Product documentation

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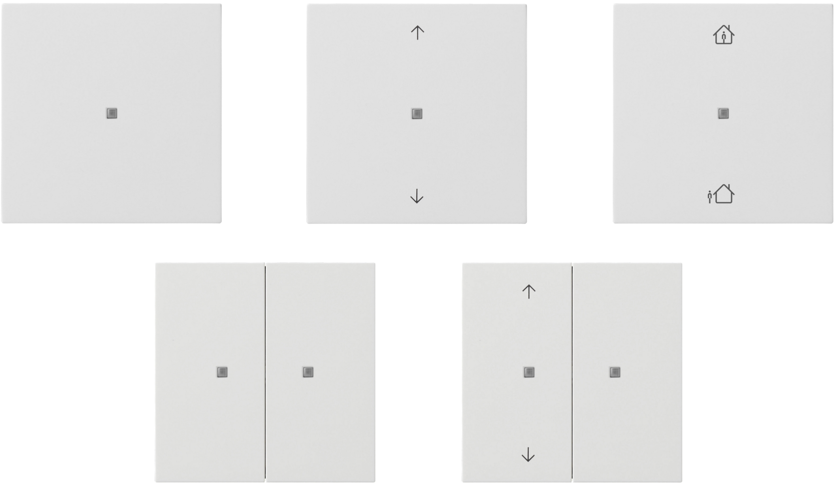
51043100

RF operating top unit

Order no. 5104 .., 5105 .., 5106 .., 5107 .., 5108 ..



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1 Information on the product

1.1 Product catalogue

Product name	Article number	Use	Design
RF operating top unit, 1-gang	5104 ..	Sensor	Cover
RF operating top unit, 1-gang arrow symbols	5105 ..	Sensor	Cover
RF operating top unit, 1-gang heating mode	5106 ..	Sensor	Cover
RF operating top unit, 2-gang	5107 ..	Sensor	Cover
RF operating top unit, 2-gang arrow symbols	5108 ..	Sensor	Cover
RF operating top unit with Blind control insert without auxiliary input	5415 00	Actuator	FM (Flush-mounted)
RF operating top unit with Blind control insert with auxiliary input	5414 00	Actuator	FM (Flush-mounted)
RF operating top unit with Relay switching insert	5403 00	Actuator	FM (Flush-mounted)
RF operating top unit with Relay switching insert 2-gang	5404 00	Actuator	FM (Flush-mounted)
RF operating top unit with Electronic switching insert	5405 00	Actuator	FM (Flush-mounted)
RF operating top unit with Room temperature controller insert with sensor connection	5395 00	Actuator	FM (Flush-mounted)
RF operating top unit with Universal LED dimming insert Standard	5400 00	Actuator	FM (Flush-mounted)
RF operating top unit with Universal LED dimming insert Komfort	5401 00	Actuator	FM (Flush-mounted)
RF operating top unit with Universal LED dimming insert Komfort 2-gang	5402 00	Actuator	FM (Flush-mounted)
RF operating top unit with Flush-mounted DALI Power control unit insert	5406 00	Actuator	FM (Flush-mounted)
RF operating top unit with Auxiliary insert 3-wire	5409 00	Actuator	FM (Flush-mounted)

1.2 Function

General

The device is KNX Data Secure capable. KNX Data Secure offers protection against manipulation in building automation and can be configured in the ETS project. Detailed specialist knowledge is required. A device certificate, which is attached to the device, is required for safe commissioning. During mounting, it is recommended to remove the certificate from the device and to store it securely.

The device can be updated. Firmware can be easily updated with the Gira ETS Service App (additional software).

Planning, installation and commissioning of the device are carried out with the aid of the ETS, version 5.7.5 and above.

The device electronics are supplied by operation of switching, dimming, DALI, Venetian blind or room temperature insert or 3-wire extension of the System 3000.

Cover-Function

When its buttons are actuated, the device sends telegrams to the KNX, depending on the ETS parameter settings. These can be telegrams for switching, for dimming or for controlling blinds. Value transmitters and scene extension functions can also be programmed. The value transmitter functions include, for example, temperature and brightness value transmitters.

The device can be used as a controller extension, i.e. as an operation and display element of a room temperature controller.

The operation concept can be configured in the ETS either as a rocker function or alternatively as a button function. With the rocker function, two buttons lying one above the other are combined into one rocker. With the button function, each button is evaluated individually.

All buttons or single buttons of the device can be disabled using the disabling function. During active disabling, the assigned buttons perform parameterised behaviour.

LED function

The device possesses a three colour status LED per rocker. These status LEDs can either be switched on or off permanently, or can function as a status indicator for a button or rocker. As an alternative, the LEDs can also be activated via separate communication objects. The LEDs can either indicate the switching status of an object statically or by flashing, or signal operating states of room temperature controllers.

The colour of the status LED can either be parameterised for all status LEDs together or separately for each status LED.

The brightness of all status LEDs is adjustable in six stages using a common parameter. A separate communication object allows the brightness to be reduced, e.g. during night hours.

ℹ When the application program is discharged and the mains voltage is connected, all status LEDs initially light up green. Whenever a button is actuated, the respective illuminated status LED changes colour (green → red → blue → green → ...).

Measurement of the room temperature

As a supplement to the controller extension the device has an integrated temperature sensor that makes it possible to measure and forward the local room temperature. A temperature value received via an object can optionally supplement the room temperature measurement performed by the internal temperature sensor in order to improve the measurement result.

ℹ Temperature measurements are only possible in combination with the following inserts:

- Relay switching insert (Order no. 5403 00)
- Electronic switching insert (Order no. 5405 00)
- Flush-mounted DALI Power control unit insert (Order no. 5406 00)
- Blind control insert with auxiliary input (Order no. 5414 00)
- Blind control insert without auxiliary input (Order no. 5415 00)
- Room temperature controller insert with sensor connection (Order no. 5395 00)
- Auxiliary insert 3-wire (Order no. 5409 00)

ℹ For accurate temperature measurement, make sure that the connected loads do not exceed 40 W for the electronic switch insert.

Switching insert function

When operated on a switch insert, electrical consumers can be switched, for example lighting systems or door openers.

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

In switching operation, the functionalities NC contact or NO contact include extensive time functions, scenes and disabling functions. In addition, the switching status of a relay output can be signaled back.

Venetian blind insert function

When operated on a Venetian blind insert, electrical consumers can be switched. In Venetian blind operation the actuator can be used with its relay contacts to control electrically driven Venetian blinds, shutters, awnings, roof windows, venting louvers or similar blinds/shutters that are suitable for mains voltage.

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

The functionalities that can be preset in the ETS include, for instance, independently parameterisable travel times, extended feedback functions, assignment to up to 3 different safety functions, a sun protection function, and incorporation into scenes or disabling functions.

Dimming insert function

When operated on a dimming insert, electrical consumers can be switched and dimmed, for example lighting systems.

The brightness values of the dimming channels in case of voltage recovery and after ETS programming can be preset separately.

In dimming mode, the functional characteristics include, for example, separately configurable brightness ranges, extended feedback functions, scenes or a locking function, a separately adjustable dimming behaviour, soft dimming functions, time delays and a staircase function with advance warning before the lighting is switched off.

DALI Tunable White insert function

When operated on a DALI insert, luminaires with DALI operating device can be collectively switched or dimmed.

The brightness values and colour temperature of the Dali channel in case of voltage recovery and after ETS programming can be preset separately.

In Dali mode, the functional characteristics include, for example, separately configurable brightness and colour temperature ranges, extended feedback functions, scenes or a locking function, a separately adjustable dimming behaviour, soft dimming functions, time delays and a staircase function with advance warning before the lighting is switched off.

Heating | Cooling insert function

When operated on an RTR insert, electric underfloor heating or electrothermal actuators (ETA) for heating or cooling systems can be controlled.

The control variables of the valve output in case of voltage recovery and after ETS programming can be preset separately.

In controller mode, the functional characteristics include the data format of the control value input, the valve direction of action, control value monitoring and limitation as well as emergency operation, forced position and valve purging. In addition, the valve control value and the valve status can be reported back.

Room temperature controller function

The temperature can be adjusted to predefined setpoints by independent control processes. Depending on the operating mode, current setpoint temperature and room temperature, using a controller means that a variable for heating or cooling control can be transmitted to the KNX for the control circuit or be forwarded internally to a valve output. The controller distinguishes between different operating modes (comfort, standby, night, frost/heat protection) each with their own temperature setpoints for heating or cooling. For heating and cooling functions, you can select continuous or switching PI or switching 2-point feedback control algorithms.

1.3 Device components

Front view 1-channel (see figure 1) **and 2-channel** (see figure 2)

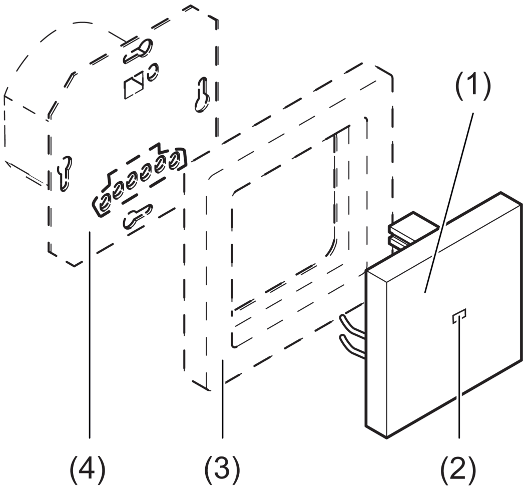


Image 1: Device components 1-channel

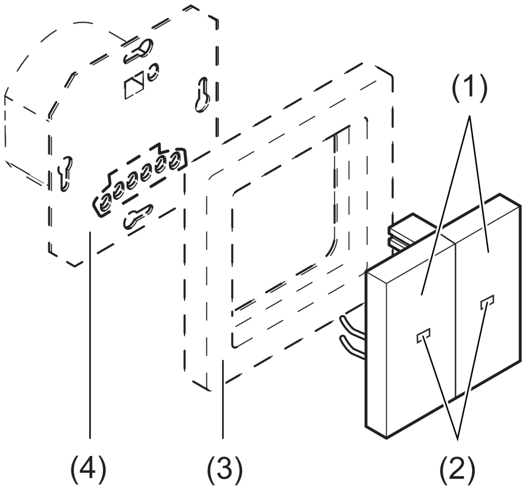


Image 2: Device components 2-channel

(1) Rockers
(2) Status LED
(3) Cover frame
(4) System 3000 insert

1.4 Insert-cover alignment

The device combination of insert and cover carries out an automatic insert-cover alignment as soon as a cover is placed on an insert and the mains voltage is switched on.

Case 1: Insert and cover are brand new

After the insert-cover alignment, the device combination is functional in a standard configuration.

Case 2: Insert is brand new and cover was already in operation

After the insert-cover alignment, the device combination is functional in a standard configuration.

Case 3: Insert was already in operation and cover is brand new

After the insert-cover alignment, the device combination is functional in a standard configuration.

Case 4: Insert and cover were already in operation in combination

After the insert-cover alignment, the device combination is functional. The device combination performs its function according to its last configuration.

Case 5: Insert and cover were already in operation separately from one another

After the insert-cover alignment, the device combination is not functional. The insert-cover alignment identifies this case as a swapping of the covers, for example after renovating a room. The insert-cover alignment reports an error via the status LED.

ℹ This device combination becomes functional again after programming with the ETS, a master reset or resetting to factory settings.

Case 6: Insert is not supported by the cover

The insert-cover alignment reports an error via the status LED if the cover has been placed on an insert not supported by the cover. The device combination is not functional.

1.4.1 Error message

The error reported by the insert-cover alignment is indicated by the status LED for 60 seconds. Within these 60 seconds, the status LED flashes 3 times in pulses.

After an error has been detected during insert-cover alignment, the new assignment of a device combination of insert and cover is only possible via the ETS. The device combination remains without function until a new ETS is commissioned.

ℹ The 60-second signalling of the error is restarted each time the button is actuated.

ℹ The 2-gang device variant indicates the error message via the left status LED.

ℹ A firmware update is also possible in the event of an error.

1.5 Delivery state

The device combination of insert and cover functions in the delivery state after successful insert-cover alignment. The cover is for local use in a standard configuration.

ℹ The device combination does not transmit RF telegrams.

ℹ The ETS can reset the device to the delivery state with the "Unload device" command.

Status LED in the delivery state

The status LEDs perform the "Actuation indicator" function in the delivery state. Each push-button or rocker actuation causes the associated green status LED to illuminate for 3 seconds.

1.6 Technical data

KNX

KNX medium	RF1.R
Safety	KNX Data Secure (X-mode)
Commissioning mode	S-mode
Radio frequency	868.0 ... 868.6 MHz
Transmission capacity	max. 20 mW
Transmitting range in free field	typ. 100 m
Receiver category	2

Ambient conditions

Ambient temperature	-5 ... +45 °C
Storage/transport temperature	-25 ... +70 °C
Relative humidity	max. 93 % (no condensation)

2 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. During installation and cable routing, comply with the regulations and standards which apply for SELV circuits.

The radio communication takes place via a non-exclusively available transmission path, and is therefore not suitable for safety-related applications, such as emergency stop and emergency call.

3 Fitting and electrical connection

⚠ **DANGER!**

Mortal danger of electric shock.

Disconnect the device. Cover up live parts.

Mounting and connecting the device

In secure operation (preconditions):

- Secure commissioning is activated in the ETS.
- Device certificate entered/scanned or added to the ETS project. A high resolution camera should be used to scan the QR code.
- Document all passwords and keep them safe.

ℹ The insert must be disconnected from the power supply before plugging in or unplugging the RF operating top unit.

Switching, dimming, Venetian blind or room temperature controller insert or 3-wire extension are mounted and connected properly (see instructions of the relevant inserts).

The mains voltage has been switched off.

- ■ Fit the cover with frame on the insert (see figure 1).
- ■ Switch on mains voltage.
- ■ In secure operation: The device certificate must be removed from the device and stored securely.

  The device can be commissioned and is ready for operation.

ℹ If the status LED flashes red three times at repeated intervals, the cover was previously connected to another insert. To enable operation again, either place the cover on the associated insert or put the device combination into operation with the ETS.

ℹ When switching to another application, the device should always be reset to the default setting and then reprogrammed.

4 Commissioning

Programming the physical address and application program, 1-channel (see figure 3) and 2-channel (see figure 4)

ℹ Project design and commissioning with ETS from version5.7.5and above.

ℹ The RF operating top unit works with the RF/TP media coupler (order no. 5110 00) from index I01. An update file for older RF/TP media couplers can be found on our website.

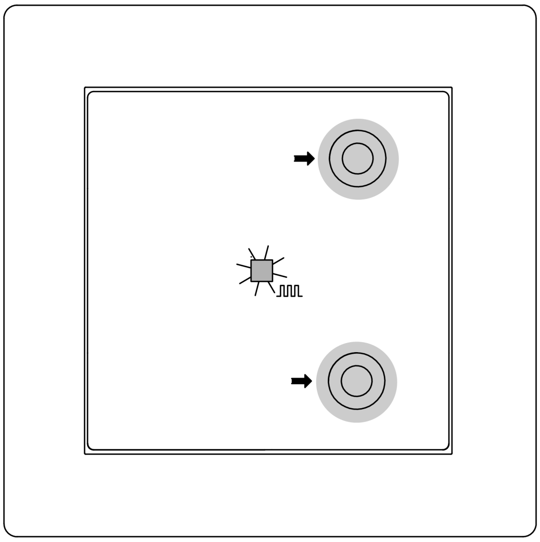


Image 3: Activating programming mode (1-channel)

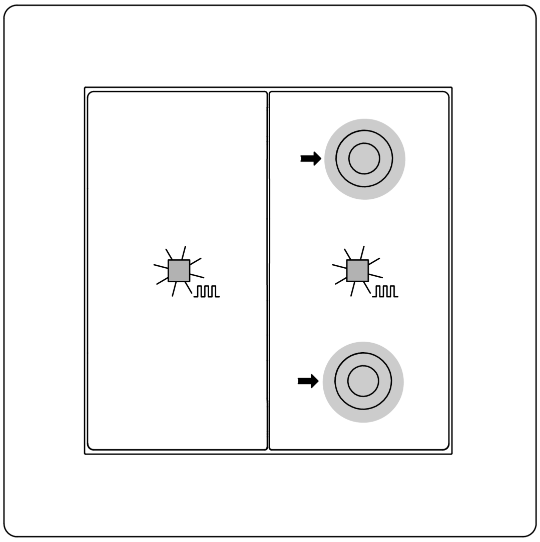


Image 4: Activating programming mode (2-channel)

Precondition: The device is connected and ready for operation.

- Activate programming mode: Press the top right button and bottom right button simultaneously and hold for longer than 4 seconds with 1-gang (see figure 3) and 2-gang (see figure 4).

  The Status LED flashes red. Programming mode is activated.

ℹ When the programming mode is activated, telegrams can be sent to the bus.

- Programming the physical address.

  The status LED returns to its previous state. Physical address is programmed.

Prerequisite for the "Dimming" function: Load is connected to the insert.

- Programming the application program.

ℹ The status LED is switched off while the application program is programmed. As soon as the programming is successfully completed, the status LED carries out its parameterised function.

ℹ For "Dimming": The load must be connected before ETS commissioning. Without a connected load, the ETS aborts the programming process of the application program.

ℹ When the application program is unloaded, the status LEDs behave as in the delivery state.

4.1 Safe-state mode and master reset

Safe-state mode

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

If the device does not work properly - for instance as a result of errors in the project design or during commissioning - the execution of the loaded application program can be halted by activating the safe-state mode. The device remains passive in safe-state mode, since the application program is not being executed (state of execution: terminated).

ℹ Only the system software of the device is still functional. ETS diagnosis functions and programming of the device are possible.

Activating the safe-state mode

- Switch off the voltage.
- Wait about 15 s.
- Press the top right and bottom right button.
- With the buttons pressed, switch the voltage back on and keep the buttons pressed for more than 10 seconds.

  The safe-state mode is activated. The status LED flashes red slowly (approx. 1 Hz).

ℹ Only release the the top right and bottom right buttons when the LED flashes.

Deactivating safe-state mode

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

Master reset

The master reset restores the basic device setting (physical address 15.15.255, firmware remains in place). The device must then be recommissioned with the ETS.

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

ℹ Devices can be reset to factory settings with the ETS Service App. This function uses the firmware contained in the device that was active at the time of delivery (delivery state). Restoring the factory settings causes the devices to lose their physical address and configuration.

If the device - for instance as a result of errors in the project design or during commissioning - does not work properly, the loaded application program can be deleted from the device by performing a master reset. The master reset resets the device to delivery state. Afterwards, the device can be put into operation again by programming the physical address and application program.

Performing a master reset

Precondition: The safe-state mode is activated.

- Press and hold down the top right and bottom right button for more than 5 seconds until the status LED flashes.
- Release the top right button and bottom right button.

  The device performs a master reset. The status LED flashes quickly (approx. 4 Hz).

  The device restarts and is in delivery state.

5 Operation

Operating areas

The device consists of up to 2 operating areas, depending on the device variant. The operating concept of an operating area can be configured in the ETS as a rocker function or as a button function.

With the rocker function, an operating area is divided into two buttons (top/bottom) with the same basic function.

In the button function either an operating area is divided into 2 functionally separate buttons (double-area operation), or an operating area is evaluated as single-area operation (only one button).

Centrally on each operating area, there is a status LED, which can be connected to the control function, according to the function of the rocker or buttons. A status LED can also signal completely independent display information, flash or be permanently on or off. Besides functions that can be set using the ETS, the status LED also indicates that the device is in the programming mode for commissioning or diagnosis purposes.

The operation of functions or electrical consumers can be set individual for each device:

Operation concept	single-area operation	dual-area operation
Rocker function	-	Each rocker can perform an individual function.
Button function	Two buttons above one another perform the same function.	Each button can perform an individual function.

5.1 Examples for operating various standard applications

- Switch: Short press on button.
- Dim: Long press on the button. The dimming process ends when the button is released.
- Move Venetian blind: Long press on button.
- Stop or adjust Venetian blind: Short press on button.
- Set value, e.g. brightness or temperature setpoint: Short press on button.
- Open scene: Short press on button.
- Save scene: Long press on button.
- Execute channel 1: Short press on button.
- Execute channel 2: Long press on button.
- Operate controller extension: Short press on button.

6 Application program

ETS search paths:

- Output / RF operating top unit, 1-gang
- Output / RF operating top unit, 2-gang
- Lighting / RF operating top unit, 1-gang
- Lighting / RF operating top unit, 2-gang
- Radio / Push-button sensor / RF operating top unit, 1-gang
- Radio / Push-button sensor / RF operating top unit, 1-gang arrow symbols
- Radio / Push-button sensor / RF operating top unit, 1-gang heating mode
- Radio / Push-button sensor / RF operating top unit, 2-gang
- Radio / Push-button sensor / RF operating top unit, 2-gang arrow symbols
- Radio / Push-button sensor / RF operating top unit with Blind control insert without auxiliary input
- Radio / Push-button sensor / RF operating top unit with Blind control insert with auxiliary input
- Radio / Push-button sensor / RF operating top unit with Relay switching insert
- Radio / Push-button sensor / RF operating top unit with Relay switching insert 2-gang
- Radio / Push-button sensor / RF operating top unit with Electronic switching insert
- Radio / Push-button sensor / RF operating top unit with Room temperature controller insert with sensor connection
- Radio / Push-button sensor / RF operating top unit with Universal LED dimming insert Standard
- Radio / Push-button sensor / RF operating top unit with Universal LED dimming insert Komfort
- Radio / Push-button sensor / RF operating top unit with Universal LED dimming insert Komfort 2-gang
- Radio / Push-button sensor / RF operating top unit with Flush-mounted DALI Power control unit insert
- Radio / Push-button sensor / RF operating top unit with Auxiliary insert 3-wire
- Radio / Lighting / RF operating top unit, 1-gang
- Radio / Lighting / RF operating top unit, 2-gang
- Radio / Output / RF operating top unit, 1-gang

- Radio / Output / RF operating top unit, 2-gang
- Radio / Heating, air conditioning, ventilation / RF operating top unit, 1-gang
- Radio / Heating, air conditioning, ventilation / RF operating top unit, 2-gang
- Radio / Venetian blind / RF operating top unit, 1-gang
- Radio / Venetian blind / RF operating top unit, 2-gang
- Heating, air conditioning, ventilation / RF operating top unit, 1-gang
- Heating, air conditioning, ventilation / RF operating top unit, 2-gang
- Venetian blind / RF operating top unit, 1-gang
- Venetian blind / RF operating top unit, 2-gang
- Push-button/ push-button, 1-gang/ RF operating top unit, 1-gang
- Push-button/ push-button, 2-gang/ RF operating top unit, 2-gang

Application program available for all device variants:

Name	RF operating top unit 117121
Version:	2.1 for ETS version 5.7.5 onwards
from mask version	07B0
Summarized description	Universal application program for suitable device combinations of insert and cover of the System 3000.

The application program contains the following attachment functions:

- Switching
- Dimming and colour temperature
- Colour control and brightness
- Venetian blind
- Value transmitter
- Scene extension
- 2-channel operation
- Controller extension

The application program offers the following actuator functions according to the parameterised device combination of insert and cover:

- Switching
- Dimming
- DALI_Tunable_White
- Venetian blind

  - Heating | cooling

Internal connection between insert and cover can be activated

LED functions orientation lighting and night reduction can be activated

Disabling function and temperature measurement can be activated

KNX Data Secure capable

7 Scope of functions

General

- KNX Data Secure capable
- Firmware updates are possible

Cover functions

- Operating concept can be configured (rocker function or button function)
- Button evaluation for button function concept can be configured (single-area or double-area operation)
- The button function can be configured (switching, dimming the colour temperature, colour control and brightness, Venetian blind, value transmitter, scene extension, 2-channel operation and controller extension, no function)
- The rocker function can be configured (switching, dimming the colour temperature, colour control and brightness, Venetian blind, value transmitter, scene extension, 2-channel operation, controller extension)

  Switching: The command on pressing and/or releasing is adjustable (no reaction, switch on, switch off, toggle).

  Dimming and colour temperature: Brightness and/or colour temperature, the command on pressing, the time between switching and dimming, the dimming in different levels, the telegram repetition on long press and the transmission of a stop telegram at the end of the press is adjustable.

  Colour control and brightness: Colour wheel sequence or brightness adjustment, the command when pressing, the time between switching and dimming, the starting value, the step width and the time between two telegrams is adjustable.

  Venetian blind: The command on pressing and the operating concept is adjustable. The operating concept can be adjusted in the times for short and long actuation and slat adjustment.

  Value transmitter: The operating mode (1-byte, 2-byte, 3-byte or 6-byte value transmitter) and the value is adjustable.

  Scene extension: The operating mode (with or without storage function) and the scene number is adjustable.

  2-channel operation: Up to two telegrams can be transmitted to the KNX by one button-press. The operating concept can be adjusted and the time for short and long actuation adapted. The function of the channels is adjustable separately.

  Controller extension: The function (operating mode selection, forced operating mode switch-over, presence function and setpoint shift) is adjustable.
- Disabling function can be activated

The rockers or buttons can be disabled via a 1-bit object. The polarity of the disabling object can be set. During an active disable, all or some of the rockers / buttons can have no function, can perform the function of a selected button or execute one of two presettable disabling functions.

Status LED

- Function can be configured

  The function is selected per status LED

  When selecting the function, the following functions can be configured: Always OFF, Always ON, Button-press display, Telegram acknowledgment, Status display, Status display, Activation via separate LED object, Operating mode display, Controller status display, Presence status display, Setpoint shift display
- Colour can be configured

  The colour is selected either together for all status LEDs or separately for each status LED of the device.

  The status LED can light up in red, green or blue according to choice.
- Brightness can be configured

  The brightness of the status LED can be set to six levels.

  Through night reduction, the brightness of the status LED can be reduced at night using a communication object.

Controller extension functions

- The controller extension can be configured as a function of a rocker or button.

  Full control of a room temperature controller (operating modes, presence functions and setpoint shift).
- The displays of the controller extension can be configured as a function of the status LED

  Full-featured indication of the controller status via the status LED of the extension (heating / cooling reporting, setpoint shift, room temperature, setpoint temperature and current operating mode).
- Temperature measurement can be activated

  Measurement of the room temperature with an internal sensor or optionally by determining the measured value of the internally measured temperature with an external temperature.

Temperature measurement

In addition to the cover, status LED and controller extension functions, the device offers temperature measurement at (siehe Kapitel "Function" ▸ Page 8) for suitable device combinations.

Measurement of the room temperature is carried out with an internal sensor or optionally by determining the measured value of the internally measured temperature with an external temperature.

Switching insert function

In addition to the cover, status LED and controller extension functions, the device offers the following functions in the device combination with a switch insert:

- Independent switching of the switching outputs.
- Operation as NO or NC contacts.
- Switching feedback mode: Active (transmitting after changes or cyclically to the bus) or passive (object readout) feedback function.
- Actively transmitting feedback or status messages can be delayed globally after voltage recovery or after ETS programming.
- Reaction in case of voltage recovery and after an ETS programming operation adjustable for each output.
- Disabling function can be parameterized for each channel.
- Timing functions (switch-on delay, switch-off delay, staircase lighting timer, also with pre-warning function).
- Incorporation into light moods: up to 16 internal scenes parameterizable per output.

Venetian blind insert function

In addition to the cover, status LED and controller extension functions, the device offers the following functions in the device combination with a Venetian blind insert:

- Operating mode configurable: control of blinds with slats, shutters, awnings, roof windows 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.
- Reaction in case of voltage recovery and after an ETS programming operation adjustable for each output.
- 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.
- Actively transmitting feedback or status messages can be delayed globally after voltage recovery or after ETS programming.
- Assigning of outputs to up to 3 different safety functions (1 wind alarm, 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.

- Disabling function can be implemented for each Venetian blind output.
- Up to 16 internal scenes configurable per output.

Dimming insert function

In addition to the cover, status LED and controller extension functions, the device offers the following functions in the device combination with a dimming insert:

- Independent switching and dimming of the dimming outputs.
- Switching feedback mode: Active (transmitting after changes or cyclically to the bus) or passive (object readout) feedback function.
- Actively transmitting feedback or status messages can be delayed globally after voltage recovery or after ETS programming.
- Reaction in case of voltage recovery and after an ETS programming operation adjustable for each output.
- Disabling function can be parameterized for each channel.
- Timing functions (switch-on delay, switch-off delay, staircase lighting timer, also with pre-warning function).
- Incorporation into light moods: up to 16 internal scenes parameterizable per output.

DALI Tunable White insert function

In addition to the cover, status LED and controller extension functions, the device offers the following functions in the device combination with a Dali insert:

- Switching and dimming of a maximum of 18 lights with a DALI operating device (e.g. electronic ballast).
- Control support of DALI operating devices of the device type "Colour Control" (DALI Device Type 8) in the specific version "Tunable White (TW)". Colour temperature control via relative or absolute dimming as well as via scenes and effects. The colour temperature control is largely independent of the brightness control and luminaire used.
- Master control of all connected DALI components (broadcast).
- For DALI operating devices of the device type "Colour Control" (DALI Device Type 8) in the specific version "Tunable White (TW)": colour temperature control via absolute dimming (2-byte communication object, colour temperature value in "K") and relative dimming (4-bit communication object), parameterisable dimming behaviour, minimum and maximum colour temperature can be set, feedbacks for current and invalid colour temperature.
- Switching feedback mode: Active (transmitting after changes or cyclically to the bus) or passive (object readout) feedback function.
- Actively transmitting feedback or status messages can be delayed globally after voltage recovery or after ETS programming.
- Reaction in case of voltage recovery and after an ETS programming operation adjustable for each output.
- Disabling function can be parameterized.

- Timing functions (switch-on delay, switch-off delay, staircase lighting timer, also with pre-warning function).
- Incorporation into light moods: up to 16 internal scenes parameterizable per output.

Heating | Cooling insert function

In addition to the cover, status LED and controller extension functions, the device offers the following functions in the device combination with a room temperature controller insert:

- Various operating modes can be activated: Comfort, standby, night or frost/ heat protection
- Each operating mode can be assigned its own temperature-setpoints (for heating and/or cooling).
- Comfort extension possible using presence button in Night or Frost/heat protection mode. Configurable duration of the comfort extension.
- Switching over the operating modes through 1-byte object.
- Frost/heat protection change-over via window status.
- Various operating modes can be set: "heating", "cooling", or "heating and cooling"
- Various control types can be configured: "permanent PI control" or switching 2-point control"
- Control parameter for PI controller (if desired: proportional range, reset time) and 2-point controller (hysteresis) adjustable.
- Switching between "heating" and "cooling": via the communication object or internally (switching contact at input).
- A temporary or permanent setpoint shift through communication objects is possible (e.g. via a controller extension).
- Control variables are transmitted internally in the device.
- Floor monitoring possible in heating and/or cooling mode. This permits temperature-controlled switch-off of floor heating or cooling as a protective function.

8 General insert settings

The following subchapters provide a description of the device functions. Each subchapter consists of the following sections:

- Functional description
- Table of parameters
- Object list

Functional description

The functional description explains the function and provides helpful tips on project design and usage of the function. Cross references support you in your search for further information.

Table of parameters

The table of parameters lists all parameters associated with the function. Each parameter is documented in a table as follows.

Name of the parameter	Parameter values
Parameter description	

Object list

The object list specifies and describes all communication objects associated with the function. Each communication object is documented in a table.

Object no.	This column contains the object number of the communication object.
Function	This column contains the function of the communication object.
Name	This column contains the name of the communication object.
Type	This column contains the length of the communication object.
DPT	This column assigns a datapoint type to a communication object. Datapoint types are standardized in order to ensure interoperability of KNX devices.
Flag	This column assigns the communication flags in accordance with the KNX specification.
K flag	activates / deactivates the communication of the communication object
L flag	enables externally triggered reading of the value from the communication object
S flag	enables externally triggered writing of the value to the communication object
Ü flag	enables transfer of a value
A flag	enables updating of an object value in case of feedback
I flag	enforces updating of the communication object value when the devices is switched on (reading at init)

8.1 Internal connection between insert and cover

The device combination insert and cover can be configured quickly and easily by activating the internal connection.

When the internal connection between insert and cover is activated, the sensor and actuator channels are automatically configured. The configuration is carried out depending on the insert used from the System 3000.

The automatic configuration is carried out in the parameters of the application programme by presetting parameters relevant for the function. The following parameters, among others, are permanently preset:

- Operating concept of buttons... (Parameter page "Cover - General" -> "Cover - Basic settings")

  The operating concept of buttons ..." is permanently set to "rocker function" when the internal connection between insert and cover is activated.

  Depending on the insert used (1-channel or 2-channel) and the cover variant (1-gang or 2-gang), the operating concept is preset only for those push-buttons that are used to operate the actuator function of the insert.
- Function (parameter page "rocker *n* (...) -> rocker *n* (...) - function")

  The "function" of the rocker is permanently set when the internal connection between insert and cover is activated. The parameter setting is based on the function of the insert.

In addition to the automatic configuration of the parameters, communication objects relevant to the function are directly linked to each other internally. The following communication objects are also linked internally:

- Relevant output objects of the sensor system with the appropriate input objects of the actuator system
- Relevant output objects of the actuator system with the appropriate input objects of the sensor system

ℹ In addition to the internal link, the communication objects are still offered in the ETS. The communication objects can also be linked via group addresses in addition to internal linking.

ℹ For a device combination with Auxiliary insert 3-wire, no internal connection can be configured.

Impact on the extension

When the internal connection between the insert and cover is activated, the extension controls all available channels synchronously. The configuration is carried out automatically by presetting parameters relevant for the function. In addition to the automatic configuration of the parameters, communication objects relevant to the function are directly linked to each other internally.

Internal connection to a switch insert

The following table shows the fixed preset parameter settings when the internal connection between a switch insert and cover is activated.

Insert	Cover - 1-gang Rocker	Cover - 2-gang left rocker	Cover - 2-gang right rocker
Relay switching insert	Function = Switching	Function = Switching	Function = Free configurable
Relay switching insert 2-gang	Function = Switching	Function = Switching	Function = Switching
Electronic switching insert	Function = Switching	Function = Switching	Function = Free configurable

The following table shows the communication objects that are directly linked to each other when the internal connection between a switch insert and cover is activated.

Cover - 1-gang and 2-gang			Logic operation	Relay switching insert Electronic switching insert		
□⇥ 31	Rocker* - output	Switching	--->	□⇤ 479	Switching 1 - input	Switching
□⇥ 31	Rocker* - output	Switching	<---	□⇥ 480	Switching 1 - output	Switching feedback
□⇤ 32	Rocker* - input	Switching feedback				

* For 2-gang cover: rocker = left rocker

Cover - 1-gang			Logic operation	Relay switching insert 2-gang		
□⇥ 31	Rocker - output	Switching	--->	□⇤ 479	Switching 1 - input	Switching
				□⇤ 509	Switching 2 - input	Switching
□⇥ 31	Rocker - output	Switching	<---	□⇥ 480	Switching 1 - output	Switching feedback
□⇤ 32	Rocker - input	Switching feedback				

Cover - 2-gang			Logic operation	Relay switching insert 2-gang		
□⇥ 31	Left rocker - output	Switching	--->	□⇤ 479	Switching 1 - input	Switching
□⇥ 31	Left rocker - output	Switching	--->	□⇥ 480	Switching 1 - output	Switching feedback
□⇤ 32	Right rocker - input	Switching feedback				

Cover - 2-gang			Logic operation	Relay switching insert 2-gang		
□→ 37	Left rocker - output	Switching	--->	□← 509	Switching 2 - input	Switching
□→ 37	Left rocker - output	Switching	<---	□→ 510	Switching 2 - output	Switching feedback
□← 38	Right rocker - input	Switching feedback				

Internal connection to a Venetian blind insert

The following table shows the fixed preset parameter settings when the internal connection between a Venetian blind insert and cover is activated.

Insert	Cover - 1-gang Rocker	Cover - 2-gang left rocker	Cover - 2-gang right rocker
Blind control insert with auxiliary input	Function = Venetian blind	Function = Venetian blind	Function = Free configurable
Blind control insert without auxiliary input	Function = Venetian blind	Function = Venetian blind	Function = Free configurable

The following table shows the communication objects that are directly linked to each other when the internal connection between a Venetian blind insert and cover is activated.

Cover - 1-gang and 2-gang			Logic operation	Blind control insert with auxiliary input Blind control insert without auxiliary input		
□→ 103	Rocker* - output	Short time operation	--->	□← 555	Venetian blind 1 - input	Short time operation
□→ 104	Rocker* - output	Long-time operation	--->	□← 554	Venetian blind 1 - input	Long-time operation

* For 2-gang cover: rocker = left rocker

Internal connection to a dimming insert

The following table shows the fixed preset parameter settings when the internal connection between a dimming insert and cover is activated.

Insert	Cover - 1-gang Rocker	Cover - 2-gang left rocker	Cover - 2-gang right rocker
Universal LED dimming insert Standard	Function = Dimming and colour temperature	Function = Dimming and colour temperature	Function = Free configurable
Universal LED dimming insert Komfort	Function = Dimming and colour temperature	Function = Dimming and colour temperature	Function = Free configurable
Universal LED dimming insert Komfort 2-gang	Function = Dimming and colour temperature	Function = Dimming and colour temperature	Function = Dimming and colour temperature

The following table shows the communication objects that are directly linked to each other when the internal connection between a dimming insert and cover is activated.

Cover - 1-gang and 2-gang			Logic operation	Universal LED dimming insert Standard Universal LED dimming insert Komfort		
☐⇥ 55	Rocker* - output	Switching	--->	☐⇤ 479	Dimming channel 1 - input	Switching
☐⇥ 56	Rocker* - output	Dimming brightness	--->	☐⇤ 482	Dimming channel 1 - input	Dimming
☐⇥ 55	Rocker* - output	Switching	<---	☐⇥ 480	Dimming channel 1 - output	Switching feedback
☐⇤ 57	Rocker* - input	Switching feedback				

* For 2-gang cover: rocker = left rocker

Cover - 1-gang			Logic operation	Universal LED dimming insert Komfort 2-gang		
☐⇥ 55	Rocker - output	Switching	--->	☐⇤ 479	Dimming channel 1 - input	Switching
				☐⇤ 509	Dimming channel 2 - input	Switching
☐⇥ 56	Rocker - output	Dimming brightness	--->	☐⇤ 482	Dimming channel 1 - input	Dimming

Cover - 1-gang			Logic operation	Universal LED dimming insert Komfort 2-gang		
				⇤ 512	Dimming channel 2 - input	Dimming
⇥ 55	Rocker - output	Switching	<---	⇥ 480	Dimming channel 1 - output	Switching feedback
⇤ 57	Rocker - input	Switching feedback				

Cover - 2-gang			Logic operation	Universal LED dimming insert Komfort 2-gang		
⇥ 55	Left rocker - output	Switching	--->	⇤ 479	Dimming channel 1 - input	Switching
⇥ 56	Left rocker - output	Dimming brightness	--->	⇤ 482	Dimming channel 1 - input	Dimming
⇥ 55	Left rocker - output	Switching	<---	⇥ 480	Dimming channel 1 - output	Switching feedback
⇤ 57	Left rocker - input	Switching feedback				
⇥ 67	Right rocker - output	Switching	--->	⇤ 509	Dimming channel 2 - input	Switching
⇥ 68	Right rocker - output	Dimming brightness	--->	⇤ 512	Dimming channel 2 - input	Dimming
⇥ 67	Right rocker - output	Switching	<---	⇥ 510	Dimming channel 2 - output	Switching feedback
⇤ 69	Right rocker - input	Switching feedback				

Internal connection to a Dali insert

The following parameters are permanently preset only in connection with a Dali insert:

- Colour temperature control (parameter page "rocker *n* (...) -> rocker *n* (...) - function")
- Communication (parameter page "rocker *n* (...) -> rocker *n* (...) - function")
- Adjustment of (parameter page "rocker *n* (...) -> rocker *n* (...) - function")

The following table shows the fixed preset parameter settings when the internal connection between a Dali insert and cover is activated.

Insert	Cover - 1-gang Rocker	Cover - 2-gang left rocker	Cover - 2-gang "Function" - right rocker
Flush-mounted DALI Power control unit insert	Function = Dimming and colour temperature Colour temperature control = Active Communication = Combi object	Function = Dimming and colour temperature Colour temperature control = Active Communication = Individual objects Adjustment of = Brightness	Function = Dimming and colour temperature Colour temperature control = Active Communication = Individual objects Adjustment of = Colour temperature

The following table shows the communication objects that are directly linked to each other when the internal connection between a Dali insert and cover is activated.

Cover - 1-gang			Logic operation	Flush-mounted DALI Power control unit insert		
□→ 55	Rocker - output	Switching	--->	□← 479	Dali channel - input	Switching
□→ 56	Rocker - output	Dimming brightness + colour temperature	--->	□← 501	Dali channel - input	Dimming (Brightness and colour temperature)
□→ 55	Rocker - output	Switching	<---	□→ 480	Dali channel - output	Switching feedback
□← 57	Rocker - input	Switching feedback				

Cover - 2-gang			Logic operation	Flush-mounted DALI Power control unit insert		
□→ 55	Left rocker - output	Switching	--->	□← 479	Dali channel - input	Switching
□→ 67	Right rocker - output	Switching				
□→ 56	Left rocker - output	Dimming brightness	--->	□← 483	Dali channel - input	brightness value

Cover - 2-gang			Logic operation	Flush-mounted DALI Power control unit insert		
□⇥ 70	Right rocker - output	Dimming colour temperature	--->	□↤ 499	Dali channel - input	Dimming (Colour temperature)
□⇥ 55	Left rocker - output	Switching	<---	□⇥ 480	Dali channel - output	Switching feedback
□↤ 57	Left rocker - input	Switching feedback				
□⇥ 67	Right rocker - output	Switching				
□↤ 69	Right rocker - input	Switching feedback				

Internal connection to a room temperature controller insert

The following parameters are permanently preset only in connection with a room temperature controller insert:

– Function (parameter page "rocker *n* (...) -> rocker *n* (...) - function")

The following table shows the fixed preset parameter settings when the internal connection between a room temperature controller insert and cover is activated.

Insert	Cover - 1-gang Rocker	Cover - 2-gang left rocker	Cover - 2-gang "Function" - right rocker
Room temperature controller insert with sensor connection	Function = Controller extension Function = Operating mode switchover	Function = Controller extension Function = Operating mode switchover	Function = Free configurable

The following table shows the communication objects that are directly linked to each other when the internal connection between a room temperature controller insert and cover is activated.

Cover - 1-gang and 2-gang			Logic operation	Room temperature controller insert with sensor connection		
□⇥ 352	Rocker* - controller extension - output	Operating mode switchover	--->	□↤ 638	Controller 1 - input	Operating mode

Cover - 1-gang and 2-gang			Logic operation	Room temperature controller insert with sensor connection		
☐← 353	Rocker* - controller extension - input	Operating mode switchover feedback	<---	☐→ 643	Controller 1 - output	Operating mode status

* For 2-gang cover: rocker = left rocker

The status LED* executes the function "Operating mode display" when the internal connection to a room temperature controller insert is activated in the standard parameterisation. The status LED lights up in red in comfort mode as soon as the communication objects "Status LED left - Input - Operating mode display" (object no. 407) and "Controller 1 - Output - Operating mode status" (object no. 643) are connected to each other via a group address.

ℹ The application program automatically sets the corresponding parameters (colour and function of the status LED).

* For 2-gang cover: status LED = left status LED

8.2 Function as repeater

In addition to the sensor and actuator function, the device can work as a repeater (also called a "retransmitter"). The repeater function is activated directly in the ETS, in the Properties container.

The repeater function can be activated via the Settings tab in the Properties container.

Activate the repeater function

- Click on the device in the ETS project
- Open the Properties container in the ETS
- Click on the Settings tab in the Properties container
- Activate the "Retransmitter" parameter on the Settings tab (check the box).

  The repeater function is activated.

Deactivate the repeater function

- Click on the device in the ETS project
- Open the Properties container in the ETS
- Click on the Settings tab in the Properties container
- Deactivate the "Retransmitter" parameter on the Settings tab (uncheck the box).

  The repeater function is deactivated.

A repeater repeats the radio telegrams received in its RF line by retransmitting them immediately. This allows an extension of the range of a KNX RF installation, meaning that it is possible to position RF devices as required in a building, even in the case of difficult transmission and reception conditions.

The operation of one or more repeaters is recommended when the range of the RF domain should be deliberately extended in one or more directions (e.g. in trans-property communication), or when a part of a building (e.g. ceilings, walls, metal constructions) which weakens the signal need to be overcome.

ℹ Using a maximum of 2 repeaters in one RF domain is recommended to prevent communication problems due to forwarded telegrams. Communication problems due to forwarded telegrams can occur when repeaters are not positioned to each other within their own reception area, but still affect identical devices in the same RF domain independently of each other. In this case, therefore, the radio ranges of the repeaters overlap for some RF devices, but not at the installation location of the repeater. If only two repeaters are used in one RF domain, the likelihood of communication problems due to repeated telegrams is reduced. The ETS permits integration of up to 255 repeaters in one domain. Nonetheless, because of the RF data protocol, one RF telegram can only be forwarded a maximum of six times.

8.3 Basic settings of the insert

The device combination of the insert and cover can consist of a selection of inserts and the 1-gang or 2-gang cover.

Each insert fulfils a specific application function. The function of the insert can be configured on the parameter page "Insert - General -> Insert - Function".

ℹ The type of insert used must be compared with the desired function of the insert.

ℹ The insert types "Relay switch" and "Electronic switch" can perform the function "Switching" or "Heating | Cooling".

8.3.1 Selecting the extension

Certain inserts allow an extension to be connected. The type of extension differs, depending on the configured type of insert and, if applicable, the configured function.

The following extensions are available:

- Installation button
- 2-wire extension
- 3-wire extension

The following tables show the selection of the extension depending on the configured function...

Extension for the switching function...

Insert type	Extension	Type of extension
Relay switch	Available	Installation button 2-wire extension 3-wire extension
Relay switch 2-gang	Available	Installation button 2-wire extension 3-wire extension
Electronic switch	Available	Installation button 2-wire extension 3-wire extension

Extension for the dimming function...

Insert type	Extension	Type of extension
Uni-LED dimmer standard	not available	---
Uni-LED dimmer comfort	Available	Installation button 2-wire extension 3-wire extension

Insert type	Extension	Type of extension
Uni-LED dimmer comfort 2-gang	Available	Installation button 2-wire extension 3-wire extension

Extension for the DALI Tunable White function...

Insert type	Extension	Type of extension
DALI Power control unit	Available	Installation button 2-wire extension 3-wire extension

Extension for the Venetian blind function...

Insert type	Extension	Type of extension
Venetian blind control w/ext. input	Available	--- (siehe Kapitel "Selecting the extension" ▸ Page 44)
Venetian blind control w/o ext. input	not available	---

ℹ An extension can be activated for the insert type "Venetian blind control w/ext. input". The type of extension cannot be configured.

Extension for the Heating | Cooling function...

Insert type	Extension	Type of extension
RTC w/sensor connection	not available	---
Relay switch (Source of switch-over = via object)	Available	Installation button 2-wire extension
Relay switch (Source of switch-over = internal)	Available	Change-over between heating and cooling
Electronic switch (Source of switch-over = via object)	Available	Installation button 2-wire extension
Electronic switch (Source of switch-over = internal)	Available	Change-over between heating and cooling

ℹ In the Heating | Cooling function, the extension unit is used to switch between heating and cooling if the "Source of switchover" parameter is set to "internal" (parameter page "Room temperature controller RTR -> RTR - General").

ℹ The room temperature controller insert with sensor connection has a switching contact for switching to cooling mode.

Extension "push-button", e.g. order no. 0151 00

The device combination can evaluate operations from an installation push-button connected as an extension. In this case, the commands of the installation push-button (pressed / released) are evaluated like a button function of the cover. The installation push-button has the same parameters and communication objects as a button on the cover.

The function of the push-button is configured on the "Button - Extension" parameter page.

ℹ When the internal connection between the insert and cover is activated, the button function of the extension is based on the function of the insert of the main controller.

"2-wire" extension, order no. 5408 00

The device combination can evaluate operations from a connected 2-wire extension. The commands of the cover are evaluated like a push-button or rocker function. The same parameters and communication objects are provided for the cover of the 2-wire extension as for the push-buttons or rockers of the cover of the main controller.

The operating concept of the extension is configured on the parameter page "Cover - General -> Cover - Function".

The function of the extension is configured on the parameter pages "Button ... - Extension" or "Rocker - Extension".

ℹ When the internal connection between the insert and cover is activated, the rocker function of the extension is based on the function of the insert of the main controller.

"3-wire" extension, order no. 5409 00

The "3-wire extension" insert is used as a power supply for another extension from the System 3000.

For example, another KNX RF cover can be attached. This cover must be configured in the ETS as a separate KNX device. The function of the insert on the 3-wire extension must be set to "Power supply". The two covers can communicate via communication objects.

ℹ No commands are generated for transmission via the extension line to a main controller.

ℹ Other device combinations of the insert and cover can be controlled via communication objects.

Extension for the Venetian blind function

The device combination can evaluate the control commands from a higher-level Venetian blind control via the extension inputs. The operating signals to be evaluated are made available to the device via the insert-cover communication.

The operating signals to be evaluated are:

- A signal at the extension terminal "Down" causes the motor to move downwards when the motor is at a standstill, as long as the signal is present and up to the bottom end position at the maximum.
- A signal at the extension terminal "Down" leads to no reaction when the motor is moving downwards. The motor continues to move downwards as long as the signal is present and up to the bottom end position at the maximum.
- A signal at the extension terminal "Down" causes the motor to stop immediately when it is moving upwards. After the switchover time has elapsed, the motor moves downwards as long as the signal is present and up to the bottom end position at the maximum.
- A signal at the extension terminal "Up" causes the motor to move upwards when the motor is at a standstill, as long as the signal is present and up to the top end position at the maximum.
- A signal at the extension terminal "Up" causes the motor to stop immediately when it is moving downwards. After the switchover time has elapsed, the motor moves upwards as long as the signal is present and up to the top end position at the maximum.
- A signal at the extension terminal "Up" leads to no reaction when the motor is moving upwards. The motor continues to move upwards as long as the signal is present and up to the top end position at the maximum.
- A signal at the extension terminals "Up" and "Down" simultaneously causes the motor to move upwards when the motor is at a standstill, as long as the signal is present and up to the top end position at the maximum.
- A signal at the extension terminals "Up" and "Down" causes the motor to stop immediately when it is moving downwards. After the switchover time has elapsed, the motor moves upwards as long as the signal is present and up to the top end position at the maximum.
- A signal at the extension terminals "Up" and "Down" simultaneously leads to no reaction when the motor is moving upwards. The motor continues to move upwards as long as the signal is present and up to the top end position at the maximum.

ℹ The extension commands have the same priority as the local operation.

8.3.2 Table of parameters

The following parameters are available on the "Insert - General -> Insert - Function" parameter page.

Function	**Switching** Dimming DALI_Tunable_White Venetian blind Heating | cooling Power supply
This parameter specifies the function of the insert.	

Insert type	**Relay switch ...** Relay switch 2-gang ... Electronic switch ...
Only if the "Switching" function is set, this parameter lists those inserts that can execute the switching function. One of these inserts must be used to execute the "Switching" function. ℹ The insert used in the device combination must be set here. The ETS checks the identifier of the insert. An extension can be activated for each of these inserts.	

Insert type	**Uni-LED dimmer standard ...** Uni-LED dimmer comfort ... Uni-LED dimmer comfort 2-gang ...
Only if the "Dimming" function is set, this parameter lists those inserts that can execute the dimming function. One of these inserts must be used to execute the "Dimming" function. ℹ The insert used in the device combination must be set here. The ETS checks the identifier of the insert. An extension can be activated for each of these comfort variants.	

Insert type	**DALI Power control unit ...**
Only if the function "DALI Tunable White" is set, this parameter is permanently set to "DALI power control unit ..." "Button ...". This insert must be used to execute the "DALI Tunable White" function. ℹ The insert used in the device combination must be set here. The ETS checks the identifier of the insert. An extension can be activated for this insert type.	

Insert type	**Venetian blind control w/ext. input ...** Venetian blind control w/o ext. input ...

Only if the "Venetian blind" function is set, this parameter lists those inserts that can execute the venetian blind function. One of these inserts must be used to execute the "Venetian blind" function.

ℹ The insert used in the device combination must be set here. The ETS checks the identifier of the insert.

An extension can be activated for the insert type "Venetian blind control w/ext. input".

Insert type	**RTC w/sensor connection ...**

Only if the "Heating | cooling" function is set, this parameter lists those inserts that can execute the "Heating | cooling" function. One of these inserts must be used to execute the "Heating | cooling" function.

ℹ The insert used in the device combination must be set here. The ETS checks the identifier of the insert.

Insert type	**Extension 3-wire ...**

Only if the function "Power supply" is set, this parameter is permanently set to "Extension 3-wire..." "Button ...". This insert must be used to execute the "Power supply" function.

ℹ The insert used in the device combination must be set here. The ETS checks the identifier of the insert.

Extension	Active **Inactive**

This parameter activates the extension of the insert.

Type of extension	Installation button 2-wire extension 3-wire extension

This parameter defines the type of extension used for:

- The insert types "Relay switch" and "Electronic switch" in the "Switch actuator" function,
- The insert type "Relay switch 2-gang",
- The insert type "UNI-LED dimmer comfort",
- The insert type "UNI-LED dimmer comfort 2-gang" and
- The insert type "DALI Power control unit".

Type of extension	Installation button 2-wire extension
This parameter defines the type of extension used for: – The insert types "Relay switch" and "Electronic switch" in the "Heating actuator" function.	

9 "Switching" insert function

9.1 Channel configuration

The device is used to switch up to two lighting groups.

9.1.1 Channel configuration object list

Object no.	Function	Name	Type	DPT	Flag
479, 509	Switching	Switching ... (...) - Input	1-bit	1,001	C, -,W, -, U
1-bit object for switching the switching channel on or off ("1" = switch on; "0" = switch off).					

Object no.	Function	Name	Type	DPT	Flag
480, 510	Switching feedback	Switching ... (...) - Output	1-bit	1,001	C, R, -, T, A
1-bit object for feedback signalling of the switching state ("1" = on / "0" = off) to the bus.					

9.2 General settings

9.2.1 Reset behaviour

Delay after voltage return

To reduce telegram traffic after switch-on of the supply voltage 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 time can be defined (parameter "Delay after voltage recovery"). 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 voltage recovery.

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

9.2.1.1 Reset behaviour parameters

Switching output -> SA - General

Delay after voltage return	**0**...59 min | 0...**17**...59 s
To reduce telegram traffic after switch-on of the supply voltage 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 delay time can be defined here. Only after the configured time elapses are feedback telegrams for initialisation transmitted to the KNX.	

9.2.2 Name of a switching output

Here, you can optionally assign a name for each switching output. The name is intended to illustrate the use of the output (e.g. "light kitchen", "wall lamp living room"). The names are only used in the ETS in the text of the parameter pages and communication objects.

9.2.2.1 Parameter name

Switching output... -> SO... - General

Name of switching output	Free text
The text entered in this parameter is applied to the name of the communication objects and is used to label the switching output in the ETS parameter window (e.g. "light kitchen", "wall lamp living room"). The text is not programmed in the device.	

9.3 Priorities

The actuator in switching operation distinguishes between different functions that can have an effect on an output. In order to prevent conflicting states, each available function has a certain priority. The function with the higher priority overrides the function with the lower priority.

For switching operation there are the following priorities...

- 1nd priority: Disabling function,
- 2nd priority: Staircase function,
- 3th priority: direct bus operation ("switching" object, scenes, reset behaviour)

The behaviour of some functions can be configured at the end (e.g. the behaviour at the end of the disabling function). These predefined reactions are only executed if the actuator can then immediately switch to direct operation (lowest priority).

If another function with a lower priority has been activated (e.g. staircase function) during a function with a high priority (e.g. disabling function), the actuator executes the behaviour at the start of the function with the next lower priority (e.g. staircase function). The behaviour at the end of the function with the higher priority (e.g. disabling function) is then not executed!

9.4 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 "Switching output... -> SO... - General".

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. staircase functions, disabling functions, scenes).

The 1-bit feedbacks always feed back the logical switching state of the switching outputs.

9.4.1 Operating mode parameters

Switching output... -> SO... - General

Operating mode	**NO contact** NC contact
The relay of a switching output can be configured as NO or NC contacts. In this way, the inversion of switching states is possible. NO contact: – Switching state = OFF ("0") -> relay contact open – Switching state = ON ("1") -> relay contact closed NC contact: – Switching state = OFF ("0") -> relay contact closed – Switching state = ON ("1") -> relay contact open	

9.4.2 Object list operating mode

Object no.	Function	Name	Type	DPT	Flag
479, 509	Switching	Switching... - Input	1-bit	1,001	C, -,W, -, U
1-bit input object to activate a switching output ("1" = Switch on / "0" = Switch off; "NO contact" or "NC contact" operating mode can be configured).					

9.5 Reset and initialisation behaviour

The switching states of the switching outputs in the event of 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 "After ETS programming operation" exists separately for each switching output. This parameter can be used to configure the switching state of a switching output, irrespective of the behaviour after voltage recovery.

ⓘ 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 voltage recovery" will be executed instead.

ⓘ A switching state set after an ETS programming operation is added to the feedback object. Actively transmitting feedback objects only transmit after an ETS programming operation when the initialisation is complete and, if applicable, the "delay after voltage recovery" has elapsed.

ⓘ After an ETS programming operation, the disabling functions are always deactivated.

Response to voltage failure

The relay contact opens in case of voltage failure.

ⓘ The behaviour is fixed in case of voltage failure.

ⓘ Active disabling functions are deleted by a voltage failure and remain inactive until they are reactivated after voltage recovery.

ⓘ In case of a voltage failure, the current switching states of all switching outputs are saved internally, so that these states can be reset after voltage recovery, if this is configured in the ETS.

Set the behaviour after voltage recovery

The parameter "After voltage recovery" exists separately for each switching output.

ⓘ Setting "state as before voltage failure": An ETS programming operation of the application or the parameter resets the stored switching state to "OFF".

ⓘ A switching state set after voltage recovery is tracked in the feedback objects. Actively transmitting feedback objects only transmit after voltage recovery when the initialisation of the actuator is complete and, if applicable, the "delay after voltage recovery" has elapsed.

ⓘ In the case of disabling function: Active disabling functions are always inactive after voltage recovery.

9.5.1 Reset and initialisation behaviour parameter

Switching output... -> SO... - General

After ETS programming operation	close contact open contact **no reaction** as with voltage return
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 for voltage return: After an ETS programming operation, the switching output behaves in the manner defined in the parameter "After voltage return". If the behaviour there is configured to "State as before voltage failure", then that switching state is also set after an ETS programming operation which was active at the time of the last voltage failure. An ETS programming operation does not overwrite the saved switching state.	

On voltage failure	**open contact**
The reaction in the event of a voltage failure is permanently set to "Open contact" for each switching output. Open contact: The relay contact opens in case of voltage failure	

After voltage return	close contact open contact **State as before voltage failure** no reaction activating staircase function
The actuator allows the reaction to be set separately for each switching output after voltage return. Close contact: The relay contact is closed. Open contact: The relay contact is opened. State as before voltage failure: After voltage return, the switching state last set and internally stored before failure is tracked. No reaction: After voltage return, the relay of the output shows no reaction and remains in the switching state last selected. Activate staircase function: The staircase function is – irrespective of the "Switching" object - activated after voltage return. This setting is only available when the staircase function is enabled.	

9.6 Feedback switching status

The actuator can track the current switching state of a switching output via a feedback object and can also transmit them to the KNX. On each switching operation, the actuator determines the object value of the feedback. The actuator tracks the switching state and updates the feedback object even when a switching output, for example, is activated by a supplementary function or scene function.

The switching status feedback object is updated after the following events:

- Immediately after switch-on of a switching output (if necessary, first after a switch-on delay has elapsed / also after a staircase function).
- After switch-off of a switching output (if necessary, only after a switch-off delay has elapsed / also after a staircase function).
- During updating of the switching state from "ON" to "ON" or "OFF" to "OFF" when the switching output is already switched on or off. However, only if the parameter "Update of the object value" is configured to "On each update of object 'Switching'".
- At the start or end of a disabling function, if a state changes as a result.
- Always on voltage recovery or at the end of any ETS programming process (if necessary, also delayed).

ℹ In the case of disabling 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.

Feedback takes place via the "Switching feedback" object. Optionally, the actuator can also feed back the status of an independent switching output in inverted form.

Depending on the configured relay operating mode and an inverted or non-inverted evaluation, a status feedback has the following meanings:

- NO contact not inverted...

  Feedback = "ON" -> Relay closed, feedback = "OFF" -> Relay opened
- NO contact inverted...

  Feedback = "ON" -> Relay opened, feedback = "OFF" -> Relay closed
- NC contact not inverted...

  Feedback = "ON" -> Relay opened, feedback = "OFF" -> Relay closed
- NC contact inverted...

  Feedback = "ON" -> Relay closed, feedback = "OFF" -> Relay opened ℹ Feedback of the current switching status via the "switching" object is not possible.

Set update of "Switching feedback"

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

This setting "only if the feedback value changes" 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 mains voltage return or after programming with the ETS

If used as active signalling object, the switching status feedback is transmitted to the KNX after voltage recovery or after ETS programming. In these cases, the feedback telegram can be time-delayed, with the delay being preset globally for all switching outputs together.

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.

9.6.1 Feedback switching status parameters

Switching output... -> SO... - General -> Enabled functions

Feedback telegrams	Active **Inactive**
This parameter can be used to disable or to enable the feedback functions.	

Switching output... -> SO... - General -> Feedback telegrams

switching status	no feedback **no inversion, active signalling object** no inversion, passive status object inversion, active signalling object inversion, passive status object
The current switching state of the switching output can be reported separately back to the KNX. no feedback: 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 mains 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 voltage return or after ETS programming. 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 mains 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 voltage return or after ETS programming. The switching status is written to the object in inverted form.	

<table>
<tr><td>Updating of the object value</td><td>after each update object "Switching"
only if the feedback value changes</td></tr>
<tr><td colspan="2">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 object "Switching": The actuator updates the feedback value in the object once a new telegram is received on the input object "Switching" or the switching state changes internally. 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. 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.</td></tr>
</table>

<table>
<tr><td>Delay after voltage return</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">The states of the switching status feedback can be transmitted to the KNX with a delay after mains voltage return or after an ETS programming operation. The activated parameter causes a delay on mains voltage return. The delay time is configured on the parameter page "Switching output -> SA - General".</td></tr>
</table>

<table>
<tr><td>Cyclical transmission</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">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.
Parameter activated: Cyclical transmission is activated.
Parameter deactivated: Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.</td></tr>
</table>

<table>
<tr><td>Time for cyclical transmission</td><td>**0**...23 h | 0...**2**...59 min | **0**...59 s</td></tr>
<tr><td colspan="2">This parameter defines the time for the cyclical transmission of the switching status feedback.</td></tr>
</table>

9.6.2 Object list feedback switching status

Object no.	Function	Name	Type	DPT	Flag
480, 510	Switching feedback	Switching... - Output	1-bit	1,001	C, R, -, T, A
1-bit object for feedback signalling of a switching state of a switching output ("1" = on / "0" = off) to the bus. Depending on the configured relay operating mode, the feedback value should be interpreted differently: – NO contact operating mode: Feedback = "0" -> Relay open, feedback = "1" -> Relay closed – NC contact operating mode: Feedback = "0" -> Relay closed, feedback = "1" -> Relay opened					

9.7 Time delays

Up to two time functions can be preset for each switching output, independently of each other. The time functions affect the communication objects "Switching" and delay the object value received depending on the telegram polarity .

ℹ At the end of a disabling function, the switching state received during the function or set before the function can be tracked. At the same time, residual times of time functions are also tracked if these had not yet fully elapsed at the time of the reactivation.

ℹ The time delays do not influence the staircase function if this is enabled.

ℹ A time delay still in progress will be fully aborted by a reset of the actuator (voltage failure or ETS programming).

Activating switch-on delay

The switch-on delay can be activated separately in the ETS for each switching output.

After reception of an ON telegram via the "switching" object, the configurable time is started. Another ON-telegram triggers the time only when the parameter "Switch-on delay retriggerable" is activated. An OFF-telegram received during the 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.

After reception of an OFF-telegram via the "switching" object, the configurable time is started. Another OFF-telegram triggers the time only when the parameter "switch-off delay retriggerable" is activated. An ON-telegram received during the OFF-delay will end the delay and sets the switching status to "ON".

9.7.1 Time delays parameters

Switching output... -> SO... - General -> Enabled functions

Time delays	Active **Inactive**
This parameter can be used to disable or to enable the time delays.	

Switching output... -> SO... - General -> Time delays

Selection of time delay	**no time delay** Switch-on delay Switch-off delay ON delay and OFF delay
The communication objects "Switching" can be evaluated after 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	**0**...59 min | 0...**10**...59 s
This parameter is used for setting the duration of the switch-on delay.	

Switch-on delay retriggerable	Active **Inactive**
A switch-on delay still in progress can be retriggered by another "ON" telegram (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed.	

Switch-off delay minutes (0…59)	**0**...59 min | 0...**10**...59 s
This parameter is used for setting the duration of the switch-off delay.	

Switch-off delay retriggerable	Active **Inactive**
A switch-off delay still in progress can be retriggered (parameter activated) by another "OFF" telegram. Alternatively, the retriggering time (parameter deactivated) can be suppressed.	

9.8 Staircase function

The staircase function can be used for implementing time-controlled lighting of a staircase or for function-related applications.

The staircase function 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.
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 parameters"Staircase time". In addition, a switch-on delay (T_{Delay}) can be activated (see "presetting switch-on delay of the staircase function"). At the end of the staircase time, the output switches off or activates optionally the pre-warning time ($T_{Prewarn}$) of the pre-warning function (see "presetting pre-warning function of the staircase function"). Taking into account any possible switch-on delay and pre-warning function, this gives rise to the switch-on behaviour of the staircase function as shown in the following diagram.

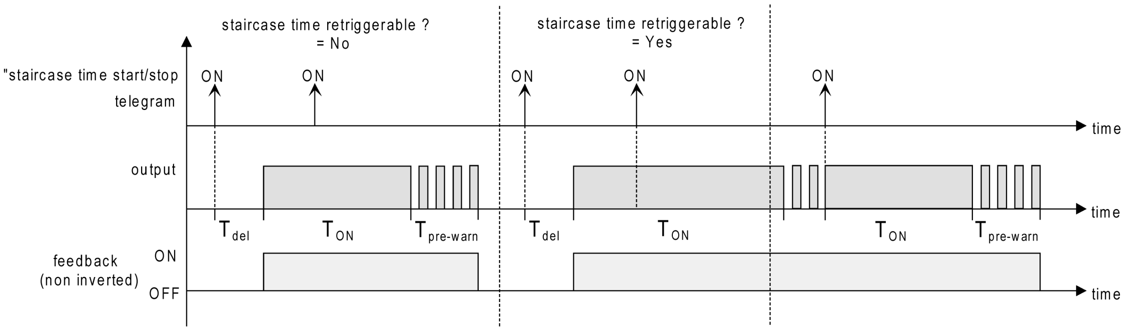


Image 5: Switch-on behaviour of the staircase function

The parameter "Staircase time retriggerable" specifies whether the staircase time can be retriggered.

ℹ An ON telegram received during the pre-warning time always retriggers the staircase time independently of the parameter "Staircase time retriggerable".

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.

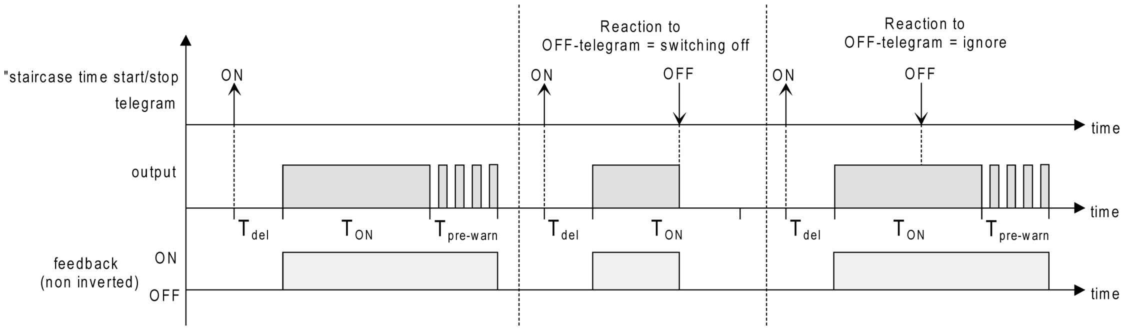


Image 6: Switch-off behaviour of the staircase function

The parameter "reaction to OFF-telegram" defines whether the staircase time (T_{ON}) of the staircase function can be aborted prematurely.

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

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".

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.

Setting the pre-warning function of the staircase function

The pre-warning should, according to DIN 18015-2, warn persons still on the staircase that the light will soon be switched off. The lighting connected on the output is briefly switched off repeatedly as a pre-warning, before the output is switched off permanently. At the same time, the pre-warning time ($T_{Prewarn}$), the duration of the interruptions during the pre-warning($T_{Interrupt}$) and the number of pre-warning interruptions are configurable(see figure 7). The pre-warning time is added to the staircase time (T_{ON}). The pre-warning time influences the value of the feedback object so that the value "OFF" (in the case of non-inverted transmission) is first tracked after the pre-warning time in the object has elapsed.

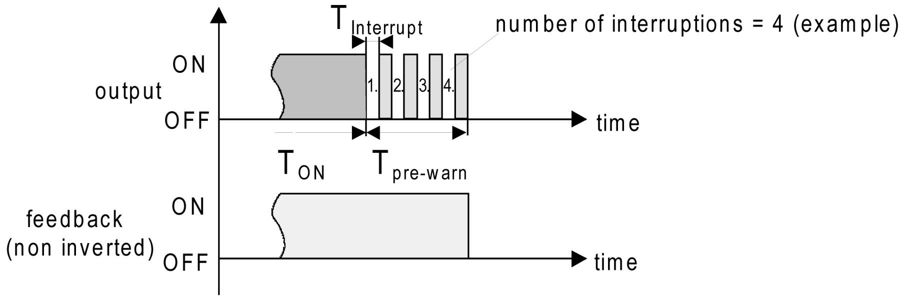


Image 7: The pre-warning function of the staircase function (example)

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 the behaviour of the staircase function after mains voltage return

The staircase function can optionally be started automatically after mains voltage return.

As soon as the staircase function is activated on the parameter page "Switching output... -> SO... General -> Enabled", on the parameter page "Switching output... -> SO... - General" the parameter "After voltage recovery" can be set to "Activate staircase function".

i During automatic starting of the staircase function after mains voltage return, no switch-on delay is started if the staircase function has configured such a delay.

i The configured behaviour "on voltage recovery" is only executed when the supply voltage is switched on if the last ETS programming operation of the application or of the parameters ended at least approx. 20 s prior to switching on the voltage. Otherwise (T_{ETS} < 20 s) the behaviour "after ETS programming" will be executed also in case of voltage recovery.

9.8.1 Staircase function parameters

Switching output... -> SO... - General -> Enabled functions

Staircase function	Active **Inactive**
This parameter can be used to disable or to enable the staircase function.	

Switching output... -> SO... - General -> Staircase function

Staircase time	**0**...23 h | 0...**3**...59 min | **0**...59 s
This parameter is used for programming the duration of the switch-on time for a scene recall.	

Staircase time retriggerable	Active **Inactive**
An active switch-on time can be retriggered (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed.	

Switch-on delay	Active **Inactive**
The staircase function enables the activation of an own switch-on delay. This switch-on delay affects the trigger result of the staircase function and thus delays the switch-on. activated: The switch-on delay for the staircase function is enabled. After 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 activated. The staircase time is activated and the output is switched on only after the time delay has elapsed. deactivated: The switch-on delay is deactivated. 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	**0**...23 h | **0**...59 min | 0...**30**...59 s
This parameter is used for setting the duration of the switch-on delay.	

Switch-on delay retriggerable	Active **Inactive**
An active switch-on delay can be retriggered (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed.	

<table>
<tr><td>Reaction to OFF-telegram</td><td>switch off
ignore</td></tr>
<tr><td colspan="2">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".
ignore: OFF Telegrams or "0" factors are ignored. The switch-on time will be executed completely to the end.</td></tr>
</table>

<table>
<tr><td>At the end of the staircase time</td><td>switch off
activate pre-warning time</td></tr>
<tr><td colspan="2">At the end of the staircase time, the actuator for the switching output concerned displays the configured behaviour here. The output can be set to switch off immediately or alternatively to execute a pre-warning function.
switch off: At the end of the staircase time, the actuator switches off the switching output concerned.
Activate pre-warning time: At the end of the staircase time, the switching output can generate a pre-warning prior to switching off. The pre-warning, for example, should warn any person still on the staircase that the light will soon be switched off.</td></tr>
</table>

<table>
<tr><td>Pre-warning time</td><td>0...59 min | 0...30...59 s</td></tr>
<tr><td colspan="2">This parameter is used for setting the duration of the pre-warning time. The pre-warning time is added to the switch-on time.</td></tr>
</table>

<table>
<tr><td>Time for pre-warning interruptions</td><td>0...59 s | 0...500...900 ms</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

<table>
<tr><td>Number of pre-warnings</td><td>1...3..10</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

9.8.2 Object list staircase function

Object no.	Function	Name	Type	DPT	Flag
489, 519	Staircase function start/stop	Switching... - Input	1-bit	1,010	C, -,W, -, U
1-bit object to activate or deactivate the switch-on time of the staircase function of a switching output ("1" = switch-on / "0" = switch-off).					

9.9 Scene function

Up to 16 scenes can be programmed and scene values stored separately for each switching output. The scene values are recalled or stored via a separate scene extension object. The data point type of the extension object permits addressing of all 16 scenes.

The scene configuration selected in the parameterization decides whether the number of scenes is either variable (1 ... 16) or alternatively fixed to the maximum (16).

– Scene configuration = "variable (1 ... 16 scenes)"
  With this setting, the number of scenes used can be selected anywhere in the range 1 to 16. The parameter "Number of scenes" decides how many scenes are visible for the switching output in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene.
– Scene configuration = "fixed (16 scenes)"
  With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 16) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.

The scene function can be combined together with other functions of a switching output, whereby the last received or preset state is always executed:
Telegrams to the "Switching" objects, a scene recall or scene storage telegram at the time of an active staircase function aborts the staircase time prematurely and presets the brightness state according to the received object value (time delays are also taken into account) or scene value.
Similarly, the state of the switching output, which was preset by the "Switching", "Dimming" or "Brightness value" objects or by a scene recall, can be overridden by a staircase function.

Presetting a scene recall delay

Each scene recall of a switching output can optionally also be delayed. With this feature, dynamic scene sequences can be configured if several scene outputs are combined with cyclical scene telegrams.

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 behaviour during ETS programming

When a scene is saved, the switching states are saved permanently in the device. To prevent the stored values from being replaced during ETS programming of the application or parameters by the originally programmed scene switching states, the actuator can inhibit overwriting of the switching states. As an alternative, the original values can be reloaded into the device during each programming run of the ETS.

ℹ When the actuator is commissioned for the first time, this parameter should be activated so that the switching output is initialised with valid scene switching states.

Setting scene numbers and scene switching states

The presetting of the scene number depends on the selected scene configuration. With variable configuration the scene number (1...64) with which the scene is addressed, i.e. recalled or stored, must be determined for each scene of the switching output. With a fixed scene configuration, the number of a scene is preset invariably.

The data point type of the scene extension object permits addressing of up to 16 scenes max.

In addition to specifying the scene number, it is necessary to define which scene command (ON, OFF) should be set on the switching output during a scene recall.

ℹ If with variable scene configuration the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.

ℹ The configured switching state is adopted in the actuator during ETS programming only if the parameter "Overwrite values stored in the device during programming" is activated.

Presetting storage behaviour

The switching state set for the switching output can be stored internally via the extension object on reception of a scene storage telegram. In this case, the switching state can be influenced before the storage by all functions of the switching output provided that the individual functions have been enabled (e.g. also the disabling function).

Optionally, a visual feedback via the switching output can be signaled when executing a storage command. The channel flashes once as feedback in the configured flashing time. This enables the system operator to determine locally whether the desired scene switching state has been saved correctly in the actuator. A switching state feedback on the KNX is not generated.

ℹ The visual feedback is only executed if no other function with a higher priority (e.g. disabling function) is active in the moment when the memory function is active.

9.9.1 Scene function parameters

Switching output... -> SO... - General -> Enabled functions

Scene function	Active **Inactive**
This parameter can be used disable or to enable the scene function.	

Switching output... -> SO... - General: -> Scenes

Delay scene recall	Active **Inactive**
A scene is recalled via the scene extension object. If required, the scene recall can be delayed on reception of a recall telegram (parameter activated). The recall is alternatively made immediately on reception of the telegram (parameter deactivated)	

Delay time minutes (0...59)	**0**...59 min | 0...**10**...59 s
This parameter specifies the length of the scene delay time.	

Visual feedback for storage function	Active **Inactive**
Optionally, a visual feedback via the switching output can be signaled when executing a storage command. The channel flashes once as feedback in the configured flashing time. Parameter activated: When a storage function is executed, the visual feedback is activated immediately. The output switches to the opposite switching state for the duration of the configured flashing time and then back to the saved scene command. Parameter deactivated: When storing a scene, the visual feedback is not executed. The actuator adopts the current switching state of the output without special feedback.	

Flashing time	0...**5**...10 s
The flashing time in which the visual feedback is to be executed is set here.	

Overwrite values stored in the device during the ETS programming operation	**Active** Inactive
During storage of a scene, the scene values (current states of the switching outputs concerned) are stored internally in the device. Active: The original configured values can be reloaded into the device during each programming operation of the ETS. Inactive: The stored values are not replaced during an ETS programming operation by the originally programmed scene values.	

<table>
<tr><td>Scene configuration</td><td>variable (1...16 scenes)
fixed (16 scenes)</td></tr>
<tr><td colspan="2">The scene configuration selected here decides whether the number of scenes is either variable (1 ... 16) or alternatively fixed to the maximum (16).
variable (1...16 scenes): With this setting, the number of scenes used can be selected anywhere in the range 1 to 16. The parameter "Number of scenes" decides how many scenes are visible for the switching output in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene.
fixed (16 scenes): With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 16) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.</td></tr>
</table>

<table>
<tr><td>Number of scenes (1...16)</td><td>1...10...16</td></tr>
<tr><td colspan="2">This parameter is only available with variable scene configuration and defines how many scenes are visible for the switching output in the ETS and can therefore be used.</td></tr>
</table>

<table>
<tr><td>Scene number</td><td>0...1*...64
*: The predefined scene number is dependent on the scene (1...16).</td></tr>
<tr><td colspan="2">With variable scene configuration, it is possible to preset which scene number (1 ... 64) controls each scene.
A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible.
If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.</td></tr>
</table>

<table>
<tr><td>Scene active</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">With a fixed scene configuration, individual scenes can be activated or deactivated. Only activated scenes can be used. A deactivated scene cannot be recalled or stored via the scene extension.</td></tr>
</table>

<table>
<tr><td>Switching state</td><td>ON
OFF</td></tr>
<tr><td colspan="2">This parameter is used for configuring the switching state which is set when the scene is recalled.</td></tr>
</table>

<table>
<tr><td>Memory function</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">If the parameter is activated, the storage function of the scene is enabled. The current switching state can then be stored internally via the extension object on receipt of a storage telegram. If the parameter is deactivated, the storage telegrams are rejected.</td></tr>
</table>

9.9.2 Object list scene function

Object no.	Function	Name	Type	DPT	Flag
485, 515	Scene extension	Switching... - Input	1 bytes	18,001	C, -,W, -, U
1-byte object for polling or saving a scene.					

9.10 disabling function

During an active disabling function, the KNX operation of the switching output concerned is overridden and locked. The disabling function has the highest priority. Continuous light switching, for example, can also be overridden.

The required behaviour at the "start of the disabling function" and at the "end of the disabling function" must be set in the parameters.

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.

ℹ After a power 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 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.

9.10.1 Parameter disabling function

Switching outputs -> SA - General

<table>
<tr><td>Time for flashing the disabling functions</td><td>1 s
2 s
5 s
10 s</td></tr>
<tr><td colspan="2">Switching outputs can flash in the disabled state (cyclical switching on and off). The flashing time is generally configured here.</td></tr>
</table>

Switching output... -> SO... - General -> Enabled functions

<table>
<tr><td>disabling function</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">It can be defined here whether a disabling function for the switching output should be available.</td></tr>
</table>

Switching output... -> SO... - General -> Disabling function

<table>
<tr><td>Acknowledgment</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">The deactivation of the disabling function can optionally take place using an additional 1-bit acknowledgement object. This prevents the deactivation of the disabling function by the disabling object. Alternatively, the acknowledgement object is not available. In this case, disabling is deactivated via the disabling object.
Parameter activated: The acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an ON telegram. Telegrams to the disabling object according to the "Deactivate disabling" polarity are ignored by the actuator.
Parameter deactivated: No additional acknowledgement object is available. The disabling function is deactivated by the disabling object according to the set polarity.</td></tr>
</table>

<table>
<tr><td>Polarity of the disabling object</td><td>0 = enabled; 1 = disabled
1 = disabled; 0 = enabled</td></tr>
<tr><td colspan="2">This parameter defines the polarity of the disabling object.</td></tr>
</table>

Beginning of the disabling function	no change to the switching state switch off **switch on** flashing
The behaviour of the switching output at the beginning of the disabling function can be configured. no change of switching state: The relay of the output shows no reaction and remains in the switching state last set (switching state in acc. with last non-inverted feedback telegram). Switch off: At the beginning of the disabling function, the switching output is switched off and locked. Switch on: At the beginning of the disabling function, the switching output is switched on and locked. Flash: The switching output is switched on and off cyclically during the disabling. The "Time for flashing" is generally configured for all outputs on the parameter page "Switching outputs -> SA - General". During flashing, the logical switching state of the switching output is fed back as "Switched on".	

End of the disabling function	no change to the switching state switch off switch on **set tracked state** flashing
The behaviour of the switching output at the end of the disabling function can be configured. no change of switching state: The relay of the output shows no reaction and remains in the state last set by the disabling function. Switch off: At the end of the disabling function, the switching output is switched off and enabled again. Switch on: At the end of the disabling function, the switching output is switched on and enabled again. Set tracked state: The last switching state received during the disabling function or the switching state set before the disabling function will be tracked. Any time functions still in progress will also be taken into account if necessary. Flash: The switching output is switched on and off cyclically after the disabling. The time for flashing is generally configured for all outputs on the "Switching outputs -> SA - General" parameter page. During flashing, the logical switching state of the output is fed back as "Switched on". The flashing state remains active until another KNX command is received and thereby predefines another switching state.	

End of the disabling function after acknowledgement	no change to the switching state switch off switch on **set tracked state** flashing
The behaviour of the switching output at the end of the disabling function after acknowledgement can be configured. no change of switching state: The relay of the output shows no reaction on acknowledgement and remains in the state last set by the disabling function. Switch off: On acknowledgement, the switching output is switched off and enabled again. Switch on: On acknowledgement, the switching output is switched on and enabled again. Set tracked state: On acknowledgement, the last switching state received during the disabling function or the switching state set before the disabling function will be tracked. Any time functions still in progress will also be taken into account if necessary. Flash: The switching output is switched on and off cyclically after the acknowledgement. The time for flashing is generally configured for all outputs on the "Switching outputs -> SA - General" parameter page. During flashing, the logical switching state of the output is fed back as "Switched on". The flashing state remains active until another KNX command is received and thereby predefines another switching state.	

9.10.2 Object list disabling function

Object no.	Function	Name	Type	DPT	Flag
487, 517	Disabling	Switching... - Input	1-bit	1,003	C, -,W, -, U
1-bit object for disabling a switching output (polarity configurable).					

Object no.	Function	Name	Type	DPT	Flag
495, 525	Disabling acknowledgment	Switching... - Input	1-bit	1,016	C, -,W, -, U
1-bit object to acknowledge an active disabling function of a switching output. This object is only visible if the acknowledgement is to be used with the disabling function ("1" = Disabling function is deactivated / "0" = disabling function remains active).					

10 "Dimming" insert function

10.1 Channel configuration

The device is used to dim up to two lighting groups.

10.1.1 Channel configuration object list

Object no.	Function	Name	Type	DPT	Flag
479, 509	Switching	Dimming channel ... (...) - Input	1-bit	1,001	C, -,W, -, U
1-bit object for switching the dimming channel on or off ("1" = switch on; "0" = switch off).					

Object no.	Function	Name	Type	DPT	Flag
480, 510	Switching feedback	Dimming channel ... (...) - Output	1-bit	1,001	C, R, -, T, A
1-bit object for feedback signalling of the switching state ("1" = on / "0" = off) to the bus.					

Object no.	Function	Name	Type	DPT	Flag
482, 512	Dimming	Dimming channel ... (...) - Input	4-bit	3,007	C, -,W, -, U
4-bit object for relative dimming of a dimming channel.					

Object no.	Function	Name	Type	DPT	Flag
483, 513	brightness value	Dimming channel ... (...) - Input	1 bytes	5,001	C, -,W, -, U
1-byte object for predefining an absolute dimming value (brightness value 0…255) from the bus.					

10.2 General settings

10.2.1 Reset behaviour

Delay after voltage return

To reduce telegram traffic after switch-on of the supply voltage 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 time can be defined (parameter "Delay after voltage recovery" on the parameter page "Dimming channels -> DA - General"). Only after the configured time elapses are feedback telegrams for initialisation transmitted to the KNX.
Which of the telegrams is actually delayed can be set for each output and status function separately.

ℹ The delay has no effect on the behaviour of the outputs. Only the bus telegrams for status or feedback are delayed. The outputs can also be activated during the delay after voltage recovery.

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

10.2.1.1 Reset behaviour parameters

Dimming channels -> DO - General -> Times

Delay after voltage return	**0** ... 59 min | 0 ... **17** ... 59 s
To reduce telegram traffic after switch-on of the supply voltage or after an ETS programming operation, it is possible to delay all active feedback telegrams of the actuator. This parameter defines a delay time independent of the channel for this case. Only after the time configured here has elapsed are feedback telegrams for initialisation transmitted to the bus.	

10.2.2 Name of the dimming channel

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

10.2.2.1 Name of the dimming channel parameters

Dimming channel ... -> DO... - General

Name of the dimming channel	Free text
The text entered in this parameter is applied to the name of the communication objects and is used to label the dimming output in the ETS parameter window (e.g. "living room wall lamp", "bathroom ceiling lamp"). The text is not programmed in the device.	

10.3 Load type

The device works according to the leading edge phase control or trailing edge phase control dimming principle and makes switching and dimming of incandescent lamps, HV halogen lamps and LV halogen lamps, compact fluorescent lamps as well as HV LEDs and LV LEDs possible by means of conventional transformers and Tronic transformers. The characteristic of the connected load is automatically measured separately for each dimming channel.

ⓘ The specifications of the lamp manufacturer and/or transformer manufacturer should generally be observed.

The dimming channel calibrates itself universally to the connected load type. After ETS programming or after voltage recovery, the actuator calibrates itself automatically to the connected load. The calibration procedure becomes noticeable during ohmic loads by a brief flicker and lasts up to 10 seconds depending on the network conditions.

10.4 Dimming characteristic

The human eye is adapted to natural daylight. As a result, it works in a very wide range of brightness from twilight in the early morning and late evening to bright daylight at noon. In the lower brightness area the eye is clearly more sensitive than in the upper area.

When dimming simple lamps, the electrical power is uniformly converted into a luminous flux that is emitted into the surrounding room. This luminous flux results in illuminance that can be measured with a luxmeter. If the lamp emits 50% of its maximum luminous flux, it already appears as intense brightness to the eye. When the luminous flux of the lamp rises to 75%, illuminance increases by the same amount. However, the eye perceives this change much weaker.

When different current lamp types are dimmed, luminous flux and subjective perceptions of brightness can vary considerably. For this reason, the dimming actuator offers several options for adjusting the dimming characteristics as required.

- If the lighting is regularly controlled via percentage presetting of the dimming value, the suitability of the dimming characteristic in the value range should be checked as a priority.
- If the lighting is dimmed manually via the 4-bit object, the dimming characteristic can be adjusted in the time range.

The dimming characteristic curve can be adjusted in the value range and in the time range.

Dimming characteristic curve in the value range

Six characteristic curves are available for adapting to different luminaires, which the dimming actuator can use to convert the percentage input value from the KNX (DPT 5.001) to the output value of the dimming channel. The following table shows the differences in the characteristic curves.

KNX value	KNX value [%]	logarithmic function [%] (1)	root function [%] (2)	linear function [%] (3)	quadratic function [%] (4)	cubic function [%] (5)	exponential function [%] (6)
0	0	0	0	0	0	0	0
1	0.4	0	6	0.4	0	0	0
10	4	42	20	4	0	0	0
25	10	58	31	10	1	0	0
50	20	71	44	20	3	1	0
80	32	79	56	32	10	3	0
100	40	83	63	40	15	6	0
125	50	87	70	50	24	12	0
150	60	90	77	60	35	20	1
175	70	93	83	70	47	32	2.4
200	80	96	88	80	62	48	8

KNX value	KNX value [%]	logarithmic function [%] (1)	root function [%] (2)	linear function [%] (3)	quadratic function [%] (4)	cubic function [%] (5)	exponential function [%] (6)
225	90	98	94	90	78	69	25
255	100	100	100	100	100	100	100

Table 1: Dimming characteristics in the value range

The connected luminaires convert the dimmed output voltage into a luminous flux that is emitted into the room. This luminous flux is different for each type of lamp. The subjective brightness perception of the human eye differs from the illuminance that can be measured.

The following diagrams present a comparison for a lamp type of the measured illuminance and the brightness perceived for the dimming characteristics that can be set in the ETS. Because the properties of different lamp types deviate from one another, the most suitable dimming characteristic must be determined locally if necessary. If an existing lamp is replaced by a lamp of a different type, it may be useful to change the dimming characteristic.

