver" / "lowering" ↔ "closing the louver).

The safety functions must be globally enabled on the parameter page "General blind outputs -> Safety".

The safety function of an output must be enabled on parameter page "Relay outputs... -> VBO... - 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 described below only once.

- Set the parameter "Behaviour in case of ..." 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 "Behaviour in case of ..." to "raising" or "opening the louver".

  The actuator raises the curtain or opens the venting louver at the beginning of the alarm and locks the output thereafter.

- Set the parameter "Behaviour in case of ..." to "lowering" or "closing the louver".

  The actuator lowers the curtain or closes the venting louver at the beginning of the alarm and locks the output thereafter.

- Set the parameter "Behaviour in case of ..." 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 movement time required by an output to move the drive into the end positions is determined by the "Movement time" parameter on parameter page "Relay outputs... -> VBO... - Times" Like the long-time operation, a safety movement is derived from the movement time. Downward movement: movement time + 20 %; Upward movement: movement time + 20 % + configured movement time extension. Safety movements are not retriggerable.

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. Thereafter, the output concerned shows the parameterized "Behaviour at the end of safety". The behaviour is configured on parameter page "Relay outputs... -> VBO... - Safety" in common for all alarms.
Depending on the selected operating mode, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening the louver" / "lowering" ↔ "closing the louver).

The safety functions must be globally enabled on the parameter page "General blind outputs -> Safety".

The safety function of an output must be enabled on parameter page "Relay outputs... -> VBO... - Enabled functions". Only then are the channel-related parameters for the safety function visible.

- Set the parameter "Behaviour at the 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 "Behaviour at the end of safety" to "raising" or "opening the louver".

  The actuator releases the output at the end of all safety alarms and raises the curtain or opens the venting louver.

- Set the parameter "Behaviour at the end of safety" to "lowering" or "closing the louver".

  The actuator releases the output at the end of all safety alarms and lowers or closes the venting louver.

- Set the parameter "Behaviour at the end of safety" 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 "Behaviour at the end of safety" 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 "Position tracking": 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" 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.

4.2.4.2.7 Sun protection function

Introduction

Each venetaian 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

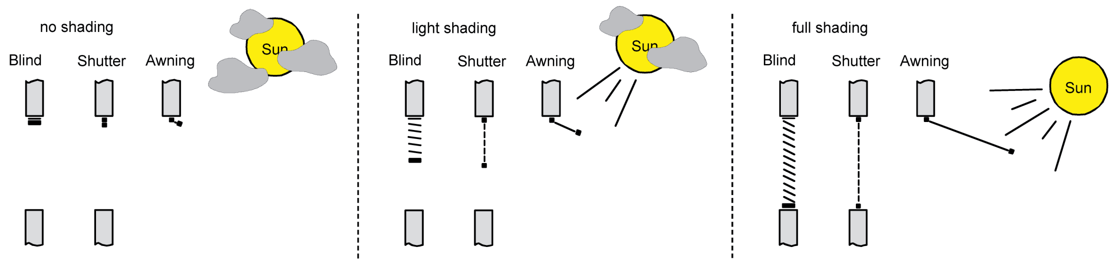

Figure 15: Sun protection principles (example)

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 allowing to enable or to 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, 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, for instance, 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 touch 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 the simple sun protection, shading against sunlight is activated and deactivated via the 1-bit communication object "Sunshine / shading facade". 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 (sun / beginning of shading or sun / end of shading) 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 / shading facade" object causes the sun protection to be reactivated, if it had been influenced and possibly been 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.

By means of a priority setting in the ETS configuration, it can be specified whether the sun protection function can be influenced by direct operation or whether the corresponding output is locked by a telegram "Sunshine / shading facade" 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 / shading facade" continues to signal the presence of sunshine.

i 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 (figure 16) and an example of how sensor components can be integrated into a simple sun protection configuration.

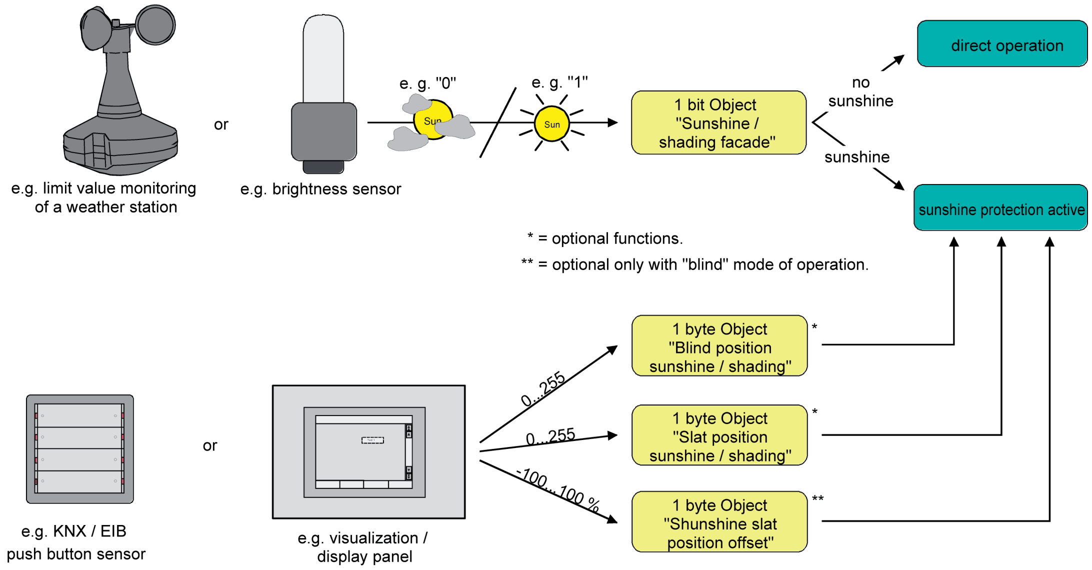

Figure 16: Schematic diagram illustrating the simple sun protection configuration

The function diagram (figure 17) 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.

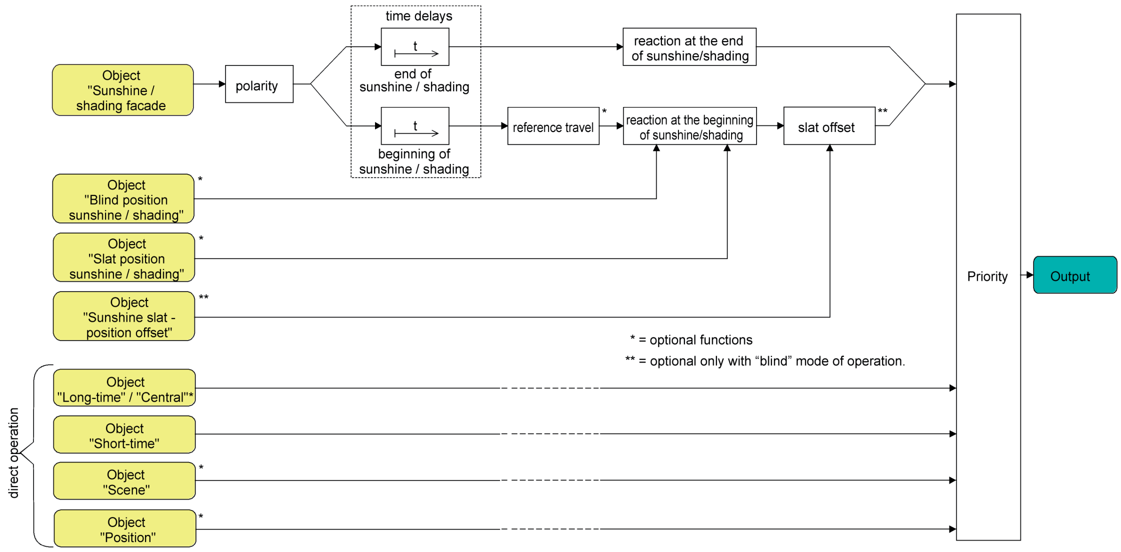

Figure 17: Function diagram illustrating the simple sun protection

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 and slat position tracking with respect to the position of the sun as, for instance, a weather station with combination sensor can therefore be integrated into the device system via the bus as an added automatic function.
In the enlarged sun protection, shading against sunlight is activated and deactivated via the 1-bit communication object "Sunshine / shading facade". 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 "Automatic" object receives a "1" telegram. The output reacts immediately to the activation and shows the preset behaviour depending on sunlight conditions (Sun / beginning of the shading action / Sun end of the shading action). The sunlight conditions are derived from the "Sun / shading facade" object according to the set polarity - if necessary after the delays have elapsed.
  After an ETS programming operation or after switch-on of the supply voltage, the "Sunshine / shading facade" object is initialised with "0" 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. The reception of a "0" telegram by the object "Automatic" always terminates an automatic operation independent of the state of the "Sunshine / shading facade" 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 / Shading, 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" object is set to 'active' in consideration of polarity. A reaction at the output occurs, however, only after a new change of state ("0" -> "1" or "1" -> "0") has been signalled via the "Sunshine / shading facade" object. In this case, the new state (beginning of sunshine/shading or end of sunshine/shading) 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 object "Automatic" 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 'Automatic deactivated' telegram by the "Automatic" object always terminates an automatic operation independent of the state of the "Sunshine / shading facade" 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 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 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.

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" and "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" object is updated again by

writing a "1" 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.

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 conditions via the "Sunshine / shading facade" communication object. The system the 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 / shading facade" 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 / shading facade" 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 / shading facade" 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 position tracking.
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 terminate 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 "Relay outputs... -> VBO... - Sun protection" using the "Automatic operation feedback" parameter. This parameter also defines whether, on a status change, the object produces active signals automatically or can be read out passively. The telegram polarity is fixed: "0" = Automatic mode inactive, "1" = Automatic mode active.
As a passive status object, no automatic telegram transmission takes place on the bus if the status of the automatic operation changes. Here, the object can only be read out using a read telegram. In the case of an actively-transmitting signal object, the parameter "Time delay for feedback after bus voltage return ?" 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 extended sun protection (figure 18) and an example of how sensor components can be integrated into an extended sun protection configuration.

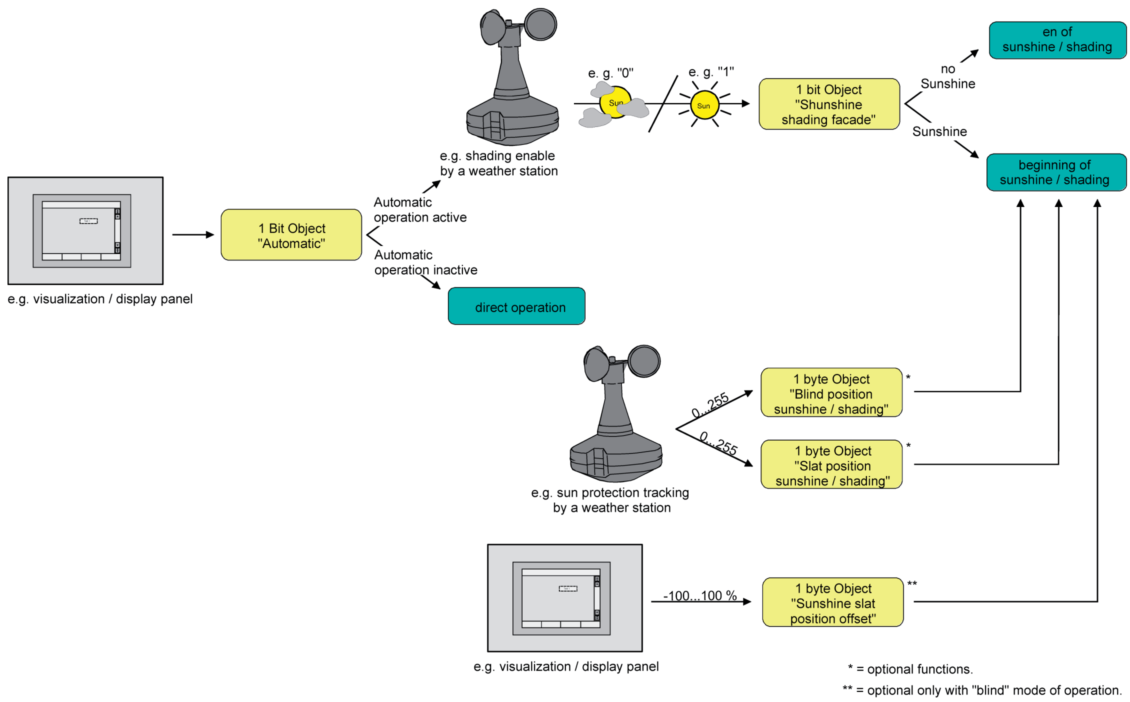

Figure 18: Schematic diagram illustrating the extended sun protection configuration (for reasons of simplicity without disabling functions)

The function diagram (figure 19) shows all possible functions of the extended sun protection. For reasons of clarity, the functions with a higher priority (manual control, forced position, safety function) are not shown in the diagram.

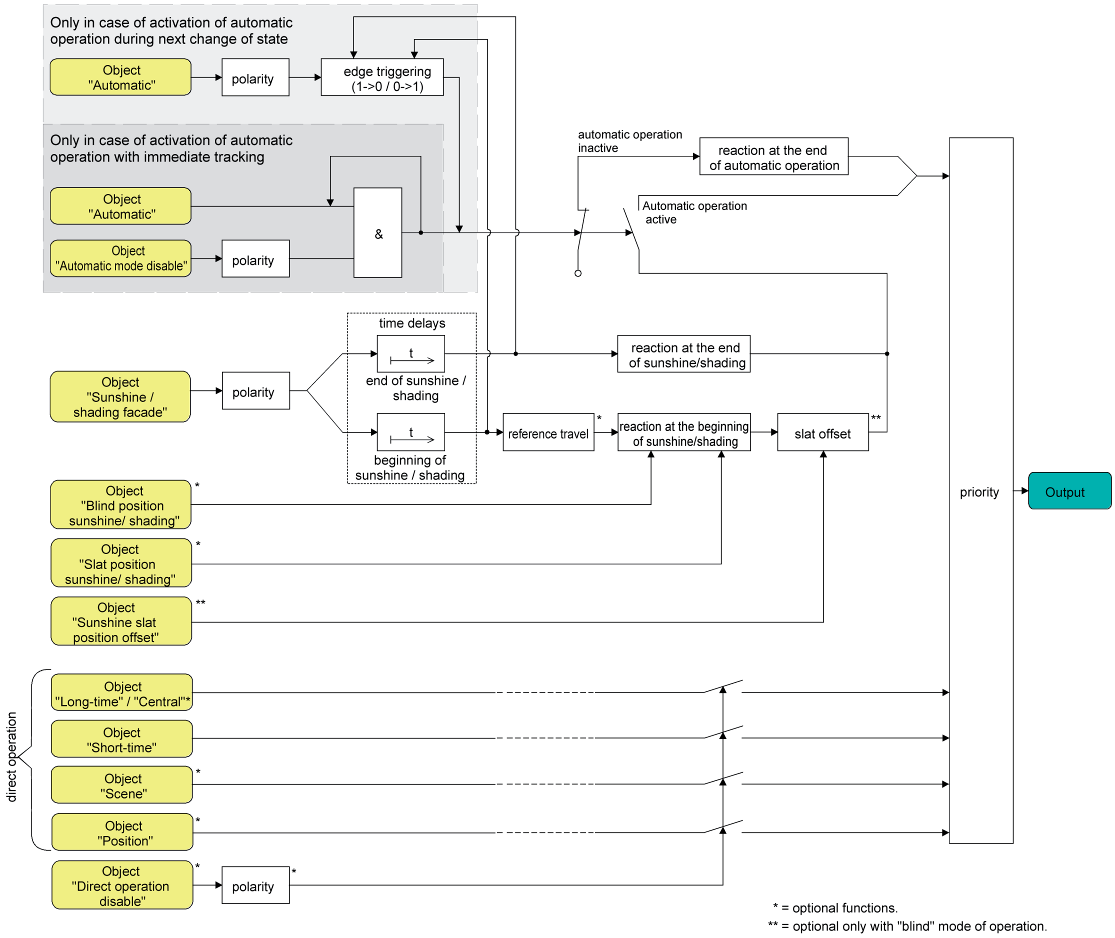

Figure 19: Function diagram illustrating the extended sun protection

[i] 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.

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 "Relay outputs... -> VBO... - Enabled functions" 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 necessary parameters and communication objects are visible.

- Set the parameter "Type of sun protection" to "extended sun protection".

  Extended sun protection is now configured. The necessary parameters and communication objects are visible.

[i] When the sun protection type parameters are changed, the assignments of group addresses to sun protection objects or other parameter settings are lost. For this reason, the sun protection type parameter should be selected directly at the beginning of the sun protection configuration and then not be changed anymore later on.

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 relations between the "Sunshine / shading facade" object 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 "Relay outputs... -> VBO... - Enabled functions" 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 with respect to direct operation" on parameter page "Relay outputs... -> VBO... - Sun protection" to "Same priority".

  The sun protection mode can be overridden at any time by direct operation. In the same way, the sun protection overrides the direct operation, when a new "sunshine" telegram is received via the "Sunshine / shading facade" object and when a configured time delay, if any, has elapsed. If the sun protection function is overridden by a direct operation, the preset behaviour "Reaction at the end of sunshine / shading" 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 by a direct operation, the preset behaviour "Reaction at the end of sunshine / shading" 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 "Sunshine / shading facade" object. 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 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 sunshine protection function will be 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 sunshine 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.

- Parameter setting "same priority" or "lower priority": A variable preset of curtain and slat positions or of a slat offset via the bus at the beginning of sunshine / shading 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 enlarged sun protection, the priority relations between the "Sunshine / shading facade" object and the objects of direct operation (short-time, long-time, central or position telegram, scene recall) must be configured. The selected priority thus 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
"Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- Set the parameter "Priority of automatic operation with respect to direct operation" on parameter page "Relay outputs... -> VBO... - 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. In the same way, the sunshine signal overrides the direct operation, when a new "sunshine" or "no sunshine" telegram is received via the "Sunshine / shading facade" object and when this telegram results in a change of state. Moreover, a configured delay time, if any, must have elapsed. When the sunshine signal is overridden by a direct operation, the preset behaviour
  "Reaction at the end of sunshine / shading" will not be executed.
- Set the parameter "Priority of automatic 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 automatic operation with respect to direct operation" to "Lower priority".

  A direct operation can at any time override the sunshine signal. If the sunshine signal is overridden, the preset behaviour "Reaction at the end of sunshine / shading" 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 via the "Sunshine / shading facade" object and when this telegram results 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 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.

- 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 "Automatic" object) always re-enables the sunshine signal as well and evaluates it when the automatic mode is active. Attention must be paid to this behaviour especially in those cases where the "Automatic" object is cyclically overwritten by 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 and slat positions or of a slat offset via the bus at the beginning of sunshine / shading 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 / shading facade" 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 / shading facade" object

The telegram polarity of the "Sunshine / shading facade" object can be preset 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
"Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

- ■ Set the parameter "Polarity of 'Sunshine / shading facade' object" on the parameter page "Relay outputs... -> VBO... - Sun protection" to the required telegram polarity.

  The sunshine signal is evaluated in accordance with the preset priority.

- [i] In the simple sun protection mode, an update (from activated to activated) of the "Sunshine / shading facade" object causes the sun protection to be reactivated, if it had been influenced and possibly been re-enabled beforehand by a direct operation in acc. with the preset priority.
- [i] In the extended sun protection mode, an update of the "Sunshine / shading facade" object 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 / shading facade" object until the corresponding output shows the reaction at the beginning or at the end of sunshine.

The sun protection function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- ■ Set the parameter "Activation of automatic operation via" on parameter page
  "Relay outputs... -> VBO... - Sun protection" to
  "'Automatic' object and next change of state".

Automatic operation is activated as soon as the "Automatic" object is set to 'active' in consideration of polarity. A reaction at the output occurs, however, only after a new change of state has been signalled via the "Sunshine / shading facade" object. In this case, the new state (beginning of sunshine/shading or end of sunshine/shading) determines the behaviour of the output.

- Set the parameter "Activation of automatic mode by..." to "Object 'Automatic' & immediate tracking".

  Automatic operation is activated as soon as object "Automatic" receives a "1" telegram. The behaviour of the output (beginning of sunshine/shading or end of sunshine/shading) is immediately determined by the state of the object "Sunshine / shading facade".

i Depending on the setting, various object numbers are created for the "Automatic" object in the ETS. If the parameters are changed, the group address assignments for the automatic object are lost.

Presetting the polarity of the "Automatic" object (for extended sun protection only)

If the automatic mode is to be activated via the object and only at the next change of state of the sunshine signal (see "Presetting the activation of the automatic mode"), the telegram polarity of the automatic object can be preset in addition.

The sun protection function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions" 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.

- Set the parameter "Polarity of 'Automatic' object" on the parameter page
  "Relay outputs... -> VBO... - Sun protection" to the required telegram polarity.

  The telegram to the "Automatic" object will be evaluated depending on the selected priority.

i After an ETS programming operation or after switch-on of the supply voltage, the object "Automatic" must at first have data written into it by the KNX also in case of inverted polarity before the automatic operation can be activated.

i The polarity of the "Automatic" object is not presettable, if the automatic mode is activated via the object with immediate tracking. In this case, the telegram polarity is fixed:
Automatic ON = "1", Automatic OFF = "0".

Presetting the disabling function for the automatic mode (for extended sun protection only)

Automatic mode can be deactivated at any time via a separate disabling object. After enabling of the disabling function in the ETS parameters, the "Automatic mode disable" object becomes visible.

The sun protection function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions" 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.

- Set the parameter "Disabling function for automatic mode ?" on parameter page "Relay outputs... -> VBO... - Sun protection" to "yes".

  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 "Automatic mode disable" object will be evaluated depending on the selected priority.

i The objects "Automatic" and "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" object is updated again by writing a "1" 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 "Automatic" and "Automatic mode disable" are always initialised with "0". 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 of the disabling function in the ETS parameters, the "Direct operation disable" object becomes visible.

The sun protection function must be enabled on the parameter page "Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- Set the parameter "Disabling function for direct mode ?" on parameter page "Relay outputs... -> VBO... - Sun protection" to "yes".

  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 "Direction operation disable" object will be evaluated depending on the selected priority.

i After an ETS programming operation or after switch-on of the supply voltage, the "Automatic mode disable" object is always initialised with "0". 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 preset on parameter page "Relay outputs... -> VBO... - Sun protection". Depending on the selected operating mode, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening the louver" / "lowering" ↔ "closing the louver).

The sun protection function must be enabled on the parameter page "Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- Set the parameter "Reaction at the end of automatic operation" 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 "Reaction at the end of automatic operation" to "raising" or "opening the louver".

At the end of automatic operation, the actuator raises the curtain or opens the venting louver.

- Set the parameter "Reaction at the end of automatic operation" to "lowering" or "closing the louver".

  At the end of automatic operation, the actuator lowers the curtain or closes the venting louver.

- Set the parameter "Reaction at the end of automatic operation" 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 "Reaction at the end of automatic operation" to "position tracking".

  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 preset in this parameter will only be executed, if no function with a higher priority (e.g. safety) is activated at the end of automatic operation.

ℹ Parameter setting "Position tracking": 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 "Relay outputs... -> VBO... - Sun protection" using the "Automatic operation feedback" parameter. This parameter also defines whether, on a status change, the object produces active signals automatically or can be read out passively. The telegram polarity is fixed: "0" = Automatic mode inactive, "1" = Automatic mode active.

The sun protection function must be enabled on the parameter page "Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- Set the parameter "Feedback, automatic operation" on parameter page "Relay outputs... -> VBO... - Sun protection" to "Feedback object is active signalling object".

  The feedback object is enabled. The status information is transmitted as soon there is a change in automatic operation.

- Set the parameter to "feedback object is passive status object".

  The feedback object is enabled. The status information will be transmitted in response only if the feedback object is read out from by the KNX.

The feedback must be set as actively transmitting.

- If a time delay after bus voltage return should be necessary, configure the parameter "Time delay for feedback after bus voltage return ?" on parameter page "Relay outputs... -> VBO... - Sun protection" to "yes".

The status information will be transmitted with a delay after bus voltage return. 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 / shading

The telegram received via the object "Sunshine / shading facade" 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 "Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

- Set the parameter "Time delay at start of sunshine / shading" on the parameter page "Relay outputs... -> VBO... - 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.
- Set the parameter "Time delay at the end of sunshine / shading" 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 / shading facade" 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 For extended sun protection mode: The time delay is started after an update of the "Sunshine / shading facade" 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 / shading facade" 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.

Presetting the reaction at the beginning of sunshine / shading

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 at the beginning of sunshine / shading is preset on parameter page "Relay outputs... -> VBO... - Beginning of sun protection". Depending on the selected operating mode, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening the louver" / "lowering" ↔ "closing the louver). The ETS equally adapts the parameter selection depending on the preset operating mode.

The sun protection function must be enabled on the parameter page "Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

- Set the parameter "Reaction at the beginning of sunshine / shading" 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 "Reaction at the beginning of sunshine / shading" to "raising" or "opening the louver".

  At the beginning of shading, the actuator raises the curtain or opens the venting louver.

- Set the parameter "Reaction at the beginning of sunshine / shading" to "lowering" or "closing the louver".

  At the beginning of shading, the actuator lowers the curtain or closes the venting louver.

- Set the parameter "Reaction at the beginning of sunshine / shading" 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 "Reaction at the beginning of sunshine / shading" to "internal scene recall". The number of the scene to be recalled must be specified in the parameter "Scene number (1…8)".

  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 "Reaction at the beginning of sunshine / shading" to "fixed position".

  At the beginning of shading, the actuator recalls a fixed position value for the output concerned.

i In the "Blinds" operating mode, the setting "fixed position" 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 operating mode.

- "Fixed position" only: Set the parameter "Fixed position of Venetian blind", "Fixed position of roller 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 roller shutter/awning (0…100%)" or "Position of venting louver (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 roller shutter/awning" or "Fixed position of venting louver" to "no change of current position".

  At the beginning of shading, the last set position of the Venetian blind height, the roller shutter, awning or venting louver will be maintained.

- "Fixed position" and operating mode = "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 "Reaction at the beginning of sunshine / shading" 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 height of the Venetian blind, of the roller shutter, awning or venting louver position is preset via the separate communication object "Sunsh./shading ... position" (in the "Venetian blind" operating mode for the slats also via the separate object "Sunsh./shading slat position").

i In the "Blind" mode of operation, the "variable 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 operating mode.

- 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.
- "Internal scene recall" setting: For 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.
- "Variable position" setting: After an ETS programming operation or after switch-on of the supply voltage, the objects "Sunsh./shading ... position" and "Sunsh./shading 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 position tracking). 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. 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 for the first time via the "Sunshine/shading facade" 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 and when automatic operation is active or is activated. 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 "Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

- Set the parameter "reference movement before every sun protection positioning operation ?" on parameter page "Relay outputs... -> VBO... - Sun protection" to "Yes".

  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.

- Set the parameter "reference movement before every sun protection positioning operation ?" to "no".

  A reference movement at the beginning of sun protection will only be executed, if the position data are unknown, for instance, 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 is not retriggerable.
- Variable position preset: No reference movement will be executed, if new position values are preset via the KNX while the sun protection is active.
- "Blind" mode of operation: A terminated reference travel of for the height of the blind synchronizes at the same time also the slat position.

Slat offset in the sun protection mode (only "Venetian blind" operating mode)

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 statical 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 additionally be adapted by the KNX via 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, the short time mode. 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 touch 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 sun / shading) 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.

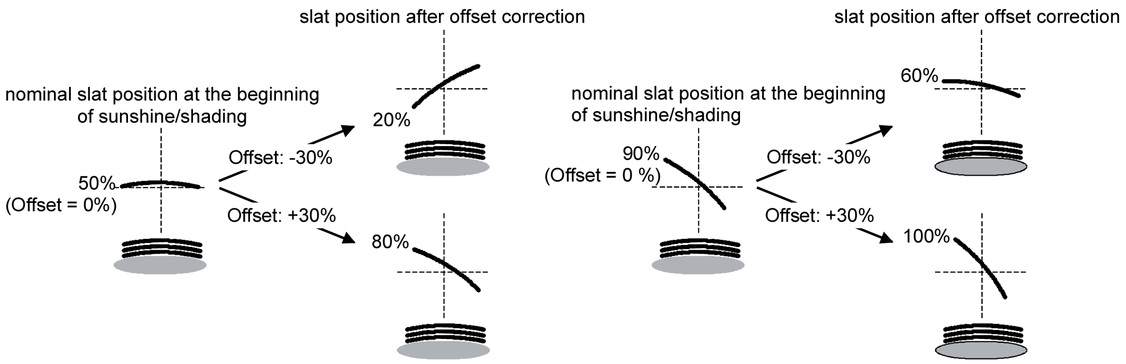

Figure 20: Functional principle of slat offset
(example showing slat type 1 / slat type 2 identical)

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 start of sun / shading = 90 %
Slat position offset at start of sun / shading = +30 %
-> The resulting slat position is 100% as the end position is reached.

In acc. 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 in 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 (-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 power supply fails. As an alternative, the offset preset via the KNX can be reset (0 %) in the event of a power supply 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" operating mode)

The sun protection function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

The function must be configured for the "Venetian blind" operating mode.

The reaction at the beginning of sunshine/shading must be configured for fixed or variable position preset.

- Set the parameter "Offset with fixed and variable slat position" on parameter page
  "Relay outputs... -> VBO... - Sun protection" to "No offset".

  Offset correction is deactivated. During shading (beginning of sunshine/shading), 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 with fixed and variable slat position" to "offset as configured".

  The static offset correction based on the parameter specification in the ETS is activated. During every shading operation (beginning of sunshine/shading), the nominal slat position is always corrected by the configured offset value.
- Set the parameter "Offset with fixed and variable slat position" to
  "offset as configured 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/shading), the nominal slat position is always corrected by the preset offset value.
- Set the parameter "Slat offset position (-100 … 100 %)" to the desired offset value.

  The configured value defines the static offset correction of the slat position. The configured value can be re-adjusted via the "Sunshine slat position offset" object, if the communication object has been enabled.
- Set the "Store offset slat position via object in case of bus voltage failure ?" to "no".

  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.
- Set the "Store offset slat position via object in case of bus voltage failure ?" to "yes".

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 bus 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/shading 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 Storage of the slat offset position in case of bus voltage failure: The offset value preset via the object is stored only if the bus voltage has been available 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!

i The slat offset has no influence on the behaviour of an output at the end of a shading phase (end of sunshine/shading).

Presetting the reaction at the end of sunshine / shading (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 at the end of sun shading is preset on parameter page
"Relay outputs... -> VBO... - End of sun protection". Depending on the selected operating mode, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening the louver" / "lowering" ↔ "closing the louver).

The sun protection function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

The function must have been configured for simple sun protection.

■ Set the parameter "Reaction at the end of sunshine / shading" 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 "Reaction at the end of sunshine / shading" to
  "raising" or "opening the louver".

  At the end of shading, the actuator raises the curtain or opens the venting louver.

■ Set the parameter "Reaction at the end of sunshine / shading" to
  "lowering" or "closing the louver".

  At the end of shading, the actuator lowers the curtain or closes the venting louver.

■ Set the parameter "Reaction at the end of sunshine / shading" 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 "Reaction at the end of sunshine / shading" to "position tracking".

  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 "Position tracking": 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 / shading (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 at the end of sunshine / shading is preset on parameter page
"Relay outputs... -> VBO... - End of sun protection". Depending on the selected operating mode, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening the louver" / "lowering" ↔ "closing the louver").

The sun protection function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions" for the sun protection parameters to be visible.

The function must have been configured for extended sun protection.

- Set the parameter "Reaction at the end of sunshine / shading" 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 "Reaction at the end of sunshine / shading" to
  "raising" or "opening the louver".

  At the end of shading, the actuator raises the curtain or opens the venting louver.

- Set the parameter "Reaction at the end of sunshine / shading" to
  "lowering" or "closing the louver".

  At the end of shading, the actuator lowers the curtain or closes the venting louver.

- Set the parameter "Reaction at the end of sunshine / shading" 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 "Reaction at the end of sunshine / shading" to "internal scene recall". The number of the scene to be recalled must be specified in the parameter
  "Scene number (1…8)".

  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 "Reaction at the end of sunshine / shading" to "fixed position".

  At the end of shading, the actuator recalls a fixed position value for the affected output.

ℹ In the "Blind" mode of operation, the setting "fixed position" 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 roller 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 roller 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 roller 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 roller shutter, awning or venting louver will be maintained.
- "Fixed position" and operating mode = "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: For 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.

Sun protection application examples

This chapter describes different application examples of the sun protection function of the actuator in combination with the modern Jung KNX weather stations.
The applications described can be used in the simple and in the extended sun protection mode. For the extended sun protection it is important that the automatic function must be activated, if the sunshine signal of the weather station is to evaluated and an reaction produced at the output. Also, the disabling functions can optionally be used for automatic or direct operation. The following section contains sketches for each application of which communication objects of the weather station should be connected with the actuator.

Information on the appropriate configuration of the KNX weather stations can be found in the appropriate product documentation.

- I. Sun protection with brightness limit value monitoring and fixed sun protection positions:

  The limit value monitoring function of the weather station is used. The weather station transmits a telegram with the value "1" via the "Limit value 1 [Sun...]" object to the KNX when a set brightness limit value is exceeded. This activates the shading function in the actuator and the corresponding fixed sun protection position set for the blind. In addition, the permanently configured slat position is recalled in the "Venetian blind" operating mode of the actuator.
  When the brightness drops below the limit value for the measured brightness (with hysteresis, if programmed), the weather station transmits the value "0" to the KNX. This deactivates the shading function in the actuator and the corresponding reaction at the end of sunshine / shading will be executed. The communication objects should be interconnected according to specifications (figure 21).

  Required actuator project design (unlisted configuration is optional):
  - Simple or extended sun protection,
  - Polarity of the "Sunshine / shading facade" object = "1" sunshine,
  - Reaction at the beginning of sunshine / shading = fixed positions,
  - Configure fixed positions.

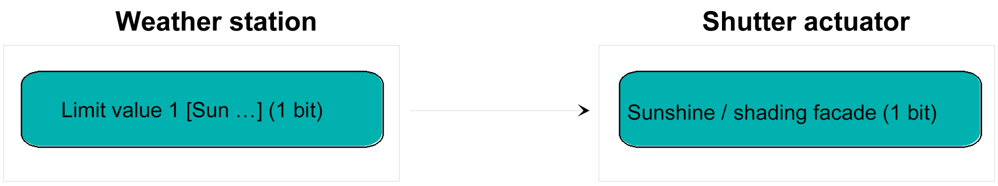

Figure 21: Project design of the communication objects for application example I.

- II. Sun protection with shading control and fixed sun protection positions:

  The shading control of the weather station is used. When the preset basic brightness for shading operations is exceeded, the weather station transmits a 1-bit telegram of value "1" via the "Shading facade [shading control facades 1-4]" to the KNX. This activates the shading function in the actuator and the corresponding fixed sun protection position set for the blind. In addition, the fixed slat position is recalled in the "Venetian blind" operating mode of the actuator.
  When the brightness drops below the basic brightness for shading operations (with hysteresis, if programmed), the weather station transmits the value "0" to the KNX. This deactivates the shading function in the actuator and the corresponding reaction at the end of sunshine / shading will be executed. The communication objects should be interconnected according to specifications (figure 22).

  Required actuator project design (unlisted configuration is optional):
  - Simple or extended sun protection,
  - Polarity of the "Sunshine / shading facade" object = "1" sunshine,
  - Reaction at the beginning of sunshine / shading = fixed positions,
  - Configure fixed positions.

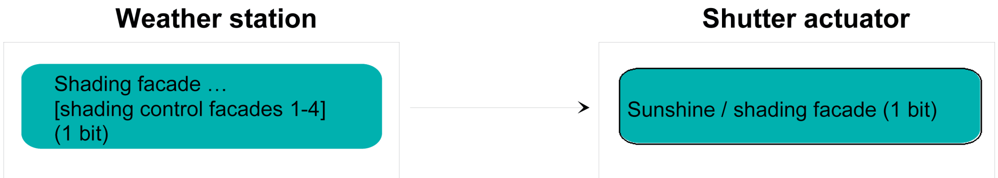

Figure 22: Project design of the communication objects for application example II.

- III. Sun protection with shading control and fixed blind height and variable slat position tracking:

  The shading control of the weather station is used. The venetian blinds connected to the actuator are slatted venetian blinds. When the basic brightness for shading operations is exceeded, the weather station transmits a 1-bit telegram of value "1" via the "Shading facade [shading control facade 1-4]" to the KNX. This activates the shading function in the actuator and the corresponding fixed sun protection position set for the Venetian blind height.
  The individual facade control of the weather station additionally transmits the slat position to be preset for sun-dependent slat tracking via the 1-byte object "Slat position (%) facade [individual control facade ...]" to the KNX. This sets the slat position required in the actuator for sun shading.
  When the brightness drops below the basic brightness for shading operations (with hysteresis, if programmed), the weather station transmits the value "0" via the "Shading facade [shading control facade 1-4]" object to the KNX. This deactivates the shading function in the actuator and the corresponding reaction at the end of sunshine / shading will be executed.

  Ideally, the telegram "Slat position (%) facade [individual facade control …]" = "0 %" is suppressed in the weather station by means of a parameter. The extra slat positioning movement might otherwise adversely affect the behaviour of the output at the end of shading (possibly brief bucking).

  The global disabling function of the weather station should not be used for disabling the individual facade control. Disabling can be achieved, for instance, with the disabling function of the automatic operation in the actuator and individually for each output.
  The communication objects should be interconnected according to specifications (figure 23).

  Required actuator project design (unlisted configuration is optional):
  - Simple or extended sun protection,
  - Polarity of the "Sunshine / shading facade" object = "1" sunshine,
  - Reaction at beginning of sun / shading = Venetian blind position fixed / slat position variable,
  - Configure fixed position of Venetian blind.

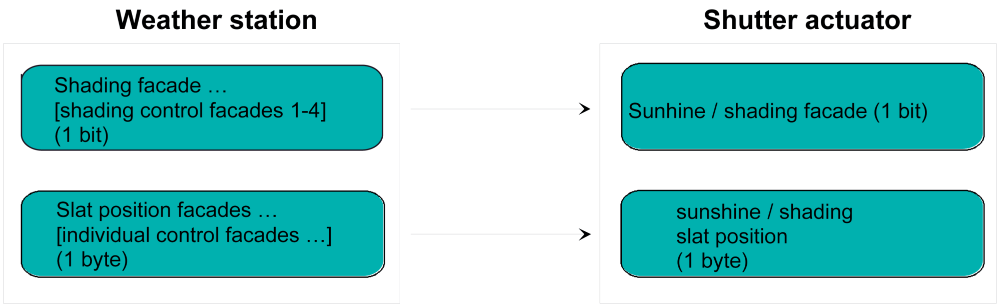

Figure 23: Project design of the communication objects for application example III.

- IV. Sun protection with shading control and variable blind height and variable slat position tracking:

  The shading control of the weather station is used. The venetian blinds connected to the actuator are slatted venetian blinds. When the basic brightness for shading operations is exceeded, the weather station transmits a 1-bit telegram of value "1" via the "Shading facade [shading control facade 1-4]" to the KNX. The actuator activates the shading function.
  The individual facade control of the weather station transmits additionally the slat position to be preset for sun-dependent slat tracking via the 1-byte object "Slat position (%) facade [individual control facade ...]" and the Venetian blind height to be adjusted via the 1-byte object "Shading facade curtain height threshold/position [individual control facade ...]" to the KNX. This sets the slat position required in the actuator for sun shading as well as the Venetian blind height required for shading.
  When the brightness drops below the basic brightness for shading operations (with hysteresis, if programmed), the weather station transmits the value "0" via the "Shading facade [shading control facade 1-4]" object to the KNX. This deactivates the shading function in the actuator and the corresponding reaction at the end of sunshine / shading will be executed.

  Ideally, the telegrams "Slat position (%) facade [individual facade control …]" = "0 %" and "Shading facade blind height threshold/position [individual control facade ...]" = 0 % are suppressed in the weather station at the end of shading by means of a parameter. The extra Venetian blind and slat positioning movement might otherwise adversely affect the behaviour of the output at the end of shading (possibly brief bucking).

  The global disabling function of the weather station should not be used for disabling the individual facade control. Disabling can be achieved, for instance, with the disabling function of the automatic operation in the actuator and individually for each output.
  The communication objects should be interconnected according to specifications (figure 24).

  Required actuator project design (unlisted configuration is optional):
  - Simple or extended sun protection,
  - Polarity of the "Sunshine / shading facade" object = "1" sunshine,
  - Reaction at beginning of sun / shading = Venetian blind position variable, slat position variable,

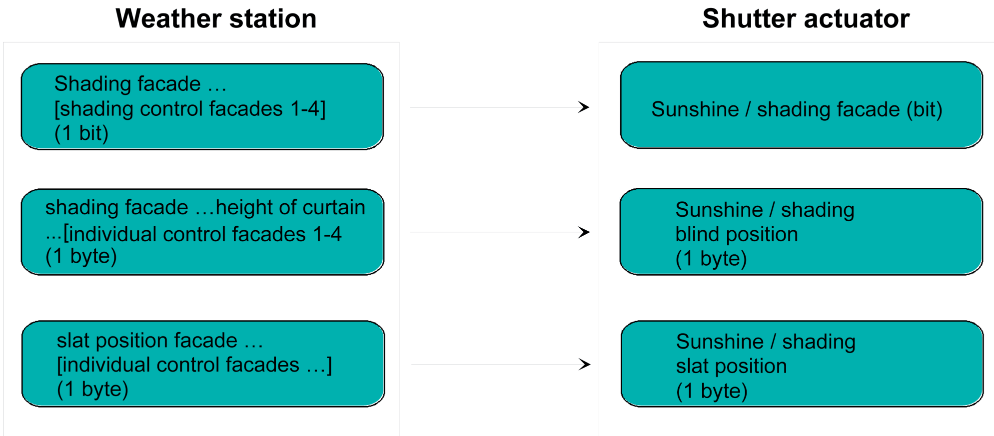

Figure 24: Project design of the communication objects for application example IV.

- V. Sun protection with shading control and variable blind height and fixed slat position:

The shading control of the weather station is used. The venetian blinds connected to the actuator are slatted venetian blinds. When the basic brightness for shading operations is exceeded, the weather station transmits a 1-bit telegram of value "1" via the "Shading facade [shading control facade 1-4]" to the KNX. This activates the shading function in the actuator and the corresponding fixed sun protection position set for the slat angle.
The individual facade control of the weather station transmits additionally the Venetian blind height to be adjusted via the
1-byte object "Shading facade blind height threshold/position [individual control facade ...]" to the KNX. This sets the slat position required in the actuator for shading.
When the brightness drops below the basic brightness for shading operations (with hysteresis, if programmed), the weather station transmits the value "0" via the "Shading facade [shading control facade 1-4]" object to the KNX. This deactivates the shading function in the actuator and the corresponding reaction at the end of sunshine / shading will be executed.

Ideally, the telegram "Slat position (%) facade [individual facade control …]" = 0 % is suppressed in the weather station at the end of shading by means of a parameter. The extra Venetian blind positioning movement might otherwise adversely affect the behaviour of the output at the end of shading (possibly brief bucking).

The global disabling function of the weather station should not be used for disabling the individual facade control. Disabling can be achieved, for instance, with the disabling function of the automatic operation in the actuator and individually for each output.
The communication objects should be interconnected according to specifications (figure 25).

Required actuator project design (unlisted configuration is optional):
- Simple or extended sun protection,
- Polarity of the "Sunshine / shading facade" object = "1" sunshine,
- Reaction at beginning of sun / shading = Venetian blind position variable, slat position fixed,
- Configure fixed slat position.

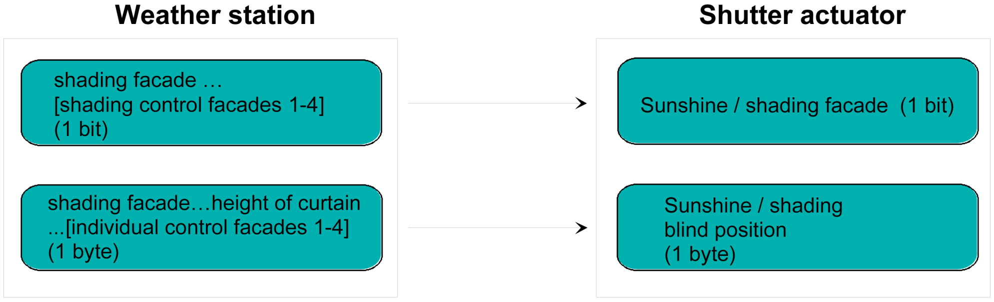

Figure 25: Project design of the communication objects for application example V.

4.2.4.2.8 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 monitor or a detector – 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 / shading facade", 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	Reaction at the beginning of sunshine/shading
People present	--- (irrelevant)	Sunshine inactive	Reaction at the end of sunshine/shading
No people present	Heating active	Sunshine active	Reaction at the beginning of sunshine/shading with heating
No people present	Heating active	Sunshine inactive	Reaction at the end of sunshine/shading with heating
No people present	Cooling active	Sunshine active	Sunshine signal active reaction at the beginning of sunshine/shading with cooling
No people present	Cooling active	Sunshine inactive	Reaction at the end of sunshine/shading 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 (figure 26) 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.

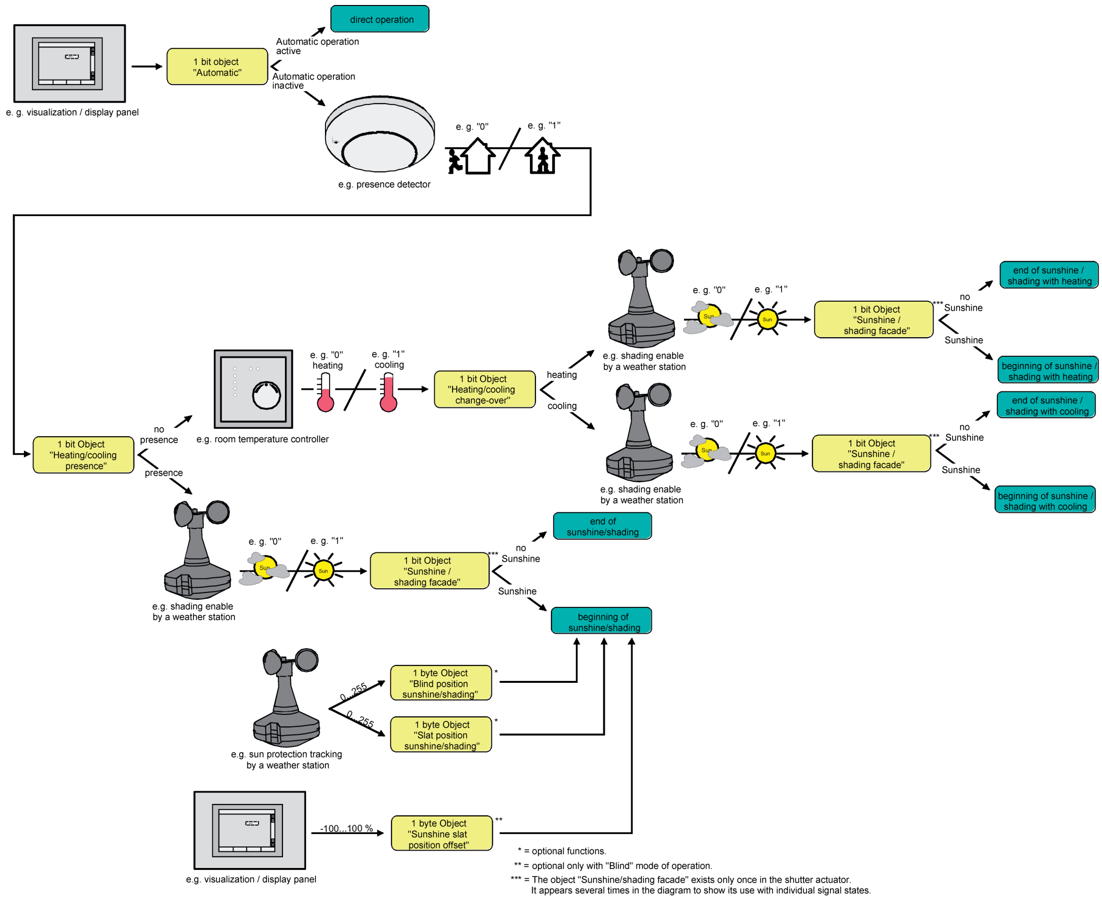

Figure 26: Schematic diagram of automatic heating/cooling
(for reasons of simplicity shown without disabling functions of the automatic or direct operation)

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 via the object "Automatic" 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 / shading facade" (cf. "Sun protection function – extended sun protection").
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 / shading facade" 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 schematic function diagram (figure 27) shows all possible functions of the extended 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.

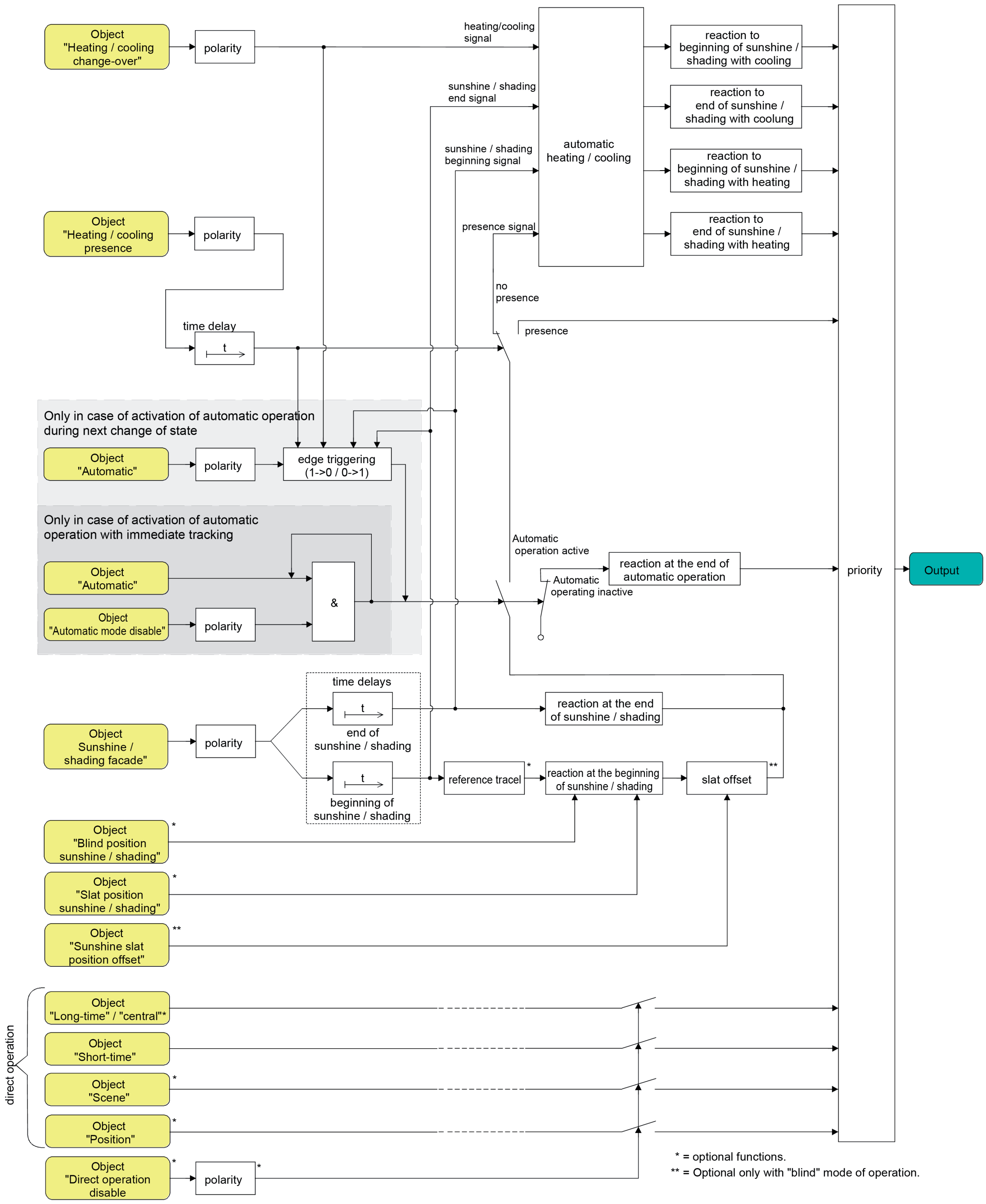

Figure 27: Schematic function diagram of automatic heating/cooling

Presetting the polarity of the "Heating/cooling switchover" object

The telegram polarity of the "Heating / cooling changeover" object can be preset separately for each output. This means that an adaptation to the signals from existing room temperature controllers or from outside thermostats is possible.

Automatic heating/cooling must be enabled on the parameter page "Relay outputs... -> VBO... - Automatic heating/cooling" so that the parameters are visible.

- Set the parameter "Polarity of 'Heating/cooling switchover' object" to the required telegram polarity.

  The heating/cooling signal is evaluated in accordance with the preset priority.

ⓘ An update of the "Heating / cooling switchover" object 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 switchover is initialised with an object value of "0".

Presetting the polarity of the "Heating/cooling presence" object

The telegram polarity of the "Heating / cooling presence" object can be preset separately for each output. This means that an adaptation to the signals from existing KNX presence detectors or motion detectors is possible.

Automatic heating/cooling must be enabled on the parameter page
"Relay outputs... -> VBO... - Automatic heating/cooling" so that the parameters are visible.

- Set the parameter "Polarity of 'Heating / cooling presence" object to the required telegram polarity.

  The presence signal is evaluated in accordance with the preset priority.

ⓘ An update of the "Heating / cooling presence" object 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 via the object "Heating / cooling presence" for transmission of the presence state (depending on polarity) can be evaluated with a time delay separately for each output.

Automatic heating/cooling must be enabled on the parameter page
"Relay outputs... -> VBO... - Automatic heating/cooling" so that the parameters are visible.

- Set the parameter "Time 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 "Time 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.

ⓘ 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.

ⓘ An update of the "Heating / cooling presence" object 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 automatic operation either.

ⓘ The time delay is started after an update of the "Heating / cooling presence" object 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.

Presetting 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 / shading facade"...

- "Reaction at the **beginning** of sunshine / shading with **heating**",
- "Reaction at the **end** of sunshine / shading with **heating**",
- "Reaction at the **beginning** of sunshine / shading with **cooling**",
- "Reaction at the **end** of sunshine / shading with **cooling**".

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 setting of the reaction of automatic heating/cooling is performed on parameter page "Relay outputs... -> VBO... - Automatic heating/cooling". Depending on the selected operating mode, the ETS adapts the designations of the parameter settings ("raising" ↔ "opening the louver" / "lowering" ↔ "closing the louver).

Automatic heating/cooling must be enabled on the parameter page
"Relay outputs... -> VBO... - Automatic heating/cooling" so that the parameters are visible.

■ Set the parameter "Reaction at the ... of sunshine / shading" 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 "Reaction at the ... of sunshine / shading" to "raising" or "opening the louver".

  During automatic heating/cooling, the actuator raises the curtain or opens the venting louver.