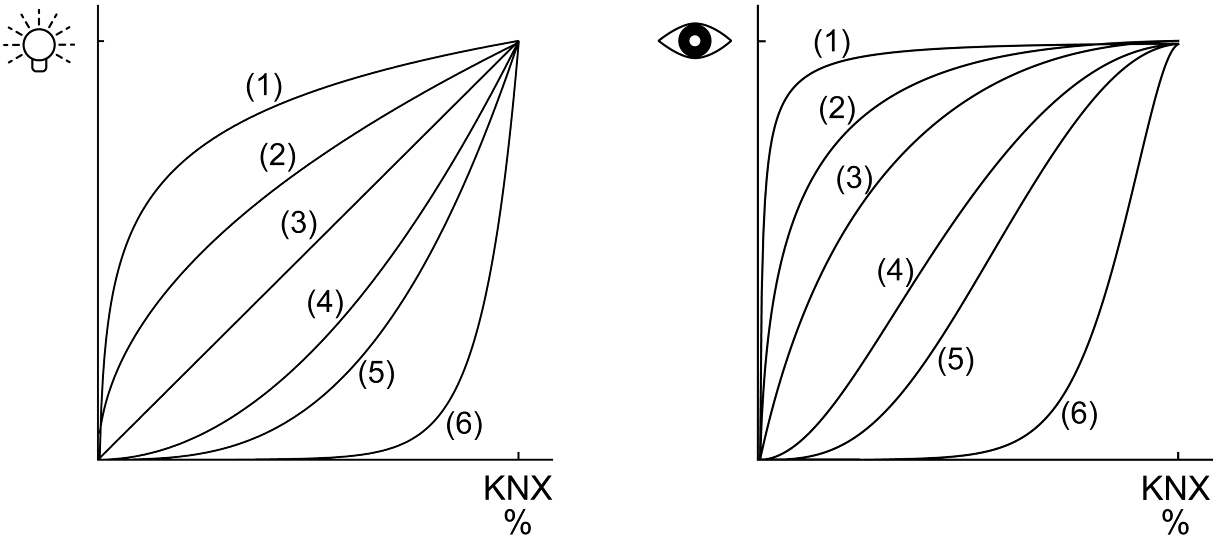


Image 8: Dimming characteristics in the value range

Setting the dimming characteristic in the value range

In the as-delivered state, the linear dimming characteristic is set in the value range. If the dimming behaviour is not satisfactory, particularly in the lower dimming range, the dimming behaviour may be improved by selecting a different dimming characteristic. The adjustment of the dimming characteristic is related to the adjustment of the minimum brightness and maximum brightness.

The 1-byte brightness value communication object is connected to a group address. The maximum brightness is set to 100%. When a brightness value is received, the value is jumped to.

- Check/set the minimum brightness.
- Gradually increase the brightness value and evaluate the brightness change.

- If the brightness change in the lower range is too strong, select a flatter characteristic curve.
- If the brightness change in the lower range is too weak, select a steeper characteristic curve.
- For maximum brightness, select the brightness value from which no change is visible in the upper range.

  The dimming characteristic is set in the value range.

ℹ If dimming operation cannot be set properly with the dimming characteristics in the value range, check the load type or replace the lamp with another type.

Dimming characteristic curve in the time range

In the case of the dimming actuator, the technically dimmable brightness range (1 % ... 100 %) is subdivided into 255 dimming increments (8-bit brightness value: 1...255 / 0 = switched off). In the as-delivered state of the actuator, the dimming increment times, i.e. the dimming times between 2 of 255 dimming increments, are set to the identical length. This results in a linear characteristic curve over the entire brightness range.

The dimmable brightness range is limited at the upper limit by the maximum brightness configured in the ETS. The lower limit is defined by the minimum brightness. The dimming characteristics shown in the following diagrams illustrate the real dimming time of a dimming procedure.

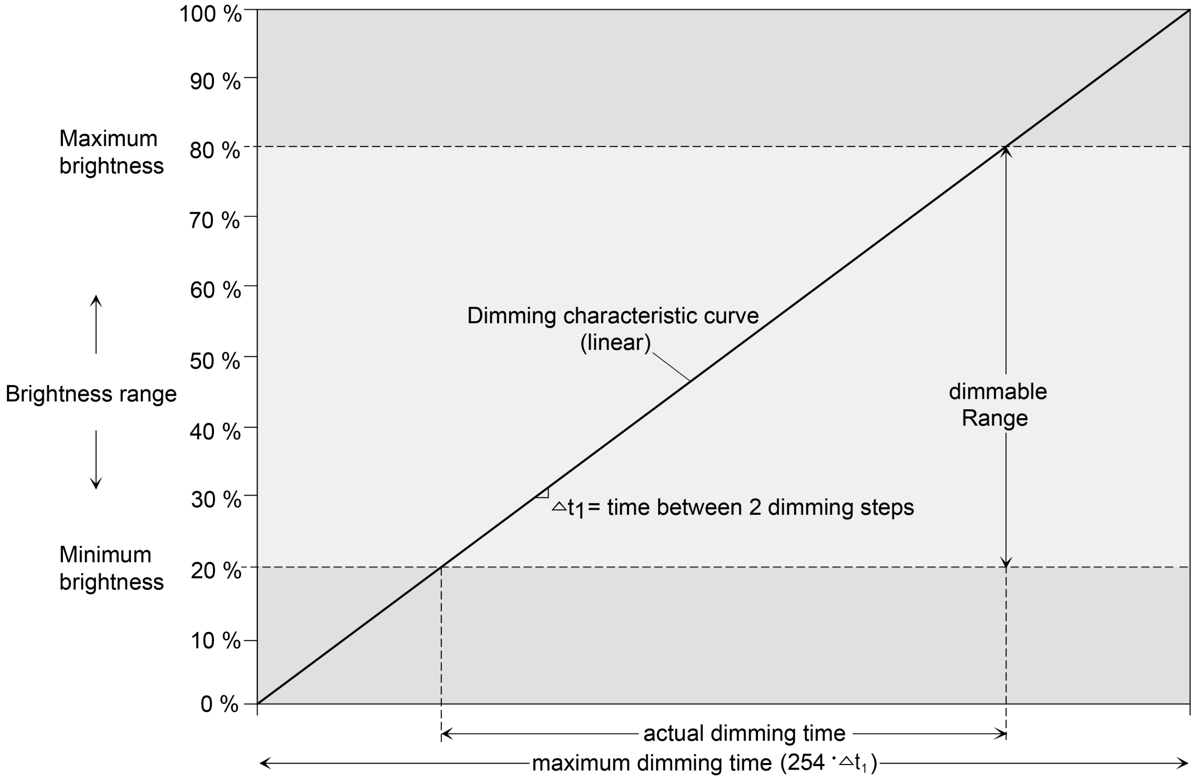


Image 9: Linear characteristic dimming curve as an example with minimum brightness > 0 % and maximum brightness

In some practical applications, a linear dimming characteristic is not optimal. Hence, the actuator in the ETS alternatively permits a user-defined adjustment of the dimming progress. In this way, for example, brightness changes can be adjusted to the brightness sensitivity of the human eye when dimming by subdividing the brightness range in up to 5 sections with different dimming increment times.

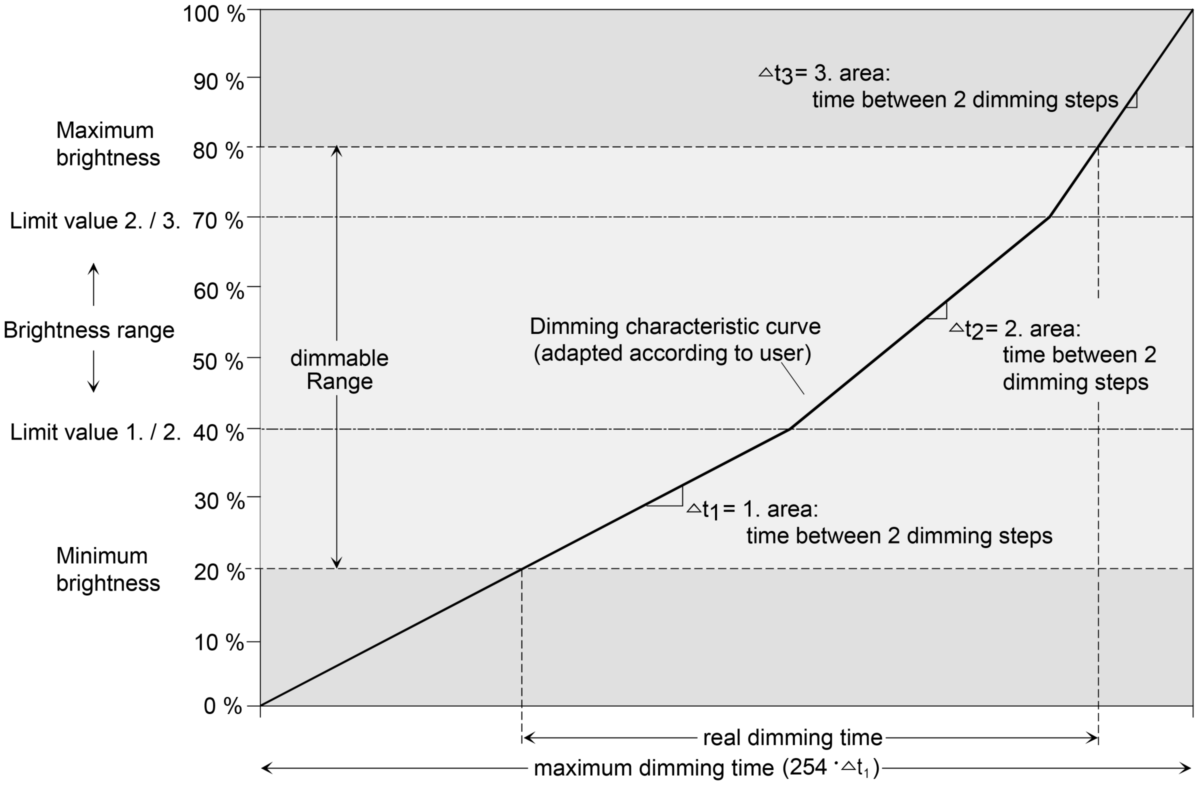


Image 10: User-defined dimming characteristic as an example with minimum brightness and maximum brightness

Setting the dimming characteristic in the time range

- Set the parameter "Characteristic curve in the time range" on the parameter page "DAx - General -> Dimming characteristic" (x = number of the dimming channel 1, 2) to "Linear function".

  A linear dimming characteristic curve is set. A time between two dimming increments can also be configured for the entire brightness range in the ETS.

- Set the parameter "Characteristic curve in the time range" on the parameter page "DAx - General -> Dimming characteristic" (x = number of the dimming channel 1, 2) to "User-defined (y ranges)" (y = 2...5).

  A user-defined dimmer characteristic curve is set. Up to 4 limiting values and 5 times between two dimming increments can be defined for the definition of the brightness sections.

The dimming increment speed is identical for a relative dimming procedure or for the dimming of an absolute brightness value (not fading) and can be set in the ETS separately for each dimming channel in the characteristic parameters.

The parameter "Characteristic curve" in the time range is set to "Linear".

- Set the parameter "Time between two dimming increments " on the parameter page "DAx - General -> Dimming characteristic" (x = number of the dimming channel 1, 2) to the necessary dimming increment time.

  During every relative or absolute dimming procedure, the entire brightness range is dimmed with the configured dimming increment speed.

The parameter "characteristic curve" is set to "user-defined".

- First define the brightness limit values. For this purpose, set the parameter "until brightness limiting value" of the various ranges on the parameter page "DAx - General -> Dimming characteristic" (x = number of the dimming channel 1, 2) to the necessary section limits.

  In the configuration of the limiting value, care must be taken to ensure that the maximum brightness is not exceeded, or if necessary, the configured minimum brightness is not undershot.

  The dimmable brightness range is divided into up to 5 sections. In the following, the dimming increment speeds for these three areas can be set separately.

- Set the parameter "Time between two dimming increments " on the parameter page "DAx - General -> Dimming characteristic" (x = number of the dimming channel 1, 2) to the necessary dimming increment time for each section.

  The dimming characteristic is defined ready. Each of the up to 5 sections is dimmed at the specified dimming increment speed.

10.4.1 Parameter Dimming characteristic

Dimming channel ... -> DO... - General -> Dimming characteristic

Characteristic curve in the time range	**linear function** User-defined (2 ranges) User-defined (3 ranges) User-defined (4 ranges) User-defined (5 ranges)

The dimming characteristic curve of the dimming channel in time domain can be set here. The lamp used can thus be adapted to the brightness sensitivity of the human eye.

Linear function: The brightness curve of minimum brightness (decimal brightness value "1") up to 100% (decimal brightness value "255") is linear.

User-defined (... ranges): The brightness curve between minimum brightness and maximum brightness can be adapted individually. For this purpose, the brightness range is subdivided in up to 5 sections. Each section can be configured with an independent dimming speed.

Range ... Time between two dimming increments	1 ... **25** ... 255 ms

At this point, the dimming step speed (time between two dimming values) of the respective partial range is set.

With a linear characteristic curve there is only range 1.

Range ... until brightness limiting value	1 % 5 % 10 % ... **100 %**

The brightness limiting value is configured here. This limiting value defines the boundary between the first and second section.

With a linear characteristic curve, the limit value is fixed at 100 %.

Characteristic curve in the value range	**linear function** exponential function cubic function quadratic function root function logarithmic function
Setting the characteristic curve in the value range allows the 256 dimming steps possible on KNX to be adapted to the perception of the human eye. If this parameter is changed, the curve of the characteristic curve is shown in the diagram below. The selection of the characteristic curve depends on the connected lamp.	

10.5 Brightness range

The adjustable brightness range for switching or dimming procedures can be limited by defining a lower and upper brightness value. The lower brightness value is defined by the minimum brightness. The upper brightness value is always characterised by the maximum brightness. The maximum brightness adjustable in the ETS is never exceeded under any circumstances in the switched-on operating state of a dimming channel. Neither when switching on nor when dimming. The maximum brightness value can be reduced for energy saving reasons, for example. Furthermore, the brightness value, which should be set whenever switching on via the "Switching" object on the dimming channel, can be predefined. This switch-on brightness must always be between the upper and lower brightness limit value of the dimming range.

Definition of the lower brightness limit with minimum brightness (see figure 11)

The "Minimum brightness" parameter predefines a lower brightness threshold in the percentage range 1 % ... 100 % (decimal "3" ... "255") in stages. The minimum brightness cannot be undershot in any switched-on operating state of the dimming channel. An undershot is only possible by switching off.

The brightness of the controlled lamps can be adapted individually – even to the brightness sensitivity of the human eye - by using the minimum brightness.

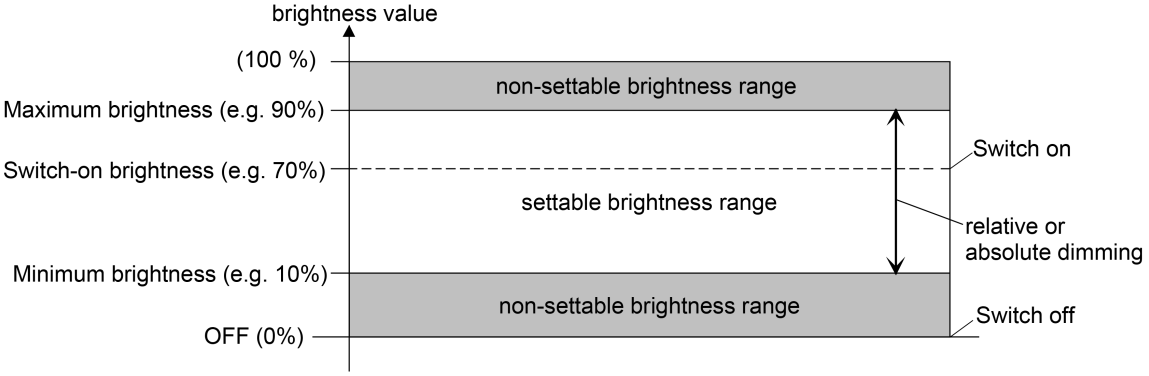


Image 11: Example of a brightness range

Setting the minimum brightness

The minimum brightness can be set separately for each dimming channel.

ℹ The ETS does not check all configured brightness values of a channel during the editing of the minimum brightness (e.g. switch-on brightness, scene values)! If values that are smaller than the configured minimum brightness are predefined by the ETS configuration, the actuator sets the minimum brightness as brightness value later during operation. The same holds true if the actuator receives values via the brightness object during operation, which undershoots the minimum brightness.

Setting the maximum brightness

The maximum brightness can be set separately for each dimming channel.

ℹ The ETS does not check all configured brightness values of a channel during the editing of the maximum brightness (e.g. switch-on brightness, scene values)! If values that are greater than the configured maximum brightness are predefined by the ETS configuration, the actuator sets the maximum brightness as brightness value later during operation. The same holds true if the actuator receives values via the brightness object during operation, which exceed the maximum brightness.

10.5.1 Brightness range parameter

Dimming channel ... -> DO... - General -> Brightness range

Minimum brightness	**1 %** 5 % 10 % ... 100 %
The brightness set here is not undershot in any switched-on operating state.	

Maximum brightness	1 % 5 % 10 % ... **100 %**
The brightness set here is not undershot in any switched-on operating state.	

10.6 Switching / dimming behaviour

Switch-on brightness

The switch-on brightness can be set separately for each dimming channel. The set brightness is set after receipt of an ON telegram via the "Switching" communication object. Alternatively, the "Memory value (brightness before last switch-off)" can be set.

ℹ After ETS programming, the memory value is predefined to maximum brightness. A voltage failure does not delete the memory value.

ℹ If the configured switch-on brightness is greater than the configured maximum brightness, the actuator sets the maximum brightness as the new brightness value for the dimming channel concerned when switching on (minimum brightness < switch-on brightness < maximum brightness).

ℹ A memory value is also saved internally by a switch-off telegram if the bus-controlled switch-off is overridden, for example, by a disabling function. In this case, the internally tracked brightness value is saved as memory value.

ℹ If no soft ON function is activated, the brightness value is jumped to when switching on. Once a soft ON function is activated, the switch-on brightness is dimmed according to the dimming speed for the soft ON function.

Behaviour when receiving a brightness value

The dimming behaviour for the absolute dimming can be set separately in the ETS for each dimming channel via the "Brightness value" object.

ℹ Brightness values can also be set by a disabling function. Absolute dimming can also be activated, even in case of voltage failure, after voltage recovery or after ETS programming, by specifying brightness values. In the case of absolute dimming functions, the brightness values are always instantly jumped to. During a scene recall, the dimming behaviour can be configured separately.

Dimming up in the switched-off state

A relative dimming process can be triggered by the 4-bit "Dimming" communication object. The data format of the "dimming" object complies with the KNX standard DPT "3.007", which means that the dimming direction and relative dimming increments can be predefined in the dimming telegram or dimming procedures can also be stopped. A relative dimming process is executed via the object until the configured basic minimum or maximum brightness of the dimming channel is set, the dimming value reaches the dimming increment predefined in the telegram or a stop telegram is received. A relative dimming process allows a brightness value to be changed constantly and always starts from the brightness that is set stationary or dynamically at the time of the incoming dimming telegram.

A relative dimming telegram can also switch on a dimming channel if this is in the "OFF" state. In some applications, it may be necessary, however, for a switched off dimming channel to remain off until a relative dimming telegram is received. This is interesting when using light scenes, for instance: Several dimming channels are set to a defined brightness value via a light scene. Other channels are switched off by the scene. Only the brightness of channels not switched off by the scene recall should be changed by dimming up afterwards. Here, it is necessary for dimming channels not to react to a relative dimming operation and thus not to switch on.

The parameter "With relative dimming up in the switched-off state" defines whether or not a dimming channel in the "OFF" state reacts to a relative dimming telegram.

10.6.1 Switching/dimming behaviour parameters

Dimming channel ... -> DO... - General -> Switching/dimming behaviour

Switch-on brightness	1% 5% 10% ... **100%** Memory value (brightness before last switch-off)
This parameter specifies the brightness value which should be set whenever switching on via the "Switching" object on the dimming channel. The switch-on brightness must always be between the upper and lower brightness limit value of the dimming range. In the "Memory value" setting, the active and internally saved brightness value prior to switching off last time is set when switching on (via the "switching" object).	

On receipt of a brightness value	jumping to **dimming to** fading
A parameter is used here to define whether a brightness value received via the bus is instantly jumped to (absolute dimming), or whether the brightness is dimmed to via the set dimming characteristic. Fading is also possible as an alternative. When fading, the received brightness value is reached in the exact configured fading time irrespective of the dimming characteristic and irrespective of which brightness value the dimming procedure was started at. Thus, for example, several dimming outputs can be set to the same brightness at the same time.	

Time for brightness value via fading	0 ... 20 ... 240 s
The fading time is set here if fading is predefined in the dimming behaviour. A dimming procedure via fading lasts for the exact configured time. If "0" is set, the brightness value is jumped to directly.	

With relative dimming up in the switched-off state	**switch ON channel** no reaction
This parameter defines whether or not a dimming channel in the "OFF" state reacts to a relative dimming telegram. Switch on channel: The dimming channel always reacts to a relative dimming telegram and executes a dimming process. In the "OFF" state, the channel switches on with a "dim up" telegram. No reaction: The dimming channel only reacts to a relative dimming telegram when it is switched on. In the "OFF" state, the channel ignores a "dim up" telegram.	

10.7 Times

Time for flashing of the disabling function

A disabling function can be activated separately for each channel as an additional function . With this disabling function it is possible to have the output flash at the start or end of disabling. The time for flashing is set collectively for all channels.

10.7.1 General times parameter

Dimming channels -> DO - General -> Times

Time for flashing of the disabling function	**1 s**, 2 s, 5 s, 10 s
At the start and end of the "disable" supplementary function, a dimming channel can flash. The flash cycle time is generally set here for all dimming channels concerned.	

10.8 Reset and initialisation behaviour

Response after a device reset

The switching states or brightness values of the dimming channels after voltage failure, after voltage recovery or ETS programming can be set separately.

Presetting the behaviour after ETS programming

The parameter "After ETS programming" exists separately for each dimming channel. This parameter can be used to configure the brightness behaviour of a channel, irrespective of the behaviour after voltage recovery.

ℹ The brightness value after ETS programming must be within the limits of the brightness range.

ℹ The behaviour after ETS programming will be executed after every ETS application or parameter download. A simple download of the physical address alone or partial programming of only the group addresses has the effect that this parameter is disregarded and that the configured "Behaviour after mains voltage return" will be executed instead.

ℹ The actuator briefly initialises after each ETS programming operation. Dimming channels calibrate themselves to the load. The calibration procedure becomes noticeable during ohmic loads by a brief flicker and lasts up to 10 seconds depending on the network conditions.

ℹ A switching state and brightness value set after an ETS programming cycle is added to the feedback objects. Actively transmitting feedback objects only transmit after an ETS programming operation when the initialisation is complete and, if applicable, the "delay after voltage recovery" has elapsed.

ℹ In the "no reaction" setting: After the programming operation, a brief switch-off occurs during the initialisation phase of the actuator. Afterwards, the brightness value that was active before is then reset again.

ℹ After an ETS programming operation, the disabling functions are always deactivated. The brightness values saved in case of the voltage failure are deleted.

Response to voltage failure

The dimming channel is switched off in the event of a voltage failure.

ℹ Active disabling functions are deleted by a voltage failure and remain inactive until they are reactivated.

ℹ In the event of a voltage failure, the current brightness values of all dimming channels are permanently stored internally so that these brightness values can be set again after voltage recovery. The data is only stored if the supply 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 (brightness value = "0").

Set the behaviour after voltage recovery

The parameter "Behaviour after voltage recovery" exists separately for each dimming channel.

i The brightness value after voltage recovery must be within the limits of the brightness range.

i Setting "Brightness before voltage failure": An ETS programming operation of the application or the parameter resets the stored switching state to "Off - 0".

i A switching state and brightness value set after voltage recovery is tracked in the feedback objects. Actively transmitting feedback objects only transmit after voltage recovery when the initialisation of the actuator is complete and, if applicable, the "delay after voltage recovery" has elapsed.

i In the case of disabling function: Active disabling functions are always inactive after voltage recovery.

10.8.1 Reset and initialisation behaviour parameter

Dimming channel ... -> DO... - General -> Reset behaviour

After ETS programming operation	brightness value switch off **no reaction** as with voltage return
The actuator permits setting the brightness value separately for each dimming channel after programming with the ETS. Brightness value: The channel restores the brightness value defined with the following parameter. Switch-off: After an ETS programming operation, the channel is switched off. No reaction: After an ETS programming operation, the actuator retains the current brightness value. As after voltage return: After an ETS programming operation, the actuator will behave in the manner specified in the parameter "After voltage return".	

brightness value	1% 5% 10% ... **100%**
This parameter defines the brightness value to be set after an ETS programming operation. The value must always be between the upper and lower brightness limit value of the dimming range.	

On voltage failure	**switch off**
In case of voltage failure, the channel is switched off.	

After voltage return	brightness value switch off **Brightness before voltage failure** no reaction activating staircase function

The actuator allows the brightness value to be set separately for each dimming channel after voltage return.

Brightness value: The channel restores the brightness value defined with the following parameter.

Switch-off: The channel is switched off after voltage return.

Brightness before voltage failure: After voltage return, the actuator restores the brightness value last stored in case of voltage failure.

No reaction: In case of voltage failure, the actuator retains the current brightness value.

Activate staircase function: The staircase function is – irrespective of the "Switching" object - activated after voltage return. This setting is only available when the staircase function is enabled.

brightness value	1% 5% 10% ... **100%**

This parameter defines the brightness value to be set after voltage return. The value must always be between the upper and lower brightness limit value of the dimming range.

10.9 Channel-oriented feedback

The actuator can track the current switching state and brightness value of a dimming channel via separate feedback objects and can also transmit them to the bus, if the bus voltage is on. The following feedback objects can be enabled independently of each other for each channel:

– Feedback switching status (1 bit)
– Feedback brightness value (1 byte)

The actuator calculates the object value of the feedback objects during each switching or dimming procedure. The actuator tracks the switching state or brightness value and updates the feedback objects even when the dimming channel is activated via the scene function.

10.9.1 Switching status feedback

The switching status feedback object is updated internally after the following events ...

– Immediately after switching on a dimming channel (if necessary, first after a switch-on delay has elapsed and at the beginning of a soft ON dimming procedure / also after a staircase function).
– After switching off a dimming channel (if necessary, first after a run-on-time has elapsed and at the end of a soft OFF dimming procedure / also after a staircase function).
– Immediately after switching off by means of the automatic switch-off function.
– At the beginning of a dimming procedure when dimming on (relatively high dimming or brightness value = 1…100 %) a dimming channel.
– At the end of a dimming procedure when dimming off (brightness value = 0 %) a dimming channel.
– Only when the switching state changes (therefore not for dimming procedures that do not change the switching state e.g. from 10 % to 50 % brightness).
– During updating of the switching state from "ON" to "ON" when the dimming channel is already switched on.
– During updating of the switching state from "OFF" to "OFF" when the dimming channel is already switched off.
– Always at the start or end of a disabling function (only if the switching state changes as a result).
– Always on voltage recovery, voltage failure ("OFF") or at the end of ETS programming (if necessary, also delayed and after calibrating the load).

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.

Feedback takes place via the "Switching feedback" object.

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.

Setting switching status feedback on mains voltage return or after programming with the ETS

If used as active signalling object, the switching status feedback is transmitted to the KNX after voltage recovery or after ETS programming.

The feedback telegram can be transmitted with a time delay (parameter "Delay after voltage return"). The delay is collectively preset globally for all outputs.

ℹ No feedback is transmitted during a running time delay.

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.

10.9.2 Brightness value feedback

The brightness value feedback object is updated internally after the following events:

- At the end of a relative (4-bit) or absolute (1-byte) dimming procedure.
- After switching on a dimming channel, if the switch-on brightness is set (if necessary, first after a switch-on delay has elapsed and at the end of a soft ON dimming procedure / also after a staircase function).
- After switching off a dimming channel (if necessary, first after a run-on-time has elapsed and at the end of a soft OFF dimming procedure / also after a staircase function).
- Immediately after switching off by means of the automatic switch-off function.
- Only if the brightness value changes (if a brightness value specification undershoots the minimum brightness as a result of relative or absolute dimming from outside or exceeds the maximum brightness, the actuator does not update a brightness value feedback according to the minimum brightness or maximum brightness).
- Always at the start or end of a disabling function (only if the brightness value changes as a result).
- Always on voltage recovery, voltage failure ("0") or at the end of ETS programming (if necessary, also delayed and after calibrating the load).

ℹ In the case of the disabling function: A "flashing" dimming channel is always reported back as "switched on" and with switch-on brightness. Switching status feedbacks are also transmitted for disabled channels.

Activate brightness value feedback

The brightness value feedback can be used as an active message object or as a passive status object. As an active signalling object, the brightness value feedback is also directly transmitted to the KNX for each update of the feedback value. 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.

Feedback takes place via the "Brightness value feedback" object.

Setting the update of the "Brightness value feedback"

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

Setting feedback for voltage return or ETS programming

If used as active signalling object, the brightness value feedback states are transmitted to the KNX after voltage return or after ETS programming.

The feedback telegram can be transmitted with a time delay (parameter "Delay after voltage return"). The delay is collectively preset globally for all outputs.

ℹ No feedback is transmitted during a running time delay.

Setting cyclical transmission of the brightness value feedback

The brightness value feedback telegrams can, if active, also be transmitted cyclically, in addition to transmission after updating.

10.9.3 Feedback telegrams parameter

Dimming channel ... -> DO... - General -> Enabled functions

Feedback	Active **Inactive**
This parameter can be used to disable or to enable the feedback functions.	

Dimming channel ... -> DO... - General -> Feedback telegrams

switching status	**no feedback** feedback is active signalling object feedback is passive status object
The current switching state of the dimming output can be reported separately back to the KNX. No feedback: The switching status feedback of the affected dimming channel is deactivated. Feedback is active signalling object: A switching status is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after mains voltage return or after programming with the ETS. Feedback is passive status object: A switching status will be transmitted in response only if the feedback object is read out by the KNX. No automatic telegram transmission of the feedback takes place after voltage return or after ETS programming.	

Updating of the object value	after each update object "Switching" **only if the feedback value changes**
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. after each update object "Switching": The actuator updates the feedback value in the object once a new telegram is received on the input objects "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.	

<table>
<tr><td>Delay after voltage return</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">The states of the switching status feedback can be transmitted to the KNX with a delay after mains voltage return or after an ETS programming operation. The activated parameter causes a delay on mains voltage return. The delay time is configured on the parameter page "General".</td></tr>
</table>

<table>
<tr><td>Cyclical transmission</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">The switching status feedback telegrams can, if actively transmitting, also be transmitted cyclically, in addition to the transmission after updating.
Parameter activated: Cyclical transmission is activated.
Parameter deactivated: Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.</td></tr>
</table>

<table>
<tr><td>brightness value</td><td>no feedback
feedback is active signalling object
feedback is passive status object</td></tr>
<tr><td colspan="2">The current brightness value of the dimming output can be reported back separately to the KNX.
No feedback: The brightness value feedback of the affected dimming channel is deactivated.
Feedback is active signalling object: The brightness value is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after mains voltage return or after programming with the ETS.
Feedback is passive status object: The brightness value will be transmitted in response only if the feedback object is read out by the KNX. No automatic telegram transmission of the feedback takes place after voltage return or after ETS programming.</td></tr>
</table>

Updating of the object value	after each update obj. "Brightness value" **only if the feedback value changes**

Here, you can specify when the actuator should update the feedback value for the switching status (object "Brightness value feedback") in case of an actively transmitting communication object. The object value updated by the actuator is then signalled actively to the KNX.

after each update "Brightness value" object: The actuator updates the feedback value in the object once a new telegram is received on the "Brightness value" input objects or once the value changes internally (e.g. due to a dimming 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 brightness value feedback is also generated on the "brightness value" 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 brightness value 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 "Brightness value" object with the same telegram value), the actuator does not transmit any feedback. Consequently, with an actively transmitting feedback object, no telegram with the same content will be transmitted repeatedly either.

Delay after voltage return	Active **Inactive**

The states of the brightness value feedback can be transmitted to the KNX with a delay after voltage return or after an ETS programming operation. The activated parameter causes a delay on mains voltage return. The delay time is configured on the parameter page "General".

Cyclical transmission	Active **Inactive**

The brightness value feedback telegrams can, if active, also be transmitted cyclically, in addition to transmission after updating.

Parameter activated: Cyclical transmission is activated.

Parameter deactivated: Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.

Time for cyclical transmission	**0**...23 h | 0 ... **2** ... 59 min | **0** ... 59 s

These parameters define the time for cyclic transmission of switching status feedback and brightness value feedback.

10.9.4 Feedback object list

Object no.	Function	Name	Type	DPT	Flag
480, 510	Switching feedback	Dimming channel ... (...) - Output	1-bit	1,001	C, R, -, T, A
1-bit object for feedback signalling of the switching state ("1" = on / "0" = off) to the bus.					

Object no.	Function	Name	Type	DPT	Flag
484, 514	Feedback brightness value	Dimming channel ... (...) - Output	1 bytes	5,001	C, R, -, T, A
1-byte object for feedback signalling of an absolute dimming value (brightness value 0…255) to the bus.					

10.10 Time delays

Up to two time functions can be preset for each dimming output, independently of each other. The time functions affect the communication objects "Switching" and delay the object value received depending on the telegram polarity .

ℹ At the end of a disabling function, the switching state received during the function or set before the function can be tracked. At the same time, residual times of time functions are also tracked if these had not yet fully elapsed at the time of the reactivation.

ℹ The time delays do not influence the staircase function if this is enabled.

ℹ A time delay still in progress will be fully aborted by a reset of the actuator (power failure or ETS programming).

Activating switch-on delay

The switch-on delay can be activated separately in the ETS for each dimming output.

After reception of an ON telegram via the "switching" object, the configurable time is started. Another ON-telegram triggers the time only when the parameter "Switch-on delay retriggerable" is activated. An OFF-telegram received during the 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 dimming output.

After reception of an OFF-telegram via the "switching" object, the configurable time is started. Another OFF-telegram triggers the time only when the parameter "switch-off delay retriggerable" is activated. An ON-telegram received during the OFF-delay will end the delay and sets the switching status to "ON".

10.10.1 Time delays parameters

Dimming channel ... -> DO... - General -> Enabled functions

<table>
<tr><td>Time delays</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">This parameter can be used to disable or to enable the time delays.</td></tr>
</table>

Dimming channel ... -> DO... - General -> Time delays

<table>
<tr><td>Selection of time delay</td><td>no time delay
Switch-on delay
Switch-off delay
ON delay and OFF delay</td></tr>
<tr><td colspan="2">The communication objects "Switching" can be evaluated after a time delay. By this setting the desired function of the time delay is selected and the additional parameters of the delay enabled.</td></tr>
</table>

<table>
<tr><td>Switch-on delay</td><td>0…59 min | 0...10…59</td></tr>
<tr><td colspan="2">This parameter is used for setting the duration of the switch-on delay.</td></tr>
</table>

<table>
<tr><td>Switch-on delay retriggerable</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">A switch-on delay still in progress can be retriggered by another "ON" telegram (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed.</td></tr>
</table>

<table>
<tr><td>Switch-off delay</td><td>0…59 min | 0...10…59</td></tr>
<tr><td colspan="2">This parameter is used for setting the duration of the switch-off delay.</td></tr>
</table>

<table>
<tr><td>Switch-off delay retriggerable</td><td>Checkbox (yes / no)</td></tr>
<tr><td colspan="2">A switch-off delay still in progress can be retriggered (parameter activated) by another "OFF" telegram. Alternatively, the retriggering time (parameter deactivated) can be suppressed.</td></tr>
</table>

10.11 Switch-on/switch-off behaviour

10.11.1 Soft ON/OFF function

The soft functions permit a dimming channel to be switched on or off at reduced speed when a switching command is received via the "Switching" communication object.

If the soft ON function is activated, a dimming procedure is executed until the switch-on brightness when switching on. This also occurs if the dimming channel is already switched on to a brightness value smaller than switch-on brightness. Likewise, with the soft OFF function, a dimming procedure is executed to 0 % brightness after receipt of an OFF telegram (see figure 12).

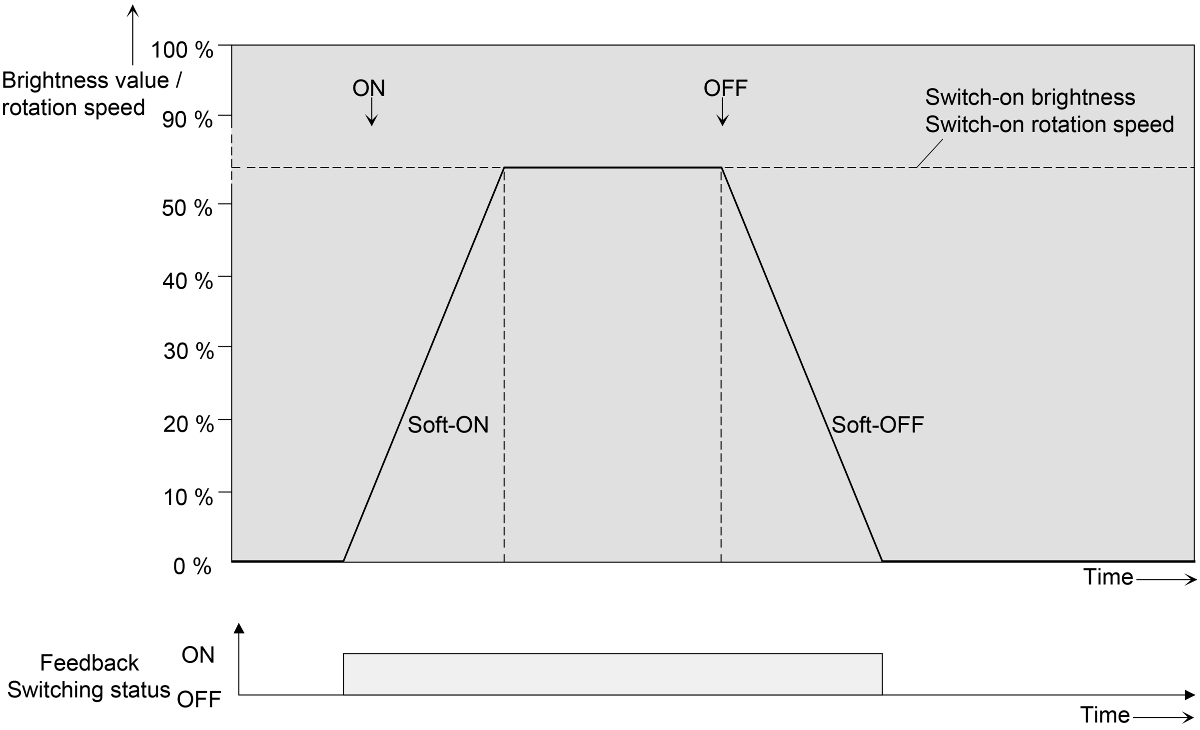


Image 12: Dimming behaviour of the soft ON/OFF functions (as an example)

The dimming speeds can be configured separately in the ETS for the soft ON and soft OFF function. The relative dimming increment time between 2 of 255 dimming increments is configured directly.

The soft ON or soft OFF functions are not retriggerable by the receipt of further switching telegrams while maintaining the switching status. The soft functions can be activated and configured separately in the ETS.

The soft functions also have effects on the switching edges of the staircase function.

ℹ A dimming channel disabled via the bus can also flash for the disabling function depending on the ETS configuration. Dimming is not executed with the soft functions during ON and OFF flashing.

10.11.2 Automatic switch-off

The switch-off function permits automatic switching of a dimming channel after a brightness value was dimmed or jumped to and this new brightness value is below a switch-off brightness set in the ETS. A time delay can be configured optionally up to switching off.

The switch-off function is activated after reaching a constant brightness value, i.e. after a completed dimming procedure.

The automatic switch-off function, for example, not only makes it possible to set the lighting to minimum brightness but to switch off by means of relative dimming as well. A further application, for example, is time-controlled "Good night switch-off" of a dimmed children's room lighting.

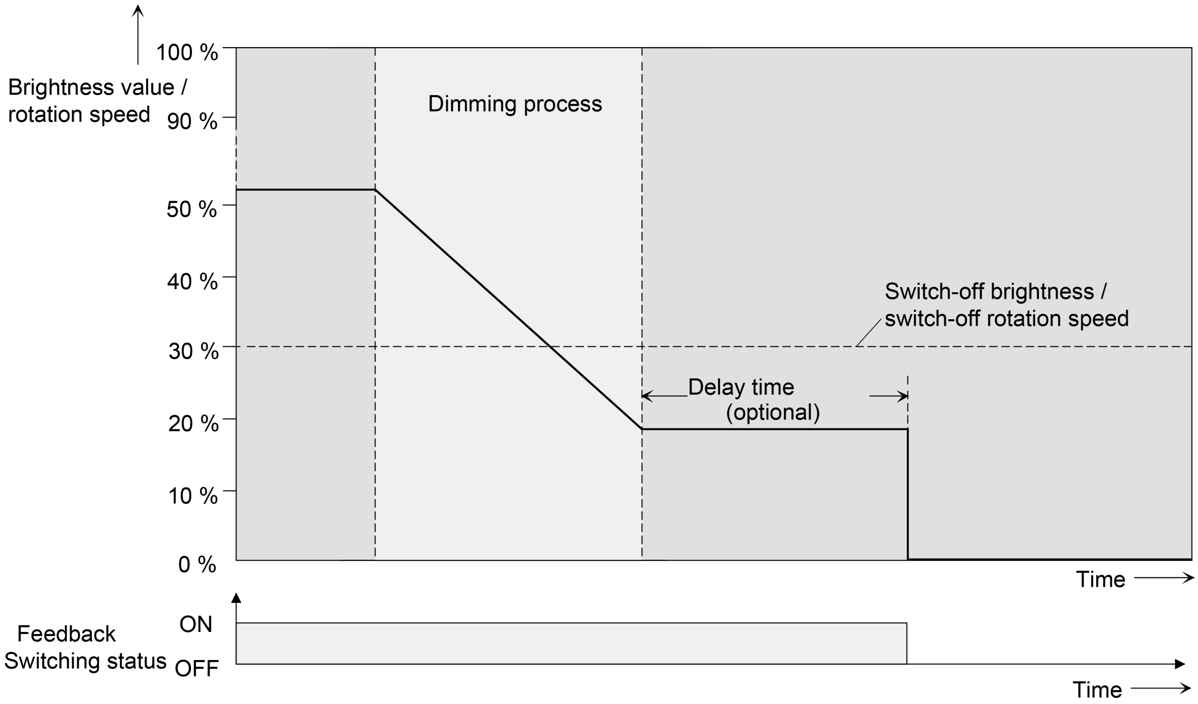


Image 13: Dimming and switching behaviour of the automatic switch-off function

- Switching off always takes place without soft OFF function.
- The switch-off brightness in the dimmable brightness range can be set between minimum and maximum brightness. The switch-off function is always active if the switch-off brightness is configured to maximum brightness and the maximum brightness is randomly undershot.
- The feedback objects for switching state and brightness value are updated by the automatic switch-off function after switching off.

The automatic switch-off can firstly be activated by a dimming procedure initiated via the 4-bit ("dimming") or 1-byte ("brightness value") communication object. Furthermore, the automatic switch-off can also be activated if a dimming channel is switched on (switch-on brightness < switch-off brightness) or a brightness is set by ETS programming or by a voltage recovery. The automatic switch-on can also be activated during a scene recall.

It should be noted that the disabling function overrides the switch-off function (Figure 20). If the switch-off function is overridden, the actuator terminates the evaluation of the switch-off brightness.

Setting the switch-off brightness

The switch-off brightness must be defined for the switch-off function. The switch-off brightness is set separately for each dimming channel in the ETS.

Once a dimming procedure causes a value to fall below the parameterized switch-off brightness and once the brightness has been set to constant, the dimming channel concerned switches off or alternatively starts the delay until switching off.

ℹ It should be noted that the configured value for the switch-off brightness is greater than any configured minimum brightness and less than the set maximum brightness (minimum brightness < switch-off brightness < maximum brightness)!

ℹ Using the staircase function with pre-warning/continuous lighting: The reduced brightness of the pre-warning or continuous lighting does not start the switch-off function after reaching or undershooting the switch-off brightness!

Setting the delay of the switch-off function

A delay can be activated before the switch-off function switches-off automatically after undershooting the switch-off brightness at the end of a dimming procedure. The time for the delay can optionally be enabled separately for each dimming channel.

Once a dimming procedure causes a value to fall below the parameterized switch-off brightness and once the brightness has been set to constant, the actuator triggers the delay time. The dimming channel concerned switches off for good once the delay time has elapsed. The delay time can be re-triggered by further dimming procedures.

10.11.3 Switch-on/switch-off behaviour parameter

Dimming channel ... -> DO... - General -> Enabled functions

Switch-on/switch-off behaviour	Active **Inactive**
Setting the switch-on/switch-off behaviour can be disabled and enabled here.	

Dimming channel ... -> DO... - General -> Switch-on/switch-off behaviour

Soft ON function	Active **Inactive**
The soft ON function permits the dimming channel to be switched on more slowly. If this function is activated, a dimming operation to the switch-on brightness is executed after receiving a switch-on telegram via the "Switching" object.	

Time between two dimming increments	**0**… 59 s | **10**… 990 ms
These parameters set the soft ON function for the dimming increment time.	

Soft OFF function	Active **Inactive**
The soft OFF function permits the dimming channel to be switched off more slowly. If this function is activated, a dimming operation to the brightness "0%" is executed after receiving a switch-off telegram via the "Switching" object.	

Time between two dimming increments	**0**… 59 s | **10**… 990 ms
These parameters set the soft OFF function for the dimming increment time.	

Automatic switch-off	Active **Inactive**
The automatic switch-off function of the dimming channel can be activated here. If this function is activated, the connect load will switch off completely when a configurable brightness is undershot at the end of a dimming procedure, and if necessary, after a delay time has elapsed.	

Switch-off if brightness value smaller than	**5%**, 10% ... 100%
This parameter defines the brightness, which, if undershot, will cause the dimming channel to be switched off at the end of a dimming procedure, or if necessary, after a delay time has elapsed. This parameter is only visible if the switch-off function is activated.	

Delay until switch-off	Active **Inactive**
The delay for the automatic switch-off function of the dimming channel can be activated here. If activated, the delay time can be set.	

Delay time	**0**… 23 h | **0**…59 min | 0...**30**…59
This parameter sets the delay time of the switch-off function. If the switch-off brightness is undershot at the end of a dimming procedure, the dimming channel is switched off after the time set here has elapsed.	

10.12 Scene function

Up to 16 scenes can be programmed and scene values stored separately for each dimming channel. The scene values are recalled or stored via a separate scene extension object. The data point type of the extension object permits addressing of all 16 scenes.

The number of scenes can either be selected arbitrarily in the range of 1 to 16 or fixed to 16.

With the variable setting (1...16 scenes), the scene number (1...64) for the control can be flexibly set.

With the fixed setting (16 scenes), the scene number (1...16) is permanently assigned to the scene. If necessary, individual scenes can be deactivated.

The scene function can be combined together with other functions, whereby the last received or preset state is always executed.

ℹ Telegrams to the "switching", "dimming" or "brightness value" objects, a scene recall or scene storage telegram at the time of an active staircase function aborts the staircase time prematurely and presets the lighting according to the received object value (time delays are also taken into account) or scene value.

ℹ The state of the dimming channel, which was preset by the "Switching", "Dimming" or "Brightness value" objects or by a scene recall, can be overridden by a staircase function.

Presetting a scene recall delay

Each scene recall can optionally also be delayed. With this feature, dynamic scene sequences can be configured if several scene outputs are combined with cyclical scene telegrams.

The delay only influences the scene recall of the dimming channel. The delay time is started on arrival of a recall telegram. The corresponding scene will be recalled and the brightness value set on the dimming channel 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 behaviour during ETS programming

During storage of a scene, the brightness values are permanently stored internally in the device. To prevent the stored values from being replaced during ETS programming of the application or of the parameters by the originally configured scene values, the actuator can inhibit overwriting of the brightness values. As an alternative, the original values can be reloaded into the device during each programming run of the ETS.

With the setting "Overwrite values stored in the device during ETS programming = Active", the scene brightness values parameterised in the ETS are programmed into the actuator when programming the application program. Scene values stored in the device by means of a storage function will be overwritten, if any.

With the setting "Overwrite values stored in the device during ETS programming = Inactive", any scene values stored in the device by a memory function are retained. If no scene values have been stored, the brightness values last programmed in the ETS remain valid.

ℹ When the actuator is commissioned for the first time, this parameter should be activated so that valid values are initialised.

Setting scene numbers and scene switching states

The presetting of the scene number depends on the selected scene configuration. With variable configuration the scene number (1...64) with which the scene is addressed, i.e. recalled or stored, must be determined for each scene. With a fixed scene configuration, the number of a scene is preset invariably. A scene can be addressed with the scene number.

The data point type of the scene extension object permits addressing of up to 16 scenes max.

In addition to specifying the scene number, it is necessary to define which scene command (brightness value) should be set on the dimming channel during a scene recall.

ℹ If with variable scene configuration the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.

ℹ For a variable configuration, a scene is deactivated by the set scene number "0". Then neither recalling nor storage is possible.

ℹ For the fixed configuration, only activated scenes can be used. A deactivated scene cannot be recalled or stored via the scene extension.

During a scene recall, the parameterized brightness value is recalled and set on the dimming channel.

ℹ The configured value is adopted in the actuator during ETS programming only if the parameter "Overwrite values stored in the device during ETS download" is activated.

Presetting storage behaviour

The scene function includes a memory function. The brightness value currently set in the dimming channel can be stored internally when a scene storage telegram is received via the extension object.

If the memory function is activated, the current brightness value is stored internally when a storage telegram is received via the "Scene extension" object.

ℹ If the memory function is deactivated, a received storage telegram is discarded via the "Scene extension" object.

10.12.1 Scene function parameters

Dimming channel ... -> DO... - General -> Enabled functions

Scene function	Active **Inactive**
This parameter can be used disable or to enable the scene function.	

Dimming channel ... -> DO... - General: -> Scenes

Delay scene recall	Active **Inactive**
A scene is recalled via the scene extension object. If required, the scene recall can be delayed on reception of a recall telegram (parameter activated). The recall is alternatively made immediately on reception of the telegram (parameter deactivated)	

Delay time	**0**...59 min | 0...**10**...59 s
These parameters specify the duration of the scene delay time.	

On scene request	Jumping to brightness value **Dimming to brightness value via dimming increm. time** Dimming brightness value via fading
When recalling a scene, the configured or stored scene value is set for the dimming channel concerned. This parameter setting can define whether the brightness value can be instantly jumped to or dimmed to or is set via fading. When fading, the brightness value to be set is reached in the exact configured fading time irrespective of the dimming characteristic of a channel and irrespective of which brightness value the dimming procedure was started at. Thus, for example, several dimming channels can be set to the same brightness at the same time.	

Dimming increment time	0 ... **5**… 255 ms
Setting of the dimming increment time if the brightness value of a scene should be dimmed.	

Fading time	0 ... **2** ... 240 s
Setting of the fading time if the brightness value of a scene should be dimmed to via fading.	

Visual feedback for storage function	Active **Inactive**

Optionally, a visual feedback via the dimming output can be signaled when executing a storage command. The channel flashes once as feedback in the configured flashing time.

Parameter activated: When a storage function is executed, the visual feedback is activated immediately. The output switches to the opposite switching state for the duration of the configured flashing time and then back to the saved scene command.

Parameter deactivated: When storing a scene, the visual feedback is not executed. The actuator adopts the current state of the output without special feedback.

Flashing time	0...**5**...10 s

The flashing time in which the visual feedback is to be executed is set here.

Overwrite values stored in the device during the ETS programming operation	**Active** Inactive

During storage of a scene, the scene values (current states of the dimming outputs concerned) are stored internally in the device. To prevent the stored values from being replaced during ETS programming by the originally programmed scene values, the actuator can inhibit overwriting of the scene values (parameter deactivated). As an alternative, the original values can be reloaded into the device during each programming run of the ETS (parameter activated).

Scene configuration	**variable (1...16 scenes)** fixed (16 scenes)

The scene configuration selected here decides whether the number of scenes is either variable (1 ... 16) or alternatively fixed to the maximum (16).

variable (1...16 scenes): With this setting, the number of scenes used can be selected anywhere in the range 1 to 16. The parameter "Number of scenes" decides how many scenes are visible for the switching output in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene.

fixed (16 scenes): With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 16) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.

Number of scenes (1...16)	1...**10**...16

This parameter is only available with variable scene configuration and defines how many scenes are visible for the dimming channel in the ETS and can therefore be used.

<table>
<tr><td>Scene number</td><td>0...1*...64
*: The predefined scene number is dependent on the scene (1...64).</td></tr>
<tr><td colspan="2">With variable scene configuration, the number of scenes used can be selected anywhere in the range 1 to 16. It is then possible to preset which scene number (1 ... 64) controls each scene.
A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible. If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.</td></tr>
</table>

<table>
<tr><td>Scene active</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">With a fixed scene configuration, individual scenes can be activated or deactivated. Only activated scenes can be used. A deactivated scene cannot be recalled or stored via the scene extension.</td></tr>
</table>

<table>
<tr><td>brightness value</td><td>switch off
1 %
5 %
...
100 %</td></tr>
<tr><td colspan="2">This parameter is used for configuring the value which is set when the scene is recalled.</td></tr>
</table>

<table>
<tr><td>Memory function</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">If the parameter is activated, the storage function of the scene is enabled. The current switching state can then be stored internally via the extension object on receipt of a storage telegram. If the parameter is deactivated, the storage telegrams are rejected.</td></tr>
</table>

10.12.2 Object list scene function

Object no.	Function	Name	Type	DPT	Flag
485, 515	Scene extension	Dimming channel ... - Input	1 bytes	18,001	C, -,W, -, U
1-byte object for polling or saving a scene.					

10.13 Staircase function

The staircase function can be used for implementing time-controlled lighting of a staircase or for function-related applications.

The staircase function is activated via the communication object "staircase function start / stop" and is independent of the "switching" object of a dimming channel. 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.

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. As an alternative to the pre-warning at the end of the staircase time, the actuator can activate reduced continuous lighting. In this way, for example, long, dark hallways can have permanent basic lighting.

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 parameters"Staircase time". In addition, a switch-on delay (T_{Delay}) can be activated (see "presetting switch-on delay of the staircase function"). At the end of the staircase time, the output switches off or activates optionally the pre-warning time ($T_{Prewarn}$) of the pre-warning function (see "presetting pre-warning function of the staircase function"). Taking into account any possible switch-on delay and pre-warning function, this gives rise to the switch-on behaviour of the staircase function as shown in the following diagram.

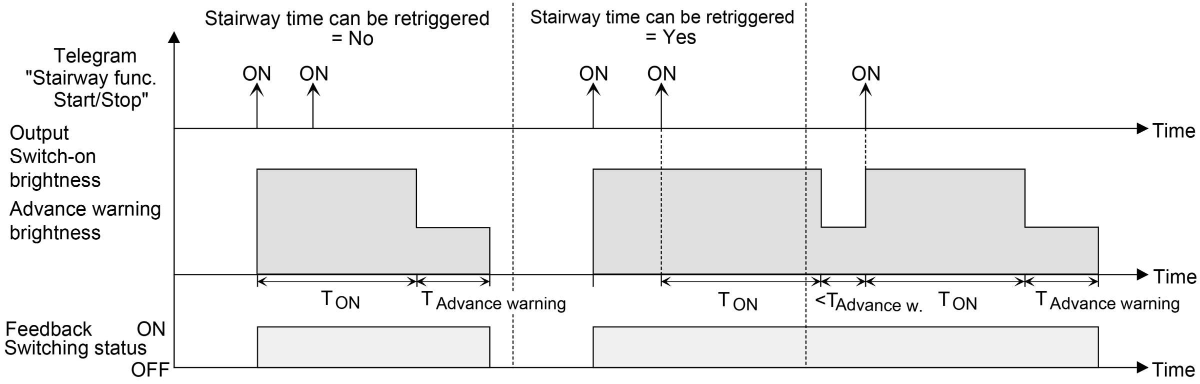


Image 14: Switch-on behaviour of the staircase function without soft functions

In addition, switching on can be influenced by the soft functions of the actuator. Taking into account any soft ON and soft OFF function, this gives rise to a modified switch-on behaviour of the staircase function.

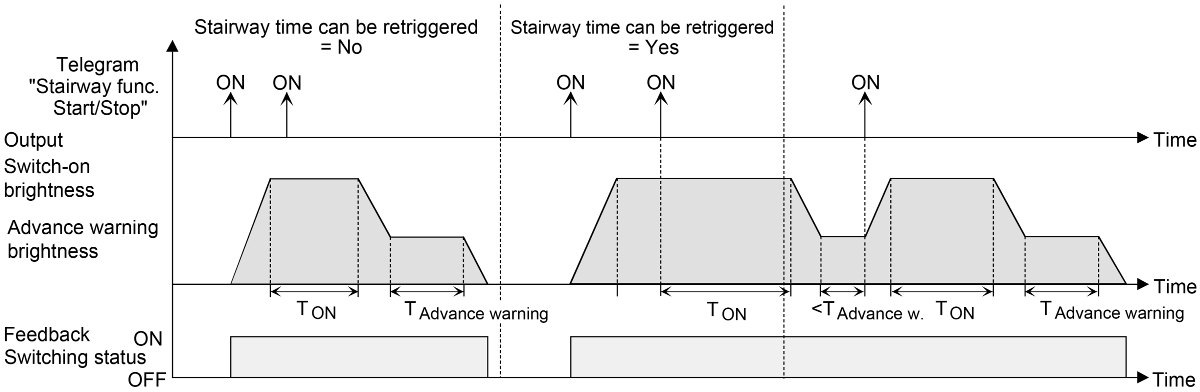


Image 15: Switch-on behaviour of the staircase function with soft functions (as an example with minimum brightness = 0 %)

The parameter "Staircase time retriggerable" specifies whether the staircase time can be retriggered.

An ON telegram received during the pre-warning time always retriggers the staircase time independently of the parameter "Staircase time retriggerable".

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". At the end of the staircase time, a dimming channel always shows the reaction "At the end of the staircase time" configured in the ETS, without the receipt of an OFF telegram. At the same time, the channel can switch off, optionally activate the pre-warning time (TVorwarn) of the pre-warning function or dim to the reduced continuous lighting (application: e.g. long, dark hallways). If, on the other hand, the dimming channel receives an OFF telegram via the object "Staircase function start/stop", the actuator evaluates the parameter "Reaction to an OFF-telegram". In this case, the channel can react immediately to the OFF telegram and end the staircase time prematurely. Alternatively, the OFF telegram can be ignored. Taking into account any possible pre-warning function, this gives rise to the example switch-off behaviour of the staircase function.

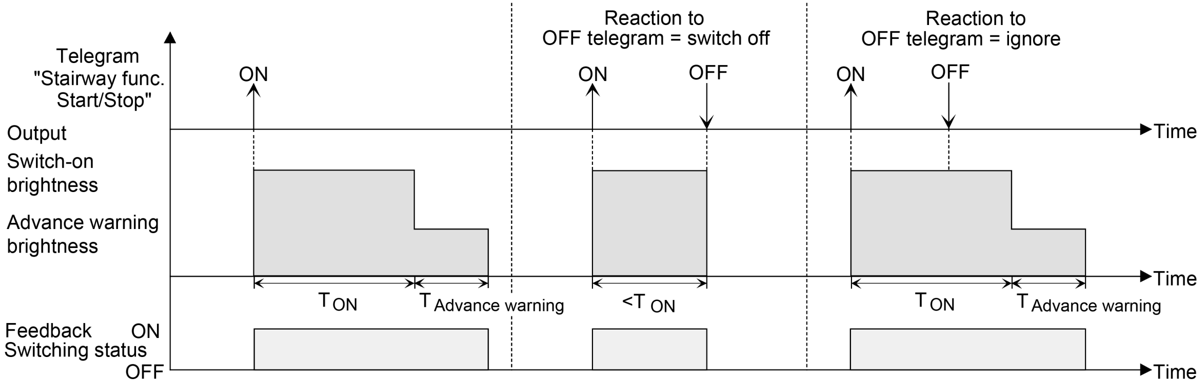


Image 16: Switch-off behaviour of the staircase function without soft functions

In addition, the switch-off can be influenced by the soft functions of the actuator. Taking into account any soft ON and soft OFF function, this gives rise to a modified switch-off behaviour of the staircase function.

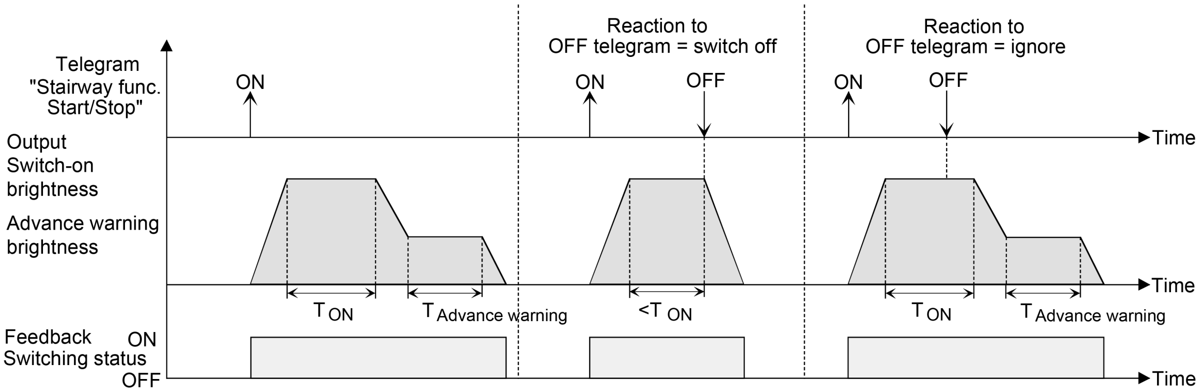


Image 17: Switch-off behaviour of the staircase function with soft functions (as an example with minimum brightness = 0 %)

The parameter "reaction to OFF-telegram" defines whether the staircase time (T_{ON}) of the staircase function can be aborted prematurely.

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".

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.

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. As a pre-warning, a dimming channel can be set to a pre-warning brightness before the channel switches off permanently. The pre-warning brightness is normally reduced in the brightness value compared to the switch-on brightness. The pre-warning time is added to the staircase time (T_{ON}). The pre-warning time influences the value of the feedback object so that the value "OFF" (in the case of non-inverted transmission) is first tracked after the pre-warning time in the object has elapsed.

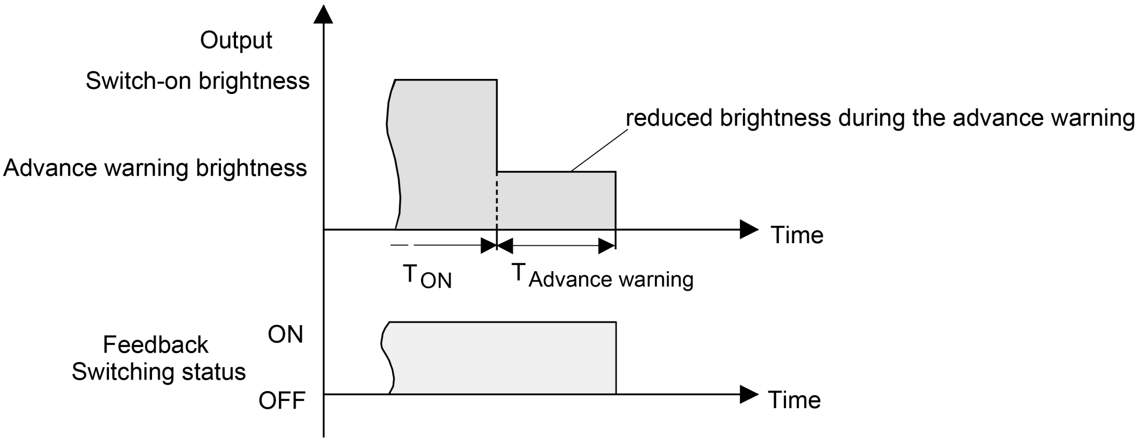


Image 18: The pre-warning function of the staircase function without soft OFF function

Additionally, the pre-warning function can also be extended by the soft OFF function. Taking into account any soft OFF function, this gives rise to a modified switch-off behaviour of the staircase function after the pre-warning has elapsed.

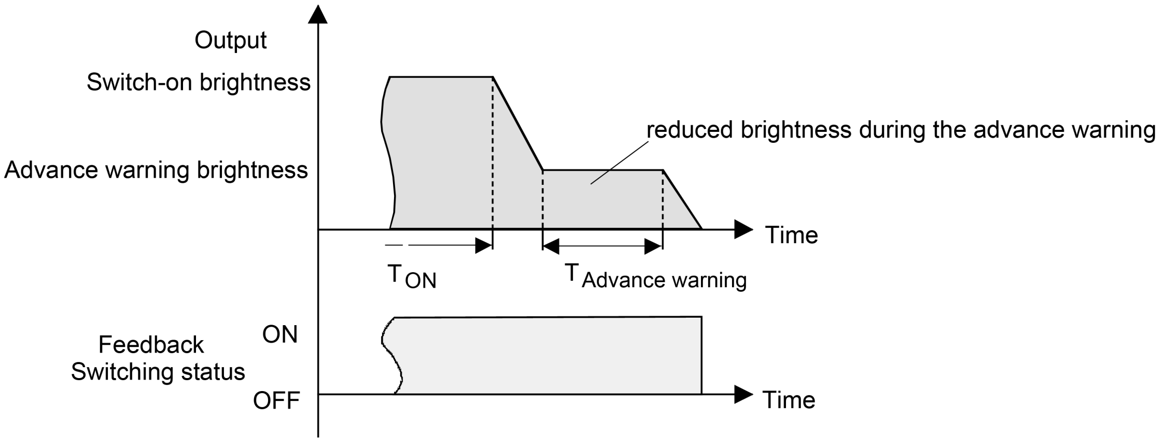


Image 19: The pre-warning function of the staircase function with soft OFF function (as an example with minimum brightness = 0%)

ℹ The configured value for the reduced brightness must be greater than or equal to the minimum brightness (if configured) or less than or equal to the maximum brightness!

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.

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 starts (independently of the parameter "Staircase time retriggerable ?") the staircase time anew. 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.

ℹ Using the automatic switch-off function: The reduced brightness of the pre-warning does not start the switch-off function after reaching or undershooting the switch-off brightness!

Setting continuous lighting of the staircase function

At the end of the switch-on time of the staircase function, the actuator for the dimming channel concerned shows the "reaction at the end of the staircase time" configured in the ETS. The channel can be set to switch off immediately, alternatively to execute a pre-warning function, or to dim to reduced continuous lighting. The reduction of the lighting to continuous lighting after the staircase time has elapsed is appropriate, for example, if a certain degree of artificial light should be switched on permanently in long, dark hallways. Switching to switch-on brightness by activating the staircase function normally takes place by additional presence detectors or motion detectors when people are present in the hallway.

If the parameter "Reaction at the end of the staircase time" is configured to "activate reduced continuous lighting", the brightness for the continuous lighting can be configured in the ETS. The continuous brightness is normally reduced in the brightness value compared to the switch-on brightness.

The continuous lighting remains permanently active after the staircase time has elapsed. Only when an ON telegram is received again via the object "Staircase function start/stop" does the actuator switch back to the switch-on brightness and start counting the staircase time again. The receipt of an OFF telegram via the object "staircase function start/stop" only switches the continuous lighting off if the parameter "Reaction to OFF-telegram" is configured to "switch off".

ℹ A dimming channel can always be switched on and off via the "switching" object independently of the staircase function. Consequently, continuous lighting will also be overridden if telegrams arrive on the actuator via the "switching" object. If permanent continuous lighting is desired, which cannot be influenced by the "switching" object nor by the object of the staircase function, the disabling function of the actuator should be used.

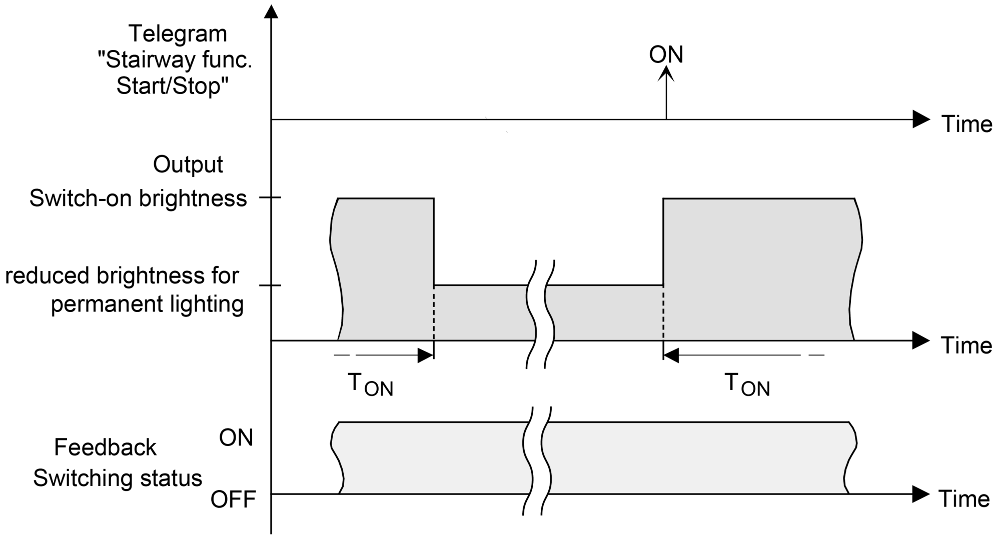


Image 20: The continuous lighting of the staircase function without soft functions

Additionally, the continuous lighting can also be extended by the soft function. Taking into account any soft ON and soft OFF function, this gives rise to modified continuous lighting behaviour of the staircase function.

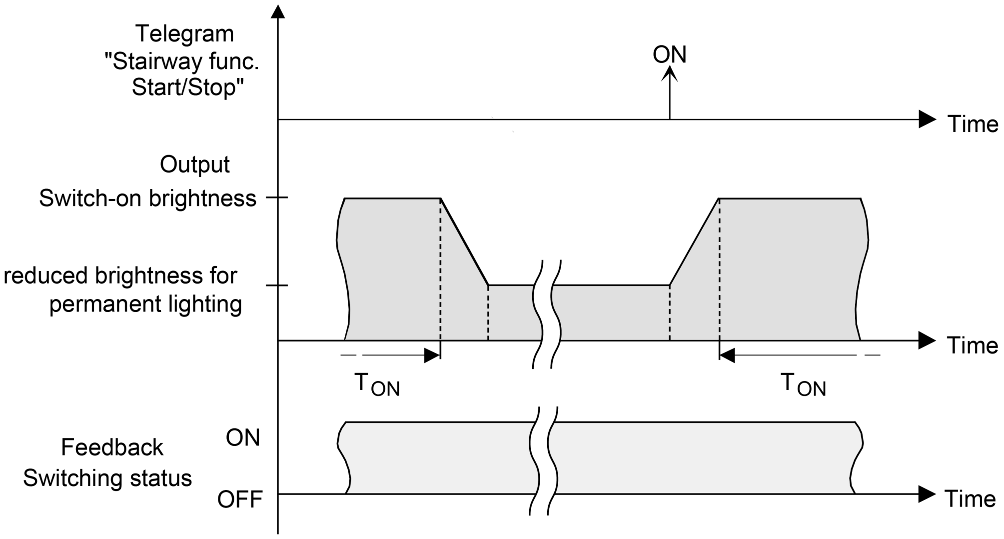


Image 21: The continuous lighting of the staircase function with soft OFF functions

ℹ The brightness of the continuous lighting does not necessarily have to be less than the switch-on brightness. The brightness of the continuous lighting can always be configured to values between basic/minimum brightness and maximum brightness.

Precondition:
The staircase function must be enabled on the parameter page "Dimming channel ... -> DO... - General -> Enabled functions".

- on the parameter page "Dimming channel ... -> DO... - General -> Staircase function", set the parameter "At end of the staircase time" to "Activate reduced continuous lighting".

  The continuous lighting is enabled. The "Reduced brightness" can be set to the desired brightness value.

ℹ The configured value for the reduced brightness must be greater than or equal to the minimum brightness (if configured) or less than or equal to the maximum brightness!

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 activated continuous lighting, the parameter "Reaction to OFF telegram" is evaluated so that continuous lighting can be switched off.

ℹ Using the automatic switch-off function: The reduced brightness of the continuous lighting does not start the switch-off function after reaching or undershooting the switch-off brightness!

Setting the behaviour of the staircase function after mains voltage return

The staircase function can optionally be started automatically after mains voltage return.

As soon as the staircase function is activated on the parameter page "Switching output... -> SO... General -> Enabled", on the parameter page "Switching output... -> SO... - General" the parameter "After voltage recovery" can be set to "Activate staircase function".

ℹ During automatic starting of the staircase function after mains voltage return, no switch-on delay is started if the staircase function has configured such a delay.

ℹ The configured behaviour "on voltage recovery" is only executed when the voltage is switched on if the last ETS programming operation of the application or of the parameters ended at least approx. 20 s prior to switching on the voltage. Otherwise (T_{ETS} < 20 s) the behaviour "after ETS programming" will be executed also in case of voltage recovery.

10.13.1 Staircase function parameters

Dimming channel ... -> DO... - General -> Enabled functions

Staircase function	Active **Inactive**
This parameter can be used to disable or to enable the staircase function.	

Dimming channel ... -> DO... - General -> Staircase function

Staircase time	**0**...23 h | 0...**3**...59 min | **0**...59 s
This parameter is used for programming the duration of the switch-on time for a scene recall.	

Staircase time retriggerable	Active **Inactive**
An active switch-on time can be retriggered (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed.	

Switch-on delay	Active **Inactive**
The staircase function enables the activation of an own switch-on delay. This switch-on delay affects the trigger result of the staircase function and thus delays the switch-on. activated: The switch-on delay for the staircase function is enabled. After 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 activated. The staircase time is activated and the output is switched on only after the time delay has elapsed. deactivated: The switch-on delay is deactivated. 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	**0**...23 h | 0...**3**...59 min | **0**...59 s
This parameter is used for setting the duration of the switch-on delay. Sets the switch-on delay hours.	

Switch-on delay retriggerable	Active **Inactive**
An active switch-on delay can be retriggered (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed.	

Reaction to OFF-telegram	**switch off** ignore
An active switch-on time can be aborted prematurely by switching off the staircase function. switch off: The switch-on time is aborted after receipt of an OFF telegram on the object "Staircase time start/stop". With the supplementary function "time preset via the bus" and the setting "Staircase function activatable via object 'Staircase time' = activated" the switch-on time can also be prematurely ended by a factor of "0". ignore: OFF Telegrams or "0" factors are ignored. The switch-on time will be executed completely to the end.	

At the end of the staircase time	**switch off** activate pre-warning time activate reduced continuous lighting
At the end of the staircase time, the actuator for the dimming channel concerned displays the configured behaviour here. The output can be set to switch off immediately or alternatively to execute a pre-warning function. switch off: At the end of the staircase time, the actuator switches off the dimming channel concerned. Activate pre-warning time: At the end of the staircase time, the dimming channel can generate a pre-warning prior to switch-off. The pre-warning, for example, should warn any person still on the staircase that the light will soon be switched off. Activate reduced continuous lighting: At the end of the switch-on time, the actuator activates reduced continuous lighting for the dimming channel concerned. The reduction of the lighting to continuous lighting is appropriate, for example, if a certain degree of artificial light should be switched on permanently in long, dark hallways. Switching to switch-on brightness by activating the staircase function normally takes place by additional presence detectors or motion detectors when people are present in the hallway. The continuous lighting remains permanently active after the switch-on time has elapsed. Only when an ON telegram is received again via the object "Staircase function start/stop" does the actuator switch back to the switch-on brightness and start counting the switch-on time again.	

Pre-warning time	**0**...59 min | 0...**30**...59 s
This parameter is used for setting the duration of the pre-warning time. The pre-warning time is added to the switch-on time.	

Reduced brightness	1 % 5 % ... **50 %** ... 100 %
This parameter defines the reduced brightness that is set either for pre-warning or continuous lighting.	

10.13.2 Object list staircase function

Object no.	Function	Name	Type	DPT	Flag
489, 519	Staircase function start/stop	Dimming channel ... - Input	1-bit	1,010	C, -,W, -, U
1-bit object to activate or deactivate the switch-on time of the staircase function of a dimming output ("1" = switch-on / "0" = switch-off).					

10.14 disabling function

During an active disabling function, the KNX control of the dimming function concerned is overridden and locked. Continuous light switching, for example, can also be overridden.

The required behaviour at the "start of the disabling function" and at the "end of the disabling function" must be set in the parameters.

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.

ℹ After a power 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 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.

10.14.1 Parameter disabling function

Dimming channel ... -> DO... - General -> Enabled functions

disabling function	Active **Inactive**
The disabling function can be disabled or enabled at this point.	

Dimming channel ... -> DO... - General -> Disabling function

Acknowledgment	Active **Inactive**
The deactivation of the disabling function can optionally take place using an additional 1-bit acknowledgement object. This prevents the deactivation of the disabling function by the disabling object. Alternatively, the acknowledgement object is not available. In this case, disabling is deactivated via the disabling object. Parameter activated: The acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an "ON telegram". Telegrams to the disabling object according to the "Deactivate disabling" polarity are ignored by the actuator. Parameter deactivated: No additional acknowledgement object is available. The disabling function is deactivated by the disabling object according to the set polarity.	

Polarity of the disabling object	**0 = enabled; 1 = disabled** 1 = disabled; 0 = enabled
This parameter defines the polarity of the disabling object.	

Beginning of the disabling function	**switch off** brightness value Memory value (brightn. bef. switch. off last time) no reaction flashing
The behaviour of the dimming output at the beginning of the disabling function can be configured. Switch off: At the start of the disabling function, the dimming output is switched off and locked. Brightness value: At the start of the disabling function, the dimming channel is set to the predefined brightness value and locked. Memory value: At the start of the disabling function, the active and internally saved value prior to the last switch-off is set (via the "Switching" object). No reaction: At the start of a disabling function, the dimming channel shows no reaction and remains in the currently set state. Control of the dimming channel is then locked. Switch on: At the start of the disabling function, the dimming channel is switched on and locked. Flashing: The dimming channel flashes on and off during the disabling function and the control is locked during this time. The flashing time is configured generally for all channels on the parameter page "DA - general". During the flashing, the logical switching state is "on 1" and the switch-on brightness is signalled back as brightness. A soft ON/OFF function is ignored during flashing.	

brightness value	1 % 5 % 10 % ... **100 %**
At this point, the brightness value at the beginning of the disabling function is configured. The brightness at the beginning of the disabling function must always be within the limits of the brightness range.	

End of the disabling function	switch off brightness value Memory value (brightn. bef. switch. off last time) **tracked brightness value** no reaction flashing

The behaviour of the dimming output at the end of the disabling function can be configured.

Switch off: At the end of the disabling function, the dimming output is switched off and enabled again.

Brightness value: At the end of the disabling function, the dimming channel is set to the predefined brightness value and enabled again.

Memory value: At the end of disabling, the active and internally stored brightness value prior to the last switch-off is set (via the "Switching" object).

tracked brightness value: At the end of the disabling function, the state received during the disabling function or the state set before the disabling function is tracked with the appropriate brightness value. Any time functions still in progress will also be taken into account if necessary.

No reaction: At the end of a disabling function, the dimming channel shows no reaction and remains in the currently set state. Control of the dimming channel is enabled again.

Flashing: The dimming channel is enabled again for operation after the end of the disabling function and flashes on and off. The flashing time is configured generally for all channels on the parameter page "DA - general". During the flashing, the logical switching state is "on 1" and the switch-on brightness is signalled back as brightness. A soft ON/OFF function is ignored during flashing. The flashing status remains active until another bus command is received and specifies another status.

End of the disabling function after acknowledgement	switch off brightness value Memory value (brightn. bef. switch. off last time) **tracked brightness value** no reaction flashing

The behaviour of the dimming output at the end of the disabling function after successful confirmation can be configured.

Switch off: On confirmation, the dimming output is switched off and enabled again.

Brightness value: On confirmation, the dimming channel is set to the predefined brightness value and enabled again.

Memory value: On confirmation, the active and internally stored brightness value prior to the last switch-off is set (via the "Switching" object).

tracked brightness value: On confirmation, the state received during the disabling function or the state set before the disabling function is tracked with the appropriate brightness value. Any time functions still in progress will also be taken into account if necessary.

No reaction: On confirmation, the dimming channel shows no reaction and remains in the currently set state. Control of the dimming channel is enabled again.

Flashing: The dimming channel is enabled again for operation on confirmation and flashes on and off. The flashing time is configured generally for all channels on the parameter page "General". During the flashing, the logical switching state is "on 1" and the switch-on brightness is signalled back as brightness. A soft ON/OFF function is ignored during flashing. The flashing status remains active until another bus command is received and specifies another status.

brightness value	1 % 5 % 10 % ... **100 %**

At this point, the brightness value at the end of the disabling function is configured. The brightness at the end of the disabling function must always be within the limits of the brightness range.

10.14.2 Object list disabling function

Object no.	Function	Name	Type	DPT	Flag
487, 517	Disabling	Dimming channel ... - Input	1-bit	1,003	C, -,W, -, U
1-bit object for disabling a dimming channel (polarity configurable).					

Object no.	Function	Name	Type	DPT	Flag
495, 525	Disabling acknowledgment	Dimming channel ... - Input	1-bit	1,016	C, -,W, -, U
1-bit object to confirm an active disabling function of a dimming channel. This object is only visible if the acknowledgement is to be used with the disabling function ("1" = Disabling function is deactivated / "0" = disabling function remains active).					

11 "DALI" insert function

11.1 Channel configuration

The device allows the switching and dimming of a maximum of 18 lights with a DALI operating device (e.g. electronic ballast).

All the connected DALI components are controlled centrally (broadcast). This means that there is no need for DALI commissioning, meaning that lighting systems can be commissioned quickly and easily.

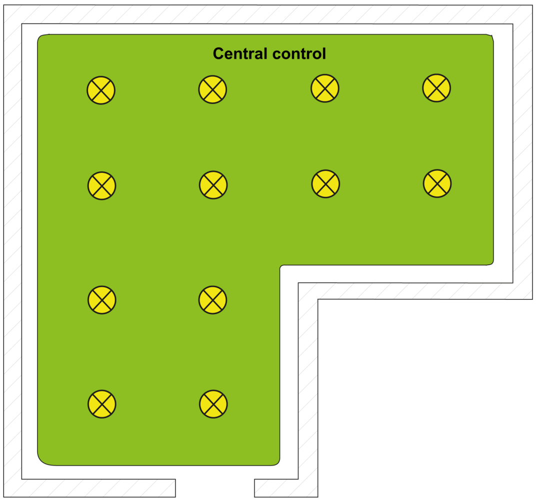


Image 22: Example of a master control (broadcast)

11.1.1 Channel configuration object list

Object no.	Function	Name	Type	DPT	Flag
479	Switching	Dali channel ... (...) - Input	1-bit	1,001	C, -,W, -, U
1-bit object for switching the Dali channel on or off ("1" = switch on / "0" = switch off).					

Object no.	Function	Name	Type	DPT	Flag
480	Switching feedback	Dali channel ... (...) - Output	1-bit	1,001	C, R, -, T, A
1-bit object for feedback signalling of the switching state ("1" = on / "0" = off) to the bus.					

Object no.	Function	Name	Type	DPT	Flag
482	Dimming	Dali channel ... (...) - Input	4-bit	3,007	C, -,W, -, U
4-bit object for relative dimming of the Dali channel brightness.					

Object no.	Function	Name	Type	DPT	Flag
483	brightness value	Dali channel ... (...) - Input	1 bytes	5,001	C, -,W, -, U
1-byte object for predefining an absolute dimming value (brightness value 0…255) from the bus.					

Object no.	Function	Name	Type	DPT	Flag
484	Feedback brightness value	Dali channel ... (...) - Output	1 bytes	5,001	C, R, -, T, A
1-bit object for feedback signalling of an absolute dimming value (brightness value 0…255) to the bus.					

Object no.	Function	Name	Type	DPT	Flag
499	Relative colour temperature	Dali channel ... (...) - Input	4-bit	3,007	C, -,W, -, U
4-bit object for relative dimming of the Dali channel colour temperature.					

Object no.	Function	Name	Type	DPT	Flag
500	Absolute colour temperature	Dali channel ... (...) - Input	2 bytes	7,600	C, -,W, -, U
2-byte object for presetting an absolute colour temperature value within the limits of the minimum and maximum colour temperature (configurable) of the bus.					

Object no.	Function	Name	Type	DPT	Flag
501	Relative dimming (brightness value and colour temperature)	Dali channel ... (...) - Input	3 bytes	250,600	C, -,W, -, U
3-byte object for relative dimming of the brightness and colour temperature of the Dali channel in a datapoint.					

Object no.	Function	Name	Type	DPT	Flag
502	Relative dimming (brightness value and colour temperature)	Dali channel ... (...) - Input	6 bytes	249,600	C, -,W, -, U
6-byte object for predefining the absolute dimming value (brightness value 0...255) and the absolute colour temperature value in a datapoint from the bus.					

Object no.	Function	Name	Type	DPT	Flag
503	Feedback colour temperature	Dali channel ... (...) - Output	2 bytes	7,600	C, R, -, T, A
2-byte object for feedback signalling of a set colour temperature to the bus.					

Object no.	Function	Name	Type	DPT	Flag
504	Feedback colour temperature invalid	Dali channel ... (...) - Output	1-bit	1,001	C, R, -, T, A

1-bit object for feedback signalling of an invalidly set colour temperature ("1" = colour temperature invalid, "0" = colour temperature valid) via the object "Absolute colour temperature (K)". A colour temperature set externally is invalid if this violates the set limits of the minimum and maximum colour temperature. After a device reset (ETS programming operation, mains voltage return), the status "valid colour temperature" is always transmitted if an object is actively transmitting.

11.2 General settings

11.2.1 Reset behaviour

Delay after voltage return

To reduce telegram traffic after switch-on of the supply voltage 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 time can be defined (parameter "Delay after voltage recovery" on the parameter page "Dali channel -> DA - General"). Only after the configured time elapses are feedback telegrams for initialisation transmitted to the KNX.
Which of the telegrams is actually delayed can be set for the output and each status function separately.

ℹ The delay has no effect on the behaviour of the output. Only the bus telegrams for status or feedback are delayed. The output can also be activated during the delay after voltage recovery.

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

11.2.1.1 Reset behaviour parameters

Dali channel -> DO - General -> Times

Delay after voltage return	**0** ... 59 min | 0 ... **17** ... 59 s
To reduce telegram traffic after switch-on of the supply voltage or after an ETS programming operation, it is possible to delay all active feedback telegrams of the actuator. The parameter specifies in this case a delay time. Only after the time configured here has elapsed are feedback telegrams for initialisation transmitted to the bus.	

11.2.2 Name of the Dali channel

An optional name can be assigned for the Dali output. The name should clarify the use of the output (e.g. "living room wall lamp", "bathroom ceiling lamp"). The name is only used in the ETS in the text of the parameter pages and communication objects.

11.2.2.1 Name of the dimming channel parameters

Dali channel ... -> DO... - General

Name of the Dali channel	Free text
The text entered in this parameter is applied to the name of the communication objects and is used to label the Dali output in the ETS parameter window (e.g. "living room wall lamp", "bathroom ceiling lamp"). The text is not programmed in the device.	

11.3 Dimming characteristic

The human eye is adapted to natural daylight. As a result, it works in a very wide range of brightness from twilight in the early morning and late evening to bright daylight at noon. In the lower brightness area the eye is clearly more sensitive than in the upper area.

When dimming simple lamps, the electrical power is uniformly converted into a luminous flux that is emitted into the surrounding room. This luminous flux results in illuminance that can be measured with a luxmeter. If the lamp emits 50% of its maximum luminous flux, it already appears as intense brightness to the eye. When the luminous flux of the lamp rises to 75%, illuminance increases by the same amount. However, the eye perceives this change much weaker.

When different current lamp types are dimmed, luminous flux and subjective perceptions of brightness can vary considerably. For this reason, the Dali actuator offers several options for adjusting the dimming characteristics as required.

- If the lighting is regularly controlled via percentage presetting of the dimming value, the suitability of the dimming characteristic in the value range should be checked as a priority.
- If the lighting is dimmed manually via the 4-bit object, the dimming characteristic can be adjusted in the time range.

Dimming characteristic curve in the value range

The device converts KNX brightness values to DALI brightness values according to DPT 5.001 and brightness values that were configured in the ETS. On the DALI page, the brightness commands are transmitted in an 8-bit data value to the DALI operating devices. This data value according to IEC 62386-102 is referred to as "Arc Power Level (APL)" in the DALI specification. The ideally dimmable brightness range on the DALI page is represented in the data value by the decimal values 1...254. The value "0" is interpreted by the operating devices as "OFF". A value "255" means "no change of brightness" ("MASK").

The DALI specification also describes a logarithmic dimming characteristic. This characteristic determines how the 8-bit data value is converted by operating devices (e.g. electronic ballast for fluorescent lamps or LED drivers) to an equivalent luminous flux at the physical output via the connected luminaire. The luminous flux (physical unit "Lumen [lm]") is a measure for the light output emitted by a luminaire.
The dimming characteristic of the operating devices represents logarithmically the 8-bit data values transmitted on the DALI page to the luminous flux in the range 1...254. This range then corresponds to a physical light output of 0.1 %...100 %.

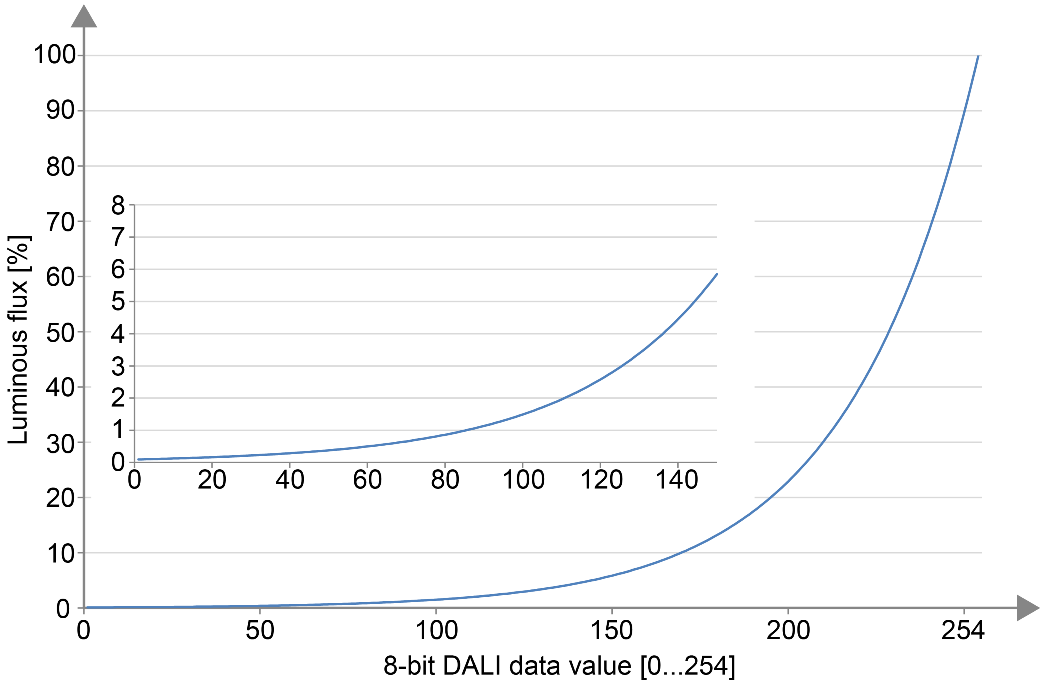


Image 23: Logarithmic dimming curve in DALI operating devices
(relative luminous flux [%] depending on the 8-bit DALI data value [0...254])

The logarithmic representation of the dimming values in the characteristic is used to adapt the emitted luminous flux to the subjective brightness sensitivity of the human eye. The human eye already perceives a far greater brightness at a luminous flux of 50 % (the luminaire emits half of its light output into the surrounding space). Brightness changes in the upper physically possible dimming range (> 50 % luminous flux) are hardly perceived anymore by the eye as a rule.
By using a logarithmic characteristic, the dimming range of the DALI data value is mapped in large parts on an area of the relative luminous flux where the human eye can optimally perceive brightness changes.

ℹ The actual dimmable brightness range by a DALI operating device does not always have to correspond to the maximum possible DALI dimming range (0.1 %...100 %). On a DALI operating device the least adjustable brightness is referred to as "Physical Minimum Level (PHM)". This lower brightness limit value is defined by the physical properties of the operating device or connected luminaire and is normally specified in the manufacturer's datasheet.
The lower physical brightness limit value of an assigned operating device is independent of the adjustable minimum brightness in the ETS. In the ETS, a lower minimum brightness (e.g. 0.1 %) can be set than an operating device can actually set as a minimum (e.g. 3 %). In such cases, the device dims to the configured minimum brightness via the DALI data value. The operating device or luminaire then already stops at the physical minimum, however. Ideally, the minimum brightness is configured to the physical minimum of the operating device.

ℹ A logarithmic dimming characteristic is standard in DALI operating devices and can normally be found in the delivery state. However, there are some operating devices, in which the characteristic curve can be adjusted - often by manufacturer-specific software tools. As a rule, it is possible to switch between a lin-

ear characteristic and a logarithmic characteristic.
Such operating devices must always be set to a logarithmic characteristic in conjunction with this device. Otherwise, the mechanism of the configurable characteristics is incorrect!

When dimming, the logarithmic characteristic curve provided for DALI is not ideal for every control task. For this reason, the device offers the possibility of influencing the DALI dimming characteristic without having to intervene in the operating devices. For this purpose, the parameter "Characteristic curve" is available on the parameter page "DALI channel 1 -> DA1 - General -> Dimming characteristic".

– Linear DALI dimming characteristic:
  In this setting, the device linearises the DALI dimming characteristic by converting all brightness values, which are received from the KNX and configured in the ETS, appropriately into DALI data values. Thus, the KNX brightness values form linearly on the luminous flux emitted by the DALI luminaire. The device itself does not dim linearly in this setting. A linear dimming sequence of the relative luminous flux first results at the physical output of an operating device through the combination of the non-linear conversion of the device and the logarithmic characteristic of the operating devices.
  Feedbacks of the brightness value to the KNX are also adjusted through conversion. On account of the internal calculation process, there may be slight deviations between the specified and fed back brightness value (e.g. specification = 50 % -> Feedback = 49 %).

  Example of brightness change:
  KNX brightness: 50 % -> DALI data value (APL): 229 -> Luminous flux: approx. 50 % -> The human eye already perceives an intensive brightness.
  KNX brightness: 75 % -> DALI data value (APL): 243 -> luminous flux: approx. 75 % -> The human eye hardly perceives the brightness difference between the previous dimming setting anymore. The dimming operation appears unsteady.

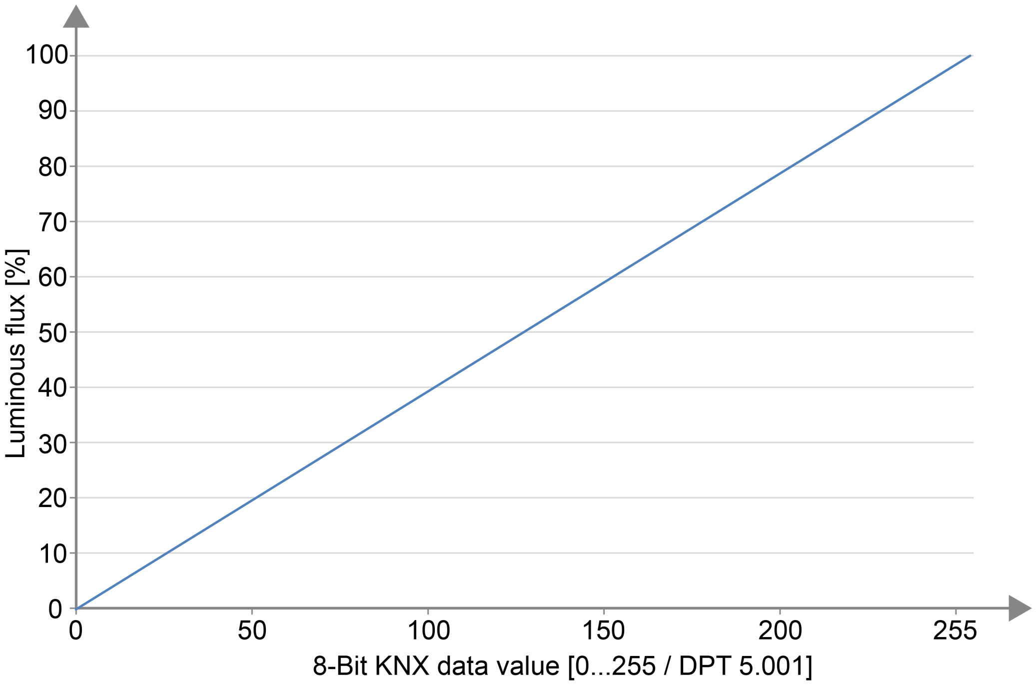


Image 24: Linear DALI dimming characteristic
(relative luminous flux [%] depending on the 8-bit KNX data value [0...255])

KNX brightness value	KNX brightness value [%]	DALI data value (APL)	Luminous flux [%]
0	0	0	0
1	0.4	27	0.2
10	4	136	4
50	20	194	19
80	32	212	32
100	40	220	40
125	50	228	49
150	60	235	60
175	70	240	68
200	80	245	78
225	90	249	87
255	100	254	100

Transmission of data values with a linear DALI dimming characteristic

i Advantages of a linear DALI dimming characteristic:
Adjustment to existing KNX actuators possible. KNX dimming actuators or 1-10-V control units normally form brightness values linearly in a physical output signal by the
"Scaling" (DPT 5.001 / 0...255 -> 0.4 %...100 %) defined according to the KNX specifica
. If a DALI system with such KNX actuators is combined in an installation, it is normally necessary to set a linear dimming characteristic in the DALI Gateway in order to adapt the dimming behaviour to the other actuators. Otherwise, the luminaires will dim to a different brightness with identical KNX data values.

A linear dimming characteristic also has a positive effect on a multichannel RGB colour control, especially during dynamic colour changes (e.g. control of 3 different DALI channels for RGB colour mixing). By converting the KNX data values to a linear luminous flux for each primary colour, colours can be mixed reliably in a wide spectrum by the luminaire.
In the case of operating devices that have a high physical minimum brightness (> 3 %) and thus a limited luminous flux range, a linear characteristic allows the possible KNX brightness range
(0.4 %...100 %) to be utilised usefully in the lower dimming range by the increased DALI data values.

ℹ Disadvantages of a linear DALI dimming characteristic:
Dimming operations are not adjusted to the brightness perception of the human eye. This means that the dimming behaviour for mere brightness control is perceived as uneven due to the logarithmic human perception.
High number of levels in the lower dimming range.

– Logarithmic DALI dimming characteristic:
With this setting, the device forwards KNX brightness values to the DALI page virtually unprocessed. Merely a smoothing of the data values in the lower dimming range takes place. A logarithmic dimming sequence of the relative luminous flux results at the physical output of an operating device through the combination of forwarding the value of the device and the logarithmic characteristic of the operating devices.

Example of brightness change:
KNX brightness: 50 % -> DALI data value (APL): 128 -> Luminous flux: approx. 3 % -> The human eye subjectively perceives about half of the luminaire brightness.
KNX brightness: 75 % -> DALI data value (APL): 191 -> Luminous flux: approx. 18 % -> The human eye clearly perceives a brightness difference between the previous dimming setting. The dimming operation is constantly effective.

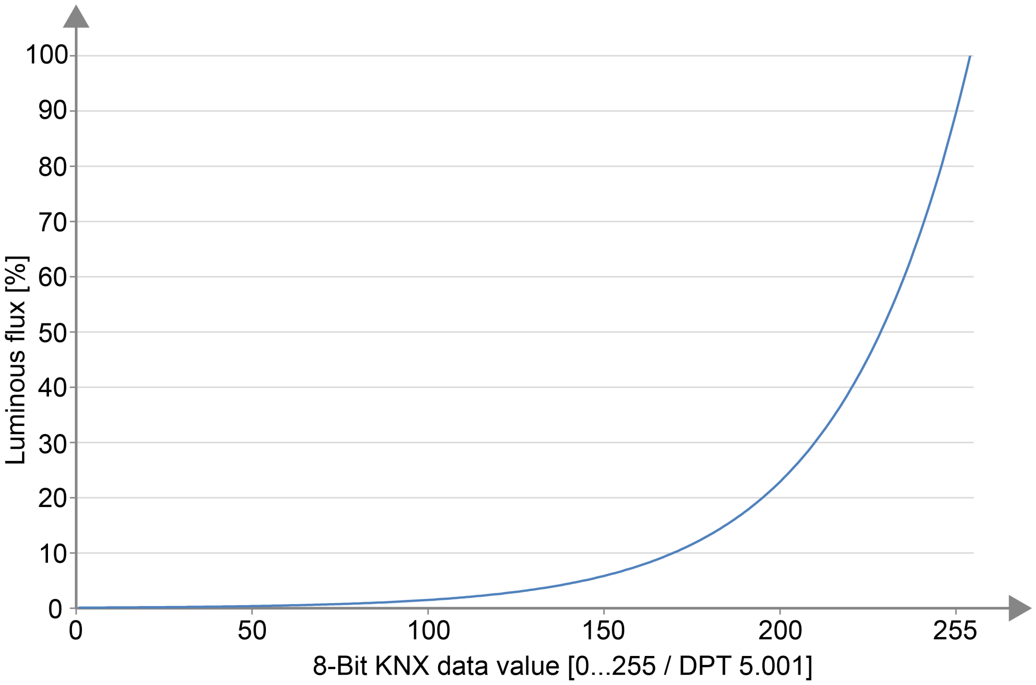


Image 25: Logarithmic DALI dimming characteristic
(relative luminous flux [%] depending on the 8-bit KNX data value [0...255])

KNX brightness value	KNX brightness value [%]	DALI data value (APL)	Luminous flux [%]
0	0	0	0
1	0.4	1	0.1
10	4	1	0.1
50	20	27	0.2
80	32	60	0.5
100	40	100	1.5
125	50	125	3
150	60	150	5.8
175	70	175	12
200	80	200	23
225	90	225	45
255	100	254	100

Transmission of data values with a logarithmic DALI dimming characteristic

i Advantages of a logarithmic DALI dimming characteristic:
Ideal for pure brightness controls. Adjustment to the brightness perception of the human eye. As a result, brightness changes are perceived evenly in the entire dimming range.
Fine number of levels in the lower dimming range.

i Disadvantages of a logarithmic DALI dimming characteristic:
Difficult adjustment up to no adjustment at all on other KNX actuators that only dim linearly. Poor sliding progression when mixing colours via separate DALI

channels.
In the case of operating devices that have a high physical minimum brightness (> 3 %) and thus a limited luminous flux range, the lower KNX dimming range (0.4 %...50 %) cannot be utilised.

Dimming characteristic curve in the time range

In the case of the Dali actuator, the technically dimmable brightness range (1 % ... 100 %) is subdivided into 255 dimming increments (8-bit brightness value: 1...255 / 0 = switched off).

The dimming times, each between 2 of the 255 dimming steps, are set to identical lengths by the "Time between two dimming steps" parameter. This results in a linear characteristic curve over the entire brightness range.

The dimmable brightness range is limited at the upper limit by the maximum brightness configured in the ETS. The lower limit is defined by the minimum brightness. The following diagrams illustrate the real dimming time of a dimming procedure.

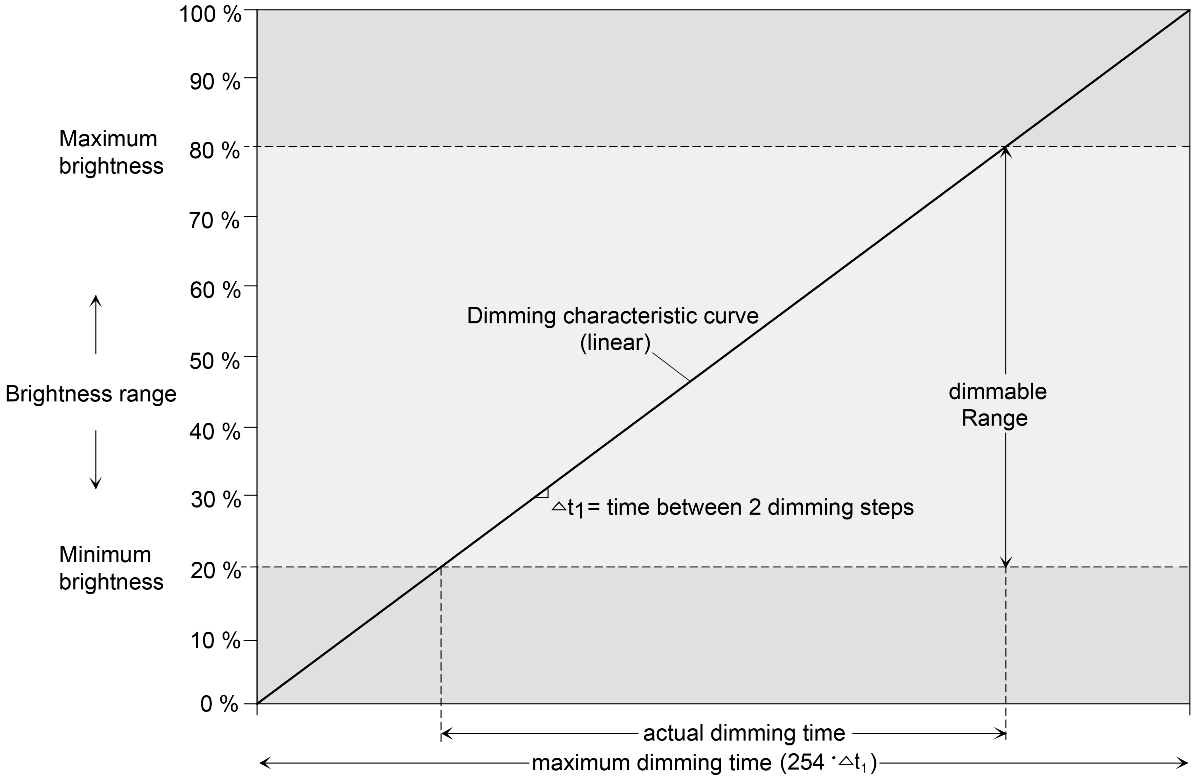


Image 26: Linear characteristic dimming curve as an example with minimum brightness > 0 % and maximum brightness

Setting the dimming characteristic in the time range

The parameter "Characteristic curve in the time range" on the parameter page "DA1 - General -> Dimming characteristic" is permanently set to "Linear function". In the time range, a linear dimming characteristic with a brightness range of 0 % to 100 % is set. This corresponds to 255 dimming steps. A time between two dimming steps can be configured in the ETS on the parameter page "DA1 - General".

ⓘ Total time of the dimming procedure = Time between two dimming increments x 255 (number of dimming increments)

ⓘ The dimming increment speed is identical for a relative dimming procedure or for the dimming of an absolute brightness value (not fading).

11.3.1 Parameter Dimming characteristic

Dali channel ... -> DO... - General -> Dimming characteristic

Characteristic curve in the time range	**linear function**
The brightness curve of minimum brightness (decimal brightness value "1") up to 100% (decimal brightness value "255") is linear.	

Characteristic curve in the value range	**linear function** logarithmic function
Setting the characteristic curve in the value range allows the 256 dimming steps possible on KNX to be adapted to the perception of the human eye. If this parameter is changed, the curve of the characteristic curve is shown in the diagram below. The selection of the characteristic curve depends on the connected lamp.	

11.4 Brightness range

Settable brightness range

The adjustable brightness range can be limited by defining a lower and upper brightness value. The "Minimum brightness" and "Maximum brightness" parameters define the brightness values that are not undercut or exceeded when a brightness value is set or during a dimming process. In this way, the brightness of the controlled lamps of the DALI operating devices can be adapted individually – even to the brightness sensitivity of the human eye. The configured minimum brightness can be undershot only by switching off or when dimming up starting from the "OFF" state. Furthermore, the brightness value, which is set whenever switching on via the "Switching" object on the DALI operating devices, can be predefined. The parameter "Switch-on brightness" defines this brightness. The settable value is anywhere between the minimum and maximum.

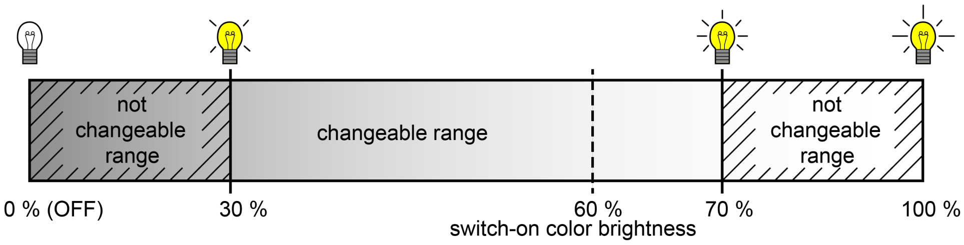


Image 27: Example of a brightness range with switch-on brightness

Setting the minimum brightness

The minimum brightness can be set for the Dali channel.

ℹ The ETS does not check all configured brightness values of the channel during the editing of the minimum brightness (e.g. switch-on brightness, scene values, etc.)! If values that are smaller than the configured minimum brightness are predefined by the ETS configuration, the actuator sets the minimum brightness as brightness value later during operation. The same holds true if the actuator receives values via the brightness object during operation, which undershoots the minimum brightness.

Setting the maximum brightness

The maximum brightness can be set for the Dali channel.

ℹ The ETS does not check all configured brightness values of a channel during the editing of the maximum brightness (e.g. switch-on brightness, scene values)! If values that are greater than the configured maximum brightness are predefined by the ETS configuration, the actuator sets the maximum brightness as brightness value later during operation. The same holds true if the actuator receives values via the brightness object during operation, which exceed the maximum brightness.

11.4.1 Brightness range parameter

Dali channel ... -> DO... - General -> Brightness range

Minimum brightness	**1 %** 5 % 10 % ... 100 %
The brightness set here is not undershot in any switched-on operating state.	

Maximum brightness	1 % 5 % 10 % ... **100 %**
The brightness set here is not undershot in any switched-on operating state.	

11.5 Colour temperature range

Settable colour temperature range

When activating DALI operating devices that support the device type "Tunable White" (DT8 - TW), the colour temperature of the connected luminaire can be changed. The adjustable colour temperature range can be limited by defining a lower and upper colour temperature value. The parameters "Minimum colour temperature" and "Maximum colour temperature" define the colour temperature values that are not undercut or exceeded in any operating state of the device. In this way, the colour temperature of the controlled luminaires of the DALI operating devices can be limited individually and adapted to the respective application.
Furthermore, the colour temperature value, which is set whenever switching on via the "Switching" object on the DALI operating devices, can be predefined. The "Switch-on colour temperature" parameter defines this colour temperature value. The settable value is anywhere between the minimum and maximum colour temperature.

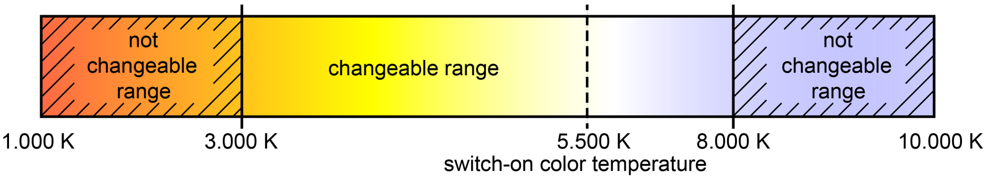


Image 28: Example of a configured colour temperature range with switch-on colour temperature

Setting minimum colour temperature

The minimum colour temperature can be set for the Dali channel.

ℹ When editing the minimum colour temperature, the ETS does not check all configured colour temperature values of a channel (e.g. switch-on colour temperature, scene values, etc.)! If values are specified by the ETS configuration that are smaller than the configured minimum colour temperature, the actuator will set the minimum colour temperature as the colour temperature value later during operation. The same applies if the actuator receives values that fall below the minimum colour temperature via the colour temperature object during operation.

Setting the maximum colour temperature

The maximum colour temperature can be set for the Dali channel.

- Set the parameter "Maximum colour temperature" on the parameter page "Dali channel 1 -> DA1 - General" to the required colour temperature value.

  The colour temperature set is not exceeded in any switched-on operating state of the Dali channel.

ℹ When editing the maximum colour temperature, the ETS does not check all configured colour temperature values of a channel (e.g. switch-on brightness, scene values, etc.)! If values are specified by the ETS configuration that are greater than the configured maximum colour temperature, the actuator will set the maximum colour temperature as the colour temperature value later during operation. The same applies if the actuator receives values that exceed the maximum colour temperature via the brightness object during operation.

11.5.1 Colour temperature range parameter

Dali channel ... -> DO... - General -> Colour temperature range

Minimum colour temperature	1000 K ... **2000 K** ... 10000 K
The minimum colour temperature can be set in increments of 100 K. The colour temperature set here is not undershot in any switched-on operating state.	

Maximum colour temperature	1000 K ... **6000 K** ... 10000 K
The maximum colour temperature can be set in increments of 100 K. The colour temperature set here is not exceeded in any switched-on operating state.	

11.6 Switching / dimming behaviour

Switch-on brightness

The switch-on brightness can be set for dimming channel. The set brightness is set after receipt of an ON telegram via the "Switching" communication object. Alternatively, the "Memory value (brightness before last switch-off)" can be set.

ℹ After ETS programming, the memory value is predefined to maximum brightness. A voltage failure does not delete the memory value.

ℹ If the configured switch-on brightness is greater than the configured maximum brightness, the actuator sets the maximum brightness as the new brightness value for the Dali channel concerned when switching on (minimum brightness < switch-on brightness < maximum brightness).

ℹ A memory value is also saved internally by a switch-off telegram if the bus-controlled switch-off is overridden, for example, by a disabling function. In this case, the internally tracked brightness value is saved as memory value.

ℹ If no soft ON function is activated, the brightness value is jumped to when switching on. Once a soft ON function is activated, the switch-on brightness is dimmed according to the dimming speed for the soft ON function.

Behaviour when receiving a brightness value

The dimming behaviour for the absolute dimming can be set in the ETS for the Dali channel via the "Brightness value" object.

ℹ Brightness values can also be set by a disabling function. Absolute dimming can also be activated, even after voltage recovery or after ETS programming, by specifying brightness values. In the case of these absolute dimming functions, the brightness values are always instantly jumped to. During a scene recall, the dimming behaviour can be configured separately.

Dimming up in the switched-off state

A relative dimming process can be triggered by the available 4-bit "Dimming" communication object. The data format of the "dimming" object complies with the KNX standard DPT "3.007", which means that the dimming direction and relative dimming increments can be predefined in the dimming telegram or dimming procedures can also be stopped. A relative dimming process is executed via the object until the configured basic minimum or maximum brightness of the dimming channel is set, the dimming value reaches the dimming increment predefined in the telegram or a stop telegram is received. A relative dimming process allows a brightness value to be changed constantly and always starts from the brightness that is set stationary or dynamically at the time of the incoming dimming telegram.

A relative dimming telegram can also switch on the Dali channel if this is in the "OFF" state. In some applications, it may be necessary, however, for a switched off Dali channel to remain off until a relative dimming telegram is received. This is interesting when using light scenes, for instance: Several Dali channels are set to a defined brightness value via a light scene. Other channels are switched off by the scene. Only the brightness of channels not switched off by the scene recall should be changed by dimming up afterwards. Here, it is necessary for Dali channels not to react to a relative dimming operation and thus not to switch on.

The parameter "With relative dimming up in the switched-off state" defines whether or not a Dali channel in the "OFF" state reacts to a relative dimming telegram.

Switch-ON colour temperature

The switch-on temperature can be set for the Dali channel. The colour temperature is set after receipt of an ON telegram. Alternatively, the "Memory value (colour temperature before last switch-off)" can be set.

ℹ After ETS programming, the memory value is predefined to maximum colour temperature. A voltage failure does not delete the memory value.

ℹ An internally stored colour temperature value (memory value) is also stored internally by a switch-off telegram if the bus-controlled switch-off is overridden, for example, by a disabling function. In this case, the internally tracked colour temperature value is saved as memory value.

ℹ If no soft ON function is activated, the brightness value is jumped to when switching on. Once a soft ON function is activated, the switch-on brightness is dimmed according to the dimming speed for the soft ON function.

Behaviour when receiving a colour temperature value

The dimming behaviour for absolute setting of the colour temperature can be set for the Dali channel in the ETS via the "Colour temperature" object.

ℹ Colour temperature values can also be set by a disabling function. An absolute setting of colour temperature values can also be done after voltage recovery or after ETS programming. In the case of these absolute dimming functions, the brightness values are always instantly jumped to.

Relative dimming of the colour temperature in the switched-off state

A relative dimming process can be triggered by the available 4-bit "Dimming" communication object (colour temperature). The data format of the "dimming" object (colour temperature) complies with the KNX standard DPT "3.007", which means that the dimming direction and relative dimming increments can be predefined in the dimming telegram and dimming procedures can also be stopped. A relative dimming process via the object is carried out until the configured minimum or maximum colour temperature of the Dali channel is set, the dimming value reaches the dimming increment specified in the telegram, or a stop telegram is received. A relative dimming process allows a colour temperature value to be changed constantly and always starts from the colour temperature that is set stationary or dynamically at the time of the incoming dimming telegram.

A relative dimming telegram can also switch on the Dali channel if this is in the "OFF" state.

The parameter "For relative dimming of the colour temperature in the switched-off state" determines whether or not a Dali channel in the "OFF" state reacts to a relative dimming telegram of the colour temperature.

Brightness dimming behaviour

The brightness of the operating devices can be changed by a dimming operation. The limits of the brightness range that can be set by a dimming operation are defined by the maximum brightness and minimum brightness predefined in the ETS.

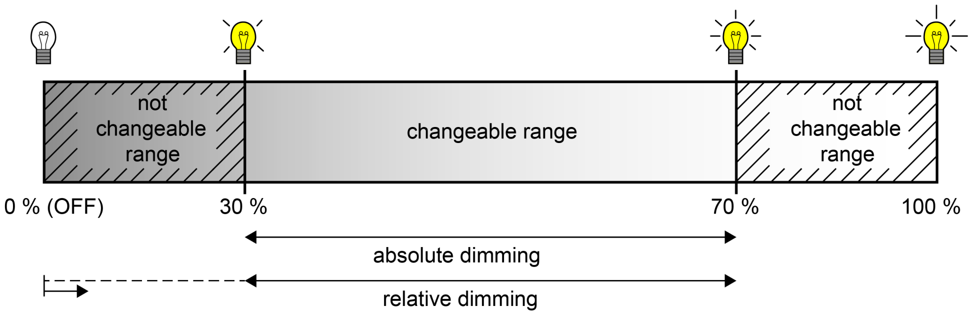


Image 29: Example of a dimmable brightness range

Dimming can be carried out by...

- Relative dimming:
  Relative dimming can be triggered by the 4-bit "Dimming" communication object. The data format of the "dimming" object complies - as is normal with KNX dimming actuators - with the KNX standard DPT 3.007, which means that the dimming direction and relative dimming increments can be predefined in the dimming telegram or dimming procedures can also be stopped. A relative dimming operation allows a brightness value to be changed constantly and always starts from the brightness that is set at the time of the dimming command. When dimming up starting from the "OFF" state, the configured minimum brightness can be undershot during the dimming operation.
- Absolute dimming:
  Absolute dimming is triggered by specifying a brightness value. This value can be predefined by the 1-byte "brightness value" communication object from the KNX. In addition, brightness values can also be set by a disabling function or scene function.

ℹ Even if brightness values are instantly jumped to, the dimming procedure on DALI operating devices always takes a very short time as well as when switching without soft ON or soft OFF. This dimming procedure is dependent on the system. The brightness value jumped to will be dimmed to within 0.7 seconds (short fading). This time cannot be altered.

The setting of a dimming time for relative dimming or for absolute dimming is done by adjusting the dimming characteristic.

Colour temperature dimming behaviour

When activating DALI operating devices that support the device type "Tunable White" (DT8 - TW), the colour temperature can be changed by a relative or absolute dimming operation. The limits of the colour temperature range adjustable by a dimming operation is defined by the minimum and maximum colour temperature predefined in the ETS.

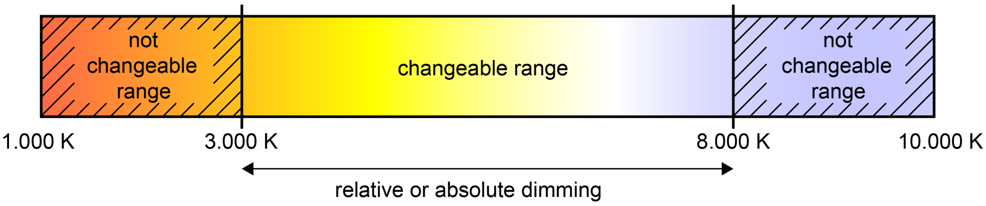


Image 30: Example of a dimmable colour temperature range

Dimming can be carried out by...

- Relative dimming:
  Relative dimming of the colour temperature can be triggered by the 4-bit "Relative colour temperature" communication object available for each group or single device. The data format of the "dimming" object - as well as with relative dimming of the brightness - complies with the KNX standard DPT 3.007, which means that the dimming direction and relative dimming increments can be predefined in the dimming telegram or dimming procedures can also be stopped. A relative dimming operation allows a colour temperature value to be changed constantly and always starts from the colour temperature that is set at the time of the dimming command.
  A relative dimming telegram for controlling the colour temperature can also switch on in the "OFF" state. In some applications, it may be necessary, however, for a switched off group or switched off device to still remain off until a relative dimming telegram of the colour temperature is received. The parameter "With relative dimming of the colour temperature in the switched-off state" determines whether the DALI lighting in the "OFF" state is switched on by a relative dimming telegram of the colour temperature or if it remains switched off and only tracks the dimming process internally.
- Absolute dimming:
  Absolute dimming is triggered by specifying a colour temperature value. This value can be predefined by the 2-byte "Absolute colour temperature" communication object according to KNX DPT 7.600 from the KNX. In addition, colour temperature values can also be set by the scene function.
  Just as with relative dimming, an absolute dimming telegram for controlling the colour temperature can also switch on the lighting in the "OFF" state. Here too, it may be necessary in some applications for a switched off group or switched off device to still remain off if a new colour temperature value is specified absolutely. The parameter "On receipt of a colour temperature value in the switched-off state" determines whether a DALI lighting in the "OFF" state is switched on by a new absolute 2-byte dimming telegram of the colour temperature or if it remains switched off and only tracks the colour value internally.

The dimming time for dimming the colour temperature corresponds to the dimming characteristic in the time range.

ⓘ The dimming characteristic in the time range for colour temperature changes corresponds to the dimming characteristic for brightness changes in the time range.

ⓘ The dimming characteristic in the value range for colour temperature changes is always linear.

ⓘ Optionally, the 1-bit feedback object "Invalid colour temperature feedback" can be used to indicate whether a colour temperature specified externally via the "Absolute colour temperature" object is invalid. This is the case, if the specified colour temperature violates the set limits of the minimum and maximum colour temperature.

ⓘ Even if colour temperature values are instantly jumped to, the dimming procedure on DALI operating devices always takes a very short time. This dimming procedure is dependent on the system. The colour temperature value jumped to will be dimmed to within 0.7 seconds (short fading). This time cannot be altered.

Dim to Warm **- Function**

The Dim to Warm function achieves the incandescent warmer or colder colour effect when dimming the brightness.

The Dali channel can react to a dimming telegram for brightness adjustment and adjust the colour temperature proportionally (brightness brighter -> increase colour temperature, brightness darker -> decrease colour temperature).

When dimming the brightness darker, the colour temperature shifts to the warmer range and when dimming brighter, the colour temperature shifts to the colder range.

The colour temperature behaviour can be set separately for relative dimming and for absolute dimming of the brightness (parameters "Colour temperature behaviour for relative dimming of the brightness" and "Colour temperature behaviour for absolute dimming of the brightness").

11.6.1 Switching/dimming behaviour parameters

Dali channel ... -> DO1 - General -> Switching/dimming behaviour

Switch-on brightness	1% 5% 10% ... **100%** Memory value (brightness before last switch-off)
This parameter specifies the brightness value which should be set whenever switching on via the "Switching" object on the Dali channel. The switch-on brightness must always be between the upper and lower brightness limit value of the dimming range. In the "Memory value" setting, the active and internally saved brightness value prior to switching off last time is set when switching on (via the "switching" object).	

On receipt of a brightness value	jumping to **dimming to** fading
A parameter is used here to define whether a brightness value received via the bus is instantly jumped to (absolute dimming), or whether the brightness is dimmed to via the set dimming characteristic. Fading is also possible as an alternative. When fading, the received brightness value is reached in the exact configured fading time irrespective of the dimming characteristic and irrespective of which brightness value the dimming procedure was started at. Thus, for example, several Dali outputs can be set to the same brightness at the same time.	

Time for brightness value via fading	0 ... **20** ... 240 s
The fading time is set here if fading is predefined in the dimming behaviour. A dimming procedure via fading lasts for the exact configured time. If "0" is set, the brightness value is jumped to directly.	

Time between two dimming increments	1 ... **25** ... 255 ms
At this point, the dimming step speed (time between two dimming increments) is set. ℹ Total time of the dimming procedure = Time between two dimming increments x 255 (number of dimming increments)	

<table>
<tr><td>With relative dimming up in the switched-off state</td><td>switch ON channel
no reaction</td></tr>
<tr><td colspan="2">This parameter defines whether or not a dimming channel in the "OFF" state reacts to a relative dimming telegram.
Switch on channel: The Dali channel always reacts to a relative dimming telegram and executes a dimming process. In the "OFF" state, the channel switches on with a "dim up" telegram.
No reaction: The Dali channel only reacts to a relative dimming telegram when it is switched on. In the "OFF" state, the channel ignores a "dim up" telegram.</td></tr>
</table>

<table>
<tr><td>Switch-ON colour temperature</td><td>Parameterise colour temperature
Track colour temperature
Colour temperature as before last switch-off</td></tr>
<tr><td colspan="2">The colour temperature can be parameterised or tracked whenever switching on via the "Switching" object at the Dali channel. Alternatively, the colour temperature that was set before the last switch-off can also be set when switching on.
In the "Parameterise colour temperature" setting, the switch-on color temperature is specified by the "Colour temperature" parameter.
With the setting "Track colour temperature", the internally stored colour temperature tracked during the switched-off state is set at the output when switched on.
With the setting "Colour temperature as before last switch-off", the colour temperature value active and internally stored before the last switch-off (via the "Switch" object) is set when switching on.</td></tr>
</table>

<table>
<tr><td>Colour temperature</td><td>1000 ... 2700 ... 10000 K</td></tr>
<tr><td colspan="2">This parameter specifies the switch-on colour temperature which should be set whenever switching on via the "Switching" object on the Dali channel.</td></tr>
</table>

<table>
<tr><td>When receiving a colour temperature value in the switched-off state</td><td>switch ON channel
no reaction</td></tr>
<tr><td colspan="2">A parameter is used here to define whether the channel is switched on when a colour temperature value (absolute dimming) is received via the bus. Alternatively, the channel shows no reaction.</td></tr>
</table>

<table>
<tr><td>With relative dimming of the colour temperature in the switched-off state</td><td>switch ON channel
no reaction</td></tr>
<tr><td colspan="2">This parameter defines whether or not a Dali channel in the "OFF" state reacts to a relative dimming telegram.
Switch on channel: The Dali channel always reacts to a relative dimming telegram and executes a dimming process. In the "OFF" state, the channel switches on with a "dim up" telegram.
No reaction: The Dali channel only reacts to a relative dimming telegram when it is switched on. In the "OFF" state, the channel ignores a "dim up" telegram.</td></tr>
</table>

<table>
<tr><td>Behaviour of the colour temperature during relative dimming of the brightness</td><td>Proportional to brightness
no change</td></tr>
<tr><td colspan="2">This parameter determines how the set colour temperature behaves during relative dimming of the brightness.
Proportional to brightness: The Dali channel reacts to a relative dimming telegram for brightness adjustment and adjusts the colour temperature proportionally to the brightness
(Brightness brighter -> increase colour temperature, Brightness darker -> decrease colour temperature).
No change: The colour temperature is not changed.</td></tr>
</table>

<table>
<tr><td>Behaviour of the colour temperature during absolute dimming of the brightness</td><td>Proportional to brightness
no change</td></tr>
<tr><td colspan="2">This parameter determines how the set colour temperature behaves during absolute dimming of the brightness.
Proportional to brightness: The Dali channel reacts to an absolute dimming telegram for brightness adjustment and adjusts the colour temperature proportionally to the brightness
(Brightness brighter -> increase colour temperature, Brightness darker -> decrease colour temperature).
No change: The colour temperature is not changed.</td></tr>
</table>

11.7 Times

Time for flashing of the disabling function

A disabling function can be activated separately for the channel as an additional function . With this disabling function it is possible to have the output flash at the start or end of disabling.

11.7.1 General times parameter

Dali channel -> DO - General -> Times

Time for flashing of the disabling function	**1 s**, 2 s, 5 s, 10 s
At the start and end of the "disable" supplementary function, the Dali channel can flash. The flash cycle time for the Dali channel is set here.	

11.8 Reset and initialisation behaviour

Response after a device reset

The switching state, brightness value or colour temperature value of the Dali channel after voltage failure, voltage recovery or ETS programming can be set separately.

Presetting the behaviour after ETS programming

The parameter "After ETS programming" configures the brightness and colour behaviour of the channel after ETS programming.

ℹ The "Brightness value" and "Colour temperature" values after ETS programming must be within the limits of the brightness and colour temperature ranges.

ℹ The behaviour after ETS programming will be executed after every ETS application or parameter download. A simple download of the physical address alone or partial programming of only the group addresses has the effect that this parameter is disregarded and that the configured "Behaviour after mains voltage return" will be executed instead.

ℹ In the "no reaction" setting: After the programming operation, a brief switch-off occurs during the initialisation phase of the actuator. Afterwards, the brightness value that was active before is then reset again.

ℹ After an ETS programming operation, the disabling functions are always deactivated. The brightness and colour temperature values stored in the event of a voltage failure are deleted.

Response to voltage failure

If there is voltage failure at the device, the Dali channel shows no reaction.

ℹ Active disabling functions are deleted by a voltage failure and remain inactive until they are reactivated.

ℹ In the event of a voltage failure, the current brightness and colour temperature values are permanently stored internally so that they can be set again after voltage recovery, if this is configured in the ETS. Storage takes place when the supply voltage has been continuously available for at least 20 seconds after the last reset before a voltage failure (energy storage sufficiently charged for storage purposes). In all other cases nothing is stored.

Set the behaviour after voltage recovery

The parameter "After voltage recovery" configures the brightness and colour behaviour of the channel after voltage recovery.

ℹ The "Brightness value" and "Colour temperature" values after voltage recovery must be within the limits of the brightness and colour temperature ranges.

ℹ Setting "Brightness and colour temperature before voltage failure": An ETS programming operation of the application or the parameter resets the stored switching state to "Off - 0".

ℹ A switching state and brightness/colour temperature value set after voltage recovery is tracked in the feedback objects. Actively transmitting feedback objects only transmit after voltage recovery when the initialisation of the actuator is complete and, if applicable, the "delay after voltage recovery" has elapsed.

ℹ In the case of disabling function: Active disabling functions are always inactive after voltage recovery.

11.8.1 Reset and initialisation behaviour parameter

Dali channel 1 -> DO1 - General -> Reset behaviour

After ETS programming operation	Brightness value and colour temperature Switch off (colour temperature unchanged) **no reaction**
The actuator permits setting the brightness value and the colour temperature for the Dali channel after programming with the ETS. Brightness value and colour temperature: The channel restores the "Brightness" and "Colour temperature" values defined with the following parameters. Switch-off: After an ETS programming operation, the channel is switched off. No reaction: After an ETS programming operation, the actuator retains the current brightness value and the current colour temperature.	

brightness value	1% 5% 10% ... **100%**
This parameter defines the brightness value to be set after an ETS programming operation. This value must always be between the upper and lower brightness limit value of the brightness range.	

Colour temperature	1000 ... **2700** ... 10000 K
This parameter defines the colour temperature value to be set after an ETS programming operation. This value must always be between minimum and maximum colour temperature.	

On voltage failure	**no reaction**
If there is voltage failure at the device, the channel shows no reaction. Brightness value and colour temperature value remain set.	

After voltage return	Brightness value and colour temperature switch off **Brightness colour temperature before voltage failure** activating staircase function
The actuator permits setting the brightness value and the colour temperature for the Dali channel after voltage return. Brightness value colour temperature: The channel restores the "Brightness" and "Colour temperature" values defined with the following parameters. Switch-off: The channel is switched off after voltage return. Brightness and colour temperature before voltage failure: After voltage return, the actuator restores the "Brightness" and "Colour temperature" values last stored in case of voltage failure. Activate staircase function: The staircase function is – irrespective of the "Switching" object - activated after voltage return. This setting is only available when the staircase function is enabled.	

brightness value	1% 5% 10% ... **100%**
This parameter defines the brightness value to be set after voltage return. The value must always be between the upper and lower brightness limit value of the dimming range.	

Colour temperature	1000 ... **2700** ... 10000 K
This parameter defines the colour temperature value to be set after voltage return. This value must always be between minimum and maximum colour temperature.	

11.9 Channel-oriented feedback

The actuator can track the current switching status, the brightness value, the colour temperature and the information about an invalid colour temperature of the Dali channel via separate feedback objects and also transmit them to the bus. The following feedback objects can be enabled independently of each other for each channel:

- Switching feedback (1 bit)
- Feedback brightness value (1 byte)
- Feedback colour temperature (2 byte)
- Feedback colour temperature invalid (1 bit)

The actuator calculates the object value of the feedback objects during each switching or dimming procedure. Even if the Dali channel is controlled via the scene function, the actuator tracks the feedback and updates the objects.

11.9.1 Feedback switching status

The switching status feedback object is updated internally after the following events ...

- Immediately after switching on the Dali channel (if necessary, only after a switch-on delay has elapsed and at the start of a soft ON dimming procedure / also after a staircase function).
- After switching off the Dali channel (if necessary, only after a switch-off delay has elapsed and at the end of a soft OFF dimming procedure / also after a staircase function),
- Immediately after switching off by means of the automatic switch-off function.
- At the beginning of a dimming procedure when dimming on (relatively high dimming or brightness value = 1…100 %) the Dali channel.
- At the end of a dimming procedure when dimming off (brightness value = 0 %) the Dali channel.
- Only when the switching state changes (therefore not for dimming procedures that do not change the switching state e.g. from 10 % to 50 % brightness).
- During updating of the switching state from "ON" to "ON" when the Dali channel is already switched on.
- During updating of the switching state from "OFF" to "OFF" when the Dali channel is already switched off.
- Always at the start or end of a disabling function (only if the switching state changes as a result).
- Always on voltage recovery or at the end of any ETS programming process (if necessary, also delayed).

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. Feedback takes place via the "Switching feedback" object.

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.

Setting switching status feedback on mains voltage return or after programming with the ETS

If used as active signalling object, the switching status feedback is transmitted to the KNX after voltage recovery or after ETS programming. In these cases, the feedback can be time-delayed with the time delay being set globally.

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.

11.9.2 Feedback brightness value

The brightness value feedback object is updated internally after the following events:

- At the end of a relative (4-bit) or absolute (1-byte) dimming procedure.
- After switching on the Dali channel, if the switch-on brightness is set (if necessary, only after a switch-on delay has elapsed and at the end of a soft ON dimming procedure / also after a staircase function).
- After switching off the Dali channel (if necessary, only after a switch-off delay has elapsed and at the end of a soft OFF dimming procedure / also after a staircase function),
- Immediately after switching off by means of the automatic switch-off function.
- Only if the brightness value changes (if a brightness value specification undershoots the minimum brightness as a result of relative or absolute dimming from outside or exceeds the maximum brightness, the actuator does not update a brightness value feedback according to the minimum brightness or maximum brightness).
- Always at the start or end of a disabling function (only if the brightness value changes as a result).
- Always on voltage recovery or at the end of any ETS programming process (if necessary, also delayed).

ℹ In the case of the disabling function: A "flashing" Dali channel is always reported back as "switched on" and with switch-on brightness. Switching status feedbacks are also transmitted for disabled channels.

Activate brightness value feedback

The brightness value feedback can be used as an active message object or as a passive status object. As an active signalling object, the brightness value feedback is also directly transmitted to the KNX for each update of the feedback value. 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. Feedback takes place via the "Brightness value feedback" object.

Setting the update of the "Brightness value feedback"

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

Setting feedback for voltage return or ETS programming

If used as active signalling object, the brightness value feedback states are transmitted to the KNX after voltage return or after ETS programming. In these cases, the feedback can be time-delayed with the time delay being set globally.

Setting cyclical transmission of the brightness value feedback

The brightness value feedback telegrams can, if active, also be transmitted cyclically, in addition to transmission after updating.

11.9.3 Feedback colour temperature

The colour temperature feedback object is updated internally for the following events:

- At the end of a relative (4-bit) or absolute (1-byte) dimming procedure.
- After switching on the Dali channel, if the switch-on colour temperature is set (if necessary, only after a switch-on delay has elapsed and at the end of a soft ON dimming procedure / also after a staircase function).
- After switching off the Dali channel (if necessary, only after a switch-off delay has elapsed and at the end of a soft OFF dimming procedure / also after a staircase function),
- Immediately after switching off by means of the automatic switch-off function.
- Only if the colour temperature changes (if a colour temperature value specification falls below the minimum colour temperature or exceeds the maximum colour temperature by relative or absolute dimming externally, the actuator does not update a colour temperature feedback according to minimum colour temperature or maximum colour temperature).
- Always at the start or end of a disabling function (only if the colour temperature changes as a result).
- Always on voltage recovery or at the end of any ETS programming process (if necessary, also delayed).

ⓘ In the case of the disabling function: A "flashing" Dali channel is always reported back as "switched on" and with switch-on colour temperature.

Activate colour temperature feedback

The colour temperature feedback can be used as an active message object or as a passive status object. As an active message object, the colour temperature feedback 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. Feedback takes place via the "Colour temperature feedback" object.

Set updating of the "colour temperature feedback"

In the ETS it can be defined when the actuator should update the feedback value for the colour temperature ("Colour temperature feedback" object) in case of an actively transmitting communication object. The object value updated by the actuator is then signalled actively to the KNX.

Setting feedback for voltage return or ETS programming

If used as an active signalling object, the colour temperature feedback is transmitted to the KNX after voltage recovery or after ETS programming. In these cases, the feedback can be time-delayed with the time delay being set globally.

Setting cyclical transmission of the colour temperature feedback

The colour temperature feedback telegrams can, if actively transmitting, also be transmitted cyclically, in addition to the transmission after updating.

11.9.4 Invalid colour temperature feedback

The "Invalid colour temperature" feedback object is updated internally for the following events:

- At the end of a relative (4-bit) or absolute (1-byte) dimming procedure.
- After switching on the Dali channel, if the switch-on colour temperature is set (if necessary, only after a switch-on delay has elapsed and at the end of a soft ON dimming procedure / also after a staircase function).
- After switching off the Dali channel (if necessary, only after a switch-off delay has elapsed and at the end of a soft OFF dimming procedure / also after a staircase function),
- Immediately after switching off by means of the automatic switch-off function.
- Only if the colour temperature changes (if a colour temperature value specification falls below the minimum colour temperature or exceeds the maximum colour temperature by relative or absolute dimming externally, the actuator does not update a colour temperature feedback according to minimum colour temperature or maximum colour temperature).
- Always at the start or end of a disabling function (only if the colour temperature changes as a result).
- Always on voltage recovery or at the end of any ETS programming process (if necessary, also delayed).

ℹ In the case of the disabling function: A "flashing" Dali channel is always reported back as "switched on" and with switch-on colour temperature.

Activate "Invalid colour temperature" feedback

The "Invalid colour temperature" feedback can be used as an active message object or as a passive status object. As an active message object, the feedback 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. Feedback takes place via the "Colour temperature feedback" object.

Set updating of the "Invalid colour temperature feedback"

In the ETS it can be defined when the actuator should update the feedback value for the colour temperature ("Invalid colour temperature feedback" object) in case of an actively transmitting communication object. The object value updated by the actuator is then signalled actively to the KNX.

Setting feedback for voltage return or ETS programming

If used as an active signalling object, the colour temperature feedback is transmitted to the KNX after voltage recovery or after ETS programming. In these cases, the feedback can be time-delayed with the time delay being set globally.

Set the cyclical transmission of the "Invalid colour temperature" feedback

The "Invalid colour temperature" feedback telegrams can, if actively transmitting, also be transmitted cyclically, in addition to the transmission after updating.

11.9.5 Feedback telegrams parameter

Dali channel 1 -> DO1 - General -> Enabled functions

Feedback	**Active** Inactive
This parameter can be used to disable or to enable the feedback functions.	

Dali channel 1 -> DO1 - General -> Feedback telegrams

Time for cyclical transmission	**0**...23 h | 0 ... **2** ... 59 min | **0** ... 59 s
These parameters define the time for cyclical transmission of all feedbacks of the Dali channel. The cycle time is set. These parameters are only available if cyclical transmission for a feedback is activated.	

switching status	no feedback **feedback is active signalling object** feedback is passive status object
The current switching state of the Dali channel can be reported separately back to the KNX. no feedback: The switching status feedback is deactivated. Feedback is active signalling object: A switching status is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after mains voltage return or after programming with the ETS. Feedback is passive status object: A switching status will be transmitted in response only if the feedback object is read out by the KNX. No automatic telegram transmission of the feedback takes place after voltage return or after ETS programming.	

Updating of the object value	after each update object "Switching" **only if the feedback value changes**

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

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

Delay after voltage return	Active **Inactive**

The states of the switching status feedback can be transmitted to the KNX with a delay after mains voltage return or after an ETS programming operation. The activated parameter causes a delay on mains voltage return. The delay time is configured on the parameter page "General".
This parameter is only visible in case of an actively transmitting feedback.

Cyclical transmission	Active **Inactive**

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.

Parameter activated: Cyclical transmission is activated.

Parameter deactivated: Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.

<table>
<tr><td>brightness value</td><td>no feedback
feedback is active signalling object
feedback is passive status object</td></tr>
<tr><td colspan="2">The current brightness value of the Dali channel can be reported back separately to the KNX.
no feedback: The brightness value feedback is deactivated.
Feedback is active signalling object: The brightness value is transmitted as soon as it is updated. An automatic telegram transmission of the feedback takes place after mains voltage return or after programming with the ETS.
Feedback is passive status object: The brightness value will be transmitted in response only if the feedback object is read out by the KNX. No automatic telegram transmission of the feedback takes place after voltage return or after ETS programming.</td></tr>
</table>

<table>
<tr><td>Updating of the object value</td><td>after each update obj. "Brightness value"
only if the feedback value changes</td></tr>
<tr><td colspan="2">Here, you can specify when the actuator should update the feedback value for the switching status (object "Brightness value 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 "Brightness value" object: The actuator updates the feedback value in the object once a new telegram is received on the "Brightness value" input objects or once the value changes internally (e.g. due to a dimming 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 brightness value feedback is also generated on the "brightness value" 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 brightness value 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 "Brightness value" 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.</td></tr>
</table>

<table>
<tr><td>Delay after voltage return</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">The states of the brightness value feedback can be transmitted to the KNX with a delay after voltage return or after an ETS programming operation. The activated parameter causes a delay on mains voltage return. The delay time is configured on the parameter page "General".
This parameter is only visible in case of an actively transmitting feedback.</td></tr>
</table>

Cyclical transmission	Active **Inactive**

The brightness value feedback telegrams can, if active, also be transmitted cyclically, in addition to transmission after updating.
This parameter is only visible in case of an actively transmitting feedback.

Parameter activated: Cyclical transmission is activated.

Parameter deactivated: Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.

Colour temperature	no feedback **feedback is active signalling object** feedback is passive status object

The current colour temperature of the Dali channel can be reported separately back to the KNX.

no feedback: The colour temperature feedback is deactivated.

Feedback is active signalling object: The colour temperature is transmitted once this it updated. An automatic telegram transmission of the feedback takes place after mains voltage return or after programming with the ETS.

Feedback is passive status object: The colour temperature will be transmitted in response only if the feedback object is read out by the KNX. No automatic telegram transmission of the feedback takes place after voltage return or after ETS programming.

Updating of the object value	after each update of the input objects **only if the feedback value changes**

Here, you can specify when the actuator should update the feedback value for the colour temperature 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 of the input object: The actuator updates the feedback value in the object once a new telegram is received on the following input objects or once the value changes internally (e.g. due to a dimming function). The telegram value of the feedback does not necessarily have to change in the process. Hence, a corresponding feedback is also generated on the object "Colour temperature" such as in the case of cyclical telegrams, for example.

- "Dimming (Colour temperature)",
- "Colour temperature",
- "Dimming (brightness value and colour temperature)" or
- "Brightness value and colour temperature"

only if the feedback value changes: The actuator only updates the feedback value in the object if the colour temperature changes or the switching state changes internally (e.g. through a time function)

<table>
<tr><td>Delay after voltage return</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">The states of the colour temperature feedback can be transmitted to the KNX with a delay after mains voltage return or after an ETS programming operation. The activated parameter causes a delay on mains voltage return. The delay time is configured on the parameter page "General".
This parameter is only visible in case of an actively transmitting feedback.</td></tr>
</table>

<table>
<tr><td>Cyclical transmission</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">The colour temperature 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.
Parameter activated: Cyclical transmission is activated.
Parameter deactivated: Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.</td></tr>
</table>

<table>
<tr><td>Invalid colour temperature</td><td>no feedback
feedback is active signalling object
feedback is passive status object</td></tr>
<tr><td colspan="2">The status "Invalid colour temperature" can be reported separately back to the KNX.
no feedback: The feedback is deactivated.
Feedback is active signalling object: The feedback is transmitted once this it updated. An automatic telegram transmission of the feedback takes place after mains voltage return or after programming with the ETS.
Feedback is passive status object: The feedback will be transmitted in response only if the feedback object is read out by the KNX. No automatic telegram transmission of the feedback takes place after voltage return or after ETS programming.</td></tr>
</table>

Updating of the object value	after each update of the input objects **only if the feedback value changes**
Here, you can specify when the actuator should update the feedback value for the status "Invalid colour temperature" 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 of the input object: The actuator updates the feedback value in the object once a new telegram is received on the following input objects or once the value changes internally (e.g. due to a dimming function). The telegram value of the feedback does not necessarily have to change in the process. Hence, a corresponding feedback is also generated on the object "Colour temperature" such as in the case of cyclical telegrams, for example. – "Dimming (Colour temperature)", – "Colour temperature", – "Dimming (brightness value and colour temperature)" or – "Brightness value and colour temperature" only if the feedback value changes: The actuator only updates the feedback value in the object if the status " Invalid colour temperature" changes (valid -> invalid or invalid -> valid)	

Delay after voltage return	Active **Inactive**
The states of the status feedback can be transmitted to the KNX with a delay after mains voltage return or after an ETS programming operation. The activated parameter causes a delay on mains voltage return. The delay time is configured on the parameter page "General". This parameter is only visible in case of an actively transmitting feedback.	

Cyclical transmission	Active **Inactive**
The 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. Parameter activated: Cyclical transmission is activated. Parameter deactivated: Cyclical transmission is deactivated so that the feedback is transmitted to the KNX only when updated by the actuator.	

11.9.6 Feedback object list

Object no.	Function	Name	Type	DPT	Flag
480	Switching feedback	Dali channel ... (...) - Output	1-bit	1,001	C, R, -, T, A
1-bit object for feedback signalling of the switching state ("1" = on / "0" = off) to the bus.					

Object no.	Function	Name	Type	DPT	Flag
484	Feedback brightness value	Dali channel ... (...) - Output	1 bytes	5,001	C, R, -, T, A
1-byte object for feedback signalling of an absolute dimming value (brightness value 0…255) to the bus.					

Object no.	Function	Name	Type	DPT	Flag
503	Feedback colour temperature	Dali channel ... (...) - Output	2 bytes	7,600	C, R, -, T, A
2-byte object for feedback signalling of the colour temperature to the bus.					

Object no.	Function	Name	Type	DPT	Flag
504	Feedback colour temperature invalid	Dali channel ... (...) - Output	1-bit	1,001	C, R, -, T, A
1-bit object for feedback signalling of the "Invalid colour temperature" status feedback to the bus.					

11.10 Time delays

Up to two time functions can be preset for the Dali output, independently of each other. The time functions affect the communication objects "Switching" and delay the object value received depending on the telegram polarity .

ℹ At the end of a disabling function, the switching state received during the function or set before the function can be tracked. At the same time, residual times of time functions are also tracked if these had not yet fully elapsed at the time of the reactivation.

ℹ The time delays do not influence the staircase function if this is enabled.

ℹ A time delay still in progress will be fully aborted by a reset of the actuator (power failure or ETS programming).

Activating switch-on delay

The switch-on delay can be activated in the ETS.

If the switch-on delay is set, the configurable time is started after receipt of an ON telegram via the "Switching" object. Another ON-telegram triggers the time only when the parameter "Switch-on delay retriggerable" is activated. 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 in the ETS.

If the switch-off delay is set, the configurable time is started after receipt of an OFF telegram via the "Switching" object. Another OFF-telegram triggers the time only when the parameter "switch-off delay retriggerable" is activated. An ON-telegram received during the OFF-delay will end the delay and sets the switching status to "ON".

11.10.1 Time delays parameters

Dali channel 1 -> DO1 - General -> Enabled functions

Time delays	Active **Inactive**
This parameter can be used to disable or to enable the time delays.	

Dimming channel 1 -> DA1 - General -> Time delays

Selection of time delay	**no time delay** Switch-on delay Switch-off delay ON delay and OFF delay
The communication objects "Switching" can be evaluated after 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	**0**…59 min 0...**10**…59
This parameter is used for setting the duration of the switch-on delay.	

Switch-on delay retriggerable	Active **Inactive**
A switch-on delay still in progress can be retriggered by another "ON" telegram (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed. The parameters for the switch-on delay are only visible if switch-on delay or switch-on and switch-off delay are activated.	

Switch-off delay	**0**…59 min 0...**10**…59
This parameter is used for setting the duration of the switch-off delay.	

Switch-off delay retriggerable	Active **Inactive**
A switch-off delay still in progress can be retriggered (parameter activated) by another "OFF" telegram. Alternatively, the retriggering time (parameter deactivated) can be suppressed. The parameters for the switch-off delay are only visible if switch-on delay or switch-on and switch-off delay are activated.	

11.11 Switch-on/switch-off behaviour

11.11.1 Soft ON/OFF function

The soft functions permit a Dali channel to be switched on or off at reduced speed when a switching command is received via the "Switching" communication object.

If the soft ON function is activated, a dimming procedure is executed until the switch-on brightness when switching on. This also occurs if the Dali channel is already switched on to a brightness value smaller than switch-on brightness. Likewise, with the soft OFF function, a dimming procedure is executed to 0 % brightness after receipt of an OFF telegram (see figure 31).

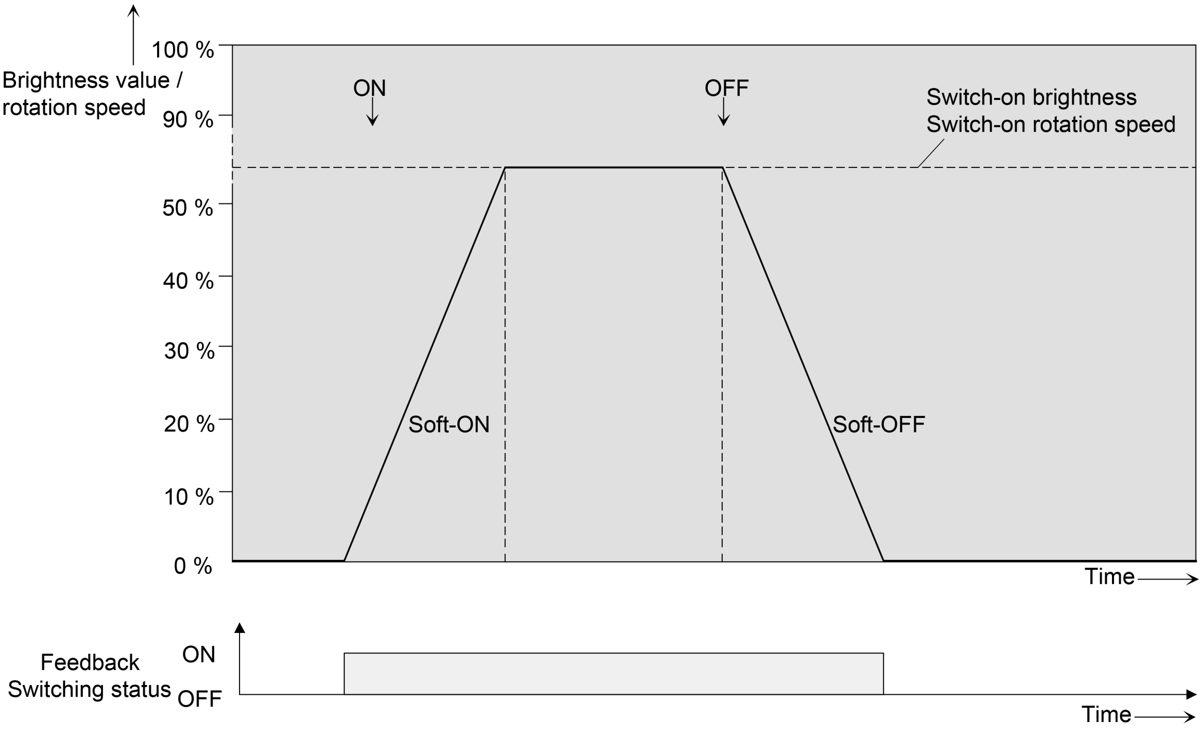


Image 31: Dimming behaviour of the soft ON/OFF functions (as an example)

The dimming speeds can be configured separately in the ETS for the soft ON and soft OFF function. The relative dimming increment time between 2 of 255 dimming increments is configured directly.

The soft ON or soft OFF functions are not retriggerable by the receipt of further switching telegrams while maintaining the switching status. The soft functions can be activated and configured separately in the ETS.

The soft functions also have effects on the switching edges of the staircase function.

ℹ A Dali channel disabled via the bus can also flash for the disabling function depending on the ETS configuration. Dimming is not executed with the soft functions during ON and OFF flashing.

11.11.2 Automatic switch-off

The switch-off function permits automatic switching of the Dali channel after a brightness value was dimmed or jumped to and this new brightness value is below a switch-off brightness set in the ETS. A time delay can be configured optionally up to switching off.

The switch-off function is activated after reaching a constant brightness value, i.e. after a completed dimming procedure.

The automatic switch-off function, for example, not only makes it possible to set the lighting to minimum brightness but to switch off by means of relative dimming as well. A further application, for example, is time-controlled "Good night switch-off" of a dimmed children's room lighting.

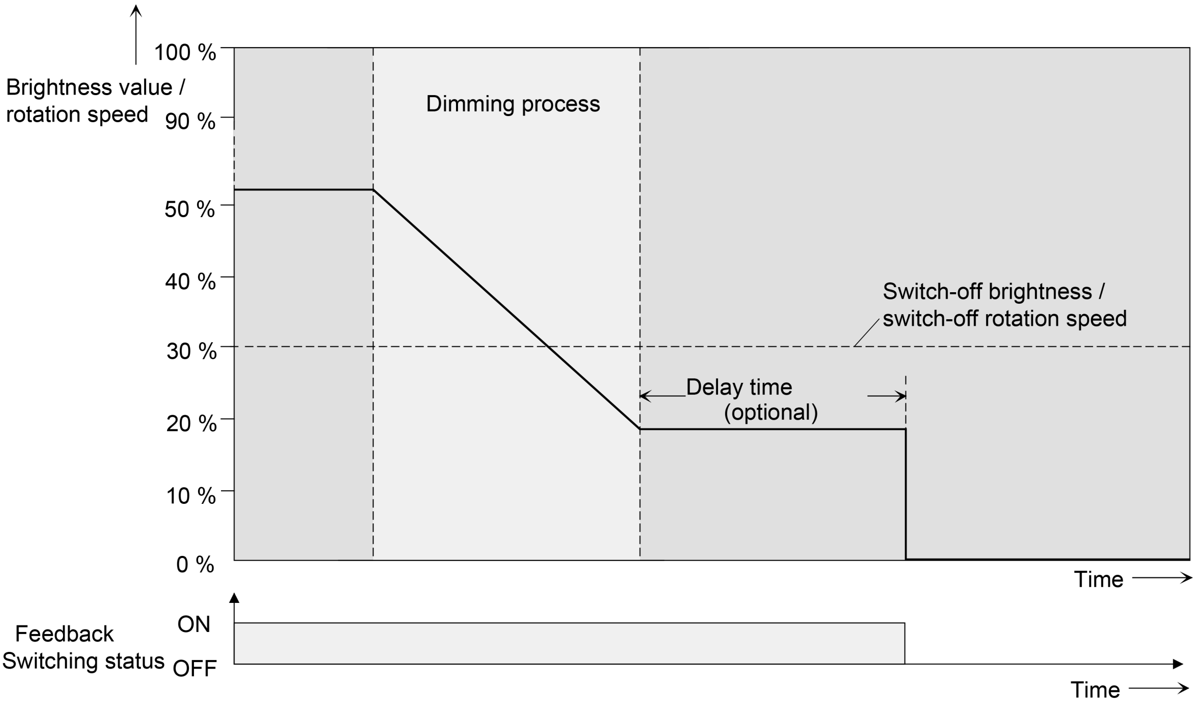


Image 32: Dimming and switching behaviour of the automatic switch-off function

- Switching off always takes place without soft OFF function.
- The switch-off brightness in the dimmable brightness range can be set between minimum and maximum brightness. The switch-off function is always active if the switch-off brightness is configured to maximum brightness and the maximum brightness is randomly undershot.
- The feedback objects for switching state and brightness value are updated by the automatic switch-off function after switching off.

The automatic switch-off can firstly be activated by a dimming procedure initiated via the 4-bit ("dimming") or 1-byte ("brightness value") communication object. Furthermore, the automatic switch-off can also be activated if a Dali channel is switched on (switch-on brightness < switch-off brightness) or a brightness is set by ETS programming or by a voltage recovery. The automatic switch-on can also be activated during a scene recall.

It should be noted that the disabling function overrides the switch-off function (Figure 20). If the switch-off function is overridden, the actuator terminates the evaluation of the switch-off brightness.

Setting the switch-off brightness

The switch-off brightness must be defined for the switch-off function. The switch-off brightness is set in the ETS.

Once a dimming procedure causes a value to fall below the configured switch-off brightness and once the brightness has been set to constant, the Dali channel concerned switches off or alternatively starts the delay until switching off.

ℹ It should be noted that the configured value for the switch-off brightness is greater than any configured minimum brightness and less than the set maximum brightness (minimum brightness < switch-off brightness < maximum brightness)!

ℹ Using the staircase function with pre-warning/continuous lighting: The reduced brightness of the pre-warning or continuous lighting does not start the switch-off function after reaching or undershooting the switch-off brightness!

Setting the delay of the switch-off function

A delay can be activated before the switch-off function switches-off automatically after undershooting the switch-off brightness at the end of a dimming procedure.

Once a dimming procedure causes a value to fall below the parameterized switch-off brightness and once the brightness has been set to constant, the actuator triggers the delay time. The dimming channel concerned switches off for good once the delay time has elapsed. The delay time can be re-triggered by further dimming procedures.

11.11.3 Switch-on/switch-off behaviour parameter

Dali channel 1 -> DO1 - General -> Enabled functions

Switch-on/switch-off behaviour	Active **Inactive**
Setting the switch-on/switch-off behaviour can be disabled and enabled here.	

Dali channel 1 -> DO1 - General -> Switch-on/switch-off behaviour

Soft ON function	Active **Inactive**
The soft ON function permits slower switch-on of the Dali channel. If this function is activated, a dimming operation to the switch-on brightness is executed after receiving a switch-on telegram via the "Switching" object.	

Time between two dimming increments	**0**… 59 s | **10**… 990 ms
These parameters set the soft ON function for the dimming increment time.	

Soft OFF function	Active **Inactive**
The soft OFF function permits slower switch-off of the Dali channel. If this function is activated, a dimming operation to the brightness "0%" is executed after receiving a switch-off telegram via the "Switching" object.	

Time between two dimming increments	**0**… 59 s | **10**… 990 ms
These parameters set the soft OFF function for the dimming increment time.	

Automatic switch-off	Active **Inactive**
The automatic switch-off function of the Dali channel can be activated here. If this function is activated, the connect load will switch off completely when a configurable brightness is undershot at the end of a dimming procedure, and if necessary, after a delay time has elapsed.	

Switch-off if brightness value smaller than	**5%**, 10% ... 100%
This parameter defines the brightness, which, if undershot, will cause the Dali channel to be switched off at the end of a dimming procedure, or if necessary, after a delay time has elapsed. This parameter is only visible if the switch-off function is activated.	

Delay until switch-off	Active **Inactive**
The delay for the automatic switch-off function of the Dali channel can be activated here. If activated, the delay time can be set.	

<table>
<tr><td>Delay time</td><td>0… 23 h | 0…59 min | 0...30…59</td></tr>
<tr><td colspan="2">This parameter sets the delay time of the switch-off function. If the switch-off brightness is undershot at the end of a dimming procedure, the Dali channel is switched off after the time set here has elapsed.</td></tr>
</table>

11.12 Scene function

Presetting a scene recall delay

Each scene recall can optionally also be delayed. With this feature, dynamic scene sequences can be configured if several scene outputs are combined with cyclical scene telegrams.

The delay only influences the scene recall of the Dali channel. The delay time is started on arrival of a recall telegram. The corresponding scene is only recalled after the time has elapsed and the brightness/colour temperature value is set on the Dali channel.

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 behaviour during ETS programming

When saving a scene, the brightness and colour temperature 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 of the parameters by the originally configured scene values, the actuator can inhibit overwriting of the brightness and colour temperature values. As an alternative, the original values can be reloaded into the device during each programming run of the ETS.

With the setting "Overwrite values stored in the device during ETS programming = Active", the scene brightness and colour temperature values configured in the ETS are programmed into the actuator with each ETS programming operation of the application program or the parameters. Scene values stored in the device by means of a storage function will be overwritten, if any.

With the setting "Overwrite values stored in the device during ETS programming = Inactive", any scene values stored in the device by a memory function are retained. If no scene values have been stored, the brightness values and colour temperature values last programmed in the ETS remain valid.

ℹ When the actuator is commissioned for the first time, this parameter should be activated so that valid values are initialised.

Up to 16 scenes can be programmed and scene values stored separately for each Dali channel. The scene values are recalled or stored via a separate scene extension object. The data point type of the extension object permits addressing of all 16 scenes.

The number of scenes can either be selected arbitrarily in the range of 1 to 16 or fixed to 16.

With the variable setting (1...16 scenes), the scene number (1...64) for the control can be flexibly set.

With the fixed setting (16 scenes), the scene number (1...16) is permanently assigned to the scene. If necessary, individual scenes can be deactivated.

The scene function can be combined together with other functions, whereby the last received or preset state is always executed.

ℹ Telegrams to the "switching", "dimming" or "brightness value" or "colour temperature" objects, a scene recall or scene storage telegram at the time of an active staircase function aborts the staircase time prematurely and presets the lighting according to the received object value (time delays are also taken into account) or scene value.

ℹ The state of the Dali channel, which was preset by the "switching", "dimming", "brightness value" or "colour temperature" objects or by a scene recall, can be overridden by a staircase function.

Setting scene numbers and scene switching states

The presetting of the scene number depends on the selected scene configuration. With variable configuration the scene number (1...64) with which the scene is addressed, i.e. recalled or stored, must be determined for each scene. With a fixed scene configuration, the number of a scene is preset invariably. A scene can be addressed with the scene number.

The data point type of the scene extension object permits addressing of up to 16 scenes max.

In addition to specifying the scene number, it is necessary to define which scene commands (brightness value and colour temperature value) are to be set when a scene is recalled at the Dali channel.

ℹ If with variable scene configuration the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.

ℹ For a variable configuration, a scene is deactivated by the set scene number "0". Then neither recalling nor storage is possible.

ℹ For the fixed configuration, only activated scenes can be used. A deactivated scene cannot be recalled or stored via the scene extension.

When a scene is recalled, the configured values of brightness and colour temperature are recalled and set at the DALI channel.

ℹ The configured values are then adopted in the actuator during ETS programming only if the parameter "Overwrite values stored in the device during ETS download" is activated.

Presetting storage behaviour

The scene function includes two memory functions. The "brightness memory function" and the "colour temperature memory function" can be activated separately. The values currently set in the Dali channel (brightness and colour temperature) can be saved internally when a scene storage telegram is received via the extension object.

If the "Brightness memory function" is activated, the current brightness value is stored internally when a storage telegram is received via the "Scene extension" object.

If the "Colour temperature memory function" is activated, the current colour temperature is stored internally when a storage telegram is received via the "Scene extension" object.

ℹ If memory functions are deactivated, a received storage telegram is rejected via the "Scene extension" object.

11.12.1 Scene function parameters

Dali channel 1 -> DO1 - General -> Enabled functions

Scene function	Active **Inactive**
This parameter can be used disable or to enable the scene function.	

Dali channel 1 -> DO1 - General -> Scenes

Delay scene recall	Active **Inactive**
A scene is recalled via the scene extension object. If required, the scene recall can be delayed on reception of a recall telegram (parameter activated). The recall is alternatively made immediately on reception of the telegram (parameter deactivated)	

Delay time	**0**...59 min 0...**10**...59 s
These parameters specify the duration of the scene delay time.	

On scene request	Jumping to brightness value **Dimming to brightness value via dimming increm. time** Dimming brightness value via fading
When a scene is recalled, the parameterised or saved scene values are set. This parameter setting can define whether the brightness value can be instantly jumped to or dimmed to or is set via fading. When fading, the brightness value to be set is reached in the exact configured fading time irrespective of the dimming characteristic of a channel and irrespective of which brightness value the dimming procedure was started at. Thus, for example, several Dali channels can be set to the same brightness at the same time.	

Dimming increment time	0 ... **5**… 255 ms
Setting of the dimming increment time if the brightness value of a scene should be dimmed.	

Fading time	0 ... **2** ... 240 s
Setting of the fading time if the brightness value of a scene should be dimmed to via fading.	

Visual feedback for storage function	Active **Inactive**
Optionally, a visual feedback via the Dali output can be signaled when executing a storage command. The channel flashes once as feedback in the configured flashing time. Active: When a storage function is executed, the visual feedback is activated immediately. The output switches to the opposite switching state for the duration of the configured flashing time and then back to the saved scene command. Inactive: When storing a scene, the visual feedback is not executed. The actuator adopts the current state of the output without special feedback.	

Flashing time (0...10)	0...**5**...10
The flashing time in which the visual feedback is to be executed is set here.	

Overwrite values stored in the device during the ETS programming operation	**Active** Inactive
During storage of a scene, the scene values (current states of the Dali output) are stored internally in the device. To prevent the stored values from being replaced during ETS programming by the originally programmed scene values, the actuator can inhibit overwriting of the scene values (parameter deactivated). As an alternative, the original values can be reloaded into the device during each programming run of the ETS (parameter activated).	

Scene configuration	**variable (1...16 scenes)** fixed (16 scenes)
The scene configuration selected here decides whether the number of scenes is either variable (1 ... 16) or alternatively fixed to the maximum (16). variable (1...16 scenes): With this setting, the number of scenes used can be selected anywhere in the range 1 to 16. The parameter "Number of scenes" decides how many scenes are visible for the switching output in the ETS and can therefore be used. It is possible to specify which scene number (1 ... 64) controls each scene. fixed (16 scenes): With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 16) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.	

Number of scenes (1...16)	1...**10**...16
This parameter is only available with variable scene configuration and defines how many scenes are visible for the dimming channel in the ETS and can therefore be used.	

Scene number	0...**1***...64 *: The predefined scene number is dependent on the scene (1...64).
With variable scene configuration, the number of scenes used can be selected anywhere in the range 1 to 16. It is then possible to preset which scene number (1 ... 64) controls each scene. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible. If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case. This parameter is only available with variable scene configuration.	

Scene active	**Active** Inactive
With a fixed scene configuration, individual scenes can be activated or deactivated. Only activated scenes can be used. A deactivated scene cannot be recalled or stored via the scene extension. This parameter is only available with fixed scene configuration.	

Change brightness	Active **Inactive**
This is where you set whether the brightness of the channel is to be changed by the scene (Active) or not (Inactive).	

brightness value	switch off 1 % 5 % ... 100 %
This parameter is used for configuring the brightness value which is set when the scene is recalled.	

Brightness memory function	Active **Inactive**
If the parameter is activated, the brightness memory function of the scene is enabled. The current brightness can then be stored internally via the extension object on receipt of a storage telegram. If the parameter is deactivated, the storage telegrams are rejected.	

Change colour temperature	Active **Inactive**
This is where you set whether the colour temperature of the channel is to be changed by the scene (Active) or not (Inactive).	

Colour temperature value	1000 ... **2700** ... 10000 K
This parameter is used for configuring the colour temperature value which is set when the scene is recalled.	

Colour temperature memory function	Active **Inactive**
If the parameter is activated, the colour temperature memory function of the scene is enabled. The current colour temperature can then be stored internally via the extension object on receipt of a storage telegram. If the parameter is deactivated, the storage telegrams are rejected.	

11.12.2 Object list scene function

Object no.	Function	Name	Type	DPT	Flag
485	Scene extension	Dali channel - input	1 bytes	18,001	C, -,W, -, U
1-byte object for polling or saving a scene.					

11.13 Staircase function

The staircase function can be used for implementing time-controlled lighting of a staircase or for function-related applications.

The staircase function is activated via the communication object "Staircase function start / stop" and is independent of the "switching" object of the Dali channel. 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.

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. As an alternative to the pre-warning at the end of the staircase time, the actuator can activate reduced continuous lighting. In this way, for example, long, dark hallways can have permanent basic lighting.

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 parameters"Staircase time". In addition, a switch-on delay (T_{Delay}) can be activated (see "presetting switch-on delay of the staircase function"). At the end of the staircase time, the output switches off or activates optionally the pre-warning time ($T_{Prewarn}$) of the pre-warning function (see "presetting pre-warning function of the staircase function"). Taking into account any possible switch-on delay and pre-warning function, this gives rise to the switch-on behaviour of the staircase function as shown in the following diagram.

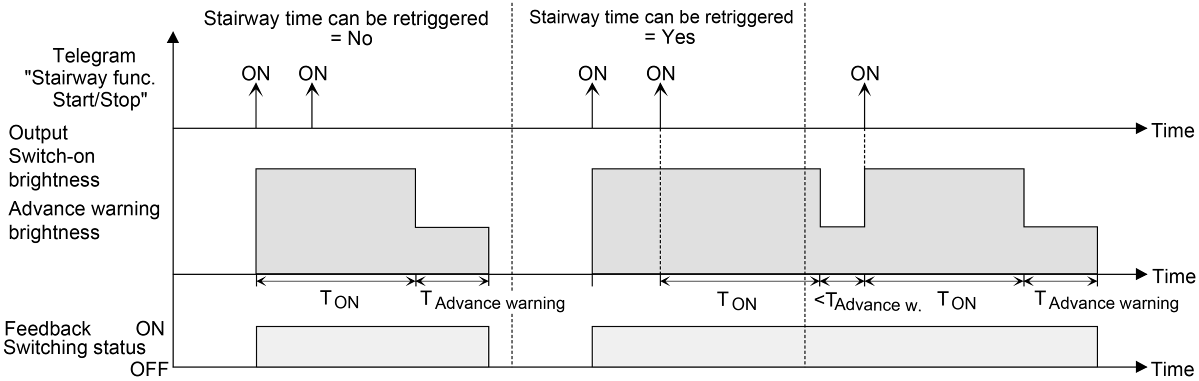


Image 33: Switch-on behaviour of the staircase function without soft functions

In addition, switching on can be influenced by the soft functions of the actuator. Taking into account any soft ON and soft OFF function, this gives rise to a modified switch-on behaviour of the staircase function.

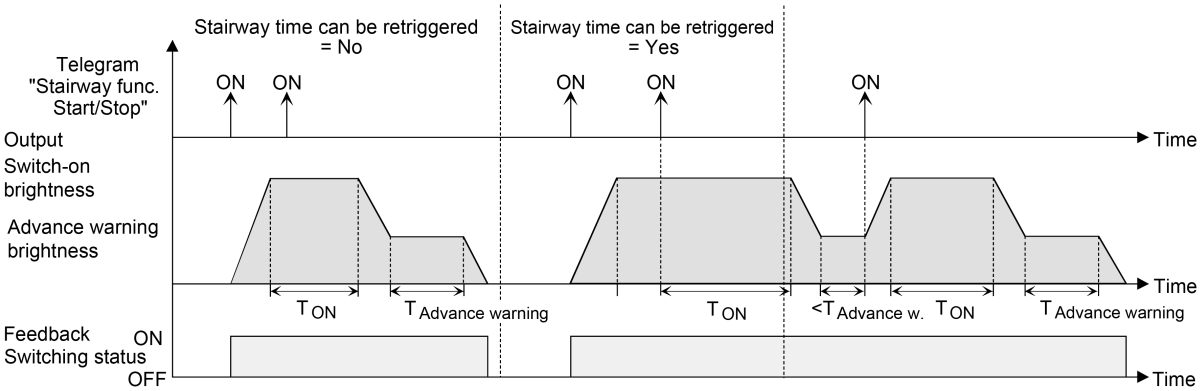


Image 34: Switch-on behaviour of the staircase function with soft functions (as an example with minimum brightness = 0 %)

The parameter "Staircase time retriggerable" specifies whether the staircase time can be retriggered.

An ON telegram received during the pre-warning time always retriggers the staircase time independently of the parameter "Staircase time retriggerable".

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". At the end of the staircase time, a dimming channel always shows the reaction "At the end of the staircase time" configured in the ETS, without the receipt of an OFF telegram. At the same time, the channel can switch off, optionally activate the pre-warning time (TVorwarn) of the pre-warning function or dim to the reduced continuous lighting (application: e.g. long, dark hallways). If, on the other hand, the Dali channel receives an OFF telegram via the "Staircase function start/stop" object, the actuator evaluates the parameter "Reaction to an OFF telegram". In this case, the channel can react immediately to the OFF telegram and end the staircase time prematurely. Alternatively, the OFF telegram can be ignored. Taking into account any possible pre-warning function, this gives rise to the example switch-off behaviour of the staircase function.

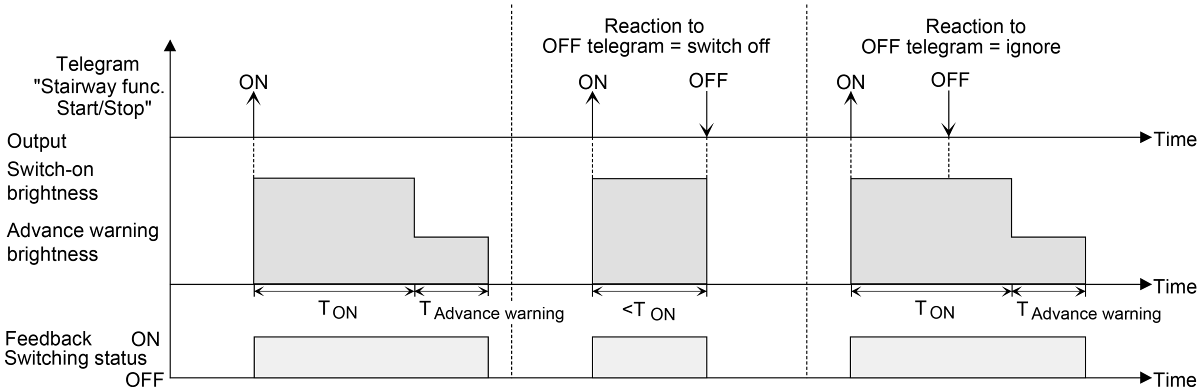


Image 35: Switch-off behaviour of the staircase function without soft functions

In addition, the switch-off can be influenced by the soft functions of the actuator. Taking into account any soft ON and soft OFF function, this gives rise to a modified switch-off behaviour of the staircase function.

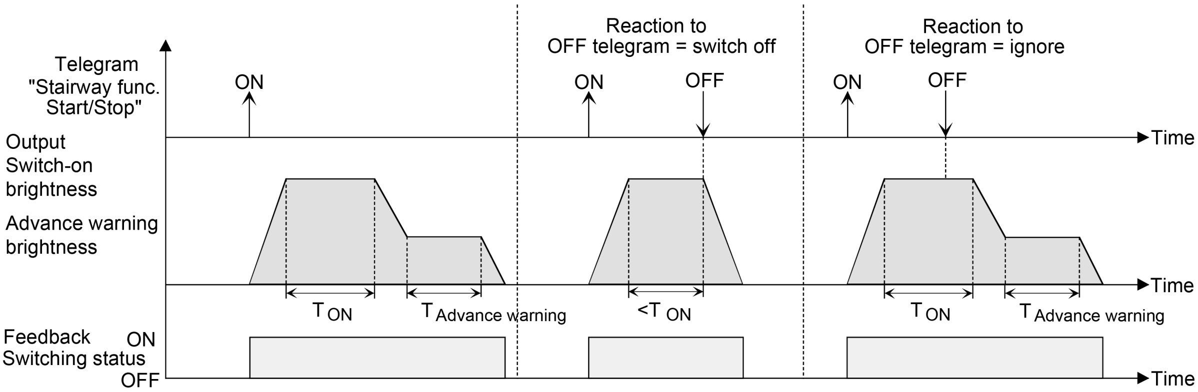


Image 36: Switch-off behaviour of the staircase function with soft functions (as an example with minimum brightness = 0 %)

The parameter "reaction to OFF-telegram" defines whether the staircase time (T_{ON}) of the staircase function can be aborted prematurely.

If the "switch off" reaction is selected, the output switches off immediately as soon as an OFF telegram is received via the "Staircase function start/stop" object during the ON phase of the staircase time. If the staircase time is stopped prematurely by such a telegram, there is no pre-warning, i.e. the pre-warning time is not started. It is also not dimmed to a reduced continuous lighting. It is also possible to switch off prematurely during a dimming procedure of a soft function or during a pre-warning or reduced continuous lighting.

If the "ignore" reaction is selected, received OFF telegrams are rejected during the ON phase of the staircase time. The staircase time will be executed completely to the end with pre-warning if necessary.

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".

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 activated. The staircase time is activated and the output is switched on only after the time delay has elapsed.

i An OFF telegram via the object "Staircase function start/stop" during the switch-on delay only terminates the delay if the parameter "Reaction to OFF-telegram" is set to "switch off". Otherwise, the OFF telegram is ignored.

Setting the pre-warning function of the staircase function

At the end of the switch-on time of the staircase function, the actuator for the Dali channel shows the reaction "At the end of the staircase time" configured in the ETS. The channel can be set to switch off immediately, alternatively to dim to the reduced continuous lighting (application: e.g. long, dark hallways) or to execute the pre-warning function. If the parameter is configured to "activate pre-warning time", the pre-warning time (TVorwarn) and pre-warning brightness (reduced brightness) can be configured in the ETS.

The pre-warning should, according to DIN 18015-2, warn persons still on the staircase that the light will soon be switched off. As a pre-warning, a Dali channel can be set to a pre-warning brightness (reduced brightness) before the channel switches off permanently. The pre-warning brightness (reduced brightness) is normally reduced in the brightness value compared to the switch-on brightness. The pre-warning time is added to the staircase time (T_{ON}). The pre-warning time influences the value of the feedback object so that the value "OFF" (in the case of non-inverted transmission) is first tracked after the pre-warning time in the object has elapsed.