■ Set the parameter "Reaction at the ... of sunshine / shading" to "lowering" or "closing the louver".

  During automatic heating/cooling, the actuator lowers the curtain or closes the venting louver.

■ Set the parameter "Reaction at the ... of sunshine / shading" 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 "Reaction at the ... of sunshine / shading" to "internal scene recall". The number of the scene to be recalled must be specified in the parameter "Scene number (1…8)".

  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 "Reaction on sunshine / shading..." to "Fixed position".

  During automatic heating/cooling, the actuator recalls the fixed position value for the output concerned.

i In the "Blind" operating mode, the setting "fixed position" 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 roller 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 roller shutter/awning (0…100%)" or "Position of venting louver (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 roller shutter/awning" or "Fixed position of venting louver" to "no change of current position".

  With automatic heating/cooling, the last set position of the Venetian blind height, the roller shutter, awning or venting louver will be maintained.

- "Fixed position" and operating mode = "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: For 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.

4.2.4.2.9 Scene function

An actuator can hold up to 8 scenes for each output and store scene position values for the height of a blind, shutter or awning or the position of a venting louver. In the 'Venetian blinds' mode, the user can also preset slat positions. The scene values are recalled or stored via a separate scene extension object by means of extension telegrams. A scene recall can optionally take place after a delay.
The datapoint type of the extension object permits addressing a maximum of 64 scenes. This means that, in the configuration of a scene, it is possible to specify which scene number (1...64) contacts the internal scene (1...8).

The scene function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions" for each output, in order for the required communication objects and parameters
(on the parameter page "Relay outputs... -> VBO... - Scenes") to be made visible.

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 for the scene function

Each scene recall of an output can optionally also be delayed. With this feature, dynamical scene sequences can be configured if several outputs are combined with cyclical scene telegrams.

The scene function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions".

- On the parameter page "Relay outputs... -> VBO... - Scenes", set the parameter "Delay scene recall" to "Yes".

  The delay time is now activated and can be configured separately. The delay only influences the scene recall of the 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.

ⓘ 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.

ⓘ 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.

ⓘ In case of bus voltage failure, all time functions will be stopped. Therefore, all scene recalls that are still in the delay stage will be aborted. A scene recall received shortly before bus voltage failure is then lost, if the corresponding delay has not yet elapsed. A delayed scene recall will also be aborted, if a function with a higher priority (manual control, forced position, safety, sun protection, if the priority is the same as or higher than that of direct operation) is activated. The scene recall is nevertheless stored internally so that the scene positions last recalled can be tracked at the end of a higher-ranking function.

Presetting the ETS download behaviour for the scene function

During storage of a scene, the scene values are stored permanently in the device (cf. "Presetting the storage behaviour for scene functions"). 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.

The scene function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions".

- On the parameter page "Relay outputs... -> VBO... - Scenes", set the parameter "Overwrite values stored in the device during ETS download?" to "yes".

  During each ETS programming of the application or of the parameters, the scene values parameterized 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.
- Set the parameter "Overwrite values stored in the device during ETS download?" to "no".

  Scene 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.

ⓘ When the actuator is put into operation for the first time, this parameter should be set to "yes" so that the output is initialized with valid scene values.

Presetting scene numbers

The datapoint type of the scene extension object permits addressing of up to 64 scenes max. For this reason, the scene number (1...64) with which the scene is addressed, i.e. recalled or stored, must be determined for each internal scene (1...8) of the output.

The scene function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions".

- On the parameter page "Relay outputs... -> VBO... - Scenes", set the parameter "Scene y activatable by scene number" (y = number of the scene (1…8)) 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.

ⓘ If the same scene number is configured for several scenes, only the scene with the lowest internal scene number (1...8) will be addressed. The other internal scenes will be ignored in this case.

Presetting scene positions

Moreover, the position value (Venetian blind, roller shutter, awning, venting louver position) to be set for the output in case of a scene recall must be specified as well. In the "Venetian blind" mode, the height of the Venetian blind and the slat position can be preset.

The scene function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions".

- On the parameter page "Relay outputs... -> VBO... - Scenes", set the parameter "Position ... for scene y" (y = number of the scene (1…8) for each scene to the desired position value (0 %...100 %).

  In case of a scene recall, the output is set to the configured position.

ⓘ The parameterized position values are adopted in the actuator during programming with the ETS only if the parameter
"Overwrite values stored in the device during ETS download ?" is set to "yes".

ⓘ 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).

Presetting the storage behaviour for the scene function

The current position value of a Venetian blind, roller shutter, awning, venting louver 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).

The scene function must be enabled on the parameter page
"Relay outputs... -> VBO... - Enabled functions".

- On the parameter page "Relay outputs... -> VBO... - Scenes", set the parameter "Storage function for scene y" (y = Number of the scene (1…8) to "Yes" for each scene.

  The storage function is activated for the scene in question. On reception of a storage telegram via the "Scene extension" object, the current position value will be internally stored.

- Set the parameter "Storage function for scene y" (y = number of the scene (1…8) to "No".

  The storage function is deactivated for the scene in question. A storage telegram received via the "scene extension" object will be rejected.

i The following rules apply for the position data to be stored:
The current blind, slat and louver positions are stored. With Venetian blinds, the height to be stored is always referred to a slat position of 100 %. Positions temporarily approached will be stored also for those outputs that are involved in a travel movement at the time of data storage.
On account of the fact that position data is stored as integer percentage values (rounding to 0...100), a minor deviation from the set positions on a later scene recall cannot be avoided.
The data is only stored 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). The data will not be stored, if the position data is unknown.

4.2.4.2.10 Supplementary functions Fabric stretching and end position correction

Depending on the operating mode set the actuator has up to two supplementary functions per output. In the "Roller shutter/Awning" operating mode the supplementary function "End position correction bottom" or "Fabric-stretching" can be configured in the ETS as an alternative. In the "Blind" operating mode, only the supplementary function "End position correction bottom" can be configured. Only in the "Venting louver" operating mode can no supplementary function be selected.
Whether an additional function is available, and whichever that may be, is specified by the parameter of the same name on the parameter page "Relay outputs... -> VBO... - Enabled functions".

Fabric stretching

In the Roller shutter/awning operating mode, 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 .

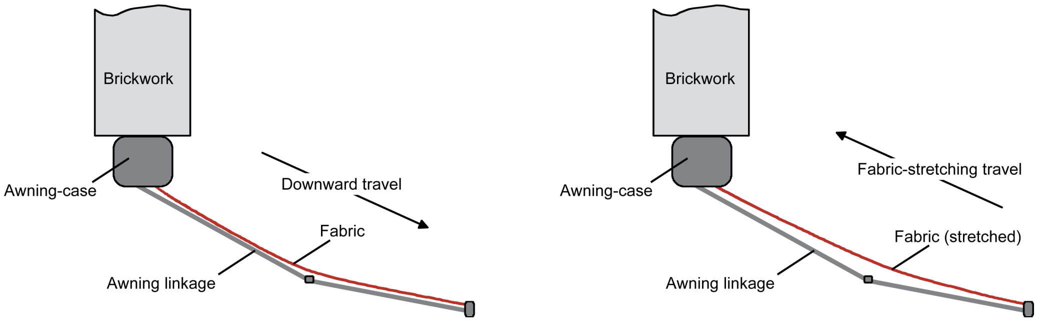

Figure 28: Fabric stretching in an awning

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 or louver modes of operation.

Activating the fabric stretching function

The Fabric stretching function can be activated independently for each Venetian blind or roller shutter/awning output on the parameter page "Relay outputs... -> VBO... - Enabled functions".

The operating mode selected must be the "Roller shutter/awning" mode.

- Set the parameter "Additional function" to "Fabric stretching".

  The parameter page "Relay outputs... -> VBO... - Fabric stretching" is enabled and the Fabric stretching function is activated.

ℹ The Fabric stretching function cannot be configured as a supplementary function in the Venetian blind or louver modes of operation.

ℹ Fabric stretching can only be configured as an alternative to the function "Bottom end position detection".

Set fabric stretching function

The Fabric stretching function can be activated independently for each roller shutter or awning output using the "Supplementary function" parameter on the parameter page "Relay outputs... -> VBO... - Enabled functions". If the function is enabled, the parameter page "Relay outputs... -> VBO... - Fabric stretching" appears in the ETS.

The Fabric stretching function must be enabled.

- Configure the "Time for fabric stretching" parameter on the parameter page "Relay outputs..." -> VBO... - Fabric stretching" to the required value.

  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 configured or measured movement time of the roller 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.

End position correction

In venetian blind and roller blind/awning modes, the end position correction can be activated for the bottom end position (100 %). The end position correction allows slat opening on a venetian blind or the opening of the roller shutter after the blind/shutter has moved downwards to the bottom end position.
If activated in the ETS parameters, 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.
The end position correction is configured differently in the ETS depending on the operating mode. In the case of 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 travelling time is set for a roller blind. This time defines the length of the downward movement of the roller blind when opening the roller shutter.

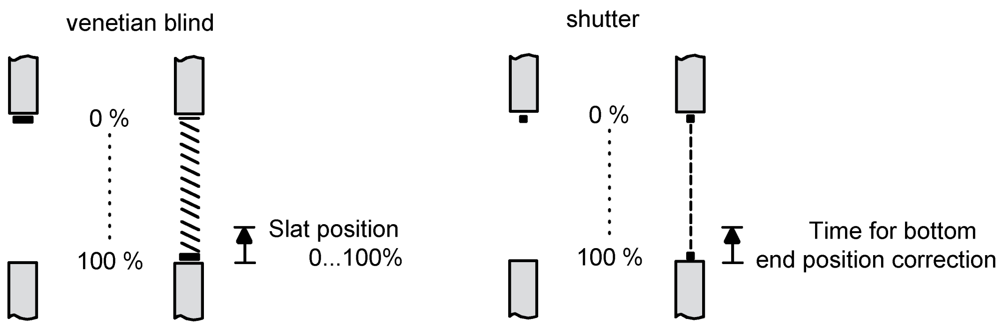

Figure 29: End position correction of a venetian blind or roller blind

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, forced position, safety / sun protection function or scene recall or manual

operation) do not cause end position correction!
End position correction is only carried out if the venetian blind or roller blind was moved to the bottom end position (100 %). In contrast to fabric stretching, for positions deviating from this (0 ... 99%), no end position correction is carried out.

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 cannot be configured as an additional function in the Venting louver operating mode.

Activating end position correction

The end position correction can be activated independently for each Venetian blind or roller shutter/awning output on the parameter page "Relay outputs... -> VBO... - Enabled functions".

The operating mode must be set to "Venetian blind" or "Roller shutter/awning" mode.

- Set the parameter "Additional function" to "Bottom end position correction".

  The parameter page "Relay outputs... -> VBO... - Bottom 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 operating mode.

i In the "Roller blind/Awning" operating mode, 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 roller shutter/awning output using the "Additional function" parameter on the parameter page "Relay outputs... -> VBO... - Enabled functions". If the function is enabled, the parameter page "Relay outputs... -> VBO... - End position correction bottom" is shown in the ETS. The end position correction is configured differently in the ETS depending on the operating mode.

The end position correction must be enabled.

- In the "Venetian blind" operating mode: Set the desired slat position value for the end position correction 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 travelling time.

- In the "Roller blind/awning" operating mode: Using the "Time for bottom end position correction" parameter, set the desired upwards travelling time for the end position correction, for the opening of the roller 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 configured or measured movement time of the roller shutter. Otherwise, there is the risk of malfunction.

4.2.4.3 Functional description of the switching outputs

4.2.4.3.1 Channel-independent functions

Delay after bus voltage return

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 telegrams of the switching function. For this purpose, a channel-independent delay can be specified (parameter "Delay after bus voltage return" on parameter page "General switching outputs"). Only after the configured time elapses are feedback telegrams for initialisation transmitted to the KNX.
Which of the telegrams is actually delayed and which is not can be set for each switching output and for 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 also be activated during the delay after bus voltage return.
- ℹ A setting of "0" for the delay after bus voltage return deactivates the delaying function altogether. In this case, any messages, if actively transmitted, will be transmitted to the KNX without any delay.

Central function

The actuator offers the possibility of linking selected individual or all switching outputs with up to three central 1-bit communication objects. The behaviour in case of activating a switching output via the central function is comparable to a central group address linked with all "Switching" input objects.
The outputs assigned to the central functions are activated in accordance with the received object value. The polarity of the up to three central telegrams can be configured independently.

The behaviour of the switching outputs on the reception of central telegrams is identical with the normal control via the "Switch" objects. (same priority – each last switching command is executed). Thus, all downstream functions, such as timing/supplementary functions, are also taken into account.

Enabling the central function

- Activate the up to three central functions on parameter page "General switching outputs" by setting the "Use central function x ?" (x = 1...3) with the "Yes" setting.
- Configure the polarity of the enabled central communication objects.

  If the functions are enabled, the associated "Central switching" communication objects become visible.

Assigning outputs to the central function

The switching outputs can be assigned to the up to three central functions, independently of one another.

Precondition:
The central functions must have been enabled on parameter page "General switching outputs". Otherwise, no assignment is possible.

- Set the Parameter "Assignment to central function x?" (x = 1...3) on parameter page "Relay output... -> SO... - General" to "yes".

The switching output is assigned to the central functions according to the selection. The connected loads can be switched on or off centrally.

i The switching state set by the central functions is not tracked in the feedback objects. The switching state set by a central function is not tracked in the "switching" objects.

i After a bus voltage return or after programming with the ETS, the central function is always inactive (object value "0").

Collective feedback

After central commands or after bus voltage return, 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.

The collective feedback summarises the switching status of all switching outputs in just one telegram. The 32 bit communication object "Collective feedback" contains bit-orientated feedback information of the individual outputs .

The datapoint type of the collective feedback corresponds to the KNX standard (DPT 27.001). The application would be possible in appropriate visualisation applications - for example in public buildings such as schools or hospitals - where the switching states of the actuators are displayed centrally and no status is displayed at the control sections. In such applications the collective feedback can replace the 1 bit individual feedbacks and thereby significantly reduce the KNX bus load.

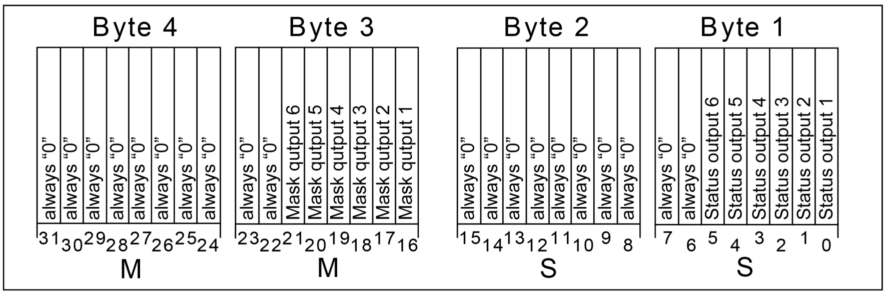

Figure 30: Object structure of the collective feedback

The collective feedback of switching operation displays up to 6 different switching states. 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 switching state of the relay can be determined from the combination of switching status and configured relay operating mode (NO or NC contact):
NO contact operating mode: Status = "0" -> Relay open, status = "1" -> Relay closed
NC contact operating mode: Status = "0" -> Relay closed, status = "1" -> Relay open

The "M" bits are "1" when the actuator possesses this output, i.e. the channel configuration plans for this switching output. In the same way, the "M" bits are "0" when the appropriate output is not available on the actuator or the channel is configured as a Venetian blind or valve output. 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".

Activate collective feedback and configure the feedback type

The collective feedback can be used as an active message object or as a passive status object. As an active message object, the collective feedback is transmitted to the KNX whenever a switching state changes or is updated (depending on the parameter "Update of the object value for collective feedback"). In the function as a passive status object, there is no automatic telegram transmission. In this case, the object value must be read out. The ETS automatically sets the object communication flags required for proper functioning.

- Set the parameter "Collective feedback switching status?" on the "General switching outputs" parameter page to "yes".

  Collective feedback is enabled. The communication object and others parameters become visible.
- Set the parameter "Type of collective feedback" to "Active signalling object".

  The collective feedback is transmitted once the status is updated. An automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS.
- Set the parameter to "Passive status object".

  The collective feedback will be transmitted in response only if the feedback object is read out from by the KNX. No automatic telegram transmission of the feedback takes place after bus voltage return 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.

Precondition:
Collective feedback must be enabled. In addition, the feedback must be configured to actively transmitting.

- Set the parameter "Update of the object value for collective feedback" to "On each update obj. '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). 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 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.

Activating collective feedback on return of bus voltage or after programming with the ETS

If used as active message object, the collective feedback is transmitted to the KNX after bus voltage return or after programming with the ETS. In these cases, the feedback telegram can be time-delayed with the delay being preset globally (see "Delay after bus voltage return").

Precondition:
Collective feedback must be enabled. In addition, the feedback must be configured to actively transmitting.

- Set the parameter "Time delay for feedback telegram after bus voltage return" of the collective feedback to "yes".

  The collective feedback telegram is transmitted with a delay after bus voltage return or after programming in ETS. No feedback telegram is transmitted during a running delay, even if a switching state changes during this delay.
- Set the parameter "Time delay for feedback telegram after bus voltage return" of the collective feedback to "no".

  The collective feedback telegram is transmitted immediately after bus voltage return or ETS programming.

Setting cyclic 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.

Precondition:
Collective feedback must be enabled. In addition, the feedback must be configured to actively transmitting.

- Set the parameter "Cyclic transmission of the collective feedback ?" to "yes".

  Cyclical transmission is activated. The collective feedback is transmitted to the KNX cyclically and if one of the switching states changes or is updated.
- Set the parameter "Cyclic transmission of the collective feedback ?" to "no".

  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 The cycle time for all cyclic feedback telegrams is defined centrally on the "Times" parameter page.

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

4.2.4.3.2 Operating mode

Setting the relay operating mode

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 "Operating mode" exists separately for each switching output on the parameter page "Relay output... -> SO... - General".

- Set the operating mode 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 operating mode 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.

i 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).

i 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, 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.

4.2.4.3.3 Reset and initialisation behaviour

The switching states of the switching outputs after a bus voltage failure, after bus voltage return or an ETS programming operation can be set separately.

Presetting the behaviour after ETS programming

The parameter "Behaviour after ETS programming operation" is available separately for each switching output on the parameter page "Relay output... -> SO... - General". This parameter can be used to configure the switching state of a switching output, irrespective of the behaviour after bus voltage return.

- 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 "Behaviour as on bus voltage return".

  After an ETS programming operation, the switching output will behave in the manner defined in the parameter "Behaviour after bus voltage return". 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 "Behaviour after bus voltage return" 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 time after bus voltage return" 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 parameter "Behaviour in case of bus voltage failure" is available separately for each switching output on the parameter page "Relay output.... -> 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 and remain inactive until they are reactivated after a bus voltage return.

- ⓘ In case of a bus voltage failure, the current states of the forced-positions are also saved so that they can be tracked on return of bus voltage if necessary (depending on the parameterization of the forced positions).
- ⓘ 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 bus voltage return, if this is configured in the ETS. The data is stored before the reaction configured for the case of bus voltage failure takes place and only if the power supply is still present, or if the supply fails completely after 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 (switching states = "OFF")!

Setting the behaviour after bus voltage return

The parameter "Behaviour in case of bus voltage return" is available separately for each switching output on the parameter page "Relay output.... -> SO... - General".

- Set the parameter to "no reaction".

  After bus voltage return, 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 bus voltage return, the switching state last set and internally stored <u>before</u> bus 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 bus voltage return.

- ⓘ Setting "State as before bus voltage failure": An ETS programming operation of the application or the parameter resets the stored switching state to "OFF".
- ⓘ A switching state set after bus voltage return is tracked in the feedback objects. Actively transmitting feedback objects first transmit, however, after bus voltage return, when the initialisation of the actuator has finished, and if necessary the "Delay time after bus voltage return" has elapsed.
- ⓘ In the case of forced position as supplementary function: The communication object of the forced position can be initialised separately after bus voltage return. This has an effect on the reaction of the switching output when the forced position is activated on bus voltage return. The configured "Behaviour after bus voltage return" is only executed when no forced position after a bus voltage return is activated.
- ⓘ In the case of enabling function as supplementary function: Active disabling functions are always inactive after bus voltage return.

4.2.4.3.4 Feedback switching status

Introduction

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 for switching status feedback" is configured to "On each update of obj. 'Switching'/'Central'".
- At the start or end of a disabling or forced position function, if a state changes as a result.
- Always on bus voltage return or at the end of any ETS programming process (if necessary, also delayed).

i In the case of enabling function as supplementary function: A "flashing" switching channel is always reported as "switched on".

Activate switching status feedback

The switching status feedback can be used as an active message object or as a passive status object. As an active message object, the switching status feedback information is also directly transmitted to the KNX whenever the feedback value is updated. As a passive status object, there is no telegram transmission after an update. In this case, the object value must be read out. The ETS automatically sets the object communication flags required for proper functioning. Optionally, the actuator can also feed back the status of an independent switching output in inverted form.
The parameter "Feedback switching status?" exists separately for each switching output on the parameter page "Relay output... -> SO... - General -> SO... - Feedbacks". Feedback takes place via the "Switching feedback" object.

Precondition:
The feedbacks must be enabled on the parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- Set the parameter to "no inversion, active signalling object".

  A switching status is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS. The switching status is written to the object in non-inverted form.

- Set the parameter to "no inversion, active signalling object".

  A switching status will be transmitted in response only if the feedback object is read out from by the KNX. No automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS. The switching status is written to the object in non-inverted form.

- Set the parameter to "Invert, active signalling object".

  A switching status is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS. The switching status is written to the object in inverted form.

- Set the parameter to "Invert, passive status object".

A switching status will be transmitted in response only if the feedback object is read out from by the KNX. No automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS. The switching status is written to the object in inverted form.

- Set the parameter to "no reaction".

  The switching status feedback of the affected switching output is deactivated.

i Depending on the configured relay operating mode and an inverted or non-inverted evaluation, 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 feedback") 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 for feedback of switching status" can be preset separately for each switching output on the parameter page "Relay output... -> SO... - Feedbacks".

Precondition:
The feedbacks must be enabled on the parameter page "Relay output... -> SO... - General -> SO... - Enabled functions". In addition, the switching status feedback must be configured to actively transmitting.

- Set the parameter to "after each update obj. '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.

- 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 on bus voltage return or after programming with the ETS

If used as active message object, the switching status feedback states are transmitted to the KNX after bus voltage return 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.

- Set the parameter "Time delay for feedback after bus voltage return?" on parameter page "Relay output... -> SO... - General -> SO... - Feedback" to "Yes".

  The switching status telegram is transmitted with a delay after bus voltage return or after an ETS programming operation. No feedback telegram is transmitted during a running delay, even if the switching state changes during this delay.
- Set the parameter "Time delay for feedback after bus voltage return?" to "no".

  The switching status telegram is transmitted immediately after bus voltage return or after an ETS programming operation.

Setting cyclical transmission of the switching status feedback telegram

The switching status feedback telegrams can, if active, also be transmitted cyclically, in addition to the transmission after updating.

- Set the parameter "Cyclical transmission of feedback telegram?" on parameter page "Relay output... -> SO... - General -> SO... - Feedback" to "Yes".

  Cyclical transmission is activated.
- Set the parameter "Cyclical transmission of feedback telegram?" to "no".

  Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.

i The cycle time is defined centrally on the parameter page "Times" for all the switching outputs.

i During an active delay after bus voltage return no feedback telegram will be transmitted even if a switching state changes.

4.2.4.3.5 Time delays

Functional description

Up to two time functions can be preset for each independent 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.

Activating switch-on delay

The switch-on delay can be activated separately in the ETS for each switching output.

Precondition:
The time functions must be enabled on the parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- Set the parameter "Selection of time delay" to "Switch-on delay" or to "Switch-on delay and switch-off 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 set to "yes". An OFF-telegram received during the ON-delay will end the delay and sets the switching status to "OFF".

Activating switch-off delay

The switch-off delay can be activated separately in the ETS for each switching output.

Precondition:
The time functions must be enabled on the parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- Set the parameter "Selection of time delay" to "Switch-off delay" or to "Switch-on delay and 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 set to "yes". An ON-telegram received during the OFF-delay will end the delay and sets the switching status to "ON".

ⓘ 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.

ⓘ The time delays do not influence the staircase function if this is enabled.

ⓘ A time delay still in progress will be fully aborted by a reset of the actuator (bus voltage failure or ETS programming).

4.2.4.3.6 Staircase function

Functional description

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 parameter page "Relay output... -> SO... - General -> SO... - Enabled functions", in order for the required communication objects and parameters to be 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 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_{Verz}) 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 ($T_{Vorwarn}$) 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.

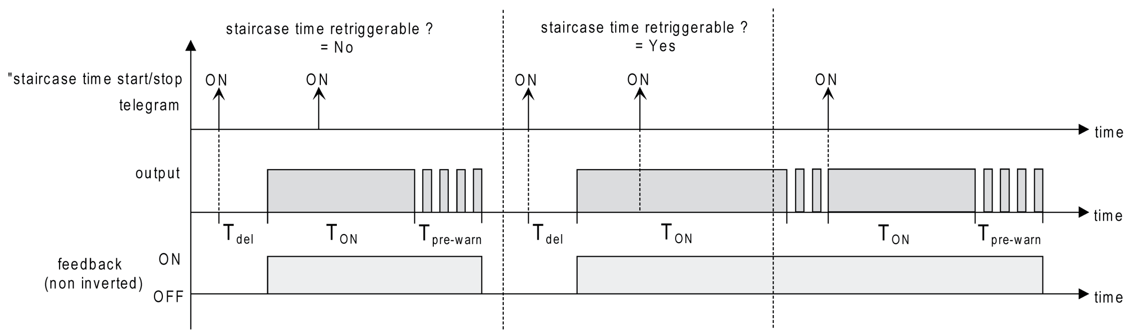

Figure 31: Switch-on behaviour of the staircase function

The parameter "Staircase time retriggerable" specifies whether the staircase time can be retriggered.

Precondition:
The staircase function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- Set the parameter "Staircase time retriggerable" to "Yes".

Every ON telegram received during the ON phase of the staircase time retriggers the staircase time completely.

- Set the parameter "Staircase time retriggerable" to "No".

  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 retriggers the staircase time independently of the parameter "Staircase time retriggerable".

[i] When the supplementary function "Time extension" is preset, the parameter "Staircase time retriggerable" cannot be adjusted. In this case, it is permanently set to "no".

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 on 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.

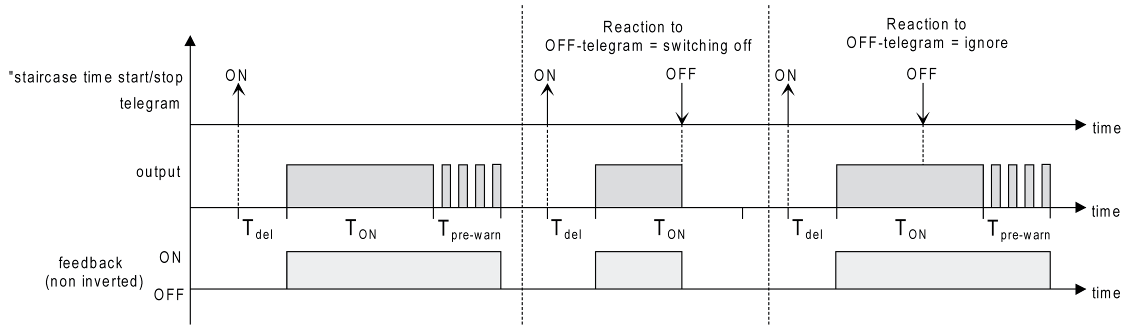

Figure 32: Switch-off behaviour of the staircase function

The parameter "reaction to OFF-telegram" defines whether the staircase time (T_{EIN}) of the staircase function can be aborted prematurely.

Precondition:
The staircase function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- Set parameter "Reaction to OFF-telegram" to "switch off".

  As soon as an OFF telegram is received via the object "Staircase function start/stop" during the ON phase of the staircase time, the output switches off immediately. 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 (cf. "Setting supplementary function of the staircase function – time preset via the bus"). 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".

Precondition:
The staircase function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- On the parameter page "Relay output... -> SO... - General -> SO... - Staircase function, set the parameter "Activate switch-on delay for the staircase function?" to "no".

  The switch-on delay is deactivated. After reception of an ON telegram on the object "Staircase function start/stop", the staircase time is activated immediately and the output switched on.

- Set the parameter "Activate the switch-on delay for the staircase function?" to "yes".

  The switch-on delay for the staircase function is enabled. The desired switch-on delay time can be specified. After reception 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 set to "yes". 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 changed. In this case, it is permanently set to "No".

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 ($T_{Vorwarn}$), the duration of the interruptions during the pre-warning($T_{Unterbr}$) and the number of pre-warning interruptions are configurable(figure 33). The pre-warning time is added to the staircase time (T_{EIN}). 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.

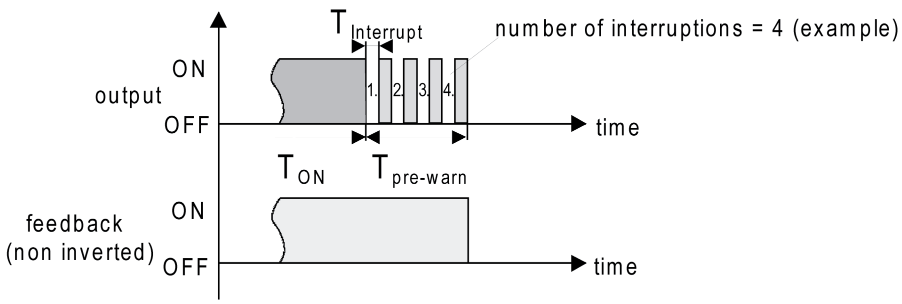

Figure 33: The pre-warning function of the staircase function (example)

Precondition:
The staircase function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- On the parameter page "Relay output... -> SO... - General -> SO... - Staircase function", set the parameter "Reaction at the end of the staircase time" to "Activate pre-warning time".

  The pre-warning function is enabled. The desired pre-warning time ($T_{Vorwarn}$) 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 ($T_{Unterbr}$) 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 restarts the staircase time (independently of the parameter "Staircase time retriggerable"). 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_{EIN}) (figure 34).

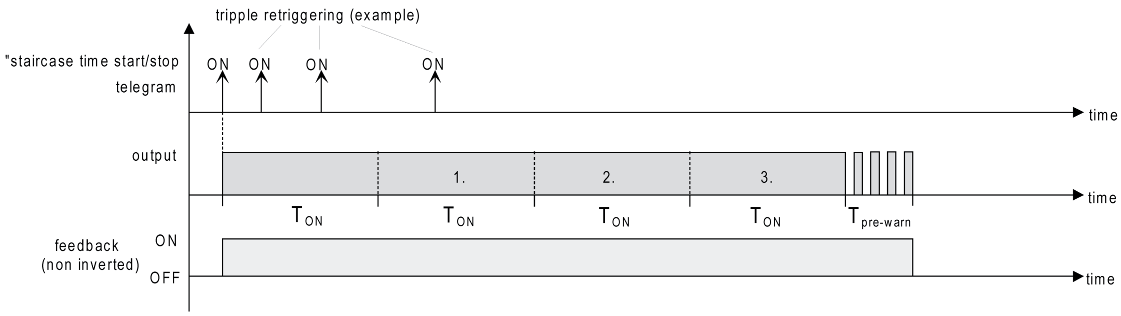

Figure 34: Time extension of the staircase function

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.

Precondition:
The staircase function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- On the parameter page "Relay output... -> SO... - General -> SO... - 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_{EIN}). 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 ?" is preset to "No" because the retriggering takes place 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 time object value) x (staircase time parameter)

Example:
Object value "staircase time factor" = 5; parameter "staircase value" = 10s.
-> set staircase time = 5 x 10s = 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.

Precondition:
The staircase function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- On the parameter page "Relay output... -> SO... - General -> SO... - Staircase function", set the "Supplementary function for staircase function" parameter to "Time preset via the bus" and set the parameter "Staircase function activatable via 'staircase time' object?" to "no".

  The staircase time can be adapted dynamically by the "staircase 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.

- Set "supplementary function for staircase function" to "time preset via the bus" and set the parameter "staircase function activatable via 'staircase time' object?" to "yes".

The staircase time can be adapted dynamically by the "staircase time factor" object. In addition, the staircase function is started with the new staircase time (the "staircase function start / stop" is not necessary) after receiving a new factor. 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 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 return").

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 bus voltage return

The staircase function can optionally be started automatically after bus voltage return.

Precondition:
The staircase function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- On the parameter page "Relay output... -> SO... - General -> SO... - General", set the parameter "Behaviour after bus voltage return" to "Activate staircase function".

  Immediately after bus voltage return, the staircase time of the staircase function is started.

i During automatic starting of the staircase function after bus voltage return, no switch-on delay is started if the staircase function has configured such a delay.

i The device only executes the configured "Behaviour on bus voltage return" 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 (TETS < 20 s), the "Behaviour after ETS programming" will be adopted also in case of bus voltage return.

i The configured behaviour will only be executed, if no forced position on bus voltage return is activated.

4.2.4.3.7 Scene function

Functional description

Up to 10 scenes can be programmed and scene values stored separately in the actuator 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 permits addressing of a maximum of 64 scenes. This means that, in the configuration of a scene, it is possible to specify which scene number (1...64) contacts the internal scene (1...10).

The scene function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions" for each switching output, in order for the required communication objects and parameters (on the parameter page "Relay output... -> SO... - General -> SO... - Scene function") to be made visible.

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. Likewise, the brightness 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 for the scene function

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.

Precondition
The scene function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- On the parameter page "Relay output... -> SO... - General -> SO... - Scene function", set the parameter "Delay scene recall?" to "yes".

  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 channel 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.

Presetting the ETS download behaviour for the scene function

During storage of a scene, the scene values are stored internally to non-volatile memory 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 scene values. As an alternative, the original values can be reloaded into the device during each programming run of the ETS.

Precondition
The scene function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- On the parameter page "Relay output... -> SO... - General -> SO... - Scene function", set the parameter "Overwrite values stored in the device during ETS download?" to "yes".

During each ETS programming operation of the application or of the parameters, the scene commands configured in the ETS for the switching output concerned will be programmed into the actuator. Scene commands stored in the device by means of a storage function will be overwritten, if any.

- Set the parameter "Overwrite values stored in the device during ETS download?" to "no".

  Scene commands stored in the device with a storage function will be maintained. If no scene commands 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 set to "Yes" so that the switching output is initialised with valid scene commands.

Setting scene numbers and scene switching states for scene function

The datapoint type of the scene extension object permits addressing of up to 64 scenes max. For this reason, the scene number (1...64) with which the scene is addressed, i.e. recalled or stored, must be determined for each internal scene (1...10) of the switching output.. Moreover, the scene command (ON, OFF) to be set at the switching output in case of a scene recall must be specified.

Precondition
The scene function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- On the parameter page "Relay output... -> SO... - General -> SO... - Scene function", set the parameter "Scene x activatable by scene number" (x = number of the scene (1…10)) 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.

i If the same scene number is configured for several scenes, only the scene with the lowest internal scene number (1...10) will be addressed. The other internal scenes will be ignored in this case.

- On the parameter page "Relay output... -> SO... - General -> SO... - Scene function", set the parameter "Switching state for scene x" (x = number of the scene (1…10)) 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 set to "yes".

Presetting the storage behaviour for the scene function

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 the individual functions have been enabled (e.g. also the disabling function, forced-control position function etc.).

Precondition
The scene function must be enabled on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- On the parameter page "Relay output... -> SO... - General -> SO... - Scene function", set the parameter "Storage function for scene x" (x = number of the scene (1…10)) for each scene to "Yes".

The storage function is activated for the scene in question. On reception of a storage telegram via the "Scene extension" object, the current switching state will be internally stored.

- Set the parameter "Storage function for scene x" (x = number of the scene (1…10)) to "No" for each scene.

  The storage function is deactivated for the scene in question. A storage telegram received via the "scene extension" object will be rejected.

Configure extended scene recall

The extended scene recall allows recalling of the 10 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.
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 (assigned scene number = "1...64") or inactive (assigned scene number = "0"). If an inactive scene is recalled via the extended scene recall, the appropriate switching output with not react.
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.

- Set the parameter "Use extended scene recall?" on parameter page "Relay output... -> SO... - General -> SO... - Scene function" to "Yes".

  The object "Extended scene recall" is available. Each ON telegram recalls the next scene. Each OFF telegram recalls the previous scene.

- Set the parameter "Use extended scene recall?" to "no".

  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 scene 10 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.

- Set the parameter "Use extended scene recall with overflow?" to "yes".

  After reaching scene 10, a further ON telegram of the overflow is executed and scene 1 recalled. In the same way, after reaching scene 1, a further OFF telegram of the overflow is executed and scene 10 recalled.

- Set the parameter "Use extended scene recall with overflow?" to "no".

  A scene overflow is not possible. After reaching scene 10, 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.

4.2.4.3.8 Supplementary function

Functional description

Supplementary functions can be enabled for each switching output. As a supplementary function, a disabling or alternatively a forced position function can be configured. In this respect, only one of these functions can be enabled for one switching output. Additionally, a logic operation function can be configured.
The supplementary functions are enabled and configured on the parameter page "Relay output... -> SO... - General -> SO... - Supplementary functions".

Setting disabling function as supplementary 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 "Relay output... -> SO... - General -> SO... Supplementary functions", set the parameter "Type of supplementary function" to "Disabling function".

  The disabling function is enabled. The communication object "Disable" and the parameters of the disabling function become visible.

- On the parameter page "Relay output... -> SO... - General -> SO... - Supplementary functions", set the parameter "Polarity disabling object" to the desired polarity.
- Set the parameter "Behaviour at the 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" is generally configured for all outputs on the parameter page "General switching outputs". During flashing, the logical switching state of the switching output is fed back as "Switched on".

For disabling function without acknowledgement object...

- Configure the parameter "Use acknowledgment?" to "No".

  No additional acknowledgement object is available. The disabling function is deactivated by the disabling object according to the set polarity.

- Set the parameter "setting the behaviour at the 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 <u>before</u> 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 is generally configured for all outputs on the parameter page "General switching outputs". During flashing, the logical switching state of the output is fed back as "Switched on". The flashing state remains active until another bus command is received and thereby predefines another switching state.

For disabling function with acknowledgement object...

- Configure the parameter "Use acknowledgment?" to "Yes".

  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 "Behaviour at the 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 is generally configured for all outputs on the parameter page "General switching outputs". During flashing, the logical switching state of the output is fed back as "Switched on". The flashing state remains active until another bus command is received and thereby predefines another switching state.

i After a bus 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 as supplementary 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 forced-position state (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 on bus voltage return.

Bit 1	Bit 0	Function
0	x	Forced position not active -> normal control
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 "Relay output... -> SO... - General -> SO... - Supplementary functions", set the parameter "Type of supplementary function" to "Forced position".

  The forced position function is enabled. The communication object "forced position" and the parameter of the forced position function become visible.
- Set the parameter "Behaviour at the end of the forced position '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 "behaviour after bus voltage return" to the required behaviour.

  After bus voltage return, 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 bus voltage return until a forced position is enabled via the KNX. The parameter "Behaviour in case of bus voltage return" on the parameter page "Relay output... -> 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 bus voltage return. 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 "Behaviour after bus voltage return" (parameter page "Relay output... -> SO... - General") will be executed on return of bus voltage.

i After programming the application or parameters with the ETS, the forced position function is always deactivated (object value "0").

Setting logic operation function as supplementary 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.

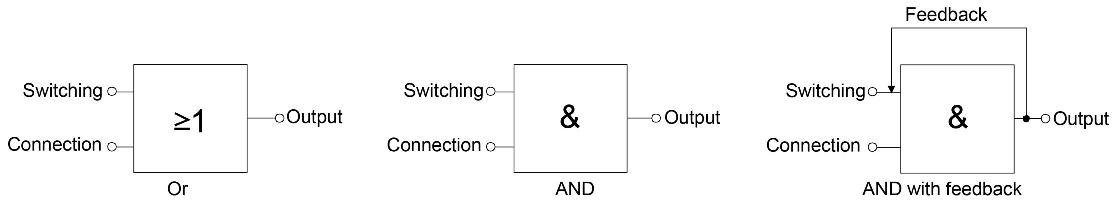

Figure 35: Logic operation types of the logic operation function

ⓘ "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 bus voltage return 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 "Relay output... -> SO... - General -> SO... - Supplementary functions", set the parameter "Logic operation function?" to "yes".

  The logic operation function is enabled. The communication object "logic operation" and the parameters of the logic operation function become visible.

- Set the parameter "Type of logic operation function" to the desired logic operation type.
- Set the parameters "object value of the logic operation object after bus voltage return" and "object value of the logic operation object after ETS download" to the required initial states.

  The "logic operation" object is initialised immediately with the set switching states after bus voltage return or ETS programming of the application program or parameters.

ⓘ 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.

ⓘ 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 bus or mains voltage return, 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.

4.2.4.3.9 Cyclical monitoring

Functional description

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 ("0" or "1") 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.

The monitoring time is specified globally for all switching outputs on the parameter page "General switching outputs" through the parameter "Time for cyclical monitoring". However, each switching output possesses its own time controllers so that the configured monitoring time is evaluated independently of the channel.
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 bus voltage return or after an ETS programming operation.

Activate cyclical monitoring

The cyclical monitoring function can be activated separately for each switching output with the parameter "Assignment to cyclical monitoring?" on parameter page "Relay output... -> SO... - General -> SO... - Enabled functions". 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.
- 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.

i If cyclical monitoring is activated, the following functions cannot be configured: Time delays, staircase function, logic operation and scene.

i The disabling and forced position function has a higher priority than the cyclical monitoring.

4.2.4.3.10 Operating hours counter

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 adds up the determined switch-on time accurately to the minute for a closed relay contact in full hours respectively (figure 36). The totalled operating hours are added in a 2-byte meter and stored permanently in the device. The current meter reading can be transmitted cyclically to the KNX by the "Value operating hours counter" communication object or when there is a change in an interval value.

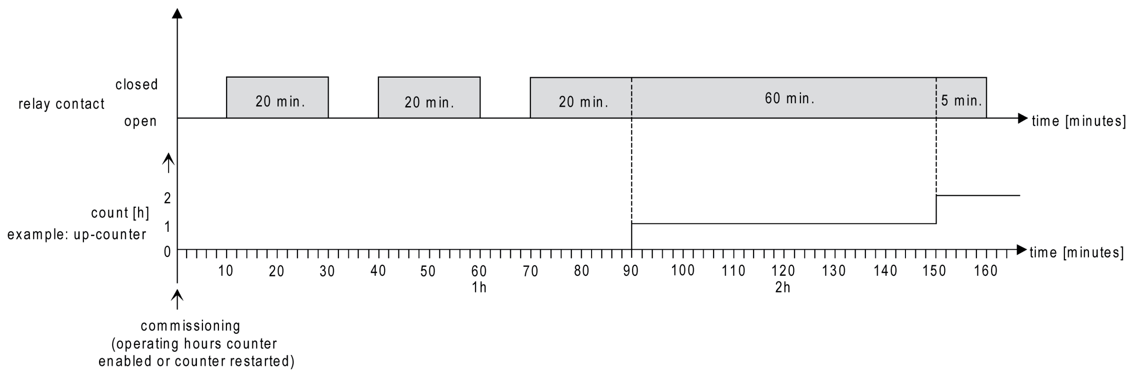

Figure 36: Function of the operating hours counter

In the delivery state, all the operating hour values of the actuator are "0". If the operating hours counter is not enabled in the configuration of an output, no operating hours will be counted for the 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 the operating hours previously counted for the output concerned will be deleted. When enabled again, the meter reading of the operating hours counter is always on "0 h".

The operating hours values (full hours) stored in the device will not be lost in case of a bus voltage failure or by ETS programming. Any summed up operating minutes (full hour not yet reached) will be rejected in this case, however.
After bus voltage return or after an ETS download, the actuator passively updates the "Value operating hours counter" communication object in 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 bus voltage return (see "Set transmission behaviour of the operating hours counter").

Activating the operating hours counter

- On the parameter page "Relay output... -> SO... - General -> SO... - Enabling functions" on parameter page "Operating hours counter" to "Enabled".

  The operating hours counter is activated.
- Set the "Operating hours counter" parameter to "Disabled".

  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 type of counter of the operating hours counter

The operating hours counter can optionally be configured as an up-counter or down-counter. Depending on this type of counter, a limit or start value can be set optionally, whereby, for example, the operating time of a lamp can be monitored 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 65535 hours can be counted, after that the meter stops and signals a counter operation via the "Operating hours count. elapsed" object.
A limiting value can be set optionally in the ETS or can be predefined via the communication object "Limiting value operating hours counter". In this case, the counter operation is signalled to the KNX via the "Operating hours count. elapsed" object if the limiting value is reached, but the meter continues counting - if it is not restarted - up to the maximum value 65535 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 h" and the actuator signals a counter operation for the output concerned after the programming operation or after bus voltage return via the "Operating hours count. elapsed" object. Only after a restart is the down-counter set to the maximum value 65535 the counting operation 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-counter reaches the value "0", the counter operation is signalled to the KNX via the "Operating hours count. elapsed" and the counting is stopped. Only a restart initiates a new counting operation.

The operating hours counter must be enabled on the parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- Set the parameter "Counter type" on the parameter page "Relay output... -> SO... - General -> SO... - Operating hours counter" to "Up counter". Set the parameter "Limiting value specification?" to "yes, as parameter" or "yes, as received via object" if it is necessary to monitor the limiting value. Otherwise, reset the parameter to "no". In the "Yes, as specified in parameter" setting, specify the required limit value (0…65535 h).

  The meter counts the operating hours forwards starting from "0 h". If the monitoring of the limiting value is activated, the actuator transmits a "1"-telegram via the object "Operating hours count. elapsed" for the output concerned once the predefined limiting value is reached. Otherwise, the counter operation is first transmitted when the maximum value 65535 is reached.
- Set the parameter "Counter type" to "Down-counter". Set the parameter "start value preset ?" to "yes, as parameter" or "yes, as received via object" if a start value preset is necessary. Otherwise, reset the parameter to "no". In the "yes, as specified in parameter" setting, specify the required start value (0…65535 h).

  The meter counts the operating hours down to "0 h" after a restart. With a start value preset, the start value is counted down, otherwise the counting operation starts at the maximum value 65535. The actuator transmits a "1"-telegram via the object "Operating hours count. elapsed" for the output concerned once the value "0" is reached.

- ⓘ The value of the communication object "Operating hours count. elapsed" is stored permanently. 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 "1", an additional telegram will be actively transmitted to the KNX as soon as the parameterized transmit delay has elapsed after bus voltage return. If the counter has not yet elapsed (object value "0"), no telegram is transmitted on bus voltage return or after an ETS programming operation.
- ⓘ With a limiting or start value preset via communication object: The values received via the object are first validly accepted and permanently saved internally after a restart of the operating hours counter. On switching on the bus 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 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 of 65535 is predefined provided that no limiting 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.
- ⓘ With a limiting or start value predefined via object: If the start or limiting value is predefined with "0", the actuator will ignore a counter restart to avoid an undesired reset (e.g. in site operation -> hours already counted by manual operation).
- ⓘ 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 "Restart operating hours counter". 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.
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, a "0" telegram is transmitted to the KNX via the object "Operating hours count. elapsed". 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 download.
- ⓘ If a start or limiting value is predefined with "0", there are different behaviours after a restart, depending on the principle of the value definition...
  Preset as parameter:
  The counter 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 hours already being counted by manual operation). A limiting or start value greater than "0" must be predefined 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 "value operating hours counter". After bus voltage return or after an ETS download, the actuator passively updates the "Value operating hours counter" communication object in each 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 operating hours counter must be enabled on the parameter page "Relay output... -> SO... - General -> SO... - Enabled functions".

- Set the parameter "Automatic transmission of counter value" on parameter page "Relay output... -> SO... - General -> SO... - Operating hours counter" to "After change by interval value". Set the "Counting value interval (1…65535 h)" to the desired value.

  The meter reading is transmitted to the KNX as soon as it changes by the predefined counting value interval. After bus voltage return or after ETS programming operation, the object value is transmitted automatically after "Delay after bus voltage return" has elapsed if the current counter status or a multiple of this corresponds to the counting value interval. A counter status "0" is always transmitted in this case.

- Set the parameter "Automatic transmission of counting value" to "Cyclical".

  The counter value is transmitted cyclically. The cycle time is defined independently of the channel on the parameter page "General switching outputs". After bus voltage return or an ETS programming operation, the counter status is only transmitted to the KNX after the configured cycle time has elapsed.

4.2.4.4 Functional description of the valve outputs

4.2.4.4.1 Channel-independent functions

Global configuration

To simplify the configuration, all the valve outputs can be assigned to the same parameters in the ETS and thus configured identically. The parameter "Setting of the output parameters" on the parameter page "General valve outputs" specifies whether every valve output of the device can be configured individually or whether all the outputs should be configured by the same parameters.

In the "All outputs equal" setting, the number of parameters in the ETS is reduced. The visible parameters are then used on all the valve outputs automatically. Only the communication objects can then be configured separately for the outputs. This setting should be selected, for example, if all the actuators behave identically and should only be activated by different group addresses (e.g. in office blocks or in hotel rooms).
In the parameter setting "Each output individually", each valve output possesses its own parameter pages in the ETS.

Delay after bus voltage return

To reduce telegram traffic on the KNX line after bus voltage switch-on (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 telegrams of the valve function. For this purpose, a channel-independent delay can be specified (parameter "Delay after bus voltage return" on parameter page "General valve outputs"). Only after the configured time elapses are feedback telegrams for initialisation transmitted to the KNX.
Which of the telegrams is actually delayed and which is not can be specified for each valve output and for status function separately.

ⓘ The delay has no effect on the behaviour of the outputs. Only the bus telegrams for status or feedback are delayed. The outputs can also be activated during the delay after bus voltage return.

ⓘ A setting of "0" for the delay after bus voltage return deactivates the delaying function altogether. In this case, any messages, if actively transmitted, will be transmitted to the KNX without any delay.

Priorities

The actuator 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...

- Manual operation
- Behaviour after ETS programming
- Behaviour in case of bus voltage return / bus voltage failure
- Service mode
- Valve rinsing
- Forced position
- Command value limit
- Emergency operation (through cyclical monitoring of the command value)
- Normal operation (activation using command value telegrams)

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 executed the behaviour after bus voltage return.

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 actuator 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.

ℹ 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 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. 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 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 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.

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 input" 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 "General valve outputs" parameter page, so that it can be activated and deactivated via the KNX during actuator operation.

- Set the parameter "Use service mode ?" to "yes".

  Service mode is enabled. The communication object "Service mode - Deactivate / activate input" becomes visible. Valve outputs can be assigned on the parameter pages "Relay output... -> VO... - General -> VO... - Assignments".

- Set the parameter "Use service mode ?" to "no".

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

Assign outputs to service mode

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

- Set the parameter "Assignment to service mode ?" to "yes".

  The appropriate valve output is assigned to service mode. It is locked according to the object value when service mode is active.
- Set the parameter "Assignment to service mode ?" to "no".

  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 take place on the "Relay output... -> VO... - General -> VO... - Assignments" parameter pages if service mode is enabled on the "General" parameter page.

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 of service mode" specifies the state to which the affected valve outputs go 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 all outputs 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 all outputs 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 states".

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

Configuring the 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 KNX after a device reset (ETS programming operation, bus voltage return).

Summer / winter switchover

The actuator possesses a summer / winter switchover. 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 switch-over". 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 operating mode 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 operating mode is activated immediately after the switch-over. If the value for emergency operation or the forced position is polled on a bus voltage return or after an ETS programming operation, the command values do not change when the operating mode is switched over.

Enable summer / winter switch-over

The summer / winter switch-over must first be enabled on the "General valve outputs" parameter page, so that it is possible to switch between summer and winter mode during actuator operation.

- Set the "Summer/winter mode switch-over ?" parameter to "yes". Configure the parameter "Polarity of 'Summer / winter switch-over' object" to the required telegram polarity.

  The summer / winter switch-over is enabled. The communication object "Summer / winter switch-over" becomes visible in the ETS. Summer and winter command values can be configured for emergency operation and a forced position for the valve outputs.
- Set the "Summer/winter mode switch-over ?" parameter to "no".

  The summer / winter switch-over is not available. For the valve outputs, only one command value can be configured separately for emergency operation or a forced position.

Define the behaviour after of the summer / winter switch-over during an ETS programming operation

The "Summer" or "Winter" state preset via the object "Summer / winter switch-over" is stored internally in the device and is restored after bus voltage return. The parameter "Operating mode after ETS programming operation" on the parameter page "General valve outputs" also defines which operating mode 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 operating mode)".

In this configuration, the actuator activates the most recently saved operating mode.

i The operating mode tracked after bus return or preset after an ETS programming operation is not tracked in the communication object by the actuator.

Collective feedback

After central commands or after bus voltage return, 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 can be used to keep the telegram load low during initialisation.
The collective feedback summarises the states of all valve outputs in bit-orientated form.

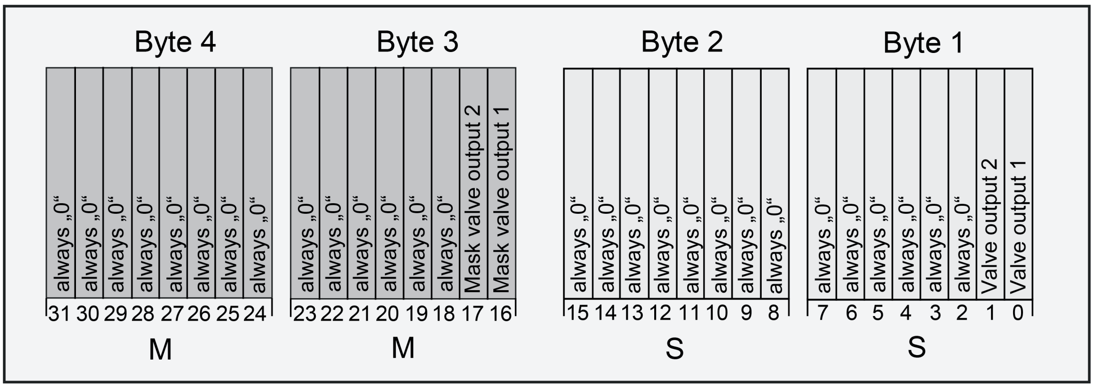

Figure 37: Object structure of the collective feedback

The 4-byte object of the collective feedback contains the status information of all 2 valve outputs. Each valve output has one bit representing the state ("S" bit) and another one defining the masking ("M" bit). The "S" bits correspond to the logical valve states and are either "1" (Valve opened) or "0" (Valve closed). Through the state "1", the "M" bits show that the output exists and, therefore, the corresponding "S" bit can be evaluated. The "0" state in an "M" bit shows that the actuator does not possess this output number. In this case, the corresponding "S" bits are constantly "0", as there is no valve state.

The status of the "S" bits in the collective feedback is dependent on the active command value of a valve output. Constant command values are converted into a 1-bit status:
0 % -> "0" / "1...100 %" -> "1"
The valve direction of action configured for each output in the ETS is also evaluated in the electrical activation of the actuators.