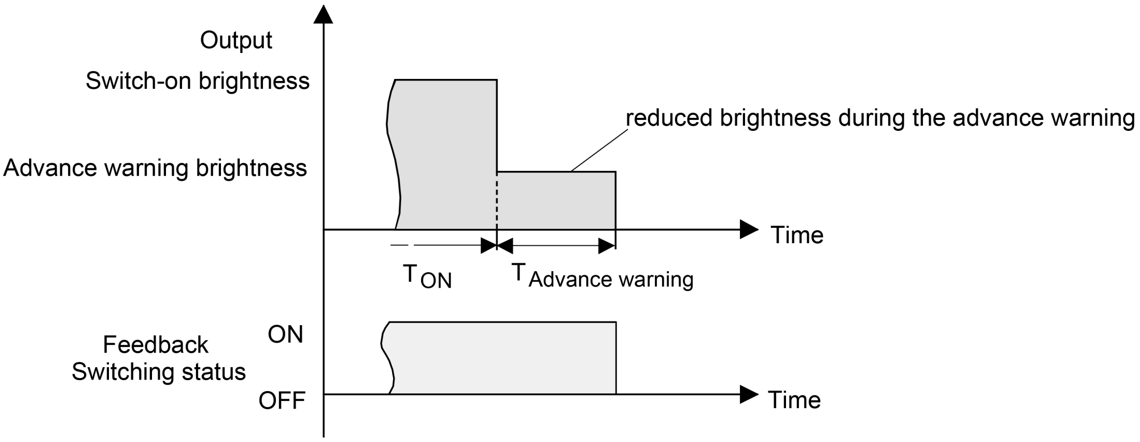


Image 37: The pre-warning function of the staircase function without soft OFF function

Additionally, the pre-warning function can also be extended by the soft OFF function. Taking into account any soft OFF function, this gives rise to a modified switch-off behaviour of the staircase function after the pre-warning has elapsed.

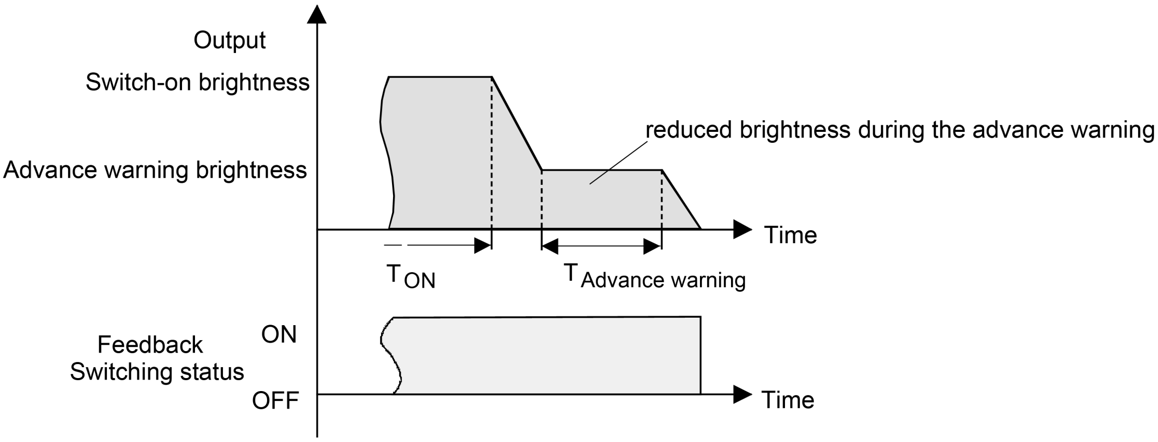


Image 38: The pre-warning function of the staircase function with soft OFF function (as an example with minimum brightness = 0%)

ℹ The configured value for the reduced brightness must be greater than or equal to the minimum brightness (if configured) or less than or equal to the maximum brightness!

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.

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 starts (independently of the parameter "Staircase time retriggerable ?") the staircase time anew. 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.

ℹ Using the automatic switch-off function: The reduced brightness of the pre-warning does not start the switch-off function after reaching or undershooting the switch-off brightness!

Setting continuous lighting of the staircase function

At the end of the switch-on time of the staircase function, the actuator for the Dali channel shows the "reaction at the end of the staircase time" configured in the ETS. The channel can be set to switch off immediately, alternatively to execute a pre-warning function, or to dim to reduced continuous lighting. The reduction of the lighting to continuous lighting after the staircase time has elapsed is appropriate, for example, if a certain degree of artificial light should be switched on permanently in long, dark hallways. Switching to switch-on brightness by activating the staircase function normally takes place by additional presence detectors or motion detectors when people are present in the hallway.

If the parameter "Reaction at the end of the staircase time" is configured to "activate reduced continuous lighting", the brightness for the continuous lighting can be configured in the ETS. The continuous brightness is normally reduced in the brightness value compared to the switch-on brightness.

The continuous lighting remains permanently active after the staircase time has elapsed. Only when an ON telegram is received again via the object "Staircase function start/stop" does the actuator switch back to the switch-on brightness and start counting the staircase time again. The receipt of an OFF telegram via the object "staircase function start/stop" only switches the continuous lighting off if the parameter "Reaction to OFF-telegram" is configured to "switch off".

ℹ A Dali channel can always be switched on and off via the "switching" object independently of the staircase function. Consequently, continuous lighting will also be overridden if telegrams arrive on the actuator via the "switching" object. If permanent continuous lighting is desired, which cannot be influenced by the "switching" object nor by the object of the staircase function, the disabling function of the actuator should be used.

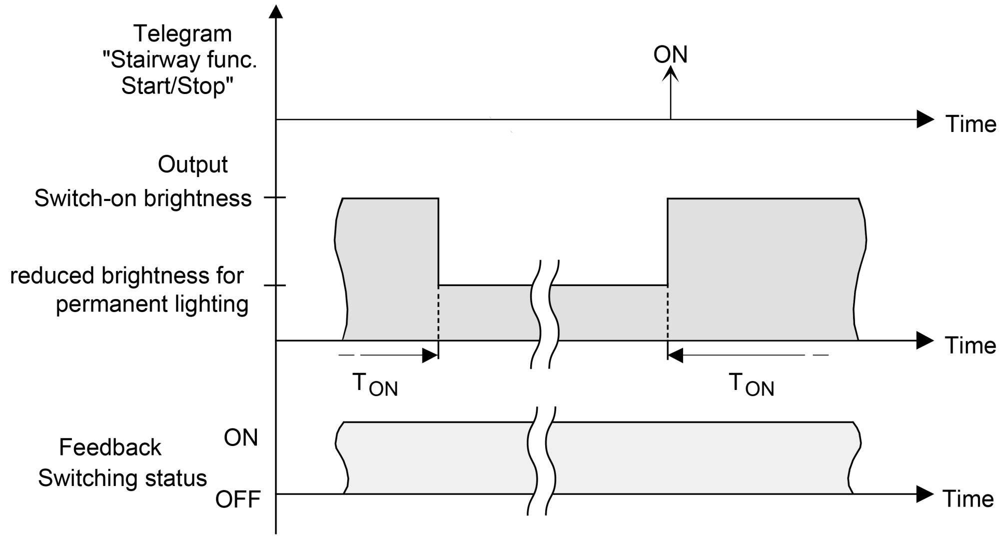


Image 39: The continuous lighting of the staircase function without soft functions

Additionally, the continuous lighting can also be extended by the soft function. Taking into account any soft ON and soft OFF function, this gives rise to modified continuous lighting behaviour of the staircase function.

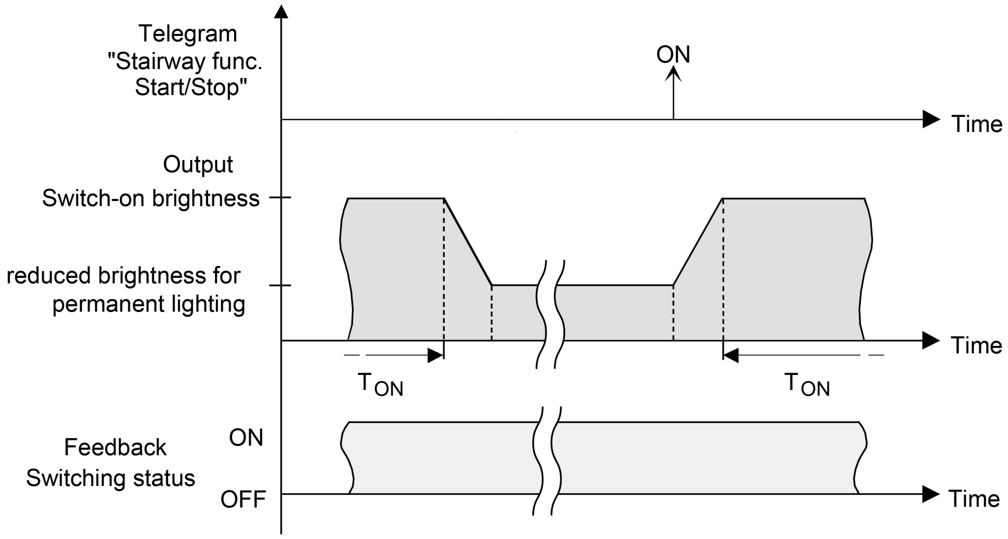


Image 40: The continuous lighting of the staircase function with soft OFF functions

i The brightness of the continuous lighting does not necessarily have to be less than the switch-on brightness. The brightness of the continuous lighting can always be configured to values between basic/minimum brightness and maximum brightness.

i The configured value for the reduced brightness must be greater than or equal to the minimum brightness (if configured) or less than or equal to the maximum brightness!

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 activated continuous lighting, the parameter "Reaction to OFF telegram" is evaluated so that continuous lighting can be switched off.

ℹ Using the automatic switch-off function: The reduced brightness of the continuous lighting does not start the switch-off function after reaching or undershooting the switch-off brightness!

Setting the behaviour of the staircase function after mains voltage return

The staircase function can optionally be started automatically after mains voltage return.

If the staircase function is enabled, the parameter "After voltage recovery" can be set to "Activate staircase function" (parameter page "Dali channel 1 -> DA1 - General").

ℹ During automatic starting of the staircase function after mains voltage return, no switch-on delay is started if the staircase function has configured such a delay.

ℹ The configured behaviour "on voltage recovery" is only executed when the voltage is switched on if the last ETS programming operation of the application or of the parameters ended at least approx. 20 s prior to switching on the voltage. Otherwise (T_{ETS} < 20 s) the behaviour "after ETS programming" will be executed also in case of voltage recovery.

11.13.1 Staircase function parameters

Dali channel ... -> DO... - General -> Enabled functions

Staircase function	Active **Inactive**
This parameter can be used to disable or to enable the staircase function.	

Dali channel 1 -> DO1 - General -> Staircase function

Staircase time	**0**...23 h 0...**3**...59 **0**...59
This parameter is used for programming the duration of the switch-on time for a scene recall.	

Staircase time retriggerable	Active **Inactive**
An active switch-on time can be retriggered (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed.	

Switch-on delay	Active **Inactive**
The staircase function enables the activation of an own switch-on delay. This switch-on delay affects the trigger result of the staircase function and thus delays the switch-on. activated: The switch-on delay for the staircase function is enabled. After 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 activated. The staircase time is activated and the output is switched on only after the time delay has elapsed. deactivated: The switch-on delay is deactivated. 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	**0**...23 h 0...**0**...59 0 ... **30**...59
This parameter is used for setting the duration of the switch-on delay. Sets the switch-on delay hours.	

Switch-on delay retriggerable	Active **Inactive**
An active switch-on delay can be retriggered (parameter activated). Alternatively, the retriggering time (parameter deactivated) can be suppressed.	

Reaction to OFF-telegram	**switch off** ignore
An active switch-on time can be aborted prematurely by switching off the staircase function. switch off: The switch-on time is aborted after receipt of an OFF telegram on the object "Staircase time start/stop". ignore: OFF Telegrams or "0" factors are ignored. The switch-on time will be executed completely to the end.	

At the end of the staircase time	**switch off** activate pre-warning time activate reduced continuous lighting
At the end of the staircase time, the actuator for the Dali channel displays the configured behaviour here. The output can be set to switch off immediately or alternatively to execute a pre-warning function. switch off: At the end of the staircase time, the actuator switches off the Dali channel. Activate pre-warning time: At the end of the staircase time, the Dali channel can generate a pre-warning prior to switch-off. The pre-warning, for example, should warn any person still on the staircase that the light will soon be switched off. Activate reduced continuous lighting: At the end of the switch-on time, the actuator activates reduced continuous lighting for the Dali channel. The reduction of the lighting to continuous lighting is appropriate, for example, if a certain degree of artificial light should be switched on permanently in long, dark hallways. Switching to switch-on brightness by activating the staircase function normally takes place by additional presence detectors or motion detectors when people are present in the hallway. The continuous lighting remains permanently active after the switch-on time has elapsed. Only when an ON telegram is received again via the object "Staircase function start/stop" does the actuator switch back to the switch-on brightness and start counting the switch-on time again.	

Pre-warning time	**0**...59 min 0...**30**...59 s
This parameter is used for setting the duration of the pre-warning time. The pre-warning time is added to the switch-on time.	

Reduced brightness	1 % 5 % ... **50 %** ... 100 %
This parameter defines the reduced brightness that is set either for pre-warning or continuous lighting.	

11.13.2 Object list staircase function

Object no.	Function	Name	Type	DPT	Flag
489	Staircase function start/stop	Dali channel... - Input	1-bit	1,010	C, -,W, -, U
1-bit object to activate or deactivate the switch-on time of the staircase function of the Dali output ("1" = switch-on / "0" = switch-off).					

11.14 disabling function

Presetting disabling function

During an active disabling function, the KNX control of the Dali channel is overridden and locked. The polarity of the disabling object can be set. 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.

At the beginning of the disabling function, the configured behaviour is executed and the control of the Dali channel locked.

The disabling function can be deactivated either directly via the disabling object or optionally via an additional 1-bit acknowledgement object.

At the end of the disabling function, the configured behaviour is executed and the control of the Dali channel enabled again.

ℹ As soon as the "Acknowledgement" parameter is activated, the acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an "ON telegram". Telegrams to the disabling object according to the "Deactivate disabling" polarity are ignored by the actuator. "OFF" telegrams to the acknowledgement object do not product a reaction.

ℹ After a power 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 In the setting "tracked brightness value and tracked colour temperature": 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.

11.14.1 Parameter disabling function

Dali channel 1 -> DO1 - General -> Enabled functions

disabling function	Active **Inactive**
The disabling function can be disabled or enabled at this point.	

Dimming channel 1 -> DO1 - General -> Disabling function

Acknowledgment	Active **Inactive**
The deactivation of the disabling function can optionally take place using an additional 1-bit acknowledgement object. This prevents the deactivation of the disabling function by the disabling object. Alternatively, the acknowledgement object is not available. In this case, disabling is deactivated via the disabling object. Parameter activated: The acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an "ON telegram". Telegrams to the disabling object according to the "Deactivate disabling" polarity are ignored by the actuator. Parameter deactivated: No additional acknowledgement object is available. The disabling function is deactivated by the disabling object according to the set polarity.	

Polarity of the disabling object	**0 = enabled; 1 = disabled** 1 = disabled; 0 = enabled
This parameter defines the polarity of the disabling object.	

Beginning of the disabling function	**switch off** Brightness value and colour temperature Memory value (brightness and colour temperature before last switch-off) no reaction flashing
The behaviour of the Dali output at the beginning of the disabling function can be configured. Switch off: At the start of the disabling function, the Dali output is switched off and locked. Brightness value and colour temperature: At the start of the disabling function, the Dali channel is set to the predefined value (brightness value and colour temperature) and locked. Memory value: At the start of the disabling function, the active and internally saved values prior to the last switch-off are set (via the "Switching" object). Control of the Dali output is then locked. No reaction: At the start of a disabling function, the Dali channel shows no reaction and remains in the currently set state. Control of the Dali output is then locked. Switch on: At the start of the disabling function, the Dali channel is switched on and locked. Flashing: The Dali channel flashes on and off during the disabling function and the control is locked during this time. The flashing time is configured on the "DO - General" parameter page. During the flashing, the logical switching state is "on 1". The switch-on brightness is reported as the brightness. The switch-on colour temperature is reported as the colour temperature. A soft ON/OFF function is ignored during flashing.	

brightness value	1 % 5 % 10 % ... **100 %**
At this point, the brightness value at the beginning of the disabling function is configured. The brightness at the beginning of the disabling function must always be within the limits of the brightness range.	

Colour temperature	1000 ... **2700** ... 10000 K
At this point, the colour temperature value for the beginning of the disabling function is parameterised. The colour temperature at the beginning of the disabling function must always be within the limits of the colour temperature range.	

End of the disabling function	switch off Brightness value and colour temperature Memory value (brightness and colour temperature before last switch-off) **tracked brightness value and tracked colour temperature** no reaction flashing
The behaviour of the Dali output at the end of the disabling function can be configured. Switch off: At the end of the disabling function, the Dali output is switched off and enabled again. Brightness value and colour temperature: At the end of the disabling function, the Dali channel is set to the predefined value (brightness and colour temperature) and enabled again. Memory value: At the end of the disabling function, the active and internally saved values (brightness and colour temperature) prior to the last switch-off are set (via the "Switching" object). tracked brightness value and tracked colour temperature: At the end of the disabling function, the states received during the disabling function or the states set before the disabling function are tracked with the appropriate values (brightness and colour temperature). Any time functions still in progress will also be taken into account if necessary. No reaction: At the end of a disabling function, the Dali channel shows no reaction and remains in the currently set state. Control of the Dali channel is enabled again. Flashing: The Dali channel is enabled again for operation after the end of the disabling function and flashes on and off. The flashing time is configured on the "DO - General" parameter page. During the flashing, the logical switching state is "on 1". The switch-on brightness is reported as the brightness. The switch-on colour temperature is reported as the colour temperature. A soft ON/OFF function is ignored during flashing. The flashing status remains active until another bus command is received and specifies another status.	

End of the disabling function after acknowledgement	switch off Brightness value and colour temperature Memory value (brightness and colour temperature before last switch-off) **tracked brightness value and tracked colour temperature** no reaction flashing

The behaviour of the Dali output at the end of the disabling function after successful confirmation can be configured.

Switch off: On confirmation, the Dali output is switched off and enabled again.

Brightness value and colour temperature: On acknowledgement, the Dali channel is set to the predefined value (brightness and colour temperature) and enabled again.

Memory value: On acknowledgement, the active and internally saved values (brightness and colour temperature) prior to the last switch-off are set (via the "Switching" object).

tracked brightness value and tracked colour temperature: On acknowledgement, the states received during the disabling function or the states set before the disabling function are tracked with the appropriate values (brightness and colour temperature). Any time functions still in progress will also be taken into account if necessary.

No reaction: On confirmation, the Dali channel shows no reaction and remains in the currently set state. Control of the Dali channel is enabled again.

Flashing: The Dali channel is enabled again for operation on confirmation and flashes on and off. The flashing time is configured on the "DO - General" parameter page. During the flashing, the logical switching state is "on 1". The switch-on brightness is reported as the brightness. The switch-on colour temperature is reported as the colour temperature. A soft ON/OFF function is ignored during flashing. The flashing status remains active until another bus command is received and specifies another status.

brightness value	1 % 5 % 10 % ... **100 %**

At this point, the brightness value at the end of the disabling function is configured. The brightness at the end of the disabling function must always be within the limits of the brightness range.

Colour temperature	1000 ... **2700** ... 10000 K

At this point, the colour temperature value at the end of the disabling function is parameterised. The colour temperature at the end of the disabling function must always be within the limits of the colour temperature range.

11.14.2 Object list disabling function

Object no.	Function	Name	Type	DPT	Flag
487	Disabling	Dali channel ... - Input	1-bit	1,003	C, -,W, -, U
1-bit object for disabling an a Dali channel (polarity configurable).					

Object no.	Function	Name	Type	DPT	Flag
495	Disabling acknowledgment	Dali channel ... - Input	1-bit	1,016	C, -,W, -, U
1-bit object to confirm an active disabling function of a Dali channel. This object is only visible if the acknowledgement is to be used with the disabling function ("1" = Disabling function is deactivated / "0" = disabling function remains active).					

12 "Venetian blind" insert function

12.1 General settings

12.1.1 Reset behaviour

Delay after voltage return

To reduce telegram traffic after switch-on of the supply voltage or after ETS programming, it is possible to delay all actively transmitted status or feedback telegrams of the Venetian blind function. For this purpose a delay time can be defined. Only after the configured time elapses are feedback telegrams for initialisation transmitted to the KNX.

Which of the telegrams is actually delayed can be specified for each status function.

ℹ The delay has no effect on the behaviour of the output. Only the bus telegrams for status or feedback are delayed. The output can also be activated during the delay after voltage recovery.

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

12.1.1.1 Reset behaviour parameters

Relay output -> JA - General

<table>
<tr><td>Delay after voltage return</td><td>0 ... 59 min | 0 ... 17 ... 59 s</td></tr>
<tr><td colspan="2">To reduce telegram traffic after switch-on of the supply voltage or after an ETS programming operation, it is possible to delay various actively sending 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.</td></tr>
</table>

12.1.2 Safety functions

The device can handle up to three 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.

- Wind alarm

  This alarm can be used to protect Venetian blinds or awnings from wind and gusts.
- Rain alarm

  This alarm can be used to protect awnings from rain.
- Frost alarm

  This alarm can be used to prevent mechanical destruction of lowered Venetian blinds at low temperatures.

The telegram polarity of the safety objects is fixed: "0" = No alarm / "1" = Alarm.

ℹ As a rule, weather stations control the communication objects of the safety function.

The safety functions are configured on the parameter page "Relay output -> JA - General". Relay output 1 is then assigned on the parameter page "Relay output 1 -> JA1 - General -> Safety". Only an assigned output reacts to a status change 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.

The output can also be assigned to several safety alarms. The priority of incoming alarm messages can be set.

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.

Different monitoring times can be selected separately in the ETS for the wind alarm, rain alarm and frost alarm.

Enabling the safety functions

The safety functions must first be enabled on the parameter page "Relay output -> JA - General" before they can be configured and used. After enabling, the individual safety alarms can be enabled or disabled independently of one another.

ℹ An update of the safety objects ("ON" to "ON" or "OFF" to "OFF") shows no reaction.

ℹ After failure of the supply voltage or after programming with the ETS, the safety functions are always deactivated.

Presetting the safety priorities

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.

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 parameter page
"Relay output -> JA - General".

As soon as monitoring is activated, the enabled alarm object (wind, rain, frost) must be transmitted cyclically with telegrams! If only one alarm telegram is missing within the monitoring time, the alarm reaction is executed for the output.

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.

12.1.2.1 Safety functions parameters

Relay output -> JA - General

Safety functions	Active **Inactive**
When the safety functions of the actuator, which can number up to 3, are used and should thus be configurable, the channel-independent enabling of the function must take place here.	

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.	

Wind alarm	Active **Inactive**
Here, the parameter can be used to enable the wind alarm and thus to enable the communication object.	

Monitoring	Active **Inactive**
If the enabled wind alarm is to be monitored cyclically for incoming telegrams to the safety objects, the monitoring function must be enabled here. Otherwise, there is no cyclical monitoring of the objects. As soon as the monitoring function is activated, telegrams must be transmitted cyclically to the enabled wind alarm object.	

Cycle time	**0** ... 23 h | 1 ... **25** ... 59 min
The wind alarm monitoring time is configured here.	

Rain alarm	Active **Inactive**
Here, the parameter can be used to enable the rain alarm and thus to enable the communication object.	

Monitoring	Active **Inactive**
If the enabled rain alarm is to be monitored cyclically for incoming telegrams to the safety object, the monitoring function must be enabled here. Otherwise, there is no cyclical monitoring of the object. As soon as the monitoring function is activated, telegrams must be transmitted cyclically to the enabled rain alarm object.	

Cycle time	**0** ... 23 h | 1 ... **25** ... 59 min
The rain alarm monitoring time is configured here.	

Frost alarm	Active **Inactive**
Here, the parameter can be used to enable the frost alarm and thus to enable the communication object.	

Monitoring	Active **Inactive**
If the enabled frost alarm is to be monitored cyclically for incoming telegrams to the safety object, the monitoring function must be enabled here. Otherwise, there is no cyclical monitoring of the object. As soon as the monitoring function is activated, telegrams must be transmitted cyclically to the enabled frost alarm object.	

Cycle time	**0** ... 23 h | 1 ... **25** ... 59 min
The frost alarm monitoring time is configured here.	

12.1.2.2 Object list safety functions

Object no.	Function	Name	Type	DPT	Flag
545	Wind alarm	Venetian blind - Safety - Input	1-bit	1,005	C, -,W, -, U
1-bit object for central activation or deactivation of the first wind alarm ("0" = wind alarm deactivated / "1" = wind alarm activated).					

Object no.	Function	Name	Type	DPT	Flag
548	Rain alarm	Venetian blind - Safety - Input	1-bit	1,005	C, -,W, -, U
1-bit object for central activation or deactivation of the rain alarm ("0" = rain alarm deactivated / "1" = rain alarm activated).					

Object no.	Function	Name	Type	DPT	Flag
549	Frost alarm	Venetian blind - Safety - Input	1-bit	1,005	C, -,W, -, U
1-bit object for central activation or deactivation of the frost alarm ("0" = frost alarm deactivated / "1" = frost alarm activated).					

12.1.3 Name of a Venetian blind output

Here, you can optionally assign a name for the Venetian blind output. The name is intended to illustrate the use of the output (e.g. "Venetian blind living room", "shutter bathroom"). The names are only used in the ETS in the text of the parameter pages and communication objects.

12.1.3.1 Parameter name

Relay output... -> VBO... - General

Name of shutter/blinds output	Free text
The text entered in this parameter is applied to the name of the communication objects and is used to label the Venetian blind output in the ETS parameter window (e.g. "Venetian blind, living room", "Shutter, bathroom"). The text is not programmed in the device.	

12.2 Priorities

The actuator in blinds operation distinguishes between different functions that can have an effect on an output. In order to prevent conflicting states, each available function has a certain priority. The function with the higher priority overrides the function with the lower priority.

For blinds operation there are the following priorities:

- 1th priority: disabling function
- 2nd priority: safety function(s)

Priority levels 3 and 4 can be configured in the ETS. The options are then...

- 3th priority: sun protection function
- 4th priority: direct bus operation

or...

- 3th priority: direct bus operation
- 4th priority: sun protection function

or...

- 3th priority: sun protection function and direct bus operation

ℹ Direct bus operation includes: short-time/long-time operation, positioning, scenes, reset behaviour, fabric stretching, end position correction.

The behaviour of some functions can be configured at the end (e.g. the behaviour at the end of a safety function). These predefined reactions are only executed if the actuator can then immediately switch to direct operation (lowest priority).

If another function with a lower priority (e.g. sun protection) has been activated during a function with a high priority (e.g. safety), the actuator executes the behaviour at the beginning of the function with the next lower priority (e.g. sun protection). The behaviour at the end of the function with the higher priority (e.g. safety) is then not executed!

12.3 Operating mode

The Venetian blind output can be configured for the drive type connected by defining the operating mode. The device permits the controlling of slatted Venetian blinds, shutters and awnings, or as a third alternative, roof windows.

Depending on the preset operating mode, the ETS adapts the parameters and communication objects for all functions.

For example, in the "Venetian blind" with slat" operating mode, there are also parameters and objects for slat control. There is no slat control in the "shutter/awning" operating mode, but a fabric stretching function can be configured for awning use. In the "Venting louver/roof window" operating mode, a distinction is made between the "opening" and "closing" drive movements, instead of an up or down movement for Venetian blinds or shutters

In this documentation, Venetian blinds, roller shutters or awnings are also designated with the term "blind", if the text does not explicitly refer to a particular function (e.g. slat control).

In all modes it is possible to specify positions.

Presetting the operating mode

The "Operating mode" parameter has an influence on many channel-oriented parameters and communication objects. When the "operating mode" parameter 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 louvers and roof windows must be connected to the outputs in such a way that they are opened in travel direction "UP" and closed in travel direction "DOWN".

ℹ An awning travels upwards when it is rolled up.

12.3.1 Operating mode parameters

Relay output 1 -> JA1 - General

Operating mode	**Venetian blind with slat** Shutter / awning Venting louver/roof window
The actuator can control various drive systems. This parameter defines which type of curtain is connected to the output. The ETS adapts all of the following parameters (designations, visible/non visible, etc.) dynamically to the respective "operating mode" parameter. For this reason, the "Operating mode" parameter should be adjusted before all other parameters of an output.	

12.4 Reset and initialisation behaviour

Presetting the behaviour after ETS programming

The parameter "After ETS programming" sets the relay behaviour of the output, irrespective of the behaviour after voltage recovery.

ℹ The parameterised behaviour "After ETS programming" will be executed after every ETS application or parameter download. A simple download of the physical address alone or partial programming of only the group addresses has the effect that this parameter is disregarded and that the configured behaviour "after voltage recovery" is executed instead.

ℹ After programming with the ETS, the safety functions and the sun protection function are always deactivated.

Set the behaviour after voltage failure

In the event of a voltage failure, the actuator always switches the relay of the output to the "stop" position. A travel movement, if any, will be interrupted.

ℹ In the event of a voltage failure, the current position data of the output are permanently stored internally so that these position values can be accurately tracked after voltage recovery. The data will not be stored, if the position data is unknown.

The following rules apply for the position data to be stored:
The current blind, slat, venting louver and roof window 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. Due to the storage of the position data as integer percentage values (0...100), a minor deviation from the positions (in the numerical range of 0..255) that may be reported back later after voltage recovery cannot be avoided.

In case of ETS programming, the saved position data is not lost.

ℹ In the event of a voltage failure, the current slat offset values of the sun protection positions are also saved.

Set the behaviour after voltage recovery

The parameter "After voltage recovery" sets the relay behaviour of the output after voltage recovery.

12.4.1 Reset and initialisation behaviour parameter

Relay output 1 -> JA1 - General

<table>
<tr><td>After ETS programming operation</td><td>**stop**
raising / opening
lowering / closing
as after voltage return</td></tr>
<tr><td colspan="2">The actuator permits setting the preferred relay contact position after ETS programming for the output.
raising / opening: After programming with the ETS, the actuator raises the blind/shutter or opens the venting louver/roof window.
lowering / closing: After programming with the ETS, the actuator lowers the blind/shutter or closes the venting louver/roof window.
stop: After programming with the ETS, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.
As after voltage return: After an ETS programming operation, the actuator will behave in the manner specified in the parameter "After voltage return".</td></tr>
</table>

<table>
<tr><td>On voltage failure</td><td>stop</td></tr>
<tr><td colspan="2">The behaviour of the actuator is predefined in case of voltage failure. The actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.</td></tr>
</table>

<table>
<tr><td>After voltage return</td><td>**stop**
raising / opening
lowering / closing
approaching a position</td></tr>
<tr><td colspan="2">The actuator permits setting the preferred relay contact position after voltage return for the output.
stop: After voltage return, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.
raising / opening: In case of voltage return, the actuator raises the blind or opens the venting louver/roof window.
lowering / closing: In case of voltage return, the actuator lowers the blind or closes the venting louver/roof window.
Approach position: In case of voltage return, the connected drive can approach a position specified by further parameters.</td></tr>
</table>

<table>
<tr><td>Position of Venetian blind</td><td>**0**...100 %</td></tr>
<tr><td colspan="2">This parameter specifies the Venetian blind position to be approached in case of voltage failure.
This parameter is only visible if the behaviour "After voltage return" in the "Venetian blind" operating mode is set to "Approach position".</td></tr>
</table>

Slat position	0...100 %
This parameter specifies the slat position to be approached in case of voltage return after the Venetian blind has been positioned at the desired height. This parameter is only visible if the behaviour "After voltage return" in the "Venetian blind" operating mode is set to "Approach position".	

Position shutter/awning	0...100 %
This parameter specifies the roller shutter or awning position to be approached in case of voltage return. This parameter is only visible if the behaviour "After voltage return" in the "shutter/awning" operating mode is set to "Approach position".	

Venting louver position	0...100 %
This parameter specifies the venting louver/roof window position to be approached in case of voltage return. This parameter is only visible if the behaviour "After voltage return" in the "venting louver/roof window" operating mode is set to "Approach position".	

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

12.5.1 Short-time / Long-time operation

Determining and configuring short-time and long-time operation

The short-time operation (Step) permits adjusting the slat tilting angle of a Venetian blind or the 'slit opening width' of a shutter. In most cases, short-time operation is activated by pressing a Venetian blind pushbutton sensor permitting manual intervention in the blind controller. When the actuator receives a short-time command while the Venetian blind, shutter, awning or louver is in motion, the travel movement is stopped immediately by the actuator.

A long-time operation (Move) is determined by the travel time of the connected Venetian blind, shutter/awning or louver and must therefore not be preset separately. The 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 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.). Thus, it is ensured that the upper end position is always reached even in case of uninterrupted long time travel movements.

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

ℹ A drive movement activated 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 for the output on the parameter page "Relay output 1 -> JA1 - General -> Times" irrespective of the travel time of the blind or the venting louver/roof window. It is possible to specify in the ETS whether the output executes only a "stop" for a travel movement on reception of a short time telegram or whether the output is activated for a specific duration.

ℹ The configured "Duration of short time operation" for a Venetian blind should correspond to approx. ¼ of the complete slat travel time and for a shutter to the full travel time needed for opening a shutter.

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

12.5.2 Setting the travel time

Determining and configuring travel times (manual entry of travel times)

For computing positions and also for executing long time operation, the device needs the exact travel time of the connected Venetian blind, shutter/awning or venting louver/roof window.

The travel times must be measured manually and entered into the ETS. It is important to determine the movement time accurately to permit positions to be approached with good precision. The average of several time measurements should be calculated.

The travel time corresponds to the duration of a travel movement from the completely open position (upper end position / awning rolled up) to the completely closed position (lower end position / awning completely unrolled) (and not vice versa). The movement times are to be determined as a function of the different types of drives.

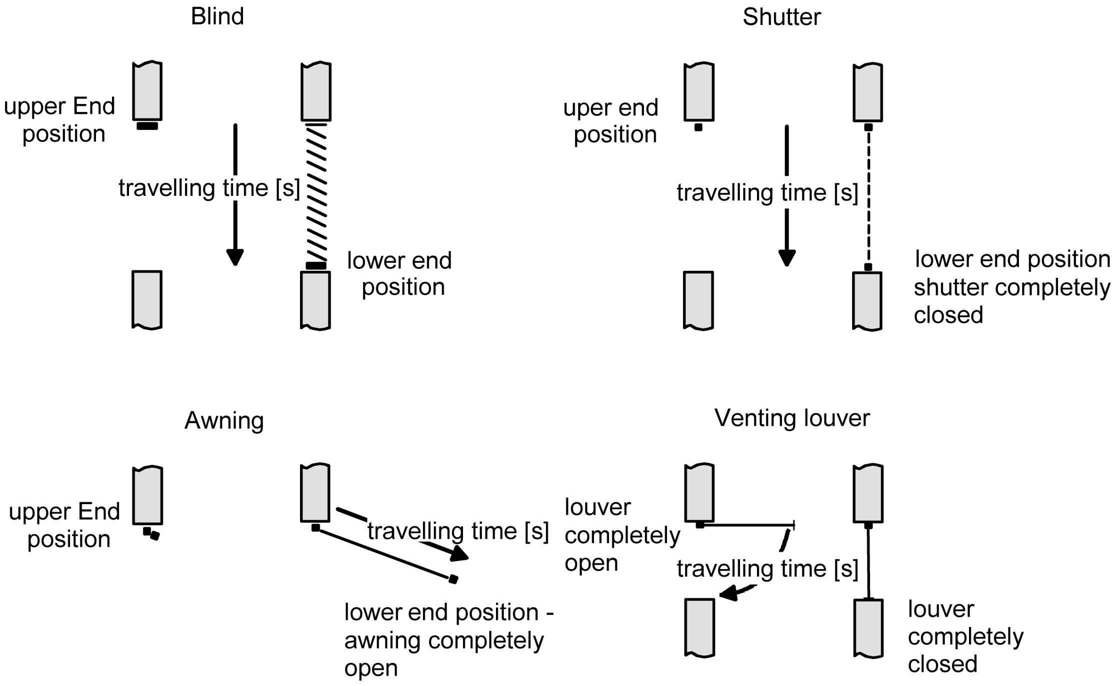


Image 41: Determining the movement time according to the drive type

Determining and configuring travel times (Setting travel time via the bus)

Apart from the classic setting of the travel time via ETS parameters, it is possible to learn (teaching) the travel time of the blind or the venting louver/roof window to simplify the commissioning of facades with identical drives (i.e. identical travel times!). Here, a manually determined travel time of a master Venetian blind output is automatically forwarded to other Venetian blind outputs (slaves).

The Venetian blind output can be configured as a master or slave. An output configured as a master defines the travel time of the slave outputs of other actuators of the same type. Slave venetian blind outputs always acquire their travel time from the 2-byte communication object "Travel time (slave)". The master Venetian blind output transmits its travel time via the "Travel time (master)" object. As a result, the objects "travel time (master)" and "travel time (slave)" must always be linked with each other via the same group address!

ℹ Only one Venetian blind output may be the master!

Procedure for setting a travel time via the bus (master-slave):

- Learn the travel time of the master Venetian blind output. The learn mode is started via the "Measurement of travel time enable" object on the actuator of the master Venetian blind output by means of an "ON" telegram.
- Move the master Venetian blind output fully up / fully open the master Venetian blind output by means of a long-time "UP" telegram.
- After the movement has been completed, lower the master Venetian blind output using a long time telegram "DOWN".

  The master Venetian blind output starts the time measurement.
- Stop the movement immediately after reaching the lower limit / fully closed position using a short-time telegram.

  The travel time measurement is stopped and temporarily stored internally.

  Afterwards, the provisionally determined time can then be corrected or finely tuned by means of further measurements. For this, repeat the measuring procedure.
-
- End the learning of the master Venetian blind output travel time by stopping the learn mode via the "Measurement of travel time enable" object by means of an "OFF" telegram.

  The actuator then sends the last determined travel time to the bus via the "Travel time (master)" object and returns to normal operation.

  Bus events received during learning mode (e.g. positions, safety or sun protection functions) are not updated!

  The Venetian blind outputs in slave mode wait for time preset of the master output. As soon as a travel time is received via the "Travel time (slave)" object, all slave outputs apply the travel time in their own configuration.

ℹ A learned travel time is stored permanently and remains unchanged even after a voltage failure and after ETS programming.

ℹ If no travel time has been determined via the bus after the function has been enabled in the ETS, the travel time configured in the ETS for the parameter "Travel time ... (default setting)" is used for the master and slaves. The travel time configured in the ETS loses its validity once a learning mode has been started and successfully completed. The ETS travel time is first valid again when the parameter "Setting travel time via the bus" is reset to "no (travel time only by parameter)".

ℹ If the learning mode on the master was terminated without determining a valid travel time (object "Measurement of travel time enable" = "OFF" before a time measurement expires), the last validly determined time is transmitted via the object "travel time (master)". If no valid travel time has yet been determined, the blind travel time set in the ETS is used after the learning mode has been cancelled

Enabling setting travel time via the bus

If the setting of the travel time is to be used via the bus (master-slave), the function must first be enabled on the parameter page "Relay output -> JA - General".

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

A distinction is made as to whether the travel time is configured using ETS parameters, or whether the travel time is to be set via the bus (master-slave).

Individual configuration of the travel time (parameter "Setting the travel time via the bus = no ...)

Enter the exact travel times determined in the course of the commissioning procedure into the "Venetian blind travel time" or "Shutter/awning travel time" or "Venting louver/roof window travel time" parameters. The maximum 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.).

Travel times via the bus (parameter "Setting the travel time via the bus = yes ...)

- The Venetian blind output as a master specifies the travel time for other slave outputs. There can only be one master in a master-slave application!
- The Venetian blind output as a slave receives its travel time from the master output. There can be any number of slaves in a master-slave application.

The parameters "Venetian blind travel time (default setting)" or
"Shutter/awning travel time (default setting)" or
"Venting louver travel time / roof window (default setting)" initialise the output with a valid travel time, provided that no learning mode has been executed on the master and consequently no learned travel time exists yet.

The travel time configured in the ETS loses its validity once a learning mode has been started and successfully completed.

ℹ The ETS travel time is first valid again when the parameter "Setting travel time via the bus" is reset to "no (travel time only by parameter)".

12.5.3 Setting slat travel times (with slatted Venetian blinds)

Presetting the slat moving time

The "Slat travel time" parameter must be set exactly to the value determined during commissioning.

- ℹ The slat moving time must be shorter than the preset or learnt blind travelling time.
- ℹ The configured movement time extension will also be taken into account when slats are moved into the completely open position (upward movement).

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 Venetian blind moves downwards. The actuator assumes that the slats are completely closed when the Venetian blind moves downwards .

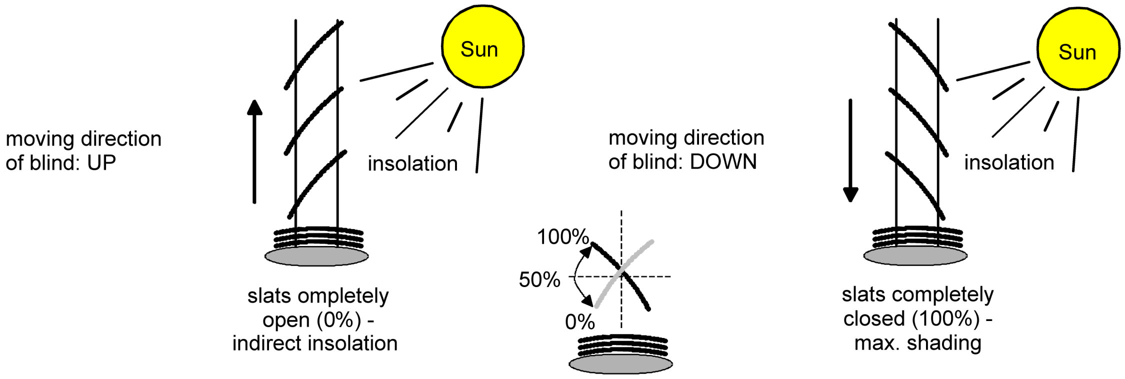


Image 42: Type 1 - Slatted Venetian blinds with oblique slat position in both travel directions

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.

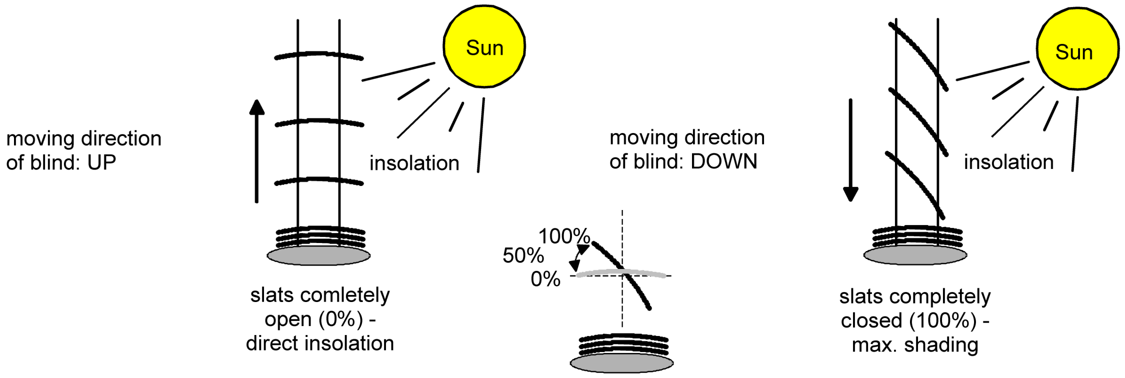


Image 43: Type 2 - Slatted Venetian blinds with oblique and horizontal slat position

12.5.4 Presetting the travel time extension and switchover time

Presetting the movement time extension

Enter the determined travel time extension into the parameter "Travel time extension for upward travel" (round up the determined extension value if necessary).

Presetting the switchover time for movement direction changes

Set the parameter "Switchover time for travel direction change" to the required switchover interval.

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

12.5.5 Short-time / Long-time operation, travel times parameter

Relay output -> JA - General

Setting the travel time via the bus	Active **Inactive**
If setting the travel time via the bus (master-slave) is to be used, the function must first be enabled by this parameter. If the function is not enabled, the Venetian blind outputs work individually with regard to their travel time.	

Relay output 1 -> JA1 - General -> Times

Setting travel time via the bus	no (travel time only by parameter) yes (travel time by KNX, Master) yes (travel time by KNX, Slave)
A distinction is made as to whether the travel time is configured using ETS parameters, or whether the travel time is to be set via the bus (master-slave). no (travel time only by parameter): The Venetian blind output operates independently with regard to its travel time. The time is not preset via the bus. yes (travel time by KNX, Master): The Venetian blind output is configured as a master and specifies the travel time for other slave outputs. There can only be one master in a master-slave application! yes (travel time by KNX, slave): The Venetian blind output is configured and receives its travel time from the master output. There can be any number of slaves in a master-slave application. This parameter is only visible if the setting of travel time via the bus has been globally enabled.	

Venetian blind travelling time	0 ... **1** ... 19 min | **0**...59 s
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.	

Shutter/awning travelling time	0 ... **1** ... 19 min | **0**...59 s
This parameter defines the travelling time of the shutter or awning. The time needed for a complete travel from the upper into the lower end position must be determined.	

Venting louver travelling time	0 ... **1** ... 19 min | **0**...59 s
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.	

Slat travelling time	**0** ... 19 min | 0 ... **2** ... 59 s | **0** ... 900 ms
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 (travel movement DOWN) must be determined.	

Short time operation	no (only stop) **yes**
This parameter can be used to configure the reaction to a received short time telegram. no (only stop): The drive will only be stopped if it is executing a movement at the time of telegram reception. There is no reaction if no movement is in progress. yes: Short-time operation is started on reception of a short-time telegram when the drive is stationary. If the drive is in motion at the time of telegram reception, it will be stopped.	

Duration of short time operation seconds: (0...59)	**0** ... 59 s | 0 ... **500** ... 990 ms
This parameter defines the duration of short-time operation. ℹ The duration of short time operation should in no case exceed half the slat adjusting time.	

Switchover time for travel direction change	0.5 s **1 s** 2 s 5 s
This parameter specifies the break in a travel direction change (switchover time).	

Travel time extension for upward travel	none 0.5% 1% 1.5% **2%** 3% 4% 5% 6% 7% 8% 9% 10% 12.5% 15%
The actuator extends all the up movements or all venting louver/roof window movements into the opened position using the extension configured here. The time extension expressed in percent is the difference between the measured travel time needed to reach the lower end position (completely closed position) and the time needed to reach the upper end position (completely open position).	

12.5.6 Object list Short-time / Long-time operation, travel times

Object no.	Function	Name	Type	DPT	Flag
550	Measurement of travel time enable	Venetian blind - travel times - Input	1-bit	1,003	C, -,W, -, U

1-bit object for starting and ending the automatic travel time measurement (teaching).

Polarity: 1 = start measurement / 0 = end measurement, abort.

This object is only visible if "Setting the travel times via the bus" is enabled.

Object no.	Function	Name	Type	DPT	Flag
551	Travel time (master)	Venetian blind - travel times - Output	2 bytes	7,004	C, R, -, T, A

2-byte object for transmitting the learned travel time of a master output to other slave Venetian blind outputs. At least one Venetian blind output must be configured as a master! In the case of a master-slave application, this object must always be linked to the "Travel time (slave)" object of other actuators via an identical group address to specify a travel time via the bus!

This object is only visible if "Setting the travel times via the bus" is enabled.

Object no.	Function	Name	Type	DPT	Flag
552	Travel time (slave)	Venetian blind - travel times - Input	2 bytes	7,004	C, -,W, -, U

2-byte object for receiving the learned travel time of a master output for other actuators (slaves). At least one Venetian blind output must be configured as a master! In the case of a master-slave application, this object must always be linked to the "Travel time (master)" object of other actuators via an identical group address to specify a travel time via the bus!

This object is only visible if "Setting the travel times via the bus" is enabled.

Object no.	Function	Name	Type	DPT	Flag
554	Long-time operation	Venetian blind 1 - input	1-bit	1,008	C, -,W, -, U

1-bit object for activation of long time operation

Object no.	Function	Name	Type	DPT	Flag
555	Short time operation	Venetian blind 1 - input	1-bit	1,007	C, -,W, -, U

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

12.6 Position calculation, position presetting and feedbacks

12.6.1 Position calculation and position presetting

Calculating 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 Venetian blind, shutter, awning or venting louver or roof window whenever these elements are adjusted. The calculated position value is a measure of the height of the blind/shutter or of the opening width of the venting louver/roof window.

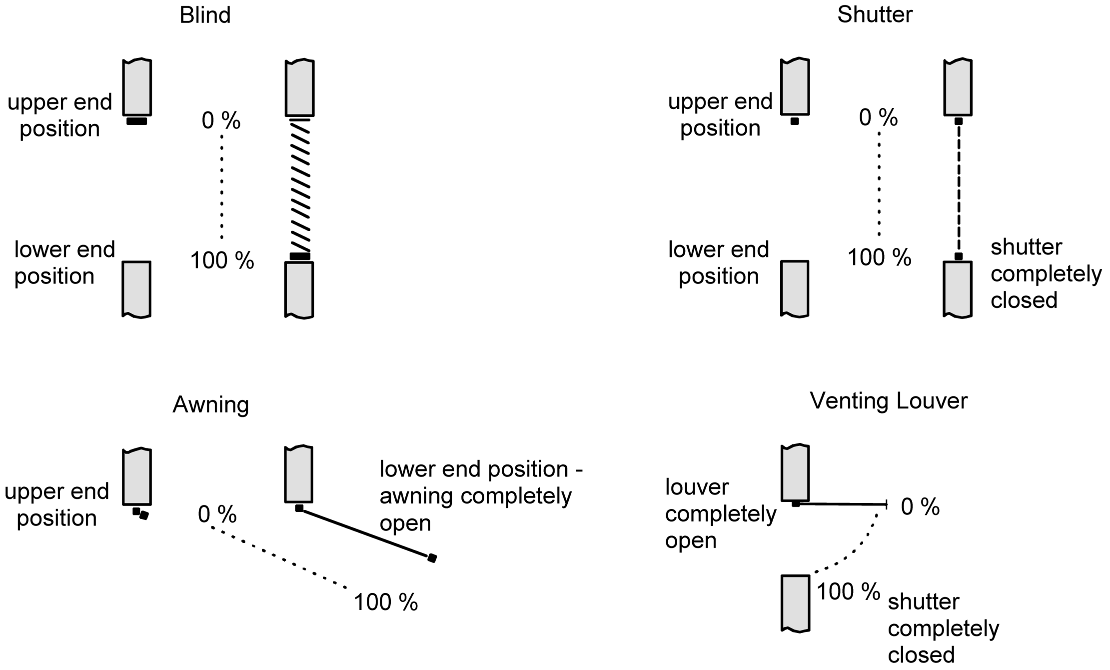


Image 44: Positions defined as a function of the type of movement

The actuator derives the positions from the configured travelling time since conventional drives do not provide feedback about their positions. Thus, the travelling time configured or learned 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 shutter connected to the certain output has an overall travel time of 20 s. The shutter is in its upper end position (0 %). It is to be positioned at 25 %. The actuator calculates the travel time required for approaching the desired position: 20 s · $0.25_{(25\ \%)}$ = 5 s. The output will then lower the shutter for 5 s and thus position the blind at height of 25 %.

Example 2

The shutter at an output has an overall travel time of 20 s. The shutter is in the 25 % position. It is to be positioned at 75 %. The difference between the positions is 50 %. The actuator calculates the travel time required for bridging the difference between the positions: $20\ \text{s} \cdot 0.5_{(50\ \%)} = 10\ \text{s}$. The output will then lower the shutter for 10 s and thus position the blind at height of 75 %.

With all the upward movements, the configured movement time extension is automatically added to the calculated movement time.

Example 3

The shutter at an output has an overall travel time of 20 s. The shutter is in the 75 % position. It is to be positioned at 25 %. The difference between the positions is 50 %. The actuator calculates the non-extended travel time required for bridging the difference between the positions:
$20\ \text{s} \cdot 0.5_{(50\ \%)} = 10\ \text{s}$. Taking the travel time extension into account (e.g. 10 %) the actual raising time is:: $10\ \text{s} \cdot ((100\ \% + 10\ \%_{(\text{travel time extension})}) : 100\ \%) = 10\ \text{s} \cdot 1.1 = 11\ \text{s}$. The output will then raise the shutter for 11 s and thus position it at a blind height of 25 %.

When the lower or upper end positions (0 % or 100 %) are approached, the movement time is always 20 % longer than the overall movement time.

Example 4

The shutter at an output has an overall travel time of 20 s. The shutter is in the 50 % position. It is to be positioned at 100 %. The difference between the positions is 50 %. The actuator calculates the travel time required for bridging the difference between the positions: $20\ \text{s} \cdot 0.5_{(50\ \%)} = 10\ \text{s}$. As the movement is a limit position movement, the actuator adds 20 % of the total travel time:
$10\ \text{s} + (20\ \% : 100\ \%) \cdot 20\ \text{s} = 14\ \text{s}$. The output will then lower the shutter for 14 s and thus positions it safely at a blind height of 100 %.

Example 5

The shutter at an output has an overall travel time of 20 s. The shutter is in the 50 % position. It is to be positioned at 0 %. The difference between the positions is 50 %. The actuator calculates the non-extended travel time required for bridging the difference between the positions: $20\ \text{s} \cdot 0.5_{(50\ \%)} = 10\ \text{s}$. As the movement is a limit position movement, the actuator additionally adds 20 % of the total travel time:
$10\ \text{s} + (20\ \% : 100\ \%) \cdot 20\ \text{s} = 14\ \text{s}$.
Taking the travel time extension into account (e.g. 10 %) the actual raising time is:
$14\ \text{s} \cdot ((100\ \% + 10\ \%_{(\text{travel time extension})}) : 100\ \%) = 14\ \text{s} \cdot 1.1 = 15.4\ \text{s}$. The output will then raise the shutter for 15.4 s and thus position safely at 0 %.

ℹ The actuator executes position approaches only if a new position deviating from the current position is preset.

ℹ The actuator stores the blind or venting louver/roof window positions temporarily. The actuator can approach newly preset positions only if the current positions are known. For this purpose, the output must be given the opportunity to synchronise itself whenever the supply voltage is switched on or after every ETS programming run (physical address, application program, partial download). This synchronisation is performed by means of a reference movement.

i Position approaches in progress are aborted in case of voltage failure. In case of voltage failure, the configured behaviour is 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 .

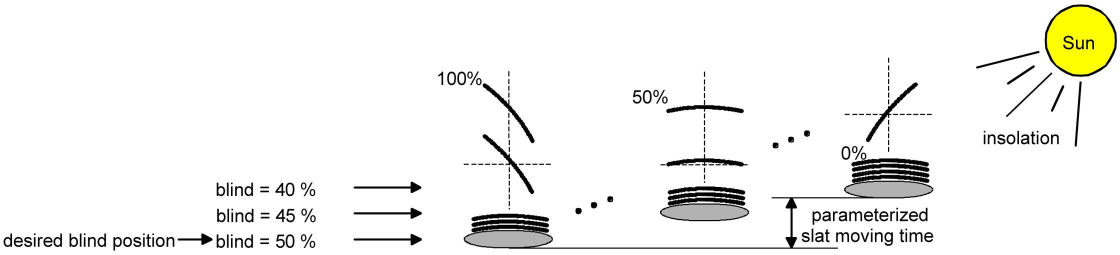


Image 45: Example of slat positioning affecting the position of the Venetian blind (typical of slat type 1; analogous reaction for type 2)

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 (see figure 45)
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%).

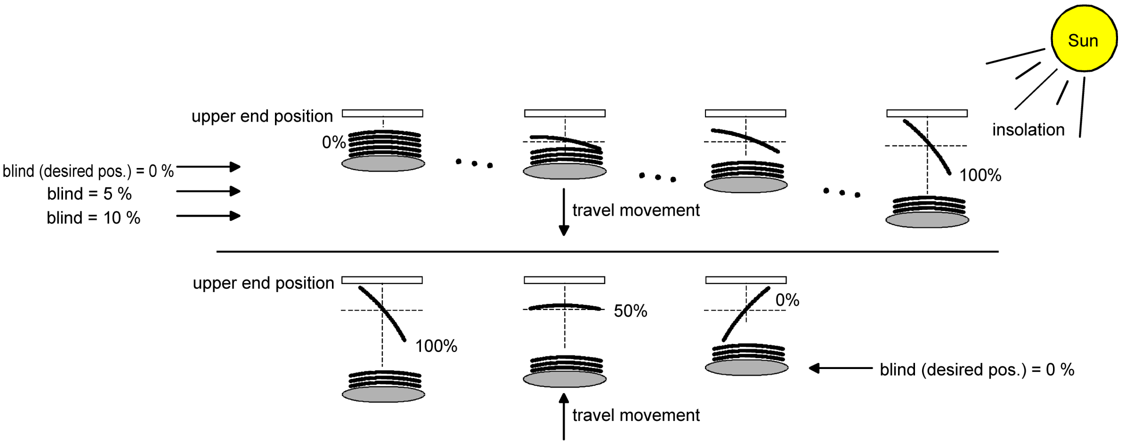


Image 46: Example of slat positioning with the Venetian blind in upper end position (typical of slat type 1.)

Example (see figure 46)
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, the 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). This synchronisation is performed by means of a reference movement for the slat or the Venetian blind.

i When positioning the Venetian blind height, the slats are always positioned afterwards. After reactivation of the 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.

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 by the behaviour after voltage recovery,
- Positioning by a scene recall.

Positioning via the positioning objects:
Each Venetian blind, shutter, awning, venting louver or each roof window can be positioned directly using the "Position ..." object. 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.
Like the operation via short time, long time or scene recall, this form of control is also designated as "direct operation". Positioning via the objects therefore has the same priority.

A position approach effected by the communication objects can be interrupted at any time by a short- or long-time or by a scene recall. The direct operation can be overridden by a function with a higher priority, e.g. safety or also sun protection (configurable).
The position telegrams must correspond to the 1 byte data format according to KNX datapoint type 5.001 (Scaling). The actuator converts the value received (0...255) linearly into a position (0...100 %).

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 supply voltage or after ETS programming, 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 travel time has been received or no slat positioning has taken place (no slat reference movement). In this case, the slat is moved during a Venetian blind position approach into the completely closed position (100 %). The slat position is then considered as calibrated.

ℹ Optionally, the sun protection function offers the possibility of receiving the instruction of the blind height, venting louver/roof window position or slat position to be adopted during sunshine via separate communication objects and to preset these values variably. This form of variable position preset in the sun protection function is identical to presetting the positions via communication objects in direct operation. The priority of the incoming telegrams in direct operation with the sun protection activated can be additionally configured in the ETS.

Positioning by the sun protection function, by the behaviour after voltage recovery 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.

Reference movement

After ETS programming (physical address, application program, partial download) or after voltage failure, all current position data are unknown. Before the actuator can approach new positions after voltage recovery 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,
– Positioning to the 0 % position.

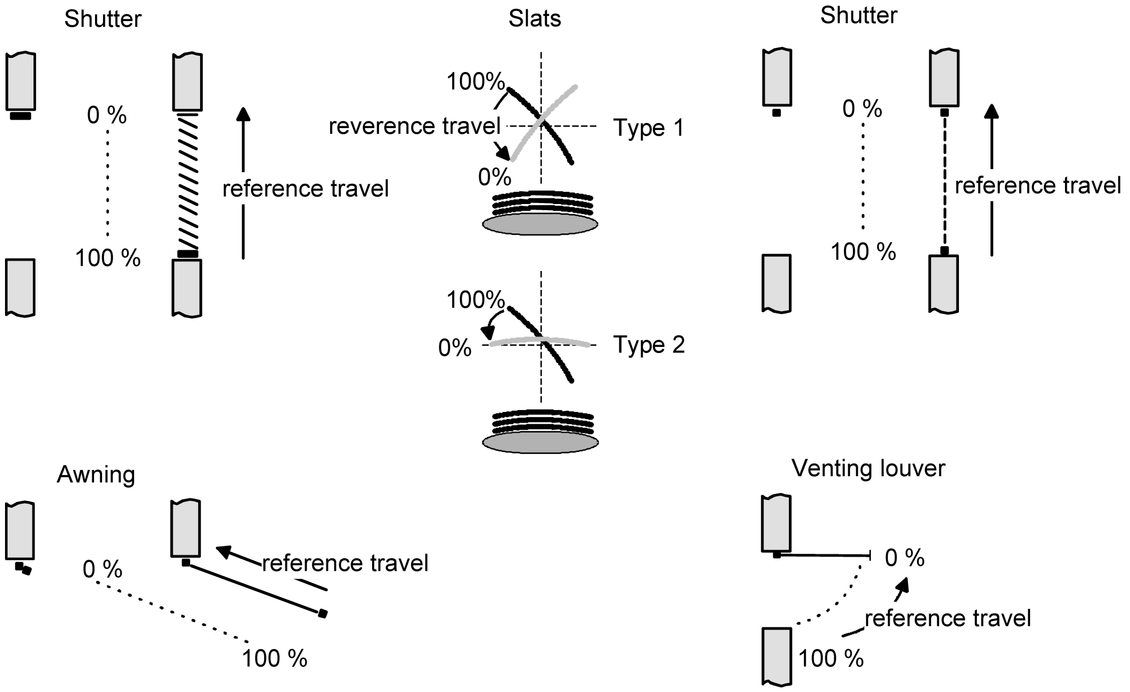


Image 47: Reference movement

In the event of slat positioning of a Venetian blind via the corresponding communication objects after voltage recovery 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 travel 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.

12.6.2 Feedback telegrams

Position feedback messages

In addition to presetting positions via positioning objects, the actuator can track the current positions values via separate feedback objects and also transmit them to the KNX, if the bus voltage is on. Thus, the preset setpoint position can be distinguished from the true actual position of the drives activated.

The following feedback telegrams can be preset for each output depending on the parameterized mode of operation...

- Feedback (1 byte) of the Venetian blind, shutter, awning or venting louver/roof window positions,
- Feedback (1 byte) of the slat position (only with Venetian blinds).

The individual position feedback messages can be enabled in the ETS independent of one another and have communication objects of their own. For each travel movement the actuator calculates the current position and tracks it in the position feedback objects. The positions are tracked and the feedback objects updated even if an output has been activated via short time or long time telegrams, provided the supply voltage is switched on.

The feedback objects are updated after the following events:

- at the end of a travel movement – including a slat positioning movement in a Venetian blind – when the drive stops and when the new position is reached,
- with a movement to an end position already at the time the end position is theoretically reached, i.e. before the 20 % extension and the travel time extension have elapsed,
- cyclically even during a travel movement, provided that cyclical transmission is active.

The feedback objects are not updated, if the position last reported back has not changed after a movement (for instance, when the Venetian blind is repositioned, the unchanged slat position will not be reported back a second time). The actuator cannot calculate a feedback position, if the current position data after switch-on of the bus and supply voltage or after ETS programming are still unknown. In these cases, the system must first perform a reference movement so that the position can be calibrated. In case of unknown positions, the actuator automatically performs reference travels, if new positions are preset and if these positions are to be approached. As long as a position is unknown, the value of the feedback objects is "0".

Presetting position feedback for Venetian blind, shutter, awning or venting louver/roof window positions

The feedback functions can be enabled and programmed for the output. In the case of enabled feedback, the ETS adapts the parameter texts depending on the set operating mode ("Venetian blind position", "Shutter / awning position" or "Venting louver / roof window position"). 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 mains voltage return, if the position value differs from the one last transmitted. If the position data are known, the feedback can be transmitted with a time delay to reduce the bus load, whereby the delay time is set on the parameter page "Relay output -> JA - General".

ℹ If the signalling object is active, no value is actively transmitted if the position is unknown.

ℹ If the status object is passive, the value "0" is reported back after readout if the position is unknown.

Feedback telegrams on active signalling objects can:

- be transmitted with a delay after voltage recovery. No feedback telegram is transmitted during a running delay, even if a position value changes during this delay.
- be transmitted cyclically during active travel. The position feedback is transmitted cyclically during a running travel movement.

ℹ The cyclical transmission only takes place if the position data is known (reference movement completed).

ℹ In case of Venetian blind operation, any position change of the Venetian blind within the limits of the slat adjustment (0 to 100 %) does not cause a movement and therefore no change of the feedback position data either.

Presetting the position feedback for slat positions (only with Venetian blinds)

The feedback functions for the slat positions can be enabled and programmed independently for the output. 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 voltage recovery, 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.

ℹ If the signalling object is active, no value is actively transmitted if the position is unknown.

ℹ If the status object is passive, the value "0" is reported back after readout if the position is unknown.

Feedback telegrams on active signalling objects can:

- be transmitted with a delay after voltage recovery, provided that the position is known (reference travel performed). After the end of the delay, the position last adjusted statically will be transmitted to the KNX. No feedback telegram is transmitted during a running delay, even if a position value changes during this delay.
- be transmitted cyclically during active travel. The position feedback is transmitted cyclically during a running travel movement.

ℹ The cyclical transmission only takes place if the position data is known (reference movement completed). The feedback object of the slat position also transmits cyclically during a blind/shutter movement (e.g. Venetian blind position approach).

ℹ In case of Venetian blind operation, any position change of the Venetian blind within the limits of the slat adjustment (0 to 100 %) does not cause a movement and therefore no change of the feedback position data either.

'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 preset:

- 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, the actuator can update the feedback object Invalid position" (object value "ON"), which will then signal that the object values of the 1-byte position feedback objects are invalid.
An invalid position feedback will only be reversed (object value
" (object value "OFF"), after the position data for the Venetian blind, shutter, awning, venting louver or roof window have been calibrated by means of a reference movement The calibration of the slat position in a Venetian blind alone will not result in the reversal of an 'invalid position "invalid position".
As an option, the object value of the status feedback message can be actively transmitted to the KNX in case of a value change.

Drive movement feedback:

The actuator can report back via a separate 1-bit communication object whether the connected drive is moving, i.e. whether the output is supplying current for any travel direction. The feedback object has the object value "ON", when current is flowing from the output to the drive. Similarly, "OFF" is written into the object if the output re-

mains in a stop position In this case, the operation by which the output was activated (short time or long time operation, positioning, etc.) is of no importance.
As an option, the object value of the status feedback message can be actively transmitted to the KNX in case of a value change.
The state of the feedback is only derived from the relay state of the actuator. This means that if a drive is blocked or already in its end position, the value reported back does not correspond to the actual state of the travel movement.

Setting feedback of an invalid position

The feedback of an invalid position can be enabled and programmed independently for each output. In the case of enabled feedback, the ETS adapts the parameter texts depending on the set operating mode ("Invalid Venetian blind position", "Invalid shutter / awning position" or "Invalid venting louver / roof window position").

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.

In case of an actively transmitting signalling object, the feedback telegram can be transmitted after voltage recovery with a time delay to reduce the bus load, with the delay being preset globally.

In case of an actively transmitting signalling object, 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).

In case of a passively transmitting status object, a telegram is transmitted in response only if the feedback object is read out by the bus.

Feedback telegrams on active signalling objects can:

– be transmitted with a delay after voltage recovery. After the end of the delay, the object value state last adjusted will be transmitted to the KNX. No feedback telegram is transmitted during a running delay, even if a position value becomes known during this delay, for example through a reference movement.

ℹ Automatic transmission after voltage recovery only takes place if there has been an internal change to the object state.

Setting drive movement feedback

The feedback of a drive movement can be enabled and configured for the 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.

In case of an actively transmitting signalling object, the feedback telegram can be transmitted after voltage recovery with a time delay to reduce the bus load, with the delay being preset globally.

In the case of an actively transmitting signalling object, a telegram is transmitted when the connected drive starts moving or stops.
The feedback of a drive movement is transmitted with a delay after voltage recovery, for example when the drive starts moving due to the set behaviour after voltage recovery. After the end of the delay, the object value state last adjusted will be transmitted to the KNX. No feedback is transmitted during a running delay, even if the drive stops or starts moving.

In case of a passively transmitting status object, a telegram representing the current drive movement is transmitted in response only if the feedback object is read out by the KNX.

ℹ Automatic transmission after voltage recovery only takes place if the drive starts moving after voltage recovery or if there has been a change in the drive movement due to the voltage failure.

12.6.3 Parameter position calculation, position presetting and feedbacks

Relay output 1 -> JA1 - General -> Enabled functions

Feedback telegrams	**Active** Inactive
This parameter can be used to enable the feedback functions of the Venetian blind output.	

Relay output 1 -> JA1 - General -> Feedback telegrams

Venetian blind position	no feedback **feedback object is active signalling object** feedback object is passive status object
The current Venetian blind position of the output can be reported separately back to the KNX. no feedback: There is no feedback object available for the output. feedback deactivated Feedback object is an active signalling object: The feedback and the object are activated. The object transmits actively. Feedback object is a passive status object: The feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request).	

Position of shutter/awning	no feedback **feedback object is active signalling object** feedback object is passive status object
The current roller shutter or awning position of the output can be reported separately back to the KNX. no feedback: There is no feedback object available for the output. feedback deactivated Feedback object is an active signalling object: The feedback and the object are activated. The object transmits actively. Feedback object is a passive status object: The feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request).	

Venting louver/roof window positions	no feedback **feedback object is active signalling object** feedback object is passive status object

The current venting louver/roof window positions of the output can be reported separately back to the KNX.

no feedback: There is no feedback object available for the output. feedback deactivated

Feedback object is an active signalling object: The feedback and the object are activated. The object transmits actively.

Feedback object is a passive status object: The feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request).

Delay after voltage return	Active **Inactive**

The feedback can be transmitted to the KNX with a delay after voltage return or after an ETS programming operation. The delay time is configured under
"Relay output -> JA - General".

Cyclical transmission during active movement	Active **Inactive**

If cyclical transmission of the blind/shutter position is required during active movement, this parameter can be activated. The position feedback is then transmitted cyclically during a running travel movement. The cyclical transmission only takes place if the position data is known (reference movement completed).

Time for cyclical transmission	2 ... **5** ... 59 s

This parameter specifies the cycle time for the cyclical transmission of the blind/shutter position and is only available if cyclical transmission is activated.

Slat position	no feedback **feedback object is active signalling object** feedback object is passive status object

The current slat position of the output can be reported separately back to the KNX.

no feedback: There is no feedback object available for the output. feedback deactivated

Feedback object is an active signalling object: The feedback and the object are activated. The object transmits actively.

Feedback object is a passive status object: The feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request).

Delay after voltage return	Active **Inactive**
The feedback can be transmitted to the KNX with a delay after voltage return or after an ETS programming operation. The delay time is configured under "Relay output -> JA - General".	

Cyclical transmission during active movement	Active **Inactive**
If cyclical transmission of the slat position is required during active movement, this parameter can be activated. The position feedback is then transmitted cyclically during a running travel movement. The feedback object of the slat position also transmits cyclically during a blind/shutter movement (e.g. Venetian blind position approach). The cyclical transmission only takes place if the position data is known (reference movement completed).	

Time for cyclical transmission	1 ... 59
This parameter specifies the cycle time for the cyclical transmission of the slat position and is only available if cyclical transmission is activated.	

Invalid Venetian blind position	**no feedback** feedback object is active signalling object feedback object is passive status object
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: There is no feedback object available for the output. feedback deactivated Feedback object is an active signalling object: The feedback and the object are activated. The object transmits actively. Feedback object is a passive status object: The feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request).	

Invalid shutter/awning position	**no feedback** feedback object is active signalling object feedback object is passive status object
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: There is no feedback object available for the output. feedback deactivated Feedback object is an active signalling object: The feedback and the object are activated. The object transmits actively. Feedback object is a passive status object: The feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request).	

Invalid venting louver/roof window position	**no feedback** feedback object is active signalling object feedback object is passive status object

The actuator can report to the KNX that the current venting louver/roof window position is unknown (e.g. after an initialisation, when no reference travel has been executed as yet).

no feedback: There is no feedback object available for the output. feedback deactivated

Feedback object is an active signalling object: The feedback and the object are activated. The object transmits actively.

Feedback object is a passive status object: The feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request).

Delay after voltage return	Active **Inactive**

The feedback can be transmitted to the KNX with a delay after voltage return or after an ETS programming operation. The delay time is configured under
"Relay output -> JA - General".

Drive movement	**no feedback** feedback object is active signalling object feedback object is passive status object

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: There is no feedback object available for the output. feedback deactivated

Feedback object is an active signalling object: The feedback and the object are activated. The object transmits actively.

Feedback object is a passive status object: The feedback and the object are activated. The object is passive (telegram transmission only as a response to 'Read' request).

Delay after voltage return	Active **Inactive**

The feedback can be transmitted to the KNX with a delay after voltage return or after an ETS programming operation. The delay time is configured under
"Relay output -> JA - General".

12.6.4 Object list position calculation, position presetting and feedbacks

Object no.	Function	Name	Type	DPT	Flag
556	Position...	Venetian blind... - Input	1 bytes	5,001	C, -,W, -, U
1-byte object for presetting a position value (0…255) for the height of the Venetian blind or shutter or the venting louver/roof window position in direct operation.					

Object no.	Function	Name	Type	DPT	Flag
557	Slat position	Venetian blind... - Input	1 bytes	5,001	C, -,W, -, U
1-byte object for presetting a slat position value (0…255) in direct operation.					

Object no.	Function	Name	Type	DPT	Flag
572	Feedback ...position	Venetian blind... - Output	1 bytes	5,001	C, R, -, T, A
1-byte object for position feedback of the Venetian blind or shutter height or venting louver/roof window position (0…255).					

Object no.	Function	Name	Type	DPT	Flag
573	Slat position feedback	Venetian blind... - Output	1 bytes	5,001	C, R, -, T, A
1-byte object for position feedback of the slat position (0…255) if one shutter is controlled.					

Object no.	Function	Name	Type	DPT	Flag
574	Invalid position feedback	Venetian blind... - Output	1-bit	1,002	C, R, -, T, A
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).					

Object no.	Function	Name	Type	DPT	Flag
575	Drive movement feedback	Venetian blind... - Output	1-bit	1,002	C, R, -, T, A
1-bit object for feedback of an active travel movement (output energised - UP or DOWN). ("0" = no drive movement / "1" = drive movement).					

12.7 Safety functions

The actuator can handle up to three different safety functions:
1 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 globally.

The output of the actuator must be separately assigned to all or to individual safety functions.

The reactions at the beginning of an alarm ("ON" telegram) can be configured for each alarm separately whereas the reaction at the end of an alarm ("OFF" telegram) can be configured in common for all alarms.

An output is assigned independently to the wind alarm, rain alarm and frost alarm. If the 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 alarm with respect to the frost alarm or rain alarm can be configured on the parameter page "Relay output -> JA - General".

An output in the active safety alarm state is locked, i.e. the control of the output via the KNX by direct operation (short-time, long-time telegram, scenes, positioning) or by a sun protection function is prevented.

Assigning safety alarms

The individual safety alarms are assigned separately. The channels are assigned on parameter page "Relay output 1 -> JA1 - General -> Safety".

ℹ The safety functions must be globally enabled on the parameter page "Relay output -> JA - General" before the output assignments are configured.

ℹ The safety functions of the output must be globally enabled on the parameter page "Relay output -> JA1 - General -> Enabled".

Presetting the behaviour at the beginning of a safety alarm

The behaviour of the output at the start of a safety alarm can be configured. The alarm behaviour is set on parameter page
"Relay output 1 -> JA1 - General -> Safety".

At the beginning of a safety alarm, the actuator locks the output, i.e. control via the KNX by direct operation (short time, long time telegram, scenes, positioning) or by a sun protection function is prevented.

ℹ The safety movement time of an output to move into the end positions is determined by the parameter "Movement time" on parameter page
"Relay output 1 -> JA1 - General -> 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 the output only after all safety alarms assigned to the output have become inactive. Afterwards, the output shows the configured "End of safety". This behavior is set on parameter page
"Relay output 1 -> JA1 - General -> Safety".

ℹ For 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.

12.7.1 Safety functions parameters

Relay output 1 -> JA1 - General -> Enabled functions

<table>
<tr><td>Safety functions</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">This parameter can be used to enable the Venetian blind output.</td></tr>
</table>

Relay output 1 -> JA1 - General -> Safety

<table>
<tr><td>Assignment to wind alarm</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">This parameter defines whether the Venetian blind output responds to the wind alarm.</td></tr>
</table>

<table>
<tr><td>For wind alarm</td><td>no reaction
raising / opening
lowering / closing
stop</td></tr>
<tr><td colspan="2">This parameter defines the behaviour of the output at the beginning of a wind alarm.
no reaction: At the beginning of the wind alarm, the output is interlocked and the relay of the output shows no reaction. Any movements in progress at this instant will still be completely finished.
raising / opening: The actuator raises the blind/shutter or opens the venting louver/roof window at the beginning of the wind alarm and then locks the output.
lowering / closing: The actuator lowers the blind/shutter or closes the venting louver/roof window at the beginning of the wind alarm and then locks the output.
stop: At the beginning of the wind alarm, the actuator switches the relay of the output to the "stop" position and locks the output. A travel movement, if any, will be interrupted.</td></tr>
</table>

<table>
<tr><td>Assignment to rain alarm</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">This parameter defines whether the output responds to the rain alarm.</td></tr>
</table>

For rain alarm	**no reaction** raising / opening lowering / closing stop

This parameter defines the behaviour of the output at the beginning of the rain alarm.

no reaction: At the beginning of the rain alarm, the output is locked and the relay of the output shows no reaction. Any movements in progress at this instant will still be completely finished.

raising / opening: The actuator raises the blind/shutter or opens the venting louver/roof window at the beginning of the rain alarm and then locks the output.

lowering / closing: The actuator lowers the blind/shutter or closes the venting louver/roof window at the beginning of the rain alarm and then locks the output

stop: At the beginning of the rain alarm, the actuator switches the relays of the output to the "stop" position and locks the output. A travel movement, if any, will be interrupted.

Assignment to frost alarm	Active **Inactive**

This parameter defines whether the output responds to the frost alarm.

For frost alarm	**no reaction** raising / opening lowering / closing stop

This parameter defines the behaviour of the output at the beginning of the frost alarm.

no reaction: At the beginning of the frost alarm, the output is interlocked and the relay of the output shows no reaction. Any movements in progress at this instant will still be completely finished.

raising / opening: The actuator raises the blind/shutter or opens the venting louver/roof window at the beginning of the frost alarm and then locks the output.

lowering / closing: The actuator lowers the blind/shutter or closes the venting louver/roof window at the beginning of the frost alarm and then locks the output

stop: At the beginning of the frost alarm, the actuator switches the relay of the output to the "stop" position and locks the output. A travel movement, if any, will be interrupted.

End of safety (wind, rain, frost)	no reaction raising / opening lowering / closing stop **tracking the position**
This parameter defines the behaviour of the output at the end of all safety functions. no reaction: At the end of the safety functions, the output is enabled and the relay of the output shows no reaction. Any travel movements still in progress at this instant will still be finished. raising / opening: The actuator enables the output at the end of all safety alarms and raises the blind/shutter or opens the venting louver/roof window. lowering / closing: The actuator enables the output at the end of the safety functions and lowers the blind/shutter or closes the venting louver/roof window. stop: At the end of the safety functions, the output is enabled and the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. 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.	

12.7.2 Object list safety functions

(siehe Kapitel "Object list safety functions" ▸ Page 221)

12.8 Sun protection function

The Venetian blind output can be separately configured for the execution of a sun protection function. Sun protection is usually combined with Venetian blinds, shutters or awnings and thus enables rooms, terraces or balconies to be shaded when the sun is shining.

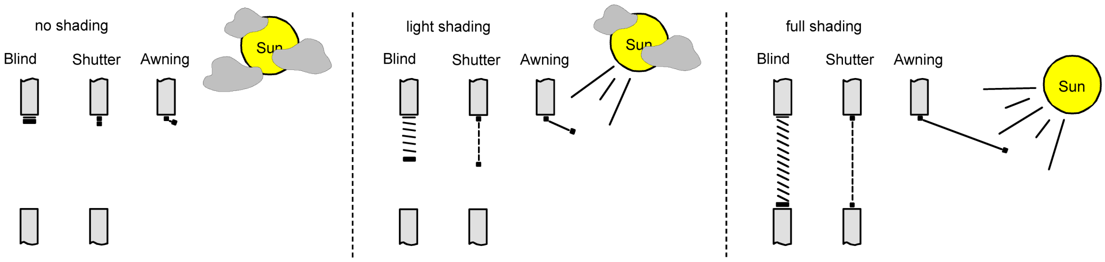


Image 48: Sun protection principles (example)

With the sun protection function, the controlled blinds can be closed completely or partially so that disturbing sunlight can be avoided. In such applications, the sun protection function only evaluates the 1-bit object "Sunshine" and initiates the closing or opening of the controlled blinds to fixed configured positions and also to positions variably specified via the bus. The control is carried out, for example, by a weather station with limiting value monitoring.

Slat positions of Venetian blinds can be readjusted in a fixed or variable way to adapt to an individual shading situation. For this purpose, it is possible to set a static slat offset in the ETS configuration, for instance, for adapting the reflection of sunlight depending on the building situation, or additionally, via a KNX communication object, e.g. for manual re-adjustment of the slat opening by people in the room or otherwise by a central building services control system.

The priority between an incoming sunshine telegram and the direct operation of an output (short-time, long-time telegram, scenes, positioning) can be set 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 safety function invariably has a higher priority than the sun protection function. At the end of one of the above mentioned functions with a higher priority, the reaction is carried out again as at the start of sun protection, if a sun protection function is still active at this time.

Sun protection

In sun protection, sun shading is activated and deactivated via the 1-bit communication object "Sunshine". The polarity of this object can be selected in the ETS. The sun protection is activated as soon as "sunshine" is signalled to the object depending on the preset polarity. After ETS programming or after switch-on of the supply voltage, the object must at first have data written into it by the KNX also in case of inverted polarity for the sun protection to be activated.

A newly received object value (sunshine beginning or sunshine end) can optionally be evaluated with a time delay. This feature permits suppressing brief brightness variations caused, for instance, by passing clouds or by a thunderstorm. An update (from activated to activated) of the "Object "sunshine" causes the sun protection to be reactivated if it had been influenced and possibly re-enabled beforehand by a direct operation in acc. with the preset priority.

The reaction of the output at the beginning of shading can be preset in the ETS. Amongst other things, this setting permits approaching fixed configured positions or positions preset via the KNX and thus variable. Variable positions for sun protection purposes can be preset, for instance, by means of pushbutton sensors or visualisations. In addition, it is possible in case of a defined sun protection positioning movement to have a reference travel executed by forced control. This ensures that identical blind positions are approached synchronously by different outputs in case of a sun protection positioning movement.

The reaction at the end of a shading task can be preset as well. In this situation, the curtain can pass into an end position, be stopped or shown no special reaction. Tracking of positions is possible as well.

A priority setting in the ETS configuration makes it possible to specify whether the sun protection function can be influenced by direct operation or whether the corresponding output is locked by a telegram "Sunshine" in the sun protection position. Generally, the "Safety" function has a higher priority, so that this function can override sun protection but not terminate it. Thus, the sun protection function is re-executed at the end of a function with a higher priority, if the Object "sunshine" continues to signal the presence of sunshine.

ℹ The following rules must be observed for sun protection: After an ETS programming operation, the sun protection function is always deactivated.

The schematic diagram of the sun protection is intended to illustrate how sensor components can be integrated into a sun protection configuration.

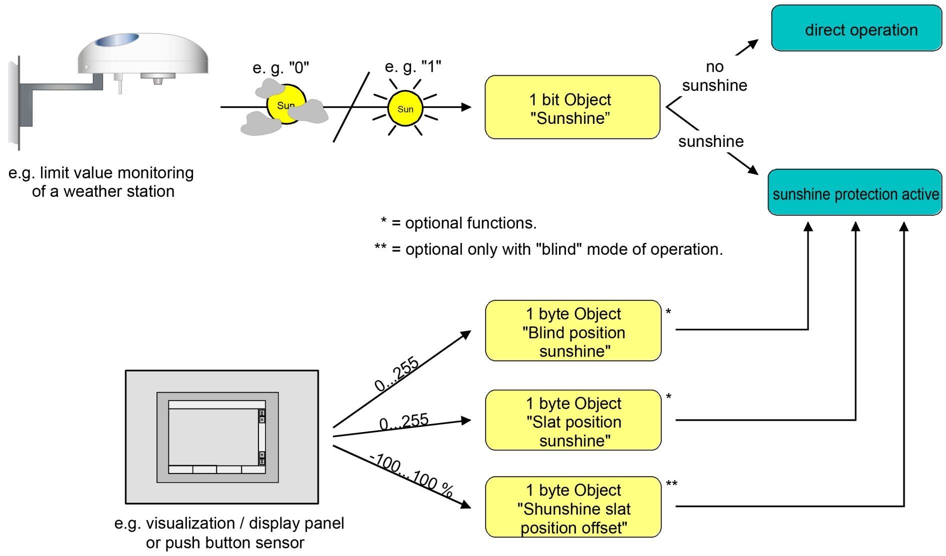


Image 49: Schematic diagram illustrating of the sun protection configuration

The function diagram shows all possible functions of the sun protection. For reasons of clarity, the functions with a higher priority (safety function) are not shown in the diagram.

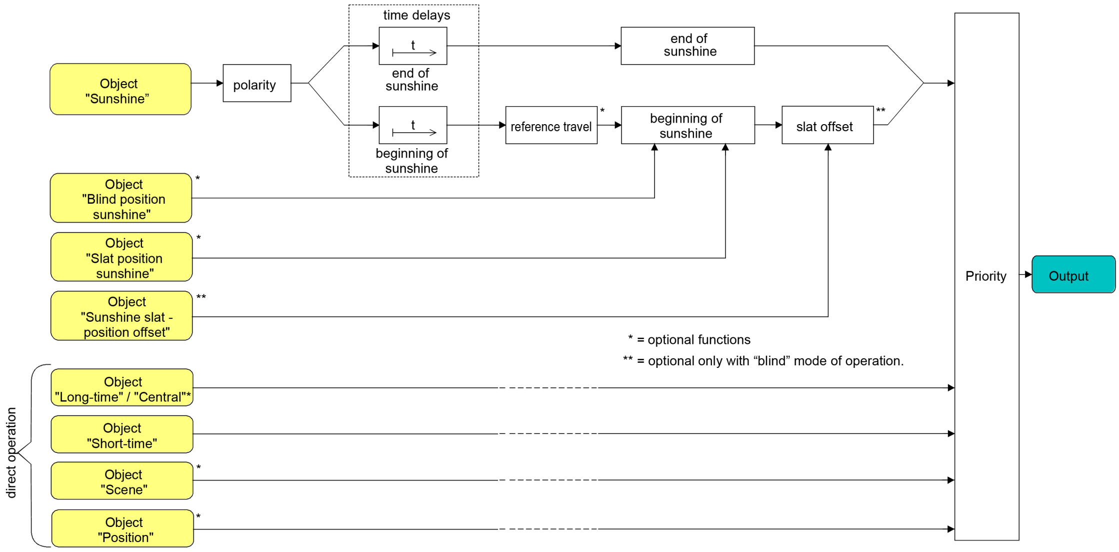


Image 50: Function diagram illustrating the sun protection

Presetting the priority of the sun protection

The priority of the sun protection function can be set for the Venetian blind output. In the sun protection, the priority between the "Sunshine" object and the objects of direct operation (short-time, long-time or position telegram, scene recall) must be configured.

- same priority

  The sun protection mode can be overridden at any time by direct operation. Similarly, the sun protection overrides the direct operation, when a new "sunshine" telegram is received via the object of the same name and when a configured time delay, if any, has elapsed. If the sun protection function is overridden by a direct operation, the preset behaviour "at the end of sunshine" will not be executed.
- higher priority

  An active sun protection will override a direct operation. The sun protection mode cannot be interrupted by a direct operation. Direct operation will be possible again only after the sun protection function is terminated.
- 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 "at the end of sunshine" will not be executed. The sun protection function can only be reactivated after an enabling movement has been made by a direct operation and a new "Sunshine" telegram has been received via the "Sunshine" 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 object "Long time operation". An upward movement after voltage recovery, a position approach to "0 %" or an upward movement after enabling 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.

i 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 an active safety function.

i Parameter setting "same priority" or "lower priority": A variable preset of blind/ shutter and slat positions or of a slat offset via the KNX at the beginning of sunshine shows no reaction at the output, if the sun protection was overridden by direct operation. However, the position data or offsets received are stored internally so that the new positions will be approached on reactivation of the sun protection.

Presetting the polarity of the "Sunshine" object

The telegram polarity of the "Sunshine" object can be set. This means that an adaptation to the signals from existing sensors or weather stations is possible in the sun protection mode.

i In the sun protection an update (from activated to activated) of the "Sunshine" object causes the sun protection to be reactivated if it had been influenced and possibly re-enabled beforehand by a direct operation in acc. with the preset priority.

Presetting a time delay for beginning and end of sunshine

The telegram received via the "sunshine" object for activation or deactivation of shading (depending on polarity) can be evaluated with a time delay. An evaluation of the set delay times at the start of sunshine and at the end of sunshine always takes place.

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 An update (from activated to activated) of the "Sunshine" object causes the sun protection to be reactivated in consideration of the delay time, if the sun protection had been influenced or aborted beforehand by a direct operation because of the same or a lower priority.

Presetting the reaction at the beginning of sunshine

The behaviour at the start of sunshine / shading – if applicable, after the end of the delay time – can be configured in the ETS. In the sun protection mode, the behaviour will be executed, when the sun protection function is activated after receiving a new sunshine signal. The reaction will not be executed if a function with a higher priority is active at the time the sun shading is received.

The reaction for the start of sunshine is set on the parameter page
"Relay output 1 -> JA1 - General -> Sun protection -> Sun protection start".

ℹ In the "Venetian blind" operating mode, the "fixed position" setting can be selected separately for the height of the blind and for the slat position. For this reason, the ETS adapts the parameter selection and enlarges the setting options in this operating mode.

ℹ In the "Venetian blind" operating mode, the "variable position" setting can be selected separately for the Venetian blind height and for the slat position. For this reason, the ETS adapts the parameter selection and enlarges the setting options in this operating mode.

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 beginning of sun shading are undefined positions. The scene position values stored in the actuator by a scene storage function will be approached as well. A delay configured for scene recalls has no influence on the recall of the scene value by the sun protection function.

ℹ With the "variable position" setting: After an ETS programming operation or after switching on the supply voltage, the objects "...position sunshine" and "slat position sunshine" 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 last position data received will be lost in the event of a voltage failure.