Command value	Parameter "Data format of the command value input"	Parameter "Valve in voltage-free state"	Limiting value of the command value for opening the valve	Valve output	Collective feedback "S" bits
„0“	switching (1 bit)	closed	···	OFF	0
		open	···	ON	0
„1“	switching (1 bit)	closed	···	ON	1
		open	···	OFF	1
„0 %“	constant (1 byte) with PWM	closed	···	OFF	0
		open	···	PWM active	0
	constant (1 byte) with limiting value	closed	···	OFF	0
		open	···	ON	0
„1...100 %“	constant (1 byte) with PWM	closed	···	PWM active	1
		open	···	OFF	1
	constant (1 byte) with limiting value	closed	Command value < Limiting value hysteresis	OFF	0
		open	Command value < Limiting value hysteresis	ON	0
		closed	Command value >= Limiting value	ON	1
		open	Command value >= Limiting value	OFF	1

Figure 38: Status in the collective feedback, dependent on the command value and configuration of the valve outputs

Use of the collective feedback would be possible in appropriate visualisation applications - for example, in public buildings such as schools or hospitals - where the valve states of the actuators are displayed centrally and there is no separate state display at the control sections. In such applications, the collective feedback can replace the status individual feedback and thereby reduce the bus load.

Activate collective feedback

Collective feedback is a global device function and can be enabled and configured on the "General valve outputs -> Valve / pump valve outputs" parameter page.

- Set the parameter "Collect. feedbk status of valve outputs (opened / closed) ?" to "yes".
  Collective feedback is enabled. The collective feedback object becomes visible in the ETS.
- Set the parameter to "no".

Collective feedback is deactivated. No collective feedback object is available.

Collective feedback type

Collective feedback can be provided in the function of an active signalling object or a passive status object. In the case of an active signal object, the feedback is automatically transmitted to the KNX whenever the status contained therein changes. In the function as a passive status object, there is no automatic telegram transmission. In this case, the object value must be read out. The ETS automatically sets the object communication flags required for proper functioning.

Collective feedback must be enabled.

- Set the parameter "Type of collective feedback" to "Active signalling object".

  The actuator transmits the collective feedback automatically when the object value is updated. After a device reset (ETS programming operation, bus voltage return), current collective feedback is always transmitted.

- Set the parameter to "Passive status object".

  Collective feedback will only be transmitted in response if the object is read out from the KNX. No automatic telegram transmission of the collective feedback takes place after bus voltage return or after an ETS programming operation.

Activating collective feedback on return of bus voltage or after programming with the ETS

If used as active message object, the collective feedback is transmitted to the KNX after bus voltage return or after programming with the ETS. 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.

Collective feedback must be enabled and the feedback type set to "Active message object".

- Set the parameter "Time delay for feedback after bus voltage return ?" to "yes".

  The collective feedback telegram is transmitted with a delay after bus voltage return or after programming in ETS. No feedback is transmitted during a running time delay, even if a valve state changes.

- Set the parameter "Time delay for feedback after bus voltage return ?" to "no".

  The collective feedback telegram is transmitted immediately after bus voltage return or ETS programming.

Setting cyclic transmission of the collective feedback

The object of the collective feedback can also transmit its value cyclically in addition to transmission when updating.

Collective feedback must be enabled and the feedback type set to "Active message object".

- Set the parameter "Cyclical transmission of feedback telegram?" to "yes".

  Cyclical transmission is activated.

- Set the parameter "Cyclical transmission of the collective feedback ?" to "no".

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

i The cycle time for all cyclic feedback telegrams is defined centrally on the parameter page "General valve outputs".

ℹ During an active delay, no collective feedback telegram will be transmitted even if a valve state changes.

4.2.4.4.2 Heat requirement control

The heating actuator 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 switch-over 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 variable 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. The telegram polarity of the heat requirement information can be configured.

- In addition, valve outputs, which receive preset command values via the data format "Switching (1-bit)" and "Switching (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 "Switching (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 %").
- With some functions and events, valve outputs, which are configured to the command value data formats "Switching (1-bit)" and "Switching (1-byte) with command value limiting value", 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 return, 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 KNX, 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.
- After bus voltage return and an ETS programming operation, the actuator always first transmits the status "No heat requirement" without a delay. The actuator then updates the status to "Heat requirement", providing that the condition for this has been fulfilled and an optionally configured "Heat requirement ACTIVE" has elapsed.

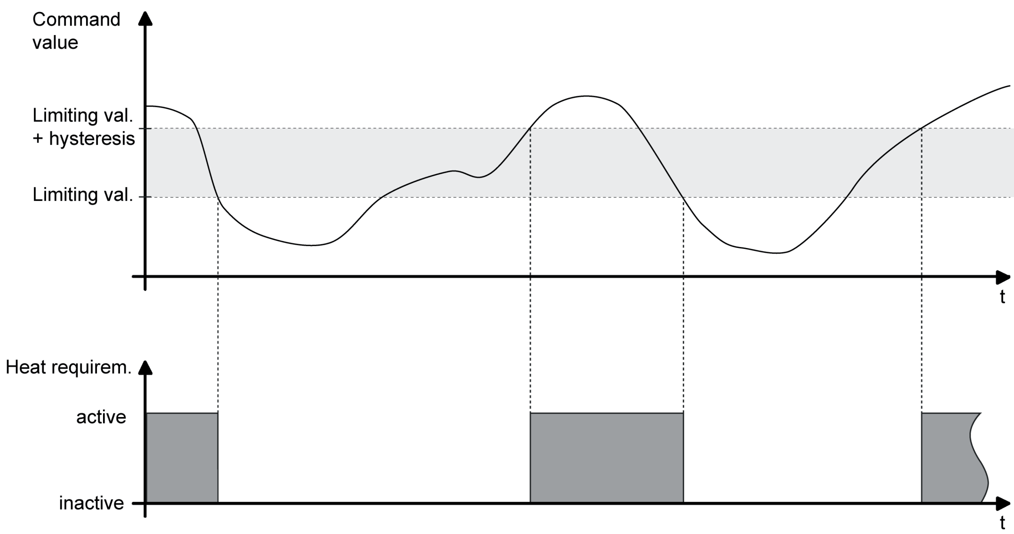

Figure 39: Heat requirement information with sample command value characteristic

Optionally, the actuator can evaluate an external telegram for heat requirement information (e.g. from another heating actuator). This allows the cascading of multiple actuators with a heat requirement signal. The local 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 telegram polarity of the external object is fixed: "0" = Heat requirement INACTIVE, "1" = Heat requirement ACTIVE.

The actuator only outputs the telegram of an active heat requirement after determination when the delay time defined by the parameter "Delay heat requirement INACTIVE" 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 "Delay heat requirement INACTIVE" has elapsed. The heat requirement information is not retracted if the actuator no longer determines a new heat requirement within the preset time.

Enabling and configuring the Heat requirement function

The Heat requirement function must first be enabled on the "General valve outputs -> Valves / pump - Valve outputs" parameter page, so that it can be used during actuator operation.

- Set the parameter "Activate function 'Heat requirement' ?" to "yes". Configure the parameter "Polarity of 'Summer Heat requirement' object" to the required telegram polarity. In addition, define the limiting 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.
  On the "Relay output..." -> VO... - Assignments" parameter page the valve outputs must be assigned to the heat requirement control individually, so that they are included in the requirement determination.
- Set the parameter "Activate function 'Heat requirement' ?" to "no".

  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 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.

- Set the parameter "Record external heat requirement ?" to "yes".

  The "External heat requirement" object is enabled. The local 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".
- Set the parameter "Record external heat requirement ?" to "no".

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

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

i After a device reset, there is no polling of the current status of the object "External heat requirement". Only when a bus telegram is received does the actuator take this status into account during evaluation of the heat requirement.

Configure delay for heat requirement control

If necessary, the activation and deactivation of the heat requirement information can be delayed.

- Set the parameter "Delay heat requirement ACTIVE" to the desired time.

  The actuator only outputs the telegram of an active heat requirement after determination when the defined delay time has elapsed. No heat requirement request is transmitted if the actuator no longer determines a heat requirement within the preset time.
- Set the parameter "Delay heat requirement INACTIVE" to the desired time.

  The actuator only retracts heat requirement information after determination when the defined delay time has elapsed. The heat requirement information is not retracted if the actuator no longer determines a new heat requirement within the preset time.

4.2.4.4.3 Pump control

The 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 "Switch pump" object, when at least one command variable of the assigned outputs exceeded a limiting value with hysteresis defined in the ETS. The pump is switched off when the limiting value is reached or undershot again. 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 "Switching (1-byte) with command value limiting 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 "Switching (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 "Switching (1-byte) with command value limiting value", 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 return, 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 KNX, 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 bus voltage return and an ETS programming operation, the actuator always first transmits the status "Pump OFF" without a delay. The actuator then updates the status to "Pump ON", providing that the condition for this has been fulfilled and an optionally configured "Pump delay ACTIVE" has elapsed.

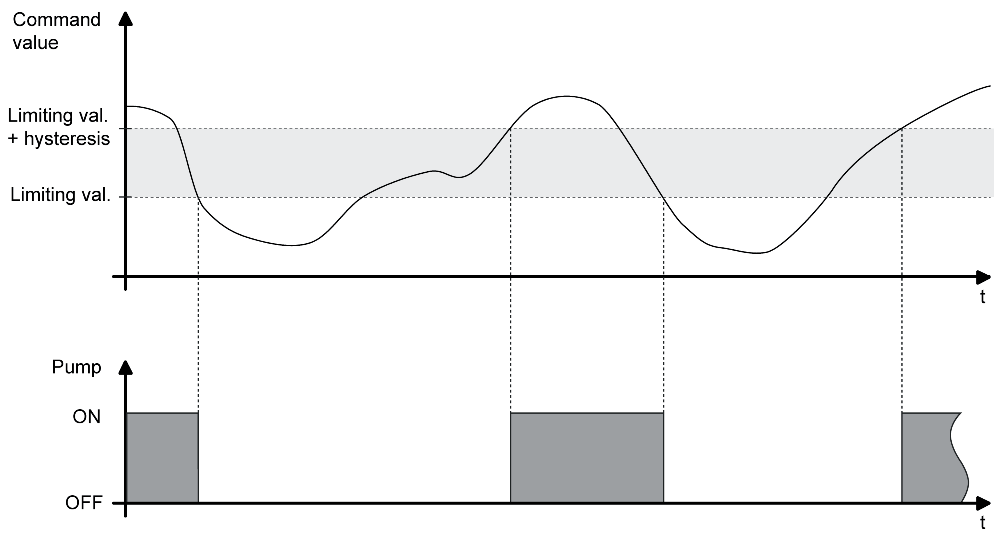

Figure 40: Pump control with sample command value characteristic

Optionally, the actuator can evaluate an external pump control signal (e.g. from another KNX heating actuator). This allows the cascading of multiple actuators with pump control. The local actuator links the 1-bit telegram value of the "External pump control" object with the internal state of the pump logically as OR and outputs the result of this link via the "Switch pump" object. The telegram polarity of the external object is fixed: "0" = Pump OFF, "1" = Pump ON.

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 pump ACTIVE delay with the dead time of the actuators). 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 "Time for cyclical switching on of the pump" 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, then the actuator will executed 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 "Pump switch-on time" defines the length of pump running 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

Pump control must first be enabled on the "General valve outputs -> Valves / pump valve outputs" parameter page, so that it can be used during actuator operation.

- Set the "Activate 'Pump control' function ?" parameter to "yes". Configure the parameter "Polarity of 'Pump control' object" to the required telegram polarity. In addition, define the limiting 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 limiting value plus hysteresis. The pump is switched off when the limiting value is reached or undershot again.
  On the "Relay output..." -> VO... - Assignments" parameter pages, the valve outputs must be assigned to the pump control individually, so that they are included in the command value evaluation.

- Set the "Activate 'Pump control' function ?" parameter to "no".

  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 KNX 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.

- Set the parameter "Detect external pump control ?" to "yes".

  The "External pump control" object is enabled. The local 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.

- Set the parameter "Detect external pump control ?" to "no".

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

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

i After a device reset, there is no polling of the current status of the "External pump control" object. Only when a bus telegram is received does the actuator take this status into account when controlling the pump.

Configure delay for pump control

If necessary, the pump switch-on and off can be delayed.

- Set the parameter "Delay pump ACTIVE" to the desired time.

  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.

- Set the parameter "Pump delay INACTIVE" to the desired time.

  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.

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 "General valve outputs -> Valves / pump - Valve outputs" parameter page, so that it can be executed during actuator operation.

- Set the "Activate anti-sticking protection ?" parameter to "yes". In addition, define the interval of the protection function in the parameter "Time for cyclical switching on of the pump". Configure the parameter "Pump 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 time by the pump controller, then the actuator will executed anti-sticking protection, if necessary on a regular basis. The actuator then switches the pump on for the preset switch-on time.

- Set the "Activate anti-sticking protection ?" parameter to "no".

  Anti-sticking protection is deactivated.

i 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.

4.2.4.4.4 Function "Largest command value"

Through evaluation and determination of the largest command value in the heating or cooling system, the actuator 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 actuator 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".

i In the case of valve outputs configured in the ETS to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value", there is no evaluation of the command values preset via the KNX.
Exception: It may also occur with such command value outputs that a constant command value is active (after bus voltage return, 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 KNX, overriding the constant command value at the valve output.

i After bus voltage return and 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.

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

Enabling the "Largest command value" function

The "Largest command value" function must first be enabled on the "General valve outputs -> Valves / pump - Valve outputs" parameter page, so that it can be used during actuator operation.

■ Set the parameter "Activate 'Largest command value' function ?" to "yes".

  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.

■ Set the parameter "Activate 'Largest command value' function ?" to "no".

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

Configuring the transmission behaviour of the "Largest command value" function

The largest command value determined by the actuator is actively transmitted to the bus. The "Transmit largest command value" parameter decides when a telegram is transmitted via the "Largest command value" object.

■ Set the parameter to "Only on change". Configure the parameter "Transmit on change by" to the required change interval for automatic transmission.

  A telegram is only transmitted when the largest command value changes by the configured change interval.

- Set the parameter to "Only cyclical".

  The actuator only transmits the "Largest command value" telegram cyclically. The cycle time is defined globally for all feedback on the parameter page "General valve outputs".
- Set the parameter to "On change and cyclically". Configure the parameter "Transmit on change by" to the required change interval for automatic transmission.

  The actuator transmits the "Largest command value" telegram cyclically and also when the largest command value changes by the configured change interval.

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 KNX 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.

- Set the "Record external largest command value ?" to "yes".

  The "External largest command value" 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".
- Set the "Record external largest command value ?" to "no".

  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.

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

i After a device reset, there is no polling of the current status of the "External largest command value" object. Only when a bus telegram is received does the actuator take this value into account during evaluation of the largest command value.

4.2.4.4.5 Valve direction of action

Both deenergised closed and deenergised opened actuators can be connected to the valve outputs. The parameter "Valve in voltage-free state (valve direction of action)" on the parameter pages "Relay output... -> VO... - General" specifies which device type is connected to a valve output.

ⓘ Only actuators with the same characteristics may be connected to each valve output (deenergised 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.

ⓘ 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.

4.2.4.4.6 Reset and initialisation behaviour

The states of the valve outputs after a bus voltage failure, bus voltage return or after an ETS programming operation can be set separately.

Setting the behaviour in case of bus voltage failure

The parameter "Behaviour in case of bus voltage failure" is available separately for each valve output on the parameter page "Relay output... -> VO... - General". The actuator executes the behaviour configured in the ETS when the bus voltage fails. As, when the bus voltage fails, the device electronics stop working, the bistable relay can only be used to switch to a defined position at the moment of the voltage failure. After this, the device does not function during the voltage failure. Thus it is not possible to perform PWM after a bus voltage failure.
The "Behaviour in case of bus voltage failure" parameter is always set to "Specify command value".

- Set the required static command value on the "Command value as before bus voltage failure" parameter.

  The actuator sets the command value after a bus voltage failure for the valve output. In the possible "0 %" and "100 %" specifications, the valve outputs are activated continuously according to the configured valve direction of action.

ℹ 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 (configurable). Saving only takes place after a previous device reset (ETS programming operation, bus voltage return) when the reset is longer than 30 seconds previously. 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.

ℹ If the bus voltage fails while a manual operation on the device is activated, the parameter "Behaviour in case of bus voltage failure" is not executed.

Setting the behaviour after bus voltage return

The parameter "Behaviour in case of bus voltage return" is available separately for each valve output on the parameter page "Relay output... -> VO... - General".

- Set the parameter to "Preset command value".

  The actuator sets the command value specified for the valve output by the parameter "Command value after bus voltage return". 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 specified using the parameter "Command value on bus voltage return". 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 KNX, overriding the constant command value on the valve output.

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

  For the valve output, the actuator polls the command value preset for the forced position, as configured in the ETS. Here, the active operating mode (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 only polls the command value preset for the forced position.

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

For the valve output, the actuator polls the emergency operation command value, as configured in the ETS. Here, the active operating mode (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 only polls the command value preset for emergency operation.

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

  After bus voltage return, that 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. Saving only takes place after a previous device reset (ETS programming operation, bus voltage return) when the reset is longer than 30 seconds previously. 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.

i A valve state set after bus voltage return is added to the command value status objects. Actively transmitting feedback objects also first transmit after bus voltage return when initialisation has finished, and if necessary the "Delay time after bus voltage return" has elapsed.

Presetting the behaviour after ETS programming

The parameter "Behaviour after ETS programming operation" is available separately for each valve output on the parameter page "Relay output... -> VO... - General". This parameter can be used to configure the behaviour of an output, irrespective of the behaviour after bus voltage return.

- Set the parameter to "Behaviour as after bus voltage return".

  After an ETS programming operation, the valve output will behave in the manner defined in the parameter "Behaviour after bus voltage return". 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 KNX, overriding the constant command value on the valve output.

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

  For the valve output, the actuator polls the command value preset for the forced position, as configured in the ETS. Here, the active operating mode (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 only polls the command value preset for the forced position.

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

For the valve output, the actuator polls the emergency operation command value, as configured in the ETS. Here, the active operating mode (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 only polls the command value preset 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 return".

i A valve state set after an ETS programming operation is added to the command value status 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 return" has elapsed.

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

4.2.4.4.7 Data formats for command values

The actuator 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 of the actuator. This allows individual adaptation to different actuator types.

ⓘ It should be noted that the actuator does not carry out temperature control itself. The actuator converts received command value telegrams or command value presettings from device functions into constant or switching output signals.

The "Data format of the command value input" parameter, which is available separately for each valve output on the parameter pages "Relay output... -> VO... - General -> VO... - Command values/Status/Operating mode", 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 is valve 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 bus voltage return,
- After an ETS programming operation,
- During a 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 KNX, overriding the constant command value on the valve output.

ⓘ 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).

ⓘ 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) 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 (figure 41). 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).

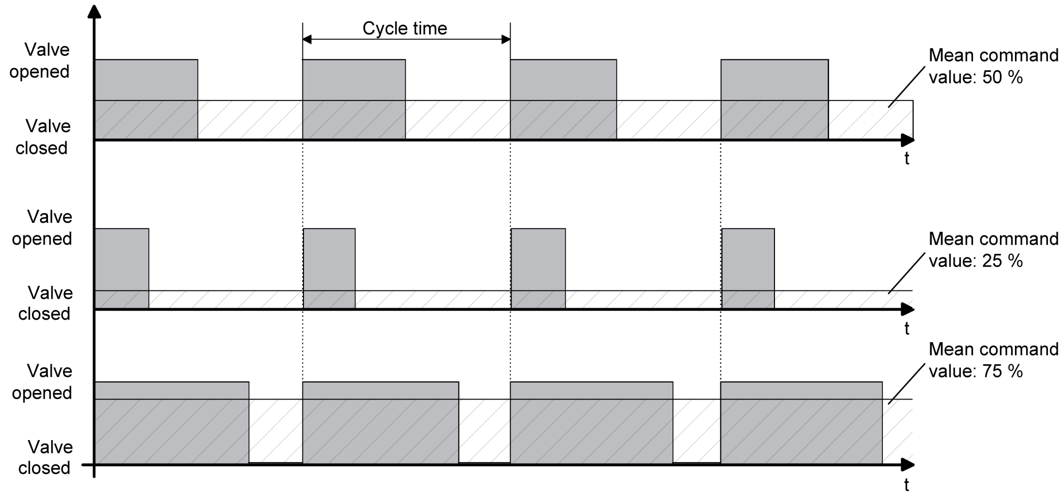

Figure 41: Resulting mean value through variable duty factor with pulse width modulation

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, deenergised closed: 60 % ON, 40 % OFF,
- Duty factor, deenergised opened: 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 (figure 42).
  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.

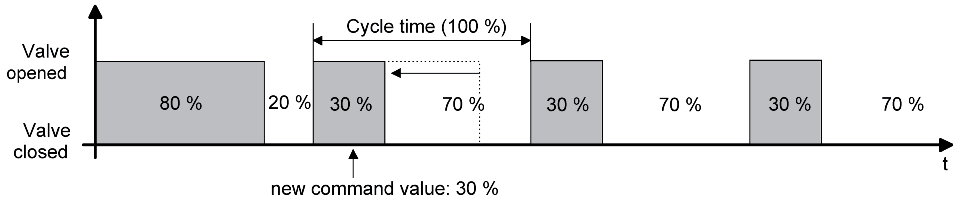

Figure 42: Example of a command value change 80 % -> 30 % during the opening phase of the valve

- <u>Case 2</u>
  Command value change, e.g. from 80 % to 30 %, during the closing phase of the valve (figure 43).
  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.

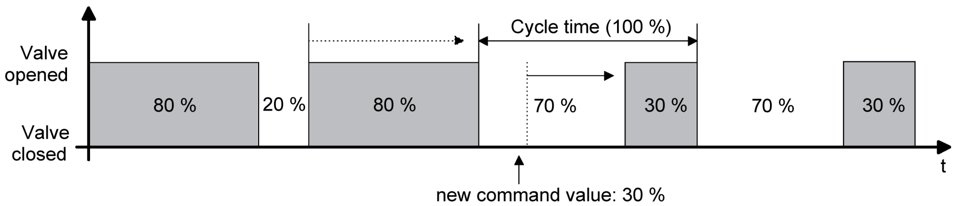

Figure 43: Example of a command value change 80 % -> 30 % during the closing phase of the valve

- <u>Case 3</u>
  Command value change, e.g. from 80 % to 30 % during the opening phase of the valve (opening phase too long) (figure 44).
  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.

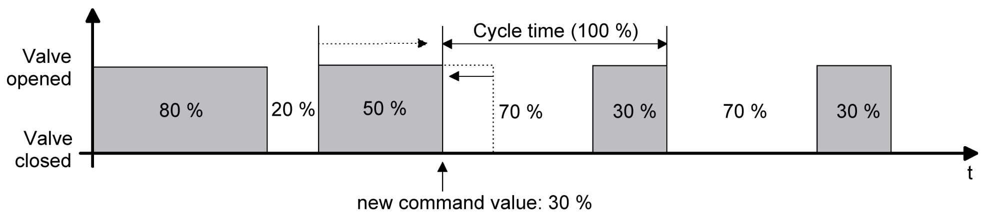

Figure 44: Example of a command value change 80 % -> 30 % during the opening phase of the valve (opening phase too long)

- Case 4
  Command value change, e.g. from 30 % to 80 %, during the opening phase of the valve (figure 45).
  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.

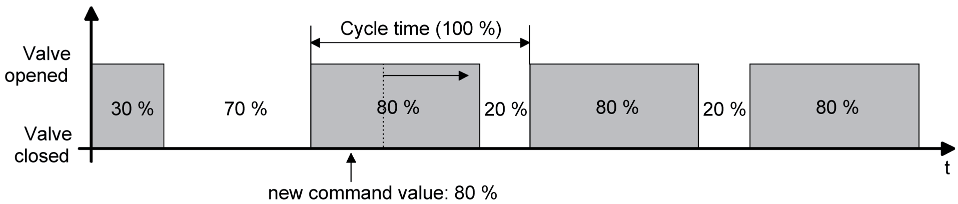

Figure 45: Example of a command value change 30 % -> 80 % during the opening phase of the valve

- Case 5
  Command value change, e.g. from 30 % to 80 %, during the closing phase of the valve (figure 46).
  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.

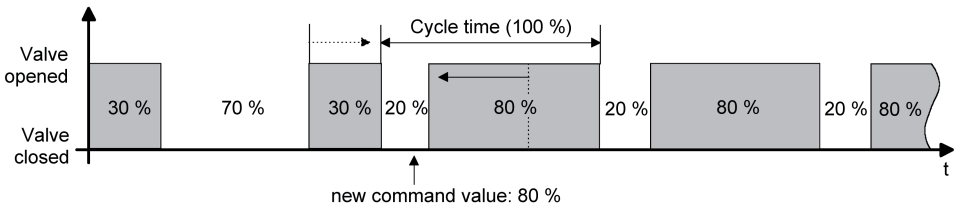

Figure 46: Example of a command value change 30 % -> 80 % during the closing phase of the valve

- Case 6
  Command value change, e.g. from 30 % to 80 %, during the closing phase of the valve (closing phase too long) (figure 47).
  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.

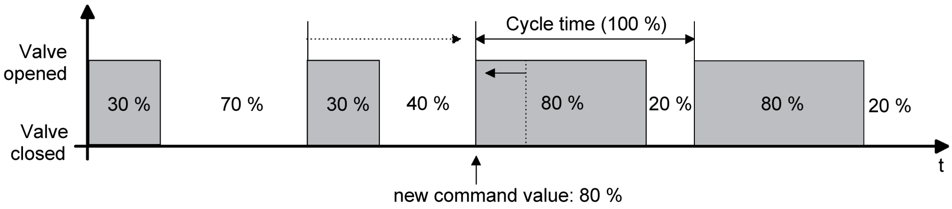

Figure 47: Example of a command value change 30 % -> 80 % during the opening phase of the valve (opening phase too long)

Data format of the command value input "Switching (1-byte) 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 actuator opens when the command value reaches the limiting value or exceeds it (figure 48). 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 actuator 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 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 and relay outputs 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 >= 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) 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 bus voltage return,
- After an ETS programming operation,
- During a 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 KNX, overriding the constant command value on the valve output.

- 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).
- Valve outputs, which receive preset command values via the data format "Switching (1-byte) with command value limiting value", 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 %").

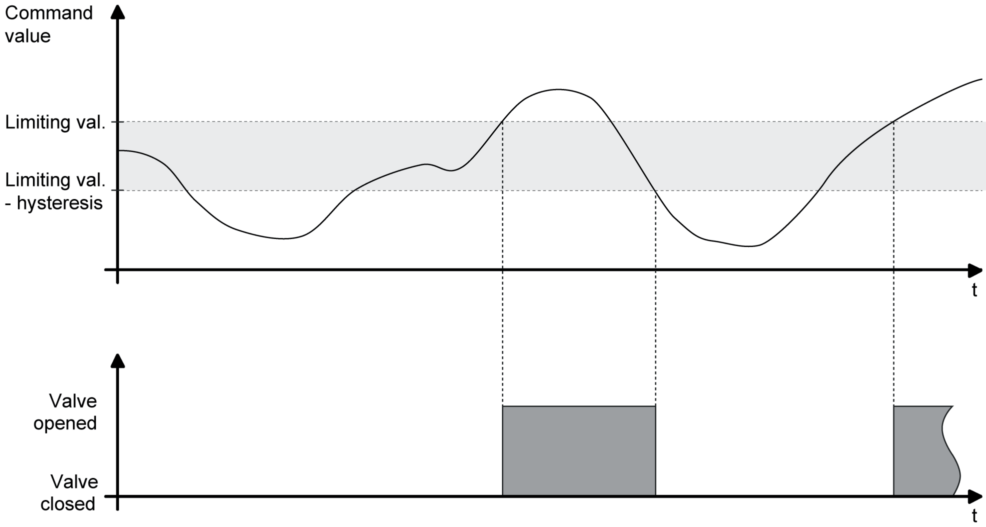

Figure 48: Example of command value evaluation with limiting value

4.2.4.4.8 Cycle time

The "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 actuators 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 or off). If different actuators with different adjusting cycle times are used at an output, take account of the longest of the times.

ℹ The "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 bus voltage return 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:

<u>Case 1</u>
Cycle time > 2 x Adjusting cycle time of the drives used (frequently > 20 minutes)

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 and briefly remain in the end positions (figure 49).

- 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. In addition, the switching frequency of the relay outputs of the actuator is smaller, creating a longer service life of the contacts.
- 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 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.

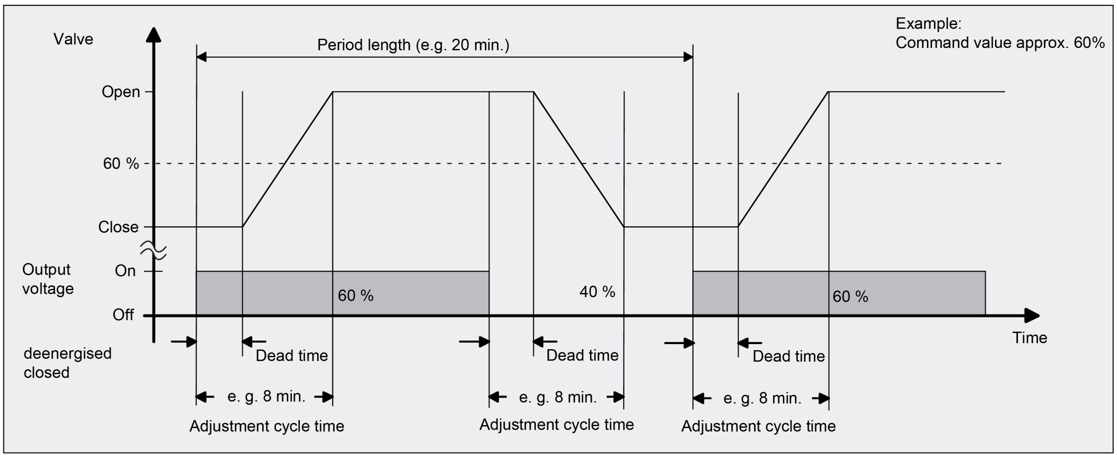

Figure 49: Ideal course of the valve stroke for a cycle time > 2 x Adjustment cycle time

Case 2
Cycle time < Adjusting cycle time of the drives used (frequently < 15 minutes)

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. Usually, this means that the valves do not remain in the end positions in a cycle. A kind of floating state results (figure 50).

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

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

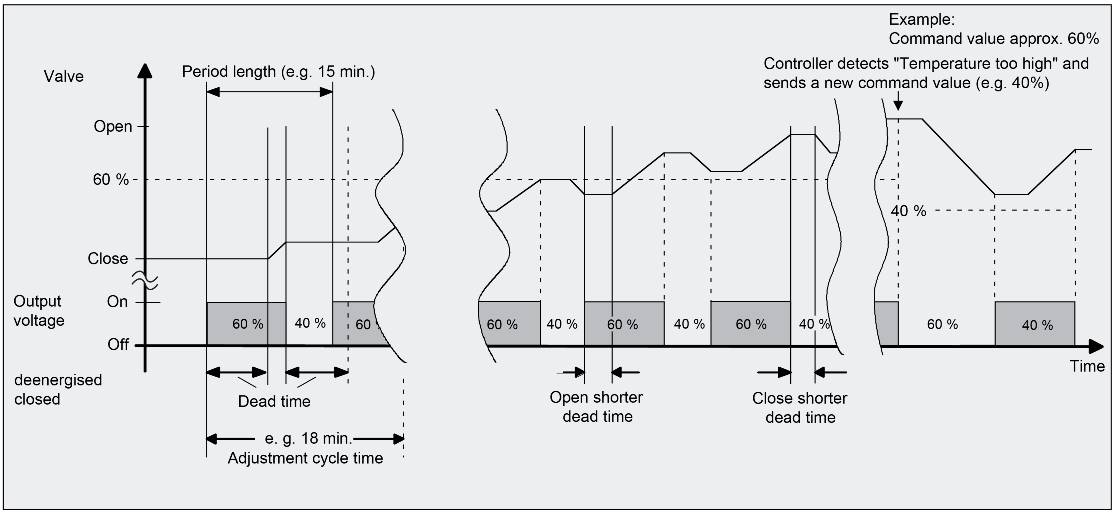

Figure 50: Ideal course of the valve stroke for a cycle time < Adjustment cycle time

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.

4.2.4.4.9 Forced position

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).

- i 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.
- i 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 possesses a summer / winter switchover. Depending on the season, this allows the setting of different command value setpoints for a valve output for forced position. It is also possible to switch over the operating mode during an active forced position. In this case, the value belonging to the operating mode is activated immediately after the switch-over.
If no summer / winter switch-over 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 after bus voltage return 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.

- i 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).

- i After a device reset (bus voltage return, ETS programming operation), the command value objects first contain the value "0".

Enabling the forced position object and configuring the forced position

For the forced position to be used as a locking function, it must first be enabled in the ETS on the parameter page "Relay output... -> VO... - General -> VO... - Command value/Status/Operating mode" and be visibly switched by the communication object.

- Set the parameter "Use object for forced position ?" to "yes". Define the parameter "Polarity of 'Forced position' object" 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 "Forced operation active" polarity at the defined command value (optional according to the most recently preset operating mode).

- Set the parameter "Use object for forced position ?" 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.

i Updates of the object from "Forced position active" to "Forced position active" or from "Forced position inactive" to "Forced position inactive" produce no reaction.

i The status preset via the forced position object is stored internally in the device after a bus voltage failure and and is restored automatically after a bus voltage return. After a bus voltage return, the actuator activates the forced position, if the tracked state allows this. However, when presetting the command values, only that behaviour is significant, according to the priority sequence, which the parameter "Behaviour after bus voltage return" 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.

i 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 a bus voltage return, 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 values as for forced position").

4.2.4.4.10 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 possesses a summer / winter switchover. Depending on the season, this allows the setting of different command value setpoints for a valve output for emergency operation. It is also possible to switch over the operating mode during active emergency operation. In this case, the value belonging to the operating mode is activated immediately after the switch-over. If no summer / winter switch-over 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 time" 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 bus voltage return 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 a device reset (bus voltage return, ETS programming operation), the command value objects first contain the value "0".

ⓘ The state or emergency operation (active or inactive) is saved internally in the device after a bus voltage failure and and is restored automatically after a bus voltage return. After a bus voltage return, 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.

ⓘ Immediately after the bus voltage return or an ETS programming operation, the object "Command value fault" does not transmit the status automatically. 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.

Enable cyclical command value monitoring

Cyclical command value monitoring can only be used if it has been enabled in the ETS.

- Set the parameter "Activate command value monitoring ?" on parameter page "Relay output... -> VO... - General -> VO... - Command value/status/operating mode" to "Yes". Configure the "Monitoring time" of the command value monitoring.

  Cyclical command value monitoring is activated. If 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 the actuator sets to a configurable constant PWM command value. This command value is fined by the Command value in the case of emergency operation..." parameter (if necessary, separately for summer and winter mode).

- Set the parameter "Activate command value monitoring ?" to "no".

  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".

- Set the parameter "Polarity of object 'Command value fault'" on the "Relay output... -> VO... - General -> VO... - Command value/status/operating mode" parameter page 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 status object "Command value fault" 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.

- Set the parameter "Cyclical transmission in the case of faulty command value ?" to "yes".

  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 "General" parameter page.

- Set the parameter "Cyclical transmission in the case of faulty command value ?" to "no".

  If a command value fault is identified, then the actuator transmits the fault telegram only once.

4.2.4.4.11 Command value limit

Enabling the command value limit

The command value limit can only be used if it has been enabled in the ETS.

- Set the "Command value limit ?" parameter on parameter page "Relay output... -> VO... - General -> VO... - Command value/status/operating mode" to "Yes".

  The command value limit is enabled. The "Activation of the command value limit" 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 "Command value limit ?" parameter to "no".

  The command value limit is not available.

Setting the activation of the command value limit

The parameter "Activation of the command value limit" on the "Relay output... -> VO... - General -> VO... Command value/Status/Operating mode" parameter page defines the mode of action of the limiting function.

The command value limit must be enabled.

- Set the parameter to "By object 'Command value limit".

  The command value limit can only be activated using the 1-bit communication object "Command value limit" ("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 activated".

  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", or be permanently active. When controlling via the object, it is possible to have the controller activate the command value limit automatically after bus voltage return or an ETS programming operation. The parameters "Activate command value limit after bus voltage return ?" and "Activate command value limit after ETS programming" define the initialisation behaviour.

ℹ With a permanently active command value limit, the initialisation behaviour cannot be configured after bus voltage return or an ETS programming operation, as the limit is always active. In this case, no object is available.

The command value limit must be enabled.

- Set the "Activate command value limit after bus voltage return ?" parameter to "no".

  The command value limit is not activated automatically after bus voltage return. A "1" telegram must first be received via the "Command value limit" object for the limiting function to be activated.
- Set the "Activate command value limit after bus voltage return ?" parameter to "yes".

  In this setting, the actuator does not activate the command value limit automatically after bus voltage return. 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 "Activate command value limit after ETS programming ?" parameter 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 "Activate command value limit after ETS programming ?" parameter 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.

ⓘ The status of the command value limit is not automatically tracked in the communication object after a device reset.

ⓘ It should be noted that, on account of priority control, the actuator executes the behaviour configured by the parameter page "Behaviour after bus or mains voltage return" and "Behaviour after an ETS programming operation" on the parameter page "Relay output... -> VO... - General" after bus voltage return and 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.

4.2.4.4.12 Status functions

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 either actively transmitting or passively (object can be read out). During status feedback, 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.

i 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. 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 opened),
- 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 specification by parameter "Behaviour after bus voltage return" or "Behaviour after ETS programming operation" ("0" at 0 %, "1" at 1...100 %),
- State of operation "Manual operation" (5...100 %)
  -> Status value = Manual operation command value ("0" at 0 % CLOSE,
  "1" at 5...100 % 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 opened),
- 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 specification by parameter "Behaviour after bus voltage return" or "Behaviour after ETS programming operation" ("0" at 0 %, "1" at 1...100 %),
- State of operation "Manual operation" (5...100 %)
  -> Status value = Manual operation command value (0 % CLOSE, 5...100 % 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 opened),
- 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 specification by parameter "Behaviour after bus voltage return" or "Behaviour after ETS programming operation" ("0" at 0 %, "1" at 1...100 %),
- State of operation "Manual operation" (5...100 %)
  -> Status value = Manual operation command value ("0" at 0 % CLOSE,
  "1" at 5...100 % OPEN),

Activating the command value status function

The status feedback is a function of the valve outputs and can be enabled on the parameter pages "Relay output... -> VO... - General -> VO... - Command value/Status/Operating mode".

- Set the "Feedback valve command value" parameter to "Yes".

  Status feedback is enabled. The status object of the valve output becomes visible in the ETS.
- Set the parameter to "no".

  Status feedback is deactivated. No status object is available.

Setting the type of the command value status function

The status feedback can be used as an active signal object or as a passive status object. As an active signal object, the feedback is also directly transmitted to the KNX whenever there is a change to the status value. As a passive status object, there is no telegram transmission after a change. In this case, the object value must be read out. The ETS automatically sets the communication flags of the status objects required for proper functioning.
The parameter "Type of feedback" is available separately for each valve output on the

parameter page "Relay output... -> VO... - General -> VO... - Command value/status/operating mode".

Status feedback must be enabled.

- Set the parameter to "Active signalling object".

  The feedback telegram is transmitted as soon as the status changes. Automatic telegram transmission of the feedback takes place after bus voltage return or after an ETS programming operation (possibly with a time delay).

ⓘ 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.

- Set the parameter to "Passive status object".

  The feedback telegram will only be transmitted in response if the status object is read out from the KNX by a read telegram. No automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS.

Setting the time delay of the command value status feedback

If used as active signal object, the state of the status feedback information is transmitted to the KNX after bus voltage return 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.

- Set the parameter "Time delay for feedback after bus voltage return ?" to "yes".

  The status feedback will be transmitted with a delay after bus voltage return 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 "Time delay for feedback after bus voltage return ?" to "no".

  The status feedback will be transmitted immediately after bus voltage return or after an ETS programming operation.

Setting cyclical transmission of the command value status feedback

The status feedback telegram can also be transmitted cyclically via the active signal object in addition to the transmission after changes.

- Set the parameter "Cyclical transmission of feedback telegram?" to "yes".

  Cyclical transmission is activated.

- Set the parameter "Cyclical transmission of feedback telegram?" to "no".

  Cyclical transmission is deactivated so that the feedback telegram is transmitted to the KNX only when the status is changed by the actuator.

ⓘ The cycle time is defined centrally for all the valve outputs on the parameter page "General valve outputs".

ⓘ There is no cyclical transmission during an active time delay after bus voltage return or an ETS programming operation.

Combined valve status

The combined valve status allows the collective feedback of various functions of a valve output in a single 1-byte bus telegram. It helps to forward the status information of an output to a suitable recipient (e.g. KNX visualisation) in a targeted manner, without having to evaluate various global and channel-orientated feedback and status functions of the actuator. The communication object "Feedback combined valve status" contains 7 different items of status information, which are bit-encoded.

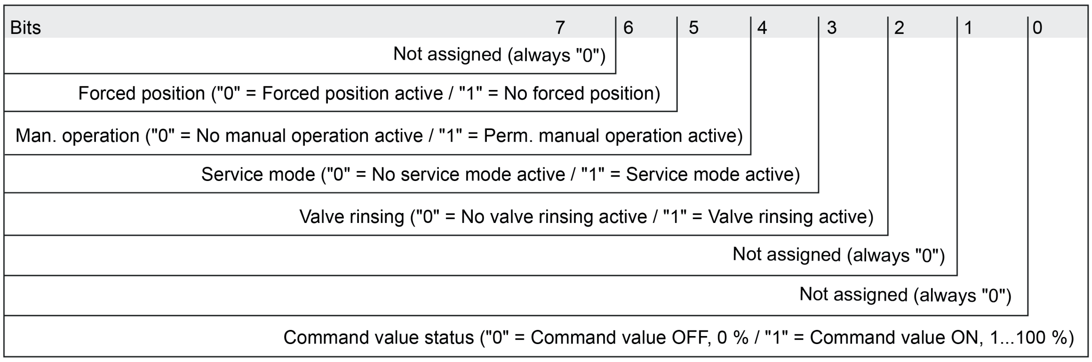

Figure 51: Bit encoding of the object "Feedback combined valve status"

The bits of the combined valve status feedback have the meaning given below...

- Bit 0 "Command value status":
  The command value status always transmits the command value status currently set at a valve output. Here, the priority control of the actuator is taken into account. Functions or events with a higher priority override lower-level functions and events. If a function with a high priority is exited, then the status information assumes the command value of functions with a lower priority, providing that they are active.
  The active command value is always made available as 1-bit information in the combined object. Constant command values (PWM at the valve output) are converted into a 1-bit status (status "0" = Command value 0 % / status "1" = Command value 1...100 %).
- Bit 1 "Not assigned":
  This bit is always "0".
- Bit 2 "Not assigned":
  This bit is always "0".
- Bit 3 "Valve rinsing":
  When "1", this bit indicates active valve rinsing (rinsing operation time running). In the "0" status, no valve rinsing is active.
- Bit 4 "Service mode":
  Service mode is a global function of the actuator. Individual valve outputs can be assigned to service mode. When "1", this bit displays an active service mode. The affected valve output then sets the command value of the service mode. In this case, the output is disabled for activation by the bus using input command values. In the "0" status, no service mode is active.
- Bit 5 "Manual operation":
  Manual operation is also a global function of the actuator. The command value of individual valve outputs can be influenced in the course of a manual operation. When "1", this bit displays an active permanent manual operation. In the "0" status, no manual operation is active. In a temporary manual operation, the status in the combined object does not become "1".
- Bit 6 "Forced position":
  When "1", this bit displays an active forced position. In the "0" status, no forced position is active.
- Bit 7 "Not assigned":
  This bit is always "0".

Activating the combined valve status

The combined status feedback is a function of the valve outputs and can be enabled on the parameter pages "Relay output... -> VO... - General -> VO... - Command value/Status/Operating mode".

- Set the "Feedback combined valve status ?" parameter to "Yes".

  The feedback of the combined valve status is enabled. The 1-byte status object becomes visible in the ETS.

- Set the parameter to "no".

  The feedback of the combined valve status is deactivated. No 1-byte status object is available.

Setting the type of the combined valve status

The combined valve status can be used as an active signal object or as a passive status object. As an active signal object, the feedback is also directly transmitted to the KNX whenever there is a change to the status value. As a passive status object, there is no telegram transmission after a change. In this case, the object value must be read out. The ETS automatically sets the communication flags of the status objects required for proper functioning.
The parameter "Type of combined status feedback" is available separately for each valve output on the parameter page "Relay output... -> VO... - General -> VO... - Command value/status/operating mode".

The combined status feedback must be enabled.

- Set the parameter to "Active signalling object".

  The feedback telegram is transmitted as soon as the status changes. Automatic telegram transmission of the feedback takes place after bus voltage return and after an ETS programming operation (possibly with a time delay).

i The combined status object does not transmit if the status information does not change after the activation or deactivation of device functions or new input command values. Only changes are ever transmitted.

i If the supply voltage of the actuators fails and returns, then the combined status feedback is not transmitted.

- Set the parameter to "Passive status object".

  The feedback telegram will only be transmitted in response if the status object is read out from the bus by a read telegram. No automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS.

Setting the time delay of the combined valve status

If used as active signal object, the state of the combined status feedback information is transmitted to the KNX after bus voltage return 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.

- Set the parameter "Time delay for feedback after bus voltage return ?" to "yes".

  The combined status feedback will be transmitted with a delay after bus voltage return or after an ETS programming operation. No feedback is transmitted during a running delay, even if the status information changes during this delay.

- Set the parameter "Time delay for feedback after bus voltage return ?" to "no".

  The combined status feedback will be transmitted immediately after bus voltage return or after an ETS programming operation.

Setting cyclical transmission of the combined valve status

The feedback telegram of the combined valve status can also be transmitted cyclically via the active signal object in addition to the transmission after changes.

- Set the parameter "Cyclical transmission of feedback telegram?" to "yes".

  Cyclical transmission is activated.
- Set the parameter "Cyclical transmission of feedback telegram?" to "no".

  Cyclical transmission is deactivated so that the feedback telegram is transmitted to the KNX only when the status is changed by the actuator.

i The cycle time is defined centrally for all the valve outputs on the parameter page "General valve outputs".

i There is no cyclical transmission during an active time delay after bus voltage return or an ETS programming operation.

4.2.4.4.13 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 KNX 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.

- i 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)".
- i 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.

- i 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 KNX 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.
- i 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.
- i The actuator also executes valve rinsing by starting the rinse time, even if the valve power supply has been switched off. A bus voltage failure immediately interrupts an active rinsing operation. After bus voltage return, a previously interrupted rinsing operation is not executed again.
- i 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 bus voltage return 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 "Use 'Valve rinsing' function ?" parameter on parameter page "Relay output... -> VO... - General -> VO... - Valve rinsing" to "Yes". In the "Valve rinsing time" parameter, 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.

i Set the length of the valve rinsing to the adjustment 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 adjustment cycle time.

- Set the "Use 'Valve rinsing' function ?" 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 "Activate cyclical valve rinsing ?" parameter to "yes". In the case of the "Cycle time" parameter, configure how often valve rinsing is to be performed automatically.

  Cyclical valve rinsing is enabled.

- Set the "Activate 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 bus voltage return.
A bus voltage failure immediately interrupts an active rinsing operation. After bus voltage return, a previously interrupted rinsing operation is not executed again. 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. It the active command value exceeds the limiting value, then the actuator will stop the cycle time. The valve drive 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 (figure 52). 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.

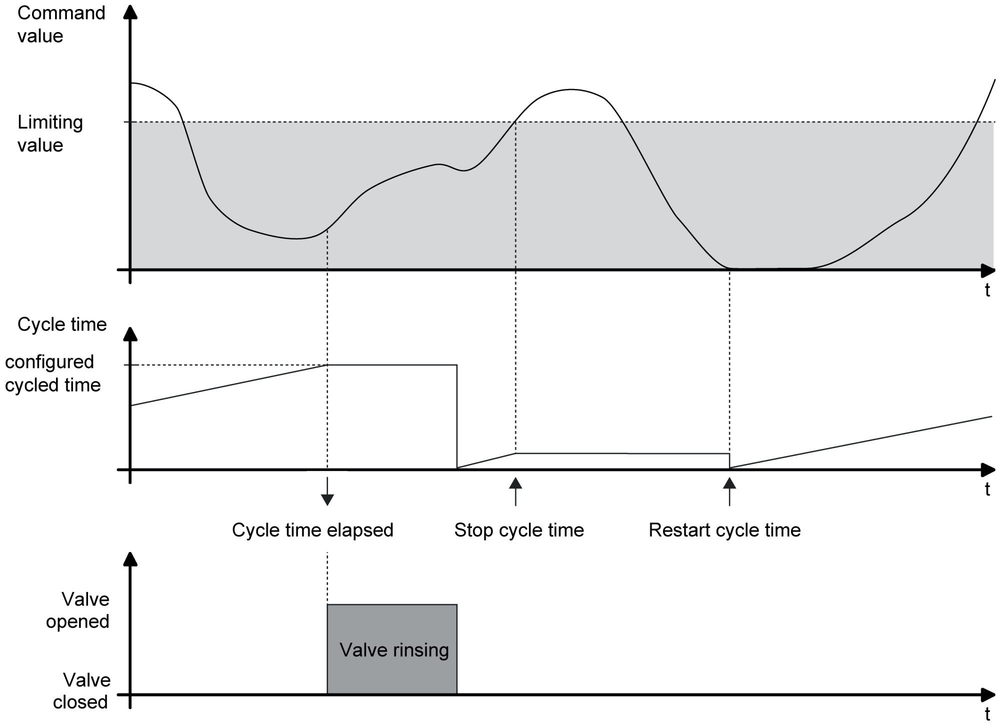

Figure 52: Example of a minimum command value limiting value for intelligent valve rinsing

- Set the "Use intelligent valve rinsing ?" parameter to "yes". Using the "Limiting value minimum command value (10...100 %)" parameter, define the command value limiting value.

  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 "Use intelligent valve rinsing ?" parameter 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 actuators, so that they perform valve rinsing simultaneously (link of the individual status objects to the input objects of the valve rinsing).
The KNX control of the valve rinsing 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 "Valve rinsing activated externally ?" parameter to "yes". In the case of the parameter "Polarity of 'Start / stop valve rinsing' object", configure the telegram polarity, thus presetting whether the bus-controlled starting and stopping, or, alternatively, only starting, should 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 "Valve rinsing activated externally ?" parameter to "no".

  Bus-controlled valve rinsing is not available. Valve rinsing can only take place cyclically.

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.

4.2.4.4.14 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 adds up the determined switch-on time accurately to the minute for energised valve outputs in full hours respectively (figure 53). The totalled operating hours are added in a 2-byte meter and stored permanently in the device. The current meter reading can be transmitted cyclically to the bus by the "value operating hours counter" communication object or when there is a change in an interval value.

ℹ During pulse width modulation (PWM) at a valve output, the operating hours counter only evaluates the switch-on time of the PWM signal.

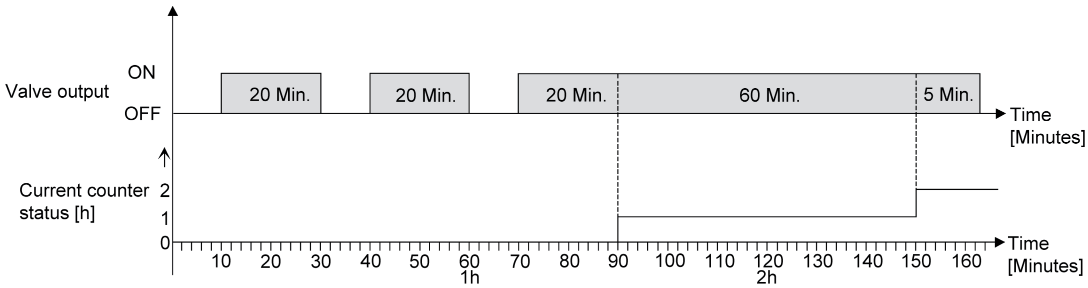

Figure 53: Function of the operating hours counter (using the example of an up-counter)

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 on "0 h".

The operating hours values (full hours) stored in the device will not be lost in case of a bus voltage failure or by ETS programming. Any summed up operating minutes (full hour not yet reached) will be rejected in this case, however.
After bus voltage return or after an ETS download, the actuator passively updates the "Value operating hours counter" communication object in each valve 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 bus, once the configured transmission delay has elapsed after bus voltage return.

The operating hours counter detects any operation of the valve outputs by the manual operation, which means that switching on an output also activates the counting of operating hours and the manual switch-off interrupts a counting operation.

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.

- On the parameter page "Relay output... -> VO... - General -> VO... - Operating hours counter", set the "Use operating hours counter ?" parameter to "yes".

  The operating hours counter is activated.

- Set the parameter "Use operating hours counter?" to "no".

  The operating hours counter is deactivated.

ℹ Deactivation of the operating hours counter and subsequent programming with the ETS resets the counter status to "0".

Setting type of counter of the operating hours counter

The operating hours counter can optionally be configured as an up-counter or down-counter. Depending on this type of counter, a limit or start value can be set optionally, whereby, for example, the operating time of an actuator can be monitored 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 65535 hours can be counted, after that the meter stops and signals a counter operation via the "Operating hours count. elapsed" object.
A limiting value can be set optionally in the ETS or can be predefined via the communication object "Limiting value operating hours counter". In this case, the counter operation is signalled to the KNX via the "Operating hours count. elapsed" object if the limiting value is reached, but the meter continues counting - if it is not restarted - up to the maximum value 65535 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 h" and the actuator signals a counter operation for the output concerned after the programming operation or after bus voltage return via the "Operating hours count. elapsed" object. Only after a restart is the down-counter set to the maximum value 65535 the counting operation 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-counter reaches the value "0", the counter operation is signalled to the KNX via the "Operating hours count. elapsed" and the counting is stopped. Only a restart initiates a new counting operation.

The use of the operating hours counter must be set on the parameter page "Relay output... -> VO... - General -> VO... - Operating hours counter".

- Set the parameter "Counter type" to "Up-counter". Set the parameter "Limiting value specification?" to "yes, as parameter" or "yes, as received via object" if it is necessary to monitor the limiting value. Otherwise, reset the parameter to "no". In the "yes, as specified in parameter" setting, specify the required limit value (1…65535 h).

  The meter counts the operating hours forwards starting from "0 h". If the monitoring of the limiting value is activated, the actuator transmits a "1" telegram via the object "Operating hours count. elapsed" for the valve output concerned once the predefined limiting value is reached. Otherwise, the counter operation is first transmitted when the maximum value 65535 is reached.

- Set the parameter "Counter type" to "Down-counter". Set the parameter "start value preset ?" to "yes, as parameter" or "yes, as received via object" if a start value preset is necessary. Otherwise, reset the parameter to "no". In the "yes, as specified in parameter" setting, specify the required start value (1…65535 h).

  The meter counts the operating hours down to "0 h" after a restart. With a start value preset, the start value is counted down, otherwise the counting operation starts at the maximum value 65535. The actuator transmits a "1"-telegram via the object "Operating hours count. elapsed" for the output concerned once the value "0" is reached.

ℹ The value of the communication object "Operating hours count. elapsed" is stored permanently. The object is initialised immediately with the value that was saved before bus voltage return or 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 KNX. If the counter has not yet elapsed (object value "0"), no telegram is transmitted on return of bus voltage or after an ETS programming operation.

- ⓘ With a limiting 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 that was last saved before bus voltage return or 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 of 65535 is predefined provided that no limiting 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.
- ⓘ With a limiting or start value predefined via object: If the start or limiting value is predefined with "0", the actuator will ignore a counter restart to avoid an undesired reset (e.g. in site operation -> hours already counted by manual operation).
- ⓘ 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 current counter status of the operating hours can be reset at any time by the communication object "Reset operating hours counter". The polarity of the reset telegram is predefined: "1" = Restart / "0" = No reaction.

- ■ Characterise the communication object "Reset operating hours counter" 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 65535.
  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, a "0" telegram is transmitted to the bus via the object "Operating hours count. elapsed
  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 download.
- ⓘ If a start or limiting value is predefined with "0", there are different behaviours after a restart, depending on the principle of the value definition...
  Preset as parameter:
  The counter 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 hours already being counted by manual operation). A limiting or start value greater than "0" must be predefined 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 "value operating hours counter". After bus voltage return or after an ETS download, the actuator passively updates the "Value operating hours counter" 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 counter must be set on the parameter page "Relay output... -> VO... - General -> VO... - Operating hours counter".

- ■ Set the parameter "Automatic transmission of numeric value" on parameter page "Relay output... -> VO... - General -> VO... - Operating hours counter" to "After change by interval value". Set the "Counting value interval (1…65535 h)" to the desired value.

The meter reading is transmitted to the KNX as soon as it changes by the predefined counting value interval. After bus voltage return or after an ETS programming operation, the object value is transmitted automatically and immediately if the current meter reading or a multiple of this corresponds to the counting value interval. A counter status "0" is always transmitted in this case.

- Set the parameter "Automatic transmission of counting value" to "Cyclical".

  The counter value is transmitted cyclically. The cycle time is defined centrally for all the valve outputs on the parameter page "General valve outputs". After bus voltage return or ETS programming, the counter status is transmitted to the KNX after the configured cycle time has elapsed.

4.2.4.5 Functional description of the binary inputs

4.2.4.5.1 Channel-independent functions

Delay after bus voltage return

It is possible to specify separately for each binary input whether a reaction should take place after a device reset (bus voltage return or ETS programming operation). This means that a defined telegram can be transmitted to the KNX according to the input signal or with forced control. The configured" Delay after bus voltage return" for the inputs on the "General binary/analogue inputs" parameter page must have elapsed fully by the time the set reaction is executed. Within the delay, any pending edges or signals at the inputs are not evaluated and are ignored. The delay time is configured generally for all the inputs.

i Inputs configured to the "Switching" function can send the object value cyclically. The cyclical transmission can start automatically after bus voltage return or after an ETS programming operation. In this case, the "Delay after bus voltage return" prevents the cyclical transmission. A cyclical transmission is first performed after the delay time has elapsed.

Debounce time

On the parameter page "General binary/analogue inputs", the debounce time of the signal is defined by the device software via the parameter "debounce time". The debounce time enables you to jointly define for all binary inputs after which activation period the binary inputs identify a valid actuation of the connected contacts. In this way, it is possible to prevent the device from mistakenly identifying short conduction faults as a signal. The debounce time makes it possible to adapt the signal evaluation to the contact quality of the connected switches or push-buttons as well.
The debounce time must be increased in the ETS if undesirable signal evaluations with very fast edge changes occur regularly or sporadically resulting in rapidly changing states of the bus telegrams.

4.2.4.5.2 Switching function

For each input whose function is set to "Switching", the ETS displays two 1-bit communication objects (switching object X.1 and X.2). It is possible to use these two objects to transmit different switching telegrams to the KNX depending on the signal edge at the input. Using the parameters of the input on the parameter page "Binary input... -> BI... - Function" can be used to define which object value is transmitted to the KNX when there is a rising or falling edge at the input (no reaction, ON, OFF, TOGGLE - switchover of the object value). No distinction is made between a brief or long signal edge/actuation in the "Switching" function.

Response to bus voltage return
After a device reset (bus voltage return or ETS programming operation), the communication objects of the input can be initialised. For this, the "Behaviour on bus voltage return" parameter should be configured to the required reaction. In the settings "On telegram" or "Off telegram" telegrams are transmitted actively to the KNX according to this requirement. In the "Transmit current input status" setting, the device evaluates the static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge). If, in this case, the edge command dependent on the current status is configured to "no reaction", the device does not transmit a telegram to the KNX on initialisation.
If, in the ETS, a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.

Cyclical transmission
Optionally, the object values can be transmitted cyclically to the KNX for the "Switching" function. For this, the transmission criteria must first be defined in the ETS. The "Transmit cyclically ?" parameter on the parameter page "Binary input... -> BI... - Transmit cyclically" specifies with which value cyclical transmission should take place. Depending on requirements, it is possible to transmit cyclically via both or just one switching object(s). In addition, it is possible to define the cycle time separately for both switching objects in the ETS.
The object value entered in the switching objects by the device on a edge change or externally by the KNX is always transmitted cyclically. The object value is then also transmitted cyclically when "no reaction" is assigned to a rising or falling edge. Cyclical transmission also takes place directly after bus voltage return, if the object (possibly influenced by the parameter "Reaction after bus voltage return") corresponds to the transmission criterion for cyclical transmission. A "Delay after bus voltage return", if configured, is expected in this case.
During an active disable, no cyclical transmissions take place via the disabled input.

4.2.4.5.3 Dimming function

For each input whose function is set to "Dimming", the ETS indicates a 1-bit "Switching" and a 4-bit "Dimming" object. In general, the device transmits a switching telegram on a short time input signal (triggered by the rising edge of a closed contact) and a dimming telegram on a long signal. In the standard configuration, the device transmits a telegram for stopping the dimming action after a long signal.
The length of time the input signal (closed push-button or switch) must last until a long actuation is detected can be set using the parameter "Time between switching and dimming" on the parameter page "Binary input... -> BI... - Function".

Operating principle
The "Operation" parameter specifies the operating principle. In the presetting of the dimming function, dual-area operation is specified here. This means that the input transmits a telegram for switching on after a short signal length and a telegram for increasing the brightness after a long signal length ("Brighter"). Alternatively, the device can transmit a telegram for switching off after a short signal length and a telegram for reducing the brightness after a long signal length ("Darker").
With a single-surface dimming function, the input transmits switch-on and switch-off telegrams ("TOGGLE") in an alternating pattern for each short signal. After long signals, the device transmits "brighter" and "darker" telegrams in an alternating pattern.

i With single-surface dimming, the following should be observed: if a dimming actuator is to be controlled from several locations, a faultless single-area operation requires that the addressed actuator reports its switching state back to the 1-bit object of the input and that the 4-bit objects of all the sensors are interlinked. The sensor 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.

Using the additional parameters of the input on the parameter page "Binary input... -> BI... - Function", it is possible to specify in which step width brighter or darker dimming takes place, whether a stop telegram is transmitted on a falling edge or whether the dimming telegram is to be repeated cyclically.

Response to bus voltage return
After a device reset (bus voltage return or ETS programming operation), the communication object "Switching" of the input can be initialised. For this, the "Behaviour on bus voltage return" parameter should be configured to the required reaction. In the settings "On telegram" or "Off telegram" telegrams are transmitted actively to the KNX.
If, in the ETS, a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.
After a device reset, the "Dimming" object is always initialised with "0".

4.2.4.5.4 Blind function

For each input, whose function is set to "Venetian blind", the ETS indicates the two 1-bit objects "Short time operation" and "Long time operation".
For the control of Venetian blind, roller shutter, awning or similar drives, the device supports two operation concepts for the Venetian blind function in which the telegrams are transmitted in different time sequences. The device can therefore be used to operate a wide variety of drive configurations. In the ETS, the operating concept of an input is defined using the parameter of the same name on the parameter page "Binary input... -> BI... - Function". The following settings are possible...

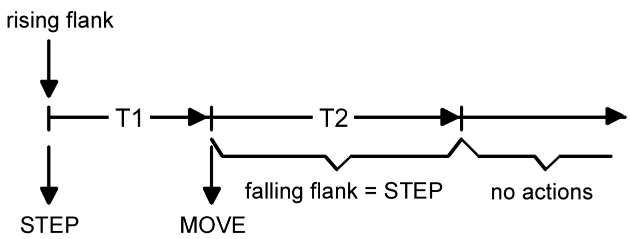

Figure 54: Operation concept "short – long – short"

Operation concept "short – long – short"
In the operation concept "short – long – short", the input shows the following behaviour:

- Immediately after a rising edge (closed push-button or switch) the input transmits a short time telegram onto the KNX. Pressing the button stops a running drive and starts time T1 ("time between short time and long time operation"). If the a falling edge is detected within T1 (closed push-button or switch), no further telegram will be transmitted. This short time serves the purpose of stopping a continuous movement.
  The "Time between short time and long time command" in the input parameters should be selected shorter than the short time operation of the actuator to prevent a jerky movement of the shutter.
- If the button is kept depressed longer than T1, the input transmits a long time telegram after the end of T1 for starting up the drive and time T2 ("slat adjusting time") is started.
- If a falling edge is detected within the slat adjustment time, the input transmits an additional short time telegram. This function is used for adjusting the slats of a blind. The function permits stopping the slats in any position during their rotation.
  The "slat adjusting time" should be chosen as required by the drive for a complete rotation of the slats. If the "slat adjusting time" is selected longer than the complete travelling time of the drive, a pushbutton function is possible as well. This means that the drive is active only when a button connected to the input is kept depressed.
- If the button is kept depressed longer than T2, the input transmits no further telegram. The drive remains on until the end position is reached.

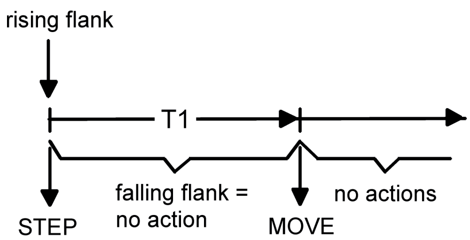

Figure 55: Operation concept "long – short"

Operation concept "long – short":
In the operation concept "long – short", the input shows the following behaviour:

- Immediately on pressing the button, the input transmits a long time telegram. The drive begins to move and time T1 ("slat adjusting time") is started.
- If a falling edge is detected within the slat adjustment time, the input transmits a short time telegram. This function is used for adjusting the slats of a blind. The function permits stopping the slats in any position during their rotation.
  The "slat adjusting time" should be chosen as required by the drive for a complete rotation of the slats. If the "slat adjusting time" is selected longer than the complete travelling time of the drive, a pushbutton function is possible as well. This means that the drive is active only when a button connected to the input is kept depressed.
- If the button is kept depressed longer than T1, the input transmits no further telegram. The drive remains on until the end position is reached.

Edge evaluation

The parameter "Command on rising edge" on the parameter page
"Binary input... -> BI... - Function" specifies the direction of movement of the short time or long time telegram. In the "TOGGLE" setting (single-area operation) the input switches the direction of the short and long time telegram each time there is a new signal. Several short time telegrams in succession have the same direction.

i If the actuator is to be controlled from several locations, a faultless single-area operation requires that the all long time objects of the sensor devices are interlinked. A sensor 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.

Response to bus voltage return

After a device reset (bus voltage return or ETS programming operation), the communication object "Long time operation" of the input can be initialised. For this, the "Behaviour on bus voltage return" parameter should be configured to the required reaction. In the settings "Up" or "Down", telegrams are transmitted actively to the KNX.
If, in the ETS, a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.
After a device reset, the "Short time operation" object is always initialised with "0".

4.2.4.5.5 Value transmitter / Light scene extension function

For each input whose function is set to "Value transmitter", the ETS indicates either a 1-byte or a 2-byte object. The data format of the value object is dependent on the set function of the value transmitter. The parameter "Function as" on the parameter page
"Binary input... -> BI... - Function" defines the function on one of the following value transmitter applications...

- Dimming value transmitter (1-byte),
- Light scene extension without memory function (1-byte),
- Light scene extension with memory function (1-byte).
- Temperature value transmitter (2-byte),
- Brightness value transmitter (2-byte),
- Value transmitter (2-byte)

The dimming value transmitter, temperature and brightness value transmitter and 2-byte value transmitter differ in data format and in the range of values. The independent function of the light scene extension is special and is described below.

Dimming value transmitter, temperature and brightness value transmitter, value transmitter 2-byte

In the function as a dimming value transmitter, the input can transmitted unformatted integers in the range 0 ... 255 to the KNX. As a brightness value transmitter, the input transmits formatted floating point values in the range 0 … 1500 Lux and, as a temperature value transmitter, in the range 0 … 40 °C. Unformatted integers in the range 0...65,535 can be transmitted as 2-byte value transmitters.
The following table shows a summary of the value ranges of the value encoders. The values to be transmitted are configured in the ETS and can be adjusted later during device operation (see value adjustment below).
The edge evaluation of the device means that it can transmit values only on a rising edge, only on a falling edge or on a rising and falling edge. In this way, it is possible to make adjustments to the contact connected at the input (push-button as NC contact or NO contact and switch).

Value transmitter type	Function	Lower numerical limit	Upper numerical limit
Dimming value transmitter	0 ... 255	0	255
Temperature value transmitter	Temperature value	0 °C	40 °C
Brightness value transmitter	Brightness value	0 lux	1.500 lux
Value transmitter 2-byte	0...65,535	0	65,535

Value ranges of dimming value transmitter, temperature and brightness value transmitter, value transmitter 2-byte

Value adjustment for dimming value transmitter, temperature and brightness value transmitter, value transmitter 2-byte

With the dimming value transmitter, the temperature and brightness value transmitter and 2-byte value transmitter, the value to be transmitted can be adjusted at any time during device operation. A value adjustment can only be configurable in the ETS when the value is to be transmitted only on a rising edge or only on a falling edge, i.e. a push-button is connected to the input.
A value adjustment is introduced by a long signal at the input (> 5 s) and continues for as long as the signal is detected as active, i.e. the push-button is actuated. With the first adjustment after commissioning, the value programmed by the ETS is increased cyclically by the configured step width and transmitted. The step width of the temperature value transmitter (1 °C) and the brightness value transmitter (50 Lux) is permanently defined. The previously transmitted value is saved after releasing the pushbutton. The next long pushbutton actuation adjusts the saved

value and the direction of the value adjustment changes.
The time between two telegrams on adjusting values can be configured in the ETS.

Example of value adjustment (figure 56):
- Function as dimming value transmitter
- Transmit value on = Rising edge
- Value configured in the ETS for rising edge = 17
- Step width = 5

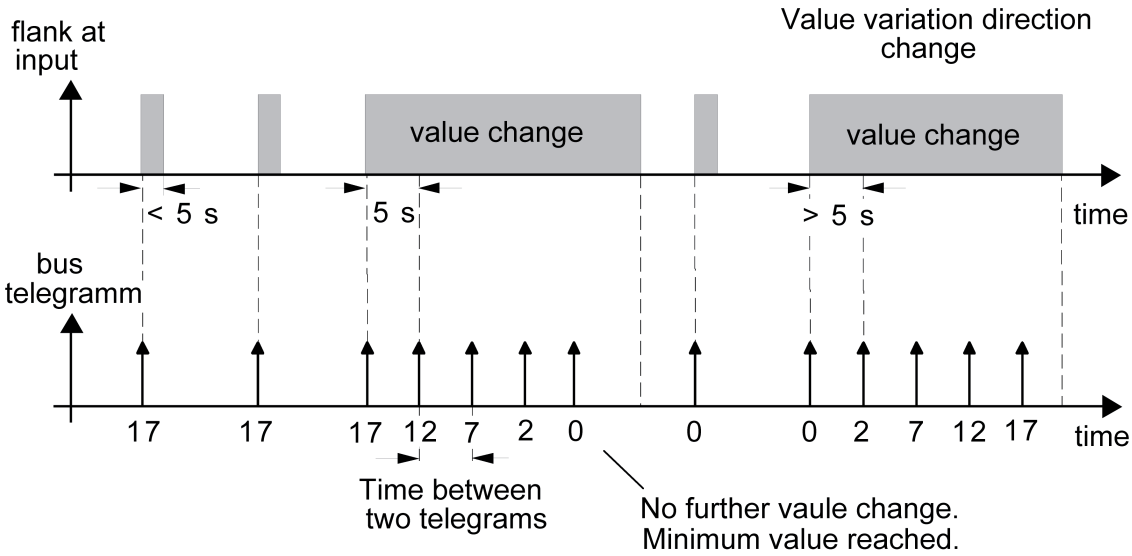

Figure 56: Example to change the value for dimming value transmitter

- ⓘ There is no value over- or underrun on adjustment. If, during an adjustment, the maximum or minimum value is reached (see Table), no more telegrams are transmitted.
- ⓘ To ensure that, during a value adjustment, for example the controlled lighting switches off or switches on at the maximum, the limit values (e.g. the values "0" or "255") are always transmitted when the limits of the adjustable range are reached. This also takes place when the configured step width of these values is not immediately taken into account (see example above: step width = 5; value "2" is transmitted, then value "0").
  In this case, to ensure that the original starting value can be reset on resetting with a change to the adjustment direction, the first value jump is not equal to the preset step width (see example above: step width = 5; value "0" is transmitted, then values "2"; "7" etc.).
- ⓘ The newly adjusted values are stored in non-volatile memory. After a device reset (bus voltage failure or ETS programming operation), the adjusted values are replaced by the values originally configured in the ETS.

Light scene extension
With a configuration as a light scene extension without a memory function, it is possible to recall a light scene, which is stored in an external bus subscriber (e.g. light scene push-button sensor). With a rising, falling or rising and falling edge, the light scene number configured in the ETS is immediately transmitted to the KNX.
With a configuration as a light scene extension with a memory function, it is possible to generate a memory telegram according to the light scene to be transmitted. For this, the appropriate memory telegram is transmitted for a long signal according to the configured edge evaluation (push-button as NC contact or NO contact - not as switch!). In this case, the time for long actuation can be configured (but not to below 5 s). With short actuation < 1 s, the configured light scene number (without memory telegram) is transmitted. If the actuation last longer than 1 s but less than 5 s, no telegram is triggered.
In addition, there is the option of only transmitting a memory telegram without prior light scene

recall. In this case, the parameter "Only memory function ?" must be set to "Yes".

Examples for a light scene extension with memory function (figure 57):
1.) Only memory function = No
2.) Only memory function = Yes

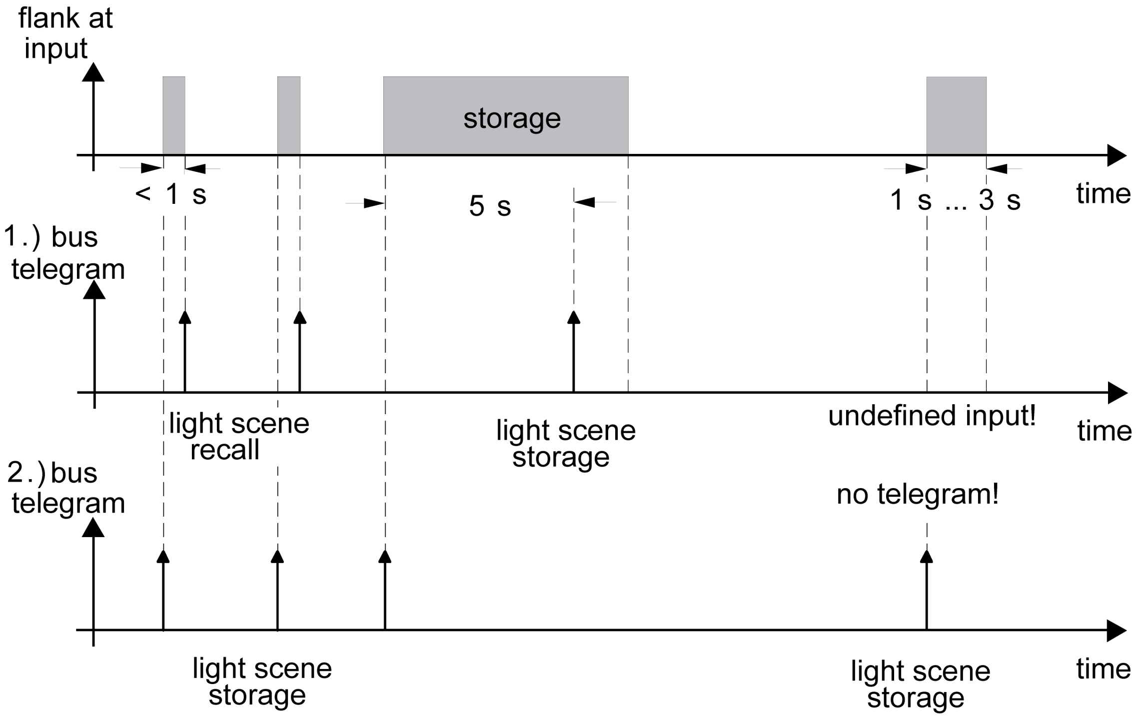

Figure 57: Example of scene storage

"Only memory function = No":
If a rising or falling edge is detected at the input (according to the configuration), the time recording operation begins. If actuation ceases during the first second, the appropriate light scene recall takes place immediately. If the signal length is longer, then the memory telegram is transmitted after 5 s.

"Only memory function = Yes":
The memory telegram is transmitted immediately after detection of the appropriate signal edge.

Behaviour on bus voltage return for value transmitter and light scene extension
After a device reset (bus voltage return or ETS programming operation), the communication object of the value transmitter or light scene extension can be initialised. For this, the "Behaviour on bus voltage return" parameter should be configured to the required reaction. The setting is dependent on the value transmitter function and edge evaluation selected in the ETS. In the settings "Reaction as rising edge" or "Reaction as falling edge", telegrams are transmitted actively to the KNX according to the configuration in the ETS. In the "Transmit current input status" setting, the device evaluates the static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge). This setting can only be configured with "Transmit value on = rising and falling edge (switch)".
If, in the ETS, a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.

4.2.4.5.6 Function HVAC value transmitter (operating mode switchover)

For each input whose function is set to "HLK value transmitter (operating mode switchover)", the ETS displays a 1-byte object in accordance with KNX DPT 20.102. In this function, the input can be used to influence the operating mode of a room temperature controller. The following table shows the defined operating modes and the dependent telegram values, which can be transmitted to the KNX on a rising or falling signal edge. The operating modes to be transmitted are configured in the ETS and cannot be adjusted later during device operation (see value adjustment below).
The edge evaluation of the device means that it can transmit values only on a rising edge, only on a falling edge or on a rising and falling edge. In this way, it is possible to make adjustments to the contact connected at the input (push-button as NC contact or NO contact and switch).

Operating mode	**Telegram value**
Automatic mode	0
Comfort mode	1
Standby mode	2
Night operation	3
Frost/heat protection mode	4

Operating modes and telegram values of the HLK value transmitter

Response to bus voltage return
After a device reset (bus voltage return or ETS programming operation), the communication object of the value transmitter can be initialised. For this, the "Behaviour on bus voltage return" parameter should be configured to the required reaction. The setting is dependent on the value transmitter function and edge evaluation selected in the ETS. In the settings "Reaction as rising edge" or "Reaction as falling edge", telegrams are transmitted actively to the KNX according to the configuration in the ETS. In the "Transmit current input status" setting, the device evaluates the static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge). This setting can only be configured with "Transmit value on = rising and falling edge (switch)".
If, in the ETS, a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.

4.2.4.5.7 2-channel operation function

In some situations, it is desirable to control two different functions with the actuation of only one push-button or switch and to transmit different telegrams, i.e. to operate two function channels at a time. This is possible with the "2-channel operation" function.
For both channels, the parameters "Function channel 1" and "Function channel 2" can be used to determine the communication object types to be used. The following types are available for selection…

- Switching (1 bit)
- Value transmitter 0 … 255 (1-byte)
- Value transmitter 0 … 100 % (1-byte)
- Temperature value transmitter (2 byte)

The object value the binary input is to transmit on a rising edge at the signal input can be selected depending on the selected object type. The "Switching (1-bit)" type permits selecting whether an ON or an OFF telegram is to be transmitted or whether the object value is be switched over (TOGGLE) and transmitted on a rising edge.
The configuration as "Value transmitter 0 … 255 (1 byte)" or as "Value transmitter 0 … 100 % (1 byte)" permits entering the object value freely within a range from 0 to 255 or from 0% to 100%. The "Temperature value transmitter (2 bytes)" permits selecting a temperature value between 0°C and 40°C.

In this case, the adjustment of the object value on a long button-press is not possible as the determination of the actuation length is needed for the adjustable operation concepts.

<u>Operation concept channel 1 or channel 2</u>
In this operation concept, exactly one telegram will be transmitted on each rising edge.

- With a brief signal length, the binary input transmits the telegram for channel 1.
- With a long signal length, the binary input transmits the telegram for channel 2.

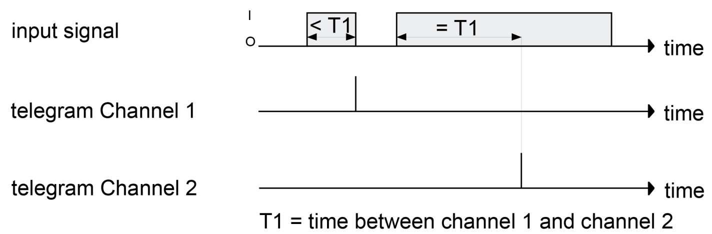

Figure 58: Example of operation concept "Channel 1 or Channel 2"

The time required for distinguishing between a short and a long signal is defined by the parameter "Time between channel 1 and channel 2". If the signal is shorter than the configured time, only the telegram to channel 1 is transmitted. If the signal time between channel 1 and channel 2 is exceeded, only the telegram to channel 2 will be transmitted. This concept provides the transmission of only one channel.

<u>Operation concept channel 1 and channel 2</u>
With this operation concept, one or alternatively two telegrams can be transmitted on each rising edge.

- With a brief signal length, the binary input transmits the telegram for channel 1.
- With a long signal length, the binary input first transmits the telegram for channel 1 and then the telegram for channel 2.

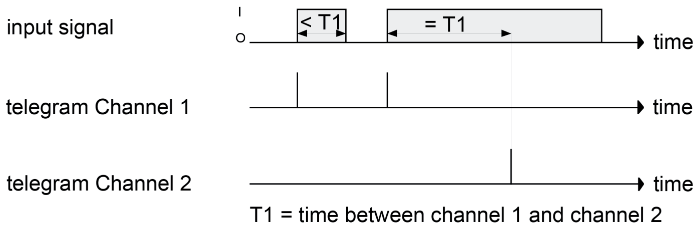

Figure 59: Example for operation concept "Channel 1 and channel 2"

The time required for distinguishing between a short and a long signal is defined by the parameter "Time between channel 1 and channel 2". With a rising edge in this concept, the telegram is immediately sent to channel 1. If the input signal is pending for longer than the configured time after the rising edge, then the telegram for the second channel is also sent. If the input signal falls back before the time has elapsed, no further telegram will be transmitted.

Response to bus voltage return
With 2-channel operation, the behaviour after bus voltage return is always set to "No reaction". In consequence, this function also reacts passively after a device reset. Should the contact at the input be closed after bus voltage return, then the input must first detect a falling edge and then a rising edge to execute the configured channel reaction.

4.2.4.5.8 Disabling functions

The binary inputs can be separately disabled via the KNX using 1-bit objects. With the "Switching" function, it is possible to disable the two switching objects of an input independently of each other.

i Binary inputs with the function "2-channel operation" can only be disabled for "Switching" channel functions. No disabling function is available in the "Value transmitter" and "Temperature value transmitter" channel functions.

With an active disabling function, signal edges at the input are ignored by the device related to the affected objects. Each input or each switching object can execute a specific independent reaction at the beginning or end of a disable. This reaction is specified in the ETS on the parameter page "Binary input... -> BI... - Disable" and is dependent on the edge evaluation defined for the affected input. In so doing, it is possible to configure to "no reaction". Only in this case are dimming or Venetian blind control operations or value adjustments completed during an active disable and only then the input locked. In all other cases, the configured disabling command is executed immediately at the beginning of disabling.
In the "Transmit current input status" setting, the device evaluates the actual static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge).

A disabling function is activated or deactivated by the corresponding 1-bit object. The telegram polarity can be set in the ETS for each disabling object. The disabling object is always inactive after a device reset. Even with an inverted polarity "Disabling = 0 (Enabling = 1)", a "0" telegram must first be received after a reset until the appropriate disabling function is activated.

i Updates to disabling objects with the same telegram polarity (disabling -> disabling or enabling -> enabling) do not show a reaction.

i With cyclical transmission in the "Switching" function: during an active disable, cyclical transmission does not take place via the disabled input switching object. Cyclical transmission is continued immediately at the end of the disabling with the last object value written to the object, provided that the transmit criterion for cyclical transmission is fulfilled ("transmit on ON, on OFF" or "on ON and OFF").

4.2.4.6 Functional description of the analogue inputs

The actuator possesses 2 analogue inputs, to which external temperature sensors (see Accessories) can be connected as required. These temperature sensors can be used to detect room temperatures, which can be fed to one of the internal room temperature controllers or other bus devices via the KNX.
The actuator evaluates a temperature sensor connected to an analogue input if the "Function" parameter on the parameter page "Analogue output... -> AI... - Function" is configured to "Input for temperature sensor". Otherwise, the corresponding analogue input is deactivated.

If using temperature measurement, then, when choosing the mounting location of the external temperature sensor, the following points must be considered:

- Do not install temperature sensors in the area of large electrical consumers (avoid heat influences).
- The push button sensor should not be installed in the vicinity of radiators or cooling systems.
- Avoid direct sunlight onto the sensors.
- The installation of the sensors on the inside of an outside wall might have a negative impact on the temperature measurement.
- The sensors should be installed at least 30 cm away from doors, windows or ventilation units.

Temperature calibration

In some cases during room temperature measurement, it may be necessary to calibrate the temperature values of an external sensor. Calibration becomes necessary, for example, if the temperature measured by the sensor 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.
The "Sensor calibration" parameter on the parameter page "Analogue input... -> AI... - Function" allows configuration of 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 only set statically once.

ⓘ 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.

ⓘ The analogue input always transmits the calibrated temperature value to the KNX or the internal group communication.

Transmission of room temperature

The determined room temperature can be transmitted to the KNX or the internal group communication via the 2-byte "Temperature sensor" object. The parameter "Transmission after room temperature change by..." on parameter page "Analouge input... -> AI... - Function" specifies the temperature value by which the actual value has to change in order to have the room temperature value transmitted automatically. Possible temperature value changes lie within a range of 0.1 K and 25.5 K. If "0" is selected, the automatic transmission of the room temperature.

In addition, the actual value can be transmitted periodically. The "Cyclical transmission of the room temperature" parameter determines the cycle time (1 to 255 minutes). The value "0" will deactivate the periodical transmission of the room temperature value.
Setting the "Read" flag on the "Temperature sensor" object makes it possible to read out the current actual value at any time over the KNX. It has to be pointed out that with deactivated periodical transmission and deactivated automatic transmission, no more room temperature telegrams will be transmitted in case of a change.

i The time between two temperature telegrams is always at least 10 seconds.

The object is updated according to the detected room temperature and transmitted to the KNX after bus voltage return or an ETS programming operation. If a "Delay after bus voltage return" is configured on the "General binary/analogue inputs" parameter page, then this time must have elapsed so that a telegram can be transmitted.

4.2.4.7 Functional description of the 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 internally linked to the valve outputs of the actuator, meaning that temperature control and valve 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 as the valve outputs can also be activated individually 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, operating mode switchover, switchover of the operating mode) 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.

4.2.4.7.1 Operating modes and operating mode change-over

Introduction

A room temperature controller distinguishes between two different operating modes. The operating modes specify whether you want the controller to use its variable 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. The parameter "Operating mode" in the "Room temperature control -> RTCx - General" parameter branch specifies the operating mode 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 operating mode. 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...

- "Switchover between heating and cooling" parameter in the "Room temperature control -> RTCx - General" parameter branch set to "Automatic".
  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 temperature for heating or cooling. If the room temperature is higher than the cooling setpoint temperature, cooling will take place. If the room temperature is higher than the heating setpoint temperature, heating will take place.
  When the operating mode is changed over automatically, the information can be actively sent to the bus via the object "Heating/cooling switchover" 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 heating/cooling change-over" parameter enables cyclic transmission (factor > "0" setting) 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).

- "Switchover between heating and cooling" parameter in the "Room temperature control -> RTCx - General" parameter branch set to "Via object".
  In this case, the operating mode is controlled via the "Heating/cooling switchover" 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 operating mode 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 "Heating/cooling switchover" object has the following polarities: "1": Heating; "0": Cooling. After a reset, the object value will be "0", and the "Heating/cooling operating mode change-over after reset" set in the ETS will be activated. You can use the "Heating/cooling operating mode after reset" parameter to set which mode you want to activate after a reset. For the "Heating" or "Cooling" settings, the controller will activate the configured heating/cooling operating mode immediately after the initialisation phase. In case of parameterisation "Operating mode before reset" the operating mode which was selected before the reset will be activated.

i 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 operating mode automatically, which is why, in this configuration, the setting for the parameter "Switchover between heating and cooling" is fixed in the ETS to "Via object".

ⓘ It is not possible to heat and cool at the same time (both command values for heating and cooling > "0"). With pulse width-modulated command value output (PWM), the command values are only adjusted by the controller at the end of a PWM cycle. The controller always recalculates and updates signal telegrams (1-bit) for "heating" and "cooling" cyclically every 30 seconds. The different update intervals for the PWM command values and the signal telegrams mean that there may be a brief overlap of the request for heating or cooling energy by the command values and by the signal telegrams at the transition between heating and cooling. This overlapping is corrected automatically at the end of a PWM cycle by adjusting the command values.

Heating/cooling message

Depending on the set operating mode, 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 through the "Heating" signal object. The signal telegram is only reset when the command value is "0" ("0" telegram is transmitted). The same applies to the signal object for cooling.

The signal objects can be enabled by the "Heating message" or "Cooling message" parameters in the "Room temperature control -> RTCx - General -> RTCx - Command value and status output" parameter branch. The control algorithm controls the signal objects. Please note that the command values are recalculated every 30 s, thus updating the signal objects.

ⓘ With pulse width-modulated command value output (PWM), the command values are only adjusted by the controller at the end of a PWM cycle. The different update intervals for the PWM command values and the signal telegrams mean that there may be a brief overlap of the request for heating or cooling energy by the command values and by the signal telegrams at the transition between heating and cooling. This overlapping is corrected automatically at the end of a PWM cycle by adjusting the command values.

ⓘ It should be noted that, with a 2-point feedback control, the signal objects for heating and cooling will already become active as soon as the temperature falls short of the temperature setpoint of the active operating mode in case of heating or exceeds the temperature setpoint in case of cooling. In this case, the configured hysteresis is not taken into account.

ⓘ The optional floor temperature limit does not influence the "Heating" message telegram. If the floor temperature exceeds the set limiting value, only the command value is switched off. In this case, the "Heating" message remains active.

4.2.4.7.2 Control algorithms and calculation of command values

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 actuator 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 (figure 60).

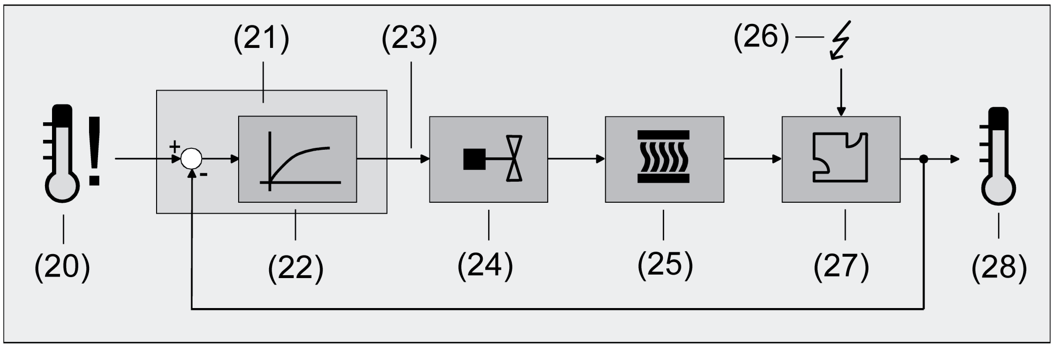

Figure 60: Controlled system of single-room temperature control

(20) Setpoint temperature specification
(21) Room temperature controller
(22) Control algorithm
(23) Command value
(24) Valve control (actuating drive, ETD, heating actuator, ...)
(25) Heat / cold exchanger (radiator, cooling ceiling, FanCoil, ...)
(26) Fault variable (sunlight penetration, outdoor temperature, illumination systems, ...)
(27) Room
(28) Actual temperature (room temperature)

The controller evaluates the actual temperature (28) and compares it with the specified setpoint temperature (20). With the aid of the selected control algorithm (22), the command value (23) 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 (24), meaning that heating or cooling energy in the heat or cold exchangers (25) is passed into the room (27). Regular readjustment of the command value means that the controller is able to compensate for setpoint / actual temperature differences caused by external influences (26) 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 actuating 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 send it to the bus via a 1-byte value object, if the calculated command value has changed by a specified percentage. You can use the "Automatic transmission on change by…" parameter in the "Room temperature control -> RTCx - General -> RTCx - Command value and status output" parameter branch to set the change interval in percent.

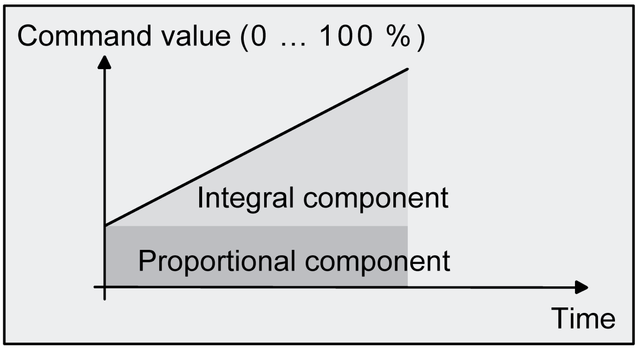

Figure 61: Continuous PI control

An additional heating or cooling level as PI control works in the same way as the PI control of the basic level, with the exception that the setpoint will shift, taking account of the configured level 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 after the cycle time has elapsed. The mean value of the command value signal resulting from this modulation is a measure for the averaged position of the control valve, thus being a reference to the room temperature set, taking account of the cycle time which you can set through the "Cycle time of the switching command value…" parameter in the "Room temperature control -> RTCx - General -> RTCx - Command value and status output" parameter branch.
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. The duty factor will be adapted by the regulator only at the end of a time period, depending on the variable calculated. This applies to any change of the command value, regardless of what

the ratio is by which the command value changes (the "Automatic transmission on change by…" and "Cycle time for automatic transmission..." parameters will have no function in this case). Each command value calculated last during an active time period will be converted. Even after you have changed the setpoint temperature, for example, by switching over the operating mode, the command value will still be adapted after the end of an active cycle time. The diagram below shows the output command value switching signal according to the internally calculated command value (first of all, a command value of 30 %, then of 50 %, with the command value output not being inverted).

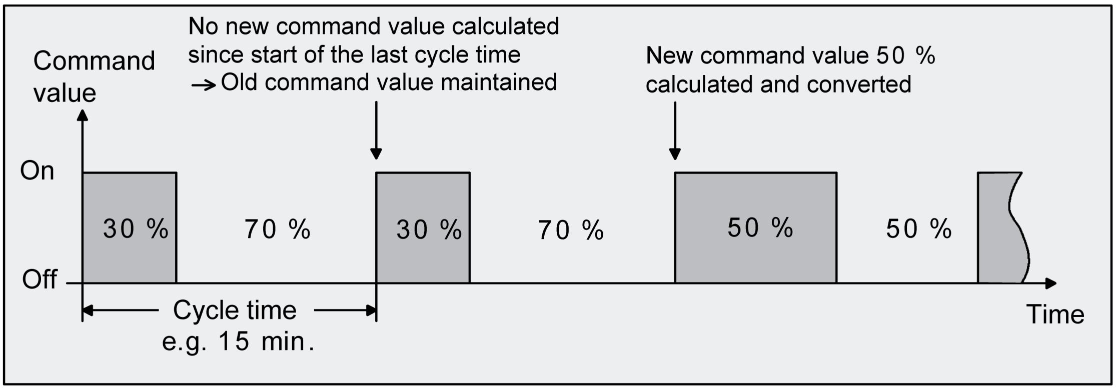

Figure 62: Switching PI control

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 and will only take place after the configured cycle time has elapsed. The parameters "automatic transmission on change by..." and "Cycle time for automatic transmission..." parameters will have no function in this case. An additional heating or cooling level 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 configured level width. All PWM control options will use the same cycle time.

Cycle time:

The pulse-width-modulated command values are mainly used for activating electrothermal drives (ETD). In this regard, the room temperature controller sends the switching command value telegrams to a 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 actuators 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 actuators do not show any response when being switched 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 x adjusting cycle time of the electrothermal drives used (ETD)

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.

- i This setting is recommended for 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.

Case 2: Cycle time < adjusting cycle time of the electrothermal drives used (ETD)

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 actuator is triggered the regulator can continuously adapt the variable 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 variable (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).

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 continuous variable 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.

<u>"Heating" or "cooling" single operating modes:</u>

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, variable "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.

i It has to be pointed out that the message objects for heating and cooling already become active as soon as the temperature falls short of the temperature setpoint of the active operating mode in case of heating or exceeds the temperature setpoint in case of cooling. In this case the hysteresis is not being considered.

The following two images each show a 2-point feedback control for the individual operating modes "Heating" (figure 63) or "Cooling" (figure 64). The images take two temperature setpoints, one-stage heating or cooling and non-inverted command value output into account.

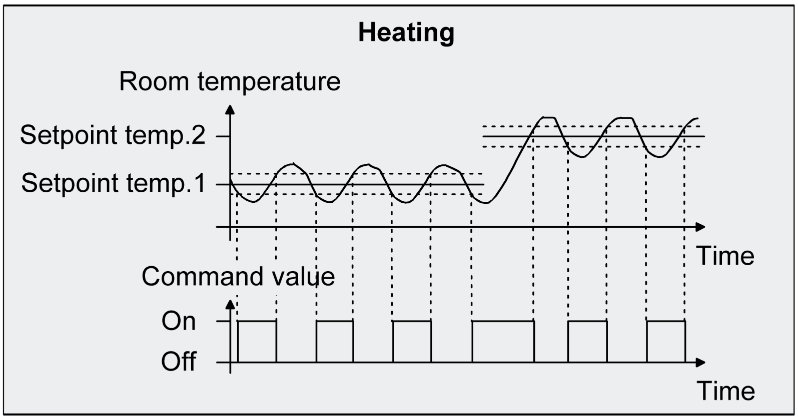

Figure 63: 2-point feedback control for the single "Heating" operating mode

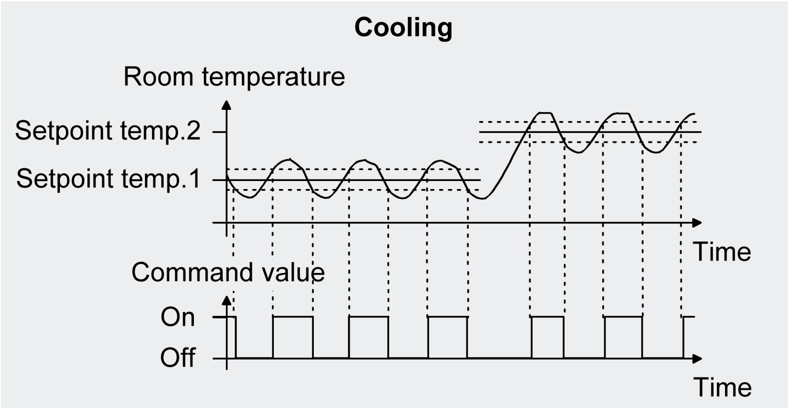

Figure 64: 2-point feedback control for the single "Cooling" operating mode

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. Similarly, 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 operating mode change-over via the object, in the 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. Similarly, 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 modes of heating or cooling, there are two hysteresis limits per operating mode. 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 control 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.

ⓘ Also with an automatic operating mode switch, an upper hysteresis limit for heating and a lower hysteresis limit for cooling can be configured in the ETS for 2-point feedback control, although they have no function.

The following two images show 2-point feedback control for the mixed operating mode "Heating and cooling", distinguishing between heating mode (figure 65) and cooling mode (figure 66). The images take two temperature setpoints, a non-inverted command value output and an automatic operating mode switchover into account. When the operating mode is switched over via the object, an upper hysteresis for heating and a lower hysteresis for cooling are active.

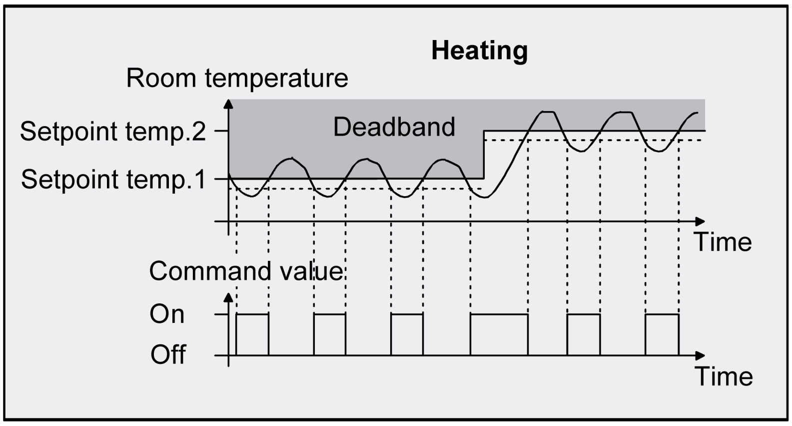

Figure 65: 2-point feedback control for mixed "Heating and cooling" mode with active heating mode.

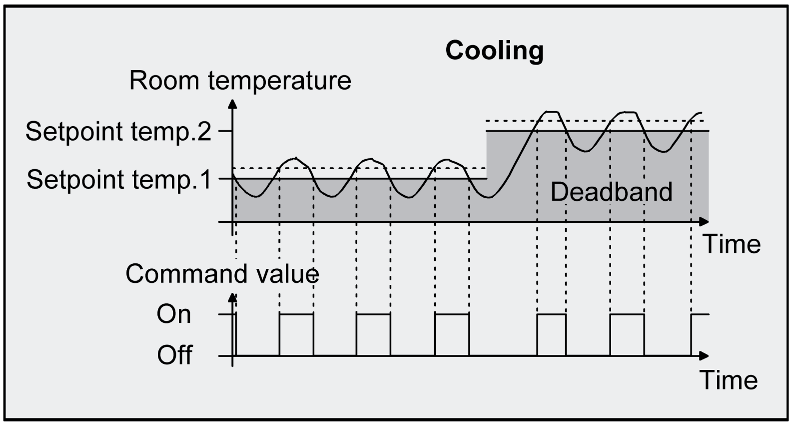

Figure 66: 2-point feedback control for mixed "Heating and cooling" mode with active cooling operation.

Depending on the switching state, the command value "1" or "0" will be output if the values exceed or remain under the hysteresis limits or the setpoints.

ℹ It has to be pointed out that the message objects for heating and cooling will already become active as soon as the temperature falls short of the temperature setpoint of the active operating mode in case of heating or exceeds the temperature setpoint in case of cooling. In this case the hysteresis is not being considered.

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.

4.2.4.7.3 Adapting the control algorithms

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	5 Kelvin	150 minutes	Continuous / PWM	15 min.
Underfloor heating	5 Kelvin	240 minutes	PWM	15-20 min.
Electrical heating	4 Kelvin	100 minutes	PWM	10-15 min.
Fan coil unit	4 Kelvin	90 minutes	Continuous	---
Split unit (split climate control unit)	4 Kelvin	90 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	5 Kelvin	240 minutes	PWM	15-20 min.
Fan coil unit	4 Kelvin	90 minutes	Continuous	---
Split unit (split climate control unit)	4 Kelvin	90 minutes	PWM	10-15 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.

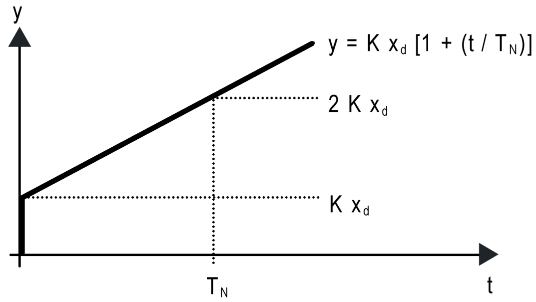

Figure 67: Function of the command value of a PI control

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

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.

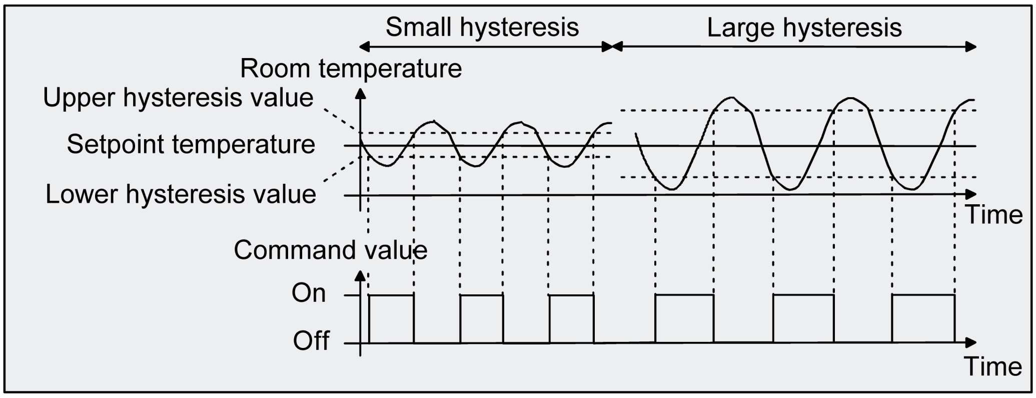

Figure 68: Effects of the hysteresis on the switching behaviour of the command value of 2-point feedback control

4.2.4.7.4 Operating mode switchover

Introduction - The 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 mode
  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 motion detector on the wall or a ceiling mounted detector.

- Standby mode
  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 operation
  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 mode /

  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 operating mode 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 modes can be switched over by means of the 1-bit communication object available separately for each operating mode, or alternatively, by means of the KNX operating mode objects. The "Operating mode switchover" parameter in the "Room temperature control -> RTCx - General" parameter branch specifies the switching method as follows...

- Operating mode switchover "Via switching (4 x 1-bit)"
  There is a separate 1-bit change-over object for each operating mode. Each of these objects allows the current operating mode to be specified, depending on the priority. Taking a specified 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 (figure 69) or the presence detector (figure 70). In addition, the status of the window in the room can be evaluated using the "Window status" object, meaning that, when the window is open, the controller can switch to Frost/heat protection mode, irrespective of the set operating mode, in order to save energy .

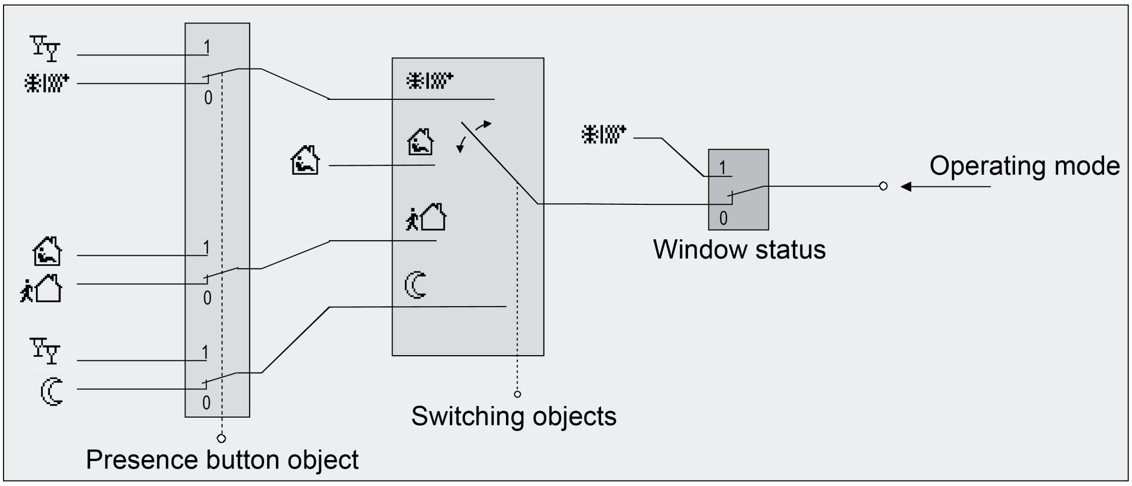

Figure 69: Operating mode change-over through 4 x 1-bit objects with presence button

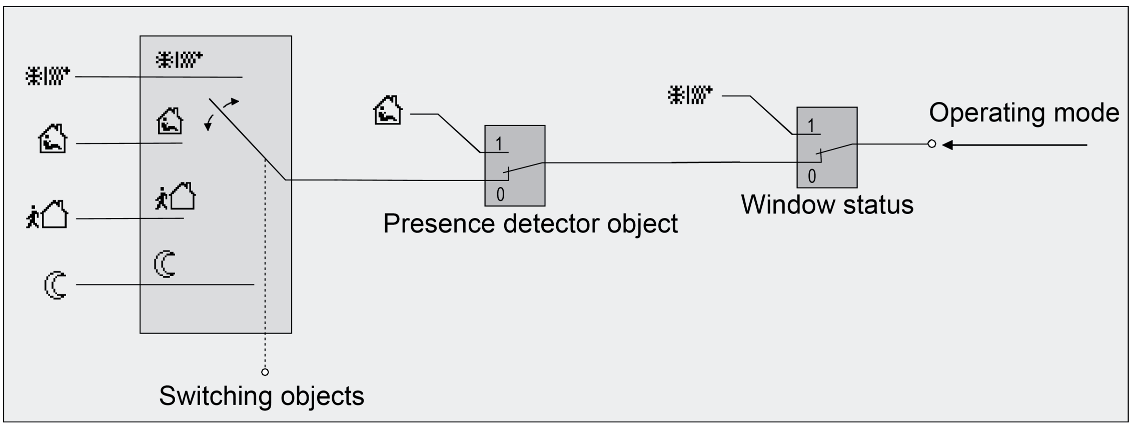

Figure 70: Operating mode change-over through 4 x 1-bit objects with presence detector

Obj. ❄|	Obj.	Obj.	Obj. ☾	Obj. Window status	Pres. button	Pres. detector	Resulting operating mode
1	X	X	X	0	0	-	Frost/heat protection
0	1	X	X	0	0	-	Comfort mode
0	0	1	X	0	0	-	Standby mode
0	0	0	1	0	0	-	Night operation
0	0	0	0	0	0	-	no change
X	X	X	X	1	X	-	Frost/heat protection
1	X	X	X	0	1	-	Comfort extension
0	1	X	X	0	1	-	Comfort mode
0	0	1	X	0	1	-	Comfort mode
0	0	0	1	0	1	-	Comfort extension
0	0	0	0	0	1	-	Comfort mode/extension *
1	X	X	X	0	-	0	Frost/heat protection
0	1	X	X	0	-	0	Comfort mode
0	0	1	X	0	-	0	Standby mode
0	0	0	1	0	-	0	Night operation
0	0	0	0	0	-	0	no change
X	X	X	X	1	-	X	Frost/heat protection
X	X	X	X	0	-	1	Comfort mode

Status of the communication objects and the resulting operating mode

X: Status irrelevant
-: Not possible
*: Dependent on the last active operating mode.

i After bus voltage recovery or an ETS programming operation (controller reset), the object which corresponds to the selected operating mode will be updated and its value actively transmitted to the bus, if the "Transmit" flag has been set.

i In parameterisation of a presence button: the presence object will be active ("1") for the period of an 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 was changed by the switchover objects. The controller therefore automatically resets the status of the presence button when an object is received via the operating mode objects.