Presetting a forced reference movement in the sun protection mode

If needed, a reference movement can be executed by forced control at the start of a shading cycle, if fixed or variable position values or scene positions are to be approached or a scene is recalled.

A reference movement is forced if the parameter "Reference movement before each sun protection positioning operation" is activated. The preset position will be approached after the end of the reference movement.

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 a reference movement, positioning inaccuracies could occur.

A reference movement by forced control will always be executed in sun protection mode, when the start of shading is signaled via the "sunshine" object. Updates of the object from "Sun is shining" to "Sun is shining" do not initiate a reference movement if, at this time, the output is still in the sun protection position.

If the "Reference movement before each sun protection positioning operation" parameter is deactivated, a reference movement is only carried out if the position data – e.g. after an ETS programming operation or after switching on the power supply – is unknown.

ℹ 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.

ℹ Variable position preset: No reference movement will be executed, if new position values are preset via the KNX while the sun protection is active.

ℹ "Venetian blind" operating mode: A terminated reference travel for the height of the blind also synchronizes the slat position at the same time.

Slat offset in the sun protection mode (only "Venetian blind" operating mode)

An offset can be specified for the slat position at the start of sun shading, 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.

A distinction is made between two offset specifications:

- 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 protection - 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 sun protection mode for each positioning move during an active shading cycle (beginning of sunshine) and added to the predefined nominal slat position. The offset value can be varied within a range from -100 % … 0 … 100 % so that the slats can be moved in both directions into the slat end positions. At an offset of "0 %", the actual slat position is always identical with the predefined nominal slat position for sun protection purposes.

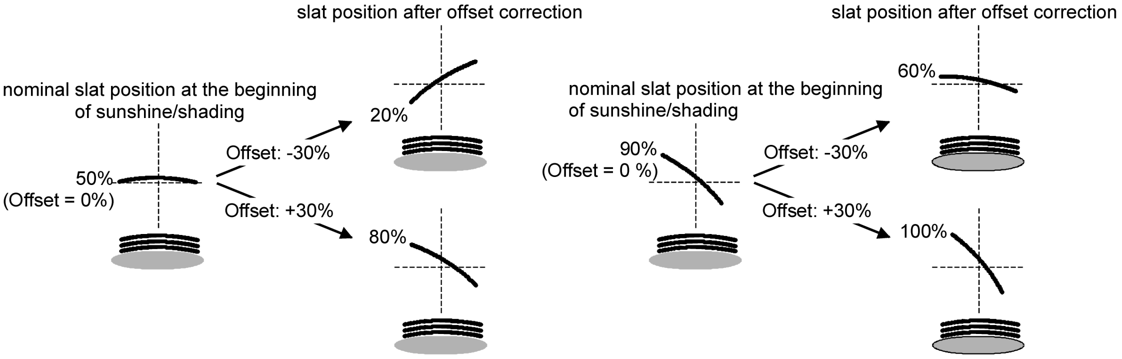


Image 51: Functional principle of slat offset
(example showing slat type 1 / slat type 2 identical)

The position value actually adjusted with the offset after adding the slat position value is always between 0 and 100 %. Minimum and maximum position are thus determined by the slat end positions. These limits cannot be exceeded by specifying an greater offset.

Example
Slat position at the beginning of sunshine = 90 %
Sunshine offset slat position = +30 %
-> The resulting slat position is 100% as the end position is reached.

In acc. with the KNX data point type 6.001 (DPT_Percent_V8) the data format of the communication object "sun protection 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 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 of supply voltage failure. 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 power failure can be configured in the ETS.

Configuring the slat offset in the sun protection mode (only "Venetian blind" operating mode)

The "Slat position offset during sunshine" parameter sets whether an offset correction should be made. The offset correction can be set statically in the parameters or additionally adjusted dynamically by a separate communication object.

During every shading operation (beginning of sunshine), the nominal slat position is always corrected by the preset offset value.

CAUTION! The dynamic offset correction can be stored in the event of voltage failure. 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 The reception of an offset value during an active shading phase (beginning of sunshine active) results in immediate and visible correction of the offset angle by the output.

ℹ After an ETS programming operation, the offset is always set to the value configured in the ETS.

ℹ The slat offset has no influence on the behaviour of an output at the end of a shading phase (end of sunshine).

Presetting the reaction at the end of sunshine

At the end of the shading phase – if applicable, after the end of the delay time – the output will show the preset reaction, if no function with a higher priority is active at the time of deactivation. The preset reaction will also not be executed at the end of sun shading, if the sunshine signal is overridden on account of priority settings by a direct operation.
The reaction for the end of sunshine is set on the parameter page
"Relay output 1 -> JA 1 - General -> Sun protection -> Sun protection end".

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.

12.8.1 Sun protection function parameters

Relay output 1 -> JA 1 - General -> Enabled functions

Sun protection function	Active **Inactive**
The sun protection function of the Venetian blind output can be enabled here.	

Relay output 1 -> JA 1 - General -> Sun protection

Priority of sun protection with respect to direct operation	**same priority** higher priority lower priority
This parameter defines the priority of the sun protection function with respect to direct operation. same priority: The sun protection can be overridden by direct operation and vice versa. Only after the next reception of a "sun is shining" signal will the sun protection mode be activated again. higher priority: The sun protection has the higher priority and cannot be aborted by a direct operation. lower priority: The direct operation has the higher priority and cannot be aborted by sun protection. The sun protection can be activated only after an enabling movement into the upper end position initiated by a direct operation has occurred without interruption. i Direct operation = long-time/short-time operation, positioning via objects, scenes.	

Object polarity "sunshine"	**sunshine = 1; no sunshine = 0** sunshine = 0; no sunshine = 1
This parameter defines the polarity of the input object "sunshine".	

Relay output 1 -> JA 1 - General -> Sun protection -> Sun protection start

Delay at the beginning of sunshine	**0**...59 min | 0...**30**...59 s
The telegram received via the object "Sunshine" for activation of shading (depending on polarity) can be evaluated with a time delay. i A time setting of "0" in the parameters deactivates the respective delay time. In this case, the state of shading is evaluated immediately.	

At the beginning of sunshine	no reaction raising lowering stop internal scene recall **venetian blind or slat position fixed** venetian blind position fixed / slat position variable slat position fixed / Venetian blind position variable Venetian blind and slat position variable

This parameter defines the behaviour at the beginning of shading – if applicable, after the end of the delay time.

no reaction: At the beginning of shading, the output switches over to sun protection while the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished.

raising: At the beginning of shading, the actuator raises the blind/shutter.

lowering: At the beginning of shading, the actuator lowers the blind/shutter.

stop: At the beginning of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

Internal scene recall: At the beginning of shading, the actuator recalls the position values for the 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 moves 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.

ℹ This parameter is only visible in the venetian blind operating mode.

<table>
<tr><td>At the beginning of sunshine</td><td>no reaction
raising
lowering
stop
internal scene recall
fixed position
variable position</td></tr>
<tr><td colspan="2">This parameter defines the behaviour of the output at the beginning of shading – if applicable, after the end of the delay time.
no reaction: At the beginning of shading, the output switches over to sun protection while the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished.
raising: At the beginning of shading, the actuator raises the blind/shutter.
lowering: At the beginning of shading, the actuator lowers the blind/shutter.
stop: At the beginning of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.
Internal scene recall: At the beginning of shading, the actuator recalls the position values for the output which were preset in the scene configuration. This is not a scene recall as in direct operation, but only an approach of the corresponding scene position values.
fixed position: At the beginning of shading, the output controls the approach to a configured fixed position.
variable position: At the beginning of shading, the output controls the approach to a position preset by a separate object and thus variable.
ℹ This parameter is only visible in the shutter/awning operating mode.</td></tr>
</table>

<table>
<tr><td>At the beginning of sunshine</td><td>no reaction
open
close
stop
internal scene recall
fixed position
variable position</td></tr>
<tr><td colspan="2">This parameter defines the behaviour of the output at the beginning of shading – if applicable, after the end of the delay time.
no reaction: At the beginning of shading, the output switches over to sun protection while the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished.
open: At the beginning of shading, the actuator opens the venting louver/roof window.
close: At the beginning of shading, the actuator closes the venting louver/roof window.
stop: At the beginning of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.
Internal scene recall: At the beginning of shading, the actuator recalls the position values for the affected output which were preset in the scene configuration. This is not a scene recall as in direct operation, but only an approach of the corresponding scene position values.
fixed position: At the beginning of shading, the output controls the approach to a configured fixed position.
variable position: At the beginning of shading, the output controls the approach to a position preset by a separate object and thus variable.
ℹ This parameter is only visible in the "venting louver/roof window" operating mode.</td></tr>
</table>

<table>
<tr><td>Internal scene</td><td>Scene 1
Scene 2
...
Scene 16</td></tr>
<tr><td colspan="2">This parameter defines the internal scene which is recalled at the beginning of shading.</td></tr>
</table>

Fixed Venetian blind position	**same as configured value** no change in current position

The fixed Venetian blind position at the beginning of shading can either be preset statically by a separate parameter or basically adjusted to the value prevailing at the time of shading activation, i.e. remain unchanged.

same as configured value: At the beginning of shading, the configured Venetian blind position will be approached.

no change in current position: At the beginning of shading, the current Venetian blind position will be maintained. In this case, the output behaves as if only the slat were positioned as a result of shading.

Venetian blind position	0...**50**…100 %

This parameter sets the fixed position of the Venetian blind to be approached at the beginning of shading.

Fixed slat position	0...**50**…100 %

This parameter sets the fixed position of the slat to be approached at the beginning of shading and, as the case may be, after positioning of the Venetian blind.

Fixed roller shutter / awning position	**same as configured value** no change in current 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 shutter or awning position will be approached.

no change in current position: At the beginning of shading, the current shutter or awning position will be maintained. Any movements in progress at the time of shading activation will be finished.

Position of roller shutter / awning	0...**50**…100 %

This parameter sets the fixed position of the shutter or awning to be approached at the beginning of shading.

Fixed position of venting louvre	**same as configured value** no change in current position

The fixed venting louvre position at the beginning of shading can either be preset statically by a separate parameter or basically adjusted to the value prevailing at the time of shading activation, i.e. remain unchanged.

same as configured value: At the beginning of shading, the configured venting louver position will be approached.

no change in current position: At the beginning of shading, the current venting louver position will be maintained. Any movements in progress at the time of shading activation will be finished.

Position of venting louvre	0...**50**…100 %
This parameter sets the fixed position of the venting louvre to be approached at the beginning of shading.	

Reference travel before every sun protection positioning operation	Active **Inactive**
A forced reference travel of the drive is performed before sun protection positioning. A reference movement is a positioning movement into the upper end position or into the completely open position. By means of a forced reference movement, drives connected to different outputs can be synchronised. If no synchronising movement is forced, the actuator performs a reference movement only once after return of the power supply.	

Offset of the slat position during sunshine	**no offset** offset as configured offset as configured and via object
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 parameter: The slat offset is statically preset by means of a fixed parameter value. Offset as parameter and via object: The slat offset is preset by a fixed parameter value and can be dynamically adapted via a separate communication object.	

Offset slat position	-100…**0**...100 %
This parameter is used for setting the slat offset. The value specified in this parameter is added at the beginning of shading to the current slat angle. Even with offset correction, the 0...100% slat position limits cannot be overstepped. It should be noted that the configured offset value can be overwritten by the object after reception of a dynamic value.	

Save in case of voltage failure	**Active** Inactive
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. Parameter activated: The value received via the object is stored permanently in the actuator in case of voltage failure. The originally configured offset value is definitely overwritten in the process. Parameter deactivated: The value received via the object will only be stored temporarily in volatile memory. This only replaces the configured value until the actuator is reinitialised (voltage return). After the initialisation, the offset value configured in the ETS will be used again.	

Relay output 1 -> JA1 - General -> Sun protection -> Sun protection end

Delay at the end of sunshine	**0**...59 min | 0...**30**...59 s
The telegram received via the object "Sunshine" for deactivation of shading (depending on polarity) can be evaluated with a time delay. ℹ A time setting of "0" in the parameters deactivates the respective delay time. In this case, the state of shading is evaluated immediately.	

At the end of sunshine	no reaction **raising / opening** lowering / closing stop tracking the position
This parameter defines the behaviour of the output at the end of shading – if applicable, after the end of the delay time. no reaction: At the end of shading, the output quits the sun protection mode and the relays of the output show no reaction. Any travel movements still in progress at this instant will still be finished. raising / opening: The actuator raises the blind/shutter or opens the venting louver/ roof window at the end of shading. lowering / closing: The actuator lowers the blind/shutter or closes the venting louver/ roof window at the end of shading. stop: At the end of shading, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. 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.	

12.8.2 Object sun protection function

Object no.	Function	Name	Type	DPT	Flag
566	Sunshine	Venetian blind... - Input	1-bit	1,001	C, -,W, -, U
1-bit object for activation or deactivation of sun shading (sun / no sun). The polarity can be configured.					

Object no.	Function	Name	Type	DPT	Flag
567	...position sunshine	Venetian blind... - Input	1 bytes	5,001	C, -,W, -, U
1-byte object for presetting a variable position value (0…255) for the height of the Venetian blind or shutter or the venting louver/roof window position in direct operation when the sun protection is active.					

Object no.	Function	Name	Type	DPT	Flag
568	Sunshine slat position	Venetian blind... - Input	1 bytes	5,001	C, -,W, -, U
1-byte object for presetting a variable slat position value (0…255) when the sun protection is active.					

Object no.	Function	Name	Type	DPT	Flag
569	Sunshine - offset slat position	Venetian blind... - Input	1 bytes	6,001	C, -,W, -, U
1-byte object for presetting a slat position angle (- 100 % … +100 % / smaller or larger position angles are treated as + or – 100 %) for 'manual' readjustment of the slat position when the sun protection is active.					

12.9 Scene function

Up to 16 scenes can be created and scene position values stored for the height of a Venetian blind, shutter or awning or the venting louver/roof window position. In the Venetian blind operating mode, the user can also preset slat positions. The scene values are recalled or stored via a separate scene extension object. The data point type of the extension object permits addressing of all 16 scenes.

The scene function must be enabled on the parameter page "Relay output 1 -> JA1 - General -> Enables" so that the required communication objects and parameters (on the parameter page "Relay output 1 -> JA 1 - General -> Scenes") become visible.

The scene configuration selected in the parameterization decides whether the number of scenes is either variable (1 ... 16) or alternatively fixed to the maximum (16).

- Scene configuration = "variable (1 ... 16 scenes)"
  With this setting, the number of scenes used can be selected anywhere in the range 1 to 16. It is possible to specify which scene number (1 ... 64) controls each scene.
- Scene configuration = "fixed (16 scenes)"
  With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 16) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.

Like the output control via short time, long time 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 safety function. The scene position last recalled can also be readjusted by other telegrams of the direct operation mode. The priority of direct operation and also of the scene function can be configured with respect to the sun protection function (cf. "Sun protection function").

Presetting a scene recall delay

Each scene recall can optionally also be delayed. With this feature, dynamic scene sequences can be configured if several scene outputs are combined with cyclical scene telegrams.

The delay only influences the scene recall of the Venetian blind output. The delay time is started on arrival of a recall telegram. The corresponding scene will be recalled and the output set to the respective scene position value only after this time has elapsed.

ℹ Each scene recall telegram restarts the delay time and retriggers it. If a new scene recall telegram is received while a delay is active (scene recall not yet executed), the old (and not yet recalled scene) will be rejected and only the scene last received executed.

ℹ The scene recall delay has no influence on the storage of scene values. A scene storage telegram within a scene recall delay terminates the delay and thus the scene recall.

Presetting the behaviour during ETS programming

When a scene is saved, the scene position values are stored permanently in the device. To prevent the stored values from being replaced during ETS programming of the application or of the parameters by the originally programmed scene position values, the actuator can inhibit overwriting of the scene values. As an alternative, the original values can be reloaded into the device during each programming run of the ETS.

ℹ When the actuator is commissioned for the first time, this parameter should be activated so that the output is initialised to valid scene position values.

Presetting scene numbers and scene positions

The presetting of the scene number depends on the selected scene configuration. With variable configuration the scene number (1...64) with which the scene is addressed, i.e. recalled or stored, must be determined for each scene of the output. With a fixed scene configuration, the number of a scene is preset invariably.

The data point type of the scene extension object permits addressing of up to 16 scenes max.

In addition to specifying the scene number, it must be defined which position is to be set for the output in case of a scene recall. In the "Venetian blind with slat" operating mode, two position values must be defined for the Venetian blind position and slat position. During a scene recall, the configured scene position is recalled and set on the output.

ℹ If with variable scene configuration the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.

ℹ The configured scene positions are then adopted in the actuator during programming with the ETS only if the parameter "Overwrite values stored in the device during ETS download" is activated.

ℹ Before approaching the required scene position, the actuator may perform a reference movement, if the current position data is unknown (e.g. after an ETS programming operation or after switch-on of the supply voltage).

Presetting storage behaviour

The current position value of a Venetian blind, 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 or scene recall telegram, safety and sun protection function).

Optionally, a visual feedback via the output can be signaled when executing a storage command. As feedback, the drive connected to the output moves for the configured travel time of the visual feedback in the opposite direction to the last travel command and then back again. This enables the system operator to determine locally whether the desired scene position has been saved correctly in the actuator.

ℹ The visual feedback is only available in the "Venetian blind with slat" and "shutter/awning" operating modes.

ℹ The visual feedback is only executed if no other function with a higher priority (e.g. safety function) is active in the moment when the memory function is active.

12.9.1 Scene function parameters

Relay output 1 -> JA1 - General -> Enabled functions

Scene function	Active **Inactive**
This parameter can be used disable or to enable the scene function.	

Relay output 1 -> JA1 - General -> Scenes

Delay scene recall	Active **Inactive**
A scene is recalled via the scene extension object. If required, the scene recall can be delayed on reception of a recall telegram (parameter activated). The recall is alternatively made immediately on reception of the telegram (parameter deactivated)	

Delay time	**0**...59 min | 0...**10**...59 s
This parameter specifies the length of the scene delay time.	

Visual feedback for storage function	Active **Inactive**
Optionally, a visual feedback via the output can be signaled when executing a storage command. As feedback, the drive connected to the output moves for the configured travel time of the visual feedback in the opposite direction to the last travel command and then back again. Parameter activated: When a storage function is executed, the visual feedback is activated immediately. The output travels in the opposite direction of the last move command and then back again for the duration of the configured travel time. Parameter deactivated: When storing a scene, the visual feedback is not executed. The actuator adopts the current position value of the output without special feedback.	

Venetian blind travelling time	1...**2**...59 s
Setting the travel time for the visual feedback.	

Shutter/awning travelling time	1...**2**...59 s
Setting the travel time for the visual feedback.	

Overwrite values stored in the device during the ETS programming operation	Active **Inactive**
During storage of a scene, the scene position values are stored internally to memory in the device. To prevent the stored values from being replaced during ETS programming by the originally programmed scene position values, the actuator can inhibit overwriting of the scene values (parameter deactivated). As an alternative, the original values can be reloaded into the device during each programming run of the ETS (parameter activated).	

Scene configuration	**variable (1...16 scenes)** fixed (16 scenes)

The scene configuration selected decides whether the number of scenes is either variable (1 ... 16) or alternatively fixed to the maximum (16).

variable (1...16 scenes): With this setting, the number of scenes used can be selected anywhere in the range 1 to 16. It is possible to specify which scene number (1 ... 64) controls each scene.

fixed (16 scenes): With this setting, all scenes are always visible and can therefore be used. The scenes are controlled via permanently assigned scene numbers (1 ... 16) (scene number 1 -> scene 1, scene number 2 -> scene 2 ...). If necessary, individual scenes can be deactivated.

Number of scenes (1...16)	1...**10**...16

This parameter defines how many scenes are visible for the output in the ETS and can therefore be used.

Scene number	0...**1***...64 *: The predefined scene number is dependent on the scene (1...16).

With variable scene configuration, it is possible to preset which scene number (1 ... 64) controls each scene.

ℹ A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible.

ℹ If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.

Scene active	**Active** Inactive

With a fixed scene configuration, individual scenes can be activated or deactivated. Only activated scenes can be used. A deactivated scene cannot be recalled or stored via the scene extension.

Position of Venetian blind	0*...100 % *: The predefined position is dependent on the scene (1...16).

This parameter is used for configuring the position of the Venetian blind, which is set when the scene is recalled.

Slat position	0*...100 % *: The predefined position is dependent on the scene (1...16).

This parameter is used for configuring the position of the slat, which is set when the scene is recalled.

Shutter/awning position	0*...100 % *: The predefined position is dependent on the scene (1...16).
This parameter is used for configuring the position of the shutter or awning , which is set when the scene is recalled.	

Position of venting louver/roof window	0*...100 % *: The predefined position is dependent on the scene (1...16).
This parameter is used for configuring the position of the venting louver or roof window, which is set when the scene is recalled.	

Memory function	Active **Inactive**
If the parameter is activated, the storage function of the scene is enabled. The current position value can then be stored internally via the extension object on receipt of a storage telegram. If the parameter is deactivated, the storage telegrams are rejected.	

12.9.2 Object list scene function

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>558</td><td>Scene extension</td><td>Venetian blind 1 - input</td><td>1 bytes</td><td>18,001</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">1-byte object for polling or saving a scene.</td></tr>
</table>

12.10 disabling function

Presetting disabling function

During an active disabling function, the KNX control of the output concerned is overridden and locked. The disabling function has the highest priority. Therefore, an active disabling function overrides the sun protection function and the direct operation (short-time, long-time telegram, scenes, positioning). Permanent locking for service purposes (drive stop) or as lockout protection (raising Venetian blind), for example, can also be overridden.

The required behaviour at the "start of the disabling function" and at the "end of the disabling function" must be set in the parameters.

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.

ℹ The polarity of the disabling object is predefined (1 = output disabled, 0 = output enabled).

ℹ After a power failure or after programming the application or the parameters with the ETS, the disabling function is always deactivated (object value "0").

ℹ Updates of the disabling object from "activated" to "deactivated do not produce a reaction.

12.10.1 Parameter disabling function

Relay output 1 -> JA1 - General -> Enabled functions

disabling function	Active Inactive
The disabling function can be disabled or enabled at this point.	

Relay output 1 -> JA1 - General -> Disabling function

Acknowledgment	Active Inactive
The deactivation of the disabling function can optionally take place using an additional 1-bit acknowledgement object. This prevents the deactivation of the disabling function by the disabling object. Alternatively, the acknowledgement object is not available. In this case, disabling is deactivated via the disabling object. Parameter activated: The acknowledgement object is available. The disabling function can only be deactivated using the acknowledgement object by an ON telegram. OFF telegrams to the disabling object are ignored by the actuator. Parameter deactivated: No additional acknowledgement object is available. The disabling function can be deactivated via the disabling object by means of an "OFF" telegram.	

Beginning of the disabling function	no reaction stop raising lowering approaching a position
The behaviour of the output at the beginning of the disabling function can be configured. no reaction: The relay of the output shows no reaction and remains in the position last set. stop: At the beginning of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted. raising: The actuator raises the blind/shutter. lowering: The actuator lowers the blind/shutter. Approach position: At the beginning of the disabling function, the connected drive can approach a position (0…100 %) specified by further parameters. If Venetian blinds are controlled with the device, the slats can be positioned independently. The actuator performs a reference movement before the position approach, because the current position at the time of the disabling function is unknown. ℹ This parameter is only available in the "Venetian blind with slat" and "shutter/awning" operating modes.	

Beginning of the disabling function	no reaction stop open close approaching a position

The behaviour of the output at the beginning of the disabling function can be configured.

no reaction: The relay of the output shows no reaction and remains in the position last set.

stop: At the beginning of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

open: The actuator opens the venting louver/ roof window.

close: The actuator closes the venting louver/ roof window.

Approach position: At the beginning of the disabling function, the connected drive can approach a position (0…100 %) specified by further parameters. If Venetian blinds are controlled with the device, the slats can be positioned independently. The actuator performs a reference movement before the position approach, because the current position at the time of the disabling function is unknown.

ℹ This parameter is only available in the "venting louver/roof window" operating mode.

Position of Venetian blind	0…100 %

This parameter sets the position value of the Venetian blind to be approached at the beginning of the disabling function.

Slat position	0…100 %

This parameter sets the position value of the slat to be approached at the beginning of the disabling function and, as the case may be, after positioning of the Venetian blind.

Shutter/awning position	0…100 %

This parameter sets the position value of the shutter or awning to be approached at the beginning of the disabling function.

Position of venting louver/roof window	0…100 %

This parameter sets the position value of the venting louver or roof window to be approached at the beginning of the disabling function.

End of the disabling function	no reaction stop raising lowering tracking the position

The behaviour of the output at the end of the disabling function can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is not used.

no reaction: The relay of the output shows no reaction and remains in the position last set.

stop: At the end of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

raising: The actuator raises the blind/shutter.

lowering: The actuator lowers the blind/shutter.

Tracking the position: The last switching state received during the disabling function or the last position set before the disabling function (terminated travel movement) will be tracked.

ℹ This parameter is only available in the "Venetian blind with slat" and "shutter/awning" operating modes.

End of the disabling function	no reaction stop open close tracking the position

The behaviour of the output at the end of the disabling function can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is not used.

no reaction: The relay of the output shows no reaction and remains in the position last set.

stop: At the end of the disabling function, the actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

open: The actuator opens the venting louver/ roof window.

close: The actuator closes the venting louver/ roof window.

Tracking the position: The last switching state received during the disabling function or the last position set before the disabling function (terminated travel movement) will be tracked.

ℹ This parameter is only available in the "venting louver/roof window" operating mode.

End of the disabling function after acknowledgement	no reaction stop raising lowering tracking the position

The behaviour of the output at the end of the disabling function can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is used.

no reaction: The relay of the output shows no reaction on acknowledgement and remains in the position last set.

stop: On acknowledgement, The actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

raising: The actuator raises the blind/shutter on acknowledgement.

lowering: The actuator lowers the blind/shutter on acknowledgement.

Tracking the position: The last switching state received during the disabling function or the last position set on acknowledgement (terminated travel movement) will be tracked.

ℹ This parameter is only available in the "Venetian blind with slat" and "shutter/ awning" operating modes.

End of the disabling function after acknowledgement	no reaction stop open close tracking the position

The behaviour of the output at the end of the disabling function can be configured. This parameter is visible only if the disabling function is enabled and acknowledgement is used.

no reaction: The relay of the output shows no reaction on acknowledgement and remains in the position last set.

stop: On acknowledgement, The actuator switches the relays of the output to the "stop" position. A travel movement, if any, will be interrupted.

open: The actuator opens the venting louver/ roof window on acknowledgement.

close: The actuator closes the venting louver/ roof window on acknowledgement.

Tracking the position: The last switching state received during the disabling function or the last position set on acknowledgement (terminated travel movement) will be tracked.

ℹ This parameter is only available in the "venting louver/roof window" operating mode.

12.10.2 Object list disabling function

Object no.	Function	Name	Type	DPT	Flag
561	Disabling	Venetian blind 1 - input	1-bit	1,003	C, -,W, -, U
1-bit object for disabling the Venetian blind output ("1" = disabling function active, "0" = disabling function inactive).					

Object no.	Function	Name	Type	DPT	Flag
562	Disabling acknowledgment	Venetian blind 1 - input	1-bit	1,016	C, -,W, -, U
1-bit object to acknowledge an active disabling function of the Venetian blind output. This object is only visible if the acknowledgement is to be used with the disabling function ("1" = Disabling function is deactivated / "0" = disabling function remains active).					

12.11 Supplementary function

Depending on the operating mode set the actuator has up to two supplementary functions per output.

In the "Venetian blind with slats" operating mode, only the supplementary function "lower end position correction/ventilation function" can be configured.

In the "Shutter/Awning" operating mode, the supplementary function "lower end position correction/ventilation function" or "Fabric-stretching" can be configured in the ETS as an alternative.

The parameter "Additional function" on the parameter page "Relay output 1 -> JA 1 - General -> Enabled" determines whether and which additional function is available.

ℹ No additional function can be selected in the "Venting louver/roof window" operating mode.

Lower end position correction/Ventilation function

In "Venetian blind with slats" and shutter/awning operating modes, the correction for the end position can be activated for the bottom end position (100%). The end position correction allows slat opening on a Venetian blind (e.g. ventilation function) or the opening of the shutter after the blind/shutter has moved downwards to the bottom end position.

The end position correction is activated after stopping at the bottom end position (completion of the extended long-time movement) and after the configured changeover time has elapsed. For correction, the blind/shutter is then moved briefly into the opposite travel direction, positioning the slats or opening the roller blind e.g. for the purpose of ventilation function.

The end position correction/ventilation function can either always be active, or alternatively it can be activated via a separate 1-bit communication object (e.g. controlled by a window contact).

Application case (lower end position correction/ventilation function controlled via object):
When the window is closed, the end position correction/ventilation function is not executed. With the window already open for ventilation.

The end position correction/ventilation function is configured differently in the ETS depending on the operating mode. On a Venetian blind a slat position (0...100%) can be configured, which is switched to immediately after the downward movement to the bottom end position through subsequent slat positioning. In contrast, a travel time is set for a shutter. This time defines the length of the downward movement of the roller blind when opening the shutter.

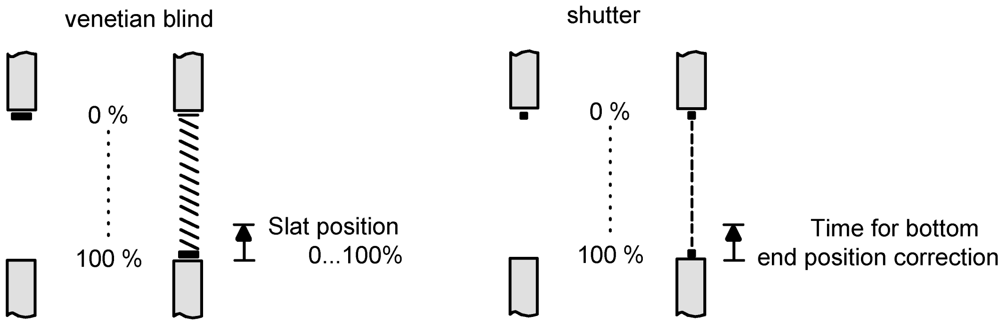


Image 52: End position correction of a Venetian blind or shutter

The trigger of the downward movement to the lower end position for end position correction/ventilation function is either a long-time telegram or a central telegram (downwards). Other functions (short-time or position telegram, disabling function, safety/sun protection function or scene recall) do not cause end position correction!

End position correction/ventilation function is only carried out if the Venetian blind or shutter was moved to the bottom end position (100 %). In contrast to fabric stretching, the end position correction/ventilation function is not executed for positions deviating from this (0...99%).

ℹ End position correction/ventilation function 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.

Activating lower end position correction/ventilation function

The end position correction/ventilation function can be activated on the parameter page "Relay output 1 -> JA1 - Enables".

Setting end position correction/ventilation function

If the function is enabled, the parameter page "Relay output 1 -> JA1 - General -> Lower end position correction/ventilation function" is displayed in the ETS. The end position correction/ventilation function is configured differently in the ETS depending on the operating mode.

As soon as the blind has been moved to the lower end position via the long-time command, the actuator carries out the correction of the lower end position/ventilation function.

ℹ Set the "Time for bottom end position correction" to less than the predefined travel time of the shutter. Otherwise, there is the risk of malfunction.

fabric stretching

In the "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.

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 .

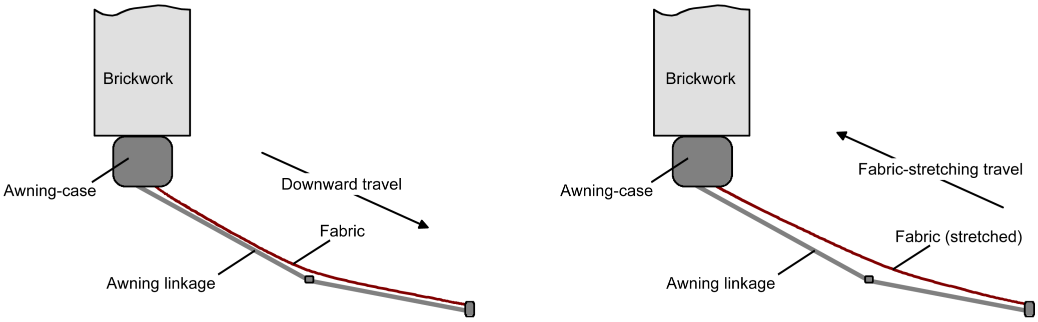


Image 53: Fabric stretching in an awning

The downward movement can be triggered by any of the following events: Long time, short time or position telegram, safety or sun protection function or scene recall.

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.

Activating the fabric stretching function

The fabric stretching function can be activated on the parameter page "Relay output 1 -> JA 1 - General -> Enabled".

Set fabric stretching function

If the function is enabled, the parameter page "Relay output 1 -> JA1 - General -> Fabric stretching" is displayed in the ETS.

After the end of a downward movement, the blind stops and – after the switchover time has elapsed – moves in the opposite direction for a period corresponding to the configured fabric stretching time.

ℹ Set the time for fabric stretching to less than the predefined travel time of the shutter or awning. Otherwise, there is the risk of malfunction.

ℹ Fabric stretching will only be effected if the downward movement lasts longer than the configured fabric stretching time.

12.11.1 Supplementary functions parameters

Relay output 1 -> JA1 - General -> Lower end position correction/ventilation function

Lower end position correction/Ventilation function	**always active** control via object
The end position correction/ventilation function can either always be active, or alternatively it can be activated via a separate 1-bit communication object. always active: The end position correction/ventilation function is always active. As soon as the blind/shutter has been moved to the lower end position by a long-time command, the actuator executes the correction. control via object: The end position correction/ventilation function is active object-controlled. If necessary, it can be enabled by an ON telegram to the "Lower end position correction/ventilation function" object. The actuator only executes the correction if the blind/shutter is moved to the lower end position by a long-time command (drive run completed) and then the enable telegram is received (e.g. opening a window). The enabling of the end position correction / ventilation function is automatically cancelled as soon as the output is controlled again using any other commands. As a result, the correction must be reactivated via another enable telegram if it is to be executed again by direct operation after the next long-time movement to the lower end position. OFF telegrams to the "Lower end position correction/ventilation function" object deactivate the end position correction/ventilation function The output does not change its blind/shutter position as a result.	

Slat position for end position	0...**50**...100 %
The slat position value desired for the end position correction/ventilation function 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 is only available in the "Venetian blind with slat" operating mode if the end position correction/ventilation function is enabled.	

Time to correct lower end position	0...**1**...59 s | **0**...900 ms
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. The parameters regarding the time of the end position correction/ventilation function are only available if the function is enabled in the "shutter/awning" operating mode.	

Relay output 1 -> JA1 - General -> Enabled functions

Supplementary function	**no supplementary function** Lower end position correction/Ventilation function fabric stretching
Here, it can be defined, which additional function should be used for the Venetian blind output. Alternatively, the supplementary function can be switched off. The "fabric stretching time" setting can only be selected in the "Shutter/awning" operating mode. This parameter is not available in the "venting louver/roof window" operating mode.	

Relay output 1 -> JA1 - General -> Fabric stretching

Time for fabric stretching	0...**1**...59 s | **0**...900 ms
This parameter can be used to specify the time for fabric stretching. After the end of a downward movement, the awning stops and – after the switchover time has elapsed – moves in the opposite direction for a period corresponding to the fabric stretching time configured here. ℹ The time for fabric stretching must be less than the travel time of the shutter/awning.	

12.11.2 Object list supplementary function

Object no.	Function	Name	Type	DPT	Flag
560	Lower end position correction/Ventilation function	Venetian blind... - Input	1-bit	1,003	C, -,W, -, U
1-bit object for enabling the end position correction/ventilation function after the blind has been moved to the lower end position by a long-time movement of direct operation ("1" = enabling signal issued).					

13 "Room temperature controller" insert function

13.1 Valve output (channel-independent functions)

13.1.1 Heat requirement for valve output

The device possesses heat requirement control. Here, the device continuously evaluates the command value of the output and provides general heat requirement information 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 device if the command value of the output exceeds the limit value with hysteresis defined in the ETS. A heat requirement signal is retracted when the limiting value is reached or undershot again (see figure 54).
The telegram polarity of the heat requirement information can be configured.

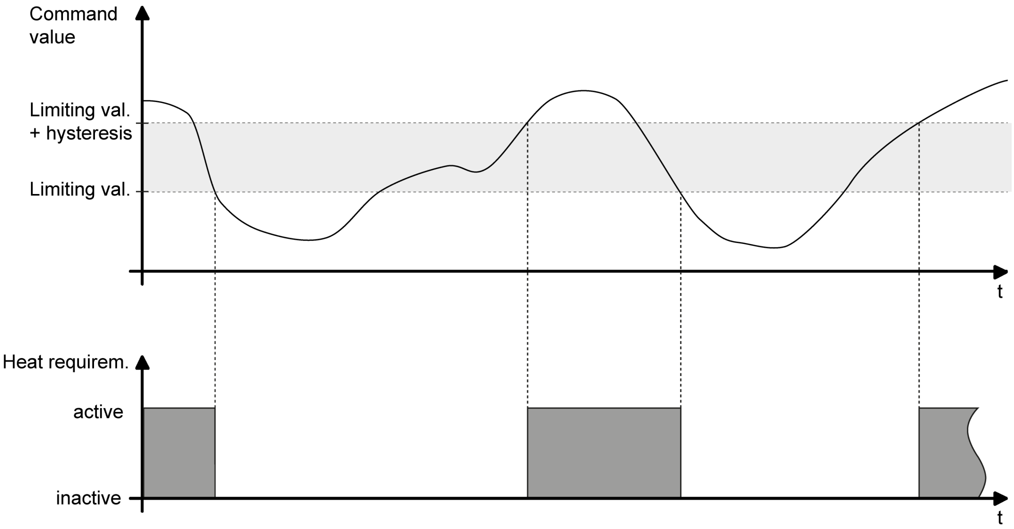


Image 54: Heat requirement information with sample command value characteristic

ℹ The heat requirement control is also influenced if the valve output receives the command values via the data format "switching (1 bit)" or "continuous (1 byte) with command value limit".
The prerequisite for this is that the parameter "Limit minimum command value" is parameterised to 0% (parameter page "Valve output -> VA - General -> Heat requirement").
In the case of "Switching (1-bit)", an "OFF" command value is interpreted as "0 %" and an "ON" command value as "100 %".
With "continuous (1 byte) with command value limit", the device evaluates the converted switching output signal in the same way ("OFF" is interpreted as "0 %", "ON" is interpreted as "100 %").

ℹ After voltage recovery, after an ETS programming operation, in the case of an active forced position or active emergency operation, the valve output is always controlled by a continuous command value through pulse width modula-

tion (PWM), provided that command values not equal to 0 % or 100 % are to be set.
PWM keeps being executed until the named functions have been exited or, after the named events, no more lower-level functions are active and a new command value telegram is received via the bus, overriding the constant command value on the valve output.
In this case, the constant command value set by the PWM is also included in the heat requirement control.

ℹ After voltage recovery and after an ETS programming operation, the device always first transmits the status "No heat requirement" without a delay. The device then updates the status to "Heat requirement", providing that the condition for this has been fulfilled and an optionally configured "Delay ACTIVE" has elapsed.

Optionally, the device 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 device links the 1-bit telegram value of the "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 "Heat requirement" object. The telegram polarity of the external object is fixed:
"0" = Heat requirement INACTIVE, "1" = Heat requirement ACTIVE.

The device only outputs the telegram of an active heat requirement after determination when the delay time defined by the parameter "Delay ACTIVE" has elapsed. No heat requirement request is transmitted if the device no longer determines a heat requirement within the preset time.
The device only retracts heat requirement information after determination when the delay time defined by the parameter "Delay INACTIVE" has elapsed. The heat requirement information is not retracted if the device no longer determines a new heat requirement within the preset time.

Enabling and configuring the "Heat requirement" function

The "Heat requirement" function can be enabled on the parameter page "Valve output -> VA - General -> Enabled".

- Set the parameter "Heat requirement" to "Active".

  The parameter page "Valve output -> VA - General -> Heat requirement" is enabled.

The "Heat requirement" function must first be enabled on the parameter page "Valve output -> VA - General -> Enabled" so that it can be used during operation of the device.

- Configure the parameter "Polarity of object" to the required telegram polarity.
- Define the limiting value and hysteresis.

Heat requirement control is activated. The heat requirement information becomes active according to the set telegram polarity when the command value of the valve output exceeds the configured limit value plus hysteresis. The heat requirement becomes inactive when the limiting value is reached or undershot again.

Assignment to valve output 1

The "Heat requirement" function is enabled and configured on the channel-independent parameter page "Valve output".

The assignment of valve output 1 is channel-oriented and automatically carried out by the ETS if the prerequisites for this are met.

The parameter page "Assignments" is purely informative. No parameterisations are carried out on this parameter page. The status of the assignment of the heat requirement function to valve output 1 is displayed.

The "Heat requirement" function is active and assigned to valve output 1 if...

- the parameter "Limit minimum command value" is set to 0% (parameter page "Valve output -> VA - General -> Heat requirement") or
- the parameter "Limit minimum command value" is set to > 0% (parameter page "Valve output -> VA - General -> Heat requirement") and the parameter "Data format of the command value input" is set to "Continuous (1 byte) with PWM" (parameter page "Valve output 1 -> VA1 - General").

ℹ The enabled and configured function "Heat requirement" is only executed for valve output 1 if the assignment is active and this assignment is confirmed by setting a checkmark on the parameter page "Valve output 1 -> VA1 - General -> Assignments".

Deactivate the function "Heat requirement"

The "Heat requirement" function can be deactivated on the parameter page "Valve output -> VA - General -> Enabled".

- Set the parameter "Heat requirement" to "Inactive".

  Heat requirement control is not available.

Enabling detection of an external heat requirement

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

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

- Set the parameter "External heat requirement" to "Active".

  The "External heat requirement / No heat requirement" object is enabled. The local device links the 1-bit telegram value of this object to the internal state of its own heat requirement logically as OR and outputs the result of this link via the "Heat requirement / No heat requirement" object.

Deactivating detection of an external heat requirement

- Set the parameter "External heat requirement" to "Inactive".

  Detection of an external heat requirement is not possible. The device 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.

13.1.1.1 Table of parameters

The following parameters are parameterised on the "Valve output -> VO - General -> Enabled functions" parameter page.

<table>
<tr><td>Heat requirement</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">The device can even evaluate the command values of its output and make general heat requirement information 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).</td></tr>
</table>

The following parameters are parameterised on the "Valve output -> VO - General -> Heat requirement" parameter page.

<table>
<tr><td>Object polarity</td><td>1 = heat requirement / 0 = no heat requirement
1 = no heat requirement / 0 = heat requirement</td></tr>
<tr><td colspan="2">This parameter defines the telegram polarity of the "Heat requirement / no heat requirement" object.</td></tr>
</table>

<table>
<tr><td>External heat requirement</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">The device is able to evaluate an external heat requirement (e.g. from another heating actuator). The local device links the external telegram with the internal status of its own heat requirement logically as OR and outputs the result of this link via the "Heat requirement / no heat requirement" object.
In the "active" setting, this parameter will enable the object "External heat requirement / no heat requirement".</td></tr>
</table>

<table>
<tr><td>Limiting value minimum command value</td><td>0...100 %</td></tr>
<tr><td colspan="2">The device only signals a heat requirement when a command value exceeds the defined limiting value plus the hysteresis defined here. A heat requirement signal is retracted when the limiting value is reached or undershot again.</td></tr>
</table>

<table>
<tr><td>Hysteresis limiting value minimum command value</td><td>1...10...20 %</td></tr>
<tr><td colspan="2">This parameter specifies the hysteresis of the limiting value of the minimum command value of the heat requirement control. The device signals a heat requirement when a command value exceeds the defined limiting value plus the hysteresis defined here.</td></tr>
</table>

Delay ACTIVE	**0**...23 h | 0...**5**...59 min | **0**...59 s
The device 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 device no longer determines a heat requirement within the preset time.	

Delay INACTIVE	**0**...23 h | 0...**5**...59 min | **0**...59 s
The device only retracts heat requirement information after determination when the delay time defined here has elapsed. The heat requirement information is not retracted if the device no longer determines a new heat requirement within the preset time here.	

13.1.1.2 Object list

Object no.	Function	Name	Type	DPT	Flag
587	Heat requirement / no heat requirement	Valve outputs - Heat requirement - output	1-bit	1,002	C, R, -, T, A

1-bit output object for the transmission of general heat requirement information to suitable burner and boiler controllers. A heat requirement is only signalled by the device if the command value exceeds the limit 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 can be configured. After voltage recovery and after an ETS programming operation, the device always first transmits the status "No heat requirement" without a delay. The device then updates the status to "Heat requirement", providing that the condition for this has been fulfilled and an optionally configured "Delay ACTIVE" has elapsed.

Object no.	Function	Name	Type	DPT	Flag
588	External heat requirement / no heat requirement	Valve outputs - Heat requirement - input	1-bit	1,002	C, -,W, -, U

1-bit input object for the cascading of multiple actuators with a heat requirement signal. The transmitting object of a heat requirement signal of another heating actuator can be connected to this object. The local device links the external telegram with the internal status of its own heat requirement logically as OR and outputs the result of this link via the "Heat requirement / no heat requirement" object.

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 device take this status into account during evaluation of the heat requirement.

13.1.2 Largest command value for valve output

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

ℹ If the data format of the command value input is configured to "switching (1 bit)" or "continuous (1 byte) with command value limit", a possibly enabled function "Largest command value" is not assigned to valve output 1. Accordingly, there is no evaluation of the command value preset via the bus.

ℹ After mains voltage return and an ETS programming operation, the device 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 device does not transmit automatically, when all the command values are set to 0 %.
After a device reset, the device immediately starts the time for cyclical transmission (if configured), so that the object value effective after the reset is transmitted cyclically.

Optionally, the device can evaluate an external telegram for the largest command value (e.g. from another heating actuator). This allows the cascading of multiple actuators with a command value signal. The local device compares the 1-byte telegram value of the object "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 can be enabled on the parameter page "Valve output -> VA - General -> Enabled".

- Set the parameter "Largest command value" to "Active".

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

  The parameter page "Valve output -> VA - General -> Largest command value" is enabled.

Assignment to valve output 1

The "Largest command value" function is enabled and configured on the channel-independent parameter page "Valve output".

The assignment of valve output 1 is channel-oriented and automatically carried out by the ETS if the prerequisites for this are met.

The parameter page "Assignments" is purely informative. No parameterisations are carried out on this parameter page. The status of the assignment of the "Largest command value" function to valve output 1 is displayed.

The "Largest command value" function is active and assigned to valve output 1 if...

- the parameter "Data format of the comm. value inp." is set to "continuous (1 byte) with PWM" (parameter page "Valve output 1 -> VA1 - General").

ℹ The enabled and configured "Largest command value" function is only executed for valve output 1 if the assignment is active and this assignment is confirmed by setting a checkmark on the parameter page "Valve output 1 -> VA1 - General -> Assignments".

Deactivate the function "Largest command value"

The "Largest command value" function can be deactivated on the parameter page "Valve output -> VA - General -> Enabled".

- Set the parameter "Largest command value" to "Inactive".

  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 device is actively transmitted to the bus. The "Transmit" parameter decides when a telegram is transmitted via the "Largest command value" object.

- Set the parameter to "on change". Configure the parameter "Transmit on change" 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 "cyclical".

  The actuator only transmits the "Largest command value" telegram cyclically. The cycle time is defined globally for all feedback telegrams on the parameter page "Valve output -> VO - General".

- Set the parameter to "On change and cyclically". Configure the parameter "Transmit on change by" to the required change interval for automatic transmission.

  The device 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 device can evaluate an external telegram for the largest command value (e.g. from another heating actuator). This allows the cascading of multiple devices with a command value signal.

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

- Set the parameter "External largest command value" to "Active".

  The "External largest command value" object is enabled. The local device 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".

Deactivating recording of an external largest command value

- Set the parameter "External largest command value" to "Inactive".

  Recording of an external largest command value is not possible. The device autonomously determines the largest command value of its valve output.

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 device take this value into account during evaluation of the largest command value.

13.1.2.1 Table of parameters

The following parameters are parameterised on the "Valve output -> VO - General -> Enabled functions" parameter page.

<table>
<tr><td>Largest command value</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">The device 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 "active" setting, the device evaluates all 1-byte command values of the valve output and, optionally, the externally received largest command value and transmits the largest command value via the "Largest command value" object.
In the case of 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 voltage return or a forced position and 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 internally, overriding the constant command value at the valve output.</td></tr>
</table>

The following parameters are parameterised on the "Valve output -> VO - General -> Largest command value" parameter page.

<table>
<tr><td>Transmit</td><td>**on change**
cyclical
on change and cyclical</td></tr>
<tr><td colspan="2">The largest command value is actively transmitted to the bus. This parameter decides when a telegram is transmitted via the "Largest command value" object.
– on change: A telegram is only transmitted when the largest command value changes.
– cyclical: The device only transmits the "Largest command value" telegram cyclically. The cycle time is defined globally for all feedback telegrams on the parameter page "Valve output -> VO - General".
– on change and cyclical: The device transmits the "Largest command value" when the object value changes and also cyclically.</td></tr>
</table>

<table>
<tr><td>Transmit on change by</td><td>0.3 %, 0.5 %, 1 %, ..., **3 %**, ..., 20 %</td></tr>
<tr><td colspan="2">Here, the change interval of the largest command value for automatic transmission is defined. The device only transmits a new telegram value when the largest command value has changed by the interval preset here since the last transmission operation.</td></tr>
</table>

External largest command value	Active Inactive
The device is able to evaluate an external largest control value (e.g. from another heating actuator). The local device monitors the external telegram with its own active constant command values and outputs the largest of all command values via the object "Largest control value". This parameter will enable the object "External largest command value" in the "active" setting.	

13.1.2.2 Object list

Object no.	Function	Name	Type	DPT	Flag
585	Largest command value	Valve outputs - Largest command value - output	1 bytes	5,001	C, R, -, T, A
1-byte output object for transmission of the largest constant command value to another bus device (e.g. suitable calorific furnaces with integrated KNX controller or visualisation).					

Object no.	Function	Name	Type	DPT	Flag
586	External largest command value	Valve outputs - Largest command value - input	1 bytes	5,001	C, -,W, -, U
1-bit input object for the cascading of multiple actuators with evaluation of the largest constant command value. The transmitting object of a largest command value of another heating actuator can be connected to this object. The local device monitors the external telegram with its own active constant command values and outputs the largest of all command values. 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 device take this status into account during evaluation.					

13.1.3 Summer/winter mode switch-over for valve output

The device 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 voltage recovery 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 switchover must first be enabled on the parameter page "Valve output -> VA - General -> Enabled" so that it is possible to switch between summer and winter mode during operation of the device.

- Set the "Summer/winter mode switch-over" parameter to "Active". Configure the parameter "Polarity of object" to the required telegram polarity.

  The summer / winter switch-over is enabled. The communication object "Summer / winter switch-over" becomes visible. Summer and winter command values can be configured for emergency operation and a forced position for the valve output.

- Set the "Summer/winter mode switch-over" parameter to "Inactive".

  The summer / winter switch-over is not available. For the valve output, 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 a device reset (voltage recovery). The parameter "After ETS programming" on the parameter page "Valve output -> VA - General -> Summer/winter mode switch-over" 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 that is tracked after voltage recovery or that is specified after an ETS programming operation is not tracked by the actuator in the communication object.

13.1.3.1 Table of parameters

The following parameters are parameterised on the "Valve output -> VO - General -> Enabled functions" parameter page.

Summer/winter mode switch-over	Active **Inactive**
The device possesses a summer / winter switchover. Depending on the season, this allows the setting of different command value setpoints for the valve output for emergency operation or forced position. Active: The summer / winter switch-over is enabled. The communication object "Summer / winter switch-over" becomes visible. Summer and winter command values can be configured for emergency operation and a forced position for the valve output. Inactive: The summer / winter switch-over is not available. For the valve output, only one command value can be configured separately for emergency operation or a forced position.	

The following parameters are parameterised on the "Valve output -> VO - General -> Summer / winter switch-over" parameter page.

Object polarity	1 = Summer / 0 = Winter **1 = Winter / 0 = Summer**
This parameter sets the telegram polarity of the "Summer / winter switch-over" object.	

After ETS programming operation	Summer mode Winter mode **no change (saved operating mode)**
The "Summer" or "Winter" state preset via the object "Summer / winter switch-over" is stored internally in the device and is restored after a device reset (voltage return). The parameter "Operating mode after ETS programming operation" defines which operating mode is active after ETS commissioning. summer operation: In this setting, the device activates summer operation after an ETS programming operation. This overwrites the value saved internally in the device. winter operation: In this setting, the device activates winter operation after an ETS programming operation. This overwrites the value saved internally in the device. no change (saved operating mode): In this configuration, the device activates the most recently saved operating mode.	

13.1.3.2 Object list

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>589</td><td>Summer/winter switchover</td><td>Valve outputs - Operating mode - input</td><td>1-bit</td><td>1,002</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">1-bit input object to switch over between summer and winter mode. The telegram polarity can be configured. The status is stored internally in the device if there is a power 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.</td></tr>
</table>

13.1.4 Service mode for valve output

Service mode allows the bus-controlled locking of the valve output in case of maintenance or installation. If service mode is active, actuators can be moved to a defined position (completely open or closed) and locked against activation by command value telegrams. 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

A service mode influences the status message of the valve output. 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.

The behaviour 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.

Enabling the "Service mode" function

The "Service mode" function can be enabled on the parameter page "Valve output -> VA - General -> Enabled".

- Set the parameter "Service mode" to "Active".

  The "Service mode" function is activated.

Assignment to valve output 1

The "Service mode" function is enabled and configured on the channel-independent parameter page "Valve output".

The assignment of valve output 1 is channel-oriented and automatically carried out by the ETS if the prerequisites for this are met.

The parameter page "Assignments" is purely informative. No parameterisations are carried out on this parameter page. The status of the assignment of the service mode function to valve output 1 is displayed.

The "Service mode" function is always active and assigned to valve output 1 if it is activated on the parameter page "Valve output -> VA - General -> Enabled".

ℹ The enabled and configured function "Service mode" is only executed for valve output 1 if the assignment is active and this assignment is confirmed by setting a checkmark on the parameter page "Valve output 1 -> VA1 - General -> Assignments".

Deactivate the function "Service mode"

The "Service mode" function can be deactivated on the parameter page "Valve output -> VA - General -> Enabled".

- Set the parameter "Service mode" to "Inactive".

  The "Service mode" function is not available.

Defining the behaviour at the end of service mode

When deactivating the service mode, the valve output is enabled again. Activation of the output using command value telegrams or other functions with a lower priority is then possible. The parameter "Behaviour at the end" specifies the state of the valve output 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".

  With this setting, the valve output shows no reaction at the end of service mode. The valve output remains in the last set state until a new command value presetting is implemented.

- Set the parameter to "Close output completely".

  With this setting, the valve output closes completely. The valve output remains in this state until a new command value presetting is implemented.

- Set the parameter to "Open output completely".

  With this setting, the valve output opens completely. The valve output remains in this state until a new command value presetting is implemented.

- Set the parameter to "Track state".

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

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.

ℹ 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.

ℹ The object value of the status function is not transmitted automatically to the bus after a device reset (ETS programming operation, voltage recovery).

13.1.4.1 Table of parameters

The following parameters are parameterised on the "Valve output -> VO - General -> Enabled functions" parameter page.

Service mode	Active **Inactive**
Service mode allows the bus-controlled locking of the valve output in case of maintenance or installation. If service mode is active, actuators can be moved to a defined position (completely open or closed) and locked against activation by command value telegrams. Active: Service mode is enabled. The communication object "Service mode - Deactivate / activate input" becomes visible. Inactive: Service mode is not available.	

The following parameters are parameterised on the "Valve output -> VO - General -> service mode" parameter page.

Behaviour at the end	no change Close output completely Open output completely **Track state**
This parameter specifies the state which the valve output goes into on when service mode is deactivated.	

13.1.4.2 Object list

Object no.	Function	Name	Type	DPT	Flag
593	Activate / deactivate	Valve outputs - Service mode - input	2-bit	2,001	C, -,W, -, U
2-bit input object for activating and deactivating service mode. With the value "1", bit 1 of the telegram activates service mode. The valve output is then locked in the status specified 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, valve closed – 11 = Service mode activated, valve opened					

Object no.	Function	Name	Type	DPT	Flag
594	Status active / inactive	Valve outputs - Service mode - output	1-bit	1,002	C, R, -, T, A
1-bit output object for status signalling of whether the service mode is active or not. In this case, the telegram polarity is fixed: "0" = Service mode inactive, "1" = Service mode active. The object value is not transmitted automatically after a device reset (ETS programming operation, mains voltage return).					

13.2 Valve output (channel-oriented functions)

13.2.1 General

13.2.1.1 Data formats for command values

Internally in the device, 1-bit or 1-byte command value telegrams are transmitted from the room temperature controller to the valve output. Usually, the room temperature controller determines the room temperature and generates the command value telegrams using a control algorithm. The device controls its valve output 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 continuous PWM output signals can be configured.

ℹ It should be noted that the device does not carry out temperature control itself. The device converts received command value telegrams or command value presettings from device functions into constant or switching output signals.

The parameter "Data format of the command value input" defines 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 output of the insert, 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 following functions and events, the valve output, if it is configured to the command value data format "switching (1-bit)", is 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,
– on power failure
– After mains voltage return and
– after an ETS programming operation.

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

ℹ In the cases mentioned, the constant command value is also included in the calculation of the largest command value and in the heat requirement control (optional functions).

ℹ Valve outputs, which receive preset command values via the data format "switching (1-bit)", influence the heat requirement 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 device with an equivalent pulse-width-modulated switch signal at the valve output. Taking the cycle time settable in the device into account, the average output signal resulting from this modulation is a measure of the centred valve position of the control valve and thus a reference for the set room temperature. A shift of the mean value, and thus a change in the heating capacity, can be obtained by changing the duty factor of the switch-on and switch-off pulses of the output signal (see figure 55). The duty factor is adapted constantly by the device, depending on the command value received (normal operation) or by active device functions (e.g. forced position, emergency operation).

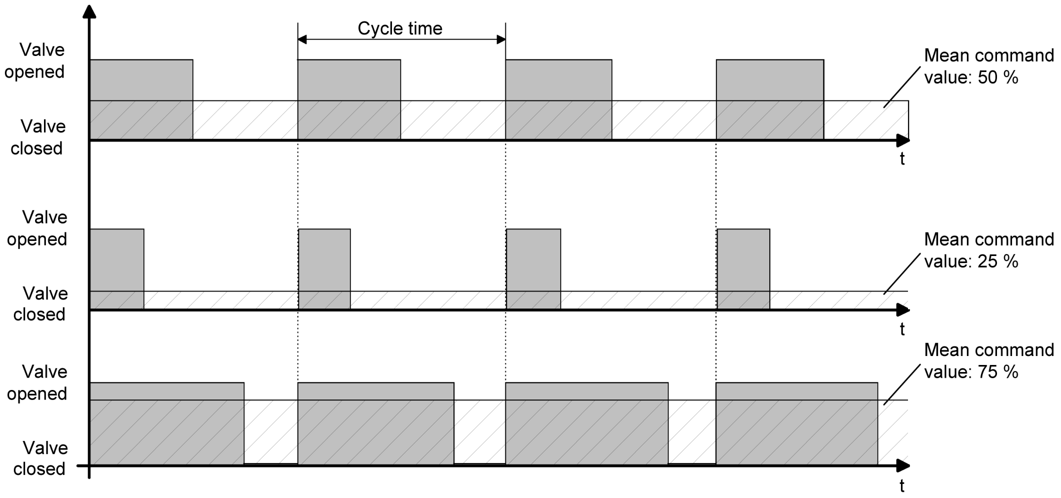


Image 55: Resulting mean value through variable duty factor with pulse width modulation

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. 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 device uses a special method for continuous command value adjustment.

The following cases are taken into account...

- Case 1
  Command value change, e.g. from 80 % to 30 %, during the opening phase of the valve (see figure 56).
  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.

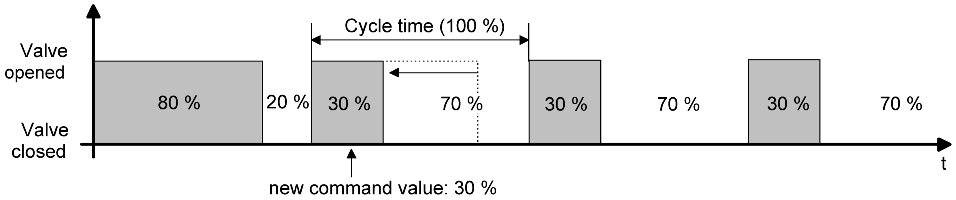


Image 56: Example of a command value change 80 % -> 30 % during the opening phase of the valve

- Case 2
  Command value change, e.g. from 80 % to 30 %, during the closing phase of the valve (see figure 57).
  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.

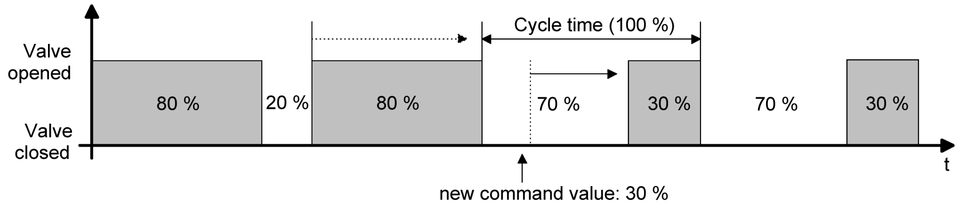


Image 57: Example of a command value change 80 % -> 30 % during the closing phase of the valve

- Case 3
  Command value change, e.g. from 80 % to 30 % during the opening phase of the valve (opening phase too long) (see figure 58).
  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.

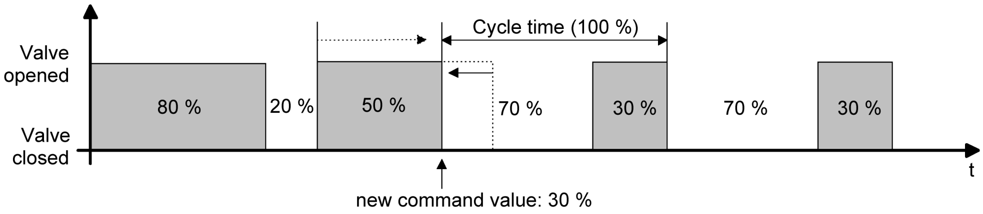


Image 58: Example of a command value change 80 % -> 30 % during the opening phase of the valve (opening phase too long)

- Case 4
  Command value change, e.g. from 30 % to 80 %, during the opening phase of the valve (see figure 59).
  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.

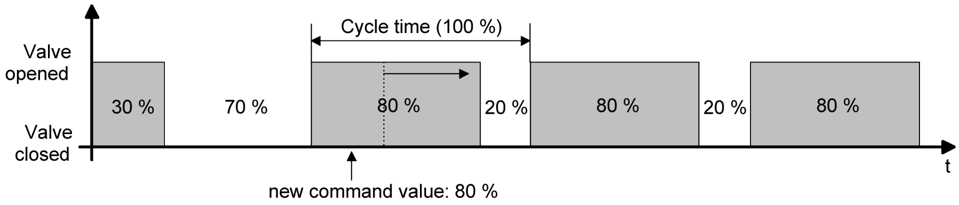


Image 59: Example of a command value change 30 % -> 80 % during the opening phase of the valve

- Case 5
  Command value change, e.g. from 30 % to 80 %, during the closing phase of the valve (see figure 60).
  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.

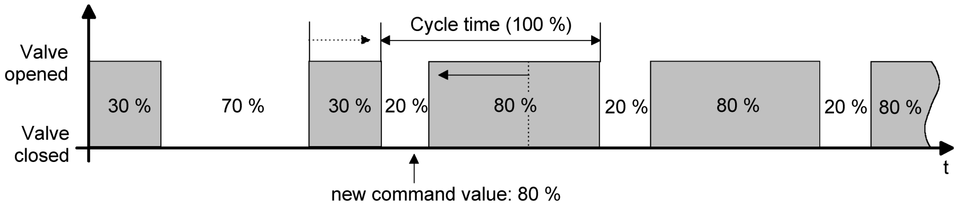


Image 60: Example of a command value change 30 % -> 80 % during the closing phase of the valve

- Case 6
  Command value change, e.g. from 30 % to 80 %, during the closing phase of the valve (closing phase too long) (see figure 61).
  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.

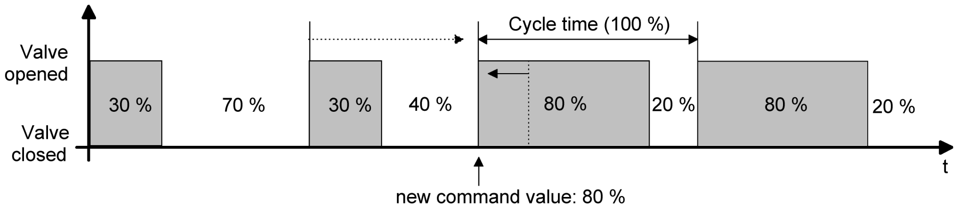


Image 61: Example of a command value change 30 % -> 80 % during the opening phase of the valve (opening phase too long)

Data format of the command value input "Continous (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 valve drive opens when the command value reaches the limiting value or exceeds it (see figure 62). A hysteresis is also evaluated to prevent constant closing and opening of the actuator for command values in the area of the limiting value. The valve drive only closes when the command value undershoots the limiting value minus the configured hysteresis.

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

The conversion of the constant input signal into a switching command value takes place internally in the device. During processing, the device 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,
- on power failure
- After voltage recovery,
- after an ETS programming operation.

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

ℹ In the cases mentioned, the constant command value is also included in the calculation of the largest command value and in the heat requirement control (optional functions).

Valve outputs, which receive preset command values via the data format "switching (1-byte) with command value limit", influence the heat requirement control. Here, the device evaluates the converted switching output signal in the same way ("OFF" is interpreted as "0 %", "ON" is interpreted as "100 %").

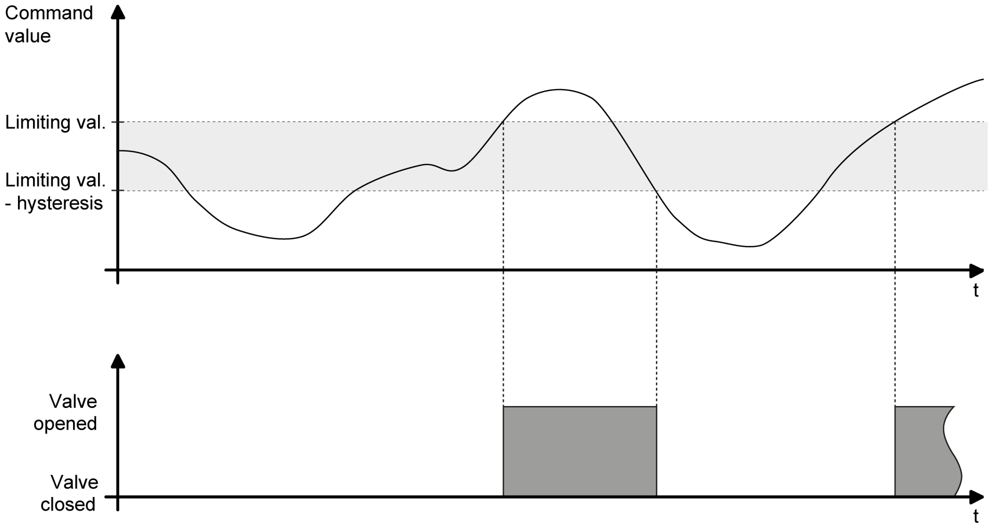


Image 62: Example of command value evaluation with limiting value

13.2.1.2 Cycle time

The "Cycle time" parameter specifies the period length of the pulse-width-modulated output signal of the valve output. It allows adaptation to the adjusting cycle times (the adjusting time it takes the drive to bring the valve from its completely closed to its completely opened position) of the valve drives used. In addition to the adjusting cycle time, take account of the dead time (the time in which the actuators do not show any response when being switched 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 the command value data formats "switching (1-bit)" or "constant (1-byte) with command value limit". In these cases, too, pulse width modulation can also be executed during an active forced position, emergency operation, after voltage failure, after voltage recovery, or after an ETS programming operation, for which, as a result, the presetting of a cycle time is required.

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

Case 1
Cycle time > 2 x Adjusting cycle time of the drives used (ETA)

In this case, the switch-on and switch-off times of the actuator are long enough for the actuators to have sufficient time to fully open and fully close within a given period (see figure 63).

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

ℹ This cycle time setting is recommended for slower, more sluggish heating systems (such as underfloor heating).

ℹ Even for a bigger number of triggered actuators, maybe of different types, this setting can be recommended to be able to obtain a better mean value of the adjusting travels of the valves.

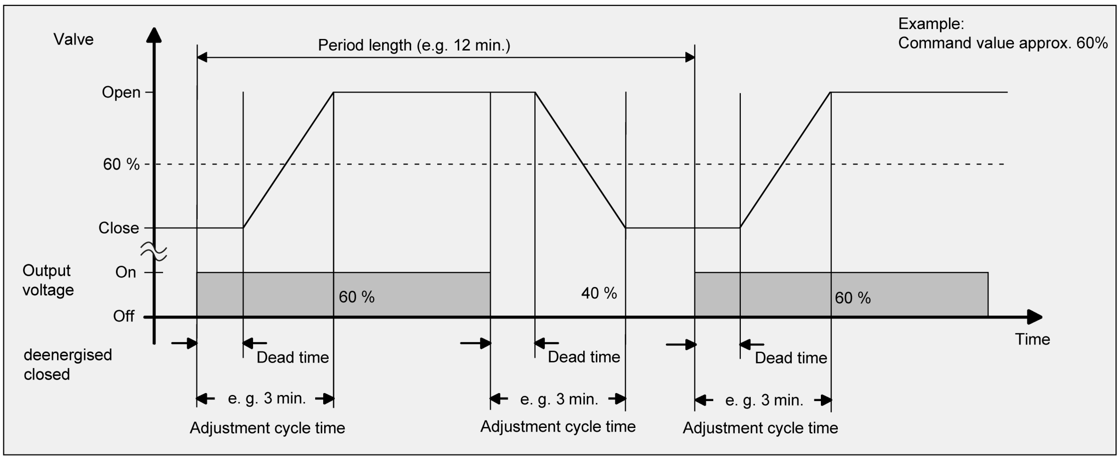


Image 63: Ideal course of the valve stroke for a cycle time > 2 x Adjustment cycle time

<u>Case 2</u>
Cycle time < Adjusting cycle time of the drives used (ETA)

In this case, the switch-on and switch-off times of the actuator are too short for the actuators to have enough time to fully open and fully close within a given period (see figure 64).

- Advantage: This setting ensures continuous water flow through the radiators, thus facilitating uniform heat emission into the room. If only one valve drive is triggered the controller can continuously adapt the command value to compensate the mean value shift caused by the short cycle time, thus setting the desired room temperature.
- Disadvantage: If more than one drive is activated at the same time, the desired mean value will become the 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).

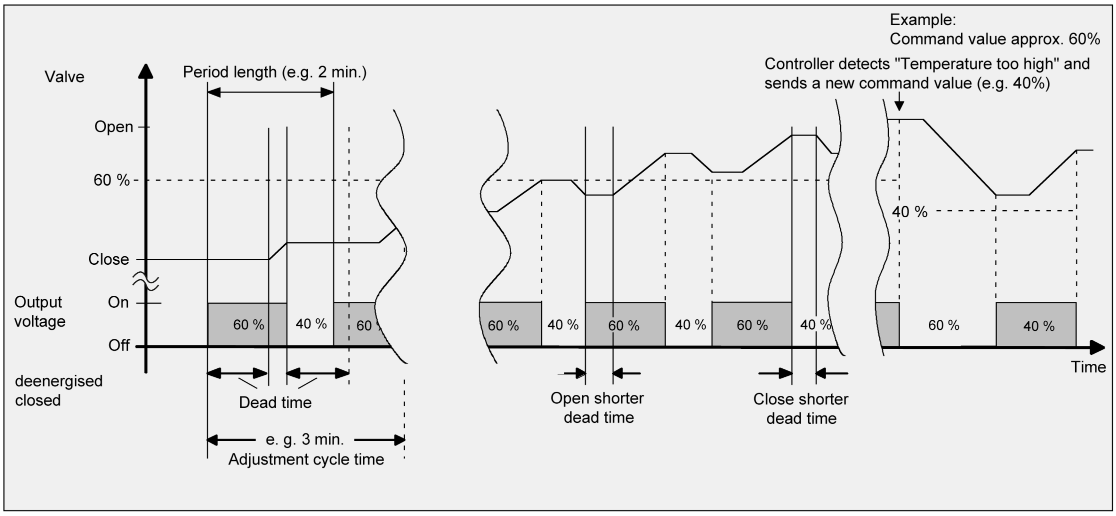


Image 64: Ideal course of the valve stroke for a cycle time < Adjustment cycle time

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.

13.2.1.3 Valve direction of action

The device has an electronic output for switching electric underfloor heating systems and electrothermal valve drives. Both deenergised closed and deenergised opened actuators can be connected. The parameter "In voltage-free state (direction of action)" on the parameter page "Valve output 1 -> VA1 - General" determines which drive type is connected to the valve output.

ℹ The drive type must match the configuration.

The configured valve direction of action is taken into account in each valve activation. With 1-byte command values and deenergised closed valves, the switch-on time is derived directly from the configured PWM and the cycle time.
Example: PWM = 30 %, cycle time = 10 minutes -> Switch-on time = 3 minutes, switch-off time = 7 minutes.
In the case of 1-byte command values and deenergised opened valves, the switch-on time is inverted. Example: PWM = 30 %, cycle time = 10 minutes -> Switch-on time = 7 minutes, switch-off time = 3 minutes.
On deenergised closed valve drives, command values are not inverted, in accordance with the 1-bit data format. Example: Command value ON -> Output switched on, Command value OFF -> Output switched off.
By contrast, switching command values are inverted for deenergised opened valve drives. Example: Command value ON -> Output switched off, Command value OFF -> Output switched on.

ℹ In the state as supplied, the valve direction of action is set to "Deenergised closed".

13.2.1.4 Reset behaviour

The states of the valve output in case of voltage failure, after voltage recovery or after an ETS programming operation can be set separately.

Response to voltage failure

The output always switches off in the event of a voltage failure. The device electronics are no longer supplied with energy, which consequently renders the device inoperable. In this state of operation, deenergised closed valve drives close completely and deenergised opened valve drives open. The configured valve direction of action can no longer be evaluated.

Set the behaviour after voltage recovery

The parameter "After voltage recovery" is available on the parameter page "Valve output 1 -> VA1 - General".

- Set the parameter to "Preset command value".

  The device sets the command value preset for the valve output by the parameter "Command value". If the command value data format is configured to "switching (1-bit)" or "constant (1-byte) with command value limit", a constant command value can also be specified by the "Command value" 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 output is permanently actuated. The preset PWM remains active until other functions have been executed or a new command value telegram is received via the bus, overriding the constant command value on the valve output.

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

  For the valve output, the device 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 device only polls the command value preset for the forced position.

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

  For the valve output, the device 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 device only polls the command value preset for emergency operation.

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

After voltage recovery, that command value is set at the valve output which was active at the moment of the last voltage failure. The device stores the active command value internally in the event of a voltage failure 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, voltage return) when the reset is longer than 30 seconds previously. Otherwise the device does not save the current command value! In that case, an old value remains valid, as was previously saved by the device on the voltage failure.

ℹ A valve state set after voltage recovery is added to the command value status objects. Actively transmitting feedback objects also transmit after voltage recovery when the initialisation is complete and, if applicable, the "delay after voltage recovery" has elapsed.

Presetting the behaviour after ETS programming

The parameter "After ETS programming" is available on the parameter page "Valve output 1 -> VA1 - General". This parameter can be used to configure the behaviour of the output, irrespective of the behaviour after voltage recovery.

- Set the parameter "Command value as after voltage recovery".

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

- Set the parameter to "Preset command value".

  The device sets the command value preset for the valve output by the parameter "After ETS programming". If the command value data format is configured to "switching (1-bit)" or "constant (1-byte) with command value limit", a constant command value can also be specified by the parameter "After ETS programming". In this case, a pulse width modulation (5 % ... 95 %) is executed 95 %) is executed for the affected command value outputs. In the "0 %" and "100 %" presettings, the valve output is permanently actuated. The preset PWM remains active until other functions have been executed or a new command value telegram is received via the bus, overriding the constant command value on the valve output.

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

  For the valve output, the device 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 device only polls the command value preset for the forced position.

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

  For the valve output, the device 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 device only polls the command value preset for emergency operation.

ⓘ 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 device, then the device will execute the configured behaviour after voltage recovery.

ⓘ A valve state set after an ETS programming operation is added to the command value status objects. Actively transmitting feedback objects only transmit after an ETS programming operation when the initialisation is complete and, if applicable, the "delay after voltage recovery" has elapsed.

13.2.1.5 Table of parameters

The following parameters are parameterised on the "Valve output 1 -> VO1 - General" parameter page.

<table>
<tr><td>Data format of the command value input</td><td>Switching (1 bit)
Constant (1 byte) with pulse width modulat. (PWM)
Const (1 byte) with command value limiting value</td></tr>
<tr><td colspan="2">Within the device, 1-bit or 1-byte command value telegrams are transmitted from the cover to the insert. The room temperature controller determines the room temperature and generates the command value telegrams using a control algorithm. The actuator controls its valve output 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 internally in the device is forwarded directly to the output of the actuator, taking the configured valve direction of action into account.
Constant (1 byte) with pulse width modulat. (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 output.
Constant (1-byte) with command value limiting value: The constant command value is converted into a switching output signal, depending on a configured limiting value.</td></tr>
</table>

<table>
<tr><td>Cycle time</td><td>0.5 minutes
1 minute
1.5 minutes
...
15 minutes
...
20 minutes</td></tr>
<tr><td colspan="2">The "Cycle time" parameter specifies the switching frequency of the pulse-width-modulated output signal of the valve output. It allows adaptation to the adjusting cycle times (the adjusting time it takes the drive to bring the valve from its completely closed to its completely opened position) of the valve drives used. In addition to the adjusting cycle time, take account of the dead time (the time in which the actuators do not show any response when being switched 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, when the 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, after voltage return or after an ETS programming operation, for which, as a result, the presetting of a cycle time is required.</td></tr>
</table>

Limiting value of the command value for opening the valve	1...**10**...100

In the 1-byte command value data with limiting value evaluation, the received constant command value is converted into a switching output signal, depending on the limiting value configured here. The valve drive opens when the command value reaches the limiting value or exceeds it.

Hysteresis limiting value for closing the valve	1...**5**...10

In the 1-byte command value data with limiting value evaluation, the received constant command value is converted into a switching output signal. A hysteresis is also evaluated to prevent constant closing and opening of the actuator for command values in the area of the limiting value. The valve drive only closes when the command value undershoots the limiting value minus the configured hysteresis.

In voltage-free state (direction of action)	**closed** open

Valve drives that are closed or open when deenergised can be connected. On each electrical activation of the valve output, the device 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. In case of voltage failure, the valve output is no longer energised. The device takes this state into account and also influences the command value feedback, according to the configured valve direction of action.

On voltage failure	**Specify command value**

In case of loss of voltage, the valve output shows the following defined behaviour:

- Specify command value: The device sets the command value preset in the ETS for the valve output by the parameter "Command value".

Command value	**0 %** 100 %

The command value to be set on voltage failure is defined here. This parameter is predefined depending on the valve direction.

For the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value", a constant command value is also preset using this parameter. In this case, the valve output is permanently actuated. The preset PWM remains active until other functions have been executed, which may override the constant command value on the valve output.

After voltage return	**Specify command value** Activate command value acc. to forced position Activate command value acc. to emergency operation Command value as before voltage failure

After voltage return, the valve output shows the behaviour parameterised at this point.

- Specify command value: The command value specified for the valve output by the parameter "Command value" is set.
- Activate the command value according to the forced position: The configured command value of the forced position is recalled for the valve output. Here, the active operating mode (summer / winter) is taken into account, providing that a summer / winter change-over is configured.

  In this setting, the forced position function is not executed! Only the command value preset for the forced position is recalled.
- Activate the command value according to emergency operation: The configured command value of emergency operation is recalled for the valve output. Here, the active operating mode (summer / winter) is taken into account, providing that a summer / winter change-over is configured.

  In this setting, the emergency operation is not executed! Only the command value preset for the emergency operation is recalled.
- Command value as before voltage failure: After voltage return, that command value is set at the valve output which was active at the moment of the last voltage failure.

  Saving only takes place after a previous device reset (ETS programming operation, voltage return) when the reset is longer than 30 seconds previously. Otherwise the device does not save the current command value! In that case, an old value remains valid, as was previously saved by the device on the voltage failure.

<table>
<tr><td>Command value</td><td>0 %
5 %
10 %
...
90 %
95 %
100 %</td></tr>
<tr><td colspan="2">The command value to be set on voltage return is defined here.
For the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value", a constant command value is also preset using this parameter. In this case, a pulse width modulation (5 % ... 95 %) is executed 95 %) is executed for the affected command value outputs. In the "0 %" and "100 %" presettings, the valve output is permanently actuated. 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.</td></tr>
</table>

<table>
<tr><td>After ETS programming operation</td><td>Command value as after voltage return
Specify command value
Activate command value acc. to forced position
Activate command value acc. to emergency operation</td></tr>
<tr><td colspan="2">After an ETS programming operation, the valve output shows the behaviour configured at this point.
– Command value as after voltage return: After an ETS programming operation, the valve output behaves in the manner defined in the parameter "After voltage return".
If the behaviour there is configured to "command value as before voltage failure", then that command value is also set after an ETS programming operation which was active at the time of the last voltage failure. An ETS programming operation does not overwrite the saved command value.
– Specify command value: The command value specified for the valve output by the parameter "Command value" is set.
– Activate the command value according to emergency operation: The configured command value of emergency operation is recalled for the valve output. Here, the active operating mode (summer / winter) is taken into account, providing that a summer / winter change-over is configured.
In this setting, the emergency operation is not executed! Only the command value preset for the emergency operation is recalled.
– Command value as before voltage failure: After voltage return, that command value is set at the valve output which was active at the moment of the last voltage failure.
Saving only takes place after a previous device reset (ETS programming operation, voltage return) when the reset is longer than 30 seconds previously. Otherwise the device does not save the current command value! In that case, an old value remains valid, as was previously saved by the device on the voltage failure.</td></tr>
</table>

Command value	**0 %** 5 % 10 % ... 90 % 95 % 100 %
The command value to be set after an ETS programming operation is defined here. For the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value", a constant command value is also preset using this parameter. In this case, a pulse width modulation (5 % ... 95 %) is executed 95 %) is executed for the affected command value outputs. In the "0 %" and "100 %" presettings, the valve output is permanently actuated. 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.	

13.2.2 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) 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 device 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 (siehe Kapitel "Summer/winter mode switch-over for valve output" ▸ Page 310). 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.

The device checks the arrival of command value telegrams within a time frame of 10 minutes when command value monitoring is enabled. Cyclical command value monitoring takes place continuously. The device automatically restarts the monitoring time (10 minutes) with every received command value telegram and after a device reset. If there are no command value telegrams during the monitoring time, then the device will activate emergency operation.

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

At the end of emergency operation (new input command value received), the behaviour of a valve output is permanently defined. Unless a function with a higher priority is active, the device always tracks the state for the valve output that was last preset by normal bus operation (activation by command value telegrams).

ℹ After a device reset (voltage recovery, ETS programming operation), the command value objects first contain the value "0".

The device 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 device retract the fault signal for cyclical monitoring. Optionally, the fault telegram can also be transmitted cyclically during active emergency operation.

ℹ Immediately after the mains 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.

13.2.2.1 Table of parameters

The following parameters are parameterised on the "Valve output 1 -> VO1 - General -> Enabled functions" parameter page.

Command value monitoring	Active **Inactive**
This parameter enables the cyclical monitoring of the command values. If, during active cyclical monitoring, there are no command value telegrams during a time frame of 10 minutes, then emergency operation is activated for the valve output, for which a configurable constant PWM command value can be preset.	

The following parameters are configured on the parameter page "Valve output 1 -> VA1 - General -> Command value monitoring".

Object polarity	**1 = fault / 0 = no fault** 1 = No fault / 0 = Fault.
If a command value fault is identified, then the device optionally transmits a fault telegram via the object "Command value fault". This parameter defines the telegram polarity of the fault telegram.	

Cyclical transmission in the case of faulty command value	Active **Inactive**
If a command value fault is identified, the device optionally transmits the fault telegram cyclically. Here, the cyclical transmission of the fault telegram can be enabled as required. ℹ The cycle time is defined by the parameter "Time for cyclical transmission of feedback signals" on the parameter page "Valve output -> VA - General".	

The following parameters are parameterised on the "Valve output 1 -> VO1 - General -> Enabled functions" parameter page.

Emergency operation	**Active**
The "emergency operation" function is always activated.	

The following parameters are parameterised on the "Valve output 1 -> VA1 - General -> Emergency operation" parameter page.

Command value	0 % 10 % ... **30 %** ... 90 % 100 %

When a fault in the input command value is detected, after voltage recovery or after an ETS programming operation, the emergency operation command value configured at this point can be set as the active command value.

When the command value of the emergency operation is recalled, the valve output configured to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limit" is always activated by a constant command value with pulse width modulation.

Command value (summer)	0 % 10 % ... **30 %** ... 90 % 100 %

When a fault in the input command value is detected, after voltage recovery or after an ETS programming operation, the emergency operation command value configured at this point can be set as the active command value. The command value preset here is only applied if summer operation is activated.

When the command value of the emergency operation is recalled, the valve output configured to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limit" is always activated by a constant command value with pulse width modulation.

Command value (winter)	0 % 10 % ... **70 %** ... 90 % 100 %
When a fault in the input command value is detected, after voltage recovery or after an ETS programming operation, the emergency operation command value configured at this point can be set as the active command value. The command value preset here is only applied if winter mode is activated. When the command value of the emergency operation is recalled, the valve output configured to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limit" is always activated by a constant command value with pulse width modulation.	

13.2.2.2 Object list

Object no.	Function	Name	Type	DPT	Flag
605	Command value fault	Valve output 1 - Output	1-bit	1,005	C, R, -, T, A
1-bit output object to signal a faulty command value. The telegram polarity can be configured. Immediately after the mains 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 for the object value to be transmitted. This is also the case if a saved emergency operation was restored after a device reset.					

13.2.3 Command value limit

If the "Data format of the command value input = constant (1-byte) with pulse width modulation (PWM)" is set, the device offers a 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 device activate the command value limit automatically after voltage recovery or an ETS programming operation.

With active control value limit, the control value range is defined by the parameter "Control value range with active limit".

ℹ With a permanently active command value limit, the initialisation behaviour cannot be configured after voltage recovery or an ETS programming operation, as the limit is always active. In this case, no object is available.

ℹ The status of the command value limit is not automatically tracked in the communication object after a device reset.

ℹ It should be noted that due to the priority control after voltage recovery and after an ETS programming operation, the device executes the behaviour configured on the parameter page "Valve output 1 -> VA1 - General" by the parameters "After voltage recovery" and "After ETS programming". 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.

13.2.3.1 Table of parameters

The following parameters are parameterised on the "Valve output 1 -> VO1 - General -> Enabled functions" parameter page.

Command value limit	Active **Inactive**
This parameter enables the command value limit. The command value range is defined by a configurable smallest and a configurable largest command value.	

The following parameters are parameterised on the "Valve output 1 -> VO1 - General -> Command value limit" parameter page.

Activation	**by object "Command value limit"** permanently active
This parameter decides whether the limit of the command values can either be activated and deactivated by the "Command value limit" object or whether the command value limit is permanently active.	

Activation after voltage return	Active **Inactive**
This parameter decides whether the command value limit is activated or inactive after voltage return.	

Activation after ETS programming operation	Active **Inactive**
This parameter decides whether the command value limit is activated or inactive after an ETS programming operation.	

Command value range with active limitation	From **0** ... 50% to 55 ... **100%**
The command value range is defined that is valid when the command value limit is activated. The smallest command value and the largest command value are set.	

13.2.3.2 Object list

Object no.	Function	Name	Type	DPT	Flag
606	Command value limit	Valve output 1 - Input	1-bit	1,002	C, -,W, -, U
1-bit input object for activating and deactivating of the command value limit. The polarity is fixed ("1" = Command value limit active, "0" = Command value limit inactive"). The activation of the command value limit after voltage recovery or after an ETS programming operation can be configured. This object is only visible for "Activation = by object command value limit".					

13.2.4 forced position

A forced position can be configured for the valve output and activated as required. 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) 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 device 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 (siehe Kapitel "Summer/winter mode switch-over for valve output" ▸ Page 310). 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.

The forced position can be 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). At the end of a higher priority function, the device executes the forced reaction once again if the forced position is still activated at this time.
Optionally, the command value of forced position can also be activated after voltage recovery and 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.

At the end of a forced position, the behaviour of a valve output is permanently defined. The device 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 (voltage recovery, ETS programming operation), the command value objects first contain the value "0".

- Updates of the object from "Forced position active" to "Forced position active" or from "Forced position inactive" to "Forced position inactive" produce no reaction.

- 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 voltage recovery, the previously stored object value "0" is restored, then the device will also activate the forced position for the polarity "0 = Forced position active / 1 = No forced position", thus locking the output.

- 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 device reset behaviour, as required ("Activate command values according to forced position").

13.2.4.1 Table of parameters

The following parameters are parameterised on the "Valve output 1 -> VO1 - General -> Enabled functions" parameter page.

forced position	**Active**
The "forced position" function is always activated.	

The following parameters are parameterised on the "Valve output 1 -> VO1 - General -> Forced position" parameter page.

Command value	0 % 10 % ... **30 %** ... 90 % 100 %
When forced operation is activated via a 1-bit object, after voltage return or after an ETS programming operation, it is possible to set the forced command value configured here as the active command value. When the command value of the forced position is recalled, the valve output configured to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value" is always activated by a constant command value with pulse width modulation.	