- Operating mode change-over through "value (1 byte)"

  There is a common 1-byte switchover object for all operating modes. 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. Both 1-byte objects have been implemented according to the KNX specification.
  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 (figure 71) or the presence detector (figure 72). In addition, the status of the window in the room can be evaluated using the "Window status" object, meaning that, when the window is open, the controller can switch to Frost/heat protection mode, irrespective of the set operating mode, in order to save energy .

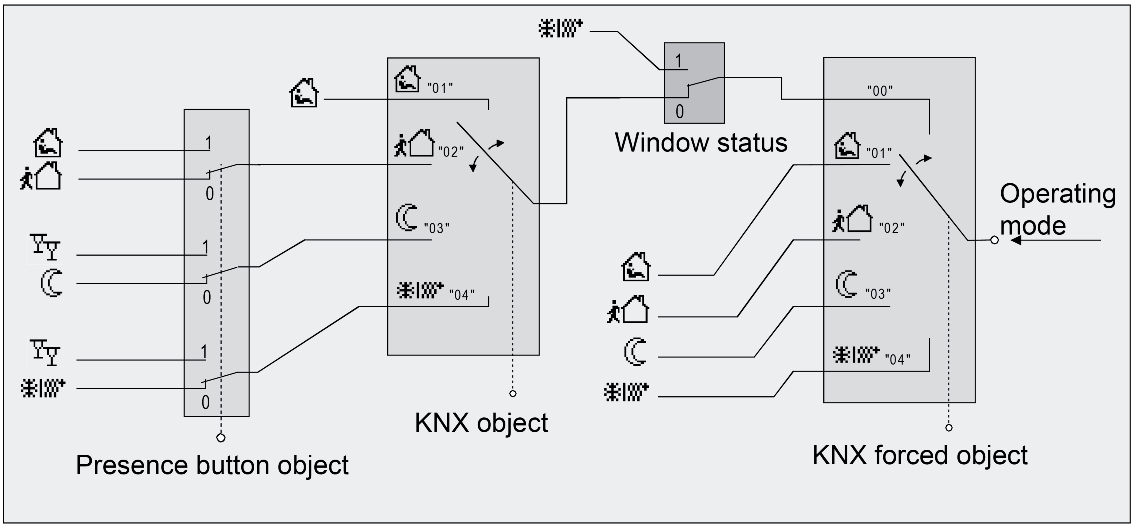

Figure 71: Operating mode switchover through KNX object with presence button

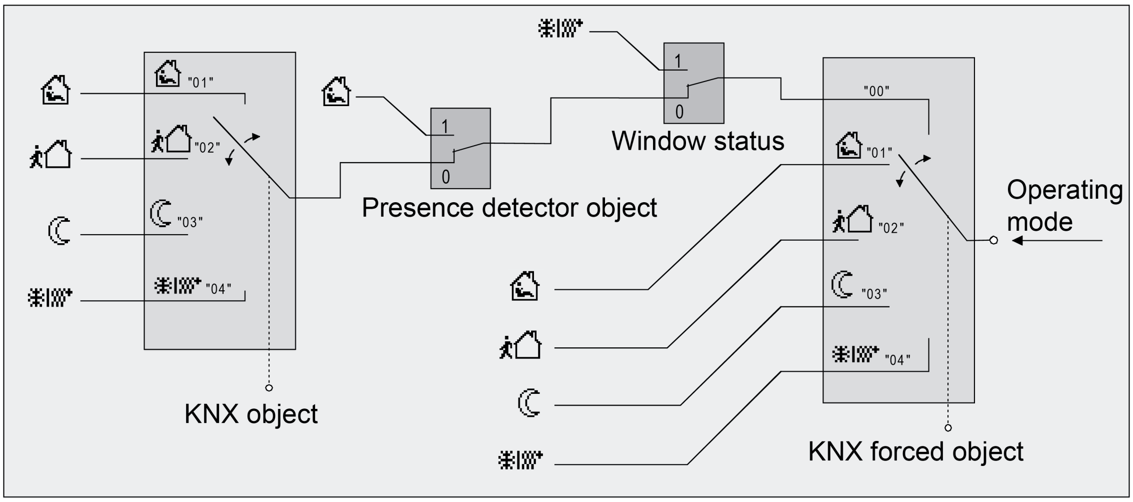

Figure 72: Operating mode switchover through KNX object with presence detector

Object value Operating mode switch-over	**Object value Forced object 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 mode
02	00	0	0	-	Standby mode
03	00	0	0	-	Night operation
04	00	0	0	-	Frost/heat protection
01	00	0	1	-	Comfort mode
02	00	0	1	-	Comfort mode
03	00	0	1	-	Comfort ex-tension
04	00	0	1	-	Comfort ex-tension
01	00	0	-	0	Comfort mode
02	00	0	-	0	Standby mode
03	00	0	-	0	Night operation
04	00	0	-	0	Frost/heat protection
X	00	0	-	1	Comfort mode
X	00	1	-	X	Frost/heat protection
X	00	1	X	-	Frost/heat protection
X	01	X	X	X	Comfort mode
X	02	X	X	X	Standby mode
X	03	X	X	X	Night operation
X	04	X	X	X	Frost/heat protection

Status of the communication objects and the resulting operating mode

X: Status irrelevant
-: Not possible

i After bus voltage recovery or an ETS programming operation (controller reset), the value which corresponds to the set operating mode is actively transmitted to the bus, if the "Transmit" flag has been 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 operation 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. In this regard, the "Presence detection" parameter in the "Room temperature control -> RTCx - General -> RTCx - Controller functionality" parameter node sets whether presence detection should be movement-controlled by a motion detector or manual through presence button actuation...

- Presence detection by the presence button
  If the presence button is configured for presence detection, then the 1-bit communication object "Presence button" is enabled. An "ON" telegram to this object makes it possible to switch to the Comfort extension if night operation or frost/heat protection (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 such 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). An active presence function is always deleted on a device reset (bus voltage failure, ETS programming operation).

i 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
  If a presence detector is configured for presence detection, then the 1-bit communication object "Presence detector" is enabled. With this object, 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.
  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.
  E An active presence function is always deleted on a device reset (bus voltage failure, ETS programming operation). In this case, the presence detector must transmit a new "1"-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 change over into the 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 in the "Room temperature control -> RTCx - General" parameter branch specifies the way in the switch-over to forced frost/heat protection takes place...

- Frost/heat protection switch-over "via window status"
  The 1-bit object "Window status" 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. You can use the "window status delay" parameter to set this delay time 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 bus voltage failure or ETS programming operation, the window status is always inactive.

- Frost protection mode switch-over by "automatic frost protection"
  For this setting, automatic switch-over 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 minute as, for example, is the case when a window is open in the winter months. You can use the "automatic frost protection temperature drop" parameter to set the maximum temperature drop in K/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 one minute, frost protection will be activated. After the time specified by the "Frost protection period in automatic mode" 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.
  The KNX forced object has a higher priority than the automatic frost protection mode and can interrupt the latter.

ℹ The automatic frost protection mode only acts on heating for temperatures below the set value temperature of the operating mode selected. 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" operating mode is on. Automatic heat protection activation is not intended with this parameterization.

ℹ 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.

Additional information on the operating mode after a reset

In the ETS, it is possible to use the "Operating mode after reset" parameter in the "Room temperature control -> RTCx - General" parameter node to specify which operating mode should be activated after bus voltage return or an ETS programming operation. The following settings are possible...

- "Comfort operation" -> The comfort mode will be activated after the initialisation phase.
- "Standby mode" -> The standby mode will be activated after the initialisation phase.
- "Night operation" -> The night mode will be activated after the initializing phase.
- "Frost/heat protection operation" -> The frost/heat protection mode will be activated after the initialisation phase.
- "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.

4.2.4.7.5 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 control -> RTCx - General -> RTCx - Room temperature measurement". Depending on the configuration, the 2-byte objects "Received temperature 1 (temperature sensor 1)" and, optionally, "Received temperature 2 (temperature sensor 2)" are enabled.

ⓘ 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).
- The push button sensor should not be installed in the vicinity of radiators or cooling systems.
- 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 units 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 "Room temperature control -> RTCx - General -> RTCx - Room temperature measurement" parameter node specifies how many external KNX sensors detect the room temperature. The following settings are possible for temperature detection

- "External temperature value 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 "Received temperature 1 (Temperature sensor 1)".
  The controller can request the current temperature value cyclically. For this purpose, the parameter "Request time of the temperature value" 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.

- "External temperature values 1 + 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 "Received temperature 1 (Temperature sensor 1)" and "Received temperature 2 (Temperature sensor 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 "Measured value formation, temperature value 1 to temperature value 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. Often, those temperature sensors that are subject to negative external influences (for example, unfavourable location because of exposure to sun or heater or door / window directly next to it) are 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 %

  -> $T_{Result\ 1} = T_1 \cdot 0.3 = 6.45$ °C,
  -> $T_{Result\ 2} = T_2 = 22.3$ °C $\cdot$ 0.7 = 15.61 °C
  -> $T_{Result} = T_{Result\ 1} + T_{Result\ 2} = \underline{22.06\ °C}$

  The controller can request both current temperature values cyclically. For this purpose, the parameter "Polling time 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 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.
The parameters "Calibration of temperature value 1" and "Calibration of temperature value 2" can 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 "Actual temperature" 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 "Actual temperature" object. The parameter "Transmission when room temperature change by..." 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. 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 "Cyclical transmission of the room temperature" parameter determines 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".

Following the return of bus voltage or after programming via 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.

4.2.4.7.6 Temperature setpoints

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 control -> RTCx - General -> RTCx - Setpoints" defines the way the setpoint temperature is specified...

- "Relative (setpoint temperatures from basic setpoint)" setting:
  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 "Basic temperature after reset" parameter on the "Room temperature control -> RTCx - General -> RTCx - Setpoints" parameter page determines the basic setpoint, which is loaded as the specification value when the device is programmed via the ETS. Taking into account the "Reduce / increase the setpoint temperature in Standby mode" or "Reduce / increase the setpoint temperature in Night mode" parameters, the temperature setpoints for the standby and night mode are derived from this value depending on the heating or cooling operating mode. The deadband will be additionally considered for the "Heating and cooling" operating mode.
  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 "Change the basic temperature setpoint via bus" to "Approve". 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).

- "Absolute (independent setpoint temperatures)" setting
  The setpoint temperatures for comfort, standby and night mode are independent of each other. Depending on the operating mode and heating/cooling 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 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 eating and cooling mode. The frost or heat protection temperature programmed in using the ETS cannot be changed in this manner.

ⓘ 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 operating mode automatically, which is why, in this configuration, the setting for the parameter "Switchover between heating and cooling" is fixed in the ETS to "Via object". Furthermore, setpoint shifting does not exist for absolute setpoint presetting.

ⓘ 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 device during ETS programming operation?" can be used on the parameter page "Room temperature control -> RTCx - General -> RTCx - Setpoints" to define whether the setpoints present in the device, which may have been changed subsequently, are overwritten during an ETS programming operation and are 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.

ⓘ During initial commissioning of the device the parameter "Overwrite setpoints in device during ETS programming operation?" 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 (operating mode, setpoint specification, etc.) are changed in the ETS through new parameter configurations!

Setpoint temperatures for relative setpoint presetting

Depending on the operating mode, different cases should be distinguished when specifying the relative setpoint temperature, which then have an impact on the temperature derivation from the basic setpoint.

<u>Setpoints for operating mode "Heating"</u>

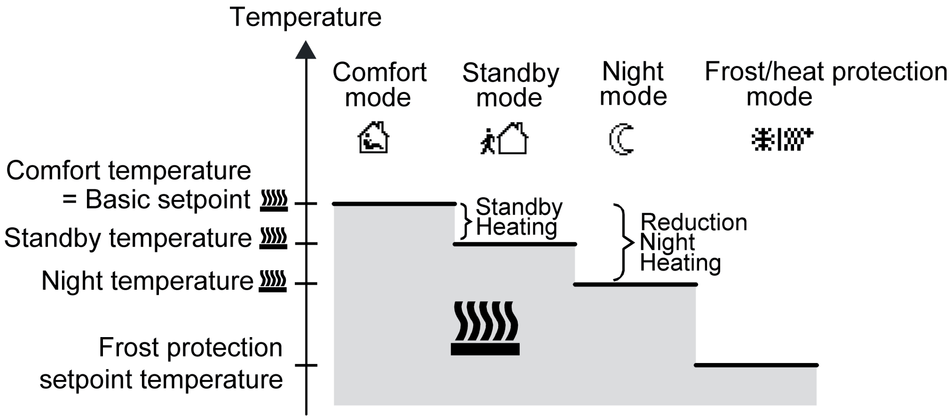

Figure 73: Setpoint temperatures in the operating mode "Heating"

The setpoint temperatures for Comfort, Standby and Night mode exist for this operating mode. The frost protection temperature can be specified (figure 73).
The following applies…

$T_{\text{Standby setpoint heating}} \le T_{\text{Comfort setpoint heating}}$

or

$T_{\text{Night setpoint heating}} \le T_{\text{Comfort setpoint heating}}$

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 to a set smaller 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 (figure 74).

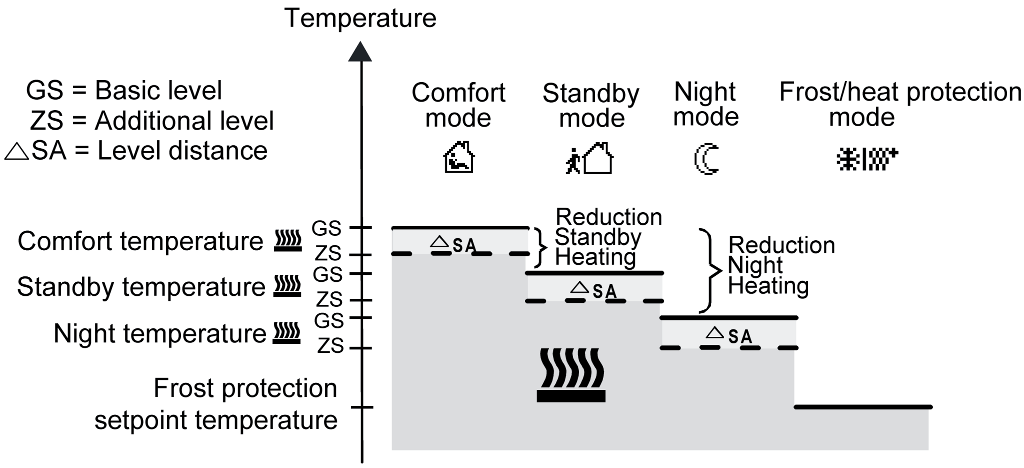

Figure 74: Setpoint temperatures in the operating mode "Basic and additional heating"

$T_{\text{Comfort setpoint additional level heating}} \le T_{\text{Comfort setpoint basic level heating}}$
$T_{\text{Standby setpoint additional level heating}} \le T_{\text{Standby setpoint basic level heating}}$
$T_{\text{Standby setpoint heating}} \le T_{\text{Comfort setpoint heating}}$

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" operating mode

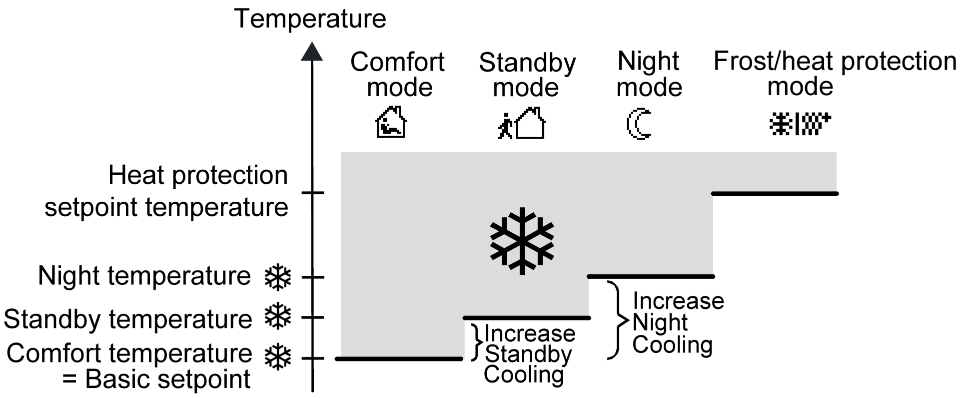

Figure 75: Setpoint temperatures in the operating mode "Cooling"

The setpoint temperatures for Comfort, Standby and Night mode exist in this operating mode and the heat protection temperature can be specified (figure 75).
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 configured increase temperatures from the comfort set-temperature (basic setpoint). The heat protection is supposed 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 larger 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 (figure 76).

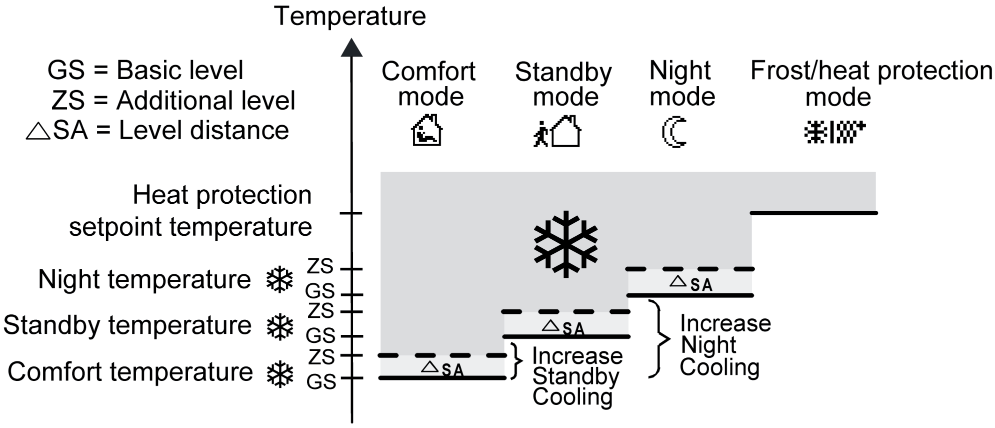

Figure 76: Setpoint temperatures in the operating mode "Basic and additional cooling"

$T_{\text{Comfort setpoint basic level heating}} \leq T_{\text{Comfort setpoint additional level heating}}$
$T_{\text{Standby setpoint basic level heating}} \leq T_{\text{Standby setpoint additional level heating}}$
$T_{\text{Comfort setpoint cooling}} \leq T_{\text{Standby setpoint cooling}}$

or

$T_{\text{Comfort setpoint basic level heating}} \leq T_{\text{Comfort setpoint additional level heating}}$
$T_{\text{Night setpoint basic level heating}} \leq T_{\text{Night setpoint additional level heating}}$
$T_{\text{Comfort setpoint cooling}} \leq T_{\text{Night setpoint cooling}}$

<u>Setpoints for the "heating and cooling" operating mode</u>

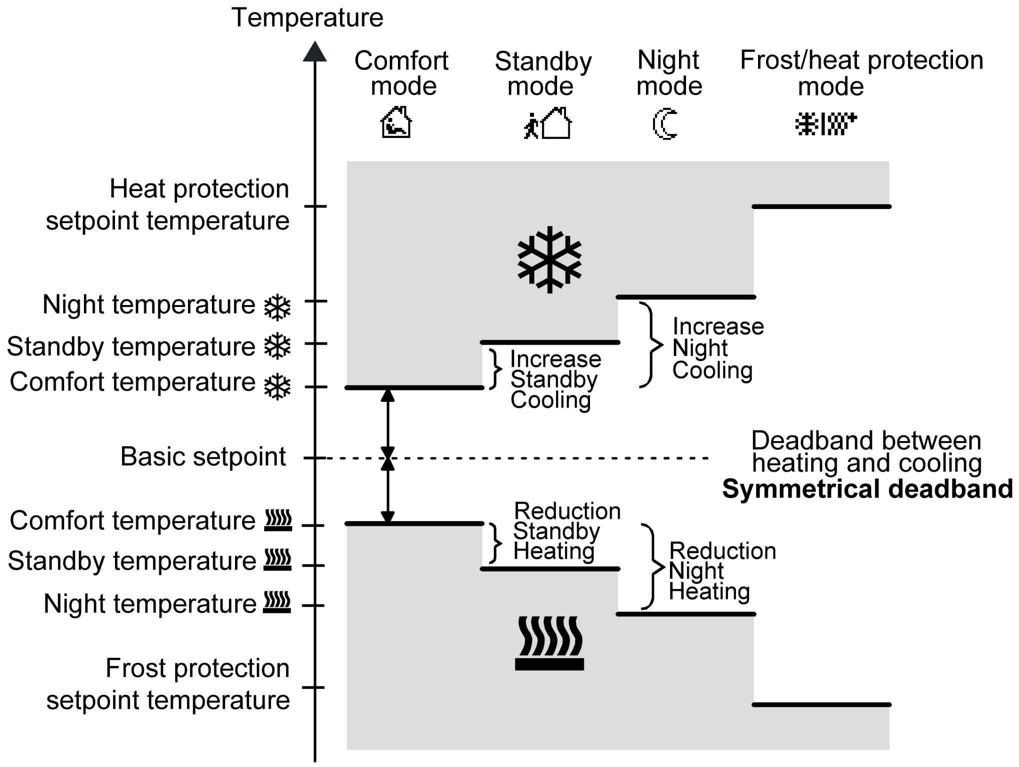

Figure 77: Setpoint temperatures in the operating mode "Heating and cooling" with symmetrical deadband

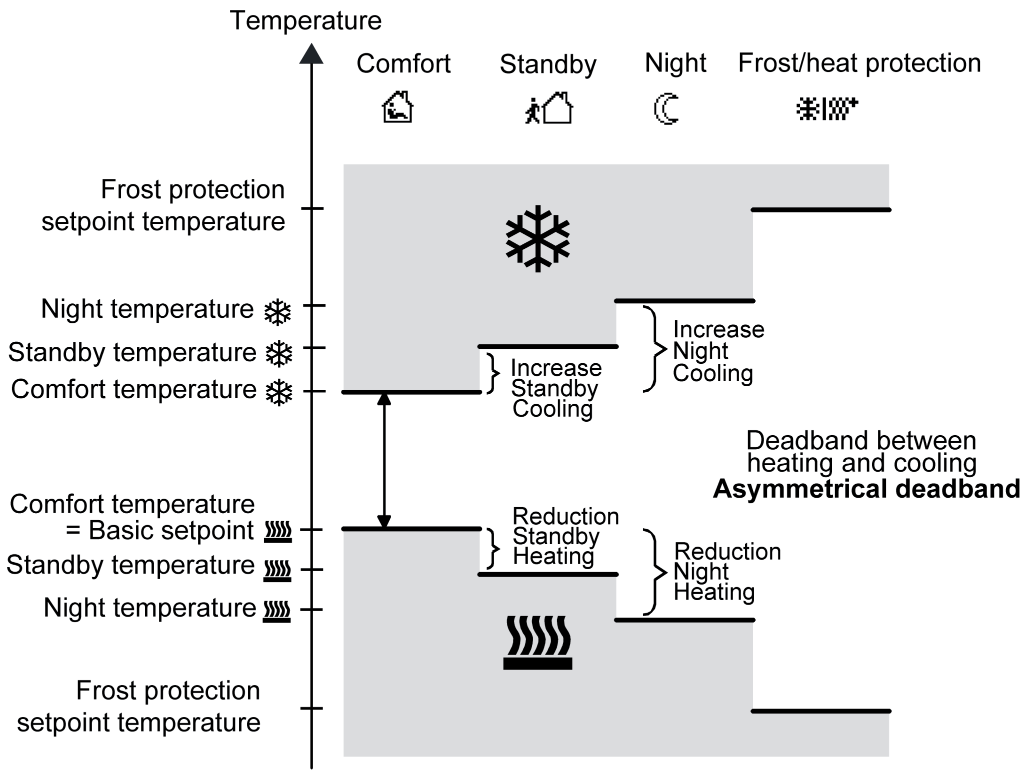

Figure 78: Setpoint temperatures in the operating mode "Heating and cooling" with asymmetrical deadband

For this heating/cooling operating mode, the setpoint temperatures of both heating/cooling modes exist for the Comfort, Standby and Night operating modes as well as the deadband. A distinction is made in the deadband position with combined heating and cooling. A symmetrical (figure 77) or an asymmetrical (figure 78) 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 set-temperatures for "Standby" and "Night" 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 itself 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 smaller 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 supposed 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 larger 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 possible range of values for a setpoint temperature ("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.

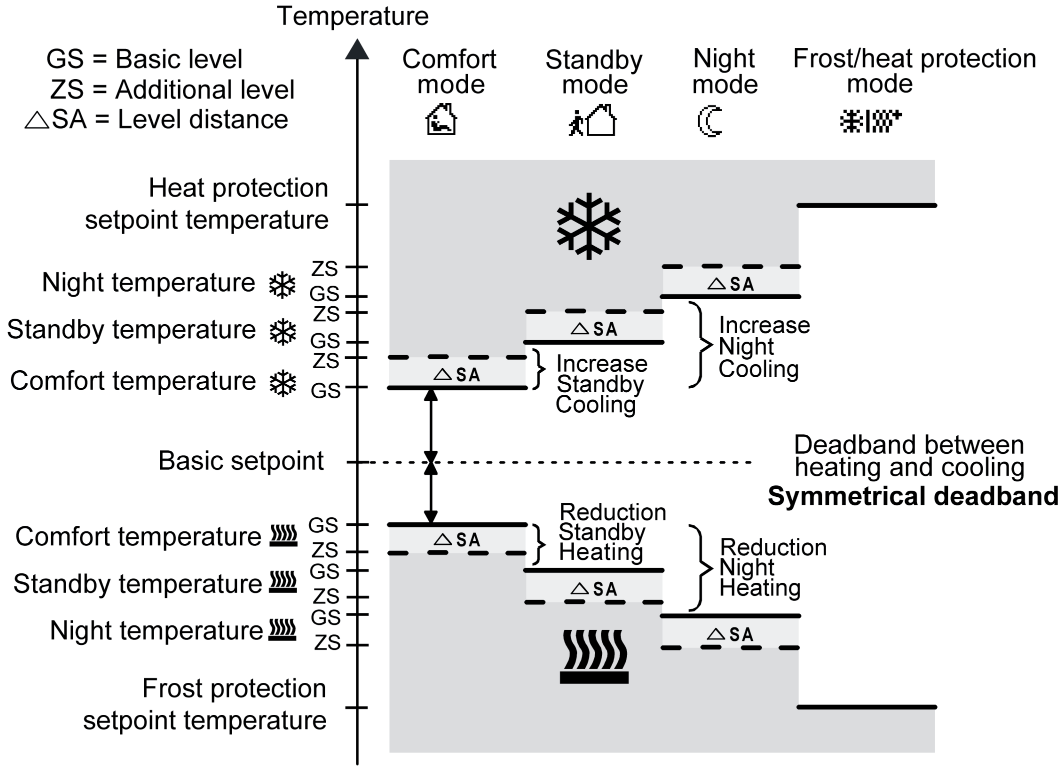

Figure 79: Setpoint temperatures in the operating mode "Basic and additional heating and cooling" with symmetrical deadband

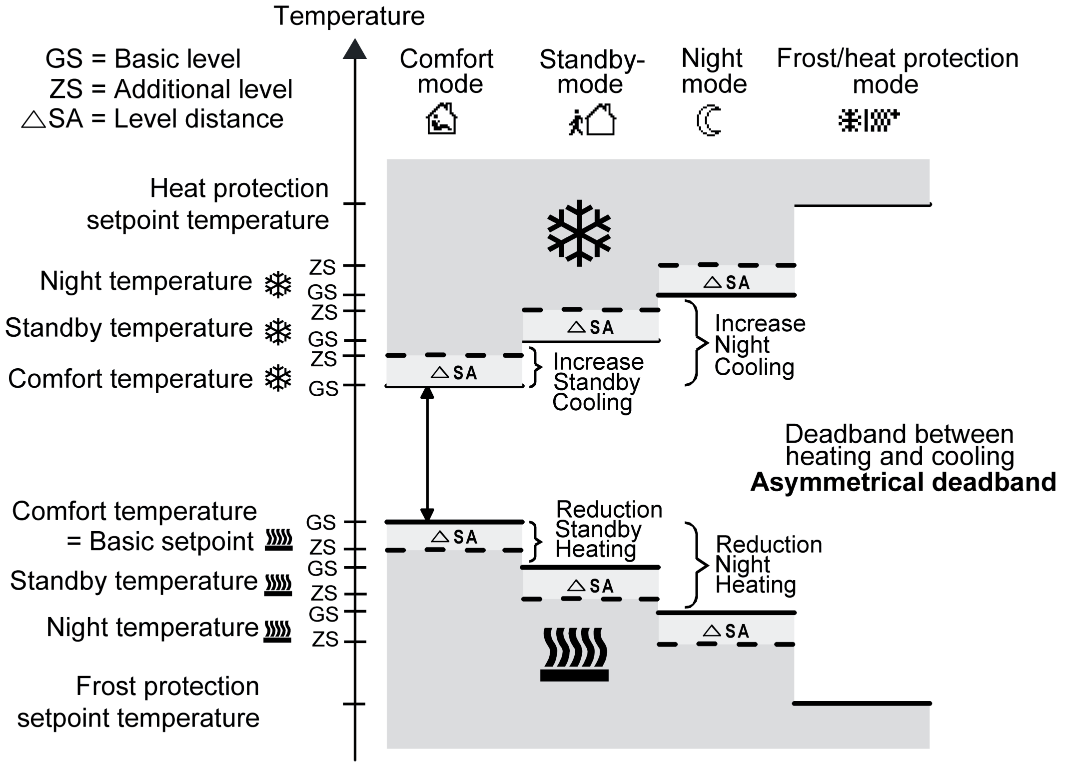

Figure 80: Setpoint temperatures in the operating mode "Basic and additional heating and cooling" with asymmetrical deadband

$T_{\text{Comfort setpoint add. level Heating}} \leq T_{\text{Comfort setpoint basic level Heating}} \leq T_{\text{Comfort setpoint basic level Cooling}} \leq T_{\text{Comfort setpoint add. level Cooling}}$
$T_{\text{Standby setpoint add. level Heating}} \leq T_{\text{Standby setpoint basic level Heating}} \leq T_{\text{Standby setpoint basic level Cooling}} \leq T_{\text{Standby setpoint add. level Cooling}}$
$T_{\text{Standby setpoint heating}} \leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Standby setpoint cooling}}$

or

$T_{\text{Comfort setpoint add. level Heating}} \leq T_{\text{Comfort setpoint basic level Heating}} \leq T_{\text{Comfort setpoint basic level Cooling}} \leq T_{\text{Comfort setpoint add. level Cooling}}$
$T_{\text{Night setpoint add. level Heating}} \leq T_{\text{Night setpoint basic level Heating}} \leq T_{\text{Night setpoint basic level Cooling}} \leq T_{\text{Night setpoint add. level Cooling}}$
$T_{\text{Night setpoint heating}} \leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Night setpoint cooling}}$

<u>deadband and deadband positions in the combined heating and cooling operating mode</u>

With relative setpoint presetting, the comfort setpoint temperatures for heating and cooling are derived from the basic setpoint in consideration of the adjusted Dead band. 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 "deadband between heating and cooling", "deadband position" parameters as well as the "Basic temperature after reset" parameter are preset in the ETS configuration. One distinguishes between the following settings...

- deadband = "symmetrical"
  The deadband preset in the ETS is divided into two parts at the basic setpoint. The comfort setpoint temperatures are derived directly from the basic setpoint resulting from the half deadband.
  The following applies...
  $T_{\text{Basic setpoint}} - \frac{1}{2}T_{\text{deadband}} = T_{\text{Comfort heating setpoint}}$

  and

  $T_{\text{Basic setpoint}} + \frac{1}{2}T_{\text{deadband}} = T_{\text{Comfort setpoint cooling}}$
  -> $T_{\text{Comfort cooling setpoint}} - T_{\text{Comfort heating setpoint}} = T_{\text{deadband}}$
  -> $T_{\text{Comfort cooling setpoint}} \geq T_{\text{Comfort heating setpoint}}$

- deadband position = "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 set-temperature for cooling is derived directly from the comfort setpoint for heating.
  The following applies...
  $T_{\text{Basic setpoint}} = T_{\text{Comfort heating setpoint}}$
  -> $T_{\text{Basic setpoint}} + T_{\text{deadband}} = T_{\text{Comfort cooling setpoint}}$
  -> $T_{\text{Comfort cooling setpoint}} - T_{\text{Comfort heating setpoint}} = T_{\text{deadband}}$
  -> $T_{\text{Comfort cooling setpoint}} \geq T_{\text{Comfort heating setpoint}}$

Accept setpoints permanently

If the basic setpoint has been modified by the communication objects "Basic setpoint" or "Setpoint of active operating mode", two possible cases can be distinguished, which are set by the parameter "Permanently apply change to basic temperature setpoint" (with relative setpoint presetting) or "Accept modification of the setpoint permanently" (with absolute setpoint presetting)...

- Case 1: The setpoint adjustment is permanently accepted ("Yes" setting):
  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 basic temperature originally configured via the ETS after a reset or the absolute setpoint temperature loaded using the ETS. The changed values are also retained after a bus voltage failure, after a switchover of the operating mode or after a switchover of the heating/cooling mode (with absolute setpoint specification individually for each operating mode for heating and cooling).
  The "Basic setpoint" object (relative setpoint presetting) is not bidirectional, meaning that a shifted basic setpoint is not signalled back to the KNX.

- Case 2: The basic setpoint adjustment is only temporarily accepted ("No" setting): The setpoints received via the objects 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 heating/cooling mode (e.g. Heating to Cooling), the last setpoint changed will be discarded and replaced by the initial value.

Basic setpoint shift for relative setpoint presetting

In addition to presetting individual setpoint temperatures by the ETS or the basic setpoint object, the user, when specifying relative setpoints, can shift the basic setpoint in predefined limits within specific limits using the the 1-byte communication object "Setpoint shift specification" (according to KNX DPT 6.010 - Depiction of positive and negative values in a double compliment). By connecting to this object, the controller extensions are, for example, also able to influence the current setpoint shift of the controller directly in steps. As soon as the controller receives a value, it will adjust the setpoint shift correspondingly according to the configured "Step width of the setpoint shift (0.1 K or 0.5 K). Values that lie within the possible value range of the basic setpoint shift can be directly jumped to.

The appropriate current setpoint shift is tracked by the controller in the communication object "Current setpoint shift" with a 1-byte counter value. This object has the same data point type and value range as the object "Setpoint shift specification" (see above). By connecting to this object, suitable controller extensions are also able to display the current setpoint shift and to check the effectiveness of the shift. As soon as a shift by one temperature increment in the positive direction is specified, the controller counts up the value by one digit. The counter value will be counted down by one digit, if there is a negative adjustment of the temperature level. A value of "0" means that no setpoint shifting has been adjusted.

Setpoint shift example:
Starting situation: Current setpoint temperature = 21.0 °C / Counter value in "Current setpoint shift" = "0" (no active setpoint shift) / Step width of the setpoint shift = 0.5 K
After the setpoint shifting:
-> A setpoint shift by one temperature increment in the positive direction will count up the value in the "Current setpoint shift" object by one = "1".
-> Current setpoint temperature = 21.5°C
-> An additional setpoint shift by one temperature increment in the positive direction will again count up the value in the "Current setpoint shift" object by one = "2".
-> Current setpoint temperature = 22.0°C
-> A setpoint shift by one temperature increment in the negative direction will count down the value in the "Current setpoint shift" object by one = "1".
-> Current setpoint temperature = 21.5°C
-> An additional setpoint shift by one temperature increment in the negative direction will again count down the value in the "Current setpoint shift" object by one = "0".
-> Current setpoint temperature = 21.0°C
-> An additional setpoint shift by one temperature increment in the negative direction will again count down the value in the "Current setpoint shift" object by one = "-1".
-> Current setpoint temperature = 20.5°C.

i The controller monitors the value received via the "Setpoint shift specification" object automatically. As soon as the external preset value exceeds the limits of the adjustment options for the setpoint shift in positive or negative direction, the controller will correct the received value and adjust the setpoint shift to maximum. Depending on the direction of the shift, the value feedback is set to the maximum value via the communication object "Current setpoint shift".

i No basic setpoint shift can be performed if the controller is configured for absolute setpoint presetting.

ⓘ It has to be considered that a shift of the displayed setpoint temperature (temperature offset of the basic temperature) will directly affect the basic setpoint and as a result shift all other temperature setpoints.
A positive shift is possible up to the configured heat protection temperature. A negative shift is possible up to the set frost protection temperature.

ⓘ The "Basic setpoint" object is not bidirectional, meaning that a shifted basic setpoint is not signalled back to the KNX.

Whether a basic setpoint shift only affects the currently active operating mode or whether it influences all other setpoint temperatures of the remaining operating modes is determined by the "Permanently apply change to basic setpoint shift" parameter in the "Room temperature control -> RTCx - General -> RTCx - Setpoints" parameter page...

- "No" setting:
  The basic setpoint shift carried out is in effect for only as long as the operating mode or heating/cooling mode has not changed or the basic setpoint is maintained. Otherwise the setpoint shift will be reset to "0".
- "Yes" setting:
  In general, the shifting of the basic setpoint carried out affects all operating modes. The shift is maintained even after a switchover of the operating mode or the heating/cooling mode or adjusting the basic setpoint.

ⓘ Since the value for the basic setpoint shift is stored exclusively in volatile memory, the shift will get lost in case of a bus voltage failure or an ETS programming operation.

ⓘ A setpoint shift does not affect the temperature setpoints for frost or heat protection!

ⓘ To ensure that controller extensions display the correct shifts and also activate the functions of the main controller correctly, it is necessary for the controller extensions to be set to the same shift limits and step width of the setpoint shift as the main unit. Observe the documentation of the controller extension!

Transmitting the setpoint temperature

The setpoint temperature, which is specified for the active operating mode, can be actively transmitted onto the bus via the 2-byte "Setpoint temperature" object. The parameter "Send on setpoint temperature change by" in the "Room temperature control -> RTCx - General -> RTCx - Setpoint values" parameter node specifies the temperature value by which the setpoint has to change in order to have the setpoint temperature value transmitted automatically via the object. Possible temperature value changes lie within a range of 0.1 K and 25.5 K. The setting "0" at this point will deactivate the automatic transmission of the setpoint temperature.
In addition, the setpoint can be transmitted periodically. The "Cyclical transmission of setpoint temperature" parameter determines the cycle time (1 to 255 minutes). The value "0" will deactivate the periodical transmission of the setpoint temperature value. It has to be pointed out that with deactivated periodical transmission and deactivated automatic transmission, no setpoint temperature telegrams will be transmitted in case of a change.
Setting the "Read" flag on the "Setpoint temperature" object makes it possible to read out the current setpoint. After a bus voltage return or after programming via the ETS, the object value will be initialised according to the current setpoint temperature and actively transmitted to the bus.

Limitation of the setpoint temperatures in cooling mode

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 of 32 °C. Exceeding these limits is only permissible in exception 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 "Setpoint temperature limit in cooling mode" parameter in the "Room temperature control -> RTCx - General -> RTCx - Setpoints" parameter node 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 compare 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 "Difference to outdoor temperature in cooling mode" parameter. The value can be set in step widths of 1 K.
  If the outdoor temperature rises above 32 °C in the sense of the statutory requirements, 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 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 32 °C.
  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 to 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.

ℹ The automatic setpoint temperature raising 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.

- Setting "Only max. setpoint temperature"
  In this setting, no setpoint temperatures are permitted in Cooling mode related to the Comfort, Standby and Night modes, which are greater than the maximum setpoints configured in the ETS. The maximum setpoint temperature is specified in the "Max. setpoint temperature in Cooling mode" parameter and can be configured within the limits 20 °C to 35 °C in 1 °C steps.
  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 "Max. 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 upwards 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 "Activation of the setpoint temperature limit via object in cooling mode" 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. 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.

4.2.4.7.7 Command value and status output

Command value objects

The format of the command value objects are determined depending on the control algorithm selected for heating and / or cooling and, if applicable, also for the additional levels. 1 bit or 1 byte command value objects can be created in the ETS. The control algorithm calculates the command values in intervals of 30 seconds and outputs them via the objects. With the pulse width-modulated PI control (PWM) the command value is updated, if required, solely at the end of a PWM cycle.

Possible object data formats for the command values separately for both heating/cooling operating modes, for the basic and the additional level or for both control circuits are…

- continuous PI control: 1 byte
- Switching PI control: 1 bit + additionally 1 byte (for example for the status indication with visualisations),
- switching 2-point feedback control: 1 bit.

Depending on the set heating/cooling operating mode, the controller is able to address heating and / or cooling systems, to determine command values and to output them via separate objects. One distinguishes between two cases for the "Heating and cooling" mixed operating mode...

- Case 1: Heating and cooling system are two separate systems
  In this case, the "Transmit heating and cooling command value to one common object" parameter should be set to "no" in the "Room temperature control -> RTCx - General" parameter node. Thus, there are separate objects available for each command value, which can be separately addressed via the individual systems.
  This setting allows to define separate types of control for heating and cooling.
- Case 2: Heating and cooling system are a combined system
  In this case, the "Transmit heating and cooling command value to one common object" parameter may be set, if required, to "yes". This will transmit the command values for heating and cooling to the same object. In case of a two-level feedback control, another shared object will be enabled for the additional levels for heating and cooling.
  With this setting it is only possible to define the same type of feedback control for heating and for cooling as the feedback control and the data format must be identical. The ("Type of heating / cooling") control parameter for cooling and heating still has to be defined separately.
  A combined command value object may be required, for example, if heating as well as cooling shall take place via a single-pipe system (combined 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 operating mode 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).

If required, the actuating variable can be inverted before output. With output via a combined object, the parameters "Output of heating command value", "Output of cooling command value" or "Output of command values..." output the command value in inverted fashion according to the object data format. The parameters for inverting the additional level(s) are additionally available in the two-level control.

The following applies…
For continuous command values:
-> not inverted: Command value 0 % ... 100 %, value 0 ... 255
-> inverted: Command value 0 % ... 100 %, value 255 ... 0
For switching command values:
-> not inverted: Command value off / on, value 0 / 1
-> inverted: Command value off / on, value 1 / 0

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 case of a continuous PI control, the room temperature controller calculates a new command value periodically every 30 seconds and outputs it to the bus via a 1-byte value object. The change interval of the command value can be determined in percent according to which a new command value is to be output on the bus via the "Automatic transmission on change by..." parameter in the "Room temperature control -> RTCx - General -> RTCx - Command values and status output" parameter node. 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 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 servo drive or in the addressed switch actuator, telegrams are received within the monitoring time. The time interval predetermined by the "Cycle time for automatic transmission..." parameter should correspond to the control interval 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. With this control, however, the update of the command value takes place, if required, solely at the end of a PWM cycle. The parameters "automatic transmission on change by..." and "Cycle time for automatic transmission..." are not enabled with this control algorithm. The parameter "Cycle time of the switching command value..." defines the cycle time of the PWM command value signal.

- 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. The "Automatic transmission on change by..." parameter is not enabled as this control algorithm does not calculate continuous command values.
  In addition to the command value output following a change, the current command value 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 servo drive or in the addressed switch actuator, telegrams are received within the monitoring time. The time interval predetermined by the "Cycle time for automatic transmission..." parameter should correspond to the control interval 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 configured in the ETS. 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. It is possible, if available, to specify various limiting values for the basic and additional stages and for heating and cooling.

ⓘ It should be noted that the command value limit has no effect with "2-point feedback control" and with "Transmitting of command values for heating and cooling via a common object"! In that case it is still possible to configure the command value limit in the ETS, but it will have no function.

The "Command value limit" parameter on the parameter page "Room temperature control -> RTCx - General -> RTCx command values and status output" defines the mode 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 bus voltage return or an ETS programming operation. Here the "Command value limit after reset" parameter defines the initialisation behaviour. In the "Deactivated" 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 "Activated" 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" 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 %. 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 %. 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.

ⓘ 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.

Controller status

The room temperature controller can transmit its current status to the KNX. A choice of data formats is available for this. The "Controller status" parameter in the "Room temperature control -> RTCx - General -> RTCx - Command value and status output" parameter branch will enable the status signal and set the status format...

- "KNX compliant"
  The KNX compliant controller status feedback is harmonised on a manufacturer-specific basis, and consists of 3 communication objects. The 2-byte object "KNX status" (DPT 22.101) indicates elementary functions of the controller. This object is supplemented by the two 1-byte objects "KNX status operating mode" and "KNX status forced operating mode" (DPT 20.102), which report back the operating mode actually set on 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 of the status telegram	Meaning
0	Controller error status ("0" = no error / "1" = 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")
7	not used (permanent "0")
8	Operating mode ("0" = Cooling / "1" = Heating)
9	not used (permanent "0")
10	not used (permanent "0")
11	not used (permanent "0")
12	Controller disabled (dew point operation) ("0" = Controller enabled / "1" = Controller disabled)
13	Frost alarm ("0" = Frost protection temperature exceeded / "1" = frost protection temperature undershot)
14	Heat alarm ("0" = heat protection temperature exceeded / "1" = Heat protection temperature exceeded)
15	not used (permanent "0")

Bit encoding of the 2-byte KNX-compliant status telegram

- "Controller general":
  The general controller status collects essential status information of the controller in two 1-byte communication objects. The "Controller status" object contains fundamental status information. The "Status signal addition" object collects in a bit-orientated manner further information that is not available via the "Controller status" object. For example, controller extensions can evaluate the additional status information, in order to be able to display all the necessary controller status information on the extension display.

Bit of the status telegram	Meaning
0	On "1": Comfort operation activated
1	On "1": Standby mode active
2	On "1": Night mode active
3	On "1": Frost/heat protection mode active
4	On "1": Controller disabled
5	On "1": Heating, on "0": Cooling
6	On "1": Controller inactive (deadband)
7	On "1": Frost alarm (T_{Room} ≤ +5 °C)

Bit encoding of the 1 byte status telegram

Bit of the status telegram	Meaning on "1"	Meaning on "0"
0	Normal operating mode	Forced operating mode
1	Comfort extension active	No comfort extension
2	Presence (Presence detector)	No presence (Presence detector)
3	Presence (Presence button)	No presence (Presence button)
4	Window opened	No window opened
5	Additional level active	Additional level inactive
6	Heat protection active	Heat protection inactive
7	Controller disabled (dew point operation)	Controller not disabled

Bit encoding of the 1 byte additional status telegram

- "Transmit individual state"
  The 1 bit status object "Controller status, ..." contains the status information selected by the "Single status" parameter. Meaning of the status signals:

  "Comfort mode active": Is "ON" if the "Comfort" operating mode or a Comfort extension is activated.

  "Standby mode active": Is "ON" if the "Standby" operating mode is activated.

  "Night mode active": Is "ON" if the "Night" operating mode is activated.

  "Frost/heat protection active": Is "ON" if the "Frost/heat protection" operating mode is activated.

  "Controller disabled": In "ON" if controller disable is activated (dew point mode).

  "Heating/cooling": Is "ON" if heating is activated and "OFF" if cooling is activated. Is "OFF" if controller is disabled.

  "Controller inactive" -> Is "ON" in the "Heating and cooling" operating mode when the detected room temperature lies within the deadband. This status information is always "OFF" for the individual "Heating" or "Cooling" operating modes. Is "OFF" if controller is disabled.

  "Frost alarm" -> Is "ON" if the detected room temperature reaches or falls below +5 °C. This status signal will have no special influence on the control behaviour.

ⓘ Upon a reset, the status objects will be updated after the initialisation phase. After this, updating is performed cyclically every 30 seconds in parallel with the command value calculation of the controller command values. Telegrams are only transmitted to the bus when the status changes.

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.

ⓘ 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.

4.2.4.7.8 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. The parameter "Switch off controller (dew point operation)" in the parameter node "Room temperature control -> RTCx - General -> RTCx - Controller functionality" enables the 1-bit object "Disable controller" when set to "Via bus". 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 "Additional level disabling object" parameter in the "Room temperature control -> RTCx - General" parameter node will enable the 1-bit "Disable additional level" object. 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).

4.2.4.7.9 Underfloor heating temperature limit

The temperature limit can be activated in the controller in order to influence the maximum temperature of an underfloor heating system. If the temperature limit is enabled in the ETS, the controller continuously monitors the floor temperature. Should the floor temperature exceed a specific limiting value on heating, the controller switches the command value off, thus switching the heating off and cooling the system. Only when the temperature falls below the limiting value, minus a hysteresis of 1 K, will the controller add the most recently calculated command value.

In the ETS, the temperature limit can be activated by setting the "Underfloor heating temperature limit available" parameter in the "Room temperature control -> RTCx - General -> RTCx - Controller functionality" parameter node to "Present".

- ℹ The temperature limit is used to increase the comfort behaviour of the heating system and may not be used as a safety-relevant protection function (immediate forced switch-off of the heating power).
- ℹ It should be noted that the temperature limit only affects command values for heating. Thus, the temperature limit requires the controller operating modes "Heating" or "Heating and cooling". The temperature limit cannot be configured in the operating mode "Cooling".

The temperature limit can also be used in a two-level feedback control with basic and additional levels. However, it must then be specified in the ETS to which level the limit shall apply. The limit can then either apply to the basic level or to the additional level for heating using the "Affects" parameter.

The underfloor heating temperature to be monitored is fed into the controller via the KNX communication object "Floor temperature". 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 maximum limit temperature, which the underfloor heating system may reach, is specified in the ETS using the "Maximum underfloor heating system temperature" parameter. The temperature can be set to a value between 20 and 70 °C. 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 intended in the control algorithm. The 1 K hysteresis is fixed and cannot be changed.

- ℹ The floor temperature limit does not influence the "Heating" message telegram. If the floor temperature exceeds the limiting value, only the command value is switched off. In this case, the "Heating" message remains active.
- ℹ With a pulse width-modulated command value, the temperature limit only switches off the command value when the current PWM time cycle has elapsed.
- ℹ 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!

4.2.4.7.10 Response after a device reset

Behaviour in case of bus voltage failure

All the functions of the integrated room temperature controller (e.g. setpoint temperature specification, operating mode switchover, switchover of the operating mode) are controlled via communication objects (object controller without its own operating elements), meaning that controller operation is possible via KNX controller extensions or KNX visualisations. The controllers are therefore activated and evaluated like object controllers without their own operating elements.
Communication via the controller objects is only possible when the bus voltage is connected to the device and is ready for operation. If the bus voltage supply fails, the controllers will not function at all. The most recently calculated command values are then rejected.

Behaviour after bus voltage return and ETS programming operation

After the bus voltage supply is switched on or after an ETS programming operation, all the controllers of the device restart and perform an initialisation (controller reset). In this context, various communication objects are updated (e.g. controller status, operating mode). Refer to the appropriate chapters of the function description and the description of the object tables for details on the reset behaviour of individual functions and communication objects.

i After a device reset, the controller will first wait for valid temperature telegrams to the input objects of the external KNX temperature sensor until control starts and a command value, if applicable, is output.

4.2.4.8 Functional description of the logic functions

4.2.4.8.1 Basic configuration

The device possesses up to 10 comprehensive 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 or, alternatively - when internal group communication is used - also internally in the device, e.g. for direct connection with binary inputs or relay outputs.

Enabling logic functions

To be able to use logic functions, they must be enabled centrally on the "General" parameter page.

- Set the parameter "Use logic functions?" to "yes".

  The logic functions can be used. The "Logic functions" parameter node becomes available, which contains additional parameter pages. Further configuration of the logic functions takes place in this parameter node.

  In addition, the result outputs of the logic functions become visible in the ETS.

Configuring the number of logic functions

Logic functions can be enabled in steps so that the number of visible functions and, in consequence, the available parameters are visible in the ETS. In the basic configuration of the logic functions, it is possible to define the number of available functions on the parameter page "Logic functions -> General logic functions".

- Configure the "Number of logic functions" parameter to the desired value.

  As many logic functions are created as have been selected.

ℹ The application program deletes existing logic functions from the configuration if the number of available functions is reduced.

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 or - if internal group communication is used - also from internal actuator functions (e.g. from the binary 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.

ℹ 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 -> General logic functions", 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.

ⓘ The application program deletes assigned data inputs from the individual configuration of logic functions, if data formats are hidden in the basic 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!

ⓘ After a device reset (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.

Result outputs

A shared collection of result outputs is available for all the 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 (figure 81).

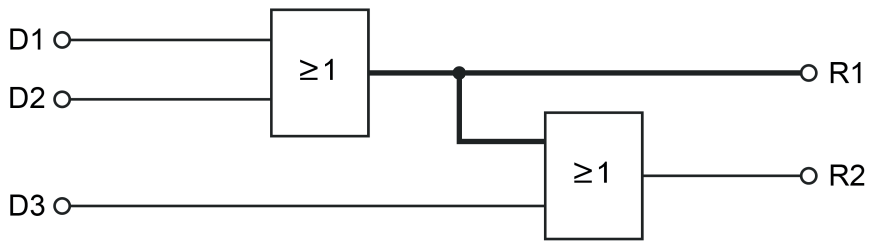

Figure 81: Example of linkage of a result output in two logic functions

D Data inputs

E1 Linked result output of logic function 1

E2 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

4.2.4.8.2 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.

ℹ Alternatively to the user-defined setting, logic functions 1 and 2 can be configured as a configuration aid to "Lighting control" (see page 303).

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.

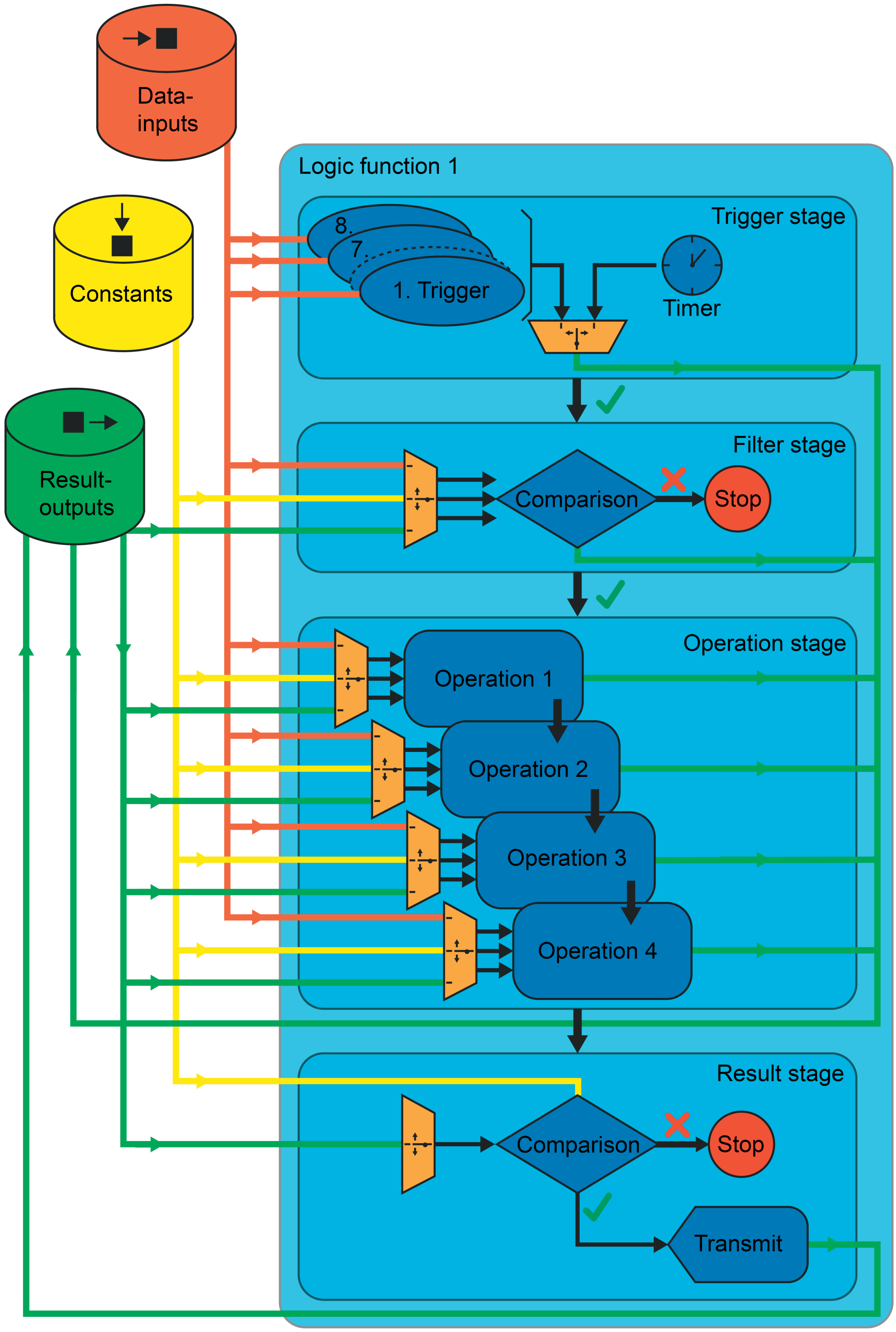

Figure 82: Processing stages of a logic function

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 at least one of the up to 8 trigger 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
1-byte operating mode switchover	20.102	3
1- byte scene extension	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 or equal than	$x \leq y \leq z$	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 perfectly 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 - result output	 x x	 - -	 - -	 - -	 - -
Arithmetic - operand - result output	 - -	 - -	 x x	 x x	 x x
Comparison - operand - result output	 - x	 x --	 x --	 x --	 x --
Type conversion - operand - result output	 x x	 x x	 x x	 x x	 x x

Data formats dependent on the selected operation type

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 is 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.
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 is also 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 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.

Configurable logic operations

Operation "arithmetic"

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 = 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. *
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	PERCENT (100 · [x : y])	Result is the percentage value of the first input (x) relative to the second input (y).

Configurable arithmetic operations

*: 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 ≠ y	2
greater	x > y	2
greater than	x ≥ y	2
smaller	x < y	2
smaller than	x ≤ y	2
range testing smaller than	x < y < z	3
range testing smaller or equal than	x ≤ y ≤ z	3

Configurable comparison operations

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.

Target (result output)	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 83: 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 (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, etc.). 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 polled 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 (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 to a dimming command, which, without "0", only permits the values "1 (100 %)...7 (1 %)". 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 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).

i 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 bus voltage return.
  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 only started by the first valid trigger after bus voltage return 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.

4.2.4.8.3 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 -> LO... - General" 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 on 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.

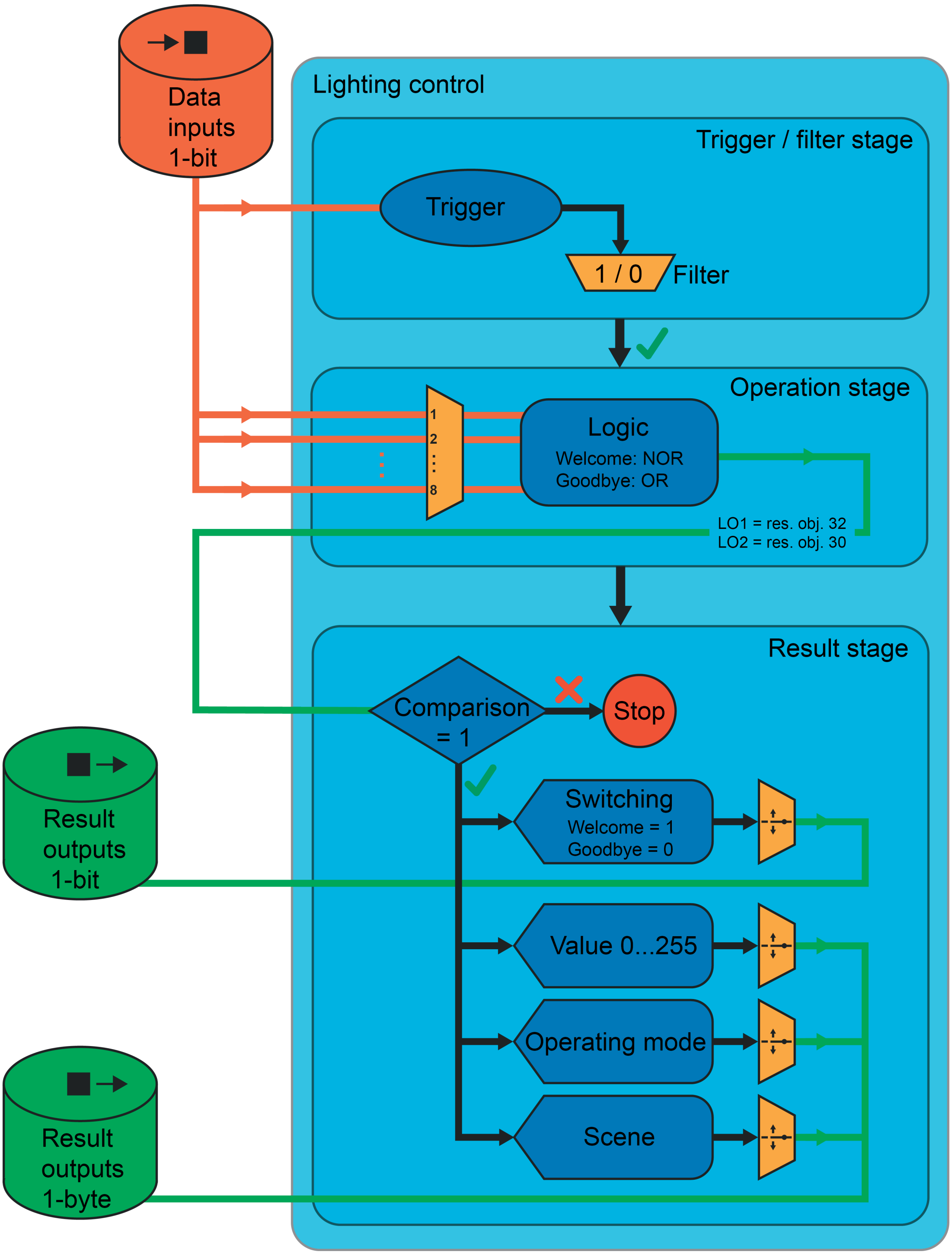

Figure 84: Processing stages of lighting control with 8 lighting inputs

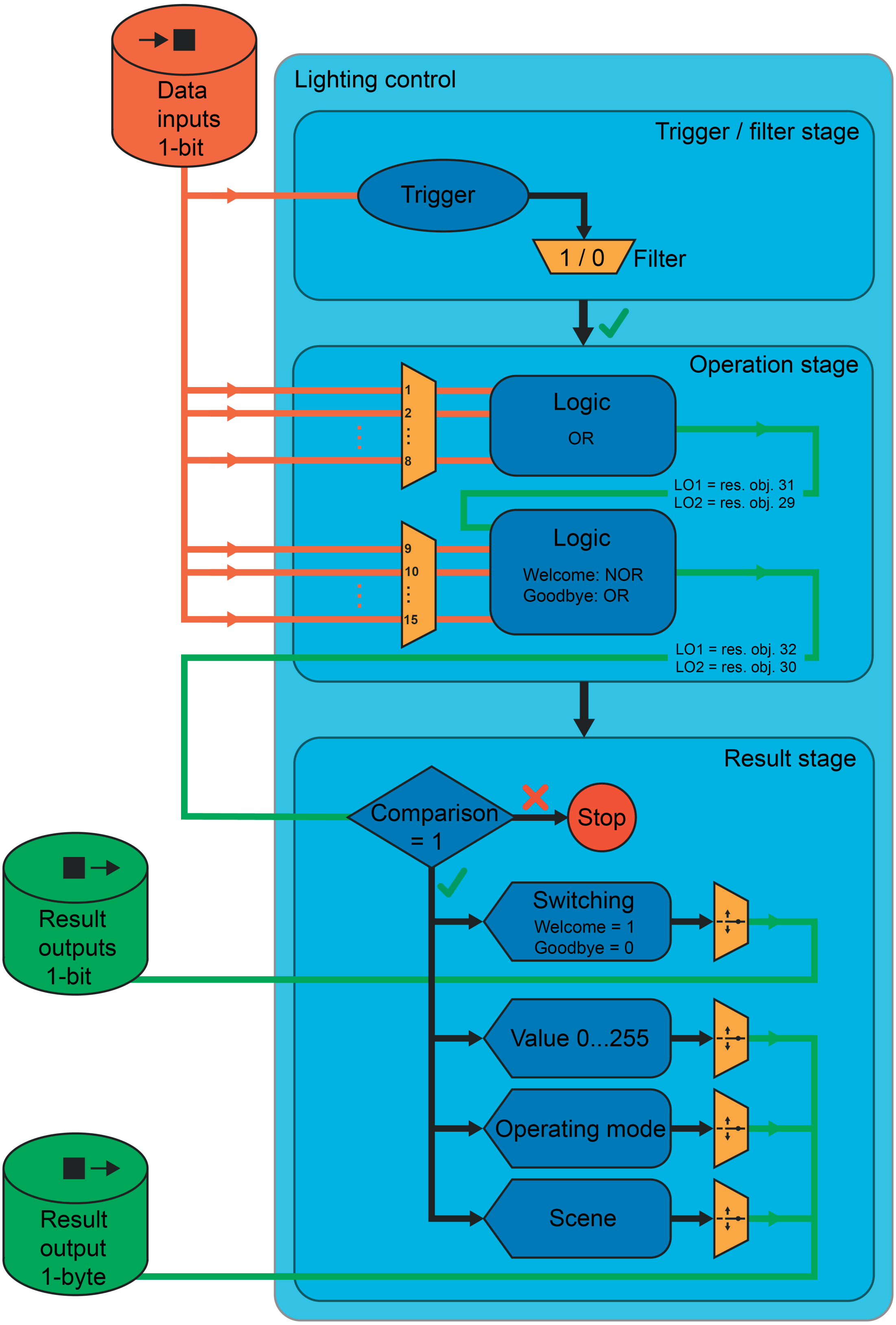

Figure 85: Processing stages of lighting control with 15 lighting inputs

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 (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 (figure 86).

Initial situation and function requirement:
In a hotel room, there is a KNX hotel card reader by the door. In addition, the subdistributor 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 on 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.

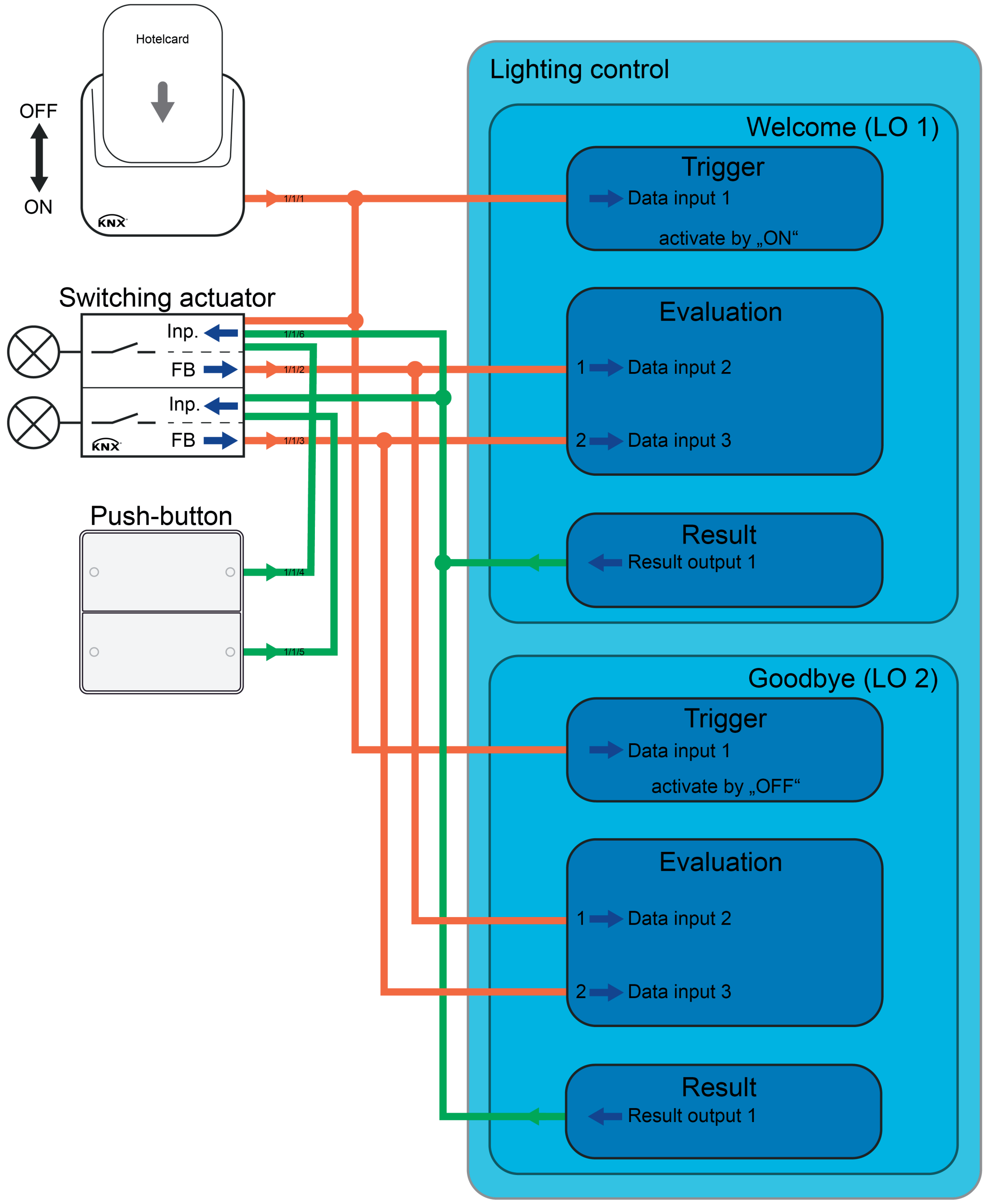

Figure 86

ⓘ 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.

ⓘ 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).

4.2.4.9 Delivery state

In the as-delivered state, the actuator is passive, i.e. no telegrams are transmitted to the KNX. All relay outputs are set to Venetian blind operation. The outputs can, however, be activated by manual operation on the device, if the bus voltage is on. In the manual control mode, no feedback telegrams are sent to the KNX. The binary inputs work in pairs on the Venetian blind outputs.
BI1 UP & BI2 DOWN -> VBO1+2
BI3 UP & BI4 DOWN -> VBO3+4
BI5 UP & BI6 DOWN -> VBO5+6
Other functions of the actuator are deactivated.

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

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

- Movement time (continuous run): 19 minutes, 59 seconds plus 20 % movement time extension
- Short time operation: 0.5 seconds
- Movement time extension: 2 %
- Break during movement direction changeover: 1 s
- Behaviour in case of bus voltage failure: Stop
- Behaviour in case of bus voltage return: Stop
- Binary inputs: Operation concept: Short – long – short
- Binary inputs: Time between short and long time operation: 0.4 seconds
- Binary inputs: Slat moving time: 2 seconds

ℹ The as-delivered state cannot be restored by unloading the application program with the aid of the ETS. When the application program is removed, all the outputs remain permanently switched off. The binary inputs then do not have a function. The manual operation remains without function in this case.

4.2.5 Parameters

4.2.5.1 General parameters

Description	Values	Comment
□↲ General		
Function of outputs A1 and A2	2 x switching outputs **1 x venetian blind output** 2 x valve outputs	This parameter defines the channel definition of the output pair A1 and A2.
Function of outputs A3 and A4	2 x switching outputs **1 x venetian blind output**	This parameter defines the channel definition of the output pair A3 and A4.
Function of outputs A5 and A6	2 x switching outputs **1 x venetian blind output**	This parameter defines the channel definition of the output pair A5 and A6.
Use binary/analogue inputs?	yes **no**	The device has 6 independent binary inputs. By using these inputs, it is possible to read in states from switches, push-buttons or comparable contacts and to process them inside the device or, alternatively, transmit them to the KNX as sensor commands. The binary inputs are replaced with 2 analogue inputs, to which external temperature sensors (see Accessories) can be connected as required. In the "Yes" setting, this parameter always enables the binary and analogue inputs.
Use logic functions?	yes **no**	The device possesses 10 comprehensive logic functions. Simple or complex logical operations can be performed using these functions. In the "Yes" setting, this parameter always enables the logic functions.
Use room temperature controller 1?	yes **no**	The actuator contains up to 2 room temperature controllers (RTC), which are integrated in the device software and which work independently of the process. In the "Yes" setting, this parameter always enables the first room temperature controller.
Use room temperature controller 2?	yes **no**	In the "Yes" setting, this parameter always enables the second room

		temperature controller.
Telegram rate limit	**disabled** enabled	Here it is possible to configure a general telegram rate limit. If the telegram rate limit is enabled, no more telegrams are transmitted to the KNX in 17 seconds (permanently defined, cyclical time interval) than is specified by the parameter "Telegrams per 17 s". This avoids fast edge changes at the binary inputs causing an inpermissibly high bus load.
Telegrams per 17 s	**30 telegrams** 60 telegrams 100 telegrams 127 telegrams	Setting the telegram rate (telegrams in 17 s) for the telegram rate limit. Only visible on "Telegram rate limit = enabled".
Use internal group communication?	yes **no**	The internal group communication allows internal device linkage of input and output objects of specific functions for the data formats "1-bit", "4-bit", "1-byte", "2-byte" and "4-byte". In many cases, this simplifies device configuration considerably, as there is no need for project design of group addresses for functions which only communicate internally in the device. If internal group communication is to be used, then this must be enabled centrally here ("Yes" setting). If enabled, the supported device functions can be linked to the internal connections of the matching data format.

□↵ General switching outputs

Delay after bus voltage return Minutes (0...59)	**0**...59	To reduce telegram traffic on the KNX line after bus voltage switch-on (bus reset), after connection of the device to the KNX line or after programming with the ETS, it is possible to delay various actively transmitting feedback telegrams of the switching function. For this purpose, a delay time can be defined here. Only after the configured time elapses are delayed feedback telegrams for initialisation transmitted to the KNX. Setting the delay time minutes.
Seconds (0...59)	0...**17**…59	Setting the delay time seconds.

Time for cycl. transmission of feedbacks Hours (0...23)	**0**...23	The transmitting feedback telegrams of the actuator can, depending on the parameterisation, also transmit their state cyclically to the KNX. The parameter "Time for cyclical transmission of feedback tel." generally defines the cycle time for all switching outputs. Setting the cycle time hours.
Minutes (0...59)	0…**2**...59	Setting the cycle time minutes.
Seconds (10...59)	**10**...59	Setting the cycle time seconds.
Time for cyclical monitoring Hours (0...23)	**0**...23	Optionally switching outputs can be assigned to the cyclical monitoring independently of each other. If, in so doing, no telegram update was received on the "Switching" object after the monitoring elapsed, the appropriate switching output switches to a predefined preference position. The parameter "Time for cyclical monitoring" generally specifies the monitoring time for all the switching outputs. Sets the monitoring time hours.
Minutes (0...59)	0…**2**...59	Sets the monitoring time minutes.
Seconds (10...59)	**10**...59	Sets the monitoring time seconds.
Time for cycl. transmission of operating hours Hours (0...23)	0...**23**	The operating hours counters - depending on the configuration - can also transmit their counter value cyclically to the KNX. The parameter "Time for cyclical transmission of feedback tel." generally defines the cycle time for all the operating hours counters of the switching outputs. Setting the cycle time hours.
Minutes (0...59)	**0**...59	Setting the cycle time minutes.
Seconds (10...59)	**10**...59	Setting the cycle time seconds.
Time for flashing the disabling functions	**1 sec** 2 sec 5 sec 10 sec	At the start and end of the "Disable" supplementary function, a switching output can flash. The flash cycle time is generally set here for all outputs concerned.
Use central function 1?	yes **no**	The "Yes" setting enables the first central function and thus the "Central switching 1" object. An assignment of individual switching outputs to the first central function is only possible if the

		function is enabled.
Central object polarity	**0 = deactivated;** **1 = activated** 0 = activated; 1 = deactivated	This parameter defines the polarity of the first central object. This parameter is visible only if central function 1 is enabled.
Use central function 2?	yes **no**	The "Yes" setting enables the second central function and thus the "Central switching 2" object. An assignment of individual switching outputs to the second central function is only possible if the function is enabled.
Central object polarity	**0 = deactivated;** **1 = activated** 0 = activated; 1 = deactivated	This parameter defines the polarity of the second central object. This parameter is visible only if central function 2 is enabled.
Use central function 3?	yes **no**	The "Yes" setting enables the third central function and thus the "Central switching 3" object. An assignment of individual switching outputs to the third central function is only possible if the function is enabled.
Central object polarity	**0 = deactivated;** **1 = activated** 0 = activated; 1 = deactivated	This parameter defines the polarity of the third central object. This parameter is visible only if central function 3 is enabled.
Collective feedback switching status?	**no** yes	After central commands or after bus voltage return, 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. The collective feedback summarises the states of all switching outputs in just one telegram. The 32 bit communication object "Collective feedback" contains bit-orientated feedback information of the individual outputs . In the "yes" setting, this parameter enables collective feedback.

Collective feedback type	**active signalling object** passive status object	Collective feedback can take place in the form of active message objects or passive status objects. In the case of active message objects, the feedback is automatically transmitted to the bus whenever the status contained therein is updated. In the function as a passive status object, there is no automatic telegram transmission. In this case, the object values must be read out. The ETS automatically sets the communication flags of the objects required for proper functioning. This parameter is visible only if collective feedback is enabled.
Time delay for feedback telegram after bus voltage return?	**no** yes	If used as active message object, the collective feedback states are transmitted to the KNX after bus voltage return or after an ETS programming operation. In these cases, the feedback can be time-delayed with the time delay being set globally on the "General switching outputs" parameter page This parameter is only visible in case of an actively transmitting feedback object.
Cyclical transmission of the feedback?	**no** yes	The objects of the collective feedback can also transmit their value cyclically in addition to transmission when updating. On "yes", cyclical transmission is performed. The cycle time is specified globally on parameter page "General switching outputs". In the "No" setting, cyclical transmission is deactivated, which means that collective feedback is only transmitted to the KNX if one of the contained states changes. This parameter is only visible in case of an actively transmitting feedback object.
Updating of the object value for collective feedback		Here, you can specify when the actuator should update the feedback values 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. This parameter is only visible in case of an actively transmitting feedback object.
	after each update obj. "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). 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.
	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.

□↵ General blind outputs

Delay after bus voltage return Minutes (0...59)	**0**...59	To reduce telegram traffic on the KNX line after bus voltage switch-on (bus reset), after connection of the device to the KNX line or after programming with the ETS, it is possible to delay various actively transmitting feedback telegrams of the venetian blind function. For this purpose, a delay time can be defined here. Only after the configured time elapses are delayed feedback telegrams for initialisation transmitted to the KNX. Setting the delay time minutes.
Seconds (0...59)	0...**17**…59	Setting the delay time seconds.
Central function?	yes **no**	The "Yes" setting enables the central function of the Venetian blind outputs and thus the "Central travel control" object. An assignment of individual venetian blind outputs to the central function is only possible if the function is enabled.
Central object polarity	**0 = UP; 1 = DOWN** 0 = DOWN; 1 = UP	This parameter defines the polarity of the first central object. This parameter is visible only if the central function is enabled.

□↵ General blind outputs -> Safety

Safety functions:	**disabled** enabled	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 occur here (setting: "enabled").
Wind alarm 1	**disabled** enabled	This parameter can be used to enable the first wind alarm and thus to enable the communication object (setting: "enabled").
Wind alarm 2	**disabled** enabled	This parameter can be used to enable the second wind alarm and thus to enable the communication object (setting: "enabled").
Wind alarm 3	**disabled** enabled	This parameter can be used to enable the third wind alarm and thus to enable the communication object (setting: "enabled").
Rain alarm	**disabled** enabled	This parameter can be used to enable the rain alarm and thus to enable the communication object (setting: "enabled").
Frost alarm	**disabled** enabled	This parameter can be used to enable the frost alarm and thus to enable the communication object (setting: "enabled").
Priority of safety alarms	**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. The safety alarm enabling parameters and the priority parameter are only visible when the safety functions are enabled. i

□↵ General blind outputs -> Safety times

Use wind alarm monitoring	yes **no**	If the wind alarms enabled under "Safety" are to be monitored cyclically

function ? (only if wind alarms are enabled!)		for incoming telegrams to the safety objects, the monitoring function must be enabled here (setting: "yes"). Otherwise (setting: "no") 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.
Time for monitoring wind alarm Hours (0...23)	**0**...23	The wind alarm monitoring time is configured here. Sets the monitoring time hours.
Minutes (1...59)	1...**25**...59	Sets the monitoring time minutes.
Use rain alarm monitoring function ?	yes **no**	If the rain alarm enabled under "Safety" is to be monitored cyclically for incoming telegrams to the safety object, the monitoring function must be enabled here (setting: "yes"). Otherwise (setting: "no") 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.
Time for monitoring rain alarm Hours (0...23)	**0**...23	The rain alarm monitoring time is configured here. Sets the monitoring time hours.
Minutes (1...59)	1...**2**...59	Sets the monitoring time minutes.
Use frost alarm monitoring function ?	yes **no**	If the frost alarm enabled under "Safety" is to be monitored cyclically for incoming telegrams to the safety object, the monitoring function must be enabled here (setting: "yes"). Otherwise (setting: "no") 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.
Time for monitoring frost alarm Hours (0...23)	**0**...23	The frost alarm monitoring time is configured here.

		Sets the monitoring time hours.
Minutes (1...59)	1...**2**...59	Sets the monitoring time minutes.

□↵ General valve outputs

Setting the parameters of the valve outputs		To simplify the configuration, all the valve outputs can be assigned to the same parameters in the ETS and thus configured identically. This parameter stipulates whether every valve output of the device can be configured individually or whether all the outputs should be configured by the same parameters.
	all outputs equal	In the "All outputs equal" setting, the number of parameters in the ETS is reduced. The visible parameters are then used on all the valve outputs automatically. Only the communication objects can then be configured separately for the outputs. This setting should be selected, for example, if all the actuators behave identically and should only be activated by different group addresses (e.g. in office blocks or in hotel rooms).
	each output individual	In the parameter setting "Each output individually", each valve output possesses its own parameter pages in the ETS.
Delay after bus voltage return Minutes (0...59)	**0**...59	To reduce telegram traffic on the bus line after bus voltage switch-on (bus reset), after connection of the device to the bus line or after an ETS programming operation, it is possible to delay selected active feedback 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 status or feedback telegrams for initialisation transmitted to the KNX, provided that the status and feedback functions are to be transmitted after a delay. Setting the delay time minutes.
	0...**17**...59	Setting the delay time seconds.
Time for cycl. transmission of feedback Hours (0...23)	**0**...23	The transmitting feedback telegrams of the actuator can, depending on the parameterisation, also transmit their state cyclically to the KNX. The parameter "Time for cyclical

		transmission of feedback tel." generally defines the cycle time for all valve outputs. Setting the cycle time hours.
Minutes (0...59)	0…**2**...59	Setting the cycle time minutes.
Seconds (10...59)	**10**...59	Setting the cycle time seconds.
Time for cycl. transmission of operating hours Hours (0...23)	0...**23**	The operating hours counters - depending on the parameterisation - can also transmit their counter value cyclically to the KNX. The parameter "Time for cyclical transmission of feedback tel." generally defines the cycle time for all valve outputs. Setting the cycle time hours.
Minutes (0...59)	**0**...59	Setting the cycle time minutes.
Seconds (10...59)	**10**...59	Setting the cycle time seconds.
Summer/winter mode switch-over		The actuator possesses a summer / winter switchover. Depending on the season, this allows the setting of different command value setpoints for a valve output for emergency operation or forced position.
	no	The summer / winter switch-over is not available. For the valve outputs, only one command value can be configured separately for emergency operation or a forced position.
	yes	The summer / winter switch-over is enabled. The communication object "Summer / winter switch-over" becomes visible in the ETS. Summer and winter command values can be configured for emergency operation and a forced position for the valve outputs.
Polarity of "Summer / winter switch-over"" object	1 = Summer / 0 = Winter **1 = Winter / 0 = Summer**	This parameter sets the telegram polarity of the "Summer / winter switch-over" object. It is only visible when the summer / winter switch-over is enabled.
Operating mode after ETS programming		The "Summer" or "Winter" state preset via the object "Summer / winter switch-over" is stored internally in the device and is restored after bus voltage return. The parameter "Operating mode after ETS programming operation" defines which operating mode is active after ETS commissioning.
	Summer mode	In this setting, the actuator activates summer operation after an ETS

		programming operation. This overwrites the value saved internally in the device.
	Winter mode	In this setting, the actuator activates winter mode after an ETS programming operation. This overwrites the value saved internally in the device.
	no change (saved operating mode)	In this configuration, the actuator activates the most recently saved operating mode.
Use 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. Service mode must first be enabled here, so that it can be activated and deactivated via the KNX during actuator operation.
	no	Service mode is not available. No valve outputs can be assigned to service mode in the ETS.
	yes	Service mode is enabled. The communication object "Service mode - Deactivate / activate input" becomes visible. Valve outputs can be assigned on the parameter pages "Relay output... -> VO... - General -> VO... - Assignments".
Behaviour at the end of the service mode	no change close all outputs completely open all outputs completely **Track states**	The parameter "Behaviour at the end of service mode" specifies the state to which the affected valve outputs go on deactivating service operation. This parameter is only visible when service operation is used.

□↵ General valve outputs -> Valve / pump - Valve outputs

Collective feedback status of value outputs (opened / closed) ?		After central commands or after bus voltage return, 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 can be used to keep the telegram load low during initialisation.
	no	Collective feedback is deactivated. No collective feedback object is available.
	yes	Collective feedback is enabled. The collective feedback object becomes visible in the ETS.

Collective feedback type		Collective feedback can be provided in the function of an active signalling object or a passive status object. In the case of an active signal object, the feedback is automatically transmitted to the KNX whenever the status contained therein changes. In the function as a passive status object, there is no automatic telegram transmission. In this case, the object value must be read out. The ETS automatically sets the object communication flags required for proper functioning. This parameter is visible only if collective feedback is enabled.
	active signalling object	The actuator transmits the collective feedback automatically when the object value is updated. After a device reset (ETS programming operation, bus voltage return), current collective feedback is always transmitted.
	passive status object	Collective feedback will only be transmitted in response if the object is read out from the KNX. No automatic telegram transmission of the collective feedback takes place after bus voltage return or after an ETS programming operation.
Time delay for feedback telegram after bus voltage return ?		If used as active message object, the collective feedback is transmitted to the KNX after bus voltage return or after programming with the ETS. 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 visible only if collective feedback is enabled.
	no	The collective feedback telegram is transmitted immediately after bus voltage return or ETS programming.
	yes	The collective feedback telegram is transmitted with a delay after bus voltage return or after programming in ETS. No feedback is transmitted during a running time delay, even if a valve state changes.
Cyclical transmission of the feedback ?		The object of the collective feedback can also transmit its value cyclically in addition to transmission when updating.

		This parameter is visible only if collective feedback is enabled.
	no	Cyclical transmission is deactivated, which means that collective feedback is only transmitted to the KNX if one of the valve states changes.
	yes	Cyclical transmission is activated.
Activate function "Heat requirement" ?	**no** yes	The actuator 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 switch-over between the reduction and comfort setpoint in a central combi boiler). Here, the heat requirement control of the actuator can be enabled centrally ("yes" setting). On the "Relay output..." -> VO... - General -> VO... - Assignments" parameter page the valve outputs must be assigned to the heat requirement control individually, so that they are included in the requirement determination.
Polarity of "Heat requirement" object	**0 = No heat requirement / 1 = Heat requirement** 0 = Heat requirement / 1 = No heat requirement	This parameter defines the telegram polarity of the "Heat requirement" object. It is visible only if the heat requirement function is enabled.
Record external heat requirement ?	**no** yes	The actuator is able to evaluate an external heat requirement (e.g. from another KNX heating actuator). The local 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 "Heat requirement". In the "yes" setting, this parameter will enable the object "External heat requirement". It is visible only if the heat requirement function is enabled.
Limiting value minimum command value for heat requirement (0...100 %)	**0**...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 for limiting value minimum command value (1...20 %)	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.
Delay heat requirement ACTIVE Hours (0...23)	**0**...23	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 preset time. This parameter is visible only if the heat requirement function is enabled. Definition of the delay time hours.
Minutes (0...59)	0...**5**...59	Definition of the delay time minutes.
Seconds (0...59)	**0**...59	Definition of the delay time seconds.
Delay heat requirement INACTIVE Hours (0...23)	**0**...23	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 preset time. This parameter is visible only if the heat requirement function is enabled. Definition of the delay time hours.
Minutes (0...59)	0...**5**...59	Definition of the delay time minutes.
Seconds (0...59)	**0**...59	Definition of the delay time seconds.
Activate "Largest command value" function ?	**no** yes	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 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) with command value limiting value", there is no evaluation of the command values preset via the KNX. Exception: It may also occur with such command value outputs that a constant command value is active (e.g. after bus voltage return 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 KNX, overriding the constant command value at the valve output.
Transmission of the largest command value		The largest command value determined by the actuator is actively transmitted to the bus. This parameter decides when a telegram is transmitted via the "Largest command value" object. This parameter is visible only if the "Largest command value" function is enabled.
	only on change	A telegram is only transmitted when the largest command value changes.
	only cyclical	The actuator only transmits the "Largest command value" telegram cyclically. The cycle time is defined globally for all feedback on the parameter page "General valve outputs".
	on change and cyclical	The actuator transmits the "Largest command value" 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.
Record external largest command value ?	**no** yes	The actuator is able to evaluate an external largest control value (e.g. from another KNX heating actuator). The local actuator 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".

		This parameter will enable the object "External largest command value" in the "yes" setting. It is only available when the "Largest command value" function is enabled.
Activate "Pump control" function ?	**no** yes	The actuator allows switching activation of the circulation pump of the heating or cooling circuit via a 1-bit KNX telegram. Here, the pump control of the actuator can be enabled centrally ("yes" setting). On the "Relay output..." -> VO... - General -> VO... - Assignments" parameter page the valve outputs must be assigned to the pump control individually, so that they are included in the requirement determination.
Polarity of "Pump control" object	**0 = Switch off pump / 1 = Switch on pump** 0 = Switch on pump/ 1 = Switch off pump	This parameter defines the telegram polarity of the "Pump control" object. It is visible only if the pump control is enabled.
Record external pump control ?	**no** yes	The actuator is able to evaluate an external pump control signal (e.g. from another KNX heating actuator). 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 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.
Limiting value minimum command value for pump (0...100 %)	**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 for limiting value minimum command value (1...20 %)	**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.
Delay pump ACTIVE Minutes (0...59)	**0**...59	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 preset time 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 delay time minutes.
Seconds (0...59)	0...**10**...59	Definition of the delay time seconds.
Delay pump INACTIVE Hours (0...23)	**0**...23	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 preset time 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 delay time hours.
Minutes (0...59)	0...**10**...59	Definition of the delay time minutes.
Seconds (0...59)	**0**...59	Definition of the delay time seconds.
Activate anti-sticking protection	**no** yes	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.
Time for cyclical switching on of the pump (1...26 weeks)	**1**...26	When anti-sticking protection is enabled, the length of protection function is defined here. If the pump is not switched on at least once during the set time by the pump controller, then the actuator will executed anti-sticking protection, if necessary on a regular basis.
Switch-on time of the pump (1...15 minutes)	1...**5**...15	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 set time without interruption, assuming that anti-sticking protection must be executed.

□↵ General binary/analogue inputs

Delay after bus voltage return Minutes (0...59)	**0**...59	It is possible to specify separately for each binary input whether a reaction should take place after a device reset (bus voltage return or ETS programming operation). This means that a defined telegram can be transmitted to the KNX according to the input signal or with forced control. The delay time for the binary input configurable at this point must have elapsed fully after a bus voltage return by the time the intended reaction is executed. Within the delay, any pending edges or signals at the inputs are not evaluated and are ignored. For analogue inputs, the temperature object value is updated according to the detected room temperature and transmitted to the KNX after bus voltage return or an ETS programming operation. If a delay is configured here, then the time must first elapse so that a temperature telegram is transmitted. Setting the delay time minutes.
Seconds (0...59)	0...**17**…59	Setting the delay time seconds.
Milliseconds (0...9 x 100)	**0**...9	Setting the delay time milliseconds.
Debounce time Milliseconds (30...255)	**30**...255	This parameter specifies the software debounce time for all binary inputs together. Depending on the quality of the connected contacts, you can define here after which activation period the binary inputs detect a valid actuation.

□↵ General Manual operation

Manual control during bus operation	disabled **enabled**	Here, it is possible to configure whether manual operation is to be possible or deactivated permanently.
Disabling function ?	yes **no**	Manual control 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 control is enabled during bus operation.
Polarity of disable object	**0 = enabled;** **1 = disabled**	This parameter sets the polarity of the disabling object.

	0 = disabled; 1 = enabled	This parameter is only visible if manual control is enabled during bus operation.
Transmit status ?	yes **no**	The current state of manual control can be transmitted to the KNX via a separate status object, if bus voltage is available (setting: "yes"). This parameter is only visible if manual control is enabled during bus operation.
Status object function and polarity		This parameter defines the information contained in the status object. The object is always "0", when the manual control mode is deactivated. This parameter is only visible if manual control is enabled during bus operation.
	0 = inactive; **1 = man.contr.active**	The object is "1" when the manual control mode is active (temporary or permanent).
	0 = inactive; 1 = perman. man. control active	The object is "1" only when the permanent manual control is active.
Behaviour at the end of permanent manual control during bus operation		The behaviour of the actuator at the end of permanent manual control depends on this parameter. This parameter is only visible if manual control is enabled during bus operation.
	no change	After the end of the permanent manual control mode, the current state of all outputs remains unchanged. If, however, a function with a priority lower than that of manual operation (e.g. forced position, service mode) has been activated via the bus before or during manual operation, the actuator sets the reaction preset for this function for the appropriate outputs.
	Output tracking	During active permanent manual operation, all incoming telegrams and state changes are tracked internally. At the end of the manual operation, the valve outputs are set according to the most recently received command or the most recently activated function with a lower priority.
Disable bus control of individual outputs during bus operation	yes **no**	Individual valve outputs can be disabled locally during permanent manual operation, so that the disabled outputs can no longer be activated using KNX telegrams or lower-priority device functions. Disabling via manual operation is only permitted if this

		parameter is set to "Yes". This parameter is only visible if manual control is enabled during bus operation.
Cycle time during manual operation	0.5 minutes 1 minute 1.5 minutes 2 minutes ... 19.5 minutes **20 minutes (recommended)**	During manual operation, all the 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). The cycle time of the PWM signal for a valve output activated by manual operation is configured by this parameter. 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 %). 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 % or 100 %).
PWM in manual control (5...100 %)	5...**50**...100	This parameter specifies the pulse-pause ratio of the pulse width modulation of the manual operation for opened valve outputs.

□↵ Summary internal group communication

The parameters for linking the internal group addresses are available on the parameter pages of the corresponding functions. In addition, all the link parameters are available in collected form on the "Overview, internal group communication" parameter page. This parameter page can be used directly for the project design of the links and also serves as an overview of internal group communication, similar to an object table in the ETS.

4.2.5.2 Parameter for blind outputs

Description	Values	Comment
□↲ Relay outputs... -> VBO... - General		
Name of shutter/blinds output	20-character 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", "Roller shutter, bathroom"). The text is not programmed in the device.
Operating mode (Please set first!)	**Venetian blind** Roller shutter / awning Venting louver	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 "Operating mode" parameter should be adjusted before all other parameters of an output.
Behaviour after ETS programming		The actuator permits setting the preferred relay contact position after ETS programming separately for each output.
	Raising / opening the louvre	After programming with the ETS, the actuator raises the blind or opens the venting louvre.
	Lowering / closing the louvre	After programming with the ETS, the actuator lowers the blind or closes the venting louvre.
	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.
Behaviour in case of bus voltage failure		The actuator permits setting the preferred relay contact position in case of bus voltage failure separately for each output.
	stop	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.
	no reaction	

		In the event of bus voltage failure, the relay of the output shows no reaction. Any drive movements still in progress at the time of failure will be completely finished.
Behaviour after bus voltage return		The actuator permits setting the preferred relay contact position after bus voltage return 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.
	Raising / opening the louvre	After bus voltage return, the actuator raises the blind or opens the venting louver.
	Lowering / closing the louvre	After bus voltage return, the actuator lowers the blind or closes the venting louver.
	Position in case of bus voltage failure	After bus voltage return, the forced-position state last selected and internally stored before bus voltage failure will be tracked.
	approaching a position	In case of bus voltage return, the connected drive can approach a position specified by further parameters.
Position of venetian blind in case of bus voltage return (0...100%)	**0**...100	This parameter specifies the blind position to be approached in case of bus voltage return. This parameter is only visible, if "Behaviour in case of bus voltage return" is set to "approaching a position".
Position of slat in case of bus voltage return (0...100%)	**0**...100	This parameter specifies the slat position to be approached in case of bus voltage return after the blind has been positioned at the desired height. This parameter is only visible, if "Behaviour in case of bus voltage return" is set to "approaching a position".
Roller shutter/awning position on bus voltage return (0...100%)	**0**...100	This parameter specifies the roller shutter or awning position to be approached in case of bus voltage return. This parameter is only visible, if "Behaviour in case of bus voltage return" is set to "approaching a position".

Position of venting louver on bus voltage return (0...100%)	**0**...100	This parameter specifies the venting louver position to be approached in case of bus voltage return. This parameter is only visible, if "Behaviour in case of bus voltage return" is set to "Approach position" in the "Venting louver" operating mode.
Travelling time extension for upward travel	**2 %** 3 % 4 % 5 % 6 % 7 % 8 % 9 % 10 % 12.5 %	The actuator extends all the up movements or all venting louver 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).
Internal group communication Long-time operation	**---** internal connection 1 (1 bit) ... internal connection 50 (1 bit)	If internal group communication is enabled, this parameter defines the internal 1-bit group address for long-time operation.
Internal group communication Short time operation	**---** internal connection 1 (1 bit) ... internal connection 50 (1 bit)	If internal group communication is enabled, this parameter defines the internal 1-bit group address for short-time operation.
Internal group communication Position of blind	**---** internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the position specification of the Venetian blind position. This parameter is only available in the "Venetian blind" operating mode.
Internal group communication Slat position	**---** internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the position specification of the slat position. This parameter is only available in the "Venetian blind" operating mode.
Internal group communication Shutter/awning position	**---** internal connection 51 (1 byte) ...	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the position specification of the roller shutter

	internal connection 100 (1 byte)	or awning position. This parameter is only available in the "Roller shutter/awning" operating mode.
Internal group communication position of venting louver	**---** internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the position specification of the venting louver position. This parameter is only available in the "Venting louver" operating mode.

□↲ Relay outputs... -> VBO... - General -> VBO... - Times

Venetian blind travelling time Minutes (0...19)	0...**1**...19	This parameter defines the travelling time of the Venetian blind. The time needed for a complete travel from the upper into the lower end position must be determined. Sets the minutes of the Venetian blind travelling time.
Seconds (0...59)	**0**...59	Sets the seconds of the Venetian blind travelling time. These parameters are visible only in the venetian blind mode of operation.
Roller shutter/awning travelling time Minutes (0...19)	0...**1**...19	This parameter defines the travelling time of the roller shutter or awning. The time needed for a complete travel from the upper into the lower end position must be determined. Sets the minutes of the roller shutter/awning moving time.
Seconds (0...59)	**0**...59	Sets the seconds of the roller shutter/awning moving time. These parameter are visible only in the roller shutter / awning operating mode.
Venting louver travelling time Minutes (0...19)	0...**1**...19	This parameter defines the travelling time of the venting louver. The time needed for a complete travel from the completely open into the completely closed position must be determined. Sets the minutes of the venting louver travelling time.
Seconds (0...59)	**0**...59	Sets the seconds of the venting louver travelling time. These parameters are visible only in the venting louver mode of operation.

Slat travelling time Minutes (0...19)	**0**...19	This parameter defines the travelling time of the slats. The time needed for a complete movement from the completely open slat position into the completely closed slat position (downward direction) must be determined. Sets the minutes of the slat moving time.
Seconds (0...59)	0...**4**...59	Sets the seconds of the slat moving time.
Milliseconds (0...9 x 100)	**0**...9	Sets the milliseconds of the slat moving time. These parameters are visible only in the venetian blind mode of operation.
Short time operation		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 Seconds (0...59)	**0**...59	This parameter defines the duration of short-time operation. Sets the monitoring time seconds.
Milliseconds (0...99 x 10)	**0**...99	Sets the monitoring time milliseconds. The duration of short time operation should in no case exceed half the slat adjusting time. This parameter is only visible, if the parameter "Short-time operation" is set to "yes".
Switchover time for travel direction change	0.5 sec **1 sec** 2 sec 5 s	Specifies the break in a travel direction change (switchover time).

□↵ Relay outputs... -> VBO... - General -> VBO... - Enabled functions

Feedback functions	**disabled** enabled	This parameter can be used to disable or to enable the feedback functions.

Safety functions	**disabled** enabled	This parameter can be used disable or to enable the safety functions.
Sun protection functions	**disabled** enabled	This parameter can be used disable or to enable the sun protection functions.
Scene function	**disabled** enabled	This parameter can be used disable or to enable the scene function.
Forced position function	**disabled** enabled	This parameter can be used to disable or to enable the forced position function.
Supplementary function	**no supplementary function** End position correction bottom Fabric-stretching	Depending on the operating mode set the actuator has up to two supplementary functions per output. In the "Roller shutter/Awning" operating mode the supplementary function "End position correction bottom" or "Fabric-stretching" can be configured in the ETS as an alternative. In the "Venetian blind" operating mode, only the supplementary function "End position correction bottom" can be configured. Only in the "Venting louver" operating mode can no supplementary function be selected. If necessary a supplementary function can be selected here and thus enabled. This parameter is visible only in the "Venetian blind" or "Roller shutter/awning" operating mode.
Assignment to central function ?		This parameter determines the assignment of the output to the central function.
	yes	The output is assigned to the central function. Note that the central function can be enabled under "General Venetian blind outputs".
	no	The output is not assigned to the central function.

□↵ Relay outputs... -> VBO... - General -> VBO... - Feedbacks

Venetian blind position feedback		The current Venetian blind position of the output can be reported separately back to the KNX.
	no feedback	No feedback object available for the output. feedback deactivated

	feedback object is active signalling object	Feedback and the object are activated. The object transmits actively.
	feedback object is passive status object	Feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request). This parameter is only visible in the venetian blind operating mode.
Roller shutter/awning position feedback		The current roller shutter or awning position of the output can be reported separately back to the KNX.
	no feedback	No feedback object available for the output. feedback deactivated
	feedback object is active signalling object	Feedback and the object are activated. The object transmits actively.
	feedback object is passive status object	Feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request). This parameter is only visible in the roller shutter / awning operating mode.
Venting louvre position feedback		The current venting louvre position of the output can be reported separately back to the KNX.
	no feedback	No feedback object available for the output. feedback deactivated
	feedback object is active signalling object	Feedback and the object are activated. The object transmits actively.
	feedback object is passive status object	Feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request). This parameter is visible only in the venting louver operating mode.
Time delay for feedback telegram after bus voltage return ?	yes **no**	The feedback telegram can be transmitted to the KNX with a delay after bus voltage return or after programming with the ETS. Setting "yes" activates the delay time of the feedback in case of bus voltage return. The delay time is configured under "General blind outputs". This parameter is only visible in case of an actively transmitting feedback object.
Slat position feedback		The current slat position of the output can be reported separately back to the KNX.

	no feedback	No feedback object available for the output. feedback deactivated
	feedback object is active signalling object	Feedback and the object are activated. The object transmits actively.
	feedback object is passive status object	Feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request). This parameter is only visible in the venetian blind operating mode.
Time delay for feedback telegram after bus voltage return ?	yes **no**	The feedback telegram can be transmitted to the KNX with a delay after bus voltage return or after programming with the ETS. Setting "yes" activates the delay time of the feedback in case of bus voltage return. The delay time is configured under "General". This parameter is only visible in case of an actively transmitting feedback object.
Invalid Venetian blind position feedback		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).
	no feedback	No feedback object available for the output. feedback deactivated
	feedback object is active signalling object	Feedback and the object are activated. The object transmits actively.
	feedback object is passive status object	Feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request). This parameter is only visible in the venetian blind operating mode.
Invalid roller shutter/awning position feedback		The actuator can report to the KNX that the current roller shutter/awning position is unknown (e.g. after an initialisation, when no reference travel has been executed as yet).
	no feedback	No feedback object available for the output. feedback deactivated
	feedback object is active signalling object	Feedback and the object are activated. The object transmits actively.
	feedback object is passive status object	Feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request). This parameter is only visible in the roller shutter / awning operating mode.

Invalid venting louvre position feedback		The actuator can report to the KNX that the current venting louvre position is unknown (e.g. after an initialisation, when no reference travel has been executed as yet).
	no feedback	No feedback object available for the output. feedback deactivated
	feedback object is active signalling object	Feedback and the object are activated. The object transmits actively.
	feedback object is passive status object	Feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request). This parameter is visible only in the venting louver operating mode.
Time delay for feedback telegram after bus voltage return ?	yes **no**	The feedback telegram can be transmitted to the KNX with a delay after bus voltage return or after programming with the ETS. Setting "yes" activates the delay time of the feedback in case of bus voltage return. The delay time is configured under "General blind outputs". This parameter is only visible in case of an actively transmitting feedback object.
Drive movement feedback		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.
	no feedback	No feedback object available for the output. feedback deactivated
	feedback object is active signalling object	Feedback and the object are activated. The object transmits actively.
	feedback object is passive status object	Feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request).
Time delay for feedback telegram after bus voltage return ?	yes **no**	The feedback telegram can be transmitted to the KNX with a delay after bus voltage return or after programming with the ETS. Setting "yes" activates the delay time of the feedback in case of bus voltage return. The delay time is configured under "General blind outputs". This parameter is only visible in case of an actively transmitting feedback object.

□↵ Relay outputs... -> VBO... - General -> VBO... - Safety

Assignment to wind alarms	**no** Wind alarm 1 Wind alarm 2 Wind alarm 3 Wind alarm 1 + 2 Wind alarm 1 + 3 Wind alarm 2 + 3 Wind alarm 1 + 2 + 3	This parameter defines whether the output responds to a wind alarm and to which of the alarms.
Behaviour in case of wind alarm		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 louvre	The actuator raises the curtain or opens the venting louver at the beginning of the wind alarm or wind alarms and locks the output thereafter.
	Lowering / closing the louvre	The actuator lowers the curtain or closes the venting louver at the beginning of the wind alarm or wind alarms and locks the output thereafter.
	stop	At the beginning of the wind alarm or wind alarms, the actuator switches the relays of the output to "stop" 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	yes **no**	This parameter defines whether the output responds to the rain alarm.
Behaviour in case of rain alarm		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 louvre	The actuator raises the curtain or opens the venting louver at the beginning of

		the rain alarm and locks the output thereafter.
	Lowering / closing the louvre	The actuator lowers the curtain or closes the venting louver at the beginning of the rain alarm and locks the output thereafter.
	stop	At the beginning of the rain alarm, the actuator switches the relays of the output to "stop" 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	yes **no**	This parameter defines whether the output responds to the frost alarm.
Behaviour in case of frost alarm		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 louvre	The actuator raises the curtain or opens the venting louver at the beginning of the frost alarm and locks the output thereafter.
	Lowering / closing the louvre	The actuator lowers the curtain or closes the venting louver at the beginning of the frost alarm and locks the output thereafter.
	stop	At the beginning of the frost alarm, the actuator switches the relays of the output to "stop" 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.
Behaviour at the end of safety (Wind, rain, frost)		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 unlocked 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	

		The actuator unlocks the output at the end of all safety alarms and raises the curtain or opens the venting louver.
	Lowering / closing the louvre	The actuator unlocks the output at the end of the safety functions and lowers the curtain or closes the venting louver.
	stop	At the end of the safety functions, the output is unlocked and the actuator switches the relays of the output into the "stop" position. A travel movement, if any, will be interrupted.
	tracking the 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.