Command value (summer)	0 % 10 % ... **30 %** ... 90 % 100 %
When forced operation is activated via a 1-bit object, after voltage return or after an ETS programming operation, it is possible to set the forced command value configured here as the active command value. The command value preset here is only applied if summer operation is activated. When the command value of the forced position is recalled, the valve output configured to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value" is always activated by a constant command value with pulse width modulation.	

<table>
<tr><td>Command value (winter)</td><td>0 %
10 %
...
70 %
...
90 %
100 %</td></tr>
<tr><td colspan="2">When forced operation is activated via a 1-bit object, voltage return or after an ETS programming operation, it is possible to set the forced command value configured here as the active command value. The command value preset here is only applied if winter mode is activated.
When the command value of the forced position is recalled, the valve output configured to the command value data formats "Switching (1-bit)" or "Constant (1-byte) with command value limiting value" is always activated by a constant command value with pulse width modulation.</td></tr>
</table>

<table>
<tr><td>Object "Forced position"</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">This parameter enables the "Forced position" object.
– Active: The "Forced position" object becomes visible. The forced position is activated and deactivated via a separate 1-bit object.
– Inactive: The configured forced command values are used for the reset behaviour after voltage return and after ETS programming operation. A forced position cannot be activated.</td></tr>
</table>

<table>
<tr><td>Polarity of "Forced position" object</td><td>1 = forced pos. active / 0 = no forced pos.
1 = No forced pos. / 0 = Forced position active</td></tr>
<tr><td colspan="2">The telegram polarity of the "Forced position" object is defined here when the forced position object is enabled.</td></tr>
</table>

13.2.4.2 Object list

Object no.	Function	Name	Type	DPT	Flag
604	forced position	Valve output 1 - Input	1-bit	1,003	C, -,W, -, U

1-bit input object for activating and deactivating of a forced position. The telegram polarity can be configured.

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 voltage failure and is restored automatically after voltage recovery.

13.2.5 Feedback telegrams

13.2.5.1 Feedback valve command value

Optionally, a feedback object of the valve command value can be enabled. This status object makes the active command value of the valve output available either actively transmitting or passively (object can be read out). During status feedback, the device 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 has 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".

Depending on the input data format of the command value and the operating status of the valve output, the status object assumes different status values.

i The device distinguishes between different functions and events that can have an effect on the valve outputs. Because these functions and events cannot be executed simultaneously, there is priority control. Each global or output-orientated function and each incoming event possesses a priority Priorities for valve outputs. The function or the event with the higher priority overrides the lower-priority functions and events.
Priority control also influences the status objects. That state is always transmitted as the status which is currently set at a valve output. If a function with a high priority is exited, then the status objects assume the command value of functions with a lower priority, providing that they are active.

Status value for input command value "Switching (1-bit)"...

- State of operation "Normal operation"
  -> Status value = Most recently received input command value ("0" or "1"),
- State of operation "Emergency operation" (0...100 %)
  -> Status value = Emergency operation command value ("0" at 0 %, "1" at 1...100 %),
- State of operation "Forced position" (0...100 %)
  -> Status value = Forced command value ("0" at 0 %, "1" at 1...100 %),
- State of operation "Valve rinsing" (0 %, 100 %)
  -> Status value = Current command value in rinsing operation ("0" when valve closed, "1" when valve opened),
- State of operation "Service mode" (0 %, 100 %)
  -> Status value = Service command value ("0" when valve forcibly closed, "1" when valve forcibly opened),

- Operating status "after device reset" (0...100 %)
  -> Status value = according to specification by parameter "After voltage recovery" or "After ETS programming" ("0" at 0 %, "1" at 1...100 %),

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),
- Operating status "after device reset" (0...100 %)
  -> Status value = according to specification by parameter "After voltage recovery" or "After ETS programming" ("0" at 0 %, "1" at 1...100 %),

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),
- Operating status "after device reset" (0...100 %)
  -> Status value = according to specification by parameter "After voltage recovery" or "After ETS programming" ("0" at 0 %, "1" at 1...100 %),

Set the 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 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.
The parameter "Type of feedback" is created on the parameter page "Valve output 1 -> VA1 - General -> Feedback".

ℹ As an active signalling object, the feedback telegram is transmitted as soon as the status changes. An automatic telegram transmission of the feedback takes place after voltage recovery or after an ETS programming operation (possibly with a delay).

ℹ The status object does not transmit if the status does not change after the activation or deactivation of device functions or new input command values. Transmission only ever takes place after changes to the command value.

ℹ As a passive status object, the feedback telegram is only transmitted as a 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 voltage return or after ETS programming.

Set the time delay of the feedback

If used as active signalling object, the state of the status feedback information is transmitted to the bus after voltage recovery 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 "Valve output -> VO - General" parameter page.

ℹ With "Delay after voltage recovery = Active", the status feedback is transmitted with a time delay after voltage recovery or after an ETS programming operation. No feedback is transmitted during a running time delay, even if the valve state changes during this delay.

ℹ With "Delay after voltage recovery = Inactive", the status feedback is transmitted immediately after voltage recovery or after an ETS programming operation.

Set the cyclical transmission of the feedback for the valve command value

The status feedback telegram can be transmitted via the active message object either when a change occurs or when a change occurs and cyclically.

ℹ The cycle time is defined centrally on the parameter page "Valve output -> VA - General".

ℹ There is no cyclical transmission during an active time delay after voltage return or an ETS programming operation.

13.2.5.2 Feedback combined valve status

The combined valve status allows the collective feedback of various functions of the valve output in a single 1-byte bus telegram. The combined valve status helps to forward the status information of a valve 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 (see figure 65).

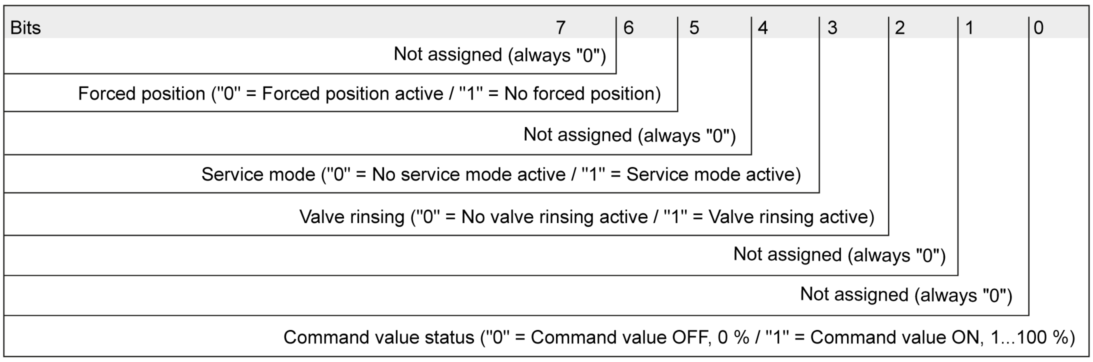


Image 65: Bit encoding of the object "Feedback combined valve status"

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 "Not assigned":
  This bit is always "0".
- 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".

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 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.
The parameter "Type of feedback" is created on the parameter page "Valve output 1 -> VA1 - General -> Feedback".

ℹ As an active signalling object, the feedback telegram is transmitted as soon as the status changes. An automatic telegram transmission of the feedback takes place (possibly with a delay) after voltage return and after an ETS programming operation.

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 As a passive status object, the feedback telegram is only transmitted as a 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 voltage return or after ETS programming.

Setting the time delay of the combined valve status

If used as active signalling object, the state of the combined status feedback information is transmitted to the bus after voltage recovery 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 "Valve output -> VO - General" parameter page.

ℹ With "Delay after voltage recovery = Active", the combined status feedback is transmitted with a time delay after voltage recovery or after an ETS programming operation. No feedback is transmitted during a running time delay, even if the valve state changes during this delay.

ℹ With "Delay after voltage recovery = Inactive", the combined status feedback is transmitted immediately after voltage recovery or after an ETS programming operation.

Setting cyclical transmission of the combined valve status

The feedback telegram of the combined valve status can be transmitted via the active message object either when a change occurs or when a change occurs and cyclically.

ⓘ The cycle time is defined centrally on the parameter page "Valve output -> VA - General".

ⓘ There is no cyclical transmission during an active time delay after voltage return or an ETS programming operation.

13.2.5.3 Table of parameters

The following parameters are parameterised on the "Valve output 1 -> VO1 - General -> Enabled functions" parameter page.

Feedback telegrams	Active **Inactive**
This parameter generally enables the feedback functions. The feedback functions are configured on the "Feedback telegrams" parameter page.	

The following parameters are parameterised on the "Valve output 1 -> VO1 - General -> Feedback telegrams" parameter page.

Feedback valve command value	Active **Inactive**
This parameter enables the status object "Valve command value feedback". The status object makes the active command value of the valve output available either actively transmitting or passively (object can be read out). All functions are taken into account that have an influence on the command value implemented at the output.	

Type of feedback	**active signalling object** passive status object
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 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 visible in case of enabled status feedback. Active signalling object: The feedback telegram is transmitted as soon as the status changes. An automatic telegram transmission of the feedback takes place after mains voltage return, if the supply voltage of the actuators fails and returns or after an ETS programming operation (possibly with a 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 bus by a read telegram. No automatic telegram transmission of the feedback takes place after voltage return, if the supply voltage of the actuators fails and returns or after an ETS programming operation.	

Updating of the object value	**on change** on change and cyclical

The status feedback telegram can also be transmitted cyclically via the active signal object in addition to the transmission after changes.
This parameter is only visible in case of an enabled status feedback and only when the object is actively transmitting.

On change and cyclical: Cyclical transmission is activated. The cycle time is defined centrally for all the valve outputs on the "Valve output -> VO - General" parameter page. There is no cyclical transmission during an active time delay after voltage return or an ETS programming operation.

No: Cyclical transmission is deactivated so that the feedback is transmitted to the bus only when the status is changed by the actuator.

Delay after voltage return	active **inactive**

If used as active signal object, the state of the status feedback information is transmitted to the bus after 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 "Valve output -> VO - General" 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 voltage return or after ETS programming. No feedback is transmitted during a running time delay, even if the valve state changes during this delay. If the supply voltage fails and returns, then the status feedback is always transmitted without a delay.

No: The status feedback will be transmitted without delay after voltage return or after ETS programming.

Feedback combined valve status	Active **Inactive**

This parameter enables the status object "Feedback combined valve status".

The combined valve status allows the collective feedback of various functions of the valve output in a single 1-byte bus telegram. The combined valve status 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 device. The communication object "Feedback combined valve status" contains four different items of status information.

Type of feedback	**active signalling object** passive status object
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. An automatic telegram transmission of the feedback takes place (possibly with a delay) after voltage return and after an ETS programming operation. 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. If the supply voltage of the actuators fails and returns, then the combined status feedback is not transmitted. 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 voltage return or after ETS programming.	

Updating of the object value	**on change** on change and cyclical
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. On change and cyclical: Cyclical transmission is activated. The cycle time is defined centrally for all the valve outputs on the "Valve output -> VO - General" parameter page. There is no cyclical transmission during an active time delay after voltage return or an ETS programming operation. In case of a change: Cyclical transmission is deactivated so that the feedback telegram is transmitted to the bus only when the status is changed by the actuator.	

Delay after voltage return	active inactive
If used as active signal object, the state of the combined status feedback information is transmitted to the bus after 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 "Valve output -> VO - General" 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 voltage return or after ETS programming. No feedback is transmitted during a running time delay, even if the valve state changes during this delay. If the supply voltage fails and returns, then the status feedback is always transmitted without a delay. No: The status feedback will be transmitted without delay after voltage return or after ETS programming.	

13.2.5.4 Object list

Object no.	Function	Name	Type	DPT	Flag
602	Feedback valve command value	Valve output 1 - Output	1-bit	1,001	C, R, -, T, A

1-bit output object to feed back the active switching command value of a valve output. In this case, the telegram polarity is fixed: "0" = Valve closed, "1" = Valve opened.

It is also possible for such command value outputs to have a constant command value (PWM at the output) active (e.g. after voltage recovery). 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 mains voltage return and an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.

This object is only available if the command value data format "switching (1-bit)" or "constant (1-byte) with command value limit" is configured and set as an active message object.

Object no.	Function	Name	Type	DPT	Flag
602	Feedback valve command value	Valve output 1 - Output	1-bit	1,001	C, R, -, -, A

1-bit output object to feed back the active switching command value of a valve output. In this case, the telegram polarity is fixed: "0" = Valve closed, "1" = Valve opened.

It is also possible for such command value outputs to have a constant command value (PWM at the output) active (e.g. after voltage recovery). 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 mains voltage return and an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.

This object is only available if the command value data format "switching (1-bit)" or "constant (1-byte) with command value limit" is configured and set as a passive status object.

Object no.	Function	Name	Type	DPT	Flag
603	Feedback valve command value	Valve output 1 - Output	1 bytes	5,001	C, R, -, T, A

1-byte output object to feed back the active constant command value of a valve output (0...100 % -> 0...255).

The object transmits the current status after mains voltage return and an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.

This object is only available if the command value data format "constant (1-byte) with pulse width modulation (PWM)" is configured and set as an active message object.

Object no.	Function	Name	Type	DPT	Flag
603	Feedback valve command value	Valve output 1 - Output	1 bytes	5,001	C, R, -, -, A

1-byte output object to feed back the active constant command value of a valve output (0...100 % -> 0...255).

The object transmits the current status after mains voltage return and an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.

This object is only available if the command value data format "constant (1-byte) with pulse width modulation (PWM)" is configured and set as a passive status object.

Object no.	Function	Name	Type	DPT	Flag
610	Feedback combined valve status	Valve output 1 - Output	1 bytes	---	C, R, -, T, A

1-byte output 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: Not assigned (always "0")
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 mains voltage return and an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.

This object is only available if it is set as an active message object.

Object no.	Function	Name	Type	DPT	Flag
610	Feedback combined valve status	Valve output 1 - Output	1 bytes	---	C, R, -, -, A

1-byte output 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: Not assigned (always "0")
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 mains voltage return and an ETS programming operation, possibly after a transmission delay (configurable) has elapsed.

This object is only available if it is set as a passive status object.

13.2.6 Valve rinsing

Valve rinsing can prevent calcification or sticking of a valve which has not been activated for some time. Valve rinsing is an automatic function of the device. 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 device activates a command value of 100 % without interruption for half of the configured "Valve rinsing time". For this, the valves open completely. After half the time, the device 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 limit was not exceeded during device operation.

ℹ During valve rinsing, the device 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 limit for the data formats "Switching (1-bit)" or "Constant (1-byte)".

ℹ The device 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 device automatically sets the tracked command value according to the priority control Priorities for valve outputs.

ℹ The device does not execute valve rinsing if a higher-priority function is active. Nonetheless, the device internally starts the rinse length, as soon as the device receives a command for valve rinsing (cyclically or via bus command). If, during an active rinsing time, higher-priority functions are exited, then the device 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 device will not execute the previously started valve rinsing.

ℹ A power failure immediately interrupts an active rinsing operation. After mains 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 mains voltage return and after an ETS programming operation without a delay.

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.

Configuring cyclical valve rinsing

The device 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.

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.

ℹ If there is a power failure, the device saves the remaining residual time of the current time cycle. The residual cycle time is restarted after mains voltage return. A power failure immediately interrupts an active rinsing operation. After mains voltage return, a previously interrupted rinsing operation is not executed again. The device then starts a new time cycle for cyclical valve rinsing.

Optionally, intelligent cyclical valve rinsing can be additionally activated. Here, valve rinsing is only executed repeatedly, if, in the current time cycle, a minimum command value limiting value, configurable in the ETS, was not exceeded. If the active command value exceeds the limiting value, the device will stop the cycle time. The device only restarts the cycle time if, in the further course of the command value change, a command value of "0 %" or "OFF" (completely closed) is set (see figure 66). 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.

- 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 device would never restart the cycle time as part of intelligent valve rinsing.

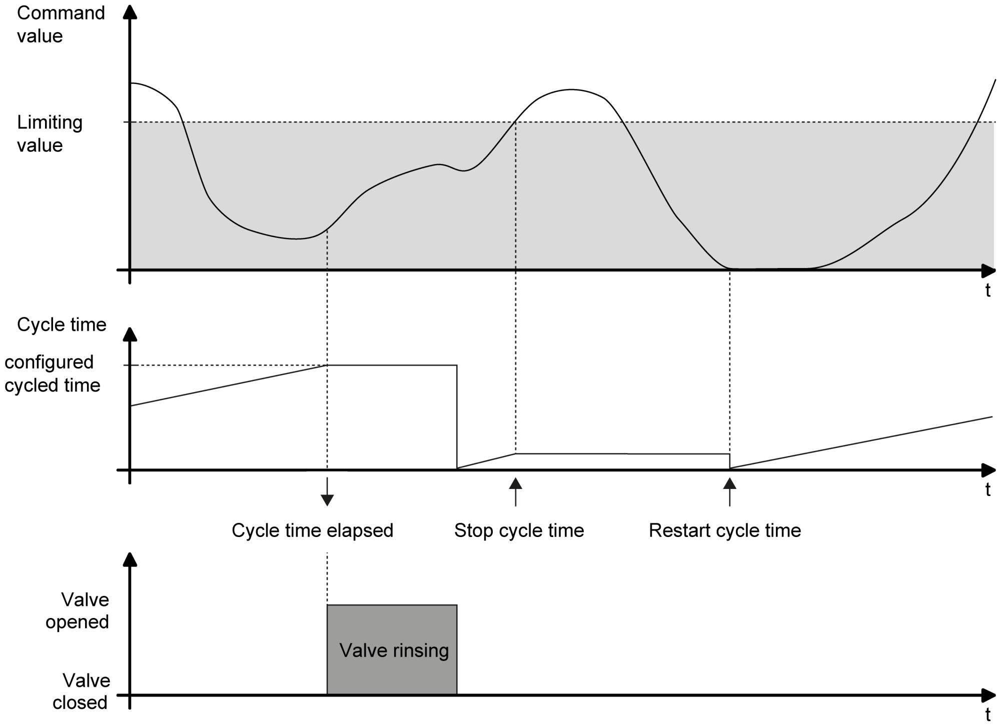


Image 66: Example of a minimum command value limiting value for intelligent valve rinsing

- Valve rinsing can optionally be started and, if required, stopped using a communication object. If valve rinsing was started by the object, then the device 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 heating actuators, so that they perform valve rinsing simultaneously (link of the individual status objects to the input objects of the valve rinsing).
The bus control of the valve rinsing can only be used if it has been enabled in the ETS ("Valve rinsing activated externally" parameter).

- 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.

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.

13.2.6.1 Table of parameters

The following parameters are parameterised on the "Valve output 1 -> VO1 - General -> Enabled functions" parameter page.

Valve rinsing	Active **Inactive**
To prevent calcification or sticking of a valve which has not been activated for some time, the actuator has an automatic valve rinsing function. Valve rinsing can be executed cyclically or using a bus command, causing the activated valves to run through the full valve stroke for a preset period of time. During valve rinsing, the actuator activates a command value of 100 % without interruption for half of the configured "Valve rinsing time". For this, the valves open completely. After half the time, the actuator switches to a command value of 0%, causing the connected valves to close completely. In the "Active" setting, this parameter enables valve rinsing.	

The following parameters are parameterised on the "Valve output 1 -> VO1 - General -> Valve rinsing" parameter page.

Length of the 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.	

<table>
<tr><td>Cyclical valve rinsing</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">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.
Active: Cyclical valve rinsing is enabled. Each ETS programming operation resets the cycle time. The first rinsing operation with cyclical valve rinsing takes place after an ETS programming operation after the first time cycle has elapsed. If there is a power failure, the actuator saves the remaining residual time of the current time cycle. The residual cycle time is restarted after mains voltage return. A power failure immediately interrupts an active rinsing operation. After mains voltage return, a previously interrupted rinsing operation is not executed again. The actuator then starts a new time cycle for cyclical valve rinsing.
Inactive: Cyclical valve rinsing is completely disabled. Valve rinsing can only be started by the communication object (if enabled).</td></tr>
</table>

<table>
<tr><td>Cycle time (1...26 weeks)</td><td>1...26</td></tr>
<tr><td colspan="2">This parameter defines how often cyclical valve rinsing is to be performed automatically.</td></tr>
</table>

<table>
<tr><td>Intelligent valve rinsing</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

<table>
<tr><td>Limiting value minimum command value (10...100 %)</td><td>10...50...100</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

Valve rinsing activated externally	**Active** Inactive
If necessary, valve rinsing can be started and, optionally, stopped using its own 1-bit communication object. This means that it is possible to activate a rinsing operation of the valve controlled by time or an event. It is also possible, for example, to cascade multiple heating actuators, so that they perform valve rinsing simultaneously (link of the individual status objects to the input objects of the valve rinsing). Bus control can only be used if it has been enabled here.	

Object polarity	**1 = start / 0 = stop** 1 = stop / 0 = start 1 = start (stop not possible) / 0 = ---
This parameter sets the telegram polarity of the object for external valve rinsing. The name of the object is aligned to the setting of the permitted telegram polarity ("Start / stop valve rinsing" or "Start valve rinsing"). When a start command is received, the actuator immediately starts the configured time for a rinsing operation. The actuator also actively executes valve rinsing if no higher-priority function is active. If bus-controlled stopping is permitted, then the actuator will also react to stop commands by immediately interrupting running rinsing operations.	

13.2.6.2 Object list

Object no.	Function	Name	Type	DPT	Flag
607	Valve rinsing start Valve rinsing start / stop	Valve output 1 - Input	1-bit	1,003	C, -,W, -, U
1-bit input object for starting and stopping valve rinsing. Valve rinsing can be activated by time or an event using this object. It is also possible, for example, to cascade multiple heating actuators, so that they perform valve rinsing simultaneously (link of the individual status objects to the input objects of the valve rinsing). The telegram polarity can be configured. Stopping can be prevented via the object as an option. The time of cyclical valve rinsing is restarted as soon as an externally started valve rinsing operation is stopped by a Stop telegram or by the expiry of the rinsing time. Updates of the object from "Start" to "Start" or "Stop" to "Stop" do not produce a reaction. The length of an elapsing valve rinsing operation or the cycle time of the cyclical valve rinsing are not restarted by this.					

Function: Valve rinsing

Object no.	Function	Name	Type	DPT	Flag
608	Valve rinsing status	Valve output 1 - Output	1-bit	1,002	C, R, -, T, A
1-bit output object for status feedback of a valve rinsing operation. The telegram polarity is fixed: "0" = Valve rinsing inactive, "1" = Valve rinsing active. The object transmits the current status after mains voltage return and after an ETS programming operation without a delay.					

13.3 Room temperature controller (channel-independent functions)

A room temperature controller is integrated in the device software, which can be used for single-room temperature control. This allows the temperature to be set to predefined setpoints.

The room temperature controller is available in combination with the following inserts:

- Room temperature controller insert with sensor connection
- Relay switching insert
- Electronic switching insert

The command value output of the room temperature controller is linked internally in the device with the electronic valve output of the insert.

ℹ External control is not possible.

The temperature control and the valve control are carried out by a bus device (device combination of insert and cover).

The room temperature controller of the device works as a 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 can be made available to the room temperature controller via separate communication objects.

13.3.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC" parameter page.

Room temperature controller	**Active** Inactive
This parameter activates the room temperature controller in the device's software. The room temperature controller is parameterised on the "RTC - General" parameter page.	

13.3.2 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).

Mixed operation can also be activated. Switching between "heating" and "cooling" is controlled either via a communication object or by the extension input of the insert. Optionally, the switching of the operating mode of further KNX devices can be controlled via the status object.

"Heating" or "cooling" single operating modes

In the single "Heating" or "Cooling" operating modes, the controller will always work with one command value. 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 <u>and</u> cooling systems. In this connection, you can set the switch-over behaviour of the modes.

- via object "Heating / cooling change-over"
- Internally (via the extension input of the insert)

The operating mode is controlled irrespective of the deadband via the "Heating / cooling switchover" object or via the extension input of the insert.

This type of switchover is required if both heating and cooling should be carried out through a one-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).

The telegram polarity is predefined: "1": Heating; "0": Cooling.

via object "Heating / cooling change-over"

After a reset, the object value will be "0", and the "Operating mode after reset" set in the ETS will be activated. The parameter "Operating mode after reset" determines which operating mode is activated 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.

internal

After a reset, the operating mode is specified by the extension input of the insert.

ℹ 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.

13.3.2.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General" parameter page.

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
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".	

Source of switch-over	**via object "Heating / cooling change-over"** internal
In a configured mixed mode it is possible to switch over between heating and cooling. – Via object: The change-over takes place only via the object "Heating / cooling change-over". – Internal: The change-over takes place only via the extension input of the insert.	

Operating mode after reset	**Heating** Cooling Operating mode before reset
When switching over via object, the preset operating mode for after a voltage return or an ETS programming operation is specified here.	

13.3.2.2 Object list

Object no.	Function	Name	Type	DPT	Flag
642	Heating / cooling change-over	Controller 1 - input	1-bit	1,100	C, -,W, T, U

1 bit object to change-over the operating mode of the controller ("Heating" or "Cooling" modes).

- Object value "1" = Heating; Object value "0" = Cooling

After voltage recovery or ETS programming operation, the object value is always "0", irrespective of which operating mode is specified via configuration after a reset.

Object no.	Function	Name	Type	DPT	Flag
676	Heating / cooling switchover - status	Controller 1 - output	1-bit	1,100	C, -,W, T, -

1-bit object for status feedback of the operating mode of the controller ("heating" or "cooling").

- Object value "1" = Heating; Object value "0" = Cooling

13.3.3 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 drive or an actuator with switching output signals (e.g. heating actuator when ETD electrothermal drives are used), the actual heating or cooling element (e.g. radiator or cooling ceiling) and of the room. This results in a controlled system (see figure 67).

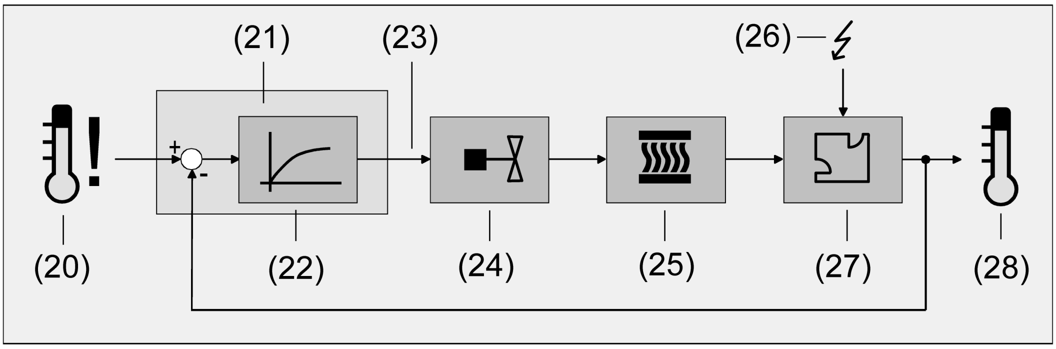


Image 67: Controlled system of single-room temperature control

(20) Setpoint temperature specification
(21) Room temperature controller
(22) Control algorithm
(23) Command value
(24) Valve control (valve 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.

The command values calculated by the control algorithm are transmitted internally in the device to the valve output.

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. With this algorithm, the room temperature controller cyclically calculates a new constant command value every 30 seconds and transmits it internally in the device to the valve output if the calculated command value has changed by 1 percent.

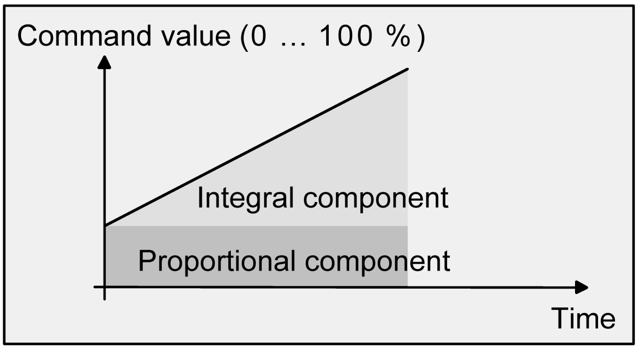


Image 68: Continuous PI control

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 are set using 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.

Predefined control parameters and recommend control types for heating systems

Type of heating	Proportional range (preset)	Reset time (preset)	Recommended PI control type	Recommended PWM cycle time
Fan coil or split unit	1.0 Kelvin	500 minutes	Continuous / PWM	15 min.
Hot water heater or electric heating	1.0 Kelvin	830 minutes	Continuous / PWM	15 min.
Underfloor heating	1.5 Kelvin	1000 minutes	Continuous / PWM	15 min.

Predefined control parameters and recommend control types for cooling systems

Type of cooling	Proportional range (preset)	Reset time (preset)	Recommended PI control type	Recommended PWM cycle time
Fan coil or split unit	1.0 Kelvin	500 minutes	Continuous / PWM	15 min.
Cooling ceiling	1.0 Kelvin	830 minutes	Continuous / PWM	15 min.
Floor cooling	1.5 Kelvin	1000 minutes	Continuous / PWM	15 min.

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.

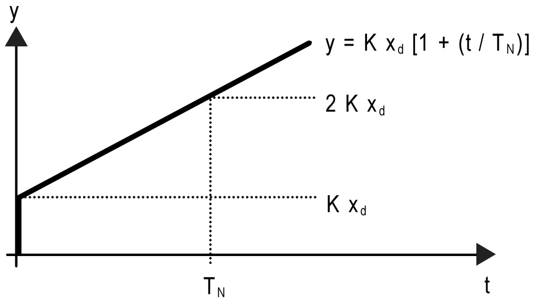


Image 69: Function of the command value of a PI control

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: parameterisable reset time

PI control algorithm: Command value $y = K\ x_d\ [1 + (t / T_N)]$

Deactivation of the reset time (setting = "0") ->
P control algorithm: Command value $y = K\ x_d$

Parameter setting	Effect
P: Small proportional range	Large overshoot in case of setpoint changes (possibly permanently), quick adjustment to the setpoint
P: Large proportional range	no (or small) overshooting but slow adjustment
T_N: Short reset time	Fast compensation of control deviations (ambient conditions), risk of permanent oscillations
T_N: Long reset time	Slow compensation of control deviations

Effects of the settings for the control parameters

2-point feedback control

2-point feedback control represents a very simple temperature control. For this type of feedback control, two hysteresis temperature values are set. The actuators are triggered by the controller via switch-on and switch-off command value commands (1-bit type). A 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.

"Heating" or "cooling" single operating modes:

In heating mode, the controller will turn on the heating when the room temperature has fallen below a preset limit. In heating mode, the feedback control will only turn off the heating once a preset temperature limit has been exceeded. In cooling mode, the controller will turn on the cooling system when the room temperature has exceeded a preset limit. The control system will only turn off the cooling system once the temperature has fallen below a preset limit. In this connection, the command value "1" or "0"

will be output, depending on the switching status, if the temperature exceeds or falls below the hysteresis limits.
The hysteresis limits of both operating modes can be configured in the ETS.

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" (see figure 70)or "Cooling" (see figure 71). The images take two temperature setpoints, one-stage heating or cooling and non-inverted command value output into account.

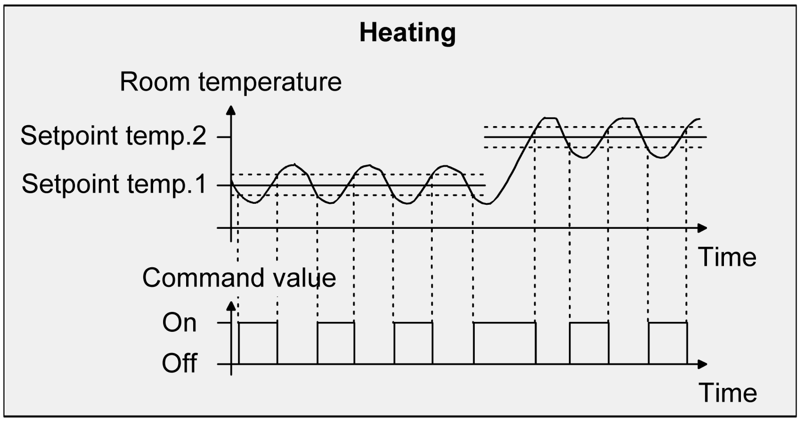


Image 70: 2-point feedback control for the single "Heating" operating mode

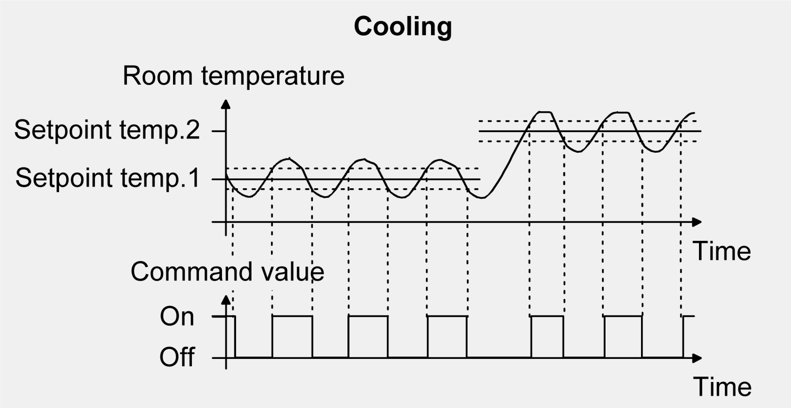


Image 71: 2-point feedback control for the single "Cooling" operating mode

"Heating and cooling" mixed operating mode:

In mixed mode, a distinction is made as to whether the switching of the operating modes for heating or cooling is controlled via the "Heating/cooling switchover" object or is carried out internally in the device.

In heating mode, the controller will turn on the heating when the room temperature has fallen below a preset hysteresis limit. The feedback control will only turn off the heating in the heating mode once the preset upper hysteresis limit has been exceeded.

In the same way, in cooling mode, the controller will turn on the cooling system when the room temperature has exceeded a preset hysteresis limit. The feedback control will only turn off the cooling system in the cooling mode once the temperature has fallen below the preset lower hysteresis limit.

As with the individual operating 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.

The following two images show 2-point control for the mixed operating mode "Heating and cooling". The images distinguish between heating mode (see figure 72) and cooling mode (see figure 73). The images take into account two setpoint temperatures and a normal command value output. In addition, an upper hysteresis for heating and a lower hysteresis for cooling are active.

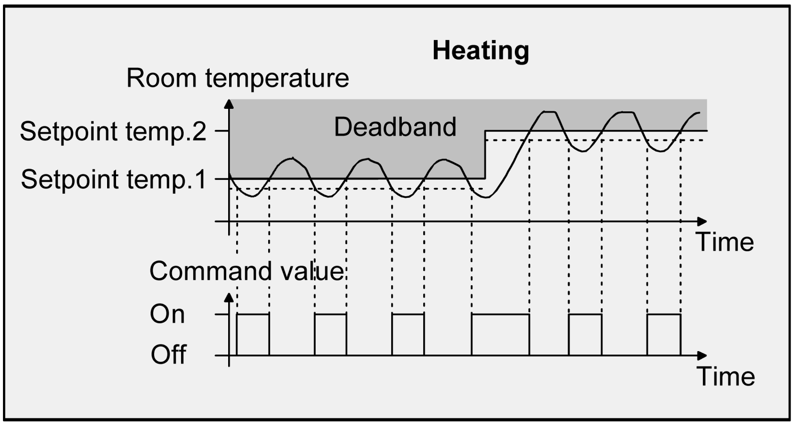


Image 72: 2-point feedback control for mixed "Heating and cooling" mode with active heating mode.

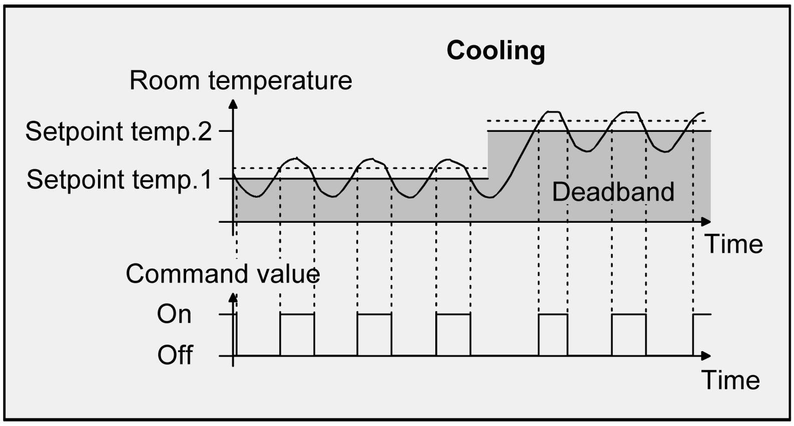


Image 73: 2-point feedback control for mixed "Heating and cooling" mode with active cooling operation.

The command value "1" or "0" is transmitted, depending on the switching status, if the hysteresis limit values or the setpoint values are undercut or exceeded.

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.

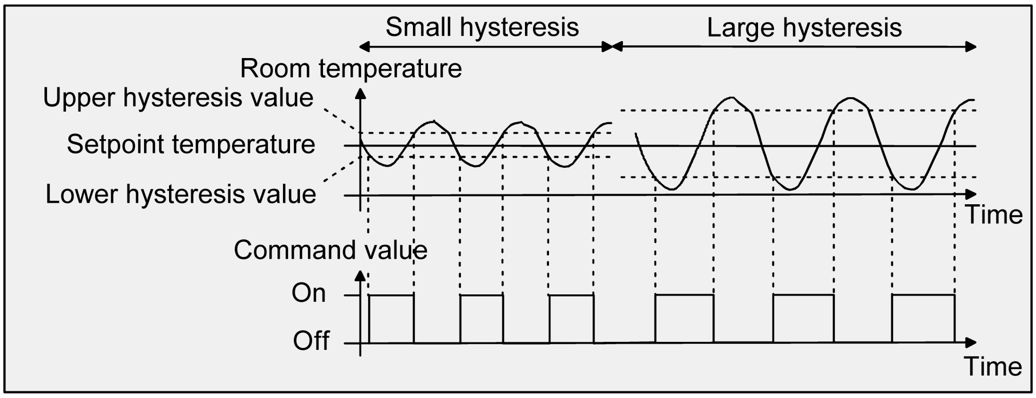


Image 74: Effects of the hysteresis on the switching behaviour of a 2-point feedback control command value

13.3.3.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General" parameter page.

Type of heating control	**continuous PI control** switching 2-point feedback control
Selecting a feedback control algorithm (PI or 2-point) with data format (1-byte or 1-bit) for the heating system.	

Type of control	**continuous PI control** switching 2-point feedback control
Selecting a control algorithm (PI or 2-point) with data format (1-byte or 1-bit) for the heating/cooling system.	

Type of heating	via control parameter Fan coil or split unit (1.0 K / 500 min) **Hot water heater or electric heating (1.0 K / 830 min)** Underfloor heating (1.5 K / 1000 min)
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.	

Proportional range	**10**...127 x 0,1 K
Separate setting of the "Proportional range" control parameter.	

Reset time (0 = inactive)	0...**83**...255 x 10 min
Separate setting of the "Reset time" control parameter.	

Lower hysteresis limit, heating	-128...**-5** x 0,1 K
Definition of bottom hysteresis (switch-on temperatures) of the heating.	

Upper hysteresis limit, heating	**5**...127 x 0,1 K
Definition of top hysteresis (switch-off temperatures) of the heating.	

Type of cooling control	**continuous PI control** switching 2-point feedback control
Selecting a feedback control algorithm (PI or 2-point) with data format (1 byte or 1 bit) for the cooling system	

Type of cooling	via control parameter Fan coil unit or split unit (1.0 K / 500 min) **Cooling ceiling (1.0 K / 830 min)** Floor cooling (1.5 K / 1000 min
Adapting the PI algorithm to different cooling systems using predefined values for the proportional range and reset time control parameters. With the "Using control parameters" setting, it is possible to set the control parameters in a manner deviating from the predefined values within specific limits.	

Proportional range	10...**10**...127 x 0.1 K
Separate setting of the "Proportional range" control parameter.	

Reset time (0 = inactive)	0...**83**...255 x 10 min
Separate setting of the "Reset time" control parameter.	

Lower hysteresis limit, cooling	-128...**-5** x 0,1 K
Definition of bottom hysteresis (switch-off temperatures) of the cooling.	

Upper hysteresis limit, cooling	**5**...127 x 0,1 K
Definition of top hysteresis (switch-on temperatures) of the cooling.	

13.3.4 Operating mode switchover

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 presence detector on the wall or a ceiling mounted presence 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 mode is switched by the "Operating mode" object.

During the running time, the operating mode can be changed over through this value object immediately after the receipt of only one telegram. In this connection, the value received will set the operating mode. In addition, a second 1-byte object is available which, by forced control and through a higher level, can set an operating mode, irrespective of any other switchover options.

Taking the priority into account, a specific switchover hierarchy will result from the operating mode switchover by the objects, a distinction being made between presence detection by the presence button (see figure 75) or the presence detector (see figure 76). 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 .

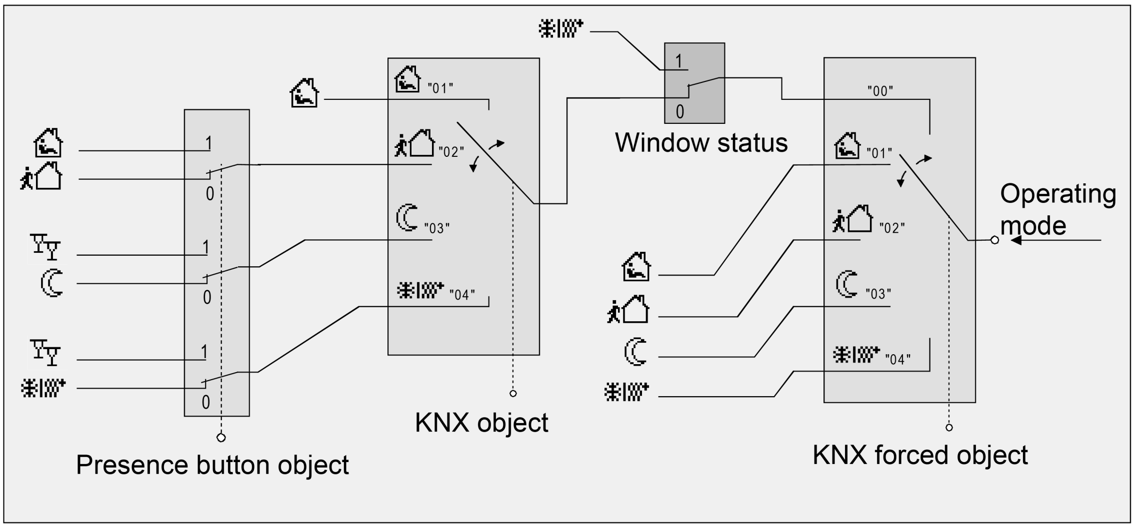


Image 75: Operating mode switchover through KNX object with presence button

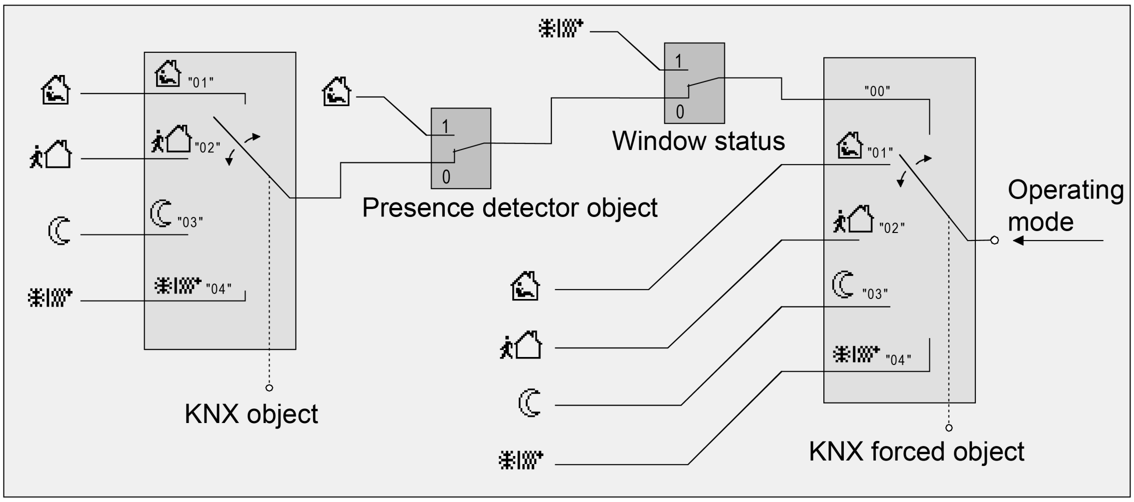


Image 76: Operating mode switchover through KNX object with presence detector

Object value Operating mode	Object value Forced object Oper.m.	object Window status	Presence button	Presence 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 extension
04	00	0	1	-	Comfort extension
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 voltage recovery or after an ETS programming operation, the value corresponding to the set operating mode is actively transmitted to the bus if the "Transmit" flag is set.

i In parameterisation of a presence button: the presence object will be active ("1") for the period of an active comfort extension. The presence object will be automatically deleted ("0") if the comfort extension is stopped after the extension time has elapsed, or if the operating mode has been changed by an 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 determines whether presence detection is movement-controlled by a motion detector or done manually using a presence button:

– Presence detection by the presence button

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). In the event of a device reset (voltage failure, ETS programming operation), an active presence function is always deleted.

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

Two 1-bit communication objects "Presence object *n*" are enabled. With this objects it is possible to integrate presence detectors into room temperature control. If a movement is detected ("ON" telegram), the controller will switch to

Comfort mode. In this connection, it is irrelevant what has been set by the switchover objects. Only a window contact or the KNX forced object are of higher priority.

Both objects form an "Or" link of two presence detectors. In larger rooms, the use of two presence detectors can be useful. As long as one of the two detectors detects a presence, the controller remains in comfort mode.

After the delay time has elapsed in the presence detector after a detected movement ("OFF" telegram), the controller will return to the mode which was active before presence detection, or it will compensate the telegrams of the operating mode objects received during presence detection, respectively.

In the event of a device reset (voltage failure, ETS programming operation), an active presence function is always deleted. 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 determines how the switchover 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. The delay time is set by the "Delay time" parameter and can be between 1 and 255 minutes. The window status will only be changed and thus the frost/heat protection mode activated after this parameterized time has elapsed. A setting of "0" will effect the immediate activation of the frost/heat protection mode when the window is open. The window status will be in effect in the heating and in the cooling mode. After a 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 4 minutes as is the case when a window is open in the winter months, for example. The "Frost protection automatic temperature reduction" parameter sets the maximum temperature reduction for frost protection switchover in K / 4 min. If the controller detects that the room temperature has changed by at least the configured temperature jump within four minutes, frost protection is activated. After the time specified by the "Frost protection period" parameter has elapsed, the controller again automatically switches to the operating mode which was set before frost protection or which was tracked during automatic operation. It is not possible to retrigger an elapsing frost protection period.

ℹ An activated automatic frost protection is cancelled by a setpoint shift, a setpoint change or an increase in the room temperature by 1 Kelvin.

ℹ 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

The "Operating mode after reset" parameter specifies which operating mode is to be activated after voltage recovery or after an ETS programming operation.

13.3.4.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General" parameter page.

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.	

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Enabled functions" parameter page.

Presence detection	Active **Inactive**
This parameter enables the "Presence detection" parameter page on which presence detection can be activated by a presence button or alternatively by a presence detector.	

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Presence detection" parameter page.

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 up to two external presence detectors, coupled to the "presence object *n*" objects. Comfort mode is recalled when a presence is detected. Comfort mode remains active until no presence is detected. Both objects "Presence object *n*" are linked ("Or" - Link).	

<table>
<tr><td>Length of the comfort extension (0 = inactive)</td><td>0 ... 30 ... 255 min</td></tr>
<tr><td colspan="2">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".</td></tr>
</table>

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Enabled functions" parameter page.

<table>
<tr><td>Frost/heat protection</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">This parameter enables the "Frost/heat protection" parameter page, on which frost/heat protection is activated by a window contact or alternatively frost protection by an automatic temperature function.</td></tr>
</table>

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Frost/heat protection" parameter page.

<table>
<tr><td>Frost/heat protection</td><td>Automatic frost protection
via window status</td></tr>
<tr><td colspan="2">Here it is possible to determine how the room temperature regulator switches into the frost/heat protection.
– "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.
– "Via window status": switch-over into the frost/heat protection takes place via the "window status" object.</td></tr>
</table>

<table>
<tr><td>Delay time</td><td>0...255 min</td></tr>
<tr><td colspan="2">This parameter defines the delay time for the window status (0 = no delay). 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.</td></tr>
</table>

Automatic frost protection temperature drop	**Off** 0.2 K / 4 min 0.3 K / 4 min 0.4 K / 4 min 0.5 K / 4 min 0.6 K / 4 min 1.0 K / 4 min
This parameter determines the decrease temperature by which the room temperature has to decrease within four minutes in order for the controller to switch into the frost protection mode. The "OFF" setting will deactivate the frost protection automatic.	

Frost protection period	4 ... **20** ... 255 min
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.	

Reactivation of frost/heat protection after override	1...**10**...255 min
This parameter defines the delay time after termination until a renewed possible reactivation of the frost/heat protection. The time set here prevents switching back to frost protection automatic mode too early.	

13.3.4.2 Object list

Object no.	Function	Name	Type	DPT	Flag
638	Operating mode	Controller 1 - input	1 bytes	20,102	C, -,W, T, -
1-byte object for change-over of the operating mode of the controller according to the KNX specification. After voltage recovery or an ETS programming operation, the current operating mode is transmitted via this object.					

Object no.	Function	Name	Type	DPT	Flag
639	Operating mode forced-control	Controller 1 - input	1 bytes	20,102	C, -,W, T, U
1-byte object for forced change-over (highest priority) of the operating mode of the controller according to the KNX specification.					

Object no.	Function	Name	Type	DPT	Flag
640	Presence button	Controller 1 - input	1-bit	1,001	C, -,W, T, U
1-bit object through which an external presence button (e.g. from a controller extension) can be linked to the controller (polarity: Presence exists = "1", no presence exists = "0"). Presence allows permanent switching to Comfort mode (starting in Standby mode) or temporary switching to this Comfort extension (starting from Night mode or Frost / heat protection mode). Presence in Standby mode: If there is a presence, the controller activates Comfort mode. As soon as the object no longer signals a presence, the controller switches back to Standby mode. Presence in Night mode or Frost / heat protection mode: If there is a presence, the controller activates the Comfort extension. After the configured length of the Comfort extension has elapsed, the system automatically switches back to Night mode or Frost / heat protection mode. In this case, the object value is reset automatically. After a mains 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".					

Object no.	Function	Name	Type	DPT	Flag
640	Presence object 1	Controller 1 - input	1-bit	1,001	C, -, W, -, -

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.

Both objects "Presence object *n*" are linked ("Or" - Link).

After a mains 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".

Object no.	Function	Name	Type	DPT	Flag
646	Presence object 2	Controller 1 - input	1-bit	1,018	C, -, W, -, -

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.

Both objects "Presence object *n*" are linked ("Or" - Link).

After a mains 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".

Object no.	Function	Name	Type	DPT	Flag
641	Window status	Controller 1 - input	1-bit	1,019	C, -,W, -, U

1-bit object for the coupling of window contacts.

Polarity: Window open = "1", window closed = "0".

13.3.5 Room temperature measurement

Basic principles

The controller operates with the controller input temperature, which is transmitted to the controller either by the internal temperature measurement of the device and / or by a received temperature via the bus.

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 devices and at least 1.5 m above the floor.

Input temperature controller and measuring value creation

The "Controller input temperature" parameter specifies the temperature at which the room temperature controller operates.

- "internal temperature"

  The room temperature controller uses the actual temperature of the temperature measurement determined by the device. The temperature value is transmitted internally in the device.

  The room temperature controller can request the current temperature value cyclically.

  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.

ℹ First activate temperature measurement on parameter page "Cover - Basic settings" and parameterise it on the parameter page "Temperature measurement".

- "received temperature"

  The room temperature controller uses the temperature value received via the communication object "Received temperature".

  The room temperature controller can request the current temperature value cyclically.

  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.

ℹ The room temperature controller uses the temperature value received via the communication object "Received temperature".

– "internal and received temperature"

The room temperature controller uses the actual temperature of the temperature measurement determined by the device and transmitted internally, and the temperature value received via the communication object "Received temperature".

When evaluating, the real temperature used is made up of the two temperature values provided. The weighting of the temperature values is defined by the "Creation of measuring value" parameter. It is thus possible to adjust the temperature used by the room temperature controller depending on the different locations of the sensors or due to a non-uniform heat distribution in the room. 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.

The room temperature controller can request both current temperature values cyclically.

After a device reset, the controller will first wait for valid temperature telegrams until control starts and a command value, if applicable, is output.

ℹ First activate temperature measurement on parameter page "Cover - Basic settings" and parameterise it on the parameter page "Temperature measurement".

Calibrating the measured values

In some cases during room temperature measurement, it may be necessary to adjust the 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.

ℹ The adjustment of the measured values should only be carried out after the device has become acclimatised in the installation environment. It is recommended to carry out the adjustment approx. 1.5 hours after commissioning. Direct sunlight penetration should be avoided.

Using the "Adjustment" parameters, it is possible to configure the positive (temperature increase, factors: 1 ... 127) or negative (temperature decrease, factors -128... -1) temperature calibration in levels of 0.1 K. Thus, the calibration is made only once statically and is the same for all operating modes of the controller.

ℹ The measured value has to be increased, if the value measured by the sensor lies below the actual room temperature. The measured value has to be decreased, if the value measured by the sensor lies above the actual room temperature.

ℹ During room temperature control, the device always uses the adjusted temperature value to calculate the command values. The adjusted temperature value is transmitted to the bus via the "Actual temperature" object. When determining the measured value, calibrated values are also used for calculation.

Transmission of room temperature

The actual temperature determined by the room temperature controller can be transmitted to the bus via the 2-byte object "Controller 1 - Output actual temperature". This parameter "Transmission on 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".

After voltage recovery or after an ETS programming operation, the object value is updated according to the current actual temperature value and is transmitted as soon as all temperature values have been received. If no temperature values have been received after a device reset, then the value "0" is seen in the "Actual temperature" object. For this reason, all the external temperature sensors should always transmit their current measured temperature value after a device reset.

13.3.5.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Room temperature measurement" parameter page.

Input temperature controller	**internal temperature** received temperature internal and received temperature

The controller operates with the controller input temperature, which is transmitted to the controller either by the internal temperature measurement of the device and / or by a received temperature via the bus.

- Internal temperature: The room temperature controller uses the actual temperature of the temperature measurement determined by the device. The temperature value is transmitted internally in the device.

ℹ First activate temperature measurement on parameter page "Cover - Basic settings" and parameterise it on the parameter page "Temperature measurement".

- Received temperature: The room temperature controller uses the temperature value received via the communication object "Received temperature".

ℹ The room temperature controller uses the temperature value received via the communication object "Received temperature".

- Internal and received temperature: The room temperature controller uses the actual temperature of the temperature measurement determined by the device and transmitted internally, and the temperature value received via the communication object "Received temperature".

ℹ First activate temperature measurement on parameter page "Cover - Basic settings" and parameterise it on the parameter page "Temperature measurement".

Measured value formation	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 "internal temperature" to "received temperature" is determined here. That results in an overall value, which will be used for the further interpretation of the room temperature.

Request time (0 = inactive)	**0**...255 min
The polling time for the internal and / or received temperature is set 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.	

Adjustment (0 = inactive)	-128...**0**...127 x 0.1 K
This parameter determines the value by which the internal and / or received temperature is adjusted.	

Time	1 ... **10** ... 128 x 10 s
The value entered here multiplied by 10 corresponds to the user-defined compensation time in seconds for temperature value (internal temperature or received temperature).	

Cyclical transmission of room temperature	0...**15**...255 min
This parameter specifies whether and when the determined room temperature is output cyclically via the "Actual temperature" object. The "0" setting deactivates the cyclic transmission of the actual temperature.	

Transmission after room temperature change by	0...**3**...255 x 0.1 K
This parameter specifies the temperature value by which the actual value has to change in order to have the actual temperature value transmitted automatically via the object. The "0" setting deactivates the automatic transmission of the actual temperature when room temperature changes.	

Cyclical monitoring the actual temperature	Active **Inactive**
This parameter activates or deactivates this function. When cyclical actual temperature monitoring is active, the device cyclically checks whether new values have been received internally (internal temperature) and/or via the "Received temperature" object.	

Cycle time	1...**20**...255 min
The actual temperature monitoring cycle time can be configured between 1 and 255 minutes and applies equally to all temperature inputs.	

13.3.5.2 Object list

Object no.	Function	Name	Type	DPT	Flag
717	Actual-temperature	Controller 1 - output	2 bytes	9,001	C, R, -,T, -

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".

Object no.	Function	Name	Type	DPT	Flag
719	Received actual temperature	Controller 1 - input	2 bytes	9,001	C, -,W, T, U

2-byte object for coupling an external KNX temperature sensor (e.g. push-button sensor with temperature measurement) for room temperature detection. The possible temperature range is specified by the KNX DPT 9.001.

The temperature value must always be specified in the format "°C".

13.3.6 Temperature setpoints

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.

The "Setpoint presetting" parameter defines the way in which the setpoint temperature is preset.

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.

Overwrite setpoints in device during ETS programming operation

The temperature setpoints programmed in the room temperature controller by the ETS during commissioning can be changed via communication objects. In the ETS, the parameter "Overwrite setpoints in the device during ETS programming" can be used to determine whether the setpoints that are present in the device and may have been subsequently changed are overwritten during an ETS programming operation and thus replaced again by the values configured in the ETS. If this parameter is "Active", 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 "Inactive", then setpoints present in the device remain unchanged. The setpoint temperatures entered in the ETS then have no significance.

ℹ During initial commissioning of the device the parameter "Overwrite setpoints in device during ETS programming" must be set to "Active" in order to perform valid initialisation of the memory slots in the device. The setting "Active" is also necessary if essential controller properties (operating mode, setpoint specification, etc.) are changed in the ETS through new parameter configurations.

Relative setpoint presetting

– Parameter "Setpoint presetting = relative (setpoint temperatures from basic setpoint)"

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 presets the basic setpoint that is loaded as the default value when the device is programmed by 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 (siehe Kapitel "Temperature setpoints" ▸ Page 403).

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". The controller rounds the temperature values received via the object to the configured value of the of the setpoint shift (0.1 K or 0.5 K).

Absolute setpoint presetting

– Parameter "Setpoint presetting = absolute (independent setpoint temperatures)"

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. The communication object "Setpoint temperature" is available for this purpose. 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.

ℹ With absolute setpoint presetting, there is no basic setpoint and in the mixed operating mode "heating and cooling" there is also no deadband. Furthermore, setpoint shifting does not exist for absolute setpoint presetting.

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.

Setpoints for operating mode "Heating"

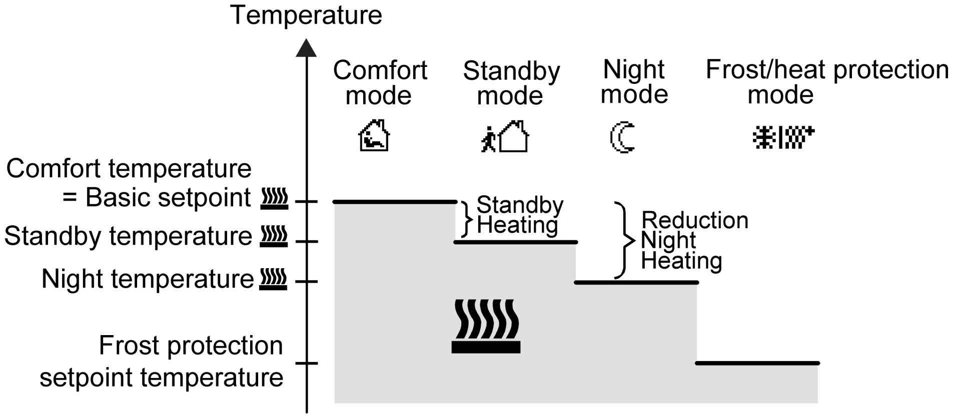


Image 77: Setpoint temperatures in the operating mode "Heating"

The setpoint temperatures for comfort, standby and night mode exist for this operating mode. The frost protection temperature can be preset (see figure 77). The following applies:

$T_{\text{Standby setpoint heating}} \leq T_{\text{Comfort setpoint heating}}$

or

$T_{\text{Night setpoint heating}} \leq T_{\text{Comfort setpoint heating}}$

The standby and night setpoint temperatures are derived from the reduction temperatures configured in the ETS from the comfort setpoint temperature (basic setpoint). The frost protection is supposed to prevent the heating system from freezing. For this reason the frost protection temperature (default: +7 °C) should be 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.

Setpoints for the "cooling" operating mode

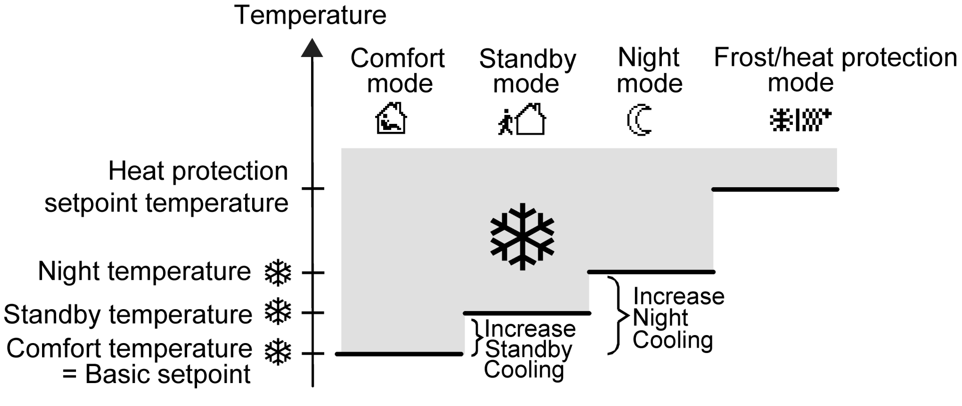


Image 78: Setpoint temperatures in the operating mode "Cooling"

The setpoint temperatures for Comfort, Standby and Night mode exist in this operating mode and the heat protection temperature can be preset (see figure 78).
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.

Setpoints for the "heating and cooling" operating mode

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 (see figure 79) or an asymmetrical (see figure 80) 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

$T_{\text{Night setpoint heating}} \leq T_{\text{Comfort setpoint heating}} \leq T_{\text{Comfort setpoint cooling}} \leq T_{\text{Night setpoint cooling}}$

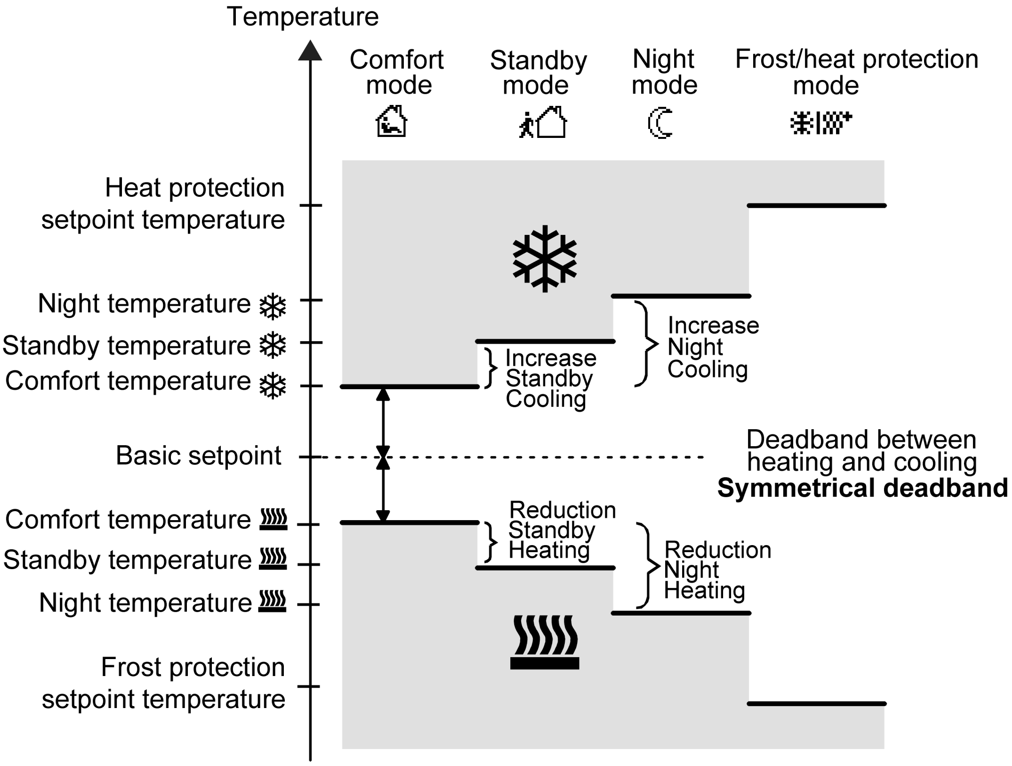


Image 79: Setpoint temperatures in the operating mode "Heating and cooling" with symmetrical deadband

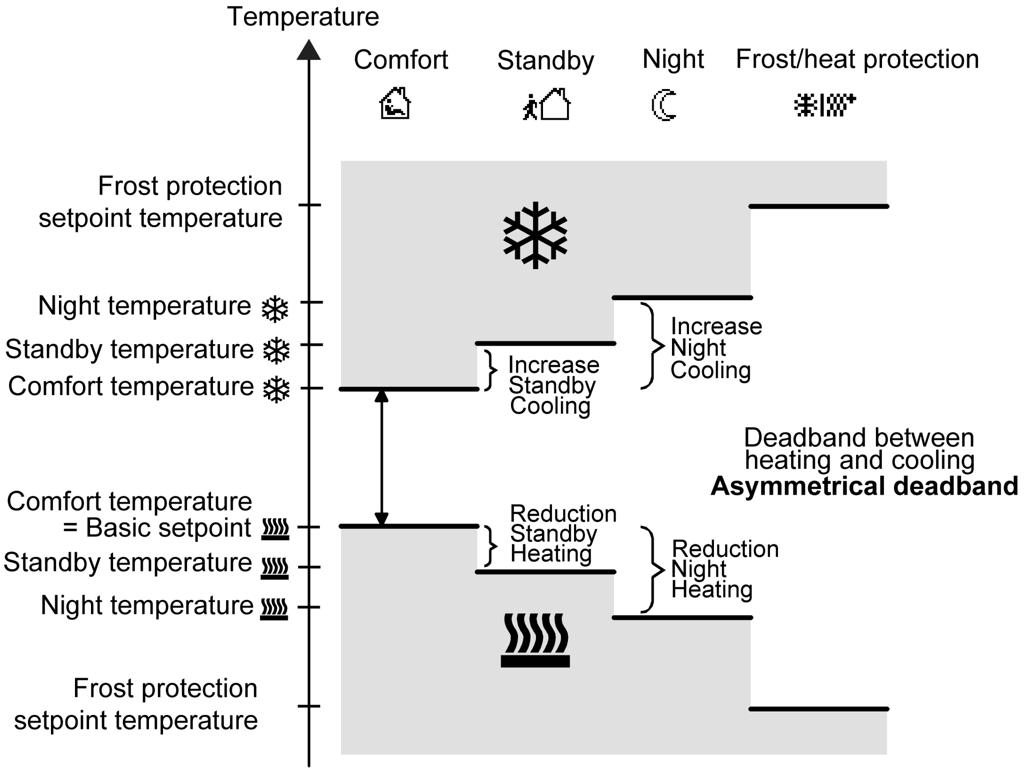


Image 80: Setpoint temperatures in the operating mode "Heating and cooling" with asymmetrical deadband

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 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 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.

<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 parameters "Deadband", "Deadband position" and "Basic setpoint temperature" 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:
  $T_{\text{Basic setpoint}} - ½T_{\text{Deadband}} = T_{\text{Comfort setpoint heating}}$
  and

  $T_{\text{Basic setpoint}} + ½T_{\text{Deadband}} = T_{\text{Comfort setpoint cooling}}$
  -> $T_{\text{Comfort setpoint cooling}} - T_{\text{Comfort setpoint heating}} = T_{\text{Deadband}}$
  -> $T_{\text{Comfort setpoint cooling}} \geq T_{\text{Comfort setpoint heating}}$
- 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 settemperature for cooling is derived directly from the comfort setpoint for heating.
  The following applies:
  $T_{\text{Basic setpoint}} = T_{\text{Comfort setpoint heating}}$
  -> $T_{\text{Basic setpoint}} + T_{\text{Deadband}} = T_{\text{Comfort setpoint cooling}}$
  -> $T_{\text{Comfort setpoint cooling}} - T_{\text{Comfort setpoint heating}} = T_{\text{Deadband}}$
  -> $T_{\text{Comfort setpoint cooling}} \geq T_{\text{Comfort setpoint heating}}$

13.3.6.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Setpoints" parameter page.

<table>
<tr><td>Overwrite setpoints in device during ETS programming operation</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">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 "Active", 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 "Inactive", then setpoints present in the device remain unchanged. The setpoint temperatures entered in the ETS then have no significance.
ℹ During initial commissioning of the device the parameter "Overwrite setpoints in device during ETS programming" must be set to "Active" in order to perform valid initialisation of the memory slots in the device. The setting "Active" is also necessary if essential controller properties (operating mode, setpoint specification, etc.) are changed in the ETS through new parameter configurations.</td></tr>
</table>

<table>
<tr><td>Setpoint presetting</td><td>relative (setpoint temperatures from basic setpoint)
absolute (independent setpoint temperatures)</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Setpoints" parameter page (only with "Setpoint specification = relative").

<table>
<tr><td>Basic setpoint temperature</td><td>7 ... 21.0 ... 40 °C</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

<table>
<tr><td>Dead band position</td><td>symmetrical
asymmetrical</td></tr>
<tr><td colspan="2">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!</td></tr>
</table>

<table>
<tr><td>Deadband</td><td>1...**5**...255 x 0.1 K</td></tr>
<tr><td colspan="2">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.</td></tr>
</table>

<table>
<tr><td>Permanently apply change to basic setpoint shift</td><td>Active
Inactive</td></tr>
<tr><td colspan="2">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 "Active" 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 "Inactive" 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".</td></tr>
</table>

<table>
<tr><td>Changing the setpoint of the basic temperature</td><td>deactivated
approve via bus</td></tr>
<tr><td colspan="2">Here, it is possible to specify if it is possible to change the basic setpoint via the bus.</td></tr>
</table>

Accept modification permanently	Active **Inactive**
One has to distinguish between two cases, defined by this parameter, if the basic setpoint has been modified via the object. When "Active": 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 switch-over of the operating mode or after a switch-over of the heating/cooling mode. When "Inactive": The setpoints set on the room temperature controller or received via the objects remain active only temporarily. In case of a voltage failure, after a switchover to another operating mode, or after a switchover of the operating mode, the last setpoint changed is discarded and replaced by the output value.	

Upward adjustment of the basic setpoint temperature	0 K + 1 K + 2 K + 3 K + 4 K + 5 K + 6 K + 7 K **+ 8 K** + 9 K + 10 K
This is used to define the maximum range in which the basic setpoint temperature can be adjusted upwards.	

Downward adjustment of the basic setpoint temperature	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.	

Type of setpoint shift	via levels (DPT 6.010) Via levels (DPT 9.002)
Depending on this parameter, the setpoint can be shifted via steps with a 1-byte communication object "Setpoint shift specification" (KNX DPT 6.010) or via offset with a 2-byte communication object "Setpoint shift specification" (KNX DPT 9.002).	

Value 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. When shifting according to KNX DPT 6.010, the received step values are multiplied by the "value of the setpoint shift" (0.1 K or 0.5 K) and set accordingly. Values that lie within the possible value range of the basic setpoint shift can be directly jumped to.	

Lower the setpoint temperature during standby operating mode (heating)	-128...**-20**...0 x 0.1 K
The value by which the standby setpoint temperature for heating is lowered compared to the heating comfort temperature. The parameter is only visible in "Heating" or "Heating and cooling" operating modes.	

Lower the setpoint temperature during Night mode (heating)	-128...**-40**...0 x 0.1 K
The value by which the night setpoint temperature for heating is lowered compared to the heating comfort temperature. The parameter is only visible in "Heating" or "Heating and cooling" operating modes.	

Raise the setpoint temperature during standby operating mode (cooling)	0...**20**...127 x 0.1 K
The value by which the standby setpoint temperature for cooling is lowered compared to the cooling comfort temperature. The parameter is only visible in "Cooling" or "Heating and cooling" operating modes.	

Raise the setpoint temperature during Night mode (cooling)	0...**40**...127 x 0.1 K
The value by which the night temperature for cooling is lowered compared to the cooling comfort temperature. The parameter is only visible in "Cooling" or "Heating and cooling" operating modes.	

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Setpoints" parameter page (only with "Setpoint specification = absolute").

Setpoint temperature Comfort mode (heating)	7 ... **21.0** ... 40 °C
Presetting of the setpoint temperature for standby mode (heating).	

Setpoint temp. standby mode (heating)	7 ... **19.0** ... 40 °C
Presetting of the setpoint temperature for standby mode (heating).	

Setpoint temperature Night mode (heating)	7 ... **17.0** ... 40 °C
Presetting of the setpoint temperature for night mode (heating).	

Setpoint temperature Comfort mode (cooling)	7 ... **23.0** ... 40 °C
Presetting of the setpoint temperature for standby mode (cooling).	

Setpoint temp. standby mode (cooling)	7 ... **25.0** ... 40 °C
Presetting of the setpoint temperature for standby mode (cooling).	

Setpoint temperature Night mode (cooling)	7 ... **27.0** ... 40 °C
Presetting of the setpoint temperature for night mode (cooling).	

Frost protection setpoint temperature	**7** ... 40 °C
This parameter specifies the setpoint temperature for frost protection. The parameter is only visible in "Heating" or "Heating and cooling" operating modes.	

Heat protection setpoint temperature	7 ... **35** ... 40 °C
This parameter specifies the setpoint temperature for heat protection. The parameter is only visible in "Cooling" or "Heating and cooling" operating modes.	

Accept modification of the setpoint permanently	Active **Inactive**
One has to distinguish between two cases, defined by this parameter, if the setpoint has been modified via the object. When "Active": 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 "Inactive": The setpoints received via the object remain active only temporarily. In case of a power failure, after a switchover to another operating mode (e.g. Comfort to Standby, or also Comfort to Comfort), or after a switchover of the operating mode (e.g. Heating to Cooling), the last setpoint changed will be discarded and replaced by the initial value.	

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Setpoints" parameter page.

Frost protection setpoint temperature	**7** ... 40 °C
This parameter specifies the setpoint temperature for frost protection in °C. The parameter is only visible in "Heating" or "Heating and cooling" operating modes.	

Heat protection setpoint temperature	7 ... **35** ... 45 °C
This parameter specifies the setpoint temperature for heat protection in °C. The parameter is only visible in "Cooling" or "Heating and cooling" operating modes.	

Transmission after setpoint temperature change (0 = inactive)	0...**1**...255 x 0.1 K
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 (0 = inactive)	**0**...255 min
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.	

13.3.6.2 Object list

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>637</td><td>Basic setpoint</td><td>Controller 1 - input</td><td>2 bytes</td><td>9,001</td><td>C, -, W, -, -</td></tr>
<tr><td colspan="6">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 irrespective of the configured value of the of the setpoint shift (0.1 K or 0.5 K).
The temperature value must always be specified in the format "°C".</td></tr>
</table>

Function: Setpoint temperature specification

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>637</td><td>Set temperature</td><td>Controller 1 - input</td><td>2 bytes</td><td>9,001</td><td>C, -, W, -, -</td></tr>
<tr><td colspan="6">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".</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>649</td><td>Current setpoint shifting</td><td>Controller 1 - output</td><td>1 bytes</td><td>6,010</td><td>C, R, -, T, A</td></tr>
<tr><td colspan="6">1-byte object for giving feedback on the current setpoint shift for evaluation, e.g. by a controller extension. The value of a counter value in the communication object is dependent on the configured setpoint shift value (0.1 K or 0.5 K). The value "0" means that no shift is active . The value is depicted in a double complement in the positive and negative direction.
After mains 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 mains voltage return or an ETS programming operation.</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>649</td><td>Current setpoint shifting</td><td>Controller 1 - output</td><td>2 bytes</td><td>9,002</td><td>C, R, -, T, A</td></tr>
<tr><td colspan="6">2-byte object for giving feedback on the current setpoint shift for evaluation, e.g. by a controller extension. The value of a counter value in the communication object is dependent on the configured setpoint shift value (0.1 K or 0.5 K). The value "0" means that no shift is active . The value is depicted in a double complement in the positive and negative direction.
After mains 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 mains voltage return or an ETS programming operation.</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>650</td><td>Preset setpoint shifting</td><td>Controller 1 - input</td><td>1 bytes</td><td>6,010</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">1-byte object for setting a basic setpoint shifting, e.g. via a controller extension. The value of a counter value in the communication object is dependent on the configured setpoint shift value (0.1 K or 0.5 K). The value "0" means that no shift is active . The value is depicted in a double complement in the positive and negative direction.
In case the limits of the value range are exceeded by the preset external value, the controller will automatically reset the received value to the minimum and maximum limits.</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>650</td><td>Preset setpoint shifting</td><td>Controller 1 - input</td><td>2 bytes</td><td>9,002</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">2-byte object for setting a basic setpoint shifting, e.g. via a controller extension. The value of a counter value in the communication object is dependent on the configured setpoint shift value (0.1 K or 0.5 K). The value "0" means that no shift is active . The value is depicted in a double complement in the positive and negative direction.
In case the limits of the value range are exceeded by the preset external value, the controller will automatically reset the received value to the minimum and maximum limits.</td></tr>
</table>

13.3.7 Feedback telegrams

Command value objects

Depending on the control algorithm selected for heating and/or cooling mode, the command values are transmitted internally in the device to the valve output in 1-bit or 1-byte format. The control algorithm calculates command values in intervals of 30 seconds. With the pulse width-modulated PI control (PWM) the command value is updated, if required, solely at the end of a PWM cycle.

The parameter "Type of control" defines the data format in which the command values are transmitted to the valve output.

- continuous PI control: 1 byte
- switching 2-point feedback control: 1 bit.

The command values for heating and cooling are transmitted internally in the device via a common object. The heating and cooling system is a combined system. The same control type must be defined for heating and for cooling. The ("Type of heating / cooling") control parameter for cooling and heating still has to be defined separately.

Automatic transmission

In case of a constant PI control, the room temperature controller calculates a new command value cyclically every 30 seconds. The parameter "Automatic transmission of the command value on change by" sets the change interval of the command value to 1 percent. Depending on this, a new command value is transmitted to the valve output.

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 is transmitted cyclically. In addition to the times when changes are to be expected, other command value telegrams are transmitted in a cycle of 3 minutes. This ensures that, during cyclical security monitoring of the command value in the valve output, telegrams are received within the monitoring time. The time interval defined by the parameter "Cycle time for automatic transmission of the command value" should correspond to the monitoring time in the valve output (preferably configure the cycle time in the controller to be smaller).

Heating / cooling status

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 message objects can be enabled by the "Heating status" and "Cooling status" parameters in the "Room temperature controller RTR -> RTR - General -> Feedback" 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.

ℹ 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.

ℹ 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.

ℹ 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.

Controller status

The room temperature controller can transmit its current status to the KNX. A choice of data formats is available for this. The "Status controller" parameter enables the status message and defines the status format ("KNX compliant" or "Controller general") ...

<u>"KNX compliant"</u>

- The KNX compliant controller status feedback is harmonised on a manufacturer-specific basis.
- The objects "Controller status RHCC - KNX compliant", "Controller status RTC - KNX compliant" and "Controller status RTSM - KNX compliant" display elementary basic functions of the controller.
- These objects are supplemented by the two 1-byte objects "Operating mode status" and "Forced operating mode status" (DPT 20.102), which report back the operating mode actually set at the controller. The last two objects mentioned above are generally used to enable controller extensions to display the controller operating mode correctly in the KNX compliant status display. Therefore, these objects should be connected with controller extensions if the KNX-compliant status feedback is not configured.

Bit coding of the 2-byte object "Controller status RHCC - KNX compliant" (DPT 22.101)

Bit of the status telegram	Meaning on "1"	Meaning on "0"
0	Error	no error
1	not used (permanent "0")	
2	not used (permanent "0")	
3	not used (permanent "0")	
4	not used (permanent "0")	
5	not used (permanent "0")	
6	not used (permanent "0")	
7	not used (permanent "0")	
8	"Heating" operating mode	"Cooling" operating mode
9	not used (permanent "0")	
10	not used (permanent "0")	
11	not used (permanent "0")	
12	Controller disabled (dew point operation)	Controller enabled
13	Frost alarm (frost protection temperature undershot)	No frost alarm (frost protection temperature exceeded)
14	Heat alarm (heat protection temperature exceeded)	No heat alarm (heat protection temperature undershot)
15	not used (permanent "0")	

Bit coding of the 2-byte object "Controller status RTC - KNX compliant" (DPT 22.103)

Bit of the status telegram	Meaning on "1"	Meaning on "0"
0	Error	no error
1	"Heating" operating mode	"Cooling" operating mode
2	Controller disabled (dew point operation)	Controller enabled
3	Frost alarm (frost protection temperature undershot)	No frost alarm (frost protection temperature exceeded)
4	Heat alarm (heat protection temperature exceeded)	No heat alarm (heat protection temperature undershot)
5	Controller inactive (deadband)	Controller active
6	not used (permanent "0")	
7	"Heating" operating mode enabled	"Heating" operating mode disabled
8	"Cooling" operating mode enabled	"Cooling" operating mode disabled
9	not used (permanent "0")	

Bit of the status telegram	Meaning on "1"	Meaning on "0"
10	not used (permanent "0")	
11	not used (permanent "0")	
12	not used (permanent "0")	
13	not used (permanent "0")	
14	not used (permanent "0")	
15	not used (permanent "0")	

Bit coding of the 1-byte object "Controller status RTSM - KNX compliant" (DPT 21.107)

Bit of the status telegram	Meaning on "1"	Meaning on "0"
0	Window opened (For "Frost/heat protection = Automatic frost protection": – The bit is active if the automatic frost protection of the temperature drop detection is active. For "Frost/heat protection = Via window status": – The bit is active if at least one window is open after the delay time has elapsed).	No window opened (For "Frost/heat protection = Automatic frost protection": – The bit is inactive if the automatic frost protection of the temperature drop detection is inactive. For "Frost/heat protection = Via window status": – The bit is inactive if all windows are closed).
1	Presence (Presence detector)	No presence (Presence detector)
2	Presence (Presence button)	No presence (Presence button)
3	Comfort extension active	Comfort extension inactive
4	Forced operating mode active	Forced operating mode inactive
5	not used (permanent "0")	
6	not used (permanent "0")	
7	not used (permanent "0")	

ℹ Bit 0 of the 1-byte object "Controller status RTSM - KNX compliant" (DPT 21.107) becomes active, depending on the setting of the parameter "Frost/heat protection".

13.3.7.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Enabled functions" parameter page.

Feedback telegrams	Active **Inactive**
This parameter switches the parameter page "Feedback functions" visible.	

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Feedback telegrams" parameter page.

Automatic transmission of the command value at modification by	**1 %**
This parameter determines the size of the command value change that will automatically transmit continuous command value telegrams to the valve output. This parameter only affects command values which are configured to "Continuous PI control".	

Cycle time for automatic transmission	**3 min**
This parameter determines the time interval for the cyclical transmission of the command values via all command value objects. The cycle time is preset to 3 minutes.	

Output of the command value	**normal (under current, this means opened)**
The output of the command value is always normal (under current, this means opened).	

Heating status	Active **Inactive**
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 "Active" setting here enables the message function for heating.	

Cooling status	Active **Inactive**
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 "Active" setting here enables the message function for cooling.	

Controller status	**no status** KNX compliant
The room temperature controller can transmit its current status to the KNX. This parameter enables the status message.	

13.3.7.2 Object list

Object no.	Function	Name	Type	DPT	Flag
643	Operating mode status	Controller 1 - output	1 bytes	20,102	C, -, -, T, -

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 voltage recovery or an ETS programming operation, the current status is transmitted via this object. This object is only available when "Controller status" = "KNX-compliant".

Object no.	Function	Name	Type	DPT	Flag
644	Currently active operating mode	Controller 1 - output	1 bytes	20,102	C, -, -, T, -

1-byte object used by the controller to output the current operating mode, taking the forced position, presence status and window status into account. This object is only visible when the status of the controller is configured as "KNX-compliant".

Object no.	Function	Name	Type	DPT	Flag
652	Status forced operating mode	Controller 1 - output	1 bytes	20,102	C, -, -, T, -

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 voltage recovery or an ETS programming operation, the current status is transmitted via this object. This object is only available when "Controller status" = "KNX-compliant".

Object no.	Function	Name	Type	DPT	Flag
651	Controller status RHCC - KNX-compliant	Controller 1 - output	2 bytes	22,101	C, -, -, T, -

2-byte object that the controller uses to display elementary basic functions in a KNX-harmonised manner (RHCC).

After voltage recovery or an ETS programming operation, the current status is transmitted via this object. This object is only available when "Controller status" = "KNX-compliant".

Object no.	Function	Name	Type	DPT	Flag
683	Controller status RTSM - KNX-compliant	Controller 1 - output	1 bytes	21,107	C, -, -, T, -

2-byte object that the controller uses to display elementary basic functions in a KNX-harmonised manner (RTSM).

After voltage recovery or an ETS programming operation, the current status is transmitted via this object. This object is only available when "Controller status" = "KNX-compliant".

Object no.	Function	Name	Type	DPT	Flag
716	Controller status RTC - KNX-compliant	Controller 1 - output	2 bytes	22,103	C, -, -, T, -

2-byte object that the controller uses to display elementary basic functions in a KNX-harmonised manner (RTC).

After voltage recovery or an ETS programming operation, the current status is transmitted via this object. This object is only available when "Controller status" = "KNX-compliant".

Object no.	Function	Name	Type	DPT	Flag
647	Status setpoint temperature	Controller 1 - output	2 bytes	9,001	C, R, -, T, A

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 mains voltage return or an ETS programming operation (controller reset), the current setpoint temperature is transmitted via this object.

Object no.	Function	Name	Type	DPT	Flag
669	Status room setpoint temperature	Controller 1 - output	1 bytes	20,113	C, -, -, T, -

1-byte object for reporting the KNX status of the setpoint temperature. This object reports which setpoint is set to the bus:

- "0" = Normal setpoint
- "1" = Setpoint as changed by summer or winter compensation
- "2" = Setpoint as changed by frost/heat protection

Object no.	Function	Name	Type	DPT	Flag
671	Night cooling status	Controller 1 - output	1-bit	1,011	C, -, -, T, -

1-bit object via which the controller outputs the current status of the function "Night cooling". When the controller function "Night cooling" is activated, the status object is set to the value "1". When the controller function "Night cooling" is deactivated, the status object is set to the value "0". After a reset, the status message object value is "0". This corresponds to the state "Night cooling not active". The status object is only sent when there is a change.

Object no.	Function	Name	Type	DPT	Flag
673	Current (control) function	Controller 1 - output	1 bytes	20,105	C, -, -, T, -

This object evaluates the function specification of controller and outputs the status to the bus. Based on the configuration (e.g. operating mode) and the evaluation of specific conditions (e.g. dew point alarm), the controller sets the resulting controller function. The controller reports the currently set controller function back to the bus separately via the status object "Current (control) function".

The following functions can be specified via a 1-byte telegram:

- "0" - Auto
- "1" = Heating
- "3" = Cooling
- "4" = Night cooling
- "5" = Pre-cooling
- "6" = Off

Object no.	Function	Name	Type	DPT	Flag
700	Heating status	Controller 1 - output	1-bit	1,001	C, -, -, T, U

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

Object no.	Function	Name	Type	DPT	Flag
701	Cooling status	Controller x - Output	1-bit	1,001	C, -, -, T, U

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

13.3.8 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 mode)" enables the 1-bit object "Disable controller" with the setting "via object". 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.

13.3.8.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General" parameter page.

Switch off controller (dew point operation)	no via object
This parameter enables the "Disable controller" object. If the controller is disabled, there is no feedback control until enabled (command values = 0).	

13.3.8.2 Object list

Object no.	Function	Name	Type	DPT	Flag
684	Disable controller	Controller 1 - input	1-bit	1,001	C, -,W, -, U
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.					

13.3.9 Floor temperature monitoring

The cyclical monitoring of the floor temperature can be activated in the controller in order to influence the minimum or maximum temperature of a floor heating system. If the monitoring is enabled in the ETS, the controller continuously monitors the floor temperature. If the floor temperature exceeds a specified limiting value during heating or falls below a specified limiting value during cooling, the controller switches off the corresponding command value for heating or cooling. This switches off the heating or cooling and the system cools down or heats up. The controller will only set the most recently calculated command value when the temperature exceeds / falls below the limiting value minus a hysteresis of 1 K again.

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!

ℹ The cyclical monitoring of the floor temperature is used to increase the comfort behaviour of the heating/cooling system and must not be used as a safety-relevant protection function (immediate forced switch-off of the heating/cooling performance).

Which operating mode the cyclical monitoring should be applied to can be set in the ETS. It is possible to limit the minimum and / or the maximum floor temperature by the parameter "Effect on".

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 minimum or maximum limit temperatures the floor heating system is permitted to reach is specified in the ETS via parameter "'Maximum floor temperature' limit temperature" and "'Minimum floor temperature' limit temperature". The temperatures can be set to a value between 10 ... 45 °C. If the limit temperature is exceeded in heating mode or fallen below in cooling mode, the controller switches the floor heating system off via the command value. As soon as the floor temperature has fallen 1 K below the limit temperature in heating mode or risen 1 K above the limit temperature in cooling mode, the controller switches the command value on again, assuming this is intended in the control algorithm. The hysteresis 1 K is fixed.

ℹ The cyclical monitoring does not affect the "Heating" or "Cooling" message telegrams. If the floor temperature exceeds or falls below the limiting value, only the command value is switched off. In this case, the "Heating" or "Cooling" message remains active.

ℹ Depending on the configuration, the temperature limiting can 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.

ℹ The limiting temperatures for minimum and maximum are not checked for plausibility. Basically, the following applies: "'Minimum floor temperature' limiting temperature" < permitted floor temperature range < "'Maximum floor temperature' limiting temperature".