□↤ Relay outputs... -> VBO... - General -> VBO... - Sun protection

Type of 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 the simple sun protection. In addition, the connected drive can be integrated in shading control systems depending on the position of the sun. Automatic heating/cooling can also be implemented.
Priority of sun protection with respect to direct operation		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 control. This parameter is only visible in the simple sun protection.
Priority of automatic operation with respect to direct operation		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 control. This parameter is only visible in the extended sun protection.
Polarity of the "Sunshine / shading facade" object	**sunshine = 1; no sunshine = 0** sunshine = 0; no sunshine = 1	This parameter defines the polarity of the input object "Sunshine / shading facade" of the sun protection.
Activation of automatic operation via		This parameter defines how to activate the automatic mode and the reactions resulting from such activation.
	object "Automatic" & next change of state	Automatic operation is activated as soon as the "Automatic" object is set to 'active' in consideration of polarity. A reaction at the output occurs, however, only after a new change of state has

		been signalled via the "Sunshine / shading facade" object. In this case, the new state (beginning of sun protection or end of sun protection) determines the behaviour of the output.
	object "Automatic" & immediate tracking	Automatic operation is activated as soon as the "Automatic" object receives a "1" telegram. The state of the object "Sunshine / shading facade" immediately determines the behaviour of the output (beginning of sun protection, end of sun protection). The reception of a telegram 'Automatic mode inactive' at the "Automatic" object immediately ends the automatic mode in both cases. The behaviour is in this case defined by the parameter "Reaction at the end of automatic operation".
Polarity of "Automatic" object	**automatic mode: activated = 1; deactivated = 0** automatic mode: activated = 0; deactivated = 1	This parameter defines the polarity of the automatic object. This parameter is only visible if the parameter "Activation of automatic operation via..." is set to "automatic" & next change of state".
Disabling function for automatic mode ?	yes **no**	The automatic mode can be disabled. When disabling is active, the automatic mode is aborted. It can only be reactivated, if a "1" is written into the "Automatic" object. The objects "Automatic" and "Automatic mode disable" are logically combined (AND with feedback). The "yes" setting enables the disabling function and makes the disabling object visible. This parameter is only visible, if the parameter "Activation of automatic operation via..." is set to "object automatic & immediate tracking".
Polarity of "Automatic mode disable" object	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 for automatic mode ?" is set to "yes".

Disabling function for direct operation ?	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. The "yes" setting enables the disabling function and makes the disabling object visible. Direct operation = long-time/short-time operation, positioning via objects, scenes, central control.
Polarity of "Direct operation disable" object	Automatic mode: enabled = 1; disabled = 0 **Automatic mode: 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 disable?" is set to "yes".
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 parameter can be used to enable the feedback object and configure it further.
	no feedback	No feedback object is available for the automatic operation of the output concerned. feedback deactivated
	feedback object is active signalling object	Feedback and the object are activated. The object transmits actively (telegram transmission after change of state of automatic mode).
	feedback object is passive status object	Feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request).
Time delay for feedback telegram after bus voltage return ?	yes **no**	The feedback telegram can be transmitted to the KNX with a delay after bus voltage return or after programming with the ETS. Setting "yes" activates the delay time of the feedback in case of bus voltage return. The delay time is configured under "General". This parameter is only visible in case of an actively transmitting feedback object.

Reaction at the end of automatic operation		This parameter defines the behaviour of the output at the end of automatic operation and also at the beginning of an automatic operation disable.
	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 curtain or opens the venting louver.
	Lowering / closing the louver	At the end of automatic operation, the actuator terminates the sun protection and lowers the curtain or closes the venting louver.
	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.
	tracking the 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 preset in this parameter will only be executed, if no function with a higher priority (e.g. safety) is activated at the end of automatic operation.

□↵ Relay outputs... -> VBO... - General -> VBO... - Beginning of sun protection

Time delay beginning of sunshine / shading Minutes (0...59)	**0**...59	The telegram received via the object "Sunshine / shading facade" for activation of shading (depending on polarity) can be evaluated with a time delay.. Setting the delay time minutes.
Seconds (0...59)	0...**30**...59	Setting the delay time seconds. A time setting of "0" in the parameters deactivates the respective delay time. In this case, the state of shading is evaluated immediately.
Reaction at the beginning of sunshine / shading		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.
	Lowering	At the beginning of shading, the actuator lowers the blind.
	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.
	venetian blind or slat position fixed	At the beginning of shading, the output controls the approach to a configured fixed Venetian blind and slat position.
	Venetian blind position fixed / slat position variable	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.
	Venetian blind and slat position variable	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 operating mode.
Reaction at the beginning of sunshine / shading		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.
	Lowering	At the beginning of shading, the actuator lowers the blind.
	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 shutter / awning position	At the beginning of shading, the output controls the approach to a configured fixed roller shutter / awning position.
	Roller shutter / awning position variable	At the beginning of shading, the output controls the approach to the roller shutter / awning position preset by a separate object and thus variable. This parameter is only visible in the roller shutter / awning operating mode.
Reaction at the beginning of sunshine / shading		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.
	Opening the louvre	At the beginning of shading, the actuator opens the venting louvre.
	Closing the louvre	At the beginning of shading, the actuator closes the venting louvre.
	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 venting louvre position	At the beginning of shading, the output controls the approach to a configured fixed venting louvre position.
	Venting louvre position variable	At the beginning of shading, the output controls the approach to the venting louvre position preset by a separate object and thus variable. This parameter is visible only in the venting louver operating mode.

Scene number (1...8)	**1**...8	This parameter defines the number of the internal scene which is recalled at the beginning of shading. This parameter is only visible, if the parameter "Reaction at the beginning of sunshine / shading" is set to "internal scene recall".
Fixed Venetian blind 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 value will be approached.
	no change in current position	At the beginning of shading, the current position of the Venetian blind 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 operating mode.
Venetian blind position (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 operating mode.
Fixed slat position (0...100 %)	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 operating mode.

Fixed roller shutter / awning position		The fixed position of the roller 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 roller shutter or awning position will be approached.
	no change in current position	At the beginning of shading, the current position of the roller shutter or awning will be maintained. Any movements in progress at the time of shading activation will be finished. This parameter is only visible when the roller shutter or awning should approach a fixed position value at the beginning of sun shading. This parameter is only visible in the roller shutter / awning operating mode.
Position of roller shutter / awning (0...100 %)	0...**50**…100	This parameter sets the fixed position of the roller 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 roller shutter / awning operating mode.
Fixed position of venting louvre		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 position of the venting louvre 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 visible only in the venting louver operating mode.
	0...**50**…100	

Position of venting louvre (0...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 visible only in the venting louver operating mode.
Reference movement before each sun protection positioning operation ?	yes **no**	A forced reference movement of the drive is performed before sun protection positioning (setting "yes"). 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 (setting "no"), the actuator performs a reference movement only once after return of the power supply.
Offset with fixed and variable slat position		For manual adjustment of the slat angle during a shading or sun position tracking 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 configured	The slat offset is statically preset by means of a fixed parameter value.
	Offset as configured 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 operating mode.
Offset slat position (-100..100 %)	-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 operating mode.
Store offset slat position via object in case of bus voltage failure ?		If the offset is preset via the object, this parameter defines whether the received value is to be stored in the actor's NV memory.
	yes	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.
	no	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 only visible, if the parameter "Offset with fixed and variable slat position" is set to "offset as configured and via object". This parameter is only visible in the venetian blind operating mode.

□↵ Relay outputs... -> VBO... - General -> VBO... - End of sun protection

Time delay at end of sunshine / shading Minutes (0...59)	**0**...59	The telegram received via the object "Sunshine / shading facade" for deactivation of shading (depending on polarity) can be evaluated with a time delay.. Setting the delay time minutes.
Seconds (0...59)	0...**30**...59	Setting the delay time seconds. A time setting of "0" in the parameters deactivates the respective delay time. In this case, the state of shading is evaluated immediately.
Reaction at the end of sunshine / shading		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 louvre	At the end of shading, the actuator raises the curtain or opens the venting louver.
	Lowering / closing the louvre	At the end of shading, the actuator lowers the curtain or closes the venting louver.
	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.
	tracking the 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.
Reaction at the end of sunshine / shading		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 curtain.
	Lowering	At the end of shading, the actuator lowers the curtain.
	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.
	Venetian blind or slat position fixed	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 operating mode. This parameter does not define the behaviour of the output at the end of automatic operation (cf. parameter "Reaction at the end of automatic operation")!

Reaction at the end of sunshine / shading		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 curtain.
	Lowering	At the end of shading, the actuator lowers the curtain.
	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 shutter / awning position	At the end of shading, the output moves to a configured fixed roller shutter / awning position. This parameter is only visible in the extended sun protection. This parameter is only visible in the roller shutter / awning operating mode. This parameter does not define the behaviour of the output at the end of automatic operation (cf. parameter "Reaction at the end of automatic operation")!

Reaction at the end of sunshine / shading		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.
	Opening the louvre	At the end of shading, the actuator opens the venting louver.
	Closing the louvre	At the end of shading, the actuator closes the venting louver.
	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 venting louvre position	At the end of shading, the output moves to a configured fixed venting louver

		position. This parameter is only visible in the extended sun protection. This parameter is visible only in the venting louver operating mode. This parameter does not define the behaviour of the output at the end of automatic operation (cf. parameter "Reaction at the end of automatic operation")!
Scene number (1...8)	**1**...8	This parameter defines the number of the internal scene which is recalled at the end of shading. This parameter is only visible, if the parameter "Reaction at the end of sunshine / shading" is set to "internal scene recall".
Fixed Venetian blind 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 position of the Venetian blind 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 operating mode.
Venetian blind position (0...100 %)	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 operating mode.
Fixed slat position (0...100 %)	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 operating mode.
Fixed roller shutter / awning position		The fixed position of the roller 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 roller shutter or awning position will be approached.
	no change in current position	At the end of shading, the current position of the roller shutter or awning 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 roller shutter / awning operating mode.
Position of roller shutter / awning (0...100 %)	0...**50**…100	This parameter sets the fixed position of the roller 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 roller shutter / awning operating mode.
Fixed position of venting louvre		The fixed venting louver 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 louver position will be approached.
	no change in current position	At the end of shading, the current position of the venting louver will be maintained. Any movements in progress at the time of shading activation will be finished. This parameter is only visible if the venting louver is to approach a fixed position at the end of shading.

		This parameter is visible only in the venting louver operating mode.
Position of venting louvre (0...100 %)	0...**50**…100	This parameter sets the fixed position of the venting louver 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 visible only in the venting louver operating mode.

□↵| Relay outputs... -> VBO... - General -> VBO... - Automatic heating/cooling

Automatic heating/cooling	**disabled** enabled	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, roller shutters, awnings or venting louvers 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.
Polarity of "Heating/cooling changeover" object	**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.
Polarity of "Heating/cooling presence" object	**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.
Time delay at the beginning of presence Minutes (0...59)	**0**...59	The telegram received via the object "Heating/cooling presence" for activation of the presence function (in acc. with polarity) can be evaluated with a time delay. Setting the delay time minutes.
Seconds (0...59)	0...**30**...59	Setting the delay time seconds. 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.
Time delay at the end of presence Minutes (0...59)	**0**...59	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. Setting the delay time minutes.
Seconds (0...59)	0...**30**...59	Setting the delay time seconds. 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.
Reaction to sunshine / shading Start on cooling * End on cooling * Start on heating * End on heating *		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 curtain.
	Lowering	The actuator lowers the curtain.

	Internal scene recall	An internal scene of the actuator is recalled.
	Venetian blind or slat position fixed	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 operating mode. *: 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.
Reaction to sunshine / shading Start on cooling * End on cooling * Start on heating * End on heating *		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 curtain.
	Lowering	The actuator lowers the curtain.
	Internal scene recall	An internal scene of the actuator is recalled.
	fixed shutter or awning position	The output moves to a configured fixed roller shutter or awning position. This parameter is visible only if automatic heating/cooling is enabled. This parameter is only visible in the roller shutter / awning operating mode. *: 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.
Reaction to sunshine / shading Start on cooling * End on cooling * Start on heating * End on heating *		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.
	Opening the louvre	The actuator opens the venting louver.
	Closing the louvre	The actuator closes the venting louver.
	Internal scene recall	An internal scene of the actuator is recalled.
	Fixed venting louvre position	The output moves to a configured fixed venting louver position. This parameter is visible only if automatic heating/cooling is enabled. This parameter is visible only in the venting louver operating mode. *: 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...8)	**1**...8	This parameter defines the number of the internal scene which is recalled. This parameter is only visible, if the parameter "Reaction in case of sunshine / shading" of the automatic heating/cooling function is set to "internal scene recall".
Fixed Venetian blind 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 position of the Venetian blind will be approached.
	no change in current position	The current position of the Venetian blind 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 operating mode.
Venetian blind position (0...100 %)	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 operating mode.
Fixed slat position (0...100 %)	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 operating mode.
Fixed roller shutter / awning position		The fixed roller 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 roller shutter or awning position is approached.
	no change in current position	The current roller shutter / awning position will be maintained. This parameter is only visible, if the roller shutter or awning is to approach a fixed position in case of automatic heating/cooling. This parameter is only visible in the roller shutter / awning operating mode.
Position of roller shutter / awning (0...100 %)	0...**50**…100	This parameter sets the fixed position of the Venetian blind 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 roller shutter / awning operating mode.
Fixed position of venting louvre		The fixed venting louver 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 louver position will be approached.
	no change in current position	The current position of the venting louver will be maintained. This parameter is only visible, if the venting louver is to approach a fixed position in case of automatic heating/cooling. This parameter is visible only in the

		venting louver operating mode.
Position of venting louvre (0...100 %)	0...**50**…100	This parameter sets the fixed position of the venting louver 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 visible only in the venting louver operating mode.

□↵ Relay outputs... -> VBO... - General -> VBO... - Scenes

Delay scene recall?	yes **no**	A scene is recalled via the scene extension object. If needed, the scene recall on the actuator can be made with a delay after reception of a recall telegram (setting: "yes"). The recall is alternatively made immediately on reception of the telegram (setting: "no"). A recall delay has no influence on the storage of scene values.
Delay time Minutes (0...59)	**0**...59	This parameter is used for setting the duration of the scene delay. Sets the scene delay in minutes.
Seconds (0...59)	0...**10**...59	Sets the scene delay in seconds. The delay time parameters are only visible, if the parameter "Delay scene recall ?" is configured to "yes".
Overwrite values stored in the device during ETS download ?	**yes** no	During storage of a scene, the scene values (current states of the outputs concerned) are stored internally in the device. To prevent the stored values from being replaced during an ETS programming operation by the originally programmed scene states, the actuator can inhibit overwriting of the scene values (setting: "no"). As an alternative, the original values can be reloaded into the device during each ETS programming operation (setting: "yes").
Scene X activatable by scene number (scene number "0" = scene deactivated) X = depending on the scene (1...8)	0…**1***...64 *: The predefined scene number is dependent on the scene (1...8).	The actuator distinguishes between up to 8 different scenes which are recalled via the scene extension object or stored. The datapoint type of the extension object, however, permits addressing a maximum of 64 scenes. This parameter defines the scene number (1...64) which is used to address the internal scene

		(1...8). A setting of "0" deactivates the corresponding scene.
Venetian blind position for scene X X = depending on the scene (1...8)	**0***...100 *: The predefined position value is dependent on the scene (1...8).	This parameter is used for parameterising the blind position which is executed when the scene is recalled. This parameter is only visible in the venetian blind operating mode.
Slat position for scene X X = depending on the scene (1...8)	**0***...100 *: The predefined position value is dependent on the scene (1...8).	This parameter is used for configuring the slat position which is executed when the scene is recalled. This parameter is only visible in the venetian blind operating mode.
Roller shutter/awning position for scene X X = depending on the scene (1...8)	**0***...100 *: The predefined position value is dependent on the scene (1...8).	This parameter is used for configuring the roller shutter or awning position which is executed when the scene is recalled. i This parameter is only visible in the roller shutter / awning operating mode.
Position of venting louver for scene X X = depending on the scene (1...8)	**0***...100 *: The predefined position value is dependent on the scene (1...8).	This parameter is used for configuring the venting louver position which is executed when the scene is recalled. This parameter is visible only in the venting louver operating mode.
Storage function for scene X X = depending on the scene (1...8)	yes **no**	Setting "yes" enables the storage function of the scene. If the function is enabled, the current position (0...100 %) can be stored internally via the extension object on reception of a storage telegram. If "no" is selected, the storage telegrams are rejected.

□↲ Relay outputs... -> VBO... - General -> VBO... - Forced position

Behaviour at the end of the forced position function		The behaviour of the output at the beginning of a forced position function is directly determined by the forced position telegram. The behaviour of the output at the end of the forced position function can be configured.
	tracking the position	At the end of the forced position state, the output will be set to the position last existing before the forced position function or to the one tracked internally while the forced position function was active.
	no change	

		At the end of forced position state, the position last adjusted will not be changed. Thereafter, the output is again enabled.
Behaviour after bus voltage return		The forced position communication object can be initialised after bus voltage return.
	no forced position active	The forced position is deactivated after bus voltage return.
	Forced position on, raising / opening the louvre	After bus voltage return, the forced position is activated and the blind raised or the venting louvre opened.
	Forced position on, lowering / closing the louvre	After bus voltage return, the forced position is activated and the blind lowered or the venting louvre closed.
	State of forced position before bus voltage failure	After bus voltage return, the forced-position state last selected and internally stored before bus or mains voltage failure will be tracked. An ETS programming operation deletes the stored state (reaction in that case same as with "no forced position active"). This parameter is evaluated even after an ETS download of the application or of parameters.

□↵ Relay outputs... -> VBO... - General -> VBO... - Fabric stretching

Time for fabric stretching Seconds (0...59)	0...**1**...59	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. Setting of the seconds of the fabric stretching time.
Milliseconds (0...9 x 100)	**0**...9	Setting of the milliseconds of the fabric stretching time. The time for fabric stretching must be less than the movement time of the roller shutter/awning. The parameters for the fabric stretching time are only available in the operating mode "Roller shutter / awning".

□↵ Relay outputs... -> VBO... - General -> VBO... - End position correction bottom

Slat position for bottom end position correction (0...100 %)	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 travelling time. This parameter for the end position correction is visible only in the 'Venetian blind' operating mode!
Time for bottom end position correction Seconds (0...59)	0...**1**...59	The desired upward travelling time to open the roller shutter 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 the set period of time. Seconds setting of the upward travelling time of the end position correction. This parameter is visible only in the "Roller Blind / Awning" operating mode.
Milliseconds (0...9 x 100)	**0**...9	Millisecond setting of the upward travelling time of the end position correction. This parameter is visible only in the "Roller Blind / Awning" operating mode.

4.2.5.3 Parameter for switching outputs

Description	Values	Comment
□↵ Relay output... -> SO... - General		
Name of switching output	20-character 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. "Lighting, kitchen", "Path illumination"). The text is not programmed in the device.
Operating mode		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
Behaviour after ETS programming		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 response to bus voltage return	After an ETS programming operation, the switching output will behave in the manner defined in the parameter "Behaviour after bus voltage return". 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.

Behaviour in case of bus voltage failure		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.
Behaviour after bus voltage return		The actuator allows the reaction to be set separately for each switching output after bus voltage return.
	close contact	The relay contact is closed.
	open contact	The relay contact is opened.
	State before bus voltage failure	After bus voltage return, the switching state last set and internally stored before bus failure will be tracked.
	no reaction	After bus voltage return, the relay of the output shows no reaction and remains in the switching state last selected.
	Activating staircase function	The staircase function is – irrespective of the "Switching" object - activated after bus voltage return. This setting is only available when the staircase function is enabled.
Assignment to 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 ("0" or "1") 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.
Assignment to central function 1?	yes **no**	This parameter determines the assignment of the switching output to the first central function. This parameter is visible only if the first central function is enabled (parameter page "General switching outputs").
Assignment to central function 2?	yes **no**	This parameter determines the assignment of the switching output to the second central function. This parameter is visible only if the second central function is enabled (parameter page "General switching outputs").
Assignment to central function 3?	yes **no**	This parameter determines the assignment of the switching output to the third central function. This parameter is visible only if the third central function is enabled (parameter page "General switching outputs").
Internal group communication Switching	**---** internal connection 1 (1 bit) ... internal connection 50 (1 bit)	If internal group communication is enabled, this parameter defines the internal 1-bit group address for output switching.

□↵ Relay output... -> SO... - General -> SO... - Enabled functions

Feedback telegrams	**disabled** enabled	This parameter can be used to disable or to enable the feedback functions.
Time delays	**disabled** enabled	This parameter can be used to disable or to enable the time delays. The parameter is preset to "disabled" if cyclical monitoring is enabled.
Staircase function	**disabled** enabled	This parameter can be used to disable or to enable the staircase function. The parameter is preset to "disabled" if cyclical monitoring is enabled.
Scene function		This parameter can be used disable or to enable the scene function.

	disabled enabled	The parameter is preset to "disabled" if cyclical monitoring is enabled.
Operating hours counter	**disabled** enabled	The operating hours counter can be disabled or enabled here.

□↵ Relay output... -> SO... - General -> SO... - Feedbacks

Feedback switching status?		The current switching state of the switching output can be reported separately back to the KNX.
	none	The switching status feedback of the affected switching channel is deactivated.
	no inversion, active signalling object	A switching status is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS. The switching status is written to the object in non-inverted form.
	no inversion, passive status object	A switching status will be transmitted in response only if the feedback object is read out from by the KNX. No automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS. The switching status is written to the object in non-inverted form.
	inversion, active signalling object	A switching status is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS. The switching status is written to the object in inverted form.
	inversion, passive status object	A switching status will be transmitted in response only if the feedback object is read out from by the bus. No automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS. The switching status is written to the object in inverted form.
Updating the object value for switching status feedback		Here, you can specify when the actuator should update the feedback value for the switching status (object "Switching feedback") 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 in case of an actively transmitting feedback.

	after each update obj. "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.
Time delay for feedback telegram after bus voltage return ?	**yes** no	The states of the switching status feedback can be transmitted to the KNX with a delay after bus voltage return or after an ETS programming operation. The "Yes" setting activates the delay time in case of bus voltage return. The delay time is configured on the parameter page "Times". This parameter is only visible in case of an actively transmitting feedback.
Cyclical transmission of the feedback?		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 in case of an actively transmitting feedback.
	yes	Cyclical transmission is activated.
	no	Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.

□↵ Relay output... -> SO... - General -> SO... - Time delays

Selection of time delay

	no time delay Switch-on delay Switch-off delay ON delay and OFF delay	The "switching" communication object can be evaluated with a time delay. By this setting the desired function of the time delay is selected and the additional parameters of the delay enabled.
Switch-on delay Minutes (0...59)	**0**…59	This parameter is used for setting the duration of the switch-on delay. Sets the switch-on delay minutes.
Seconds (0...59)	0...**10**…59	Sets the switch-on delay seconds.
Switch-on delay retriggerable?	yes **no**	A switch-on delay still in progress can be retriggered (setting "yes") by another "ON" telegram. Alternatively, the retriggering time can be suppressed (setting "no"). 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 Minutes (0...59)	**0**…59	This parameter is used for setting the duration of the switch-off delay. Sets the switch-off delay minutes.
Seconds (0...59)	0...**10**…59	Sets the switch-off delay seconds.
Switch-off delay retriggerable?	yes **no**	A switch-off delay still in progress can be retriggered (setting "yes") by another "OFF" telegram. Alternatively, the retriggering time can be suppressed (setting "no"). The parameters for the switch-off delay are only visible if switch-on delay or switch-on and switch-off delay are activated.

□↵ Relay output... -> SO... - General -> SO... - Staircase function

Staircase time Hours (0...23)	**0**...23	This parameter is used for programming the duration of the switch-on time for a scene recall. Switch-on time hours setting.
Minutes (0...59)	0...**3**...59	Switch-on time minutes setting.
Seconds (0...59)	**0**...59	Switch-on time seconds setting.

Staircase time retriggerable	**yes** no	An active switch-on time can be retriggered (setting "yes"). Alternatively, the retriggering time can be suppressed (setting "no"). This parameter is preset to "no" if the supplementary function "Time extension" is configured. Re-triggering will not be possible.
Reaction to OFF-telegram		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' ? = yes", 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 for staircase function		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 spann-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 time** 2-fold time 3-fold time 4-fold time 5-fold time	In case of a time extension (retriggering the lighting time n-times via the object "Staircase function start/stop), the parameterized staircase lighting time will be extended by the value programmed in this parameter. "1-fold 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?	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 (setting "yes"). At the same time, the object "Staircase function start/stop" is hidden. If the setting is "no", 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.
Activate the switch-on delay for the staircase function?		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.
	yes	The switch-on delay for the staircase function is enabled. After reception 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 set to "yes". The staircase time is activated and the output is switched on only after the time delay has elapsed.
	no	The switch-on delay is deactivated. After reception of an ON telegram on the object "Staircase function start/stop", the staircase time is activated immediately and the output switched on.
Switch-on delay Hours (0...23)	**0**...23	This parameter is used for setting the duration of the switch-on delay. Sets the switch-on delay hours.
Minutes (0...59)	**0**...59	Sets the switch-on delay minutes.
Seconds (0...59)	0...**30**...59	Sets the switch-on delay seconds.
Switch-on delay retriggerable ?	**yes** no	An active switch-on delay can be retriggered (setting "yes"). Alternatively, the retriggering time can be suppressed (setting "no").

		i This parameter is preset to "no" if the supplementary function "Time extension" is configured. Re-triggering will not be possible. i The parameters for the switch-on delay are only visible when the parameter "Activate switch-on delay for the staircase function?" is configured to "yes".
Reaction at the end of the staircase time		At the end of the switch-on time, the actuator for the switching output concerned displays the configured behaviour here. The channel can be set to switch off immediately or alternatively to execute a pre-warning function.
	switch off	At the end of the switch-on time, the actuator switches off the switching output concerned.
	Activate pre-warning time	At the end of the switch-on 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 Minutes (0...59)	**0**...59	This parameter is used for setting the duration of the pre-warning time. The pre-warning time is added to the switch-on time. Sets the pre-warning time in minutes.
Seconds (0...59)	0...**30**...59	Sets the pre-warning time in seconds. These parameters are visible only if the pre-warning function is enabled.
Number of pre-warnings(1...10)	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.
Time for pre-warning interruptions Seconds (0...59)	**0**...59	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. Sets the pre-warning interruption seconds.
Milliseconds (0...9 x 100)	0...**5**...9	Sets the pre-warning interruption milliseconds.

□↵ Relay output... -> SO... - General -> SO... - Scene function

Delay scene recall?	yes **no**	A scene is recalled via the scene extension object. If needed, the scene recall on the actuator can be made with a delay after reception of a recall telegram (setting: "yes"). Alternatively, recall takes place immediately on reception of the telegram (setting: "no").
Delay time Minutes (0...59)	**0**...59	This parameter is used for setting the duration of the scene delay time. Sets the scene delay time in minutes.
Seconds (0...59)	0...**10**...59	Sets the scene delay time in seconds. ⓘ The delay time parameters are only visible, if the parameter "Delay scene recall ?" is configured to "yes".
Overwrite values stored in the device during ETS download?	**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 an ETS programming operation by the originally programmed scene values, the actuator can inhibit overwriting of the scene values (setting: "no"). As an alternative, the original values can be reloaded into the device during each ETS programming operation (setting: "yes").
Use extended scene recall?	yes **no**	The extended scene recall allows polling of the 10 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.
Scene X activatable by scene number (scene number "0" = scene deactivated) X = depending on the scene (1...10)	0...**1***...64 *: The predefined scene number is dependent on the scene (1...10).	The actuator distinguishes between up to 10 different scenes which are recalled via the scene extension object or stored. The datapoint type of the extension object, however, permits addressing a maximum of 64 scenes. This parameter defines the scene

		number (1...64) which is used to address the internal scene (1...10). A setting of "0" deactivates the corresponding scene.
Switching state for scene X X = depending on the scene (1...10)	switch on **switch off**	This parameter is used for configuring the switching state which is set when the scene is recalled.
Storage function for scene X X = depending on the scene (1...10)	yes **no**	Setting "yes" enables the storage function of the scene. If the function is enabled, the current switching state can be stored internally via the extension object on receipt of a storage telegram. If "no" is selected, the storage telegrams are rejected.

□↵ Relay output... -> SO... - General -> SO... - Operating hours counter

Type of counter	**Up-counter** Down-counter	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.
Limiting value specification ?	**no** yes, as specified in parameter yes, as received via object	If the up-counter is used, a limiting value can optionally be predefined. This parameter defines whether the limiting value can be set via a separate parameter or adapted individually by a communication object from the bus. The "No" setting deactivates the limiting value. This parameter is only visible in the configuration "Type of counter = up-counter".
Limit value (0...65535 h)	0...**65535**	The limiting value of the up-counter is set here. Once the limiting value is reached, a "1" telegram is transmitted via the object "Operating hours count elapsed". The counter itself continues until the maximum counter status (65535) is reached and then stops. This parameter is only visible if the parameter "Limiting value specification ?" is set to "Yes like the parameter".
Start value preset ?	**no** yes, as specified in parameter	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

	yes, as received via object	parameter or adapted individually by a communication object from the bus. The setting "No" deactivates the start value. This parameter is only visible in the configuration "Type of counter = down-counter".
Start value (0...65535 h)	0...**65535**	The start value of the down-counter is set here. After the initialisation, the counter starts counting down the predefined value by the hour until the value "0". If this end value is reached, a "1" telegram is transmitted via the object "Operating hours count elapsed" This parameter is only visible if the parameter "Start value preset ?" is set to "Yes like the parameter".
Automatic transmitting of the counter value ?		The current meter reading of the operating hours counter can be transmitted actively to the KNX via the "value operating hours counter" communication object.
	Cyclical	The meter reading is transmitted cyclically to the KNX and when there is a change. The cycle time is parameterised under "General switching outputs" generally for all switching outputs.
	after change by interval value	The counter level is transmitted to the KNX only when there is a change.
Counting value interval (1…65535 h)	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 value configured here. This parameter is only visible if the parameter "Automatic transmission of the number value ?" is set to "after change by interval value".

□↵ Relay output... -> SO... - General -> SO... - Supplementary function

Selection of supplementary function	**No supplementary function** Disabling function Forced position	The supplementary function can be defined and enabled here. The disabling function is only configurable as an alternative to the forced position function.
Use acknowledgment?		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.
	yes	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.
	no	No additional acknowledgement object is available. The disabling function is deactivated by the disabling object according to the set polarity.
Polarity of the disabling object	**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.
Behaviour at the beginning of the disabling function		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 to the 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.
	Flashing	The switching output is switched on and off cyclically during the disabling. The "time for flashing" is generally configured for all outputs on the parameter page "General switching outputs". During flashing, the logical switching state of the switching output is fed back as "Switched on".
Behaviour at the end of the disabling function		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 to the 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.
	Flashing	The switching output is switched on and off cyclically after the disabling. The time for flashing is generally configured for all outputs on the parameter page "General switching outputs". During flashing, the logical switching state of the output is fed back as "Switched on". The flashing state remains active until another bus command is received and thereby predefines another switching state.
Behaviour at the end of the disabling function after acknowledgement		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 used.
	No change to the 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	At the end of disabling, the switching state received during the disabling function or set before the disabling function will be tracked. Any time functions still in progress will also be taken into account if necessary.
	Flashing	The switching output is switched on and off cyclically after the acknowledgement. The time for flashing is generally configured for all outputs on the parameter page "General switching

		outputs". During flashing, the logical switching state of the output is fed back as "Switched on". The flashing state remains active until another bus command is received and thereby predefines another switching state.
Behaviour for forced position "switch on, active"	**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.
Behaviour for forced position "active, switch off"	**Switch off**	If the forced position is activated and forced-position state 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.
Behaviour for forced position end "inactive"		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.
	tracking the 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 to the 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.
Behaviour after bus voltage return		The forced position communication object can be initialised after bus voltage return. 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	

		The force-independent parameter "Behaviour after bus voltage return" (parameter page "Relay output... -> SO... - General") will be executed on return of bus voltage.
	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	After bus voltage return, the forced position state last selected and internally stored before bus voltage failure will be tracked. 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 "Behaviour after bus voltage return" (parameter page "Relay output... -> SO... - General") will be executed on return of bus voltage.
Logic operation function?	yes **no**	This parameter can be used to enable the logic operation function (setting "yes"). The parameter is preset to "No" if the staircase function or cyclical monitoring is enabled.
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 switching output (object "switching" after evaluation of 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 of logic operation obj. after bus voltage return	**0 (OFF)** 1 (ON)	After bus voltage return, 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 of logic operation obj. after ETS download	**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.

4.2.5.4 Parameter for valve outputs

Description	Values	Comment
☐↲ Relay output... -> VO... - General		
Name of valve output	20-character 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. "Heating, kitchen", "Heating, bathroom"). The text is not programmed in the device.
Valve in voltage-free state (Valve 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.
Behaviour after bus voltage failure		If there is a bus voltage failure, the valve outputs perform the set behaviour at this point. This parameter cannot be changed.
	Specify command value	The actuator sets the command value preset in the ETS for the valve output by the parameter "Command value on bus voltage failure".
Command value in case of bus voltage failure	**0 %** 100 %	The actuator sets the command value after a bus voltage failure for the valve output. In the possible "0 %" and "100 %" specifications, the valve outputs are activated continuously according to the configured valve direction of action.
Behaviour after bus voltage return		After a bus voltage return , the valve outputs perform the configured reaction at this point.
	Specify command value	The actuator sets the command value specified in the ETS for the valve output by the parameter "Command value after bus voltage return".
	Activating command as for forced position	For the valve output, the actuator polls the command value preset for the forced position, as configured in the ETS. Here, the active operating mode (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 only polls the command value preset for the forced position.
	Activating command as for emergency operation	For the valve output, the actuator polls the emergency operation command value, as configured in the ETS. Here, the active operating mode (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 only polls the command value preset for emergency operation.
	Command value as before bus voltage failure	After bus voltage return, that 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. Saving only takes place after a previous device reset (ETS programming operation, bus voltage return) when the reset is longer than 30 seconds previously. 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 after bus voltage return	**0 %** 5 % 10 % ... 90 % 95 % 100 %	The command value to be set on bus voltage return is defined here. This parameter is only visible on "Behaviour after bus voltage return" = "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.

Behaviour after ETS programming		After an ETS programming operation, the valve outputs perform the configured reaction at this point.
	Behaviour as after bus voltage return	After an ETS programming operation, the valve output will behave in the manner defined in the parameter "Behaviour after bus voltage return". 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.
	Specify command value	The actuator sets the command value preset for the valve output by the parameter "Command value after ETS programming operation" in the ETS.
	Activating command as for forced position	For the valve output, the actuator polls the command value preset for the forced position, as configured in the ETS. Here, the active operating mode (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 only polls the command value preset for the forced position.
	Activating command as for emergency operation	For the valve output, the actuator polls the emergency operation command value, as configured in the ETS. Here, the active operating mode (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 only polls the command value preset for emergency operation.
Command value after ETS programming	**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.

□↵ Relay output... -> VO... - General -> VO... - Command value/status/operating mode

Data format of the command value input		The actuator 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.
	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 is valve 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.
	Constantly (1 byte) with pulse width modulation (PWM)	Command values corresponding to the data format "Constant 1-byte with pulse width modulation (PWM)" 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. 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).
	Const (1 byte) 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 actuator 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 actuator only closes when the command value undershoots the limiting value minus the configured hysteresis.
Cycle time for continuous command value on the valve output	15 minutes 15.5 minutes ... 29.5 minutes **30 minutes (recommended)**	The "Cycle time" parameter specifies the switching frequency 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 actuators 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 or off). If different actuators with different adjusting cycle times are used at an output, take account of the longest of the times. The "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 bus voltage return or after an ETS programming operation, for which, as a result, the presetting of a cycle time is required.
Limiting value of the command value for opening the valve (1...100 %)	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 actuator opens when the command value reaches the limiting value or exceeds it.

		This parameter is only available in the command value data format "Switching (1-byte) with command value limiting value".
Hysteresis limiting value for closing the valve (1...10 %)	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 actuator only closes when the command value undershoots the limiting value minus the configured hysteresis. This parameter is only available in the command value data format "Switching (1-byte) with command value limiting value".
Activate command value monitoring ?	**no** yes	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.
Monitoring time Minutes (0...59)	0...**10**...59	This parameter specifies the monitoring time 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.
Seconds (10...59)	**10**...59	presetting of the monitoring time seconds.
Polarity of "Command value fault" object	**0 = No fault / 1 = 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". 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 ?	**no** yes	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.
Command value in the case of emergency operation	0 % 10 % ... **30 %** ... 90 % 100 %	When a fault in the input command value is detected and also after a bus voltage return and after an ETS programming operation (configurable), it is possible to set the emergency operation command value configured here as the active command value. When the command value of emergency operation is polled, 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. This parameter is only available when no summer / winter switch-over is planned.
Command value in the case of emergency operation Summer	0 % 10 % ... **30 %** ... 90 % 100 %	When a fault in the input command value is detected and also after a bus voltage return and after an ETS programming operation (configurable), it is possible to set the emergency operation 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 emergency operation is polled, 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. This parameter is only available when a summer / winter switch-over is planned.
Command value in the case of emergency operation Winter	0 % 10 % ... **70 %** ...	When a fault in the input command value is detected and after a bus voltage return and after an ETS programming operation (configurable), it is possible to set the emergency operation command

	90 % 100 %	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 emergency operation is polled, 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. This parameter is only available when a summer / winter switch-over is planned.
Command value in the case of forced position	0 % 10 % ... **30 %** ... 90 % 100 %	When forced operation is activated via a 1-bit object and also in the case of bus voltage return and after an ETS programming operation (configurable), 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 polled, 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. This parameter is only available when no summer / winter switch-over is planned.
Command value in the case of forced position Summer	0 % 10 % ... **30 %** ... 90 % 100 %	When forced operation is activated via a 1-bit object and also in the case of bus voltage return and after an ETS programming operation (configurable), 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 polled, 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. This parameter is only available when a summer / winter switch-over is planned.
Command value in the case of forced position Winter	0 % 10 % ... **70 %**	When forced operation is activated via a 1-bit object and also in the case of bus voltage return and after an ETS programming operation (configurable), it

	... 90 % 100 %	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 polled, 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. This parameter is only available when a summer / winter switch-over is planned.
Use object for forced position ?	**no** yes	A forced position can be configured separately for each valve output here and activated according to requirements. If a forced position is active, a defined command value is set at the output (see parameter "Command value in case of forced position..."). 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). For each valve output, the forced position is activated and deactivated via a separate 1-bit object. This parameter will enable the object (setting "Yes").
Polarity of "Forced position" object	**0 = No forced pos. / 1 = Forced pos. active** 0 = Forced pos. active / 1 = No forced pos.	The telegram polarity of the "Forced position" object is defined here when the forced position object is enabled.
Feed back valve command value ?	**no** yes	A status object can be optionally enabled here ("Yes" setting) for each valve output. The status object makes the active command value of a valve output available either actively transmitting or passively (object can be read out). During status feedback, the actuator takes all the functions into account which have an influence on the command value implemented at the output.
Type of feedback		The status feedback can be used as an active signal object or as a passive status object. As an active signal object, the feedback is also directly transmitted to the KNX whenever there is a change

		to the status value. As a passive status object, there is no telegram transmission after a change. In this case, the object value must be read out. The ETS automatically sets the communication flags of the status objects required for proper functioning. This parameter is only visible in case of enabled status feedback.
	active signalling object	The feedback telegram is transmitted as soon as the status changes. Automatic telegram transmission of the feedback takes place after bus voltage return or after an ETS programming operation (possibly with a time delay). 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.
	passive status object	The feedback telegram will only be transmitted in response if the status object is read out from the KNX by a read telegram. No automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS.
Time delay for feedback telegram after bus voltage return ?		If used as active signal object, the state of the status feedback information is transmitted to the KNX after bus voltage return 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 an enabled status feedback and only when the object is actively transmitting.
	yes	The status feedback will be transmitted with a delay after bus voltage return or after an ETS programming operation. No feedback is transmitted during a running time delay, even if the valve state changes during this delay.
	no	The status feedback will be transmitted immediately after bus voltage return or after an ETS programming operation.
Cyclical transmission of the feedback ?		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

		an enabled status feedback and only when the object is actively transmitting.
	yes	Cyclical transmission is activated. The cycle time is defined centrally for all the valve outputs on the parameter page "General valve outputs". There is no cyclical transmission during an active time delay after bus voltage return or an ETS programming operation.
	no	Cyclical transmission is deactivated so that the feedback telegram is transmitted to the KNX only when the status is changed by the actuator.
Feedback combined valve status ?	**no** yes	The combined valve status allows the collective feedback of various functions of a valve output in a single 1-byte bus telegram. It helps to forward the status information of an output to a suitable recipient (e.g. KNX visualisation) in a targeted manner, without having to evaluate various global and channel-orientated feedback and status functions of the actuator. The communication object "Feedback combined valve status" contains 5 different items of status information, which are bit-encoded. In the "Yes" setting, this parameter enables the combined valve status.
Type of combined status feedback		The combined valve status can be used as an active signal object or as a passive status object. As an active signal object, the feedback is also directly transmitted to the bus whenever there is a change to the status value. As a passive status object, there is no telegram transmission after a change. In this case, the object value must be read out. The ETS automatically sets the communication flags of the status objects required for proper functioning. This parameter is only available if the combined valve status is enabled.
	active signalling object	The feedback telegram is transmitted as soon as the status changes. Automatic telegram transmission of the feedback takes place after bus voltage return and after an ETS programming operation (possibly with a time delay). The combined status object does not transmit if the status information does not change after the activation or deactivation of device functions or new input command values. Only changes are ever transmitted.

	passive status object	The feedback telegram will only be transmitted in response if the status object is read out from the KNX by a read telegram. No automatic telegram transmission of the feedback takes place after bus voltage return or after programming with the ETS.
Time delay for feedback telegram after bus voltage return ?		If used as active signal object, the state of the combined status feedback information is transmitted to the KNX after bus voltage return 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 available if the combined valve status is enabled.
	yes	The status feedback will be transmitted with a delay after bus voltage return or after an ETS programming operation. No feedback is transmitted during a running time delay, even if the valve state changes during this delay.
	no	The status feedback will be transmitted immediately after bus voltage return or after an ETS programming operation.
Cyclical transmission of the feedback ?		The combined status feedback telegram can also be transmitted cyclically via the active signal object in addition to the transmission after changes. This parameter is only available if the combined valve status is enabled.
	yes	Cyclical transmission is activated. The cycle time is defined centrally for all the valve outputs on the parameter page "General valve outputs". There is no cyclical transmission during an active time delay after bus voltage return or an ETS programming operation.
	no	Cyclical transmission is deactivated so that the feedback telegram is transmitted to the KNX only when the status is changed by the actuator.
Internal group communication Command value (Constant 1 byte)	**---** internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the constant command value input.

Internal group communication Command value (switching 1 bit)	**---** internal connection 1 (1 bit) ... internal connection 50 (1 bit)	If internal group communication is enabled, this parameter defines the internal 1-bit group address for the switching command value input.

□↵ Relay output... -> VO... - General -> VO... - Valve rinsing

Use function "Valve rinsing" ?	**no** yes	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. In the "Yes" setting, this parameter enables valve rinsing.
Length of valve rinsing (1...59 minutes)	1...**5**...59	Here, preset for how long the rinse function (100 % -> 0 %) is to be executed. Set the length of the valve rinsing to the adjustment 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 adjustment cycle time. This parameter is only available if valve rinsing is enabled.
Activate 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. This parameter is only available if valve rinsing is enabled.
	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 bus voltage failure, the actuator saves the remaining residual time of the current time cycle. The residual cycle time is restarted after bus voltage return. A bus voltage failure immediately interrupts an active rinsing operation. After bus voltage return, a previously interrupted rinsing operation is not executed again. 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).
Cycle time (1...26 weeks)	**1**...26	This parameter defines how often cyclical valve rinsing is to be performed automatically. This parameter is only available if cyclical valve rinsing is enabled.
Use intelligent valve rinsing ?	**no** yes	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. It the active command value exceeds the limiting value, then the actuator will stop the cycle time. The valve drive 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. This parameter is only available if cyclical valve rinsing is enabled.
Limiting value minimum command value (10...100 %)	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. It the active command value exceeds the limiting value, then the actuator will stop

		the cycle time. This parameter is only available if cyclical valve rinsing is enabled.
Valve rinsing activated externally ?	**no** yes	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. This parameter is only available if valve rinsing is enabled.
Polarity of object "Valve rinsing Start / Stop"	**0 = Stop / 1 = Start** 0 = Start / 1 = Stop 0 = --- / 1 = Start (Stop not possible)	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.

□↵ Relay output... -> VO... - General -> VO... - Operating hours counter

Use operating hours counter ?	**no** yes	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 valve 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 on "0 h".
Type of counter	**Up-counter** Down-counter	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.
Limiting value specification ?	**no** yes, as received via object yes, as specified in parameter	If the up-counter is used, a limiting value can optionally be predefined. This parameter defines whether the limiting value can be set via a separate parameter or adapted individually by a communication object from the bus. The "No" setting deactivates the limiting value. This parameter is only visible in the configuration "Up-counter" counter type.
Limit value (0...65535 h)	0...**65535**	The limiting value of the up-counter is set here. This parameter is only visible in the "Up-counter" counter type if the parameter "Limiting value presetting ?" is set to "Yes like the parameter".
Start value preset ?	**no** yes, as received via object yes, as specified in parameter	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 only visible in the "Down-counter" counter type.
Start value (0...65535 h)	0...**65535**	The start value of the down-counter is set here. This parameter is only visible in the "Down-counter" counter type and also only if the parameter "Start value preset ?" is set to "Yes like the parameter".
Automatic transmitting of the counter value		The current meter reading of the operating hours counter can be transmitted actively to the KNX via the

		"value operating hours counter" communication object.
	cyclical	The meter reading is transmitted cyclically to the KNX and when there is a change. The cycle time is configured generally on the parameter page "General valve outputs".
	after change by interval value	The counter level is transmitted to the KNX only when there is a change.
Counting value interval (1…65535 h)	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 value configured here. This parameter is only visible if the parameter "Automatic transmission of the number value" is set to "Change on interval value".

□↵ Relay output... -> VO... - General -> VO... - Assignments

Assignment to the function "Pump control" ?	**no** yes	The actuator allows switching activation of the circulation pump of the heating or cooling circuit via a 1-bit KNX telegram. Pump control is a global function of the actuator. It is enabled and configured on the "General valve outputs -> Valve / pump - Valve outputs" parameter page. The parameter "Assignment to the function 'Pump control' ?" specifies whether the appropriate valve output is included in the pump control. The presetting of the parameter depends on the enabling function of the function. If pump control is not enabled on the "General valve outputs -> Valve / pump - Valve outputs" parameter page, then the ETS will permanently set this parameter to "No". In this case, assignment is not possible. If pump control is enabled, this parameter is preset to "Yes".
Assignment to the "Heat requirement" function ?	**no** yes	The actuator 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 switch-over between the reduction and comfort setpoint in a central combi boiler). The heat requirement control function is a global

function of the actuator. It is enabled and configured on the "General valve outputs -> Valve / pump - Valve outputs" parameter page. The parameter "Assignment to the 'Heat requirement' function ?" specifies whether the appropriate valve output is included in the heat requirement control.
The presetting of the parameter depends on the enabling function of the function. If the heat requirement function is not enabled on the "General valve outputs -> Valve / pump - Valve outputs" parameter page, then the ETS will permanently set this parameter to "No". In this case, assignment is not possible. If the heat requirement function is enabled, this parameter is preset to "Yes".

Assignment to the "Largest command value" function ?	**no** yes	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 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) with 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 (e.g. after bus voltage return 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 KNX, overriding the constant command value at the valve output. The "Largest command value" function is a global function of the actuator. It is enabled and configured on the "General valve outputs -> Valve / pump - Valve outputs" parameter page. The "Assignment to the 'Largest command value' function ?" parameter specifies whether the appropriate valve output is included in the evaluation of the largest

		command value. The presetting of the parameter depends on the enabling function of the function. If the "Largest command value" function is not enabled on the "General valve outputs -> Valve / pump - Valve outputs" parameter page, then the ETS will permanently set this parameter to "no". In this case, assignment is not possible. If the "Largest command value" function is enabled, then the parameter can be edited. It is also then present to "No".
Assignment to service mode ?	**no** yes	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. Service mode is a global function of the actuator. It is enabled and configured on the "General valve outputs" parameter page. The parameter "Assignment to service mode ?" specifies whether the affected valve output is influenced by the service mode. The presetting of the parameter depends on the enabling function of the function. If service mode is not enabled on the "General valve outputs" parameter page, then the ETS will permanently set this parameter to "No". In this case, assignment is not possible. If service mode is enabled, this parameter is preset to "Yes".

4.2.5.5 Parameter for binary inputs

Description	Values	Comment
□↵ Binary input... -> BI... - Function		
Function input 1	No function **Switching** Dimming Venetian blind Value transmitter HVAC value transmitter (operating mode switchover) 2-channel operation	The basic function of the appropriate binary input is defined here. The same functions are available for all inputs. In the "no function" setting, the input is deactivated.

The following parameters are available for the function "Switching".

Command on rising edge Switching object 1	no reaction **ON** OFF TOGGLE	This parameter can be used to define which object value is transmitted first to the KNX via the first communication object of the input when there is a rising edge (TOGGLE - switchover of the object value).
Command on falling edge Switching object 1	no reaction ON **OFF** TOGGLE	This parameter can be used to define which object value is transmitted first to the KNX via the first communication object of the input when there is a falling edge (TOGGLE - switchover of the object value).
Command on rising edge Switching object 2	**no reaction** ON OFF TOGGLE	This parameter can be used to define which object value is transmitted first to the KNX via the second communication object of the input when there is a rising edge (TOGGLE - switchover of the object value).
Command on falling edge Switching object 2	**no reaction** ON OFF TOGGLE	This parameter can be used to define which object value is transmitted first to the KNX via the second communication object of the input when there is a falling edge (TOGGLE - switchover of the object value).

Behaviour after bus voltage return		After a device reset (bus voltage return or ETS programming operation), the communication objects of the input can be initialised. If, in the ETS, a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.
	no reaction	After a device reset, no reaction takes place automatically (no telegram is transmitted to the KNX).
	Send ON telegram	In this configuration, an "ON" telegram is actively transmitted to the KNX after a device reset.
	Send OFF telegram	In this configuration, an "OFF" telegram is actively transmitted to the KNX after a device reset.
	Transmit current input status	In this setting, the device evaluates the static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge). If, in this case, the edge command dependent on the current status is configured to "no reaction", the device does not transmit a telegram to the KNX on initialisation.

The following parameters are available for the function "Dimming".

Operation		This parameter specifies the reaction to a rising edge at the input.
	Single-area operation: darker/brighter (TOGGLE)	With a short signal length at the input, the object value of the switching object is toggled and an appropriate telegram transmitted. With a long signal length, a dimming telegram (brighter / darker). The dimming direction is switched on sequential dimming operations.
	Dual-area operation: brighter (ON)	With a short signal length at the input, an ON telegram is triggered and, if there is a long signal length, a dimming telegram (brighter) is triggered.
	Dual-area operation: darker (OFF)	With a short signal length at the input, an OFF telegram is triggered and, if there is a long signal length, a dimming telegram (darker) is triggered.
	Dual-area operation: brighter (TOGGLE)	With a short signal length at the input, the object value of the switching object is toggled and an appropriate telegram transmitted, if there is a long signal length, a dimming telegram (brighter) is triggered.

	Dual-area operation: darker (TOGGLE)	With a short signal length at the input, the object value of the switching object is toggled and an appropriate telegram transmitted, if there is a long signal length, a dimming telegram (darker) is triggered.
Time between switching and dimming Seconds (0...59)	**0**...59	Time from which the dimming function ("long signal length") is executed. Sets the time seconds.
Milliseconds (4...9 x 100)	**4**...9	Sets the time milliseconds.
Behaviour after bus voltage return		After a device reset (bus voltage return or ETS programming operation), the communication object "Switching" of the input can be initialised. If, in the ETS, a delay is set for the inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.
	no reaction	After a device reset, no reaction takes place automatically (no telegram is transmitted to the KNX).
	Send ON telegram	In this configuration, an "ON" telegram is actively transmitted to the KNX after a device reset.
	Send OFF telegram	In this configuration, an "OFF" telegram is actively transmitted to the KNX after a device reset.
Increase brightness by	**100 %** 50 % 25 % 12.50 % 6 % 3 % 1.50 %	A dimming telegram can increase brightness by a maximum of X %. This parameter determines the maximum dimming step width for a dimming telegram. This parameter depends on the set operation.
Reduce brightness by	**100 %** 50 % 25 % 12.50 % 6 % 3 % 1.50 %	A dimming telegram can increase darkness by a maximum of X %. This parameter determines the maximum dimming step width for a dimming telegram. This parameter depends on the set operation.
Send stop telegram ?	**yes** no	One or no telegram is transmitted on releasing a pushbutton at the input (falling edge).

Telegram repeat?	yes **no**	It is possible to use this parameter to determine whether the dimming telegram should be repeated cyclically for a long signal length (actuation of a pushbutton at the input).
Time between two telegrams Seconds (0...59)	0...**1**...59	Time between two telegrams when telegram repetition is active. A new dimming telegram is transmitted after this time has elapsed. Sets the time seconds.
Milliseconds (5...9 x 100)	**5**...9	Sets the time milliseconds.
Internal group communication Switching	**---** internal connection 1 (1 bit) ... internal connection 50 (1 bit)	If internal group communication is enabled, this parameter defines the internal 1-bit group address for output switching. This parameter is only available with the application program "Multi station 802812"!
Internal group communication Relative dimming command	**---** internal connection 111 (4 bit) ... internal connection 120 (4 bit)	If internal group communication is enabled, this parameter defines the internal 4-bit group address for the relative dimming telegram. This parameter is only available with the application program "Multi station 802812"!

The following parameters are available for the function "Venetian blind".

Command on rising edge		This parameter specifies the reaction to a rising edge at the input.
	No function	The input is deactivated.
	UP	A short time telegram (UP) is triggered by a short signal length and a long time telegram (high) is triggered by a long signal length.
	DOWN	A short time telegram (DOWN) is triggered by a short signal length and a long time telegram (low) is triggered by a long signal length.
	TOGGLE	With this setting, the direction is switched over internally long signal length (MOVE). If a short time signal transmits a STEP telegram, then this STEP is always switched in the opposite direction of the last MOVE. Several STEP telegrams transmitted successively are switched in the same direction.

Behaviour after bus voltage return		After a device reset (bus voltage return or ETS programming operation), the communication object "Long time operation" of the input can be initialised. If, in the ETS, a delay is set for the binary inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.
	no reaction	After a device reset, no reaction takes place automatically (no telegram is transmitted to the KNX).
	up	In this configuration, an "UP" telegram is actively transmitted to the KNX after a device reset.
	Down	In this configuration, an "DOWN" telegram is actively transmitted to the KNX after a device reset.
Operation concept		This parameter specifies the telegram sequence after actuation (rising edge).
	short – long - short	A STEP is transmitted with a rising edge and the "Time between short and long time operation" started. This STEP serves the purpose of stopping a continuous movement. If, within the started time, a falling edge is detected, the input does not transmit an additional telegram. If no falling edge was detected during the time, a MOVE is transmitted automatically after the time has elapsed and the "slat adjustment time" is started. If a falling edge is detected within the slat adjustment time, the input transmits a STEP. This function is used for slat adjustment. The "slat adjusting time" should correspond to the time required for a 180° rotation of the slats.
	long - short	A MOVE is transmitted when there is a rising edge at the input and the "slat adjustment time" started. If a falling edge is detected within the started time, the input transmits a STEP. This function is used for slat adjustment. The "slat adjusting time" should correspond to the time required for a 180° rotation of the slats.
Time between step and move operation Seconds (0...59)	**0**...59	Time after which the function of a long actuation is executed. Only visible with "Operation concept = "Short – Long – Short". Sets the time seconds.
	4...9	

Milliseconds (4...9 x 100)		Sets the time milliseconds.
Slat adjusting time Seconds (0...59)	0...**2**...59	Time during which a long time telegram for slat adjustment can be terminated by a falling edge at the input. Sets the time seconds.
Milliseconds (0...9 x 100)	**0**...9	Sets the time milliseconds.