13.3.9.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Enabled functions" parameter page.

Floor temperature monitoring	Active **Inactive**
The cyclical monitoring of the floor temperature can be activated in the controller in order to influence the minimum or maximum temperature of a floor heating system. If the cyclical monitoring is enabled in the ETS, the controller continuously monitors the floor temperature. The floor temperature is fed to the controller using a separate object.	

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Floor temperature monitoring" parameter page.

Effect on	**Maximum floor temperature** Minimum floor temperature Maximum and minimum floor temperature
This parameter determines which operating mode the cyclical floor temperature monitoring should be applied to. The monitoring can be limited to heating (maximum floor temperature), cooling (minimum floor temperature), or heating and cooling.	

Limit temperature "Maximum floor temperature"	10 ... **35** ... 45 °C
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.	

Limit temperature "Minimum floor temperature"	**10** ... 45 °C
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.	

13.3.9.2 Object list

Object no.	Function	Name	Type	DPT	Flag
695	Floor temperature monitoring - status	Controller 1 - output	1-bit	1,011	C, -, -, T, U
1-bit object for the status output of the monitoring of the configured limiting values of the floor temperature. If the monitoring is enabled in the ETS, the controller continuously monitors the floor temperature. If the floor temperature exceeds a specified limiting value during heating or falls below a specified limiting value during cooling, the controller switches off the corresponding command value for heating or cooling. This switches off the heating or cooling. The controller will only set the most recently calculated command value when the temperature exceeds / falls below the limiting value minus a hysteresis of 1 K again.					

Object no.	Function	Name	Type	DPT	Flag
696	Floor temperature	Controller 1 - input	2 bytes	9,001	C, -,W, -, U
2-byte object for coupling an external temperature sensor for floor temperature monitoring. The temperature value must always be specified in the format "°C".					

13.3.10 Behaviour after a device reset

Behaviour after voltage recovery and ETS programming operation

When the voltage supply is switched on or after an ETS programming operation, the room temperature controller restarts and performs 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.

13.3.11 Boost function

The boost function can only be activated while in heating mode. The boost function heats a room strongly for a short time. If the boost function is activated via the "Boost function - Activate" object, the command value is set to maximum (ON or 100%) in the standard parameterisation for a duration of 5 minutes. After the time has elapsed, the boost switches off again automatically.

The current status of the boost function and the remaining time of a current boost can be sent out on the bus.

ℹ The boost function cannot be retriggered.

ℹ The boost function can be aborted at any time.

ℹ The controller calculates the command values cyclically every 30 seconds. This can delay the adoption of the command value by a maximum of 30 s. As this delay affects switching on and off, the duration of the boost function remains unchanged.

13.3.11.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Enabled functions" parameter page.

Boost function	Active **Inactive**
The boost function can only be activated while in heating mode. The boost function heats a room strongly for a short time. The boost function has fixed settings that cannot be changed. These settings are on the "Boost function" parameter page.	

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Boost function" parameter page.

Effect on	**Heating**
The boost function only works in the "Heating" operating mode. This parameter cannot be changed.	

Length	1 ... **5** ... 60 min
The device performs the boost according to the configuration of this parameter for a period of 1 to 60 minutes.	

Command value	0 ... **100 %**
For the configured duration, the command value is set to the value parameterised here, e.g. maximum (ON or 100%).	

13.3.11.2 Object list

Object no.	Function	Name	Type	DPT	Flag
713	Boost function - activate	Controller 1 - input	1-bit	1,001	C, -, W, -, -
1-bit input object for demand-based activation and deactivation of the boost function. The telegram polarity is fixed: "0" = boost inactive, "1" = boost active. Updates of the object from "1" to "1" or "0" to "0" do not produce a reaction.					

Object no.	Function	Name	Type	DPT	Flag
714	Boost function - status	Controller 1 - output	1-bit	1,011	C, R, -,T, -
1-bit object , via which the controller outputs the current status of the boost function. When the boost function is activated, the status object is set to the value "1". When the boost function is deactivated, the status object is set to the value "0". After a reset, the status message object value is "0". The status object is only sent when there is a change.					

Object no.	Function	Name	Type	DPT	Flag
715	Boost function - period	Controller 1 - output	2 bytes	7,005	C, R, -,T, -
2-byte object via which the controller outputs the period of the boost function. The remaining time of the boost function is transmitted via the object in 10 second increments.					

13.3.12 Temperature compensation

The room temperature controller has two temperature compensations. The summer compensation for cooling operation and the winter compensation for heating operation.

Summer compensation

The room temperature controller offers a summer compensation, which is only effective in cooling mode.

The summer compensation function gradually raises the comfort and standby setpoints after a specified outdoor temperature is reached. This prevents temperature shock when entering or leaving the building in summer and also reduces energy consumption for cooling the building.

Summer compensation gradually raises the room temperature setpoint depending on the outdoor temperature. It calculates an offset and adds it to the specified setpoint temperature. Because of the added offset, when summer compensation is activated, the defined setpoint temperature shifts to a higher room temperature as indicated.

Summer compensation only works in the controller's cooling operating mode. The working range can be configured and is defined via parameter "Maximum distance outdoor temperature". For summer compensation, the configured maximum distance from the outdoor temperature is subtracted from the received outdoor temperature. This calculated value corresponds to the calculated summer compensation setpoint temperature. If the calculated setpoint temperature exceeds the value of the specified setpoint temperature (configured in the ETS or changes via the bus), the calculated setpoint temperature becomes active. When summer compensation is activated, the calculated setpoint is then the specified setpoint temperature. Correspondingly, the specified setpoint temperature is reactivated when the calculated setpoint temperature value falls below the specified setpoint temperature.

When the building protection temperature is reached, the setpoint temperature is no longer raised. This offset is only brief, so it is not persistently saved.

Example summer compensation: - Cooling comfort mode setpoint temperature = Specified setpoint temperature = 23 °C - Maximum distance outdoor temperature = 6 K
Outdoor temperature = 28 °C, Outdoor temp. - Current setpoint = 5 K -> Set setpoint temperature = Specified setpoint temperature = 23 °C
Outdoor temperature = 29 °C, Outdoor temp. - Current setpoint = 6 K -> Set setpoint temperature = Specified setpoint temperature = 23 °C
Outdoor temperature = 30 °C, Outdoor temp. - Current setpoint = 7 K -> Set setpoint temperature = Calculated setpoint temperature = 24 °C)
Outdoor temperature = 31 °C, Outdoor temp. - Current setpoint = 8 K -> Set setpoint temperature = Calculated setpoint temperature = 25 °C)

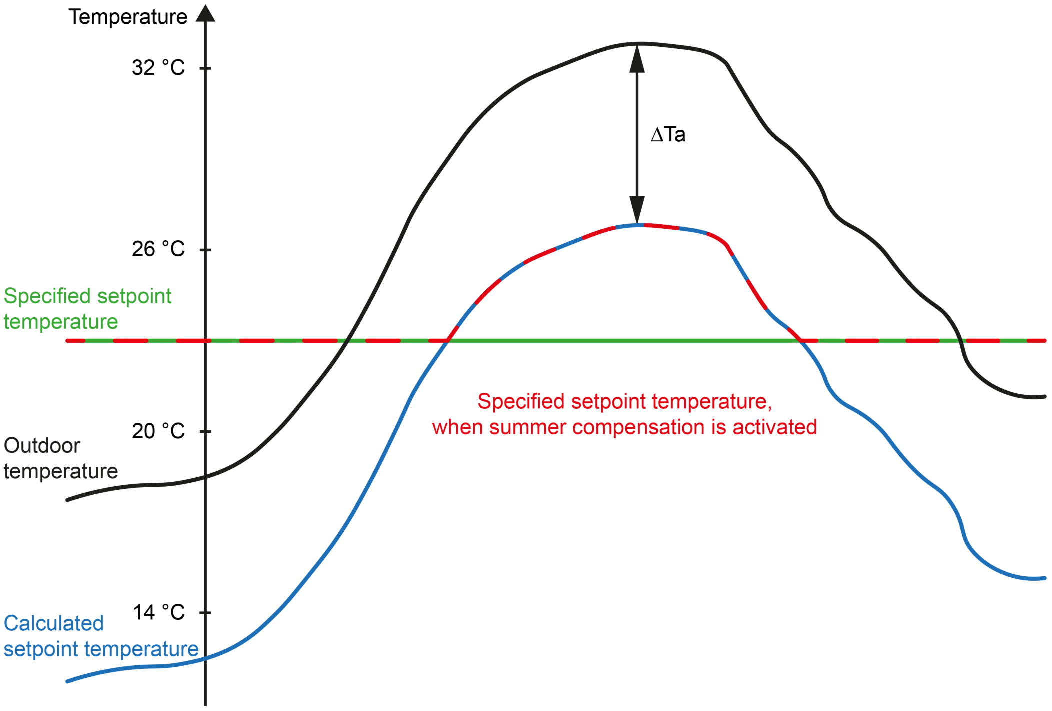


Image 81: Example for summer compensation:

ΔTa	Maximum distance outdoor temperature

Winter compensation

The room temperature controller offers a winter compensation, which is only effective in heating mode.

The winter compensation function raises the comfort and standby setpoints when outdoor temperatures are dropping. This counteracts the radiative cooling from outdoor walls in winter, increasing the sense of well-being.

Winter compensation also gradually raises the room temperature setpoint depending on the outdoor temperature. It calculates an offset and adds it to the specified setpoint temperature. Because of the added offset, the heating setpoint shifts to a higher room temperature value.

Winter compensation only works in the controller's heating operating mode. The working range can be configured and is defined via parameter "Maximum distance outdoor temperature". For winter compensation, the configured maximum distance from the outdoor temperature is added to the received outdoor temperature. The specified setpoint is subtracted from this sum. The absolute amount of this result is multiplied by the "Factor for distance to outdoor temperature" and added to the specified setpoint. This calculated value corresponds to the calculated winter compensation setpoint temperature.

Example winter compensation: - Heating comfort mode setpoint temperature = Specified setpoint temperature = 21 °C - Maximum distance to outdoor temperature = 10 K - Factor for distance to outdoor temperature = 10
Outdoor temperature = 11 °C, spec. setpoint temperature + (|outdoor temp. + max. distance - spec. setpoint| x factor) = 21.0 °C -> Set setpoint temperature = Specified setpoint temperature = 21 °C
Outdoor temperature = 10 °C, spec. setpoint temperature + (|outdoor temp. + max. distance - spec. setpoint| x factor) = 21.1 °C -> Set setpoint temperature = Calculated setpoint temperature = 21.1 °C
Outdoor temperature = 9 °C, spec. setpoint temperature + (|outdoor temp. + max. distance - spec. setpoint| x factor) = 21.2 °C -> Set setpoint temperature = Calculated setpoint temperature = 21.2 °C
Outdoor temperature = 8 °C, spec. setpoint temperature + (|outdoor temp. + max. distance - spec. setpoint| x factor) = 21.3 °C -> Set setpoint temperature = Calculated setpoint temperature = 21.3 °C

If the value of the shifted outdoor temperature (grey characteristic line) falls below the value of the specified setpoint temperature (green characteristic line), the calculated setpoint temperature (blue characteristic line) becomes active. When winter compensation is activated, the calculated setpoint is then the specified setpoint temperature. Correspondingly, the specified setpoint temperature is reactivated when the calculated setpoint temperature value falls below the specified setpoint temperature.

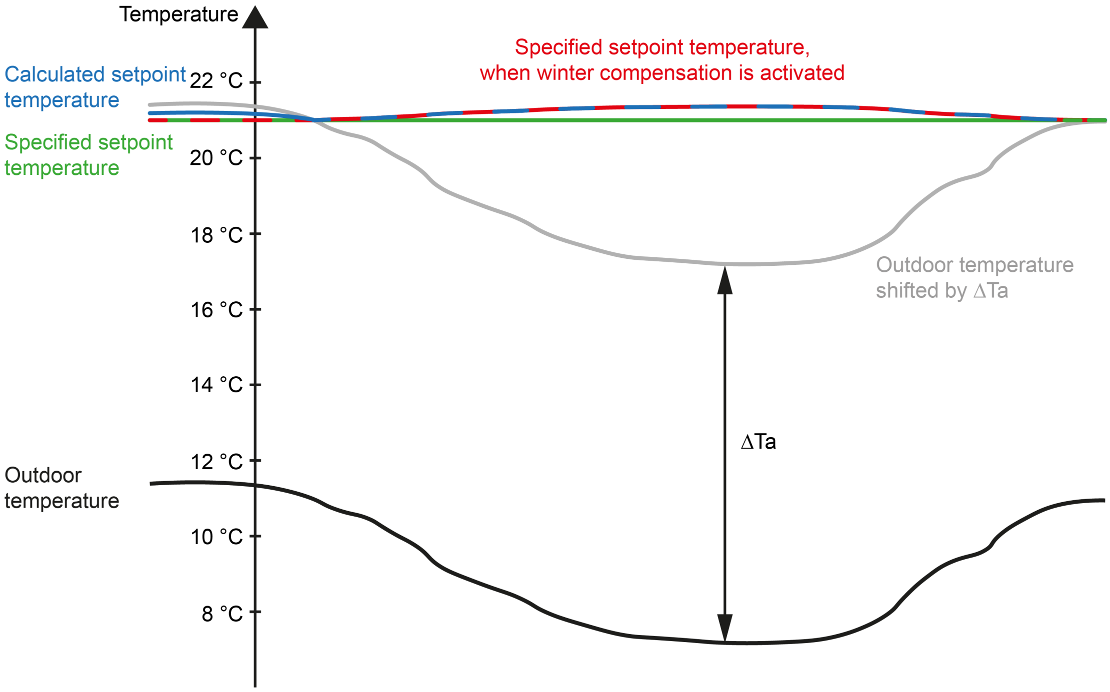


Image 82: Example for winter compensation

ΔTa Maximum distance outdoor temperature

In the heating operating mode, when winter compensation is active, the setpoint temperatures for heating and cooling are shifted by the offset.

Additional information about summer and winter compensation:

- The precondition for both summer and winter compensation is reception of a valid outdoor temperature.
- Setpoints shifted by summer or winter compensation are checked against the frost and heat protection temperatures and if they exceed or fall below, they are restricted to these values.
- Summer and winter compensation only work in comfort and standby operating modes.
- Switching between heating and cooling changes the operating mode; which is the corresponding precondition for summer and winter compensation.
- Heating operating mode switches summer compensation to inactive and sets its offset to the value "0". Correspondingly, cooling operating mode switches winter compensation to inactive and sets its offset to the value "0".
- An operating mode switchover in comfort or standby operating modes does not affect summer or winter compensation. In contrast, the night and frost/heat protection modes switch the summer and winter compensation to inactive.

Summer and winter compensation status message

An active summer or winter compensation is reported to the bus via the object "Status setpoint temperature". This makes it possible for the user to recognise a changed temperature setpoint. After a reset, the status message object value is "0". This corresponds to the normal setpoint of the operating modes "Comfort", "Standby" and "Night". The setpoint temperature status is only sent when there is a change.

13.3.12.1 Table of parameters

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Enabled functions" parameter page.

Temperature compensation	Active **Inactive**
The room temperature controller has two temperature compensations. The summer compensation for cooling operation and the winter compensation for heating operation. This parameter enables the parameter page with the same name.	

The following parameters are parameterised on the "Room temperature controller RTC -> RTC - General -> Temperature compensation" parameter page.

Summer compensation	Active **Inactive**
Summer compensation gradually raises the room temperature setpoint depending on the outdoor temperature. Summer compensation only works in the controller's cooling operating mode.	

Maximum distance to outdoor temperature	0 ... **6** ... 10 K
This parameter defines the summer compensation working range. For summer compensation, the configured maximum distance from the outdoor temperature is subtracted from the received outdoor temperature. This calculated value corresponds to the calculated summer compensation setpoint temperature.	

Winter compensation	Active **Inactive**
Winter compensation also gradually raises the room temperature setpoint depending on the outdoor temperature. Winter compensation only works in the controller's heating operating mode.	

Maximum distance to outdoor temperature	10 ... **15** ... 20 K
This parameter defines the winter compensation working range. For winter compensation, the configured maximum distance from the outdoor temperature is added to the received outdoor temperature and multiplied by the "Factor for distance to outdoor temperature".	

Factor for distance to outdoor temperature	0 ... **10** ... 20 x 0.01
The value entered here multiplied by 0.01 defines the factor used in calculating the setpoint temperature in the context of activated winter compensation.	

13.3.13 Scenes

Up to 16 scenes can be created for the room temperature controller and scene values (operating mode) stored. The scene values are recalled or stored via a separate scene extension object. The data point type of the extension object permits addressing of all 16 scenes.

The scene function must be enabled on the parameter page "Room temperature controller RTR -> RTR - General -> Enabled" so that the required communication objects and parameters (on the parameter page "Room temperature controller RTR -> RTR - General -> Scenes") become visible.

The number of scenes used can be selected anywhere in the range 1 to 16. The parameter "Number of scene assignments" decides how many scenes are visible and consequently usable for the room temperature controller in the ETS. It is possible to specify which scene number (1 ... 64) controls each scene.

The scene function can be combined together with other functions of the room temperature controller, whereby the last received or set state is always executed.

Presetting a scene recall delay

Each scene recall of the room temperature controller can also be optionally delayed. With this feature, dynamic scene sequences can be configured if several scene outputs are combined with cyclical scene telegrams.

Precondition
The scene function must be enabled on the parameter page "Room temperature controller RTR -> RTR - General -> Enabled".

- On the parameter page "Room temperature controller RTR -> RTR - General -> Scenes", activate the parameter "Delay scene recall".

  The delay time is now activated and can be configured separately. The delay only affects the scene recall of the room temperature controller. The delay time is started on arrival of a recall telegram. Only after the time has elapsed is the corresponding scene called up and the operating mode set.

ℹ Each scene recall telegram restarts the delay time and retriggers it. If a new scene recall telegram is received while a delay is active (scene recall not yet executed), the old (and not yet recalled scene) will be rejected and only the scene last received executed.

ℹ The scene recall delay has no influence on the storage of scene values. A scene storage telegram within a scene recall delay terminates the delay and thus the scene recall.

Presetting the behaviour during ETS programming

When saving a scene, the operating modes are stored internally in the device in a non-volatile manner. To ensure that the stored values are not replaced by the originally programmed scene operating modes during an ETS programming operation of the application program or the parameters, the actuator can prevent the operating modes from being overwritten. As an alternative, the original values can be reloaded into the device during each programming run of the ETS.

Precondition
The scene function must be enabled on the parameter page "Room temperature controller RTR -> RTR - General -> Enabled".

- On the parameter page "Room temperature controller RTR -> RTR - General -> Scenes", activate the parameter "Overwrite scene values during download".

  With each ETS programming operation of the application program or the parameters, the scene operating modes configured in the ETS are programmed into the actuator. This may overwrite the scene operating modes stored in the device by means of a storage function.

- Deactivate the parameter "Overwrite scene values during download".

  Scene operating modes that may have been stored in the device by means of a storage function are maintained. If no scene switching states have been stored, the last operating modes programmed in by the ETS remain valid.

ℹ When commissioning the actuator for the first time, the parameter should be activated so that the operating mode is initialised to valid scene operating modes.

Set scene numbers and scene operating modes

The presetting of the scene number can be defined for each scene of the room temperature controller, by which scene number (1...64) the scene is addressed, i.e. called up or stored.
The data point type of the scene extension object permits addressing of up to 16 scenes max.

In addition to defining the scene number, it must be defined which scene command (comfort mode, standby mode, night mode, frost/heat protection) is to be set when a scene is called up on the room temperature controller.

Precondition
The scene function must be enabled on the parameter page "Room temperature controller RTR -> RTR - General -> Enabled".

- On the parameter page "Room temperature controller RTR -> RTR - General -> Scenes", set the parameter "Scene number" for each scene to the number by which the scenes are to be addressed.

  A scene can be addressed with the configured scene number. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible.

ℹ If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.

- On the parameter page "Room temperature controller RTR -> RTR - General -> Scenes", set the "Operating mode" parameter for each scene to the desired operating mode.

  With a scene recall, the configured operating mode is recalled and set at the room temperature controller.

ℹ The configured operating mode is only transferred to the actuator during an ETS programming operation if the "Overwrite scene values during download" parameter is activated.

Presetting storage behaviour

The operating mode set on the room temperature controller can be stored internally when a scene storage telegram is received via the extension object. The operating mode can be influenced by all functions of the room temperature controller before storage, provided that the individual functions are also enabled.

Precondition
The scene function must be enabled on the parameter page "Room temperature controller RTR -> RTR - General -> Enabled".

- On the parameter page "Room temperature controller RTR -> RTR - General -> Scenes", activate the "Storage function" parameter for each scene.

  The storage function is activated for the scene in question. When a storage telegram is received via the "Scene extension" object, the current operating mode is stored internally.

- Deactivate the parameter "storage function" for each scene.

  The storage function is deactivated for the scene in question. A storage telegram received via the "scene extension" object will be rejected.

13.3.13.1 Table of parameters

Room temperature controller RTC -> RTC - General -> Enabled functions

Scenes	Checkbox (yes / **no**)
This parameter can be used disable or to enable the scene function.	

Room temperature controller RTC -> RTC - General -> Scenes

Overwrite scene values during download	Checkbox (**yes** / no)
During storage of a scene, the scene values are stored internally to memory in the device. To prevent the stored values from being replaced during ETS programming by the originally programmed scene values, the actuator can inhibit overwriting of the scene values (parameter deactivated). As an alternative, the original values can be reloaded into the device during each programming run of the ETS (parameter activated).	

Delay scene recall	Checkbox (yes / **no**)
A scene is recalled via the scene extension object. If required, the scene recall can be delayed on reception of a recall telegram (parameter activated). The recall is alternatively made immediately on reception of the telegram (parameter deactivated)	

Delay time minutes (0...59)	**0**...59
This parameter specifies the length 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 activated.	

Number of scene assignments (1...16)	1...**10**...16
This parameter defines how many scenes are visible for the room temperature controller in the ETS and can therefore be used.	

Scene number	0...**1***...64 *: The predefined scene number is dependent on the scene (1...64).
It is possible to preset which scene number (1 ... 64) controls each scene. A setting of "0" deactivates the corresponding scene so that neither recalling nor storage is possible. If the same scene number is configured for several scenes, only the scene with the lowest sequential number will be addressed. The other scenes will be ignored in this case.	

Operating mode	Comfort mode Standby mode Night operation Frost/heat protection mode
This parameter is used for configuring the´operating mode which is set when the scene is recalled.	

Memory function	Checkbox (yes / **no**)
If the parameter is activated, the storage function of the scene is enabled. The current operating mode can then be stored internally via the extension object on receipt of a storage telegram. If the parameter is deactivated, the storage telegrams are rejected.	

13.3.13.2 Object list

Object no.	Function	Name	Type	DPT	Flag
726	Scene extension	Controller 1 - input	1 bytes	18,001	C, -,W, -, U
1-byte object for polling or saving a scene.					

14 General cover settings

The "KNX Secure" parameter page provides information about KNX Data Secure. No parameterisation is performed on this parameter page.

On the parameter page "Cover - General", general settings of the device cover are configured. This includes the activation of the device-internal connection between insert and cover and the operating concepts of all buttons on the device. Button evaluation can be parameterised depending on the parameterised operating concept.

Furthermore, general settings of all status LEDs are configured and the functions "LED orientation lighting", "LED night reduction", "disabling function" and "temperature measurement" are enabled. These functions are configured on separate parameter pages.

14.1 Table of parameters

The following parameter is available on the "Cover - General" parameter page under the "Selection of device cover" header.

Cover	1-gang **2-gang**
This parameter specifies the variant of the cover used. ℹ At this point, the cover used in the device combination must be set. The ETS checks the identifier of the cover.	

The following parameter is available on the "Cover-General" parameter page under the "Internal connection between insert and cover" header.

Internal connection	Active **Inactive**
The device combination insert and cover can be configured quickly and easily by activating the internal connection. When the internal connection between insert and cover is activated, the sensor and actuator channels are automatically configured. The automatic configuration is carried out in the parameters of the application programme by presetting parameters relevant for the function.	

The following parameter is available on the "Cover - General" parameter page under the "Operating concept" header.

Operating concept of buttons	**Rocker function** Button function
For each operating area, the user can specify independently whether it is to be used as a rocker with a common basic function or as two different buttons with completely independent functions. Depending on this setting, the ETS displays different communication objects and parameter pages. ℹ If the internal connection between insert and cover is active, these parameters are fixed depending on the device combination.	

Button evaluation	Single-area operation (button *n*) Dual-area operation (buttons *n* & button *m*)
If the operation concept of an operating area is configured as "button function", this parameter can be used to specify whether single-area or dual-area operation should be implemented. In single-area operation, the entire operating area is evaluated as a single button. The surface can be depressed at any desired point in order to execute the underlying button function. In this setting, the lower button is inactive and physically not present. In dual-area operation, the operating area is divided into two mutually independent buttons.	

The following parameters are available on the "Cover - General" parameter page under the "Status LED" header.

Colour	red **green** blue Colour selection per status LED
A distinction is made whether all of the status LEDs have the same colour (settings "red", "green" or "blue"), or whether different colours can alternatively be configured for the LEDs ("Colour selection per status LED" setting). With colour selection per status LED, it is possible to set the colour on the parameter pages of the individual status LEDs.	

Brightness	Level 0 (OFF) Level 1 (dark) Level 2 Level 3 **Level 4** Level 5 (bright)
The brightness level for all status LEDs is defined at this point.	

Light duration of status LED for button-press display	1 s 2 s **3 s** 4 s 5 s
This parameter defines the switch-on time the status LED is lit up to indicate actuation. The setting concerns all status LEDs whose function is set to "Button-press display".	

The following parameters are available on the "Cover - General" parameter page under the "Enabled functions" header.

LED orientation lighting	Active **Inactive**
The LED orientation lighting of the device can be centrally enabled at this point. If "Active", the ETS shows further communication object and parameters.	

LED night reduction	Active **Inactive**
The LED night reduction of the status LED can be centrally enabled at this point. If "Active", the ETS shows further communication object and parameters.	

disabling function	Active **Inactive**
With this parameter, the disabling function of the device can be centrally activated. If "Active", the ETS shows further communication object and parameters.	

Temperature measurement	Active **Inactive**
The temperature measurement of the device can be centrally enabled at this point. If "Active", the ETS shows further communication object and parameters.	

15 Channel-oriented cover functions (sensor technology)

15.1 Switching

For each rocker or button with the function set to "switching", the ETS indicates two 1-bit communication objects. The parameters permit fixing the value the "switching" object is to assume on pressing and/or releasing (ON, OFF, TOGGLE – toggling of the object value). No distinction is made between a brief or long press.

15.1.1 Table of parameters

The following parameters are available for the individual buttons, depending on the set operating concept. The default settings change in accordance with the set operating concept.

Command on pressing	no reaction ON OFF **TOGGLE**
This parameter defines the reaction when the button is pressed.	

Command on releasing	**no reaction** ON OFF TOGGLE
This parameter defines the reaction when the button is released.	

15.1.2 Object list

The following communication objects are available for the individual rockers or buttons, depending on the set operating concept. The name of the object corresponds to the selection of the operating concept and can be adjusted by the parameter "Name of ..." .

Object no.	Function	Name	Type	DPT	Flag
31, 34, 37, 40, 49, 52	Switching	Button/rocker *n* - output	1-bit	1,001	C, -,W, T, -
1-bit object for transmission of switching telegrams (ON, OFF).					

Object no.	Function	Name	Type	DPT	Flag
32, 35, 38, 41, 50, 53	Switching feedback	Button/rocker *n* - input	1-bit	1,001	C, -,W, -, U
1-bit object for receiving feedback telegrams (ON, OFF).					

15.2 Dimming and colour temperature

For each rocker or button with the function set to "dimming and colour control", the ETS indicates two 1-bit objects and one 4-bit or 3-byte object. Generally, the device transmits a switching telegram after a brief press and a dimming telegram after a long press. In the standard parameterisation the device transmits a telegram for stopping the dimming action after a long press. The time needed by the device to detect an actuation as a long actuation can be set in the parameters. The brightness or the colour temperature can be dimmed.

Feedback

If an actuator is controlled from multiple control elements, the actuator must report its switching status to the 1-bit object "Switching feedback" of the button or rocker. Due to the feedback, the device detects that the actuator has changed its switching status by input from another element and adjusts the dimming direction accordingly.

The dimming direction is always only evaluated and switched locally, unless the actuator changes its switching status due to input from multiple elements (e.g. lighting ON / change of brightness value only). The 4-bit dimming objects and the 3-byte combi object are not tracked via the bus.

Advanced configuration options

The device has advanced parameters for the dimming function. If necessary, these advanced parameters can be activated and thus be made visible.

The advanced parameters can be used to determine whether the device is to cover the full adjusting range of the actuator with one dimming telegram continuously ("Increase brightness / colour temperature by 100%", "Reduce brightness / colour temperature by 100%") or whether the dimming range is to be divided into several small levels 50%, 25%, 12.5%, 6%, 3%, 1.5%).

In the continuous dimming mode (100%), the device transmits a telegram only at the beginning of the long press to start the dimming process and generally a stop telegram after the end of the press. For dimming in small levels it may be useful if the device repeats the dimming telegram in case of a sustained press for a presettable time (parameter "Telegram repetition"). The stop telegram after the end of the press is then not needed.

ℹ When the parameters are hidden ("Advanced parameters = deactivated"), the dimming range is set to 100 %, the stop telegram is activated and the telegram repetition is deactivated.

15.2.1 Brightness

In the standard parameterisation, the brightness is dimmed, which is why the "Colour temperature control" parameter is set to inactive.

i Even with "colour temperature control" activated, the brightness can be dimmed.

The control of the brightness in the "Dimming and colour temperature" function distinguishes between dual-area operation and single-area operation. The parameter "Brightness on pressing" defines the single-area or dual-area dimming function.

dual-area operation	single-area operation
Brighter (ON)	Brighter / darker (TOGGLE)
Darker (OFF)	Brighter (TOGGLE)
	Darker (TOGGLE)

With double-area operation, the device transmits a telegram for switching on or off after a brief press, and a telegram for increasing the brightness ("Brighter") or decreasing the brightness ("Darker") after a long press.

With single-area operation, the device transmits ON and OFF telegrams in an alternating pattern ("TOGGLE") for each brief press, and the "brighter" and "darker" telegrams in an alternating pattern for long actuations.

15.2.2 Colour temperature

When "Colour temperature control" is activated, the colour temperature can be dimmed.

i Even with "colour temperature control" activated, the brightness can be dimmed.

The "Dimming and colour temperature" function with the control of the colour temperature distinguishes between dual-area operation and single-area operation. The parameter "Colour temperature on pressing" defines the single-surface or double-surface dimming function.

dual-area operation	single-area operation
Increase (ON)	Increase / Reduce (TOGGLE)
Reduce (OFF)	Increase (TOGGLE)
	Reduce (TOGGLE)

With dual-area operation, the device transmits a telegram for switching on or off after a brief press, and a telegram for increasing or decreasing the colour temperature after a long press.

With single-area operation, the device transmits ON and OFF telegrams in an alternating pattern ("TOGGLE") for each brief press of the respective button, and "increase colour temperature" and "decrease colour temperature" telegrams in an alternating pattern for long actuations.

15.2.3 Brightness and colour temperature

If "colour temperature control" is activated, both the brightness and the colour temperature can be dimmed.

The dimming process can only adjust either the brightness or the colour temperature via individual objects.

Optionally, the brightness and the colour temperature can also be adjusted together via a combi object.

The "Dimming and colour temperature" function with the control of the brightness and colour temperature distinguishes between dual-area operation and single-area operation. The parameter "Brightness + colour temperature on pressing" defines the single-area or dual-area dimming function.

dual-area operation	single-area operation
Brighter + Increase (ON)	Brighter + Increase / Darker + Reduce (TOGGLE)
Darker + Reduce (OFF)	Brighter + Increase (TOGGLE)
	Darker + Reduce (TOGGLE)

With dual-area operation, the device transmits a telegram for switching on or off after a brief press, and a telegram for increasing the brightness / colour temperature or decreasing the brightness / colour temperature after a long press.

With single-area operation, the device transmits ON and OFF telegrams in an alternating pattern ("TOGGLE") for each brief press of the respective button, and the "brighter + increase" and "darker + decrease" telegrams in an alternating pattern for long actuations.

15.2.4 Table of parameters

The following parameters are available for the individual buttons, depending on the set operating concept. The default settings change in accordance with the set operating concept.

Colour temperature control	**Inactive** Active
This parameter activates the variable colour temperature control and thus the Tunable White function. Additional parameters become visible.	

Communication	**Individual objects** Kombi object
With colour temperature control activated, either the brightness or the colour temperature can be dimmed via an individual object or the brightness and colour temperature can be controlled together via a combination object.	

Adjustment of	**Brightness** Colour temperature
For communication via individual objects, this parameter sets whether the brightness or the colour temperature is dimmed via an individual object.	

Brightness on pressing	no reaction Brighter (ON) Darker (OFF) **Brighter / darker (TOGGLE)** Brighter (TOGGLE) Darker (TOGGLE)
This parameter defines the reaction when a button is pressed. If the device is to toggle on a brief press, the corresponding switching objects of other sensors with the same function must be interlinked. This parameter is only visible with: – "Colour temperature control =Inactive"or – "Colour temperature control = Active" and – "Communication = Individual objects" and – "Adjustment of = Brightness"	

Colour temperature on pressing	no reaction Increase (ON) Reduce (OFF) **Increase / Reduce (TOGGLE)** Increase (TOGGLE) Reduce (TOGGLE)
This parameter defines the reaction when a button is pressed. If the device is to toggle on a brief press, the corresponding switching objects of other sensors with the same function must be interlinked. This parameter is only visible with: – "Colour temperature control = Active" and – "Communication = Individual objects" and – "Adjustment of = Colour temperature"	

Brightness + colour temperature on pressing	no reaction Brighter + Increase (ON) Darker + Reduce (OFF) **Brighter + Increase / Darker + Reduce (TOGGLE)** Brighter + Increase (TOGGLE) Darker + Reduce (TOGGLE)
This parameter defines the reaction when a button is pressed. If the device is to toggle on a brief press, the corresponding switching objects of other sensors with the same function must be interlinked. This parameter is only visible with: – "Colour temperature control = Active" and – "Communication = Combi object"	

Time between switching and dimming	**0** ... 50 s | 100 ... **400** ... 990 ms
This parameter defines how long the button must be pressed for a dimming telegram to be transmitted.	

Advanced parameters	Active **Inactive**
When the advanced parameters are activated, the ETS shows the following parameters.	

Increase brightness by	1.5 % 3 % 6 % 12.5 % 25 % 50 % **100 %**

This parameter sets the relative dimming level when the brightness is increased. On each button-press, the brightness is changed at maximum by the configured step width.
It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").

Reduce brightness by	1.5 % 3 % 6 % 12.5 % 25 % 50 % **100 %**

This parameter sets the relative dimming level when the brightness is reduced. On each button-press, the brightness is changed at maximum by the configured step width.
It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").

Increase colour temperature by	1.5 % 3 % 6 % 12.5 % 25 % 50 % **100 %**

This parameter sets the relative dimming level when the colour temperature is increased. On each button-press, the brightness is changed at maximum by the configured step width.
It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").

Reduce colour temperature by	1.5 % 3 % 6 % 12.5 % 25 % 50 % **100 %**

This parameter sets the relative dimming level when the colour temperature is reduced. On each button-press, the brightness is changed at maximum by the configured step width.
It is recommended that the device repeats the dimming telegrams automatically, particularly with a small dimming level (see "Telegram repetition").

Stop telegram	**Active** Inactive

On "Active" the device transmits a telegram for stopping the dimming process when the button is released.

i When the device transmits telegrams for dimming in smaller levels, the stop telegram is generally not needed.

Telegram repetition	Active **Inactive**

This parameter can be used to activate telegram repetition for dimming. With telegram repetition activated, the device cyclically sends relative dimming telegrams (in the parameterised step width) to the bus if the button is pressed long.

Time between two telegrams	**200 ms** 300 ms 400 ms 500 ms 750 ms 1 s 2 s

This parameter defines the interval at which the dimming telegrams are automatically repeated in the telegram repetition mode.
This parameter is only visible if "Telegram repetition = active"!

15.2.5 Object list

The following communication objects are available for the individual buttons or rockers, depending on the set operating concept. The name of the object corresponds to the selection of the operating concept and can be adjusted by the parameter "Name of ..." .

Object no.	Function	Name	Type	DPT	Flag
55, 61, 67, 73, 91, 97	Switching	Button/rocker *n* - output	1-bit	1,001	C, -,W, T, -
1-bit object for transmission of switching telegrams (ON, OFF).					

Object no.	Function	Name	Type	DPT	Flag
56, 62, 68, 74, 92, 98	Dimming brightness	Button/rocker *n* - output	4-bit	3,007	C, -,W, T, -
4-bit object for sending relative dimming telegrams to adjust the brightness.					

Object no.	Function	Name	Type	DPT	Flag
56, 62, 68, 74, 92, 98	Dimming brightness + colour temperature	Button/rocker *n* - output	3 bytes	250,600	C, -, -, T, -
3-byte object for sending dimming telegrams for adjusting the brightness and the colour temperature in combination.					

Object no.	Function	Name	Type	DPT	Flag
57, 63, 69, 75, 93, 99	Switching feedback	Button/rocker *n* - input	1-bit	1,001	C, -,W, -, U
1-bit object for receiving feedback telegrams (ON, OFF).					

Object no.	Function	Name	Type	DPT	Flag
58, 64, 70, 76, 94, 100	Dimming colour temperature	Button/rocker *n* - output	4-bit	3,007	C, -,W, T, -
4-bit object for sending relative dimming telegrams to adjust the colour temperature.					

15.3 Colour control and brightness

For each rocker or button with the function set to "colour control and brightness", the ETS indicates up to 10 objects. Generally, the device transmits a switching telegram (ON, OFF, TOGGLE) after a brief press to the bus, and cyclical telegrams for colour control after a long press. Either a colour sequence or a brightness adjustment can be achieved.

i The time needed by the device to detect an actuation as a long actuation can be set in the parameters.

The colour control is performed after parameterisation either in the colour space RGB or HSV. The colour space can be optionally expanded to include the white component. The bus communication can be performed either via individual objects or a combi object (only for RGB and RGBW). Using the parameters "Colour space" and "Communication" the data types of the communication objects are adjusted automatically.

Feedback

If an actuator is controlled from multiple control elements, the actuator must report its switching status and its colour values to the feedback objects of the button or rocker. Due to the feedback, the device detects that the actuator has changed its switching status by input from another element and adjusts its switching status or colour value accordingly.

Advanced configuration options

The device has advanced parameters for the colour control. If necessary, these advanced parameters can be activated and thus be made visible. The advanced parameters determine the source of the start value, the step width and the time between two telegrams of a value adjustment on a long press.

With the colour sequence, the step width is configured in degrees. The value adjustment takes place without a stop. As soon as the device reaches the lower or upper range limit, the device sends the value of this range limit and then inserts a pause whose duration corresponds to two steps. Thereafter, the device transmits a telegram with the value of the other range limit and continues the value adjustment in the same direction.

With the brightness adjustment, one step width for increase and one step width for reduction of brightness is parameterised as a percentage value. The brightness adjustment is done with stop.

i With hidden switched parameters ("Advanced parameters = deactivated"), the following default values are loaded to the device:

- Start value = same as the value from the feedback object
- Step width = 4° (only for colour sequence)
- Increase brightness = 2% (only for brightness adjustment)
- Reduce brightness = 2% (only for brightness adjustment)

- Time between two telegrams = 200 ms

15.3.1 colour sequence

The colour sequence performs a value adjustment of the colour hue (H) in the range from 0 to 360°.

For the set colour space "RGB" or "RGBW", an adjustment of the colour hue (H) is converted internally in the device.

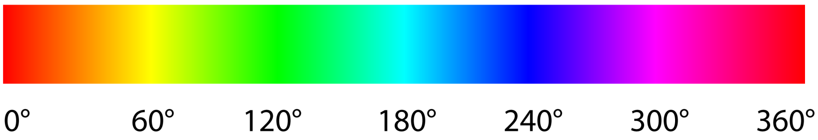


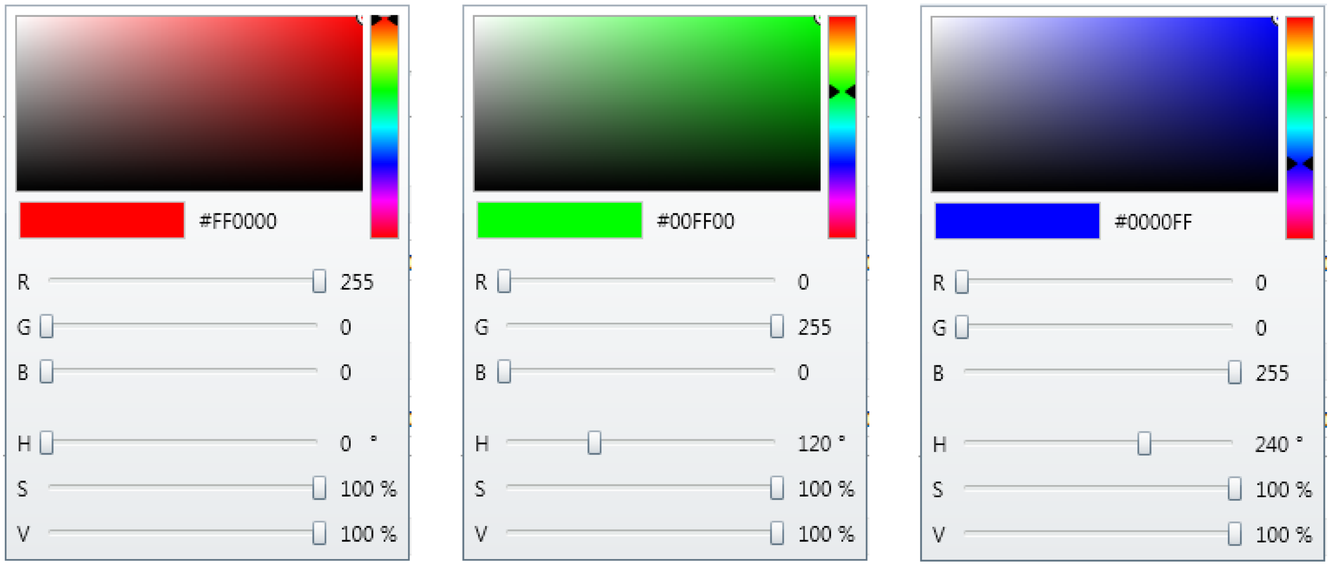
Image 83: Colour scale (Colour hue H)

The colour sequence is realised according to the adjustment direction ("Command on pressing") and the step width via bus telegrams. During a colour sequence with a long actuation, the device cyclically sends new values to the bus, whereby the colour wheel is run through.

- Colour space HSV and HSVW: The colour hue (H) changes cyclically by the parameterised step width. The saturation (S) and the brightness value (V) remain unaffected by a colour pass.
- Colour space RGB and RGBW: Depending on the start position at the beginning of the adjustment, the values R, G or B change cyclically.

Colour sequence - Colour picker

Using the colour picker of the ETS, the colour wheel sequence can be traced by adjusting the slider of the H value from 0° to 360°.



#FF0000
R 255
G 0
B 0
H 0 °
S 100 %
V 100 %

#00FF00
R 0
G 255
B 0
H 120 °
S 100 %
V 100 %

#0000FF
R 0
G 0
B 255
H 240 °
S 100 %
V 100 %

Image 84: Examples of colour adjustment using the ETS colour picker

Examples of HSV-RGB conversion:

Example	HSV - Values	RGB - Values	Colour
1	0°, 100%, 100%	255, 0, 0	Red
2	120°, 100%, 100%	0, 255, 0	Green
3	240°, 100%, 100%	0, 0, 255	Blue
4	360°, 0%, 100%	255, 255, 255	White
5	360°, 0%, 0%	0, 0, 0	Black

ℹ With "Saturation (S) = 0%" and "Brightness (V) = 100%", a change in the colour hue (H) has no effect on the RGB values and thus no effect on the colour (see example 4).

ℹ With "Saturation (S) = 0%" and "Brightness (V) = 0%", a change in the colour hue (H) has no effect on the RGB values and thus no effect on the colour (see example 5).

Colour sequence - Operation of the function

When operating the colour sequence, the device differentiates between dual-area operation and single-area operation. The parameter "Command on pressing" defines the single-area or dual-area operation principle.

dual-area operation	single-area operation
Colour sequence in anti-clockwise direction (ON)	Toggle colour sequence (TOGGLE)
Colour sequence in clockwise direction (OFF)	Colour sequence in anti-clockwise direction (TOGGLE)
	Colour sequence in clockwise direction (TOGGLE)

ℹ With dual-area operation, the device transmits a telegram for switching on or off after a brief press, and a colour sequence telegram after a long press.

ℹ With single-area operation, the device transmits ON and OFF telegrams in an alternating pattern ("TOGGLE") for each brief press of the respective button, and a colour sequence telegram for a long actuation.

15.3.2 Brightness adjustment

The brightness adjustment performs a value adjustment of the brightness value (V) in the range from 0 to 100%.

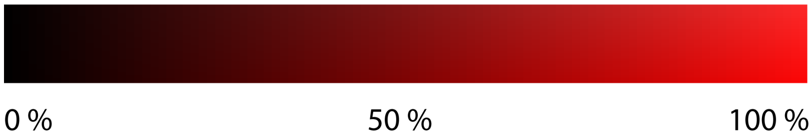


Image 85: Brightness scale (brightness value V) - example red

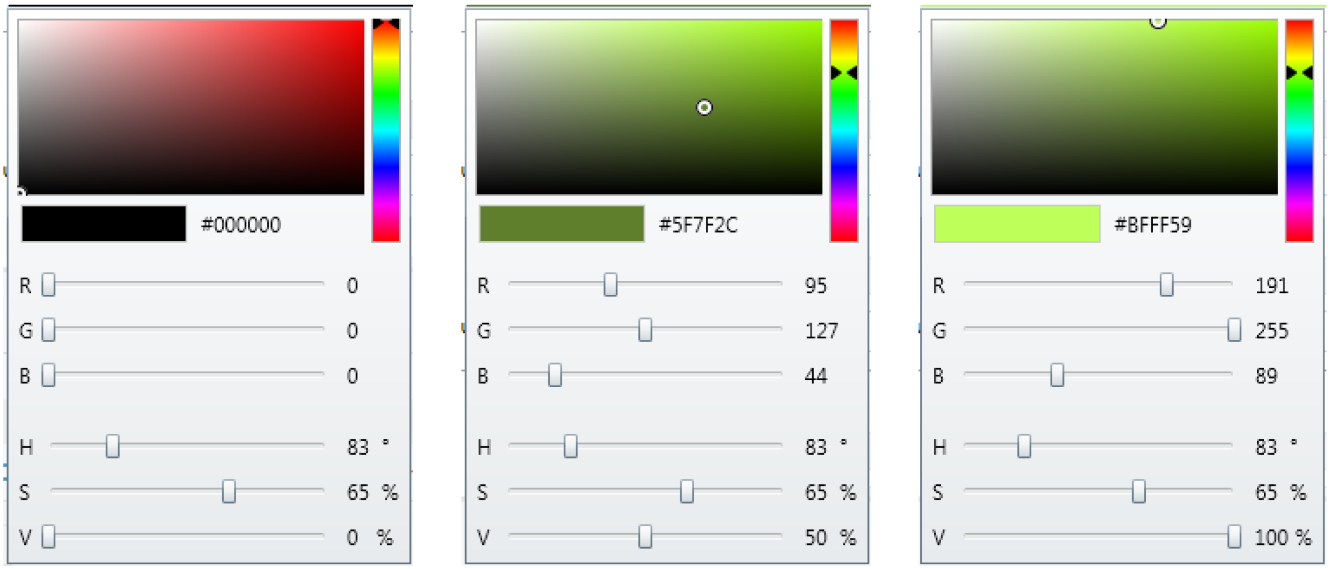
The brightness adjustment is realised according to the adjustment direction ("Command on pressing") and the step width ("Increase brightness" or "Reduce brightness") via bus telegrams. When adjusting the brightness, a long press causes the device to cyclically send new values to the bus, which changes the brightness.

ℹ The brightness adjustment due to a long press ends automatically, either when the brightness is increased to 100 per cent or when the brightness is decreased to 0 per cent.

- Colour space HSV and HSVW: The brightness value (V) changes cyclically by the parameterised step width ("Increase brightness" or "Reduce brightness"). The colour hue (H) and the saturation (S) remain unaffected by a brightness adjustment.
- Colour space RGB and RGBW: Depending on the start position at the beginning of the adjustment, the values R, G or B change cyclically.

Brightness adjustment - Colour picker

Using the colour picker of the ETS, the brightness adjustment can be reproduced by adjusting the slider of the V-value between 0% and 100%.



	#000000	#5F7F2C	#BFFF59
R	0	95	191
G	0	127	255
B	0	44	89
H	83 °	83 °	83 °
S	65 %	65 %	65 %
V	0 %	50 %	100 %

Image 86: Examples of brightness adjustment using the colour picker of the ETS

Examples of HSV-RGB conversion:

Example	HSV - Values	RGB - Values	Colour
1	83°, 65%, 0%	0, 0, 0	Black
2	83°, 65%, 50%	95, 127, 44	Dark green
3	83°, 65%, 100%	191, 255, 89	Light green

i With "Brightness (V) = 0%", a change in the colour hue (H) or the saturation (S) has no effect on the RGB values and thus no effect on the colour (see example 1).

Brightness adjustment - Operating the function

When operating the brightness adjustment, the device differentiates between dual-area operation and single-area operation. The parameter "Command on pressing" defines the single-area or dual-area operation principle.

dual-area operation	single-area operation
Brightness adjustment brighter (ON)	Brightness adjustment brighter / darker (TOGGLE)
Brightness adjustment darker (OFF)	Brightness adjustment brighter (TOGGLE)
	Brightness adjustment darker (TOGGLE)

i With dual-area operation, the device transmits a telegram for switching on or off after a brief press, and brightness adjustment telegrams after a long press.

i With single-area operation, the device transmits ON and OFF telegrams in an alternating pattern ("TOGGLE") for each brief press of the button, and telegrams for brightness adjustment for a long actuation.

15.3.3 Table of parameters

Type of colour control	**colour sequence** Brightness adjustment

This parameter sets whether a colour circle run or a brightness adjustment is performed. Depending on this setting, all further parameters are automatically adjusted.

- The colour sequence performs a value adjustment of the colour hue (H) in the range from 0 to 360°.
- The brightness adjustment performs a value adjustment of the brightness value (V) in the range from 0 to 100%. This function is unsuitable for combination with DALI operating devices. In this case, the brightness adjustment should be implemented with the function "Dimming and colour temperature" (DPT 3.007).

Colour space	RGB **RGBW** HSV HSVW

This parameter defines the colour space of the function. With the colour spaces RGB and RGBW, communication can take place via individual objects or via a combination object. With the colour spaces HSV and HSVW, communication takes place via individual objects.

Communication	Individual objects **Kombi object**

Only when the colour space is set to RGB or RGBW, can communication via the bus take place either via individual objects (red, green, blue, white*) or via a combination object (RGBW). The parameter defines input and output objects in the same way.
*Only for RGBW

Value (RGB/HSV)	#000000 ... **#FF0000** ... #FFFFFF

This parameter determines the object values (communication via individual objects) or the object value (communication via combination object) when the button is pressed.

The value (RGB/HSV) is configured by means of a colour picker.

The W-value is parameterised using a separate slider.

Value (W)	0 ... 255 or 0 ... 100%

This parameter defines the white value for the object when the button is pressed.

When the colour space has been configured to "RGBW" the W-value is set from 0 to 255.

When the colour space has been parameterised to "HSVW" the W-value is set between 0 and 100%.

Command on pressing	no reaction Colour sequence in anti-clockwise direction (ON) Colour sequence in clockwise direction (OFF) Toggle colour sequence (TOGGLE) **Colour sequence in anti-clockwise direction (TOGGLE)** Colour sequence in clockwise direction (TOGGLE)

When the button is actuated briefly, the device sends a switching telegram according to the parameterisation (ON, OFF or TOGGLE).

With a long press, the device can either vary the values always in the same direction or it stores the direction of the last adjustment and reverses it on the next button-press.

The device adjusts the values in the same direction with the options:

- Colour sequence in anti-clockwise direction (ON)
- Colour sequence in clockwise direction (OFF)
- Colour sequence in anti-clockwise direction (TOGGLE)
- Colour sequence in clockwise direction (TOGGLE)

The device inverts the adjustment direction with the following option:

- Toggle colour sequence (TOGGLE)

This parameter is only visible if the "Type of colour control = Colour sequence" has been parameterised.

Command on pressing	no reaction Brightness adjustment brighter (ON) Brightness adjustment darker (OFF) Brightness adjustment brighter / darker (TOGGLE) **Brightness adjustment brighter (TOGGLE)** Brightness adjustment darker (TOGGLE)

When the button is actuated briefly, the device sends a switching telegram according to the parameterisation (ON, OFF or TOGGLE).

With a long press, the device can either vary the values always in the same direction or it stores the direction of the last adjustment and reverses it on the next button-press.

The device adjusts the values in the same direction with the options:

- Brightness adjustment brighter (ON)
- Brightness adjustment darker (OFF)
- Brightness adjustment brighter (TOGGLE)
- Brightness adjustment darker (TOGGLE)

The device inverts the adjustment direction with the following option:

- Brightness adjustment brighter / darker (TOGGLE)

This parameter is only visible if the "Type of colour control = Brightness adjustment" has been parameterised.

Time between switching and colour sequence	**0** ... 50 s | 100 ... **400** ... 990 ms

This parameter defines how long the button must be pressed for a colour sequence to be started.

This parameter is only visible if the "Type of colour control = Colour sequence" has been parameterised.

Time between switching and brightness adjustment	**0** ... 50 s | 100 ... **400** ... 990 ms

This parameter defines how long the button must be pressed for a brightness adjustment to be started.

This parameter is only visible if the "Type of colour control = Brightness adjustment" has been parameterised.

Advanced parameters	Active **Inactive**

When the advanced parameters are activated, the ETS shows the following parameters, depending on the parameter "Type of colour control".

Start value	same as configured value Same as value after last adjustment **as value from feedback object**

Value adjustment can begin with different starting values.

With "Same as parameterised value": After each long press, the device always starts with the value configured in the ETS.

With "Same as value after last adjustment": After a long press, the device starts with the value transmitted by itself or by another device with this group address as the last value.

With "Same as value from feedback object": After each long press, the device starts with the value that it or another device with this group address transmitted as the last value.

ℹ The start value of the value adjustment is different for both buttons of a rocker if the setting is "same as value after last adjustment". If the value adjustment works for both buttons of a rocker and the last rocker adjustment is to be taken into account, the setting "same as value from feedback object" must be configured.

Step width	1° 2° **4°** 5° 10° 20° 25° 30° 50° 60°

This parameter defines the step width with which the device adjusts the colour when a button is pressed for a long time and telegram repetition is activated.

In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the adjustment range or if it exceeds the upper limit, the sensor adapts the step width of the last step automatically.

This parameter is only visible if the "Type of colour control = Colour sequence" has been parameterised.

Increase brightness	1% **2%** 3% 4% 5% 6% 7% 8% 9% 10%
This parameter defines the step width with which the device increases the brightness when a button is pressed for a long time and telegram repetition is activated. In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the adjustment range or if it exceeds the upper limit, the sensor adapts the step width of the last step automatically. This parameter is only visible if the "Type of colour control = Brightness adjustment" has been parameterised.	

Reduce brightness	1% **2%** 3% 4% 5% 6% 7% 8% 9% 10%
This parameter defines the step width with which the device reduces the brightness when a button is pressed for a long time and telegram repetition is activated. In a value adjustment, the device determines the new telegram value from the previous value and the preset step width. If the value falls below the lower limit of the adjustment range or if it exceeds the upper limit, the sensor adapts the step width of the last step automatically. This parameter is only visible if the "Type of colour control = Brightness adjustment" has been parameterised.	

Telegram repetition	**Active**
The telegram repetition for colour control is always active. The device cyclically sends operating telegrams (in the parameterised step width) to the bus if the button is pressed for a long time.	

Time between two telegrams	**0.5 s** 1 s 2 s 5 s 10 s
This parameter determines how fast the telegrams for operating the colour sequence are automatically repeated in the telegram repetition mode. This parameter is only visible if "Type of colour control = Colour sequence" and "Telegram repetition = active" have been parameterised!	

Time between two telegrams	**200 ms** 300 ms 400 ms 500 ms 750 ms 1 s 2 s
This parameter determines how fast the telegrams for operating the brightness adjustment are automatically repeated in the telegram repetition mode. This parameter is only visible if "Type of colour control = Brightness adjustment" and "Telegram repetition = active" have been parameterised!	

15.3.4 Object list

The following communication objects are available for the individual buttons or rockers, depending on the set operating concept. The name of the object corresponds to the selection of the operating concept and can be adjusted by the parameter "Name of ..." .

Object no.	Function	Name	Type	DPT	Flag
728, 743, 758, 773, 818, 833	Switching	Button/rocker *n* - output	1-bit	1,001	C, -, -, T, -
1-bit object for transmission of switching telegrams (ON, OFF).					

Object no.	Function	Name	Type	DPT	Flag
729, 744, 759, 774, 819, 834	Switching feedback	Button/rocker *n* - input	1-bit	1,001	C, -,W, -, U
1-bit object for receiving feedback telegrams (ON, OFF).					

Object no.	Function	Name	Type	DPT	Flag
730, 745, 760, 775, 820, 835	Colour value RGB	Button/rocker *n* - output	3 bytes	232,600	C, -, -, T, -
3-byte object for transmitting the RGB colour values. This object is only visible with "Colour space = RGB" and "Communication = Combi object".					

Object no.	Function	Name	Type	DPT	Flag
730, 745, 760, 775, 820, 835	Colour value RGBW	Button/rocker *n* - output	6 bytes	251,600	C, -, -, T, -
6-byte object for transmitting the RGBW colour values. This object is only visible with "Colour space = RGBW" and "Communication = Combi object".					

Object no.	Function	Name	Type	DPT	Flag
731, 746, 761, 776, 821, 836	Colour value Red	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the red colour value. This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects".					

Object no.	Function	Name	Type	DPT	Flag
731, 746, 761, 776, 821, 836	Colour hue (H)	Button/rocker *n* - output	1 bytes	5,003	C, -, -, T, -
1-byte object for transmitting the colour hue. This object is only visible with "Colour space = HSV or HSVW".					

Object no.	Function	Name	Type	DPT	Flag
732, 747, 762, 777, 822, 837	Colour value Green	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the green colour value. This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects".					

Object no.	Function	Name	Type	DPT	Flag
732, 747, 762, 777, 822, 837	Saturation (S)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the saturation. This object is only visible with "Colour space = HSV or HSVW".					

Object no.	Function	Name	Type	DPT	Flag
733, 748, 763, 778, 823, 838	Colour value Blue	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the blue colour value. This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects"					

Object no.	Function	Name	Type	DPT	Flag
733, 748, 763, 778, 823, 838	Brightness (V)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the brightness value. This object is only visible with "Colour space = HSV or HSVW".					

Object no.	Function	Name	Type	DPT	Flag
734, 749, 764, 779, 824, 839	Colour value White	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the white colour value. This object is only visible with "Colour space = RGBW" and "Communication = Individual objects".					

Object no.	Function	Name	Type	DPT	Flag
734, 749, 764, 779, 824, 839	White level (W)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the white level. This object is only visible with "Colour space = HSVW".					

Object no.	Function	Name	Type	DPT	Flag
736, 751, 766, 781, 826, 841	Colour value RGB feedback	Button/rocker *n* - input	3 bytes	232,600	C, -,W, -, U
3-byte object for receiving feedback telegrams (RGB colour values). This object is only visible with "Colour space = RGB" and "Communication = Combi object".					

Object no.	Function	Name	Type	DPT	Flag
736, 751, 766, 781, 826, 841	Colour value RGBW feedback	Button/rocker *n* - input	6 bytes	251,600	C, -,W, -, U
6-byte object for receiving feedback telegrams (RGBW colour values). This object is only visible with "Colour space = RGBW" and "Communication = Combi object".					

Object no.	Function	Name	Type	DPT	Flag
737, 752, 767, 782, 827, 842	Colour value Red feedback	Button/rocker *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (red colour value). This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects"					

Object no.	Function	Name	Type	DPT	Flag
737, 752, 767, 782, 827, 842	Colour hue (H) feedback	Button/rocker *n* - input	1 bytes	5,003	C, -,W, -, U
1-byte object for receiving feedback telegrams (colour hue H). This object is only visible with "Colour space = HSV or HSVW".					

Object no.	Function	Name	Type	DPT	Flag
738, 753, 768, 783, 828, 843	Colour value Green feedback	Button/rocker *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (green colour value). This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects"					

Object no.	Function	Name	Type	DPT	Flag
738, 753, 768, 783, 828, 843	Saturation (S) feedback	Button/rocker *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (saturation S). This object is only visible with "Colour space = HSV or HSVW".					

Object no.	Function	Name	Type	DPT	Flag
739, 754, 769, 784, 829, 844	Colour value Blue feedback	Button/rocker *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (blue colour value). This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects"					

Object no.	Function	Name	Type	DPT	Flag
739, 754, 769, 784, 829, 844	Brightness (V) feedback	Button/rocker *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (brightness value V). This object is only visible with "Colour space = HSV or HSVW".					

Object no.	Function	Name	Type	DPT	Flag
740, 755, 770, 785, 830, 845	Colour value White feedback	Button/rocker *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (white colour value). This object is only visible with "Colour space = RGBW" and "Communication = Individual objects".					

Object no.	Function	Name	Type	DPT	Flag
740, 755, 770, 785, 830, 845	White level (W) feedback	Button/rocker *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (white value W). This object is only visible with "Colour space = HSVW".					

15.4 Venetian blind

For each rocker or button with the function set to "Venetian blind" the ETS indicates the two 1-bit objects "STEP operation" and "MOVE operation".

The "Venetian blind" function distinguishes between double-area operation (UP, DOWN) and single-area operation (TOGGLE). The "Command on pressing" parameter defines the single-area or double-area blind function.

dual-area operation	single-area operation
UP	TOGGLE
DOWN	

With an operating area as a rocker, the double-surface Venetian blind function is preset. This means that the device e.g. with a press of the top button, transmits a telegram for an upward movement and, after a press of the bottom button, transmits a telegram for a downward movement.

In the separate buttons function, the device is preprogrammed for single-surface Venetian blind function. In this case, the device alternates between the directions of the long time telegram (TOGGLE) on each long actuation of the sensor. Several short time telegrams in succession have the same direction.

Feedback

If the actuator can be controlled from several sensors, a faultless single-area operation requires that the long time objects of the control elements are interlinked. The device would otherwise not be able to detect that the actuator has been addressed from another sensor, in which case it would have to be actuated twice during the next use in order to produce the desired reaction.

Operation concept for the Venetian blind function

For the control of Venetian blind, shutter, awning or similar drives, the device supports four operating concepts, for which the telegrams are transmitted in different time sequences. The device can therefore be used to operate a wide variety of drive configurations.

Operation concept "short – long – short"
In the operation concept "short – long – short", the device shows the following behaviour:

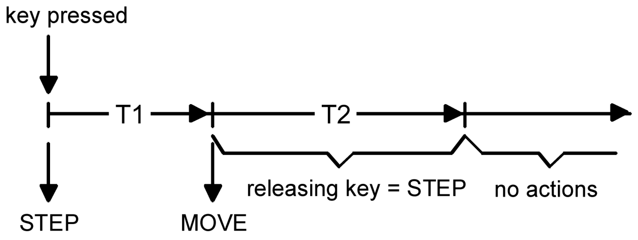


Image 87: Operation concept "short – long – short"

- Immediately on pressing the button, the device transmits a short time telegram. Pressing the button stops a running drive and starts time T1 ("time between short time and long time command"). No other telegram will be transmitted, if the key is released within T1. This short time serves the purpose of stopping a continuous movement.
  The "time between short and long time command" in the device should be selected shorter than the short-time operation of the actuator to prevent a jerky movement of the blind.
- If the button is kept depressed longer than T1, the device transmits a long time telegram after the end of T1 for starting up the drive and time T2 ("slat adjusting time") is started.
- If the button is released within the slat adjusting time, the device sends another 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 running time of the drive, a push button function is possible as well. This means that the drive is active only when the button is kept depressed.
- If the button is kept depressed longer than T2, the device transmits no further telegram. The drive remains on until the end position is reached.

<u>Operation concept "long – short":</u>
In the operation concept "long – short", the device shows the following behaviour:

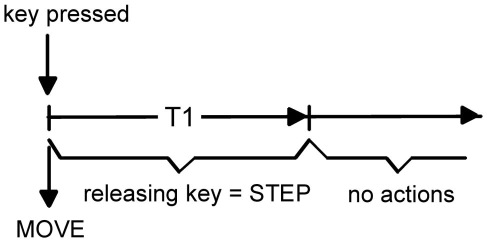


Image 88: Operation concept "long – short"

- Immediately on pressing the button, the device transmits a long time telegram. The drive begins to move and time T1 ("slat adjusting time") is started.
- If the button is released within the slat adjusting time, the device sends 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 running time of the drive, a push button function is possible as well. This means that the drive is active only when the button is kept depressed.
- If the button is kept depressed longer than T1, the device transmits no further telegram. The drive remains on until the end position is reached.

<u>Operation concept "short – long"</u>
In the operation concept "short – long", the device shows the following behaviour:

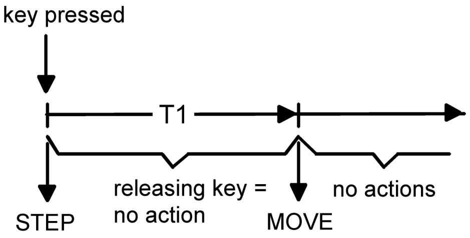


Image 89: Operation concept "short – long"

- Immediately on pressing the button, the device transmits a short time telegram. Pressing the button stops a running drive and starts time T1 ("time between short time and long time command"). No other telegram will be transmitted, if the key is released within T1. This short time serves the purpose of stopping a continuous movement.
  The "time between short and long time command" in the device should be selected shorter than the short-time operation of the actuator to prevent a jerky movement of the blind.
- If the button is kept depressed longer than T1, the device transmits a long time telegram after the end of T1 for starting the drive.
- No further telegram is transmitted by the device when the button is released. The drive remains on until the end position is reached.

Operation concept "long – short or short":
In the operation concept "long – short or short", the device shows the following behaviour:

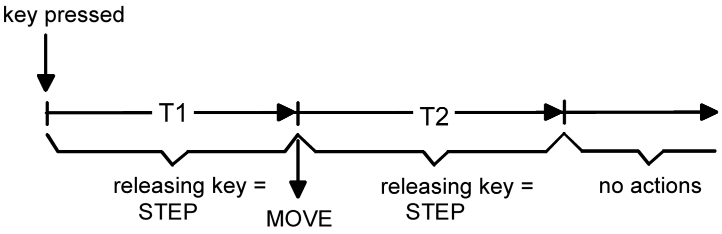


Image 90: Operation concept "long – short or short"

- Immediately on pressing the button, the device starts time T1 ("time between short time and long time command") and waits. If the button is released again before T1 has elapsed, the device transmits a short time telegram. This telegram can be used to stop a running drive. A stationary drive rotates the slats by one level.
- If the button is kept depressed after T1 has elapsed, the device transmits a long time telegram and starts time T2 ("slat adjusting time").
- If the button is released within T2, the device sends another 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 running time of the drive, a push button function is possible as well. This means that the drive is active only when the button is kept depressed.

- If the button is kept depressed longer than T2, the device transmits no further telegram. The drive remains on until the end position is reached.

15.4.1 Table of parameters

The following parameters are available for the individual buttons, depending on the set operating concept. The default settings change in accordance with the set operating concept.

Command on pressing	UP DOWN **TOGGLE**
This parameter defines the running direction of the drive on pressing the button. If the setting is "TOGGLE", the direction is changed after each long time command. If several devices are to control the same drive, the long time objects of the devices must be interlinked to ensure that the running direction can be changed correctly.	

Operation concept	**short – long – short** long – short short – long long – short or short
For Venetian blind control, four different operation concepts can be selected. For these concepts, the ETS shows further parameters.	

Time between short-time and long-time command	**0** ... 4 min | **0** ... 59 s | 100 ... **400** ... 990 ms
This parameter sets the time after which the long-time operation will be evaluated on pressing the button. This parameter is not visible with "Operation concept = long – short"!	

Slat adjusting time	**0** ... 4 min | **0** ... 59 s | 100 ... **500** ... 990 ms
The time during which a transmitted MOVE telegram can be terminated by releasing the button (STEP) is set here. This function serves to adjust the slats of a blind. This parameter is not visible with "Operation concept = short - long"!	

15.4.2 Object list

The following communication objects are available for the individual buttons or rockers, depending on the set operating concept. The name of the object corresponds to the selection of the operating concept and can be adjusted by the parameter "Name of ..." .

Object no.	Function	Name	Type	DPT	Flag
103, 106, 109, 112, 121, 124	Short time operation	Button/rocker *n* - output	1-bit	1,007	C, -, -, T, -
1-bit object for the transmission of telegrams with which a Venetian blind or shutter drive motor can be stopped or with which the blind slats can be adjusted by short time operation.					

Object no.	Function	Name	Type	DPT	Flag
104, 107, 110, 113, 122, 125	Long-time operation	Button/rocker *n* - output	1-bit	1,008	C, -,W, T, -
1-bit object for the transmission of telegrams with which a Venetian blind or shutter drive motor can be can be moved upwards or downwards.					

15.5 Value transmitter

With the "Value transmitter" function, the device sends parameterised values to the bus at the press of a button. In case of a rocker function, different values can be configured for both buttons.

Value ranges

The value transmitter knows twelve different value ranges. Depending on the application, the parameters "Function" and "Value range" determine which value range the value transmitter uses.

Function	Function	Lower numerical limit	Upper numerical limit
1-byte value transmitter	0...255	0	255
1-byte value transmitter	0...100%	0%	100%
1-byte value transmitter	-128...127	-128	127
1-byte value transmitter	0...255%	0%	255%
2-byte value transmitter	0...65535	0	65535
2-byte value transmitter	-32768...32767	-32768	32767
2-byte value transmitter	Temperature value	0 °C	40 °C
2-byte value transmitter	brightness value	0 lux	1500 lux
2-byte value transmitter	Colour temperature value	1000 K	10000 K
Value transmitter 3-byte	Colour value RGB/HSV	#000000	#FFFFFF
6-byte value transmitter	Colour value RGBW/HSVW	#000000 + 0	#FFFFFF + 255
6-byte value transmitter	Colour temperature value + brightness	1000 K | 0 %	10000 K | 100 %

For each of these ranges, the value that can be transmitted to the bus for each button actuation is configurable.

15.5.1 1-byte value transmitter

The 1-byte value transmitter is available in the following four variants:

- 0 ... 255
- 0 ... 100%
- -128 ... 127
- 0 ... 255%

For each rocker or button, ETS indicates an object for sending out the parameterised value. On pressing a button, the configured value is transmitted to the bus. In case of a rocker function, different values can be configured for both buttons.

15.5.2 2-byte value transmitter

The 2-byte value transmitter is available in the following five variants:

- 0 ... 65535
- -32768 ... 32767
- Temperature value (0 ... 40 °C)
- Brightness value (0, 50, ..., 1500 lux)
- Colour temperature value (1000, 1100, ..., 10000)

For each rocker or button, ETS indicates an object for sending out the parameterised value. On pressing a button, the configured value is transmitted to the bus. In case of a rocker function, different values can be configured for both buttons.

15.5.3 3-byte value transmitter

The 3-byte value transmitter is available in the following variant:

- Colour value RGB/HSV

For each rocker or button, ETS indicates up to three objects for sending out the parameterised values. The parameterised values are sent to the bus at the touch of a button. In case of a rocker function, different values can be configured for both buttons.

In the parameters, the colour space of this function can be defined. With the colour space RGB, communication can take place via individual objects or via a combination object. With the colour space HSV, communication takes place via individual objects.

The object values to be transmitted are parameterised via a colour picker.

15.5.4 6-byte value transmitter

The 6-byte value transmitter is available in the following two variants:

- Colour value RGBW/HSVW
- Colour temperature value + brightness

For each rocker or button, ETS indicates up to four objects for transmitting the parameterised values. The parameterised values are sent to the bus at the touch of a button. In case of a rocker function, different values can be configured for both buttons.

With the value range "Colour value RGBW/HSVW", the colour space of this function can be defined in the parameters. With the colour space RGBW, communication can take place via individual objects or via a combination object. With the colour space HSVW, communication takes place via individual objects.

The RGB or HSV object values to be transmitted are parameterised via a colour picker. The object value W is parameterised using a separate slider.

With the value range "Colour temperature value + brightness", the object values to be transmitted for colour temperature and brightness as well as a time window are defined in the parameters. The device packs all three pieces of information together in one communication object and sends them to the bus. The receiving actuator converts this information, according to DPT 249.600 and sets the colour temperature and brightness in the parameterised time window.

15.5.5 Table of parameters

The following parameters are available for the individual buttons, depending on the set operating concept. The default settings change in accordance with the set operating concept.

Function	No function **1 bytes** 2 bytes 3 bytes 6 bytes
The "value transmitter" function distinguishes between 1-byte, 2-byte 3-byte and 6-byte values.	

Value range	**1 byte (0...255)** 1 byte (0...100%) 1 byte (-128...127) 1 byte (0...255%)
The 1-byte value transmitter offers these value ranges for setting. The other parameters and objects of the function are based on the setting of this parameter.	

Value range	**2 byte (0...65535)** 2 byte (-32768...32767) 2 byte temperature value 2 byte brightness value 2 bytes colour temperature value
The 2-byte value transmitter offers these value ranges for setting. The other parameters and objects of the function are based on the setting of this parameter.	

Value range	**3-bytes colour value RGB/HSV**
The 3-byte value transmitter offers these value ranges for setting. The other parameters and objects of the function are based on the setting of this parameter.	

Colour space	**RGB** HSV
This parameter defines the colour space of the function. With RGB, communication can take place via individual objects or via a combination object. With HSV, communication takes place via individual objects. This parameter is only visible if "Value range = 3-byte colour value RGB/HSV"	

Communication	**Individual objects** Kombi object
When the colour space is set to RGB, communication via the bus can take place either via individual objects (red, green, blue) or via a combination object (RGB). This parameter is only visible if "Value range = 3-byte colour value RGB/HSV"	

Value range	**6-bytes colour value RGBW/HSVW** 6 bytes colour temperature value + brightness
The 6-byte value transmitter offers these value ranges for setting. The other parameters and objects of the function are based on the setting of this parameter.	

Colour space	**RGBW** HSVW
This parameter defines the colour space of the function. With RGBW, communication can take place via individual objects or via a combination object. With HSVW, communication takes place via individual objects. This parameter is only visible if "Value range = 6-byte colour value RGBW/HSVW"	

Communication	**Individual objects** Kombi object
When the colour space is set to RGBW, communication via the bus can take place either via individual objects (red, green, blue, white) or via a combination object (RGBW). This parameter is only visible if "Value range = 6-byte colour value RGBW/HSVW"	

Value (0…255)	**0**...255
This parameter defines the object value when the button is pressed. This parameter is only visible if "Function = 1-byte" and "Value range = 1-byte (0...255)".	

Value (0…100 %)	**0**...100
This parameter defines the object value when the button is pressed. This parameter is only visible if "Function = 1-byte" and "Value range = 1-byte (0...100%)".	

Value (-128...127)	-128...**0**...127
This parameter defines the object value when the button is pressed. This parameter is only visible if "Function = 1-byte" and "Value range = 1-byte (-128...127)".	

Value (0…255%)	**0**...255
This parameter defines the object value when the button is pressed. This parameter is only visible if "Function = 1-byte" and "Value range = 1-byte (0...255%)".	

Value (0…65535)	**0**...65535
This parameter defines the object value when the button is pressed. This parameter is only visible if "Function = 2-byte" and "Value range = 2-byte (0...65535)".	

Value (-32768…32767)	-32768...**0**...32767
This parameter defines the object value when the button is pressed. This parameter is only visible if "Function = 2-byte" and "Value range = 2-byte (-32768...32767)".	

Temperature value (0...40 °C)	0...**20**...40
This parameter defines the object value when the button is pressed. This parameter is only visible if "Function = 2-byte" and "Value range = 2-byte temperature value".	

Brightness value (0, 50, ..., 1500 lux)	0, 50, ..., **300**, ..., 1500
This parameter defines the object value when the button is pressed. This parameter is only visible if "Function = 2-byte" and "Value range = 2-byte brightness value".	

Colour temperature (1000, 1100, ..., 10000 K)	1000, 1100, ..., **2700**, ..., 10000
This parameter defines the object value when the button is pressed. This parameter is only visible if "Function = 2-byte" and "Value range = 2-byte temperature value".	

Value (RGB/HSV)	#000000 ... **#FFFFFF**
This parameter determines the object values of the following output objects when the button is pressed: – "Colour value transmitter red", "Colour value transmitter green", "Colour value transmitter blue" or – "Colour value transmitter RGB", "Colour value transmitter **RGB**W" or – "Colour hue (H)", "Saturation (S)", "Brightness (V)" The parameter is visible with "Function = 3-byte RGB/HSV" or "Function = 6-byte RGBW/HSVW". The value (RGB/HSV) is configured by means of a colour picker. With the "6 byte RGBW / HSVW" function, the W value is configured using a separate slider.	

<table>
<tr><th>Value (W)</th><th>0 ... 255</th></tr>
<tr><td colspan="2">This parameter determines the object values of the following output objects when the button is pressed:
– "Colour value transmitter White" or
– "Colour value transmitter RGBW"
Visible only if "Function = 6-byte RGBW/HSVW" and "Colour space = RGBW".</td></tr>
</table>

<table>
<tr><th>Value (W)</th><th>0 ... 100 %</th></tr>
<tr><td colspan="2">This parameter determines the object values of the following output objects, when the button is pressed:
– "White level (W)
Visible only if "Function = 6-byte RGBW/HSVW" and "Colour space = HSVW".</td></tr>
</table>

<table>
<tr><th>Colour temperature (1000, 1100, ..., 10000 K)</th><th>1000, 1100, ..., 2700, ..., 10000</th></tr>
<tr><td colspan="2">This parameter determines the colour temperature of the object value when the button is pressed.
This parameter is only visible if "Function = 6-byte" and "Value range = 6-byte temperature value + brightness".</td></tr>
</table>

<table>
<tr><th>Brightness</th><th>0 ... 100 %</th></tr>
<tr><td colspan="2">This parameter determines the brightness of the object value when the button is pressed.
This parameter is only visible if "Function = 6-byte" and "Value range = 6-byte temperature value + brightness".</td></tr>
</table>

<table>
<tr><th>Time frame</th><th>0 ... 100 min | 0 ... 1 ... 59 s | 0 ... 900 ms</th></tr>
<tr><td colspan="2">This parameter determines the time period in which the actuator adjusts the colour temperature and brightness after the button has been pressed.
This parameter is only visible if "Function = 6-byte" and "Value range = 6-byte temperature value + brightness".</td></tr>
</table>

15.5.6 Object list

The following communication objects are available for the individual buttons or rockers, depending on the set operating concept. The name of the object corresponds to the selection of the operating concept and can be adjusted by the parameter "Name of ..." .

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Value transmitter 0...255	Button/rocker *n* - output	1 bytes	5,010	C, -, -, T, -

1-byte object for the transmission of values from 0 to 255.

ℹ These objects are only visible when:

- "Function = 1 byte" and
- "Value range = 1 bytes (0...255)"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Value transmitter 0…100 %	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting values from 0 to 100%.

ℹ These objects are only visible when:

- "Function = 1 byte" and
- "Value range = 1 byte (0...100%)"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Value transmitter -128...127	Button/rocker *n* - output	1 bytes	6,010	C, -, -, T, -

1-byte object for the transmission of values from -128 to 127.

ℹ These objects are only visible when:

- "Function = 1 byte" and
- "Value range = 1 bytes (-128...127)"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Value transmitter 0…255 %	Button/rocker *n* - output	1 bytes	5,004	C, -, -, T, -

1-byte object for transmitting values from 0 to 255%.

ℹ These objects are only visible when:

- "Function = 1 byte" and
- "Value range = 1 byte (0...255%)"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Value transmitter 0...65535	Button/rocker *n* - output	2 bytes	7,001	C, -, -, T, -

2-byte object for the transmission of values from 0 to 65535.

ℹ These objects are only visible when:

– "Function = 2 byte" and

– "Value range = 2 bytes (0...65535)"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Value transmitter -32768...32767	Button/rocker *n* - output	2 bytes	8,001	C, -, -, T, -

2-byte object for the transmission of values from -32768 to 32767.

ℹ These objects are only visible when:

– "Function = 2 byte" and

– "Value range = 2 bytes (-32768...32767)"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Temperature value transmitter	Button/rocker *n* - output	2 bytes	9,001	C, -, -, T, -

2-byte object for transmitting temperature values from 0 to 40 °C.

ℹ These objects are only visible when:

– "Function = 2 byte" and

– "Value range = 2-byte temperature value"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Brightness value transmitter	Button/rocker *n* - output	2 bytes	9,004	C, -, -, T, -

2-byte object for transmitting brightness values from 0 to 1500 Lux.

ℹ These objects are only visible when:

– "Function = 2 byte" and

– "Value range = 2-byte brightness value"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Colour temperature value transmitter	Button/rocker *n* - output	2 bytes	7,600	C, -, -, T, -

2-byte object for transmitting colour temperature values from 1000 to 10000 Kelvin.

ℹ These objects are only visible when:

- "Function = 2 byte" and
- "Value range = 2-byte colour temperature value"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Colour value transmitter RGB	Button/rocker *n* - output	3 bytes	232,600	C, -, -, T, -

3-byte object for transmitting the colour information red, green and blue in one communication object.

ℹ These objects are only visible when:

- "Function = 3-byte",
- "Value range = 3-byte colour value RGB/HSV",
- "Colour space = RGB" and
- "Communication = Combi object"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Colour value transmitter RGBW	Button/rocker *n* - output	6 bytes	251,600	C, -, -, T, -

6-byte object for sending the colour information red, green, blue and white in one communication object.

ℹ These objects are only visible when:

- "Function = 6-byte",
- "Value range = 6-byte colour value RGBW/HSVW",
- "Colour space = RGBW" and
- "Communication = Combi object"

Object no.	Function	Name	Type	DPT	Flag
128, 140, 152, 164, 200, 212	Colour value transmitter Red	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the red colour value from 0 to 100 per cent.

ⓘ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW",
- "Colour space = RGB or RGBW" and
- "Communication = Individual objects"

Object no.	Function	Name	Type	DPT	Flag
129, 141, 153, 165, 201, 213	Colour value transmitter Green	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the green colour value from 0 to 100 per cent.

ⓘ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW",
- "Colour space = RGB or RGBW" and
- "Communication = Individual objects"

Object no.	Function	Name	Type	DPT	Flag
130, 142, 154, 166, 202, 214	Colour value transmitter Blue	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the blue colour value from 0 to 100 per cent.

ⓘ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW",
- "Colour space = RGB or RGBW" and
- "Communication = Individual objects"

Object no.	Function	Name	Type	DPT	Flag
131, 143, 155, 167, 203, 215	Colour value transmitter White	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the white colour value from 0 to 100 per cent.

ℹ These objects are only visible when:

- "Function = 6-byte",
- "Value range = 6-byte colour value RGBW/HSVW",
- "Colour space = RGBW" and
- "Communication = Individual objects"

Object no.	Function	Name	Type	DPT	Flag
128, 140, 152, 164, 200, 212	Colour hue (H)	Button/rocker *n* - output	1 bytes	5,003	C, -, -, T, -

1-byte object for sending the colour hue (H) from 0 ... 360°.

ℹ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW" and
- "Colour space = HSV or HSVW"

Object no.	Function	Name	Type	DPT	Flag
129, 141, 153, 165, 201, 213	Saturation (S)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the saturation (S) from 0 to 100 per cent.

ℹ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW" and
- "Colour space = HSV or HSVW"

Object no.	Function	Name	Type	DPT	Flag
130, 142, 154, 166, 202, 214	Brightness (V)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the brightness (V) from 0 to 100 per cent.

ℹ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW" and
- "Colour space = HSV or HSVW"

Object no.	Function	Name	Type	DPT	Flag
131, 143, 155, 167, 203, 215	White level (W)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the white value (W) from 0 to 100 per cent.

ℹ These objects are only visible when:

- "Function = 6-byte",
- "Value range = 6-byte colour value RGBW/HSVW" and
- "Colour space = HSVW"

Object no.	Function	Name	Type	DPT	Flag
127, 139, 151, 163, 199, 211	Colour temperature value transmitter + brightness	Button/rocker *n* - output	6 bytes	249,600	C, -, -, T, -

6-byte object for sending the time window, colour temperature and brightness.

ℹ These objects are only visible when:

- "Function = 6 byte" and
- "Value range = 6-byte colour temperature value + brightness".

15.6 Scene extension

For each rocker or button with the function set to "scene extension unit", the ETS indicates the "Function" parameter which distinguishes between the following settings:

- "Scene extension without storage function",
- "Scene extension with storage function",

In the scene extension function, the device transmits a preset scene number (1…64) via the "scene extension" communication object to the bus after a button-press. This feature permits recalling scenes stored in other devices and also storing them, if the storage function is used.

Function for the setting "… Scene extension without storage function":

- A button actuation results in a simple recall of the scene.
- A long button-press has no further or additional effect.

Function for the setting "… Scene extension with storage function":

- A button actuation of less than one second results in a simple recall of the scene.
- A button-press of more than five seconds, generates a storage instruction. In the scene extension function, a storage telegram is in this case transmitted to the bus. The internal scene is stored. The internal scene control module will then request the current scene values for the actuator groups used from the bus.

ℹ A button actuation lasting between one and five seconds will be discarded as invalid.

15.6.1 Table of parameters

The following parameters are available for the individual buttons, depending on the set operating concept. The default settings change in accordance with the set operating concept.

Function	**Scene extension without storage function** Scene extension with storage function
This parameter defines the functionality of the scene extension. If the device is used as a scene extension, the scenes can either be stored in one or several other KNX devices (e.g. light scene push button sensor). During a scene recall or in a storage function, the device transmits a telegram with the respective scene number via the extension object of the button.	

Scene number (1 … 64)	**1**...64
In accordance with the KNX standard, objects with data type 18.001 "Scene Control" can retrieve or store up to 64 scenes by their numbers. The parameter defines the scene number to be transmitted when the button is pressed.	

15.6.2 Object list

The following communication objects are available for the individual buttons or rockers, depending on the set operating concept. The name of the object corresponds to the selection of the operating concept and can be adjusted by the parameter "Name of ..." .

Object no.	Function	Name	Type	DPT	Flag
224, 227, 230, 233, 242, 245	Scene extension	Button/rocker *n* - output	1 bytes	18,001	C, -, -, T, -
1-byte object for recalling or for storing one of 64 scenes max. from a scene push button sensor.					

15.7 2-channel operation

The "2-channel operation" function allows two function channels to be operated with a single press of a button. In some situations it is desirable to control two different functions with a single press of a button and to transmit different telegrams.

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 functions are available:

- 1-bit switching
- Value transmitter 1 byte (0...255)
- Value transmitter 1 byte (0...100%)
- Value transmitter 1 byte (-128...127)
- Value transmitter 1 byte (0...255%)
- Value transmitter 2 byte (0...65535)
- Value transmitter 2 byte (-32768...32767)
- Value transmitter 2-byte temperature value
- Value transmitter 2-byte brightness value
- Value transmitter 2 byte colour temperature value
- Value transmitter 3 byte colour value RGB/HSV
- Value transmitter 6 byte colour value RGBW/HSVW
- Value transmitter 6 byte colour temperature value + brightness
- Recalling scene (external)

The object value that the device is to transmit on a button actuation can be selected depending on the selected function.

The "1 bit switching" type permits selecting whether an ON or an OFF telegram is to be transmitted or whether the object value is to be switched over (TOGGLE) and transmitted on the press of a button.

With parameterization as a value transmitter ("1 byte ..." or "2 byte ...") the object value can be selected within the value range.

With parameterization as a value transmitter ("3 byte ...") the RGB or HSV object values can be set via a colour picker.

With parameterization as a value transmitter (6-byte colour value ...") the RGB or HSV object values can be set via a colour picker. The object value W is parameterised using a separate slider.

When parameterising as a value transmitter (6-byte colour temperature value + brightness"), the object values colour temperature and brightness as well as a time window can be set.

"Recalling scene (...)" can be used to set the scene number to be transmitted to the bus when a button is pressed.

Unlike in the other rocker and button functions, the application program assigns the "Telegram acknowledge" function instead of the "Button-press display" function to the status LED. In this mode, the status LED lights up for approx. 250 ms with each telegram transmitted.

Operation concept channel 1 or channel 2

In this operation concept, exactly one telegram will be transmitted on each press of a button.

- A brief press causes the device to transmit the telegram channel 1.
- A long press causes the device to transmit the telegram for channel 2.

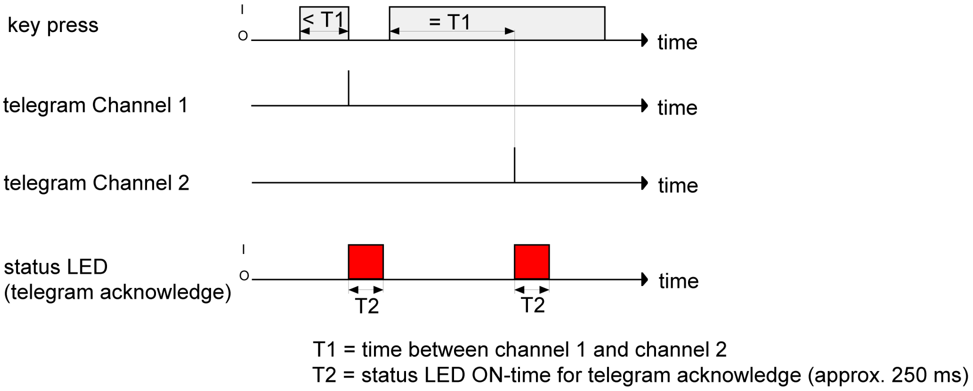


Image 91: Example of operation concept "Channel 1 or Channel 2"

The time required for distinguishing between a short and a long operation is defined by the parameter "Time between channel 1 and channel 2". If the button is pressed for less than the configured time, only the telegram to channel 1 is transmitted. If the length of the button-press exceeds the time between channel 1 and channel 2, only the telegram to channel 2 will be transmitted. This concept provides the transmission of only one channel. To indicate that a telegram has been transmitted, the status LED lights up for approx. 250 ms in the "Telegram acknowledge" setting.
In this operation concept, the push-button sensor will not transmit a telegram immediately after the rocker has been depressed.