The following parameters are available for the function "Value transmitter".

Function as	**Dimming value transmitter 1 byte** Light scene extension without memory function Light scene extension with memory function Temperature value transmitter Brightness value transmitter Value transmitter 2-byte	This parameter specifies the value transmitter function to be executed. The data format of the value object is dependent on the set function of the value transmitter.
Transmit value on	**rising edge (push-button as NO contact)** falling edge (push-button as NC contact) rising and falling edge (switch)	This parameter specifies the edge which starts signal evaluation in the device. The setting "rising and falling edge (switch)" cannot be selected with the value transmitter function "Light scene recall with memory function".
Value on rising edge (0...255)	0...**100**...255	This parameter specifies the dimming value transmitted on a rising edge. Only visible with "1-byte dimming value transmitter" and "Transmit value on = Rising edge (push-button as NO contact)" and "Transmit value on = Rising and falling edge (switch)".
Value on falling edge (0...255)	**0**...255	This parameter specifies the dimming value transmitted on a falling edge. Only visible with "1-byte dimming value transmitter" and "Transmit value on = Falling edge (push-button as NC contact)" and "Transmit value on = Rising and falling edge (switch)".

Light scene on rising edge (1...64)	**1**...64	This parameter specifies the light scene number transmitted on a rising edge. Only visible with "Light scene recall" and "Transmit value on = rising edge (push-button as NO contact)" and "Transmit value on = rising and falling edge (switch)".
Light scene on falling edge (1...64)	**1**...64	This parameter specifies the light scene number transmitted on a falling edge. Only visible with "Light scene recall" and "Transmit value on = falling edge (push-button as NC contact)" and "Transmit value on = rising and falling edge (switch)".
Value on rising edge (0...40 x 1 °C)	0 °C...**20 °C**...40 °C	This parameter specifies the temperature value transmitted on a rising edge. Only visible with "Temperature value transmitter" and "Transmit value on = rising edge (push-button as NO contact)" and "Transmit value on = rising and falling edge (switch)".
Value on falling edge (0...40 x 1 °C)	0 °C...**18 °C**...40 °C	This parameter specifies the temperature value transmitted on a falling edge. Only visible with "Temperature value transmitter" and "Transmit value on = falling edge (push-button as NC contact)" and "Transmit value on = rising and falling edge (switch)".
Value on rising edge	0 Lux...**200 Lux**...1.500 Lux	This parameter specifies the brightness value (in 50 Lux steps) transmitted on a rising edge. Only visible with "Brightness value transmitter" and "Transmit value on = rising edge (push-button as NO contact)" and "Transmit value on = rising and falling edge (switch)".
Value on falling edge	**0 Lux**...1,500 Lux	This parameter specifies the brightness value (in 50 Lux steps) transmitted on a falling edge. Only visible with "Brightness value transmitter" and "Transmit value on = falling edge (push-button as NC contact)" and "Transmit value on = rising and falling edge (switch)".
	0...**60000**...65535	

Value on rising edge (0...65535)		This parameter specifies the 2-byte value transmitted on a rising edge. Only visible with "2-byte value transmitter" and "Transmit value on = Rising edge (push-button as NO contact)" and "Transmit value on = Rising and falling edge (switch)".
Value on falling edge (0...65535)	0...**30000**...65535	This parameter specifies the 2-byte value transmitted on a falling edge. Only visible with "2-byte value transmitter" and "Transmit value on = Falling edge (push-button as NC contact)" and "Transmit value on = Rising and falling edge (switch)".
Behaviour after bus voltage return		After a device reset (bus voltage return or ETS programming operation), the communication object of the value transmitters or light scene extension can be initialised. If, in the ETS, a delay is set for the binary inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.
	no reaction	After a device reset, no reaction takes place automatically (no telegram is transmitted to the KNX).
	Reaction as rising edge	In this configuration, a telegram is actively transmitted to the KNX after a device reset in accordance with the configuration for the rising edge. This setting can only be configured with "Transmit value on = rising edge (switch)".
	Reaction as falling edge	In this configuration, a telegram is actively transmitted to the KNX after a device reset in accordance with the configuration for the falling edge. This setting can only be configured with "Transmit value on = falling edge (switch)".
	Transmit current input status	In this setting, the device evaluates the static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge). This setting can only be configured with "Transmit value on = rising and falling edge (switch)".

Adjustment via long actuation	yes **no**	With the 1-byte dimming value transmitter, the temperature and brightness value transmitter and 2-byte value transmitter, the value to be transmitted can be adjusted at any time during device operation. A value adjustment can only be configured here when the value is to be transmitted only on a rising edge or only on a falling edge, i.e. a push-button is connected to the input. A value adjustment is introduced by a long signal at the input (> 5 s) and continues for as long as the signal is detected as active, i.e. the push-button is actuated. With the first adjustment after commissioning, the value programmed by the ETS is increased cyclically by the step width configured for the 1-byte dimming value transmitter or 2-byte value transmitter and transmitted. The step width of the temperature value transmitter (1 °C) and the brightness value transmitter (50 Lux) is permanently defined. The previously transmitted value is saved after releasing the pushbutton. The next long pushbutton actuation adjusts the saved value and the direction of the value adjustment changes. Only visible with "Transmit value on = rising edge (push-button as NO contact)" and "Transmit value on = falling edge (push-button as NC contact)".
Time between two telegrams Seconds (0...59)	0...**1**...59	The time between two telegrams on adjusting values can be configured here. Only visible on "Adjustment via long actuation = Yes". Sets the time seconds.
Milliseconds (5...9 x 100)	**5**...9	Sets the time milliseconds.
Step width (1...10)	1...**10**	Step width by which the adjusted 1-byte value is increased or decreased with long actuation. Only visible on "Function as = Dimming value transmitter 1-byte".
Step width	1 2 5 10 20 50 75	Step width by which the adjusted 2-byte value is increased or decreased with long actuation. Visible only if "Function as = Value transmitter 2-byte"!

	100 200 500 750 **1000**	
Internal group communication Value	**---** internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the dimming value to be transmitted. Only visible on "Function as = Dimming value transmitter 1-byte".
Internal group communication Light scene extension	**---** internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the light scene number to be transmitted. Only visible on "Function as = Light scene extension with/without memory function"!
Internal group communication Temperature value	**---** internal connection 101 (2 byte) ... internal connection 110 (2 byte)	If internal group communication is enabled, this parameter defines the internal 2-byte group address for the temperature value to be transmitted. Visible only with "Function as = Temperature value transmitter"!

The following parameters are available for the function "HLK value transmitter (operating mode switchover)".

Send operating mode on	**rising edge (push-button as NO contact)** falling edge (push-button as NC contact) rising and falling edge (switch)	This parameter specifies the edge which starts signal evaluation in the device.
Operating mode on rising edge	Automatic mode **Comfort mode** Standby mode Night operation Frost/heat protection mode	This parameter specifies the operating mode transmitted on a rising edge. Only visible with "Transmit value on = rising edge (pushbutton as NO contact)" and "Transmit value on = rising and falling edge (switch)".
Operating mode on falling edge	Automatic mode Comfort mode	This parameter specifies the operating mode transmitted on a falling edge.

	Standby mode Night operation Frost/heat protection mode	Only visible with "Transmit value on = falling edge (pushbutton as NC contact)" and "Transmit value on = rising and falling edge (switch)".
Behaviour after bus voltage return		After a device reset (bus voltage return or ETS programming operation), the communication object of the HVAC value transmitter can be initialised. If, in the ETS, a delay is set for the binary inputs after bus voltage return, the device only transmits the telegrams when the delay has elapsed.
	no reaction	After a device reset, no reaction takes place automatically (no telegram is transmitted to the KNX).
	Reaction as rising edge	In this configuration, a telegram is actively transmitted to the KNX after a device reset in accordance with the configuration for the rising edge. This setting can only be configured with "Transmit value on = rising edge (switch)".
	Reaction as falling edge	In this configuration, a telegram is actively transmitted to the KNX after a device reset in accordance with the configuration for the falling edge. This setting can only be configured with "Transmit value on = falling edge (switch)".
	Transmit current input status	In this setting, the device evaluates the static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge). This setting can only be configured with "Transmit value on = rising and falling edge (switch)".
Internal group communication HVAC operating mode	**---** internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the operating mode to be transmitted.

The following parameters are available for the function "2-channel operation".

Operation concept	**Channel 1 or channel 2** Channel 1 and channel 2	This parameter defines the 2-channel operation concept. In the "Channel 1 or channel 2" setting, the binary input uses

		the signal length to determine which of the two channels it uses. If the setting "Channel 1 and channel 2" is selected, the input transmits only the telegram of channel 1 on a short button-press and both telegrams on a sustained button-press.
Function channel 1 / 2	No function **Switching (1 bit)** Value transmitter 0 … 255 (1-byte) Value transmitter 0 … 100 % (1-byte) Temperature value transmitter (2 bytes)	This parameter defines the channel function and specifies which other parameters and which communication object are to be displayed for channel 1 (2).
Command channel 1 / 2	ON OFF **TOGGLE**	This parameter determines the object value transmitted to the KNX on a rising edge. This is only visible if "Function channel 1 (2) = Switching (1 bit)"!
Value channel 1 / 2 (0 … 255)	**0**...255	This parameter determines the object value transmitted to the KNX on a rising edge. It is only visible if "Function channel 1 (2) = Value transmitter 0…255 (1 byte)"!
Value channel 1 / 2 (0 … 100 %)	**0**...100	This parameter determines the object value transmitted to the KNX on a rising edge. It is only visible if "Function channel 1 (2) = Value transmitter 0…100 % (1 byte)"!
Temperature value channel 1 / 2 (0 … 40 °C)	0...**20**...40	This parameter determines the temperature value transmitted to the KNX on a rising edge. It is only visible if "Function channel 1 (2) = Temperature value transmitter (2 bytes)"!
Time between channel 1 and channel 2 Seconds (0...20)	0...**3**...20	Depending on the selected operating concept, this parameter determines when the input transmits the telegram for channel 1 and the telegram for channel 2 on a rising edge.
	no reaction	In the function "2-channel operation", the binary input always behaves

Behaviour after bus voltage return		passively after bus voltage return or an ETS programming operation. A device reset does not cause telegrams to be transmitted automatically.
Internal group communication Switching (channel 1 / 2)	**---** internal connection 1 (1 bit) ... internal connection 50 (1 bit)	If internal group communication is enabled, this parameter defines the internal 1-bit group address for the switching command of channel 1 / 2 to be transmitted. Only visible if "Function channel 1 / 2 = Switching (1 bit)"!
Internal group communication Value (channel 1 / 2)	**---** internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the value of channel 1 / 2 to be transmitted. Visible only if "Function channel 1 / 2 = Value transmitter 0...255 (1-byte) / value transmitter 0…100 % (1-byte)"!
Internal group communication Temperature value (Channel 1 / 2)	**---** internal connection 101 (2 byte) ... internal connection 110 (2 byte)	If internal group communication is enabled, this parameter defines the internal 2-byte group address for the temperature value of channel 1 / 2 to be transmitted. Visible only if "Function channel 1 / 2 = Temperature value transmitter (2-byte)"!

□↵ Binary input... -> BI... - Transmit cyclically

Cyclical transmission ?		Optionally, the object values can be transmitted cyclically to the KNX for the "Switching" function. For this, the transmission criteria must first be defined in the ETS. This parameter specifies with which value cyclical transmission should take place. The object value entered in the switching objects by the device on a edge change or externally by the KNX is always transmitted cyclically. The object value is then also transmitted cyclically when "no reaction" is assigned to a rising or falling edge. Cyclical transmission also takes place directly after bus voltage return, if the reaction after bus voltage return corresponds to the transmission criterion for cyclical transmission. During an active disable, no cyclical transmissions take place via the disabled input.

	no cyclical transmission	There is no cyclical transmission.
	Repeat on ON	Transmission takes place cyclically when the object value is "ON".
	Repeat on OFF	Transmission takes place cyclically when the object value is "OFF".
	Repeat on ON and OFF	Transmission takes place cyclically irrespective of the object value.
Cyclical transmission Switching object 1?	**yes** no	Here, it is possible to specify whether cyclical transmission should take place via the first switching object of the input.
Time for cyclical transmission Hours (0...23)	**0**...23	If cyclical transmission should take place via the first switching object of the input, then the cycle time can be configured here. Setting the cycle time hours.
Minutes (0...59)	**0**...59	Setting the cycle time minutes.
Seconds (0...59)	0...**30**...59	Setting the cycle time seconds.
Cyclical transmission Switching object 2?	yes **no**	Here, it is possible to specify whether cyclical transmission should take place via the second switching object of the input.
Time for cyclical transmission Hours (0...23)	**0**...23	If cyclical transmission should take place via the second switching object of the input, then the cycle time can be configured here. Setting the cycle time hours.
Minutes (0...59)	**0**...59	Setting the cycle time minutes.
Seconds (0...59)	0...**30**...59	Setting the cycle time seconds.

□↵ Binary input... -> BI... - Disabling (Only for "Switching" function!)

Disabling function switching object 1	**disabled** enabled	The inputs can be separately disabled via the KNX using 1-bit objects. With the "Switching" function, it is possible to disable the two switching objects of an input independently of each other. With an active disabling function, signal edges at the input are ignored by the device related to the affected objects. This parameter enables the disabling function of the first communication object.

Polarity of the disabling object	**Disable = 1 (Enable = 0)** Disable = 0 (Enable = 1)	This parameter defines the polarity of the disabling object.
Behaviour at the beginning of the disabling function Switching object 1	**no reaction** ON OFF TOGGLE	With an active disable, the first switching object is disabled. This parameter specifies the command transmitted via this object at the beginning of the disabling. "TOGGLE" switches over the current object value.
Behaviour at the end of the disabling function Switching object 1	**no reaction** ON OFF Transmit current input status	With an active disable, the first switching object is disabled. This parameter specifies the command transmitted via this object at the end of the disabling. "TOGGLE" switches over the current object value. In the "Transmit current input status" setting, the device evaluates the current static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge).
Disabling function switching object 2	**disabled** enabled	The inputs can be separately disabled via the KNX using 1-bit objects. With the "Switching" function, it is possible to disable the two switching objects of an input independently of each other. With an active disabling function, signal edges at the input are ignored by the device related to the affected objects. This parameter enables the disabling function of the second communication object.
Polarity of the disabling object	**Disable = 1 (Enable = 0)** Disable = 0 (Enable = 1)	This parameter defines the polarity of the disabling object.
Behaviour at the beginning of the disabling function Switching object 2	**no reaction** ON OFF TOGGLE	With an active disable, the second switching object is disabled. This parameter specifies the command transmitted via this object at the beginning of the disabling. "TOGGLE" switches over the current object value.
Behaviour at the end of the disabling function Switching object 2	**no reaction** ON OFF Transmit current input status	With an active disable, the second switching object is disabled. This parameter specifies the command transmitted via this object at the end of the disabling. "TOGGLE" switches over the current object value. In the "Transmit

		current input status" setting, the device evaluates the current static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge).

□↵ Binary input... -> BI... - Disabling (Only for "Dimming" function!)

Disabling function	**disabled** enabled	The inputs can be separately disabled via the KNX using 1-bit objects. With an active disabling function, signal edges at the input are ignored by the device related to the affected objects. This parameter enables the disabling function of the input.
Polarity of the disabling object	**Disable = 1 (Enable = 0)** Disable = 0 (Enable = 1)	This parameter defines the polarity of the disabling object.
Behaviour at the beginning of the disabling function	**no reaction** ON OFF TOGGLE	With an active disable, the input is disabled. This parameter specifies the command transmitted via the "Switching" object at the beginning of the disabling. "TOGGLE" switches over the current object value.
Behaviour at the end of the disabling function	**no reaction** OFF	With an active disable, the input is disabled. This parameter specifies the command transmitted via the "Switching" object at the end of the disabling.

□↵ Binary input... -> BI... - Disabling (Only for "Venetian blind" function!)

Disabling function	**disabled** enabled	The inputs can be separately disabled via the KNX using 1-bit objects. With an active disabling function, signal edges at the input are ignored by the device related to the affected objects. This parameter enables the disabling function of the input.
Polarity of the disabling object	**Disable = 1 (Enable = 0)** Disable = 0 (Enable = 1)	This parameter defines the polarity of the disabling object.
Behaviour at the beginning of the disabling function	**no reaction** up Down Toggle	With an active disable, the input is disabled. This parameter specifies the command transmitted via the "Long time operation" object at the beginning of the

		disabling. "TOGGLE" switches over the current object value.
Behaviour at the end of the disabling function	**no reaction** up Down Toggle	With an active disable, the input is disabled. This parameter specifies the command transmitted via the "Long time operation" object at the end of the disabling. "TOGGLE" switches over the current object value.

□↵ Binary input... -> BI... - Disabling (Only for "Value transmitter" function!)

Disabling function	**disabled** enabled	The inputs can be separately disabled via the KNX using 1-bit objects. With an active disabling function, signal edges at the input are ignored by the device related to the affected objects. This parameter enables the disabling function of the input.
Polarity of the disabling object	**Disable = 1 (Enable = 0)** Disable = 0 (Enable = 1)	This parameter defines the polarity of the disabling object.
Behaviour at the beginning of the disabling function	**no reaction** Reaction as rising edge Reaction as falling edge Transmit current input status	With an active disable, the input is disabled. This parameter specifies the command transmitted via the value object at the beginning of the disabling. In the "Transmit current input status" setting, the device evaluates the static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge). The selection of the settings of this parameter depends on the configured edge evaluation of the input.
Behaviour at the end of the disabling function	**no reaction** Reaction as rising edge Reaction as falling edge Transmit current input status	With an active disable, the input is disabled. This parameter specifies the command transmitted via the value object at the end of the disabling. In the "Transmit current input status" setting, the device evaluates the static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge). The selection of the settings of this parameter depends on the configured edge evaluation of the input.

□↲ Binary input... -> BI... - Disabling (Only for "HVAC value transmitter" function!)

Disabling function	**disabled** enabled	The inputs can be separately disabled via the KNX using 1-bit objects. With an active disabling function, signal edges at the input are ignored by the device related to the affected objects. This parameter enables the disabling function of the input.
Polarity of the disabling object	**Disable = 1 (Enable = 0)** Disable = 0 (Enable = 1)	This parameter defines the polarity of the disabling object.
Behaviour at the beginning of the disabling function	**no reaction** Reaction as rising edge Reaction as falling edge Transmit current input status	With an active disable, the input is disabled. This parameter specifies the command transmitted at the beginning of disabling via the operating mode object. In the "Transmit current input status" setting, the device evaluates the static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge). The selection of the settings of this parameter depends on the configured edge evaluation of the input.
Behaviour at the end of the disabling function	**no reaction** Reaction as rising edge Reaction as falling edge Transmit current input status	With an active disable, the input is disabled. This parameter specifies the command transmitted at the end of disabling via the operating mode object. In the "Transmit current input status" setting, the device evaluates the static signal status of the input and, according to this, transmits the appropriately configured telegram to the KNX (contact closed at the input = telegram as with rising edge; contact open at input = telegram as with falling edge). The selection of the settings of this parameter depends on the configured edge evaluation of the input.

□↲ Binary input... -> BI... - Disabling (Only for "2-channel operation" function!)

Disabling function channel 1	**disabled** enabled	The inputs can be separately disabled via the KNX using 1-bit objects with "2-channel operation", if the channel function is set to "Switch (1-bit)". With an active disabling function, signal edges at the input are ignored by the device

		related to the affected objects. This parameter enables the disabling function of the input and is only visible when the function of channel 1 is configured to "Switching (1-bit)".
Polarity of the disabling object	**Disable = 1 (Enable = 0)** Disable = 0 (Enable = 1)	This parameter defines the polarity of the disabling object for channel 1. This parameter is visible only if the disabling function is enabled for channel 1.
Behaviour at the beginning of the disabling function	**no reaction** ON OFF TOGGLE	With an active disable, the first switching object is disabled. This parameter specifies the command transmitted via this object at the beginning of the disabling. "TOGGLE" switches over the current object value. This parameter is visible only if the disabling function is enabled for channel 1.
Behaviour at the end of the disabling function	**no reaction** ON OFF	With an active disable, the switching object is disabled. This parameter specifies the command transmitted via this object at the end of the disabling. This parameter is visible only if the disabling function is enabled for channel 1.
Disabling function channel 2	**disabled** enabled	The inputs can be separately disabled via the KNX using 1-bit objects with "2-channel operation", if the channel function is set to "Switch (1-bit)". With an active disabling function, signal edges at the input are ignored by the device related to the affected objects. This parameter enables the disabling function of the input and is only visible when the function of channel 2 is configured to "Switching (1-bit)".
Polarity of the disabling object	**Disable = 1 (Enable = 0)** Disable = 0 (Enable = 1)	This parameter defines the polarity of the disabling object for channel 1. This parameter is visible only if the disabling function is enabled for channel 2.
Behaviour at the beginning of the disabling function	**no reaction** ON OFF TOGGLE	With an active disable, the first switching object is disabled. This parameter specifies the command transmitted via this object at the beginning of the

		disabling. "TOGGLE" switches over the current object value. This parameter is visible only if the disabling function is enabled for channel 2.
Behaviour at the end of the disabling function	**no reaction** ON OFF	With an active disable, the switching object is disabled. This parameter specifies the command transmitted via this object at the end of the disabling. This parameter is visible only if the disabling function is enabled for channel 2.

4.2.5.6 Parameter for analogue inputs

Description	Values	Comment
□↵ Analogue input... -> AI... - Function		
Function	**No function** Input for temperature sensor	The actuator possesses 2 analogue inputs, to which external temperature sensors (see Accessories) can be connected as required. These temperature sensors can be used to detect room temperatures, which can be fed to one of the internal room temperature controllers or other bus devices via the KNX. The actuator evaluates a temperature sensor connected to an analogue input if the parameter configured to "Input for temperature sensor" here. Otherwise, the corresponding analogue input is deactivated.
Sensor calibration	-128...**0**...127	Depending on the mounting location, it may be necessary to compare the measured temperature value statically, for example to compensate for external temperature influences. For example, a calibration becomes necessary if the temperature measured by the temperature sensor stays permanently below or above the actual room temperature. To determine the temperature deviation, the actual room temperature should be detected with a reference measurement using a calibrated temperature measuring device. Here, it is then also possible to add an offset in the positive or negative direction to the measured value of the sensor and thus to shift it. This parameter is only available with "Function = Input for temperature sensor"!
Transmission when room temperature change by (0...255 x 0.1 K) (0 = inactive)	0...**3**...255	The temperature determined by the device can be actively transmitted to the KNX via the 2-byte "Temperature sensor" object. This parameter specifies the temperature value by which the measured value has to change in order to have the temperature value transmitted automatically 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 temperature after a change. This parameter is only available with "Function = Input for temperature

		sensor"!
Cyclical transmission of room temperature (0...255) Minutes (0 = inactive)	0...**15**...255	In addition, the temperature can be transmitted cyclically. This parameter specifies the cycle time (1 to 255 minutes). The value "0" will deactivate the periodical transmission of the temperature value. This parameter is only available with "Function = Input for temperature sensor"! The time between two temperature telegrams is always at least 10 seconds.
Internal group communication Temperature value	**---** internal connection 101 (2 byte) ... internal connection 110 (2 byte)	If internal group communication is enabled, this parameter defines the internal 2-byte group address for the temperature value to be transmitted.

4.2.5.7 Parameters for room temperature controllers

Description	Values	Comment
□↵ Room temperature control (RTC...) - RTC... - General		
Name of the controller	20-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.
Operating mode	**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 variable 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 and transmitted to the bus for the basic and additional levels. This parameter specifies the operating mode and, if necessary, enables the additional level(s).
Transmit heating and cooling command values to one common object	yes **no**	If the parameter is set to "Yes", the command value will be transmitted on 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, if applicable, with additional levels.
Type of heating control (if applicable, for basic and additional stage)	**continuous PI control** switching PI control (PWM) Switching 2-point feedback control (ON/OFF)	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 (5 K / 150 min)** Underfloor heating (5 K / 240 min) Electric heating (4 K / 100 min) Fan convector (4 K / 90 min) Split unit (4 K / 90 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 heating (10 ... 127 x 0.1 K)	10...**50**...127	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 heating Minutes (0 = inactive) (0 ... 255)	0...**150**...255	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".
Top hysteresis of the 2-point controller heating (5 ... 127 x 0.1 K)	**5**...127	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 (ON/OFF)".
Bottom hysteresis of the 2-point controller heating (-128 ... –5 x 0.1 K)	-128...**-5**	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)".
Type of cooling control (if applicable, for basic and additional stage)	**continuous PI control** switching PI control (PWM) Switching 2-point feedback control (ON/OFF)	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 (5 K / 240 min)** Fan convector	Adapting the PI algorithm to different cooling systems using predefined values for the proportional range and reset time control parameters.

	(4 K / 90 min) Split unit (4 K / 90 min) via control parameter	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 cooling (10 ... 127 x 0.1 K)	10...**50**...127	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 cooling Minutes (0 = inactive) (0 ... 255)	0...**150**...255	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".
Top hysteresis of the 2-point controller cooling (5 ... 127 x 0.1 K)	**5**...127	Definition of top hysteresis (switch-on temperatures) of the cooling. This parameter is only visible if "Type of cooling control = Switching 2-point feedback control (ON/OFF)".
Cooling 2-point controller hysteresis lower limit (-128 ... –5 x 0.1 K)	-128...**-5**	Definition of bottom hysteresis (switch-off temperatures) of the cooling. This parameter is only visible if "Type of cooling control = Switching 2-point feedback control (ON/OFF)".
Internal group communication Command value... (Constant 1 byte)	**---** internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for constant command value outputs. The parameter is available for every transmitting constant command value of the controller.
Internal group communication Command value... (switching 1 bit)	**---** internal connection 1 (1 bit) ... internal connection 50 (1 bit)	If internal group communication is enabled, this parameter defines the internal 1-bit group address for switching command value outputs. The parameter is available for every transmitting switching command value of the controller.

Additional stage inhibit object	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.
Operating mode switch-over	**via value (1 byte)** via switching (4 x 1 bit)	In the setting "via value (1-byte) the change-over of the operating modes via the bus takes place according to the KNX specification via a 1-byte value object. In addition, a higher-ranking forced object is available for this setting. In the setting "via switching (4 x 1 bit)" the ‘classic’ change-over of the operating modes via the bus is via four separate 1-bit objects.
Operation mode after reset	Restore operating mode before reset Comfort mode **Standby mode** Night operation Frost/heat protection mode	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 initializing 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.
Change-over between heating and cooling	**automatic** via object (heating/cooling change-over)	In a configured mixed mode it is possible to switch over between heating and cooling. With "Automatic": Depending on the operating mode and the room temperature, the change-over takes place automatically. With "via object (heating/cooling change-over)": The change-over takes place only via the object "Heating/cooling change-over". With automatic setpoint presetting this parameter is permanently set to "Via object (heating/cooling change-over)"!
Heating / cooling mode after a reset	**Heating** Cooling Operating mode before reset	The preset operating mode for after a bus voltage return or an ETS programming operation is specified here. Only visible if "Switchover between heating and cooling = via object"!
Cyclical transmission heating/cooling change-	**0**...255	This parameter specifies whether the current object status of the "Heating /

over Minutes (0 = inactive) (0...255)		cooling change-over" object should be output cyclically to the bus on an automatic change-over. The cycle time can be set here. The "0" setting deactivates the periodic transmission of the object value. Only visible if "Change-over between heating and cooling = automatic".
Frost/heat protection	Automatic frost protection **via window status**	Here it is possible to determine how the room temperature regulator switches into the frost/heat protection. With "automatic frost protection": the automatic frost protection is activated. Depending on the room temperature this allows an automatic switch-over into the frost protection mode. With "Via window status": switch-over into the frost/heat protection takes place via the "window status" object.
Automatic frost protection temperature drop	**Off** 0.2 K / min. 0.3 K / min. 0.4 K / min. 0.5 K / min. 0.6 K / min.	This parameter determines the decrease temperature by which the room temperature has to decrease within one minute in order for the controller to switch into the frost protection mode. The "OFF" setting will deactivate the frost protection automatic. Only visible if "frost/heat protection = Automatic frost protection"!
Frost protection period in automatic mode (1...255) * 1 min	1...**20**...255	The length of the automatic frost protection is defined here. After the preset time has elapsed, the controller will return to the operating mode which was set before frost protection. Re-triggering will not be possible. Only visible if "frost/heat protection = Automatic frost protection"!
Window status delay Minutes (0 = inactive) (0...255)	**0**...255	This parameter defines the delay time for the window status. After the parameterised time has elapsed after the window is opened the window status will be changed and thus the frost/heat protection mode activated. Such delay can make sense if short ventilation of the room by opening the window is not supposed to change the operating mode. Only visible if "Frost/heat protection = via window status"!

□↲ Room temperature control (RTC...) - RTC... - Room temperature measurement

Temperature detection of the room temperature controller through	**External temperature value 1** External temperature values 1 + 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 "Received temperature 1 (temperature sensor 1)" and, optionally, "Received temperature 2 (temperature sensor 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 "External temperature value 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 "Received temperature 1 (Temperature sensor 1)". Setting "External temperature values 1 + 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 "Received temperature 1 (Temperature sensor 1)" and "Received temperature 2 (Temperature sensor 2)".
Calibration of temperature value 1 (-128...127 x 0.1 K)	-128...**0**...127	Specifies the value by which the room temperature measured value of the first external KNX temperature sensor is calibrated.
Calibration of received temperature value (-128...127 x 0.1 K)	-128...**0**...12	Specifies the value by which the room temperature measured value of the second external KNX temperature sensor is calibrated. This parameter is only visible when the temperature detection system requires two external temperature sensors.
Measured value formation Temperature value 1 to temperature value 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.

Polling time for temperature value Minutes (0 = inactive) (0...255)	**0**...255	The polling time for the external temperature value is specified here. In the "0" setting, the temperature value is not automatically polled by the controller. In this case the communication partner (e.g. controller extension) must transmit its temperature value itself. This parameter is only visible when the temperature detection system requires only one temperature sensor.
Polling time, temperature values Minutes (0 = inactive) (0...255)	**0**...255	The polling time for both external temperature values is specified here. In the "0" setting, the temperature values are not automatically polled by the controller. In this case, the communication partners (e.g. controller extensions) must transmit their temperature value themselves. This parameter is only visible when the temperature detection system requires two external temperature sensors.
Transmission when room temperature change by (0 = inactive) (0..255 x 0.1 K)	0...**3**...255	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 transmission of room temperature Minutes (0 = inactive) (0...255)	0...**15**...255	This parameter specifies whether and when the determined room temperature is output cyclically via the "Actual temperature" object.

□↵ Room temperature control (RTC...) - RTC... - Setpoint values

Overwrite setpoint in device during ETS programming operation?	**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	**relative (setpoint temperatures from basic setpoint)** absolute (independent setpoint temperatures)	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 operating mode and heating/cooling mode.
Basic temperature after reset (7.0 ... 40.0 °C)	**21.0**	This parameter defines the temperature value to be applies 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!
Permanently apply change to basic setpoint shift	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 operating mode or the heating/cooling mode or adjusting the basic setpoint. In the "no" setting, the basic setpoint shift carried out is in effect for only as long as the operating mode or heating/cooling mode has 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!

Changing the setpoint of the basic temperature	deactivated **approve via bus**	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!
Permanently apply change to basic temperature setpoint?	yes **no**	One has to distinguish between two cases, defined by this parameter, if the basic setpoint has been modified via the object. This parameter is only visible with relative setpoint presetting! 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 basic temperature originally configured via the ETS after a reset! The changed values are also retained after a device reset, after a switchover of the operating mode or after a switchover of the heating/cooling mode. When "no": The setpoints set on the room temperature controller or received via the objects 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 heating/cooling mode (e.g. Heating to Cooling), the last setpoint changed will be discarded and replaced by the initial value.
Dead band position	symmetrical **asymmetrical**	With relative setpoint presetting, the comfort setpoint temperatures for the operating mode "Heating and cooling" are derived from the basic setpoint in consideration of the adjusted Dead band. 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. The comfort setpoint temperatures are derived directly from the basic setpoint resulting from the half deadband (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 set-temperature for cooling is derived directly from the comfort setpoint for heating. The parameter is only visible in the "Heating and cooling" operating mode (if necessary with additional levels) and only with relative setpoint presetting!
Deadband between heating and cooling (0...127) x 0.1 K	0...**20**...127	With relative setpoint presetting, the comfort setpoint temperatures for heating and cooling are derived from the basic setpoint in consideration of the adjusted Dead band. 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" operating mode (if necessary with additional levels) and only with relative setpoint presetting!
Setpoint temp. comfort mode (heating) (7.0 °C...40.0 °C)	**21.0**	With absolute setpoint presetting the setpoint temperatures for comfort, standby and night mode are independent of each other. Depending on the operating mode and heating/cooling 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 active operating mode". Presetting of the setpoint temperature for the comfort heating mode. These parameters are only visible with absolute setpoint presetting!
Setpoint temp. standby mode (heating) (7.0 °C...40.0 °C)	**19.0**	Presetting of the setpoint temperature for standby mode (heating).

Setpoint temp. night mode (heating) (7.0 °C...40.0 °C)	**17.0**	Presetting of the setpoint temperature for night mode (heating).
Setpoint temp. comfort mode (cooling) (7.0 °C...40.0 °C)	**23.0**	Presetting of the setpoint temperature for standby mode (cooling).
Setpoint temp. standby mode (cooling) (7.0 °C...40.0 °C)	**25.0**	Presetting of the setpoint temperature for standby mode (cooling).
Setpoint temp. night mode (cooling) (7.0 °C...40.0 °C)	**27.0**	Presetting of the setpoint temperature for night mode (cooling).
Accept modification of the setpoint permanently?	yes **no**	One has to distinguish between two cases, defined by this parameter, if the setpoint has been modified via the object. This parameter is only visible with absolute setpoint presetting! 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 heating/cooling mode (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 heating/cooling mode (e.g. Heating to Cooling), the last setpoint changed will be discarded and replaced by the initial value.
Upward adjustment of the basic setpoint temperature (0...10 x 1 K)	0 K + 1 K + 2 K + 3 K + 4 K + 5 K + 6 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!

	+ 7 K **+ 8 K** + 9 K + 10 K	
Downward adjustment of the basic setpoint temperature (0...10 x 1 K)	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!
Lower the setpoint temperature during standby operating mode (heating) (-128...0 x 0.1 K)	-128...**-20**...0	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" operating mode (if necessary with additional levels) and only with relative setpoint presetting.
Lower the setpoint temperature during Night mode (heating) (-128...0 x 0.1 K)	-128...**-40**...0	The value by which the night setpoint temperature for heating is lowered compared to the heating comfort temperature. The parameter is only visible in the "Heating" or "Heating and cooling" operating mode (if necessary with additional levels) and only with relative setpoint presetting.
Raise the setpoint temperature during standby operating mode (cooling) (0...127 x 0.1 K)	0...**20**...127	The value by which the standby setpoint temperature for cooling is lowered compared to the cooling comfort temperature. The parameter is only visible in the "Heating" or "Heating and cooling" operating mode (if necessary with additional levels) and only with relative setpoint presetting.
Raise the setpoint temperature during Night mode (cooling) (0...127 x 0.1 K)	0...**40**...127	The value by which the night temperature for cooling is lowered compared to the cooling comfort temperature. The parameter is only visible in the "Heating" or "Heating and cooling" operating mode (if necessary with

		additional levels) and only with relative setpoint presetting.
Difference between basic and additional levels (0...127 x 0.1 K)	0...**20**...127	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.
Step width of the setpoint shift	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 "Basic Setpoint" object and matches the values to the step width configured here.
Frost protection setpoint temperature (7.0...40.0 °C)	**7.0**	This parameter specifies the setpoint temperature for frost protection. The parameter is only visible in "Heating" or "Heating and cooling" operating modes (if necessary with additional levels).
Heat protection setpoint temperature (7.0...45.0 °C)	**35.0**	This parameter specifies the setpoint temperature for heat protection. The parameter is only visible in "Cooling" or "Heating and cooling" operating modes (if necessary with additional levels).
Transmission at setpoint temperature change by (0...255 x 0.1 K)	0...**1**...255	Determines the size of the value change required to automatically transmit the current value via the "Setpoint temperature" object. In the "0" setting, the setpoint temperature is not transmitted automatically when there is a change.
Cyclical transmission of setpoint temperature Minutes (0 = inactive) (0...255)	**0**...255	This parameter determines whether the setpoint temperature is to be transmitted periodically via the "Setpoint temperature" object. Definition of the cycle time by this parameter In the "0" setting, the setpoint temperature is not transmitted automatically cyclically.

Setpoint temperature limit in cooling operation	**no limit** Only difference to outdoor temperature Only max. setpoint temperature Max. setpoint and difference to outdoor temperature	Optionally, the setpoint temperature limit can be enabled here, which is only effective in cooling operation. If necessary, the controller limits the setpoint temperature to specific values and prevents an adjustment beyond the limits. "Only difference to outdoor temperature" setting, the outdoor temperature is monitored and compared to the active setpoint temperature in this setting. 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 rise, the controller raises the setpoint temperature until the required difference to the outdoor temperature is achieved, 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 max. setpoint temperature" setting: In this setting, no setpoint temperatures are permitted in Cooling mode related to the Comfort, Standby and Night modes, which are greater than the maximum setpoints configured in the ETS. 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. "Max. setpoint temperature and difference to outdoor temperature" setting: 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 upwards 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.
Activation of the setpoint temperature limit in cooling operation via object?	**no** yes	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.
Difference to outdoor temperature in cooling operation (1...15 K)	1 K...**6 K**...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 in cooling operation	20°C...**26°C**...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".

□↵ Room temperature control (RTC...) - RTC... - Command value and status output

	0...**3**...100	

Automatic transmission at modification by (0 = inactive) (0...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)".
Cycle time of the switching command value Minutes (1...255)	1...**15**...255	This parameter specifies the cycle time for the pulse width modulated command value (PWM). Thus this parameter only affects command values which are configured to "Switching PI control (PWM)".
Cycle time for automatic transmission (0 = inactive) (0...255)	0...**10**...255	This parameter determines the time interval for the cyclical transmission of the command values via all command value objects.
Output of the heating variable	inverted (under current, this means closed) **normal (under current, this means opened)**	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 operating mode "Heating" or "Heating and cooling" is configured and not two-level operation.
Output of the command value basic level heating	inverted (under current, this means closed) **normal (under current, this means opened)**	At this point, it is possible to specify whether the command value telegram for the heating basic level is output normally or in inverted form. This parameter is only visible if the operating mode "Heating" or "Heating and cooling" is configured along with two-level operation.
Output of the heating additional stage variable	inverted (under current, this means closed) **normal (under current, this means opened)**	At this point, it is possible to specify whether the command value telegram for the heating additional level is output normally or in inverted form. This parameter is only visible if the operating mode "Heating" or "Heating and cooling" is configured along with two-level operation.
Output of the cooling variable	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

	normal (under current, this means opened)	inverted form. This parameter is only visible if the operating mode "Cooling" or "Heating and cooling" is configured and not two-level operation.
Output of the command value basic level cooling	inverted (under current, this means closed) **normal (under current, this means opened)**	At this point, it is possible to specify whether the command value telegram for the cooling basic level is output normally or in inverted form. This parameter is only visible if the operating mode "Cooling" or "Heating and cooling" is configured along with two-level operation.
Output of the cooling additional stage variable	inverted (under current, this means closed) **normal (under current, this means opened)**	At this point, it is possible to specify whether the command value telegram for the cooling additional level is output normally or in inverted form. This parameter is only visible if the operating mode "Cooling" or "Heating and cooling" is configured along with two-level operation.
Heating indication	yes **no**	Depending on the set operating mode, 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.
Cooling indication	yes **no**	Depending on the set operating mode, 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.
Command value limit	**deactivated** continuously activated can be activated via object	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 "Command value limit" parameter defines the mode 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.
Command value limit after reset	**deactivated** activated	When controlling via the object, it is possible to have the controller activate the command value limit automatically after bus voltage return or an ETS programming operation. This parameter defines the initialisation behaviour here. In the "Deactivated" 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 "Activated" 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" object. The limit can be switched on or off at any time using the object. This parameter is only visible with "Command value limit = can be activated via object"!
Minimum command value for heating (optionally also for basic and additional level)	**5%**, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%	The "Minimum command value" parameter specifies the lower command value limiting value for heating. 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 for heating (optionally also for basic and additional level)	55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, **95%**, 100%	The "Maximum command value" parameter specifies the upper command value limiting value for heating. 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.
Minimum command value for cooling (optionally also for basic and additional level)	**5%**, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%	The "Minimum command value" parameter specifies the lower command value limiting value for cooling. 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 for cooling (optionally also for basic and additional level)	55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, **95%**, 100%	The "Maximum command value" parameter specifies the upper command value limiting value for cooling. 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.
Controller status	**no status** KNX compliant Controller general transmit individual state	The room temperature controller can transmit its current status to the KNX. A choice of data formats is available for this. This parameter enables the status signal and sets the status format.
Single status	**Comfort operation activated** Standby mode activated Night mode activated Frost/heat protection active Controller disabled Heating / cooling Controller inactive Frost alarm	Here, the status information is defined which is to be transmitted onto the bus as the 1-bit controller status. This parameter is only visible if the parameter "Controller status" is set to "Transmit single status".

□↵ Room temperature control (RTC...) - RTC... - Controller functionality

Presence detection	none **Presence button** Presence detector	In the "None" setting, the presence mode is deactivated. In the "Presence button" setting, presence detection takes place using the "Presence button" object (e.g. other push-button sensors). When the presence button is pressed from the night mode or frost/heat protection, the comfort extension is activated. If the presence button is pressing in standby mode, the controller activates the comfort mode for the duration of the presence mode. In the "Presence detector" setting, presence detection takes place using an external presence detector, coupled to

		the "Presence detector" object. Comfort mode is recalled when a presence is detected. Comfort mode remains active until the presence detector ceases to detect movement.
Length of the comfort extension Minutes (0 = OFF) (0 .. 255)	0...**30**...255	When the presence button is pressed from the Night mode or Frost/heat protection, the controller switches to Comfort mode for the length of time specified here. When this time has elapsed, it switches back automatically. In the "0" setting, the comfort extension is switched off, meaning that it cannot be activated from Night or Frost/heat protection mode. In this case, the operating mode will not be changed, although the presence function has been activated. This parameter is only visible when presence detection is configured to "Presence button".
Switch off controller (dew point operation)	**no** via bus	This parameter enables the "Disable controller" object. If the controller is disabled, there is no feedback control until enabled (command values = 0).
Underfloor heating temperature limit	**not present** present	The temperature limit can be activated in the controller in order to protect an underfloor heating system. If the temperature limit is enabled here ("Present" setting), the controller continuously monitors the floor temperature. Should the floor temperature exceed a specific limiting value on heating, the controller switches the command value off immediately, thus switching the heating off and cooling the system. Only when the temperature falls below the limiting value, minus a hysteresis of 1 K, will the controller add the most recently calculated command value. The floor temperature is fed to the controller using a separate object. It should be noted that the temperature limit only affects command values for heating. Thus, the temperature limit requires the controller operating modes "Heating" or "Heating and cooling".
Effect on	**Heating, basic level** Heating, additional level	The temperature limit can also be used in a two-level feedback control with basic and additional levels. It must then be specified here to which level the limit

		shall apply. Either the basic level or to the additional level for heating can be limited. This parameter can only be set in two-level control operation.
Maximum temperature, underfloor heating (20...70 °C)	20...**30**...70	The maximum limit temperature which the underfloor heating system may reach 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 intended in the control algorithm.
Hysteresis of limit temperature	**1 K**	The hysteresis of the floor temperature limit is fixed to "1 K" and cannot be changed.

4.2.5.8 Parameter for logic functions

Description	Values	Comment
□↵ Logic functions -> General logic functions		
Number of logic functions (1...10)	**1**...10	Logic functions can be enabled in steps so that the number of visible functions and, in consequence, the available parameters are visible in the ETS. In the basic configuration of the logic functions, it is possible here to define the number of available functions. As many logic functions are created as have been selected.
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.
Internal group communication Data input... (1-bit)	**---** internal connection 1 (1 bit) ...	If internal group communication is enabled, this parameter defines the internal 1-bit group address for the 1-bit data inputs.

	internal connection 50 (1 bit)	This parameter is available for each of the 32 1-bit data inputs.
Internal group communication Data input... (4-bit)	--- internal connection 111 (4 bit) ... internal connection 120 (4 bit)	If internal group communication is enabled, this parameter defines the internal 4-bit group address for the 4-bit data inputs. This parameter is available only for the first 8 4-bit data inputs. This parameter is only available with the application program "Multi station 802812"!
Internal group communication Data input... (1-byte)	--- internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the 1-byte data inputs. This parameter is available for each of the 16 1-byte data inputs.
Internal group communication Data input... (2-byte)	--- internal connection 101 (2 byte) ... internal connection 110 (2 byte)	If internal group communication is enabled, this parameter defines the internal 2-byte group address for the 2-byte data inputs. This parameter is available only for the first 8 2-byte data inputs. This parameter is only available with the application program "Multi station 802812"!
Internal group communication Data input... (4-byte)	--- internal connection 121 (4 byte) ... internal connection 130 (4 byte)	If internal group communication is enabled, this parameter defines the internal 4-byte group address for the 4-byte data inputs. This parameter is available only for the first 4 4-byte data inputs. This parameter is only available with the application program "Multi station 802812"!
Internal group communication Result output... (1-bit)	--- internal connection 1 (1 bit) ... internal connection 50 (1 bit)	If internal group communication is enabled, this parameter defines the internal 1-bit group address for the 1-bit result outputs. This parameter is available for each of the 32 1-bit result outputs.

Internal group communication Result output... (4-bit)	--- internal connection 111 (4 bit) ... internal connection 120 (4 bit)	If internal group communication is enabled, this parameter defines the internal 4-bit group address for the 4-bit result outputs. This parameter is available only for the first 8 4-bit result outputs. This parameter is only available with the application program "Multi station 802812"!
Internal group communication Result output... (1-byte)	--- internal connection 51 (1 byte) ... internal connection 100 (1 byte)	If internal group communication is enabled, this parameter defines the internal 1-byte group address for the 1-byte result outputs. This parameter is available for each of the 16 1-byte result outputs.
Internal group communication Result output... (2-byte)	--- internal connection 101 (2 byte) ... internal connection 110 (2 byte)	If internal group communication is enabled, this parameter defines the internal 2-byte group address for the 2-byte result outputs. This parameter is available only for the first 8 2-byte result outputs. This parameter is only available with the application program "Multi station 802812"!
Internal group communication Result output... (4-byte)	--- internal connection 121 (4 byte) ... internal connection 130 (4 byte)	If internal group communication is enabled, this parameter defines the internal 4-byte group address for the 4-byte result outputs. This parameter is available only for the first 4 4-byte result outputs. This parameter is only available with the application program "Multi station 802812"!

□↵ Logic functions -> LO... - General

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		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.
	Lighting control hotel "Welcome" (8 inputs) Lighting control hotel "Welcome" (15 inputs) Lighting control hotel "Goodbye" (8 inputs) Lighting control hotel "Goodbye" (15 inputs)	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). Depending on the selection here, up to 8 or 15 defined lighting inputs are available as status information for lighting control.

□↵ Logic functions -> LO... - General -> 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 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.
	0...99	

Monitoring time Hours (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 -> LO... - General -> 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)**	This parameter defines the data format of the filter stage. In consequence, it specifies the format of all comparison

	4 bit dimming (DPT 3.007) 1 byte operating mode switchover (DPT 20.102) 1 byte scene extension (DPT 18.001) 1 byte value 0...255 (DPT 5.010) 1 byte brightness value 0...100 % (DPT 5.001) 2 byte value 0...65535 (DPT 7.001) 2 byte value -32768...32767 (DPT 8.001) 2 byte floating-point number (DPT 9.0xx) 4 byte value -2147483648...2147483647 (DPT 13.001)	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 ≠ y) greater than (x > y) greater or equal than (x ≥ y) smaller than (x < y) smaller or equal than (x ≤ y) range testing smaller than (x < y < z) range testing smaller or equal than (x < y < 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 ≠ y)" can be selected. This parameter is only available if the filter stage is used.
Comparison value 1 (x)		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) increase brightness, stop (8) increase brightness, 100 % (9) increase brightness, 50 % (10) increase brightness, 25 % (11) increase brightness, 12.5 % (12) increase brightness, 6 % (13) increase brightness, 3 % (14) increase 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 (0)** Comfort mode (1) Standby mode (2) Night operation (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 is specified here. This parameter is only available with the data format "1-byte scene extension (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 only available with the data format "1-byte value 0...255 (DPT 5.010)" and the evaluation of a constant.
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 only available with the data format "2-byte value 0...65535 (DPT 7.001)" and the evaluation of a constant.
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 only available with the data format "2-byte value -32768...32767 (DPT 8.001)" and the evaluation of a constant.
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 only available with the

		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 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)** ...	This parameter specifies the result object for the first comparison value.

	Result output 32 (1 bit)	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.

Comparison value 3 (z)		See comparison value 1. 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 ≤ y ≤ 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 -> LO... - General -> 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		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)		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 -> 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 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...		
Logic operation		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...65535 (DPT 7.001) 2 byte value -32768...32767 (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)		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 only available with the data format "1-byte value 0...255 (DPT 5.010)" and the evaluation of a constant.
	0...100	

Constant Operand 1 (x) (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 only available with the 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 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 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 data format "4-byte value -2147483648...2147483647 (DPT 13.001)" and the evaluation of a constant.
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 ≠ y) greater than (x > y) greater or equal than (x ≥ y) smaller than (x < y) smaller or equal than (x ≤ y) range testing smaller than (x < y < z) range testing smaller or equal than (x ≤ y ≤ 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 (DPT 18.001) **1 byte value 0...255 (DPT 5.010)** 1 byte brightness value	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

	0...100 % (DPT 5.001) 2 byte value 0...65535 (DPT 7.001) 2 byte value -32768...32767 (DPT 8.001) 2 byte floating-point number (DPT 9.0xx) 4 byte value -2147483648...2147483647 (DPT 13.001)	"Comparison".
Operand 1 (x)		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) increase brightness, stop (8) increase brightness, 100 % (9) increase brightness, 50 % (10) increase brightness, 25 % (11)	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.

	increase brightness, 12.5 % (12) increase brightness, 6 % (13) increase brightness, 3 % (14) increase brightness, 1.5 % (15)	
Constant Operand 1 (x)	**Automatic (0)** Comfort mode (1) Standby mode (2) Night operation (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 is specified here. This parameter is only available with the data format "1-byte scene extension (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 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 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 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 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 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 (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...65535 (DPT 7.001) x -> 2 byte -32768...32767 (DPT 8.001) x -> 2 byte floating point value (DPT 9.0xx) x -> 4 byte -2147483648...2147483647	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".

	(DPT 13.001)	
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 (DPT 18.001) 1 byte value 0...255 (DPT 5.010) 1 byte brightness value 0...100 % (DPT 5.001) 2 byte value 0...65535 (DPT 7.001) 2 byte value -32768...32767 (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)		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) increase brightness, stop (8) increase brightness, 100 % (9) increase brightness, 50 % (10) increase brightness, 25 % (11) increase brightness, 12.5 % (12) increase brightness, 6 % (13) increase brightness, 3 % (14) increase 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 (0)** Comfort mode (1) Standby mode (2) Night operation (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 is specified here. This parameter is only available with the input data format "1-byte scene extension (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 -> LO... - General -> 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 (DPT 18.001) 1 byte value 0...255 (DPT 5.010) 1 byte brightness value 0...100 % (DPT 5.001) 2 byte value 0...65535 (DPT 7.001) 2 byte value -32768...32767 (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 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 ≠ x) greater than (result >x) greater or equal than (result ≥ x) smaller than (result < x) smaller or equal than (result ≤ x) range testing smaller than (x < result < y) range testing smaller or equal than (x ≤ result ≤ 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) increase brightness, stop (8) increase brightness, 100 % (9) increase brightness, 50 % (10) increase brightness, 25 % (11) increase brightness, 12.5 % (12) increase brightness, 6 % (13) increase brightness, 3 % (14) increase 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 (0)** Comfort mode (1) Standby mode (2) Night operation (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 is specified here. This parameter is only available with the data format "1-byte scene extension (DPT 18.001)" and the evaluation of a constant.
Constant Operand 1 (x) (0...255)	**0**...255	The constant of the 1-byte comparison value for the value command is specified here. This parameter is only available with the 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 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)	**0**...65535	The constant of the 2-byte comparison value for the unsigned value command is specified here. This parameter is only available with the 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 comparison value for the signed value command is specified here. This parameter is only available with the 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 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 only available with the data format "4-byte value -2147483648...2147483647 (DPT 13.001)" and the evaluation of a constant.
Constant Operand 2 (y)		See operand 1 (x). This parameter is only available with the operators "Range check smaller than (x < result < z)" and "Range check smaller than or equal to (x ≤ result ≤ 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 (DPT 18.001) 1 byte value 0...255 (DPT 5.010) 1 byte brightness value 0...100 % (DPT 5.001) 2 byte value 0...65535 (DPT 7.001) 2 byte value -32768...32767 (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) increase brightness, stop (8) increase brightness, 100 % (9) increase brightness, 50 % (10) increase brightness, 25 % (11) increase brightness, 12.5 % (12) increase brightness, 6 % (13) increase brightness, 3 % (14) increase 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 (0)** Comfort mode (1) Standby mode (2) Night operation (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 (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 only available with the data format "1-byte value 0...255 (DPT 5.010)" and the evaluation of a constant.
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) increase brightness, stop (8) increase brightness, 100 % (9) increase brightness, 50 % (10)	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.

	increase brightness, 25 % (11) increase brightness, 12.5 % (12) increase brightness, 6 % (13) increase brightness, 3 % (14) increase brightness, 1.5 % (15)	
Output value for type conversion OFF	**Automatic (0)** Comfort mode (1) Standby mode (2) Night operation (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 (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 only available with the data format "1-byte value 0...255 (DPT 5.010)" and the evaluation of a constant.
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	-32768...**0**...32767	The output value of the 2-byte type conversion is specified here. This parameter is only available with the

OFF (-32768...32767)		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		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 bus voltage return. 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 only started by the first valid trigger after bus voltage return 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.
Delay for transmission of the result Hours (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 -> LO... - General -> LO... - Lighting control

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 activate 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.
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 on 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.
Selection of result object for lighting control output "Switching"	**Result output 1 (1 bit)** ... Result output 32 (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 switch-on of lighting Hours (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 switch-off of lighting 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 "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 (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 only available if the type conversion "Value 0...255" is enabled.
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.
Type conversion "Operating mode switchover"	**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 (DPT 18.001)" via separate result outputs. This parameter enables the type conversion for an operating mode switchover by the result stage.
Output value for type conversion	**Automatic (0)** Comfort mode (1) Standby mode (2) Night operation (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 enabled.

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 enabled.
Type conversion "Scene extension"	**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 (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 only available if the type conversion "Scene extension" is enabled.
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" is enabled.

5 Appendix

5.1 Index

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