Operation concept channel 1 and channel 2

With this operation concept, one or alternatively two telegrams can be transmitted on each button-press.

- A brief press causes the device to transmit the telegram channel 1.
- A long press causes the device to transmit first the telegram for channel 1 and then the telegram for channel 2.

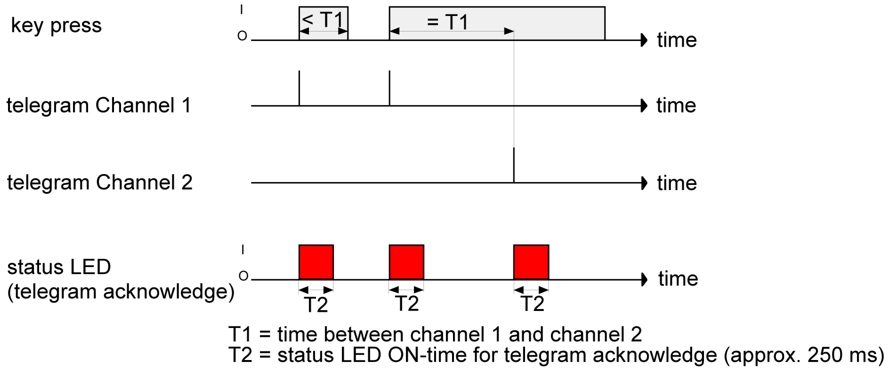


Image 92: Example for operation concept "Channel 1 and channel 2"

The time required for distinguishing between a short and a long operation is defined by the parameter "Time between channel 1 and channel 2". In this operation concept, a button-press sends this telegram is immediately to channel 1. If the button is held depressed for the configured time, the telegram for the second channel is transmitted as well. If the button is released before the time has elapsed, no further telegram will be transmitted. This operation concept, too, offers the configurable possibility of having the transmission of a telegram signalled by the status LED (setting "Telegram acknowledge").

15.7.1 Table of parameters

The following parameters are available for the individual buttons, depending on the set operating concept. The default settings change in accordance with the set operating concept.

Operation concept	**Channel 1 or channel 2** Channel 1 and channel 2
This is where the 2-channel operation concept is defined. If the setting "channel 1 or channel 2" is selected, the device decides dependent on the button-press duration, which of the channels will be used. If the setting "channel 1 and channel 2" is selected, the device transmits only the telegram of channel 1 on a short button-press and both telegrams on a sustained button-press.	

Function channel 1 (Function channel 2)	No function 1-bit switching 1 byte (0...255) 1 byte (0...100%) 1 byte (-128...127) 1 byte (0...255%) 2 byte (0...65535) 2 byte (-32768...32767) 2 byte temperature value 2 byte brightness value 2 bytes colour temperature value 3-bytes colour value RGB/HSV 6-bytes colour value RGBW/HSVW 6 bytes colour temperature value + brightness Recalling scene (external)
This parameter defines the channel function and specifies which other parameters and which communication objects are to be displayed for channel 1 or channel 2 respectively.	

Colour space	**RGB** HSV
This parameter defines the colour space of the function. With RGB, communication can take place via individual objects or via a combination object. With HSV, communication takes place via individual objects. Visible only if "Function channel 1 (2) = 3-byte colour value RGB/HSV".	

Communication	**Single object** Kombi object
When the colour space is set to RGB, communication via the bus can take place either via individual objects (red, green, blue) or via a combination object (RGB). Visible only if "Function channel 1 (2) = 3-byte colour value RGB/HSV".	

Colour space	**RGBW** HSVW
This parameter defines the colour space of the function. With RGBW, communication can take place via individual objects or via a combination object. With HSVW, communication takes place via individual objects. Visible only if "Function channel 1 (2) = 6-byte colour value RGBW/HSVW".	

Communication	**Single object** Kombi object
When the colour space is set to RGBW, communication via the bus can take place either via individual objects (red, green, blue, white) or via a combination object (RGBW). Visible only if "Function channel 1 (2) = 6-byte colour value RGBW/HSVW".	

Time between channel 1 and channel 2	0...**3**...25 s | 0...990 ms
Depending on the selected operation concept, this parameter defines the interval at which the device transmits the telegram for channel 1 and the telegram for channel 2. A time from 100 ms to 25.5 s can be set.	

Command for channel 1 (2)	ON OFF **TOGGLE**
This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = 1 bit switching".	

Value (0...255) for channel 1 (2)	**0**...255
This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = 1-byte (0...255)".	

Value (0...100%) for channel 1 (2)	**0**...100
This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = 1-byte (0...100%)".	

Value (-128...127) for channel 1 (2)	-128...**0**...127
This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = 1-byte (-128...127)".	

Value (0...255%) for channel 1 (2)	**0**...255
This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = 1-byte (0...255%)".	

Value (0...65535) for channel 1 (2)	**0**...65535
This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = 2-byte (0...65535)".	

Value (-32768...32767) for channel 1 (2)	-32768...**0**...32767
This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = 2-byte (-32768...32767)".	

Temperature value (0…40 °C) for channel 1 (2)	0...**20**...40
This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = 2-byte temperature value".	

Brightness value (0, 50, …, 1500 lux) for channel 1 (2)	0...**300**...1500
This parameter defines the object value transmitted to the bus when the button is pressed. Visible only if "Function channel 1 (2) = 2-byte brightness value".	

Value (1000, 1100, ..., 10000) for channel 1 (2)	1000, 1100, ...**2700,**..., 10000
This parameter determines the colour temperature of the object value when the button is pressed. It is only visible with "Function channel 1 (2) = 2 byte colour temperature value".	

Value (RGB/HSV) for channel 1 (2)	#000000 ... #FFFFFF

This parameter determines the object values of the following output objects when the button is pressed:

- "Channel *n* colour value transmitter red", "Channel *n* colour value transmitter green", "Channel *n* colour value transmitter blue" or
- "Channel *n* colour value transmitter RGB", "Channel *n* colour value transmitter RGBW"

  or
- "Channel *n* colour hue (H)", "Channel *n* saturation (S)", "Channel *n* brightness (V)"

The parameter is only visible with "Function channel 1 (2) = 3 byte colour value RGB/HSV or 6 byte colour value RGBW/HSVW".

The value (RGB/HSV) is configured by means of a colour picker.

With the "6-byte colour value RGBW / HSVW" function, the W-value is configured using a separate slider.

Value (W) for channel 1 (2)	**0** ... 255

This parameter determines the object values of the following output objects when the button is pressed:

- "Channel *n* colour value transmitter white" or
- "Channel *n* colour value transmitter RGBW"

The parameter is only visible with "Function channel 1 (2) = 2-byte colour temperature value".

Value (W) for channel 1 (2)	**0** ... 100 %

This parameter determines the object values of the following output objects when the button is pressed:

- "Channel *n* white value (W)"

The parameter is only visible with "Function channel 1 (2) = 2-byte colour temperature value".

Colour temperature	1000, 1100, ..., **2700**, ..., 10000

This parameter determines the colour temperature of the object value when the button is pressed.

The parameter is only visible with "Function channel 1 (2) = 6-byte colour temperature value + brightness".

Brightness	**0** ... 100 %

This parameter determines the brightness of the object value when the button is pressed.

The parameter is only visible with "Function channel 1 (2) = 6-byte colour temperature value + brightness".

Time frame	0 ... 100 min | 0 ... 1 ... 59 s | 0 ... 900 ms
This parameter determines the time period in which the actuator adjusts the colour temperature and brightness after the button has been pressed. The parameter is only visible with "Function channel 1 (2) = 6-byte colour temperature value + brightness".	

Scene number (1…64) for channel 1 (2)	1...64
This parameter defines the object value transmitted to the bus when the button is pressed. It is only visible if "Function channel 1 (2) = Recalling scene (external)".	

15.7.2 Object list

The following communication objects are available for the individual buttons or rockers, depending on the set operating concept. The name of the object corresponds to the selection of the operating concept and can be adjusted by the parameter "Name of ..." .

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 switching	Button/rocker *n* - output	1-bit	1,001	C, -,W, T, U
1-bit object for transmitting switching telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 switching	Button/rocker *n* - output	1-bit	1,001	C, -,W, T, U
1-bit object for transmitting switching telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 value 0...255	Button/rocker *n* - output	1 bytes	5,010	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 value 0...255	Button/rocker *n* - output	1 bytes	5,010	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 value 0...100 %	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 value 0...100 %	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 value -128...127	Button/rocker *n* - output	1 bytes	6,010	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 value -128...127	Button/rocker *n* - output	1 bytes	6,010	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 value 0...255 %	Button/rocker *n* - output	1 bytes	5,004	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 value 0...255 %	Button/rocker *n* - output	1 bytes	5,004	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 value 0...65535	Button/rocker *n* - output	2 bytes	7,001	C, -, -, T, -
2-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 value 0...65535	Button/rocker *n* - output	2 bytes	7,001	C, -, -, T, -
2-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 value -32768...32767	Button/rocker *n* - output	2 bytes	8,001	C, -, -, T, -
2-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 value -32768...32767	Button/rocker *n* - output	2 bytes	8,001	C, -, -, T, -
2-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 temperature value	Button/rocker *n* - output	2 bytes	9,001	C, -, -, T, -
2-byte object for transmitting temperature values on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 temperature value	Button/rocker *n* - output	2 bytes	9,001	C, -, -, T, -
2-byte object for transmitting temperature values on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 brightness value	Button/rocker *n* - output	2 bytes	9,004	C, -, -, T, -
2-byte object for transmitting brightness values on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 brightness value	Button/rocker *n* - output	2 bytes	9,004	C, -, -, T, -
2-byte object for transmitting brightness values on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 colour value transmitter	Button/rocker *n* - output	2 bytes	7,600	C, -, -, T, -
2-byte object for transmitting colour temperature values from 1000 to 10000 Kelvin on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 colour value transmitter	Button/rocker *n* - output	2 bytes	7,600	C, -, -, T, -
2-byte object for transmitting colour temperature values from 1000 to 10000 Kelvin on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 colour value transmitter RGB	Button/rocker *n* - output	3 bytes	232,600	C, -, -, T, -
3-byte object for transmitting the colour information red, green and blue in a communication object on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 colour value transmitter RGB	Button/rocker *n* - output	3 bytes	232,600	C, -, -, T, -
3-byte object for transmitting the colour information red, green and blue in a communication object on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 colour value transmitter RGBW	Button/rocker *n* - output	6 bytes	251,600	C, -, -, T, -
6-byte object for transmitting the colour information red, green, blue and white in a communication object on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 colour value transmitter RGBW	Button/rocker *n* - output	6 bytes	251,600	C, -, -, T, -
6-byte object for transmitting the colour information red, green, blue and white in a communication object on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
249, 262, 275, 288, 327, 340	Channel 1 colour value transmitter Red	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value red from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
253, 266, 279, 292, 331, 344	Channel 2 colour value transmitter Red	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value red from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
250, 263, 276, 289, 328, 341	Channel 1 colour value transmitter Green	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value green from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
254, 267, 280, 293, 332, 345	Channel 2 colour value transmitter Green	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value green from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
251, 264, 277, 290, 329, 342	Channel 1 colour value transmitter Blue	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value blue from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
255, 268, 281, 294, 333, 346	Channel 2 colour value transmitter Blue	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value blue from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
252, 265, 278, 291, 330, 343	Channel 1 colour value transmitter white	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value white from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
256, 269, 282, 295, 334, 347	Channel 2 colour value transmitter white	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value white from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
249, 262, 275, 288, 327, 340	Channel 1 colour hue (H)	Button/rocker *n* - output	1 bytes	5,003	C, -, -, T, -
1-byte object for sending the colour hue (H) from 0 ... 360° on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
253, 266, 279, 292, 331, 344	Channel 2 colour hue (H)	Button/rocker *n* - output	1 bytes	5,003	C, -, -, T, -
1-byte object for sending the colour hue (H) from 0 ... 360° on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
250, 263, 276, 289, 328, 341	Channel 1 saturation (S)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the saturation (S) from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
254, 267, 280, 293, 332, 345	Channel 2 saturation (S)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the saturation (S) from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
251, 264, 277, 290, 329, 342	Channel 1 brightness (V)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the brightness value (V) from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
255, 268, 281, 294, 333, 346	Channel 2 brightness (V)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the brightness value (V) from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
252, 265, 278, 291, 330, 343	Channel 1 white level (W)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the white value (W) from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
256, 269, 282, 295, 334, 347	Channel 2 white level (W)	Button/rocker *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the white value (W) from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 colour value transmitter + brightness	Button/rocker *n* - output	6 bytes	249,600	C, -, -, T, -
6-byte object for transmitting the time window, colour temperature and brightness on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 1 colour value transmitter + brightness	Button/rocker *n* - output	6 bytes	249,600	C, -, -, T, -
6-byte object for transmitting the time window, colour temperature and brightness on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
247, 260, 273, 286, 325, 338	Channel 1 scene (external) 1…64	Button/rocker *n* - output	1 bytes	18,001	C, -, -, T, -
1-byte object for transmitting scene values on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
248, 261, 274, 287, 326, 339	Channel 2 scene (external) 1…64	Button/rocker *n* - output	1 bytes	18,001	C, -, -, T, -
1-byte object for transmitting scene values on channel 2 if 2-channel operation is activated.					

15.8 Controller extension

The "controller extension" button or rocker function can be used to control a KNX room temperature controller.

The controller extension itself is not involved in the regulating process. With it, the user can operate the single-room regulation from different places in the room. It can also be used to adjust central heating control devices which are located, for instance, in a sub-distribution device.

Typical KNX room temperature controllers generally offer different ways of influencing the room temperature control:

– Operating mode switch:
  Switching over between different modes of operation (e.g. "Comfort", "Night" ...) with different setpoint temperatures assigned to each mode by the controller.
– Presence function:
  Signalling the presence of a person in a room. The signalling may also be combined with a configured switchover in the mode of operation.
– Setpoint shift:
  Adjustment of the setpoint temperature via a temperature offset (DPT 9.002) or via levels (DPT 6.010).

The controller extension is operated using the push button functions of the device. In this way, it is possible to completely control a room temperature controller by changing the operating mode, by predefining the presence function or by readjusting the setpoint shift.

In addition, the device can – independent of the controller extension function – indicate the state of one or more room temperature controllers with the status LEDs of the rockers or buttons. This feature permits the indication of operating modes or the bit-oriented evaluation of different status objects of controllers. In case of the controller extension functions "Setpoint shift" or "Presence function", the status LEDs can also signal the state of the corresponding functions directly.

15.8.1 Operating mode switchover

Switchover of the controller operating mode can be effected in accordance with the standard function block for room temperature controllers defined in the KNX handbook using two 1-byte communication objects. The operating mode can be switched over with the normal and with the forced objects. The "Operating mode switchover" object offers a selection between the following modes:

- Comfort mode
- Standby mode
- Night operation
- Frost/heat protection mode

The "Forced object operating mode" communication object has a higher priority. It permits forced switching between the following modes of operation:

- Auto (normal operating mode switchover)
- Comfort mode
- Standby mode
- Night operation
- Frost/heat protection mode

The operating mode transmitted to the bus on a button press of the controller extension is defined by the parameter "Operating mode on pressing". Depending on the parameterized operating concept, either a button press activates one of the above modes (with the "rocker function" and "button function" operating concepts), or each button press toggles between two or three modes (only with the "rocker function" operating concept).

ℹ Notes on multiple selection:
In order to ensure that a change-over from one operating mode to another works properly even from different locations, the operating mode objects of the controller and those of all controller extensions must be interlinked and have their "Write" flag set. In the objects concerned, this flag is set by default
By checking the linked operating mode switchover feedback object, the controller extension knows which of the possible operating modes is active. Based on this information, the device switches over into the next operating mode in sequence when a button is pressed. In the event that none of the possible operating modes is active, the next operating mode in the sequence is activated.
As far as switching over between the forced operating modes and "Auto" is concerned, the device switches into the "Auto" operating mode when none of the configured operating modes is active.

ℹ If a status LED is to indicate the current operating mode, the status LED function must be programmed for "Operating mode indication" and its status object be linked with the corresponding group address for operating mode changeover with normal or high priority.

15.8.2 Presence function

All operating areas with a function set to "Presence function" have the two communication objects "Presence function" and "Presence function feedback". The parameter "Presence function on pressing" defines the object value transmitted to the bus on pressing a button.

In order to ensure that the object value transmitted in the "Presence TOGGLE" setting is always the correct one, the presence object of the room temperature controller and the feedback objects of the controller extensions must be interlinked and have their "Write" flag set. In the extension objects concerned, this flag is set by default.

The status LED of a presence function button can directly indicate the presence status (setting "Presence status indicator").

15.8.3 Setpoint shift

The setpoint shift is another available function of the controller extension. It makes use of either two 2-byte communication objects with datapoint type 9.002 or two 1-byte communication objects with datapoint type 6.010 (integer with sign).

This extension function allows shifting of the basic setpoint for the temperature on a room temperature controller by pressing a button. Operation of the extension is generally the same as the operation of the main controller. A button configured as a setpoint shifting button reduces or increases the setpoint shift value on each press by one step respectively. The direction of the value adjustment is defined by the parameters "Temperature difference on pressing" or "Setpoint shift on pressing".

The status LED of a setpoint shifting button can directly indicate the setpoint shifting status (setting "Setpoint value shift indicator").

Type of setpoint shift

The device provides two options for setpoint shifting. Depending on the setting of the parameter "Type of setpoint shift", the shift takes place via the 2-byte communication object "Setpoint shift specification" (acc. to KNX DPT 9.002) or via the 1-byte-communication object "Setpoint shift specification" (acc. to KNX DPT 6.010).

The setting "Via offset (DPT 9.002)" defines the temperature difference in Kelvin by which the setpoint temperature will be shifted up or down when the button is pressed. For a setpoint value shift, the controller extension makes use of the two communication objects "Setpoint shift specification" and "Current setpoint shift". The "Current setpoint shift" communication object informs the extension about the current state of the room temperature controller. Based on this value and the respective parameter, the controller extension determines the new level size which it transmits via the "Setpoint shift specification" communication object to the room temperature controller.

With the "Via levels (DPT 6.010)" setting, only the direction of the setpoint shift on the extension is defined. For a setpoint value shift, the controller extension makes use of the two communication objects "Setpoint shift specification" and "Current setpoint shift". The "Current setpoint shift" communication object informs the extension about the current state of the room temperature controller. Based on this value and the respective parameter, the controller extension determines the new level size which it transmits via the "Setpoint shift specification" communication object to the room temperature controller.

Communication with main controller

In order to enable the device to effect a setpoint shift in a room temperature controller, the controller must have input and output objects for setpoint shifting. In this case, the output object of the controller must be linked with the input object of the extension device and the input object of the controller must be linked with the output object of the extension via an independent group address.

All objects are of the same datapoint type and have the same value range. A setpoint shift is interpreted by count values: a shift in positive direction is expressed by positive values whereas a shift in negative direction is represented by negative object values. An object value of "0" means that no setpoint shift has been activated.

Via the "Current setpoint shift" object of the controller extensions, which is linked with the room temperature controller, the extensions are enabled to determine the current setpoint shift position. Starting from the value of the communication object, each button-press on an extension will adjust the setpoint in the configured direction. Each time the setpoint is adjusted, the new shift is transmitted to the room temperature controller via the "Controller extension setpoint value specification" object of the controller extension. The controller itself checks the received value for the minimum and maximum temperature limits (see controller documentation) and adjusts the new setpoint shift if the values are valid. When the new count value is accepted as valid, the controller transfers this value to its output object for setpoint shifting and retransmits the value to the extension as feedback.

Due to the standard data point type used as the output and input object of the controller extension, each extension unit is able to determine whether a shift took place, in which direction it took place and by which value (DPT 9.002) or by how many levels (DPT 6.010) the setpoint was shifted.

ℹ In "Via levels (DPT 6.010)" function, the weighting of the respective level is done by the controller itself.

ℹ This requires that the communication objects are connected on all controller extensions and the controller. The feedback information from the controller enables the extension to continue the adjustment anytime at the right point.

15.8.4 Table of parameters

The following parameters are available for the individual buttons, depending on the set operating concept. The default settings change in accordance with the set operating concept.

Function	**Operating mode switchover** Forced oper. mode switchover Presence function Setpoint shift
A controller extension can optionally switch over the operating mode with normal or high priority (forced), change the presence state or change the current room temperature setpoint value. With regard to the setting of this parameter, the ETS shows further parameters.	

Operating mode on pressing	**Comfort mode** Standby mode Night operation Frost/heat protection mode Comfort mode -> Standby mode ->* Comfort mode -> Night mode ->* Standby mode -> Night mode ->* Comfort mode -> Standby mode -> Night mode ->*
If the controller extension is to change over the operating mode of the room temperature controller with normal priority, the extension can – when operated – either switch on a defined operating mode or change over between different operating modes. This parameter is only visible if "Function = operating mode switchover". * Only for operation concept = button function The options marked with a * are only available if the operating concept is set to the button function. i Toggling between operating modes (identified by "->") is only possible if the object value has been received via the "Operating mode switchover feedback" object.	

Forced operating mode on pressing	Auto (Normal operating mode change-over) **Comfort mode** Standby mode Night operation Frost/heat protection mode Comfort mode -> Standby mode ->* Comfort mode -> Night mode ->* Standby mode -> Night mode ->* Comfort mode -> Standby mode -> Night mode ->* Auto -> Comfort mode ->* Auto -> Standby mode ->* Auto -> Night mode ->* Auto -> Frost/heat protection mode ->*

If the controller extension is to change over the operating mode of the room temperature controller with high priority, the extension can – when operated – either enable change-over with normal priority (Auto), switch on a defined operating mode with high priority or change over between different operating modes.

This parameter is only visible if "Function = forced operating mode switchover".

* Only for operation concept = button function
The options marked with a * are only available if the operating concept is set to the button function.

ℹ Toggling between forced object operating modes (identified by "->") is only possible if the object value has been received via the "Forced object operating mode feedback" object.

Presence function on pressing	Presence OFF Presence ON **Presence TOGGLE**

On pressing a button, the controller extension can switch the presence state of the room temperature controller either on or off in a defined way or change over between both states ("Presence TOGGLE").

This parameter is only visible if "Function = presence function".

Type of setpoint shift	**Via offset (DPT 9.002)** Via levels (DPT 6.010)

Depending on the setting of the parameter "Type of setpoint shift", the shift takes place via the 2-byte communication object "Setpoint shift specification" (acc. to KNX DPT 9.002) or via the 1-byte-communication object "Setpoint shift specification" (acc. to KNX DPT 6.010).

This parameter is only visible if "Function = Setpoint shift".

Temperature difference on pressing	-2 K -1.5 K -1 K -0.5 K 0.5 K 1 K 1.5 K 2 K
The temperature difference is defined in Kelvin here by which the setpoint temperature will be shifted up or down when the button is pressed. For a setpoint value shift, the controller extension makes use of the two communication objects "Setpoint shift specification" and "Current setpoint shift". The "Current setpoint shift" communication object informs the extension about the current state of the room temperature controller. Based on this value and the respective parameter, the controller extension determines the new level size which it transmits via the "Setpoint shift specification" communication object to the room temperature controller. This parameter is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via offset".	

Setpoint shift on pressing	Reduce setpoint value (level size) **Increase setpoint (level size)**
This parameter defines the direction of the setpoint shift on the extension. For a setpoint value shift, the controller extension makes use of the two communication objects "Setpoint shift specification" and "Current setpoint shift". The "Current setpoint shift" communication object informs the extension about the current state of the room temperature controller. Based on this value and the respective parameter, the controller extension determines the new level size which it transmits via the "Setpoint shift specification" communication object to the room temperature controller. This parameter is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via levels".	

15.8.5 Object list

The following communication objects are available for the individual buttons or rockers, depending on the set operating concept. The name of the object corresponds to the selection of the operating concept and can be adjusted by the parameter "Name of ..." .

Object no.	Function	Name	Type	DPT	Flag
352, 359, 366, 373, 394, 401	Operating mode switchover	Button/rocker n - controller extension - output	1 bytes	20,102	C, -, -, T, -
1-byte object for changing over a room temperature controller between the Comfort, Standby, Night and Frost/heat protection operating modes. This object is only visible if "Function = operating mode change-over".					

Object no.	Function	Name	Type	DPT	Flag
353, 360, 367, 374, 395, 402	Operating mode switchover feedback	Button/rocker n - controller extension - input	1 bytes	20,102	C, -,W, -, U
1-byte object for receiving the operating mode of a room temperature controller. This object is only visible if "Function = operating mode change-over".					

Object no.	Function	Name	Type	DPT	Flag
352, 359, 366, 373, 394, 401	Operating mode forced-control	Button/rocker n - controller extension - output	1 bytes	20,102	C, -, -, T, -
1-byte object for changing over a room temperature controller under forced control between the Automatic, Comfort, Standby, Night and Frost / heat protection operating modes This object is only visible if "Function = forced operating mode change-over".					

Object no.	Function	Name	Type	DPT	Flag
353, 360, 367, 374, 395, 402	Forced object operating mode feedback	Button/rocker n - controller extension - input	1 bytes	20,102	C, -,W, -, U
1-byte object for receiving the operating mode of a room temperature controller. This object is only visible if "Function = forced operating mode change-over".					

Object no.	Function	Name	Type	DPT	Flag
352, 359, 366, 373, 394, 401	Presence function	Button/rocker n - controller extension - output	1-bit	1,018	C, -, -, T, -
1-bit object for changing over the presence status of a room temperature controller. This object is only visible if "Function = presence function".					

Object no.	Function	Name	Type	DPT	Flag
353, 360, 367, 374, 395, 402	Presence function feedback	Button/rocker n - controller extension - input	1-bit	1,018	C, -,W, -, U

1-bit object for receiving the presence status of a room temperature controller.

This object is only visible if "Function = presence function".

Object no.	Function	Name	Type	DPT	Flag
352, 359, 366, 373, 394, 401	Preset setpoint shifting	Button/rocker n - controller extension - output	2 bytes	9,002	C, -, -, T, -

2-byte object for presetting a basic setpoint shift in Kelvin. The value "0" means that no shift is active . The values can be specified between -670760 K and 670760 K.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via offset (DPT 9.002)".

Object no.	Function	Name	Type	DPT	Flag
353, 360, 367, 374, 395, 402	Current setpoint shifting	Button/rocker n - controller extension - input	2 bytes	9,002	C, -,W, -, U

2-byte object for receiving the feedback from the current basic setpoint shift in Kelvin.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via offset (DPT 9.002)".

Object no.	Function	Name	Type	DPT	Flag
352, 359, 366, 373, 394, 401	Preset setpoint shifting	Button/rocker n - controller extension - output	1 bytes	6,010	C, -, -, T, -

1-byte object for presetting a basic setpoint shift. The value "0" means that no shift is active . The value is depicted in a two's complement in the positive or negative direction.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via levels (DPT 6.010)".

Object no.	Function	Name	Type	DPT	Flag
353, 360, 367, 374, 395, 402	Current setpoint shifting	Button/rocker n - controller extension - input	1 bytes	6,010	C, -,W, -, U

1-byte object for receiving the feedback from the current basic setpoint shift.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via levels (DPT 6.010)".

15.9 Status LED

Each operating area of the basic device has a status LED.

The 1-gang device variant has one status LED (see figure 1) and the 2-gang device variant has 2 status LEDs (see figure 2).

The configurable functions of the status LED adapt to the configured functions of the rockers or buttons.

ℹ A status LED can either be assigned to a rocker or two buttons.

The devices RF operating top unit differ in the configuration of the status LED as follows.

Device variant	Status LED
RF operating top unit, 1-gang	A three-colour status LED (RGB)
RF operating top unit, 2-gang	Two three-colour status LEDs (RGB)

Independent functions of the status LED

A variety of functions of the status LED can be configured independently of the configured rocker or button function. These functions either define a fixed lighting status of the status LED or have a separate communication object.

The following functions can always be configured for each Status LED:

- always OFF
- always ON
- Control via separate LED object
- Operating mode display
- Controller status indication

Dependent functions of the status LED

A variety of functions of the status LED can be configured depending on the configured rocker or button function.

The following functions are configurable for each Status LED depending on the configured rocker or button function.

- Button-press display
- Telegram acknowledgment
- Status indication
- inverted status display
- Presence status
- Setpoint value shift display

15.9.1 Basic functions

"always OFF" or "always ON"

The corresponding status LED is always switched off or always switched on depending on the parameter setting.

"button-press display"

This function can be configured for each status LED if the rocker or button is configured to "switching", "dimming", "colour control", "Venetian blind", "value transmitter", "scene extension" or "controller extension":

- With the rocker function, each actuation of one of the two buttons is displayed.
- With the key function, the parameter "Assignment of the status LED" decides whether the actuation of both keys or a single key is displayed.

A status LED used as button-press display is switched on by the device each time the corresponding rocker or button is pressed. The parameter "Light period of status LED for button-press indicator" on the parameter page "General -> Status LED" determines how long the status LED for all status LEDs remains on together. Even if the device only sends a telegram when you release it, the status LED lights up regardless of whether you press the rocker or button.

"telegram acknowledgment"

This function can be configured for each status LED if the rocker or button is configured to "2-channel operation".

- With the rocker function, each telegram of one of the two buttons is acknowledged.
- With the button function, the parameter "Assignment of the status LED" decides whether the telegrams of both buttons or of a single button are acknowledged.

If a status LED is used for telegram acknowledgement, the status LED lights up when both channels are transmitted for about 250 ms each.

"Status display" and "inverted status display"

These functions can be configured for each status LED if the rocker or button is configured to "switching", "dimming" or "colour control":

- With the rocker function, the switching status of the rocker is displayed.
- With the button function, the parameter "Assignment of the status LED" decides which of the two buttons shows the switching status.

In the rocker or button functions "switching", "dimming" or "colour control", the status LEDs can also be linked internally in the device to the "Switching feedback" object and thus signal the current switching state of the actuator group.
It is possible to indicate or evaluate the inverted object value.

ℹ After a bus reset or after ETS programming, the value of the LED object is always "OFF".

"control via separate LED object"

Each status LED indicates the state of a separate LED communication object. Here the LED can be switched on or off statically via the 1-bit object value received, or also activated as flashing. If multiple status LEDs are configured to "flashing" and switched on, they will flash synchronously.
It is possible to indicate or evaluate the inverted object value.

ℹ After a bus reset or after ETS programming, the value of the LED object is always "OFF".

"Operating mode display"

In this configuration the status LED has its own 1-byte communication object.
If a status LED is to indicate the operating mode, the communication object of the status LED must be linked with the matching object of a room temperature controller (e. g. Controller status). The desired operating mode that the LED is to indicate can then be selected with the parameter "Status LED ON with". The LED is then lit up when the corresponding operating mode has been activated at the controller.

ℹ After a bus reset or after ETS programming, the value of the LED object is always "0" (automatic).

"Controller status display"

The status LED can indicate the controller status in the data formats "KNX-compliant" or "Controller general". The KNX-compliant objects or general controller objects are offered depending on the configuration. The objects should be connected to the communication objects of the main controller with the same functions via group addresses.
The status objects combine different informations. The "Status LED on with" parameter is used to select what information should be evaluated and displayed via the status LED.

The following information is available for selection with "KNX-compliant":

- Controller error status ("0" = no error / "1" = error)
- Operating mode ("0" = Cooling / "1" = Heating)
- Controller disabled ("0" = Controller enabled / "1" = Controller disabled)
- Frost alarm ("0" = Frost protection temperature exceeded / "1" = Frost protection temperature undershot)
- Heat alarm ("0" = Heat protection temperature exceeded / "1" = Heat protection temperature undershot)
- Controller inactive (Is active in the "Heating and cooling" operating mode when the measured room temperature lies within the deadband. This status information is as a rule always "0" for the individual operating modes "heating" or "cooling"! Is inactive if controller is disabled.)

- Additional level active ("0" = Additional level inactive / "1" = Additional level active)

The following table shows the evaluation of the three KNX-compliant objects.

Status LED ON with	Object RHCC - DPT22.101	Object RTC - DPT22.103
Controller error status	✓ (bit 0)	✓ (bit 0)
Operating mode	✓ (bit 8)	✓ (bit 1)
Controller disabled	✓ (bit 12)	✓ (bit 2)
Frost alarm	✓ (bit 13)	✓ (bit 3)
Heat alarm	✓ (bit 14)	✓ (bit 4)
Controller inactive	☒	✓ (bit 5)
Additional level active	☒	✓ (bit 6)

The following information is available for selection with **"Controller general"**:

- Comfort mode ("0" = Comfort mode inactive / "1" = Comfort mode active)
- Standby mode ("0" = Standby mode inactive / "1" = Standby mode active)
- Night mode ("0" = Night mode inactive / "1" = Night mode active)
- Frost/heat protection mode ("0" = Frost/heat protection mode inactive / "1" = Frost/heat protection mode active)
- Controller disabled ("0" = Controller enabled / "1" = Controller disabled)
- Heating / cooling ("0" = Cooling / "1" = Heating)
- Controller inactive ("0" = Controller active / "1" = Controller inactive (dead band))
- Frost alarm ("0" = no frost alarm / "1" = frost alarm)

The following table shows the evaluation of the object.

Status LED ON with	Object "controller status"
Comfort mode	✓ (bit 0)
Standby mode	✓ (bit 1)
Night operation	✓ (bit 2)
Frost/heat protection mode	✓ (bit 3)
Controller disabled	✓ (bit 4)
Heating / cooling	✓ (bit 5)
Controller inactive	✓ (bit 6)
Frost alarm	✓ (bit 7)

ℹ After a bus reset or after ETS programming, the value of the LED object is always "0".

"Presence status display" and "Inverted presence status display"

These functions can be configured for each status LED if the rocker or button is parameterised to "controller extension" with the "presence" function:

- With the rocker function, the presence status of the rocker is displayed.
- With the button function, the parameter "Assignment of the status LED" decides which of the two buttons shows the presence status:

When the presence status is displayed the LED evaluates the value of the object "Feedback presence function" and switches either on or off, depending on the parameter configuration in the ETS.

"Setpoint value shift display"

This function can be configured for each status LED if the rocker or button is parameterised to "controller extension" with the "setpoint shift" function.

With the rocker function, the setpoint shift of the rocker is displayed.

With the button function, the parameter "Assignment of the status LED" decides which of the two buttons shows the setpoint shift.

When a setpoint shift is indicated the LED evaluates the value of the "Current setpoint shift" object and switches either on or off, depending on the parameter configuration in the ETS.

15.9.2 Colour settings

User-defined colour setting

The colour of the status LEDs can be adjusted. The colours of the status LED can be selected in the ETS to be red, green or blue. In the colour configuration a distinction is made between whether all of the status LEDs have the same colour (common colour setting), or whether alternatively various colours can be configured for each LED (separate colour setting).

The difference is as follows:

– All status LEDs have the same colour.

  If common colour setting is desired, then the "Colour" parameter on parameter page "General -> Status-LED" must be configured to the settings "red", "green" or "blue". The status LEDs light up unchangeably in the configured colour later during operation, if they are switched on.

– The status LEDs have various colours.

  If the separate colour setting is desired, then the parameter "Colour" on parameter page "General -> Status-LED" must be configured to the setting "Colour selection per status LED". In this case additional parameters become visible on the parameter pages of the individual status LEDs. The parameters "Colour of the status LED" can then be used individually to define the desired colour for each status LED. The LED lights up in the configured colour if it is subsequently switched on regularly in operation, in accordance with the basic configuration "Function of the status LED".

Superposed function

Additionally, a superposed function can be enabled for each status LED. The superposed function allows for a colour change of the status LED during device operation. It is also possible here to change the display function.

ℹ A status LED will also indicate actuation if the status LED is controlled by the superposed function.

The superposed function of a status LED is controlled by a separate communication object. The device provides the two following options for controlling the superposed function:

– Control via separate LED object (1 bit)

– Control via separate LED object (1 byte)

Depending on the superposed function selected, the device provides either a 1-bit object or a 1-byte object.

If control via the 1-bit object is selected, the superimposed function is defined in the ETS parameters. You can use the parameters to set whether the superposed function will be switched on or off via a 1-telegram or a 0-telegram, and whether the status LED will statically be switched on or flash with the superposed function switched on. You can additionally set a separate colour for the superposed function in which the status LED will light up when the superposed function is switched on. When a superposed function is switched off the status LED will be activated according to its basic configuration (regular colour and display function).

If control via the 1-byte object is selected, the superposed function is defined by the bit coding of the 1-byte communication object. No other parameters are available in the in the ETS. The bit coding of the 1-byte communication object "Superposed function" is shown in the table below.

Value of the telegram	Superposed function of the status LED
0_{dec}	Superposed function is deactivated. Status LED has standard colours and display function.
1_{dec}	Lights up red
2_{dec}	Flashes red
3_{dec}	Lights up green
4_{dec}	Flashes green
5_{dec}	Lights up blue
6_{dec}	Flashing blue

ℹ The superposed function is initially always inactive after a device reset. The superposed function is only executed when a telegram is received via the corresponding object.

ℹ During colour configuration it must be ensured that different colours are configured for the basic display and the superposed function. If this is not done (the colours are the same), then when the display is static it is not possible to determine which display function is being indicated.

ℹ During flashing the status LED switches cyclically between the "switched-on" and "switched-off" states. No colour change is performed between the regular colour and the superposed colour.

15.9.3 Brightness settings

The brightness of all status LEDs is defined in the ETS. The "Brightness of all status LEDs" parameter on the "General" parameter page can be used to set the regular brightness of all status LEDs in 6 levels (level 0 = OFF, level 1 = dark, ..., level 5 = bright).

Optionally the brightness can be changed during operation of the device, controlled by the night reduction.

15.9.4 Table of parameters

The following parameters are parameterised on the "General" parameter page.

Colour	red **green** blue Colour selection per status LED
All status LEDs can have the same colour ("red", "green" or "blue" settings). The colours for the LEDs can also be configured separately ("Colour selection per status LED" setting). With colour selection per status LED, it is possible to set the colour on the parameter pages of the individual status LEDs.	

Brightness	Level 0 (OFF) Level 1 (dark) Level 2 Level 3 **Level 4** Level 5 (bright)
The brightness level for all status LEDs is defined at this point.	

Light duration of status LED for button-press display	1 s 2 s **3 s** 4 s 5 s
This parameter defines the switch-on time the status LED is lit up to indicate actuation. The setting concerns all status LEDs whose function is set to "Button-press display".	

The following parameters are configured on the parameter pages "Status-LED *n* - function".

Function of status LED	always OFF always ON **Button-press display** Telegram acknowledgment Status indication inverted status display Control via separate LED object Operating mode display Controller status indication Setpoint value shift display Presence status Inverted presence status
The ETS automatically compiles the selection of functions of the status LED depending on the set rocker or button function. Only functions that make sense in combination with the parameterised rocker or button function are offered for selection.	

The following selection of status LED basic functions can be parameterised for each rocker or button function.

Function of status LED	always OFF always ON Control via separate LED object Operating mode display Controller status indication
always OFF: Irrespective of the pushbutton or rocker function, the status LED is switched off permanently. always ON: Irrespective of the pushbutton or rocker function, the status LED is switched on permanently. Control via separate LED object: The status LED indicates the state of its own, separate 1-bit LED object. This setting causes the additional parameter "Control of the status LED via object value" to be shown. Operating mode display: The status LED indicates the state of a KNX room temperature controller via a separate 1-byte communication object. This setting causes the additional parameter "Status LED ON with" to be shown. Controller status display: The status LED indicates the state of the internal room temperature controller or the controller extension. This setting causes the additional "controller status" and "Status LED on with" parameters to be displayed.	

The following selection of status LED functions can be parameterised **in addition** to the basic functions for the rocker or button functions "Switching", "Dimming" and "Colour control".

Function of status LED	Button-press display Status indication inverted status display
button press display: The status LED indicates a button actuation. The ON time is set on the parameter page "General" in common for all status LEDs that are configured as actuation displays. status display: The status LED indicates the state of the communication object "Switching". If the object value is "ON", the status LED is illuminated. If the object value is "OFF" the status LED is switched off. inverted status display: The status LED indicates the state of the communication object "Switching". If the object value is "OFF", the status LED is illuminated. If the object value is "ON" the status LED is switched off.	

The following selection of status LED functions can be parameterised **in addition** to the basic functions for the rocker or button function "2-channel operation".

Function of status LED	Button-press display Telegram acknowledgment
button press display: The status LED indicates a button actuation. The ON time is set on the parameter page "General" in common for all status LEDs that are configured as actuation displays. telegram acknowledge: The status LED indicates the transmission of a telegram in 2-channel operation.	

The following selection of status LED functions can be parameterised **in addition** to the basic functions for the rocker or button function "Controller extension > Presence function".

Function of status LED	Button-press display Presence status Inverted presence status
button press display: The status LED indicates a button actuation. The ON time is set on the parameter page "General" in common for all status LEDs that are configured as actuation displays. Presence status: The status LED indicates the state of the presence button of the controller operation or in case of controller extension operation. The LED lights up if the presence function is activated. The LED is off if the presence function is inactive. Presence status: The status LED indicates the state of the presence button of the controller operation or in case of controller extension operation. The LED lights up if the presence function is inactive. The LED is off if the presence function is activated.	

The following selection of status LED functions can be parameterised **in addition** to the basic functions for the rocker or button function "Controller extension > Setpoint shift".

Function of status LED	Button-press display Setpoint value shift display
button press display: The status LED indicates a button actuation. The ON time is set on the parameter page "General" in common for all status LEDs that are configured as actuation displays. Setpoint value shift display: The status LED indicates the state of a setpoint shift of the controller operation or in case of controller extension operation. This setting causes the additional parameter "Status LED" to be shown.	

Status LED	**ON in case of variation** On in case of positive variation ON in case of negative variation OFF in case of variation OFF in case of positive variation OFF in case of negative variation
Setting this parameter defines at which setpoint variation the status LED is switched on or off.	

The following parameter is visible on the parameter pages "Status-LED *n* - function" if the function of the status LED is configured to "control via separate LED object".

Control of the status LED via object value	**1 = LED static ON / 0 = LED static OFF** 1 = LED static OFF / 0 = LED static ON 1 = LED flashes / 0 = LED static OFF 1 = LED static OFF / 0 = LED flashes
This parameter defines the telegram polarity of the 1-bit object "status LED". The LED can be switched on or off statically. In addition, the received switching telegram can be evaluated in such a way that the LED flashes.	

The following parameter is visible on the parameter pages "Status-LED *n* - function" if the function of the status LED is configured to "Operating mode display".

<table>
<tr><td>Status LED ON with</td><td>Automatic mode
Comfort mode
Standby mode
Night operation
Frost/heat protection mode</td></tr>
<tr><td colspan="2">The values of a communication object with data type 20.102 "HVAC Mode" are defined as follows:
0 = Automatic
1 = Comfort
2 = Standby
3 = Night
4 = Frost/heat protection
The value "Automatic" is used only by the "forced operating mode switchover" objects.
The status LED is illuminated when the object receives the value configured here.</td></tr>
</table>

The following parameters are visible on the parameter pages "Status-LED *n* - function" if the function of the status LED is configured to "Controller status display".

<table>
<tr><td>Controller status</td><td>KNX compliant
Controller general</td></tr>
<tr><td colspan="2">Room temperature controllers can transmit their current status to the KNX. The data formats "KNX compliant" and "Controller general" are usually available for this. This parameter adjusts the "Controller status display" function of the status LED to the status message's status format of the room temperature controller.
The selection options of the "Status LED ON with" parameter as well as the available communication objects adapt depending on this setting.
In the "KNX-compliant" setting, the device provides the 2 communication objects "Controller status RHCC" and "Controller status RTC", depending on the parameter.
With the "Controller general" setting, the device provides the "Controller status" communication object.</td></tr>
</table>

<table>
<tr><td>Status LED ON with</td><td>Controller error status
Operating mode (Heating = 1 / Cooling = 0)
Controller disabled (dew point operation)
Frost alarm
Heat alarm</td></tr>
<tr><td colspan="2">This parameter is only visible if "Controller status = KNX compliant".
The status LED shows the information of the controller status according to the parameterization.</td></tr>
</table>

DPT controller status	**RHCC (DPT 22.101)** RTC (DPT 22.103)
This parameter is only visible if "Controller status = KNX compliant". This parameter defines the datapoint type of the input object. The input object receives the controller status from the room temperature controller. The datapoint type of the input object must be synchronised with the output object of the room temperature controller.	

Status LED ON with	**Comfort mode** Standby mode Night operation Frost/heat protection mode Controller disabled Heating / Cooling (Heating = 1 / Cooling = 0) Controller inactive (deadband operation) Frost alarm
This parameter is only visible if controller status = controller general. The status LED shows the information of the controller status according to the parameterization.	

The following parameter is exclusively visible for "Colour = Colour selection per status LED" ("General" parameter page).

Colour of the status LED	red **green** blue
If separate colour settings for the status LEDs are required, then this parameter can be used individually to define the desired colour for each status LED. The LED lights up in the configured colour if it is subsequently switched on regularly during operation of the device, in accordance with the "Function" basic configuration.	

Superposed function	Active **Inactive**
Additionally, a superposed function can be enabled separately for each status LED. The superposed function can be used to change the colour of a status LED via a 1-byte communication object during device operation. It is also possible here to change the display function.	

Selection of the superposed function	**Control via separate LED object (1 bit)** Control via separate LED object (1 byte)

This parameter defines whether the superposed function of the status LED is controlled via a 1-bit object or via a 1-byte object.

If "Control via separate LED object (1-bit)" is selected, the superimposed function is defined in the ETS parameters.

If "Control via separate LED object (1-byte)" is selected, the superimposed function is defined in the 1-byte communication object bit coding.

Superposed function ON when	**1 telegram** 0 telegram

This parameter is used to set whether the superposed function will be switched on via a 1-telegram or a 0-telegram.

If the setting "1 telegram" is selected, the superposed function will be switched on via a 1-telegram and switched off via a 0-telegram.

If the setting "0 telegram" is selected, the superposed function will be switched on via a 0-telegram and switched off via a 1-telegram.

This parameter is only visible when "Selection of superposed function" = "Control via separate LED object (1-bit)".

Type of reading with superposed function	**LED static ON** LED flashes

This parameter defines whether the status LED will be statically switched on or flash when the superposed function is switched on.

This parameter is only visible when "Selection of superposed function" = "Control via separate LED object (1-bit)".

Colour of the superposed status LED	**red** green blue

The status LED lights up in the colour set here when the superposed function is switched on.

This parameter is only visible when "Selection of superposed function" = "Control via separate LED object (1-bit)".

15.9.5 Object list

The following communication objects are available for the individual buttons or rockers, depending on the set operating concept. The object name corresponds to the selection for the operating concept (button or rocker). The name of the object can be specified by the parameter "Name of ..." .

Object no.	Function	Name	Type	DPT	Flag
407, 423	Switching	Button/rocker *n* - status LED - input	1-bit	1,001	C, -, W, -, -
1-bit object to control the status LED. This object is only visible with "Function of status LED = Control via separate LED object".					

Object no.	Function	Name	Type	DPT	Flag
407, 423	Operating mode display	Button/rocker *n* - status LED - input	1 bytes	20,102	C, -, W, -, -
1-byte object to control the status LED. This object is only visible with "Function of status LED = Operating mode display".					

Object no.	Function	Name	Type	DPT	Flag
407, 423	Controller status RHCC - KNX-compliant	Status LED *n* - Input	2 bytes	22,101	C, -,W, -, U
2-byte object to control the status LED. This object is only visible for "Function of status LED = Controller status display", "Controller status = KNX-compliant" and "DPT controller status = RHCC (DPT 22.101)".					

Object no.	Function	Name	Type	DPT	Flag
410, 426	Controller status RTC - KNX-compliant	Status LED *n* - Input	2 bytes	22,103	C, -,W, -, U
2-byte object to control the status LED. This object is only visible for "Function of status LED = Controller status display", "Controller status = KNX-compliant" and "DPT controller status = RTC (DPT 22.103)".					

Object no.	Function	Name	Type	DPT	Flag
407, 423	Controller status - controller general	Button/rocker *n* - status LED - input	1 bytes	---	C, -, W, -, -
1-byte object to control the status LED. This object is only visible with "Function of status LED = Controller status display" and "Controller status = Controller general".					

Object no.	Function	Name	Type	DPT	Flag
408, 424	Superposed function	Button/rocker n - status LED - input	1-bit	1,001	C, -, W, -, -
1-bit object for forced control of the status LED. It enables the superposed function to be switched on or off when "Control via separate LED object (1-bit)" is set.					

Object no.	Function	Name	Type	DPT	Flag
408, 424	Superposed function	Button/rocker n - status LED - input	1 bytes	---	C, -, W, -, -
1-byte object for forced control of the status LED. This can be used to change the colour and display information of individual status LEDs according to priority when "Control via separate LED object (1-byte)" is set. "0" = Superposed function is deactivated "1" = LED lights up red, "2" = LED flashes red "3" = LED lights up green, "4" = LED flashes green "5" = LED lights up blue, "6" = LED flashes blue					

16 Channel-independent cover functions (sensor technology)

The following subchapters provide a description of the device functions. Each subchapter consists of the following sections:

- Functional description
- Table of parameters
- Object list

Functional description

The functional description explains the function and provides helpful tips on project design and usage of the function. Cross references support you in your search for further information.

Table of parameters

The table of parameters lists all parameters associated with the function. Each parameter is documented in a table as follows.

Name of the parameter	Parameter values
Parameter description	

Object list

The object list specifies and describes all communication objects associated with the function. Each communication object is documented in a table.

Object no.	This column contains the object number of the communication object.
Function	This column contains the function of the communication object.
Name	This column contains the name of the communication object.
Type	This column contains the length of the communication object.
DPT	This column assigns a datapoint type to a communication object. Datapoint types are standardized in order to ensure interoperability of KNX devices.
Flag	This column assigns the communication flags in accordance with the KNX specification.
K flag	activates / deactivates the communication of the communication object
L flag	enables externally triggered reading of the value from the communication object
S flag	enables externally triggered writing of the value to the communication object
Ü flag	enables transfer of a value
A flag	enables updating of an object value in case of feedback
I flag	enforces updating of the communication object value when the devices is switched on (reading at init)

16.1 LED orientation lighting

All status LEDs of the device can be used as orientation lights if necessary. The colour of the LED orientation lights can be freely selected from the colour range available for the status LEDs. The brightness with which the status LED lights up when the LED orientation light is switched on can also be set. When the LED orientation light is switched on, all status LEDs of the device always light up in the set colour and brightness. With LED night reduction activated, the corresponding parameter page can be used to configure a separate brightness for the LED orientation light during LED night reduction.

The LED orientation light is activated on the "General" parameter page and can subsequently be configured on the "LED orientation lighting" parameter page.

For orientation, the status LEDs can be:

– switched on continuously,

– switched on via an object, or

– switched on for a set period of time after pressing a button.

ℹ In accordance with the available selection options, random levels can be configured for the regular brightness and for the brightness with activated LED orientation lighting in the ETS. It is advisable to set the brightness value for LED orientation lighting to a lower level than regular brightness.

16.1.1 Table of parameters

"General" parameter page

LED orientation lighting	Active **Inactive**
The LED orientation light can be enabled at this point. If the LED orientation light is enabled, the ETS shows further parameters and up to one more communication object.	

The following parameters are visible on the "LED orientation light" parameter page if orientation light has been enabled.

Function	always OFF **always ON** Control via object automatic switch-off
This parameter defines the function of LED orientation lighting. always OFF: LED orientation lighting is permanently switched off. always ON: LED orientation lighting is permanently switched on. Control via object: LED orientation lighting can be switched on and off via the "Switching orientation lighting" object. Automatic switch-off: The LED orientation light is switched on with each press of a button and switched off after a parameterised switch-on time.	

Control via object value	**1 = static ON / 0 = static OFF** 1 = static OFF / 0 = static ON 1 = flashing / 0 = static OFF 1 = static OFF / 0 = flashing
With the "Control via object" function set, this parameter defines the object values for the "Switching orientation lighting" object.	

Switch-off after	**0**...20 min | 0...**3**...59 s
With the "Automatic switch-off" function enabled, this parameter defines the switch-on time of the LED orientation light.	

Colour	red **green** blue
The colour for all status LEDs with LED orientation lighting switched on can be selected here.	

Brightness	Level 0 (OFF) Level 1 (dark) **Level 2** Level 3 Level 4 Level 5 (bright)
The brightness for all status LEDs with LED orientation lighting switched on can be selected here.	

16.1.2 Object list

Object no.	Function	Name	Type	DPT	Flag
5	Switching orientation lighting	LED orientation lighting - input	1-bit	1,001	C, -,W, -, U
1-bit object for switching the LED orientation light on or off. The telegram polarity can be configured.					

16.2 LED night reduction

Optionally, the brightness of the status LED can be adjusted via the LED night reduction during operation of the device. Changing may be advisable, for example, to reduce the brightness during nighttime hours. If change-over of the brightness via the object is required, the "LED night reduction" must be activated on the "General" parameter page. In this case the "LED night reduction" communication object becomes visible in the ETS. As soon as "1" telegram is received via this object, the device switches over to the "Brightness of all status LEDs in night reduction" configured in the ETS ("LED night reduction" parameter page). If a "0" telegram is received via the object, the device switches back to regular brightness.

The change-over of the LED brightness is always performed softly by means of a brief dimming process. Dimming up to a higher level value results in quicker dimming than with dimming to a lower level value. This results in a slow soft dimming that is pleasing for the human eye. The dimming speeds are fixed and therefore not changeable.

After a button has been actuated while the LED night reduction is active, the switched-on LEDs of the device can be controlled to light up with regular brightness for 30 seconds. This behaviour can be activated or deactivated using the "Brightness increase for 30 seconds" parameter. Increasing the brightness, especially with significantly reduced brightness values or LEDs even switched off, permits status changes to be identified more easily (or identified at all) in night mode.

i In the ETS it is possible to perform configuration in accordance with the possible selection of required stage values for the regular and reduced brightness. No check is made whether a reduced brightness level is configured for the reduced brightness level. This also makes it possible to use the object to switch over the object to larger brightness levels in comparison to the regular brightness. It is recommended, however, to set the brightness value for the night reduction lower than the regular brightness.

i After a device reset, the regular brightness for switched-on LEDs is always effective. Switch-over by night reduction will only take place when a telegram is written to the respective object after a reset.

i When the status LED is activated via the regular display function or via the superposed function, it is possible to let the status LED flash. During flashing the LEDs switch synchronously between the "switched-on" and "switched-off" states in the active brightness. This is not interpreted as a change of state of the display function, by means of which the brightness is therefore also not switched over automatically.

16.2.1 Table of parameters

"General" parameter page

LED night reduction	Active **Inactive**
The LED night reduction can be enabled at this point. If the LED night reduction is enabled, the ETS shows further parameters and another communication object.	

The following parameters are visible on the "Night reduction" parameter page if the LED night reduction has been enabled.

Polarity of the night reduction object	**1 = active / 0 = not active** 0 = active / 1 = not active
The night reduction object is used as an input for activating or deactivating the LED night reduction. This object defines the polarity of the "Switching night reduction" object.	

Brightness of all status LEDs in night reduction	Level 0 (OFF) Level 1 (dark) **Level 2** Level 3 Level 4 Level 5 (bright)
The brightness of all status LEDs of the device can be defined on the "General" parameter page. The illumination brightness of all LEDs with active LED night reduction can be set here in 6 levels.	

Increase brightness for 30 seconds	**Active** Inactive
After a button has been actuated while the LED night reduction is active, the switched-on LEDs of the device can be controlled to light up with regular brightness for 30 seconds. This behaviour can be activated or deactivated using this parameter.	

Brightness of orientation lighting in night reduction	Level 0 (OFF) **Level 1 (dark)** Level 2 Level 3 Level 4 Level 5 (bright)
The brightness of the LED orientation light can be defined on the "LED orientation light" parameter page. The illumination brightness of the LED orientation light with active LED night reduction can be set here in 6 levels.	

16.2.2 Object list

Object no.	Function	Name	Type	DPT	Flag
7	Switching night reduction	LED night reduction - input	1-bit	1,001	C, -,W, -, U
1-bit object for activating or deactivating the night reduction (brightness of all LEDs changed). This makes it possible, for example, to reduce the brightness during nighttime hours to a value configured in the ETS ("1" = Night reduction ON; "0" = Night reduction OFF).					

16.3 disabling function

Configuration

With the 1-bit communication object "Disabling", the operating areas of the device can be partly or completely disabled. During a disable, the rockers or buttons can also temporarily execute other functions.

ℹ An active disable applies only to the functions of the rockers or buttons. The functions of the status LED and temperature measurements are not affected by the disabling function.

The disabling function and the associated parameters and communication objects are enabled if the "Disabling function" parameter on the "General" parameter page is enabled.

You can parameterize the polarity of the disabling object. In case of polarity inversion (disabled = 0 / enabled = 1), the disabling function is not activated immediately after a bus reset or after ETS programming (object value = "0"). There must first be an object update "0" until the disabling function will be activated. Telegram updates from "0" to "0" or from "1" to "1" on the "Disabling" object remain without effect.

ℹ After a device reset, the disabling function is deactivated and must be activated via the bus.

Configuring the reaction during a disable

In an active disable, either all buttons of the device or only individual buttons may be affected by the disable. You can furthermore define in the ETS whether disabled buttons will not show any response when pressed or, alternatively, will behave like another button of the device. This can be used to limit the control function of the device completely or partially.

The disabling function must be activated.

- Set the "Button assignment" parameter to "All buttons assigned".

  The disabling function affects all buttons. As soon as any button of the device is pressed while a disabling function is active, the device executes the "behaviour when a disabling function is active".

- Set the "Button assignment" parameter to "Individual buttons assigned".

  The disabling function affects only the buttons that are assigned on the "Disable function" parameter page. As soon as one of the assigned buttons is pressed while a disabling function is active, the "Behaviour when a disabling function is active" for this button is executed. All other, non-disabled buttons respond normally when pressed.

- Set the parameter "Behaviour when a disabling function is active" to "No response when pressed".

The disabled buttons do not respond when pressed. The status LEDs of the disabled buttons remain off if the display function is configured to "Button-press display" or "Telegram acknowledgement".

- Set the parameter "Behaviour when a disabling function is active" to "No response when pressed like...". Also configure the parameters "All assigned top buttons behave like" and "All assigned bottom buttons behave like" to the required button or disabling function (the disabling function is a reference button).

  All buttons assigned to the disabling function behave as defined in the parameters for the two specified reference buttons of the device. Different or identical reference buttons can be parameterised separately for all the top and bottom buttons. The two disabling functions of the device can also be configured as a reference button.
  The telegrams are transmitted to the bus via the communication objects of the specified reference buttons. The status LEDs of the reference buttons are controlled according to their function. The status LEDs of the disabled buttons remain off if the display function is configured to "Button-press display" or "Telegram acknowledgement".

ℹ If a button evaluation is taking place at the time of activation / deactivation of a disabling function, this function is aborted immediately and with it also the pertaining button function. It is first necessary to release all buttons before a new button function can be executed if so permitted by the state of disabling.

16.3.1 Table of parameters

"General" parameter page

disabling function	Active **Inactive**
The disabling function can be enabled centrally at this point. If "Active", the ETS shows further communication object and parameters.	

"Disable function" parameter page

Polarity of disabling object	**1 = disable / 0 = enable** 0 = disable / 1 = enable
This parameter defines the value of the disabling object at which the disabling function is active.	

Button assignment	**All buttons assigned** individual buttons assigned
"All buttons assigned": The disabling function affects all buttons. As soon as any button of the device is pressed while a disabling function is active, the "Behaviour when a disabling function is active" is executed. "Individual buttons assigned": The disabling function affects only the assigned buttons. As soon as one of the assigned buttons is pressed while a disabling function is active, the "Behaviour when a disabling function is active" for this button is executed. All other, non-disabled buttons respond normally when pressed.	

Button *n*	Active **Inactive**
With the setting "Individual buttons assigned", these parameters define the assignment of the buttons to the disabling function.	

Behaviour when the disabling function is active	**no reaction to button-press** Reaction to a button-press like...
You can define here whether disabled buttons will not show any response when pressed or, alternatively, will behave like another button of the device or like a virtual disabling function. "no reaction to button-press": The disabled buttons do not respond when pressed. "Reaction to a button-press like...": The disabled buttons can either execute the function of a button that has already been configured or the function of a separate disabling function. The parameters "All assigned top buttons behave like" and "All assigned bottom buttons behave like" define the function of the buttons assigned to the disabling function.	

All assigned upper buttons behave as	**At top of button** At bottom of button (Selection depends on device variant!) Disabling function 1 Disabling function 2
If a specific button function is to be assigned during disabling to all or to individual buttons, this parameter can be used to select the desired button the function of which will then be executed. During disabling, all assigned upper buttons behave like the one parameterized here. The desired functions can either correspond to the function of an existing button or they can be configured as special disabling functions. This parameter is only visible with "Behaviour when a disabling function is active" = "Reaction to a button-press like..."!	

All assigned lower buttons behave as	**At top of button** At bottom of button (Selection depends on device variant!) Disabling function 1 Disabling function 2
If a specific button function is to be assigned during disabling to all or to individual buttons, this parameter can be used to select the desired button the function of which will then be executed. During disabling, all assigned lower buttons behave like the one parameterized here. The desired functions can either correspond to the function of an existing button or they can be configured as special disabling functions. This parameter is only visible with "Behaviour when a disabling function is active" = "Reaction to a button-press like..."!	

Disabling function 1 and disabling function 2

Parameter page "Disabling function -> Disabling function 1 / Disabling function 2"

ℹ The functions "Switching", "Dimming and colour temperature", "Colour control and brightness", "Venetian blind", "Value transmitter", "Scene extension", "2-channel operation" and "controller extension" are available for the two disabling functions. These functions behave like the button functions of the device (same parameters).

16.3.2 Object list

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>9</td><td>Disabling</td><td>Disabling function - input</td><td>1-bit</td><td>1,002</td><td>C, -, W, -, -</td></tr>
<tr><td colspan="6">1-bit object for transmission of switching telegrams (ON, OFF).</td></tr>
</table>

Function: switching

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>43, 46</td><td>Switching</td><td>Disabling function *n* - output</td><td>1-bit</td><td>1,001</td><td>C, -, -, T, -</td></tr>
<tr><td colspan="6">1-bit object for transmission of switching telegrams (ON, OFF).</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>44, 47</td><td>Switching feedback</td><td>Disabling function *n* - input</td><td>1-bit</td><td>1,001</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">1-bit object for receiving feedback telegrams (ON, OFF).</td></tr>
</table>

Function: Dimming and colour temperature

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>79, 85</td><td>Switching</td><td>Disabling function *n* - output</td><td>1-bit</td><td>1,001</td><td>C, -, -, T, -</td></tr>
<tr><td colspan="6">1-bit object for transmission of switching telegrams (ON, OFF).</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>80, 86</td><td>Dimming</td><td>Disabling function *n* - output</td><td>4-bit</td><td>3,007</td><td>C, -,W, T, -</td></tr>
<tr><td colspan="6">4-bit object for the transmission of relative dimming telegrams.</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>80, 86</td><td>Dimming brightness</td><td>Disabling function *n* - output</td><td>4-bit</td><td>3,007</td><td>C, -,W, T, -</td></tr>
<tr><td colspan="6">4-bit object for sending relative dimming telegrams to adjust the brightness.</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>80, 86</td><td>Dimming brightness + colour temperature</td><td>Disabling function *n* - output</td><td>3 bytes</td><td>250,600</td><td>C, -,W, T, -</td></tr>
<tr><td colspan="6">3-byte object for sending dimming telegrams for adjusting the brightness and the colour temperature in combination.</td></tr>
</table>

Object no.	Function	Name	Type	DPT	Flag
81, 87	Switching feedback	Disabling function *n* - input	1-bit	1,001	C, -,W, -, U
1-bit object for receiving feedback telegrams (ON, OFF).					

Object no.	Function	Name	Type	DPT	Flag
82, 88	Dimming colour temperature	Disabling function *n* - output	4-bit	3,007	C, -,W, T, -
4-bit object for sending relative dimming telegrams to adjust the colour temperature.					

Function: Colour control and brightness

Object no.	Function	Name	Type	DPT	Flag
788, 803	Switching	Disabling function *n* - output	1-bit	1,001	C, -, -, T, -
1-bit object for transmission of switching telegrams (ON, OFF).					

Object no.	Function	Name	Type	DPT	Flag
789, 804	Switching feedback	Disabling function *n* - input	1-bit	1,001	C, -,W, -, U
1-bit object for receiving feedback telegrams (ON, OFF).					

Object no.	Function	Name	Type	DPT	Flag
790, 805	Colour value RGB	Disabling function *n* - output	3 bytes	232,600	C, -, -, T, -
3-byte object for transmitting the RGB colour values. This object is only visible with "Colour space = RGB" and "Communication = Combi object".					

Object no.	Function	Name	Type	DPT	Flag
790, 805	Colour value RGBW	Disabling function *n* - output	6 bytes	251,600	C, -, -, T, -
6-byte object for transmitting the RGBW colour values. This object is only visible with "Colour space = RGBW" and "Communication = Combi object".					

Object no.	Function	Name	Type	DPT	Flag
791, 806	Colour value Red	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the red colour value. This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects".					

Object no.	Function	Name	Type	DPT	Flag
791, 806	Colour hue (H)	Disabling function *n* - output	1 bytes	5,003	C, -, -, T, -
1-byte object for transmitting the colour hue. This object is only visible with "Colour space = HSV or HSVW".					

Object no.	Function	Name	Type	DPT	Flag
792, 807	Colour value Green	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the green colour value. This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects".					

Object no.	Function	Name	Type	DPT	Flag
792, 807	Saturation (S)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the saturation. This object is only visible with "Colour space = HSV or HSVW".					

Object no.	Function	Name	Type	DPT	Flag
793, 808	Colour value Blue	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the blue colour value. This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects"					

Object no.	Function	Name	Type	DPT	Flag
793, 808	Brightness (V)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the brightness value. This object is only visible with "Colour space = HSV or HSVW".					

Object no.	Function	Name	Type	DPT	Flag
794, 809	Colour value White	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the white colour value. This object is only visible with "Colour space = RGBW" and "Communication = Individual objects".					

Object no.	Function	Name	Type	DPT	Flag
794, 809	White level (W)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the white level. This object is only visible with "Colour space = HSVW".					

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>796, 805</td><td>Colour value RGB feedback</td><td>Disabling function <i>n</i> - input</td><td>3 bytes</td><td>232,600</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">3-byte object for receiving feedback telegrams (RGB colour values).
This object is only visible with "Colour space = RGB" and "Communication = Combi object".</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>796, 805</td><td>Colour value RGBW feedback</td><td>Disabling function <i>n</i> - input</td><td>6 bytes</td><td>251,600</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">6-byte object for receiving feedback telegrams (RGBW colour values).
This object is only visible with "Colour space = RGBW" and "Communication = Combi object".</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>797, 812</td><td>Colour value Red feedback</td><td>Disabling function <i>n</i> - input</td><td>1 bytes</td><td>5,001</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">1-byte object for receiving feedback telegrams (red colour value).
This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects"</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>797, 812</td><td>Colour hue (H) feedback</td><td>Disabling function <i>n</i> - input</td><td>1 bytes</td><td>5,003</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">1-byte object for receiving feedback telegrams (colour hue H).
This object is only visible with "Colour space = HSV or HSVW".</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>798, 813</td><td>Colour value Green feedback</td><td>Disabling function <i>n</i> - input</td><td>1 bytes</td><td>5,001</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">1-byte object for receiving feedback telegrams (green colour value).
This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects"</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>798, 813</td><td>Saturation (S) feedback</td><td>Disabling function <i>n</i> - input</td><td>1 bytes</td><td>5,001</td><td>C, -,W, -, U</td></tr>
<tr><td colspan="6">1-byte object for receiving feedback telegrams (saturation S).
This object is only visible with "Colour space = HSV or HSVW".</td></tr>
</table>

Object no.	Function	Name	Type	DPT	Flag
799, 814	Colour value Blue feedback	Disabling function *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (blue colour value). This object is only visible with "Colour space = RGB or RGBW" and "Communication = Individual objects"					

Object no.	Function	Name	Type	DPT	Flag
799, 814	Brightness (V) feedback	Disabling function *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (brightness value V). This object is only visible with "Colour space = HSV or HSVW".					

Object no.	Function	Name	Type	DPT	Flag
800, 815	Colour value White feedback	Disabling function *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (white colour value). This object is only visible with "Colour space = RGBW" and "Communication = Individual objects".					

Object no.	Function	Name	Type	DPT	Flag
800, 815	White level (W) feedback	Disabling function *n* - input	1 bytes	5,001	C, -,W, -, U
1-byte object for receiving feedback telegrams (white value W). This object is only visible with "Colour space = HSVW".					

Function: Venetian blind

Object no.	Function	Name	Type	DPT	Flag
115, 118	Short time operation	Disabling function *n* - output	1-bit	1,008	C, -, -, T, -
1-bit object for the transmission of telegrams with which a Venetian blind or shutter drive motor can be stopped or with which the blind slats can be adjusted by short time operation.					

Object no.	Function	Name	Type	DPT	Flag
116, 119	Long-time operation	Disabling function *n* - output	1-bit	1,008	C, -,W, T, -
1-bit object for the transmission of telegrams with which a Venetian blind or shutter drive motor can be can be moved upwards or downwards.					

Function: value transmitter

Object no.	Function	Name	Type	DPT	Flag
175, 187	Value transmitter 0...255	Disabling function *n* - output	1 bytes	5,010	C, -, -, T, -
1-byte object for the transmission of values from 0 to 255.					

Object no.	Function	Name	Type	DPT	Flag
175, 187	Value transmitter 0…100 %	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting values from 0 to 100%.					

Object no.	Function	Name	Type	DPT	Flag
175, 187	Value transmitter -128...127	Disabling function *n* - output	1 bytes	6,010	C, -, -, T, -
1-byte object for the transmission of values from -128 to 127.					

Object no.	Function	Name	Type	DPT	Flag
175, 187	Value transmitter 0…255 %	Disabling function *n* - output	1 bytes	5,004	C, -, -, T, -
1-byte object for transmitting values from 0 to 255%.					

Object no.	Function	Name	Type	DPT	Flag
175, 187	Value transmitter 0...65535	Disabling function *n* - output	2 bytes	7,001	C, -, -, T, -
2-byte object for the transmission of values from 0 to 65535.					

Object no.	Function	Name	Type	DPT	Flag
175, 187	Value transmitter -32768...32767	Disabling function *n* - output	2 bytes	8,001	C, -, -, T, -
2-byte object for the transmission of values from -32768 to 32767.					

Object no.	Function	Name	Type	DPT	Flag
175, 187	Temperature value transmitter	Disabling function *n* - output	2 bytes	9,001	C, -, -, T, -
2-byte object for transmitting temperature values from 0 to 40 °C.					

Object no.	Function	Name	Type	DPT	Flag
175, 187	Brightness value transmitter	Disabling function *n* - output	2 bytes	9,004	C, -, -, T, -
2-byte object for transmitting brightness values from 0 to 1500 Lux.					

Object no.	Function	Name	Type	DPT	Flag
175, 187	Colour temperature value transmitter	Disabling function *n* - output	2 bytes	7,600	C, -, -, T, -

2-byte object for transmitting colour temperature values from 1000 to 10000 Kelvin.

ℹ These objects are only visible when:
- "Function = 2 byte" and
- "Value range = 2-byte colour temperature value"

Object no.	Function	Name	Type	DPT	Flag
175, 187	Colour value transmitter RGB	Disabling function *n* - output	3 bytes	232,600	C, -, -, T, -

3-byte object for transmitting the colour information red, green and blue in one communication object.

ℹ These objects are only visible when:
- "Function = 3-byte",
- "Value range = 3-byte colour value RGB/HSV",
- "Colour space = RGB" and
- "Communication = Combi object"

Object no.	Function	Name	Type	DPT	Flag
175, 187	Colour value transmitter RGBW	Disabling function *n* - output	6 bytes	251,600	C, -, -, T, -

6-byte object for sending the colour information red, green, blue and white in one communication object.

ℹ These objects are only visible when:
- "Function = 6-byte",
- "Value range = 6-byte colour value RGBW/HSVW",
- "Colour space = RGBW" and
- "Communication = Combi object"

Object no.	Function	Name	Type	DPT	Flag
176, 188	Colour value transmitter Red	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the red colour value from 0 to 100 per cent.

ℹ These objects are only visible when:
- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW",
- "Colour space = RGB or RGBW" and
- "Communication = Individual objects"

Object no.	Function	Name	Type	DPT	Flag
177, 189	Colour value transmitter Green	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the green colour value from 0 to 100 per cent.

ℹ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW",
- "Colour space = RGB or RGBW" and
- "Communication = Individual objects"

Object no.	Function	Name	Type	DPT	Flag
178, 190	Colour value transmitter Blue	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the blue colour value from 0 to 100 per cent.

ℹ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW",
- "Colour space = RGB or RGBW" and
- "Communication = Individual objects"

Object no.	Function	Name	Type	DPT	Flag
179, 191	Colour value transmitter White	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the white colour value from 0 to 100 per cent.

ℹ These objects are only visible when:

- "Function = 6-byte",
- "Value range = 6-byte colour value RGBW/HSVW",
- "Colour space = RGBW" and
- "Communication = Individual objects"

Object no.	Function	Name	Type	DPT	Flag
176, 188	Colour hue (H)	Disabling function *n* - output	1 bytes	5,003	C, -, -, T, -

1-byte object for sending the colour hue (H) from 0 ... 360°.

ℹ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW" and
- "Colour space = HSV or HSVW"

Object no.	Function	Name	Type	DPT	Flag
177, 189	Saturation (S)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the saturation (S) from 0 to 100 per cent.

ℹ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW" and
- "Colour space = HSV or HSVW"

Object no.	Function	Name	Type	DPT	Flag
178, 190	Brightness (V)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the brightness (V) from 0 to 100 per cent.

ℹ These objects are only visible when:

- "Function = 3-byte or 6-byte",
- "Value range = 3-byte colour value RGB/HSV or 6-byte colour value RGBW/HSVW" and
- "Colour space = HSV or HSVW"

Object no.	Function	Name	Type	DPT	Flag
179, 191	White level (W)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -

1-byte object for transmitting the white value (W) from 0 to 100 per cent.

ℹ These objects are only visible when:

- "Function = 6-byte",
- "Value range = 6-byte colour value RGBW/HSVW" and
- "Colour space = HSVW"

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>175, 187</td><td>Colour temperature value transmitter + brightness</td><td>Disabling function <i>n</i> - output</td><td>6 bytes</td><td>249,600</td><td>C, -, -, T, -</td></tr>
<tr><td colspan="6">6-byte object for sending the time window, colour temperature and brightness.
ℹ These objects are only visible when:
– "Function = 6 byte" and
– "Value range = 6-byte colour temperature value + brightness".</td></tr>
</table>

Function: scene extension

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>236, 239</td><td>Scene extension</td><td>Disabling function <i>n</i> - output</td><td>1 bytes</td><td>18,001</td><td>C, -, -, T, -</td></tr>
<tr><td colspan="6">1-byte object for recalling or for storing one of 64 scenes max. from a scene push button sensor.</td></tr>
</table>

Function: 2-channel operation

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>299, 312</td><td>Channel 1 switching</td><td>Disabling function <i>n</i> - output</td><td>1-bit</td><td>1,001</td><td>C, -,W, T, U</td></tr>
<tr><td colspan="6">1-bit object for transmitting switching telegrams on channel 1 if 2-channel operation is activated.</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>300, 313</td><td>Channel 2 switching</td><td>Disabling function <i>n</i> - output</td><td>1-bit</td><td>1,001</td><td>C, -,W, T, U</td></tr>
<tr><td colspan="6">1-bit object for transmitting switching telegrams on channel 2 if 2-channel operation is activated.</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>299, 312</td><td>Channel 1 value 0...255</td><td>Disabling function <i>n</i> - output</td><td>1 bytes</td><td>5,010</td><td>C, -, -, T, -</td></tr>
<tr><td colspan="6">1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.</td></tr>
</table>

<table>
<tr><th>Object no.</th><th>Function</th><th>Name</th><th>Type</th><th>DPT</th><th>Flag</th></tr>
<tr><td>300, 313</td><td>Channel 2 value 0...255</td><td>Disabling function <i>n</i> - output</td><td>1 bytes</td><td>5,010</td><td>C, -, -, T, -</td></tr>
<tr><td colspan="6">1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.</td></tr>
</table>

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 value 0...100 %	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 value 0...100 %	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 value -128...127	Disabling function *n* - output	1 bytes	6,010	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 value -128...127	Disabling function *n* - output	1 bytes	6,010	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 value 0...255 %	Disabling function *n* - output	1 bytes	5,004	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 value 0...255 %	Disabling function *n* - output	1 bytes	5,004	C, -, -, T, -
1-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 value 0...65535	Disabling function *n* - output	2 bytes	7,001	C, -, -, T, -
2-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 value 0...65535	Disabling function *n* - output	2 bytes	7,001	C, -, -, T, -
2-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 value -32768...32767	Disabling function *n* - output	2 bytes	8,001	C, -, -, T, -
2-byte object for transmitting value telegrams on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 value -32768...32767	Disabling function *n* - output	2 bytes	8,001	C, -, -, T, -
2-byte object for transmitting value telegrams on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 temperature value	Disabling function *n* - output	2 bytes	9,001	C, -, -, T, -
2-byte object for transmitting temperature values on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 temperature value	Disabling function *n* - output	2 bytes	9,001	C, -, -, T, -
2-byte object for transmitting temperature values on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 brightness value	Disabling function *n* - output	2 bytes	9,004	C, -, -, T, -
2-byte object for transmitting brightness values on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 brightness value	Disabling function *n* - output	2 bytes	9,004	C, -, -, T, -
2-byte object for transmitting brightness values on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 colour value transmitter	Disabling function *n* - output	2 bytes	7,600	C, -, -, T, -
2-byte object for transmitting colour temperature values from 1000 to 10000 Kelvin on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 colour value transmitter	Disabling function *n* - output	2 bytes	7,600	C, -, -, T, -
2-byte object for transmitting colour temperature values from 1000 to 10000 Kelvin on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 colour value transmitter RGB	Disabling function *n* - output	3 bytes	232,600	C, -, -, T, -
3-byte object for transmitting the colour information red, green and blue in a communication object on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 colour value transmitter RGB	Disabling function *n* - output	3 bytes	232,600	C, -, -, T, -
3-byte object for transmitting the colour information red, green and blue in a communication object on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 colour value transmitter RGBW	Disabling function *n* - output	6 bytes	251,600	C, -, -, T, -
6-byte object for transmitting the colour information red, green, blue and white in a communication object on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 colour value transmitter RGBW	Disabling function *n* - output	6 bytes	251,600	C, -, -, T, -
6-byte object for transmitting the colour information red, green, blue and white in a communication object on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
301, 314	Channel 1 colour value transmitter Red	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value red from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
305, 318	Channel 2 colour value transmitter Red	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value red from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
302, 315	Channel 1 colour value transmitter Green	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value green from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
306, 319	Channel 2 colour value transmitter Green	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value green from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
303, 316	Channel 1 colour value transmitter Blue	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value blue from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
307, 320	Channel 2 colour value transmitter Blue	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value blue from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
304, 317	Channel 1 colour value transmitter white	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value white from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
308, 321	Channel 2 colour value transmitter white	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the colour value white from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
301, 314	Channel 1 colour hue (H)	Disabling function *n* - output	1 bytes	5,003	C, -, -, T, -
1-byte object for sending the colour hue (H) from 0 ... 360° on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
305, 318	Channel 2 colour hue (H)	Disabling function *n* - output	1 bytes	5,003	C, -, -, T, -
1-byte object for sending the colour hue (H) from 0 ... 360° on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
302, 315	Channel 1 saturation (S)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the saturation (S) from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
306, 319	Channel 2 saturation (S)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the saturation (S) from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
303, 316	Channel 1 brightness (V)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the brightness value (V) from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
307, 320	Channel 2 brightness (V)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the brightness value (V) from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
304, 317	Channel 1 white level (W)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the white value (W) from 0 to 100 per cent on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
308, 321	Channel 2 white level (W)	Disabling function *n* - output	1 bytes	5,001	C, -, -, T, -
1-byte object for transmitting the white value (W) from 0 to 100 per cent on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 colour value transmitter + brightness	Disabling function *n* - output	6 bytes	249,600	C, -, -, T, -
6-byte object for transmitting the time window, colour temperature and brightness on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 1 colour value transmitter + brightness	Disabling function *n* - output	6 bytes	249,600	C, -, -, T, -
6-byte object for transmitting the time window, colour temperature and brightness on channel 2 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
299, 312	Channel 1 scene (external) 1…64	Disabling function *n* - output	1 bytes	18,001	C, -, -, T, -
1-byte object for transmitting scene values on channel 1 if 2-channel operation is activated.					

Object no.	Function	Name	Type	DPT	Flag
300, 313	Channel 2 scene (external) 1…64	Disabling function *n* - output	1 bytes	18,001	C, -, -, T, -
1-byte object for transmitting scene values on channel 2 if 2-channel operation is activated.					

Function: controller extension

Object no.	Function	Name	Type	DPT	Flag
380, 387	Operating mode switchover	Disabling function *n* - controller extension - output	1 bytes	20,102	C, -, -, T, -
1-byte object for changing over a room temperature controller between the Comfort, Standby, Night and Frost/heat protection operating modes. This object is only visible if "Function = operating mode change-over".					

Object no.	Function	Name	Type	DPT	Flag
381, 388	Operating mode switchover feedback	Disabling function *n* - controller extension - input	1 bytes	20,102	C, -,W, -, U
1-byte object for receiving the operating mode of a room temperature controller. This object is only visible if "Function = operating mode change-over".					

Object no.	Function	Name	Type	DPT	Flag
380, 387	Operating mode forced-control	Disabling function *n* - controller extension - output	1 bytes	20,102	C, -, -, T, -
1-byte object for changing over a room temperature controller under forced control between the Automatic, Comfort, Standby, Night and Frost / heat protection operating modes This object is only visible if "Function = forced operating mode change-over".					

Object no.	Function	Name	Type	DPT	Flag
381, 388	Forced object operating mode feedback	Disabling function *n* - controller extension - input	1 bytes	20,102	C, -,W, -, U
1-byte object for receiving the operating mode of a room temperature controller. This object is only visible if "Function = operating mode change-over".					

Object no.	Function	Name	Type	DPT	Flag
380, 387	Presence function	Disabling function *n* - controller extension - output	1-bit	1,018	C, -, -, T, -
1-bit object for changing over the presence status of a room temperature controller. This object is only visible if "Function = presence function".					

Object no.	Function	Name	Type	DPT	Flag
381, 388	Presence function feedback	Disabling function *n* - controller extension - input	1-bit	1,018	C, -,W, -, U

1-bit object for receiving the presence status of a room temperature controller.

This object is only visible if "Function = presence function".

Object no.	Function	Name	Type	DPT	Flag
380, 387	Preset setpoint shifting	Disabling function *n* - controller extension - output	2 bytes	9,002	C, -, -, T, -

2-byte object for presetting a basic setpoint shift in Kelvin. The value "0" means that no shift is active . The values can be specified between -670760 K and 670760 K.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via offset (DPT 9.002)".

Object no.	Function	Name	Type	DPT	Flag
381, 388	Current setpoint shifting	Disabling function *n* - controller extension - input	2 bytes	9,002	C, -,W, -, U

2-byte object for receiving the feedback from the current basic setpoint shift in Kelvin.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via offset (DPT 9.002)".

Object no.	Function	Name	Type	DPT	Flag
380, 387	Preset setpoint shifting	Disabling function *n* - controller extension - output	1 bytes	6,010	C, -, -, T, -

1-byte object for presetting a basic setpoint shift. The value "0" means that no shift is active . The value is depicted in a two's complement in the positive or negative direction.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via levels (DPT 6.010)".

Object no.	Function	Name	Type	DPT	Flag
381, 388	Current setpoint shifting	Disabling function *n* - controller extension - input	1 bytes	6,010	C, -,W, -, U

1-byte object for receiving the feedback from the current basic setpoint shift.

This object is only visible if "Function = Setpoint shift" and "Type of setpoint shift = Via levels (DPT 6.010)".

16.4 Temperature measurement

Basic principles

The device possesses an integrated temperature sensor, using which the room temperature can be detected. Alternatively (e.g. if the device has been installed in an unfavourable location or in case of operation in difficult conditions, e.g. in a moist atmosphere) or additionally (e.g. in large rooms or halls), a second external sensor linked via bus telegrams can be used to determine the actual value.

The temperature measurement is activated on the "General" parameter page and configured on the "Room temperature measurement" parameter page.

When choosing the installation location for the device or the external sensors, the following points should be considered:

- The device or 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 devices and at least 1.5 m above the floor.

Temperature measurement and measured value determination

The device possesses an integrated temperature sensor. This temperature sensor can be used to measure the ambient temperature and forward it to a room temperature controller via the 2-byte object "Actual temperature".

The room temperature measurement can optionally be supplemented with an external sensor. The external sensor is linked to the device (for example a KNX room temperature controller) via the bus by means of the additional 2-byte communication object "External temperature".

The "Room temperature measurement by" parameter in the "Room temperature measurement" parameter node specifies the sensors to detect the room temperature. The following settings are possible:

- "internal temperature sensor"

  The temperature sensor integrated in the device is activated. Thus, the actual temperature value is determined only locally on the device.
- "Internal temperature sensor and external temperature

  With this setting the internal as well as the external temperature sensor is active. The external sensor must either be a KNX room temperature controller coupled via the "External temperature" 2-byte object or another bus device

with temperature detection.
When evaluating the internal and the external sensors, the real actual temperature is made up from the two measured temperature values. The weighting of the temperature values is defined by the "Creation of measuring value internal against external" parameter. Depending on the different locations of the sensors or a possible 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:

The device has been installed next to the entrance door (internal sensor). An additional external temperature sensor has been mounted on an inner wall in the middle of the room below the ceiling.
Internal sensor: 21.5 °C
Receiving temperature value: 22.3 °C
Determination of measured value: 30 % to 70 %

-> TResult internal = T internal · 0.3 = 6.45 °C,
-> TResult external = Texternal = 22.3 °C · 0.7 = 15.61 °C
-> TResult actual = TResult internal + TResult external = 22.06 °C

Transmission of the actual temperature

The determined actual temperature can be actively transmitted to the bus via the "Actual temperature"or "actual temperature not adjusted" 2-byte objects.

The room temperature can be transmitted to the bus either after a change in a parameterised temperature value or cyclically after a parameterised cycle time.

i The value "0" deactivates the transmission when room temperature changes and the cyclical transmission of the room temperature. If both parameters are set to zero, the room temperature is not transmitted to the bus.

Calibrating the measured values

In some cases during room temperature measurement, it may be necessary to adjust the single 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 "Calibration ..." parameter enables the temperature calibration to be calibrated in 0.1 K-levels. Thus, the calibration is only set statically once.

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 The "Actual temperature" object is always used to transmit the adjusted temperature value to the bus.
When determining the measured value using combined sensors, the two adjusted values are used to calculate the actual value.

16.4.1 Table of parameters

"General" parameter page

Temperature measurement	Active **Inactive**
This parameter activates the temperature measurement. Additional parameters and objects become visible.	

"Room temperature measurement" parameter page

Room temperature measurement using	**internal temperature sensor** Internal temperature sensor and external temperature
The "Room temperature measurement using" parameter specifies the sensors to detect the room temperature. "internal temperature sensor": The temperature sensor integrated in the device is activated. Thus, the actual temperature value is determined only locally on the device. In this configuration, the feedback control will start directly after a device reset. "Internal temperature sensor and external temperature": This setting is used to combine the selected temperature sources. The external temperature is received via the "External temperature" 2-byte object.	

Determination of measured value from internal / external ratio	10% to 90% 20% to 80% 30% to 70% 40% to 60% **50% to 50%** 60% to 40% 70% to 30% 80% to 20% 90% to 10%
The weighting of the measured temperature value for the internal and external 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 with "Room temperature measurement using = internal sensor and external temperature"!	

Internal sensor calibration	-12.8...**0**...12.7
Determines the value in Kelvin by which the internal sensor’s measured value is adjusted. This parameter is only visible when the temperature detection system requires an internal sensor.	

Transmission after room temperature change by	0...**0.2**...25.5
Determines the size of the value change of the room temperature in Kelvin after which the current value is automatically transmitted to the bus via the "Actual temperature" object. If set to "0", the actual value will not be transmitted to the bus depending on a room temperature change.	

Cyclical transmission of room temperature	0...**15**...255
This parameter specifies whether and at what time in minutes the determined room temperature is to be periodically output via the "Actual temperature" object. If the setting is "0", the current room temperature will not be transmitted cyclically to the bus.	

16.4.2 Object list

The name of the following objects can be specified by the parameter "Name of the room temperature measurement".

Object no.	Function	Name	Type	DPT	Flag
441	Actual-temperature	Room temperature - output	2 bytes	9,001	C, -, -, T, -
2-byte object for displaying the actual temperature (room temperature) determined internally. Possible value range: -99.9 °C to +99.9 °C / Measuring range of internal temperature sensor: -40 °C to +125 °C. The temperature value is always output in the format "°C".					

Object no.	Function	Name	Type	DPT	Flag
442	External sensor	Room temperature - input	2 bytes	9,001	C, -,W, -, U
2-byte object for coupling an external KNX room temperature sensor or a controller extension. Thus cascading of multiple temperature sensors for room temperature measurement. Possible range of values: -99.9 °C to +99.9 °C. The temperature value must always be specified in the format "°C".					

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